REDLAND CITY COUNCIL

Koala Conservation Strategy

2016

Redland CITY COUNCIL

Table of Contents

Executive summary

The koala is the faunal emblem of the Redlands and holds a special place in the hearts of the community. The mainland area of Redlands forms the majority of the Koala Coast and is recognised as one of the most significant natural koala populations in Australia. Significant declines have been recorded in Koala Coast koala populations since monitoring began in 1996. The koala population decline is attributed to the key threating processes of habitat loss and fragmentation, road mortality, dog attacks and disease (DERM 2009).

In 2007, to address the issue of koala population decline Council held a Koala Forum with community and other stakeholders. The establishment of the Koala Policy and Strategy (2008-12) was an outcome of a community and stakeholder forum held in 2007 to address declining koala populations. Since the policy and strategy's adoption, Council has increased investment in koala conservation and management initiatives.

In recognition of the ongoing requirement to protect koala populations in the Redlands the koala policy strategy was reviewed in line with Council's 2015-2020 Corporate Plan and Natural Environment Policy resulting in the development of the Redland Koala Conservation Strategy 2016 and Action Plan. The strategy and action plan's primary aim to guide management actions across the Redlands to retain a viable koala population and conserve and manage suitable habitat within the city.

The Redland Koala Conservation Strategy 2016 proposes that Council and its community in partnership with relevant state government departments, businesses, neighbouring local governments and research bodies implement appropriate actions for koala conservation on the Redlands mainland areas and on North Stradbroke Island through:

- Implementing educative programs and collaborative activities with community, government and research bodies to develop a robust understanding of koala population health, ecology and movement to inform and strengthen koala conservation planning.
- Enhancing and protecting koala habitat by maintaining an integrated, connected, high quality network of koala habitats, through strategic plantings and restoration projects across the landscape, supporting a viable and sustainable population of koalas for the long term.
- Minimising the impact of threatening process on koala population by undertaking on ground works that reduce koala mortality, protect and enhance koala populations and their habitats through a collaborative approach.
- Active community engagement to increase the understanding, connection to and participation of Redlands residents in koala conservation actions and behaviours across all sectors of the community and Council.

The Redland Koala Conservation Action Plan 2016-2021 supports this strategy providing a functional hands-on tool for Council and the community to describe and assist in the implementation of the koala conservation actions.

The implementation of this plan will be funded through a combination of general revenue, environment separate charge, reserve funds and resources obtained through external funding sources. Reviews will be undertaken on the success of implementation of the identified actions and reported annually.

Introduction

The Redland City Council local government area contains two prominent koala (*Phascolarctos cinereus*) populations. One population is located across the mainland area of Redlands (part of the south east Queensland Koala Coast). The other population is found on North Stradbroke Island (NSI). There are no koalas identified on the Southern Moreton Bay Islands.

The koala is the faunal emblem of the Redlands and one of the most recognised animals in Australia. Koalas are well recognised and highly valued in the Redlands community and accordingly koala conservation and welfare is held in high regard.

Concern about koala conservation in the 1990's led to the Queensland Government recognising part of south east Queensland as an important koala habitat. This area has since been named the Koala Coast, covers 375 km^2 and encompasses the entire mainland area of Redland City, the eastern area of Logan City and the south-eastern area of Brisbane City. The Koala Coast was recognised as one of the most significant natural koala populations in Australia, due to the relatively large numbers of koalas living in close proximity to a capital city and the identified genetic distinctiveness of koalas in this population compared with other koalas in south east Queensland (Lee *et al*. 2010).

The Koala Coast has a series of state and local government administered conservation reserves, however, the majority of koala habitat occurs on freehold land. Previously mapped boundaries for the Koala Coast assumed that koala populations were mostly in bushland areas.

The Queensland Government first began monitoring the Koala Coast koala populations in 1996. The results of the 2008 Koala Coast koala survey estimated a 64% decline in koala population (from 6246 to 2279 animals since the 1996 monitoring) (DERM 2009). The largest declines occurred in bushland areas, which were found to be as a result of excessive habitat loss and mortality in urban areas. This monitoring showed that the koala populations in bushland areas would continue to decline if a viable urban koala population was not conserved and protected from threatening processes (DERM 2009). In 2015 a trend modelling study of koala density in the Koala Coast revealed an estimated 80% decline in koala population densities between 1996 and 2014 (Rhodes et al. 2015). In response to the decline, the Queensland Government announced the establishment of an expert panel to assess how koalas could be better protected and recommended actions provided to address the decline of the state's koala population.

Council's koala policy and strategy background and achievements

Between 1996 and 2016 all levels of government have been active in attempts to protect koala populations and habitats from threats. In 2002 Redland City Council adopted the Koala Conservation and Management Strategy (and corresponding policy) to clearly articulate Council's position and actions in relation to koalas in the Redlands. In 2007 Redland City Council held a Koala Summit to coordinate input from all stakeholders and develop a new Koala Policy and Strategy (2008-2012).

