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Cover image: Darren Doyle

Glossary, acronyms and abbreviations

ARKS	Areas of Regional Koala Significance
APZ	Asset Protection Zone
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BOS	Biodiversity Offset Scheme
BDAR	Biodiversity Development Assessment Report under NSW BC Act
CKPoM	Comprehensive Koala Plan of Management
Council	Armidale Regional Council
DA	Development Application
DBH	diameter at breast height
DCP	Development Control Plan
DPIE	Department of Planning, Industry and Environment
DAWE	Commonwealth Department of Agriculture, Water and Environment
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
the Guideline	Koala Habitat Protection Guideline
IUCN	International Union for Conservation of Nature
KTP	Key Threatening Process under the NSW BC Act
LEP	Local Environment Plan
LGA	Local Government Area
LLS Act	NSW <i>Local Land Services Act 2013</i>
NPW Act	NSW <i>National Parks and Wildlife Act 1974</i>
NPWS	National Parks and Wildlife Services
NSW	New South Wales
NTKRS	Northern Tablelands Koala Recovery Strategy
PCT	Plant Community Type

the Strategy	Koala Management Strategy
SAT	Spot Assessment Technique
SEPP 2019	State Environmental Planning Policy (Koala Habitat Protection) 2019
SEPP 2020	State Environmental Planning Policy (Koala Habitat Protection) 2020
SEPP 2021	State Environmental Planning Policy (Koala Habitat Protection) 2021
SIS	Species Impact Statement under the NSW Biodiversity Conservation Regulation 2017
SNELC	Southern New England Landcare
SOS	Saving Our Species Fund
TfNSW	Transport for New South Wales
ToS	Test of Significance under the EP&A Act
WIRES	NSW Wildlife Information, Rescue and Education Services

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1 Introduction

The koala (*Phascolarctos cinereus*) is an iconic Australian marsupial. The koala population's decline in abundance and distribution leaves the species vulnerable to extinction under the New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act), the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species.

Armidale Regional Council (Council) is within the New England and Northern Tablelands region and covers an area of 8,621 km² (Figure 1). The Northern Tablelands region has been identified as an important area for the future of koalas. A number of koala studies have been undertaken in the Northern Tablelands region with funding from the Department of Planning, Industry and Environment (DPIE) and Northern Tablelands Local Land Services (LLS). The Saving our Species Iconic Koala Project 2017-2021: Securing Koalas in the wild for the next 100 years (SOS Iconic Koala Project) sets out broad conservation actions for koalas across NSW. In the 2020-21 financial year, the Northern Tablelands Koala Conservation Project was partly funded by the SOS Iconic Koala Project. Council is also part of the Northern Tablelands Koala Recovery Strategy 2015-2025 (NTKRS) along with five other local governments; Inverell, Tenterfield, Glen Innes Severn, Uralla and Walcha (Hawes et al. 2016). As part of the NTKRS, the LLS Cool Country Koala Project 2018-2019 delivered baseline knowledge of koala distribution and abundance within the Northern Tablelands region (Carr et al 2017 and Cristescu et al. 2019). Additionally, mapping of koala priority areas and usage patterns including ongoing koala tracking projects have and are being undertaken around Armidale (Carr 2020). Before these studies, koalas' distribution and status in the Northern Tablelands was poorly understood (Hawes et al. 2016). Enhanced understanding of koala populations will allow the Armidale community to deliver better strategic conservation decisions for koalas and koala habitat in the region.

The timing and development of this Koala Management Strategy has been complicated by the NSW Government's recent repeal of the State Environmental Planning Policy (Koala Habitat Protection) 2019 (SEPP 2019) in November 2020. SEPP 2019 was replaced by State Environmental Planning Policy (Koala Habitat Protection) 2020 (SEPP 2020) which replicates the objectives and provisions of the former State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44). This includes the processes for preparing koala plans of management, determining whether land contains potential or core koala habitat and determining development applications associated with core koala habitat.

As of 17 March 2021, the Koala SEPP 2021 reinstates the policy framework of SEPP Koala Habitat Protection 2019, with the Koala SEPP 2020 applying to Primary Production, Rural Landscape or Forestry areas outside the Sydney Metropolitan Area and Central Coast.


This Koala Management Strategy has been strongly guided by the intent of SEPP 2019 regarding the definitions of koala habitat including alignment with the draft Koala Habitat Protection Guideline (not adopted) (DPIE 2019a). It is understood that the NSW government is proposing to prepare a new Koala SEPP in 2021, however, at this time there are no guidelines or provisions as to what might be included in the policy.




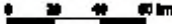
Figure 1: New England Tablelands and Armidale LGA

Armidale Regional Council
Koala Management Strategy

Armidale LGA boundary
 New England Tablelands boundary
 Towns


Job number: PR5838
Date: 22/02/2021





 GDA 1994 MGA Zone 56
 Projection: Transverse Mercator
 Datum: GDA 1994
 Units: Meter

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1.1 Purpose

The purpose of this Koala Management Strategy (hereafter called the Strategy) is to encourage the conservation, management and rehabilitation of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range in Armidale local government area (LGA). Combined with other initiatives across the state the intent is to reverse the current trend of koala population decline.

This Strategy is guided by the planning principles in the draft Koala Habitat Protection Guideline (the Guideline) which are:

1. Understand and identify areas of habitat that meet the definition of core koala habitat and other habitat values (including habitat linking areas and underutilised koala habitat).
2. Avoid inappropriate land uses or intensifying land uses in koala habitat areas through appropriate landscape planning.
3. Encourage the proper conservation and management of areas of natural vegetation that provide core habitat or likely habitat for koalas.
4. Minimise potential impacts to koalas and their habitat through design that avoids fragmentation or direct loss of koala habitat and maintains the function of koala habitat.
5. Implement best practice measures to manage identified threats, particularly bushfire and drought in the prevailing climate, to koalas and their habitat.
6. Use compensatory (i.e. offsetting) measures only where they can be shown to meet the aim of the Strategy.
7. Use adaptive management strategies to monitor, evaluate and deliver appropriate planning outcomes for koalas in the Armidale region.

1.2 Strategy aims

Within the Armidale LGA, there are two areas (Precinct 1 and 1a, and Precinct 2) where this Strategy will apply (Figure 2). The main aims of the Strategy are to:

- identify areas of protection that meet the definition of core koala habitat that are on private or public land (excluding state forests and national parks)
- identify areas with other habitat values (i.e. habitat linkages, impact buffers, areas sufficient for population expansion or recovery, underutilised koala habitat that koalas may move into)
- provide management recommendations for planning frameworks for the Local Environmental Plan (LEP) and Development Control Plan (DCP)
- establish a landholder education program including awareness of koalas, habitat management, rehabilitation and koala corridor management in Precinct 2

- identify key threatening processes
- establish procedures to secure and manage koala populations into the future
- specify requirements for land use/activity assessment inside and outside core koala habitat and areas with other habitat value
- provide the next steps for Council in management of koala habitat and strategic planning.

The existing land uses within Precinct 1 and 1a are provided in Figure 3. Precinct 2 is predominantly zoned Primary Production of which Council has planning control over the use of land, subdivision and building development in this zone.

Whilst Precinct 1a, as shown in Figure 2, overlaps part of Uralla Shire Council LGA, this Strategy does not apply to that area.

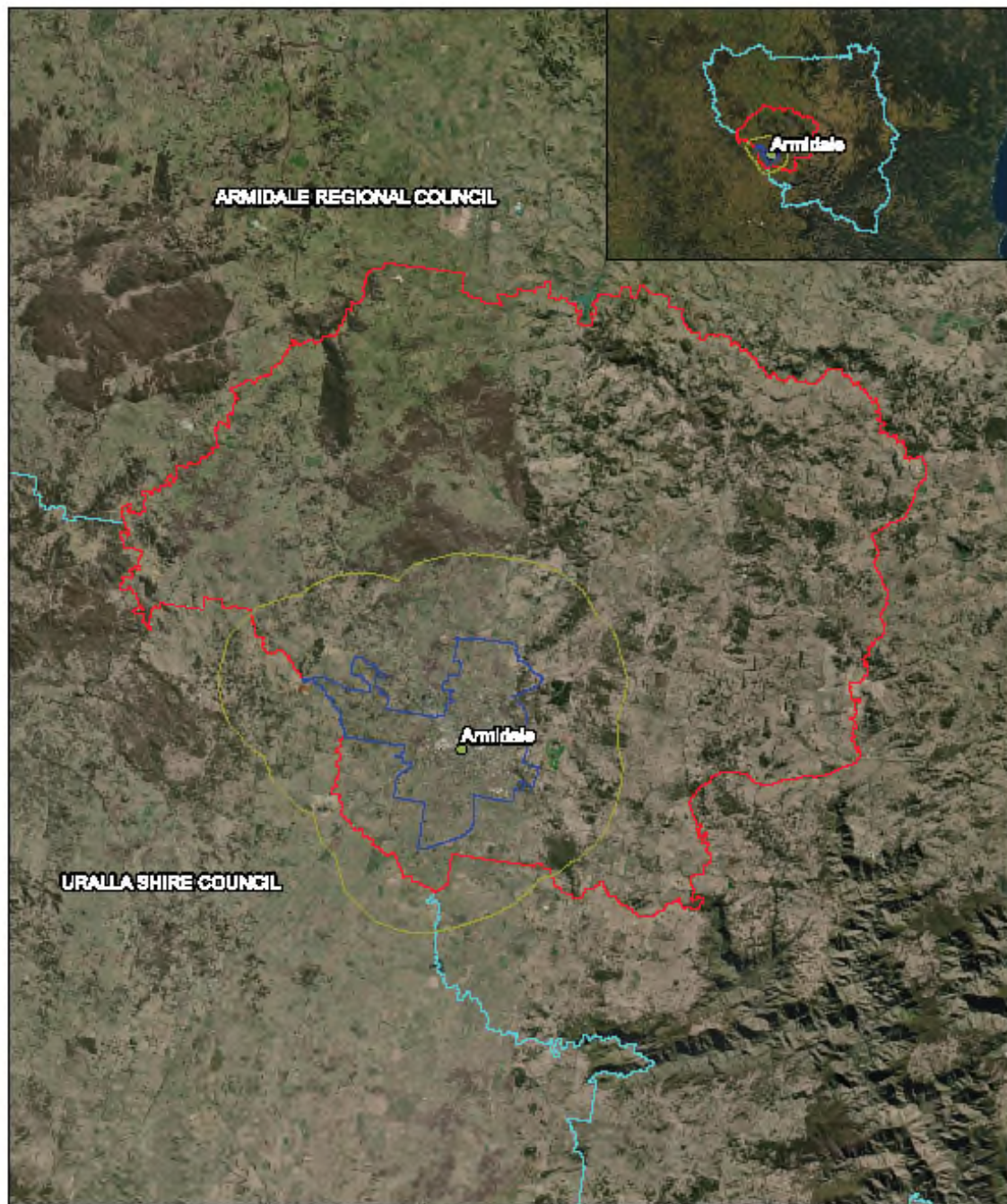


Figure 2: Precincts 1, 1A and 2

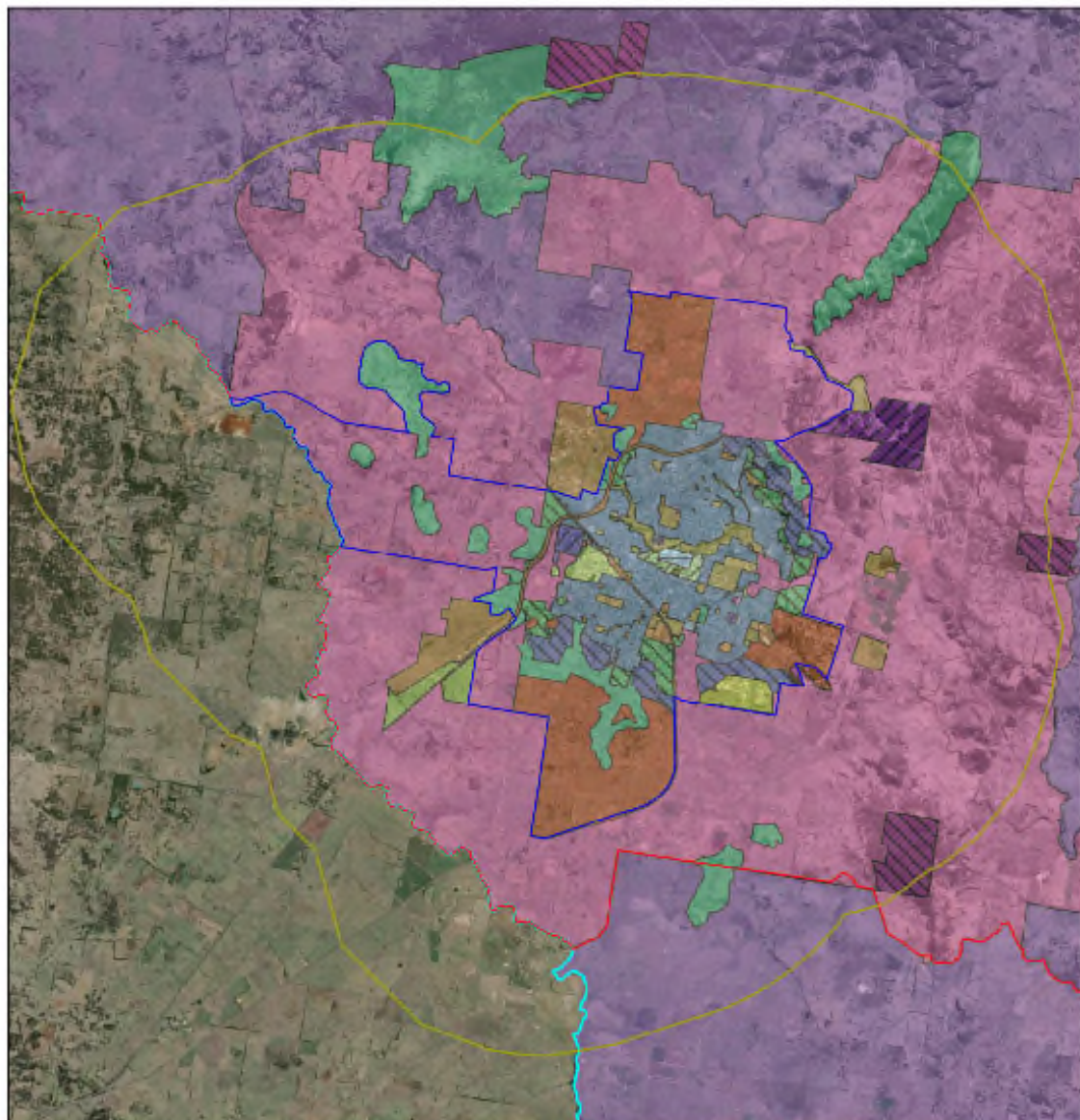
Armidale Regional Council
Koala Management Strategy

- Precinct 1
- Precinct 1A
- Precinct 2
- Armidale LGA boundary

Job number: PR5858
Date: 09/03/2021

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
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Land zoning			
Business Development	Environmental Management	Large Lot Residential	National Parks and Nature Reserves
Business Park	Forestry	Light Industrial	Primary Production
Commercial Core	General Industrial	Local Centre	Primary Production Small Lots
Environmental Living	General Residential	Low Density Residential	Private Recreation
	Infrastructure	Mixed Use	Public Recreation

Figure 3: Precinct 1 and land zones

Armidale Regional Council
Koala Management Strategy

	Precinct 1
	Precinct 1A
	Precinct 2
	Armidale LGA boundary

Job number: PR5858
Date: 06/03/2021

0 1 2 3 km

GDA 1994 MGA Zone 58
Projection: Transverse Mercator
Datum: GDA 1994
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1.3 Legislative context

Appendix 1 provides an overview of the legislation relevant to the operation of this Strategy and which relate to the management and conservation of koalas and their habitat in the Armidale LGA.

