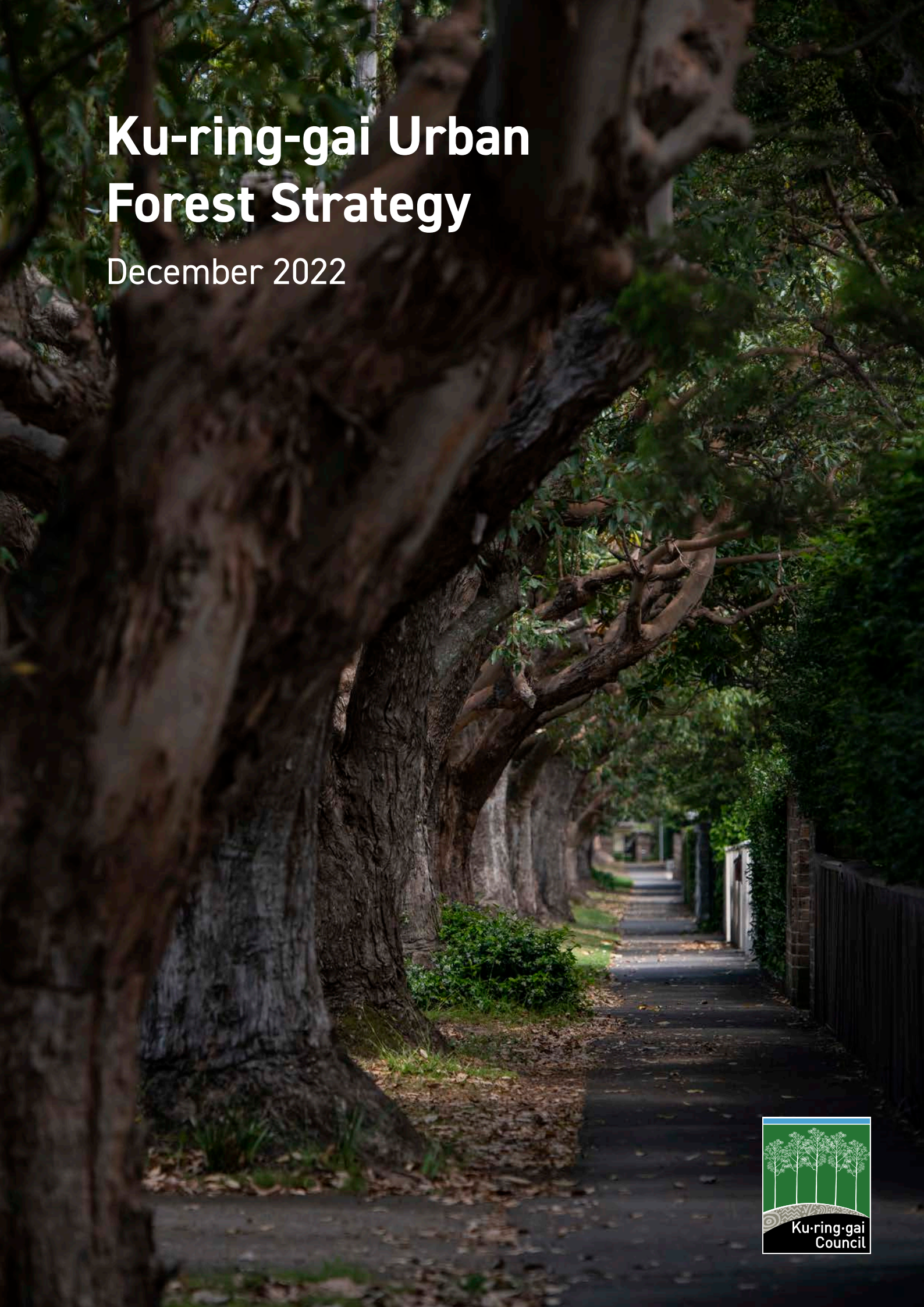
Ku-ring-gai Urban Forest Strategy

December 2022



Ku·ring·gai Council

Acknowledgement of Country

We acknowledge Aboriginal and Torres Strait Islander peoples as the First People and traditional custodians of the land and waters of this place. We express our gratitude in the sharing of this land, our sorrow for the personal, spiritual and cultural costs of that sharing and our hope that we may walk forward together in harmony and in the spirit of healing.

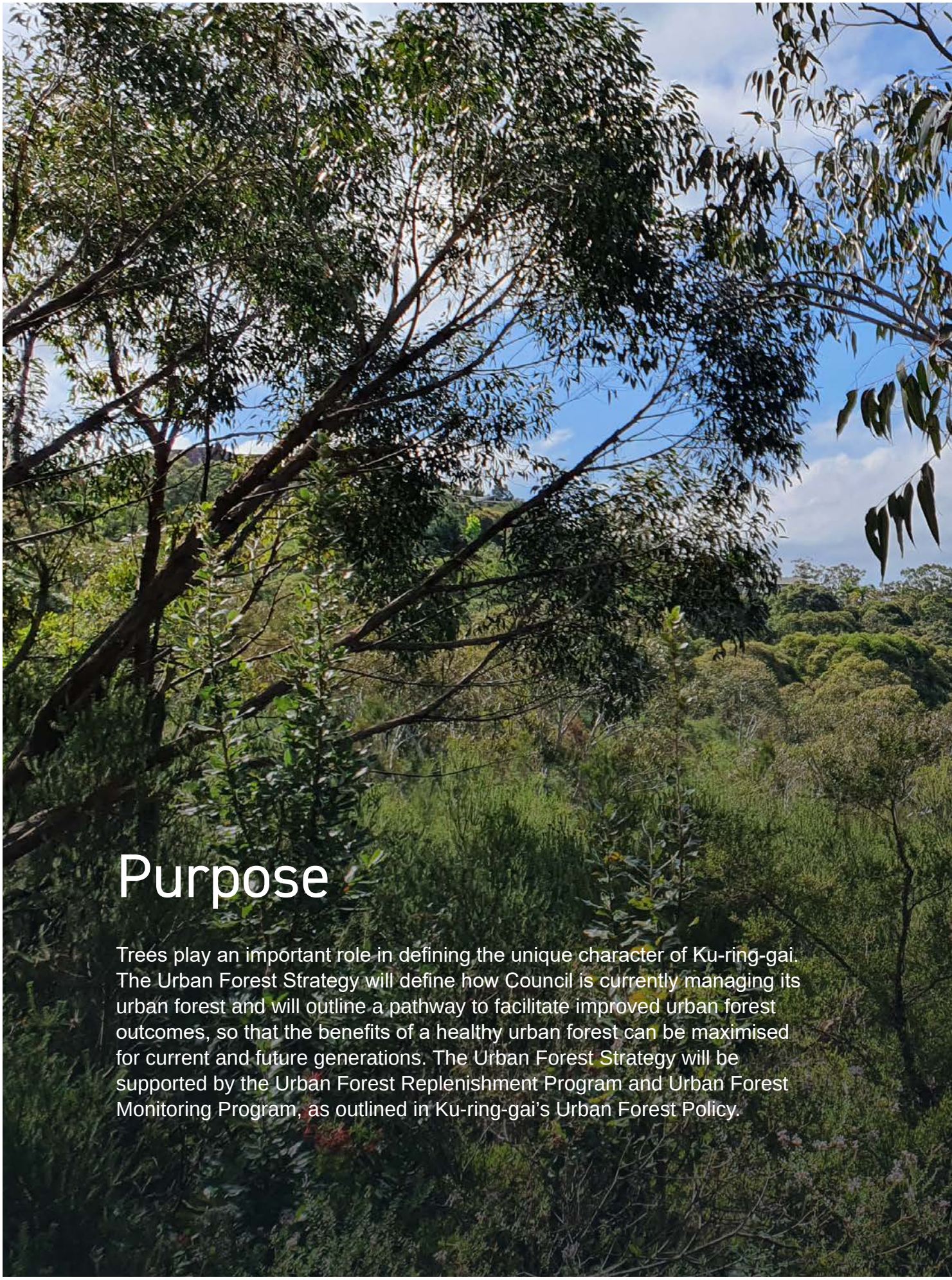
We acknowledge the importance of Aboriginal custodial and cultural connection to place which is embodied in the term ‘Country’. We recognise and admire the ecological knowledge of Aboriginal people that has developed from thousands of generations of careful, sustainable land management practices.

We seek to integrate Aboriginal values around Country with scientific and mainstream land management approaches and to learn about complex indigenous knowledge systems and encourage greater understanding of Aboriginal cultural and spiritual connections to Country.

The Ku-ring-gai Urban Forest Strategy was adopted at the Ordinary Meeting of Council on 13 December 2022.

Contents

Produced by Ku-ring-gai Council in conjunction with consultants Arbor Carbon and Good Canopy Company



Purpose

Trees play an important role in defining the unique character of Ku-ring-gai. The Urban Forest Strategy will define how Council is currently managing its urban forest and will outline a pathway to facilitate improved urban forest outcomes, so that the benefits of a healthy urban forest can be maximised for current and future generations. The Urban Forest Strategy will be supported by the Urban Forest Replenishment Program and Urban Forest Monitoring Program, as outlined in Ku-ring-gai's Urban Forest Policy.

Vision Statement

To recognise that the Ku-ring-gai urban forest forms an important part of the cultural identity of Ku-ring-gai, where residents value trees and the natural landscape. Council will protect and enhance the urban forest to ensure this unique character and established canopy cover is preserved and improved for future generations.

Executive Summary

Ku-ring-gai, known as Sydney's 'green heart', has developed its first Urban Forest Strategy to support the recently adopted Urban Forest Policy. This Strategy outlines how Ku-ring-gai will achieve the purpose set out in the Urban Forest Policy.

Council is committed to protecting and enhancing this character and identity through sustainable management of its Urban Forest. This includes:

- Integration of green landscaping elements within built infrastructure
- Conservation of our magnificent environment for future generations
- Balancing benefits from the protection, health and growth of the urban forest against associated risks

Ku-ring-gai is committed to protecting its existing valuable and unique urban forest, as well as replenishing and expanding it.

Ku-ring-gai is fortunate to have an established urban forest with good canopy cover. Priority will be given to protecting these existing assets, many of which have significant cultural and ecological importance, both on public land and private land.

Council is also committed to increasing canopy cover where appropriate, focusing on areas where canopy is lower than average, in order to ensure that all of the community has equitable access to high quality green spaces.

Council has identified areas that lack canopy, pinpointing road reserves that can accommodate trees, parks that lack sufficient tree cover, and active transport routes that lack shade, with the purpose of increasing canopy cover where it will benefit the community the most. This will also provide linkages between Ku-ring-gai's many pockets of remnant bushland, providing corridors for wildlife and numerous other ecological benefits. We will use utilise the latest technology and research available to ensure we are accurately monitoring our performance and ensuring we achieve our targets and goals. We will engage the community every step of the way. Partnering with and empowering local residents and organisations will help build urban forest awareness and support for the protection, management and increasing of urban canopy.

A long term implementation plan paves the way for the Council to achieve the targets and goals set out in the Ku-ring-gai Urban Forest Strategy.

Key Strategic Principles:

1. Retain & Protect

Key to increasing urban tree canopy is protecting what you have.

2. Expand & Integrate

Expand tree planting programs and integrate capital programs to increase canopy on public land.

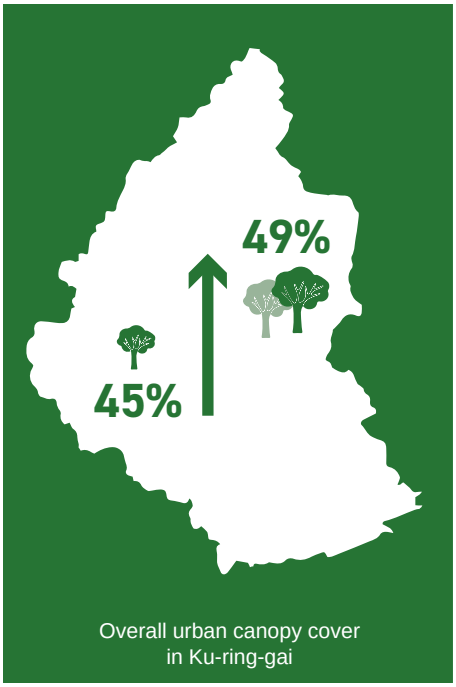
3. Monitor & Maintain

You need to know what you have to know how to manage it.

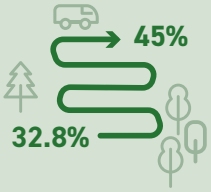
4. Collaborate & Incentivise

Raising awareness of the benefits of trees across the community will drive change.

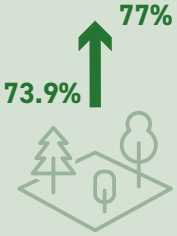
Key Targets



Overall urban canopy cover in Ku-ring-gai



Road reserves



Public open space

44,043

New trees required

23,352

Available planting spaces for new trees (on public land)

MIN. 55%

Locally indigenous canopy tree planting on public land annually.

20,691

New trees on private land

Introduction

What it is

Ku-ring-gai's environment is made up of trees, shrubs and ground cover along with the soil and water that support these - together they create an Urban Forest.

Benefits

Our Urban Forest helps:

- Reduce urban heat and energy consumption.
- Reduce air pollution.
- Increase land and property values.
- Increase social health and wellbeing.
- Store and sequester carbon.
- Stabilise land and reduce erosion.
- Reduce stormwater flows and nutrient loads.
- Increase habitat for wildlife therefore improving biodiversity.

We define urban forest as all of the trees, other vegetation as well as the soil, seedbank and water that support these. It includes the network of vegetation within both public and private ownership, encompassing the spectrum of vegetation growing within:

- Natural soils
- Altered soils, and
- Engineered structures

When we delve into the measurement of and the targets for increasing our urban forest canopy, we are addressing areas of Ku-ring-gai classified as 'urban'. From a land use zoning and ownership perspective, we have not included land which is classified as National Park or Nature Reserve.

The Ku-ring-gai Urban Forest Strategy development

The Ku-ring-gai Urban Forest strategy has been in progress since in mid 2021, with consultants ArborCarbon and Good Canopy Company engaged to prepare it through a formal tender process.

Four comprehensive reports have been produced for each stage of the strategic development process.

Stage 1

Stage one included a background studies report and phase one community engagement.

The background studies report delves in to the history of Ku-ring-gai, and explores its current conditions focussing on vegetation, landform and development. It also analyses the strategic context of the strategy within state government requirements and plans. There was extensive internal stakeholder consultation throughout the preparation of this report in order to better understand what the current resourcing and culture is within Council relating to urban forest management. These findings have been able to identify areas for improvement.

Phase one community engagement for the urban forest strategy was run concurrently with the production of the Stage one report in October of 2021. For this we established a page through Council's engagement hub where we included a link to a survey asking about peoples experience and sentiment towards trees in Ku-ring-gai. Overall from the 138 or so respondents, most people are supportive of trees and increasing our canopy cover. We also received a number of detailed submissions from local interest groups which were insightful. Key take-aways were that people want to see more native trees, that we can do better to manage what we have and we need to co-ordinate with utility companies to ensure that best practice measures are followed in relation to pruning.

Stage 2

Stage two included a comprehensive mapping and analysis report not only determining the current levels of vegetative cover and heat mapping, but also identifying opportunities where gains can be made in terms of increasing canopy coverage.

Differing scales of private development were explored in order to see where improvements could be made to planning controls to enhance canopy. Active transport routes were explored to see where shade could be incorporated to improve user comfort. The analysis was divided up by suburb, and further explored a the local centre level. This highlighted the challenge that Ku-ring-gai faces in terms of ownership of trees, with a large percentage being located on privately owned land.

Stage 3

Stage three report centred on the principles and actions for the strategy, supported by an implementation plan and targets for increasing canopy coverage.

This is a Council wide approach from planning through to implementation, backed by a resourcing and funding plan.

Stage 4

Stage four included the final report, and preparation of a draft strategy.

This draft strategy was placed on public exhibition mid-year where the community were invited to provide feedback.

Stage 1	• Background analysis • Phase 1 community engagement	July - November 2021 October / November 2021
Stage 2	• Canopy mapping analysis / tree inventory • Tree planting opportunities • Town centre case studies	July 2021 - January 2022
Stage 3	• Principles and actions • Implementation plan • Canopy targets	Feb - May 2022
Stage 4	• Finalisation of draft Urban Forest Strategy • Councillor briefing	March - May 2022 March 2022
Stage 5	• Council endorsement • Exhibition / Community engagement • Urban Forest Strategy Adoption	May 2022 June/July 2022 November 2022 TBC

Why we need it

The contribution of trees to ecosystem services is significant. These services include air and water filtration, shade, habitat for animals, oxygen production, carbon sequestration, and nutrient cycling. Add to this the connection that the urban forest provides between nature and people, and it's clear that trees and vegetation have a crucial role as part of an urban landscape. From the native fauna species that have improved access to food and shelter, to community members who have enhanced recreational opportunities and water and air quality, to individual property owners who have a more comfortable environment and often increased property resale value – all benefit from a robust and extensive urban forest.

The urban forest is a complex and essential system under Council's responsibility to manage. The strategy has been developed to guide our future management and maintenance of our urban forest. It follows on from the adopted Urban Forest Policy (Appendix A) and is supported by the urban forest replenishment and monitoring programs.

How to use it

The strategy provides the background information on Ku-ring-gai's urban forest and outlines the guiding principles for its management.