The objective of the 2008 Koala Policy was: to provide a new vision and to meet community expectations to stop the rapid continuing decline of koalas by 2011 and take immediate action to recover the existing population to more than 5000 koalas in the Koala Coast by 2014. The policy included key stakeholders feedback (including the local community, local business, Queensland Government and other local governments) and corresponding suggested actions that would address the key identified threats to koalas. These identified threats included: habitat loss, fragmentation, vehicle strikes, train strikes, dog attacks and disease. The strategy contained 150 key actions to be implemented between 2008 and 2012.

Council has increased investment in koala conservation and management initiatives since adopting the policy and strategy in January 2008. The activities that have been the most effective within the current approach and resources include:

- Maintaining the protection of koalas and koala habitat under a regulatory and planning framework and other Council policies, programs and activities.
- Consolidating, linking and expanding koala habitat areas throughout the Redlands through:
    - improved identification of habitat areas
    - purchase and protection of habitat
    - acceptance of reserve values
    - restoration and management programs
    - improved management of the threats to koalas on Council reserves.
- Encouraging and supporting residents who protect koalas in their backyards to:
    - plant appropriate koala habitat trees
    - improve movement through neighbourhoods
    - modify their fences to be koala friendly
    - practice dog management.
- Increasing community education, awareness and involvement in koala conservation.
- Continuing to work collaboratively with government, business and community interests.

In 2015 a review of the implementation of the Koala Policy and Strategy (2008-2012) was undertaken by Council officers. The results of this review were considered in the drafting of the 2016-2021 strategy and action plan.

Purpose of the Redland Koala Conservation Strategy 2016 and Redland Koala Conservation Action Plan 2016-2021

In 2015 Council reviewed and updated its corporate environmental policies and its overarching corporate plan. The Natural Environment Policy (POL 3128) and Corporate Plan 2015-2020 identify the commitment Council has made to:

protect, enhance and restore the natural values of the City which include koalas and other native animals and plant populations and habitats; core habitat areas as sanctuaries for wildlife and safe wildlife movement across the landscape.

To address this commitment, the overall aim of the Redland Koala Conservation Strategy 2016 and Redland Koala Conservation Action Plan 2016-2021 is to guide management actions that will help retain a viable koala population, and conserve and manage suitable habitat both on the south east Queensland mainland areas and North Stradbroke Island. The plan to retain a viable koala population between 2016-2021 will focus on the following objectives:

- Improve knowledge on koala populations, health ecology and movement
- Improve koala habitat quality and connectivity
- Provide on ground solutions to reduce threats to koalas
- Collaborate with universities, government agencies and community groups to improve koala knowledge and initiate collaborative partnerships
- Increase understanding of and connection with koalas within Redland City Council and the Redlands community.

The 2016 Redland Koala Conservation Strategy provides the background, policy and process alignment to underpin the action plan. The Redland Koala Conservation Action Plan 2016-2021 provides a functional 'hands-on' tool for Council and the community to identify priority actions in consolidating koala habitat and ecology data, and information to achieve koala conservation within the Redlands.

Annual progress reviews will be undertaken on the success of implementation of the action plan. Implementing the action plan will involve working in partnership with state government agencies, universities, community groups, local councils, business and industry, Council officers and teams, and most importantly community members. Implementation of the action plan, and Council (local government) based resourcing, will be funded through a combination of general revenue, environment separate charge, reserve funds and resources obtained through external funding sources.

The Redland Koala Conservation Strategy 2016 and Redland Koala Conservation Action Plan 2016-2021 do not address Queensland Government controlled issues surrounding koala welfare, including translocation and animal hospitals.

Legislation, policy and plans relevant to koala conservation

Koala protection and conservation involves a hierarchy of management. Within the suite of legislation relating to planning and the environment, Council has numerous statutory obligations regarding the conservation of koalas.

The Australian Government ascribes a national conservation status and provides advice on (research and management actions) for threat abatement actions.

The Queensland Government is responsible for animal welfare matters (for example, animal hospitals and translocation permits), protection of native animal species and vegetation, regulating land use planning and offset requirements.

Local Governments are responsible for developing and the implementation of policy, plans, local planning schemes, and local laws that deal with a suite of conservation issues, including koalas.

Legislation, policy and plans relevant to koala conservation are constantly altering due to changes in population, threats and the environment. The table below provides a summary of the current legislation, policy and planning relating to koala conservation at a federal, state and local government level.

