

HUNTERS HILL

URBAN FOREST MANAGEMENT STRATEGY 2024



Acknowledgement of Country

Council acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of this land – Australia; and in particular the Wallumedegal people of the Eora Nation, the Traditional Custodians of the Hunters Hill area and their continued connection to the land and primary custodial care obligations.

Preface

“Trees Are The Answer.”

Tree protection and the planting of trees in urbanised areas for their nutritional, aesthetic and spiritual value has been commonplace for centuries. Trees were planted along the main thoroughfares of Egypt during the rule of the pharaohs, planted in the communal areas of China during the Qin Dynasty, 221-206 B.C., and one of the first recorded tree translocations can be traced back to the 3rd Century BC, when a cutting from the sacred Bodhi Tree was transported from India and replanted in Sri Lanka. Closer to home, trees in Australia have always been, and will continue to be celebrated. This especially for the Aboriginal peoples as trees represent significant connections to Country, their ancestry and lore.

Over the past few decades evidence-based research has really started to show us the true importance of urban and peri-urban trees, and the wide range of socio-political, economic and environmental benefits that they provide. Hence, communities worldwide now regard urban trees as critical ‘Green’ Infrastructure, which is deemed as important to the day-to-day functionality and well-being of a community as its ‘Grey’ and ‘Blue’ Infrastructure. This becoming even more evident as communities are now being confronted with challenges associated with Climate Change and the ensuing Urban Heat Island effect, of which trees are a major combatant.

Therefore, common-sense would suggest that nowadays any tree with an assessed ‘positive retention value’, is by default a valuable community asset, and thereby worthy of retention and protection. However, recent urban tree canopy cover statistics have highlighted a decline in urban forests and the consequential loss of tree canopy cover across most Australian municipalities. Therefore, as a progressive and forward-thinking Council, Hunters Hill has made a conscious decision to not only halt this trend, but to proactively work towards increasing its tree canopy coverage across the municipality from 33.5% to 40% by the year 2045. This proposition initiated by the following recommendations provided in this bespoke Urban Forest Management Strategy, which in turn will allow informed and educated decisions to be made. These decisions pertain to the understanding, safeguarding and furthering of the Hunters Hill urban forest for the long-term health, enjoyment and well-being of the community.

Please Note: additional educational material has been interwoven into the framework of the Strategy. This in an effort to stimulate urban forest dialogue and inspire individuals, families and social groups to go outside and enjoy the vibrant Hunters Hill urban forest - and maybe even plant a tree or two.

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OUR VISION

"A community within a healthy, resilient, biodiverse urban forest"

The Hunters Hill community vision is derived from the Latin phrase *'quid pro quo'*. Whereby, a protected and healthy Hunters Hill urban forest will provide in-kind a continuance of eco-benefits for the enjoyment and well-being of the community. Thereby, the primary aim of the Hunters Hill Urban Forest Management Strategy is the achievement of *'a healthy, resilient, biodiverse urban forest for the long-term enjoyment and well-being of the community'*.



Eucalyptus microcorys, Prince Edward Parade, Hunters Hill

EXECUTIVE SUMMARY

Hunters Hill - 'Australia's Oldest Garden Suburb'.

Hunters Hill is a small 'boutique' municipality located on Sydney's lower north shore. It is renowned for its tree lined streets, family-friendly parks and water-way vistas that both frame and highlight its rich heritage and character. Collectively, the trees that make-up the Hunters Hill Urban Forest provide cooling shade-cast in summer, shelter in winter and a mosaic of vibrant colours in both spring and autumn. Concurrent with these ecological benefits ('eco-benefits') are the ecosystem services ('eco-services') that the Hunters Hill urban forest delivers everyday. As evidenced, these eco-benefits and eco-services are essential to the well-being of the community and span social, environmental, economic and cultural domains alike (Miller. 2007). Hence, Hunters Hill is one of the most liveable areas in Greater Sydney, and aptly referred to as '*Australia's Oldest Garden Suburb*'.

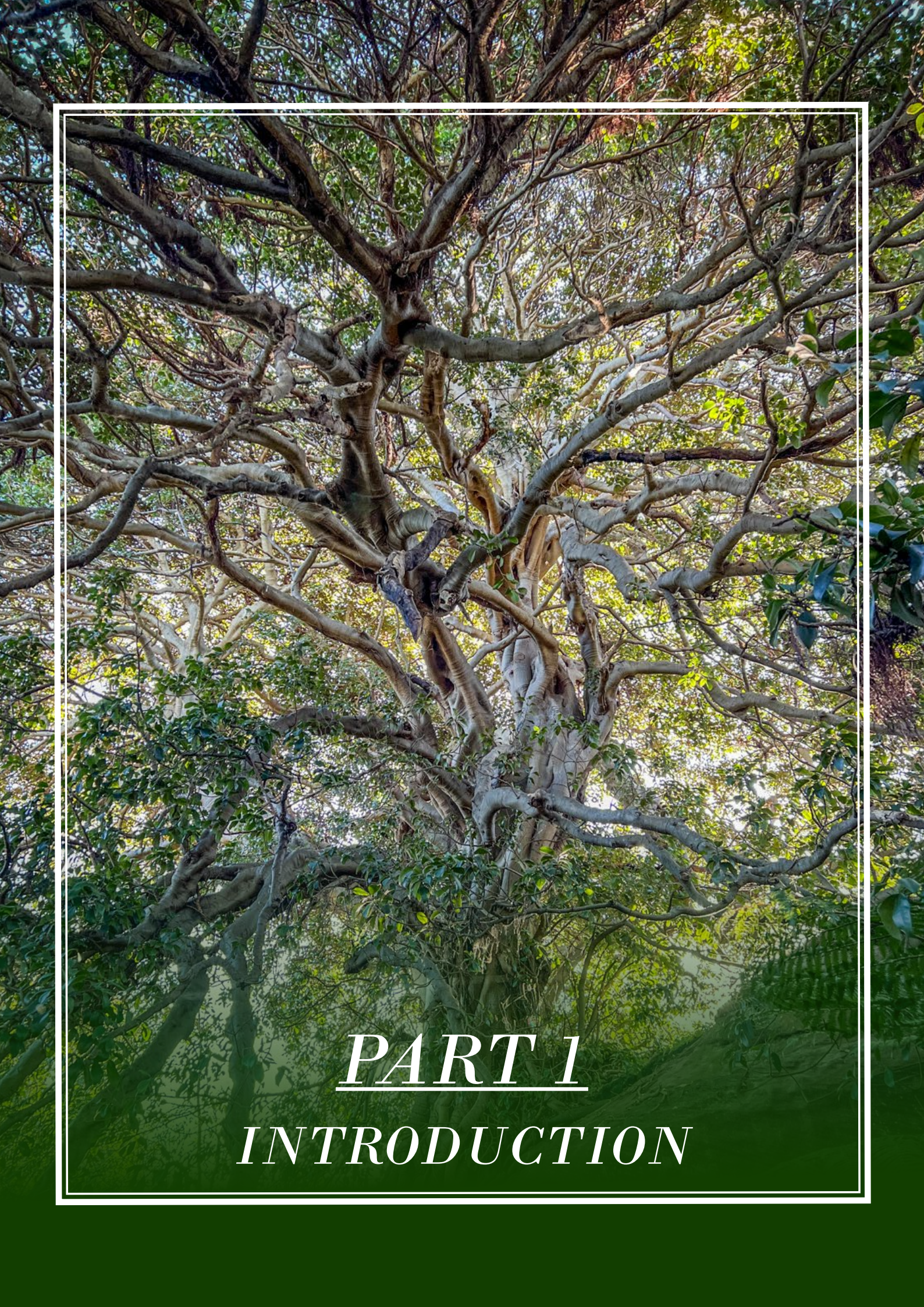
From an analytical perspective, the individual tree count of the urban forest is estimated at 12,777, and importantly its tree canopy coverage is 33.5%, which exceeds the current NSW Urban Tree Canopy Coverage target of 30%. Managing the collective needs of the urban forest are representatives from Hunter's Hill Council who are committed to protecting, maintaining and growing this community asset long-term. However, trees are living dynamic organisms that grow in a delicate balance with their environment. Therefore, any impact and/or change to that balance must be safeguarded against if they are to remain healthy and fulfil their potential. This is even more so with urbanised trees as these trees grow in an ever-changing environment that is both harsh, alien and plays host to additional anthropogenic stressors (Urban. 2008). Hence, in many urban and peri-urban areas of Australia, tree canopy cover has declined over the last decade (NSWDP&E. 2022).

As evidenced in many Australian municipalities, (including Hunters Hill) tree and tree canopy loss is predominantly caused by 'apathetic development' and a lack of integrated Tree Sensitive Urban Design (TSUD). This loss often compounded by poor planting options post-development (site, stock and/or species), inadequate compensatory replanting ratios and/or a general lack of understanding with regards to biophilic design and the eco-benefits that urban trees provide (Klobucar et al. 2021). In addition, healthy tree removal or vandalism can be attributed to unqualified risk assessment, unsubstantiated fears, urban legends and/or general ignorance. This evidenced in studies that show residents tend to exhibit risk-averse behaviour when it comes to trees and tree care, not fully recognising their positive benefits (Kirkpatrick et al. 2012).

Therefore, in response to tree and subsequent tree canopy loss a bespoke Urban Forest Management Strategy ('Strategy') has been authored. This Strategy developed around the following five (5) core principles of:

Robust Tree Protection – Strategic Plantings – Best Management Practices – Proactive Monitoring – Community Stewardship

This mantra providing the necessary cornerstones for the enhancement of the Hunters Hill urban forest and the development of an interconnected network of treed green spaces throughout the neighbourhoods. Thereby increasing the volume of eco-benefits and eco-services, whilst inspiring a deep-rooted appreciation for nature within the Hunters Hill community.



PART 1
INTRODUCTION

1.1 THE ‘WHERE’

The public and private realm trees of Hunters Hill are waypoints that mark the changing of the seasons and time. Its tree-lined streets highlight the heritage elements of its suburbs, whilst the parks and reserves support social gatherings, biodiversity, and local habitat. Hence, Hunters Hill is rightly recognised as “Australia’s Oldest Garden Suburb”.

PRE-COLONIAL HUNTERS HILL

The original inhabitants of the Hunters Hill area were the Wallumedegal clan, who used the Woolwich area for thousands of years prior to European settlement. Aptly named “Moocooboola” (meeting of waters), the area now known as Kellys Bush was predominantly used as a summer camp by the Wallumedegal. This is evidenced by the archaeological traits that are concealed along the foreshore and include middens, rock paintings and engravings, rock pools, shelters, axe-grinding grooves and burials. An extensive study of this area was conducted by Dr. Val Attenbrow in 1988, who was instrumental in identifying forty-seven (47) sites of interest. These identified sites are now registered with the Aboriginal Heritage Information Management System.

HUNTERS HILL TODAY

Early French settlers, the Joubert brothers and Gabriel de Milhau were influential in gaining the proclamation of Hunters Hill as a separate Borough in 1861, and a lot of the character that the municipality still showcases. Today Hunters Hill is the smallest Local Government Area (LGA) in Greater Sydney and NSW. Geographically it is located approximately ten (10) kilometres from Sydney’s CBD in the Northern District and is made up of six (6) suburbs that include Gladesville (part of), Henley, Hunters Hill, Huntleys Cove, Huntleys Point and Woolwich. As a peninsular LGA of Sydney Harbour, it has seventeen (17) kilometres of irregular shaped shoreline that runs along the Lane Cove and Parramatta River. It is six (6) square kilometres in area, and is primarily used for residential living, with housing covering five hundred seventy-two (572) hectares.

With regards to its green spaces Hunter’s Hill Council manages the combined natural and open areas of protected land that are 90.54 hectares in total, with the majority of the LGA’s biodiversity being found within the bushland area that spans over 38.5 hectares. With more than 70% of the LGA being a declared conservation area, it is easy to understand why it scores extremely high in “Lifestyle, Family living, Safety, Convenience, Tranquility and Community-based activities” (Microsuburbs. 2023).



Hunter’s Hill Town Hall, Hunters Hill

1.2 THE ‘WHAT’

“Urban Forestry is the art, science, and technology of managing trees and forest resources in and around community ecosystems for the psychological, sociological, aesthetic, economic, and environmental benefits that trees provide society” - Cecil Konijnendijk

URBAN FOREST

The term Urban Forest was officially coined in North America in the mid 1960’s, with its definition since expanded upon by numerous academics. In the wider sense an Urban Forest can be defined as *“the sum of street trees, residential trees, park trees and greenbelt vegetation. It includes trees on unused public and private land, trees in transportation and utility corridors, and forests on watershed land. Some of these trees and forests were willfully planted and are carefully managed by their owners, while others are accidents of land use decisions, economics, topography, and neglect”*(Miller. 2007). However, for the purposes of this Strategy (and brevity), the term Urban Forest is to be interpreted literally as:

“The sum of all the trees, both public and private realm, that are growing in situ within the geographical boundaries of the Hunters Hill Local Government Area”.

Understandably, the main emphasis of an urban forest strategy is on trees. Simply because of their larger size, structure and longevity, trees deliver the largest range and volume of environmental, social and economic benefits. Whereby, approximately 70% of the eco-benefits provided are linked to canopy coverage (Dobbs et al. 2011). Shade-cast and the cooling effect being of even greater importance nowadays, as urban trees are known to be the most effective combatant of Climate Change, the Urban Heat Island effect and various heat related illnesses (Rahman et al. 2020).

URBAN FORESTRY

Due to concerns of tree loss and the importance of tree canopy cover, over the past few decades there has been a shift in emphasis from the traditional

management of an individual tree, to a more holistic approach. Whereby a tree is considered in its wider context, and thus the emergence of the ‘Urban Forestry’ paradigm (Miller. 2007). Hence, the discipline of Urban Forestry essentially considers the management of urban and peri-urban trees as a collective group, as opposed to individualised tree management (Harris et al. 2004). This management with the aim of securing the ongoing health and vitality of the urban forest as a collective entity or ‘ecosystem’. This holistic management resulting in the sustained delivery of eco-benefits and eco-services for both the community and the environment.



Acacia terminalis in Boronia Park, Hunters Hill

AN URBAN FOREST INCLUDES:
PARKS & RESERVES



Clarks Point Reserve, Woolwich



Boronia Park, Hunters Hill



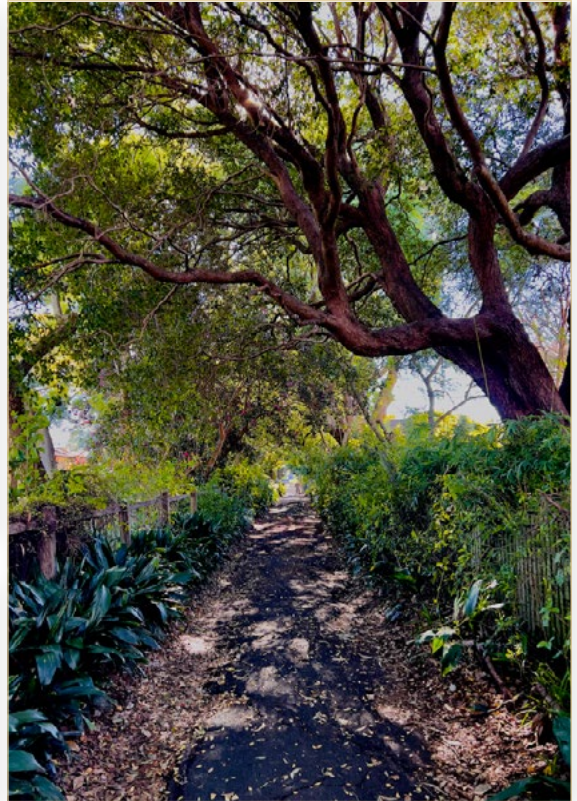
Prince Edward Reserve, Hunters Hill



St Malo Reserve, Hunters Hill



Gladesville Road, Hunters Hill



Blake Avenue, Hunters Hill

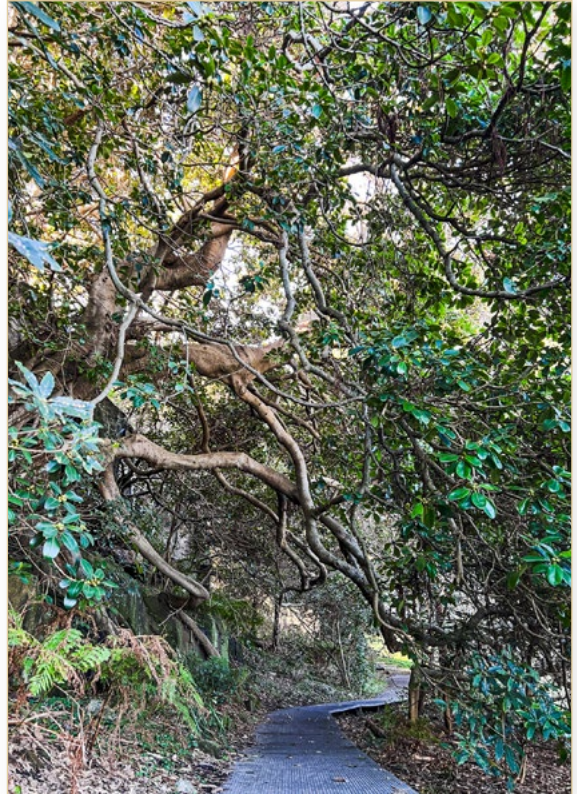
AN URBAN FOREST INCLUDES:
STREET TREES



Woolwich Road, Woolwich



Sydney Turpentine Ironbark Forest Community (Critically Endangered Ecological Community), Boronia Park



Kellys Bush, Woolwich

AN URBAN FOREST INCLUDES:
**BUSHLAND
& WATERWAYS**



Riverglade Reserve, Huntleys Cove



Woolwich Road, Woolwich



Ferry Street, Hunters Hill



Alexandra Street, Hunters Hill

**AN URBAN FOREST INCLUDES:
PRIVATE TREES & GREEN INFRASTRUCTURE**



Woolwich Road, Woolwich

1.3 THE ‘WHY’

“The tree which moves some to tears of joy is in the eyes of others is only a green thing that stands in the way. Some see nature all ridicule and deformity..... and some scarce see nature at all. But to the eyes of the person of imagination, nature is imagination itself.” - William Blake

THE BENEFITS OF AN URBAN FOREST

Over the last few decades extensive research has been undertaken documenting the benefits delivered by urban trees and the wider benefits provided by urban nature and greenspaces. These eco-benefits and eco-services provided are now known to be vast, and span social, environmental, and economic realms alike. A brief cross-section of these tree-related benefits are highlighted in the following infographic.

ECOSYSTEM SERVICES

Ecosystem services (Eco-services) refer to the transformation of natural assets (soil, plants and animals, air and water) into things that we value through natural or enhanced ecological processes.

For example, those organisms and processes which clean our air and water, pollinate plants, filter and recycle nutrients, modify our climate, control floods and improve soil fertility, and enhance the aesthetic and cultural benefits that derive from nature.

ECOLOGICAL BENEFITS

Ecological benefits (Eco-benefits) are the positive impacts that natural ecosystems and biodiversity provide to the environment, human societies, and the planet as a whole. These benefits stem from the functioning and processes of ecosystems, and they contribute to the sustainability and health of both natural and human systems.

Benefits of the Hunters Hill Urban Forest



● **Social** ● **Environmental** ● **Economic** ●

ECO-SERVICES & ECO-BENEFITS PROVIDED

“Ancient trees are precious. There is little else on Earth that plays host to such a rich community of life within a single living organism” - Sir David Attenborough

A healthy urban forest provides a multitude of eco-services to a community and their environment on an everyday basis. This highlighting the importance of urban tree retention and the necessity to increase urban tree canopy coverage. Due to their ecophysiology, bio-functionality, and longevity, trees are the most efficient and cost-effective way of combating the adverse effects of Climate Change and anthropogenic Urban Heat Islands (Wang et al. 2020).

For interest, a cross-section of these eco-services provided by trees and the collective urban forest have been selected from various studies and are summarised below.

