Draft – Banyule Urban Forest Strategy

2022-2032

Banyule
City Council

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Acknowledgements

Banyule City Council is proud to acknowledge the Wurundjeri Woi-wurrung people as traditional custodians of the land and we pay respect to all Aboriginal and Torres Strait Elders, past, present and emerging, who have resided in the area and have been an integral part of the region's history.

Our community is made up of diverse cultures, beliefs, abilities, bodies, sexualities, ages and genders. Council is committed to access, equity, participation and rights for everyone; principles which empower, foster harmony and increase the wellbeing of an inclusive community.

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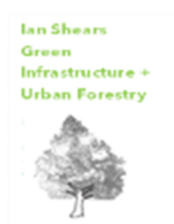
Message from the Mayor

Banyule City Council residents have a strong connection to natural and green spaces including its population of more than 150,000 public trees and with much more living in the private realm. Banyule recognises the vital contribution the Urban Forest provides both for biodiversity and habitat as well as neighbourhood character and designed amenity. With pressures of growth and climate change the importance of the ecosystem services, these trees provide, including shade and cooling, will be essential for Banyule to provide a liveable city to present and future generations. This strategy has been developed by working closely with the community and undertaking direction to include the community as joint custodians of the Urban Forest.

Executive Summary

Banyule City Council has a long history of valuing and improving its management of the city's urban forest, trees and greening, and developed its first Urban Forest Strategic Plan in 2015. In 2019 Council declared a Climate Emergency and recognised the need for an updated approach to managing its urban forest.

This strategy provides a summary of the:

- benefits of the urban forest
- challenges for urban forestry
- current state of the urban forest in Banyule
- strategic framework that will guide action (definition, vision, principles and key directions)
- major actions to be taken over the next ten years
- measures of success

The Strategy builds on the foundation of the 2015 Urban Forest Strategic Plan (UFSP). All 9 goals set in 2015 UFSP match to a principle and strategic area in the Strategy. Of the 40 measures were identified in the 2015 UFSP 26 are retained and enhanced in the UFS, 7 are replaced with an improved alternative target and 7 are discarded as no longer appropriate. Of the 94 actions were set in the 2015 UFSP 15 have been achieved, 41 are retained, 34 are replaced with an improved alternative action, 4 are discarded as no longer appropriate

This refreshed Strategy has been developed with input from a wide range of stakeholders including the Urban Forest Community Reference Group, Banyule Environment and Climate Action Advisory Committee (BECAAC), Councillors, Council officers, other agencies, and the wider Banyule community through Shaping Banyule (Banyule's community engagement portal). The feedback from these stakeholders has informed the future direction by:

- clarifying what the term urban forest means for Banyule
- drafting a vision for the urban forest (a 50+ year vision)
- confirming the five principles by which the urban forest will be managed
- developing six key directions with major actions for Banyule

The structure of the strategy and the relationship of the vision to the measurements of success are in the following figure.
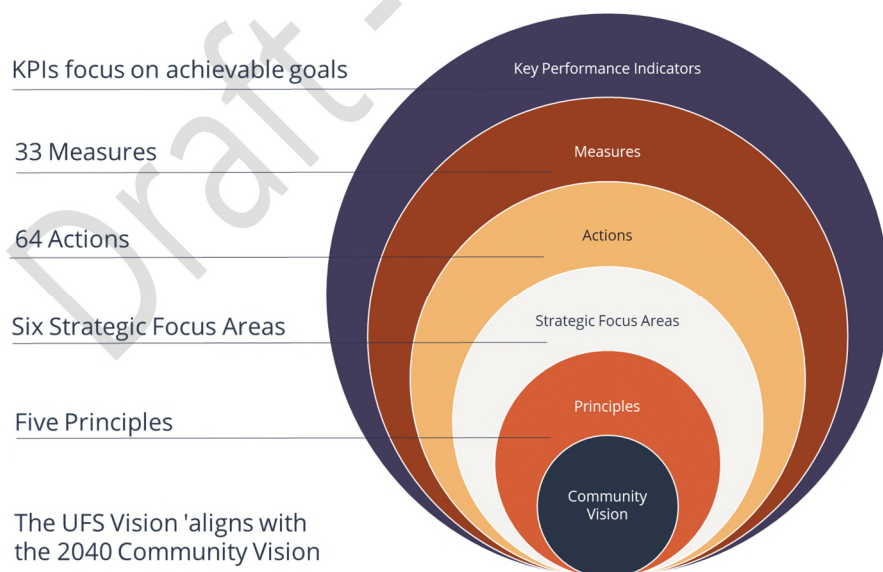

Figure 1: The structure of the Urban Forest Strategy

The five principles developed through the consultation are:

1. We believe the urban forest is an essential asset for Banyule, shared by all and crucial for the health and wellbeing of the community and natural environment.
2. We believe a healthy urban forest is the result of strong partnerships between Council and community.
3. We act today to respond to the changing climate and to leave a positive legacy for the future community, and we act responsibly, using evidence-based practice in our leadership and management of the urban forest.
4. We plan, design and deliver for the people, places and natural environments of Banyule including:
    a. Climate change and reduction of the urban heat island effect
    b. Liveability, amenity and neighbourhood character
    c. Banyule's ecosystems and biodiversity
5. We protect and enhance the Banyule's natural environment to care for flora and fauna.

The strategy emphasises improving governance and management along with building the capacity of all parts of Council to integrate the urban forest needs into their work. This approach will see greater efficiencies in the planning, design and delivery of infrastructure as green assets are managed alongside and in concert with other non-living (grey) infrastructure.

Six strategic focus areas will be delivered using a combination of existing and new staff resources, new grant funding, community and volunteer resources and new initiative funding.

The strategic focus areas are:

1. Prioritise urban forest improvements in the most vulnerable suburbs and places across Banyule
2. Increase the diversity of the Urban Forest for biodiversity and habitat with ground cover and shrub layer plantings
3. Manage the Urban Forest across public and private land for resilience to climate chang1
4. Take a long term, asset management approach to the Urban Forest
5. Build and maintain partnerships with others in the protection and management of the Urban Forest
6. Integrate urban forest principles in all parts of Council services

Under the six strategic focus areas there are 64 actions described to allow immediate and ongoing work which will respond to the challenge that the urban forest faces, including impacts of climate change and increasing urban development. With this Urban Forest Strategy Council will focus its efforts on the actions needed today and over the next ten years so that by 2032 Banyule is well on its way to achieving the long-term Banyule Community Vision.

33 measures are established with reporting intervals to report on the progress towards the vision over the life of the strategy.

KPIs are also established to focus reporting on the critical outcomes. Specific, acheivable and timely measures have been set for; canopy cover across the suburbs (27% by 2050 with no loss in suburbs exceeding the target), canopy cover across the footpath network (45% by 2040 with no loss in suburbs exceeding the target) and completing the planting of all viable vacant street tree sites (currently approximately 10,000).

The development of an endorsed tree management framework will include clear and transparent process, procedure and applications, including, but not limited to, managing tree risk, processes for removal, process for reporting and customer engagement, planning planting and species and managing complaints and disputes. This action will integrate existing policy and process and develop new outcomes where gaps exist.

The Strategy will be reviewed every four years and annual results published in Banyule's State of the Environment report.

Section 1. About this Strategy

Banyule has inherited an urban forest shaped by many influences, both natural and human. Generations of changing land uses, increased urban development, design and public policy have influenced the urban forest that exists today. This strategy will continue to positively and constructively shape the urban forest to enhance and protect it for future generations.

Banyule's community has clearly set the city's future direction by defining a long-term vision within a 50+ year plan for Banyule. With this new Urban Forest Strategy, Council is focussing its efforts on the actions needed to be taken today and over the next ten years so that by 2032 Banyule is well on its way to achieving the long-term vision. The actions taken today will influence the future state of the urban forest to the end of the century.

The Urban Forest in Pre-colonial Banyule

The area covered by the municipality of Banyule is the traditional lands of the Wurundjeri Woi-wurrung People. Over 50 Aboriginal heritage sites have been identified in Banyule, most beside the major waterways of Darebin Creek and the Yarra and Plenty Rivers[1].

Banyule Councils vision for reconciliation identified in the Innovate Reconciliation Action Plan is to have a just and equal society where Aboriginal and Torres Strait cultures and heritage are a proud part of our shared national identity. Banyule continues to work in partnership with Aboriginal and Torres Strait Islander peoples to ensure meaningful relationships are built through shared decision making, fairness, respect and trust.

The development of the city

The 1830s and 1840s saw parts of Banyule become a farming district earlier than most other parts of Melbourne. In the1840s and 1850s, wooded areas around Heidelberg and further north along the Plenty River were exploited by timber cutters. From the 1870's quarries operated in and around Heidelberg up until 1950s. Suburban growth in Banyule was reasonably slow in the late 19th and early 20th centuries. Growth around this time was in the form of large country homes, and smaller stand-alone dwellings, where people were drawn to Banyule for its extant natural beauty. Private greening at this time was influenced by the Garden Suburb movement, and this can be seen across Banyule today in the suburbs associated with the Heidelberg to Eaglemont and Bundoora to Diamond Village to Army Barracks ridgelines.

Suburbia sprawled throughout Banyule from the late 1940s during the post-war housing boom, as this area saw the development of new affordable homes and large housing estates. Many of the houses were built as 'pre-fab' concrete, and early examples of these can be seen in West Heidelberg today. These are often large blocks, which would later present opportunities for infill development in the early 21st century. Despite significant interwar and post-war suburban growth, parts of Banyule had a strong drive for tree retention and naturalistic design for homes and gardens. This is evident throughout Heidelberg, and pockets of Montmorency and Rosanna today.

The history of the public urban forest can be seen in a rich collection of significant trees and street tree plantings, some from pre-European Banyule, some from early estates, and some significant to the 20th century. Remnant Scarred trees in what is now Eaglemont and Lower Plenty are surviving pieces of Wurundjeri Woi-wurrung heritage. Pines, conifers and oaks from Banyule's farming and grazing estate eras remain throughout

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[1] Context (2018) *Banyule Thematic Environmental History*, prepared for Banyule City Council, electronic copy, https://shapingbanyule.files/5015/4404/7951/Banyule_thematic_history_final_3.12.18.pdf Accessed September 2021

Heidelberg and Eaglemont. Ornamental pines planted post-war by Italian immigrants are an iconic 20th-century planting that can be seen throughout Ivanhoe[2,3].

Historic urban tree forest management activities and initiatives by Council

There is a long history of recognition of the urban forest in Banyule. Banyule's significant trees were first formally recorded by Warringal Conservation Society, and primarily included trees in Heidelberg that were notable for their size, age, grouping or location. Banyule City Council went on to adopt the Significant Tree Register, which now falls under the Banyule Planning Scheme.

Banyule's 2013 City Plan, Environmental Sustainability Policy and Strategy, and Neighbourhood Character Strategy all identified the need to protect, retain and manage Banyule's trees. Emerging from the City Plan came the first standalone Urban Forest Strategic Plan (2015) and supporting urban forest policies. In 2019 Council declared a Climate Emergency and set about responding to this and supporting the reduction of greenhouse gas emissions from both Council activities and from the wider community. Community and Council Climate Action Plans were prepared to support the mitigation of emissions and support the achievement of Net Zero Emissions by 2040. During this time, it was also acknowledged that the response to climate change must include adaptation and resilience: resilience has been a seam running through Banyule's strategy work since. Council and the community recognised that the management of the urban forest was critical to adaptation and the future resilience of the community and the built and natural environment.

Purpose

This Urban Forest Strategy outlines Banyule's vision for the long-term future for the urban forest and provides strategic management actions to get there over the short and medium term.

This Strategy will support Council to plan, manage and maintain one of Banyule's highest-valued assets for the next 10 years.

The Strategy outlines:

- a vision for the future with indicators to assist Council measure success
- a set of principles for urban forest management to guide the delivery by Council
- a baseline from available information about the current state of the urban forest and tree canopy
- six key directions with major actions which provide both new ways of managing trees and vegetation for a range of current programs (e.g., street tree planting and tree renewal programs), as well as a range of new actions and programs that deliver and guide future analysis of the urban forest and tree canopy
- case studies of best practice from other local government areas

Audience

An urban forest strategy is critical to directing action around the creation, protection and enhancement of tree canopy and urban forest health within Banyule.

The urban forest is essential for the liveability and resilience of Banyule and as a result, this Strategy is directed at:

- agencies and landowners who plan for and manage infrastructure within Banyule
- the broader community who manage land and infrastructure and who are crucial in the success of this strategy
- officers within Council who manage trees and greening in the public domain

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[2] Context (2018) *Banyule Thematic Environmental History*, prepared for Banyule City Council, electronic copy, https://shapingbanyule.files/5015/4404/7951/Banyule_thematic_history_final_3.12.18.pdf Accessed September 2021
[3] Banyule City Council (2020) *Banyule Significant Tree and Vegetation Assessments*, electronic copy, https://shaping.banyule.vic.gov.au/download_file/2473/927, Accessed September 2021

- officers within Council who manage land and infrastructure and have any dealing with trees and greening in both the private and public domains

The Strategy will be implemented by Council in partnership with the community.

The Urban Forest Strategy – Plan on a Page

The following diagram outlines the major elements of the Banyule Urban Forest Strategy. Each element is integrated so there is a clear line of sight between the vision statement through the key directions to the more detailed major actions. The key directions are further expanded in with each direction having a series of major actions outlined.

Definition

Banyule's urban forest is the trees and greening assets that exist in an urban area, that are strategically planned, designed, and managed as well as the ecosystems, soils and water that support them.

Long-term Vision

Banyule's urban forest is resilient. It is thriving and people are aware and value the role of the urban forest for health and wellbeing and in making Banyule a great place to live.

The urban forest is managed as an essential asset for Banyule and decisions about the urban forest are fit for place and purpose and space is provided to support greening and larger tree canopy.

People work with Council and are active in the protection, management and maintenance of the urban forest.

Principles

We believe a healthy urban forest is the result of strong partnerships between Council and community.

We believe the urban forest is an essential asset for Banyule, shared by all and crucial for the health and wellbeing of the community and natural environment.

We act today to respond to the changing climate and to leave a positive legacy for the future community, and we act responsibly, using evidence-based practice in our leadership and management of the urban forest.

We plan, design and deliver for the people, places and natural environments of Banyule including:

- Climate change and reduction of the urban heat island effect

- Liveability, amenity and neighbourhood character

- Banyule's ecosystems and biodiversity

We protect and enhance the Banyule's natural environment to care for flora and fauna.

Strategic Areas

Prioritise urban forest improvements in the most vulnerable suburbs and places across Banyule

Increase the diversity of the Urban Forest for biodiversity and habitat with ground cover and shrub layer plantings

Manage the Urban Forest across public and private land for resilience to climate change

Take a long term, asset management approach to the Urban Forest

Build and maintain partnerships with others in the protection and management of the Urban Forest

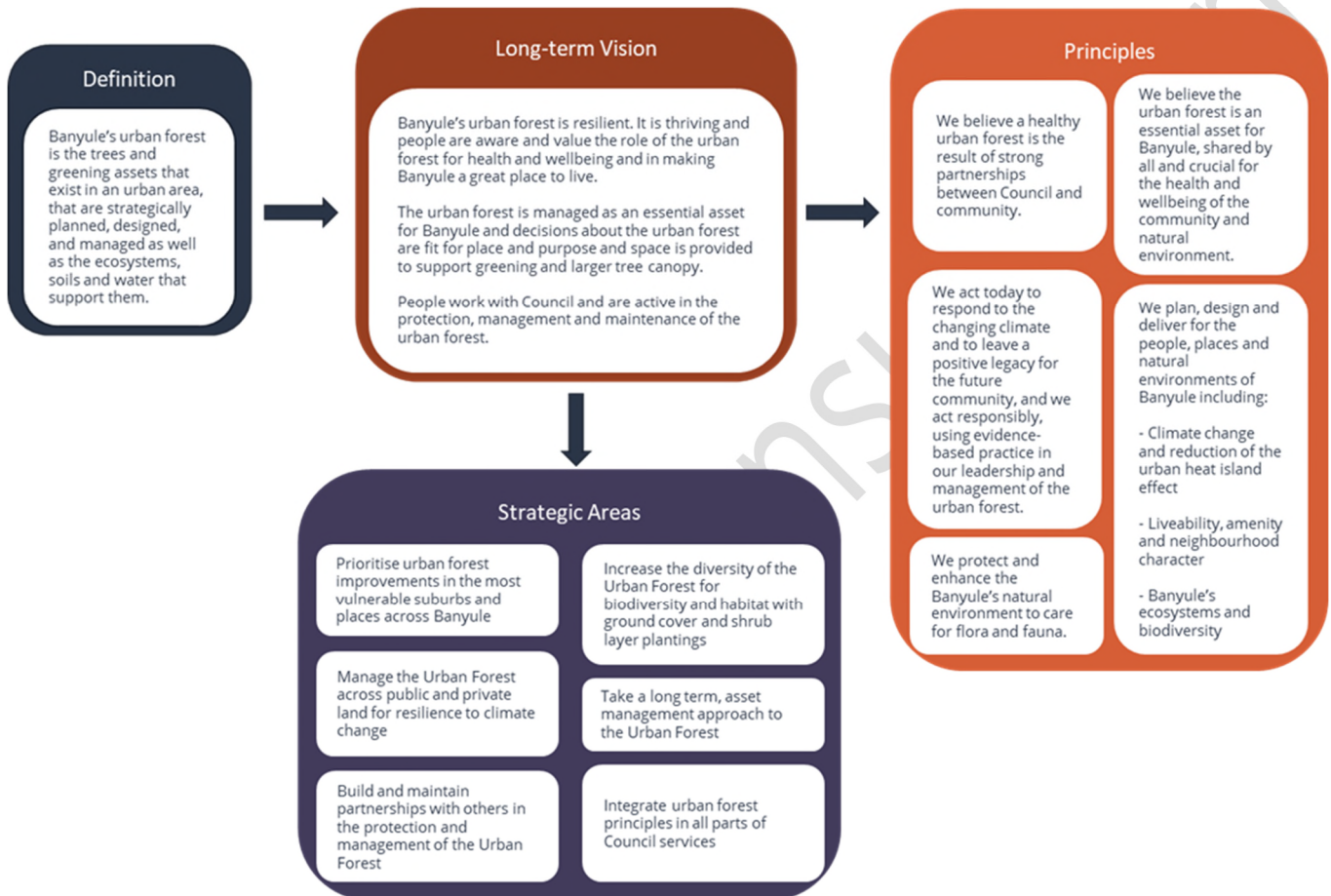Integrate urban forest principles in all parts of Council services