Instrument	Author	Summary
Federal		
Environmental Protection and Biodiversity Conservation Act 1999	Australian Government Department of the Environment	• Identifies and protects species and ecological communities as 'matters of national environmental significance' (MNES) • Koala populations in QLD, NSW and ACT listed as vulnerable under EPBC in 2012
Conservation Advice for Koala (QLD, NSW & ACT) 2012	Threatened Species Scientific Committee	• Provides advice (research and management actions) for threat abatement actions that would support the recovery of the koala
National Koala Conservation and Management Strategy 2009	Natural Resource Management Ministerial Council	• Provides policy advice to ensure koala habitat is prioritised in land conservation and management initiatives and in statutory planning strategies and applications
State		
Sustainable Planning Act 2009	Queensland Government	• Regulates land use planning and development in Queensland, by managing the process development takes place, effects of development on the environment and coordinating and integrating local, regional and state planning • Refers to statutory instruments which are relevant to the protection of koala habitat
South East Queensland Koala Conservation State Planning Regulatory Provisions 2010	Queensland Government	• Includes Redland City in the 'Priority Koala Development Area' (PKADA) • Regulates new development in PKADA • Applies to development that is made assessable by a local government's planning scheme
State Planning Policy 2014	Queensland Government	• Outlines matters of 'State Interest' in land use planning and development including 'biodiversity'

Instrument	Author	Summary
State Planning Policy 2014	Department of State Development, Infrastructure and Planning	• Directs that 'Matters of environmental significance are valued and protected and the health and resilience of biodiversity is maintained or enhanced to support ecological integrity' • Directs that to demonstrate compliance local government to prepare a Koala Strategy demonstrating actions to meet objectives of the SPP
South East Queensland Regional Plan 2009-2031	Queensland Government Department of Infrastructure and Planning	• Provides strategic direction to achieve outcomes for the south east Queensland region by ensuring that state interests are applied in local planning • Aims for a net gain in koala habitat by managing conflict with urban development
Nature Conservation Act 1992 and Nature Conservation (Wildlife) Regulation 2006	Queensland Government	• Identifies and protects threatened species • The koala is currently included in the threatened species list as 'vulnerable' Queensland wide
Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 (Koala Plan)	Queensland Government Environmental Protection Agency	• Parts of this plan were superseded by the introduction of the KSPRP • The elements that still apply in Redland City include: ▪ requirements to undertake sequential clearing and use of a koala spotter ▪ provisions for rehabilitation of injured and sick koalas and translocation
Vegetation Management Act 1999	Queensland Government	• Regulates the clearing of native vegetation, including koala habitat
Environmental Offsets Act 2014	Queensland Government	• Provides a framework for offsets to be applied • Identifies 'prescribed activities' that may cause 'significant residual impacts' on 'prescribed matters' • Specific requirements for koala related offsets (including rehabilitation, establishment and protection of koala habitat to offset koala habitat loss)

Local		
Redlands 2030 Community Plan	Redland City Council	• Vision Outcome - Healthy Natural Environment: ▪ A diverse and healthy natural environment, with an abundance of native flora and fauna and rich ecosystems will thrive through our awareness, commitment and action in caring for the environment. • Other relevant goals include: ▪ Thriving koala population ▪ Sanctuaries for wildlife ▪ Extensive wildlife linkages and corridors • Includes a target to measure progress of halting the decline in koala numbers then increase to maintain a population of 5,000 koalas by 2014
Redland City Council Corporate Plan 2015-2020	Redland City Council	• Renewed Council's commitment to protecting Redland's natural environment by delivering on the outcomes of the Redlands 2030 Community Plan • Specific 2020 outcomes: ▪ *Redland's natural assets including flora, fauna, habitats, biodiversity, ecosystems and waterways are managed, maintained and monitored* ▪ *Threatened species are maintained and protected, including the vulnerable koala species*
Natural Environment Policy 2015	Redland City Council	• Objective: ▪ *Our corporate decisions protect, enhance and restore the health and viability of the City's natural values both on public and private lands and waterways for the benefit, use and lifestyle of current and future generations of our community*'. • The policy statement includes koalas specifically, as one of these 'natural values' (along with other native animal and plant populations).
Redland Planning Scheme V7 2006	Redland City Council	• Desired Environmental Outcome No. 1 – Natural Environment "1. Redland City's environmental values and natural resources are managed in a sustainable manner to maintain biodiversity, ecological processes and community well-being by ensuring development (a) protects and enhances (i) a wide range of natural ecosystems including (e) koala habitat, in order to meet a net gain that will assist in the long term retention of a viable koala population
Draft Redland City Plan 2015	Redland City Council	• Koalas identified in strategic framework as a key priority • Provisions within zoning and environmental significance overlay codes require development to be designed to provide safe koala movement opportunities, minimise impediments to a koala traversing the landscape, minimises the loss of koala habitat trees and minimises the amount of clearing and fragmentation of koala habitat

Koala biology and ecology

Koalas (*Phascolarctos cinereus*) are the sole member of the marsupial family *Phascolarctidae* and their closest living relatives are the wombats. Koalas are widely distributed across Australia from northern Queensland to west of Adelaide in South Australia. Differences in physical features of koalas throughout Australia, such as fur colour and body size, are attributed to different environmental conditions rather than subspecies differentiation. Koala populations are currently scattered throughout Queensland, with south-east Queensland having the greatest concentration.