1.4 Limitations of methodology

This Strategy has utilised methods in accordance with best practice and incorporates the provisions in SEPP 2019 and SEPP 2020. Future legislative changes (e.g. SEPP 2021) have not been considered in the development of this strategy, any future changes to legislation may require a revision of this strategy.

1.5 Koala ecology and status in the Armidale region

1.5.1 Koala ecology

Koalas are mostly nocturnal and usually arboreal, feeding almost exclusively on *Eucalyptus* leaves. Koalas are solitary, living up to 12 years in the wild, much longer in captivity. They are distributed along the east coast of Australia, Queensland, NSW, Victoria and South Australia. As marsupials, they give birth after 34-36 days gestation, where the young joey then grows in the pouch for another six months. They are capable of moving around on the ground where they are vulnerable to fire and attack from predators.

1.5.2 Home range

Koalas are solitary living in a network of overlapping home ranges, allowing contact between individuals for mating. Koalas in the Northern Tablelands areas are generally sparsely distributed with home range reflecting the resource ability for required food, shelter and space for successful reproduction. As a result, a relative abundance of healthy large food and shelter trees allows koalas to have smaller home ranges than would an area with less resources (Callaghan et al. 2011). In one study (Heinz 1999) koalas within the Northern Tablelands strategy area recorded home ranges of 35-50 ha, varying in size between summer and winter. In the recent north Armidale radio tracking project koalas were found to have home ranges from 1-4 km² (ie >100ha) (Carr 2020).

Males have larger home ranges encompassing several female home ranges. They mate in spring. Males begin mating at three to four years of age, whereas females begin, and can breed, when they are two years of age, generally giving birth to one or two joeys once per year, for the next 10 to 15 years. The young are weaned at 12 months when it takes up its own home range overlapping the mother. At two to three years these young disperse (often many kilometres) to take up a new home range (McAlpine et al. 2007, Dique et al. 2004).

1.5.3 Diet

The koala is a folivorous arboreal marsupial primarily restricted to eucalypt woodlands and

forests containing their preferred food tree species (Lee & Martin 1988). Within a given area only a few of the available eucalyptus species will be preferentially browsed, while others, including some non-eucalypts, may be incorporated into the diet as supplementary browse and/or utilised for other purposes (Lee & Martin 1988; Hindell & Lee 1990; Phillips 1990; Callaghan & Thompson 2000; Phillips & Callaghan 2000). Koalas will preferentially use trees between 33-97 cm diameter at breast height (DBH) but will also use larger trees 60-90cm DBH (Roberts 1998; Heinz 1999 in Hawes 2016).

Due to their highly specialised diet, food availability is a key determinant of high koala habitat quality (Moore & Foley 2000).

Koalas can exhibit preference for particular foraging trees from a group of the same species which may also vary between seasons. Carr (2020) found that individual koalas have a strong preference for food tree species which may be completely different to other koalas in the same area which may limit interactions between koalas. New foliage, leaf moisture and the palatability of young and old trees contributes to foliage selection (Reckless et al. 2017). High nutrient soils affecting palatability of the leaves, forest area and landscape configuration are also considered to be involved (McAlpine et al. 2007). Better quality habitat for koalas is considered to be in lower elevation alluvial soil plains, which coincides with areas that have been historically cleared for agriculture or grazing (Cristescu 2019; Hawes et al. 2016).

Altered water regimes from agricultural practices have changed water availability and led to the death of eucalypt and acacia woodlands, further reducing the suitability of available food and shelter trees (McAlpine et al. 2009). It was previously believed koalas rarely drink water with observations of drinking in captivity considered 'unusual' or koalas seen drinking from pools or water bottles attributed to heat stress. However, a recent study revealed koalas were observed (44 records) to drink by licking trees during or immediately after rain even when free standing water was available. It is likely this behaviour has probably gone unnoticed because observations are rarely undertaken during heavy rainfall (Blake 2020).

Field surveys by Carr et al (2017) and Cristescu et al. (2019) found koalas in the Northern Tablelands were using (i.e. including shelter trees) 35 different tree species; the most common included *Eucalyptus caliginosa*, and *E. blakelyi*. Hawes (2016) identified 14 preferred koala food trees in Armidale. A list of the likely primary and secondary feed trees for the Armidale area (Table 1) takes into consideration the SEPP 2019 koala tree species (Appendix 5) and previous studies for the region.

Table 1 Koala feed trees in Armidale (Source: DPIE 2020a, Carr et al 2017, Cristescu et al 2019; Hawes et al 2016)

Primary species	Secondary species
<i>Eucalyptus acaciiformis</i> (Wattle-leaved Peppermint)	<i>Angophora floribunda</i> (rough-barked apple)
<i>Eucalyptus blakelyi</i> (Blakely's red gum)	<i>Angophora subvelutina</i> (Broad-leaved Apple)
<i>Eucalyptus bridgesiana</i> (apple box)	<i>Eucalyptus banksii</i> (Tenterfield woollybutt)
<i>Eucalyptus caliginosa</i> (New England stringybark)	<i>Eucalyptus dalrympleana</i> (subsp. heptantha) (mountain white gum)
<i>Eucalyptus melliodora</i> (yellow box)	<i>Eucalyptus laevopinea</i> (silver-top stringybark)
<i>Eucalyptus nicholii</i> (narrow-leafed black peppermint)	<i>Eucalyptus macrorhyncha</i> (Red Stringybark)
<i>Eucalyptus radiata</i> (Narrow-leafed Peppermint Gum)	<i>Eucalyptus michaeliana</i> (Hillgrove gum)
<i>Eucalyptus stellulata</i> (black sally)	<i>Eucalyptus moluccana</i> (grey box)
<i>Eucalyptus viminalis</i> (ribbon gum)	<i>Eucalyptus nobilis</i> (forest ribbon gum)
<u><i>Eucalyptus youmanii</i> (Youman's stringybark)</u>	<i>Eucalyptus notabilis</i> (mountain mahogany)
	<i>Eucalyptus nova-anglica</i> (New England peppermint)
	<i>Eucalyptus obliqua</i> (messmate)
	<i>Eucalyptus pauciflora</i> (white sally snow gum)
	<i>Eucalyptus prava</i> (orange gum)
	<i>Eucalyptus retinens</i> (Hillgrove box)
	<i>Eucalyptus tereticornis</i> (forest red gum)

1.5.4 Koala status in Armidale region

The Northern Tablelands region has been identified as an important area for the future of koalas, with Armidale being described as having a robust koala population (Carr et al 2017, Cristescu et. al. 2019) and estimated to contain 5-10% of the NSW population (Rennison & Fisher 2019). Further to this, Adams-Hoskings et al. (2016) identified the New England Tablelands as the only bioregion on the east coast of Australia with evidence of a stable population from both expert elicitation and records trend data. The study concluded this may be due to the reduced population and development pressures on koalas in the Armidale region compared to those populations on the coast. Similarly, the cooler tablelands may also help koalas avoid heat extremes associated with a changing climate (Adam-Hoskings et al. 2016).

Council has had an online Koala Sightings Register operating since 2010. There are several clusters of koala sightings around Armidale in Precinct 1. Common sightings are in the northwest including the University of New England grounds, northeast around Rockvale Road and the Archery Reserve, and to the south, near the cemetery and Bona Vista Road. In

Precinct 1a, koala sightings exist in the northwest region around Duval Nature Reserve and Dumaresq Dam Road and to the south in the Imbota Nature Reserve. It should be noted that this data from the Koala Sightings Register may contain observation bias as records coincide with human populated centres, concentrated along roads and on cleared land where koalas are most likely to be observed.

1.5.5 Collaboration and research

Numerous collaborative and research projects have been ongoing in the region in the last five years. The Northern Tablelands Koala Conservation Project is being part-funded by the SOS Iconic Koala Project. Council is a part of the Northern Tablelands Koala Project Partnership which includes the NSW DPIE, Northern Tablelands Local Land Services, Uralla Shire Council, Southern New England Landcare and local ecologists. In order to deliver a range of conservation and engagement programs in the region, a Koala Conservation Project Officer has been employed through Southern New England Landcare, whom Council will work with to share in kind resources.

Council is also part of the Northern Tablelands Koala Recovery Strategy 2015-2025 (NTKRS) along with five other local governments; Inverell, Tenterfield, Glen Innes Severn, Uralla and Walcha (Hawes et al. 2016). From the NTKRS, the Cool Country Koala Project 2018-2019 and 2019-2020, delivered baseline knowledge of koala distribution and abundance across the Northern Tablelands (Carr et al 2017, Cristescu et al. 2019; Shultz et al. 2020). Additionally, mapping of koala priority areas and usage patterns including ongoing koala tracking projects have and are being undertaken around Armidale (Carr 2020).

DPIE's SOS Iconic Koala Project also funded a study which identified Areas of Regional Koala Significance (ARKS) and priority threats to key koala populations through mapping areas of koala occupancy which were at a risk of decline (DPIE 2020b). The New England Tableland bioregion supports two ARKS, Armidale and Severn River Nature Reserve. The "Blinky Drinkers" project, funded by DPIE, installed eight koala 'blinky drinkers' in targeted known koala habitat areas affected by drought and the summer bushfires in 2019. Wildlife cameras were also installed on four of the 'koala drinkers' to determine what came to the 'koala drinkers' and how often they were used.

In a 2015-17, Quollity Koala Corridors and Questions Project, a Southern New England Landcare (SNELC) and Citizens for Wildlife Corridors project funded by the NSW Environmental Trust, surveyed eleven properties in the corridor between Dangars Falls and Tilbuster during the 2015-16 summer. As a result, nine of these properties revealed evidence of recent koala activity, or the actual presence of at least one koala. In June 2017, landholders of the eleven properties surveyed in 2015-16 were contacted to follow-up on 'citizen surveys' for koalas during the 2016-17 period. Four landholders reported sightings of koalas (SNELC 2016). As part of this project landholders will rehabilitate 18 sites on 11 properties in this corridor.

Research gaps in the Northern Tableland studies and others in NSW include:

- koala usage/occupancy across the entirety of the landscape, outside existing project areas;
- seasonal or temporal changes in feed/shelter tree selection (Hawes 2016);
- whether food tree specificity is restricting dispersal of koalas to all available, but unoccupied, habitat;
- use of and dispersal across non-feeding habitat such as Travelling Stock Routes (Shultz 2020);
- minimum habitat patch size;
- genetic information including source populations (Shultz 2020);
- cumulative impact of threats (including drought and heat stress);
- identification of climate refugia (OEH 2019).

1.6 Threats to koalas in Armidale region

Threats to koala populations have a range of spatial scales, ranging from continental (e.g. climatic influences) to site level (e.g. vehicle strike and habitat loss). The influence of scale is important to recognise when addressing threatening processes in order to direct the right kind of mitigating actions.

It is well established that the most rapid declines in koala populations in NSW have been in high-density urban and remnant populations which have experienced rapid conversion from rural to urban environments (McAlpine et al. 2006; Adams–Hosking 2017).

There are eight key threats to koala identified in this strategy including, habitat destruction, road mortality, disease, bushfire, human induced climate change including drought, dog attack, injuries from livestock and drowning in swimming pools. These are detailed further in the sections below. These threats were assessed in the Framework for the Spatial Prioritisation of Koala Conservation Action in NSW (DPIE 2020b) and were assigned to four risk rank categories as defined in Table 2.

Table 2 Threat risk categories for ARKS (Source: DPIE 2020b)

Area risk rank	Criteria	Description
Very High	Top 25% of risk range	The threat category has an overwhelming influence on koala persistence in the area.
High	Top 50% of risk range	The threat category has a marked influence on koala persistence in the area.
Moderate	Lower 50% of risk range	The influence of the threat category in the area is noticeable, but not prevalent in the area.
Low	Lower 25% of risk range	The threat category is absent, or insignificant in the area.

Using the Armidale ARKS regional scale assessment, local studies and local expert opinion, the eight threats were assigned to the following risk categories:

- high risk - habitat destruction and climate change (including drought, heat stress, large scale bushfires)
- moderate risk - disease, roads and bushfire
- low risk - dog attack, injuries from livestock and drowning in swimming pools.

1.6.1 Habitat destruction, fragmentation and degradation

Although extensive clearing and modification of native vegetation has occurred historically within the Northern Tablelands, habitat loss is an ongoing issue and was identified as the key threat to the persistence of the Northern Tablelands koala population (DECC 2008) as well as being a key threatening process under both the BC Act and EPBC Act. The ARKS profile considered fragmentation to be a high threat risk in Armidale (DPIE 2020b).

Land clearing is often focused disproportionately on flatter, more fertile areas, which constitute high quality habitat for koalas. As koala habitat is reduced, koala population sizes will decline, and the likelihood of local extinction is increased.

In the Armidale LGA, the proposed changes north of Rockvale Road, west of the highway bypass and south around Kelly's Plains Road and Translator Hill, is likely to reduce and fragment koala habitat in these areas if not protected. This impact will include:

- Direct loss of core and supporting habitat due to residential and road infrastructure development.
- Potential fragmentation of habitat from road upgrades on principal roads and new roads and development.

The distribution of koalas within their entire population range is not continuous due to habitat fragmentation, and has led to isolated subpopulations, with likely lower genetic diversity (Reckless et al. 2017). Ensuring habitat linkages remain intact is critical for dispersal of individuals and maintenance of genetic diversity within the population. Actions to prevent habitat loss or fragmentation include covenanting properties, voluntary conservation agreements, land acquisition, revegetation (planting) and restoration of existing degraded habitats through weed management.

Spatially mapping threats to koalas including clearing of vegetation, mining exploration, urban expansion areas or changes to zoning can help understand the scale of and where the threat may be highest.

1.6.2 Disease

Disease has been identified as a driver of the decline of some koala populations (Brown et al 1987; Rhodes et al 2011; Kollipara et al. 2013). Koala are susceptible to several diseases, however the main threat is infection by bacteria of the genus *Chlamydia*, or *Chlamydiosis*,

which occurs in most wild koala populations (Polkinghorne et al. 2013). Two species of *Chlamydia*, *C. pneumonia* and more commonly, *C. pecorum*, have been identified in koala populations (Kollipara et al. 2013; Devereaux et al. 2003). Wildlife Information, Rescue and Education Service (WIRES) advise that 50% of koalas coming into their care show signs of Chlamydiosis (Hawes 2016). Both the Northern Tablelands Wildlife Carer group and WIRES cite the majority of the deaths of rescued koalas has been from illness resulting in 'poor condition'. According to care groups, *Chlamydia* is the major illness affecting the local koala population, mortality often results from stresses due to *Chlamydia* or Lymphoma (pers. comm. Des Anderson 2021, 26 March). The ARKS profile considered disease to be a moderate threat risk in Armidale (DPIE 2020b).

Chlamydiosis is a debilitation disease, causing elevated rates of infertility and mortality (Hanger & Loader 2009); and is likely to be influenced when exposed to environmental stressors such as habitat loss and fragmentation (Brearley et al. 2012, Rhodes et al. 2011), and harassment by predators, nutritional and climatic stress, or overcrowding (Phillips 1997, Melzer et al. 2000, Phillips 2000, Lunney et al. 2012). Whilst the current antibiotic treatments for koalas are improving and producing fewer side effects, recent research also shows promising signs for a *Chlamydia* vaccine (Phillips et al. 2020a). Despite this, the understanding of the threat posed by disease, and its interaction with other threats, is still poorly understood.

1.6.3 Road mortality

Determining a clear number of koalas injured or killed by vehicles is problematic because many are likely to go unreported. However, vehicle strike is frequently one of the most reported causes of injury and death by wildlife rehabilitation groups and is considered a key threat to NSW koalas (OEH 2018). Local wildlife care groups consider roadkill as the second most common cause of injury or death. Northern Tablelands Wildlife Care group noted that the animal corridor, tunnel and barrier fence significantly reduced injury and death at "Devil's Pinch" 20km north of Armidale on the New England Highway (pers. comm. Des Anderson 2021, 26 March). The ARKS profile considered vehicle strike to be a moderate threat risk in Armidale (DPIE 2020b).