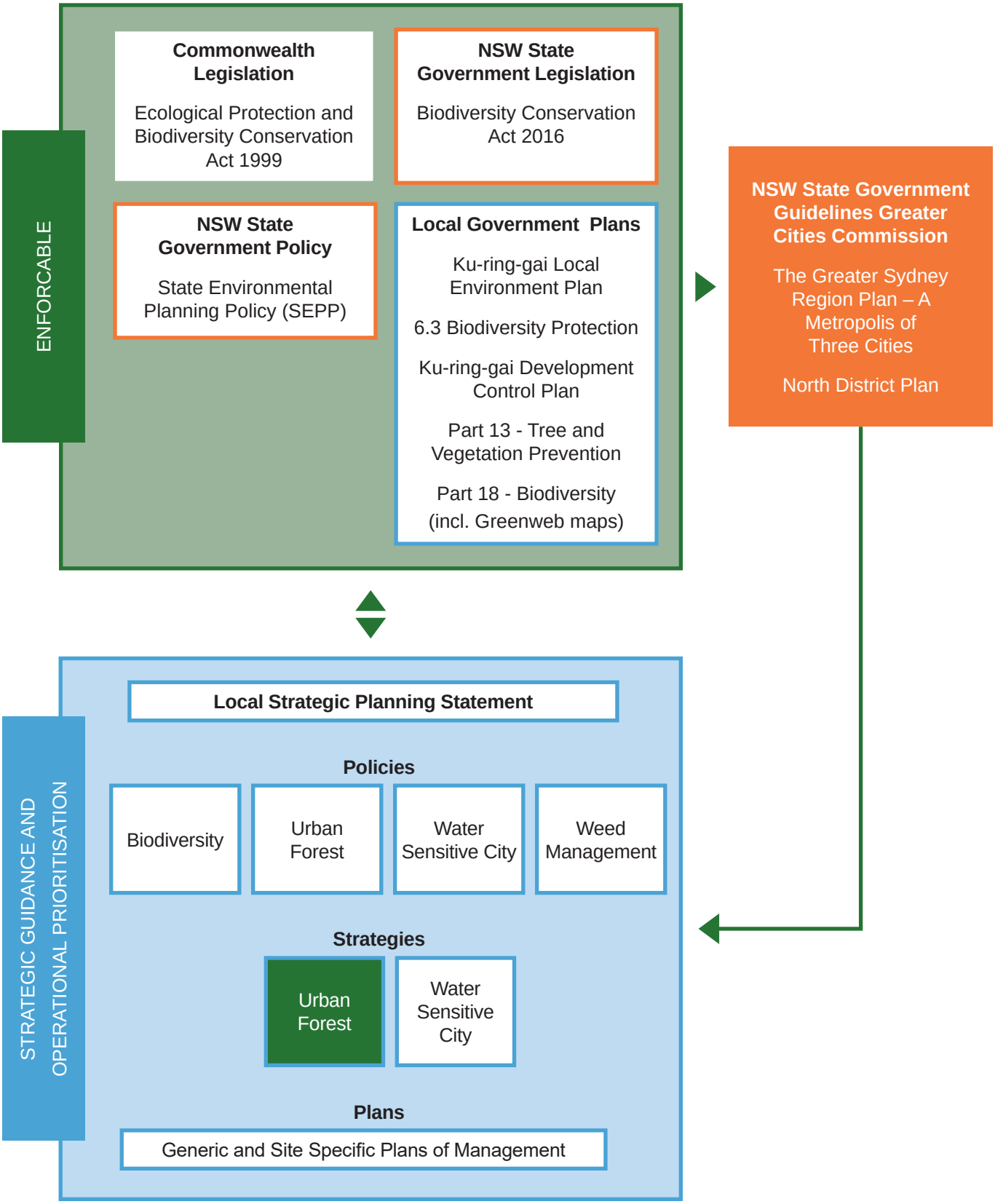
The action and implementation plan provides specific actions for implementing the management, maintenance and enhancement of the urban forest. This includes resourcing and funding implications.

The strategy will be periodically reviewed to ensure that current best practice measures are incorporated, and that targets are on track or require review subject to the outcomes of the urban forest monitoring program.

Governance Framework

The protection and management of our Urban Forest is enforced at several levels. The most vulnerable elements of our urban forest which include but are not limited to threatened species and communities are afforded the highest level of protection through Commonwealth and State Legislation including the *Ecological Protection and Biodiversity Conservation Act 1999,* and the *Biodiversity Conservation Act 2016*.

Vegetation including trees is also protected through State Environmental Planning policies, Council Local Environment Plans, and Development Control Plans. The requirement to ensure protection and management is set out in the next section under Strategic Framework, which includes State and Council guiding documents.



Framework for the urban forest strategy – governance hierarchy

Strategic Framework

Council Policies and Strategies

In 2020, Council adopted the Ku-ring-gai Urban Forest Policy, a policy that established Council's commitment to the improved holistic management of Ku-ring-gai's urban forest. This Urban Forest Strategy will provide the mechanism for implementing the Ku-ring-gai Urban Forest Policy 2020.

This Urban Forest Strategy will sit alongside other key Council documents and aims to align with State Planning Directions, including the North District Plan and the Ku-ring- gai Local Strategic Planning Statement, as well as recent policies and strategies that have been prepared for and by Council. Some of these key documents are:

- Urban Forest Policy 2020
- Urban Forest - Strategic Directions Paper 2020
- Ku-ring-gai Public Domain Plan 2022
- Biodiversity Policy 2022
- Climate Change Policy and Adaptation Strategy 2016
- Bushfire Management Policy 2020
- Weed Management Policy 2018
- Water Sensitive City Policy and Strategy 2022
- Green Grid Strategy (to be created 2022-2024)
- Local Character Background Study 2021
- Ku-ring-gai Play Space Strategy 2020

Urban forest management is supported by the Ku-ring-gai Community Strategic Plan 2038 in Theme 3: Places, spaces and infrastructure – Issue P1: Preserving the unique visual character of Ku-ring-gai. It is also recognised in Theme 2 which identifies the importance of 'enhancing our tree canopy and green corridors'.

Council's Operational Plan and Delivery Program 2018-2022 sets out priority P1.1.1: Strategies, plans and processes are in place to protect and enhance Ku-ring-gai's unique visual and landscape character. This is the strategic driver for the preparation of this Urban Forest Strategy.

Strategic urban forest planning within Council is driven by the Ku-ring-gai Community Strategic Plan 2038 and Council's Operational Plan and Delivery Program. Community Strategic Plans are required by all Councils in NSW under the Integrated Planning and Reporting (IP&R) Framework. Figure 1 outlines where this Urban Forest Strategy sits within that framework.

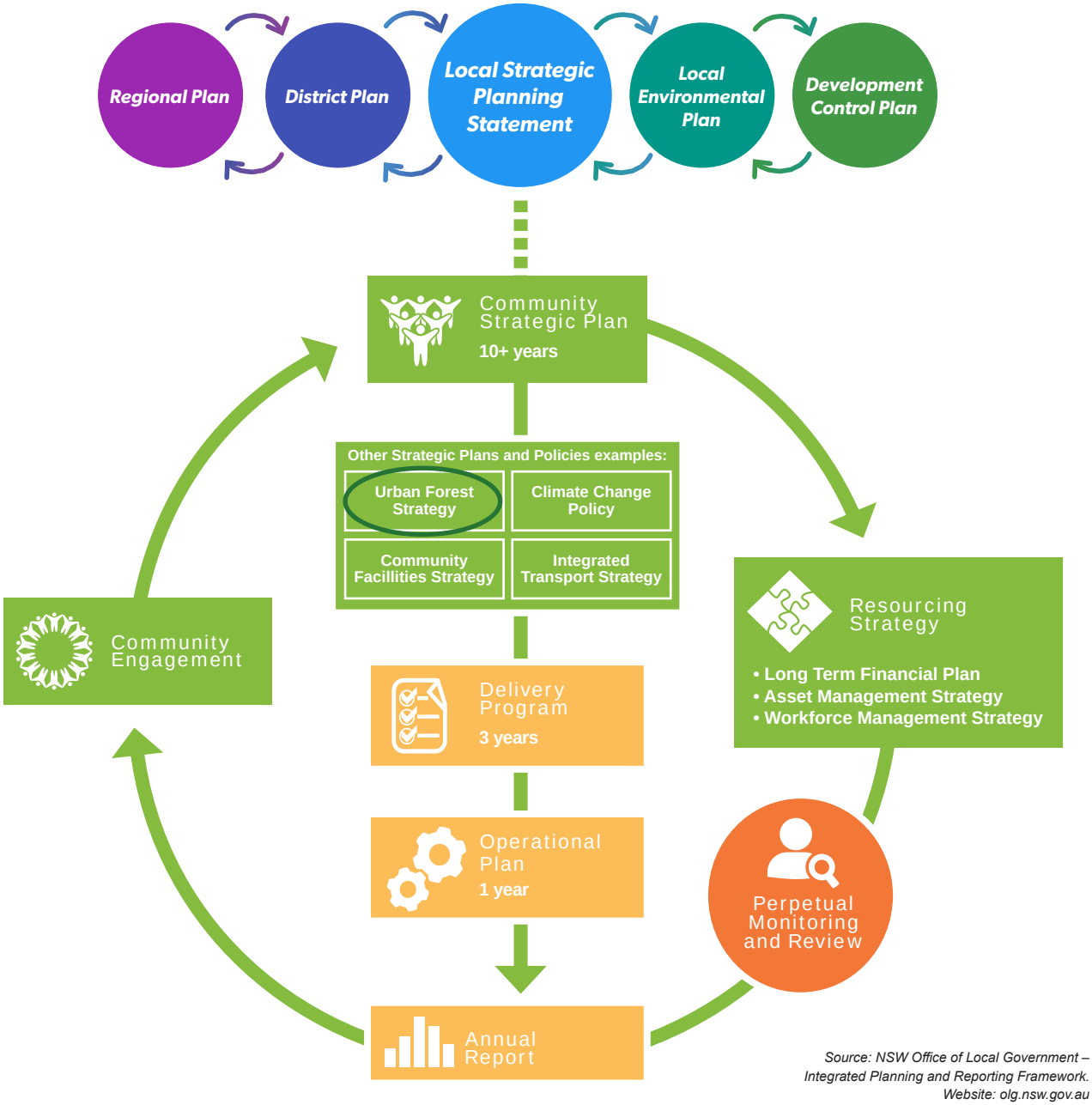


Figure 1: The IP&R Framework and where the Urban Forest Strategy sits in relation

State Planning Directions

The NSW strategic planning framework connects key planning priorities identified at regional or district scale with the finer-grained planning at the local level.

Greater Sydney Commission North District Plan

The North District Plan Priorities that are relevant to the Ku- ring-gai Urban Forest Strategy are summarised below.

Planning Priority N19

Increasing urban tree canopy cover and delivering Green Grid connections. Increasing the Green Grid means:

- Expanding canopy in the public realm;
- Providing opportunities for connections that form the long-term vision of the network; and
- Walking and cycling links for transport as well as recreational trips.

Planning Priority N22

Adapting to the impacts of urban and natural hazards and climate change, such as:

- Supporting initiatives that respond to the impacts of climate change; and
- Mitigating the urban heat island effect and reducing vulnerability to extreme heat.

Ku-ring-gai Local Strategic Planning Statement

The Local Strategic Planning Statement Priorities that are relevant to the Ku-ring-gai Urban Forest Strategy are summarised below:

Urban Forest

- K30. Improving the quality and diversity of Ku-ring-gai's urban forest.
- K31. Increasing, managing and protecting Ku-ring-gai's urban tree canopy.

Green Grid

- K32. Protecting and improving Green Grid connections.
- K33. Providing a network of walking and cycling links for leisure and recreation.

Water Sensitive City

- K35. Protecting and improving the health of waterways and riparian areas.
- K36. Enhancing the liveability of Ku-ring-gai's urban environment through integrated water infrastructure landscaping solutions.
- K37. Enabling water resource recovery through the storage and reuse of water, alternate water and increased water efficiency.

Change and Resilience

- K40. Increasing urban tree canopy and water in the landscape to mitigate the urban heat island effect and create greener, cooler places.

Bushland and Biodiversity

- K28. Improving the condition of Ku-ring-gai's bushland and protecting native terrestrial and aquatic flora and fauna and their habitats.
- K29. Enhancing the biodiversity values and ecosystem function services of Ku-ring-gai's natural assets.

Local Context

In the context of the Greater Sydney northern region, looking at comparative data from 2020, Ku-ring-gai is well placed in terms of its canopy cover. The neighbouring LGAs of Hornsby and Northern Beaches may have higher overall canopy cover, but this is due to large areas of National Park. As would be reasonably expected, LGAs with more urban densification and less National Park such as Willoughby and Ryde have lower total canopy cover.

When examining urban canopy cover, data is only available for Hornsby and Ku-ring-gai as these are the two Councils who have made the most progress in terms of their Urban Forest Strategies. Ku-ring-gai places well in terms of its 45% cover comparative to Hornsby with 39%.

2020 Canopy Data*

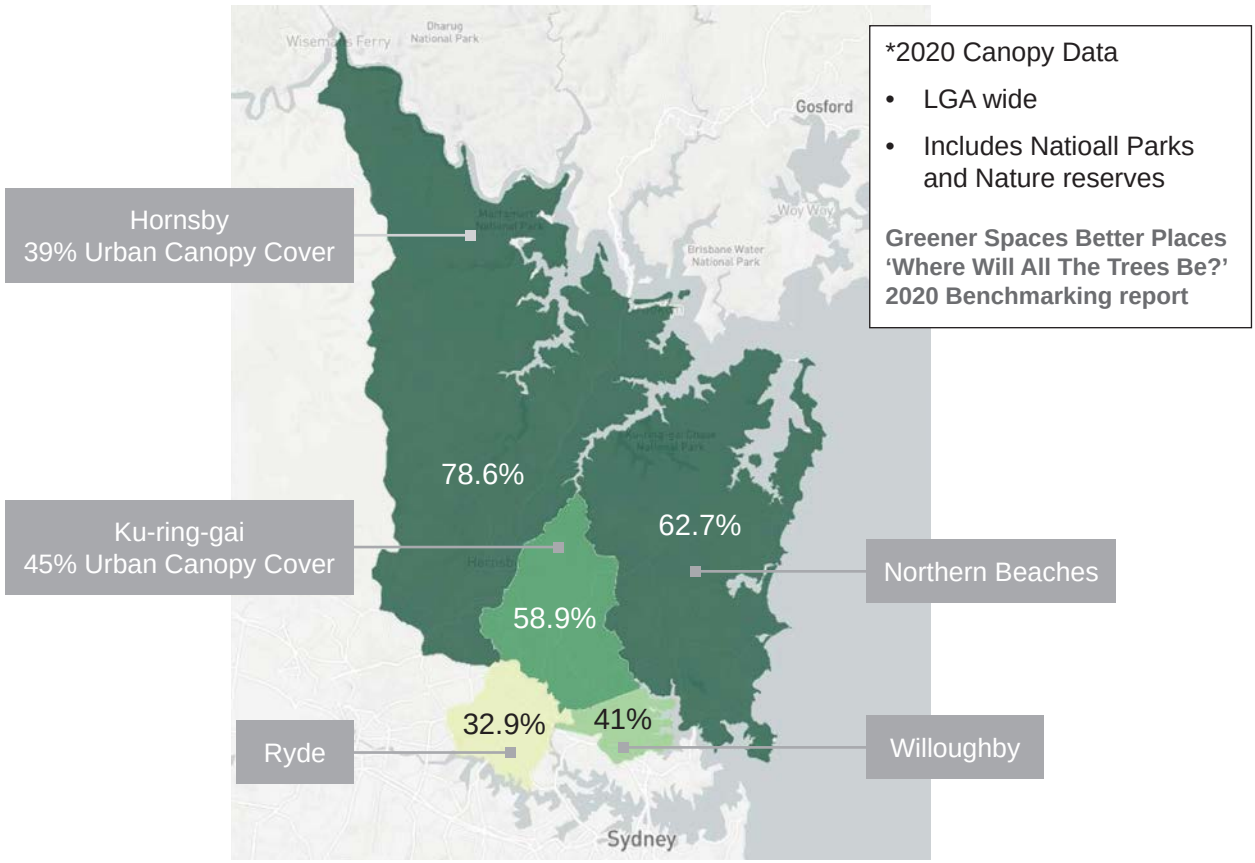


Figure 2 – 2020 Canopy data for the Northern Sydney region

Ku-ring-gai's Urban Forest

Ku-ring-gai's environment is made up of trees, shrubs and ground cover along with the soil and water that support these - together they create an Urban Forest.

History

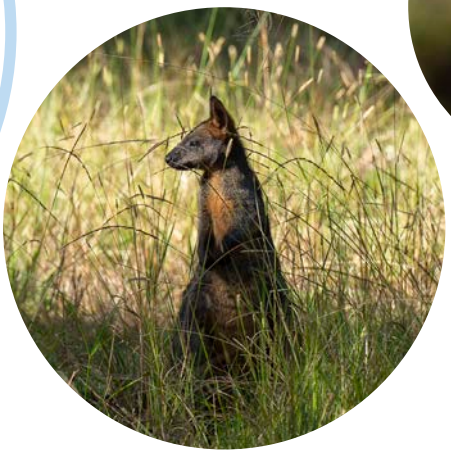
Indigenous History

Aboriginal peoples, including the Darramuragal or Darug people, have lived in the Ku-ring-gai area for tens of thousands of years. These peoples have deep and complex ties to their Country, including rich cultural, spiritual and practical relationships with the flora, fauna, and geology of the area.

The arrival of Europeans in 1788 resulted in widespread disease and famine for Aboriginal peoples, as well as violent dispossession of land and the disruption of cultural practices. Many Aboriginal language groups and peoples in the Sydney area were displaced and scattered by colonial expansion and policies of cultural displacement, meaning some historical accounts of the Aboriginal history of the Ku-ring-gai area are unclear or based on limited information (Aboriginal Heritage Office 2015).

What is clear about the Aboriginal people of the area, is that they have and had a deep connection to the land that they live on and alongside. Plants, animals, seasons, waterways, and landforms all influenced the culture and spirituality of Aboriginal peoples across the Sydney area and beyond. The identity and practices of Aboriginal people are inextricably linked to Country and certainly were pre-colonisation, with the landscape actively and skillfully maintained and altered by the people who relied on it.

People in the area have a close relationship with plants and animals in practical ways as well as cultural and spiritual ones. Vegetation was used for food, medicine, tools, shelter, and clothing. People of the Darramuragal and other local peoples would have hunted, fished, and gathered plants in and around the area.



Ecology in Ku-ring-gai

Many of the forests and woodlands that survive in parts of the Council area, as well as neighbouring National Parks, are representative of the kinds of vegetation that existed prior to colonisation; however, the vegetation prior to colonisation was more extensive and better connected. A diverse range of vegetation types existed in the wider Sydney area. In what is now the Ku-ring-gai Council area, the major vegetation types were Blue Gum High Forest (BGHF); and Sandstone Heaths, Woodlands and Forests (SHWF). There were also some scattered areas of Sydney Turpentine-Ironbark Forest (STIF) (Benson and Howell 1990). Endangered and Critically Endangered communities (including canopy remnants) are protected under Commonwealth legislation – *Ecological Protection and Biodiversity Conservation Act 1999*, and NSW legislation – *Biodiversity Conservation Act 2016.*

The Aboriginal peoples of the region were a significant influencing force in the landscape and ecologies of the area. Vegetation was actively managed and Aboriginal people had and maintain a close relationship with Country. Aboriginal identity, culture, and practices are inextricably linked with landscape and ecology; similarly, ecologies of the area were integrally defined by Aboriginal influence.