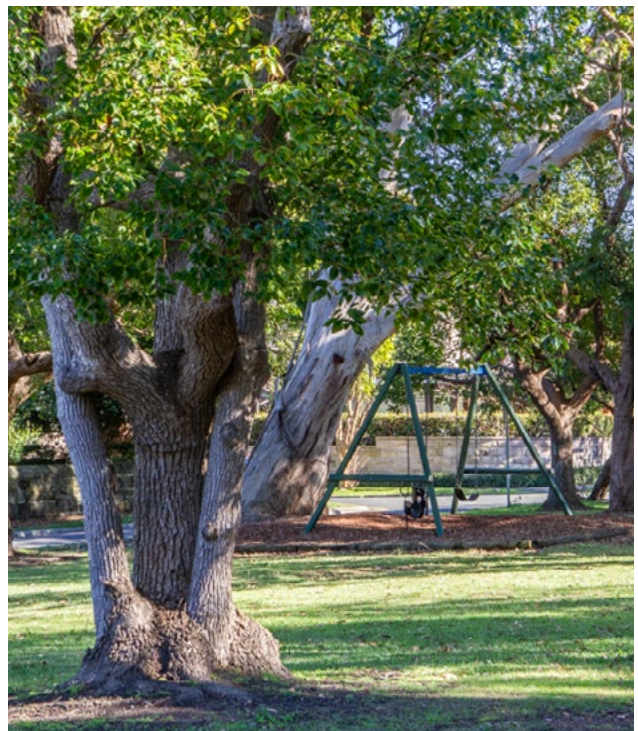
- **Heat Mitigation** - Urban green cover reflects sunlight and can reduce air temperatures through transpiration, providing shade and passive cooling. This not only makes the urban environment more comfortable but can provide health benefits reducing the incidence of heat related illnesses and deaths. I.e., a tree shaded surface is 10C°- 20C° cooler (Rahman et al. 2020).
- **Energy and Cost Efficiency** - The heat mitigating features of increased green cover can reduce the need for air conditioning in offices and homes. I.e., Trees properly placed around buildings can reduce air-conditioning needs by 30%. (Akbari et al. 2021).
- **Traffic Calming and Reduced Noise Pollution** - Trees have been shown to calm traffic and reduce vehicle speeds, whilst reducing urban noise by 3-5 decibels (Nguyen et al. 2023).
- **Improved Air Quality** - Tree foliage can trap and remove carbon dioxide and pollutants from the urban atmosphere, especially air-borne particulates, keeping urban spaces cleaner and healthier. (I.e., in one year, an acre of mature trees absorbs the amount of CO₂ produced by a car driven 41,850 km; and roadside trees have shown to reduce nearby indoor air pollution by more than 50%. (Nowak et al. 2007).
- **Water Quality & Storm Water Attenuation** - Urban green cover and the soil or substrate in which it grows can capture storm water, reduce peak flows and improve water quality in urban streams and catchment health. In addition, it stabilises soil and assists in waste decomposition and nutrient recycling. Studies show that trees intercept 15 to 27 per cent of the annual rainfall that falls upon their canopy, depending on a tree’s species and architecture. (Xaio et al. 2006).
- **Carbon Sequestration** - Trees reduce CO₂ in the atmosphere through sequestering carbon in new growth. For example, 1 tonne of carbon stored in wood is equivalent to removing 3.67 tonnes of CO₂ from the atmosphere; and in 1 year, a mature tree will absorb more than 22kg of CO₂ from the atmosphere; and release one day’s supply of oxygen for up to four people in exchange (Ferrini et.al. 2009).

HEALTH BENEFITS PROVIDED BY THE URBAN FOREST

In addition to the multitude of eco-benefits and eco-services provided by an urban forest are the often gone unnoticed contributions to community health and well-being. As studies have shown, and in keeping with the later mentioned *3:30:300 Rule*, people benefit greatly from seeing and interacting with trees on a daily basis. Ergo, equitable tree canopy coverage across a community and easily accessible treed greenspaces are key town planning elements.

For interest a few facts regarding the urban forest and the social eco-benefits that they provide follow:

- Health and Safety** – urban trees have shown to reduce stress and aggressive behaviour, which has been linked to crime reduction. Studies also showed that for every 10% increase in tree canopy cover, there was a 15% percent decrease in the violent crime, and a 14% fall in the property crime rate (Gilstad-Hayden et al. 2015).
- Outdoor Physical Activity** - The availability of public open green space is an important enabler of physical activities, including organised and casual sports. Physical activity has a positive impact on health and wellbeing. It improves mental health and cognitive function and reduces the risks of non-communicable diseases such as coronary heart disease, stroke, type 2 diabetes, breast cancer and colon cancer (Ding et al. 2016).
- Children’s Health & Mental Well-Being** - In children, attention fatigue causes an inability to pay attention and control impulses. The part of the brain affected by attention fatigue (right pre-frontal cortex) is also involved in Attention-Deficit/Hyperactivity Disorder (ADHD). Studies show that children who spend time in natural outdoor environments have a reduction in attention fatigue and children diagnosed with ADHD show a reduction in related symptoms (Kuo.et. al. 2004). In addition, it was found that children who live in close proximity to green space are more resistant to stress; have lower incidence of behavioural disorders, anxiety, and depression; and have a higher measure of self-worth (Grahn et al. 2003).
- Health & Mental Well-Being** - Trees release chemicals called Phytoncides. Research has shown that when we breathe these in, they can reduce blood pressure, lower anxiety levels and make us feel happier. All great reasons to have a go at “Forest bathing” (Li. 2010).
- Patient Recovery Rates** - Patients recover from surgery faster and better when they have a “green” view (Ulrich. 1984). Hospital patients may be stressed from a variety of factors, including pain, fear, and disruption of normal routine. Research found that patients with “green” views had shorter postoperative stays, took fewer painkillers, and had slightly fewer post-surgical complications compared to those who had no view or a view of a cement wall (Lee. et. al. 2009).
- Street Trees** - Providing access to nature with street trees and landscaping can reduce blood pressure and improve emotional and psychological health (World Health Organization. 2014). “In a study of 46,786 adults older than 45 years, exposure to 30% or more tree canopy compared with 0% to 9% tree canopy was associated with 31% lower odds of incident psychological distress. Whereas exposure to 30% or more grass was associated with 71% higher odds of prevalent psychological distress after adjusting for age, sex, income, economic status, couple status, and educational level.” (Astell-Burt and Feng. 2019).



Prince George Parade Reserve

1.4 THE 'HOW'

"A society grows great when old people plant trees in whose shade they shall never sit."

- Greek Proverb

STRATEGY OVERVIEW

Urban forest strategies are being implemented worldwide with the specific aims of tree preservation and increasing urban tree canopy cover. As evidenced, a healthy urban forest provides a wealth of ecological benefits and ecosystem services that are essential to the functionality, livability, and overall well-being of a community (Dorst et al. 2019). Therefore, as with any other valuable community asset a proactive management strategy is required which protects, and where possible increases its benefits. Hence, a bespoke Urban Forest Management Strategy for the well-being of the Hunters Hill urban forest and the community has been formulated.

This Strategy is evidence-based, with its recommendations founded on considered empirical knowledge, science-based research and underpinned by recognised industry standards. Primarily, these recommendations have been provided so that informed and educated decisions can be made to distill the many eco-benefits and eco-services produced by the Hunters Hill urban forest. This concurrent with addressing specific concerns associated with Climate change, Biodiversity, and the decline in tree canopy coverage due to urban sprawl. The keystones of this Strategy are its five (5) core principles - *Robust Tree Protection, Strategic Plantings, Best Management Practice, Proactive Monitoring and Community Engagement*. However, these principles are not to be considered mutually exclusive nor individual, but are intended to overlap and complement each other. This with the common interest of increasing awareness about the Hunters Hill urban forest, the numerous and diverse eco-benefits it provides, and the practical actions needed to protect and grow it. Thereby, achieving the community vision of a healthy, resilient, biodiverse urban forest for the enjoyment and well-being of the community, and its patrons for future generations.

This Strategy aims to support and promote the protection, growth, and enhancement of the trees that collectively make-up the Hunters Hill Urban Forest. However, it is not only authored for policy and decision makers. Its intention is to welcome anyone who simply wishes to gain a quick overview of the enormous potential offered by trees and an urban forest. This including the many unseen 'nature-based' benefits, services, and solutions that a healthy urban forest provides to an individual on an 'everyday' basis.



Kellys Bush, Woolwich

POLICY CONTEXT: LEGISLATION, POLICY AND PLANNING

Both Commonwealth and NSW legislation promote the sustainable use and development of land and the protection of natural resources including the preservation of trees, vegetation and flora plus the maintenance of ecological process and genetic diversity. In addition, there are a number of other protections and mechanisms for Local Government planning instruments that enable the retention of trees on public and private land.

Hunter's Hill Council utilises a combination of these mechanisms. At the state level key pieces for the assessment and regulation of trees and vegetation, including approvals framework for removal, are the *Environmental Planning and Assessment Act 1979 (EPA)* and *Chapter 2, Vegetation in non-rural areas, of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (B&C SEPP)*. Underneath these state planning instruments sit the two (2) main documents/ planning controls unique to Hunters Hill regarding trees and the Hunters Hill urban forest, being the *Hunters Hill Local Environmental Plan 2012 (HHLEP)*; and the *Hunter Hill Development Control Plan 2013 (DCP)*.

These main planning controls provide planning objectives for the Council, incorporating detailed controls for development within the *LGA*. These planning controls, among other things, define different zones for development, set out standards to be met for development consent/ approval, and are utilised for biodiversity protection and management.

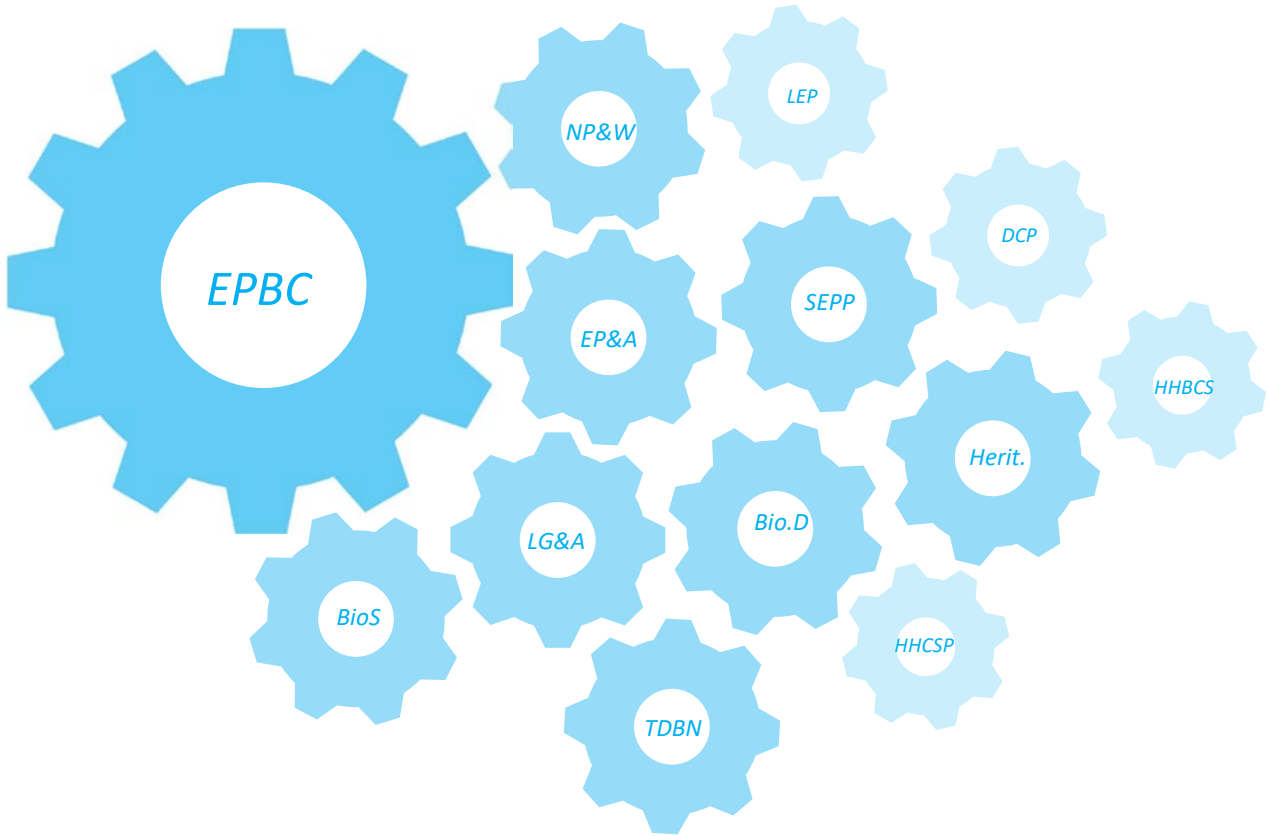
Accordingly, removal of trees and vegetation is regulated in two (2) key ways via the planning system:

- Assessment of development applications involving the removal of trees and vegetation under *Part 4 of the EPA Act*, which includes consideration of the *LEP* and *HHDCP*; and/ or
- Assessment of Tree and Vegetation Management Application/ Permit applications for tree or vegetation removal pursuant to *Chapter 2* of the *B&C SEPP* which also includes consideration of the *LEP* and *HHDCP*.

In addition, to the above-mentioned, relevant legislation and policy documents relating to the regulation of trees, vegetation and Council's urban forest include:

- *Biodiversity and Conservation Act 2016 (NSW)*;
- Other Chapters of the *B&C SEPP* (in addition to chapter 2 referred to above)
- 'Draft' Hunter's Hill Biodiversity Conservation Strategy 2021-2026, which is intended as a response to the Bushland Management Advisory Committee's (BMAC) need for a base document with current information on the extent and status of its biodiversity assets. (This document lays out a strategy for harnessing opportunities identified in the Hunters Hill Local Strategic Planning Statement 2040 and managing the biodiversity resources of the LGA).
- Hunter's Hill Council Community Plan 2022-2032, which acknowledges that preserving the environment is part of the obligations of the local government organisations; henceforth, this document represents the intention of the community to make biodiversity resources conservation a main theme in "*protecting and enhancing the integrity, character and visual amenity of Hunters Hill*".

Hunters Hill Legislative Instruments



Commonwealth Documents

(EPBC): Environment Protection and Biodiversity Conservation Act 1999

New South Wales Documents

(NP&W): National Parks & Wildlife Act 1974 (NP&W)

(EP&A): Environmental Planning and Assessment (EP&A) Act 1979 (NSW)

(LG&A): Local Government Act 1993 (NSW)

(BioS): Biosecurity Act 2015

(BioD): Biodiversity Conservation Act 2016

(BioC): State Environmental Planning Policy (Biodiversity and Conservation) 2021

(Herit.): Heritage Act 1977

(TDBN): Trees (Disputes Between Neighbors) Act 2006

Local Laws

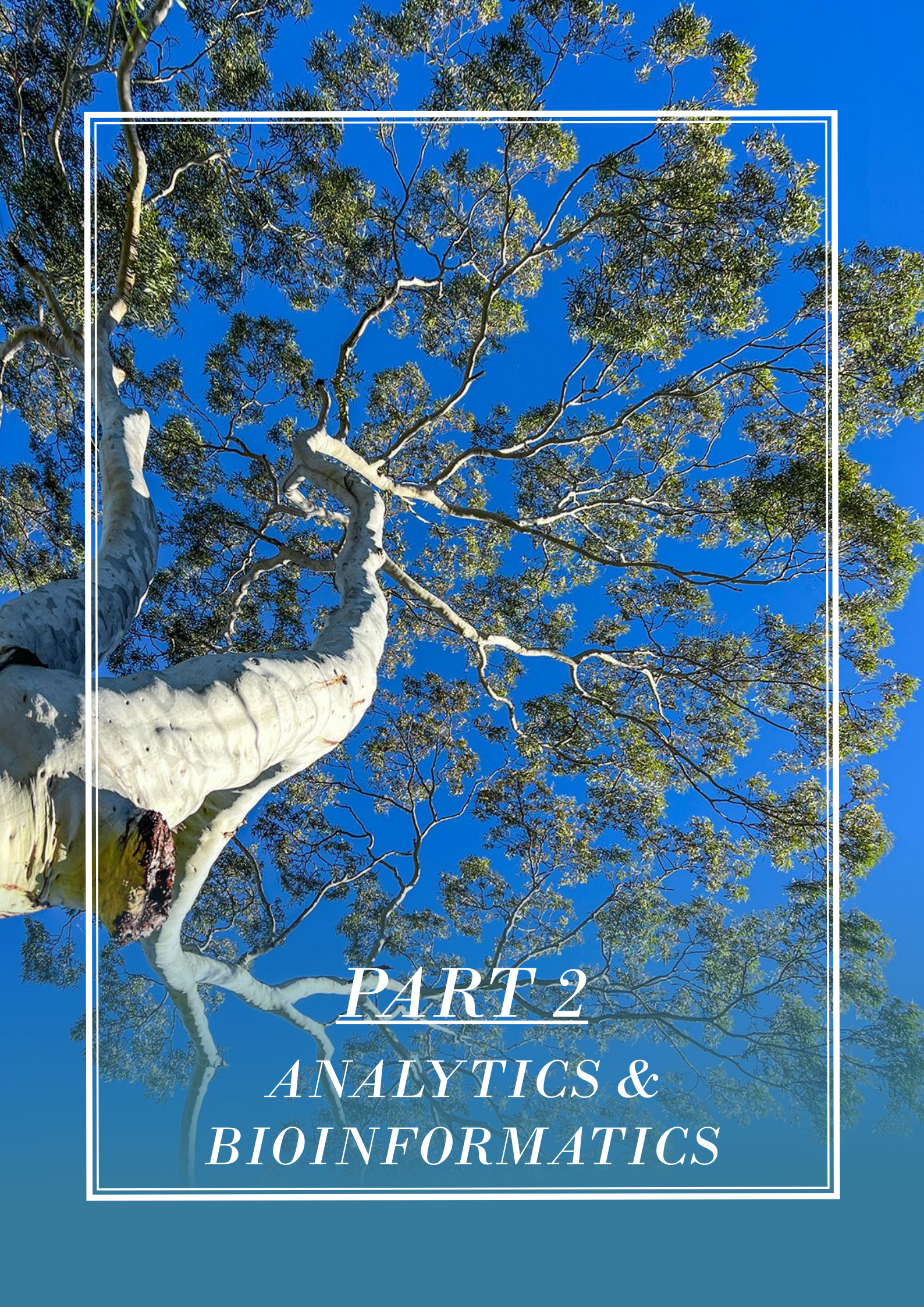
(LEP) Hunters Hill Local Environmental Plan 2012

(DCP): Development Control Plan 2013

Local Plans & Strategy

(HHBCS): Hunters Hill Biodiversity Conservation Strategy 2021-2026

(HHCS): Hunter's Hill Council Community Strategic Plan 2018-2028



PART 2
ANALYTICS &
BIOINFORMATICS

2.1 OVERVIEW

“Given a limited budget, the most effective expenditure to improve a street would probably be on trees. Trees can transform a street more easily than any other physical improvement. Moreover, for many people trees are the most important single characteristic of a good street” - Allan Jacobs

Street trees are a key element of an urban forest as they deliver a range of benefits that are often more discernible, quantifiable, and relevant to a community. A cross-section of these benefits include: aesthetically pleasing streetscapes and neighbourhoods that increase property values (Wolf. 2007); local micro-climate improvement due to shade-cast and evapotranspiration (reduced Urban Heat Island), and thus a reduction in energy costs (Dwyer. 1992); improved air quality due to the removal of atmospheric pollutants coupled with carbon sequestration and increased oxygen supply (Ferrini et.al. 2009); rainfall inception, erosion control, soil bioremediation and stormwater attenuation (Xiao et al. 2006); habitat for local and migratory flora and fauna (Tait et al. 2005); traffic calming, noise reduction, reduced glare and wind breaks (O’Brien. 1993); and the numerous social, cultural and psychological benefits associated with human health and well-being (Tarran. 2006). Therefore, conducting a comprehensive street tree inventory on a regular basis to quantify, qualify and help best manage these eco-benefits is essential. Whereby, new tree data captured can be used to inform decision-making, optimise maintenance schedules and maximize the eco-benefits that urban trees provide.

2.2 AERIAL SURVEY 2022

In March 2022 aerial measurements were conducted to determine the Hunters Hill canopy coverage. A manned aircraft with a mounted ArborCam was used to acquire high resolution imagery to measure surface temperatures and accurately quantify canopy cover and condition. High-resolution airborne multi-spectral imagery was acquired at 16,000 ft above ground level over the LGA. Vegetation strata and canopy cover statistics were extracted and categorized into different height strata.

The main findings of the survey are as follows:

- Total vegetation coverage in Hunters Hill is 52.5% (294.8 ha) of the total Council area of 562 ha.
- Tree Canopy Coverage (vegetation 3m and above) is 35.1% (197.1 ha). (Currently 33.5% per NSW Planning).
- Twelve thousand seven hundred-seventy (12,770) trees were captured.
- Higher land surface temperatures were observed in association with areas of lower vegetation cover and impervious surfaces such as asphalt, dead grass, and synthetic playing fields. Lower land surface temperatures were found in areas with denser vegetation cover.

2.3 STREET TREE INVENTORY 2023

Following the aerial survey conducted in 2022, was a ground-based ('bottoms-up') Street Tree Inventory. This was carried out in May 2023 to August 2023 by suitably qualified and experienced AQF Level 5 arborists per the International Society of Arboriculture – Best Management Practices. For interest, this street tree data captured has been summarised and displayed visually in the following pages by suburb.