Road-associated koala mortality is influenced by a variety of factors. Vehicle speed, high traffic volume, road verge width, road fencing, availability for fauna crossings (e.g. culverts) or season (i.e. breeding season) may increase the probability of koala vehicle strike (Dique et al. 2003). Wildlife vehicle strike tends to occur in specific locations or 'hotspots' (DPIE 2020c), where roads cut through koala habitat.

Construction of road and residential infrastructure are likely to increase traffic volume, resulting in greater risk of vehicle-collisions for koalas in areas proposed for development in Armidale. A range of structures and mechanisms can be implemented to help keep koalas off roads as well as change driver behaviour.

Further information on roads and mitigating impacts on koalas can be sourced on the NSW Koala Country website at

<https://koala.nsw.gov.au/resources/>

1.6.4 Bushfire

The 2019-2020 fire season was one of the worst recorded in history for eastern Australia. According to the IUCN, bushfires are listed as the predominant threat associated with koalas (Woinarski & Burbidge 2016 in Charalambous & Narayan 2020). The ARKS profile considered wildfire to be a moderate threat risk in Armidale (DPIE 2020b).

Following the extensive bushfires of the summer of 2019-2020 koala populations and numbers across NSW and other states have been severely affected, with the recent NSW Parliamentary Inquiry finding that at least 5,000 koalas died in the bushfires (DPIE 2020d; NSW Government 2020). Large and intense wildfires that burn into the canopy kill koalas either through direct flame contact or inhalation of smoke and ash, however there is some evidence that koalas can survive high intensity fires by seeking refuge in riparian areas, gorges, rocky outcrops or wombat burrows (DPIE 2020b).

The 2019-2020 fire ground included over 3.5 million hectares, or 25%, of the most suitable koala habitat in eastern NSW. This includes moderate, high and very high suitability habitat. Koala regions with the greatest percentage of the best koala habitat in the fire ground are the North Coast, Central and Southern Tablelands, Central Coast and the South Coast. The Northern Tablelands had 34% of its koala habitat within the fire ground (DPIE 2020d) and Armidale LGA was burnt across 214,365 ha or 27% of the LGA (Figure 4). Overall, the New England Tablelands lost 7.31% of its koala population due to fire since October 2019 (Lane et al. 2020).

Hazard reduction burns too, are a risk to koalas if not properly managed, with fire intensity driven fragmentation resulting in disjunct populations (Phillips et al 2020). Reinstating cultural burning practices may minimise the risk of catastrophic wildfires which creates healthier more productive landscapes for animals (Allam 2020).

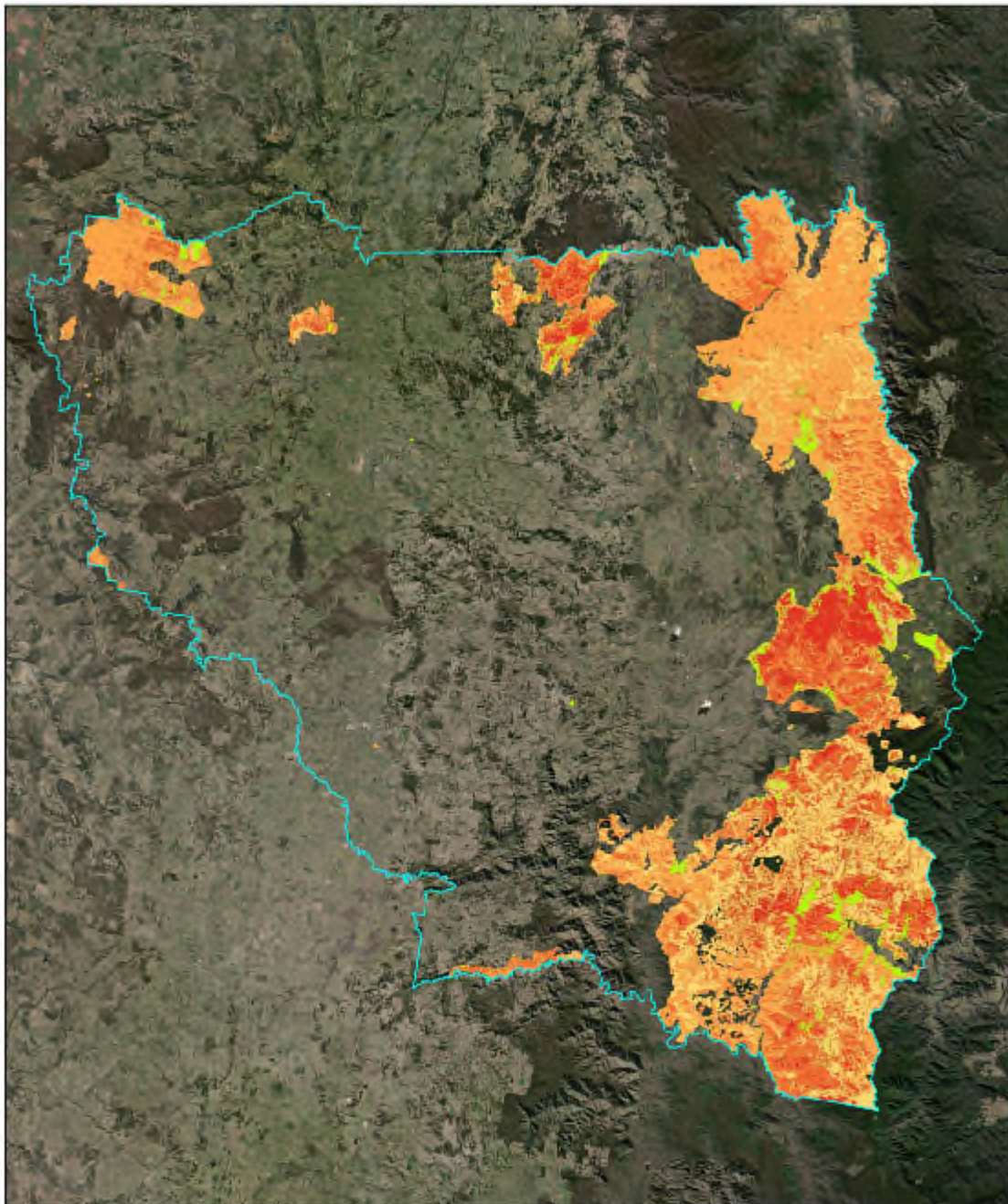


Figure 4: Bushfire burnt areas (2020)

Armidale Regional Council
Koala Management Strategy

Armidale LGA boundary	Medium
Data n/a	High
Low	Very high
	Not native vegetation

Job number: 2015876
Date: 09/01/2021

Scale: 0 5 10 20 km

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Metres

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1.6.5 Human induced climate change, including drought

Climate change is recognised as an emerging threatening factor for koalas. Higher temperatures are associated with heat stress events, increases in fire occurrence, reduced relative humidity or drought. Drought or wildfire followed by weed invasion all contribute to changes in habitat structure and quality.

Temperature is a major factor in koala viability because they are limited in their capacity to cope with very hot days. Animals also stop eating in very hot weather to avoid heat stress or come to the ground to drink directly making them susceptible to predation (Crowther et al. 2014; Degabriele and Dawson 1979 in Reckless et al. 2017).

Koala mortality during heatwaves can be minimised where habitat quality is high such as riparian and drainage lines. *Eucalyptus viminalis*, *E. camaldulensis* and *E. tereticornis* are all key koala refugia species for climate change adaption based on predicted distributions (Gordon et al. 1988 in Reckless et al. 2017).

Trees utilised for roosting and shelter may also differ from those used for diet (Reckless et al. 2017). This is important when considering management for climate change adaption, as high-quality habitat is essential in refugia or corridors to help koalas cope with associated heat, humidity or drought.

Detailed studies of the impact of climate change on the chemical composition of tree species preferred by koalas are now warranted to guide future local revegetation strategies and to better assess areas for koala conservation in the future (Reckless et al. 2017). Modelling studies suggest the distributions of other favoured food species, such as *E. viminalis*, *E. populnea* and *E. tereticornis*, will likely contract eastwards and southwards, and have a fragmented distribution by 2070 (Adams-Hosking et al. 2012).

Drought affected dieback (where deterioration in the canopy can result in death of trees) is regularly reported to the Armidale Tree Group, from areas such as Gara, near Imbota Nature Reserve, west of Uralla and Rockvale (Carr 2017); these represent areas in Precinct 2 of the Strategy. In a community survey conducted by the NTLLS, the following species were reported as most affected by dieback: yellow box (*Eucalyptus melliodora*), Blakely's red gum (*Eucalyptus blakelyi*), New England peppermint (*E. nova-anglica*), New England stringybark (*Eucalyptus caliginosa*), black sallee (*Eucalyptus stellulata*) and white gum (*Eucalyptus viminalis*), all significant koala feed trees.

Mitigating the impacts of climate change is not directly considered as part of this Strategy however, a monitoring program should assist to identify any impacts of climatic events on koala populations.

The ARKS profile considered climate change to be a low threat risk in Armidale (DPIE 202a). Despite this valuation, the effects of anthropogenic climate change combined with other threats has been modelled (Briscoe et al. 2016 and OEH 2016b in Reckless et al. 2017) and shows significant, possibly severe, reduction in the suitability of habitat across NSW. However, this modelling also found New England Tablelands to be key refugia for the state.

1.6.6 Dog attack

Wild dog or domestic dog attacks on koalas can be a major threat to koalas. At regional scale the ARKS profile for Armidale considered dog attack to be a high threat risk (DPIE 2020b). At a state-wide level an analysis of dog attack data from the NSW BioNet (post 1990) showed that 80% of recorded dog attacks occurred within and around 200 m of urban, large lot residential and rural small holdings zoned land.

Although koalas can defend themselves, attacks are likely to come from larger dogs (>10kg) or by more than one dog. Dog bites may not always be visible on a koala, with internal damage or infection hidden by their fur.

There are numerous campaigns designed to build awareness in communities about how to protect koalas, including making properties koala friendly and ensuring pets are kept responsibly within key koala areas. Further information on management of dogs and koalas can be sourced on the NSW Koala Country website at

<https://koala.nsw.gov.au/resources/>

1.6.7 Drowning in swimming pools

An increase in residential suburban space near koala habitat, exacerbated by habitat loss and fragmentation, will cause koalas to travel across the residential landscape more frequently. Although limited data exists for this threat and is likely to be a low risk, the risk of koalas drowning in residential pools increases as building densities increase and cannot be disregarded.

Koala friendly community campaigns should include information regarding pool construction, fencing and escape mechanisms.

1.6.8 Injuries from livestock

Injury and mortality from cattle or horses has been reported by veterinarians, farmers and wildlife carers. Cattle trampling of koalas was considered quite common around northern NSW, with eight killed in the last 15 months (Rebgetz 2017); one koala rescuer comparing it to the frequency of dog attacks (Mitchell-Whittington 2017).

It is thought when koalas source water from farm dams and water points shared with livestock they maybe susceptible to head tosses or kicks from cattle or horses (D Anderson 2021, pers. comm. 23 March). Another veterinarian suggests that cattle may confuse koalas with a threat like a small dog (Mitchell-Whittington 2017).

2 General provisions

2.1 Name of the strategy

This document is called the Armidale Koala Management Strategy 2021.

2.2 Application of the strategy

This Strategy was adopted by Armidale Regional Council at its Ordinary Council Meeting on the 23rd June 2021. It was approved by the Stakeholder Group on the 28th June 2021.

Land to which the strategy applies

This Strategy applies to private or public land (excluding state forests and national parks) within the Armidale LGA demarcated as:

- Precinct 1
- Precinct 1a (5 km buffer area outside Precinct 1)
- Precinct 2 (predominantly zoned RU1 [Primary Production under the Armidale Dumaresq LEP]) (Figure 2).

2.3 Koala habitat mapping

Koala habitat mapping was undertaken using Plant Community Type (PCT) mapping with vegetation communities (PCTs) containing koala food tree species identified as koala habitat. The PCT mapping was sourced from DPIE (date 2015), as no PCT data was currently available for the Armidale region in the NSW SEED data sharing site. The koala habitat mapping was based on a spatial analysis of the the data provided by DPIE to include PCTs that contained koala food tree species and koala records (Carr and Wilkie 2020)

“The results of the koala habitat mapping are presented in the following figures:

- Figure 5 illustrates all available PCTs containing koala habitat, along with koala sightings. (NB: only BioNet sighting records with accuracy over 10,000m were removed in this case).
- Figure 6 illustrates core koala habitat (or highly suitable koala habitat as defined by SEPP 2021).
- Figure 7 illustrates areas of core koala habitat from Figure 6 with the addition of potential koala habitat in Rural Areas as defined under the SEPP 2020.

Core koala habitat mapping was derived by an GIS analysis using the PCTs and koala records in BioNet to derive areas considered to meet the core koala habitat definition in SEPP 2021. Additionally, an assessment of the remnant size of koala habitat areas was undertaken to help define suitable koala linkages (DPIE 2019b):

- Koala sightings with core habitat patches bigger than 380 ha
- Koala sightings with core habitat patches in size range of 100 ha to 380 ha and smaller patches that were not contiguous and less than 50 m apart
- Koala sightings with core habitat patches in size range of 30 ha to 100 ha and all non-core habitat patches bigger than 30 ha.

Refer to Appendix 2 for a map of potential koala habitat, linkages and potential areas for tree planting derived by council, along with the zones (i.e. Crown land, State Forest and/or forested remnants) that can function as linkages.