Figure 2: Framework of the Urban Forest Strategy

How this strategy was developed

This Strategy has been developed in collaboration with a number of stakeholders. Council recognises the important role that other agencies and the community must play in achieving the vision and set about involving these stakeholders at all stages in the project. Figure 3 outlines the major steps taken to develop this Strategy.
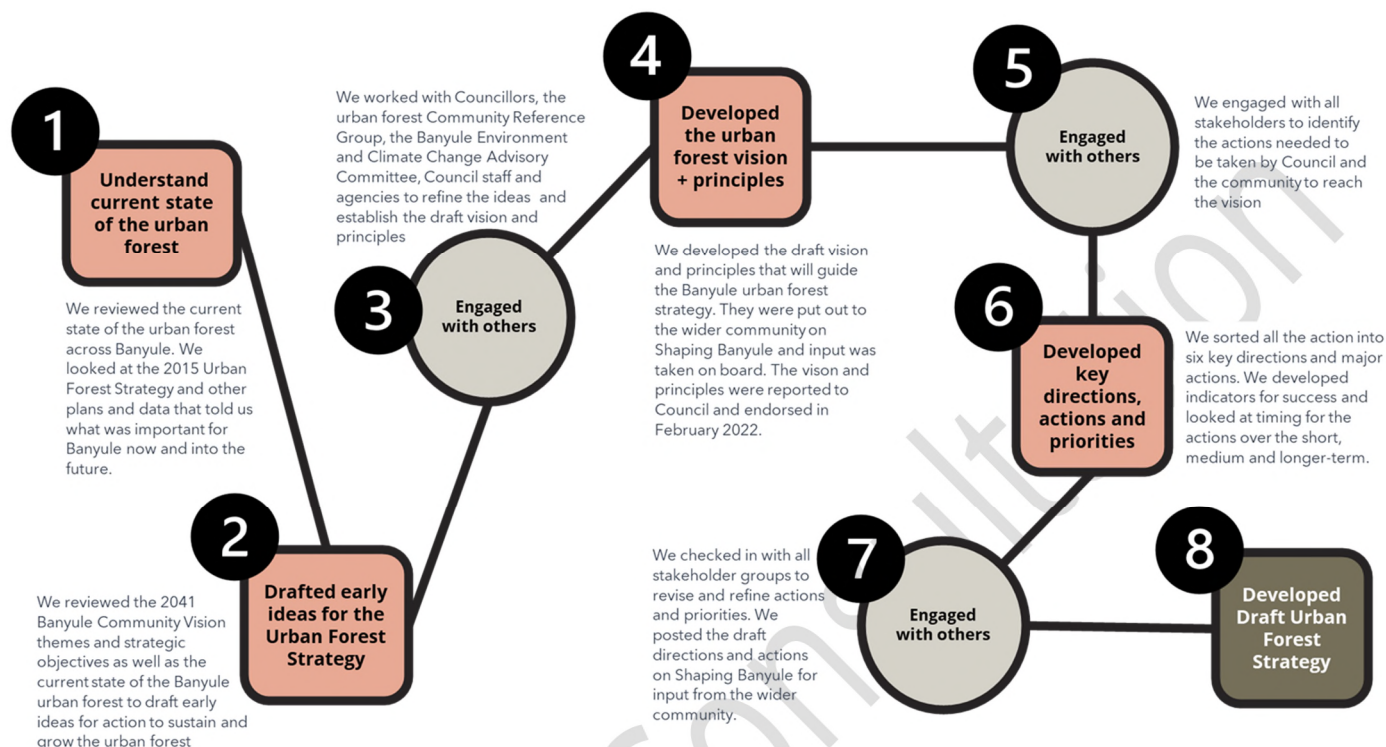

1 Understand current state of the urban forest

We reviewed the current state of the urban forest across Banyule. We looked at the 2015 Urban Forest Strategy and other plans and data that told us what was important for Banyule now and into the future.

2 Drafted early ideas for the Urban Forest Strategy

We reviewed the 2041 Banyule Community Vision themes and strategic objectives as well as the current state of the Banyule urban forest to draft early ideas for action to sustain and grow the urban forest

3 Engaged with others

We worked with Councillors, the urban forest Community Reference Group, the Banyule Environment and Climate Change Advisory Committee, Council staff and agencies to refine the ideas and establish the draft vision and principles

4 Developed the urban forest vision + principles

We developed the draft vision and principles that will guide the Banyule urban forest strategy. They were put out to the wider community on Shaping Banyule and input was taken on board. The vison and principles were reported to Council and endorsed in February 2022.

5 Engaged with others

We engaged with all stakeholders to identify the actions needed to be taken by Council and the community to reach the vision

6 Developed key directions, actions and priorities

We sorted all the action into six key directions and major actions. We developed indicators for success and looked at timing for the actions over the short, medium and longer-term.

7 Engaged with others

We checked in with all stakeholder groups to revise and refine actions and priorities. We posted the draft directions and actions on Shaping Banyule for input from the wider community.

8 Developed Draft Urban Forest Strategy

Figure 3: Steps involved in developing the Urban Forest Strategy

Other Council Strategies

Council has more than ten current strategies, plans and programs that are important for supporting a healthy urban forest.

- Banyule Bicycle Strategy 2010-2020
- Aboriginal and Torres Strait Islander Plan 2017-2021
- Banyule Biodiversity Plan 2019-2022
- Community Climate Action Plan
- Rights of Way Strategy 2014-2024

- Safe Travel Plan 2016-2026
- Water Plan 2019-2023
- Actions for zero net emissions 2020-2023
- Environmental Stewardship Strategic Plan 2019-2021
- Gardens for Wildlife
- Integrated Transport Plan 2015-2035

- Neighbourhood Character Strategy 2012
- Northern Regional Trails Strategy
- Walking Strategy 2018-2028
- Weed Management Strategy 2006
- Public Open Space Plan 2016-2031
- Banyule Youth Space Plan

Banyule Council is also a signatory to Living Melbourne – Our Metropolitan Urban Forest, the Northern Metropolitan Framework Plan and the Yarra Strategic Plan (Burndap Birrarung burndap umarkoo) 2022-2032 that set out commitments and targets for urban greening and positive environmental outcomes.

Glossary of Terms

Term	What it means
Canopy	The uppermost branches of the trees in a forest, forming a more or less continuous layer of foliage.
Urban forest	Banyule's urban forest is the trees and green assets (such as vines and climbers, shrubs, groundcovers, and grasses) that exist in an urban area, that are strategically planned, designed, and managed as well as the ecosystems, soils and water that support them.
Urban Forest Vulnerability	The areas of Banyule where there is a risk of not thriving or demonstrating resilience, for example in areas with low canopy, aging street trees or increased urban development the community is vulnerable to negative health outcomes, or the urban forest is vulnerable to stress and disease.
Social Vulnerability	Social vulnerability is a widely recognised way of assessing the sensitivity of a population to natural hazards and its ability to respond to and recover from them[4].
Useful life expectancy (ULE)	The length of time that a tree is expected to remain healthy and provide ecosystem services within its environment before it begins to decline. This length of time can vary between trees and between species, as it depends on tree health, condition, safety and location.
Resilience	The ability of the urban forest to adapt, survive and thrive in a changing climate.
Water sensitive urban design	The approach to planning and designing urban areas and buildings to make use of the valuable resource of stormwater, make places cooler and reduce the harm it causes to waterways rivers and creeks.
Urban Infill[5]	Redevelopment within established urban areas, typically using previously undeveloped or underutilised land (grey field) or redeploying previously developed land (brown field).
Ecosystem Services	The benefits people derive from ecosystems (such as clean air, clean water, shade, cooling, stormwater filtration, pollination etc) – the support of sustainable human well-being that ecosystems provide[6,7].
Socio-Economic Indexes for Areas (SEIFA)	A product developed by the Australian Bureau of Statistics that ranks areas in Australia according to relative socio-economic advantage and disadvantage based on people's access to material and social resources, and their ability to participate in society.
Climate Change[8]	Changes to the Earth's climate caused by human activity including burning fossil fuels (coal, gas, petrol and diesel) and clearing vegetation. Impacts include a global temperature increase as well as local droughts, floods, extreme hot and cold spells, and more intense rainfall.
Green Infrastructure	The green spaces and water systems that intersperse, connect and provide life support for humans and other species in urban environments. Green infrastructure ranges in scale from residential gardens to local parks and housing estates, streetscapes and highway verges, services and communications corridors, waterways and regional recreation areas. Green infrastructure has many benefits for society and the environment.[9]
Grey Infrastructure	Human-built physical structures and systems, such as buildings, water and electrical supply, sewers, stormwater drains, dams, reservoirs, fences, paths, roads and bridges. [9]

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[4] Ogie, R, Pradhan, B. (2020) Social vulnerability to natural hazards in Wollongong: comparing strength-based and traditional methods. Australian Journal of Emergency Management, Australian Institute for Disaster Resilience https://knowledge.aidr.org.au/resources/ajem-january-2020-social-vulnerability-to-natural-hazards-in-wollongong-comparing-strength-based-and-traditional-methods/

[5] Cooperative Research Centre for Water Sensitive Cities Ltd (2021) *Urban Infill,* https://watersensitivecities.org.au/urban-infill/ , Accessed 21st December 2021

[6] Costanza, R., De Groot, R., Sutton, P., Van der Ploeg, S., Anderson, S.J., Kubiszewski, I., Farber, S. and Turner, R.K., (2014) *Changes in the global value of ecosystem services*. Global environmental change, 26, pp.152-158.

[7] Millennium Ecosystem Assessment (2005) *Ecosystems and human well-being: synthesis*. Island, Washington, DC.

[8] Banyule City Council (2020) Community Climate Action Plan (CAP) Accessed July 2022 https://www.banyule.vic.gov.au/files/assets/public/about-us/strategies/banyule-community-climate-action-plan.pdf

[9] Living Melbourne Strategy https://resilientmelbourne.com.au/wp-content/uploads/2019/09/LivingMelbourne_Strategy_online3.pdf

Section 2. Why an Urban Forest Strategy?

Local governments around the world are focussed on better management of nature in cities and urban areas. The pressures experienced over the recent years with Coronavirus (COVID-19) lockdowns and more extreme weather as a result of continued climate change have highlighted the importance of healthy and diverse urban vegetation: trees, canopy, open space and greening, for the liveability of cities and for the health and wellbeing of the people who live there.

Banyule City Council recognises the value of the urban vegetation to the citizens of Banyule and to future generations and has developed this strategy to lay out immediate and ongoing action to respond to the impacts of climate change and increasing urban development.

The Benefits of Urban Forests

The benefits of urban forests (Figure 4) have been a focus of much recent study around the world, but the broad benefits of trees and plants in the city are often not known by the wider community. This section outlines some of the values of an urban forest, and these values provide the basis for the vision, principles and strategic areas that for the foundation of this Strategy.
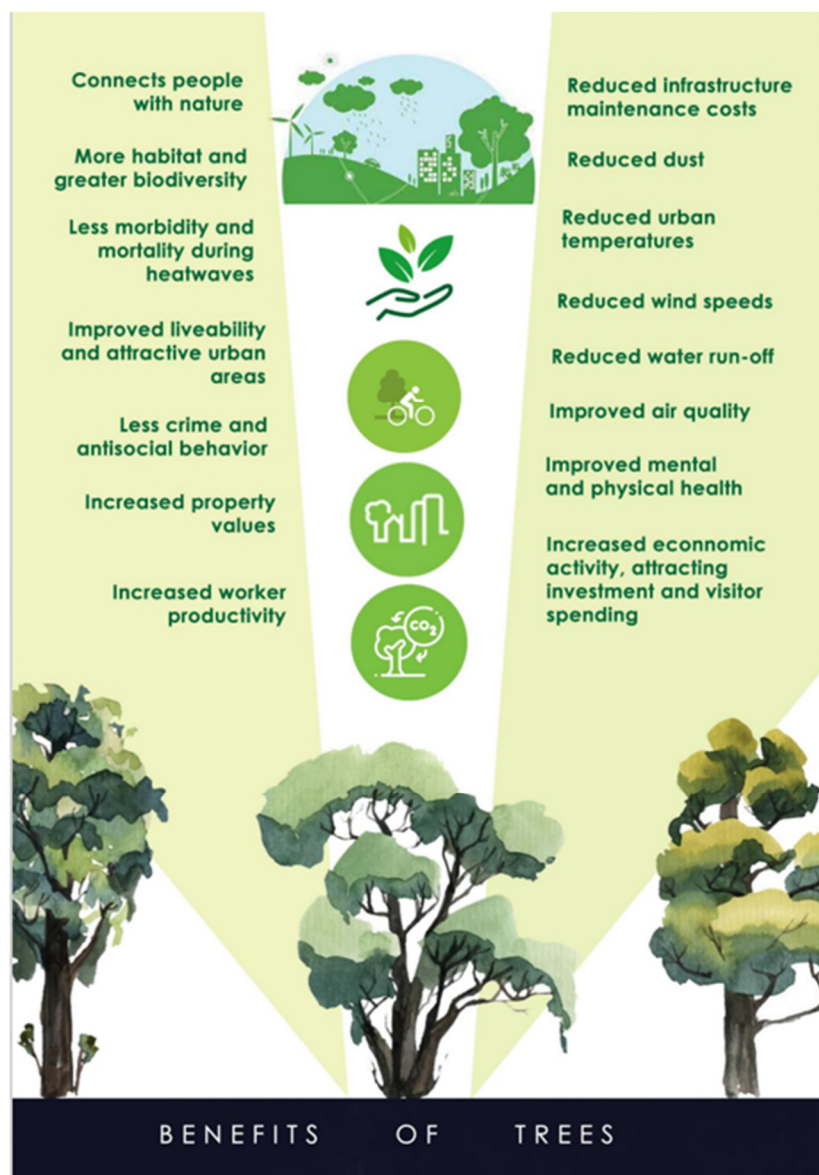

Figure 4: Benefits of the urban forest for Banyule

Shade and Cooling

Cities and towns frequently experience higher air temperatures than surrounding rural areas due to the Urban Heat Island[10] (UHI) effect. In these built-up and densely populated urban areas heat is generated, trapped and stored, creating localised warming. During heatwaves, the UHI effect can not only cause people to feel uncomfortable but for vulnerable groups[11,12] such as young children and the elderly, it also poses a serious health risk which may lead to health problems such as exhaustion, respiratory illness, and heat stroke[13]. As our climate changes, it is expected that in Banyule, heatwaves will happen more often, last longer, and be more intense[14].

Increasing trees and other vegetation within the built environment helps mitigate the UHI effect. Through the process of transpiration[15] and the provision of shade, trees help reduce day and sometimes night-time temperatures. Trees not only shade streets and footpaths, but their leaves also reflect more sunlight and absorb less heat than built materials reducing the heat absorbed by buildings and roads.

A Sense of Place and Social Connection

Access to nature, from large bushland reserves to individual street trees, can have positive effects on the mental, as well as physical, health of people. Key social benefits of the urban forest include:

- *Shaping local identity* **-** Trees and other vegetation define the character and identity of urban places [16]. Trees. whether remnants of the original ecological community or exotics planted in the early settlement of Banyule, contribute significantly to a sense of place. Trees provide seasonal interest, food supply and natural beauty through their interesting colours, shapes, textures of bark, foliage, canopy, flowers and fruit.
- *Improving social cohesion* **-** Access to trees in green spaces improves various measures of social cohesion including community connection by providing places for events, festivals and celebrations that can bring diverse groups of people together [17].
- *Stress and wellbeing* **-** Recreation in green space can reduce stress and the psychological toll of urban living and improve mental health [18] among many other health benefits. Access to green space for 120 minutes per week can increase feelings of good health or wellbeing significantly, for any age group, including older adults and those with long-term health issues [19].
- *Reducing crime rates* Increased urban vegetation has been linked to reduced levels of crime[20]

Heathier Biodiversity

Biodiversity isn't just about the diversity of trees and their species. A healthy, biodiverse place shows not only a breadth of species, but also a complexity of urban forest structure (such as trees, shrubs, groundcovers), function (availability of a diverse set of urban forest features which support urban ecosystems, ground cover,

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[10] Haider Taha, Heat Islands and Energy, Editor(s): Cutler J. Cleveland, Encyclopedia of Energy, Elsevier, 2004, Pages 133-143

[11] Jay, O., Capon, A., Berry, P., Broderick, C., de Dear, R., Havenith, G., Honda, Y., Kovats, R. S., Ma, W., Malik, A., Morris, N. B., Nybo, L., Seneviratne, S. I., Vanos, J., & Ebi, K. L. (2021). Reducing the health effects of hot weather and heat extremes: from personal cooling strategies to green cities. The Lancet, 398(10301), 709-724. https://doi.org/10.1016/S0140-6736(21)01209-5

[12] Heaviside, C., Macintyre, H. & Vardoulakis, S. The Urban Heat Island: Implications for Health in a Changing Environment. Curr Envir Health Rpt 4, 296–305 (2017).