Behavior and movement

Koalas live for around 15 years in the wild. Koalas are solitary and have specific home ranges. Males mate with a number of females and the home ranges of dominant – breeding males will overlap those of several adult females. In the initial stages of independence, a young female koala usually remains in its mother's home range for approximately a year, until they establish their own home range, often overlapping with their mother's, or dispersing to other areas. In contrast, a young male is often turned out of the maternal home range and becomes nomadic. These males may be forced into marginal habitats and become more generalist in their dietary intake and may travel substantial distances.

Home range size also varies according to quality of the habitat. Home ranges can vary from a hectare to hundreds of hectares (Jurskis and Potter 1997). Koala size also varies according to sex (males tend to be larger) and carrying capacity of the habitat (Phillips and Callaghan 1995).

Breeding

Healthy females breed from about two years of age and give birth each year, however some produce offspring every 2-3 years (depending on habitat quality and age). The breeding season can range from August to February, with peak mating generally occurring in December. During the breeding season males will bellow frequently to locate females and 'announce' their size and status. They are also more mobile during the breeding season as individuals seek out mates. Females, in Queensland, can give birth to a joey between August and May, but most births occur in December and January. Young begin to emerge from the pouch at about six months of age and are weaned at about 12 months of age to find their own home range (Australian Koala Foundation 2015). Koalas are dependent for a long period of time compared to most other marsupials.

Habitat requirements

Koalas are found in communities of eucalypts and some related species. While koalas choose their habitat based on the suitability of food trees, the reasons for choosing these trees is not well understood. There are generally more koalas in forests and woodlands occurring on more fertile soils (EPA 2006). In more arid regions, water regime appears to be important, as koalas are often more abundant along watercourses and on adjacent floodplains (Gordon et al. 1988; Melzer 1995; Munks et al. 1996). Koalas generally attain different population densities in different vegetation communities according to suitability of the habitat.

Factors that may contribute to the suitability of habitat include:

- availability of seasonal or supplementary food species
- presence of suitable shelter and shade trees (particularly important in harsh climates)
- structural diversity of the vegetation
- tree size (NPWS 2003).

Research has found that koalas tend to prefer larger trees (Hindell and Lee 1987; White 1999).

Within a home range, a few specific trees (home range trees) are used by koalas to mark territories and identify individual koalas. Such trees are recognisable by heavy scratching and collections of scats close to the tree base, and may also have significant forage value (Phillips and Callaghan 1995, Hume 1995). Such trees are very important as they help to maintain social structure by allowing koalas to identify each other and their home ranges (Phillips 1997, Sharp and Phillips 1999).

Diet

Koalas are specialised leaf eaters, feeding primarily on selected species of *Eucalyptus*, and some related genera including *Corymbia*, *Angophora* and *Lophostemon*. However, koalas also feed on a number of other species, including species from the genera *Melaleuca* and *Leptospermum* (EPA, 2006). Some tree species are preferred by koalas, with individuals showing a preference for a small number of food trees in each locality. Food tree preference can vary in different regions, with a tree species preferred in one region sometimes being avoided in another region. A detailed understanding on koala food tree preferences is yet to be reached, however it is thought a range of factors can contribute to preferences, including: leaf moisture content, leaf nitrogen content and level of formylated phloroglucinol (a compound produced by Eucalypts that adversely affects mammals) (Chambers & Schell 2007).

Preferred koala food trees identified within the Redlands by Chambers & Gilbert, 2014, include:

Common Name	Scientific Name
*Blue Gum	*Eucalyptus tereticornis**
Tallowwood	*Eucalyptus microcorys*
*Swamp mahogany	*Eucalyptus robusta**
Orange Gum	*Eucalyptus bancroftii*
*Blackbutt	*Eucalyptus pilularis**
Scribbly Gum	*Eucalyptus racemosa*
Narrow-leafed Red Gum	*Eucalyptus seeana*
Small-fruited Grey Gum	*Eucalyptus propinqua*
Flooded / Rose Gum	*Eucalyptus grandis*
Grey Gum	*Eucalyptus major*
Gum-topped Box	*Eucalyptus mollucana*
Needle-barked Stringybark	*Eucalyptus planchoniana*
Pink Bloodwood	*Corymbia intermedia*
Spotted Gum	*Corymbia citriodora*
Red Stringybark	*Eucalyptus resinifera*
Broad-leaved Mahogany	*Eucalyptus carnea*
Grey Ironbark	*Eucalytpus siderophloia*
White Stringybark	*Eucalytpus tindaliae*
Narrow-leafed Ironbark	*Eucalyptus crebra*
Red Ironbark	*Eucalyptus fibrosa*
*Brush Box	*Lophostemon confertus**
*Swamp Box	*Lophostemon suaveolens**
Broad-leaved Paperbark	*Melaleuca quinquenervia*

* North Stradbroke Island

Koala population estimates

Historically, koalas had a mostly continuous distribution throughout coastal and inland Queensland and New South Wales, throughout most of Victoria and in the south-eastern area of South Australia. Since European settlement koala population has rapidly declined as a result of habitat loss, drought, hunting and disease (NRMMC 2009). Large numbers of koalas were hunted in the late 19th and early 20th centuries for the fur and skin trade. In Queensland, the annual commercial harvest of koalas ranged from approximately 450,000 animals to nearly one million between 1906 and 1927 (Hrdina and Gordon 2004).