Post Colonisation

Ku-ring-gai was originally settled by timber getters, orchardists and farmers and supplied much of the timber for Sydney in the early 1800s. Native bushland was cleared and settled by farmers and their workers. The vegetation of the area was important for early settlers, both as an obstacle and as a resource. To settle the region, colonists had to clear the land of vegetation to farm and build houses. Local trees, including the Sydney Blue Gum (*Eucalyptus saligna*) and the Blackbutt (*Eucalyptus pilularis*), were considered particularly useful sources of timber by colonists, especially because of their height and straight trunks. Logs were hauled to the Lane Cove River and punted downstream to the growing settlement in Sydney. Blue gums were used for floorboards, beams, and ship-building, while Blackbutt was used for general construction. Other eucalypts like Red Bloodwood (*Eucalyptus gummifera*) and Grey Ironbark (*Eucalyptus paniculata*) were cut into fence posts. Turpentine (*Syncarpia glomulifera*) was suitable for wharf-building and other situations where its preservative oils were useful, while Forest Oak (*Allocasuarina torulosa*) was used for furniture- making and as roofing shingle (Benson & Howell 1990). These and other trees and shrubs were also used for firewood.

This clearing meant the vegetation of the district was altered significantly, with the BGHF that had once traced the ridgelines of the area almost entirely cleared of trees through logging.

Expansion of housing and commercial areas throughout the Twentieth and Twenty-First Centuries has further affected the vegetation on ridge-tops, including the BGHF areas. These only exist today in small pockets, notably at the Dalrymple-Hay Nature Reserve and Browns Forest in St Ives.

The National Parks that are included in the LGA – Ku-ring-gai Chase, Garigal, and Lane Cove – have examples of the vegetation communities that were more widespread prior to colonisation.

Alongside clearing of native vegetation came the planting of exotic species for farms, orchards, and suburban gardens and roadsides. Numerous exotic species were planted in the parks, gardens, and road reserves of the area.

Following the end of logging in the 1900's there was substantial regrowth of native forest and tree canopy. During this time Ku-ring-gai was designated for suburban residential development. This has allowed the tree stands to recover.

Soils, Topography and Climate

Soil type is influenced by many factors, including the underlying geology, the topography, and the forces that have led to soil formation. The soil map, Figure 3, illustrates the many Soil Landscapes of the LGA, and it is apparent from this that the topography of the area has a notable influence on soil distribution; soils along the ridgelines are distinct from those in gullies and valleys, and along waterways.

Major Soil Landscapes in the LGA include Glenorie Erosional, Hawkesbury Colluvial, and Lucas Heights Residual. Each of these soil types is defined by different underlying geology and different formation and deposition processes. As a result of these differences, vegetation growing in these Landscapes varies. The Glenorie Erosional soils, formed from shales, are dominated by Blue Gum forest (BGHF), which has been extensively cleared, leaving scattered areas of bushland and dispersed individual trees; the Hawkesbury Colluvial soils are formed from sandstone and support sandstone open woodlands along crests and ridgelines (SHWF woodlands) and wet closed forests (BGHF and SHWF forests) in sheltered gullies; meanwhile, Lucas Heights Residual soils are formed in an intersecting zone of the shale and sandstone of the aforementioned Landscapes, supporting low open forests and woodlands of eucalypts and turpentine, which have been mostly cleared.

Ku-ring-gai is upon the Hornsby Plateau, with high ridges cut into by waterways, feeding Middle Harbour and the Lane Cove River. Deep gullies have formed over millennia. Ridgelines slope down to the three National Parks around the LGA – Ku-ring-gai Chase to the north, Lane Cove to the west, and Garigal to the east. Residential areas are

concentrated along these ridges and higher areas, with the Pacific Highway following the broad ridgeline that transects the LGA. The northern parts of the LGA (north of Pymble) are particularly elevated, with elevations surpassing 200 metres despite being quite close to waterways. It is also one of Sydney's highest-rainfall areas; Bureau of Meteorology data from weather stations across the LGA demonstrate that average rainfall over the previous few decades ranges from just over 1200 mm to around 1400 mm per annum. This high rainfall was one of the key factors allowing the extensive Blue Gum forest that existed prior to colonisation to flourish in the area; this rainfall continues to support the diverse vegetation types in the LGA.

Severe weather events like storms and bushfires are a concern for the LGA. The risk of heatwaves, catastrophic bushfires, flooding, and extreme storms is increasing with climate change. Recent examples like the November 2019 storms that hit the LGA, the more recent October 2021 storm, and the 2019-20 extreme bushfires across NSW demonstrate the level of damage that natural disasters can cause in and around the LGA. Natural disasters like storms and bushfires threaten vegetation, damaging trees and reducing canopy cover.

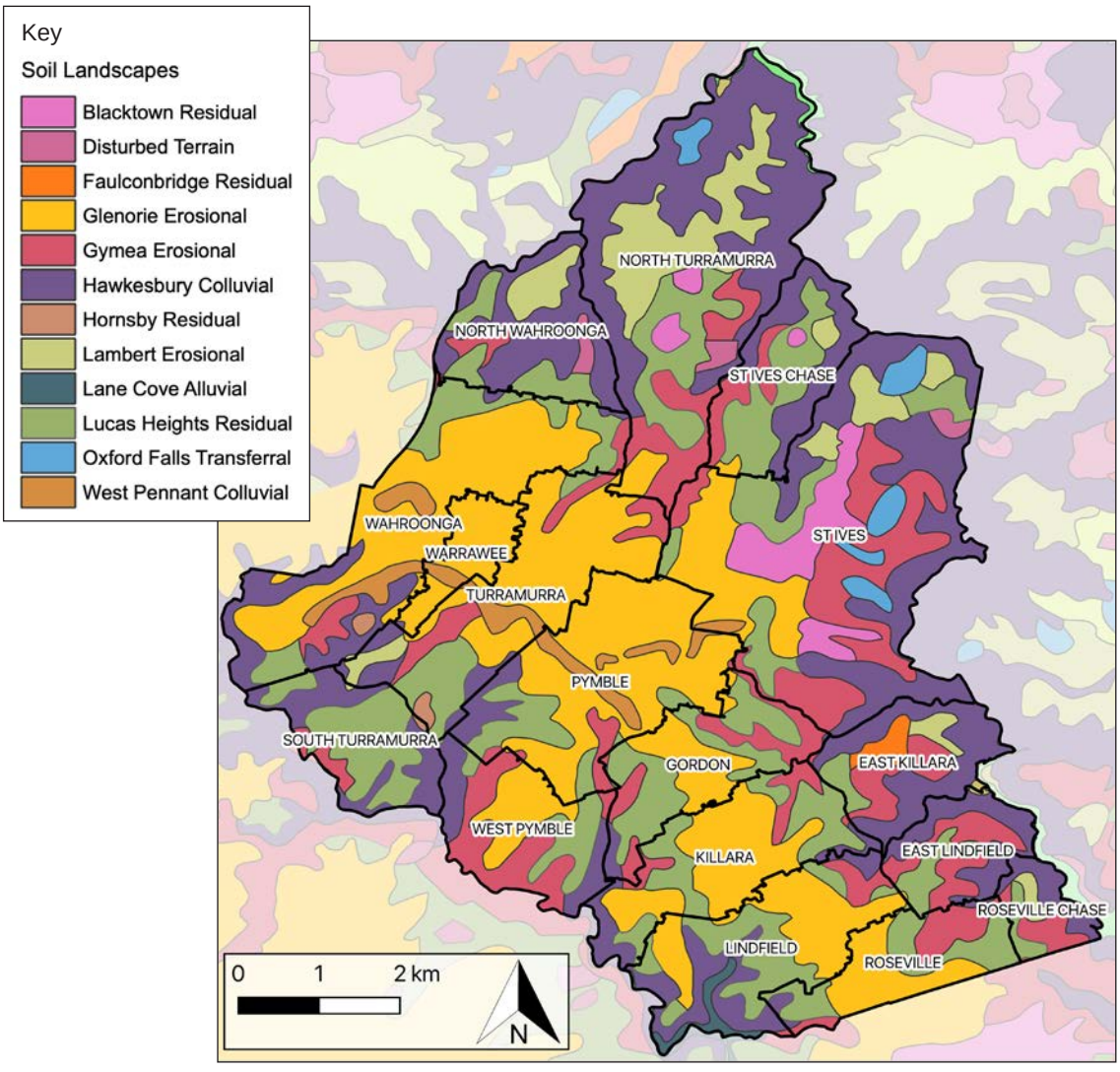
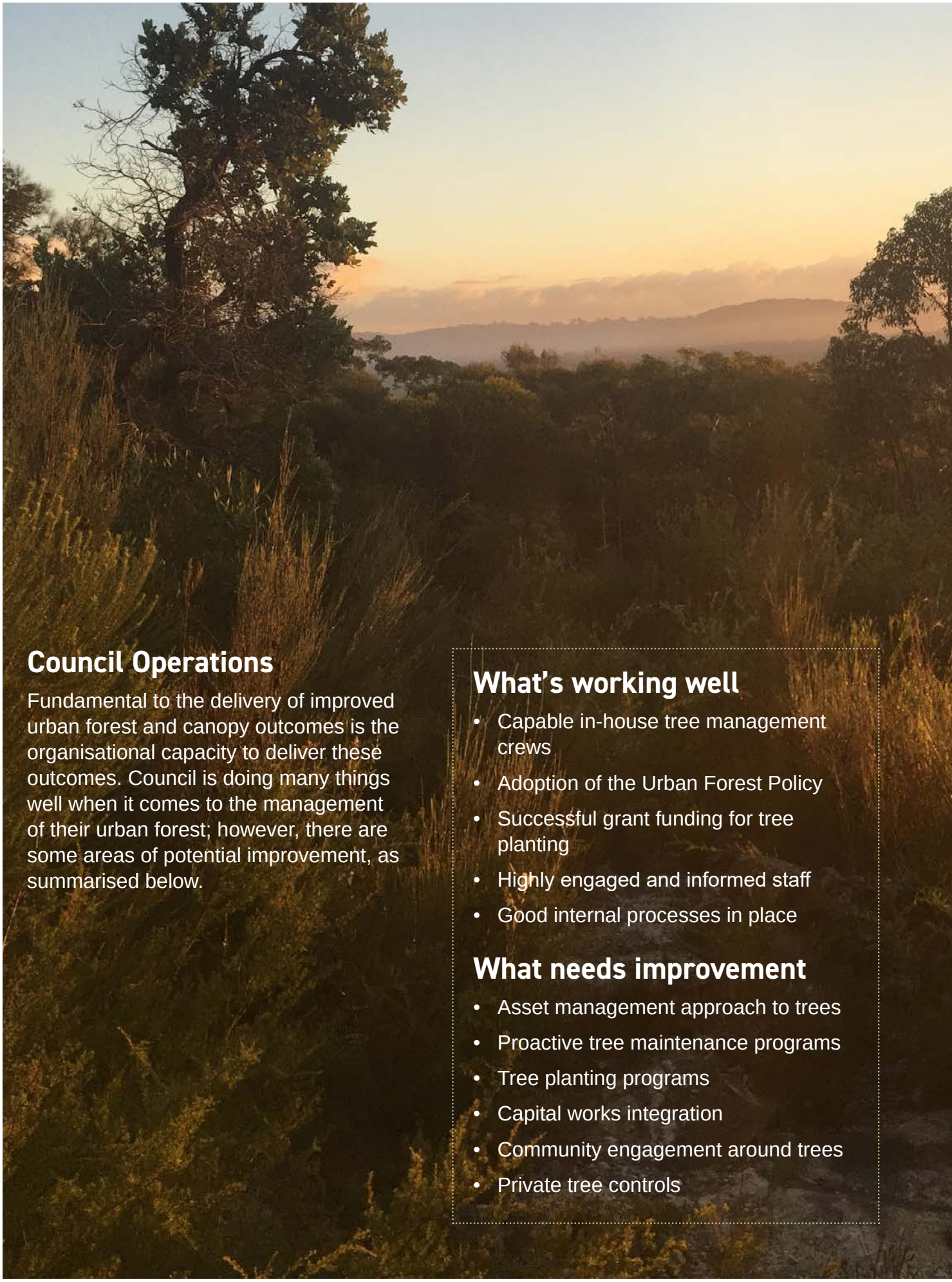


Figure 3 – Soil map of the Ku-ring-gai LGA using the NSW Government's eSPADE data, illustrating the underlying soil types of the area (NSW Soil Landscapes).



Council Operations

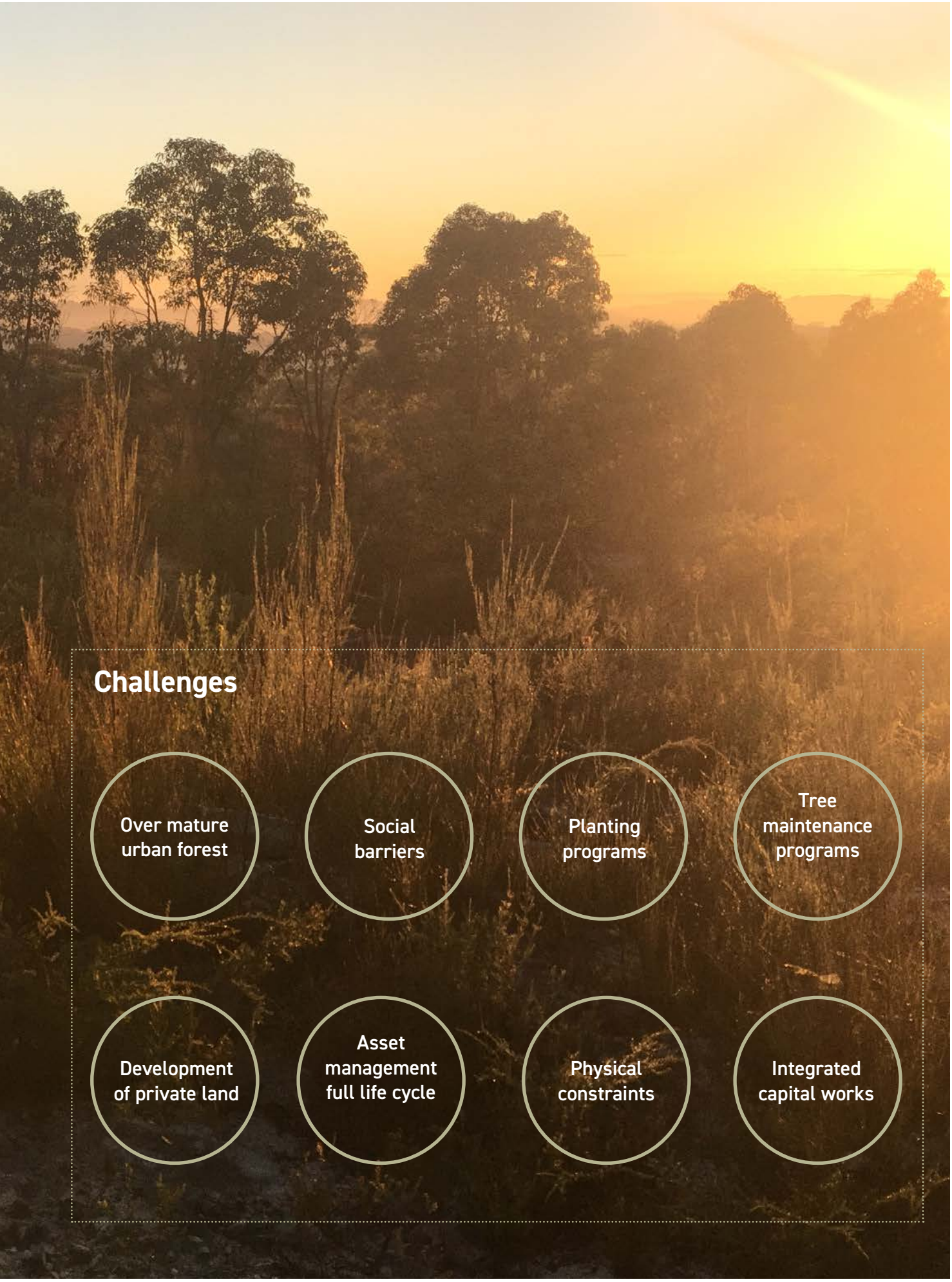
Fundamental to the delivery of improved urban forest and canopy outcomes is the organisational capacity to deliver these outcomes. Council is doing many things well when it comes to the management of their urban forest; however, there are some areas of potential improvement, as summarised below.

What's working well

- Capable in-house tree management crews
- Adoption of the Urban Forest Policy
- Successful grant funding for tree planting
- Highly engaged and informed staff
- Good internal processes in place

What needs improvement

- Asset management approach to trees
- Proactive tree maintenance programs
- Tree planting programs
- Capital works integration
- Community engagement around trees
- Private tree controls


Challenges
Over mature urban forest
Social barriers
Planting programs
Tree maintenance programs
Development of private land
Asset management full life cycle
Physical constraints
Integrated capital works

Challenges and drivers for change

Aging Tree Population

Ku-ring-gai is fortunate to have many large mature street trees providing excellent canopy cover. Many of these are trees remnant from the Blue Gum High Forest and Sydney Turpentine Ironbark Forest and are considered key components of the urban forest. This, in combination with an observed lack of recently planted, younger or semi-mature trees will cause issues with age diversity. Many of Ku-ring-gai's trees, including those in the iconic boulevards and parks, are close to 100 years old.

An ageing tree population requires increasing resources to manage and sustain, and with fewer trees in the lower age categories the Council will inevitably see a decline in canopy on public land if not well managed.

Physical Challenges

The public realm is high contested space and finding room for trees can be an issue in urban areas. Trees did not evolve to deal with urban pressures, however, they have now become essential assets in our cities, and we need them to make our cities liveable and resilient.

Conflicts with infrastructure such as roads, buildings, footpaths and utilities are perhaps the most challenging issues. This combined with poor planning or species choices in the past can inevitably lead to trees being removed.

Impacts from powerline clearance pruning to street trees can be observed throughout the LGA. This pruning significantly impacts on the ability to establish good canopy cover and severely limits available tree planting locations. The repeated pruning and resulting stress it imposes on trees can also predispose trees to infection by plant disease pathogens and attack from pests.

Some of these locations are exacerbated by poor tree species selection. Installation of bundled cables (ACB) in strategic areas would enable improved tree planting outcomes, however, this is costly.

Social Challenges

Living in close proximity to trees can cause issues. They can drop leaves, damage property, over shade and be potentially dangerous if not managed correctly. Pressure from community and negative attitudes towards trees can be major obstacle for Council when it comes to planting, maintaining and retaining trees.

Negative attitudes can range from an acute fear of trees, from a risk perspective or cultural barriers, and acceptance of trees from an aesthetics perspective.

Improved education and engagement around trees is often seen as the way to improve this issue. It is however, very difficult to do well and needs a carefully considered approach to achieve any real improvement.

Climate Change and Urban Heat

Trees, have numerous benefits for addressing causes and effects of climate change. These include mitigating urban heat, temperature regulation, carbon capture and storage, and soil structure and erosion reduction.

As Australia's climate changes over the next 50 to 100 years, the species of trees and plants that exist in Ku-ring-gai Council today may not be suited to the range of conditions presented by the new climate.

A study by Gallagher et al. (2019) indicated that 47% of vegetation in Australia is potentially at risk from increasing temperatures and showed low adaptability to climate change. Future planting programs throughout the Council will take this into account, and species selection will consider those that have been proven to withstand higher temperatures, drought, and are more tolerant to pollution.

