

Sub-Plan B: Koalas

Draft Cumberland Plain
Conservation Plan

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Acknowledgement of Country

The development of the Cumberland Plain Conservation Plan acknowledges more than 60,000 years of continuous Aboriginal connection to the land that makes up NSW.

This Plan recognises that, as part of the world's oldest living culture, traditional Aboriginal and Torres Strait Islander owners and custodians of the Australian continent and adjacent islands share a unique bond to Country — a bond forged through thousands of years of travelling across lands and waterways for ceremony, religion, trading and seasonal migration.

Aboriginal peoples maintain a strong belief that if we care for Country, it will care for us. The area covered by the Cumberland Plain Conservation Plan is cared for by three Aboriginal groups: the Darug, Dharawal and Gundungurra. Others, such as the Eora, Darkinjung, Wiradjuri and Yuin maintain trade or other obligatory care relationships with the area. The Deerubbin, Gandangara and Tharawal Local Aboriginal Land Councils also have local land holdings and responsibilities towards Aboriginal peoples living in the area.

This significant connection to Country has played an important part in shaping this Plan.

For Traditional Owners, Country takes in everything within the physical, cultural and spiritual landscape - landforms, waters, air, trees, rocks, plants, animals, foods, medicines, minerals, stories and special places. It includes cultural practice, kinship, knowledge, songs, stories and art, as well as spiritual beings, and people: past, present and future.

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Executive summary

The [Cumberland Plain Conservation Plan](#) (the Plan) has been developed to meet requirements for strategic biodiversity certification under the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and strategic assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act).

Sub-Plan B: Koalas (Sub-Plan B) is one of two sub-plans prepared to support the implementation of the Plan. The full conservation program is provided in [Sub-Plan A: Conservation program and implementation](#) (Sub-Plan A), which includes 28 commitments and 141 actions to deliver on the Plan's vision. Sub-Plan B outlines the conservation program to protect the Southern Sydney koala population.

Koalas are highly valued by the local community and are one of Australia's most iconic animals. They are listed as a threatened species under the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). The Southern Sydney koala population, estimated to be between 600 and 1,000 koalas, is a significant regional population and the largest in the Sydney area. The Southern Sydney koala population includes koalas in South Western Sydney in the Campbelltown Local Government Area (LGA) and the eastern section of the Wollondilly LGA and to the Southern Highlands. The koalas in the Campbelltown LGA are the largest chlamydia-free koala population in NSW.

In August 2020, the NSW Deputy Chief Scientist and Engineer released the [Advice on the protection of the Campbelltown koala population](#) (Chief Scientist Koala Report). Major threats to koalas include habitat loss and fragmentation (such as from urban development and agriculture), vehicle strikes, dog attacks (both domestic and wild dogs), drought, bushfires, disease (for example chlamydia), and climate change.

The conservation program includes specific commitments and actions to protect the Southern Sydney koala population by addressing the impacts and potential risks to koalas from future development in the Wilton and Greater Macarthur growth areas. These commitments and actions were developed on advice from the [Chief Scientist Koala Report](#) (2020) and the [NSW Koala Strategy](#).

The conservation program for koalas will establish the Georges River Koala Reserve east of Appin Road from Kentlyn through to Appin, protecting up to 1,885 hectares of existing important habitat and enhance the connectivity of fragmented patches of koala habitat.

The NSW Government has committed \$84 million in the first five years to fund priority conservation actions including planting 100,000 trees to restore koala habitat in the koala reserve and 120 kilometres of koala exclusion fencing in priority locations as well as establish biodiversity stewardship sites on public and private land.

The conservation program will invest in the *NSW Koala Strategy* to deliver research, monitoring and actions. This investment, in partnership with the local community, will support koala health and welfare in South Western Sydney.

Conserving Koalas in South Western Sydney to 2056

6 commitments



Establish the Georges River Koala Reserve to protect up to

1,885
hectares of important koala habitat



3,720
hectares of koala habitat will be protected from development within the nominated areas



Fund research and koala health and welfare programs



Install **120** km of koala exclusion fencing to separate important koala habitat from new residential areas and along Appin Road

The Southern Sydney Koala Population

- Largest koala population in Sydney
- Around **600-1000** koalas
- The koalas in the Campbelltown LGA are the healthiest population in NSW

Introduction



Koala signage on Appin Road

Introduction

The department has undertaken strategic conservation planning to develop [the Plan](#). The Plan Area covers much of the Cumberland subregion, which is home to a rich variety of plants, animals and their habitats, including the largest koala population in Sydney.

The Plan been developed to meet requirements for strategic biodiversity certification under the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and strategic assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) in four nominated areas:

- Greater Macarthur Growth Area
- Wilton Growth Area
- Greater Penrith to Eastern Creek Urban Investigation Area
- Western Sydney Aerotropolis.

Major transport infrastructure is planned to respond to the needs of Western Sydney over the next 40 years. The Plan will also facilitate implementation of some of the major infrastructure corridors identified in [Future Transport Strategy 2056](#), including:

- potential future extension of Sydney Metro Greater West, south from Western Sydney Aerotropolis to Macarthur (except for those areas in the South West Growth Area)
- Western Sydney Freight Line
- Outer Sydney Orbital 1
- M7/Ropes Crossing Link Road.

It will also support conservation outside those areas through new or additional national parks and public reserves, investing in biodiversity stewardship sites, and ecological restoration of the Cumberland subregion's native vegetation communities.

These actions offset impacts to biodiversity from developing Western Sydney's nominated areas and major infrastructure corridors over the next four decades. They will also improve ecological resilience and function in the Cumberland subregion in perpetuity. This will safeguard Western Sydney's natural environment over the long term and in a changing climate.

The Plan provides more information on the scope of development in Western Sydney and its linkages with other NSW Government plans and strategies. These include the [Greater Sydney Region Plan—A metropolis of three cities](#) (GSC, 2018a), [Western City District Plan](#) (GSC, 2018b) and *Future Transport Strategy 2056* (TfNSW, 2018).

Purpose of Sub-Plan B: Koalas

Sub-Plan B is one of two sub-plans that support the implementation of the [Draft Cumberland Plain Conservation Plan](#) (the Plan). The other one is [Sub-Plan A: Conservation program and implementation](#) (Sub-Plan A) (see Figure 1).

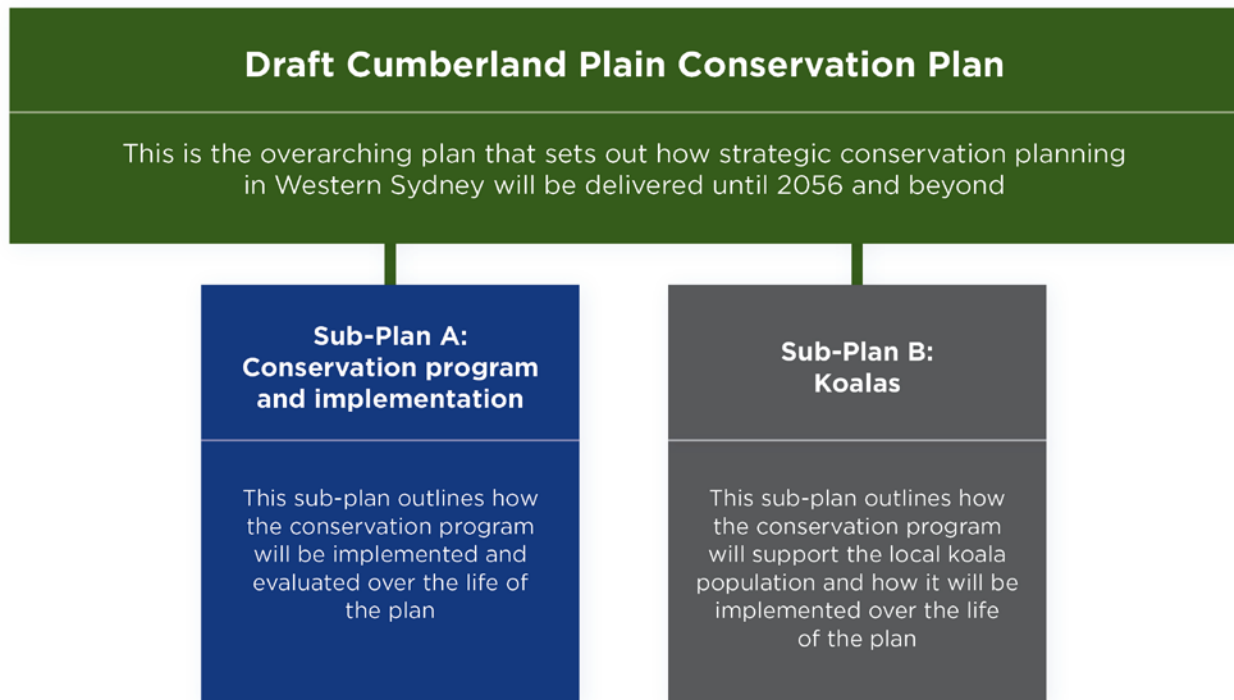


Figure 1: Hierarchy of the Draft Cumberland Plain Conservation Plan and sub-plans

Sub-Plan B outlines the conservation program including commitments and actions specifically to protect and manage koalas and their habitat. These include the establishment of the Georges River Koala Reserve, the installation of koala-exclusion fencing and actions to support koala health and welfare.

The Plan is guided by the conservation framework detailed in Sub-Plan A, which details the conservation program and how it will be implemented to 2056 through its 28 commitments and 141 actions to achieve the Plan's objective.

Expert advice on the protection of the Campbelltown koala population

In August 2020 the NSW Deputy Chief Scientist and Engineer released an independent, expert panel report, [Advice on the protection of the Campbelltown koala population](#) (Chief Scientist Koala Report 2020). The Chief Scientist Koala Report advised on the adequacy of the protection of koalas in the Greater Macarthur Growth Area through the Plan's conservation program and consistency with the [NSW Koala Strategy](#). The Chief Scientist Koala Report included several recommendations relating to the Plan. For further information on these recommendations and an analysis of how they have been addressed in the Plan, see Appendix B.

Conservation program for koalas

The conservation program's commitments and actions for koalas will ensure persistence and contribute to the long-term viability of the Southern Sydney koala population.

Outcome for koalas

Outcomes are the intended environmental, economic and social effect or value of delivering on the Plan's commitments. The conservation program for koalas comprises 6 commitments and 20 actions that will deliver the outcome for koalas (see Figure 2). The koala-specific commitments and actions are listed in Appendix A.

The commitments for koalas will be implemented as a series of planned and managed actions over the life of the Plan. Delivery will be staged according to priority and feasibility over time. The actions will be reviewed through the Plan's evaluation program, described in Sub-Plan A, which will incorporate an adaptive framework for implementing the conservation program for koalas. The evaluation program will track progress and ensure actions are informed by an ongoing review process.

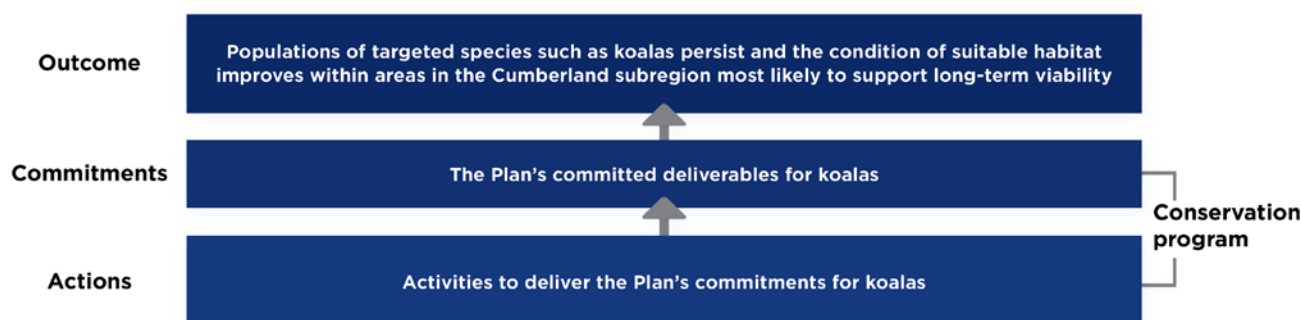


Figure 2: Program logic to achieve the Plan's vision

Alignment with existing programs

Existing NSW Government, local council and community programs support koala conservation in South Western Sydney and across NSW. The Plan's conservation program for koalas aligns with the following programs and other local council and community programs that will support delivery of the commitments and actions.

The *NSW Koala Strategy* aims to stabilise and then increase koala numbers over the longer-term, ensuring genetically diverse and viable populations across NSW. It commits \$44.7 million to fund a range of conservation actions for koalas, including providing more koala habitat, supporting local community action, improving koala health and safety, and building our knowledge to improve koala conservation.

The *NSW Saving our Species Iconic Koala Project* (2017) is delivering strategic, on-ground conservation actions at both a local and state-wide scale, as part of the *NSW Koala Strategy*.

NSW councils may prepare a *Koala Plan of Management* (KPoM) under Part 3 of the State Environmental Planning Policy (Koala Habitat Protection) 2019, as outlined in the *Koala Habitat Protection Guideline* (2020). KPoMs may be prepared by councils to take a strategic approach to the identification and protection of koalas and koala habitat. Once approved, a KPoM may trigger additional assessments for proposals on sites, depending on the location, including the vegetation and habitat present. Campbelltown Council had prepared a draft KPoM under the former State

Environmental Planning Policy or SEPP (SEPP 44) and this was submitted to the department in 2019 for consideration.

Community and stakeholder engagement

The Plan will be implemented for the people of Western Sydney—both present and future. In particular, the local community in South Western Sydney are actively engaged in ensuring the protection of the Southern Sydney koala population.