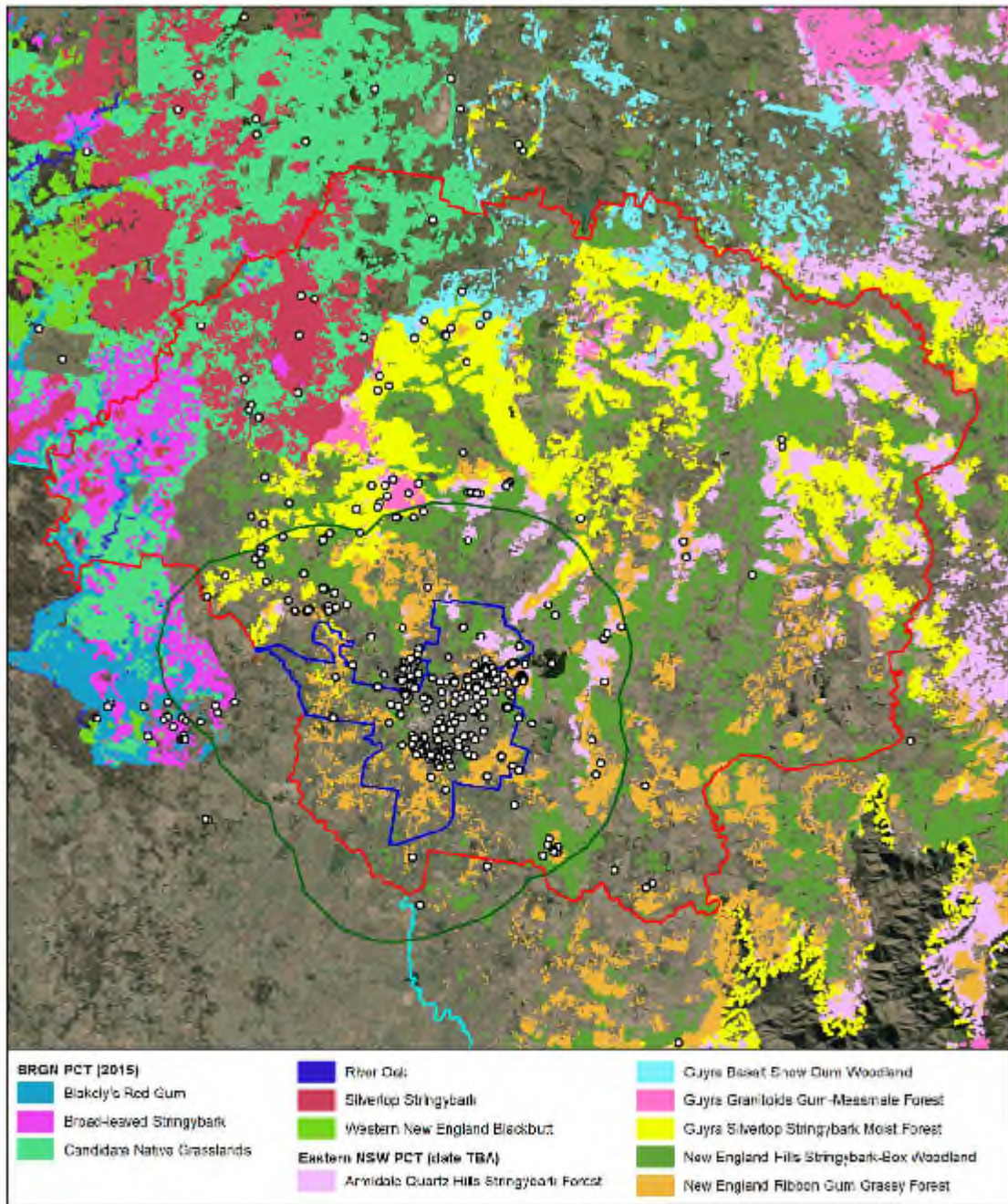
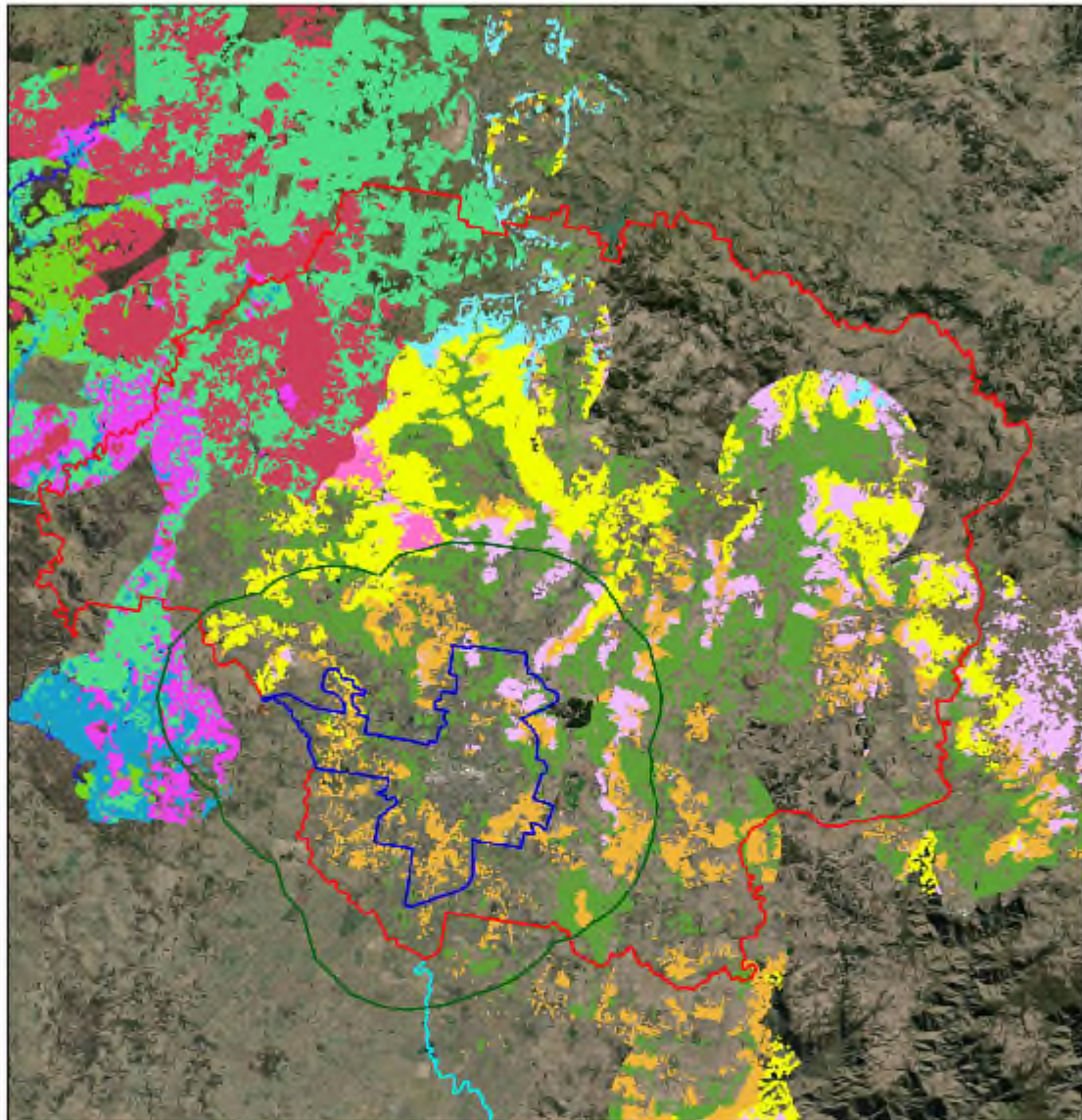


Figure 5: Plant community type with koala records

Armidale Regional Council
Koala Management Strategy

- Koala sightings
- ▭ Precinct 1
- ▭ Precinct 1A
- ▭ Precinct 2
- ▭ Armidale LGA boundary

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BRGN PCT (2016)		
Blackely's Red Gum	River Oak	Guyra Desert Snow Gum Woodland
Broad-leaved Stringybark	Silvertop Stringybark	Guyra Granitoids Gum-Massmate Forest
Candidate Native Grasslands	Western New England Blackbutt	Guyra Silvertop Stringybark Moist Forest
Eastern NSW PCT (date TBA)		
Armidale Quartz Hills Stringybark Forest	New England Hills Stringybark-Box Woodland	New England Hobson Gum Grassy Forest

Figure 6: Core koala habitats and plant community type

Armidale Regional Council
Koala Management Strategy

Precinct 1
Precinct 1A
Precinct 2
Armidale LGA boundary

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Job number: PR5558
Date: 06/04/2021

0 2 4 8 km

GDA 1994 MGA Zone 56
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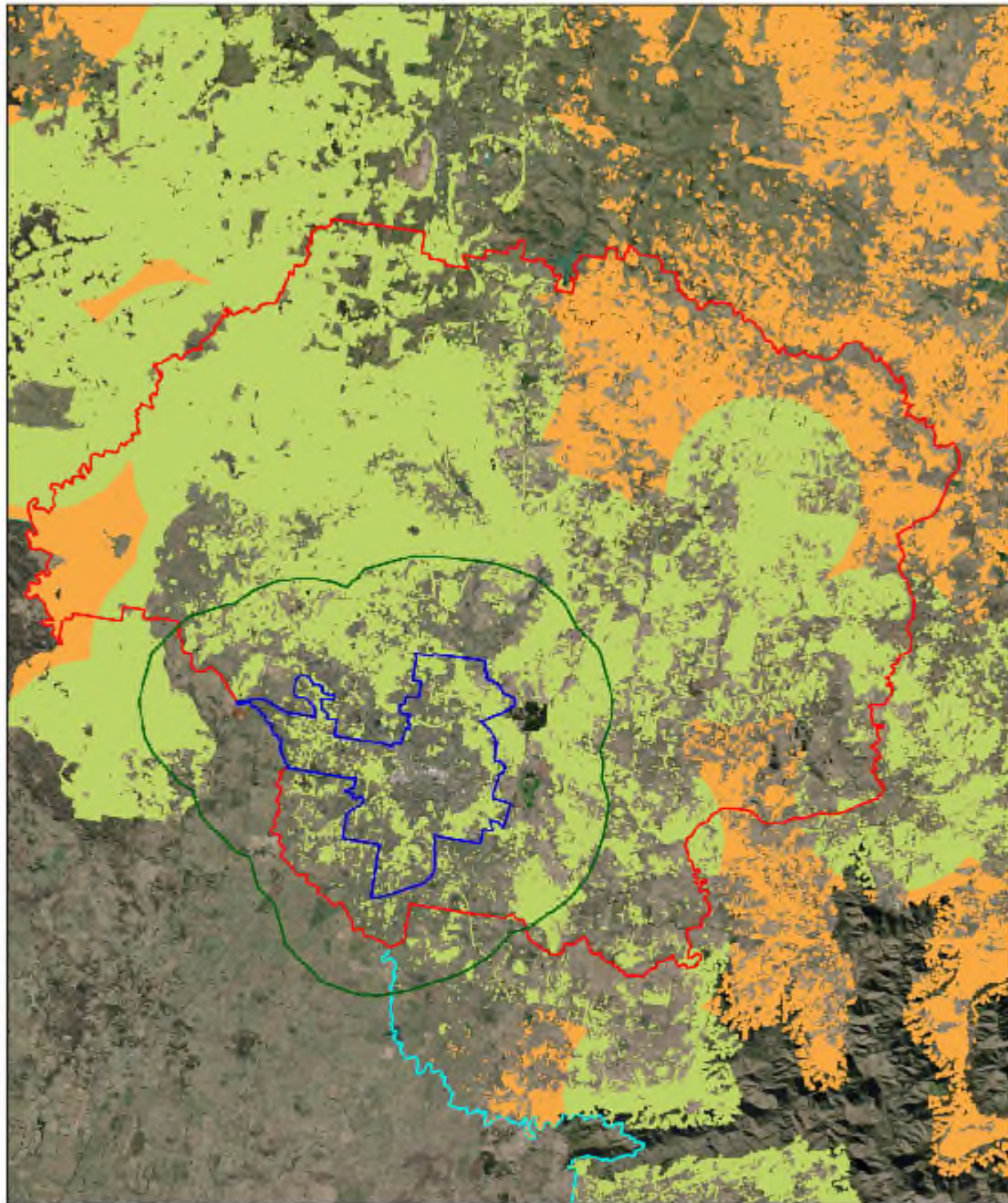


Figure 7: Core and suitable koala habitat

Armidale Regional Council
Koala Management Strategy

- | | |
|------------------------|-----------------------|
| Core koala habitat | Precinct 1A |
| Suitable koala habitat | Precinct 2 |
| Precinct 1 | Armidale LGA boundary |



Job number: PR5858
Date: 06/03/2021



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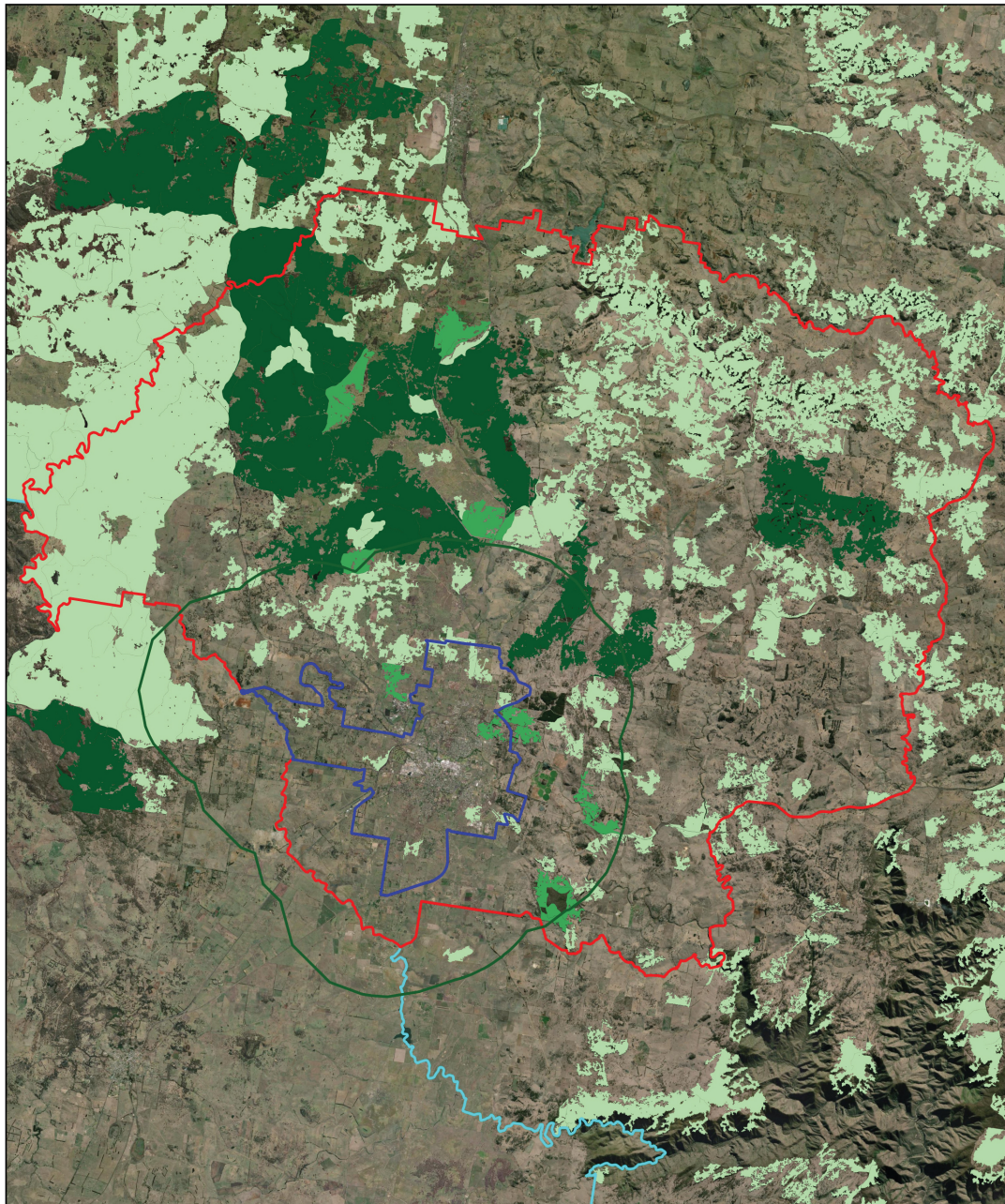


Figure 8: Habitat patches to derive future corridor mapping

Armidale Regional Council
Koala Management Strategy

Habitat patch rank	Precinct 1
Patches > 380 ha	Precinct 1A
Patches 100-380 ha	Precinct 2
Patches 30-100 ha	Armidale LGA boundary

Job number: PR5838
Date: 16/06/2021

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Datum: GDA 1994
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2.4 Relationship to the other koala plans of management

There are no other approved Koala Plans of Management currently in force in the LGA. Should any other Koala Plan of Management be required in the Armidale LGA outside the areas subject to this Strategy, they should utilise the standards and requirements of this Strategy as a minimum guide.

2.5 Duration of the Strategy

This Strategy takes effect from 23rd June 2021 which is the date of approval by the Council. This Strategy is to remain in effect for ten years and must be reviewed every two years, however, may be reviewed at any time at discretion of Council.

3 Management and monitoring activities

Management and monitoring activities (Table 3) will apply to Precincts 1, 1a and 2 (Figure 2).

The key principles underlying these management and monitoring activities are:

1. Avoid development within core koala habitat and koala corridors:
 - Maintenance and protection of core koala habitat is essential for the koala populations feeding and sheltering requirements.
 - Maintenance and protection of koala corridors is essential for linking patches of koala habitat and maintaining dispersal and breeding requirements.
2. Separate koala populations from new development to minimise threats from dogs and vehicles and maintain healthy immunity:
 - Prevention and reduction of koala mortalities due to development stress such as dog attacks and vehicle collisions is essential for koala population survival.
 - Prevention and reduction of stress on koalas as a result of development is essential to maintain healthy koala immunity and reduce risk of chlamydia.
3. Identify critical revegetation zones that will augment and strengthen core koala habitat and koala corridors:
 - Restoration and revegetation of koala habitat adjacent to existing core koala habitat and koala corridors will ensure expansion of koala habitat and an increase in koala abundance.
 - Restoration and revegetation of koala habitat will replace unavoidable loss of koala habitat.
4. Identify koala roadkill hotspots requiring roadkill mitigation measures such as fencing and/or underpasses or other appropriate measures to exclude koalas from the roadway and to allow safe passage of koalas:
 - Roadkill mitigation fencing will prevent koala road mortalities.
 - Koala underpasses will prevent koala road mortalities and allow dispersal of koalas through to connecting corridors.
5. Compliance:
 - Monitor compliance of development consent conditions and activities.
 - Investigate instances of unexplained land clearing in collaboration with other government agencies.
6. Education and community engagement:
 - Provide education and awareness programs for stakeholders (See Appendix 3 for Landholder education strategy) in understanding key threats and management measures.
 - Support continued monitoring and reporting of koala populations.