The urban heat island effect (UHIE) is the build up of heat within built up areas, such as cities, due to the higher occurrence of hard exposed surfaces which retain more heat than natural surfaces, such as water and vegetation. Ku-ring-gai must focus on the significant benefits of the urban forest if a more sustainable and resilient city is to be developed, particularly in the face of a changing, hotter climate. An extensive and

well linked urban forest that incorporates all trees and other vegetation on public and private lands, and encompasses the mosaic of streets, parks, gardens, understorey and natural areas, watercourses and drainage banks and remnant vegetation and the environment that supports ecosystem services provided by soil and water, is the best strategy to mitigate future heat island impacts.

Population Increase and Urban Consolidation

Population growth, subdivision of land and increasing densities of urban areas all place pressure on Council's capacity to maintain current canopy coverage on private lands. The NSW Department of Planning and Environment projects that Ku-ring-gai's population will increase by more than 25,000 people to a population of 140,809 in 2036. The majority of these new dwellings will be accommodated within the existing mixed use, medium and high-density zoned sites which are concentrated along the Pacific Highway corridor and around the Local Centres of Turramurra, Gordon, Lindfield and St Ives. This is seeing large mature trees removed, and less space available for large trees to be planted. Redevelopment of free-standing houses inevitably results in larger building footprints, less space for large trees to be planted and removal of mature trees. Residual capacity within current planning controls will be supplemented by the delivery of seniors housing developments and alternative dwellings such as secondary dwellings, group homes and boarding houses where permissible.

Increased housing density in residential areas has the potential to negatively impact the Ku-ring-gai urban forest.

Existing Canopy

Canopy mapping was undertaken over the Ku-ring-gai LGA in 2020.

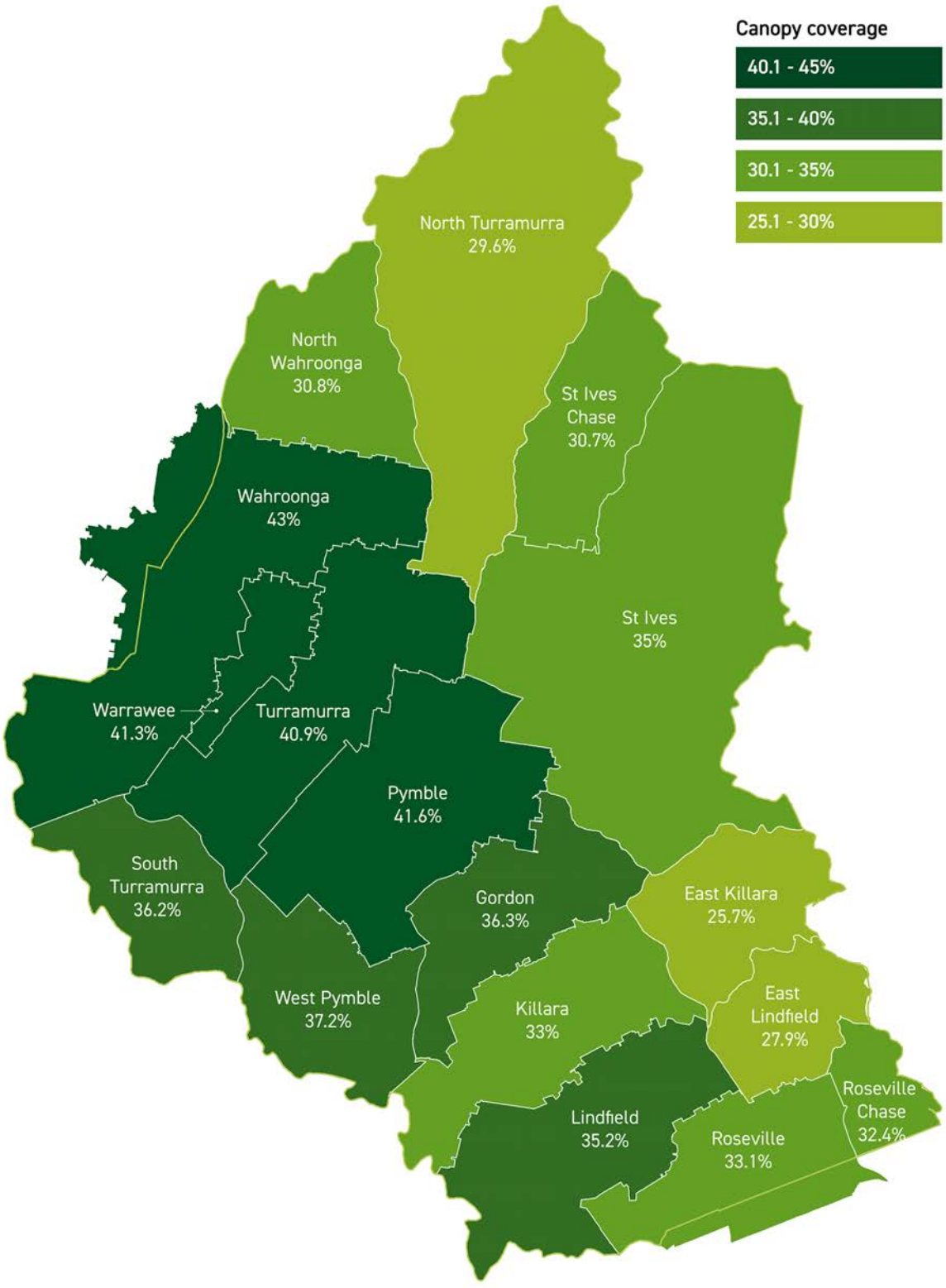


Figure 4 – Canopy mapping by suburb. Darker green indicates higher levels of canopy cover

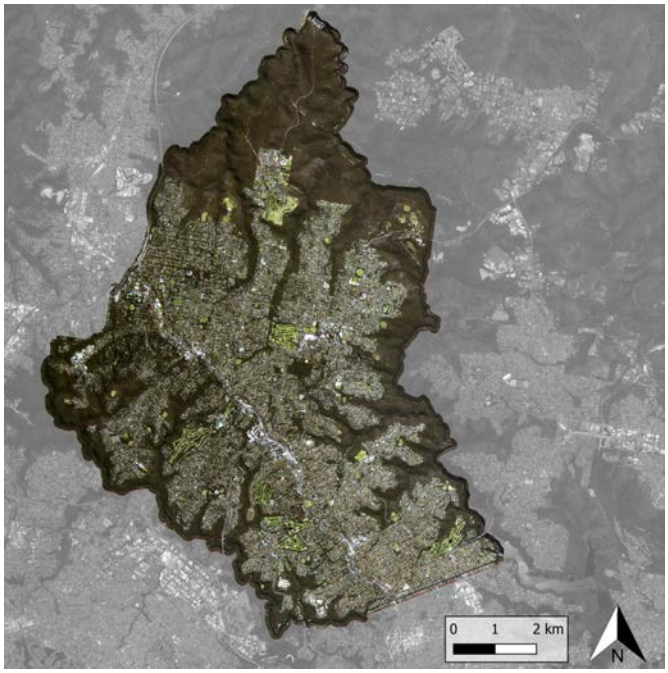


Figure 5 – High-resolution RGB imagery of Ku-ring-gai Council (ArborCarbon 2020)

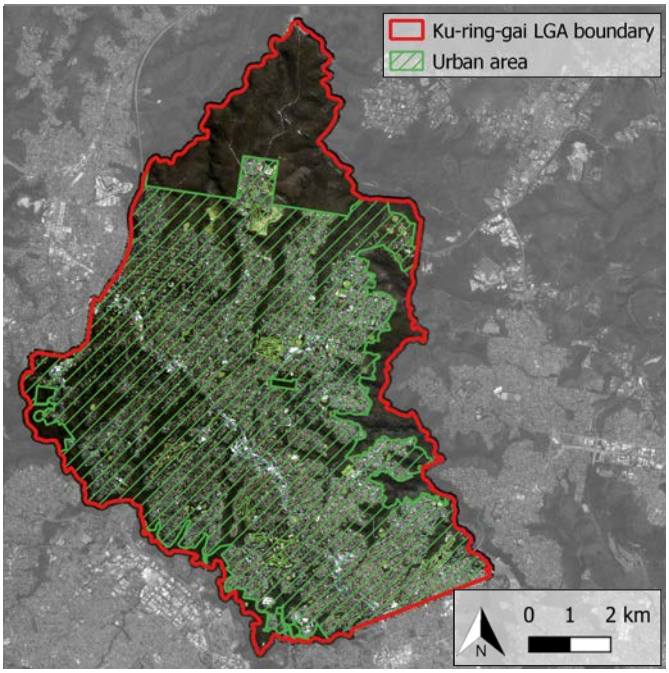


Figure 6 – Urban boundary of Ku-ring-gai Council. (ArborCarbon 2020)

Canopy cover statistics were calculated for the urban area only – this was determined to be the LGA boundary, excluding land zoned as C1 – National Parks and Nature Reserves (Figure 6).

National Parks and Nature Reserves are managed by the State Government, and while they are within the LGA boundary, they require different management approaches to urban areas of vegetation. Excluding National Parks and Nature Reserves from the analysis produces data that is relevant and useful for guiding management of land that is actually under the Council's control. C1 land is managed by the State government under the National Parks and Wildlife Act. Other areas of bushland which may be similar in management approach (fire, weed, erosion management etc.) to National Parks are included within the urban area of the LGA for analysis purposes, as they are managed by Council.

Suburb Canopy Cover

Average canopy cover in the urban area was 45%.

The suburb with the greatest proportional canopy cover was South Turramurra (57.9%), closely followed by North Wahroonga (53.1%) and Wahroonga (50.1%) (Figure 4). Each of these suburbs is in the western part of the Council and have a large proportion of environmentally zoned land (C2 (Environmental Conservation) and C4 (Environmental Living)), contributing greatly to canopy cover. In addition, these suburbs have a significant number of areas with particularly low-density residential housing with established, mature trees on residential blocks and along streets. Meanwhile, Killara had the lowest canopy cover at 34.7%, followed by Roseville (35.7%) and East Lindfield (37.1%).

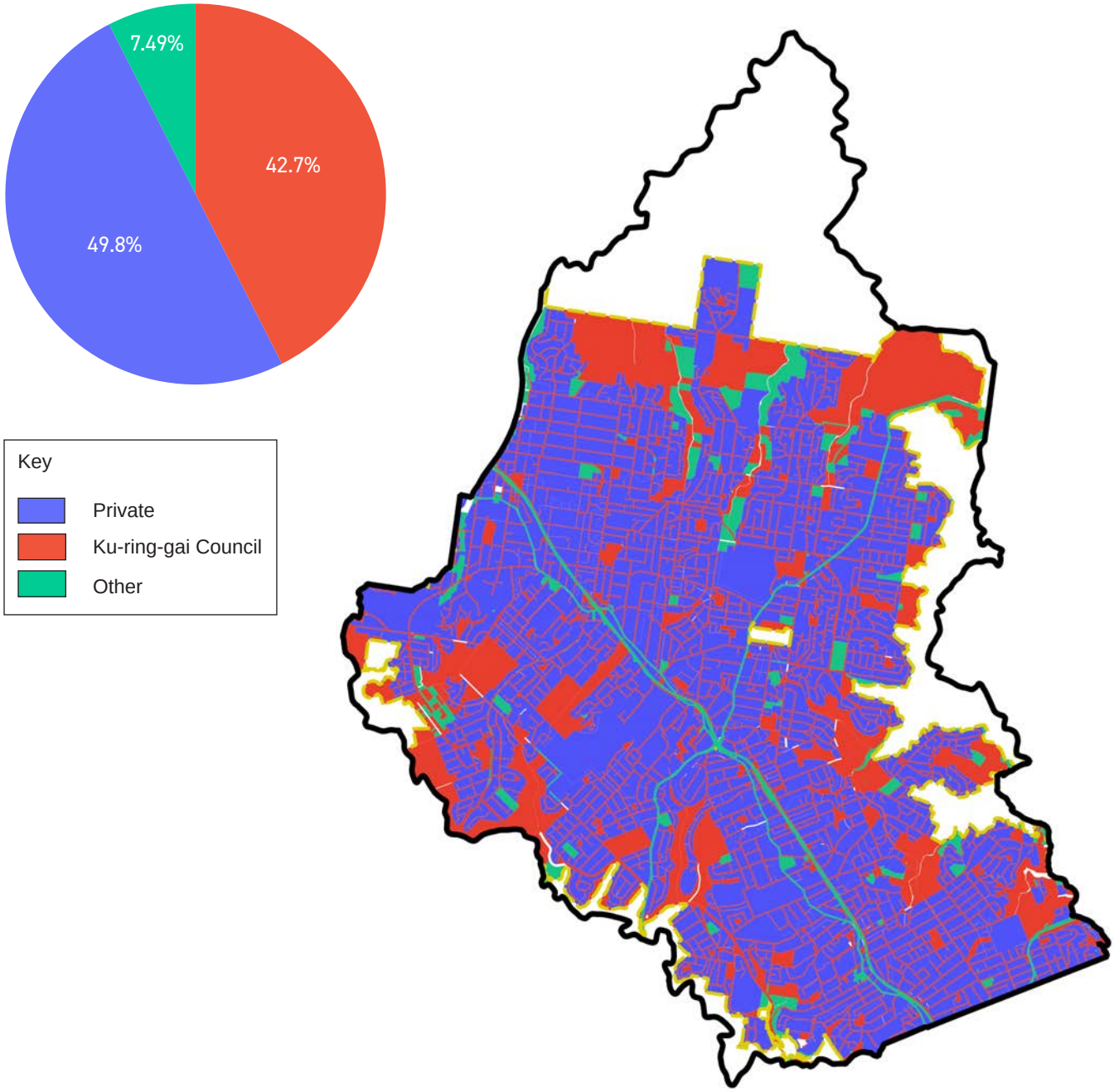


Figure 7 – The proportion of tree canopy within the Ku-ring-gai Council and the distribution of land tenure classes. 'Ku- ring-gai Council' land includes council managed land such as local parks, road reserves and municipal buildings. Other includes state and federally managed lands, and all other land tenure classes.

Public vs Private Land Ownership

Of the 3024.8 ha of canopy within the urban LGA boundary, nearly half (49.8%) is within privately owned land (Figure 7). Another 42.7% falls on land managed by Ku-ring-gai Council, which includes local parks, road reserves and municipal buildings. The remaining 7.5% of canopy falls on land classified as 'Other', such as state and federally managed land.

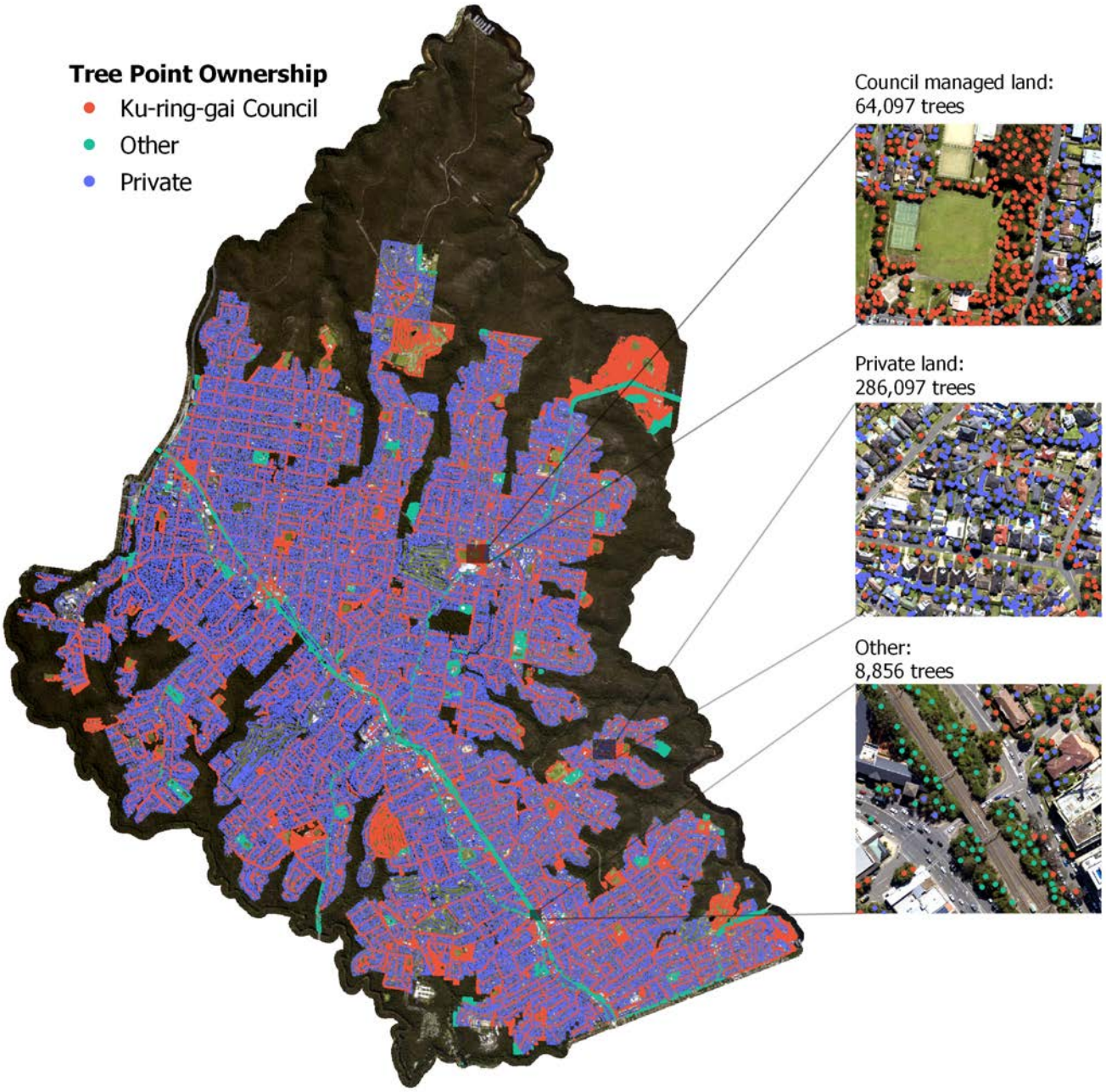


Figure 8 – Tree location and count on Council managed land, private land, and land classified as 'other' (excluding land classified as C1 and C2).

Existing Tree Population

Ku-ring-gai's urban tree population is a unique blend of exotic and native tree species. These trees contribute significantly to the character and identity of Ku-ring-gai and form an important part of the cultural and historic landscape of the area.