Since 2017, the department has consulted with the community and stakeholders on the Plan, including the protection of koalas. These consultations have included local councils, landholders, environmental groups and members of the community. In 2018, the department ran multiple meetings with councils and local environment groups to discuss the protection of the Southern Sydney koala population.

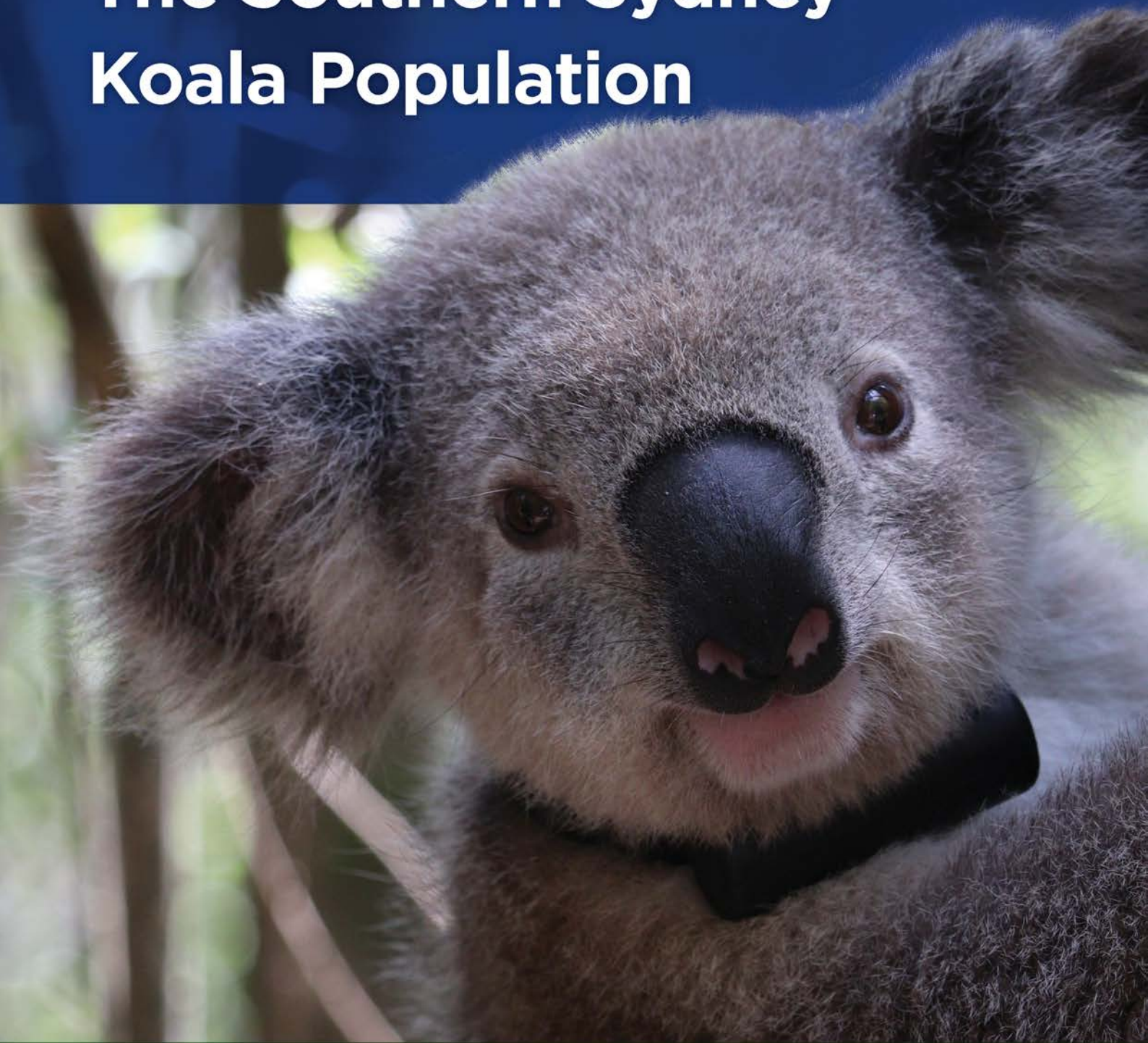
Between July and December 2019, the department coordinated six months of early engagement to inform the development of the Plan. The exercise was designed to inform stakeholders and seek preliminary feedback to support development of the draft Plan before releasing it for public exhibition in 2020. During this period, the department sought community feedback on local conservation issues, including the protection of the Southern Sydney koala population. The Campbelltown and Wollondilly communities emphasised protecting the region's koala population through new reserves, restoring important habitat and reducing roadkill. A full report on the community engagement process, including what we heard, is available on the [department's website](#).

Structure of Sub-Plan B

Sub-Plan B is structured in three parts:

1. The **Southern Sydney koala population** provides information on the distribution, dynamics and potential threats from proposed land use change to the population that informed the development of the conservation program for koalas.
2. The **conservation program for koalas** details commitments and actions to address the impacts and potential risks to the Southern Sydney koala population from planned development in the Wilton and Greater Macarthur growth areas.
3. The **implementation** section outlines roles and responsibilities relating to the conservation program, including governance arrangements for implementing the Plan, and monitoring, evaluation, reporting and delivery.

The Southern Sydney Koala Population



A Southern Sydney Koala with a NPWS GPS tracking collar

The Southern Sydney Koala Population

This section summarises the best available information for the Southern Sydney koala population that informed the development of the conservation program for koalas. This includes the threats and issues influencing the viability of the population.

Koalas across Australia and NSW

Koalas are one of Australia's most iconic animals. However, their number and distribution have significantly declined in recent years. In NSW in 2016, the estimated koala population was around 36,000, representing a 20% decline from slightly more than 45,000 in 1996 (NSW Chief Scientist and Engineer, 2016). This decline has been more pronounced in locations where urban development has cleared more habitat and increased threats such as vehicle strikes and dog attacks.

The widespread bushfires in the summer of 2019–20 also had a significant impact on koala populations across NSW, Victoria and South Australia. The department is analysing the effect of these bushfires on koalas and koala habitat across NSW. The findings of this study will inform the Plan's adaptive management strategy and assist in delivering a coordinated and targeted response to support koala recovery efforts.

Koalas in the Cumberland subregion

Koalas once inhabited forests and woodlands on the fertile shale soils across the Cumberland subregion. Aboriginal history of the subregion speaks about koalas in Dreamtime stories and as a source of food (Lunney *et al*, 2015). Following the arrival of European settlers, who cleared land for agriculture and hunted for the fur trade, the koala population and distribution dramatically declined in the Cumberland subregion.

The Cumberland Plain has two known populations of koalas: in Southern Sydney, and in the Blue Mountains, extending from west of the Cumberland subregion to Kurrajong in the north and Bargo in the south. The [Cumberland Plain Assessment Report](#) (the Assessment Report) undertook koala habitat mapping across all nominated areas. This included mapping of important habitat as required by the Biodiversity Assessment Method, which built on the work of the department in mapping habitat around the Greater Macarthur Growth Area and Wilton Growth Area. Koalas were excluded from further consideration in the assessment in Greater Penrith to Eastern Creek Investigation Area and the Western Sydney Aerotropolis on the basis that no important habitat was mapped in these areas. Therefore, koalas in and around the Greater Macarthur Growth Area and the Wilton Growth Area are the focus of Sub-Plan B and are referred to collectively as the Southern Sydney koala population.

Southern Sydney koala population

The Southern Sydney koala population is a regional population located near and within the Wilton and Greater Macarthur growth areas (Office of Environment and Heritage, 2018) (see Figure 3). The department (formerly the Office of Environment and Heritage or OEH) mapped the extent of the population in 2018, including koalas from the Campbelltown and Wollondilly local government areas. The population occurs:

- east of Campbelltown and Wollondilly local government areas to the NSW east coast
- south from Holsworthy, where it connects with koalas in the Southern Highlands
- an unknown distance west towards the Blue Mountains.

The habitat has a low carrying capacity, so each koala may require more habitat to meet their life cycle requirements than in other areas across Australia with a higher capacity (Close *et al*, 2017). It is estimated to be between 600 and 1,000 koalas. Because mobile young males aged between one and three can currently move through the landscape to new habitat, the population is the only one out of 13 regional populations in NSW that is showing signs of recovery.

The koalas in the Campbelltown local government area make up the largest chlamydia-free population of koalas in NSW.

Koala movement corridors and habitat in South Western Sydney

Connectivity between important patches of koala habitat is critical to the continued presence of koalas in South Western Sydney. Koala movement corridors facilitate dispersal of the population, which supports breeding and protects against localised extinctions. Koalas need large, connected areas of important habitat for feeding and breeding.

Table 1 categorises primary and secondary corridors that, combined, establish important habitat for koala movement. Figure 3 identifies the current extent of important koala habitat in the Cumberland subregion. Most of this is found on the shale and shale-influenced soils in South Western Sydney.

Table 1: Definitions of koala movement corridors and habitat

Term	Definition
Primary corridors	Connected area of koala habitat that is contiguous (gaps between trees less than 100 metres) and greater than 380 hectares in width.
Secondary corridors	Movement corridors that are less than 50 metres wide or not connected at both ends to other koala habitat.
Important habitat	Within the Plan, important koala habitat consists of both primary and secondary corridors. It is the area that is critical to the long-term viability of koalas (primary corridors) as well as the areas (if enhanced) that would support the population (secondary corridors).

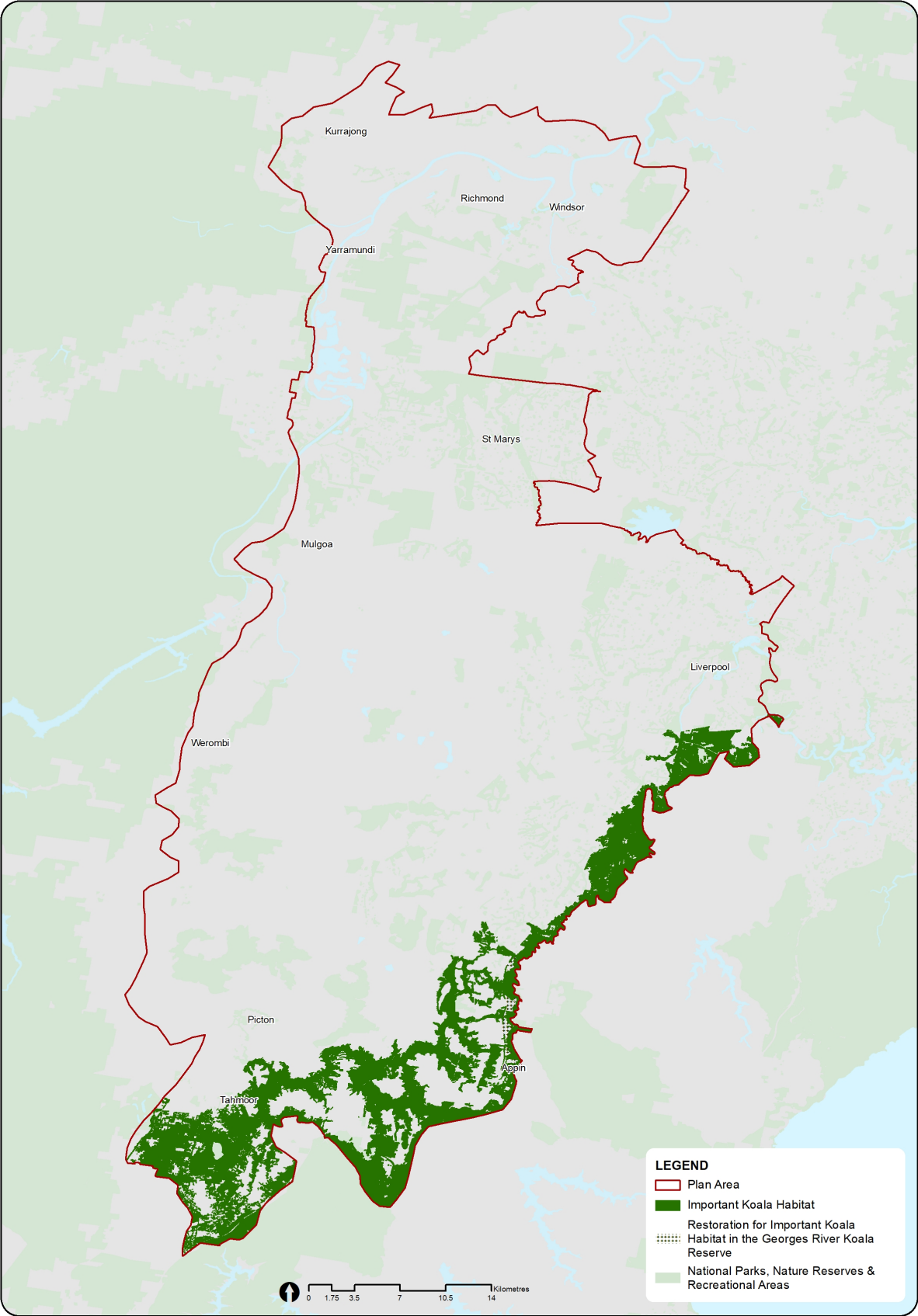


Figure 3: Important koala habitat in South Western Sydney

Threats to koalas

Koala populations in NSW are declining despite a range of initiatives to protect them (NSW Chief Scientist and Engineer, 2016). Threats to koalas that are associated with human activity include:

- habitat loss and fragmentation
- vehicle strike
- proximity of urban development including domestic dog attacks, light and noise
- bushfires
- disease (particularly chlamydia)
- climate change (which increases drought and heatwaves, and alters habitat quality) (NSW Chief Scientist and Engineer, 2016)

Koalas in South Western Sydney will be exposed to some of these threats as land use changes and development proceeds within the nominated areas.