The application of these principles in the DA process are further illustrated in Figure 9.

Koala Development Assessment Pathway

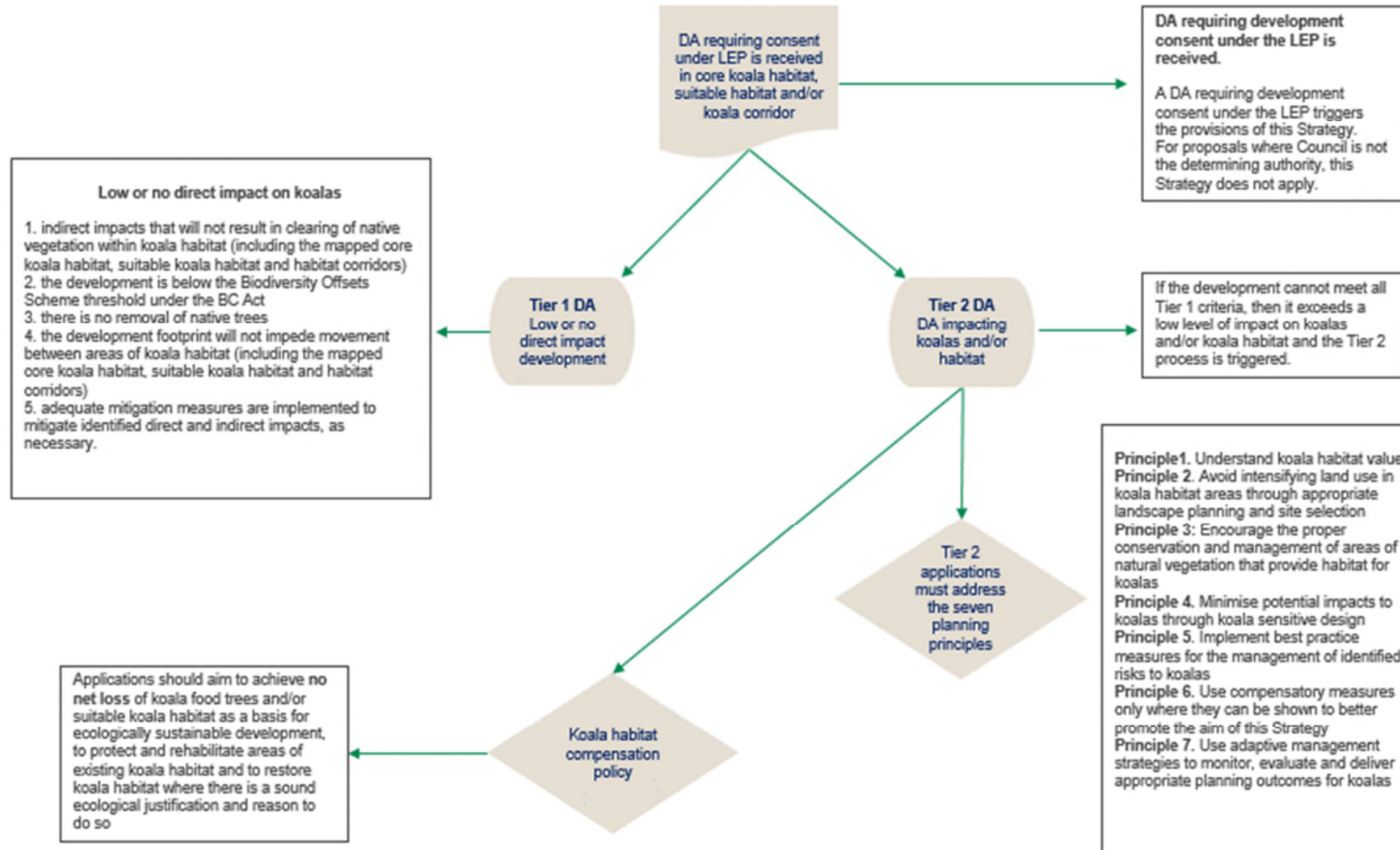


Figure 1 Koala development assessment pathway

Table 3 Management actions

Action ID	Description of Action	Priority	Target Start Date	Action Duration	Indicative Budget	Indicative Budget Funding Source
1. Implementation and Review						
1.1	Identify entity to deliver the Strategy – resources not yet allocated	High	< 6 months	Quarterly meetings	Internal	Council
1.2	Preparation of a koala habitat clause for inclusion in the LEP, and development of appropriate planning provisions to protect core koala habitat and koala corridors	High	When Strategy is adopted	3 months	Internal	Council
1.3	Council to update Section 149 Planning Certificates under the EP&A Act to include information on the presence of koala habitat	High	< 1 year	6 months	Internal	Council
1.4	Council to amend its Development Control Plan Chapter 2.2 Tree Preservation in regard to koala tree species that triggers the requirements of the Plan	Medium	< 6 months	3 months	Internal	Council
1.5	Review and modify Strategy when updated SEPP is finalised	Medium	< 6 months	3 months	Internal	Council
1.6	Review habitat spatial layers and incorporate most up to date PCTs when available from DPIE to model koala corridors from preliminary mapping	High	< 6 months	3 months	Internal	Council
2. Regulatory Processes						
2.1	Creation of an interactive koala habitat planning layer to support the koala habitat provisions	High	When Strategy is adopted	6 months	Internal	Council
3. General Development Assessment Controls (see Section 4 for detailed DA Framework)						
3.1	Development of an interactive DA register to enable access and review of past and current conditions of consent in areas of core koala habitat	Medium	< 2 years	3 months	Internal	Council
3.2	Development of a monitoring program to randomly audit the compliance of conditions of consent for DA's subject to the Strategy	High	< 6 months	3 months	Internal	Council
3.3	Strategic measures in Section 4 to be incorporated into DCP	High	< 1 month	3 months	Internal	Council

Action ID	Description of Action	Priority	Target Start Date	Action Duration	Indicative Budget	Indicative Budget Funding Source
4. Koala Habitat Protection, Restoration and Management						
4.1	Ensure no net loss of core koala habitat and koala corridors through the application of actions within the Strategy	High	When Strategy is adopted	Ongoing	Internal	Council
4.3	Engage local nursery groups and/or revegetation specialists and/or conservation partnerships for planting of koala tree species and koala shelter trees in priority restoration sites for core koala habitat revegetation adjacent to koala habitat corridors. Action will be subject to grant funding or financial allocation in future years.	Medium	< 1 year	Ongoing	\$100,000	External grants
4.4	Develop a Council-owned land register listing properties suitable for offsetting and compensatory koala tree species plantings	Low	< 2 years	3 months	Internal	Council
4.5	Work with NTLLS to conserve habitat in travelling stock routes. Consider those travelling stock route sites which are of high conservation value to be managed for conservation					Local Land Services
4.6	In partnership with SNLC and NT Koala Conservation project, maintain a register of landholders who are interested in rehabilitating koala habitat and developing the conservation value of their property (e.g. Guyra, Glad Blair, Baldersleigh, Boorolong)	Medium	< 2 years	Ongoing	\$5,000	External grants
4.7	In partnership with SNLC and NT Koala Conservation project, undertake letterbox drop property owners providing information on koala conservation agreements, targeting landowners in core koala habitat	Low	< 2 years	3 months	Internal	Council
4.8	Undertake koala community planting projects with Armidale Tree Group, Bushcare groups or projects such as the Trees on Farms Program in strategic linkage areas	Low	< 2 years	6 months	Internal	Council
5 Compensation for Loss of Koala Habitat						
5.1	Preparation of compensatory provisions for inclusion in the DCP for offsetting the loss of koala tree species	High	When Strategy is adopted	3 months	Internal	Council
5.2	Prepare a database of koala habitat polygons with areas to measure loss and gain of koala habitat	Medium	< 6 months	Ongoing	Internal	Council
5.3	Embed a policy into the LEP of financial penalty for koala habitat clearing of which funds will be used for koala habitat revegetation projects	High	< 3 months	Ongoing	Internal	Council

Action ID	Description of Action	Priority	Target Start Date	Action Duration	Indicative Budget	Indicative Budget Funding Source
6 Communication and Education						
6.1	Maintain the Koala Sightings Register and provide regular updated sighting data to DPIE. Continue promotion of I Spy Koala app.	High	When Strategy is adopted	Ongoing	Internal	External grants
6.2	In conjunction with SNLC, Armidale Tree Group and NT Koala Conservation project, develop a koala field ID guide/ booklet for the community to encourage education and promote koala conservation	Low	<2 years	1 month	Internal	Council
6.3	In partnership with SNLC and NT Koala Conservation project, provide community seminars and workshops to actively engage residents and stakeholder groups on koala related issues	Low	<2 years	Ongoing	Internal	Council
6.4	In partnership with SNLC and NT Koala Conservation project, develop koala education programs for primary schools, particularly for those areas in close proximity to core koala habitat	Medium	<2 years	Ongoing	\$10,000	External grants
6.5	In partnership with SNLC and NT Koala Conservation project, install educational koala signage and plaques in local schools to encourage younger generations to actively engage on koala related issues	Medium	<2 years	3 months	\$15,000	External grants
6.6	Promote koalas through Citizen Science projects through social media engagement methods	Low	<2 years	Ongoing	Internal	Council
7 Road mortality						
7.1	Lobby Transport for NSW (TfNSW) to incorporate koala-friendly crossings (such as fauna underpasses and culverts) into state road designs in koala core habitat	High	<6 months	3 months	Internal	Council
7.2	Contact TfNSW to upgrade road signage to reflect reduced speeds (60km/ hour) within koala habitat, and enforce speed limits on roads in koala habitat	High	<1 year	6 months	Internal	Council
7.3	Include koala urban design principles such as speed humps in planning designs of proposed new roads in core koala habitat and koala corridors (refer to NSW Koala Country website for best practice guidelines)	Medium	<1 year	6 months	Internal	Council
8 Dog Management						
8.1	Install signage in high-risk dog attack areas in koala habitat outlining leashed area restrictions to notify and educate dog owners	High	<1 year	3 months	Internal	Council

Action ID	Description of Action	Priority	Target Start Date	Action Duration	Indicative Budget	Indicative Budget Funding Source
8.2	Letterbox drop property owners in high-risk dog attack areas to educate residents and promote responsible dog ownership	Medium	<1 year	1 month	Internal	Council
8.3	Implement appropriate regulatory tools and compliance measures in Council Reserves subject to leashed area restrictions	High	<1 year	1 month	Internal	Council
8.4	Collaborate with Local Land Services to undertake wild dog monitoring and determine level of control required in core koala habitat (refer to NSW Koala Country website for best practice guidelines)	Medium	<1 year	1 month	Internal	Council
9 Koala Health and Welfare						
9.1	Support rescuers / carer effort and investment in rehabilitating koalas and other wildlife	Medium	<2 years	3 months	Internal	Council
9.2	In partnership with SNLC and NT Koala Conservation project, meet with key stakeholders and landholders to identify and explore options, to collaborate, consider options for soft release sites and tracking of released animals.	Medium	<2 years	3 months	Internal	Council
9.3	Provide community information with regards to Wildlife Friendly Backyards to prevent koalas drowning in pools	Low	<2 years	Every 3 years	Internal	Council
10 Bushfire Management						
10.1	Develop an interactive internal mapping system to query history and extent of bushfires and hazard reduction burns across the Armidale LGA to inform future burns in koala habitat	High	<6 months	3 months	Internal	Council
10.2	Coordinate meetings with NSW Rural Fire Service (RFS) to establish planning instruments for hazard reduction burns and firebreaks adjacent to core koala habitat and koala corridors	High	<6months	Ongoing	Internal	Council
10.3	Establish an emergency wildlife rescue facility specifically for bushfire events. Register voluntary veterinarians for assistance during bushfire events	Medium	<1 year	1 year	\$50,000	External grants
10.4	Provide RFS with core koala habitat mapping and identify key refugia within core habitat that provides climate resilience	Medium	<6 months	1 month	Internal	Council
11 Funding						
11.1	Develop a Koala Finance Team to design cash-flow into a koala cash-fund, and to apply for new conservation and research funding grants	High	<1 year	1 month	Internal	Council

Action ID	Description of Action	Priority	Target Start Date	Action Duration	Indicative Budget	Indicative Budget Funding Source
11.2	In partnership with SNLC and Armidale Tree Group, use Charitable Trusts and Funds to encourage donations from the public and philanthropic organisations to support koala projects	Medium	<2 years	Ongoing	Internal	Council
12 Research and Monitoring						
12.1	Continue to gather and assess trends in Armidale koala population. Population estimates should follow the methods in DPIE (2019c)	High	<2 years	Ongoing	\$20,000 +	External grants
12.2	In partnership with SNLC and NT Koala Conservation project, coordinate annual community citizen science transect-based koala searches of designated monitoring sites	Low	<2 years	Annually	Internal	Council
12.3	In partnership with UNE and the NT Koala Conservation Project develop research project and seek funding to address research gaps identified in the strategy	Medium	<2 years	Ongoing	Internal	External grants

4 Development Assessment Framework

This section refers to the process for assessing all development applications on land mapped as core koala habitat and koala corridors.

4.1 When is the development assessment framework triggered

The development assessment framework for this Strategy is triggered when a development application in either mapped core koala habitat, suitable habitat or koala corridors is received by Council.

This will be decided through assessment pathways to ascertain what level of impact the Development Application (DA) may have on koalas.

4.2 Assessment pathways

Development applications will be assessed under two pathways:

Tier 1 DA – Low or no direct impact development.

Tier 2 DA – Development applications impacting koalas and/or koala habitat.

The Tier 1 process is for development which can be demonstrated to have low or no direct impact on koalas or koala habitat as follows:

1. indirect impacts that will not result in clearing of native vegetation within koala habitat (including the mapped core koala habitat, suitable koala habitat and habitat corridors)
2. the development is below the Biodiversity Offsets Scheme threshold under the BC Act
3. there is no removal of native trees
4. the development footprint will not impede movement between areas of koala habitat (including the mapped core koala habitat, suitable koala habitat and habitat corridors)
5. adequate mitigation measures are implemented to mitigate identified direct and indirect impacts, as necessary (Table 4 below).

If the development cannot meet all criteria above, then it exceeds a low level of impact on koalas and/or koala habitat and the Tier 2 process is triggered (see Section 4.3).