Despite the major historical logging and land clearing in Ku-ring-gai, the area retains a relatively high level of native vegetation compared to many other urban LGAs in Sydney, and elsewhere in Australia

Dominant street tree species include:

- *Angophora costata* (Sydney Red Gum)
- *Eucalyptus pilularis* (Black butt)
- *Eucalyptus saligna* (Sydney Blue Gum)
- *Eucalyptus microcorys* (Tallow wood)
- *Jacaranda mimosifolia* (Jacaranda
- *Liquidambar styraciflua* (Liquidambar)
- *Lophostemon confertus* (Brush Box)
- *Platanus x acerifolia* (London Plane Tree)
- *Syncarpia glomulifera* (Turpentine)

There are several well-known iconic mature street tree boulevard plantings in Ku-ring-gai. These are generally formal planted streetscapes, some of which include;

- Burns Road, Wahroonga (London Plane Tree)
- Roseberry Road, Killara (Tallow wood)
- Winton Street, Warrawee (Liquidambar)

There are numerous examples within the LGA where the streetscape is dominated by less formal native remnant style planting. There areas are characterised by 'towering giant' eucalypt species such as Sydney Blue Gum and Black Butt. Some of these areas include; Mt William Street, Gordon; several streets in east Killara and east Lindfield; and suburbs such as Turramurra, St Ives and Warrawee.

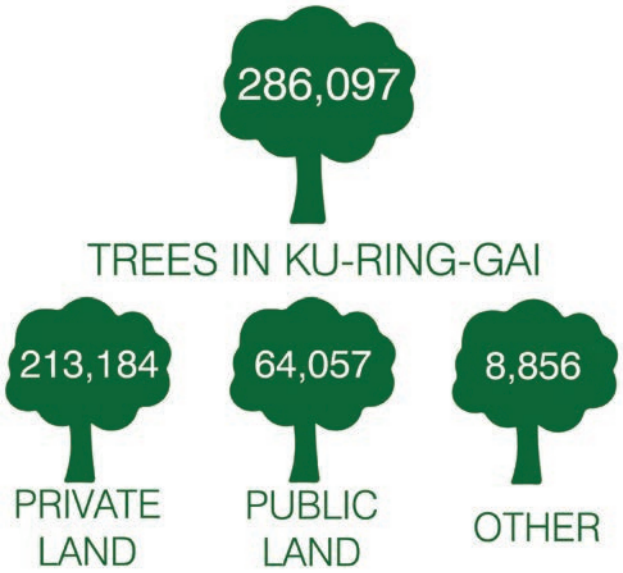
Parks and open space within the area are predominately characterised by native bushland style tree plantings and/or remnant vegetation; some of these include Turramurra Memorial Park, Turramurra; Killara Park, Killara; and Golden Jubilee Park, Wahroonga. There are however several parks with a more European tree planting style, the most notable of these is Wahroonga Park, Wahroonga; Pymble Soldiers Memorial Park, Pymble; and Swain Gardens, Lindfield.

Tree Count

In 2021, ArborCarbon undertook analysis to determine a preliminary tree inventory based on the 2020 aerial imagery datasets. The analysis was conducted on LGA boundary, excluding land classified as C1 (National Parks and Nature Reserves) and C2 (Natural Areas). The analysis resulted in a tree asset database for trees in the 5540 ha of remaining land. A total of 286,097 trees were identified in this area.

The majority (213,184) are on private land. Ku-ring- gai Council manages approximately 64,057 trees on public land, such as on streets and in parks.

The remaining 8,856 trees are on land classified as ‘other’, primarily under state or federal management.



Targeted Planting for Canopy Increase

A lack of planting space on public land has been identified as a limiting factor to increasing urban canopy. Available aerial imagery, land use boundaries, and planting guidelines have been used to locate Available Planting Space (APS) on public land throughout the urban area of Ku-ring-gai, with the purpose of identifying the most suitable opportunities for planting investment (Figure 9). In addition, shade cast by canopy over existing and proposed Active Transport Routes (ATRs) throughout the LGA has been modelled and quantified, to further focus planting efforts to where the benefits and values provided by these new trees can be maximised.

The identification of APS was limited to Council managed land, therefore the majority of APS identified was road verges and parks. A significant number of verges were identified as not having a tree, and the space available to plant one or more trees.

The analysis identified 157 ha of APSs managed by the Council, currently containing bare-ground, grass or shrubs, in the urban area of Ku-ring-gai. These APSs have the capacity to support approximately 23,552 additional trees, which is approximately 54% of the 44,043 trees required across the LGA to meet targets.

The potential canopy increases from planting these areas is dependent on the tree species selected. Larger trees have the capacity to provide substantially more canopy area per tree planted, as well as the associated values such as shade and habitat etc. However, a range of constraints exist which limit the size of tree which can be planted at a given site, notably powerlines and other infrastructure requirements.

The average area of a tree crown within Ku-ring-gai was used to estimate the number of trees required to meet the canopy cover targets which was compared with the APS on public land within each suburb. In most suburbs, the canopy cover targets exceed the APS on public land, with the exception of Pymble, Turramurra, Wahroonga and Warrawee. This highlights the importance of community engagement in order to facilitate increasing canopy cover in private land.

Figure 9 – Example of APS dataset, showing identified APS in red, and the number of trees that could fit in the available space (label). Overhead power distribution lines observed in the aerial imagery is illustrated as a dotted blue line.

Canopy Cover Targets

Canopy cover targets have been developed using significant detailed analysis of current canopy cover across Land Zones, as identified in the NSW Local Environmental Plan (LEP), as well as road reserves and public open space (POS). The Council's capacity to achieve these targets was also considered. The targets were developed in line with canopy cover targets outlined in the DPE 'Draft Urban Design and Place Guide', where possible, or using the current average canopy cover of that Land Zone. A detailed breakdown of the targets and their development is in Appendix B.

Using this process to develop targets based on Land Zones (Figure 10), the resulting canopy target translates to a canopy cover increase of 287.3 ha in the urban area. This is approximately a 9.4% increase in canopy from 3059.0 ha (45% of the urban area) to 3346.3 ha (49%).

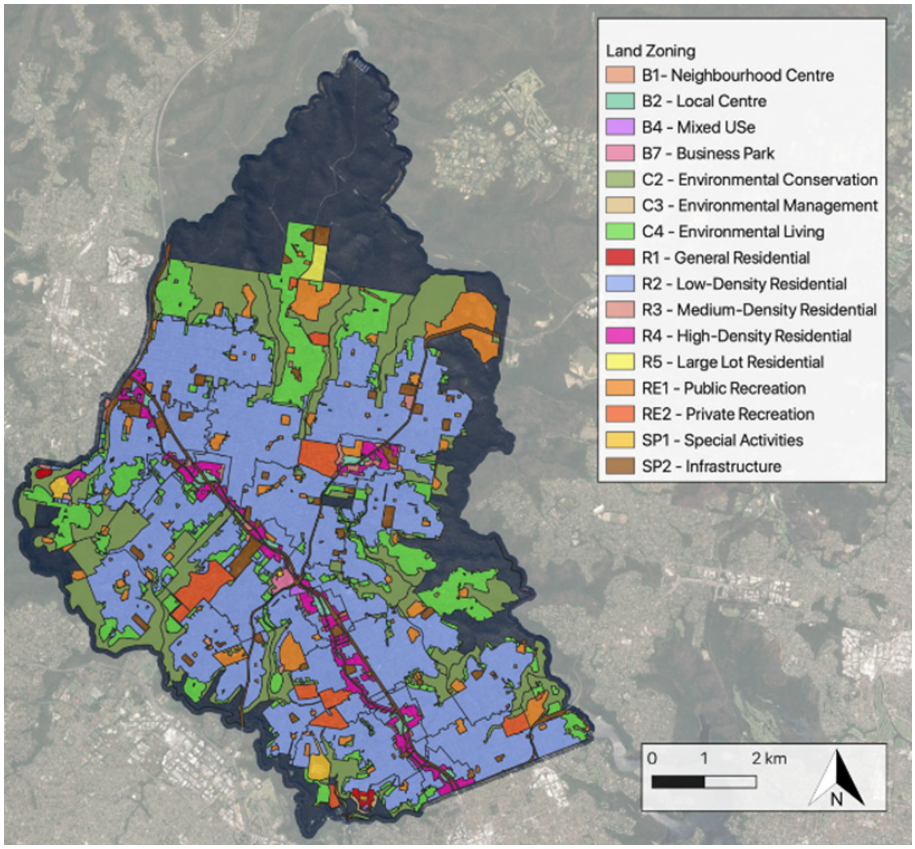
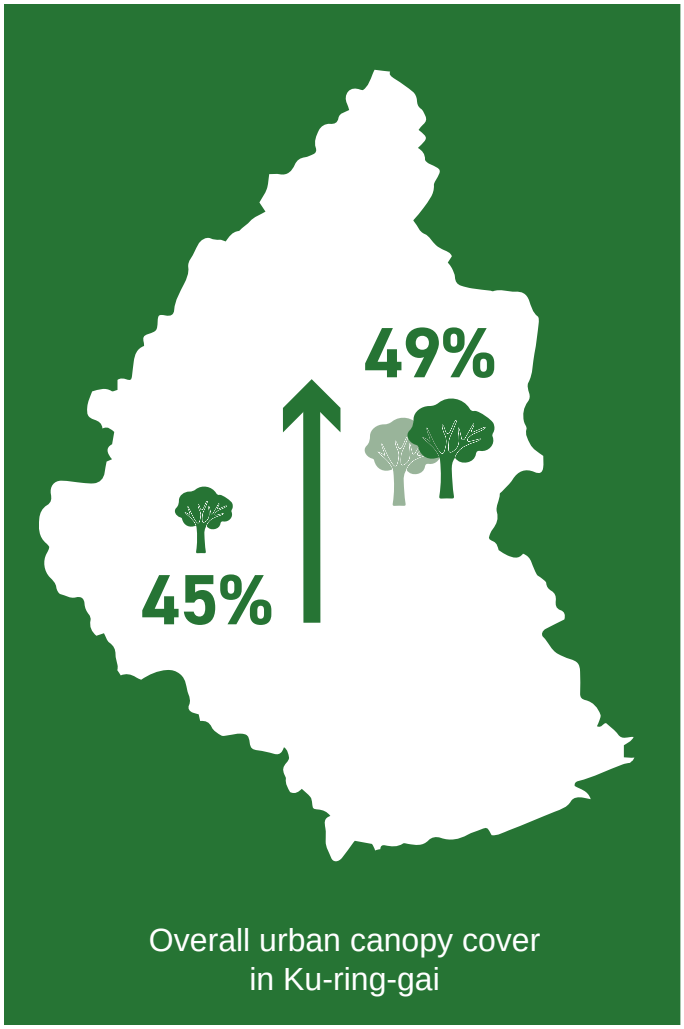
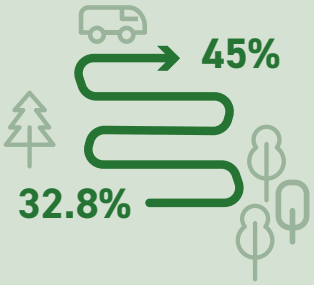


Figure 10 – Land Zone classification (identified in the NSW LEP) of the Ku-ring-gai urban area.

Key Targets



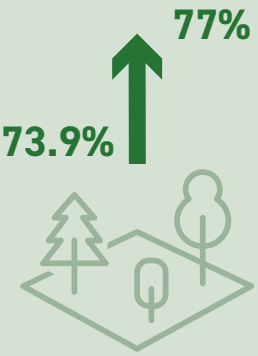
Overall urban canopy cover in Ku-ring-gai



Road reserves

44,043

New trees required



Public open space

23,352

Available planting spaces for new trees (on public land)

MIN. 55%

Locally indigenous canopy tree planting on public land annually

20,691

New trees on private land

Ku-ring-gai aims to increase overall urban canopy cover from 45% to 49%.

This will include an increase of canopy cover on road reserves from 38.2% to 45%, and an increase in Public Open Space from 73.9% to 77%.

The number of trees required to be planted to achieve the canopy targets was estimated, based on the average crown area of a tree in Ku-ring-gai to be 70m2.

To achieve 49% canopy cover, there needs to be an additional 44,043 trees planted throughout the urban area of Ku-ring-gai by 2036.

This will include at least 9,929 new plantings in road reserves and 8,243 new plantings in Public Open Space (POS).

Canopy cover targets were set for road reserves and POS, as well as each Land Zone across the entire urban area. They were then broken down for each suburb and each Local Centre, based on Land Zones.

It is imperative to note that Ku-ring-gai has a significant area of Bushfire Prone Land (BPL) within its boundary (Figure 11). As recent years have shown in various parts of Australia, the risk of catastrophic bushfire is increasing with a warming, drying climate. In BPL, expanding canopy cover and the many benefits that result, needs to be balanced with any increased fire risks that increased vegetation cover might pose. Land identified for planting to increase canopy cover that is identified as bushfire prone, will need to be assessed for its planting potential on a case-by-case basis. These areas will be investigated as part of the Urban Forest Monitoring program. Species selection will be especially important in these areas.

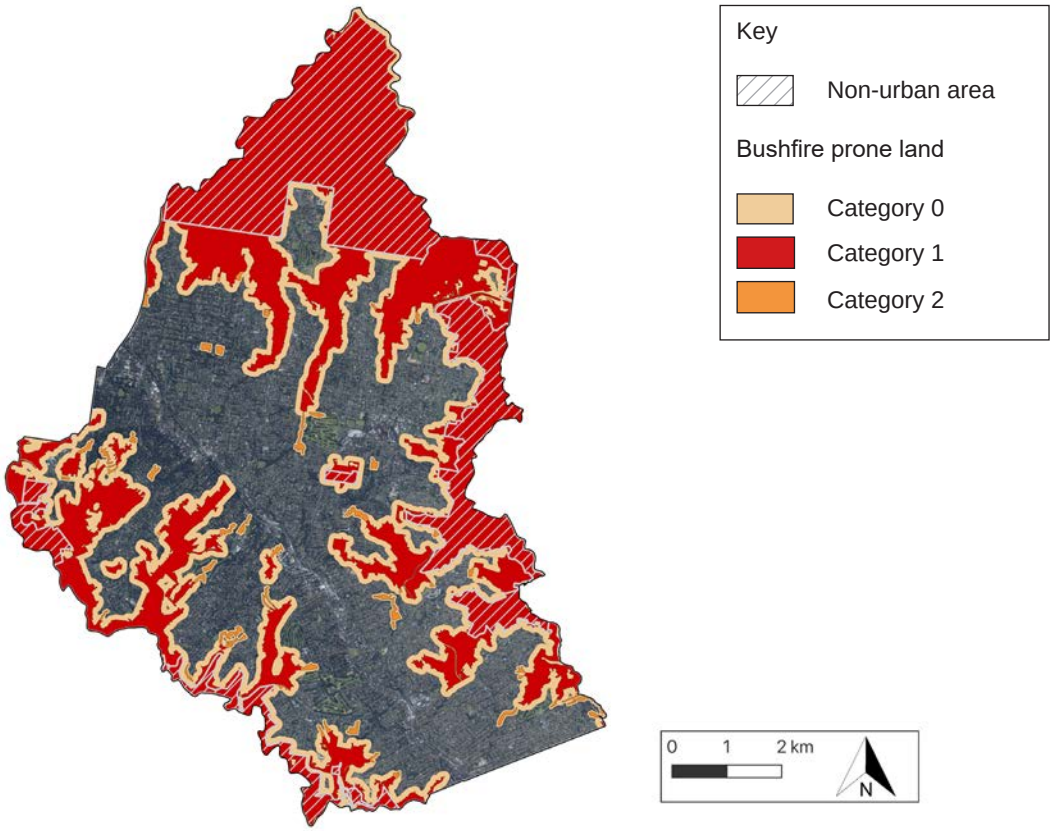
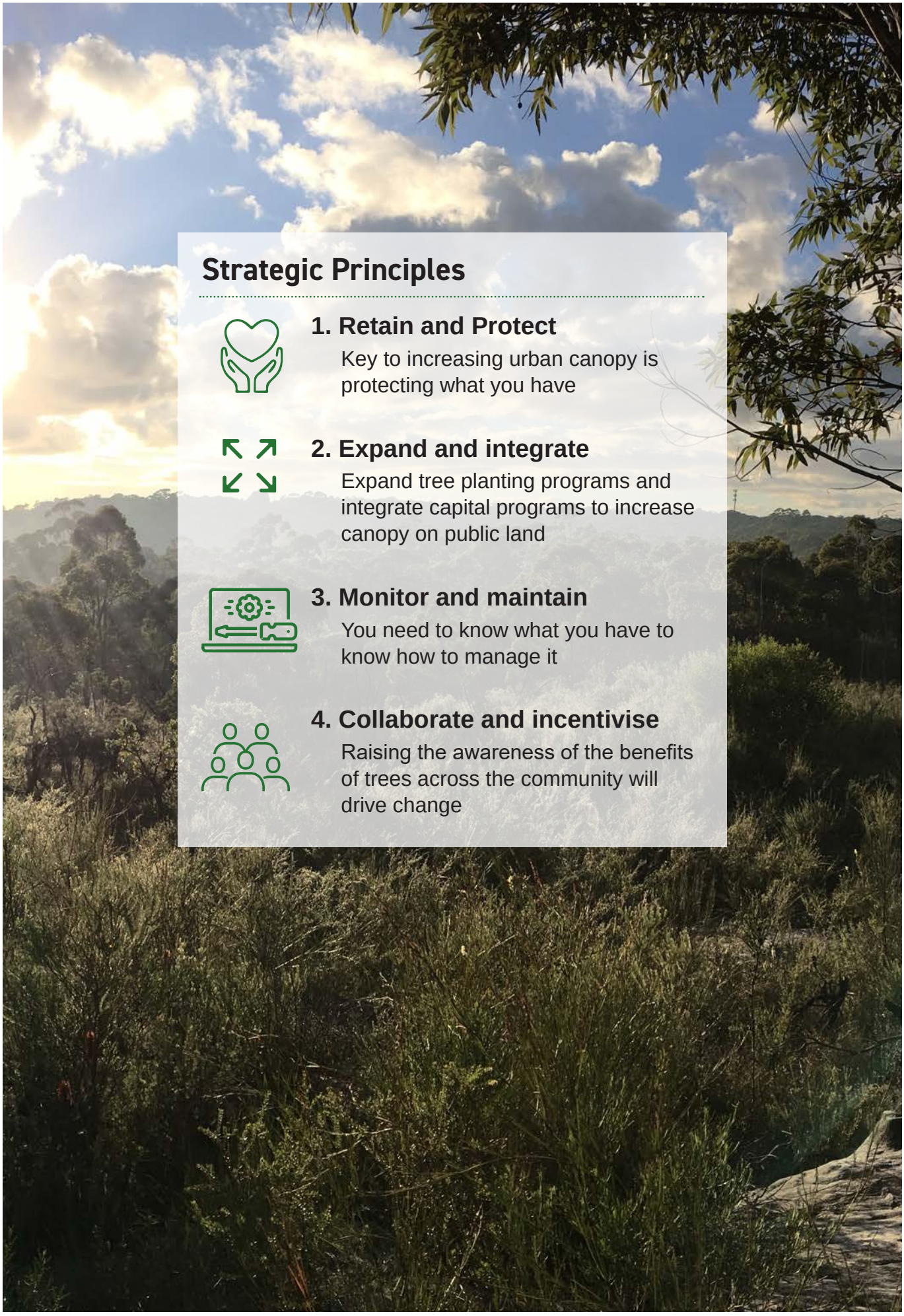


Figure 11 – Map of Bushfire Prone Lands in the LGA (2017 data)



Strategic Principles

1. Retain and Protect

Key to increasing urban canopy is protecting what you have

2. Expand and integrate

Expand tree planting programs and integrate capital programs to increase canopy on public land

3. Monitor and maintain

You need to know what you have to know how to manage it

4. Collaborate and incentivise

Raising the awareness of the benefits of trees across the community will drive change

Principles

Council has developed a set of four Strategic Principles for the urban forest.