Habitat loss and fragmentation

Koalas need large, connected areas of important habitat for their food and breeding. Impacts to habitat include loss in the size of the habitat, but also the fragmentation of the habitat. This creates remnant patches that can isolate koalas in small woodlots. Direct impacts to primary corridors are the most significant, as these corridors provide for ecological function of the population. Impacts to secondary corridors are also of concern, as they have the potential to play a supporting role within the landscape. However, secondary corridors are considered less important because they:

- have narrow points (less than 50 metres wide), which can create bottlenecks for movement and expose koalas to greater edge effects, or
- are not connected at both ends, which means they lack important landscape function at the population level.

Other habitat may be locally significant, but at a regional level, is poorly connected and provides only scattered trees across the landscape. The habitat may provide small stepping-stone patches, but moving between the isolated trees can leave koalas exposed to dogs and other threats. Due to its size and edge effects, the koalas are also more exposed and vulnerable to fluctuations in available food and water.

Without appropriate management of the landscape, increasing human activity could lead to adverse environmental impacts to koala habitat.

Vehicle strike

Vehicle strike refers to a vehicle colliding with a koala as it attempts to cross a road. Usually, the koala will be killed or injured. Without appropriate mitigation measures, the increasing traffic density associated with urban development is likely to increase the risk of vehicle strikes. Several major roads in or adjacent to koala habitat in South Western Sydney have crossings requiring management to prevent vehicle strike.

Koalas are highly mobile and typically move at night. As rural roads are not generally well lit, it can be difficult for road users to see them. Over the past decade, there has been a significant increase in koala fatalities from vehicle strikes. It is reasonable to assume that future urban land use changes, as part of the nominated areas and increasing traffic on major roads, will increase the threat to koalas from vehicle strikes.

Proximity of urban development

Urban development in proximity to koala habitat poses several threats to koalas, particularly in the Wilton and Greater Macarthur growth areas. These threats can affect dispersing koalas, which travel through urban areas, in addition to locally resident koalas living nearby. Threats include:

- domestic dog attacks
- swimming pools
- light and noise
- habitat degradation due to increased edge effects from land clearing and greater risk of disturbance (for example, slashing, pollution and illegal dumping).

Without specific mitigation actions, threats to koalas near urban areas will increase as the population grows.

Bushfire

Bushfire is a threat to koalas through loss of habitat, death or starvation due to food shortages. The bushfires in the summer of 2019–20 demonstrated the catastrophic impact of fires on local koala populations and their habitat, with a loss of 25% of suitable koala habitat in eastern NSW (EES, 2020). However, there was no direct impact to the Southern Sydney koala population and their habitat. Effects of climate change will likely increase the risk of impacts to koalas from fire over time.

Disease

Chlamydia is a serious disease that can lead to koala infertility and death, though not all infected koalas are symptomatic. Koalas in the Campbelltown area are considered to be free of chlamydia, though the bacteria has been recorded elsewhere in the Southern Sydney koala population. Urban development has the potential to increase the severity of chlamydia symptoms and therefore increase infertility and mortality rates (McAlpine *et al*, 2017).

Climate change

Climate change contributes to drought, heatwaves and altered habitat quality and will affect the Southern Sydney koala population. On average, Western Sydney experiences 10–20 hot days a year (with maximum temperatures above 35° C). However, by 2039 Western Sydney is predicted to experience an additional 5–10 hot days a year and an additional 10–20 hot days by 2070 (OEH 2018). Management of heat stress and habitat will be required increasingly for the Southern Sydney koala population.

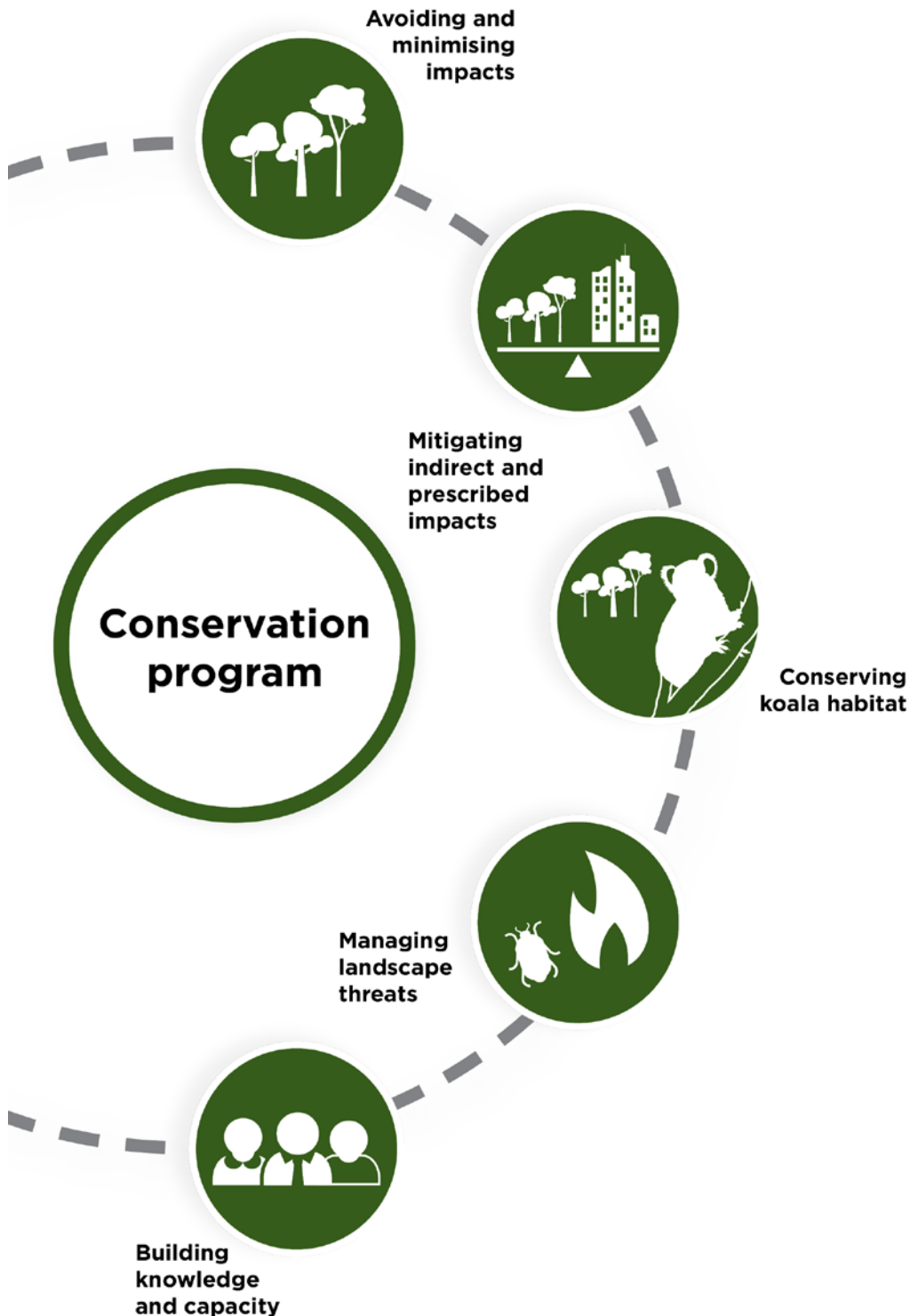
The Conservation Program for Koalas



A Southern Sydney koala being monitored through the NSW Koala Strategy

The Conservation Program for Koalas

This section outlines the conservation program for koalas. The conservation program has been developed to address impacts and potential risks to koalas in Western Sydney associated with existing and planned development in the Wilton and Greater Macarthur growth areas. The conservation program for koalas includes commitments that have been categorised into the following five categories.





Avoiding and minimising impacts

Avoiding and minimising highlights:

Avoid impacts to at least 3,720 hectares of koala habitat in the nominated areas.

This section describes actions to avoid and minimise impacts to at least 3,720 hectares of koala habitat. This is 26% of the total known koala habitat in the Plan Area. Avoiding and minimising is an important part of strategic conservation planning and is required under the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). The Plan has prioritised landscape-scale avoidance of the potential impacts of urban development on koala habitat in the Western Sydney nominated areas.

Avoiding impacts to koala habitat

The certified - urban capable land is where future urban development is likely to occur in each nominated area. Important koala habitat in the Wilton and Greater Macarthur growth areas was mapped in 2018 (Office of Environment and Heritage, 2018) and updated for [the Plan](#). Through application of a set of avoidance criteria, at least 3,720 hectares of the mapped koala habitat has been avoided from the certified - urban capable land. The avoidance criteria were also applied on cleared land that had previously supported koala habitat if the land was in an important koala corridor.

This means that development will be avoided in almost 74% of the important koala habitat, including 1,190 hectares in the Wilton Growth Area and 1,675 hectares in the Greater Macarthur Growth Area.

This boundary determination will be implemented through the Greater Macarthur and Wilton Land Use and Infrastructure Implementation Plans (LUIIPs) and precinct-planning process.

The Assessment Report calculated that 260 hectares of important koala habitat could be impacted by development in the Wilton and Greater Macarthur growth areas. These predicted impacts will be offset through the conservation program.

Protecting koala habitat

Avoided areas inside nominated areas, including those avoided for koala habitats, will be protected through the application of environmental conservation zoning. An environmental zoning can be applied to private or public land where the primary focus for that land is the conservation and/or management of environmental values and sets out land uses that are permissible and prohibited.

Environmental conservation zoning will not be applied on land owned by Local Aboriginal Land Councils (LALCs) or under claim by LALCs. Aboriginal-owned land and land under claim represents 90 hectares of the total 4,795 hectares of avoided land.

The [Explanation of Intended Effect](#) for the proposed State Environmental Planning Policy (SEPP) Strategic Conservation Planning provides further detail about how proposed environmental zoning will be applied within nominated areas.



Mitigating indirect and prescribed impacts

This section describes how the conservation program will manage threats to koalas by constructing exclusion fencing and applying controls from the [Koala Habitat Protection Guideline](#) and including design requirements in the relevant development control plans.

Mitigating indirect and prescribed impacts highlights:

Mitigate indirect and prescribed impacts from urban, transport and agricultural development on koalas, using best-practice standards, by:

- installing exclusion fencing between important koala habitat and the certified - urban-capable land to protect koalas and along Appin Road
- implementing additional requirements for the few locations where exclusion fencing is not feasible, including where the slope of the land is greater than 30 degrees; across a watercourse and adjacent to heritage-listed assets

Protecting koalas from the urban related threats

Indirect and prescribed impacts to koalas are often associated with human activities associated with urbanisation. Urban threats for koalas include habitat loss and fragmentation, vehicle strikes, dog attacks (both domestic and wild dogs) and drowning in swimming pools. The transition from rural to urban land uses in the Wilton and Greater Macarthur growth areas will require careful strategic planning.

Koala-exclusion fencing

In the first three years of implementation, the Plan will fund the installation of 120 km of koala-exclusion fencing to protect koalas from increasing threats of vehicle strikes, dog attacks and drowning in swimming pools.

Koala-exclusion fencing will be installed between important koala habitat and the certified - urban capable land to protect koalas near urban areas in the first three years of implementation (Commitment 7, Action 1). Exclusion fencing will separate koalas from future urbanised areas in the Wilton and Greater Macarthur growth areas. The exact location and design (see Case Study 2) of exclusion fencing in these nominated areas is subject to ground truthing during the Plan's implementation but will be at least three metres from koala habitat trees (Commitment 7, Action 2).

In some circumstances, exclusion fencing may not be feasible due to:

- land topography or road access constraints that make it difficult to install and maintain fences
- waterways or creeks
- being a heritage-listed area.

See Figure 7 and Figure 8 for important koala habitat and locations where exclusion fencing may not be suitable.

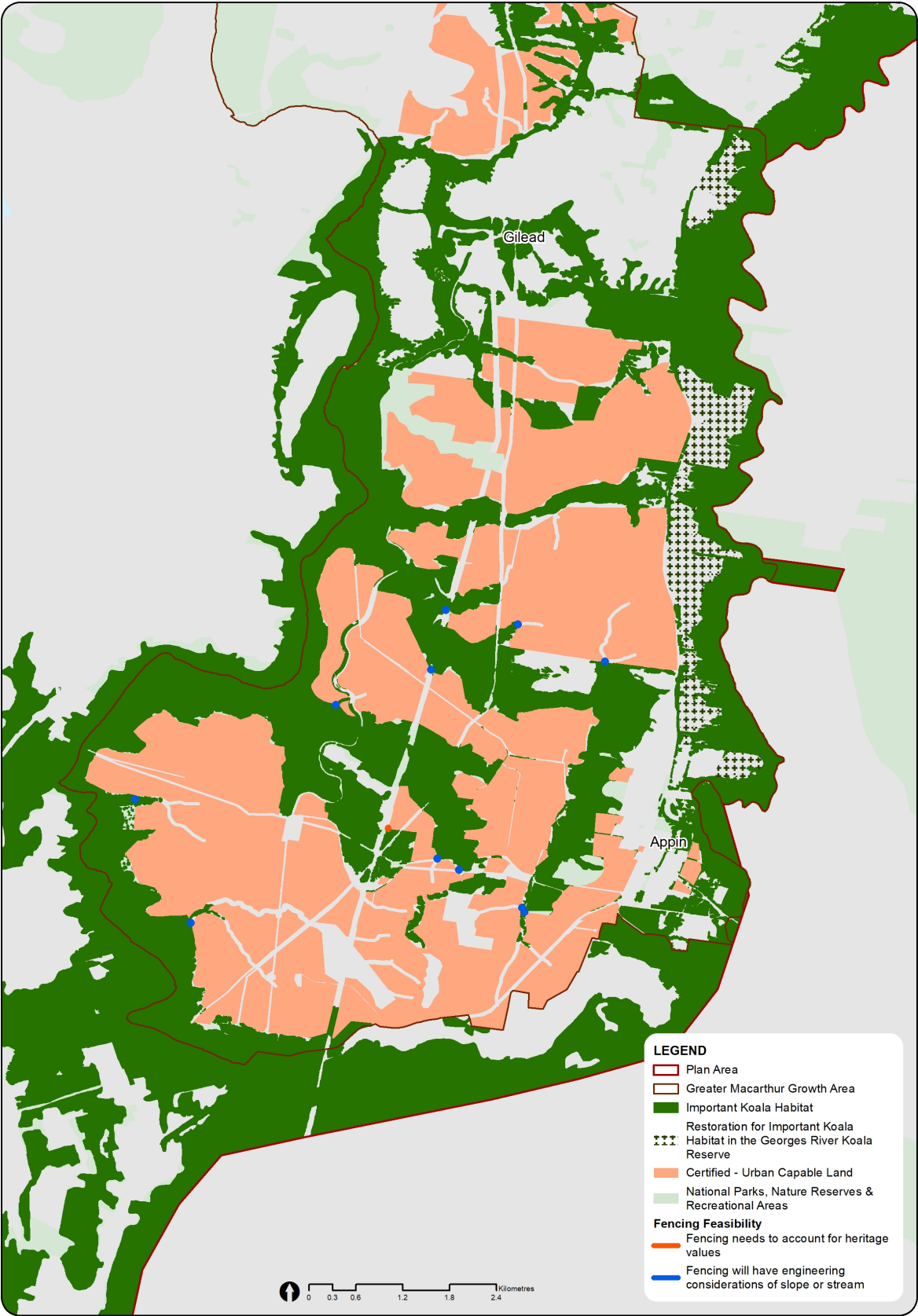


Figure 4: Important koala habitat and locations where exclusion fencing may not be suitable in Greater Macarthur Growth Area