It is evident that the national koala population distribution has changed little since European settlement, however deriving reliable broad-scale population estimates are very difficult, and so the national population of the koala remains unclear (NRMMC 2009).

In Queensland, koalas occur throughout most of their natural range, although the overall koala population continues to decline (including local extinctions and local declines in abundance) due to extensive clearing and fragmentation of woodland and forest (EPA 2006).

Koala population estimates (continued)

The koala population within the Koala Coast (which includes the entire mainland portion of Redland City, the eastern portion of Logan City and the south-eastern portion of Brisbane City) has been in significant decline since comprehensive monitoring by the Queensland Government began in 1996. Between 1996 and 1999, the Koala Coast koala population was estimated at approximately 6,000 animals. A re-survey of the Koala Coast between 2005 and 2006 indicated that the population had declined by 26 per cent to an estimated 4600 animals. In 2008, another round of comprehensive surveys revealed that the population had undergone a steep decline and was estimated at about 2,300 animals – more than a 50 per cent population loss in less than three years. An analysis of the raw survey data for the 2010 survey led to a population estimate of around 2000, which although a decline from the 2008 surveys, was not shown to be a statistically significant decrease in population (DERM, 2012).

In 2015 the University of Queensland was commissioned by the Queensland Department of Environment and Heritage Protection to analyse all koala survey data for south east Queensland between 1996 and 2015. Using models of trends in koala density for the Koala Coast there was strong evidence of a rapid decline in population densities between 1996 and 2014. The modelling revealed an estimated 80.3% (95% credible interval: 70.8% to 86.2%) decline in koala population density in the Koala Coast monitoring sites (Rhodes et al. 2015).

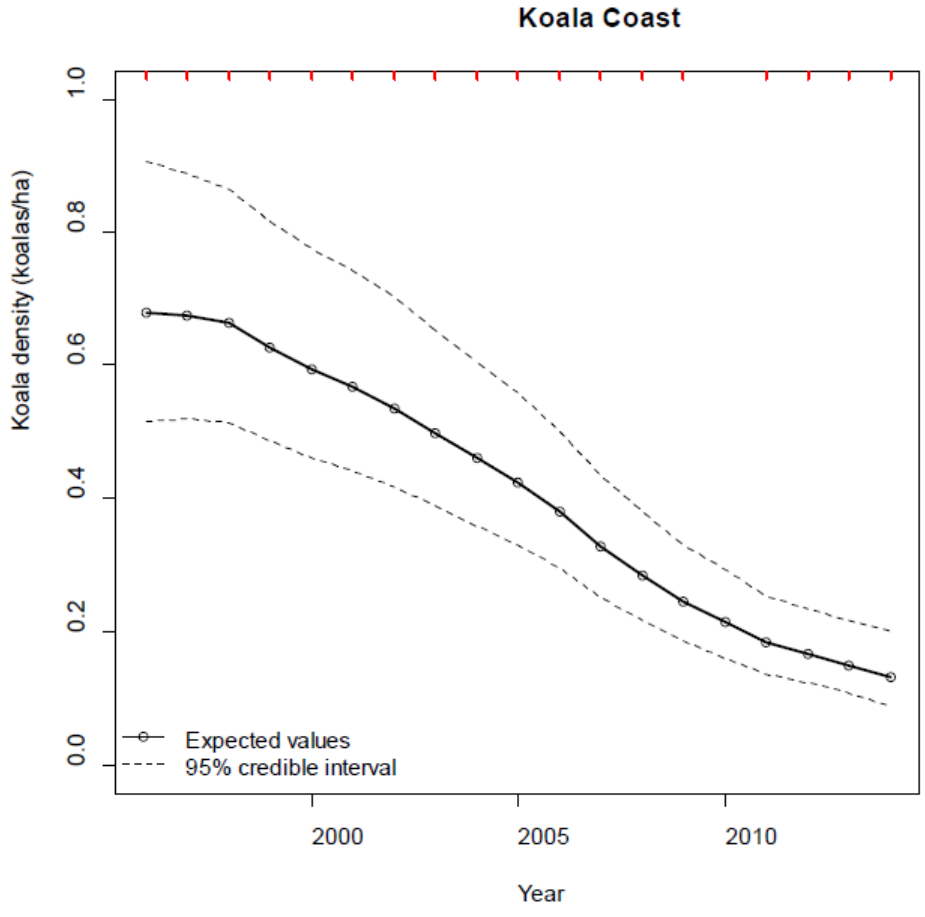

Figure 1. Estimated mean koala densities at the Koala Coast sites between 1996 and 2014. Reprinted from "South East Queensland Koala Population Modelling Study", by Rhodes, J. R., Beyer, H. L., Preece, H.J. and McAlpine, C.A, 2015, UniQuest.