These are key, overarching themes or values which will guide the implementation of the Urban Forest Strategy and guide Council's thinking around managing the urban forest

The Principles are:

1. **Retain and Protect**
2. **Expand and Integrate**
3. **Monitor and Maintain**
4. **Collaborate and Incentivise**

Each of these addresses an important aspect of urban forest management, encouraging protection of existing trees and vegetation, expansion and strengthening of the urban forest, effective monitoring and management, and engagement with the community. A number of goals are attached to each Principle, addressing key aspects of the broader Principle. These Principles and Goals guide a range of Strategic Actions, which are important for the Council to undertake to ensure the health and robustness of the urban forest into the future.

1. Retain and Protect

Key to increasing urban tree canopy is protecting what you have.

Trees take many years to mature and provide valuable canopy. Ku-ring-gai is fortunate to have an established urban forest with good canopy cover (total urban LGA canopy area of 45%). Priority needs to be given to protecting these existing assets, both on public land and private land. This includes the protection of trees including but not limited to those identified as threatened species and communities.

Goal 1.1 Protection of existing trees on private land

60.8% of the land in Ku-ring-gai's urban area is privately owned, and this land contributes 49.6% of total canopy to the urban forest.

Considering that tree canopy on privately owned land contributes nearly half of the overall total canopy of the Council's urban forest, focus must be given to protecting trees on private land, in order to meet urban forest targets and maintain a high level of canopy cover.

The majority (73%) of privately owned land in Ku-ring-gai is classified as Residential. The remaining private land is mostly zoned as Business and Local Centres, Infrastructure and Special Activities.

The minimum canopy cover target for Residential-zoned land is 40%. This translates to an additional 25,000 trees (note: Residential Zoned land includes adjacent Road Reserves and therefore that additional tree figure is likely to be partly within Council-managed Road Reserve areas).

Protecting trees on private land is a complex practice as there are multiple legislated controls that are relevant beyond the jurisdiction of Council, such as State Environmental Planning Policies (SEPPs), which allow for significant development to occur with limited Council oversight. Development has been identified as a major threat to protecting and increasing canopy cover on privately owned land, as has the 10/50 Vegetation Clearing Scheme, which bypasses Council tree protection controls.

Council can control certain aspects of the management of trees on private land via their Local Environment Plans and Development Control Plans.

Private landholders are also required to comply with Commonwealth and State legislation ensuring the protection of threatened species and communities, including the *Ecological Protection and Biodiversity Conservation Act 1999*, and the *Biodiversity Conservation Act 2016*.

Goal 1.2 Protection of trees on public land

32.9% of the land in Ku-ring-gai's urban area is Council owned, and this land contributes 42.7% of the Council's urban canopy.

Urban public trees provide many essential benefits for Ku-ring-gai and its residents, from temperature reduction to improved health and wellbeing. To ensure these benefits are maximised it is vital that existing established trees are retained and protected

Ku-ring-gai Council values and maintains their public tree population and aims to only remove trees if they are dead, dying or dangerous. Much of the pressure on public trees can come from the interface with private development and from infrastructure and utility service providers (including Sydney Water, Ausgrid and Transport for NSW).

Goal 1.3 Ensure urban forest diversity and protect against pests and diseases

A key potential threat to any urban forest is attack from pests and diseases. Effective management of pest and diseases is becoming even more of a focus due to climate change. With increased temperatures and altered weather pevents conditions may favor

various pathogens and allow them to thrive. If mechanisms are not in place to manage these outbreaks our urban forest could be at risk.

Ensuring species diversity within the urban forest is an important way to protect against the impact of pest and diseases. A highly diverse urban forest is a resilient urban forest.

2. Expand and Integrate

Expand tree planting programs and integrate capital programs to increase canopy on public land.

Key to any successful urban forest program is the planting of trees. Public land increasingly needs to accommodate more trees as pressure on private trees increases, and it is essential that Council has a well-resourced tree planting program to facilitate an increase in canopy on public land.

Aligning tree planting programs and integrating capital project delivery is necessary to achieve improved canopy outcomes. All parts of Council should be actively seeking to incorporate tree planting in their projects where possible. Integrated project delivery leads to greater cost efficiencies and improved services for the community.

Goal 2.1 Increase tree planting on council land

In 2020, average canopy cover of road reserves was 38.2%. Our target is to increase average canopy cover on road reserves to a minimum of 45%. Road reserves with below ground power services can achieve greater canopy cover and should aim for 50%.

The average canopy cover of Public Open Space (POS) (zoned as RE1) was 40.9%. The minimum canopy target for POS is 45%. Town Centres will need to accommodate the majority of the increasing population within the Council, and therefore are likely to experience canopy loss from development.
To compensate for the loss of canopy as a result of private development, increased planting on public land will be required.

Goal 2.2 Integrate delivery of green, blue and grey infrastructure capital programs

Integration of blue, green and grey infrastructure will provide mutual benefits to all. Opportunities to enhance and reconnect Ku-ring-gai's blue, green and grey infrastructure exist at all scales, from large public infrastructure projects to small private developments.

Goal 2.3 Integrate urban ecology values into programs

Biodiverse and ecologically rich urban areas promote resilient and livable cities. When appropriately integrated, urban ecology values can enhance the benefits of the urban forest and provide improved soil and water quality and pollution mitigation, and support overall tree health. Fundamental to this is the protection of our diverse native vegetation ecological communities many of which contain threatened species.

Goal 2.4 Improved management of trees in bushfire prone land

Bushfires pose a significant threat to establishment, retention and management of trees. Much of the Ku-ring-gai area is designated as 'bushfire prone land' and comes under state legislation that impacts how trees are managed.

3. Monitor and Maintain

You need to know what you have to know how to manage it.

Having good data on the urban forest is critical for day-to-day decision-making and high-level strategic planning. It can provide valuable insights into the quality and value of your tree assets and uncover underlying issues or barriers to achieving targets. It will ensure resources are being directed to where they are required the most.

Vegetation extent and condition are necessary factors to know in order to maintain it throughout its life cycle. It is important to identify and quantify trees and record tree maintenance and planting activities. This will help to minimise resource use and minimise losses when investing in urban forestry programs.

While the present focus of this Strategy is urban canopy cover, there are many other quantitative and qualitative measures and targets that can be included in regular monitoring and reporting, which relate to the development and management of a healthy and resilient urban forest. Health and condition of the urban forest are as important as canopy cover. Urban forest composition, structure and age class are important measures of urban forest success, as a diverse forest is a resilient forest. Mapping urban forest landscapes and habitat values will help to identify opportunities for the creation and enhancement of corridors through targeted planting of particular species as informed by the Biodiversity Policy, Green Grid Strategy and Council's LEP and DCP biodiversity controls. Monitoring air quality and temperature can also be used to assess the health and success of the urban forest. In addition, the contribution of the forest to soil and water resources and the carbon cycle, and its socioeconomic impacts can be used as other methods of evaluation.

Goal 3.1 Monitor vegetation and canopy cover

Accurately monitoring changes in canopy cover will enable evaluation of the effectiveness of the management interventions and greening programs and will help to achieve targets and objectives. This is anticipated to be captured on a bi-annual basis.

Goal 3.2 Monitor land surface and air temperature

Spatial analysis of urban heat islands is an important tool to measure the success of the urban forest. Investigating the relationship between vegetation and canopy cover, and land surface temperature can be used to develop a framework to prioritise green infrastructure and mitigate high urban temperatures.

Goal 3.3 Manage the contribution of the urban forest to soil and water resources

The interaction between urban trees, surrounding infrastructure, soils and water is complex. There are positive correlations between the growth rate of trees, fine-root biomass and water infiltration rates. Appropriate and considered planting of trees has the potential to intercept stormwater runoff and reduce the requirement for additional irrigation. Trees have great potential for urban stormwater management, and research is required to develop policy mechanisms to encourage their cost-effective implementation.

Goal 3.4 Improve asset and data management

Most Councils are recognising trees as assets in their operational planning and maintenance programs and managing their trees with a 'whole of life' asset management approach. This ensures that risks from trees are managed and that costs associated with maintaining trees over their life cycle are accounted for.

A tree inventory is the most powerful and accurate method of collecting and analysing urban forest data in the public realm; it will provide metrics such as species diversity, tree health and condition, useful life expectancy and risk profile, in an easily accessible format.

Council manages approximately 64,057 public trees. Currently, the maintenance of these trees is carried out on a reactive basis according to risk.

Goal 3.5 Improve tree maintenance practices

As previously discussed, Ku-ring-gai has a well-established urban forest. Properly maintaining this existing urban forest is an essential part of protecting what exists, and ensuring it's continuation into the future.

4. Collaborate and Incentivise

Raising awareness of the benefits of trees across the community will drive change.

Bring the community along for the journey – a strong relationship with our community will improve how well Council can deliver on these urban forest goals.

One of the biggest barriers to achieving improved urban forest programs is limited community awareness and understanding of the need for improved urban forest planning and greening outcomes.

Partnering with and empowering local residents and organisations will help build urban forest awareness and support for the protection, management and increasing of urban canopy.

Goal 4.1 Enable, support and empower the community to actively participate in the planning and management of trees

Ku-ring-gai encourages the community to have a sense of ownership and acceptance of the community greening initiatives. Involving and enabling the community with each step of the Urban Forest Strategy will ensure a sense of connection with the urban forest. It's crucial that the Council provides opportunities for active participation in greening activities throughout the LGA, including ongoing education and awareness activities, hands on activities such as planting programs, and encouraging citizen science.

Goal 4.2 Incentivise increased canopy on private land

One of the most important things that the community can do is green their own property. As previously discussed, 60.8% of the land in Ku-ring-gai's urban area is privately owned. Private land holds significant influence over Ku-ring-gai's overall canopy cover, and residents can have a huge impact. The community is one of Ku-ring-gai's greatest resources for increasing canopy and green cover.

Goal 4.3 Advocate for greater recognition of green infrastructure

Advocacy is an important part of building urban forest awareness and support for trees. This advocacy needs to occur both externally and internally.

Ku-ring-gai Council has a positive history of engaging and collaborating with infrastructure agencies and providers such as Ausgrid, Transport for NSW, Sydney Water, utilities providers, and individuals and will continue to do so.

Implementation & Action Plan

The implementation and action plan is the guiding document for how the Ku-ring-gai Urban Forest Strategy will be rolled out.

This summarises the principles, goals and actions and assigns a responsible manager to each. Each action is then given a time frame and funding is identified as existing or additional funding is required to be sought.

STRATEGIC PRINCIPLES → GOALS → ACTIONS

Implementation of Actions

ONGOING	Work is already underway, or is part of our current DP & OP CURRENTLY FUNDED
PRIORITY 2	Will require some additional funding and/ or resources CURRENTLY UNFUNDED
PRIORITY 3	Will require significant additional funding and/ or resources (inlcuding staff) CURRENTLY UNFUNDED

The whole process for the development of the Urban Forest Strategy has been embedded in collaboration between various Council teams. In particular, the development of the Implementation and Action Plan has seen an ongoing and rigorous dialogue to produce a plan which is realistic, ambitious and achievable.

The creation of the Implementation and Action plan has been the result of multiple group workshops and meetings to define what differing teams across Council have agreed to take on as their responsibility, their capacity to deliver that, and who they will collaborate with as part of that process. All teams involved are eager to ensure improved outcomes for the urban forest in Ku-ring-gai, and are on board make changes to a ‘business as usual’ approach where required.

Supporting the strategic principles are broad goals. These goals then drill down into 56 specific actions, with each action assigned to a manager responsible for its delivery.

The implementation of the actions will be staged, subject to funding constraints. Many of our actions are part of ongoing works identified in Council's Delivery Plan & Operational Plan, and are funded.

Priority 2 and priority 3 works will require additional funding and a longer term approach. Actions have been broadly grouped together into their respective staging being ongoing, stage 2 or stage 3. It is the intention that the expanded implementation and action plan will remain as a operational document for utilisation by Council staff.

Principle 1 – Retain and Protect

Key to increasing urban tree canopy is protecting what you have.

Goals

1.1 Protection of existing trees on private land

1.2 Protection of trees on public land

1.3 Ensure urban forest diversity and protect against pests and diseases

Actions

Ongoing – funded	Priority 2	Priority 3
• Review of controls, DA conditions, and best practice specifications • Retain trees wherever possible • Tree bonds • Collaborate with utility/ infrastructure agencies	• Tree valuation framework • Pest & disease management	

Principle 2 – Expand and Integrate

Expand tree planting programs and integrate capital programs to increase canopy on public land.

Goals

2.1 Increase tree planting on council land

2.2 Integrate delivery of green, blue and grey infrastructure capital programs

2.3 Integrate urban ecology values into programs

2.4 Improved management of trees in bushfire prone land

Actions

Ongoing – funded	Priority 2	Priority 3
• Best practice urban forest management and increased biodiversity • Best practice bushfire management	• Increase tree planting • Street tree masterplan • Habitat trees	• Undergrounding & Aerial Cable Bundling (ACB) of power • Green infrastructure solutions • Timber reuse program

Principle 3 – Monitor and maintain

You need to know what you have to know how to manage it.

Goals

3.1 Monitor vegetation and canopy cover

3.2 Monitor land surface and air temperature

3.3 Manage the contribution of the urban forest to soil and water resources

3.4 Improve asset and data management

3.5 Improve tree maintenance practices

Actions

Ongoing – funded	Priority 2	Priority 3
• Tree inventory - monitor tree removals and installations • Focus tree planting in priority areas • Water Sensitive Urban Design (WSUD) • Best practice tree maintenance	• Acquire airborne imagery and thermal data relating to canopy coverage • Tree inventory database • Monitoring of street tree planting programs	• Smart technology integration • Proactive tree maintenance

Principle 4 – Collaborate and incentivise

Raising awareness of the benefits of trees across the community will drive change.

Goals

4.1 Enable, support and empower the community to actively participate in the planning and management of trees

4.2 Incentivise increased canopy on private land

4.3 Advocate for greater recognition of green infrastructure

Actions

Ongoing – funded	Priority 2	Priority 3
• Community education • Partnerships, collaboration & advocacy • Events • Tree species list	• Subsidised tree program (private land)	• Private tree maintenance subsidies

Conclusion

The Ku-ring-gai Urban Forest Strategy will define how Council is currently managing its urban forest and will outline a pathway to facilitate improved urban forest outcomes, so that the benefits of a healthy urban forest can be maximised for current and future generations.

Ku-ring-gai urban forest forms an important part of the cultural identity of Ku-ring-gai, where residents value trees and the natural landscape. Council will protect and enhance the urban forest to ensure this unique character and established canopy cover is preserved and improved for future generations.

The Urban Forest Strategy will be supported by the Urban Forest Replenishment Program and Urban Forest Monitoring Program, as outlined in Ku-ring-gai's Urban Forest Policy.

Abbreviations

Blue Gum High Forest (BGHF)

Sydney Turpentine Ironbark Forest (STIF)

Urban Heat Island Effect (UHIE)

Available Planting Space (APS)

Department of Planning and Environment (DPE)

Water Sensitive Urban Design (WSUD)

Aerial Cable Bundling (ACB)

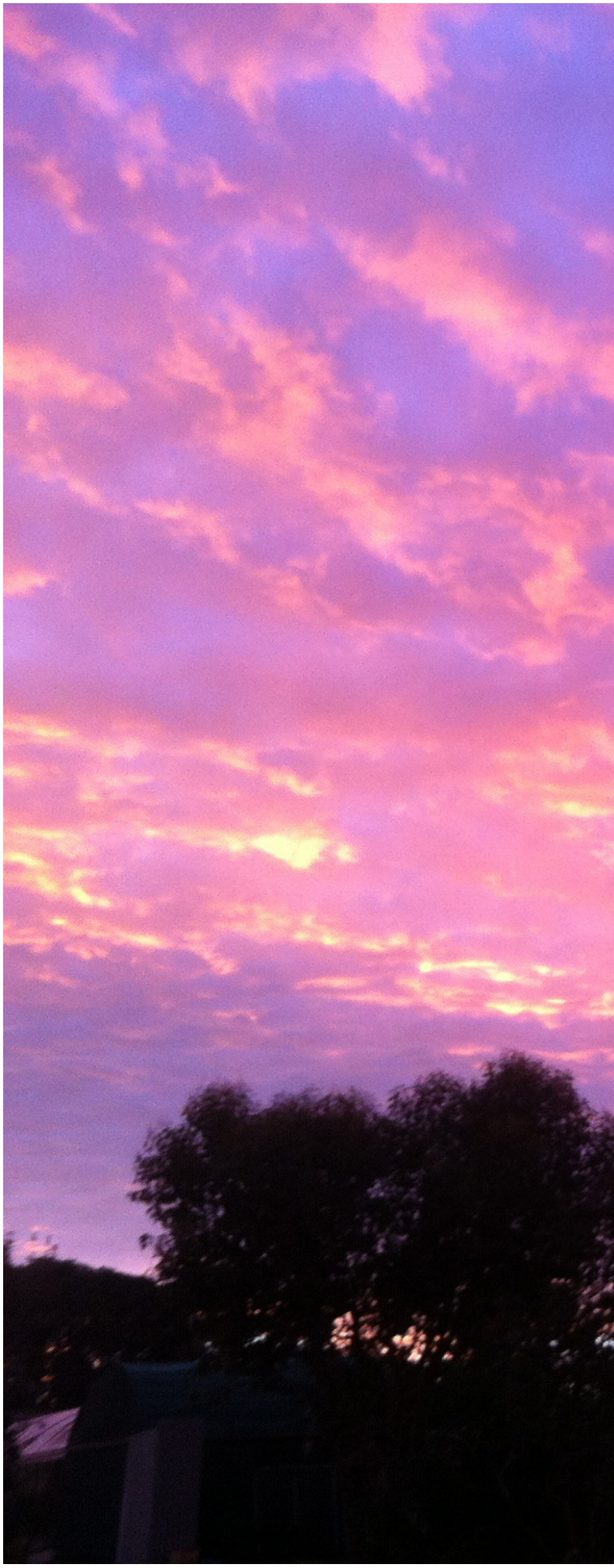
Bushfire Prone Land (BPL)