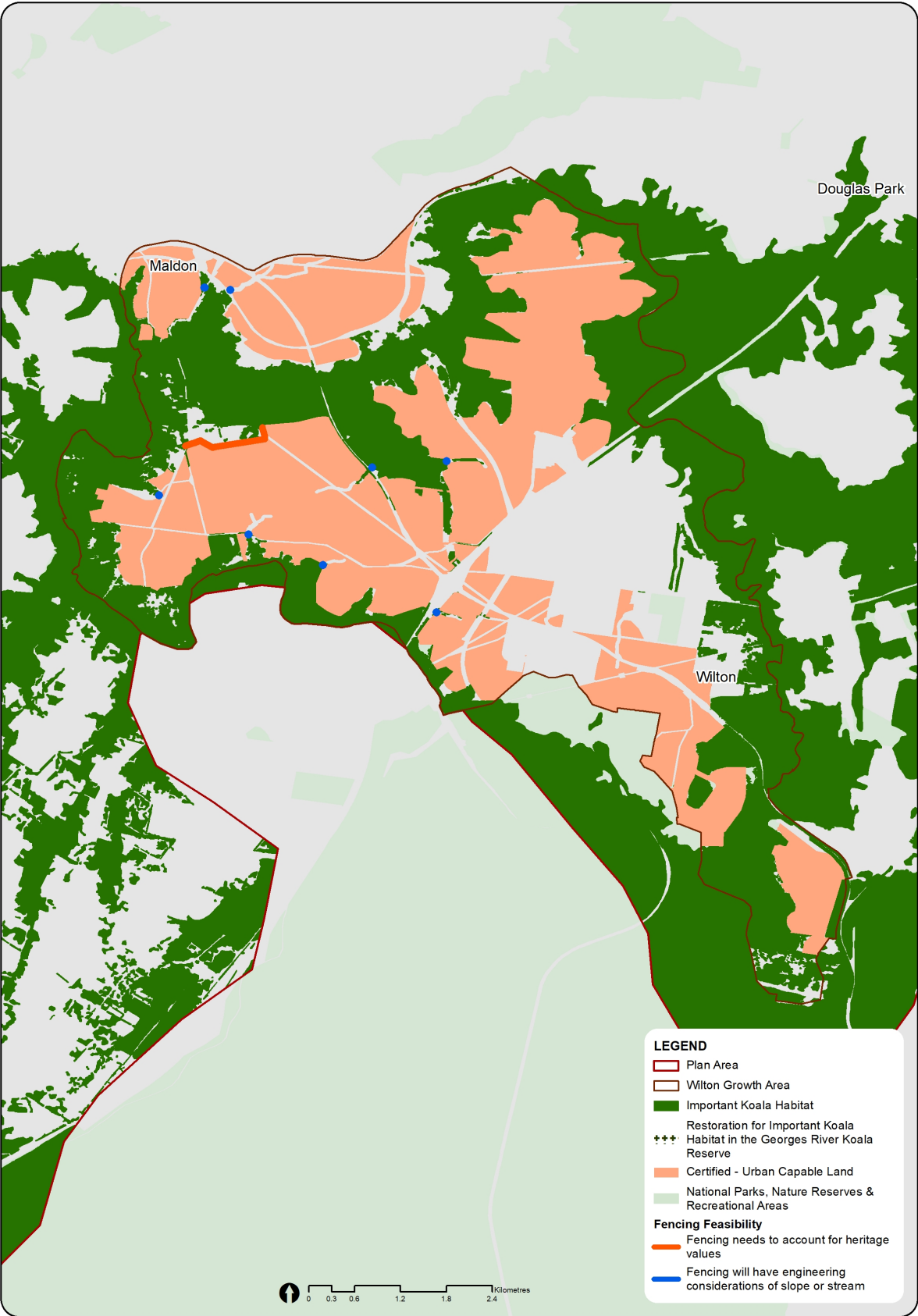


Figure 5: Important koala habitat and locations where exclusion fencing may not be suitable in Wilton Growth Area

In these areas, bespoke fencing will be considered. However, in cases where exclusion fencing is not possible, controls will be developed according to the Koala Habitat Protection Guideline made under the [Koala Habitat Protection SEPP 2019](#). These controls will apply to land 60 metres from important koala habitat and design requirements included in the relevant development control plans (Commitment 7, Action 3).

Where fencing is not possible, the asset protection zone will also act as a buffer to the koala habitat. An APZ is a buffer zone between a bushfire hazard and buildings. Further detail on the APZ is provided in Sub-Plan A.

Where access is required for community safety or fauna escape during bushfires, or for maintenance, gates will be designed as part of the fencing implementation program. Gate management will be undertaken by local councils and the Rural Fire Service.

Where fencing must cross existing or planned linear infrastructure such as gas and electricity transmission, appropriate access treatments such as gates will be considered to ensure the integrity of the koala-exclusion fencing.

In the first three years of implementation of the Plan, koala-exclusion fencing will also be installed along Appin Road to mitigate vehicle strike for koalas (Commitment 7, Action 3). Vehicle strikes on Appin Road is a well-known threat to the koalas in South Western Sydney. This will be implemented in partnership with TfNSW (see Box 2).

Fencing will be installed in accordance with the recommendation from the [Chief Scientist Koala Report](#). It will be installed within the first 1–3 years of the Plan's implementation program.

Case study 2. Koala-exclusion fencing design

Transport for NSW has installed a 'floppy-top' fence along Wilton Road in South Western Sydney that is topped with an angled and unsecured section that bends under a koala's weight, preventing them from climbing over.

'Slippery-top' fencing has superseded the floppy-top design. This type of fence was recently installed over a 4.5-kilometre koala roadkill hotspot, along Picton Road in South Western Sydney. A 60-centimetre strip of steel or heavy plastic sheeting tops the fence on the side of the koala habitat. The sheeting prevents koalas getting a grip to climb over the top section.

Box 2. Upgrade of Appin Road and koala crossing at Kings Fall Bridge

Transport for NSW is primarily responsible for funding and implementing mitigation measures to reduce vehicle strikes involving koalas and other animals along major roads.

Two Reviews of Environmental Factors (REFs) have been released for the upgrade and safety improvements of Appin Road between Rosemeadow and Mount Gilead. The upgrade will unlock new housing at Mount Gilead and improve safety and access for local residents and through traffic. The upgrade will be funded and delivered by Lendlease under a voluntary planning agreement with the NSW Government as part of the Figtree Hill residential development. The NSW Government will also provide part-funding for the road works under the Housing Acceleration Fund program.

As part of the Appin Road upgrade, fauna-exclusion fencing will be installed to reduce the current levels of roadkill on Appin Road. This fencing will protect koalas from vehicle strike and direct koala movement to the south and south-west and within primary habitat corridors mapped by the department's Environment, Energy and Science group.

The Appin Road upgrade includes fauna exclusion fencing and/or barriers at suitable locations on either side of Appin Road. Whilst the fauna exclusion fencing is predominantly focussed on the eastern side of Appin Road opposite Lendlease's Figtree Hill development, there will koala-exclusion fencing along the western side of Appin Road at Noorumba Reserve.

Transport for NSW is now preparing a detailed design for Appin Road safety improvements between Mount Gilead and Appin. The \$50-million package is funded by the Commonwealth Government to improve safety on Appin Road and support affordable housing in the Greater Macarthur Growth Area.

The Appin Road safety improve project would involve shoulder widening on both sides of Appin Road near Beulah Reserve and to the north of Beulah Reserve. The offset between the shoulder and safety barrier on both sides of Appin Road would be reduced to about 2.5 metres to avoid property acquisition from the property directly to the east, which contains an endangered ecological community and from Beulah Reserve as a recognised biobank site.

The safety works will also include installing koala-exclusion fencing along Appin Road at areas of potential or known habitat. As part of the koala-exclusion fencing strategy under current consideration, grids would be installed at driveway access points to maintain access but to prevent movements on the road corridor. The fencing is scheduled to be installed in 2022.

Transport for NSW proposes to augment the existing Kings Falls Bridge at the Georges River by constructing a concrete bench adjacent to the bridge abutments that would allow dry passage for koala (and other fauna) under the bridge. This would ensure north-south connectivity for koala movement from the Georges River Koala Reserve to the southern koala habitat. The department will work with Transport for NSW to ensure that koala-exclusion fencing is installed on both sides of Appin Road before installation of the bridge passage to channel koalas under the bridge and prevent access to Appin Road (Commitment 12, Action 6). This action will be delivered in the first five years of the Plan's implementation.

Transport for NSW may fund additional exclusion fencing at other hotspot areas as part of major road upgrades throughout the life of the Plan.

The Plan will fund installation of koala-exclusion fencing on both sides of Appin Road between Mount Gilead and Appin Village in all areas not fenced by Transport for NSW through their planned upgrade. This action will be delivered in the first five years of the Plan's Implementation (Commitment 7, Action 4).



Conserving koala habitat

Conserving koala habitat highlights:

Establish the Georges Rivers Koala Reserve to secure the north–south koala movement corridor along the Georges River between Appin and Kentlyn.

Restore up to 200 hectares of important koala habitat in Georges River Koala Reserve and other priority areas.

Secure priority areas of koala habitat in the Cumberland subregion in perpetuity.

Facilitate koala movement for at least one east–west koala corridor by constructing an animal crossing at Appin Road.

This section describes how the conservation program will protect priority areas of koala habitat to support the Southern Sydney koala population while offsetting habitat loss.

The [Chief Scientist Koala Report](#) recommends the protection of koala corridor habitat. The Plan's conservation program will establish new conservation lands to protect koala habitat that will be secured in perpetuity. Conservation lands include additions to existing public reserves, new public reserves and biodiversity stewardship sites. Ecological restoration of koala habitat will also be prioritised in conservation lands, to expand koala habitat and facilitate koala movement.

Public reserves and biodiversity stewardship sites will protect existing koala habitat and provide environmental buffers against adverse impacts and fauna corridors to improve landscape connectivity for koalas. Ecological restoration in reserves and biodiversity stewardship sites will play an important role in enhancing connectivity between remnant habitat patches and improving the condition of existing koala habitats.

Establishment of the Georges River Koala Reserve

The conservation program will establish the Georges River Koala Reserve, the most important north–south koala movement corridor along the Georges River between Appin and Kentlyn (see Figure 4) (Commitment 10). This north–south corridor has high-fertility shale and shale-influenced transition soil that supports preferred koala feed trees. The reserve will facilitate movement of koalas between Campbelltown and the Southern Highlands and promote the genetic diversity of the species.

The establishment of the Georges River reserve was recognised in the Chief Scientist Koala Report as essential to the persistence of the Southern Sydney koala population. The reserve will protect and manage up to 1,885 hectares (including ecological restoration), which is three times the required offset target for important koala habitat for the Plan. The first 800 hectares of publicly owned land was announced in November 2018 to be set aside as part of the reserve. There is also an opportunity to restore up to 200 hectares of important koala habitat within the reserve. The reserve will also give local communities accessible public space for recreation, such as walking, education opportunities and may provide opportunities for koala-based tourism.

The Chief Scientist Koala Report recommends a minimum corridor width of 390 metres, plus an additional 30m buffer for a safe koala corridor. Based on desktop mapping, it is estimated that this

width is achieved in 99% of the primary north-south koala movement corridors along the Nepean and Georges rivers. The north–south koala movement corridor (the proposed Georges River Koala Reserve) is also greater than the minimum recommended widths. Restoration will be targeted in some locations to widen the corridor, and this analysis will be refined when the koala exclusion fencing is designed and installed.

Implementation of the Georges River Koala Reserve

The NSW Government will prioritise the establishment of the Georges River Koala Reserve in the first 10 years of implementing the Plan.

The Georges River Koala Reserve will be established in two stages, comprising in total up to 1,885 hectares of land. Stage 1a will include approximately 700 hectares (Commitment 10, Action 1) and 1b approximately 430 hectares of land (Commitment 10, Action 2). Stage 2 will comprise up to 755 hectares of additional land that will be added to the reserve by 2040 (see Figure 4) (Commitment 10, Action 4).