HUNTERS HILL STREET TREE FACTS



6

Suburbs



113

Streets



4049

Street Trees



\$110M

Total Tree Value



478t_(p/a)

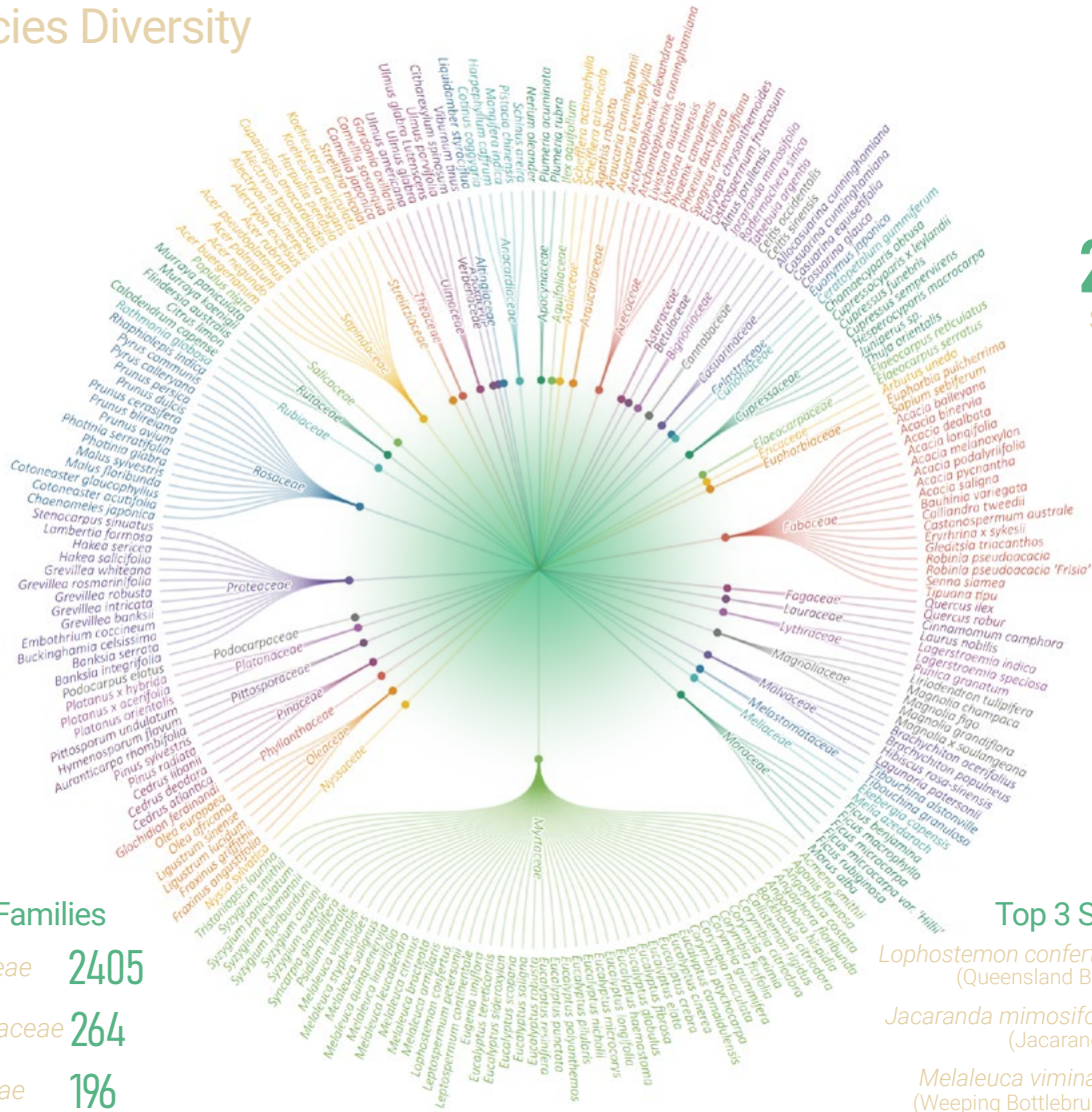
Produced Oxygen



81t_(p/a)

Carbon Sequestration

Species Diversity



46

Family

119

Genus

222

Species

Top 3 Families

Myrtaceae 2405

Bignoniaceae 264

Rosaceae 196

Top 3 Species

Lophostemon confertus (Queensland Box) 1165

Jacaranda mimosifolia (Jacaranda) 262

Melaleuca viminalis (Weeping Bottlebrush) 197

Size



Small (< 6m) 39%

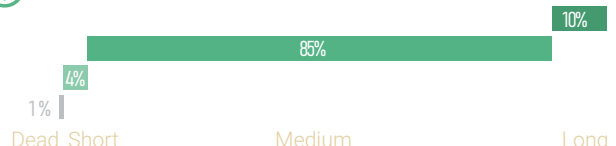


Medium (6m - 15m) 53%

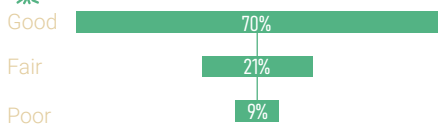
Large (≥15m) 8%



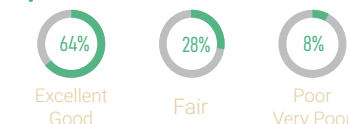
Useful Life Expectancy



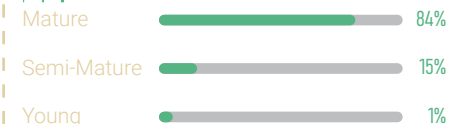
Structure



Vitality



Age



Data based on Hunters Hill Street Tree Inventory 2023

SUBURB: GLADESVILLE

Key Points

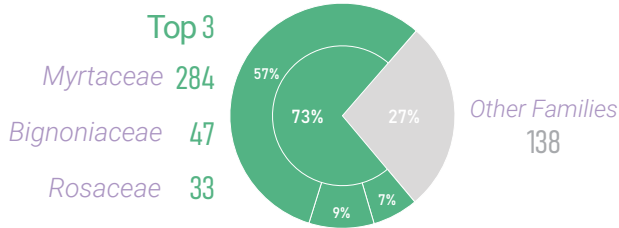
Biodiversity is essential: moving forward, trees from outside the Myrtaceae Family should be selected to avoid monoculture concerns.

Prioritise New Plantings: the current street tree population does not conform to Richards Rule of 40:30:20:10 (i.e., 40% Young trees recommended). Therefore, more 'Young' trees need to be planted in the streetscape. This to offset a future decline in tree canopy coverage due to an aged tree population. (Tree planting should be prioritised, as Gladesville has the lowest tree canopy coverage in Hunters Hill).

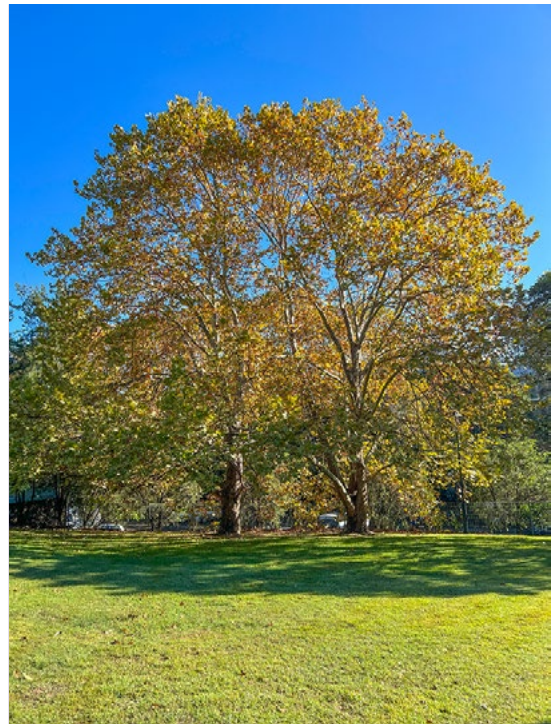
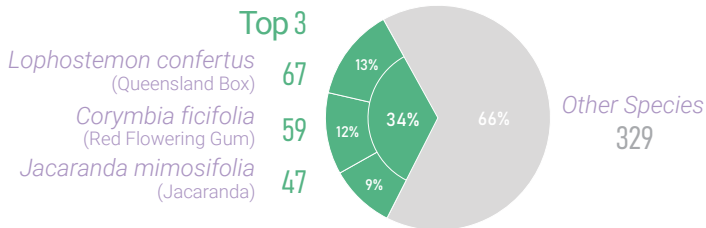


502 Street Trees ▶ **29** Family ▶ **58** Genus ▶ **83** Species

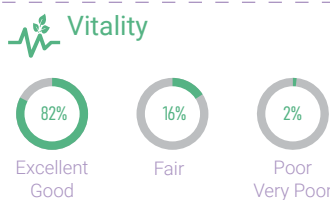
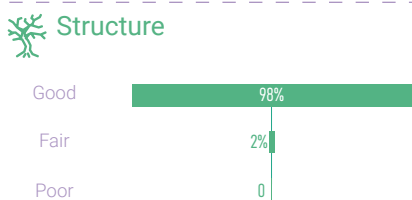
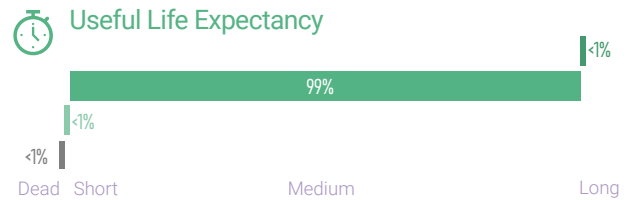
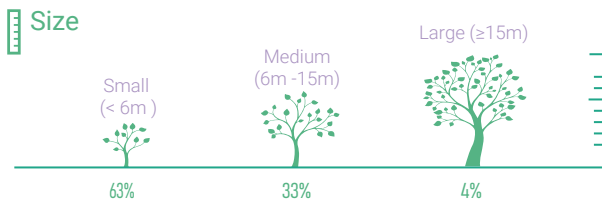
Family



Species



Platanus x acerifolia, Gladesville



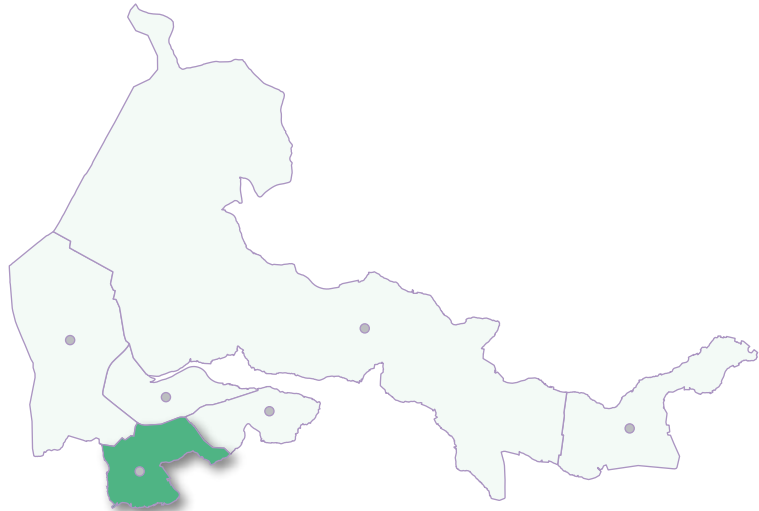
Data based on Hunters Hill Street Tree Inventory 2023

SUBURB: HENLEY

Key Points

Biodiversity is essential: moving forward, trees from outside the Myrtaceae Family should be selected to avoid monoculture concerns.

Prioritise New Plantings: the current street tree population does not conform to Richards Rule of 40:30:20:10 (i.e., 40% Young trees recommended). Therefore, more 'Young' trees need to be planted in the streetscape. This to offset a future decline in tree canopy coverage due to an aged tree population; and achieve canopy coverage targets.



239

Street Trees



20

Family



36

Genus



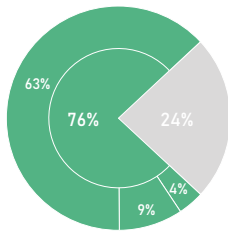
48

Species

Family

Top 3

Myrtaceae	151
Proteaceae	22
Lythraceae	9

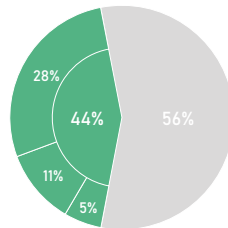


Other Families
57

Species

Top 3

<i>Lophostemon confertus</i> (Queensland Box)	66
<i>Eucalyptus microcorys</i> (Tallowwood)	26
<i>Grevillea robusta</i> (Silky Oak)	13

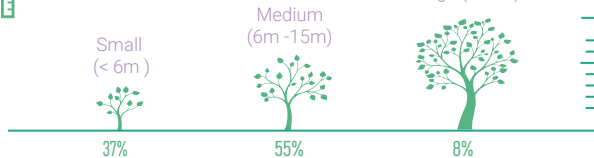


Other Species
134

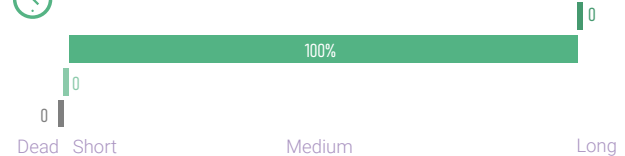


Significant tree (*Eucalyptus saligna*) in William Street, Henley

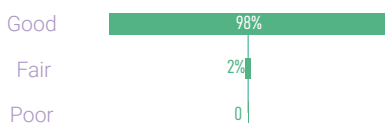
Size



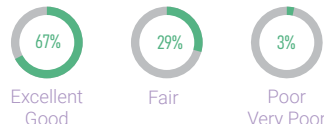
Useful Life Expectancy



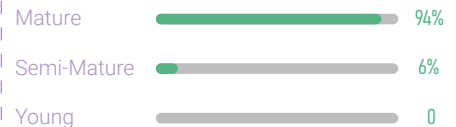
Structure



Vitality



Age



Data based on Hunters Hill Street Tree Inventory 2023

SUBURB: HUNTERS HILL

Key Points

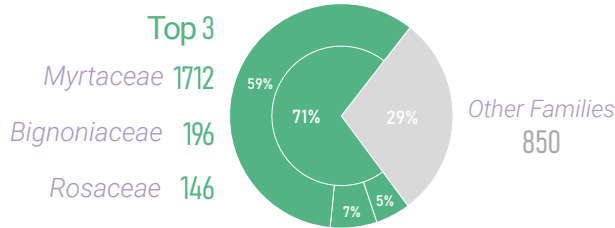
Biodiversity is essential: moving forward, trees from outside the Myrtaceae Family should be selected to avoid monoculture concerns.

Prioritise New Plantings: the current street tree population does not conform to Richards Rule of 40:30:20:10 (i.e., 40% Young trees recommended). Therefore, more 'Young' trees need to be planted in the streetscape. This to offset a future decline in tree canopy coverage due to an aged tree population; and achieve canopy coverage targets.

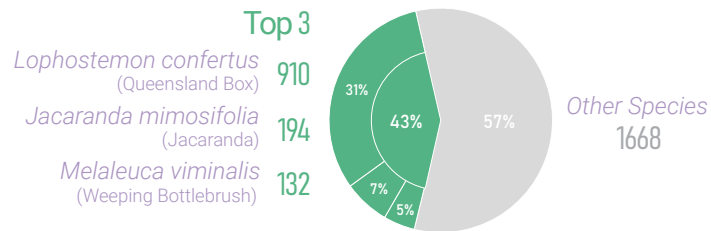


2904 Street Trees ▶ **45** Family ▶ **107** Genus ▶ **193** Species

Family

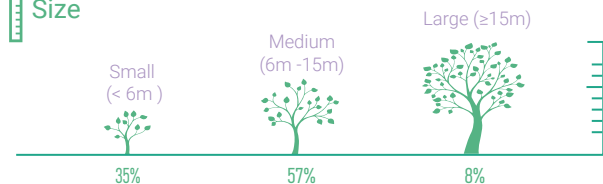


Species

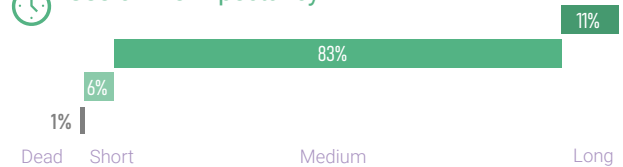


Significant tree (*Eucalyptus haemastoma*) in Prince Edward Reserve

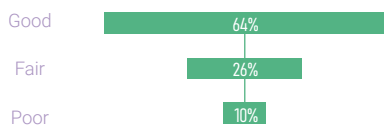
Size



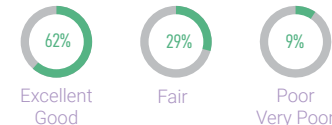
Useful Life Expectancy



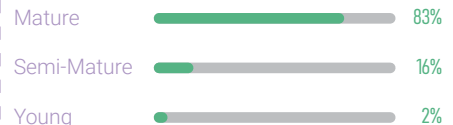
Structure



Vitality



Age



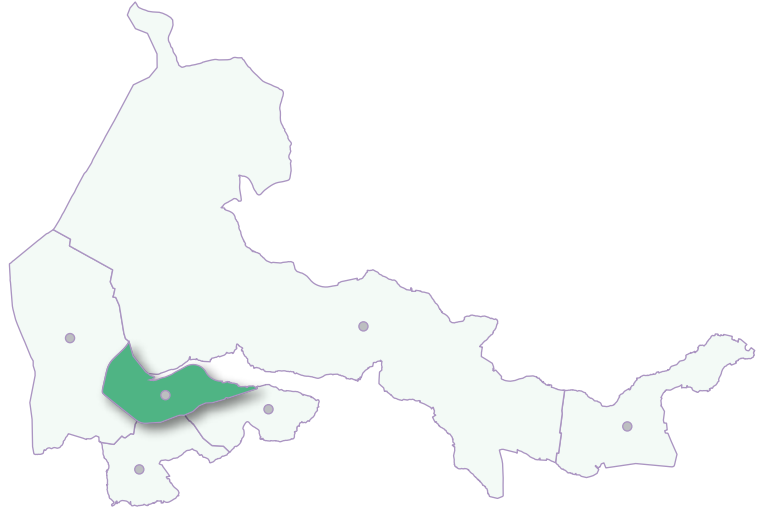
Data based on Hunters Hill Street Tree Inventory 2023

SUBURB: HUNTLEYS COVE

Key Points

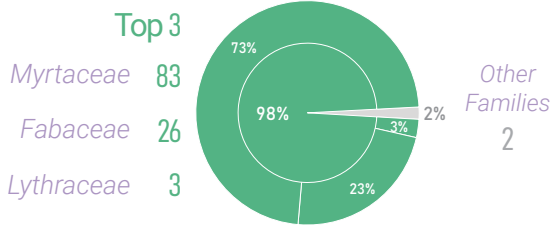
Biodiversity is essential: moving forward, trees from outside the Myrtaceae Family should be selected to avoid monoculture concerns.

Prioritise New Plantings: the current street tree population does not conform to Richards Rule of 40:30:20:10 (i.e., 40% Young trees recommended). Therefore, more 'Young' trees need to be planted in the streetscape. This to offset a future decline in tree canopy coverage due to an aged tree population; and achieve canopy coverage targets.

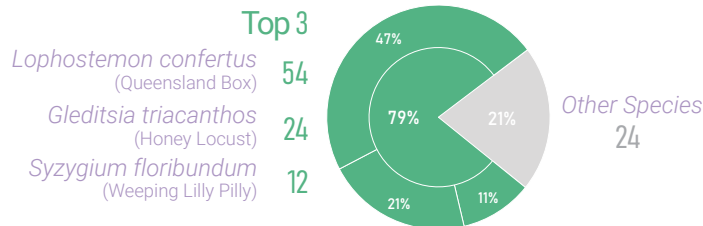


114 Street Trees ▶ **5** Family ▶ **10** Genus ▶ **12** Species

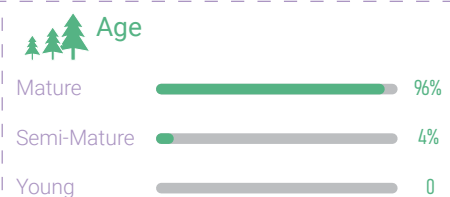
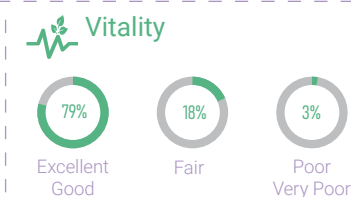
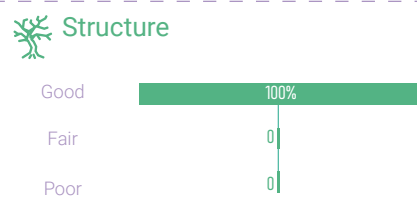
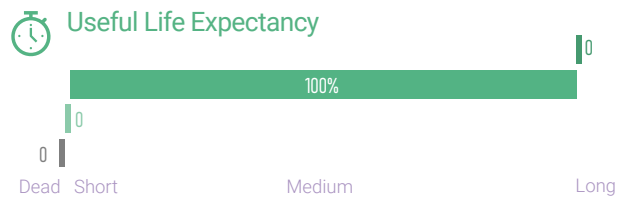
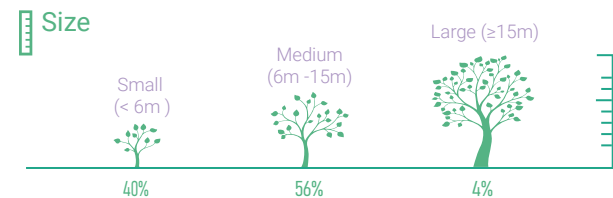
Family



Species



Phoenix canariensis in Riverglade Reserve, Huntleys Cove



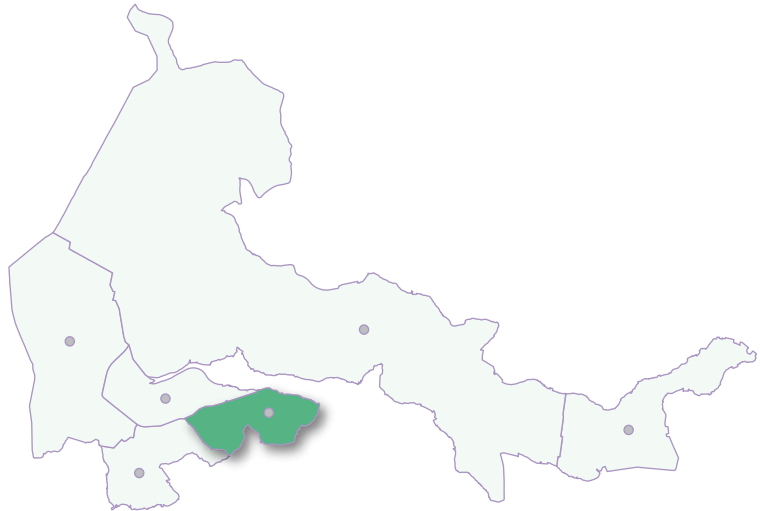
Data based on Hunters Hill Street Tree Inventory 2023

SUBURB: HUNTLEYS POINT

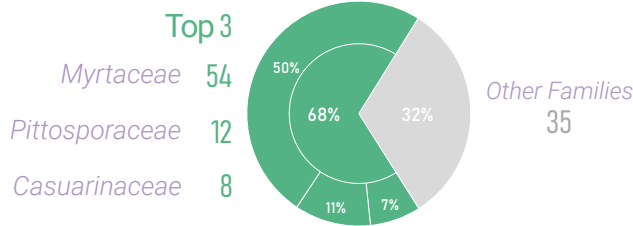
Key Points

Biodiversity is essential: moving forward, trees from outside the Myrtaceae Family should be selected to avoid monoculture concerns.