[13] Twohig-Bennett, C. and Jones, A., 2018. The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. Environmental research, 166, pp.628-637.

[14] Clarke, J.M., Grose, M., Thatcher, M., Hernaman, V., Heady, C., Round, V., Rafter, T., Trenham, C. and Wilson, L., 2019. Victorian Climate Projections 2019 Technical Report. Melbourne Australia.

[15] (Taha et al., 1988, Grimmond and Oke, 1991)

[16] Threlfall, C.G., Ossola, A., Hahs, A.K., Williams, N.S., Wilson, L. and Livesley, S.J., 2016. Variation in vegetation structure and composition across urban green space types. Frontiers in Ecology and Evolution, 4, p.66.

[17] Hartig, T., Mitchell, R., De Vries, S. and Frumkin, H., 2014. Nature and health. Annual review of public health, 35, pp.207-228.

[18] Francis, J., Wood, L.J., Knuiman, M. and Giles-Corti, B., 2012. Quality or quantity? Exploring the relationship between Public Open Space attributes and mental health in Perth, Western Australia. Social science & medicine, 74(10), pp.1570-1577.

[19] White, M.P., Alcock, I., Grellier, J. et al. Spending at least 120 minutes a week in nature is associated with good health and wellbeing. Sci Rep 9, 7730 (2019)

[20] Yang, B.Y., Zhao, T., Hu, L.X., Browning, M.H., Heinrich, J., Dharmage, S.C., Jalaludin, B., Knibbs, L.D., Liu, X.X., Luo, Y.N. and James, P., 2021. Greenspace and human health: An umbrella review. The Innovation, 2(4), p.100164.

tree hollows, feeding and roosting sites), and age, as well as space to allow these forest elements to grow, adapt and recover.

Biodiverse, complex and connected plant communities in urban areas are vital to support biodiverse faunal communities and may be far better at supporting humans in Banyule, too.

Reduced Pollution

In Melbourne, the main source of air pollution is emissions from vehicles. Combustion (burning) of other fuels (such as gas, wood, and coal) also contributes significantly to poor air quality[21]. Cities are often designed around cars, and there is growing evidence that people travelling outdoors near busy city roads are exposed to high levels of traffic emissions [22].

Barriers between roads and people through dense roadside vegetation, can shield communities from pollution (Figure 5). Trees and shrubs will assist pollution reduction as part of a road buffer with good structure (understorey and canopy) by reducing particulates such as PM2.5 and PM10[23].
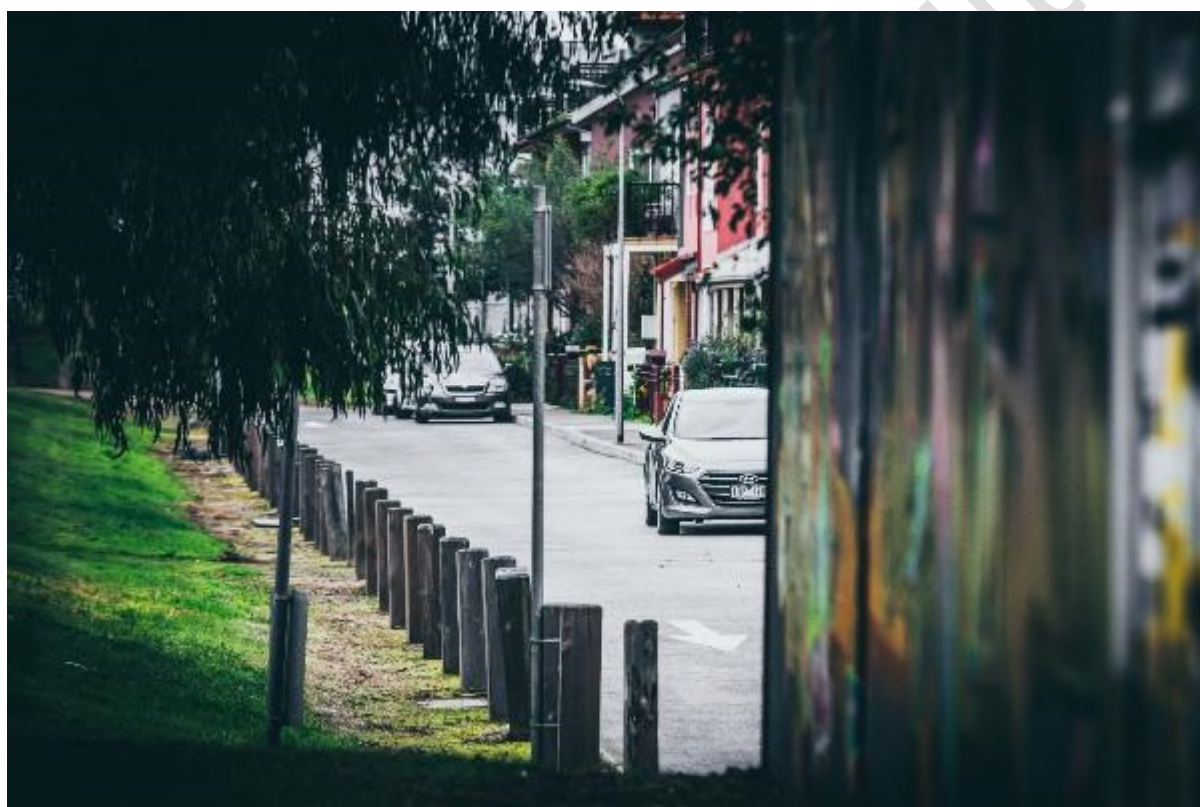

Figure 5: Buffers of vegetation can significantly improve air quality Image Source: tomas-vysniauskas,Unsplash

A Stronger Economy

There are a range of ways that trees contribute to the economies of urban places:

Reducing energy use and costs

Trees, when properly placed around buildings, can provide significant cooling, and thereby reduce air conditioning needs and save energy used for heating[24]. Shading buildings in summer and cutting energy costs

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[21] Victorian Department of Health (2021) *Air pollution* Department of Health, State Government of Victoria, viewed 30th June 2022 https://www.betterhealth.vic.gov.au/health/healthyliving/air-pollution
[22] Forehead H, Barthelemy J, Arshad B, Verstaevel N, Price O, Perez P (2020) Traffic exhaust to wildfires: PM2.5 measurements with fixed and portable, low-cost LoRaWAN-connected sensors. PLoS ONE 15(4): e0231778
[23] Diener, A. and Mudu, P., 2021. How can vegetation protect us from air pollution? A critical review on green spaces' mitigation abilities for air-borne particles from a public health perspective-with implications for urban planning. Science of the Total Environment, 796, p.148605.
[24] Yenneti, K., Ding, L., Prasad, D., Ulpiani, G., Paolini, R., Haddad, S. and Santamouris, M., 2020. Urban overheating and cooling potential in Australia: An evidence-based review. Climate, 8(11), p.126.

reducing the need for air conditioning, in turn cutting energy costs. Strategically planting shade trees around buildings can save annual heating and cooling costs by approximately $50 - $90 per dwelling[25].

Reducing expenditure

Costs of other local government services, such as air pollution removal and storm water infrastructure can be reduced if trees and greening are present[26], and in some cases lengthen the lifespan of non-green assets by up to 30%[27].

Increasing property values and benefits

The presence of trees in streets and nearby parks can increase residential property values [28]. The benefits of trees to property value are pronounced, with the dollar value of having a leafy street worth double the costs of street tree planting and management[29].

Improving city branding and economic productivity

Green space plays a role in creating a desirable character and city image, encouraging people to live, work and visit, which in turn can increase a city's economic productivity[30].

Better than alternative

Green infrastructure is long-term investment that reduces the need for much greater expenditures in grey infrastructure[31].

The Challenges Faced by Banyule's Urban Forest

Of the many challenges facing urban forests and their management: climate change, population growth and barriers to forest growth and health are the most widespread and locally important for Banyule.

Climate Change

Climate change is increasing the frequency, severity and duration of heatwaves, droughts and storm events. These changes are likely to have a significant effect on the trees in Banyule's urban forest.

> 48% of species in City of Melbourne were found to be moderately or extremely vulnerable to increasing temperatures predicted for Greater Melbourne

Heat

Some species that have previously thrived in Banyule may not be able to continue to do so in the decades ahead, and other species may perform better. Some of Banyule's much-loved tree species, widely planted across our urban areas, do not handle heat well. Trees cool down by losing water from their leaves (evapotranspiration). In doing this, trees also cool the surrounding environment (Figure 6). However, when

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[25] BDO EconSearch 2020 *OPTIONS ANALYSIS: Costs and Benefits of Urban Tree Canopy Options for Minor Infill Development in the Planning and Design Code A Report to the Attorney-General's Department* South Australian Attorney-General's Department (AGD) Planning Reform area Accessed 30th June 2022 https://plan.sa.gov.au/__data/assets/pdf_file/0008/730745/Options_Analysis_-_Costs_and_Benefits_of_Urban_Tree_Canopy_Options_for_Minor_Infill_Development.pdf
[26] Roy, S., Byrne, J. and Pickering, C., 2012. A systematic quantitative review of urban tree benefits, costs, and assessment methods across cities in different climatic zones. Urban forestry & urban greening, 11(4), pp.351-363.
[27] McPherson, E.G. and Muchnick, J., 2005. Effects of street tree shade on asphalt concrete pavement performance. Journal of Arboriculture 31 (6): 303-310, 31(6), pp.303-310.
[28] Pandit, R., Polyakov, M., Tapsuwan, S. and Moran, T., 2013. The effect of street trees on property value in Perth, Western Australia. Landscape and Urban Planning, 110, pp.134-142.
[29] Plant, L.J., Morrison, T. and Rambaldi, A., 2016. Street trees: paying their way in property value benefits. Acta Horticulturae, (1108), pp.13-24.
[30] Roy, S., Byrne, J. and Pickering, C., 2012. A systematic quantitative review of urban tree benefits, costs, and assessment methods across cities in different climatic zones. Urban forestry & urban greening, 11(4), pp.351-363.
[31] Schwab J (2009) The principles of an effective urban forestry program. In: Schwab J (ed) Planning the urban forest: ecology, economy, and community development. American Planning Association (APA), Chicago, pp 25–41

exposed to high or prolonged heat and drought, a tree might suffer modest to extensive dieback (loss of foliage and other outer parts), reducing their ability to cool down. This loss can depend greatly on tree species.

Research undertaken by the School of Ecosystem and Forest Science at the University of Melbourne in 2016[32] found that 48% of the species present in the City of Melbourne, and more than a third of currently planted trees, were moderately or extremely vulnerable to increasing temperatures under a moderate climate change scenario.
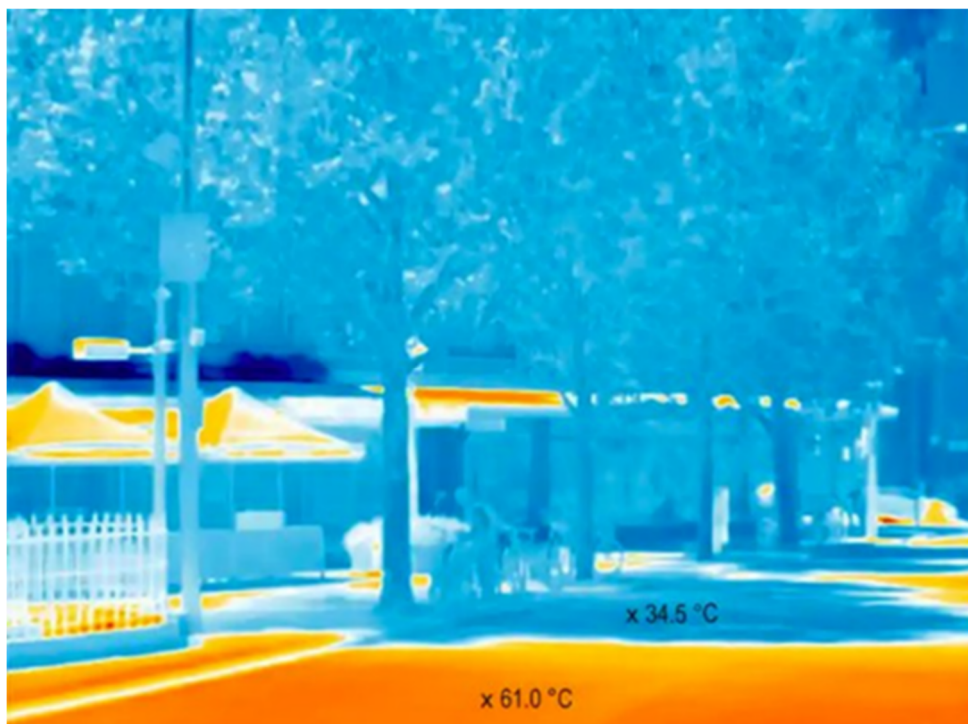

Figure 6: *Trees and canopy are crucial for maintaining cooler urban areas Image Source[33]*

Tree canopy has the most significant impact on reducing urban heat while shrubs have a lesser effect. Melbourne has experienced some significant drought and heat wave conditions over the past ten years[34]. Trees and canopy, along with water sensitive urban design, can significantly reduce temperatures in urban areas, making it more comfortable for people to move around, socialise and maintain good health and wellbeing[35].

Some of the trees in Banyule will be lost to pests, disease and heat stress in the near future as a result of climate change. This will result in loss of shade, amenity and contribute to increased maintenance and watering costs. Action on species resilience to climate change ties directly into Banyule's 2019 declaration of a climate emergency[36].

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[32] Kendal and Baumann, 2016, The City of Melbourne's future urban forest: identifying vulnerability to future temperatures, Report to the City of Melbourne

[33] City of Melbourne (2017) thermal images taken in a January 2017 heatwave show the impact of urban heat islands in Melbourne. Taken by an Elizabeth Street heat camera opposite Queen Victoria Market. https://www.theguardian.com/sustainable-business/2017/feb/21/urban-heat-islands-cooling-things-down-with-trees-green-roads-and-fewer-cars, Accessed June 2022

[34] e.g. Victorian Government Department of Human Services (2009) January 2009 Heatwave in Victoria: an Assessment of Health Impacts, Electronic access, https://www.health.vic.gov.au/chief-health-officer/heatwave-in-victoria, Accessed June 2022

[35] Nice, K. (2021). Managing urban heat in water sensitive cities: research and policy responses. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.

[36] Banyule City Council (2019) *Climate Action,* Electronic access, https://www.banyule.vic.gov.au/Waste-environment/Environment-sustainability/Climate-action, Accessed July 2022
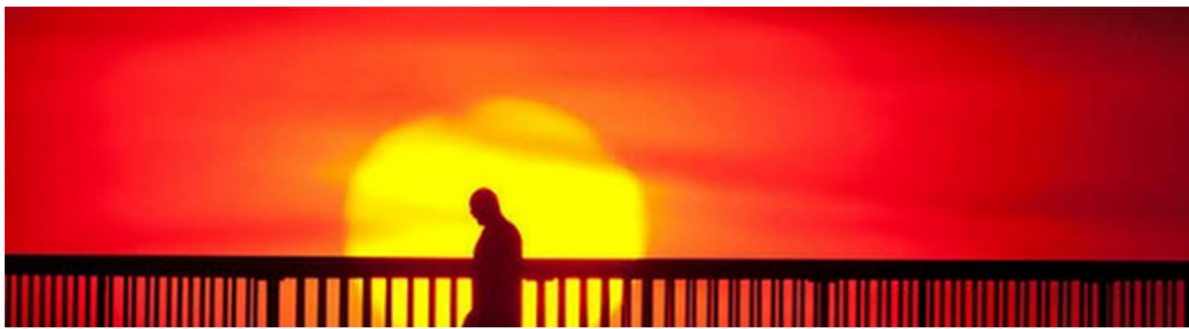
Figure 7: South-eastern Australia heatwave breaks records for temperatures in Melbourne 2013

Storms

Climate change brings more frequent extreme weather events. Recent storm events have significantly damaged trees in Banyule. Trees that are planted for stability, with appropriate size and feature selection, are best suited to withstand the force of high winds and storms. The physical features of trees, like size, root structure and branching structure all affect how a tree will respond to forces from wind, and species can vary greatly.

Figure 8: Banyule Council arborists clean storm damage in Ford St, Ivanhoe. Source Banyule City Council

Population Growth and Urban Consolidation

Up until about 1990, much of Melbourne's residential development consisted of modest sized detached houses that took up about a third of the typical property lot, and a large backyard[37]. This previously common type of backyard created large areas of private open space that had ecological, cooling, aesthetic, and many other benefits.

Urban growth in Melbourne has since trended towards larger houses on smaller plots as well as urban infill in established urban areas. Larger new houses and infill consolidates the urban population, building more medium to high density development into cities. This sort of growth has reduced garden sizes from the large backyards seen before the 1990s (Figure 9).

Banyule has planning provisions that can assist with protection of the urban forest and replanting of trees that are lost due to age, damage and other factors.

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[37] Hall, T., 2010. The life and death of the Australian backyard. CSIRO publishing.

Often the value including ecosystem services of green infrastructure particularly trees are undervalued compared with the ecosystem services that other infrastructure provides.

Figure 9: Urban development and densification – larger houses on smaller plots and infill housing is restricting the space provided for trees and the urban forest. Source: Banyule City Council

Pests and Diseases

Climate change can alter dynamics of tree pests and pathogens and affect the capacity of forest systems to resist and tolerate attacks. Two main threats to Banyule's urban forest are lerps and myrtle rust.