Public Open Space (POS)

Integrated Planning and Reporting (IP&R) Framework

Sandstone Heaths, Woodlands and Forests (SHWF)

Local Government Area (LGA)



Appendices

Appendix A

Ku-ring-gai Council

Policy

Urban Forest Policy

Version Number 1

Adopted: 18 February 2020

Effective: 19 February 2020

Urban Forest Policy

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Controlled Document Information

Authorisation Details

This is a Controlled Document. Before using this document check it is the latest version by referring to Council's Controlled Document Register. Unless otherwise indicated, printed or downloaded versions of this document are uncontrolled.			
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Related Legislation:	Commonwealth • *Ecological Protection and Biodiversity Conservation Act 1999* New South Wales • *Biodiversity Conservation Act 2016* • *Electricity Supply (Safety and Network Management Regulation) 2014* • *Electricity Supply Act 1995* • *Environmental Planning and Assessment Act 1979* • *Fisheries Management Act 1994* • *Heritage Act 1977* • *Local Government Act 1993* • *Local Land Services Act 2013* • *Protection of the Environment Operations Act 1997* • *Rural Fires Act 1997* • *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017* • *Sydney Water Act 1994* • *The Roads Act 1993* • *Trees (Disputes Between Neighbours) Act 2006*
Related Policies (Council & Internal)	New South Wales • *Greener Places Policy (Draft)*[1]

[1] *Government Architect NSW, 2017, Greener Places (The Draft Green Infrastructure Policy)*

	• *The Greater Sydney Region Plan – A Metropolis of Three Cities*[2] • *The North District Plan*[3] • *Local Government Association Urban Forest Policy (2003)* Ku-ring-gai • *Asset Management Policy* • *Biodiversity Policy* • *Bushfire Management Policy* • *Climate Change Adaptation Strategy* • *Climate Change Policy* • *Drainage works and Maintenance Policy and Procedures* • *Fauna Management Policy* • *Green Grid Strategy (to be created 2022/2024)* • *Ku-ring-gai Development Control Plan* • *Ku-ring-gai Local Centres Development Control Plan* • *Ku-ring-gai Local Environmental Plan (2015)* • *Ku-ring-gai Local Environmental Plan (Local Centres) (2012)* • *Ku-ring-gai Local Strategic Planning Statement* • *Ku-ring-gai Planning Scheme Ordinance* • *Ku-ring-gai Playground Strategy* • *Local Approvals Policy* • *Open Space Acquisition Strategy* • *Private Use of Road Reserves and Nature Strips Policy* • *Tree Notification Policy* • *Water Sensitive City Policy* • *Water Sensitive City Strategy (2019, pending)* • *Weed Management Policy*
Related Documents - Procedures, Guidelines, Forms	• *Tree Assessment Guidelines to Prune or Remove Trees on Private and Council Managed Land* • *Ku-ring-gai Council Drainage Asset Management Plan (2014)*
Other References	• *Australian Standard AS4373-2007 Pruning Amenity Trees* • *Australian Standard AS4970-2009 Protection of Trees on Development Sites* • *Australian Standard AS 2303 Tree Stock For Landscape use* • *Safe Work NSW Guide to Managing Risks of Tree Trimming and Removal Work- July 2016* • *WorkCover Code of Practice for Amenity Trees 1998* • *NSW Rural Fire Service 10/50 Vegetation Clearing Code of Practice 2015* • *Ku-ring-gai Community Strategic Plan 2038*

Version History

Version Number	Version Start Date	Version End Date	Author	Details and Comments
1	19 February 2020	19 February 2024	Greg Narker Penny Hemsworth	(first version)

[2] *Greater Sydney Commission 2018, The Greater Sydney Region Plan – A Metropolis of Three Cities*

[3] *Greater Sydney Commission 2018, The North District Plan*

Policy Statement

Ku-ring-gai, with its high rainfall, ridgelines capped with rich shale soils and steeply incised sandstone valleys, has evolved a special tall forest character, which is one of the defining and valued characteristics of the area.

Ku-ring-gai's Urban Forest has been modified over the years which has left extensive bushland within gullies, leading to scattered remnant vegetation and bushland along ridgelines, including a significant number of threatened species and ecological communities.

The diversity, heritage, visual and cultural landscape character of Ku-ring-gai has been further defined through the planting of exotic and non-endemic native species within the Urban Forest.

Council is committed to protecting and enhancing this character and identity through sustainable management of its Urban Forest. This includes:

- Integration of green landscaping elements within built infrastructure
- Conservation of our magnificent environment for future generations
- Balancing benefits from the protection, health and growth of the urban forest against associated risks

Policy

Purpose

The following guiding principles establish a high-level framework for the management of Ku-ring-gai's Urban Forest:

1. That Ku-ring-gai's Urban Forest is a valuable resource with significant economic, environmental and social benefits.
2. That our Urban Forest is intrinsically linked to Ku-ring-gai's cultural integrity and character and its protection and management is essential to the look, feel and liveability of Ku-ring-gai.
3. That the use of large canopy trees where planting opportunities exist, is essential for maintaining Ku-ring-gai's unique visual character.
4. That the Urban Forest is a component of Green Infrastructure, requiring appropriate planning and financial resources.
5. That a resilient Urban Forest plays a critical role in ecosystem health and urban ecology, and can help to mitigate human activities and adapt to climate change.
6. That Urban Forest planning and management provides for the protection and enhancement of remnant vegetation, bushland and biodiversity (including Threatened Species, Threatened Ecological Communities).
7. That our Urban Forest sustains biodiversity, providing habitat and food source for native wildlife.
8. That the composition, structure, distribution and condition of our Urban Forest plays a critical role in supporting local and transient wildlife.
9. That the Urban Forest should be managed as a continuous resource regardless of ownership boundaries.
10. That urban forest management and protection be informed through the use of relevant legislation, policies, strategies standards, codes and approved guidelines.
11. That Urban Forest planning and management recognises the presence and importance of native and remnant vegetation, including Threatened Ecological Communities.
12. That development within Ku-ring-gai is designed to protect and enhance the economic, environmental and social benefits of the Urban Forest.

13. That protection and management of the Urban Forest be supported and enhanced through the use of alternative engineering approaches that accommodate trees and other vegetation and provide for their long-term viability.
14. That risk to life, property, infrastructure and the environment be managed through best practice tree assessment, maintenance and planting in accordance with Council's adopted Risk Management System.
15. That structural diversity of the Urban Forest be maintained and protected through the maximisation of space for planting (including deep soil) and improvement in the quality of the growing environment (including soil health and structure).
16. That the health and condition of the Urban Forest be optimised by increasing species diversity and establishing a diverse age distribution of trees.
17. That sustainable Urban Forest targets/Indicators (including canopy coverage targets) be established and recognised as a provisional basis for monitoring the quality, and quantity and effectiveness of any special functions of Ku-ring-gai's Urban Forest.
18. That monitoring and management of the Urban Forest be undertaken through a planned, systematic and integrated approach.
19. That partnerships, advocacy and community engagement are integral to effective Urban Forest management.

Scope

Council's Urban Forest Strategy, Urban Forest Replenishment Program and Urban Forest Monitoring Program will support this Policy and will provide the framework and resources for the management of the Urban Forest.

Responsibilities

This Policy applies to all sections of Council.

Council's Manager Technical Services has overall responsibility for compliance with this Policy. Implementation of this Policy is the responsibility of the General Manager and all Directors, Managers, Supervisors and Council Staff.

Definitions

Term	Definition
Age distribution	The varying life spans and growth rates within a tree population.
Canopy Coverage	An indicator of the quantity of urban forest often used as a measure of an urban forests general capacity to provide economic, social, environmental and aesthetic benefits
Ecosystem services	Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other nonmaterial benefits[4].
Green Infrastructure	The network of parks, reserves, gardens, nature strips and water systems (creeks, dams, water retention and stormwater management systems) that deliver environmental, economic and social values and benefits to urban communities. Including both natural and built elements such as green roofs (landscaped roof top gardens) and green walls (vertical gardens).
Other vegetation	Includes but not limited to shrubs, ferns, grass, vines, palms, tree ferns, epiphyte, cycads and xanthorrhoea.
Structural diversity	The various vegetation layers of the urban forest including groundcovers, shrubs and trees.
Threatened (in reference to species or ecological communities)	Threatened species or threatened ecological communities are those threatened with extinction or destruction. In the International Union for the Conservation of Nature Red List of Threatened Species the term 'threatened' encompasses, from most to least likely to become extinct: critically endangered; endangered; and vulnerable. This terminology is widely used in Australia, including in legislation relating to biodiversity conservation and protection.
Urban Forest	All of the trees, other vegetation as well as the soil, seedbank and water that support these. It includes the network of vegetation within both public and private ownership, encompassing the spectrum of vegetation growing within: • Natural soils that exists independent of human involvement • Altered soils, including gardens, bio-retention basins, raingardens • Engineered structures such as tree cells / vaults, vertical and roof top gardens

[4] *Ecosystems and human well-being : a framework for assessment / Millennium Ecosystem Assessment ; authors, Joseph Alcamo [et al.] ; contributing authors, Elena M. Bennett [et al.], 2003. Available on line: http://pdf.wri.org/ecosystems_human_wellbeing.pdf (Downloaded: 21/08/2019)*

Term	Definition
Urban Forest Management/ Urban forestry[5]	- The management and minimisation of threats to the forest. - The science and art of managing trees, forests and natural ecosystems in and around urban communities to maximise the physiological, sociological, environmental, economic and aesthetic benefits that trees provide society.
Urban Heat Island	An area that is significantly warmer than surrounding rural areas due to human activities.

[5] *Derived from; Schwab, James C (Ed.), 2009. Planning the Urban Forest: Ecology, Economy and Community Development American Planning Association Planning Advisory Service Report No. 555*

Appendix B

Canopy Targets

Methodology

Minimum target levels for each Land Zone were devised based on either the DPE 'Draft Urban Design and Place Guide', where possible, or using the current average canopy cover of that Land Zone. Canopy Targets were then set for Streets and Public Open Space (POS), and by Land Zone across the LGA using these minimum target levels.

Specific hectare targets for Land Zone by suburb and by Local Centre were also calculated, using a more complex process. This process involved calculating what the total canopy cover for each Land Zone would be if every land parcel in that Zone was brought up to at least the DPE or mean target level for that Zone. In this analysis, land parcels with canopy cover already at or above the target level were left as-is for the purposes of the analysis, while parcels with current canopy cover lower than the target had an estimated canopy level calculated based on bringing canopy cover up to the target level as a new minimum. The results of this analysis are outlined by suburb and for local centres. These Tables illustrate how much canopy should be planted in each Land Zone by suburb or local centre, in order to reach targets.

An average tree canopy area of 70 m2 was then used to determine approximately how many trees would need to be planted to meet targets.

Although targets were set by modelling increases in low-canopy land parcels and assuming no change in canopy for those parcels already above set minimum levels, the final canopy targets may be achieved by planting wherever space is available within that Land Zone and suburb/local centre. Furthermore, some canopy loss is likely to occur in particular land parcels. The process of modelling and calculating targets did not directly include canopy loss. Rather, the process was an indicative one based on current canopy levels, with the assumption that Council can use the calculated final targets to target plantings flexibly and with the ability to counteract canopy losses with increased plantings to meet targets.

Shade modelling over cycle routes was also conducted across the Ku-ring-gai using a Digital Surface Model (DSM; 70cm GSD) produced from high-resolution airborne imagery acquired by ArborCarbon for the Ku-ring-gai Council in 2020 for the purposes of canopy mapping (ArborCarbon 2020).

Public Land	Current Canopy (%)	Canopy Target (%)	Trees* required to achieve target
Road reserves	38.2	45	9929
POS	73.9	77	8243

Table 1: Canopy targets for road reserves and Public Open Space (POS). *Average tree crown area of 70m^2

Land Zone	Current Canopy (%)	Canopy Target (%)	Trees* required to achieve target
B1	23.2	27.7	86
B2	16.6	17.6	57
B4	12.4	12.4	0
B5	25.4	35	14
B7	22.6	35	229
C2	83.4	86.1	4914
C3	67	67	0
C4	41.3	46.7	6786
R1	29.1	40	114
R2	35.8	40	22400
R3	32.2	40	514
R4	32.9	40	1943
R5	26.8	40.1	400
RE1	40.9	45	3329
RE2	38.3	47.4	2314
SP1	37.1	37.1	0
SP2	29.6	31.7	929
W1	42.3	44	14
Total	45	49	44043

Table 2: Council-wide (urban area) Land Zone based canopy targets (excluding C1 – National Parks). *Average tree crown area of 70m^2

Suburb	Current Canopy (%)	Canopy Target (%)	Trees* required to achieve target
East Killara	43.1	54.1	3286
East Lindfield	37.1	49.6	3657
Gordon	45	47.7	1443
Killara	34.7	41.7	4514
Lindfield	41.5	45.9	2843
North Turramurra	44.3	53.3	4814
NORTH WAHROONGA	53.1	65.1	4314
Pymble	46.3	46.5	186
Roseville Chase	44	55.5	2043
Roseville	35.7	43.6	3357
South Turramurra	57.9	60.4	1000
St Ives Chase	49.7	56.2	2043
St Ives	43.5	49.2	8671
Turramurra	47	47.2	171
Wahroonga	50.1	50.4	329
Warrawee	41.7	42.1	86
West Pymble	48.6	51.4	1300

Table 3: Canopy targets for each suburb. *Average tree crown area of 70m^2

Local Centre	Current Canopy (%)	Canopy Target (%)	Trees* required to achieve target
Gordon	34	38.4	1331
Killara	33.6	33.6	0
Lindfield	34.5	39.1	1396
Pymble	41.4	42.2	157
Roseville	35.1	39.7	649
St Ives	34.5	44.3	3590
Turramurra	43.9	44.9	344
Wahroonga	36	36.5	76

Table 4: Canopy targets for each Local Centre. *Average tree crown area of 70m^2

Table 5: Canopy targets for streets and Public Open Space (POS).

Land Zone	Area (ha)	Canopy (ha)	Current Canopy (%)	Canopy Target (%)	Additional canopy required (ha)
Road Reserves	1020.1	389.5	38.2	45.0	69.5
POS	1609.2	1189.4	73.9	77	57.7

Table 6: City-wide Land Zone based canopy targets (excluding C1 – National Parks).

Land Zone	Area (ha)	Canopy (ha)	Current Canopy (%)	Canopy Target (%)	Additional canopy required (ha)
B1	12.3	2.8	23.2	27.7	0.6
B2	36.8	6.1	16.6	17.6	0.4
B4	5.2	0.6	12.4	12.3	0.0
B5	1.2	0.3	25.4	35.0	0.1
B7	12.8	2.9	22.6	35.0	1.9
C2	1250.4	1042.5	83.4	86.1	34.4
C3	5.7	3.8	67.0	67.0	0.0
C4	866.1	357.3	41.3	46.7	47.5
R1	14.0	4.1	29.1	40.0	0.8
R2	3453.3	1237.3	35.8	40.0	156.8
R3	43.4	14.0	32.2	40.0	3.6
R4	191.9	63.1	32.9	40.0	13.6
R5	21.4	5.7	26.8	40.1	2.8
RE1	358.8	146.8	40.9	45.0	23.3
RE2	176.4	67.5	38.3	47.4	16.2
SP1	33.9	12.6	37.1	37.1	0.0
SP2	302.5	89.5	29.6	31.7	6.5
W1	4.9	2.1	42.3	44.0	0.1
Total	6790.8	3059.0	45.0	49	287.3

Table 7: Breakdown of Suburbs into Land Zone based canopy targets.

Suburb	Land Zone	Area (ha)	Canopy (ha)	Canopy (%)	Target (%)	Additional canopy required (ha)	Current suburb canopy cover (%)	Overall target for suburb (%)
EAST KILLARA	B1	0.5	0.1	19.9	23.2	0.0	43.1	54.1
	C2	65.9	53.1	80.6	83.4	1.8		
	C3	83.7	21.5	25.7	41.3	13.0		
	R2	42.9	10.8	25.3	40.0	6.3		
	RE1	10.0	2.7	26.5	45.0	1.9		
	SP2	3.7	1.1	30.0	29.7	0.0		
	W1	1.8	0.5	25.7	22.7	-0.1		
EAST LINDFIELD	B1	0.1	0.0	11.2	23.2	0.0	37.1	49.6
	C2	45.2	31.4	69.4	83.4	6.3		
	C3	13.0	4.2	32.1	41.3	1.2		
	R2	132.8	35.9	27.0	40.0	17.3		
	RE1	9.0	3.2	35.9	45.0	0.8		
	RE2	0.3	0.1	38.5	45.0	0.0		
	SP2	3.5	0.8	23.4	23.4	0.0		
GORDON	B2	7.1	1.2	17.6	16.6	-0.1	45.0	47.7
	B4	4.0	0.6	15.4	12.4	-0.1		
	B5	0.5	0.2	40.0	25.4	-0.1		
	C2	65.4	56.4	86.3	83.4	-1.9		
	C3	35.4	17.4	49.1	41.3	-2.8		
	R2	191.3	71.7	37.5	40.0	4.8		
	R3	4.8	1.3	27.9	40.0	0.6		
	R4	23.7	6.7	28.3	40.0	2.8		
	RE1	29.3	11.3	38.4	45.0	1.9		
	RE2	0.0	0.0	0.0	45.0	0.0		
	SP1	0.4	0.2	38.5	39.0	0.0		

Suburb	Land Zone	Area (ha)	Canopy (ha)	Canopy (%)	Target (%)	Additional canopy required (ha)	Current suburb canopy cover (%)	Overall target for suburb (%)
	SP2	16.2	3.1	19.0	18.4	-0.1		
KILLARA	B1	0.7	0.4	57.9	23.2	-0.2	34.7	41.7
	B2	0.9	0.2	19.9	16.6	0.0		
	C2	15.3	12.4	80.9	83.4	0.4		
	C3	10.1	4.2	42.1	41.3	-0.1		
	R2	316.7	103.3	32.6	40.0	23.4		
	R3	0.8	0.4	45.1	40.0	0.0		
	R4	30.2	11.1	36.7	40.0	1.0		
	RE1	10.4	5.4	51.9	45.0	-0.7		
	RE2	43.3	12.7	29.4	45.0	6.8		
	SP2	17.0	4.3	25.6	25.2	-0.1		
LINDFIELD	B1	0.8	0.1	16.5	23.2	0.1	41.5	45.9
	B2	6.8	1.1	16.3	16.6	0.0		
	B4	1.2	0.0	3.4	12.4	0.1		
	B5	0.3	0.1	21.6	25.4	0.0		
	C2	55.6	48.2	86.7	83.4	-1.8		
	C3	5.7	3.8	67.6	67.0	0.0		
	C3	29.8	11.0	37.0	41.3	1.3		
	R1	9.3	1.9	20.4	29.1	0.8		
	R2	256.7	87.6	34.1	40.0	15.1		
	R3	3.6	1.5	40.4	40.0	0.0		
	R4	28.4	9.4	33.1	40.0	2.0		
	RE1	13.0	5.4	41.2	45.0	0.5		
	RE2	6.2	4.1	66.4	45.0	-1.3		
	SP1	20.5	9.9	48.5	42.5	-1.2		
	SP2	15.1	3.7	24.4	22.6	-0.3		
	W1	1.1	0.6	57.8	57.8	0.0		