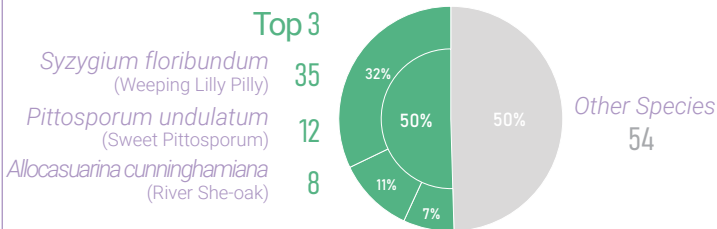
Prioritise New Plantings: the current street tree population does not conform to Richards Rule of 40:30:20:10 (i.e., 40% Young trees recommended). Therefore, more 'Young' trees need to be planted in the streetscape. This to offset a future decline in tree canopy coverage due to an aged tree population. (Tree planting should be prioritised, as Huntleys Point has the second lowest tree canopy coverage).



Family

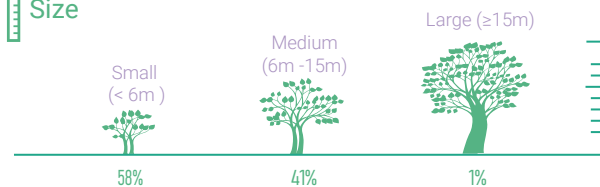


Species

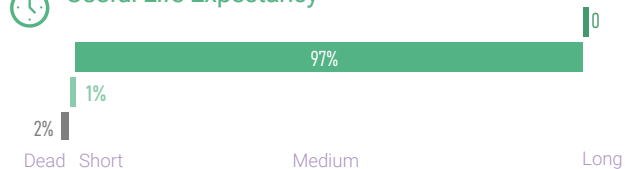


Agathis robusta in Huntleys Point Road, Huntleys Point

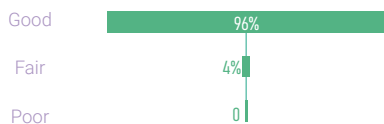
Size



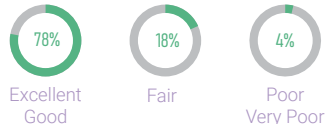
Useful Life Expectancy



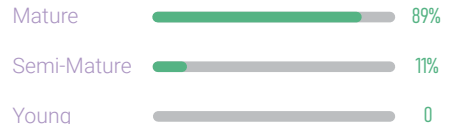
Structure



Vitality



Age



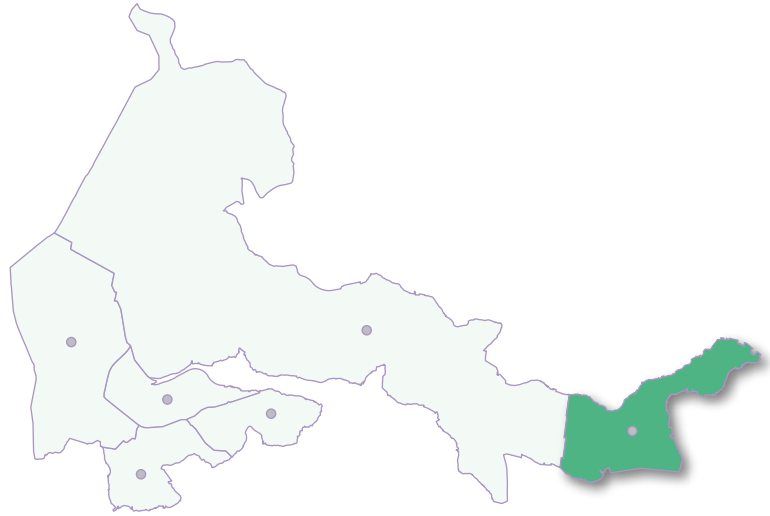
Data based on Hunters Hill Street Tree Inventory 2023

SUBURB: WOOLWICH

Key Points

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181

Street Trees



19

Family



33

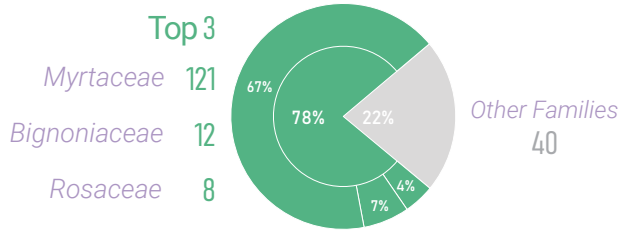
Genus



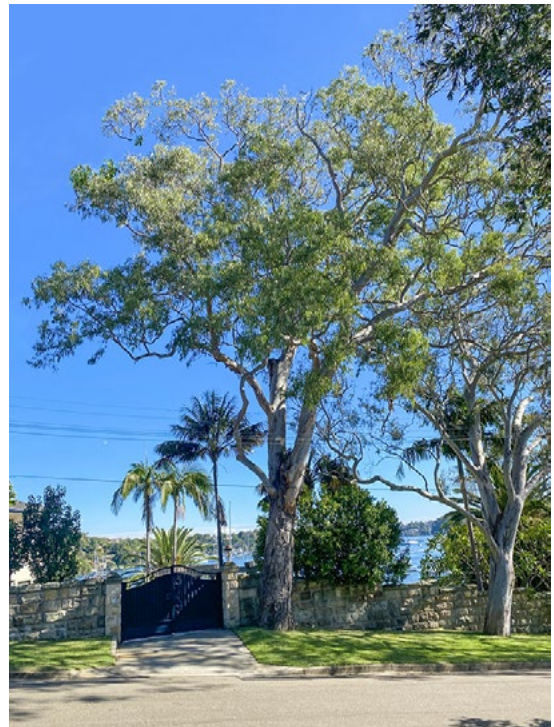
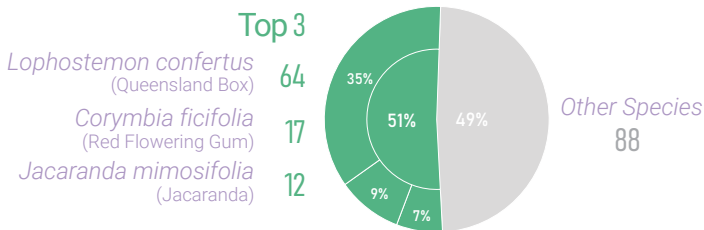
41

Species

Family

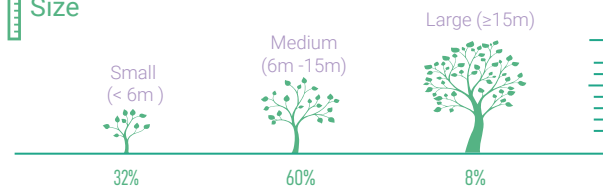


Species

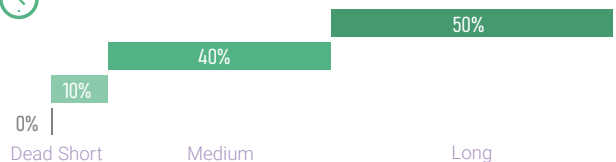


Significant tree (*Eucalyptus tereticornis*) in Gale Street, Woolwich

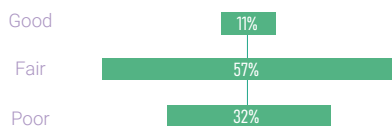
Size



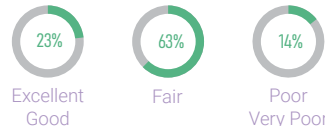
Useful Life Expectancy



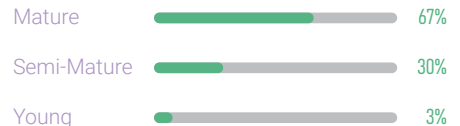
Structure



Vitality



Age



Data based on Hunters Hill Street Tree Inventory 2023



PART 3
SPECIAL
CONSIDERATIONS

3.1 CLIMATE CHANGE

As stated by the United Nations in 2022 - *“Climate Change is the defining issue of our time”*. The term ‘Climate Change’ has many connotations, but for brevity it refers to the worldwide increase in temperature (global warming), and the subsequent abnormal weather patterns associated with it.

With regards to the predicted Hunters Hill future climate, it is projected that in the coming years more summer days over 35°C will be experienced, and by the year 2050 the Hunters Hill climate will be similar to that of Grafton, NSW which is located approximately 600km north.

Therefore, to protect the Hunters Hill community from these days of extreme heat Council is targeting and proactively working towards 40% tree canopy cover across the LGA. One of the main benefits being that an increase in tree canopy cover is proven to be the most effective way of cooling an

urban environment (Pataki et al. 2021). I.e., trees cool the urban microclimate primarily through shading and transpiration (releasing water from their leaves into the air). This effectively reducing air and land surface temperatures (Schwaab et al. 2021). Thus, an increase in tree canopy coverage is a key tool in

heat mitigation. As studies have shown, for every unit increase in Leaf Area Index (LAI), the land surface temperature decreases by 1–4 °C (Rahman et al. 2020). In addition, studies have also shown that when vegetation cover is greater than 40% of a total area, a 10% increase in vegetation leads to a reduction in land surface temperature of more than 1°C. However, when mixed vegetation cover is less than 40%, there is no reduction

in land surface temperature (Adams et.al. 2014). Ergo, this is why the Hunter’s Hill Council is targeting a tree canopy coverage of 40%.

“...in the coming decades Australia will experience ongoing changes to its climate. These changes will include higher maximum and minimum temperatures, more hot days and heat waves, more intense precipitation, and increased summer drying which will increase the risk of both fire and drought”.

-Australian Bureau of Meteorology

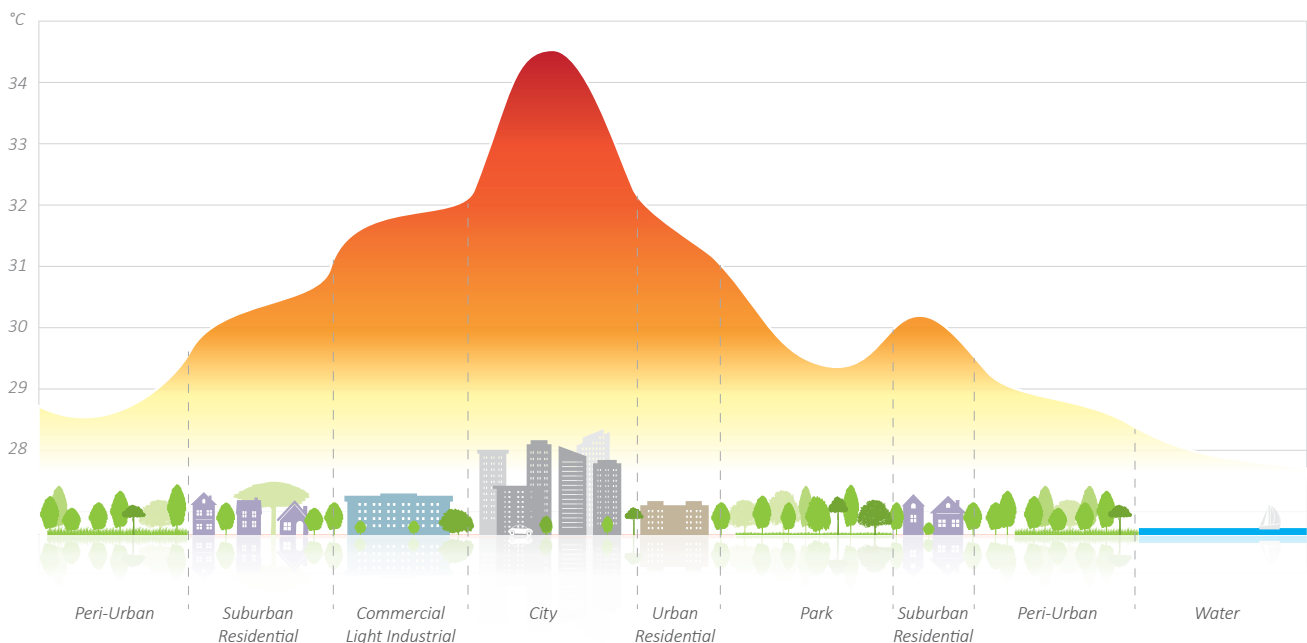


Indicative Climate Change -*“the defining issue of our time”* (United Nations, 2022)

3.2 THE URBAN HEAT ISLAND EFFECT

Contributing to the concerns of Climate Change are the adverse effects of an Urban Heat Island (UHI). By definition the UHI effect is the difference in air temperature between an urbanised area and its surrounding rural regions (Wenga et al. 2004). This created by a concentration of heat-absorbing building materials that trap heat during the day, releasing it at night at a much slower rate than natural vegetation. Thereby, an urbanised area heats up at approximately double the rate of rural areas and this attributed to the decrease in vegetation and the increase of dark building materials and human waste heat emissions in urban areas (Akbari et al. 2001).

As evidenced, rural areas or non-urbanised areas typically consist of more 'Green Infrastructure' (i.e., trees and green cover). This reflects heat and actively cools and cleans the air by evapotranspiration. However, an urbanised area is predominantly made up of 'Grey Infrastructure' (i.e., buildings and hardscapes), which have hard impermeable artificial surfaces. These surfaces (concrete, brick, glass, asphalt, and roofing), have a high thermal mass and a lower albedo, so heat is absorbed (stored) taking these surfaces a lot longer to cool down (Adinna et al. 2009). In addition, the form and geometry of Grey Infrastructure (often street layouts) interrupts air flow patterns, so heat and pollutants are trapped in street "heat canyons". This raising the ambient temperature and creating a large stable mass of hot air that sits over the urban area, and hence an Urban Heat Island is formed. Whereas, the surface area of an urban street in summer with no tree shade-cast (versus a street with tree shade cast) can be >20C higher (Ferranti et al. 2021).



The Urban Heat Island Effect (adapted from McDonald et al. 2016)

In addition, anthropogenic heat production (air-conditioning, industry, and transport) also contributes to these UHI's. As high air temperatures further increase, the demand for cooling energy in commercial and residential buildings increases to maintain comfort levels. This not only contributes to the overall increase in air temperature, but also impacts on air quality when nitrous oxides and volatile organic compounds combine to produce ground level ozone (Rosenfeld et al. 1998).

As per the above-outlined rationale, foreseeably UHI's are by-products of urban development and densification. I.e., they are typically created in whole or part thereof when 'Green Infrastructure' (e.g., trees and vegetation) is removed to accommodate development and it is not replaced post-development. Therefore, to combat the loss of Green Infrastructure, and more so urban tree canopy loss, robust tree protection needs to be mandated concurrent public and private realm tree canopy coverage with the utilisation of Tree Sensitive Urban Design (TSUD) Compensatory Replanting ratios and/or the installation of Green technology.

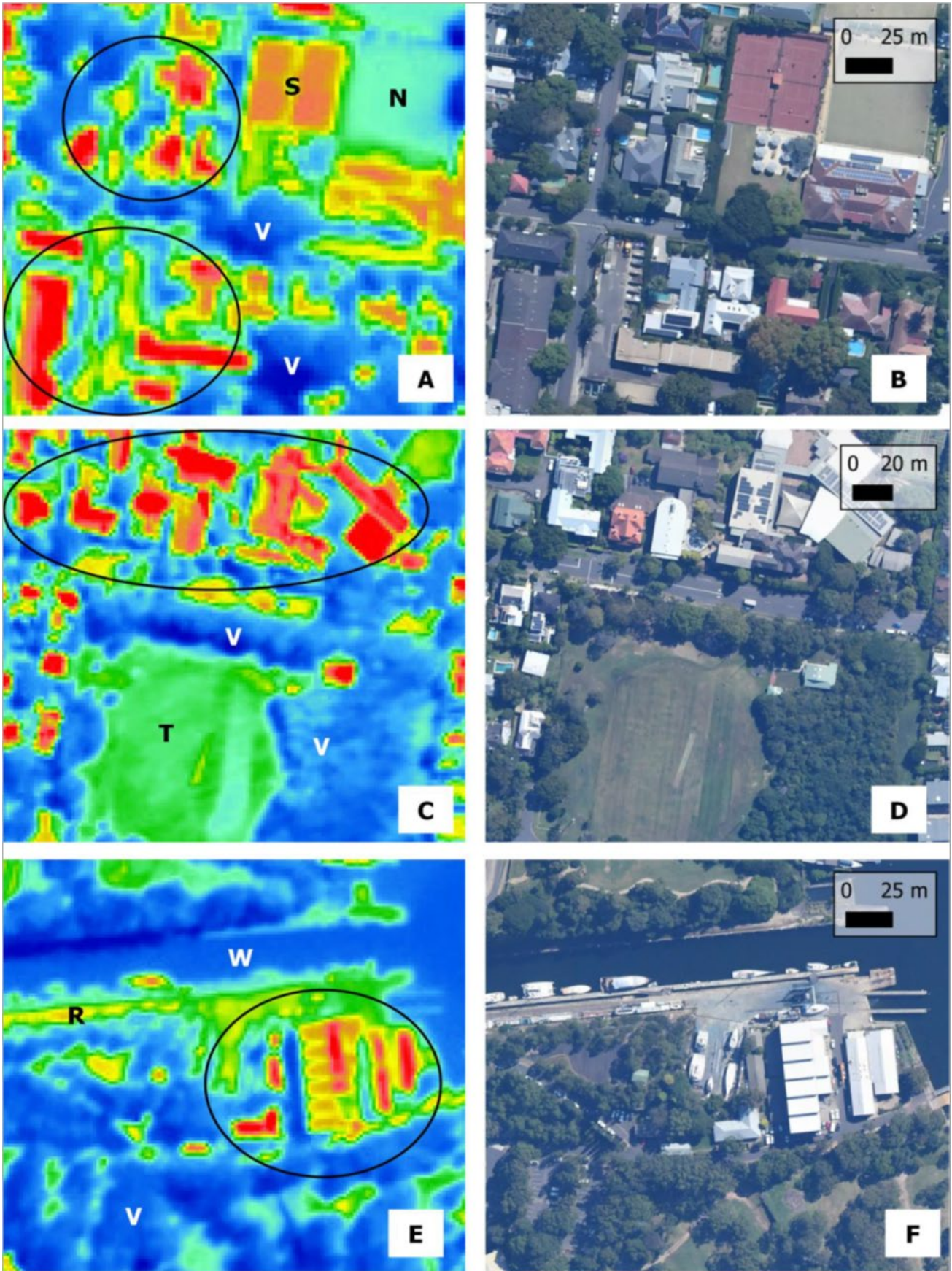
3.3 THE COOLING EFFECTS OF TREES

Tree shade-cast and its beneficial cooling effect has always played an integral part in promoting a community's outdoor activities and lifestyle choices. This more evident now with average temperatures predicted to increase in the future due to climate change. These warmer temperatures generated by climate change and the above-mentioned UHI effect can lead to increased living costs and more importantly direct and indirect heat-related health issues (Harlan et al. 2006). However, tree canopy coverage has proven to be highly effective when it comes to urban cooling and combating the UHI effect (Nuruzzaman. 2015). Therefore, this is one of the key reasons for increasing tree canopy coverage across the Hunters Hill municipality.