The Office of Strategic Lands (OSL) owns around 760 hectares of land proposed for the reserve and is currently establishing biodiversity stewardship agreements over some of its holdings. OSL has been acquiring land in this corridor since the 1980s under the Regional Open Space program. Any Biodiversity Stewardship Agreements established before implementation of the Plan will generate credits that will be purchased under the conservation program.

OSL will manage the land acquisition program for the reserve. It will aim to acquire land for Stage 1 of the Georges River Koala Reserve in the first 5 years and for Stage 2 by year 10 of the Plan's operation, subject to and in close consultation with affected landowners. Once acquired, OSL will establish biodiversity stewardship agreements to generate biodiversity credits that will be used to cover costs associated with future management of the reserve.

When the land acquisition program is complete and stewardship agreements are established, ownership and management of the reserve will be transferred to the NSW National Parks and Wildlife Service (NPWS) in accordance with the *National Parks and Wildlife Act 1974* (NSW) (Commitment 10, Action 3).

Restoration in the Georges River Koala Reserve

Koala habitat in South Western Sydney is highly fragmented between remnant patches of important koala habitat. Ecological restoration, which helps degraded and damaged ecosystems return to a more natural state, will help to improve connectivity and expand the total area of koala habitat in South Western Sydney.

In the first five years of delivering the conservation program, the NSW Government will plant 100,000 trees to restore important koala habitat in Georges River Koala Reserve, along Ousedale Creek, around Appin and other priority locations in the strategic conservation area.

The conservation program will restore around 200 hectares of land in the Georges River Koala Reserve over the life of the Plan (Commitment 10, Action 5). The higher fertility shale and shale-influenced soils provide an opportunity to restore plant community types that are preferred by the Southern Sydney koala population, including Grey Box, Grey Gum, and Narrow-leaved Ironbark trees.

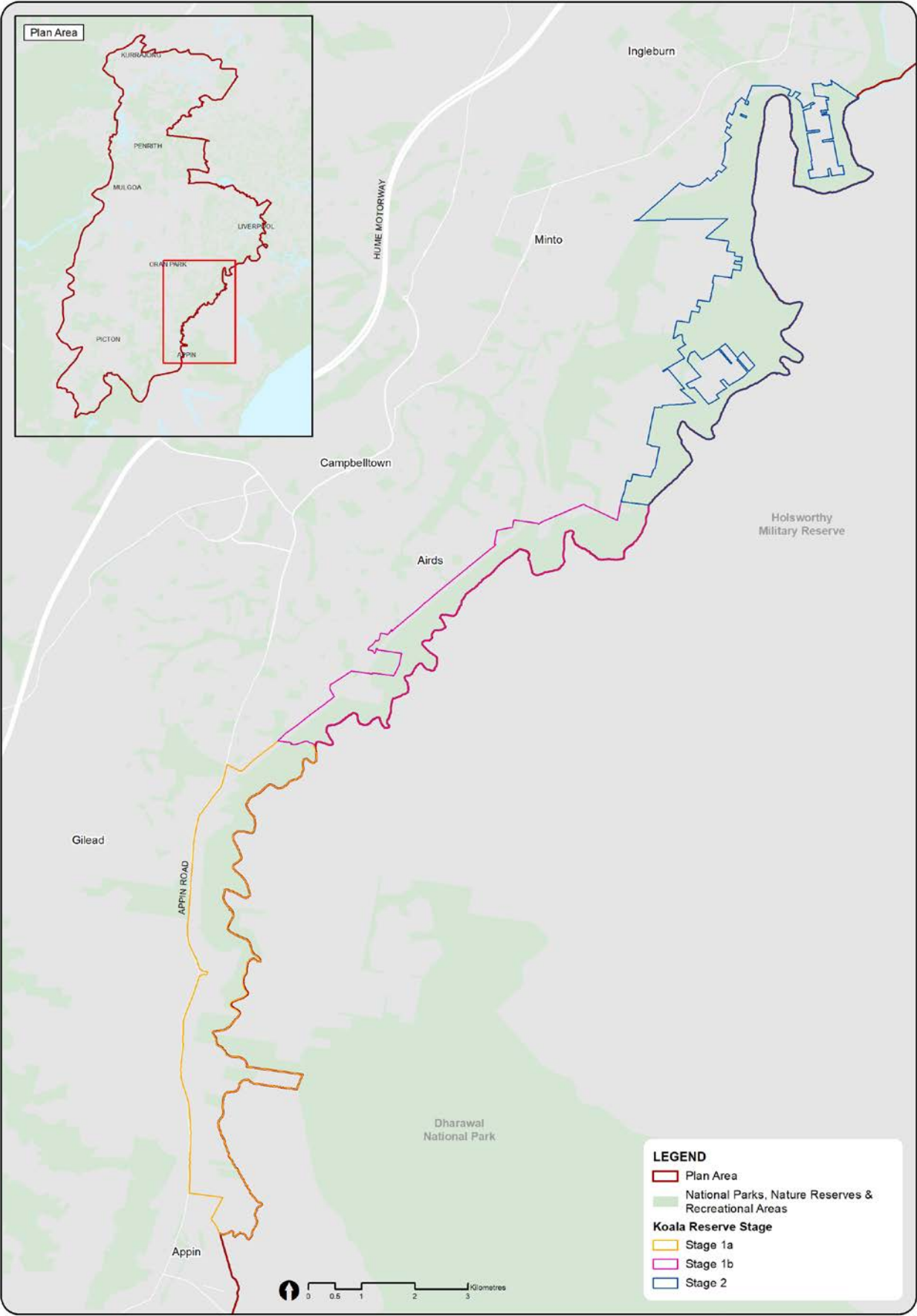


Figure 6: Proposed staging of the Georges River Koala Reserve

Secure additional priority areas of koala habitat

Only 9% of the 14,430 hectares of important Southern Sydney koala habitat is currently protected and managed through public reserves or private land conservation.

In addition to the Georges River Koala Reserve, around 7,345 hectares of important koala movement corridors and habitat have been identified within the strategic conservation area that are potential candidates for conservation lands (Figure 5). Some locations in the strategic conservation area include Allens Creek, Douglas Park, Tahmoor, Bargo and the Nepean River. Protecting and restoring these areas in the strategic conservation area would help support the viability of the Southern Sydney koala population.

All east–west koala corridors within the Plan Area will be protected (for vegetation) using environmental conservation zoning. Where not feasible due to width, the corridor will be fenced to exclude koalas but can be considered for future restoration to support koala movement, noting at least one will be secured for koala movement including safe crossing of Appin Road through the Plan (Commitment 12, Action 3).

Box 1. Strategic conservation area

The strategic conservation area is identified as having the greatest potential to deliver long-term conservation outcomes for biodiversity in the Plan Area. They include large patches of native vegetation with good connectivity to other such patches, or areas with the potential to enhance connectivity that directly offset impacts to koalas and other threatened species and ecological communities. The strategic conservation area will be monitored over the life of the Plan and regularly refined as constraints and opportunities change.

The department has identified the Plan's strategic conservation area that contains around 28,300 hectares of land in Western Sydney. Excluding the Georges River Koala Reserve, 26% of these areas are important koala habitat (see Figure 5).

At their request, land owned by Deerubbin LALC has been excluded from the strategic conservation area. Land owned or under claim by other LALCs is included in the strategic conservation area, but the planning controls proposed for this conservation area will not be applied to LALC owned or claimed land.

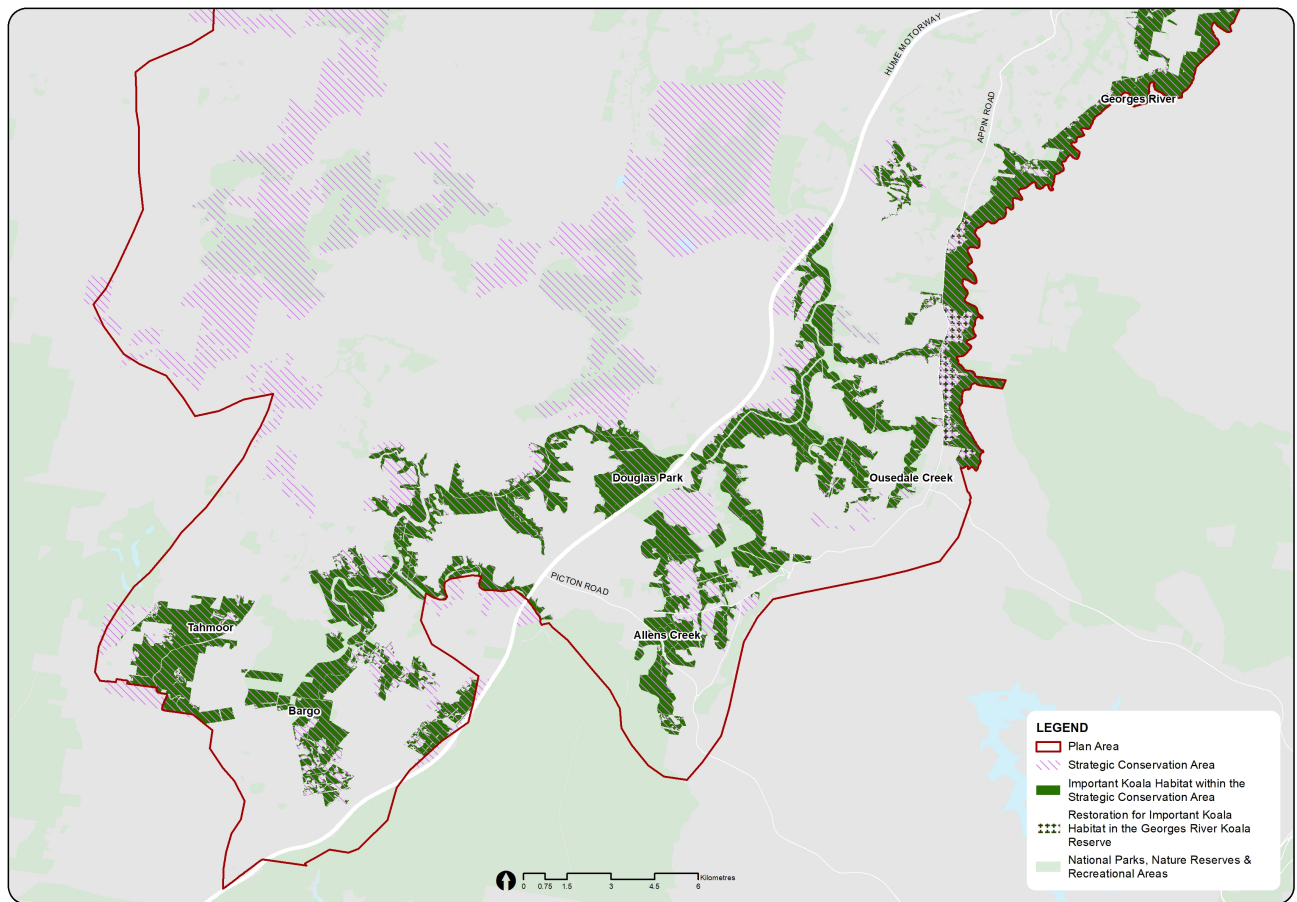


Figure 7: Important koala habitat within the strategic conservation area

Implementation of reserves and biodiversity stewardship sites

The establishment of additional conservation lands to protect koala habitat will include both reserves and biodiversity stewardship sites (Commitment 12, Action 2). The Office of Strategic Lands will manage the land acquisition program, which will include establishing Biodiversity Stewardship Agreements over land that is suitable for future reserves. This approach will ensure adequate funding is available for long-term management by NPWS or councils.

Land acquisition will be phased staged over the life of the Plan and the complexity of the acquisition process will depend on the number of lots and landholders to be negotiated with for each reserve proposal.

Biodiversity stewardship sites provide permanent protection for threatened species and ecological communities, including koalas, while enabling private or public landholders to continue to use their land outside the site as normal.

The NSW Government does not need to acquire land to establish a biodiversity stewardship site. Instead, a landholder enters into a Biodiversity Stewardship Agreement with the NSW Government, and can generate biodiversity credits and earn income from trading these credits under the Plan.

The landholder receives support from the Biodiversity Conservation Trust, including an annual payment from funds held and invested on their behalf, to undertake the required management actions. Landholders don't need to set aside all their land for a Biodiversity Stewardship Agreement.

More details about the reserve and biodiversity stewardship programs and their implementation are provided in [Sub-Plan A](#).

Case study 1 provides information on a Biodiversity Stewardship Site established in Douglas Park, an important area in Western Sydney for koalas, to protect and manage koala habitat and other important biodiversity values.

Case study 1. St Mary's Towers biodiversity stewardship site at Douglas Park

St Mary's Towers biobank site at Douglas Park in the Wollondilly LGA was established in 2010 under an agreement between the landowner and the NSW Minister for the Environment. A biobank is a historic type of agreement, similar to a Biodiversity Stewardship Agreement.

This site contains Cumberland Plain Woodland and Shale Sandstone Transition Forest that provides habitat for koalas and a range of other threatened species. Allens Creek also flows adjacent to the site, making it part of an important koala corridor between the Nepean and Cataract rivers that is also protected.

St Mary's Towers is divided into 10 management zones that are informed by vegetation type, condition and management objective. Actions required under the biobank agreement include managing grazing, weeds, use of fire, stressors created by human activity, erosion and feral animals, and replanting of native plants.

While the agreement was being established, the former Office of Environment and Heritage provided advice and support to the landowner, which included identifying and costing proposed management actions.

Management of the land has generated credits worth more than \$1.7 million. The landholder received \$1 million and more than \$500,000 was deposited into a trust, which is used to deliver management actions. The credits from this biobank site were purchased under the Growth Centres Biodiversity Offset Program.