Lerps

The bell miner bird and its interaction with a tree sap-eating insect, a 'lerp' is causing the spread of the deadly tree disease dieback in East Coast Australia. Lerps are protected and 'farmed' by the bell miner as a food source. An abundance of lerps on eucalypt species (like flooded gums, blue gums, ironbark, red gum and grey gums) can kill a tree.

This process is known as Bell miner Associated Dieback (BMAD)[38] and it is an increasingly prevalent landscape management problem across Victoria.
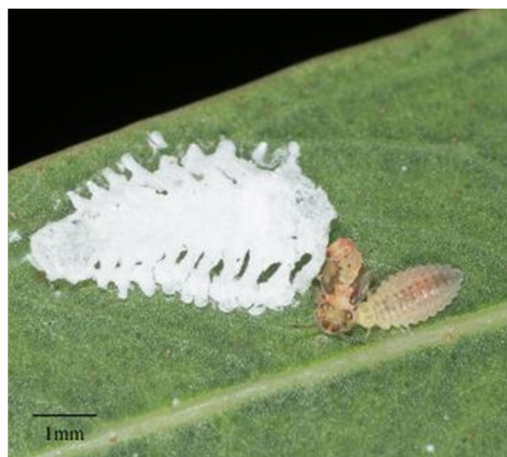

Figure 10: Spotted Gum Lerp Psyllid on Eucalyptolyma maiden Image Source: glmory, iNaturalist

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[38]Northern Rivers Fire & Biodiversity Consortium (2022) *BMAD – What is it?* http://www.bmadproject.info/project-page Accessed 30th June 2022

Myrtle Rust

Myrtle rust is a plant fungal disease. Its presence in Victoria is mainly within commercial nurseries in and around metropolitan Melbourne. When it appears on a plant, it looks like bright yellow egg-yolk, and is found on the leaf surface. Myrtle rust threatens trees and shrubs in the Myrtaceae family, which includes Eucalyptus, Angophora and Callistemon species, among many others[40]. It can deform tree leaves, cause leaf loss, reduce fertility, stunt plant growth, and result in plant death[41].

Figure 11: Myrtle rust (Austropuccinia psidii) on Callistemon spp. [39]

Tree Vandalism

Trees and vegetation are vandalised when removed, destroyed, pruned and interfered with without permission. Trees, especially public trees are vulnerable to vandalism. Many mature publicly owned trees are killed each year throughout Australia[42]. However, young trees are the more common targets. Among this age bracket, urban street trees have experienced vandalism in the form of theft or destruction.

Infrastructure Conflicts

Underground and above-ground conflicts for trees are complex and can involve a range of interested parties. Public space, especially nature strips, needs to be shared by trees, concrete for kerbs and footpaths, utility pipes and wires and for bin collection. Issues or damage can arise when the demands on the space and the tree species are not planned together.

Other physical constraints of urban environments on tree planting include conflicting priorities for space such as line-of-sight requirements from pedestrian crossings and streets intersections, footpath width requirements, on-street parking requirements (which prevents/limits planting in the road). The conditions of weather, soil type and soil volume, aspect, wind and shade can also affect the viability of trees in urban spaces. Providing a tree with the space it needs to grow healthily can avoid conflict with other needs above and below ground.

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[39] Agriculture Victoria (2022) *About Myrtle Rust,* electronic access, https://www.awe.gov.au/biosecurity-trade/invasive-species/diseases-fungi-and-parasites/myrtle-rust, Accessed June 2022

[40] Agriculture Victoria (2022) *Myrtle rust host plants and symptoms* Victorian State Government Department of Jobs, Precincts and Regions Accessed 30th June 2022 https://agriculture.vic.gov.au/biosecurity/plant-diseases/shrub-and-tree-diseases/myrtle-rust/myrtle-rust-host-plants-and-symptoms

[41] Agriculture Victoria (2022) *About Myrtle Rust,* electronic access, https://www.awe.gov.au/biosecurity-trade/invasive-species/diseases-fungi-and-parasites/myrtle-rust, Accessed June 2022

[42] Moore, G. (2015) *Acts of arboreal violence: tree vandals deprive us all*, Electronic article, The Conversation Media Group Ltd https://theconversation.com/acts-of-arborial-violence-tree-vandals-deprive-us-all-41342, Accessed June 2022

Section 3. Banyule's Urban Forest Today

In order to plan for the future of the Banyule urban forest, it is important to understand the current state of the urban forest. This section explores the state of the urban forest using the available data from Council[44], the Victorian Government (Vegetation Change 2014-2018[45]; Vegetation Extent 2021[46]; Planning Scheme Zones[47]) and the Federal Government (SEIFA[48]) as well as literature on urban forestry. This section provides a snapshot of the current state of Banyule's Urban Forest.

Banyule's Places

The diverse character of Banyule's urban forest and local neighbourhoods mean it is important to take a place-based approach to urban forest management. To support this we have considered the city as a whole, as well as its specific places, such as neighbourhoods, suburbs, natural areas and water catchments.

Neighbourhood Character

Neighbourhood character is the way buildings, vegetation and the topography relate to each other to create a visual sense-of-place. It's what makes one place different from another. The vegetation and trees that make up the urban forest have a significant impact on character. The Neighbourhood Character Strategy 2012 and Residential Neighbourhood Character Policy assist developers respect the existing character and/or contribute to the preferred character of an area.

The Neighbourhood Character Strategy lists five types of character areas each with specific reference to the types of vegetation that contribute to the existing and future desired character

Table 1: Features of the Neighbourhood Character places in Banyule

Features	Urban Forest Considerations
Garden Suburban	
Occupies MOST of the Banyule municipality Spacious leafy character Formal garden settings Wide and open street space, with mature and exotic vegetation Tree-dominated landscape setting in some streets. Special mention of the Heidelberg to Eaglemont Ridgeline, Bundoora to Diamond Village to Army Barracks Ridgeline	Mix of exotic and native Opportunity for range of nature strip gardens (native and exotic) The continuous green, dominant treed canopy and natural vegetated appearance of the ridgelines should be maintained and improved. The continuity of the treed canopy should only be punctured by taller development at the core of Activity Centres. Integrate water sensitive urban design into streetscape and open space plantings

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[44] Banyule City Council (2021) Banyule Public Urban Forest Tree Inventory
[45] DELWP (2019) *Change in Vegetation Cover in Metropolitan Melbourne between 2014 and 2018,* electronic dataset, Victorian State Government Department of Environment, Land Water and Planning, http://services.land.vic.gov.au/SpatialDatamart/dataSearchViewMetadata.html?anzlicId=ANZVI0803008491&extractionProviderId=1, Accessed 21st December 2021
[46] DELWP (2021) *Vicmap Vegetation: Tree Extent,* electronic dataset, Victorian State Government Department of Environment, Land Water and Planning https://tiles.arcgis.com/tiles/GB33F62SbDxJjwEL/arcgis/rest/services/Vicmap_Vegetation_Tree_Extent/MapServer
[47] DELWP (2022) *Planning scheme zones - Vicmap Planning,* electronic dataset, Victorian State Government Department of Environment, Land Water and Planning, https://discover.data.vic.gov.au/dataset/planning-scheme-zones-vicmap-planning
[48] Australian Bureau of Statistics (2016) *The Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD)* [Census TableBuilder], Accessed 21st December 2021.

Features	Urban Forest Considerations
Garden Court	
Occupies a large area of Banyule Spacious, often informal garden settings, with a mix of native and exotic plantings Important characteristics of the area are the mature vegetation setting in most of these areas and the tall indigenous native trees should be retained Bundoora to Diamond Village to Army Barracks Ridgeline.	Mix of exotic and native Opportunity for range of nature strip gardens (native and exotic) Courts often have a common identity of vegetation or garden style Courts often have no clear delineation of private garden and public nature strip The continuous green, dominant treed canopy and natural vegetated appearance of the ridgeline should only be punctured by taller development at the core of Activity Centres. Integrate water sensitive urban design into streetscape and open space plantings
Bush Garden	
There are three areas of Bush Garden neighbourhoods across Banyule Stands of substantial large native trees Important characteristics of the area are the canopy of indigenous and other native vegetation. Trees and other vegetation dominate the street scene and many longer distance views. Dwellings sit beneath the tree canopy, within established gardens. The Foothills Ridgeline runs through the Semi Bush Area.	Use of local native species should be preferred in public plantings Opportunity for habitat nature strip and open space gardens and ecological corridors Encourage through advocacy the planting of indigenous plants on private property Removal of large trees should be avoided The continuous green, dominant treed canopy and natural vegetated appearance of the ridgeline should be maintained and improved. Integrate water sensitive urban design into streetscape and open space plantings.
Semi Bush	
There are two areas of semi-bush neighbourhoods in Banyule separated by a large Bushland neighbourhood character zone Highly valued native vegetation- dominated residential environments At risk of more intense development Important characteristics of the area are the canopy of indigenous trees and abundant vegetation. Trees and other vegetation dominate the street scene and many longer distance views. The Foothills Ridgeline runs through the Semi Bush Area.	Use of local native species should be preferred in public plantings Opportunity for habitat nature strip and open space gardens and ecological corridors Encourage through advocacy the planting of indigenous plants on private property Removal of large trees should be avoided The continuous green, dominant treed canopy and natural vegetated appearance of the ridgeline should be maintained and improved. Integrate water sensitive urban design into streetscape and open space plantings.
Bush Woodland	
Two areas in the southwest of Banyule Rural, undeveloped character with significant indigenous vegetation Farmland landscape character: meandering or straight country roads without made kerbs Important characteristics of the area are the dominant landscape setting of rolling hills and the Yarra River flood plain, together with remnant indigenous vegetation.	Mixed use of natives and exotics – use of local native species should be preferred in public plantings Opportunity for habitat nature strip and open space gardens and ecological corridors to join pockets of bushland and open spaces Encourage through advocacy the planting of indigenous plants on private property Retain unformed kerb and gutter and integrate water sensitive urban design with urban forest management Removal of vegetation should be avoided The continuous green, dominant treed canopy and natural vegetated appearance of this ridgeline should be maintained and improved. Integrate water sensitive urban design into streetscape and open space plantings.
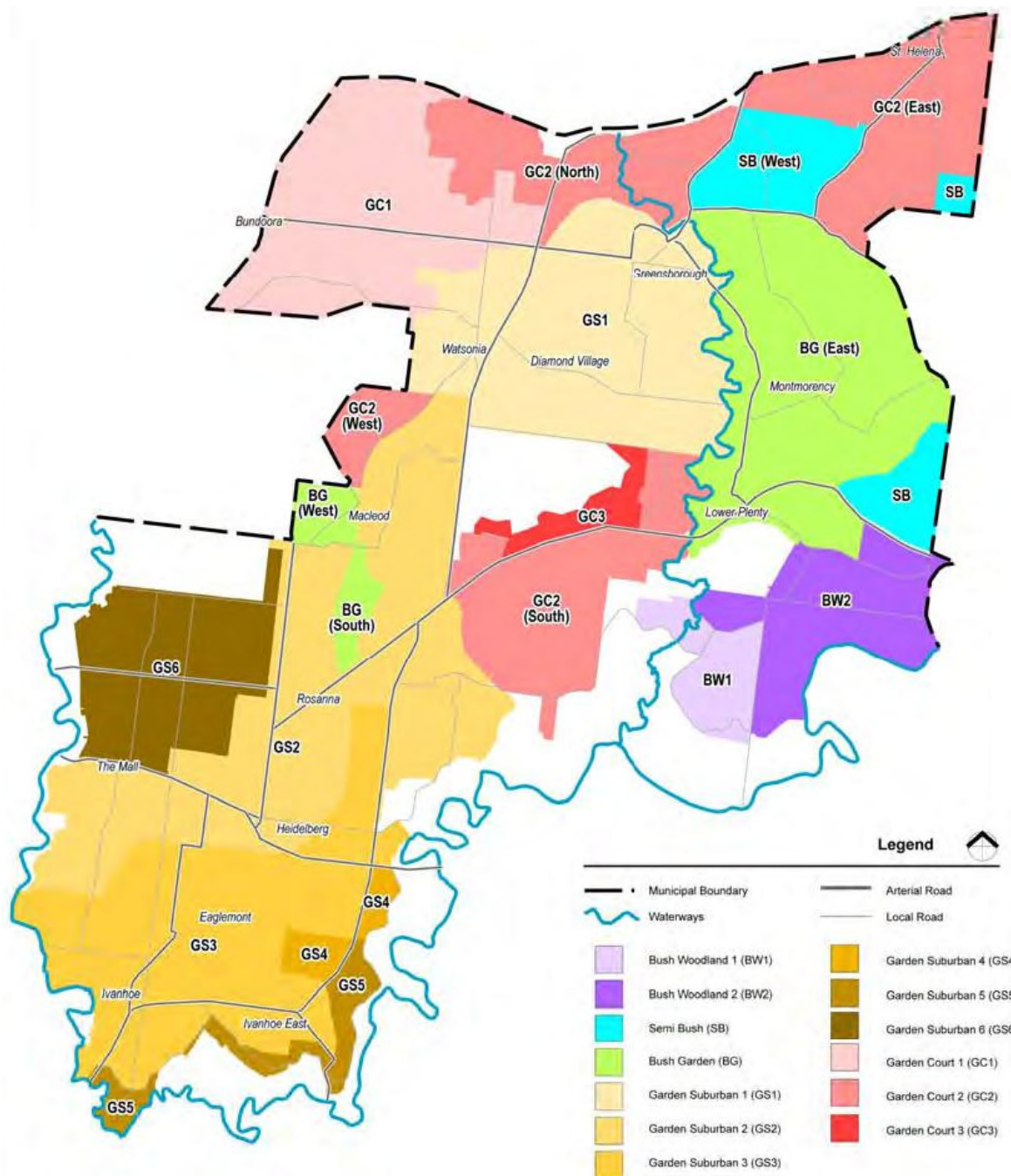
Figure 14: Banyule's Neighbourhood Character Precincts

Tree Canopy Cover

Areas of Banyule with the lowest canopy cover are in the north-west and south-west parts of the LGA

Distribution of canopy cover

The urban forest canopy is not evenly distributed across Banyule Figure 15 and Figure 16. Data provided by the Victorian Government show that residential areas with lowest canopy cover are in the north-west of Banyule, in particular Bundoora. The Heidelberg West Business Park has very low canopy cover, typical of industrial estates across Melbourne. The southern area of Lower Plenty encompasses the floodplain of the Yarra River, which is still used for grazing and is the location of a golf course. Both these land uses have low levels of canopy cover. Typical streetscape images of these areas are provided below (Figure 17).
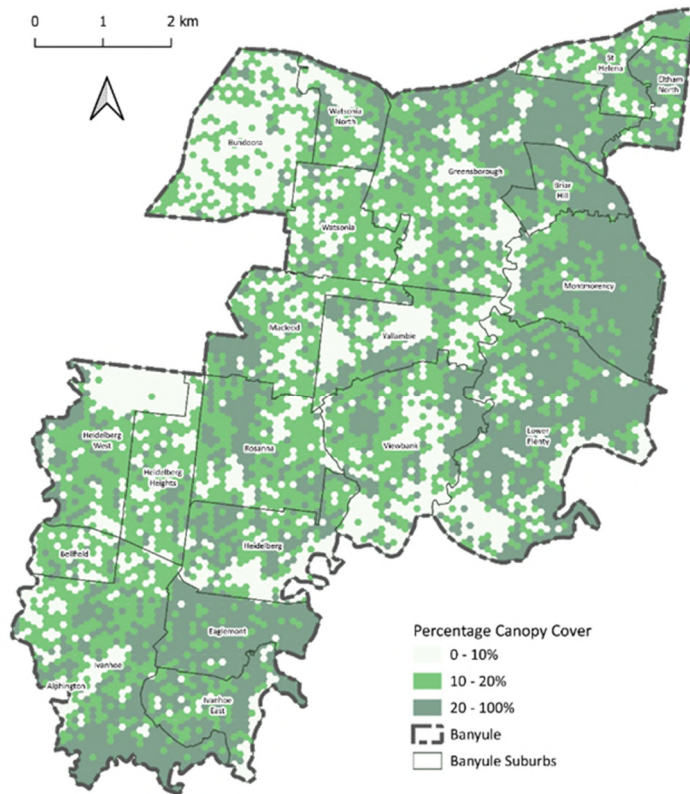
Figure 15: Tree canopy cover across Banyule. Cover is averaged to hexagonal mesh with 100 m long sides. Suburb boundaries are represented by thin black lines. Data collected, quality assured and supplied by the Victorian Government as part of the Vicmap data set released in 2021[49]

> **NOTE ON DATA**: Vicmap Vegetation Tree Urban was constructed from high resolution aerial photography which was used as the source information and a machine learning technique was utilised to extract the location of individual trees. A canopy height model derived from LiDAR which covered the tree Urban extent was used to assign height to each of the mapped trees
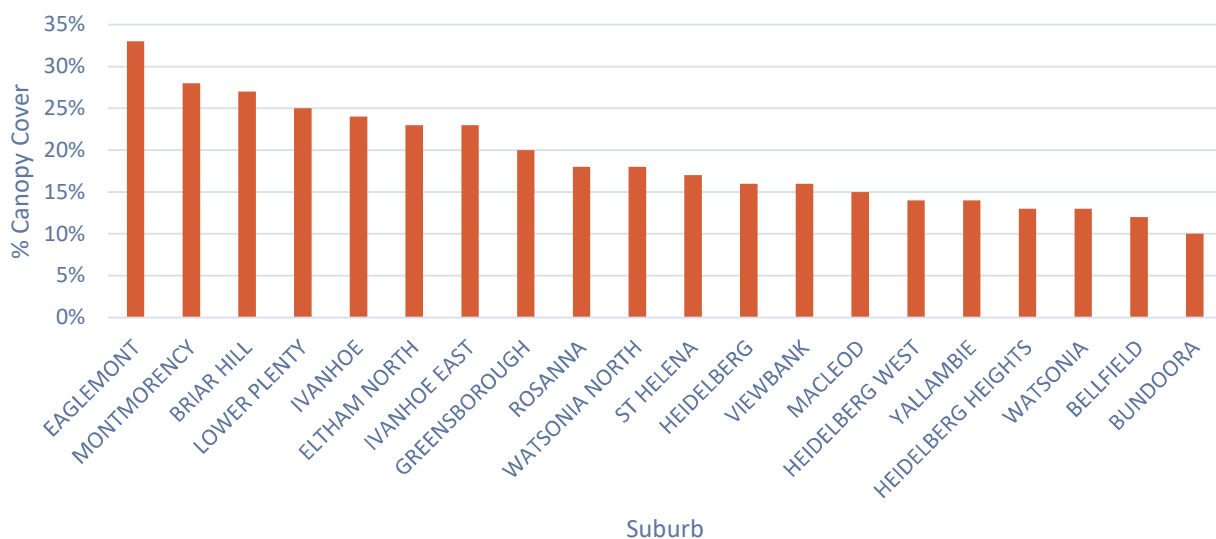
Figure 16: Tree canopy cover by suburb. Data collected, quality assured and supplied by the Victorian Government as part of the Vicmap data set released in 2021[49]