Clarke's Point Reserve

The below thermal images were extracted from the Aerial Survey 2022. Images A and B demonstrate the surface temperature difference between built up areas (circled) and large trees (labelled V). The shade cast by the trees is significantly cooler than the adjacent buildings. In addition, the synthetic turf playing fields (labelled S) have a higher surface temperature than surrounding areas, including roads, and significantly higher surface temperature than the adjacent natural turf playing fields (labelled N). Image C and D indicate the difference in land surface temperature between dense vegetation (labelled V) and irrigated turf playing fields (labelled T). The vegetation is much cooler than the turf. The built-up area to the north (Marist Sisters College) has a much higher LST than the surrounding areas. Images E and F demonstrate the similarity in temperature between the water of the Lane Cove River (labelled W) and nearby vegetation (labelled V). Shade cast by the vegetation is cooler than the water. Hot spots in this environment include the buildings (circled) and the road (labelled R).



Thermal Imagery of Hunters Hill in the summer of 2022 (Courtesy of ArborCarbon, 2022)

3.4 BENEFITS OF LARGE TREES - “BIG IS BEST”

As abovementioned all trees provide eco-benefits, and understandably a larger tree provides exponentially more benefits than a smaller tree (Turner-Skoff and Cavender 2019). Research supports this rationale, confirming that large mature trees provide a greater volume of eco-services and positive impacts on urban ecology than small mature trees. This in the way of providing greater shade-cast, wildlife habitat, biodiversity, carbon sequestration, erosion control, noise mitigation, crime reduction and stormwater attenuation whilst improving air, soil and water quality for improved physical and mental well-being. Whereby it is estimated that a large tree with a height of 14.3m provides three (3) times the annual environmental benefits of a similarly aged 6.7m high tree; and that the value of benefits increases faster than the costs of managing a larger tree (McPherson et al. 2005).

In addition to the increased volume of eco-services, larger street trees provide greater economic benefits. For example, they are highly valued by residents for their amenity value (Schroeder et al. 2009), which increases property values (Wolf. 2007); and studies have repeatedly shown that the value returned by a large street tree performing well exceeds the cost of it maintenance. For example, over its lifetime a larger tree returns approximately sixteen (16) times more

value than a small tree (McPherson et al. 2005); and a street with a small population of widely spaced large trees is more cost-effective to manage than the same street planted with a larger number of more closely spaced smaller stature trees (Young et al. 2005).

From an ecological perspective, typical land development scenarios involve clearing existing habitat, including large established trees, and subsequently planting many smaller immature trees as compensatory habitat. Given the time lags involved

Large trees provide 16 times the value to the community compared to small trees over their lifetime.

- McPherson et al. 2005

in tree maturation and the set of unique structural attributes provided only by large trees

(e.g., hollows), it has yet to be demonstrated that several smaller trees are a valid offset for the loss of a single large tree (Gibbons et al. 2002). Especially as case studies have shown, established trees more than often provide better outcomes than newly planted trees both economically and ecologically (Tyrväinen. 2005). Whereby, new plantings are costly, often fail, and even when they succeed it takes on average 25yrs to match the eco-benefits provided by an existing mature-age tree (Hirons et al. 2018). Therefore, as per the above rationale a larger tree should always be prioritised for retention; and a larger tree species the first-choice option for planting which should be allowed to grow to maturity to maximise its eco-services (Geiger. 2004).



Large Tree Benefits (adapted from McPherson et al. 2005)

3.5 TREE SENSITIVE URBAN DESIGN

Tree Sensitive Urban Design (TSUD) can be utilised to create additional planting opportunities and facilitate tree retention. TSUD simply aims to provide adequate space for desirable root growth, whilst safeguarding against infrastructure and root damage from potential conflict alike (Urban. 2008). Therefore, TSUD can be implemented to create new planting opportunities in hardscapes, facilitate the coexistence of trees and grey infrastructure on developments and further biophilic urban design in general. As the materials used in TSUD usually have a high albedo and/or are permeable by design they assist in stormwater attenuation, ground cooling and the general reduction of the Urban Heat Island effect (Nuruzzaman. 2015). Some of the TSUD installations include:

- Directional-drilling, Screw-Piling, Cantilevers, 'Build-outs' and 'Build-overs'.
- Tree Root Trenches & Paths, Root Barriers, Root Deflectors and Root Directors.
- Porous Permeable Pavers, Asphalt, Concrete and Resin Bound Aggregates.
- Structural Confinement Systems (Tree Pits or Soil Cells) which contain structural soil. (These cells can be installed in an urban scape to provide space for necessitated root growth, whilst accommodating infrastructure installations).
- Water Sensitive Urban Design (WSUD) & Stormwater Urban Design (SUD).



Water-way adjacent Riverglade Reserve, Huntley's Cove

3.6 GREEN INFRASTRUCTURE

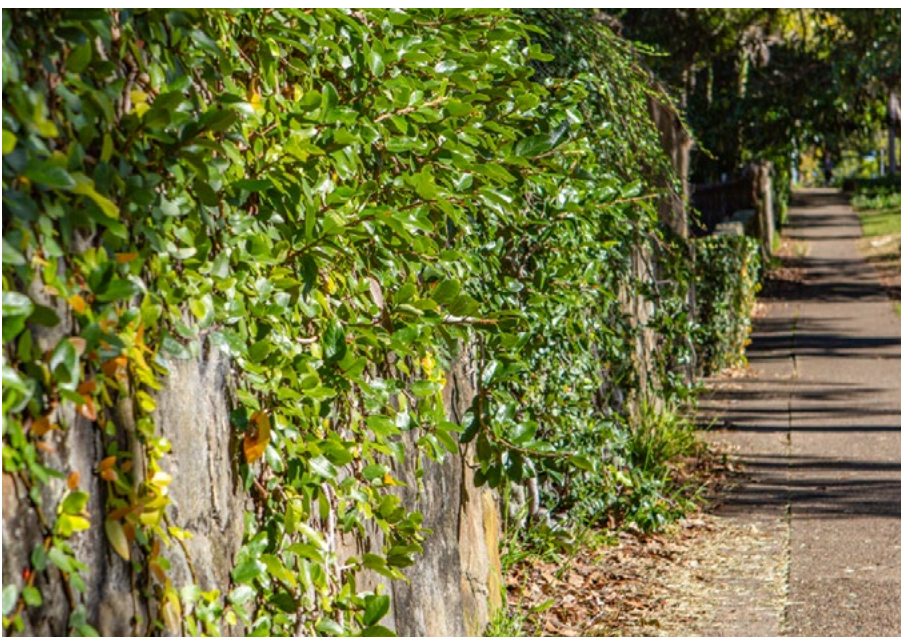
As with most other municipalities in Greater Sydney, Hunters Hill faces continued pressure from increasing urban sprawl. Whereby, population growth and the increased demand for housing is impacting upon and/or transforms natural greenspaces into areas of ‘Grey’. Coincident with urban development is the heat generated from additional vehicles, industry, and commerce. This heat couples with the retention of solar energy from buildings and hard surfaces and an undesirable Urban Heat Island forms as above-mentioned (Adinna et al. 2009). In addition to the ill-effects associated with heat, this transition from a naturally vegetated landscape to a built environment with large areas of hardscape surfaces (roads and footpaths), causes issues with stormwater attenuation. This in turn creates an increase in surface water run-off, which results in flash flooding, erosion, and waterway pollution (Wolf. 2003).

However, the utilisation of Green Infrastructure is one of the most effective mitigants to these challenges created by development and the removal of vegetation. Green Infrastructure can be defined as “the natural vegetative systems and green technologies that collectively provide a community with a multitude of economic, environmental, health and social benefits” (Bolund et al. 1999). It includes trees, vegetation, green space, water sensitive urban design, permeable pavements and surfaces, green roofs, walls, facades, and vertical gardens.



Woolwich Road, Woolwich

One of the main objectives of Green Infrastructure is to create cooler environments with the integration of vegetation and/or green technologies that have permeable and reflective surfaces to minimise local temperatures and encourage evaporation from the soil and plants into the urban environment. In addition to combating heat, Green infrastructure also delivers a range of engineering and human services to a community, known as ecosystem services. A cross-section of these eco-services include stormwater attenuation and management, thermal insulation, air quality improvement, Urban Heat Island effect mitigation, Ultra Violet radiation protection for buildings, evapotranspiration and increased vegetation, wildlife habitat creation, local food production and urban agriculture, pollination, increased aesthetics and amenity, noise reduction, improved community cohesion and atmosphere composition - CO₂/O₂ balance (Nowak and Dwyer. 2007).



Alexandra Street, Hunters Hill



Indicative Green Infrastructure Options

As shown above, there are a number of ways to introduce green cover into both residential and commercial developments. However, tree canopy coverage is still the most efficient way of cooling an urban environment and improving human thermal comfort (Nuruzzaman. 2015). For example, trees provide cooling through both evapotranspiration and shade-cast which is critical for improved human thermal comfort during warm sunny conditions.

Green open space and green roofs are reasonable heat mitigants, however they do not provide shade for pedestrians unless trees are included; and Green walls and facades can only provide shade if grown over artificial structures. In addition, trees provide all the additional eco-services and eco-benefits concurrent with urban cooling; and importantly, people have a greater understanding, connection, and affinity with trees than with any other types of urban vegetation (McPherson. 2005).

3.7 BIODIVERSITY

“Urban Forest - a collective network of street trees, parks, private gardens and bushland reserves that are important biodiversity corridors. Whereby these urban nature-ways contain high levels of biodiversity, whilst providing diverse habitat which is critically important for enhancing biodiversity across the Hunters Hill municipality.”

To mitigate the risk of economic loss, financial advisors recommend asset diversification. The same principle applies for an environmental asset such as an urban forest. A biodiverse urban forest delivers a greater range of biological and ecological benefits. These of which are fundamentally essential to a healthy, resilient, and sustainable urban forest as they boost the ecosystems productivity, sustainability, climate resilience and overall health. Thus, a healthy biodiverse urban forest is often less vulnerable to the many biotic and abiotic stressors such as pests, diseases, and climate change (Dwyer. 1991). In addition, biodiversity reduces the risks that are foreseeable to plant monocultures - e.g., outbreaks of Dutch Elm Disease (*Ophiostoma ulmi*), and more recently Myrtle Rust (*Austropuccinia psidii*) and Shot-hole Borer (*Euwallacea fornicates*).

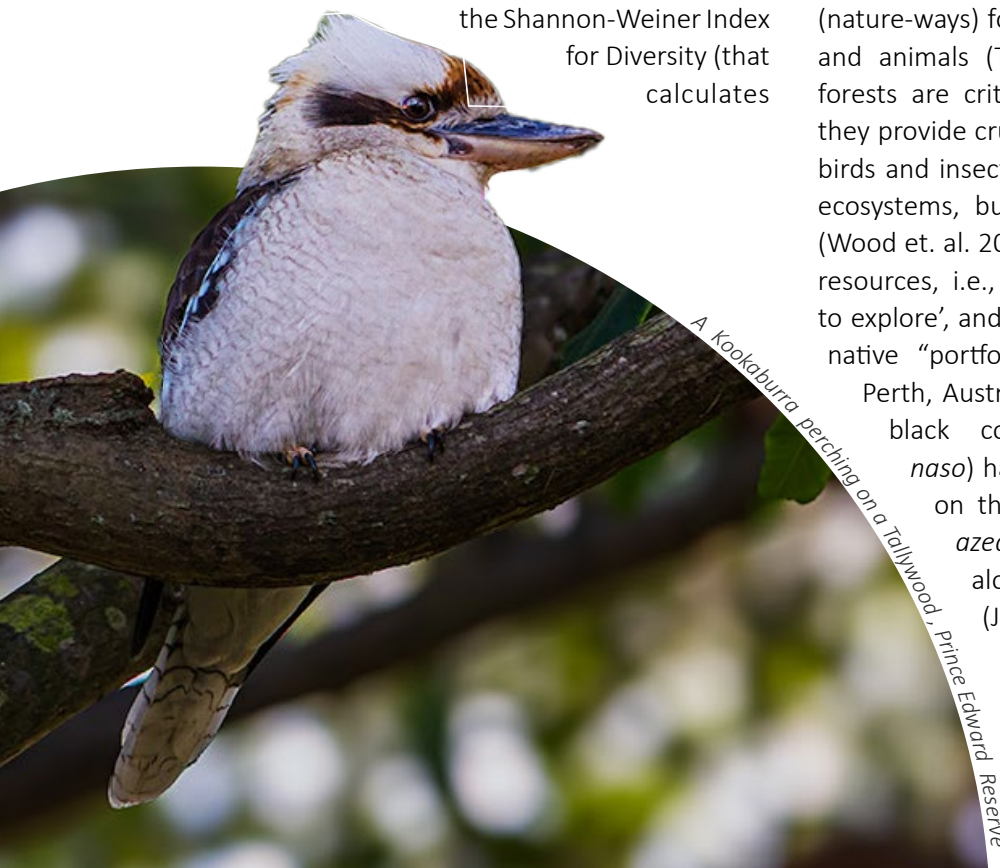
Hence the adoption of a bespoke Biodiversity Model is recommended to safeguard an urban forest, and a combination of planting ratios and rules is recommended. These combinations usually include the Shannon-Weiner Index for Diversity (that calculates



Frog in Boronia Park Reserve

the biodiversity of a given plant community); Santamour 10:20:30 Rule for Planting Diversity (whereby an urban tree population should include no more than 10% of any one species, 20% of any one genus, and 30% of any family); and Richards Rule 40:30:20:10 (that uses tree size as a proxy for age to suggest resilience in an urban tree population).

Regarding Pest and Disease mitigation, a more biodiverse urban forest has shown to be more aesthetically pleasing for its patrons (Nowak. 2007), and importantly provides habitat and connectivity (nature-ways) for smaller vegetation, beneficial fungi and animals (Tews et al. 2004). Whereby, urban forests are critical for biodiversity conservation as they provide crucial habitat resources for not only to birds and insects that are native to adjacent natural ecosystems, but also to those that are migratory (Wood et. al. 2020). Urban forests also provide novel resources, i.e., resources that species ‘have learnt to explore’, and that are not part of their traditional, native “portfolio” of resources. For example, in Perth, Australia, the threatened forest red-tailed black cockatoos (*Calyptorhynchus banksii naso*) have in recent decades begun foraging on the non-native cape lilac trees (*Melia azedarach*), which are frequently planted along residential streets and in gardens (Johnstone et al. 2017).



A Kookaburra perching on a Tallywood, Prince Edward Reserve

3.8 CONTEMPORARY URBAN FORESTRY

As above-mentioned the Hunters Hill urban forest faces several challenges. These include reduced tree planting opportunities, climate-change, the ill-effects of Urban Heat Islands, apathetic development and mis-advised tree removal. However Hunter’s Hill Council is well-equipped to address these challenges and is committed to equitably balancing the needs of urban densification with the community’s demand for high-quality green space. Hence it has set a tree canopy coverage target of 40% that is to be achieved by 2045.

Moving downstream, this canopy coverage target can in part be realised through traditional avenues such as stronger tree protections and increased tree plantings. However, due to the worldwide concerns of climate change and deforestation, trees and urban forestry is topical. Hence there is more evidence-based theories and innovative technologies (e.g., TSUD) which can assist in making tree canopy coverage targets more obtainable.

One of the more recent approaches to improve the overall health and well-being of the community, whilst indirectly increasing tree canopy coverage is the recognised ‘3-30-300’ Rule (as pictured on the right). Whereby, it is envisioned that every resident has a view of at least three (3) large trees from their residence; every suburb has and maintains thirty (30) percent tree canopy coverage; and every resident is no more than three hundred (300) metres away from a treed urban green space (Konijnendijk. 2022). The application of this Rule ensuring that all residents in a community have sufficient tree cover and access to treed green space at a level that is relevant, desirable, and beneficial to their well-being. Ergo, areas with limited tree canopy coverage can be targeted and greenspace created.

(This simple ‘rule of thumb’ is both easy to remember, easy to apply, and therefore is useful to encourage both public and private tree plantings. For interest and to gauge tree cover the Hunters Hill community were recently invited to participate in a short survey which contained this criterion. The results of this survey can be found in the Appendix of this document).



3

Trees from every home



30%

Tree canopy cover in every neighbourhood



300M

From the nearest park or green space

3.9 HUNTERS HILL SIGNIFICANT TREE REGISTER

The purpose of the Hunters Hill Significant Tree Register (STR) is to identify and recognise the importance of significant trees in the landscape – both Private and Public Realm. This so these identified trees can be managed as per best arboricultural practice and ensuring their protection and longevity for future generations.

During 2014/15 the Hunters Hill STR was revised, with a newly developed format adopted at the Ordinary Council meeting, August 2015. Now for ease the STR tree listings are supported by a Tree Profile Sheet that provides specific details about the subject tree and the criteria used to establish its significance. This criterion taking into consideration the trees Cultural/Social/Commemorative Value, Historic Value, Botanic/Scientific Value, Ecological Value and/or Aesthetic Value. Also, at this meeting Council resolved to implement a twelve (12) year ‘growth and review’ cycle for the STR. This in an effort to increase the number of tree listings, and realistically reflect the number of trees that are actually significant in the Hunters Hill municipality. Council called for additional STR nominations in 2021.



Eucalyptus pilularis, Dick Street, Henley



Eucalyptus microcorys, Prince Edward Parade, Hunters Hill

Please note that there are currently forty-six (46) trees listed on the STR and this number is likely to be increased.

Further information regarding the selection process and the currently listed Significant trees can be found on the Hunter’s Hill Council website. New nominations for trees to be assessed for inclusion on the STR can be emailed to: info@huntershill.nsw.gov.au. Anyone may lodge a nomination at any time. If the nomination is made outside an assessment year, it will be filed and considered during the next assessment period.

3.10 GENERAL TREE PROTECTION

In addition to the Significant Tree Register, the *Hunters Hill Consolidated DCP (2013)* promotes urban greening whilst establishing a framework for protecting and maintaining any tree in Hunters Hill per se. Whereby, any tree that is greater than 4m in height and has a diameter of 200mm or greater measured at 1.4m from the existing ground level requires Council consent prior to its removal or pruning. (For further information and exceptions, the Hunters Hill Council website can be referenced).

3.11 TREE PRESERVATION ON PRIVATE LAND

Hunter's Hill Council is committed to practicable tree retention on private land. Whereas:

- Development Applications must include a site analysis that provides information about the site and its surroundings relevant to the proposed development. This including any existing trees and vegetation per the *DCP s1.4*. Therefore, all Applications must provide sufficient information for the Council to assess proposals with regards to removing existing vegetation or proposed tree management works. This information required may also include arboricultural reports which must be prepared by a Consulting Arborist (minimum AQF Level 5).
- Successive planning policies have been adopted by Hunter's Hill Council over the past thirty (30) years confirming the existing character and identity of this Municipality. This includes an extensive tree canopy for river front areas in particular, ensuring that building forms or structures do not visually dominate scenically prominent backdrops to waterways (*DCP s2.2.3*). This congruent with the *LEP s6.7*, whereby "the development on riverfront areas must minimise visual impacts by appropriate siting and design of buildings together with the conservation of existing trees".
- Hunter's Hill Council *DCP, Chapter 2.3* prescribes controls which apply to development proposals, as well as requirements for the management of existing trees and vegetation by way of pruning, cutting down and removal, lopping or ringbarking.
- Proposed subdivisions should satisfy the following requirements for *Subdivisions and future development*, which would be permitted should not result in significant clearing of existing trees (*DCP s3.8.6*).
- Existing trees on development sites should be conserved unless an arborist's report confirms that removal is desirable (*DCP s4.5.8*)
- To be exempt development, the development must, among other things, not involve the removal, pruning or other clearing of vegetation that requires a permit, development consent or other approval unless it is undertaken in accordance with a permit, development consent or other approval (*LEP s3.1*).
- Development consent is required for demolishing, moving or altering the exterior of a tree within a heritage conservation area (*LEP 5.10 (2a)*).



Moorefield Ave, Hunters Hill

3.12 DEVELOPMENT & TREE MANAGEMENT APPLICATIONS

As highlighted throughout this document, Hunter's Hill Council is dedicated to preserving the significant environmental qualities and biodiversity of the communities existing vegetation. These qualities are considered to be a significant element of the Municipality's existing character, and exist on both public and private land. However, understandably pressures often arise regarding proposed development and the removal of trees and vegetation.

As referenced in *Part s1.4* above, the two (2) key ways in which the removal of trees and/or vegetation is regulated on private land in Hunters Hill are:

- Assessment of development applications involving the removal of trees and vegetation under *Part 4* of the *EPA Act*; and/ or
- Assessment of Tree and Vegetation Management Application/ Permit applications for tree or vegetation removal pursuant to *Chapter 2, B&C SEPP*

In practice the above system generally involves private land owners:

- seeking development consent under *Part 4* of the *EPA Act* where redevelopment of private land is proposed and involves tree / vegetation removal; or
- lodging/ seeking a Tree and Vegetation Management Application / Permit under *Chapter 2* of the *B&C SEPP* for the removal of individual trees.