Table 4 General mitigation measures

Impact	Management measures
Impacts to core koala habitat	<ul style="list-style-type: none"> · Retention of core koala habitat with the principle of minimising adverse impacts and retaining existing core koala habitat. · The border of the development footprint will be demarcated with orange fence netting. No materials or works will occur outside the footprint in core koala habitat. · An erosion and sediment control plan will include measures to prevent erosion into core koala habitat. · Infrastructure or development to be designed in a way that facilitates koala habitat regeneration by incorporating retention and planting of koala trees, where it is safe to do so. For example, retaining and planting paddock trees, trees along fencelines and remnant patches of bushland on properties.
Impediments to movement	<ul style="list-style-type: none"> · Retention of koala habitat corridors with the principle of minimising adverse impacts and retaining existing corridors. · Infrastructure or development to be designed in a way that is reliably known to not impede safe koala movement. For instance, underpasses as part of road design. · Infrastructure or development to be designed in a way that facilitates koala movement by incorporating retention and planting of koala trees, where it is safe to do so. For example, retaining and planting paddock trees, trees along fencelines and remnant patches of bushland on properties. · In some instances, there may be a need to reduce koala movement into development areas where they are more at risk (e.g. through the use of exclusion fencing along habitat corridors). However, this fencing will not block dispersal.
Dog attack	<ul style="list-style-type: none"> · Restrictions on the movement of dogs, including use of dog and koala proof fencing that effectively contains dogs and excludes koalas, with the provision of koala furniture that allows koalas to escape yards should they gain entry. · Signage and education. · Dogs excluded from koala habitat areas and only allowed off leash in areas established as not being habitat.
Vehicle strike	<ul style="list-style-type: none"> · Traffic speed limited as far as possible. · Traffic calming measures and roadside lighting. · Use of koala proof exclusion fencing, with the provision of escape mechanisms should koalas gain access to the road. · Inclusion of koala land bridges and/or underpasses where appropriate and in combination with koala proof exclusion fencing.
Drowning in pools	<ul style="list-style-type: none"> · Incorporation of features and koala furniture that allow koalas to escape from pools and the fenced area, such as a shallow ramp or thick, taut rope. · Use of pool fencing that effectively excludes koalas. · No structures near pool fences that allow koala to gain access over fencing.
Bushfire	<ul style="list-style-type: none"> · Development and implementation of a bushfire management plan with measures that specifically address risks to koala habitat and koalas. · Core koala habitat should not form part of the Asset Protection Zone (APZ). The APZ should occur beyond any koala habitat. · Develop an emergency response plan that identifies key contacts in RFS, local wildlife carers and vets, and list of appropriate Government resources.
Introduction or spread of disease	<ul style="list-style-type: none"> · Use of biosecurity and hygiene procedures in instances where vegetation pathogens known to affect koala trees might be spread or introduced. For example, strict enforcement of vehicle wash-down points.
Disturbance	<ul style="list-style-type: none"> · Establishment of tree protection zones around any retained koala trees within the site area and preclusion of any development activities within the tree protection zones. · Habitat restoration and strategic plantings to improve connectivity of retained habitat and trees. · Where there may be indirect impacts on koala habitat, use of a suitably qualified koala spotter or koala sniffer dog to inspect habitat prior to any development taking place.

Impact	Management measures
	<ul style="list-style-type: none"> · Where koalas are identified, temporary suspension of works that might disturb the koala and/or prevent it from moving to adjacent undisturbed habitat of its own volition. · Koalas should be protected from disturbance and indirect impacts via appropriate exclusion fencing from urban areas and roads. · Fencing of urban areas should still allow for koalas to disperse through the koala habitat in the landscape and to connect with other koalas and koala colonies.

4.3 Koala habitat development applications

Tier 2 DA – Development applications impacting koalas and/or koala habitat.

Development applications which are likely to impact koalas and/or koala habitat (including the mapped core koala habitat, suitable habitat and habitat corridors) and do not meet the criteria for Tier 1 must address the criteria against each of the seven planning principles and the criteria (as per the Guideline [DPIE 2019a]).

Principle 1. Understand koala habitat values.

Criteria 1. *The site is established as core koala habitat, suitable habitat, or koala corridor habitat if it mapped on the Core Koala Habitat Map and the Koala Corridor Map of the Strategy.*

Criteria 2. *Further analysis is undertaken to understand the broader values of the core koala habitat, including information about the koala population using the habitat and any specific ecological functions the habitat might serve.*

Key questions which need to be addressed in meeting this criterion include:

- What is known about the size, health and viability of the koala population?
- What is known about the generational persistence of the local koala populations through an analysis of records to determine population trends and persistence over time?
- What is the broader landscape context of the habitat within the site area? For instance, is it contiguous with broader areas of habitat or relatively isolated, and what are the likely regional movement patterns of koalas using the site area?
- Does the site area contain particular values that are likely to serve an important ecological function for koalas? For instance, providing linkage between other habitats, or serving as a habitat buffer to broader areas?
- Could the habitat area and/or koala population using the site area be important to the recovery of the koala? For instance, does the habitat contain features that might provide refuge during droughts, extreme heat, or fire? Or is the population considered to be healthy, robust or showing relatively low incidence of disease?
- Drawing on evidence presented, what significance are the values of the site to preserving the existing koala population and supporting recovering and expanding populations?

Principle 2. Avoid intensifying land use in koala habitat areas through appropriate landscape planning and site selection.

Criteria 3. *Site selection considers koala habitat values.*

In addressing this criterion, the development application needs to show:

- How has the development footprint avoided habitat?
- What feasible alternatives were assessed as part of the process?

Principle 3. Encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas.

Criteria 4. *Development avoids the direct loss of koala habitat within the site area and avoids fragmentation.*

Criteria 5. *Koala habitat is excluded from the development footprint.*

Principle 4. Minimise potential direct impacts to koalas through koala sensitive design.

Criteria 6. *Development avoids direct impacts to koala habitat within the site area.*

In addressing this criterion, the development application needs to show:

- How will impacts to koala habitat be minimised so as to not fragment existing koala habitat, impact the ability of koalas to move across the landscape or impact the recovery and expansion of populations?

Criteria 7. *Where some loss of habitat cannot be avoided (and providing it is consistent with all other criteria set out here), development is designed in a way that retains higher value areas across the site and avoids fragmentation of habitat within the site area and more broadly within the region.*

For instance, this might mean prioritising the retention of koala trees that are greater than 250 mm DBH, or areas of koala habitat that are in better condition, show signs of koala tree recruitment, are better connected with habitat more broadly, or contain features that might be important for refuge.

Criteria 8. *Development is undertaken in a way that maintains the potential function of the koala habitat.*

For instance, if the koala habitat within the site area has been identified as an important linkage corridor, development should be undertaken in a way that enables the continued movement of koalas.

Principle 5. Implement best practice measures for the management of identified risks to koalas.

Criteria 9. *All relevant indirect impacts to koalas and koala habitat associated with the*

development are identified.

Potential indirect impacts which may be relevant include (but are not limited to): dog attacks, vehicle strikes, drowning in pools, increased risk of fire, introduction or spread of disease, disturbance, and impediments to movement.

It is important when considering potential indirect impacts to look beyond the site area to any additional areas which are likely to be affected by the proposal to take all potential impacts into account.

Criteria 10. *Development uses best practice management measures to address the potential impacts considered likely to pose an increased risk to koalas or their habitat.*

The types of measures or controls used to address impacts will vary depending on the nature of the development, the relative importance of the site area to koalas, and the extent and magnitude of impacts.

The specific requirements may be guided by development control plans relevant to each council area.

Principle 6. Use compensatory measures only where they can be shown to better promote the aim of the SEPP.

Criteria 11. *Compensatory measures are only used once it has been demonstrated that options to avoid, minimise and manage impacts to koala habitat have been exhausted.*

Criteria 12. *Where there is any direct loss of habitat or compromise in the potential function of a koala habitat area (and providing it is consistent with all other criteria outlined here), suitable compensatory measures are provided.*

Determining the suitability of any proposed compensatory measures should be guided by the overall aim of the SEPP.

Principle 7. Use adaptive management strategies to monitor, evaluate and deliver appropriate planning outcomes for koalas.

Criteria 13. *Development application includes a monitoring, adaptive management and reporting component against the key outcomes.*

A Koala Assessment Report addressing the criteria must accompany any development application to which Tier 2 applies. A template for a Koala Assessment Report is provided in Appendix 4 of this Strategy. The Koala Assessment Report must be prepared by a suitably qualified and experienced person.

4.4 Koala habitat compensation policy

4.4.1 Background

This policy is designed to provide a system for determining appropriate compensation for any activity associated with the removal of koala food trees and/or koala habitat (core, suitable habitat, habitat linkage) that has the potential to adversely impact koalas and/or impede safe koala movement.

The policy aims to achieve no net loss of koala food trees and/or preferred koala habitat as a basis for ecologically sustainable development, to protect and rehabilitate areas of existing koala habitat and to restore koala habitat where there is a sound ecological justification and reason to do so.

4.4.2 Guiding principles

The principles that underpin this policy are:

(a) The primary objective of habitat compensation must be to:

- protect
- rehabilitate or
- restore

Ecologically viable koala food trees and/or koala habitat in this order of preference.

(b) Compensation must only be considered once all options to:

- avoid
- minimise and
- mitigate

any adverse impacts have been applied in this order of preference and, exhausted.

(c) Clearing must not be approved where the impact of clearing cannot be satisfactorily compensated. If a proposal is unable to meet the strict requirements of the compensation policy, Council may however consider alternative outcomes that are able to demonstrate satisfactory koala outcomes.

(d) Habitat restoration compensation works should lead to a net gain in the area of koala habitat, and an improvement in the condition of koala habitat.

(e) The receiving land on which compensation works are proposed must:

- i. have koala habitat of the same or higher class to that being removed,
- ii. be within, adjoining or as close as possible to the development area,
- iii. be within the related Koala Precinct Area and;

- iv. be ecologically suitable and appropriate for protection, rehabilitation or restoration of koala habitat.
- (f) An activity that leads to the loss of koala habitat (especially clearing) should only proceed once the management arrangements on the receiving land are legally secure.
- (g) Compensation works must not lead to permanent adverse environmental impacts and must not be used as a justification for granting approval to a Development Application where the adverse environmental impacts of a development are greater than the benefit to be obtained from the compensation works.
- (h) Management and monitoring of habitat compensation activities should be undertaken over an ecologically meaningful timeframe (i.e. a minimum of five years).
- (i) Council should consider a register of receiving lands.

4.4.3 Components of the habitat compensation policy

Where Council gives approval to clear an area of koala habitat, this policy requires the proponent to undertake compensation works to compensate for the loss of koala habitat. The compensation works must benefit another area of core koala habitat or a koala habitat linkage area to that being impacted by development. The policy is based on two main components:

- (a) the nature of and level of legal protection afforded an area of receiving land;
- (b) a loss / gain multiplier that takes into account:
 - i. the relative conservation value of the area of koala habitat (core, suitable habitat or habitat corridor) adversely impacted by the proposed development;
 - ii. a time / risk factor that takes into account the time lag before ecological benefits are realised and the risk of the compensation works failing.

Koala habitat compensation strategies

Based on the type of compensation works to be undertaken and the level of legal protection afforded an area of receiving land, this compensation policy recognises three category priorities of compensation works that can be applied to koala habitat, namely:

- protection
- rehabilitation and
- restoration.

Habitat compensation works may be undertaken concurrently with other activities that protect, rehabilitate or restore habitat. For example, this may include the restoration of biological buffers, linkage areas or rehabilitation of riparian corridors.

4.5 Koala habitat compensatory measures

The Armidale Regional Council Koala Habitat Compensation Policy is detailed in Section 4.4 of this Strategy. The Policy is designed to provide a system for determining appropriate compensation for the removal of koala food trees or koala habitat in association with development activities.

Compensation for adverse impacts of a proposed development activity through the application of the Policy should only be approved if Council is satisfied that all feasible strategies to avoid, minimise and mitigate clearing of koala food trees and/or koala habitat have been fully exhausted.

4.5.1 Applies to land

Compensatory measures apply to land shown on Figure 2 and applies to Tier 1 and Tier 2 areas including mapped core koala habitat, suitable habitat and habitat corridors.

4.5.2 Objectives

Offsetting should be considered a last resort of the development application process where proponents should first seek to avoid and then minimise any impacts from a development.

The control applies areas to offset the impacts associated with the removal (or other specified action) of core koala habitat, suitable habitat and habitat corridors.

4.5.3 Requirements

- (a) Compensatory planting is to be provided for the removal of koala habitat in accordance with the following (Table 5):

Table 5 Compensatory replacement rates for the removal of koala food trees

Mapped koala habitat type		*Replacement rate (loss:gain)
Tier 1	core koala habitat	1:10
Tier 1	Suitable habitat	1:5
Tier 1	Habitat corridors	1:10
Tier 2	core koala habitat	1:20
Tier 2	Suitable habitat	1:10
Tier 2	Habitat corridors	1:20

*Note: these ratios only apply to koala food tree species listed in Appendix 4 and have a diameter at breast height of >20cm.

- (b) Where development requires the provision of bushfire APZ, the location and type of

compensatory planting is to have regard to *Planning for Bushfire Protection 2019* and the NSW Rural Fire Services document Standards for APZs.

- (c) Where practicable, compensatory planting is to be located on the subject site to enhance habitat links with regard to the Armidale Koala Management Strategy 2021.
- (d) Compensatory planting is to reflect the PCT being removed and/or modified in accordance with the NSW BioNet Vegetation Classification database.

References

- Adams-Hosking, C, McBride, MF, Baxter, G, Burgman, M, de Villiers, D, Kavanagh, R, Lawler, I, Lunney, D, Melzer, A, Menkhorst, P, Molsher, R, Moore, BD, Phalen, D, Rhodes, JR, Todd, C, Whisson, D and McAlpine, CA 2016, 'Use of expert knowledge to elicit population trends for the koala (*Phascolarctos cinereus*)', *Diversity and Distributions*, 22, pp. 249-262, viewed 22 January 2021, available: https://www.researchgate.net/publication/289501583_Use_of_expert_knowledge_to_elicit_population_trends_for_the_koala_Phascolarctos_cinereus
- Adams-Hosking, C 2017, *Current Status of the Koala in Queensland and New South Wales*. Report for WWF Australia.
- Allam, L 2020, Right fire for right future: how cultural burning can protect Australia from catastrophic blazes, 19 January 2020, *The Guardian*, available: <https://www.theguardian.com/australia-news/2020/jan/19/right-fire-for-right-future-how-cultural-burning-can-protect-australia-from-catastrophic-blazes>
- Blake, E 2020, *Tree trunks take a licking as koalas source water*, University of Sydney, available: <https://www.sydney.edu.au/news-opinion/news/2020/05/03/tree-trunks-take-a-licking-as-koalas-source-water.html> accessed 22 February 2021
- Brearley, G, Rhodes, JR, Bradley, A, Baxter, GS, Seabrook, L, Lunney, D, Liu, Y and McAlpine, C 2013, 'Wildlife disease prevalence in human-modified landscapes: a review', *Biological Reviews*, 88, pp. 427-442.
- Brown, AS, Giryes, AA, Lavin, MF, Timms, P and Woolcock JB, 1987, 'Chlamydial disease in koalas' *Australian Veterinary Journal*, 46(11), pp. 346-350.
- Carr, D 2017, *Did we fix Dieback?* In Stellar K (ed), Armidale Tree Group Newsletter, No. 110, Spring Edition, September 2017, available: <http://armidaletreegroup.org.au/wp-content/uploads/ATG-NEWSLETTER-Spring-2017.pdf>, accessed 8 April 2021.
- Carr, D.B, Lemon J.M., and Wilkie, A., 2017, *Cool Country Koala Project (South) – Final Project Report and Koala Management Plans – Armidale Uralla, Walcha and Nowendoc. A report to Northern Tablelands Local Land Services*. Stringybark Ecological, Armidale, NSW,
- Carr, D 2020, *Armidale Local Government Area Koala Habitat Study*, final report to Department of Planning, Industry and Environment, Armidale.
- Carr, D and Wilkie, A., 2020, *Armidale Local Government Area Koala Habitat Study: Final report to Department of Planning, Industry and Environment*, July 2020.
- Charalambous, R and Narayan, E 2020, *A 29-year retrospective analysis of koala rescues in New South Wales, Australia*. PLoS ONE 15(10): e0239182, viewed 20/01/2020, available: <https://doi.org/10.1371/journal.pone.0239182>
- Cristescu, R, Hohwieler, K, Gardiner, R, deVilliers, D, Vincent, B and Frere, C 2019, *Cool Country Koala Project 2018/2019: Final Report*, prepared for Northern Tablelands Local Land

Services, available:
https://northerntablelands.ils.nsw.gov.au/__data/assets/pdf_file/0006/1156479/cool-country-koala-project-report-2018.pdf

DECC 2008, *Recovery plan for the koala (Phascolarctos cinereus)*, Department of Environment and Climate Change NSW.