Source: OEH 2017, Conservation achievements: St Mary's Towers biobank site

Secure one east–west Koala movement corridor between the Georges and Nepean rivers

East–west connectivity between the Georges and Nepean rivers is important for the resilience of the Southern Sydney koala population. However, scientific advice from the department and the research community suggest that the existing six east–west corridors in the Greater Macarthur Growth Area are too fragmented and not wide enough to support koalas over the long term (Figure 6). The Chief Scientist Koala Report recommends a width of 390–420 metres for a safe koala corridor.

The department, under the Plan will secure at least one east–west koala movement corridor (Commitment 12, Action 3,4,5). Using ecological restoration to ensure enough width and a fauna crossing for safe koala movement across Appin Road (Commitment 12, Action 4,5). Corridor E (Figure 6) at Ousedale Creek to Appin North is recommended by the Chief Scientist Koala Report as the most suitable for koala movement because of the condition and width of the existing vegetation. Box 4 provides more information.

The securing and enhancing of at least one east–west corridor, likely the Ousedale corridor, will start in the first five years of the Plan's implementation, with a feasibility study currently underway for implementation.

Native vegetation within all east–west koala movement corridors will be protected through environmental zoning following approval of the Plan, consistent with the Chief Scientist Koala Report (Commitment 12, Action 3).

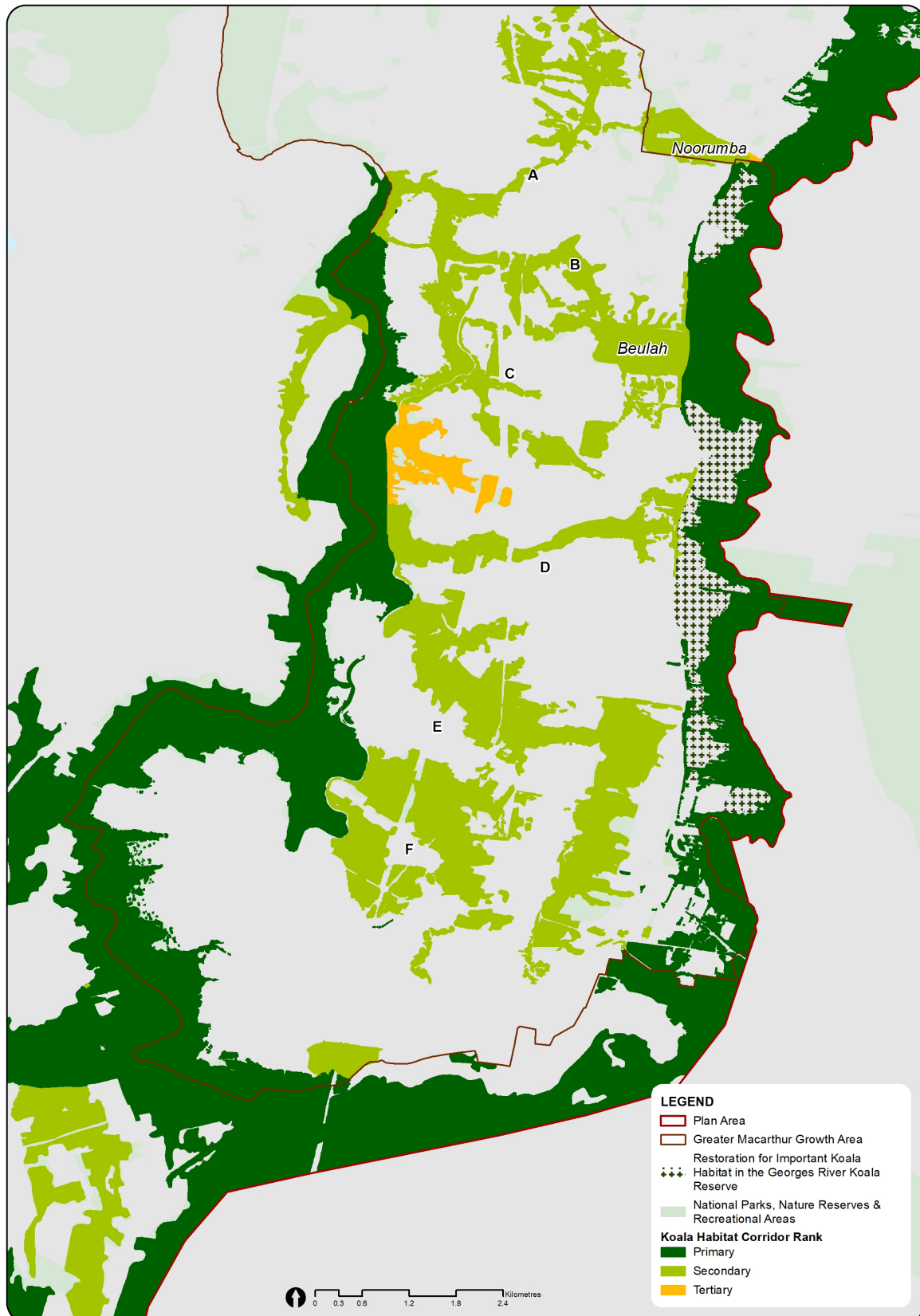


Figure 8: Potential east–west corridors connecting Nepean River to Georges River A) Menangle Creek to Noorumba B) Woodhouse Creek to Beulah C) Nepean Creek to Beulah D) Mallaty Creek to Georges River E) Ousedale Creek to Appin North F) Elladale Creek and Simpson Creek to the colliery

Ecological restoration of koala habitat

Most of the Southern Sydney koala population prefers feed trees such as grey gum and blue-leaved stringybark that are found on nutrient-rich soils derived from Wianamatta shale. Due to historical clearing for agriculture, these vegetation types were largely removed from the landscape and only fragmented patches of koala habitat remain.

To enhance the connectivity between patches of koala habitat, and augment and strengthen existing primary and secondary koala corridors, native vegetation on Wianamatta shale soils should be restored. In addition to the 200 hectares of ecological restoration proposed in the Georges River Koala Reserve, around 1,920 hectares of cleared or degraded land has been identified across the strategic conservation area for potential restoration of koala habitat.

In line with the recommendation of the Chief Scientist Koala Report, the Plan's Restoration Implementation Strategy will clarify approaches to ensure the long-term sustainability of restoration considers genetic diversity in what is planted (Commitment 13).

Sub-Plan A provides more detailed information about the ecological restoration program and its implementation.



Managing landscape threats

This section describes how the conservation program will reduce and manage landscape threats, including those threatening koalas and their habitat.

Managing landscape threats highlights:

- undertake a coordinated weed-management program to reduce weeds in and around conservation lands including koala habitat
- introduce a program to coordinate pest-control actions across the conservation lands
- develop and implement a Fire Management Strategy to manage fire to support biodiversity on conservation land including koala habitat

In addition to habitat loss, increased urbanisation brings increased threats to biodiversity, including from fire, weed invasion, pest animals and disease. Reducing and managing threats to an area's biodiversity in a strategic and coordinated manner will be critical for achieving the Plan's objective to improve ecological function and resilience. Delivering commitments for landscape threats and managing these threats will also benefit the Southern Sydney koala population and their habitat.

The conservation program will focus on reducing priority weed species within the conservation lands including koala habitat to reduce threats to land secured under the Plan. It will target weeds that have the most impact, such as exotic vines and scramblers; African olive; African boxthorn; Bitou bush and boneseed; exotic perennial grasses; and other readily dispersed or persistent, escaped garden plants. A weed-control working group will be established to guide the implementation of weed-control activities under the Plan, including the development of a Weed-Control Implementation Strategy (Commitment 16, Actions 1 and 3).

The conservation program will also implement coordinated control activities within the conservation lands and throughout the Plan Area to manage priority pest animals in the Cumberland subregion. This will mitigate against dog and fox attacks, which are a common threat to koalas in peri-urban areas. The actions also include the establishment of a pest animal working group to guide the implementation of pest animal control activities under the Plan (Commitment 17, Action 1).

The Plan commits to managing fire in strategic locations in the Cumberland subregion to support the maintenance of biodiversity values on conservation lands within the Plan Area. The conservation program will develop and implement a Fire Management Strategy that will support the management of biodiversity including koala habitat. It aims to manage fire regimes in conservation lands including areas protecting koalas and their habitat to maintain and enhance biodiversity over time and manage current and emerging bushfire risks (Commitment 18, Action 3).

Sub-Plan A provides further information on actions to manage landscape threats.



Building knowledge and capacity

This section describes how the conservation program will invest in the [NSW Koala Strategy](#) to deliver expanded research priorities and a range of on-ground actions to support koala health and welfare in South Western Sydney.

Building knowledge and capacity highlights:

- raise awareness of the Southern Sydney koala population and provide opportunities for local communities to participate in koala conservation and management
- research and monitor the health of the Southern Sydney koala population
- build capacity in the rehabilitation sector to support koala health and welfare.

A targeted stakeholder and community engagement program will raise awareness and provide opportunities for local communities to participate in koala conservation and management. Research will enhance our knowledge of koalas and allow for conservation initiatives and monitoring of populations as development in South Western Sydney occurs. Building capacity in the rehabilitation sector will support koala health and welfare in Western Sydney. Together, these programs will help to achieve the Plan's outcome for koalas.

Raise awareness and community participation

South Western Sydney's residents may not know about their unique local fauna, and as Western Sydney grows, some new residents may not have lived near koalas before. Targeted community education programs provide an opportunity to raise awareness about the unique presence of koalas, threats and opportunities for community participation in koala conservation.

The conservation program will invest in the [NSW Koala Strategy](#) to raise awareness of the Southern Sydney koala population and encourage community participation in koala conservation, consistent with the Plan's education and engagement program (Commitment 21, Action 7).

Biodiversity education program

Within the first two years of implementing the Plan, the department will run a Biodiversity Education Symposium including a focus on the Southern Sydney koala population.

The conservation program will also establish the Cumberland Biodiversity Education Network which will provide for education officers embedded in councils across selected local government areas. The Education Network will deliver activities such as on-ground conservation activities for koalas and community education on the Southern Sydney koala population. Sub-Plan A outlines additional detail on the Biodiversity Education Symposium and the Education Network.

Research to support koalas

The conservation program will invest in the [NSW Koala Strategy](#) to support research priorities identified in the [NSW Koala Strategy Research Plan](#) including identifying key threats and innovative mitigation measures, demographics, life history and ecology of the koalas in South Western Sydney (Commitment 24, Action 1). It will involve collaboration with external research organisations, local councils and the community.

Key threats and innovative mitigation measures

Chlamydia is a key threat to the Southern Sydney koala population that may increase over the life of the Plan. Some koalas in the Wollondilly LGA have contracted the disease, while those in the Campbelltown LGA remain uninfected.

The Southern Sydney koala population needs to be monitored to better understand the threat from chlamydia. The conservation program will support the *NSW Koala Strategy* to mitigate the threat of chlamydia (Commitment 24, Action 1). The department has partnered with Taronga Zoo to mitigate the threat of chlamydia. Current and proposed actions include:

- launching a research project to better understand the impacts of chlamydia on koala populations and to identify management options
- trialling chlamydia vaccines to increase the incidence of healthy and disease-free koalas and decrease the prevalence of the disease
- launching a research project to better understand the links between koala stress (for example, heatwaves and chlamydia).

Demographics, life history and ecology

Better understanding is needed of koalas in parts of Western Sydney such as Tahmoor, Bargo and Silverdale. Improving the knowledge of koala ecology will help to strengthen the conservation program and assist in managing the Southern Sydney koala population.

The conservation program will address knowledge gaps related to koala population demographics, life history and ecology to deliver a targeted research program in the first five years of the Plan (Commitment 24, Action 1). This research program will target areas with knowledge gaps.

Reporting data and information for all research, once data is collected, and analysed against triggers for adaptive management, will then be reported in the public literature as soon as possible but within three years.

Supporting koala health and welfare

The conservation program will invest in the *NSW Koala Strategy* to build capacity in the koala rehabilitation sector to support koala health and welfare in South Western Sydney (Commitment 25, Action 1).

Support training programs and resources for veterinarians and wildlife carers

The conservation program will invest in the *NSW Koala Strategy* to deliver training and technical resources needed by wildlife carers and veterinarians in line with the [NSW Volunteer Wildlife Rehabilitation Sector Strategy](#) (see Box 3) (Commitment 25, Action 1). Funding will improve access to resources, veterinary services, transport and facilities for koalas in South Western Sydney.

Building capacity for koala rehabilitation among veterinarians and wildlife carers will be delivered from Year 2 onwards as part of the Plan's implementation. This action is designed to improve the skills and resources to better rehabilitate sick and injured koalas.

Box 3. NSW Koala Strategy Volunteer Wildlife Rehabilitation Sector Strategy

The *NSW Volunteer Wildlife Rehabilitation Sector Strategy* identified a shortage of technical resources and veterinarians trained to work with wildlife.

In partnership with Sydney University, the *NSW Volunteer Wildlife Rehabilitation Sector Strategy* allocated \$1.5 million over three years to Taronga Zoo for professional development to improve veterinarians' and veterinary nurses' skills in wildlife care. The funding will also pay to upgrade technical resources to handle, triage and treat wildlife.

The conservation program supports this strategy to strengthen the NSW wildlife rehabilitation sector.

Monitoring koalas in South Western Sydney

The conservation program will invest in the *NSW Koala Strategy* to support monitoring of koalas in South Western Sydney from Year 1 of the Plan as part of the *NSW Koala Strategy Monitoring Framework* and in line with recommendations in the Chief Scientist Koala Report (Commitment 25, Action 1). This will include designating the koalas in this area as one of the dedicated monitoring sites.

The *NSW Koala Monitoring Framework* provides a structure for long-term koala monitoring in NSW and sets goals and procedures that should be used to guide monitoring plans and policies. Koalas that are captured and/or handled as part of a monitoring program or those that are rehabilitated and released back into the Campbelltown population will be vaccinated against chlamydia. If a joint vaccine for chlamydia and KoRV (koala retrovirus) is available, this will be used. Koalas with no microchip or other identifying features that are captured will have a tissue sample taken for genetic analysis, with the tissue samples lodged with the NSW Koala Biobank.