When assessing such applications, in addition to relevant legislation and planning controls, Council representatives take into consideration numerous site-specific and species-specific arboricultural traits when objectively considering tree removal versus tree retention per the Development Application and/or a Tree and Vegetation Management Application/ Permit process. Some of these considerations include tree health, vitality, phytomorphology, ecophysiology, useful life expectancy, amenity value and landscape significance.

In addition to these arboricultural elements the geo-location of the tree is also a relevant factor having regard to relevant legislative requirements. For example, under *Chapter 2* of the *B&C SEPP*, a Permit cannot allow the removal/ clearing of trees or vegetation that is or forms part of a heritage item or that is within a heritage conservation area unless Council is satisfied that the proposed activity is:

- of a minor nature or is for the maintenance of the heritage item or heritage conservation area, and
- would not adversely affect the heritage significance of the heritage item or heritage conservation area.

If such criteria are not met then a development application under *Part 4* of the *EPA Act* it may be required for the removal/ clearing of trees or vegetation.

By way of another example, if a property is located in a conservation area and/or is a Heritage home, a Tree and Vegetation Management Development Application must be lodged with Council before an inspection of the tree can be done. However, if a property is not located in the above mentioned areas then a Tree and Vegetation Management Application must be lodged with Council before Council can inspect your tree. (Understandably, in certain circumstances further information may be required prior to the final determination).

A key consideration under *s2.3, Trees and Vegetation, Hunters Hill Consolidated DCP 2013* is that existing trees and vegetation that are considered by Council to have a 'High' retention value', should be retained in the original location concurrent with the construction of new buildings or structures, together with any associated services and construction activities.

Section 2.3, Trees and Vegetation, of Hunters Hill Consolidated DCP 2013 also provides that applications for or involving tree removal require various technical reports. These include:

- Preliminary Arboricultural Report, Arboricultural Impact Assessment Report, Tree Protection Management Plan all of which must be authored by a Consulting Arborist (AQF Level 5 minimum) per Australian Standard *AS4970-2009 Protection of Trees on Development Sites* by a suitably qualified Consulting Arborist. In addition other Arboricultural Reports may be requested to support Applications. These may include Pruning Specification Reports, Root Mapping Reports and Succession Planting Plans.
- Other Technical Reports from other industries may also be requested to support the abovementioned arboricultural reports. Some of these may include Engineering Reports prepared by a qualified structural engineer; Drainage Reports prepared by qualified hydraulic engineers or licensed plumbers (including diagrams of utilities or pipes in relation to existing trees), and other technical reports that may be needed to address site-specific considerations regarding the management of trees and/or vegetation.

Please note that any unapproved tree removal, act of vandalism and/or the poisoning of trees are deemed serious offences in Hunters Hill and thus the resulting penalties can be severe. The *EPA Act* provides for significant penalties in relation to vegetation management/ removal works that have been undertaken without development consent or a permit. The maximum penalties are currently as follows:

- For 'Teir 1' Offences- the most serious offences involving the prosecutor having to prove the offence was committed intentionally and (i) caused or was likely to cause significant harm to the environment or (ii) caused the death of or serious injury or illness to a person: \$5 million for a corporation and \$1 million for an individual;
- For 'Teir 2' Offences- generally speaking will comprise the majority of offences that are subject to criminal prosecution: \$2 million for a corporation and \$500,000 for an individual;
- The *EPA Act* also provides in addition to, or substitution of, monetary penalties; and the ability for the Land and Environment Court to order a person to plant new trees and vegetation, there maintenance until mature growth, and to provide security for the performance of any obligation imposed.



The Avenue, Hunters Hill



PART 4

GROWING FORWARD

4.1 CANOPY COVERAGE TARGETS

“By knowing the amount of, and the direction in which the urban tree cover is moving, urban forest management plans can be developed to obtain desired levels of urban tree cover for both current and future generations.” - David Nowak

An urban forest is a dynamic living ecosystem. It is constantly regenerating, growing and adapting, whilst competing for space, sunlight, moisture, oxygen and nutrients. This whilst combating pathogens and other adversities, so understandably tree numbers and subsequent tree canopy coverage fluctuates. Therefore, new tree plantings are key, and obtainable goals for increased urban tree canopy cover must be established and acted upon pragmatically.

Hunter’s Hill Council and the local community understands the importance of a healthy urban forest, tree canopy coverage and the need to increase it equitably across the suburbs. Hence they are committed to increasing its current tree canopy coverage of 33.5% to 40% by the year 2045, meaning 36.53ha of tree canopy area needs to be increased. (This tree canopy coverage target aligning with State government directives for Metropolitan Sydney councils).

To achieve this target of 40% tree canopy coverage a mathematical-based algorithm was utilised to depict four (4) alternative planting scenarios. Each of the scenario’s based on a 10% tree mortality rate; with the trees average growth period of twelve (12) years to maturity. With regards to the Tree Canopy Spread Classifications utilised, these are modeled on both evidence-based research and recognised industry standards, and can be referenced per *Table 1* adjacent.

Table 1. Tree Canopy Spread Classifications

Canopy Spread Classification	Canopy Diameter(m)	Canopy Spread Area(m ²)
<i>Small</i>	6	28
<i>Medium</i>	8	50
<i>Large</i>	12	113

Of note, the following four (4) scenarios do not take into consideration tree removal (public or private) or natural tree mortality. However, Compensatory Replanting should be adopted to offset these tree canopy cover losses. With regards to the geo-location of the prospective tree plantings, as outlined there are numerous, easily identifiable tree planting opportunities available in Hunters Hill. Albeit, if a more ‘geo-specific’ tree planting regime is decided upon, these opportunities can be quantified through ground-truthing and/or electronically.

Scenario 1: Depicts the planting of only trees with a ‘*Small*’ canopy spread. Therefore, to achieve an outcome of 40% canopy coverage within the above timeframe 14356 trees will need to be planted over the next 10yrs or 1436 trees planted per year.

Scenario 2: Depicts the planting of only trees with a ‘*Medium*’ canopy spread. Therefore, to achieve an outcome of 40% canopy coverage within the above timeframe 6,088 trees will need to be planted over the next 10yrs or 808 trees planted per year.

Scenario 3: Depicts the planting of only trees with a ‘*Large*’ canopy spread. Therefore, to achieve an outcome of 40% canopy coverage within the above timeframe 3,589 trees will need to be planted over the next 10yrs or 359 trees planted per year.

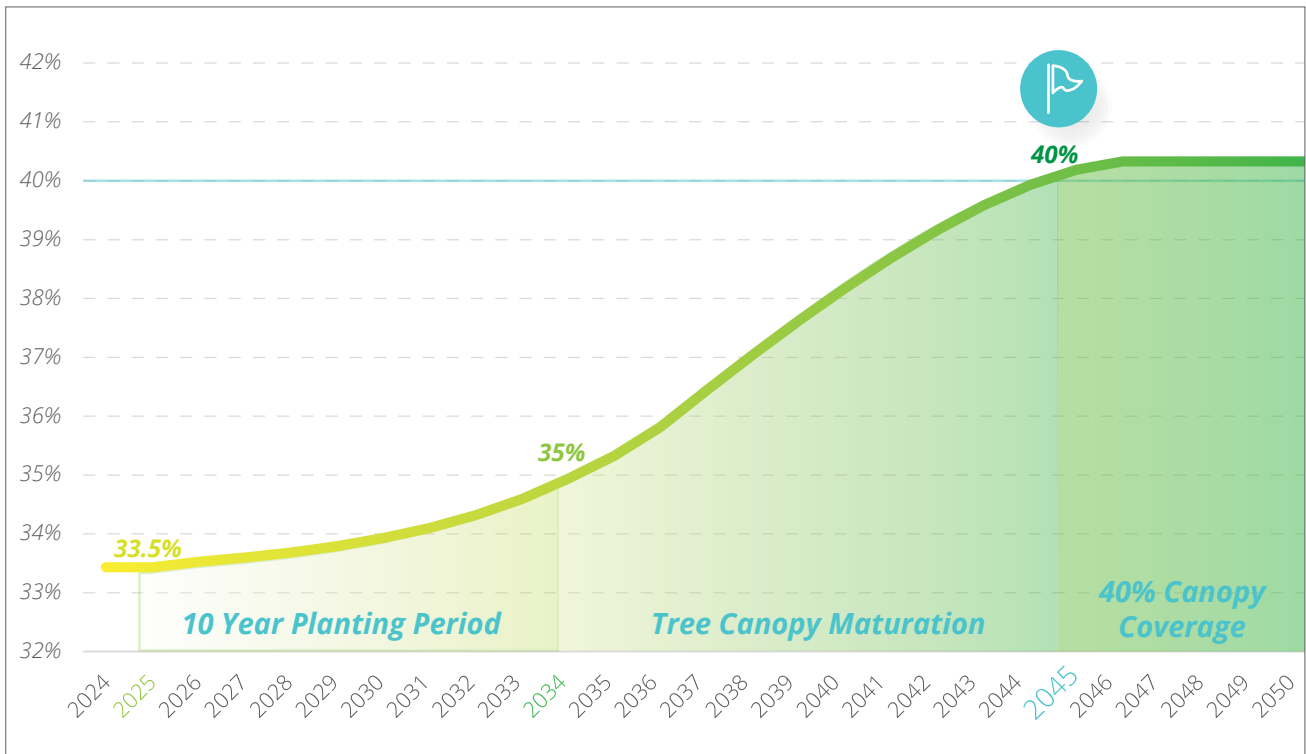
Scenario 4: Depicts a mixed planting of *Small*, *Medium* and *Large* trees with varying canopy spread. Therefore, to achieve an outcome of 40% canopy coverage within the above timeframe 2,872 small trees, 2,423 medium trees and 1,795 large trees respectively will need to be planted over the next 10yrs as per a 20:30:50 ratio.

Table 2. 10 Year Tree Planting Scenarios

	Scenario 1			Scenario 2			Scenario 3			Scenario 4		
	Small 100%	Medium n/a	Large n/a	Small n/a	Medium 100%	Large n/a	Small n/a	Medium n/a	Large 100%	Small 20%	Medium 30%	Large 50%
2025	1436				808				359	288	243	180
2026	1436				808				359	288	243	180
2027	1436				808				359	288	243	180
2028	1436				808				359	288	243	180
2029	1436				808				359	288	243	180
2030	1436				808				359	288	243	180
2031	1436				808				359	288	243	180
2032	1436				808				359	288	243	180
2033	1436				808				359	288	243	180
2034	1432				803				358	280	236	175
Total	14356 Trees			8075 Trees			3589 Trees			2872 + 2423 + 1795 = 7090 Trees		

CANOPY COVERAGE PROJECTIONS

The below infographic depicts the timeline for achieving the target of 40% tree canopy coverage by 2045.



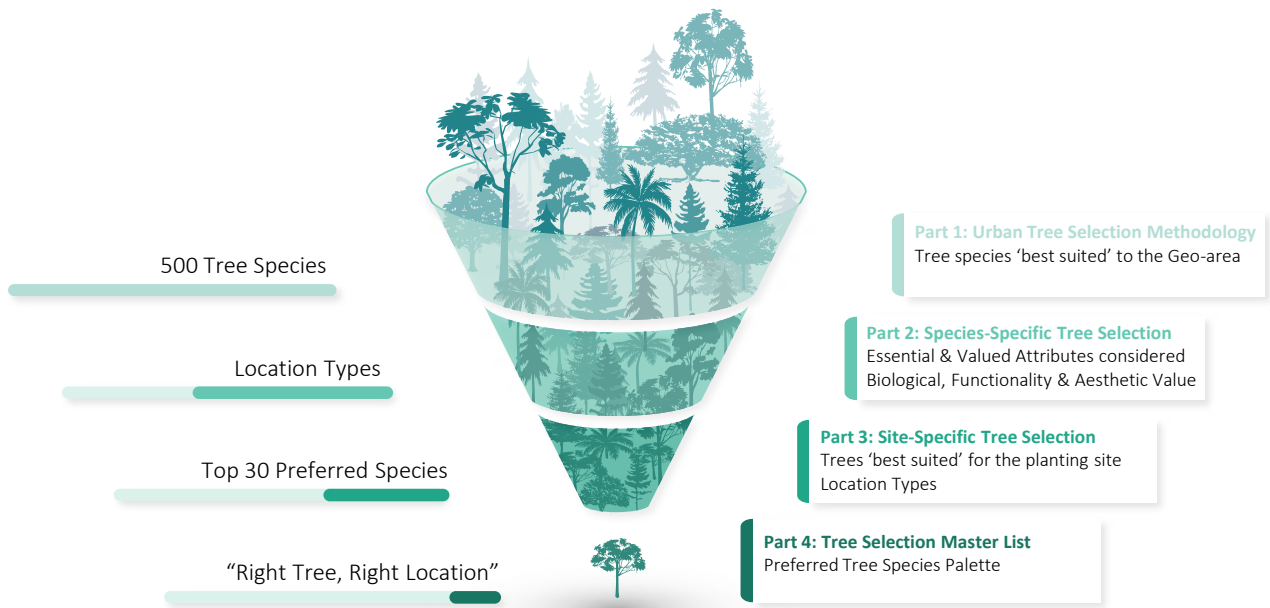
Hunters Hill Canopy Coverage Projection

4.2 RIGHT TREE + RIGHT PLACE + RIGHT WAY

“Plant a Tree, Plant a Memory – Do it Today for Tomorrow” -Yukihiro Matsumoto

Hunter’s Hill Council aim is to increase its tree canopy coverage from 33.5% to 40% by 2045, so as mentioned new tree plantings are an essential ingredient in achieving this target. However, as it has been said *“there are no trees native to the built-up environment”*. Therefore, the selection process of the ‘Right Tree’ (stock and species) for the ‘Right Place’ planted and maintained the ‘Right Way’ must be methodical and unerring as it is critical to the overall result (Miller. 1997).

Historically, the approach to increasing an urban forest has focused primarily on inputs (trees planted) and species bias. However, as opposed to this emotive ‘shotgun’ approach, it is recommended that a more analytical research-based methodology is utilised (Helms. 1998). As depicted in the below infographic, a recommended methodology is in essence a filtering process. Whereby, the most appropriate tree species for the given planting geo-location is selected – i.e., *“the Right Tree, for the Right Location”* (Miller. 1997). Based on this methodology a bespoke Urban Tree Selection Master Plan can be compiled of geographically appropriate trees for the use in both the public and private realm, and both Council representatives, developers and the public can select from. By design an evidence-based tree planting palette is livable, climate-change adaptive and biodiverse, with the aim of educating, whilst inspiring more tree plantings across the community in general.



“Right Tree-Right Place”. An Indicative Urban Tree Selection ‘filter’

4.3 PLANTING OPPORTUNITIES

For any tree to survive (function) it needs five (5) basic resources. These being Sunlight, Water, Oxygen, Micro-nutrients and Space (Trowbridge et.al. 2004). Foreseeably, urban development and its associated Grey Infrastructure significantly impact upon these needs.

In addition, urban sprawl reduces viable green space, resulting in far fewer tree planting opportunities for communities (Wolf. 2008). Therefore, one of the challenges with increasing tree canopy coverage in an urban setting can be finding a planting footprint that has the correct amount of space to satisfy the subject tree planting at maturity- both above and below ground.









However, although planting spaces in Hunters Hill are at a premium, a more creative and innovative approach can be adopted with regards to exploring planting opportunities. Some of these more novel planting opportunities that can be explored are listed below.

In addition to the below alternative planting options, Green Infrastructure alternatives and Tree Sensitive Urban Design installations can also be feasible options for urban greening solutions.



A Memorial planting in Weil Park. Tree planting courtesy of the students from Marist Sisters College

ALTERNATIVE PLANTING OPPORTUNITIES

-  **Institutional Grounds** - hospitals, schools, cemeteries or other public facilities.
-  **New Developments**- mandate Compensatory Replanting and alternative Green Infrastructure installations.
-  **Vacant or Derelict Land** - including former industrial sites and 'Brownfield' lands.
-  **Public Hardscapes**- include TSUD installations in town squares, thoroughfares and civic spaces.
-  **Roof Tops** - integrated roof top gardens, green roofs and vertical gardens.
-  **Public Gardens**- promote and incentivise tree plantings on privately owned land.
-  **Road Corridors**- develop 'blister plantings', median strips and road islands.
-  **Innovative Floating Gardens** - island plantings in waterways.

4.4 PREFERRED URBAN TREES SPECIES

From the estimated seventy thousand (70,000) known tree species, arguably there is no known 'perfect' tree for the urban environment. However, there are hundreds of 'well suited' ones, and this is what makes the selection of the 'right' urban tree species for the provided planting footprint such a fascinating, and yet at times a controversial task.

As alluded to above the selection of a tree that will not just survive but thrive, reaching its full potential in the given planting footprint is a multi-faceted process. Fortunately, a number of horticultural, arboricultural and urban forest experts were involved in the development of the Hunters Hill Urban Forest Management Strategy. Along with their invaluable commentary regarding contemporary urban forestry principles, they graciously contributed to the modest 'Preferred Urban Trees' palette for the Hunters Hill municipality shown below.

All of the below nominated trees have known urban adaptability (a proven track record) and are considered to be 'climate change ready'. This was reaffirmed when the nominated trees attributes were cross-referenced against recognised sources such as the Which Plant Where database; and the NSW Flora Online (PlantNET) which is managed by the Botanic Gardens of Sydney. Therefore, these subject trees can be selected for either a private and/or a public realm planting opportunity.



New tree planting in Boronia Park

Please Note: By design the below tree species palette is liveable and not definitive. For the purposes of this document it contains a modest cross-section of the various tree species that are best suited to the Hunters Hill urban environment. Of note being that the majority of the trees nominated are *Medium* and *Large*. This because although all trees provide eco-benefits, not all trees are equal contributors. Whereas a tree with a large canopy is known to provide exponentially more eco-benefits than a tree with a small canopy, so is always preferred where practicable. This evidenced in the above Canopy Coverage scenario's.

Table 3. Preferred Urban Trees Species

Family	Botanical Name	Common Name	Nominal Height (m)	Nominal Canopy Diameter (m)	Canopy Spread Classification
Myrtaceae	<i>Backhousia citriodora</i>	Lemon Myrtle	8	6	Small
Myrtaceae	<i>Callistemon viminalis</i> *	Weeping Bottlebrush	8	6	Small
Ericaceae	<i>Arbutus unedo</i>	Irish Strawberry Tree	9	6	Small
Sapindaceae	<i>Cupaniopsis anacardioides</i>	Tuckeroo	9	8	Medium
Sapindaceae	<i>Harpullia pendula</i>	Tulipwood	9	8	Medium
Myrtaceae	<i>Tristaniopsis laurina</i> *	Water Gum	10	8	Medium
Proteaceae	<i>Buckinghamia celsissima</i>	Ivory Curl	10	10	Medium
Sapindaceae	<i>Acer palmatum</i> *	Japanese Maple	12	10	Medium
Myrtaceae	<i>Corymbia eximia</i>	Yellow Bloodwood	15	10	Medium
Fabaceae	<i>Delonix regia</i>	Royal Poinciana	12	12	Large
Bignoniaceae	<i>Tabebuia impetiginosa</i>	Pink Trumpet Tree	12	12	Large
Ulmaceae	<i>Ulmus parvifolia</i> *	Chinese Elm	12	12	Large
Bignoniaceae	<i>Jacaranda mimosifolia</i> *	Jacaranda	15	12	Large
Fabaceae	<i>Libidibia ferrea</i>	Leopard Tree	15	12	Large
Myrtaceae	<i>Waterhousea floribunda</i> *	Weeping Lilly Pilly	15	12	Large
Myrtaceae	<i>Angophora costata</i>	Sydney Red Gum	18	12	Large
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple	18	12	Large
Altingiaceae	<i>Liquidambar formosana</i>	Chinese Sweet Gum	18	14	Large
Magnoliaceae	<i>Liriodendron tulipifera</i>	Tulip Tree	18	14	Large
Myrtaceae	<i>Lophostemon confertus</i> *	Queensland Brush Box	20	15	Large
Myrtaceae	<i>Corymbia citriodora</i>	Lemon-Scented Gum	25	15	Large
Myrtaceae	<i>Corymbia maculata</i> *	Spotted Gum	25	15	Large
Myrtaceae	<i>Eucalyptus microcorys</i>	Tallowwood	25	15	Large
Myrtaceae	<i>Eucalyptus saligna</i>	Sydney Blue Gum	25	15	Large
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum	25	15	Large
Moraceae	<i>Ficus benjamina</i>	Weeping Fig	20	20	Large
Moraceae	<i>Ficus rubiginosa</i>	Port Jackson Fig	20	20	Large
Fagaceae	<i>Quercus palustris</i> *	Pin Oak	20	20	Large
Platanaceae	<i>Platanus orientalis</i> *	Oriental Plane Tree	25	20	Large
Platanaceae	<i>Platanus x acerifolia</i> *	London Plane Tree	25	20	Large

* Indicates that Varieties of this tree species are available. Further information regarding the biometrics and species-specific traits of these trees is easily obtainable from a recognised grower.

Please Note: A Local Native Plant List can also be referenced on the Hunters Hill website courtesy of Hunters Hill Bushcare.