There was also evidence that the rates of decline have increased over time (see Figure 1). The estimated annual rate of change in density in the Koala Coast in 1996 was -1.93% (95% credible interval: -6.84% to +3.26%), but in 2014 it was -13.26% (95% credible interval: -19.44% to -6.49%). This illustrates a likely acceleration in the rate of decline over time (Rhodes et al. 2015). The report suggests that there are a number of areas in which koalas may become locally extinct or are at such low densities that they are effectively extinct and that it appears that the loss of koalas from many sites in the Koala Coast is imminent (Rhodes et al. 2015). These types of patterns are common across coastal eastern Australia where development and koala habitat coincide (Lunney et al. 2002, Lunney et al. 2007b, Santika et al. 2014).

Key threats

Habitat loss and fragmentation

Habitat loss has been identified as the greatest threat to koala survival. Koala habitat can be lost through clearing for urban development, broad scale clearing in rural and peri-urban areas and fragmentation by development creating physical and behavioural barriers to movement, including the loss of stepping stone trees in the urban landscape. Bushland can also become degraded through poor management, fire, or pest and weed infestations (EPA 2006).

The extent of Eucalypt woodland clearing over the past 200 years has significantly reduced primary and secondary koala habitat availability (Reed *et al.* 1990; Melzer et al. 2000). Almost the entire range of koalas has been impacted by some level of vegetation clearing with less than 50% of pre 1860's koala habitat remaining across their national range (ANRA 2001; Seabrook *et al.* 2003; DSEWPC 2011).

Habitat that is highly suitable for koalas is now considered to consist of large areas of sustainable forests on fertile soils in close proximity to neighbouring habitat patches of similar quality and low proximity to roads (McAlpine *et al.* 2006). The closer an area of koala habitat becomes to this ideal the more effectively the habitat will support high quality breeding and low risk movement (McAlpine *et al.* 2006).

Habitat loss and fragmentation can also affect the genetics of koala populations. Koalas living in and amongst urban environments are most threatened by habitat loss and fragmentation (Dique et al. 2004). It is likely that recent reductions in population size and restricted gene flow through barriers to gene movement and urbanisation have contributed to the genetic differentiation of the koala populations within the Koala Coast region (Lee et al. 2010). There is some evidence to suggest that reduced genetic variation might reduce the fitness of koala populations (Sherwin et al. 2000).

Road mortality

Vehicle related koala mortality is the second most significant impact on koalas (after habitat loss and fragmentation) affecting about 300 koalas per year in the Koala Coast alone (EPA 2006). Although koalas spend most of their time in trees, they need to come to ground to move between trees within their home range. This on-ground movement mostly occurs at night but koalas can be active at any time. The movement of adult and dispersing koalas in the breeding season (August to February) greatly increases the risk of car strikes and

dog attacks (Dique et al. 2003b). Koalas living in or near urban developed areas where traffic volume and speed are greater are more at risk.

Dog attacks

Domestic dogs have a significant impact on koala populations, particularly in south east Queensland. Attacks from domestic dogs are the third most significant known cause of death behind car strikes and habitat clearing (EPA 2006). On average, approximately 110 koalas are attacked and killed by dogs each year in south east Queensland (EHP 2013). Dog-related mortality is principally caused by domestic dogs, generally in suburban backyards.

Studies have demonstrated that:

- although they occur throughout the year, more dog attacks during July to September (the months leading up to koala breeding)
- there is a seasonal peak in dog attacks in September, which particularly affects young males
- if two or more dogs are present at a property there is a higher incidence of attack
- the frequency of dog attacks in a particular urban area strongly correlates with the density of dogs that area
- attacks on sick animals are no more frequent than for healthy koalas (EPA 2006).

Disease

Several diseases existing within koala populations pose a threat to koala population resilience. Chlamydiosis and koala retrovirus (KoRV) are the two diseases most frequently threatening koala health. Symptoms of Chlamydiosis include reduced fertility rates, blindness and ultimately death (Martin & Handasyde 1999). Koala retrovirus is the agent of Koala Immune Deficiency Syndrome, an immunodeficiency that can be genetically transmitted both between koalas and from parent to offspring (Stoye 2006). Failure to breed for two or more successive years is usually a sign of infertility brought on by a chlamydial infection of the reproductive tract (EPA 2006). High levels of female infertility are present in many koala populations, with levels of more than 50 percent being recorded in Queensland (Gordon et al. 1990a). This results in depression of the reproductive rate and may lead to reduced population growth or population decline. For this reason, monitoring of diseases such as Chlamydiosis and KoRV within individual populations is crucial for the survival of all koala populations.