Implementation



Koala exclusion fencing on Picton Road protects koalas from speeding vehicles

Implementation

This section summarises the implementation of the program for conserving the Southern Sydney Koala population. This includes governance; delivery partners; monitoring, evaluating and reporting; and adaptive management.

Implementation and assurance framework

The implementation and assurance framework provides the foundation for the Plan's vision, objectives, intended outcomes and commitments, and coordinates its delivery. This includes delivering outcomes and commitments specific to koalas. See [Sub-Plan A](#) for full details of implementation of the Plan.

Governance

The governance structure for implementing [the Plan](#) identifies accountable parties and sets a framework for roles, responsibilities, resourcing and milestone reporting. This structure will be essential for the successful delivery of the conservation program for koalas and will protect and manage important koala habitat. See Sub-Plan A for full details of the governance structure.

Delivery partners

Delivery partners will support the implementation of the conservation program for koalas. They include government agency teams such as the [NSW Koala Strategy](#), the NSW Office of Strategic Lands and the Biodiversity Conservation Trust. Other partners are community-based, volunteer organisations. See Sub-Plan A for the role of delivery partners during implementation of the Plan.

Adaptive management

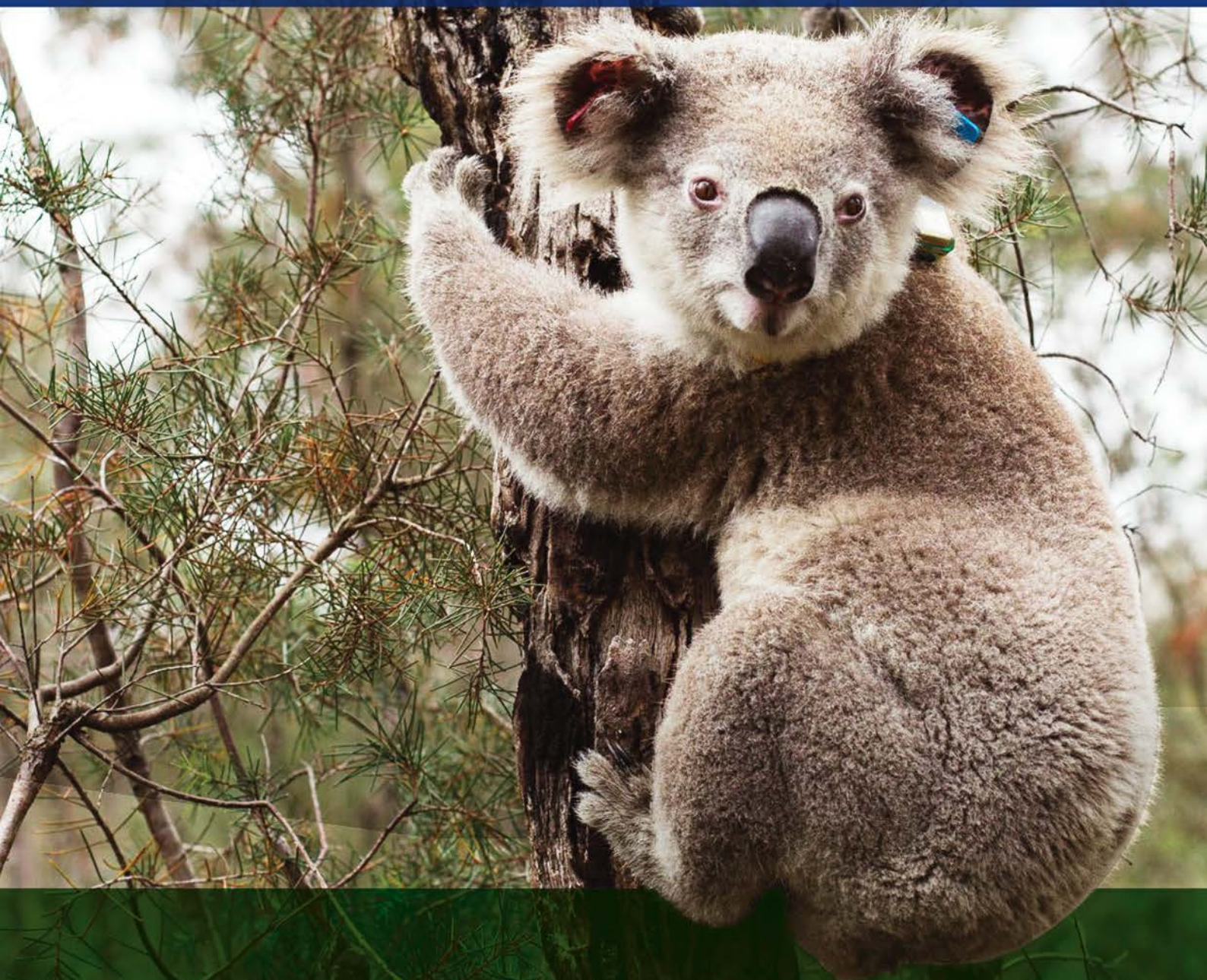
Adaptive management refers to a process of monitoring and management that is adjusted over time, considering the findings from monitoring data.

Adaptive management will be achieved through regular evidence-based review processes that will inform decision-making, improve conservation programs and share learnings. Koala-specific conservation actions may be adapted over time to account for learnings arising from monitoring and evaluation, to ensure effective implementation of the commitments and delivery of the outcome for koalas over time. Adaptive management will be iterative, overlapping and responsive to changing circumstances over the life of the Plan.

Monitoring, evaluation and reporting

The evaluation program will track the progress and effectiveness of the conservation program over the life of the Plan. The evaluation program will gather and monitor data to consistently evaluate projects and programs delivering koala-related conservation actions to inform adaptive management decision-making. It will also deliver publicly available annual updates on the delivery on the Plan's commitments and actions, including koala-specific actions, and five-yearly reporting on the Plan's effectiveness in delivering outcomes, including achieving the outcome for koalas. The evaluation program will link to the *NSW Koala Strategy* and the *NSW Koala Strategy Monitoring Framework*. See Sub-Plan A for further details on the Plan's evaluation program.

Appendix A



A tagged koala released through the Wollondilly Koala project

Appendix A—Commitments and actions for koalas

Conservation program

Mitigating indirect and prescribed impacts

Commitments	Actions	Timing
<p>Commitment 7</p> <p>Mitigate indirect and prescribed impacts from urban, infrastructure and major infrastructure (transport) development on the Southern Sydney koala population to best practice standards and in line with the Chief Scientist Koala Report (2020).</p>	<ol style="list-style-type: none"> 1. Install koala-exclusion fencing between important koala habitat and certified-urban capable land within Greater Macarthur Growth Area and Wilton Growth Area as identified in Figure 7 and Figure 8, except where exclusion fencing is not feasible due to slope, heritage or water courses. 2. Ensure all koala-exclusion fencing is at least 3 metres from koala habitat trees. 3. In areas where exclusion fencing is not feasible, apply mitigation actions 60 metres from the koala habitat. These actions include developing controls in accordance with the Koala Habitat Protection Guidelines and including design requirements in relevant development control plans. Specific locations are identified in Figure 7 and Figure 8. 4. Install koala-exclusion fencing on both sides of Appin Road between Rosemeadow and Appin to mitigate koala vehicle strikes at roadkill hotspots. 5. Where fencing must cross existing or planned linear infrastructure such as gas and electricity transmission, consider appropriate access treatments such as gates to ensure the integrity of the koala-exclusion fencing. 6. Establish a koala working group including koala experts and relevant government agencies to determine priorities for koala conservation consistent with the objectives of the NSW Koala Strategy. 	<p>Action 1: Years 1-3</p> <p>Action 2: Year 1</p> <p>Action 3: Years 1-3</p> <p>Action 4: Life of Plan</p> <p>Action 5: Year 1</p> <p>Action 6: Year 1</p>

Conserving flora, fauna and habitat

Commitments	Actions	Timing
Commitment 10 Establish a reserve to protect the north–south koala movement corridor along the Georges River between Appin and Kentlyn.	<ol style="list-style-type: none"> 1. Protect up to 700 hectares of land between Appin and Kentlyn that is currently in ownership of NSW Government as the first stage in establishing the Georges River Koala Reserve. 2. Protect an additional 430 hectares of land between Appin and Kentlyn through the acquisition of land for the Georges River Koala Reserve. 3. Gazette the preliminary stages of the Georges River Koala Reserve as a conservation reserve under the management of National Parks and Wildlife Service. 4. Protect up to 755 hectares of land between Kentlyn and Long Point as future additions to the Georges River koala reserve. 5. Restore up to 200 hectares of cleared land within the Georges River koala reserve to strengthen the north-south koala movement corridor. 	Action 1: Year 1 Action 2: Year 1-10 Action 3: Year 10 Action 4: Years 10-20 Action 5: Years 1-20
Commitment 12 Secure priority habitat corridors in the Cumberland subregion in perpetuity, to support connectivity for ecological communities and species.	<ol style="list-style-type: none"> 1. Undertake ground-truthing within the strategic conservation area to confirm native vegetation extent and condition in areas identified as potential habitat corridors. 2. Secure priority habitat and koala movement corridors in accordance with the Conservation Lands Implementation Strategy (Commitment 8 Action 1) to protect habitat corridors in the Cumberland subregion. 3. Protect avoided koala habitat through environmental conservation zoning in potential east–west koala movement corridors between the Georges River and the Nepean River. 4. Through restoration, ensure at least one north–south corridor (the Georges River Koala Reserve) is at least 390m wide with an adequate or additional buffer, for koala viability and movement. 5. Facilitate koala movement for at least one east–west corridor by constructing a koala crossing at Appin Road and, through restoration, 	Action 1: Year 1-3 Action 2,3: Before start of Plan Action 4: Years 1-5 Action 5: Years 1-20 Action 6: Years 1-3

	<p>ensure the corridor is at least 390m wide with an adequate or additional buffer wherever feasible, for koala viability and movement</p> <p>6. Construct a koala passage under Kings Fall Bridge to support north-south koala movement from the Georges River Koala Reserve to the southern koala habitat.</p>	
<p>Commitment 13</p> <p>Undertake ecological restoration of up to 25% of the Plan's offset target for native vegetation (Commitment 8) in areas secured for conservation within the Cumberland subregion.</p>	<p>1. Develop a Restoration Implementation Strategy in consultation with key stakeholders and delivery partners, to:</p> <ul style="list-style-type: none"> • provide a clear purpose for undertaking restoration, including how the Plan will meet its restoration target for impacted native vegetation communities • ensure the long-term sustainability of restoration considers genetic diversity in what is planted • identify restoration potential of land within priority sites • provide guidance on restoration expectations at priority sites • identify opportunities for landholders to undertake active restoration as part of a biodiversity stewardship agreement • identify and potentially fund restoration on land adjacent to conservation land established under the Plan • develop a seed-procurement approach • determine any research needs. <p>2. Enter into written agreements with delivery partners and engage specialist providers where necessary to implement the restoration plan.</p> <p>3. Undertake up to 1,365 hectares of ecological restoration on conservation land targeting the following threatened ecological communities:</p> <ul style="list-style-type: none"> • Cooks River Castlereagh Ironbark Forest • Cumberland Plain Woodland • River-flat Eucalypt Forest • Shale Gravel Transition Forest 	<p>Action 1: Before start of Plan</p> <p>Action 2: Year 1</p> <p>Action 3: Life of Plan</p> <p>Action 4: Years 1-5</p> <p>Action 5: Year 6 onwards</p> <p>Action 6: Year 10 onwards</p>

- Swamp Oak Forest.
4. Plant around 100,000 trees to restore important koala habitat in
 - Georges River Koala Reserve
 - along Ousedale Creek
 - around Appin
 - other priority locations in the strategic conservation area.

The restoration of important koala habitat will primarily include the restoration of Cumberland Plain Woodland and Shale/Sandstone Transition Forest.
 5. In partnership with restoration providers, supply training in best-practice bush regeneration and ecological restoration techniques to landholders and community groups that is consistent with the Restoration Implementation Strategy.
 6. Establish demonstration sites to showcase best-practice bush regeneration and ecological restoration of threatened ecological communities within the Plan Area.