PART 5

RECOMMENDATIONS

5.1 OVERVIEW

“Normality is a paved road; it’s comfortable to walk, but no flowers grow” – Vincent Van Gogh

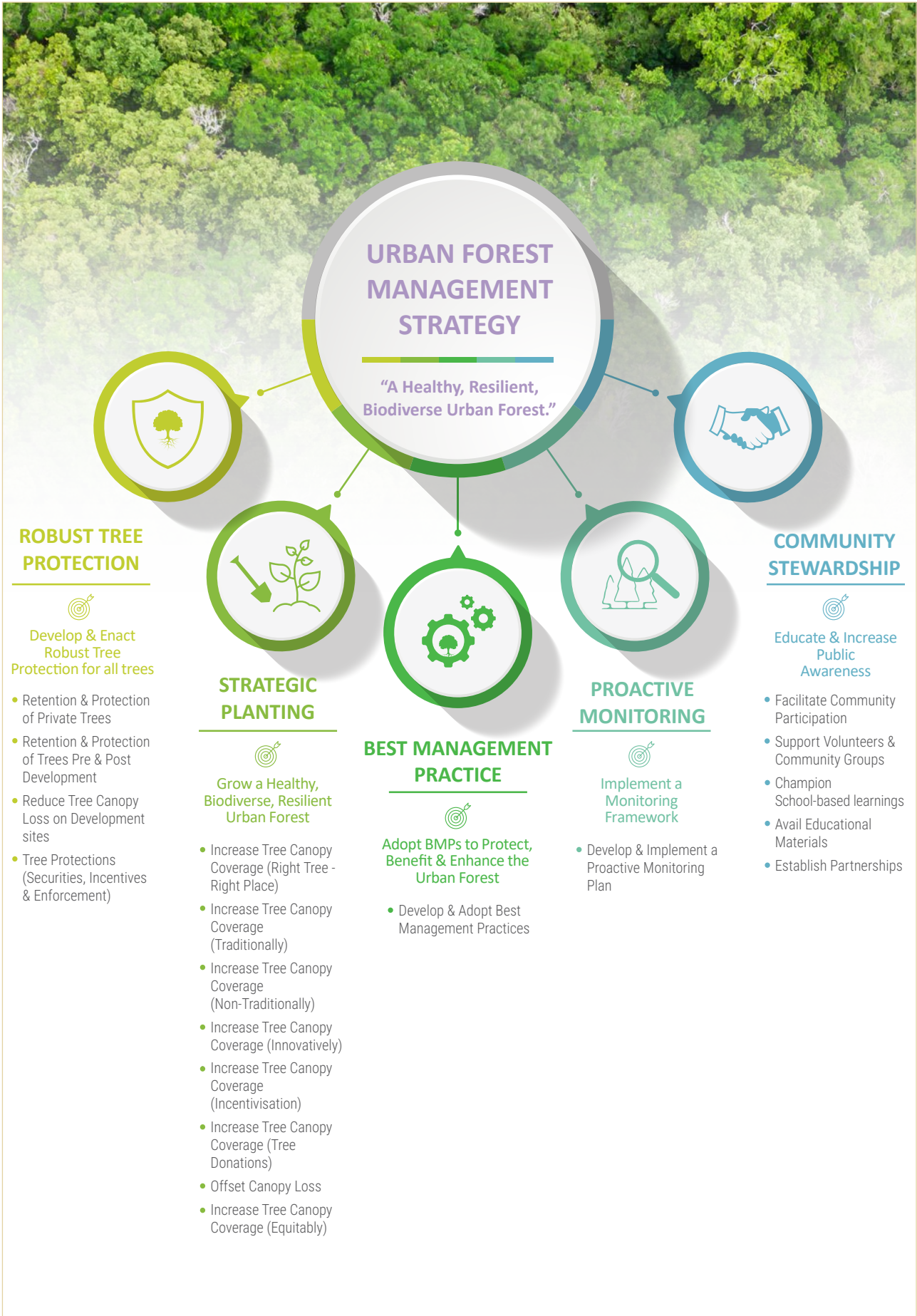
The Hunters Hill Urban Forest Management Strategy was developed with and for the community. Its intention is to provide a set of actionable recommendations that can be candidly discussed and developed for the enhancement of the Hunters Hill urban forest. In particular, this Strategy highlights the need for public and private tree preservation; increased ‘Right tree’ plantings; the implementation of Best Management Practices; and greater tree protection for trees on development sites.

Other points worthy of further consideration include: innovative planting opportunities, incentivisation, increased community initiatives and engagement, and the possible collaborative opportunities with research institutions, developers, corporations neighbouring councils, schools and community groups. All of which will contribute to the enhancement of the Hunters Hill urban forest and benefit the community long-term.

Please note that the overarching principles and the following outlined recommendations of this Strategy are not to be considered mutually exclusive, nor individual. They are simply elemental pieces that are intended to overlap and complement each other. This with the common interest of increasing awareness about the Hunters Hill urban forest, its numerous and diverse benefits that it provides, and the practical steps needed for its enhancement long-term. Whereby, the community’s vision of a healthy resilient, biodiverse urban forest that provides eco-benefits for the enjoyment and well-being of the Hunters Hill community is realised.



Hunters Hill



5.2 ROBUST TREE PROTECTION

“The most ethical choice is the one that will produce the greatest good for the greatest number.”

– Bentham. 1789



OVERVIEW

Establishing and enabling a robust Tree Protection framework is an essential step in achieving the Hunters Hill community vision. As outlined above, the major contributors to the decline of the Hunters Hill urban forest and subsequent tree canopy coverage loss are apathetic urban development and the unwarranted removal of trees due to unqualified arboricultural opinion. However, both of these concerns can be addressed and mitigated by the enactment of coherent Council policy and procedure that mandates tree protection congruent with the best interests of the community and the environment.



Develop and enact robust tree protection for all trees within Hunters Hill.

KEY OBJECTIVE 1: RETENTION AND PROTECTION OF PRIVATE REALM TREES

✓ **Recommendation: Review and amend the Hunters Hill Tree Removal Policy criteria.**

All Applications regarding Tree Removal or Tree Pruning must be accompanied by an Arboricultural Report. This Report must be authored by a suitably qualified Consulting Arborist (AQF Level 5 min.); and must include a recognised tree risk assessment to support the Application (e.g., TRAQ, QTRA, VALID or MIS501). The author must have no discernible affiliation with a tree contracting company.

KEY OBJECTIVE 2: RETENTION AND PROTECTION OF TREES PRE-AND-POST DEVELOPMENT

✓ **Recommendation: Review and where practicable amend the Development Application criteria.**

All Development Applications must be accompanied by an Arboricultural Impact Assessment Report which includes a site-specific Tree Protection Management Plan ('Report'). This Report must be authored by a suitably qualified Consulting Arborist (AQF Level 5 min.) and authored per the criteria outlined in *AS4970-2009 Protection of trees on development sites*. The author must have no discernible affiliation with a tree contracting company and/or the Developer(s). In addition, when any works are to be conducted within the calculated Tree Protection Zone, initial Non-Destructive Root Exploration must be carried out, and a Root Mapping Report authored by a Consulting Arborist. This Report is to be submitted with the Development Application. The Consulting Arborist must have no discernible affiliation with a tree contracting company and/or the Developer(s).

KEY OBJECTIVE 3: MITIGATE TREE CANOPY COVERAGE LOSS ON DEVELOPMENT SITES

✓ **Recommendation: Update policies to include canopy coverage targets on developments sites.**

Develop urban forest canopy coverage targets by land-use type or neighbourhood, in coordination with other Planning policies and Council objectives, updates and sustainable site design goals. For example, establish requirements for development sites to have a minimum of 20% projected tree canopy cover onsite, or pay a Financial Contribution (FC) to Council for a tree(s) to be planted, which includes the first two (2) years maintenance (please refer NSWDP&E and the Greening Sydney Strategy).

KEY OBJECTIVE 4: TREE PROTECTIONS (SECURITIES, INCENTIVES & ENFORCEMENT)

✓ **Recommendation: Discuss and where practicable adopt mechanisms to enable securities to be taken for Tree Protection compliance and Compensatory Replanting.**

- **Tree Management Incentives:** Council has the ability to develop a range of incentives that recognises and rewards the public for tree sensitive activities, for preserving and increasing tree canopy coverage and stewarding areas of ecological interest on private land. These incentives can be applied at subdivision, demolition and/or development approval stage and applied to any private lot. They should be tied to some form of legal agreement and have a long-term timeframe. Some of these incentives provided may include amendments to building restrictions and ‘fast-track’ approvals, and/or assistance with Tree Sensitive Urban Design, alternative Green Infrastructure technologies, tree selection and arboricultural management.
- **Tree ‘Green’ Bonds:** Local Laws can impose Tree Bonds where development works and/or other activities (i.e., pruning) have the potential to impact on public trees/ Council Street trees. This bond for the protection of the tree can be held by the Council prior to the commencement of development; and released in whole or part thereof on completion of the development works per the following criterion. Whereas, if the subject tree is damaged, dies or is removed as a result of development, without Council authorisation, the trees value (e.g., per MIS506 Tree Valuation), and tree replacement costs can be deducted from the full bond. In addition, if a tree is damaged or pruned without authorisation, the bond or part thereof may be retained dependent on the impact caused to the tree.
- **Significant Tree Register:** Hunters Hill has a Significant Tree Register which affords additional protection to notable tree(s). It is recommended that this option is reviewed by a suitably qualified and experienced arborist (AQF Level 5 min.), and aggressively promoted to the public and community groups. More information regarding this Register can be found on the Council website.
- **Enforcement Action:** Council can take enforcement action, including criminal prosecutions in the Land and Environment Court or Local Court, in relation to unauthorised tree removal. Commencement and successful prosecution for unauthorised tree removal provides for, among other things, general deterrence by sending a message to the community of the importance to obtain approval prior to removing or damaging trees/vegetation and the potential consequences and penalties of such action. Council can also commence civil enforcement proceedings in relation to unlawful tree or vegetation removal. Penalty notices for unlawful tree vegetation removal may also be issued.
- As with other LGAs, a dedicated Ranger for parks and tree compliance should be considered, who can issue on the spot fines for illegal tree removals/pruning per the EPA Act.

5.3 STRATEGIC PLANTINGS

“The best time to plant a tree was 20 years ago, the second-best time is now.” - Chinese Proverb



OVERVIEW

Hunter’s Hill Council aims to increase its tree canopy coverage from 33.5% to 40% by 2045. Understandably, new tree plantings are an essential ingredient, and alternative tree planting scenarios have been provided to achieve this target. However as per the above rationale, an urban forest is not determined by the sheer number of trees it plants, but by those trees that become established and reach their full potential as community assets. Therefore, the initial selection of the best suited tree (‘Right Tree’) for the planting opportunity (‘Right Place’) is key. In addition, planting opportunities are not infinite, so ‘less conventional’ and innovative planting opportunities will need to be sourced. This includes the consideration of ‘Green Infrastructure’ installations and Tree Sensitive Urban Design.



Grow a healthy, biodiverse, resilient urban forest for the well-being of the community.

KEY OBJECTIVE 5: INCREASE TREE CANOPY COVERAGE: (RIGHT TREE - RIGHT PLACE)

✓ Recommendation: Develop an Urban Street Tree Selection Master Plan

Develop an Urban Street Tree Selection Master Plan that contains a bespoke tree species list that is both geo-specific and species-specific to Hunters Hill. In addition, this document will outline the correct methodology and considerations needed to be undertaken when planting a tree. This including stock selection, soil volumes, site selection, planting techniques and plant health aftercare. This document can then be utilised as both a regulatory and a reference document for Council staff, contractors, property owners, and developers in relation to Best Management Practices, recognised industry specifications and Australian Standards.

KEY OBJECTIVE 6: INCREASE TREE CANOPY COVERAGE (TRADITIONALLY)

✓ Recommendation: Increase Council tree plantings in the more traditional planting locations.

Explore and increase Council tree plantings in streetscapes, parks and reserves. This should include the prioritisation of new tree plantings in neighbourhoods with less tree canopy cover, the inclusion of large tree plantings in public developments per a Consulting Arborists guidance, and the replacement of failing and failed plantings. (As per the rationale outlined below in Proactive Monitoring, a desktop analysis of Hunters Hill to locate viable planting footprints (traditional and innovative) can be conducted to maximise future planting opportunities).

KEY OBJECTIVE 7: INCREASE TREE CANOPY COVERAGE (NON-TRADITIONALLY)

✓ Recommendation: Increase Council tree plantings in non-traditional locations.

Seek out and increase Council tree plantings in areas that are less traditional. As above-mentioned, some of these areas may include institutional grounds, derelict sites and civic hardscapes.

KEY OBJECTIVE 8: INCREASE TREE CANOPY COVERAGE (INNOTIVELY)**✓ Recommendation: Investigate and candidly consider the utilisation of alternative Green Infrastructure technologies and Tree Sensitive Urban Design**

Investigate where the use of Tree Sensitive Design can be implemented to retain and include trees (e.g., the use of tree pits and soil cells in hardscapes and developments); and the inclusion of alternative Green Infrastructure (e.g., green roofs, living vertical walls and permeable surfaces). Both of these options should be candidly discussed in planning and design meetings and included in both public and private developments where practicable.

KEY OBJECTIVE 9: INCREASE TREE CANOPY COVERAGE (INCENTIVISATION)**✓ Recommendation: Investigate and develop ways in which Council can incentivise and encourage private landowners to retain and plant more trees**

This may include free trees, subsidised trees, or nursery rebate programs. Of interest being that various Councils have mooted the idea of enabling a small rates discount for a no net change or increase in tree cover and an effective rates penalty for any decrease. The objective is to make residents realise that we are all responsible for the greenness of our neighbourhoods, and the benefits are so important that the local government is prepared to provide financial incentives to retain or increase tree canopy cover on private residential properties.

KEY OBJECTIVE 10: INCREASE TREE CANOPY COVERAGE (TREE DONATIONS)**✓ Recommendation: Develop and adopt a Tree Donation program**

Develop a 'Donate a Tree' program that both encourages the public, businesses, corporations, and associations to fund a public tree planting and/or participate in community tree plantings. Incentives may include tax deductions, public recognition, advertising and social networking at gatherings.

KEY OBJECTIVE 11: OFFSET TREE CANOPY COVERAGE LOSS**✓ Recommendation: Develop and adopt a comparative Compensatory Replanting ratio**

Compensatory Replanting should not be exclusively relied upon to secure good tree outcomes, and a tree with a positive retention value should be retained where practicable. Albeit trees die, and tree retention is not always practicable. Therefore, to offset tree canopy loss a realistic Compensatory Replanting ratio needs to be formulated and mandated. (As abovementioned, Financial Compensation should also be a consideration).

KEY OBJECTIVE 12: INCREASE TREE CANOPY COVERAGE (EQUITABLY)**✓ Recommendation: Prioritise planting in streets and suburbs with lesser Tree Canopy Coverage**

Trees and tree canopy cover is essential to the health and well-being of the community. As such, all community members should have the opportunity to benefit from the numerous eco-benefits that an urban forest provides. Therefore, any plantable areas or neighbourhoods that have significantly lower tree canopy cover should be prioritised for new tree plantings, and where applicable alternative planting footprints developed.

5.4 BEST MANAGEMENT PRACTICES

“An urban forest is best managed when it provides the inhabitants with a continuing level of economic, social and environmental benefits today and into the future” - Robert Miller



OVERVIEW

Establishing significant urban tree canopy takes time, so planting a tree is a long-term investment. Therefore, it is essential that educated and well-informed decisions are made to allow the subject tree to fulfill its potential. To better manage an urban forest, Best Management Practices (BMPs) need to be integrated into tree management frameworks and everyday arboricultural practices. In essence, BMPs are a set of proven and tested methods based on current industry standards and evidence-based research. To assist in better managing the Hunters Hill urban forest, and thereby achieving the community’s vision, it is recommended that a liveable Technical Manual underpinned by the relevant industries BMP’s is developed.



Adopt Best Management Practices to protect, benefit and enhance the Hunters Hill urban forest.

KEY OBJECTIVE 13: DEVELOP AND ADOPT BEST MANAGEMENT PRACTICES

✓ Recommendation: Develop an Urban Tree Management Technical Manual

It is recommended that a Technical Manual is developed to provide the necessary technical framework and guidelines to ensure the best long-term outcomes for a tree. This is to include: tree stock selection, planting footprint requirements, tree planting and establishment, maintenance requirements and any other necessitated tree management decisions. In addition, this Manual is to outline the relevant Australian Standards and stair-step methodology that must be adhered too with regards to tree protection and urban development, construction and any other form of works that may foreseeably cause arboricultural impact. This Manual can then be utilised as both a regulatory and a reference document for Council staff, contractors, property owners, and developers in relation to tree planting, urban development and general urban tree management.

5.5 PROACTIVE MONITORING

“It is that range of biodiversity that we must care for. The whole thing, rather than just one or two stars.”

- Sir David Attenborough



OVERVIEW

An urban forest is made up of dynamic living organisms. Therefore, ongoing monitoring and the utilisation of data-driven technologies to fill in known, unknown and unforeseeable knowledge gaps is crucial to securing successful long-term outcomes. Scheduled monitoring provides real-time data needed to objectively review the efficacy of current strategy, policy and procedure, and whether adaptive management is required. In addition, this data can be shared with industry professionals, academics, decision-makers and the wider community in an effort to stimulate proactive urban forest related discussion, support citizen-science and aid technological innovation.



Implement a monitoring framework so informed decisions can be formulated to optimise the eco-benefits and eco-services of the Hunters Hill urban forest.

KEY OBJECTIVE 14: DEVELOP A PROACTIVE MONITORING PLAN

✓ **Recommendation: Develop a Monitoring Plan with adaptive management capabilities**

Develop a livable Monitoring Plan for the Hunters Hill urban forest that includes an Annual Review of any recommended actions, objectives, and planting targets. In addition, this Plan should also include the scheduling of larger surveys and inventories such as:

- A Tree Canopy Coverage Survey of Hunters Hill scheduled for every five (5) years; and
- A ground-based Street Tree Inventory scheduled for every three (3) years.
- Use of Aerial Imagery to identify tree canopy on both private and public land to enable improvement of tree canopy coverage.

The data captured from these surveys will assist in adaptive management decisions regarding the 40% tree canopy coverage target and new plantings; the equitable distribution of tree canopy coverage, reviewed planting priorities and the allocation of resources; biodiversity ratios and the identification of areas needing concerted conservation efforts; urban planning and development decisions, eco-services provided; proactive pest and disease management; science-based research and the development of green technologies; climate-change forecasting, adaptability and bench-marking; raise public awareness about the importance of trees and provide educational materials to encourage community engagement and urban forest advocacy. All of which are key considerations in furthering the Hunters Hill urban forest.

5.6 COMMUNITY STEWARDSHIP

“Bringing nature into the classroom can kindle a fascination and passion for the diversity of life on earth and can motivate a sense of responsibility to safeguard it.” - Sir David Attenborough



OVERVIEW

The Hunters Hill urban forest consists of both private and public realm trees. Therefore, the responsibility of protecting and growing it is a shared responsibility. Therefore, proactive community participation, ongoing co-operation and urban forest stewardship is vital to the achievement of the community vision.



Educate and Increase Public Awareness to inspire Urban Forest Stewardship

KEY OBJECTIVE 15: ENCOURAGE AND FACILITATE COMMUNITY PARTICIPATION

✓ Recommendation: Community Approach (Organise Eco-events)

To inspire a sense of ownership and stewardship, stage community Tree Planting days, neighbourhood Greening projects and Citizen-science projects for the community to participate in. In addition, encourage local businesses, neighbourhood Councils, Developers, the wider Green industry and flora and fauna groups to get involved.

KEY OBJECTIVE 16: SUPPORT COMMUNITY GROUPS

✓ Recommendation: Support local volunteers in Urban Greening initiatives

Promote, support and provide resources to local urban greening volunteers, bushcare and landcare groups.

KEY OBJECTIVE 17: CHAMPION SCHOOL-BASED LEARNING

✓ Recommendation: Assist and promote School-based Learnings

Promote and contribute resources to school-based urban forest education. With the emphasis on ‘hands-on’ urban greening activities (plantings) and the promotion of urban forestry and environmental career pathways.

KEY OBJECTIVE 18: DEVELOP PUBLIC AWARENESS

✓ Recommendation: Avail educational materials

Provide access to educational materials and develop an online hub for learning about trees and the benefits of a healthy urban forest. In addition, a forum space should be provided to enable people to discuss and collaborate on possible urban greening projects, green infrastructure technologies and urban forest initiatives.

KEY OBJECTIVE 19: ESTABLISH PARTNERSHIPS

✓ Recommendation: Initiate and host Knowledge Sharing Forums

Engage and build relationships with the Traditional Owners, local Community groups, educational institutions, local authorities, and neighbouring Councils. This with regards to sharing ideas, resources and technologies that can assist in the protection and growth of the Hunters Hill urban forest.

AFTERWORD

“I see trees of green, red roses too ... and I think to myself What a Wonderful World”

- Louis Armstrong

Indisputably, trees and the collective urban forest are crucial contributors to the livability and well-being of a community. As evidenced, a healthy urban forest adds vibrancy and interest to a place, whilst delivering a multitude of often unseen and/or un contemplated eco-benefits and eco-services to a community on an every-day basis.