Climate change

Climate change is predicted to include an increase in drought frequency and high-fire-danger weather in many parts of Australia, owing to reduced rainfall levels, increased evaporation levels and an overall temperature increase between 0.4 to 2.0°C by 2030 (CSIRO 2001).

It has been predicted that increasing atmospheric CO2 levels will reduce the nutritional quality of Eucalyptus leaves. This may compromise the ability of koalas to meet their nutritional requirements. It is also predicted that increasing frequency and intensity of droughts may force koalas to move more frequently in search of water or new habitats, increasing their vulnerability to predators and motor vehicles (IUCN 2009).

Studies on the implications of climate change for koala distribution in Queensland has predicted that south east Queensland may become increasingly important to the long-term survival of Queensland's koala population as the climate in other parts of Queensland become more hostile to the species' survival (Adams-Hosking et al., 2011).

Strategic outcomes and objectives

This plan articulates actions for koala conservation on both the Redlands mainland and North Stradbroke Island that Redlands Council can undertake in partnership with its community, state government, businesses, neighbouring local governments and research bodies in the following areas.

Objectives

- **Decisions based on science**
  - Objective 1. Collaborating with research bodies, government agencies and the community to develop a robust understanding of koala population health, ecology and movement on the mainland and North Stradbroke Island to inform and strengthen koala conservation planning.
- **Protect and improve koala habitat**
  - Objective 2. Maintain an integrated, connected, high quality network of koala habitats across the landscape capable of supporting a viable sustainable population of koalas for the long term.
- **Reduce koala deaths**
  - Objective 3. Minimise the impacts of threatening processes on koala populations by undertaking on ground works that reduce koala mortality.
- **Community making a difference**
  - Objective 4. Increase understanding, connection to and participation in koala conservation actions and behaviours across all sectors of the Redlands community and Redland City Council.

Action plan

The 2008 Redlands Koala Policy and Implementation Strategy contained 150 key actions to be implemented between 2008 and 2012. 57 of these actions were completed during the life of the plan. The actions contained in the 2008-2012 strategy covered a spectrum from highly aspirational to detailed and practical. The 2016 Redland Koala Conservation Strategy and action plan have been developed following a review of the status of the 150 actions from the 2008-2012 strategy.

Actions have been formulated based on the aforementioned strategic outcomes and objectives of the 2016 Redlands Koala Conservation Strategy. Each action addresses issues identified though the analysis of information gaps and threats to koala populations both on the mainland and North Stradbroke Island. The priority for consolidating meaningful koala habitat and ecology information will allow the action plan to be further refined in the future with targeted and effective actions. Each action has been assigned a specific outcome that will be assessed to provide an indication of the success of the action. A review of the action plan outcomes will occur in 2017 – after the first 12 months of implementation. The review will align with recommendations from the Queensland Government Koala Expert Panel.

The Redland Koala Conservation Action Plan 2016-2021 guides immediate on-ground measures that are achievable within Council's sphere of influence. The action plan is a supporting document to this strategy providing a functional hands-on tool for Council and the community.

Performance measures

The implementation of the actions in this plan will be reviewed annually. The review will assess the success of each action based on the associated outcome achieved. Information from each Council department and external partners (with assigned actions) will be collated for the annual review.

Funding of the action plan is critical to the success and performance of this strategy. A five year budget submission will be developed to provide for the implementation of the action plan. Council actions to implement the plan will be funded through a combination of general revenue, environment separate charge, reserve funds and resources obtained through external funding sources.

References

Adams-Hosking C, Grantham H, Rhodes J, McAlpine C, and Moss P (2011), Modelling climate –change-induced shifts in the distribution of the koala. Wildlife Research. 38, 122-13

Chambers J and Gilbert M (2014) Review and map Koala habitat within Redland City – Version 2. BAAM Ecological Consultants for Redland City Council

Chambers J & Schell C (2007). Koala Impact Assessment: Proposed Boral Narangba Quarry Extension. Biodiversity Assessment and Management Pty Ltd.

CSIRO (2001) Climate Change Projections for Australia. CSIRO Atmospheric Research, Aspendale, Victoria [Accessed 04 November 2015: http://www.cmar.csiro.au/e-print/open/projections2001.pdf].

Department of Environment and Heritage Protection (2010) South East Queensland Koala Conservation State Planning Regulatory Provisions. Queensland State Government, DEHP.

Department of Environment and Heritage Protection (2013) Koalas and dogs - Living with Wildlife – Koalas Fact Sheer. Queensland State Government, Brisbane.

Department of Environment and Resource Management (2009) Decline of the Koala Coast Population: Population Status in 2008. Department of Environment and Resource Management, Brisbane.

Department of Environment and Resource Management (2012) Koala Coast Koala Population Report 2010. Koala Policy and Operations, Department of Environment and Resource Management, Brisbane

Environmental Protection Agency. (2006) Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016. Queensland Government - Environmental Protection Agency.

Environmental Protection Agency. (2006) Koalas and cars – Fact Sheet Koala Conservation. Queensland Government - Environmental Protection Agency.