Suburb	Land Zone	Area (ha)	Canopy (ha)	Canopy (%)	Target (%)	Additional canopy required (ha)	Current suburb canopy cover (%)	Overall target for suburb (%)
NORTH TURRAMURRA	B1	1.0	0.1	10.7	23.2	0.1	44.3	53.3
	C2	92.8	81.5	87.9	83.4	-4.2		
	C3	169.8	50.0	29.5	41.3	20.0		
	R2	2.8	1.1	37.8	40.0	0.1		
	R5	21.4	5.7	26.7	40.0	2.8		
	RE1	50.1	12.3	24.6	45.0	10.3		
	RE2	10.8	6.1	56.3	45.0	-1.2		
	SP2	18.8	5.9	31.3	33.3	0.4		
NORTH WAHROONGA	C2	141.8	99.8	70.4	83.4	18.4	53.1	65.1
	C3	69.0	22.4	32.4	41.3	6.1		
	R2	21.7	6.7	31.2	40.0	1.9		
	RE1	12.2	1.7	13.9	45.0	3.8		
	SP2	7.0	3.0	43.3	43.4	0.0		
PYMBLE	B2	3.0	0.7	24.1	16.6	-0.2	46.3	46.5
	B4	0.0	0.0	0.0	12.4	0.0		
	B5	0.3	0.0	0.1	25.4	0.1		
	B7	12.8	2.9	22.5	22.6	0.0		
	C2	58.5	55.0	94.0	83.4	-6.2		
	C3	39.9	26.0	65.2	41.3	-9.6		
	R2	399.2	160.6	40.2	40.0	-0.9		
	R3	4.0	1.4	35.6	40.0	0.2		
	R4	14.5	4.8	33.3	40.0	1.0		
	RE1	12.0	7.3	60.4	45.0	-1.8		
	RE2	50.8	23.7	46.6	45.0	-0.8		
	SP1	1.2	0.5	42.6	42.5	0.0		
	SP2	56.9	19.4	34.1	34.1	0.0		
ROSEVILLE CHASE	C2	0.4	0.0	8.4	83.4	0.3	44.0	55.5

Suburb	Land Zone	Area (ha)	Canopy (ha)	Canopy (%)	Target (%)	Additional canopy required (ha)	Current suburb canopy cover (%)	Overall target for suburb (%)
	C3	29.8	24.2	81.1	41.3	-11.9		
	R2	24.1	10.3	42.9	40.0	-0.7		
	RE1	42.6	10.2	24.0	45.0	8.9		
	RE2	19.2	6.6	34.6	45.0	2.0		
	SP2	1.4	0.4	25.8	43.1	0.2		
	W1	7.1	3.0	42.7	83.6	2.9		
ROSEVILLE	B1	0.1	0.0	10.1	23.2	0.0	35.7	43.6
	B2	3.2	0.5	15.0	16.6	0.0		
	B5	0.1	0.0	8.0	25.4	0.0		
	C2	13.1	12.3	93.6	83.4	-1.3		
	C3	0.0	0.0	76.9	67.0	0.0		
	C3	15.0	8.9	59.4	41.3	-2.7		
	R1	0.0	0.0	0.0	40.0	0.0		
	R2	215.3	69.2	32.2	40.0	16.9		
	R4	17.1	5.5	32.4	40.0	1.3		
	RE1	7.0	3.2	45.6	45.0	0.0		
	RE2	15.4	4.8	31.2	45.0	2.1		
	SP2	12.9	2.4	18.7	43.1	3.2		
	W1	0.1	0.1	95.5	83.6	0.0		
SOUTH TURRAMURRA	B1	0.7	0.2	22.9	23.2	0.0	57.9	60.4
	C2	119.2	102.4	85.9	83.4	-3.0		
	C3	23.5	10.5	44.5	41.3	-0.8		
	R2	115.0	39.5	34.3	40.0	6.5		
	RE1	11.2	4.5	40.6	45.0	0.5		
	SP2	4.4	1.5	35.4	35.2	0.0		
ST IVES CHASE	B1	0.4	0.1	23.9	23.2	0.0	49.7	56.2
	C2	77.5	65.2	84.1	83.4	-0.6		

Suburb	Land Zone	Area (ha)	Canopy (ha)	Canopy (%)	Target (%)	Additional canopy required (ha)	Current suburb canopy cover (%)	Overall target for suburb (%)
	C3	74.8	24.9	33.3	41.3	6.0		
	R2	59.3	16.8	28.3	40.0	7.0		
	RE1	6.1	1.4	23.2	45.0	1.3		
ST IVES	B1	0.8	0.2	21.7	23.2	0.0	43.5	49.2
	B2	6.3	0.8	12.8	16.6	0.2		
	C2	205.3	163.7	79.7	83.4	7.5		
	C3	85.5	38.2	44.7	41.3	-3.0		
	R2	529.6	170.5	32.2	40.0	41.3		
	R3	19.5	5.6	28.4	40.0	2.3		
	R4	21.4	6.1	28.5	40.0	2.4		
	RE1	118.0	58.2	49.3	45.0	-5.1		
	RE2	40.9	11.4	27.9	45.0	7.0		
	SP2	53.2	16.0	30.0	30.1	0.0		
	W1	0.5	0.1	16.6	11.9	0.0		
TURRAMURRA	B1	0.7	0.1	15.7	23.2	0.1	47.0	47.2
	B2	7.1	1.2	17.1	16.6	0.0		
	C2	82.6	70.5	85.4	83.4	-1.7		
	C3	41.8	24.2	57.8	41.3	-6.9		
	R2	407.6	163.2	40.0	40.0	-0.1		
	R3	3.9	1.4	36.5	40.0	0.1		
	R4	26.4	9.9	37.4	40.0	0.7		
	RE1	19.0	8.2	43.4	45.0	0.3		
	RE2	0.0	0.0	27.9	45.0	0.0		
	SP2	12.2	4.0	32.5	31.9	-0.1		
WAHROONGA	B1	4.2	1.0	24.6	23.2	-0.1	50.1	50.4
	B2	2.5	0.3	13.6	16.6	0.1		
	C2	110.9	102.9	92.8	83.4	-10.5		

Suburb	Land Zone	Area (ha)	Canopy (ha)	Canopy (%)	Target (%)	Additional canopy required (ha)	Current suburb canopy cover (%)	Overall target for suburb (%)
	C3	114.5	66.5	58.1	41.3	-19.3		
	R1	4.7	2.1	46.0	40.0	-0.3		
	R2	429.2	181.4	42.3	40.0	-9.7		
	R3	4.7	2.0	43.4	40.0	-0.2		
	R4	26.1	8.2	31.4	40.0	2.2		
	RE1	15.1	6.9	45.8	45.0	-0.1		
	SP1	11.8	2.0	16.7	16.6	0.0		
	SP2	50.0	14.4	28.9	24.3	-2.3		
WARRAWEE	C2	1.2	1.1	94.0	83.4	-0.1	41.7	42.1
	C3	5.0	3.9	77.6	41.3	-1.8		
	R2	109.8	45.3	41.3	40.0	-1.4		
	R3	2.0	0.4	19.0	40.0	0.4		
	R4	4.2	1.4	34.7	40.0	0.2		
	RE1	0.8	0.6	74.2	45.0	-0.2		
	SP2	12.3	3.6	29.6	29.5	0.0		
WEST PYMBLE	B1	1.9	0.5	25.5	23.2	0.0	48.6	51.4
	C2	69.2	62.2	89.8	83.4	-4.5		
	C3	31.4	13.3	42.5	41.3	-0.4		
	R2	180.6	63.2	35.0	40.0	9.0		
	RE1	16.3	8.0	49.4	45.0	-0.7		
	RE2	7.1	4.1	57.4	45.0	-0.9		
	SP2	12.2	3.3	27.2	27.2	0.0		
	W1	1.5	0.8	54.4	59.9	0.1		

Table 8: Breakdown of Town Centres into Land Zone based canopy targets.

Town Centre	Land Zone	Area (ha)	Canopy (ha)	Canopy (%)	Target (%)	Additional canopy required (ha)	Current Town Centre canopy cover (%)	Overall target for Town Centre (%)
Gordon	**B2**	7.37	1.26	17.09	16.57	-0.04	34.0	38.4
	B4	3.97	0.61	15.35	12.35	-0.12		
	B5	0.54	0.21	39.98	25.42	-0.08		
	C2	1.28	1.16	90.21	83.37	-0.09		
	C3	12.26	6.66	54.34	41.25	-1.60		
	R2	132.83	47.48	35.74	40.00	5.65		
	R3	3.45	0.98	28.39	40.00	0.40		
	R4	29.15	8.47	29.06	40.00	3.19		
	RE1	3.08	1.30	42.27	45.00	0.08		
	SP1	0.41	0.16	38.48	38.97	0.00		
	SP2	16.49	3.40	20.62	12.12	-1.40		
Killara	**B1**	0.65	0.38	58.97	58.97	0.00	33.6	33.6
	B2	0.60	0.17	27.58	27.58	0.00		
	C2	0.00	0.00	0.00	0.00	0.00		
	R2	62.20	20.14	32.38	32.38	0.00		
	R3	0.78	0.35	45.10	45.10	0.00		
	R4	21.01	8.32	39.61	39.61	0.00		
	RE1	0.63	0.51	80.13	80.13	0.00		
	SP2 Water Supply System	8.73	1.93	22.14	22.14	0.00		
Lindfield	**B2**	6.83	1.12	16.32	16.57	0.02	34.5	39.1
	B5	0.34	0.06	18.91	25.42	0.02		
	C2	1.98	1.85	93.40	83.37	-0.20		
	C3	7.35	2.94	39.98	41.25	0.09		
	R2	151.01	53.02	35.11	40.00	7.38		
	R3	3.60	1.45	40.39	40.00	-0.01		

Town Centre	Land Zone	Area (ha)	Canopy (ha)	Canopy (%)	Target (%)	Additional canopy required (ha)	Current Town Centre canopy cover (%)	Overall target for Town Centre (%)
	R4	28.86	9.69	33.56	40.00	1.86		
	RE1	0.86	0.61	70.42	45.00	-0.22		
	SP2 Railway Infrastructure	14.56	3.68	25.27	28.00	0.40		
Pymble	B2	2.95	0.71	24.06	16.57	-0.22	41.4	42.2
	B5	0.28	0.00	0.07	25.42	0.07		
	B7	7.03	1.67	23.81	22.58	-0.09		
	C2	2.92	2.82	96.65	83.37	-0.39		
	C3	10.82	6.48	59.89	41.25	-2.02		
	R2	76.20	31.56	41.41	40.00	-1.08		
	R3	3.76	1.40	37.17	40.00	0.11		
	R4	12.98	4.27	32.94	40.00	0.92		
	RE1	2.49	1.63	65.30	45.00	-0.51		
	SP1 Defence	1.18	0.50	42.55	42.54	0.00		
	SP2 Water Supply System	19.08	6.76	35.44	28.74	-1.28		
Roseville	B2	3.17	0.48	15.03	16.57	0.05	35.1	39.7
	B5	0.02	0.00	4.80	25.42	0.00		
	C3	4.75	2.93	61.64	59.89	-0.08		
	R2	64.92	22.86	35.21	40.00	3.11		
	R4	16.58	5.26	31.70	40.00	1.38		
	RE1	0.95	0.56	59.16	45.00	-0.13		
	SP2 Classified Road	1.72	0.26	14.99	14.99	0.00		
	SP2 Railway Infrastructure	2.28	0.76	33.21	33.21	0.00		
St Ives	B2	6.29	0.80	12.77	16.57	0.24	34.5	44.3
	C2	6.79	6.57	96.77	83.37	-0.91		

Town Centre	Land Zone	Area (ha)	Canopy (ha)	Canopy (%)	Target (%)	Additional canopy required (ha)	Current Town Centre canopy cover (%)	Overall target for Town Centre (%)
	C3	10.38	6.83	65.83	41.25	-2.55		
	R2	131.66	43.68	33.18	40.00	8.98		
	R3	15.52	4.28	27.60	40.00	1.92		
	R4	21.37	6.10	28.54	40.00	2.45		
	RE1	11.56	5.19	44.88	45.00	0.01		
	RE2	40.92	11.43	27.93	45.00	6.98		
	SP2 Water Supply System	13.21	4.10	31.05	65.50	4.55		
Turramurra	**B2**	7.05	1.21	17.14	16.57	-0.04	43.9	44.9
	C2	3.92	3.75	95.58	83.37	-0.48		
	C3	17.89	11.81	66.03	41.25	-4.43		
	R2	172.18	75.88	44.07	40.00	-7.01		
	R3	6.07	1.83	30.16	40.00	0.60		
	R4	30.99	11.50	37.10	40.00	0.90		
	RE1	7.54	3.33	44.16	45.00	0.06		
	SP2 Railway Infrastructure	14.89	5.14	34.55	40.24	0.85		
Wahroonga	**B1**	0.29	0.14	47.01	23.16	-0.07	36.0	36.5
	B2	2.51	0.34	13.62	16.57	0.07		
	C2	0.03	0.00	7.79	16.57	0.00		
	R2	60.70	25.14	41.42	40.00	-0.86		
	R3	0.25	0.19	75.35	40.00	-0.09		
	R4	19.17	7.21	37.60	40.00	0.46		
	RE1	3.33	1.62	48.62	45.00	-0.12		
	SP2 Water Supply System	34.65	8.95	25.84	9.28	-5.74		

Appendix C

Case Study

154 Mona Vale Rd, St Ives

Seniors Living

Source: Google maps ©2021

Development date:	2005 - 2007
Lot size:	3753 m^2
Dwelling number:	12
Building footprint:	37 %
Canopy cover (2005):	41.6 %
(2020):	22.4 %

Development controls for Seniors Living developments are defined by the State Environmental Planning Policy (Seniors Living) 2004.

Seniors Living: Self-contained dwellings, are permitted a maximum building footprint of 50% and a minimum landscaped area of 30%, at least 15% must be reserved as a deep-soil zone.

154 Mona Vale Rd was developed between 2005 and 2007. Examination of the historical imagery below shows that a number of mature trees were retained during development, although not all persist to the present day. subsequent landscaping has favored smaller trees and shrubs. Front and rear setbacks of 10m have not been landscaped with tall trees, with the rear garden area prioritising turf to capitalise on views over the adjacent golf course. Buffers of 3.5m between adjacent building have been planted with large hedging plants to provide privacy between building, which contribute to the canopy cover figure, but the space does not permit tall trees.
The main building footprint covers 37% of the lot, well under the maximum allowed within the SEPP.

2005

41.6 % Canopy

2007

21.4 % Canopy

2020

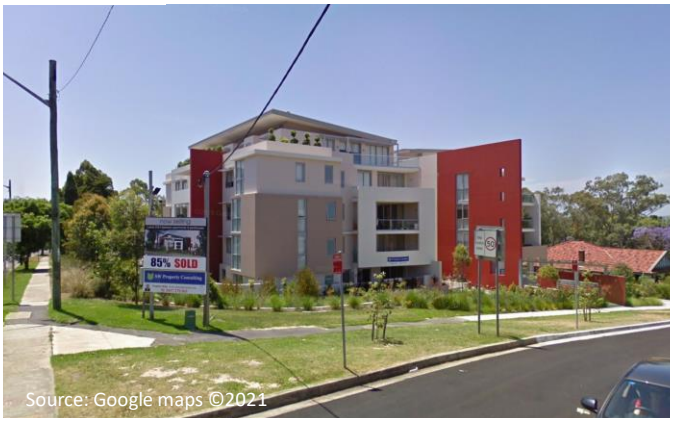
22.4 % Canopy

Case Study

2-8 Burleigh St, Lindfield

R4 – High Density Residential

2008



2021

Development date:	2005 - 2007
Lot size:	2790 m^2
Dwelling number:	31
Building footprint:	30 %
Canopy cover (2005):	30.6 %
(2020):	40.3 %

Development controls within the R4 – High density residential zones are outlined within Ku-Ring-Gai DCP Section A Part 7: Residential Flat Buildings.

The plans have multiple objectives to regulate the impacts of development on the natural landscape character of the LGA, including building setbacks, the provision of deep soil zones, and requirements for the landscaped areas.

Residential flat building can have a maximum site coverage of 30%, with a further 40-50% (depending on lot size) of the remaining area dedicated as a Deep Soil zone to support tall trees and vegetation.

2-8 Burleigh Street was developed between 2005 and 2007. Examination of the historical imagery from 2007 shows that few trees were retained during development. Street front setback of 10-15m and 5m between adjacent properties result in large open areas of landscaping which accommodate large trees and shrubs. The main building footprint covers 30% of the lot, in line with the DCP requirements. Larger trees have been planed along the Pacific Hwy side which effectively screen the building from the main road.

2005

2007

2020

Case Study

6 Shinfield Avenue, St Ives

R3 – Medium Density Residential

2009

2020

Development date:	2012
Lot size:	1943 m^2
Dwelling number:	11
Building footprint:	39 %
Canopy cover (2005):	35.8 %
(2020):	24.6 %

Development controls within the R3 – Medium density residential zones are outlined within Ku-Ring-Gai DCP Section A Part 6: Multi-Dwelling-Housing

Multi dwelling housing can have a maximum site coverage of 40%, with another 40% dedicated as a Deep Soil zone to support tall trees and vegetation.

Townhouse Development at 6 Shinfield Avenue was completed during 2012. Eight years after development canopy cover has reached 24.6% of the lot, although a significant portion of this appears to originate from the overhanging crowns from adjacent properties. Street front setback of 12m has been planted mainly with low shrubs and hedging. A setback of 3m between adjacent properties provides a strip of landscaping area to support trees and shrubs, which are yet to reach maturity. A further 3 to 4 meters of outdoor living area is provided, but this is largely unplanted and sits above basement-level parking. The main building footprint covers 39% of the lot, in line with the DCP requirements. A 6m rear setback, when combined with that of the adjacent property, provides a space to support larger tree growth.

2005

35.8 % Canopy

2020

2020

24.6 % Canopy

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