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[49] DELWP (2021) *Vicmap Vegetation: Tree Extent,* electronic dataset, Victorian State Government Department of Environment, Land Water and Planning https://tiles.arcgis.com/tiles/GB33F62SbDxJjwEL/arcgis/rest/services/Vicmap_Vegetation_Tree_Extent/MapServer

Figure 17: Images from areas of Banyule with low canopy cover: Taunton Drive in Bundoora (top), Orthla Avenue in Heidelberg West (middle) and Orsova Court in Bundoora Source Google Maps

Urban Forest Equity

The uneven distribution of canopy means the benefits of the urban forest are not felt equally across the population. This is problematic when low canopy cover coincides with the location of more vulnerable communities. The distribution of social advantage and disadvantage across Banyule using SEIFA can be seen in Figure 19. The spatial distribution of SEIFA (the Socio-Economic Indexes for Areas, of which we looked at the Index of Relative Social Advantage or Disadvantage (IRSAD)[50]) in Banyule shows that areas of disadvantage are concentrated in the western areas of Banyule, in particular Bundoora, Watsonia, Heidelberg West, Heidelberg Heights and Bellfield. Greensborough has a mixed of advantage and disadvantage, and most of the eastern area of Banyule show relative social advantage with respect to Victoria as a whole.
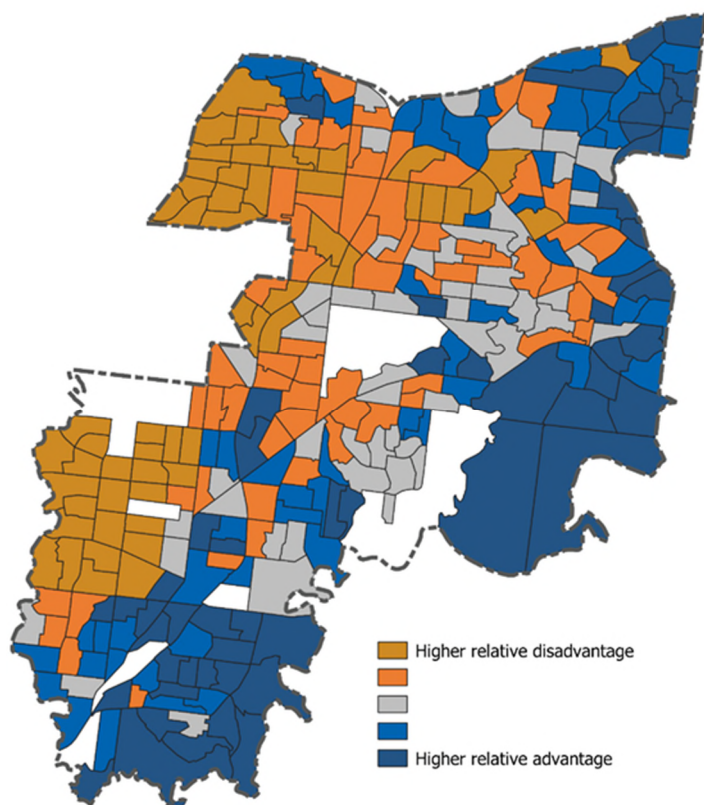
Figure 18: Map of SEIFA in Banyule. The red and orange areas have a higher social disadvantage relative to other parts of Banyule and Victoria. The blue parts of this map are areas of relative social advantage

Combining the canopy cover data with SEIFA shows a relationship between social disadvantage and tree canopy cover. The results show that the most advantaged communities have the highest level of canopy cover, with a general trend towards lower canopy with lesser levels of advantage (Figure 19).

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[50] Australian Bureau of Statistics (2018) *IRSAD*, Electronic Access, https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2033.0.55.001~2016~Main%20Features~IRSAD~20, Accessed September 2021

Figure 19: Percentage tree canopy cover by SEIFA

How is canopy cover changing across Banyule?

Banyule had a net loss of canopy between 2014 and 2018, but there was a net gain on public land

This can be seen using data that was generated in a 2019 RMIT University   report, which assessed changes in urban forest canopy between 2014 and 2018[51].This analysis combined Australian Bureau of Statistics (ABS) data with CSIRO's imagery-based classification of varied land surfaces (e.g., roofs, vegetation lawns)[52] to assess change in canopy cover and the relationship between any observed change and land-use categories

Most of the loss occurred across private land with 97% of the private canopy loss was on residential land. There was a net gain in public canopy over this time (Figure 20) but not enough balance the canopy losses on private property.

Figure 20: The change in canopy cover between 2014-2018 on private land in Banyule (RMIT 2019)

> **NOTE ON DATA** *The analysis on losses and gains in canopy was carried out using a different tree canopy data set than th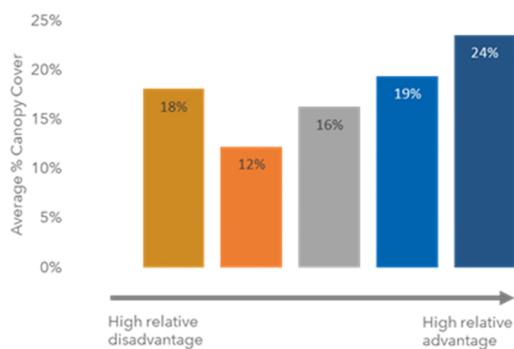e 2021 Vicmap Vegetation used for the analysis of distribution of tree canopy. The different data collection methods mean the RMIT analysis cannot be directly compared to the Vicmap Vegetation data set.*

Canopy over Footpaths

Trees in streets provide shade for daily activities and influence the way that people access and experience active travel options such as walking and cycling[53]. Shade from trees provide protection from UV exposure and a comfortable walking environment[54]. Closely spaced shade trees are described as an essential ingredient for designing 'walkable communities for pedestrians'[55]. Street trees also make a substantial contribution to the visual attractiveness of the streetscape and provide important habitat and movement pathways animals. The value the community places on trees in streets is reflected in the higher prices paid for houses on leafy streets[56].

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[51] Hurley, J., Saunders, A., Both, A., Sun, C., Boruff, B., Duncan, J., Amati, M. and Caccetta, P., 2019. Urban vegetation cover change in Melbourne: 2014-2018.

[52] Commonwealth Scientific and Industrial Research Organisation (2021) *Urban Monitor*, Electronic Access, https://www.csiro.au/en/research/technology-space/data/urban-monitor, Accessed December 2021

[53] Sun, Q *et al* 2021, A human-centred assessment framework to prioritise heat mitigation efforts for active travel at city scale, *Science of The Total Environment*, 763

[54] White, M and Langenheim, N 2014, Impact assessment of street trees in the City of Melbourne using temporal high polygon 3D canopy modelling, *7th International Urban Design Conference Designing Productive Cities*

[55] Ewing, R and Bartholomew, K 2013, *Pedestrian & Transit-Oriented Design*

[56] Pandit *et al* 2013, 'The Effect of Street Trees on Property Value in Perth', *Landscape and Urban Planning* 110 (1), pp. 134-142

The current extent of tree canopy cover of public footpaths across the city was measured by analysing data sets that map the current urban forest canopy and footpaths along streets and in parks and reserves. Tree canopy over footpaths ranges from 24.9% in Bundoora and 26.2% in Bellfield up to 41.4% in Ivanhoe East and 51.1% in Eaglemont. Figure 21and Figure 22show low canopy in the streetscape of Bundoora. Figure 23 and Figure 24 show the impact of shaded streetscape in Ivanhoe East which is more amenable to walking.

Figure 21: Poorly shaded footpaths in Bundoora (Source Banyule Council)

Figure 22: Streetscape view of poorly shaded footpaths in Bundoora (Source Google Maps)

Figure 23: Well shaded footpaths in Ivanhoe East (Source Banyule Council)

Figure 24: Streetscape view of well shaded footpaths in Ivanhoe East (Source: Google Maps)

Diversity and Age of Public Trees

Diversity of Species

Overall Banyule's species-level diversity at the whole of city area is healthy.

Figure 25: Public tree species in Banyule, based on analysis of Council's tree inventory which includes all street trees and some park trees.

Figure **25** shows the current diversity of species in Banyule's recorded public street tree population (note: current tree records focus on street trees and high use parks, with most of the city's natural area park trees yet to be included in the inventory).

The data shows that of the five dominant species no single species contributes more than 7% of the public tree inventory.

The most dominant tree is *Eucalyptus melliodora* or Yellow Box, is 7% of the recorded population, with 6,500 out of 95,000 trees.

While the overall diversity of the Urban Forest tree population is good there are some neighbourhoods where street trees are much less diverse. In the Semi-Bush and Bush Woodland precincts more than 25% is made up of *Eucalyptus melliodora.*
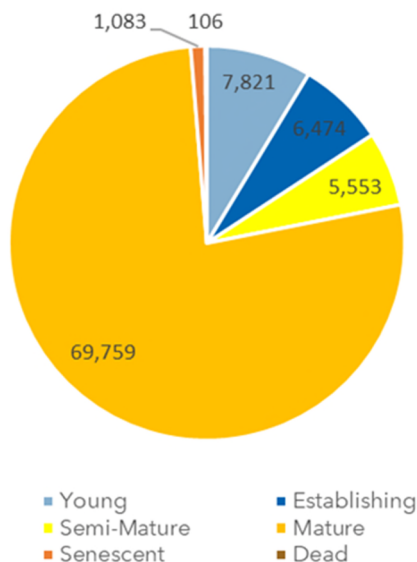
Distribution of Age

Figure 26 shows the age of public street trees across Banyule. There is not available data for date of planting prior to 2016, so tree age has been estimated. The majority of trees in the '*mature*' or younger category have an estimated lifespan of over 30 years. Most trees that are in the '*senescent*' category are shorter lived, with a lifespan of less than 30 years.

Most of the street trees in Banyule are mature - a phenomenon seen across each of Banyule's neighbourhoods. In part by nature of their large area, the Garden Court Precinct and the Garden Suburban Precincts contain the majority of these aging trees.

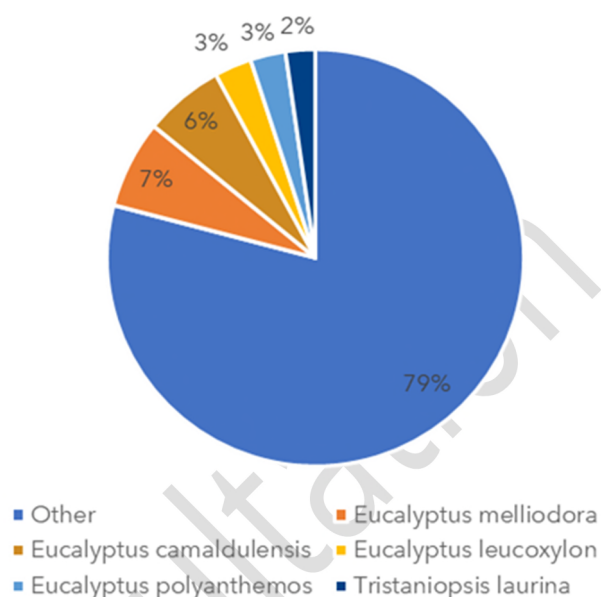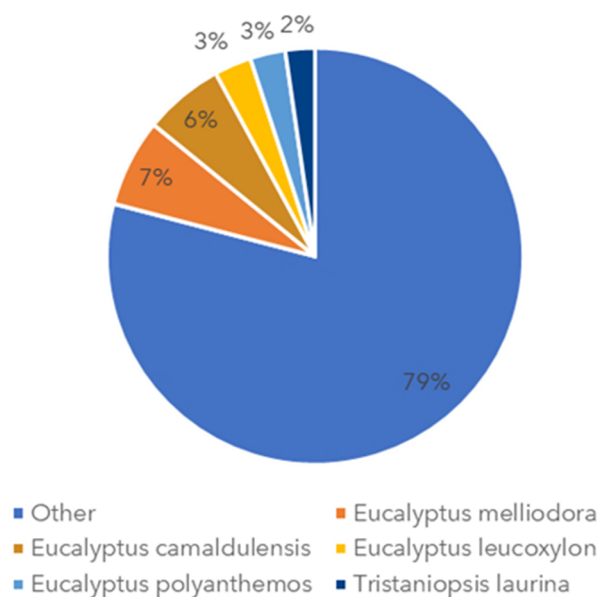**Figure 26: Public tree age across Banyule, based on analysis of Council's tree inventory which includes all street trees and some park trees.**

Climate Vulnerability

The impact of climate change on the vulnerability of the most common trees in Banyule is illustrated in Figure 27. This projected vulnerability is based on climate vulnerability data used to assess the City of Melbourne's street tree climate vulnerability[57] and CSIRO's climate analogues[58] (Table 2: Climate Change Scenarios).

The analysis shows that under an extreme climate change scenario (3°C increase in mean annual temperature by 2090), common trees that are well adapted to the present climate will become very vulnerable to future conditions e.g., *Eucalyptus melliodora*, *Eucalyptus leucoxylon* and *Eucalyptus nicholii*. The first two of these species are locally native (indigenous) and common in Banyule.

> Under an extreme climate future (3°C increase in mean annual temperature by 2090), 40% or more of the public tree population would have moderate to high vulnerability to projected climate change.

Under a more moderate climate scenario, over 20% of the most common tree individuals may show increased vulnerability to climate change.

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[57] Kendal D., Baumann, J. (2016) The City of Melbourne's Future Urban Forest: Identifying vulnerability vulnerability to future temperatures. School of Ecosystem and Forest Sciences The University of Melbourne, Accessed December 2021 http://www.melbourne.vic.gov.au/news-and-media/Pages/world-leading-research-tells-us-which-trees-to-plant-.aspx
[58] CSIRO (2020) Climate Change in Australia: Climate Analogues, Accessed August 2022 https://www.climatechangeinaustralia.gov.au/en/projections-tools/climate-analogues/analogues-explorer

Table 2: Climate Change Scenarios

Current Climate	Moderate Climate Change Scenario	Extreme Climate Change Scenario
• *Mean annual temp 16.4°C* • *Extreme maximum temperature 44°C* • *Extreme minimum temperature of -2.4°C*	• 0.8 °C increase in mean annual temperature to 17.2°C • 0.5 °C increase in extreme maximum temperatures 44.5°C • 0.5 °C increase in extreme minimum temperatures to -1.9°C • **Climate changing to resemble Albury-Wodonga**	• 3 °C increase in mean annual temperature to 19.4°C • 2 °C increase in extreme maximum temperature to 46°C • 2 °C increase in extreme minimum temperature to -0.4°C • **Climate changing to resemble inland NSW towns of Dubbo, Parkes and Forbes**
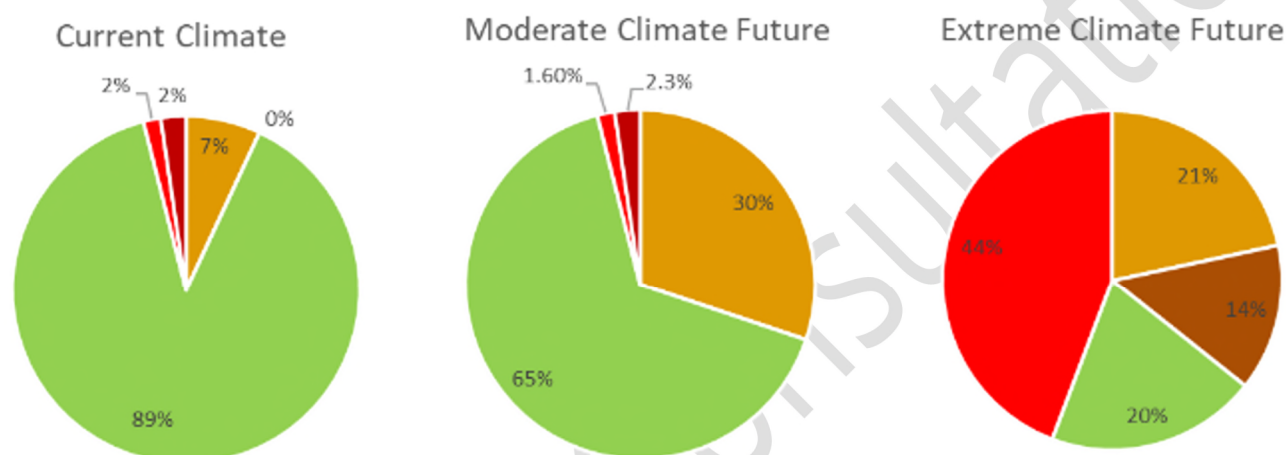
KEY The colours in the charts represent different levels of vulnerability to increased temperatures under different climate scenarios.