Devereaux, LN, Polkinghorne, A, Meijer, A and Timms, P 2003, 'Molecular evidence for novel chlamydial infections in the koala (*Phascolarctos cinereus*)', *Systems of Applied Microbiology*, 26, pp. 245-253.

DoE 2014, EPBC Act referral guidelines for the vulnerable koala (combined population of Queensland, New South Wales and the Australian Capital Territory), Commonwealth of Australia.

DoE 2013, Matters of National Environmental Significance Significant impact guidelines 1.1, Commonwealth of Australia.

DPIE 2020a, Koala Habitat Protection Guideline – Implementing State Environment Planning Policy (Koala Habitat Protection) 2019, NSW Department of Planning, Industry and Environment.

DPIE 2020b, Framework for the spatial prioritisation of koala conservation actions in NSW, Iconic Koala Project, NSW Government.

DPIE 2020c, Wildlife vehicle strike and contributing factors, Koala vehicle strike fact sheet 1, NSW Government.

DPIE 2020d, NSW Fire and the Environment 2019-2020 Summary, Biodiversity and landscape data and analyses to understand the effects of the fire events, Department of Planning, Industry and Environment.

DPIE 2019a, Koala Habitat Protection State Environment Planning Policy (Koala Habitat Protection) 2019, NSW Department of Planning, Industry and Environment.

DPIE 2019b, Conserving Koalas in the Wollondilly and Campbelltown Local Government Areas, NSW Department of Planning, Industry and Environment.

DPIE 2017, *Wilton Priority Growth Area – Interim Land Use and Infrastructure Implementation Plan Background Analysis*, NSW Department of Planning, Industry and Environment.

Hanger, J and Loader, J 2009, 'Infectious disease in koalas: implications for conservation', in *Koala Conservation Conference*, Friends of the Koala, Lismore.

Hawes, W, Hunter, J, Lechner, A and Ede, A 2016, *Northern Tablelands Koala Recovery Strategy 2015-2025*, report for Northern Tablelands Local Land Services, Inverell.

Heinz, B 1999, *The Koalas at Newholme Field Laboratory in Northern NSW – A Field Study*. Diploma Thesis University of New England.

Kollipara, A, Polkinghorne, A, Wan, C, Kanyoka, P, Hanger, J, Loader, J, Callaghan, J, Bell,

A, Ellis, W, Fitzgibbon, S, Melzer, A, Beagley, K and Timms, P 2013, 'Genetic diversity of *Chlamydia pecorum* strains in wild koala locations across Australia and the implications for a recombinant *C. pecorum* major outer membrane protein based vaccine', *Veterinary Microbiology*, 167, pp. 513-522.

Lane, A, Wallis, K, and Phillips, S 2020, A review of the conservation status of New South Wales populations of the Koala (*Phascolarctos cinereus*) leading up to and including part of the 2019/20 fire event. Report to International Fund for Animal Welfare (IFAW). Biolink Ecological Consultants, Uki NSW.

Lunney, D, Crowther, MS, Wallis, I, Foley, WJ, Lemon, J, Wheeler, R, Madani, G, Orscheg, C, Griffith, JE, Krockenberger, M, Retamales, M and Stalenberg, E 2012, 'Koalas and climate change: a case study on the Liverpool Plains, north-west NSW', in Lunney, D & Hutchings, P (eds), *Wildlife and Climate Change: Towards Robust Conservation Strategies for Australian Fauna*, Royal Zoological Society of New South Wales, Mosman, in press.

McAlpine, C, Brearley, G, Rhodes, J, Bradley, A, Baxter, G, Seabrook, L, Lunney, D, Liu, Y, Cottin, M, Smith, AG and Timms, P 2017, 'Time-delayed influence of urban landscape change on the susceptibility of koalas to chlamydiosis'. *Landscape Ecology* 32 (3): 663–679.

McAlpine, CA, Rhodes, JR, Callaghan, JG, Bowen, ME, Lunney, D, Mitchell, DL, Pullar, DV and Possingham, HP 2006, 'The importance of forest area and configuration relative to local habitat factors for conserving forest mammals: A case study of koalas in Queensland, Australia'. *Biological Conservation* 132: 153–165.

Melzer, A, Carrick, F, Menkhorst, P, Lunney, D and St. John, B 2000, 'Overview, critical assessment, and conservation implications of koala distribution and abundance', *Conservation Biology*, 14(3): 619–628.

Mitchell-Whittington, A, 2017, 'Koalas are being attacked by cattle, horses as trees are felled: wildlife carer', *Brisbane Times*, available: <https://www.brisbanetimes.com.au/national/queensland/koalas-are-being-attacked-by-cattle-horses-as-trees-are-felled-wildlife-carer-20170619-gwtucn.html>, accessed 7 April 2021.

Moore, BD, Lawler, IR, Wallis, IR, Beale, CM and Foley, WJ 2010, 'Palatability mapping: a koala's eye view of spatial variation in habitat quality', *Ecology*, 91 (11): 3165–3176.

NRC 2019, Annual Progress Report – Koala Research Program February 2020, Natural Resources Commission NSW.

NSW Government 2020, *Koala populations and habitat in New South Wales*, Portfolio Committee No. 7 – Planning and Environment, New South Wales Parliament, Legislative Council, Report no. 3.

OEH 2017, *Securing the Koala in the wild in NSW for 100 years – Saving Our Species Iconic Koala Project 2017-21*, The Office of Environment and Heritage NSW.

OEH 2018, *NSW Koala Strategy*, The Office of Environment and Heritage NSW.

OEH 2019, *NSW, Koala Research Plan 2019-28, A 10-year plan under the NSW Koala Strategy*, The Office of Environment and Heritage NSW.

Phillips, S, Quigley, B, Olagoke, O, Booth, R, Pyne, M and Timms, P, 2020a, 'Vaccination of koalas during antibiotic treatment for *Chlamydia*-induced cystitis induces an improved antibody response to *Chlamydia pecorum*', *Scientific Report*, 10, available: <https://www.nature.com/articles/s41598-020-67208-x#:~:text=Antibiotics%20remain%20the%20front%20line,in%20mild%20ocular%20Chlamydia%20disease>, accessed 8 April 2021.

Phillips, S, Wallis, K and Lane A 2020b, *Quantifying the impacts of bushfire on populations of wild koalas (Phascolarctos cinereus): insights from the 2019/20 fire season*, Final report to WWR-Australia, Uki, New South Wales.

Phillips S and Callaghan J 2000, 'Tree species preferences of koalas (*Phascolarctos cinereus*) in the Campbelltown area south-west of Sydney, New South Wales'. *Wildlife Research* 27: 509–516.

Phillips, S, 1997, 'Some issues associated with the relocation of koalas *Phascolarctos cinereus*', In Tribe, A (ed.), *Challenging the Boundaries – Proceedings of the Annual Conference of the Australian Association of Veterinary Conservation Biologists*, Australian Veterinary Association, Brisbane, pp. 187–193.

Polkinghorne, A, Hanger, J and Timms, P. 2013, 'Recent advances in understanding the biology, epidemiology and control of chlamydial infections in koalas', *Veterinary Microbiology*, 165(3-4): 214-223.

Prevett, P, Pope, R, Callaghan, J, and Bailey, L 2001, *The koala habitat atlas: preliminary results for koala tree species preferences in the city of Ballarat local government area, Victoria*. The Research and Management of Non-Urban Koala Populations. Koala Research Centre of Central Queensland, pp 122.

Reckless, HJ, Murray, M and Crowther, MS, 2017, 'A review of climatic change as a determinant of the viability of koala populations', *Wildlife Research*, 44 (77):458-470.

Rebgetz, L, 2017, 'Koalas being trampled by livestock amid habitat loss, wildlife experts say' ABC News, available: <https://www.abc.net.au/news/2017-06-17/livestock-attacks-koalas-more-common-wildlife-experts-say/8625762>, 7 April 2021.

Rhodes, JR, Ng, CF, de Villiers, DL, Preece, HJ, McAlpine, CA & Possingham, HP 2011, 'Using integrated population modelling to quantify the implications of multiple threatening processes for a rapidly declining population', *Biological Conservation*, 144, pp. 1081-1088.

Schultz, A, Hohwieler, K, Frere, C and Cristescu R. (2020), *Cool Country Koala Project 2019-2020: Northern Tablelands Koala Habitat and Pilot Genetic Project*, University of the Sunshine Coast, Detection Dogs for Conservation.

Sluiter, AF, Close, RL and Ward SJ 2002, 'Koala feeding and roosting trees in the Campbelltown area of New South Wales', *Australian Mammalogy* 23(2)

Ward, SJ 2002, *Koalas and the community: a study of low density populations in southern Sydney utilising community reports, opportunistic captures, and radio-tracking techniques*. PhD thesis, University of Western Sydney, Campbelltown.

Woinarski J, and Burbidge AA 2016, *Phascolarctos cinereus*. IUCN.

Appendix 1 Legislative context

Commonwealth legislation

Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The koala is listed as vulnerable under the EPBC Act and hence a matter of national environmental significance. The EPBC Act requires that individuals and/or Council assess whether proposed actions will have a significant impact on koala populations and koala habitat based on an Assessment of Significance. The Significant Impact Guidelines (DoE 2013) and referral guidelines for the koala (DoE 2014) should be used to assist this process.

State legislation

Biodiversity Conservation Act 2016 (BC Act)

The koala is listed as vulnerable in NSW under the BC Act. This legislation requires that individuals and/or Council assess whether proposed actions will have a significant impact on koala populations and koala habitat based on a Test of Significance. The BC Act links to other legislation including the *Environmental Planning and Assessment Act 1979* (EP&A Act) (see below). If a proposed development under Part 4 of the EP&A Act is likely to significantly affect the koala or koala habitat, a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor. The Biodiversity Offsets Scheme (BOS) will apply (see below). If a proposed activity under Part 5 of the EP&A Act is likely to significantly affect koalas and koala habitat, and the proponent does not opt into the BOS, a Species Impact Statement (SIS) must be prepared.

The Biodiversity Offset Scheme

The BOS is a framework to avoid, minimise and offset impacts on biodiversity (including the koala and koala habitat) from development and clearing, and to ensure land that is used to offset impacts is secured in perpetuity. There are two elements to this scheme. Developers and landholders wanting to undertake development on or clearing of koala habitat generate a credit obligation which must be retired to offset their activity. Or, landholders who establish a biodiversity stewardship site on their land with koala habitat through a Biodiversity Stewardship Site Assessment generate credits to sell to developers or landholders who require those credits to securely offset activities at other sites.

Relevant to koalas, the BOS applies to:

- local development (assessed under Part 4 of the EP&A Act) that triggers the Biodiversity Offsets Scheme Threshold or is likely to significantly affect koalas based on the test of significance in section 7.3 of the BC Act
- state significant development and state significant infrastructure projects, unless the Secretary of the DPIE and the environment agency head determine that the project is not likely to have a significant impact

- biodiversity certification proposals (for areas of land that are proposed for development, including proposed strategic land use planning)
- clearing of native vegetation (including koala habitat in urban areas and areas zoned for environmental conservation that exceeds the BOS threshold)
- clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2013* (see below)
- activities assessed and determined under Part 5 of the EP&A Act (generally, proposals by government entities) if proponents choose to 'opt in' to the Scheme.

Environmental Planning and Assessment Act 1979

The EP&A Act is the legislation for planning in NSW. Part 4 (Development Assessment) and Part 5 (Environmental Assessment) are the most relevant for koalas.

State environmental planning instruments that provide protection of koala habitat are also created through EP&A Act. These include State Environmental Planning Policies (SEPPs), Local Environment Plans (LEPs) and Development Control Plans (DCPs).

State Environmental Planning Policy (Koala Habitat Protection) 2020

The SEPP 2020 commenced on 30 November 2020 to replace and repeal the SEPP 2019. The SEPP 2020 replicates the objectives and provisions of the former SEPP 44 – koala habitat protection and applies to Armidale local government area.

As the SEPP 44 listed only one koala food tree (*Eucalyptus viminalis*) that occurs in the Northern Tablelands, this Strategy will utilise the Koala Tree Species and the mapping methods provided in the SEPP 2019.

State Environmental Planning Policy (Koala Habitat Protection) 2019

The SEPP 2019 replaced the previous SEPP No 44 – Koala Habitat Protection.

The Guideline developed for the SEPP 2019 was drafted by DPIE (DPIE 2019a). Relative to Comprehensive Koala Plan of Management (CKPoM), the Guideline provided support under the SEPP 2019 for:

- preparation of CKPoMs
- koala habitat mapping
- definitions of koala habitat including survey methods for core koala habitat and listed koala tree species
- development assessment and application process.

Koala habitat definitions under the SEPP 2019

The SEPP 2019 defined core koala habitat as:

-
- (a) an area of land where koalas are present, or
- (b) an area of land—
- i. which has been assessed by a suitably qualified and experienced person in accordance with the Guideline as being highly suitable koala habitat, and
 - ii. (ii) where koalas have been recorded as being present in the previous 18 years.

Methods used to determine core koala habitat can be found in the Guideline (DPIE 2019a). These methods were used to determine core koala habitat for this Strategy and development application proponents wishing to undertake surveys to demonstrate their land does not contain core koala habitat. Furthermore, an updated list of koala trees species has been included in the SEPP 2019 (DPIE 2019a). This list is an expansion from the previous SEPP 44 Koala Habitat Protection and now includes 123 species. The Northern Tablelands koala management area (KMA), of which Armidale is a part, includes 40 species of koala tree species (Appendix 6).

Local Land Services Act 2013

The *Local Land Services Act 2013* (LLS Act) provides a regulatory framework for the management of native vegetation in NSW. It applies in the Armidale LGA. An amendment to the LLS introduced a Land Management Code which allows code-based clearing of vegetation on regulated land. Land classified as ‘Sensitive Regulated Land’ cannot be cleared under this code. This includes core koala habitat in a CKPoM made under the SEPP 2019. Approvals for clearing this land cannot be granted by the Native Vegetation Panel. Furthermore, Private Native Forestry cannot be conducted on this land.

Rural Fires Act 1997

The *Rural Fires Act 1997* among other things provides protection of the environment by requiring its key management focus (i.e. fire prevention, mitigation and suppression) to be carried out having regard to the principles of ecologically sustainable development as defined by Section 6 (2) of the *Protection of the Environment Administration Act 1991*.

Bush Fire Environmental Assessment Code for NSW

The purpose of this Code is to provide a streamlined environmental assessment process for use by issuing authorities and certifying authorities in determining bushfire hazard reduction certificates. The Code has been prepared pursuant to sections 100J to 100N of the *Rural Fires Act 1997*. Section 4.5 of the Code sets out standards for the protection of biodiversity, including determining the presence of threatened species and management conditions set out in the Threatened Species Hazard Reduction List. Under this list, the species-specific conditions outlined for koalas relate to the:

- Use of fire: Low intensity fire only in areas formally identified as koala core habitat or koala high use habitat
- Mechanical forms of hazard reduction: No tree removal.
- 10/50 Vegetation Clearing Code of Practice 2014.

The Rural Fires Amendment (Bush Fire Prevention) Bill 2015

This Bill amends the *Rural Fires Act 1997* to make provision with respect to bushfire hazard reduction work and vegetation clearing work associated with the 10/50 Vegetation Clearing Code of Practice. Under the Code, land parcels (lots) which are wholly or partly mapped within core koala habitat as identified in CKPoMs, are now excluded from the operation of the 10/50 scheme meaning tree clearing measures associated with the Code of Practice cannot be applied.

Companion Animals Act 1993

The *Companion Animals Act 1998* and the Companion Animals Regulation 2008 provide for the identification and registration of cats and dogs, how they are managed and the duties and responsibilities of their owners in NSW. In particular, pet owners must ensure that their dog (or cat) does not threaten or harm a person or animal (such as a koala) and is prevented from straying or causing other nuisance. The *Companion Animals Act 1998* also provides for Council to prohibit dogs and cats on public land for the purpose of protecting wildlife.