Gordon, G., Brown, A. S., and Pulsford, T. (1988) 'A koala (Phascolarctos cinereus Goldfuss) population crash during drought and heatwave conditions in south western Queensland' Australian Journal of Ecology 13: 451–462.

Gordon, G., McGreevy, D. G., and Lawrie, B. C. (1990a) 'Koala populations in Queensland: major limiting factors' Biology of the Koala (editors A. K. Lee, K. A. Handasyde, and G. D. Sanson), Surrey Beatty & Sons, Sydney, pp. 85-95.

Hindell, M. and A.K. Lee (1987). Habitat use and tree preferences of koalas in a mixed eucalypt forest in Australian Wildlife Research 14:349-360.

Hrdina, F. and G. Gordon (2004). The Koala and Possum Trade in Queensland, 1906-1936 in Australian Zoologist 32(4):543-585.

Hume, I.D. (1995). The mystery of Koala food choice. In: Proceedings on a Conference on the Status of the Koala in 1995. pp 55-64. Australian Koala Foundation, Brisbane.

International Union for Conservation of Nature and Natural Resources (2009) Koalas and Climate Change Hungry for CO2 cuts. International Union for Conservation of Nature and Natural Resources – Red List

Jurskis, V. and Potter, M. (1997). Koala Surveys, Ecology and Conservation at Eden. Research Paper No. 34. State Forests, Sydney.

Lee, K.E., Seddon, J.M., Corley, S., Ellis, W.A.H., Johnston, S.D., de Villiers, D.L., Preece, H.J., and Carrick, F.N. (2010) Genetic variation and structuring in the threatened koala populations of Southeast Queensland reveals a genetically distinct population in the Koala Coast. Conservation Genetics 11:2091-2103

Lunney, D., L. O'Neill, A. Matthews, and W. B. Sherwin. 2002. Modelling mammalian extinction and forecasting recovery: koalas at Iluka (NSW, Australia). Biological Conservation 106:101-113.

Lunney, D., S. Gresser, L. E. O'Neil, A. Matthews, and J. R. Rhodes. 2007b. The impact of fire and dogs on koalas at Port Stephens, New South Wales, using population viability analysis. Pacific Conservation Biology 13:189-201.

Melzer, A., F. Carrick, P. Menkhorst, D. Lunney and B. St John (2000). Overview, Critical Assessment, and Conservation Implications of Koala Distribution and Abundance in Conservation Biology 14(3):619-628.

Melzer, A. (1995) Aspects of the ecology of the koala, Phascolarctos cinereus (Goldfuss, 1817), in the sub-humid woodlands of central Queensland PhD Thesis, University of Queensland, Brisbane.

NPWS (New South Wales National Parks and Wildlife Service) (2003). Draft Recovery Plan for the Koala (Phascolarctos cinereus). New South Wales National Parks and Wildlife Service, Hurstville, NSW.

Natural Resource Management Ministerial Council (2009). National Koala Conservation and Management Strategy 2009–2014. Department of the Environment, Water, Heritage and the Arts, Canberra.

Munks, S. A., Corkrey, R. and Foley, W. J. (1996) 'Characteristics of arboreal marsupial habitat in the semi-arid woodlands of northern Queensland' Wildlife Research 23: 185–195.

Phillips, B. (1990) Koalas: the little Australians we'd all hate to lose Australian Government Publishing Service, Canberra.

Phillips, S. (1997). Some issues associated with the translocation of Koalas (*Phascolarctos cinereus*). Paper presented to the Australian Veterinary Association Symposium

Phillips, S., and Callaghan, J. (1995) The Spot Assessment Technique for determining the significance of habitat utilisation by Koalas. Unreviewed addendum to: Proceedings of a conference on the status of the Koala in 1995. Australian Koala Foundation: Brisbane.

Rhodes, J. R., Beyer, H. L., Preece, H.J. and McAlpine, C.A. 2015. South East Queensland Koala Population Modelling Study. UniQuest, Brisbane, Australia.

Santika, T., C. A. McAlpine, D. Lunney, K. A. Wilson, and J. R. Rhodes. 2014. Modelling species distributional shifts across broad spatial extents by linking dynamic occupancy models with public-based surveys. Diversity and Distributions 20:786-796.

Sharp, A. and Phillips, S. (1999). Koalas, Science and Conservation. In: Saving Our Natural Heritage - The role of science in managing Australia's ecosystems.

Sherwin, W.B., P. Timms, J. Wilcken and B. Houlden (2000). Analysis and Conservation Implications of Koala Genetics in Conservation Biology 14(3):639-649.

Stoye, J. P. (2006). Koala retrovirus: a genome invasion in real-time. Genome Biology 7(11): 241.

White, N. A. (1999). Ecology of the koala (*Phascolarctos cinereus*) in rural south-east Queensland, Australia in Wildlife Research 26:731-744.

www.redland.qld.gov.au

Redland
CITY COUNCIL