Green – species in this group are not considered vulnerable in each climate scenario. The proportion of species in Banyule in this group declines from 89% to 20% in the extreme climate future.

Amber and amber-max - species in this group are moderately vulnerable in each temperature scenario. The proportion of species in this group increases from 9% in the current climate to 35% to 32% in the moderate climate future.

Red – species in this group are very vulnerable in each temperature scenario. 44% of the 30 most common species in Banyule would be very vulnerable to climate change, and 35% would be moderately vulnerable.

Figure 27: Vulnerability of Banyule's current public tree composition to climate change, given different scenarios

Section 4. The Urban Forest Strategy

The strategic framework for the Banyule Urban Forest Strategy provides a clear definition of the urban forest, a vision for its future, and principles to guide progress towards the vision.

These elements are crucial to achieving a common understanding of what is needed and wanted, how the urban forest should be delivered, and what it means for current and future Banyule communities. The Urban Forest Definition, Vision and Principles were developed collectively by community, officers and Councillors.

Defining what the urban forest is to Banyule, setting the longer-term vision and mapping out a pathway are all critical steps in achieving best practice urban forest planning and management.

The definition, vision and principles make up the strategic framework (Figure 28) for the Banyule Urban Forest Strategy and should be used together to guide action. Each element is expanded below.

Definition

Banyule's urban forest is the trees and greening assets that exist in an urban area, that are strategically planned, designed, and managed as well as the ecosystems, soils and water that support them.

Long-term Vision

Banyule's urban forest is resilient. It is thriving and people are aware and value the role of the urban forest for health and wellbeing and in making Banyule a great place to live.

The urban forest is managed as an essential asset for Banyule and decisions about the urban forest are fit for place and purpose and space is provided to support greening and larger tree canopy.

People work with Council and are active in the protection, management and maintenance of the urban forest.

Principles

We believe a healthy urban forest is the result of strong partnerships between Council and community.

We believe the urban forest is an essential asset for Banyule, shared by all and crucial for the health and wellbeing of the community and natural environment.

We act today to respond to the changing climate and to leave a positive legacy for the future community, and we act responsibly, using evidence-based practice in our leadership and management of the urban forest.

We plan, design and deliver for the people, places and natural environments of Banyule including:

- Climate change and reduction of the urban heat island effect

- Liveability, amenity and neighbourhood character

- Banyule's ecosystems and biodiversity

We protect and enhance the Banyule's natural environment to care for flora and fauna.

Strategic Areas

Prioritise urban forest improvements in the most vulnerable suburbs and places across Banyule

Increase the diversity of the Urban Forest for biodiversity and habitat with ground cover and shrub layer plantings

Manage the Urban Forest across public and private land for resilience to climate change

Take a long term, asset management approach to the Urban Forest

Build and maintain partnerships with others in the protection and management of the Urban Forest

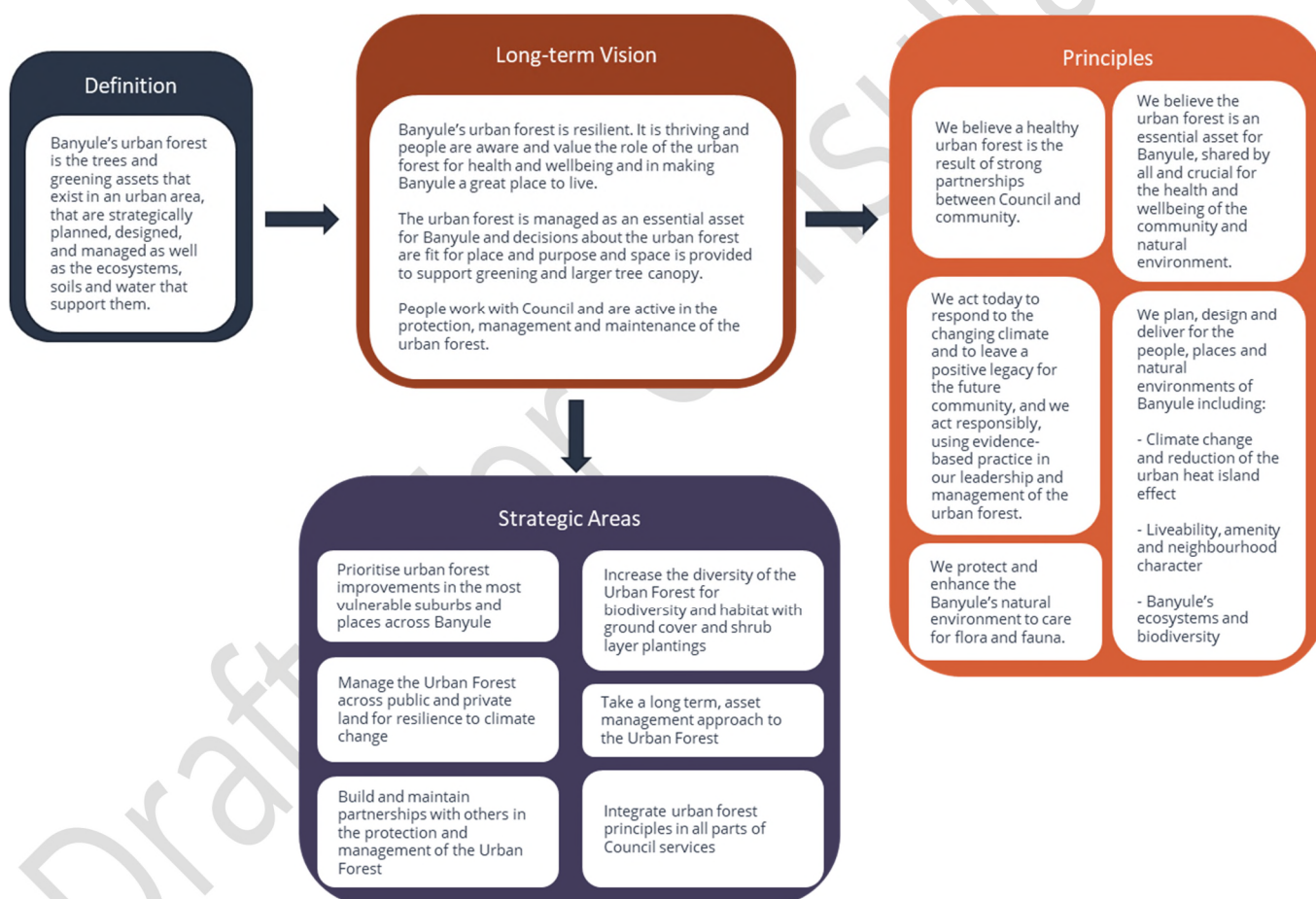Integrate urban forest principles in all parts of Council services

Figure 28: Strategic framework that guides the Banyule Urban Forest Strategy

What is the Urban Forest in Banyule?

In February 2022, Council adopted a definition of the urban forest (**Error! Reference source not found.**). This definition will assist Council officers and the community to understand the reach of this Strategy and consider the urban forest improvements to be made across all areas.

> **Banyule's Urban Forest is the trees and green assets that exist in the urban area, that are strategically planned, designed, and managed and the ecosystems, soils and water that support them.**

This definition highlights that the Banyule urban forest is: made up of all trees and green assets that exist in the urban area (not just bushland) a managed asset and therefore not a purely natural system vegetation as well as the soils and water needed to support resilience and healthy growth.

A Vision for Banyule's urban forest

This is the long-term community vision for Banyule's future urban forest:

> **Banyule's Urban Forest is resilient. It is thriving and people are aware and value the role of the Urban Forest for health and wellbeing and in making Banyule a great place to live. The Urban Forest is managed as an essential asset for Banyule and decisions about the Urban Forest are fit for place, and purpose and space is provided to support greening and larger tree canopy.**
> **People work with Council and are active in the protection, management and maintenance of the Urban Forest.**

It is understood that this vision may not be fully realised for 50 years or more and it describes the far future state of the urban forest for Banyule.

It was developed collaboratively with the community and guides the strategic areas, important areas of work and actions to take, over the next 10 years. It was endorsed by Council in February 2022.

Indicators to demonstrate achievement of this vision have been developed. These are outlined in Section 9.

A Powerful Owl in a Banyule tree Image credit: banyule.vic.gov.au/Events-activities/Whats-on/Council-events/Biodiversity-photo-contest

Principles for the Urban Forest in Banyule

There are five urban forest principles that provide the focus for Council in the implementation of Banyule's Urban Forest Strategy. These principles were developed collaboratively with the community and Councillors and were endorsed by Council in February 2022.

The five Principles that provide the focus for Banyule's Urban Forest Strategy are:

1. **We believe the urban forest is an essential asset for Banyule, shared by all and crucial for the health and wellbeing of the community and natural environment.**
2. **We believe a healthy urban forest is the result of strong partnerships between Council and community.**
3. **We act today to respond to the changing climate and to leave a positive legacy for the future community, and we act responsibly, using evidence-based practice in our leadership and management of the urban forest.**
4. **We plan, design and deliver for the people, places and natural environments of Banyule including:**
   - **Climate change and reduction of the urban heat island effect**
   - **Liveability, amenity and neighbourhood character**
   - **Banyule's ecosystems and biodiversity**
5. **We protect and enhance the Banyule's natural environment to care for flora and fauna.**

Strategic Areas to Deliver a Thriving and Resilient Urban Forest

There are six key strategic areas for Banyule to pursue over the next 10 years.

1. **Prioritise urban forest improvements in the most vulnerable suburbs and places across Banyule**
2. **Increase the diversity of the Urban Forest for biodiversity and habitat with ground cover and shrub layer plantings**
3. **Manage the Urban Forest across public and private land for resilience to climate change**
4. **Take a long term, asset management approach to the Urban Forest**
5. **Build and maintain partnerships with others in the protection and management of the Urban Forest**
6. **Integrate urban forest principles in all parts of Council services**

These key and strategic directions were developed in collaboration with the community and reflect the areas of work most needed to be taken to achieve the Urban Forest Vision.

Each strategic area has a series of major actions to be implemented over the short- and medium-term. Key performance indicators will assist with measuring and reporting on success and supporting a continuous improvement process for the management of the urban forest.

Evolution from the 2015 Urban Forest Strategic Plan

This Urban Forest Strategy replaces the 2015 Urban Forest Strategic Plan (UFSP). The UFSP was structured around a number of goals. The values that underpinned the goals were repeated by the community and stakeholders in the development on the UFS, with goals matched to equivalent principles and strategic areas in in the UFS (Table 3).

The detail of actions from the UFSP that are matched to actions in the UFS are detailed in Section 8. .

Table 3: 2015 UFSP Goals mirrored in the UFS

2015 UFSP Goal	Matching 2022 UFS Principles	Matching 2022 UFS Strategic Areas
Increase environmental benefits of urban forest	**4**	**Take a long term, asset management approach to the Urban Forest**
Improve biodiversity and increase habitat	**4 & 5**	**Increase the diversity of the Urban Forest for biodiversity and habitat with ground cover and shrub layer plantings**
Increase canopy cover in available open space	**1, 3 & 4**	**Prioritise urban forest improvements in the most vulnerable suburbs and places across Banyule**
Improve health of the Urban Forest	**2 & 3**	**Manage the Urban Forest across public and private land for resilience to climate change**
Improve species diversity	**2**	**Increase the diversity of the Urban Forest for biodiversity and habitat with ground cover and shrub layer plantings** **Manage the Urban Forest across public and private land for resilience to climate change**
Raise the profile of the urban forest within Council	**6**	**Integrate urban forest principles in all parts of Council services**
Improve community engagement with the urban forest	**4**	**Build and maintain partnerships with others in the protection and management of the Urban Forest**
Improve establishment rate of new tree plantings	**1**	**Take a long term, asset management approach to the Urban Forest**
Apply Best Practice	**1**	**Take a long term, asset management approach to the Urban Forest**

Section 5. Where is the Urban Forest Most Vulnerable?

A central tenet of the Urban Forest Strategy is that actions should target places in greatest need. To determine where these places are, we looked at the available data to assess the areas of highest need i.e., those that were most vulnerable.

Determining High Priority Places

There are many ways to define where both the urban forest and the community are most vulnerable and where priority action is needed. Spatial analysis, overlaying data about vegetation in an area and how the community uses that area, is a way to rank the importance of action in different areas.

Having access to good quality, well collated data about the trees and vegetation and their urban environment is critical to the delivery of best practice urban forestry[59]. Banyule, the Victorian Government and others have a range of data available that has assisted with the analysis of urban forest vulnerability in Banyule. As data improves the accuracy of prioritisation will improve.

Data for this analysis has come from:

- Banyule's Tree Inventory (2021)
- Vicmap Vegetation Tree Extent Data (2021)[60]
- Victorian planning scheme zones (2022)[61]
- SEIFA (2016)[62]
- Metropolitan Melbourne Heat Vulnerability Index (2018)[63]
- Victorian Planning overlays, specifically Land Subject to Inundation Overlays (LSIO) and Urban Floodway Zone (UFZ) (2022)[64]

Prioritisation Matrix

A draft prioritisation matrix has been applied to a series of urban forest data to demonstrate the approach and results. The matrix proposes a method to collate and assess climate, urban forest and socio-economic data (historic, current and emerging) to assign weightings against actions. The matrix is intended to be used as living tool and will be periodically reviewed to refine its application against emerging data and trends.

While there are many elements that could be included in the matrix, the following six elements of the urban forest were considered important to assess priority places for Banyule, below. The places considered more vulnerable or more in need of urban forest action are in brackets.

- Existing canopy cover (Low canopy cover)
- Socio-economic disadvantage (High levels of socio-economic disadvantage)
- Biodiversity (Low levels of biodiversity / habitat)
- Urban heat islands (High levels of urban heat)

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[59] Best Practice Urban Forest Planning and Management, Literature Review, Mosaic Insights 2021

[60] DELWP (2021) *Vicmap Vegetation: Tree Extent,* electronic dataset Victorian State Government Department of Environment, Land Water and Planning, https://tiles.arcgis.com/tiles/GB33F62SbDxJjwEL/arcgis/rest/services/Vicmap_Vegetation_Tree_Extent/MapServer

[61] DELWP (2022) *Planning scheme zones - Vicmap Planning,* electronic dataset, Victorian State Government Department of Environment, Land Water and Planning, https://discover.data.vic.gov.au/dataset/planning-scheme-zones-vicmap-planning

[62] Australian Bureau of Statistics (2016) *The Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD)* [Census TableBuilder], Accessed 21st December 2021.

[63] DELWP (2018) *Metropolitan Melbourne Heat Vulnerability Index 2018,* electronic dataset, Victorian State Government Department of Environment, Land Water and Planning, Accessed 21st December 2021

[64] DELWP (2022) Planning scheme overlay - Vicmap Planning, electronic dataset, Victorian State Government Department of Environment, Land Water and Planning, https://discover.data.vic.gov.au/dataset/planning-scheme-overlay-vicmap-planning

- Walking routes (Priority walking and cycling routes present and opportunities for connectivity)
- Flooding hot spots (Nuisance flooding)

Other factors that can be included in the prioritisation matrix in the future include:

- Places with capacity for storm buffer/ wind break
- Places that can accommodate large trees
- Relative diversity of tree species
- Trees reaching the end of their life (useful life expectancy - ULE)
- Areas with upcoming maintenance activities or capital works planned e.g., roads, footpaths, traffic calming infrastructure
- Active Transport Routes, such as shared user trails

Emerging priority places for urban forest action

The analysis of data using the draft prioritisation matrix shows that the high priority areas for intervention and Urban Forest improvements, as shown in Figure 29, are:

- Bundoora
- Greensborough
- Watsonia
- Heidelberg West
- Heidelberg

- Eltham North
- Belfield
- Viewbank
- Ivanhoe

These suburbs have a range of factors to make them priorities, for example Bundoora has low canopy cover and higher disadvantage while areas of Ivanhoe East are prioritised for their pedestrian activity, urban heat and proximity to biodiversity areas.
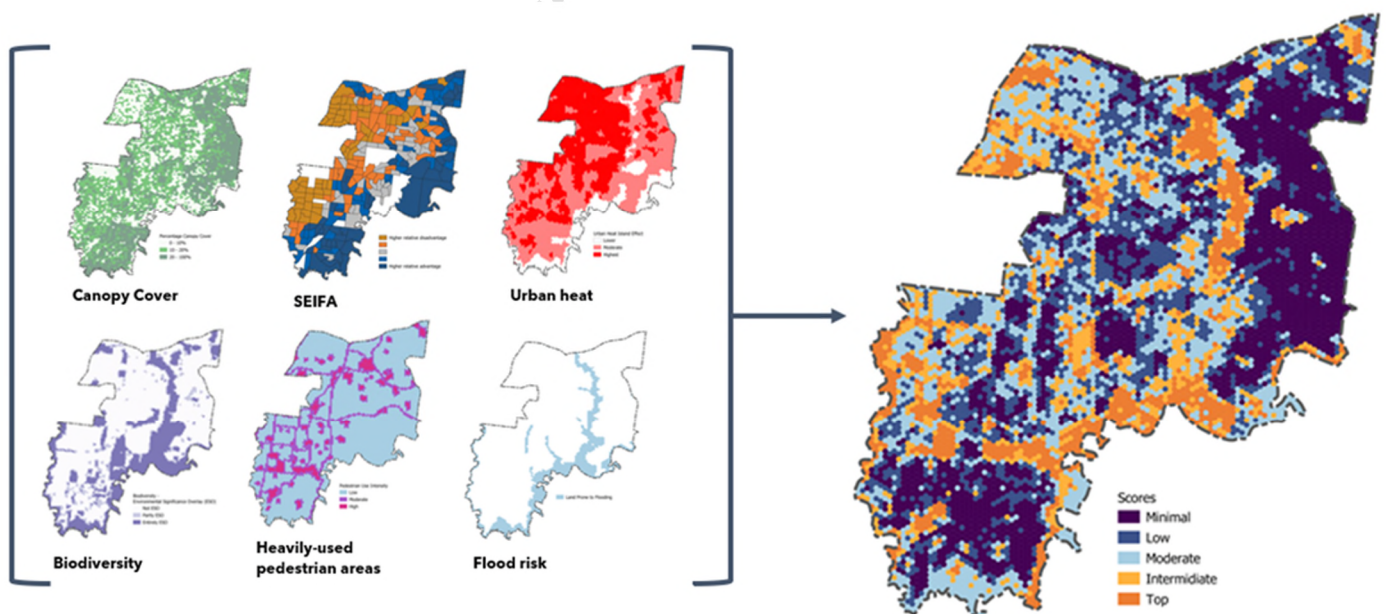
Figure 29: Draft spatial prioritisation of urban forest actions in Banyule with equally weighted factors

Strategic Area 1 has a number of actions to formalise this approach, including developing an agreed weighting of the factors, the need to align action plans with the prioritisation and the periodic review of the matrix as new data becomes available.