However, as an urban forest consists of dynamic, living organisms it needs to be protected and cared for accordingly. This even more important nowadays, due to climate change and the adverse impacts associated with increased densification and urban development. Hunter’s Hill Council acknowledges this fact and realises the need to proactively adapt its tree management methodologies and procedures for the better of the community. Hence the commentary and recommendations provided in this Strategy will allow informed decisions to be made for the betterment of the Hunters Hill urban forest.

Albeit the safeguarding, future growth and vitality of the Hunters Hill urban forest is not solely reliant on ‘carrot and stick’ ordinances, nor a mosaic of professionals. Realised success and the actualisation of the Hunters Hill vision ultimately needs discerning participation, advocacy and stewardship from the Hunters Hill community. As echoed in the words of Sir David Attenborough –

“What we humans do over the next 50 years will determine the fate of all life on the planet. So, leave a legacy and plant a tree or two”.



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APPENDIX A: VOLUNTEER GROUPS

“Having public agencies, private landholders, the green industry, and neighbourhood groups all share the same vision of the city’s urban forest is a crucial part of sustainability. This condition is not likely to result from legislation. It will only result from a shared understanding of the urban forest’s value to the community and commitment to dialogue and cooperation among the stakeholders.”

- James Clark

Concurrent with the staff from Hunter’s Hill Council, the urban forest and its inhabitants (fauna and flora) are actively cared for by various community groups. We thank these below-mentioned “eco-warriors” for graciously giving up their time and participating in urban greening activities for the betterment of the community.

- Happy Hens Community Gardens
- Landcare Australia Corporate Environmental Volunteering Program
- ECOBEL
- Friends of Kellys Bush
- Greater Sydney Landcare Network
- The Priory Bushcare Group
- Habitat Network
- Friends of Ferdinand Street Reserve
- Tarban Creek Action Group
- Tarban Creek Bridge Bushcare Group
- Bedlam Bay Bushcare Group
- Friends of Betts Park and Gladesville Reserve
- Friends of Buffalo Creek and the Great North Walk
- Collingwood Street Reserve Bushcare Group
- Friends of Boronia Park
- Riverglade Bushcare Group
- River to River Project (2010-2012)
- Ryde-Hunters Hill Flora & Fauna Preservation Society

Please see the following commentary, which was authored and provided by the Hunters Hill Bushcare. Whom of which are great contributors to the growth and overall vitality of the Hunters Hill Urban Forest. For further information regarding this group, its activities, biodiversity considerations and/or native plant lists please refer to the Hunter’s Hill Council website.

Bushland Management Advisory Committee: Commentary

The Municipality of Hunters Hill supports a high diversity of native species, including 1 critically endangered ecological community, 3 threatened ecological communities, 20 known threatened flora and fauna and 27 species identified as locally significant. There are regionally significant biodiversity corridors both along and between the Lane Cove and Parramatta Rivers. These ecosystems and flora and fauna species are actively managed by Council working together with 11 Bushcare groups. (Lapa et al 2021).

Increasingly, research at the city/county scale as well as at the landscape scale reveals that urban areas can contain relatively high levels of biodiversity. Important percentages of species found in the surrounding natural habitat, including endangered species, have been found in the urban forest. (Alvey 2006). Therefore, a balance is needed to protect and support local biodiversity with the provision of crucial ecosystem services to people (Dickinson et al 2022). An extensive urban forest, especially consisting of diverse vertical complexity and canopy connectivity, encourages strong biodiversity outcomes. When there is good vertical complexity (a diverse mix of groundcover, understory, and canopy) habitat is diversified; this supports an improved biodiversity of mammals, birds, reptiles, and insects. (Alvey 2006; Craig, 2004; Gibson et al. 2004; Strehlow et al. 2004; Threlfall et al 2017).

The network of street trees, parks, private gardens, and bushland reserves are important biodiversity corridors for flora and fauna species (Garden et al 2010). Understanding species-specific requirements and sensitivities is important for planning and managing our urban forests for native biodiversity (Garden et al 2007). Research has found that biodiversity conservation is actively considered in the planning and management of urban forest in natural areas and parks, but rarely in streetscapes (Dickinson et al 2022).

Individual trees can also provide foraging resources (e.g., fruits and flowers), nesting and roosting resources (hollow-bearing trees are particularly important as well as retention of dead and fallen trees), and potential safe havens for species escaping dangers (e.g. cats and dogs) (Garden et al 2010). Native trees are most likely to support larger numbers of native species and species assemblages (White et al., 2005; Threlfall et al., 2015), however emerging evidence indicates that non-native trees can play important roles in supporting native biodiversity in cities (Liu and Slik, 2022). The recommendation is to use local native species for street trees where possible and select species from nearby local bushland reserves, including trees with dense canopy (e.g., *Melaleuca linariifolia*) as well as species with good foraging and habitat values (e.g. *Banksia*, *Leptospermum*, *Hakea* species). Species selection should also allow for adaptability to climate change, aging/senescence, and experiment using multiple tree species in any given streetscape (Debrincat 2024).

There are also opportunities to plant more structured and diverse habitat within the parks and bushland reserves and promote habitat planting in private gardens to improve biodiversity corridors. Native fauna in particular need an increase in dense protected habitat areas to survive and to be able to move safely from place to place (Debrincat 2024). The co-benefits to biodiversity from tree and understory plantings can be directed towards rebuilding biodiversity corridors, replenishing foraging and habitat resources, restoring natural ecosystem processes, and inhibiting pest species incursions. In particular, identifying locally, state and nationally threatened species and/or communities and their requirements and sensitivities should be used to inform the selection of tree species as well as the spatial location of plantings. (Edge Environment 2022).

In addition, improving native biodiversity will require protection of existing trees and habitat; retaining vegetation across development and infrastructure zones (Seed Consulting Services 2019); strategic planning to connect green space in development sites with external green spaces in the parks, reserves etc. (Debrincat 2024); and the use of key planning mechanisms (Local Environment Plan and the Development Control Plan) to implement vegetation controls to protect existing trees and native habitat and enhance connectivity, including promoting green roofs and green walls (Seed Consulting Services 2019).

Hunters Hill Bushcare Planting Activities



2019 Bedlam Bay Community Planting



2019 Gladesville Reserve Riverside Girls High



2021 Boronia Park Corporate Planting



2021 Gladesville Reserve Planting With HappyHens



2023 Hunters Hill Moocooboola Festival



2023 Riverglade Reserve Community Planting



2024 Buffalo Creek Reserve Bushcare Planting



2024 Riverglade Reserve Community & Corporate Planting

Photo Credit: Hunters Hill Bushcare

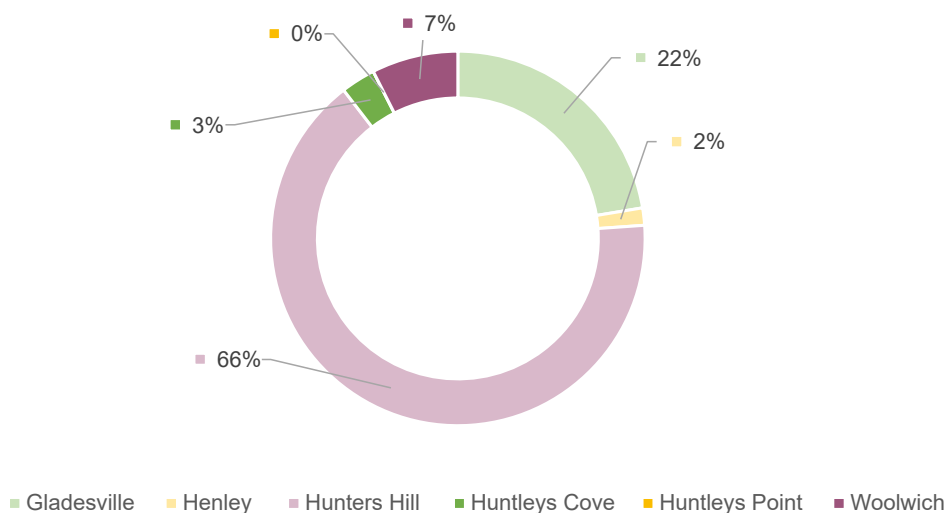
APPENDIX B: COMMUNITY SURVEY 2024

“They are beautiful in their peace; they are wise in their silence. They will stand after we are dust. They teach us, and we tend them.” - Galeain ip Altium

The following survey questionnaire overarches various key aspects related to urban forest awareness, usage patterns, priorities for improvement, community engagement and its future vision. Its aim is to gather diverse perspectives and preferences to inform the development of a comprehensive Urban Forest Strategy.

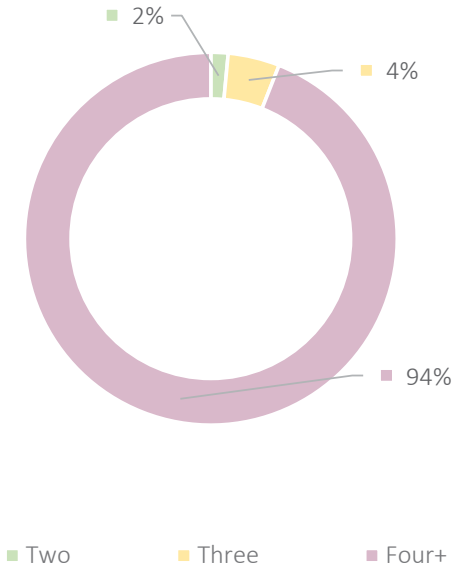
As above mentioned Community Stewardship is a key element with regards to developing an informed Urban Forest Strategy. Therefore, we thank the people that took the time for participating in this survey questionnaire and for the additional comments that they chose to provide. The results and the comments will be taken into consideration and under advisement during the development process and finalisation of the Hunters Hill Urban Forest Management Strategy, 2024.

Please see the following results from the twelve (12) survey questions posed for a small insight into the Hunters Hill community beginning with the participants suburb of residence

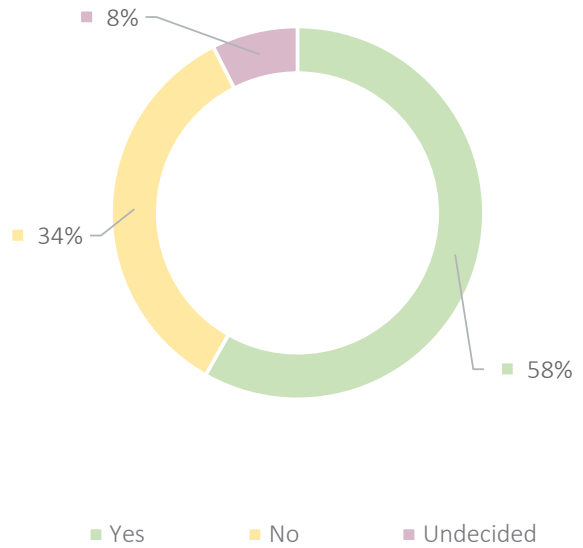


Community Participation by Suburb

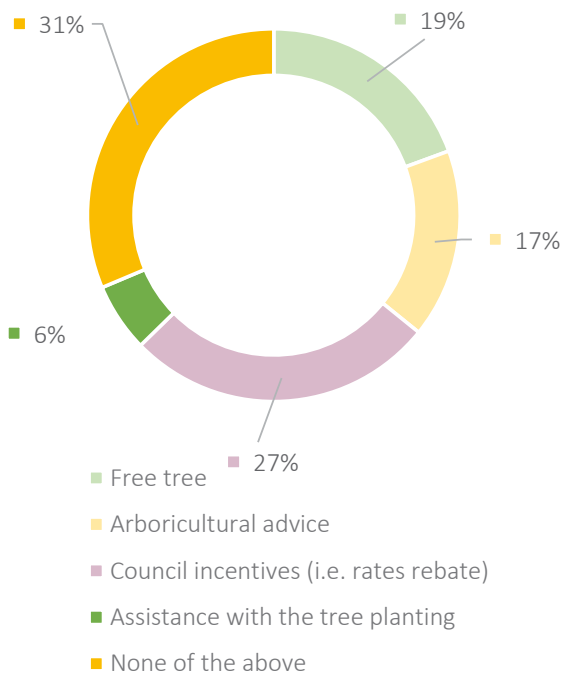
1. How many trees can you see from your house windows?



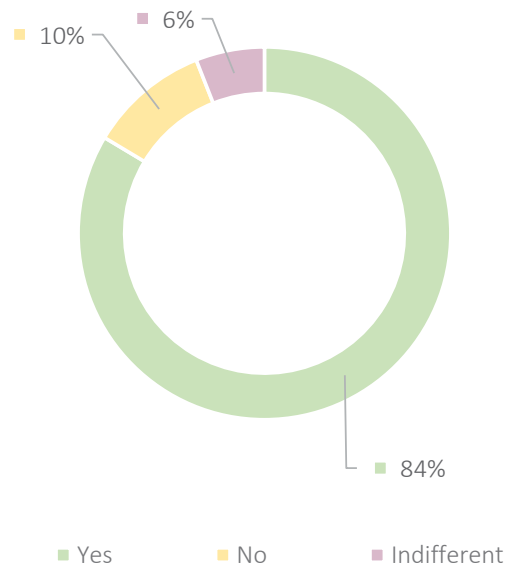
2. Would you like more trees in your garden?



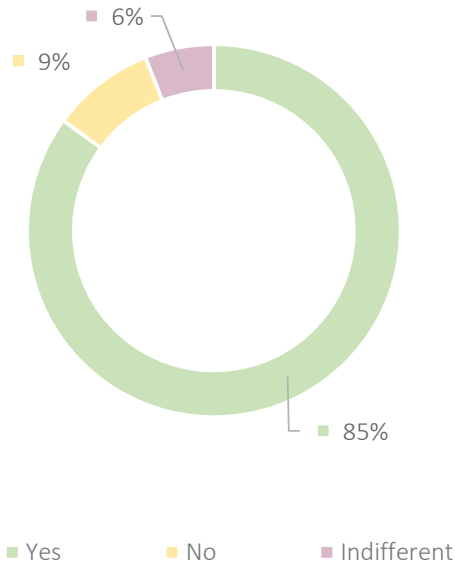
3. What would encourage you to plant a tree in your garden?



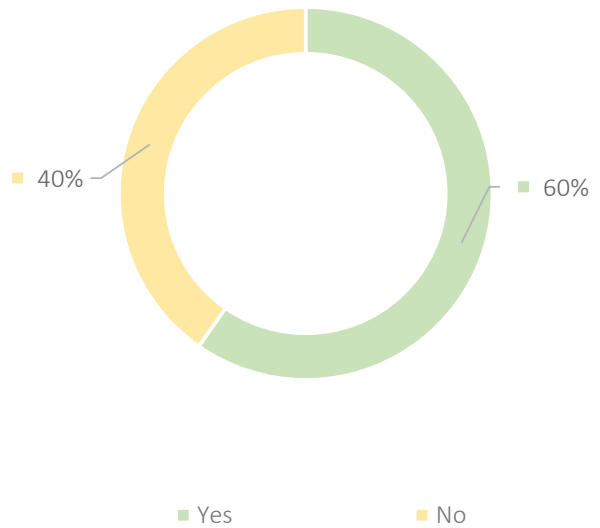
4. Would you like to see more trees planted in your local streetscapes?



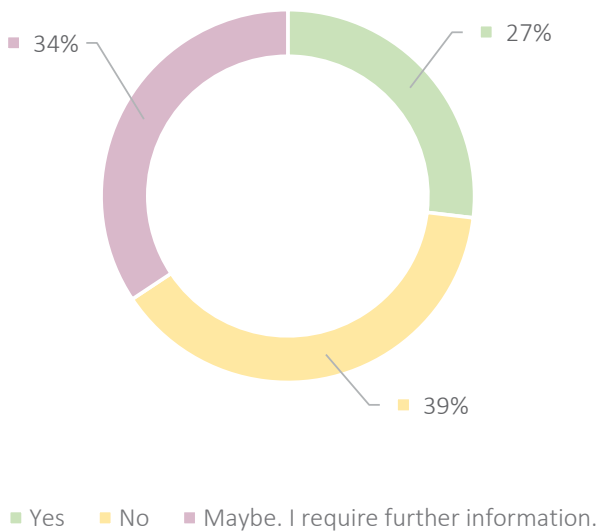
5. Would you like more trees planted in your local parklets, parks and greenspace areas?



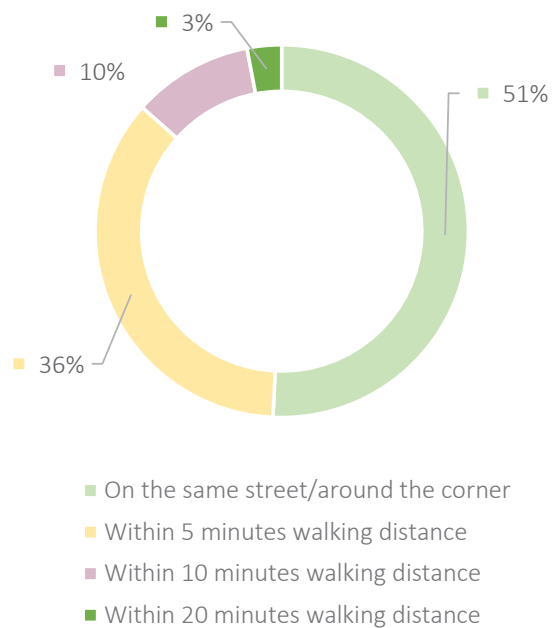
6. A healthy urban forest provides a host of eco-services and eco-benefits. Would you like to know more about this subject and the urban forest in general?



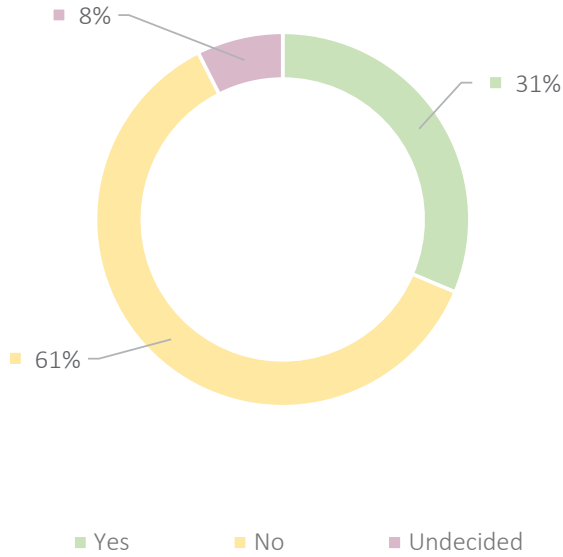
7. Would you like to join or participate in community greening groups such as Bushcare and/or related workshops?



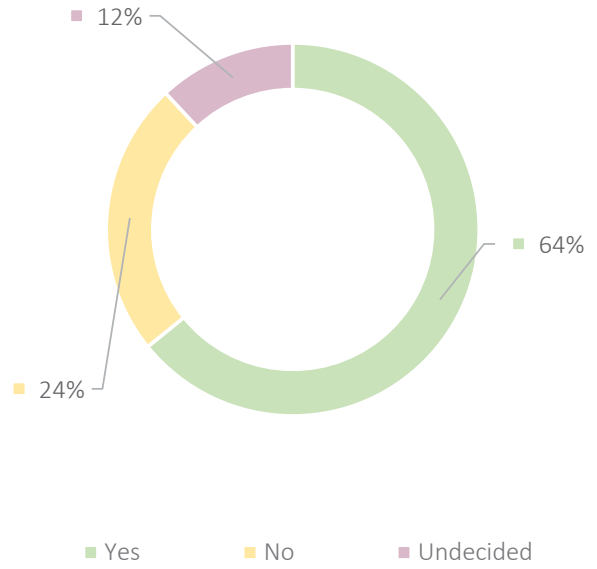
8. How far do you live from your closest park, bushland and/or greenspace area?



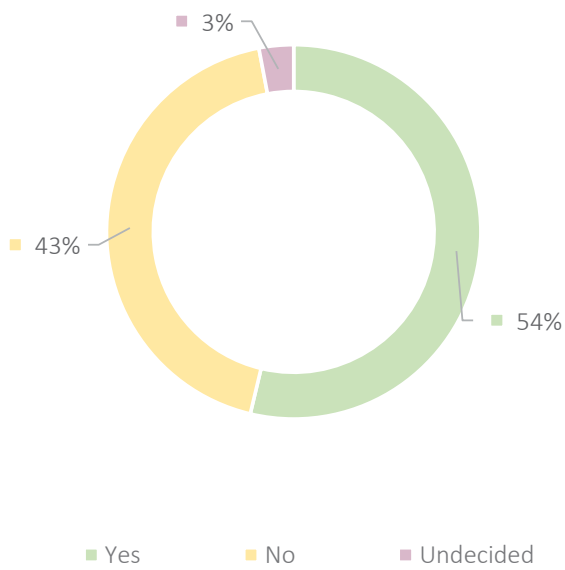
9. Do you feel community trees have adequate protection from development?



10. Would you like to see the adoption of stricter criteria regarding any tree removal (including illegal tree removal)?



11. Would you like more information regarding best management practices and plant health care?



12. Have you observed changes in our tree canopy over the last 5 - 10 years?