Build knowledge and capacity

Commitments	Actions	Timing
Commitment 21 Provide opportunities for the residents of Western Sydney to learn about and actively participate in biodiversity conservation including koala conservation.	7. Invest in the NSW Koala Strategy to raise awareness of the Southern Sydney koala population and encourage community participation in koala conservation in Western Sydney, consistent with the Plan's education and engagement program.	Action 7: Year 6 onwards

<p>Commitment 24</p> <p>Invest in research that will help to secure threatened species and increase understanding of threats and land management issues.</p>	<p>4. Implement the research program with key outcomes including:</p> <ul style="list-style-type: none"> research that increases knowledge of population demographics, life-history and ecology of the Southern Sydney koala population, as part of the <i>NSW Koala Strategy Research Plan</i>. 	<p>Actions 4: Year 2 onwards</p>
<p>Commitment 25</p> <p>Support rehabilitation measures to help maintain koala health and welfare.</p>	<p>1. Invest in the <i>NSW Koala Strategy</i> and other potential partners to implement the koala health and welfare program in South Western Sydney with key deliverables including:</p> <ul style="list-style-type: none"> monitoring of koalas including key threats and effectiveness of mitigation measures as part of the <i>NSW Koala Strategy Monitoring Framework</i> providing enhanced training in wildlife treatment for veterinarians providing grants for community wildlife organisations for resources and carer recruitment and training establishing health and welfare programs to support koalas from threats including vehicle strike, fire, disease and climate change. 	<p>Action 1: Year 1 onwards</p>

Appendix B— Chief Scientist Koala Report recommendations and analysis relevant to the Cumberland Plain Conservation Plan

Recommendation 1: Georges River Koala Reserve

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
R1	<p>The Georges River Koala Reserve should be protected and revegetated as set out in the draft Cumberland Plain Conservation Plan ensuring that revegetation is undertaken in such a manner as to ensure long term sustainability (i.e. species are planted to maintain genetic diversity and minimize kinship to ensure reproduction).</p> <p>Connectivity and threats should be considered within this corridor.</p> <p>Fencing should be placed on Appin Road and a connectivity structure be developed with the bridge over the Georges River.</p>	<p><i>“The Georges River Koala Reserve should be protected and revegetated”</i></p> <p>The Plan commits to establish a reserve to protect the north–south koala movement corridor along the Georges River between Appin and Kentlyn (Commitment 10) with specific actions outlining the staging of the reserve including restoration¹:</p> <ol style="list-style-type: none"> 1. Protect up to 700 hectares of land between Appin and Kentlyn that is currently in ownership of NSW Government as the first stage in establishing the Georges River Koala Reserve. 2. Protect an additional 430 hectares of land between Appin and Kentlyn through the acquisition of land for the Georges River Koala Reserve. 3. Gazette the preliminary stages of the Georges River Koala Reserve as a conservation reserve under the management of National Parks and Wildlife Service. 4. Protect up to 755 hectares of land between Kentlyn and Long Point as future additions to the Georges River koala reserve. 5. Restore up to 200 hectares of cleared land within the Georges River koala reserve to strengthen the north-south koala movement corridor. <p><i>“ensuring that revegetation is undertaken in such a manner as to ensure long term sustainability (i.e. species are planted to maintain genetic diversity and minimize kinship to ensure reproduction)”</i></p>

¹ Note that the Chief Scientist Koala Report uses the term ‘revegetation’ while the Plan uses the term ‘restoration’ but these terms can be used interchangeably and the intent is the same.

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
		<p>The Plan commits to “undertake ecological restoration of 25% of the Plan’s offset target for native vegetation in areas secured for conservation within the Cumberland subregion” (Commitment 13) including an action to:</p> <ol style="list-style-type: none"> 1. Develop a Restoration Implementation Strategy in consultation with key stakeholders and delivery partners, to: <ul style="list-style-type: none"> • provide a clear purpose for undertaking restoration, including how the Plan will meet its restoration target for impacted native vegetation communities • ensure the long-term sustainability of restoration considers genetic diversity in what is planted • identify restoration potential of land within priority sites • provide guidance on restoration expectations at priority sites • identify opportunities for landholders to undertake active restoration as part of a biodiversity stewardship agreement • identify and potentially fund restoration on land adjacent to conservation land established under the Plan • develop a seed-procurement approach • determine any research needs. <p><i>“Connectivity and threats should be considered within this corridor”</i></p> <p>Connectivity within this north-south corridor is a priority under the Plan as fragmentation within it, would limit koala movement and the function of the corridor. This is why the Plan has committed to the establishment of the Georges River Koala Reserve and restoration within it to ensure connectivity. See Commitment 11 and Commitment 9 at the response to R1.</p> <p>Threats will be managed in this corridor in the same way as they will be managed across the Plan Area (through koala exclusion fencing and additional controls). See Commitment 6 at the response to R2b.</p> <p>Monitoring will ensure that the commitments and actions are effectively managing threats to koalas in South Western Sydney. Commitment 25 has a number of actions regarding health and welfare, and includes one specific to monitoring:</p>

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
		<ol style="list-style-type: none"> 1. Invest in the <i>NSW Koala Strategy</i> and other potential partners to implement the koala health and welfare program in South Western Sydney with key deliverables including: <ul style="list-style-type: none"> • monitoring of koalas including key threats and effectiveness of mitigation measures as part of the <i>NSW Koala Strategy Monitoring Framework</i>. <p><i>“Fencing should be placed on Appin Road and a connectivity structure be developed with the bridge over the Georges River”</i></p> <p>The Plan’s action for fencing at Appin Road are outlined in at Commitment 7:</p> <ol style="list-style-type: none"> 1. Install koala exclusion fencing on both sides of Appin Road between Rosemeadow and Appin to mitigate koala vehicle strikes at roadkill hotspots <p>The Plan’s action for the bridge at the Georges River is outlined in Commitment 12:</p> <ol style="list-style-type: none"> 1. Construct a koala passage under Kings Fall Bridge to support north-south koala movement from the Georges River Koala Reserve to the southern koala habitat.

Recommendation 2, Part A: Connectivity

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
R2a	<p>Within the Greater Macarthur Growth Area covered in the draft Cumberland Plain Conservation Plan:</p> <ul style="list-style-type: none"> • The Ousedale Creek to Appin North Corridor (E) should be secured as the east – west corridor to connect the Georges River 	<p>The east-west corridors are referenced in Commitment 12, with the following action:</p> <ol style="list-style-type: none"> 1. Facilitate koala movement for at least one east–west corridor by constructing a koala crossing at Appin Road and, through restoration,

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
	<p>Reserve and Nepean Corridors. A suitable crossing structure (e.g. culvert) should be constructed at Appin Road.</p> <ul style="list-style-type: none"> • The Mallaty Creek to Georges River Corridor (D) should be fenced if feasible and protected in the event that suitable land cannot be purchased to finalise corridor E. If a crossing at E cannot be progressed, then an underpass across Appin Road should be developed at Corridor D. The measures to protect the corridors as in c) should be applied. • If a crossing at Corridor E is secured and crossing at Appin Road for Corridor D not pursued, then a decision would need to be made based on the risk/benefits of maintaining the koalas and mitigation measures in Corridor D without a crossing at Appin Road. • The habitat in Corridor F should be protected including with exclusion fencing to minimise risks from threats, and with monitoring of risks to avoid a population sink. 	<p>ensure the corridor is at least 390m wide with an adequate or additional buffer wherever feasible, for koala viability and movement.</p> <p>Sub-Plan B provides more detail regarding the preference for the Ousedale corridor, as below.</p> <p>“The securing and enhancing of at least one east-west corridor, likely the Ousedale corridor, will commence in the first five years of the Plan’s implementation, with a feasibility study currently underway for implementation.”</p> <p>All east-west corridors within the Plan Area will be protected (for vegetation) using environmental conservation zoning. Where not feasible due to width, the corridor will be fenced to exclude koalas but can be considered for future restoration (noting at least one will provide a safe crossing for koalas). See commitment 12:</p> <ol style="list-style-type: none"> 1. Protect avoided koala habitat through environment conservation zoning in potential east-west koala movement corridors between the Georges River and the Nepean River.

Recommendation 2, Part B: Habitat

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
R2b	<p>Habitat within identified corridors should be:</p> <ul style="list-style-type: none"> • protected (especially from development creep) • widened through revegetation (average size 390m to 425 m) • include a buffer on either side of the corridor habitat that is at least 30 m wide from the corridor to the exclusion fence with feed trees permitted in this buffer area • include, between the buffer area and the urban areas, koala proof fencing to prevent the movement of koalas out of the corridor into urban areas (with trees more than 3 m from the fencing to avoid 	<p>The Plan commits to “secure priority habitat corridors in the Cumberland subregion in perpetuity, to support connectivity for ecological communities and species” (Commitment 12) with specific actions regarding koala habitat and corridors:</p> <ol style="list-style-type: none"> 1. Undertake ground-truthing within the strategic conservation area to confirm native vegetation extent and condition in areas identified as potential habitat corridors.

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
	<p>damage) and the movement of domestic dogs (amongst other potential threats) into the corridor</p> <ul style="list-style-type: none"> for sites where exclusion fencing is infeasible due to steep terrain, then additional buffer width should be utilised (buffer ~60 m), with a traffic speed limit of 40 km/h and predator / dog monitoring asset protection zone is outside the exclusion fencing, within the development footprint <p>Further, connectivity structures within corridors should also be assessed including local roads and other infrastructure (e.g. <i>the Upper Canal</i>).</p>	<ol style="list-style-type: none"> Secure priority habitat and koala movement corridors in accordance with the Conservation Lands Implementation Strategy (Commitment 8) to protect habitat corridors in the Cumberland subregion. Protect avoided koala habitat through environmental conservation zoning in potential east-west koala movement corridors between the Georges River and the Nepean River. Through restoration, ensure at least one north-south corridor (the Georges River Koala Reserve) is at least 390m wide with an adequate or additional buffer, for koala viability and movement. Facilitate koala movement for at least one east-west corridor by constructing a koala crossing at Appin Road and, through restoration, ensure the corridor is at least 390m wide with an adequate or additional buffer wherever feasible, for koala viability and movement Construct a koala passage under Kings Fall Bridge to ensure north-south connectivity to support koala movement from the Georges River Koala Reserve to the southern koala habitat. <p>The Plan commits to “mitigate indirect and prescribed impacts from urban and major infrastructure (transport) development on the Southern Sydney koala population to best practice standards and in line with the Chief Scientist Report (Commitment 7). Commitment 7 outlines a number of actions which detail the approach for fencing and other mitigation measures:</p> <ol style="list-style-type: none"> Install koala exclusion fencing between important koala habitat and urban capable land within Greater Macarthur Growth Area and Wilton Growth Area as identified in Figures 7 and 8, except where exclusion fencing is not feasible due to slope, heritage or water courses. Ensure all koala exclusion fencing is at least 3 metres from koala habitat trees. In these areas where exclusion fencing is not feasible, apply mitigation actions 60 metres from the koala habitat. These

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
		<p>actions include developing controls according to the Koala Habitat Protection Guidelines and including design requirements in relevant development control plans. Specific locations are identified in Figures 7 and 8.</p> <ol style="list-style-type: none"> 10. Install koala-exclusion fencing on both sides of Appin Road between Rosemeadow and Appin to mitigate koala vehicle strikes at roadkill hotspots. 11. Where fencing must cross existing or planned linear infrastructure such as gas and electricity transmission, consider appropriate access treatments such as gates to ensure the integrity of the koala exclusion fencing. 12. Establish a Koala working group including koala experts to determine priorities for koala conservation consistent with the objectives of the <i>NSW Koala Strategy</i>. <p>In addition to the controls mentioned above the asset protection zone (APZ) will also act as a buffer to the koala habitat. An APZ is a buffer zone between a bushfire hazard and buildings. The Plan confirms that the APZ must be located within the urban capable land, and outside the environmental conservation zoning (Commitment 2):</p> <ol style="list-style-type: none"> 13. When preparing new precinct plans for nominated areas, ensure that asset protection zones are located wholly within certified - urban capable land.

Recommendation 3: Monitoring and adaptive management

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
R3	<p>Monitoring should be undertaken to enable adaptive management of the koala population in the proposed Mount Gilead Stage 2 development and in the draft Cumberland Plain Conservation Plan. This monitoring should:</p> <ul style="list-style-type: none"> be consistent across the region to ensure data and adaptive management strategy outcomes are comparable 	<p>The Plan commits to “support rehabilitation measures to help maintain koala health and welfare” (Commitment 25). Commitment 25 has a number of actions regarding health and welfare, and includes one specific to monitoring:</p>

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
	<ul style="list-style-type: none"> include trigger levels that enable actions for adaptive management e.g. increased vehicle strikes, increased dog attacks or disease prevalence. (As part of the planning process, targets should be set to gauge success.) align with best practice and the NSW Koala Monitoring Framework (as part of the NSW Koala Strategy) and data made available through the SEED portal and any tissue samples provided to the NSW Koala Biobank be funded by developers through the establishment of a monitoring trust monitor the movement of koalas in the region and understand use of the corridors and connectivity structures, the NSW Government should investigate the development of implantable sensor technologies, such as through the NSW Smart Sensing Network. 	<ul style="list-style-type: none"> Invest in the <i>NSW Koala Strategy</i> and other potential partners to implement the koala health and welfare program in South Western Sydney with key deliverables including: monitoring of koalas including key threats and effectiveness of mitigation measures as part of the <i>NSW Koala Strategy Monitoring Framework</i> providing enhanced training in wildlife treatment for veterinarians providing grants for community wildlife organisations for resources and carer recruitment and training establishing health and welfare programs to support koalas from threats including vehicle strike, fire, disease and climate change. <p>Funding arrangements for the Plan are outlined at Commitment 26 including specific actions such as the establishment of a Trust, and the levying of developers through the existing Special Infrastructure Contribution framework, including:</p> <ul style="list-style-type: none"> Establish a biodiversity component of the Special Infrastructure Contribution to apply to developers in the nominated areas as the primary cost-recovery mechanism to fund implementation of the Plan. Establish a Trust to administer funds on behalf of the Department. Establish arrangements in consultation with the Trust to clarify funding arrangements including how funding decisions will be made, administered and reported.

Recommendation 4: Disease prevention

No.	Recommendation relevant to the Cumberland Plain Conservation Plan	Analysis and response
R4	Koalas that are captured and/or handled as part of a monitoring program or those that are rehabilitated and released back into	The Plan clarifies in Sub-Plan B that:

<p>the Campbelltown population should be vaccinated against chlamydia. If a joint vaccine for chlamydia and KoRV is available this should be used. Koalas with no microchip or other identifying features that are captured should have a tissue sample taken for genetic analysis, with the tissue samples lodged with the NSW Koala Biobank.</p>	<p>“koalas that are captured and/or handled as part of a monitoring program or those that are rehabilitated and released back into the Campbelltown population will be vaccinated against chlamydia. If a joint vaccine for chlamydia and KoRV is available this will be used. Koalas with no microchip or other identifying features that are captured will have a tissue sample taken for genetic analysis, with the tissue samples lodged with the NSW Koala Biobank.”</p>
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References



Close up of *Melaleuca styphelioides*,
part of a threatened ecological community

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