Section 6. Strategic Areas for the Banyule Urban Forest

This Strategy outlines six key strategic areas. Each strategic area has a series of major actions to be implemented over the short- and medium-term. Key performance indicators assist with measuring and reporting on success and supporting a continuous improvement process for the management of the urban forest. More detail on measuring performance can be found in Section 8. .

This section outlines each Strategic Area and provides:

1. An overview of the issue being addressed
2. The major action areas to be implemented by Council and its partners over the next 10 years and
3. Case studies of best practice by other local government agencies.

Strategic Area 1 – Prioritise Urban Forest Improvements in the Most Vulnerable Suburbs and Places

Overview

This Direction will see Council and the community take affirmative action to address the inequity in canopy cover and urban forest quality in the areas with the lowest canopy, the highest proportion of lower socio-economic communities (page 29) , areas of highest urban heat and exposure to the impacts of climate change (page 27).

Major Actions

Actions	Further Detail
S1.1 - Develop an agreed urban forest prioritisation method that is based on the Urban Forest Principles to identify areas in most need of planning and intervention.	Determine a weighting for combining spatial factors of canopy cover, socio-economic disadvantage, UHI priority, flooding, wildlife corridors etc. The output is a map to allocate the relative priority of taking action in different locations.
S1.2 - Train staff in all areas about the prioritisation method and engage the key teams in the process to deliver increased understanding and integration into other programs and annual plans.	Training will require documentation for procurement, customer service and an induction process as well as a program to hold regular discussions with teams during meetings.
S1.3 - Review the urban forest priorities every 3 years (using the prioritisation method) and include actions in asset management and annual operational plans.	To be reflected in service levels and annual operational plans with a workshop review with the output of a report.
S1.4 - Develop and improve the urban forest prioritisation method as new data become available.	Update the matrix as new information becomes available such as census, canopy or ecological data.
S1.5 - Program annual planting in areas with highest priority.	Focus annual street and park planting, and replacement of underperforming trees, in locations of high priority.
S1.6 - Identify vacant street tree sites and program infill plantings to be completed in the short term.	Plant out the approximately 10,000 vacant street tree sites by 2027.
S1.7 - Work with local indigenous plant nurseries or community nurseries to provide local provenance.	Obtain tree and plant stock from locally sourced seed. Engage nurseries to grow trees to advanced stage for street tree planting or bring in-house to council.

Details of the major actions with their priority and resourcing are provided in Section 7. and their measures and indicators are in Section 8. .

Case Study: Frankston City Council's approach to getting the right tree in the right place

Frankston City Council (FCC) manages around 62,000 trees in streets, with many more trees located in parks. Canopy cover is not evenly distributed across the city's suburbs. FCC has a substantial tree planting budget and has identified vacant sites for tree planting throughout the municipality. They developed a prioritisation process to strategically focus tree planting where it is most needed, in a way that benefits the community the most at the lowest cost.

Five prioritisation criteria were identified for their relevance to Frankston's low canopy cover precincts:

- Current tree canopy cover
- Heat vulnerability
- Pedestrian intensity
- Biodiversity
- Flooding

Each criterion was assigned a score, and these were added to give an overall score for each section of road and open space managed by FCC. Areas were grouped into high, medium and low priority based on this overall score, and this informed a 10-year planting plan.

Banyule could use a similar method to identify its own priority areas for greening. Criteria may be similar to those used in FCC or differ to reflect the specific aims and objectives of Banyule's UFS as described in Prioritisation Matrix on page 42.

Relevant Banyule Key Direction
Prioritise urban forest improvements in the most vulnerable suburbs and places across Banyule

Related Actions
S1.1 - Develop an agreed urban forest prioritisation method that is based on the Urban Forest Principles to identify areas in most need of planning and intervention
S1.3 - Review the urban forest priorities every 3 years (using the prioritisation method) and include actions in asset management and annual operational plans
S1.4 – Develop and improve the urban forest prioritisation method as new data become available
S1.5 - Program annual planting in areas with highest vulnerability
S1.6 - Identify vacant street tree sites and program infill plantings to be completed in the short term
S2.1 - Identify suitable sites in reserves, roadsides and underutilised land where mown turf can be improved to include trees, shrubs, native grasses or groundcovers

Case Study: 3-30-300 Rule

The 3-30-300 rule has been developed to guide urban forest strategy and planning to reflect the crucial contribution of the urban forest and other urban nature to community health and wellbeing, as well as climate adaptation. The rule recognises that we need to make urban forests accessible to all residents, bringing trees and green space into every neighbourhood and street. Cities and organisations around the world are adopting the rule, and I commend the City of Banyule in their leadership in the urban forest strategy space.'

Overview of the 3-30-300 rule

3 trees from every home

The first rule is that every citizen should be able to see at least three trees (of a decent size) from their home.

30 percent tree canopy cover in every neighbourhood

Studies have shown an association between urban forest canopy and, for example, cooling, better microclimates, mental and physical health, and possibly also reducing air pollution and noise. By creating more leafy neighbourhoods, we also encourage people to spend more time outdoors and to interact with their neighbourhoods (which in turn promotes social health).

300 metres from the nearest park or green space

Many studies have highlighted the importance of proximity and easy access to high-quality green space that can be used for recreation. A safe 5-minute walk or 10-minute stroll is often mentioned.

It is essential for successful urban forestry programs to have long-term strategies and plans in place, based on a clear vision of what the urban forest can do for local communities. Having clear targets in terms of urban forest visibility, canopy, and access is an important element of this.

Strategic Area 2 - Increase the Diversity of the Urban Forest for Biodiversity and Habitat with Ground Cover and Shrub Layer Plantings

Overview

Banyule, like most other local government areas across Australia, has a low level of diversity in its urban forest in certain neighbourhood character areas (Diversity of Species on page 33).

This strategic area will see Council and the community continue the work to extend the urban forest beyond trees and introduce more diversity into the structure of the forest. If successful it will see a range of trees, shrubs and groundcovers/grasses across the Banyule local government area. It will also see an increase in partnership between Council and the community and enhance community biodiversity actions already activity occurring across Banyule. Figure 30 shows the contributions to streetscapes that can be made by nature strip plantings.

As a managed system, selection of species to plant within the urban forest is influenced by many factors. To assist Council staff and the community it will be important that the rationale for the selection of certain species for street trees is understood and communicated. Figure 31 provides an example of species selection processes.

Major Actions

Actions	Further Detail
S2.1 - Identify suitable sites in reserves, roadsides and underutilised land where mown turf can be improved to include trees, shrubs, native grasses or groundcovers.	Year 1, map suitable locations and develop a program for implementation.
S2.2 - Establish and maintain new planting locations of shrubs, native grasses and groundcovers.	Year 2 would be a pilot program of a small number of sites. Funding sought in Year 3 to roll out to larger number of sites. Resource staff to establish and maintain planting locations.
S2.3 - Investigate the co-management of new planting sites within the Urban Forest with the community.	Initial target groups will be community groups such as friends' groups or scouts.
S2.4 - Develop the nature strip planting program, provide guidelines, and promotion of the benefits to residents	Implement through a permit system and or change to the local law to allow residents to plant nature strips where appropriate.
S2.5 - Map the ecological corridors (wildlife connection and known fauna movements) to integrate with the urban forest data to identify opportunities for planting sites	This will include spatial mapping based on fauna movement from an urban ecologist.
S2.6 - Provide recommended species lists for a fit for purpose urban forest i.e., the 'right-tree-right-place'. This will include species that are climate ready, suitable for the site and consider the benefit for urban ecology.	Develop an online, location-based list of appropriate species for public and private plantings including a set of suitable substitutes to overly used or inappropriate species.
S2.7 - Provide training and information for Council staff on the urban forest - its definition, vision and principles and what it means for their work.	This will run in tandem with S1.2 'Staff training' specifically including the induction process.

Details of the major actions with their priority and resourcing are provided in Section 7. and their measures and indicators are in Section 8. .

Figure 30: Nature strip or verge planting in Banyule's streets can improve local environmental conditions and amenity, enhance biodiversity, and bring communities together Source: Banyule Council

Species Selection Matrix

Species selection of street trees is guided by the main factors, including:

- Neighbourhood character and surrounding character of the streets trees and properties.
  We can influence this neighbourhood character on unplanted streets and have the ability to phase-in more indigenous and native species on established streets, to create a more Australian character.

- Semi Bush and Bush Woodland would ideally be indigenous plantings.

- Garden Court and Garden Suburban would be influenced by the existing street trees, and sometimes the front garden character.

- The individual variances of the neighbourhood character are considered – each planting is site specific.

	Example Exotic Selection	Example Native Selection	Example Indigenous Selection
Small / Under HV	*Acer buergerianum* *Lagerstroemia* sp.	*Hakea* sp. *Banksia marginata* *Geijera parviflora*	*Callistemon sieberi* *Acacia pycantha* *Bursaria spinosa*
Small / Vase for under LV	*Koelreuteria paniculata* *Gleditsia tricanthos*	Brachychiton hybrids Mallee Eucalypts *Corymbia citriodora* grafted cultivars	*Eucalyptus leucoxylon* *Melaleuca ericifolia* *Leptospermum lanigreum*
Tall / Narrow	*Pistacia chinensis* *Zelkova serrata* 'Green Vase'	*Banksia integrifolia* *Hymenosporum flavum*	*Acacia implexa* *Eucalyptus rubida* *Allocasuarina littoralis*
Larger sites	*Quercus lusitanica* *Ulmus carpinifolia* x*parvifolia* 'Frontier'	*Lophostemon confertus* *Brachychiton populneus*	*Eucalyptus yarraensis* *Acacia dealbata* *Eucalyptus tricarpa*

Figure 31: Factors guiding the selection of species for street tree plantings

Case Study: Marrickville Sustainable Streets

Inner city urban areas are space-poor and often lack the canopy and greening of outer suburban places. The community, however, can be just as interested as council in increasing the opportunities for nature. To realise the benefits that come from a healthy urban forest and to respond to community need, Marrickville Council developed the Sustainable Streets Program. Sustainable streets were created by volunteers with a range of support options from Council. They were designed to reduce the maintenance burden of verge mowing on Council, increase the amount of water infiltration, biodiversity and amenity and create opportunities for neighbours to come together.

The program worked on multiple levels:
- as a core component of the annual footpath maintenance and replacement program – where tree pits were widened and gardens were created;
- at the request of a resident, Council would remove concrete to create a garden area and
- a general verge gardening program administered under verge gardening guidelines.

Banyule might develop opportunities for verge garden by the community.
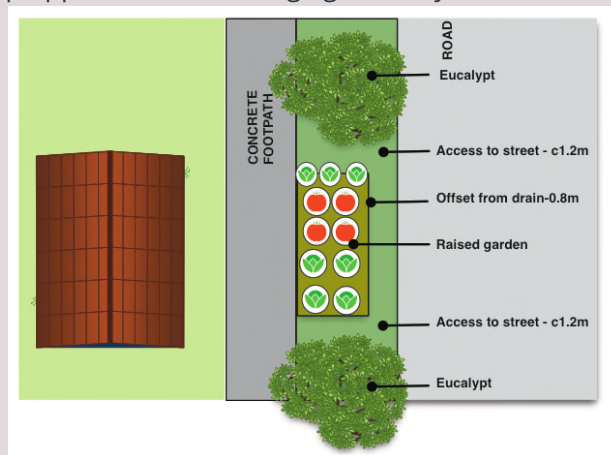
Garden Plan of 2011 Marrickville Council Edible Garden of the Year Winner,
Browns Avenue, Marrickville

Relevant Banyule Key Directions
- Increase the diversity of the urban forest for biodiversity and habitat with ground cover and shrub layer plantings
- Build and maintain partnerships with others in the protection and management of the urban forest

Related Actions
- S2.1: Identify suitable sites in reserves, roadsides and underutilised land where mown turf can be improved to include trees, shrubs, native grasses or groundcovers
- S2.3: Investigate the co-management of new planting sites within the Urban Forest with the community
- S2.4: Develop the nature strip planting program, provide guidelines, and promotion of the benefits to residents
- S2.5: Map the ecological corridors (wildlife connection and known fauna movements) to integrate with the urban forest data to identify opportunities for planting sites

Strategic Area 3 - Manage the Urban Forest Across Public and Private Land for Resilience to Climate Change

Overview

This strategic area will focus Council's efforts on active management of the urban forest to help the community adapt to a changing climate and help the urban forest increase its resilience so it can thrive. This will respond to the current areas of highest urban heat and exposure to the impacts of climate change and to public and private tree resilience by selecting the tree species that will not only survive but thrive in a changing climate).

Details of the major actions with their priority and resourcing are provided in Section 7. and their measures and indicators are in Section 8. .

Major actions

Actions	Further Detail
S3.1 - Provide support for the protection and survival of listed significant trees on private lands, include tree owners and neighbours in the communication and engagement around significant trees.	Support may include access to a grant for arboricultural tree assessments and/or tree works. The amount of investment will be reviewed annually.
S3.2 - Provide care and protection of listed significant trees on public land.	After an annual arboricultural inspection for each significant tree, care may include additional pruning, watering, mulching and understory planting or risk reduction by moving targets.
S3.3 - Work with private and non-council land holders to improve the urban forest on their land via place-based programs and development processes.	As an example, this may include schools, encumbered open space under transmission power lines and water easements.
S3.4 - Implement passive irrigation (WSUD) for public realm trees and make this business as usual for capital projects and new developments.	Run a trial of small scale WSUD systems that can be easily replicated, incorporate into standard kerb and street tree planting design.
S3.5 - Provide the public with a recommended species lists for a fit for purpose urban forest i.e., the 'right-tree-right-place'. This will include species that are climate ready, suitable for the site and consider the benefit for urban ecology.	Share and promote the recommended species list with the public. The place-based plans will be available online for residents to view which neighbourhood place/area they are in.
S3.6 - Review the recommended species lists annually or when new information comes to light and communicate to community and Council staff.	The list will be maintained in a live format that will enable easy updating as tree species and climate data becomes available.

Case Study: Wyndham's Significant Trees

Many trees within Wyndham City Council (WCC) are important to the community and have significant scientific, social, historic and amenity attributes, yet they were not uniformly assessed or recorded.

WCC called on residents to nominate public and private trees for potential inclusion in the Wyndham Significant Tree Register, giving the following nomination guide:

- Trees are deemed significant based on the Natural Heritage Trust's criteria of scientific, social, historical and amenity values
- Property owners are contacted if a tree has been nominated on their land
- Every nominated receives an arboriculture and heritage assessment
- WCC identifies options to assist residents with managing trees that are included in the final Significant Tree Register
- Any tree can be nominated by any person

Residents use a spatial tool (below) to identify a potentially significant tree. Though it already has a significant tree register, Banyule may benefit from a spatial tool similar to that used in WCC. The spatial tool would allow residents to see the nomination status of trees across their area, and to draw attention to additional private and public trees which may be formally registered as significant.
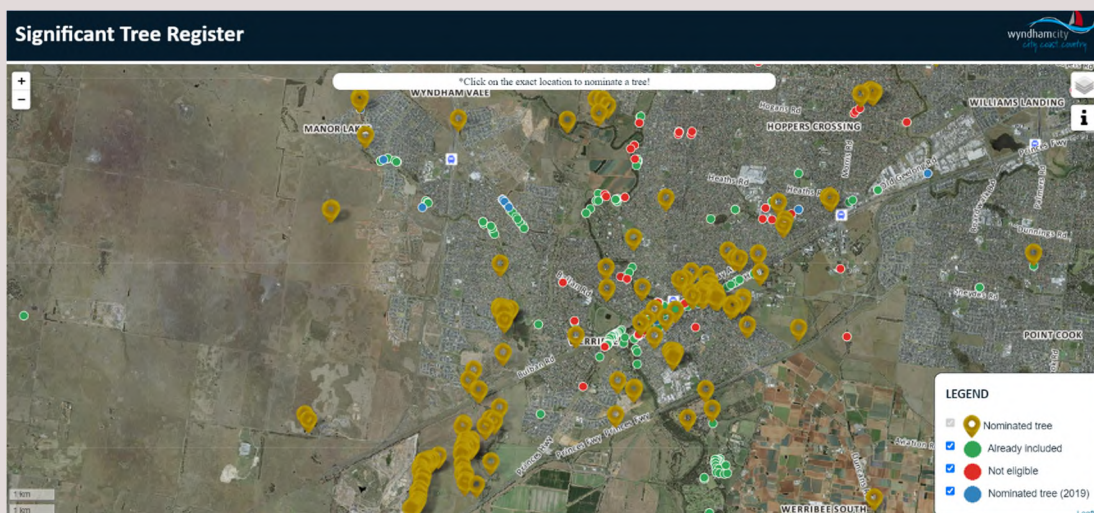
WCC Spatial tool to assist with identification and tagging of Significant Trees

Relevant Banyule Key Directions

- Manage the urban forest across public and private land for resilience to climate change
- Build and maintain partnerships with others in the protection and management of the urban forest

Related Actions

S3.1: Provide resources and support for the protection and survival of culturally significant trees on public and private lands, include tree owners and neighbours in the communication and engagement around significant trees

Strategic Area 4 - Take a Long Term, Asset Management Approach to the Urban Forest

Overview

Managing the urban forest as an essential asset for Banyule is outlined in the Urban Forest vision (0). The definition of an urban forest for Banyule clearly states that the urban forest is a green asset that is strategically planned, designed and managed. This brings urban forest elements into line with other public assets or grey infrastructure.