Local Government Act 1993

Responsibility for nature conservation is firmly embedded in the NSW *Local Government Act 1993* by way of the Council Charter, which includes the following requirement:

- *to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically sustainable development.*

Armidale Regional Council

This document aims to align with Council's Community Strategic Plan 2017-2027 under section Environment and Infrastructure:

- *E1 Environment – The unique climate, landscape and environment of the region is protected, preserved and made accessible.*
- *E1.4 Protect and enhance the natural environment to promote and support biodiversity.*

Council has also developed and adopted EcoARC, a “Green-print” strategy for environmental sustainability. EcoARC encompasses nine key areas, one of which is Biodiversity. The scope and intent of the Biodiversity key area is “to protect and enhance biodiversity in the region”, with the following strategic initiatives relating to koalas:

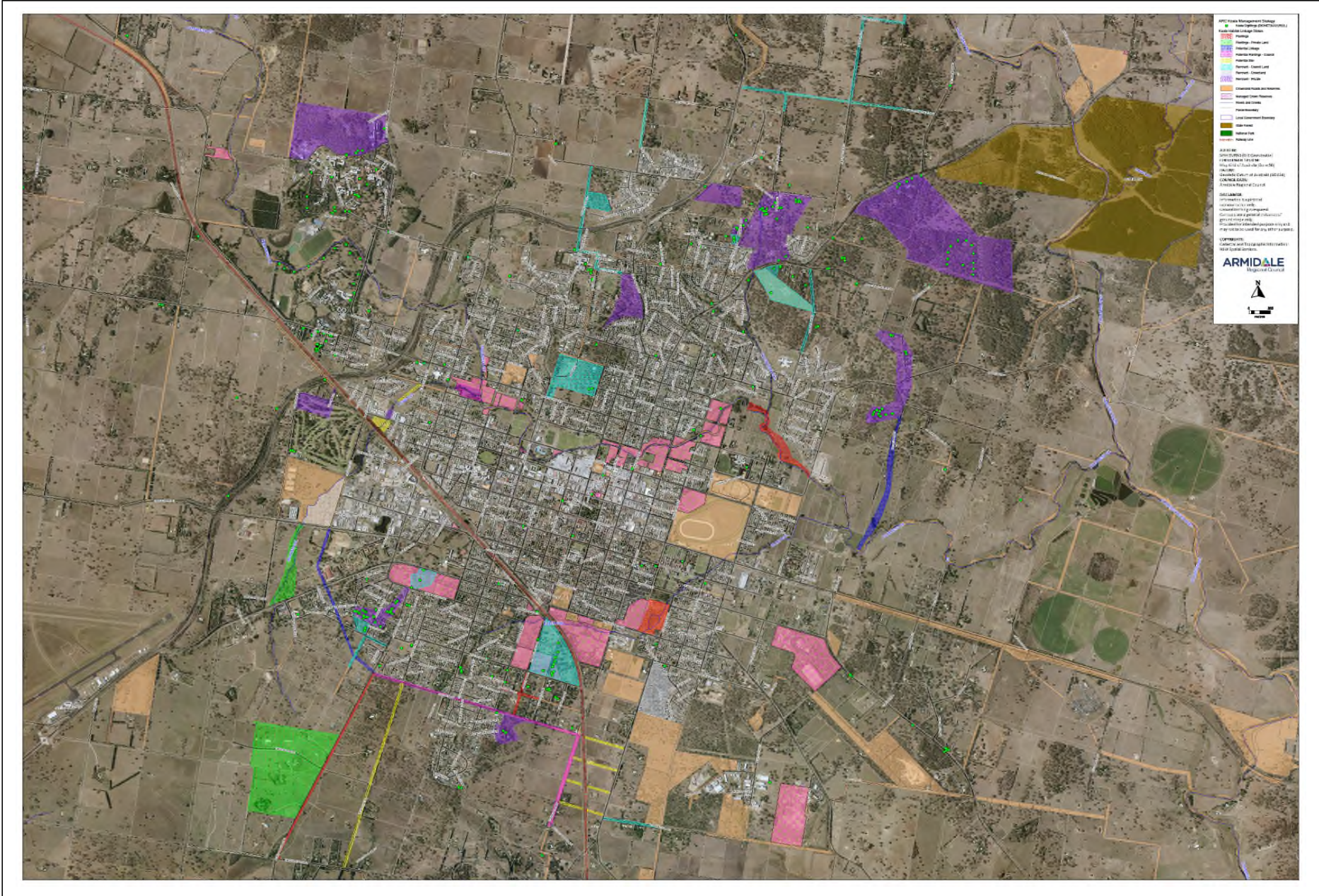
- *List and protect threatened species and communities, and protect and enhance wildlife corridors.*
- *Develop a “Flagship” Biodiversity program for the region (e.g. around the koala).*

In addition, the 2018 – 2021 Delivery Program E1.4 requires under Biodiversity:

- *Protect and enhance the natural environment to promote and support biodiversity.*

Appendix 2 Koala habitat, linkages and Sightings

(Source: Armidale Regional Council 2021)



Appendix 3 Landholder education strategy outline

Landholders in the Armidale LGA are a valuable resource; their participation is critical to enable implementation of many of the Strategy’s management actions. Building successful partnerships should be based on mutually beneficial outcomes for both Council and landholders. Below is a preliminary outline of management actions, stakeholders (including landholders) and suggested educational methods, messages and available resources upon which to develop an education program for the whole community.

The process for engaging landholders directly may include:

- marketing and advertising of workshops / information days
- provision of background information (brochures/website)
- registration of interest in specific programs (i.e. koala sightings, habitat restoration advice, plantings, access for research or surveys)
- ongoing communication during and after program (feedback mechanisms)
- recognition of contribution through media or other incentives.

Management action	Targeted stakeholders	Delivery methods	Purpose and messaging	Resources available
Koala Conservation Project Officer (or similar)	Schools Clubs Landholders Community	In person workshops Guided tours of plantings Plant ID - Citizen Science Radio interviews	To disseminate information Raise awareness Act as a liaison between stakeholders for Armidale koala information and resources To monitor implementation and effectiveness of education programs	NSW Koala Country Project Officer https://koala.nsw.gov.au/portfolio/georgina-jones/ Community guidelines – running a koala habitat restoration program with volunteers https://koala.nsw.gov.au/wp-content/uploads/2019/01/community-guidelines-koala-habitat-restoration-program-190029.pdf

Management action	Targeted stakeholders	Delivery methods	Purpose and messaging	Resources available
Koala monitoring and conservation	Community Schools Northern Tablelands Wildlife Carers WIRES NTLLS Universities, researchers Landowners Gayinyaga Community Consultative Committee Ecological consultants Thalgarrah Field Studies Centre	Promote Koala Sightings Register Council website Social media Brochure Signage Spy Koala Phone application In person workshops Spotlighting tours	To disseminate information and raise awareness. To provide for community education and engagement How you can help protect koalas and their habitat How to report sightings / injured koalas How to ID and find koala scats Creating a koala friendly backyard	Koala Country fact sheet (DPIE 2019) https://koala.nsw.gov.au/wp-content/uploads/2019/04/0802-BD-OEH_Koala-Community-Infographic.pdf Example brochure https://koala.nsw.gov.au/wp-content/uploads/2020/11/Koala-Reveg-Pamphlet-Small.pdf Spy Koala Phone appr https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/saving-our-species-program/threatened-species-conservation/iconic-species/saving-our-species-iconic-koala-project Koala friendly backyards https://www.savethekoala.com/about-koalas/living-koalas-how-can-you-help-protect-them Koala Smart https://www.koalasmart.org.au/ How to ID Koalas by their nose https://www.koalacancyfoundation.org.au/learn-about-koalas/koala-id-presentation/ Koala Health Hub https://koalahealthhub.org.au/
Koala habitat restoration and enhancement	Armidale Tree Group SNE Landcare Landholders Land managers Trees on Farms Program Plant nurseries Gayinyaga Community Consultative Committee	Training – peer to peer Council website Brochure – plant ID, scat ID Social media Community tree planting days	To build skills Facilitate partnerships and networks Importance of corridors and genetic movement Importance of Armidale ARK Refugia and resilience to climate change, drought, bushfire	Revegetating Koala Habitat (DPIE 2020) https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/programs-legislation-and-framework/nsw-koala-strategy/local-government-resources-for-koala-conservation/northern-tablelands-koala-management-area Koala habitat revegetation guidelines (DPIE 2020) https://www.environment.nsw.gov.au/-/media/OEH/Corporate-

Management action	Targeted stakeholders	Delivery methods	Purpose and messaging	Resources available
	NPWS		Promotion of planting sites Improved habitat quality and linkages	Site/Documents/Animals-and-plants/Threatened-species/koala-habitat-revegetation-guidelines-200263.pdf Koala Connections Forum (Tweed Shire Council 2016) https://www.tweed.nsw.gov.au/Koalas Koala Habitat Information Base (DPIE 2019) https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/programs-legislation-and-framework/nsw-koala-strategy/building-knowledge-on-koala-habitat
Wild dog and Domestic Dog (Owner) Management	Community Landholders	Brochure – responsible dog ownership Social media Signage in high-risk areas	To build understanding To change behaviour Minimise risk and incidence of koala injury and mortality from dog attack Improve community understanding of wild dog management	AKF – https://www.savethekoala.com/about-koalas/koalas-and-dogs-how-be-responsible-pet-owner K9 Koala Program https://www.steveaustindogtrainer.com/k9-koala-dog-training-a-barking-succes/
Roads and driver behaviour	Community DPIE	Social media Council website Signs	To improve awareness and change behaviour To reduce incidents of road strike	DPIE Koala vehicle strike facts sheets Fact sheet 1 Fact sheet 2 Fact sheet 3 Fact sheet 4

Appendix 4 Example template for koala assessment report

1. Introduction

Describe the nature of the proposed development.	<input type="checkbox"/>
--	--------------------------

2. Define how the SEPP applies to the proposed development.

Koala habitat values – addressing criteria 1 and 2	<input type="checkbox"/>
--	--------------------------

Describe the site area, including the general environment and condition, location and extent of the development area and any other areas that may be directly or indirectly impacted by the proposed development.	<input type="checkbox"/>
---	--------------------------

Provide details of koala survey as undertaken in accordance with the Guideline. This should include details of the results of the koala surveys, including how the site area meets the definition of core koala habitat and mapping that shows habitat areas and koala records within the site area and adjoining areas.	<input type="checkbox"/>
--	--------------------------

Describe the site context (including mapping showing habitat that might be associated with vegetation in the adjoining landscape and records within the vicinity of the site area) and provide an analysis of the koala habitat values (including how koalas might use the site area and the relative importance of the site area to a local koala population).	<input type="checkbox"/>
---	--------------------------

3. Measures taken to avoid impacts to koalas – addressing criteria 3, 4, 5, 6, 7 and 8

Describe the site selection process, including how koala habitat was taken into account and any avoidance outcomes achieved through this process.	<input type="checkbox"/>
---	--------------------------

Describe how the proposed development avoids or minimises direct impacts to koala habitat and habitat function within the site area.	<input type="checkbox"/>
--	--------------------------

4. Analysis of potential impacts – addressing criteria 9

Identify the residual direct impacts to koalas and koala habitat within the site area, including the nature and extent of impacts and the likely implications for the viability of a local koala population.	<input type="checkbox"/>
--	--------------------------

Identify the relevant potential indirect impacts to koalas and koala habitat within the site area and adjacent habitat areas, including the nature and extent of potential indirect impacts and the likely implications for the viability of a local koala population.	<input type="checkbox"/>
--	--------------------------

5. Plan to manage and protect koalas and their habitat – addressing criteria 10, 11, 12 and 13

Describe the management measures that will be implemented as part of proposed construction and operations to manage the direct and indirect impacts identified. These measures should be outcomes focused and include performance targets.	<input type="checkbox"/>
--	--------------------------

Describe any compensatory measures that will be delivered, including an analysis of the suitability of these measures against criteria 9 and 10.	<input type="checkbox"/>
--	--------------------------

Outline a plan for monitoring, adaptive management and reporting against the key outcomes and performance targets.	<input type="checkbox"/>
--	--------------------------

6. References

Include a list of all references cited in the report.	<input type="checkbox"/>
---	--------------------------

7. Appendices

Include any additional information or supplementary material pertinent to the DA proposal.	<input type="checkbox"/>
--	--------------------------

Appendix 5 SEPP 2019 Koala Tree Species for the Northern Tablelands KMA

<i>Allocasuarina littoralis</i>	Black She-oak
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Callitris glaucophylla</i>	White Cypress Pine
<i>Eucalyptus acaciiformis</i>	Wattle-leaved Peppermint
<i>Eucalyptus albens</i>	White Box
<i>Eucalyptus amplifolia</i>	Cabbage Gum
<i>Eucalyptus biturbinata</i>	Grey Gum
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
<i>Eucalyptus bridgesiana</i>	Apple Box
<i>Eucalyptus brunnea</i>	Mountain Blue Gum
<i>Eucalyptus caleyi</i>	Drooping Ironbark
<i>Eucalyptus caliginosa</i>	Broad-leaved Stringybark
<i>Eucalyptus camaldulensis</i>	River Red Gum
<i>Eucalyptus campanulata</i>	New England Blackbutt
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
<i>Eucalyptus dalrympleana</i>	Mountain Gum
<i>Eucalyptus dealbata</i>	Tumbledown Red Gum
<i>Eucalyptus eugenioides</i>	Narrow-leaved Stringybark
<i>Eucalyptus laevopinea</i>	Silver-top Stringybark
<i>Eucalyptus macrorhyncha</i>	Red Stringybark
<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark
<i>Eucalyptus melliodora</i>	Yellow Box
<i>Eucalyptus michaeliana</i>	Brittle Gum
<i>Eucalyptus microcorys</i>	Tallowwood
<i>Eucalyptus moluccana</i>	Grey Box
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint
<i>Eucalyptus nobilis</i>	Forest Ribbon Gum
<i>Eucalyptus nova-anglica</i>	New England Peppermint
<i>Eucalyptus obliqua</i>	Messmate
<i>Eucalyptus pauciflora</i>	White Sally, Snow Gum
<i>Eucalyptus prava</i>	Orange Gum
<i>Eucalyptus radiata</i>	Narrow leaved Peppermint
<i>Eucalyptus saligna</i>	Sydney Blue Gum
<i>Eucalyptus sideroxylon</i>	Mugga Ironbark
<i>Eucalyptus stellulata</i>	Black Sally
<i>Eucalyptus subvelutina</i>	Broad-leaved Apple
<i>Eucalyptus tereticornis</i>	Forest Red Gum
<i>Eucalyptus viminalis</i>	Ribbon Gum
<i>Eucalyptus williamsiana</i>	Eucalyptus williamsiana
<i>Eucalyptus youmanii</i>	Youman's Stringybark

Appendix 6 Potential Koala Linkages – Northern Tablelands Koala Conservation Partnership Project

(Source: Armidale Regional Council 2021)

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	09/03/2021	Armidale Koala Management Strategy-DR	Emily Hatfield Senior Wildlife Biologist	Julie Whelan, Senior Environmental Scientist	Dr Natalie Toon, Environmental Services Manager
01	12/04/2021	Armidale Koala Management Strategy-final draft	Emily Hatfield Senior Wildlife Biologist	Nigel Cotsell, Senior Ecologist	Dr Natalie Toon, Environmental Services Manager
02	8/6/2021	Armidale Koala Management Strategy-final draft (note certain dates will need to be included if approved by Council at June meeting)	Updated from public submissions	John Turbill DPIE, Mandy McLeod ARC	John Turbill DPIE
03 Final	19/7/2021	Armidale Koala Management Strategy - update of final dates of approval by Council. Update of Figure 8 supplied by John Turbill DPIE	Update from Ordinary Council Meeting	Mandy McLeod ARC	Mandy McLeod ARC

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