With this approach there is a clear need for:

- clear and accurate data
- an asset management plan that considers timing, resourcing and risk
- resourcing to maintain and renew the urban forest
- monitoring and reporting for continuous improvement
- integration of greening assets with other asset management planning

The focus of this strategic area is on establishing an asset management approach to the urban forest elements.

The business case for investing in formative pruning of young trees is compelling. Ryder & Moore[65] assessed the number of defects in a population of commonly planted trees in Melbourne, the time required to prune juvenile trees and time required to manage the defects in mature trees. Allowing for inflation when the cost of pruning a 20-year-old tree is compared to the cost of two formative pruning cycles after three and six years, totalling less than $10, there is a 13–18-fold increase.

Proactive controls for managing tree risk will adhere to Banyule's risk management framework and will inform the inspection time frames for trees depending on the location. This will determine that all trees will be inspected for risk in streets, parks, reserves, council facilities, bushland and along the path network with appropriate frequency depending on the risk profile for the area.

Major Actions

Actions	Further Detail
S4.1 - Develop place-based plans to manage the urban forest taking into account use, neighbourhood character and climate. Including: In-fill planting program, maintenance, street tree renewal.	The place-based plans will be available online for residents to view which place/area they are in.
S4.2 - Implement a tree valuation policy including amenity value and ecological value.	Tree amenity and ecological valuation methodologies use are widely used by local governments around Melbourne. Revenue for trees that are removed for development would be expended through the Future Canopy fund (S6.3.3)
S4.2.1 - Link the urban forest amenity value to current asset management processes.	Track the amenity and ecosystem service value of trees in the tree asset system, link the tree asset records to Council's central asset management system (Assetic)
S4.3 - Adopt a canopy cover assessment method to measure canopy gains and losses annually.	Acquire canopy data and analyse the drivers for canopy losses and gains on public and private land
S4.4 - Develop a comprehensive urban forest database to allow the analysis of effort and outcome of the urban forest strategy and asset management programs.	Essential systems upgrade to allow for the core delivery of the Urban Forest Strategy including tree planting program.
S4.5 - Develop a comprehensive urban forest interactive mapping portal that includes information on:	Essential system upgrade to enable management of the existing tree population, design future plantings and collect tree risk data.
S4.5.1 - Street, facility and park trees.	Facility trees surround council owned buildings such as kindergartens, halls and community centres.
S4.5.2 - Urban Forest understory plantings.	Inclusions for external engagement item such as ward newsletters, Banyule banner as well as digital platforms.

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[65] Ryder, C.M. and Moore, G.M., 2013. The arboricultural and economic benefits of formative pruning street trees. Arboriculture & Urban Forestry, 39(1), pp.17-24.

S4.5.3 - Reporting to include urban forest distribution, tree health, species and structural diversity, risk, maintenance.	Resilience and benefits provided by trees such as shade and cooling, are linked to the health, complexity and diversity of the urban forest. Structural diversity will be increased with the focus on shrubs and non-tree vegetation.
S4.5.4 - Develop an "Our Trees App" using collected data for residents to engage with the urban forest.	A public facing web-based tool that is accessible from mobile devices to allow for generation of requests and has potential for citizen science.
S4.6 - Prepare a communication and engagement plan and program that includes reporting to share information with internal and external audiences - focus reporting against elements of the vision.	Inclusions for external engagement item such as ward newsletters, Banyule banner as well as digital platforms.
S4.7 - Build relationships with key research partners to investigate the benefits of 'smart planting' programs for street trees and quantify the benefits of the urban forest including carbon sequestration.	Opportunity for universities to have masters or PhD students work on several projects. This may also include WSUD and new tree trials.
S4.8 - Develop tree asset and risk management guidelines for the urban forest work on public lands.	An asset, risk and customer focused approach to tree management that includes a documented method for the controls for tree risk including a proactive inspection regime in streets, facilities and open space for all trees Banyule is responsible for and that is consistent with Banyule's risk management framework and risk appetite.
S4.8.1 - Continue to build on community engagement programs and educate the public about the importance of individual tree removal decisions on the urban forest.	Transparent data should be available for residents when trees must be removed for example due to risk.
S4.8.2 - Review and refine Council's policy and process to manage resident requests for street tree removal.	Clear and transparent process, procedure and application for managing tree removal & tree planting customer workflows from requests to completion or complaints and disputes that recognises risk profiles for person & property.

Details of the major actions with their priority and resourcing are provided in Section 7. and their measures and indicators are in Section 8. .

Opportunities for Urban Forest in Banyule's Streets

The following figures demonstrate the opportunities to enhance the urban forest within the streets of Banyule. These streets have been chosen as they represent some typical street typologies found across Banyule. They are used here as a demonstration only.

Each set of figures shows the current street (taken from Google Maps) and the possible urban forest improvements that could be accommodated:

- Figure 32 shows a street with a wide nature strip
- Figure 33 shows a street with a wide landscaped median strip
- Figure 34 shows a street with a narrow nature strip

Typologies of Garden Surburb street with wide naturestrips
Example street: Porter Road, Heidelberg Heights

Existing site cross-section

| Residential area | Pedestrian Pathway 1.5M | Nature strip 4M | Road 7M | Nature strip 4M | Pedestrian Pathway 1.5M | Residential area |

With Urban Forest Strategy possibilites

| Residential area | Pedestrian Pathway 1.5M | Naturestrip 4M | Road 7M | Naturestrip 4M | Pedestrian Pathway 1.5M | Residential area |

Strategic aerial bundling provides more space for trees with good canopy coverage that gives shade to both the road and pedestrian pathways

Passive irrigation of street trees to improve tree health and support urban cooling

Naturestrip planting to support biodiversity and to prevent surface run-off

Nature strip with more canopy coverage providing shade to roads and pedestrian pathwyas

Street plan with Urban Forest Strategy possibilities

Existing street plan

Figure 32: Urban Forest possibilities in a street with a wide nature strip

Typologies of Garden Surburb with wide landscaped median strips
Example street: Oriel Road, Ivanhoe

| Residential area | Pedestrian Pathway 1.2M | 0.9M | Road 6.5M | Landscaped Median strip 3.5M | Road 6.5M | Nature strip 1M | Pedestrian Pathway 1.2M | Residential area |

Strategic aerial bundling provides more space for trees with good canopy coverage that gives shade to both the road and pedestrian pathways

Landscaped Median strip with swale (if surface water drianage available)

Passive irrigation of street trees to improve tree health and support urban cooling

Naturestrip planting to support biodiversity and to prevent surface run-off

Swale between trees on the landscaped median strip

Nature strip with more canopy coverage providing shade to roads and pedestrian pathwyas
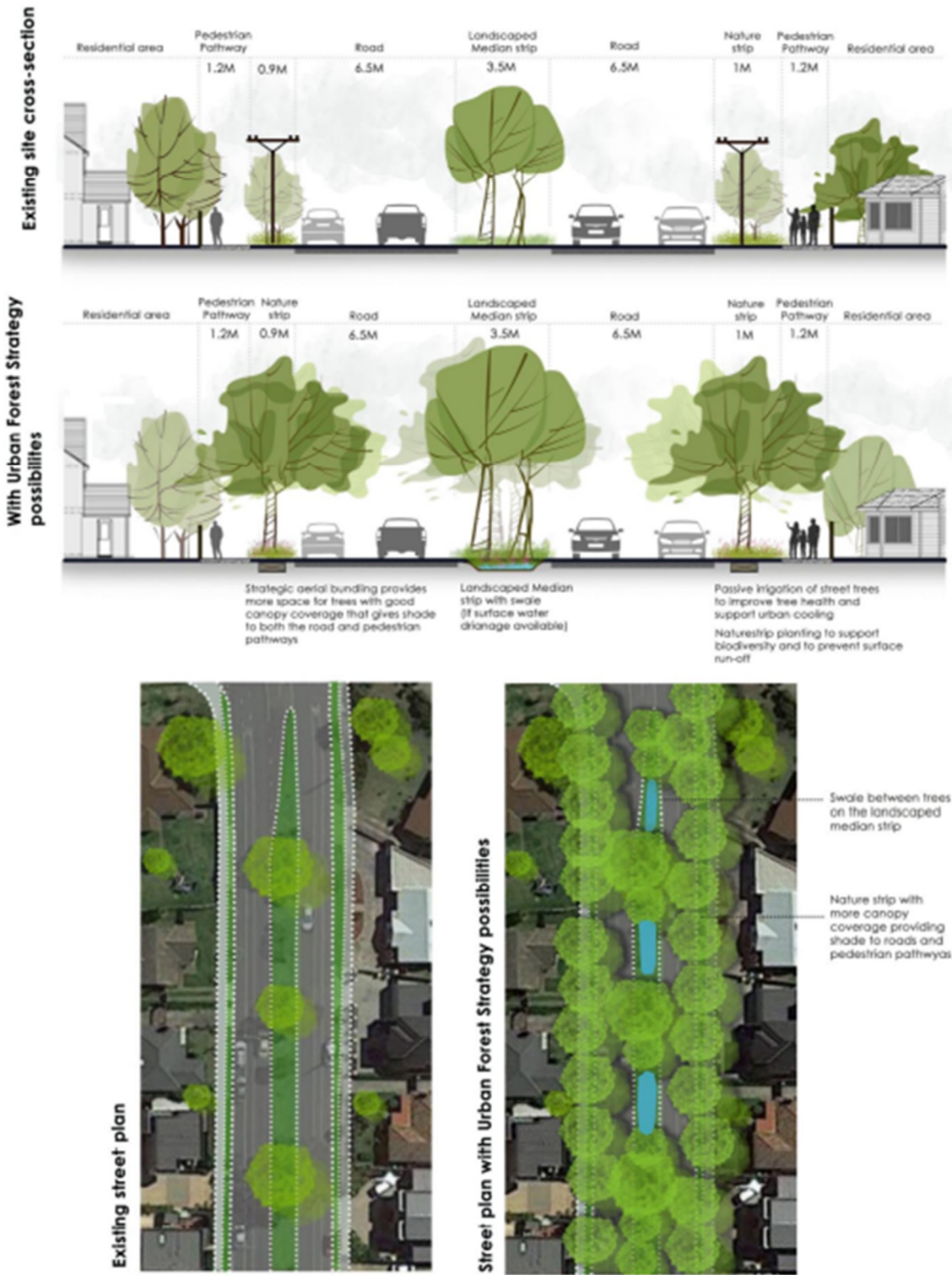
Figure 33: Urban Forest possibilities for a street with a wide landscaped median

Typologies of Garden Surburb street with narrow naturestrips with footpath in centre
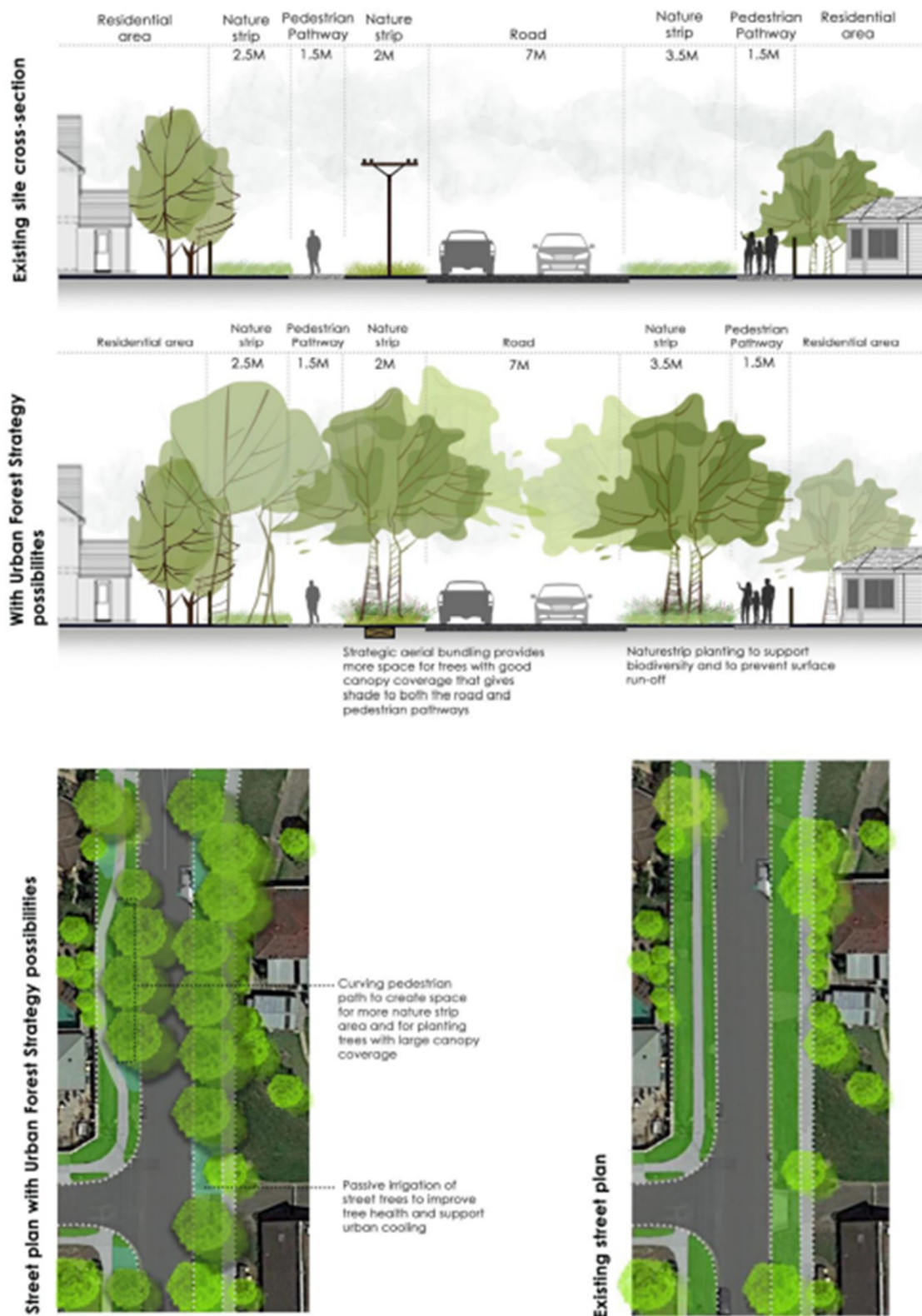
Example street: St.James Road, Heidelberg

Figure 34: Urban Forest possibilities on a street with a narrow nature strip

Case Study: City of Melbourne's Tree Valuation, Retention and Protection

A critical component of urban forest management is the protection and retention of existing trees. The City of Melbourne (CoM) developed an approach to the management of the important public tree assets using a valuation formula. Assigning a valuing to the trees allowed CoM to recover compensation for the community for trees that were damaged or where trees are required to be removed for development. Developers can make an informed decision about design when the cost of the tree removal is quantified.

Tree Value Calculation
A Tree Amenity Value Formula Calculating a Tree's Amenity Value (2006) informs CoM's Tree Retention and Removal Policy (2012). This is a calculation of the value of the public tree to be paid by the property owner prior to removal.

Value calculation criteria include:
1. Removal Costs
2. Amenity Value – calculated using CoM's Amenity Formula.
3. Ecological Services Value – calculated using i-Tree valuation tool
4. Reinstatement Costs - the greening required to replace the loss to the landscape

Amenity Value Compensation Fund
The compensation paid through the removal of public trees operates as a dedicated fund for CoM to invest in replacing vegetation in the community. This fund is designed to increase greening in the private realm including rooftop urban farms, green walls and greening of private laneways.

Banyule's ability to protect, retain and gain compensation would be greatly enabled through development of policy and a valuation methodology.

Relevant Banyule Strategic Areas
- Prioritise urban forest improvements in the most vulnerable suburbs and places across Banyule
- Take a long term, asset management approach to the urban forest
- Integrate the urban forest principles into all parts of Council services

Related Actions
- S4.2: Implement a tree valuation methodology including amenity and ecological value
- S4.2.1: Link the urban forest amenity value to current asset management

Case Study: Technologies for Measuring Canopy

Understanding the current extent and characteristics of the urban forest, including private land, across the entire municipality is an important input for urban vegetation management.

Understanding the current extent and characteristics of the urban forest, across the public and private domain is an important input for urban vegetation management. With the increased focus from governments and the community on climate change and adaptation urban canopy has become a valuable indicator of liveability and adaptation to increasing urban heat. Methods of canopy data collection differ in their degree of accuracy, feasibility and ease of use.

Technologies:

Multi and hyper spectral imagery captures image data from a fixed wing plane. Analysis of data is done with a combination of Ai deep learning and human assessment. *High accuracy, high cost, moderate usage ease.*

AI deep learning uses algorithms to undertake image recognition that can identify and track features of interest from aerial surveys, including canopies and vegetation. *Medium-high accuracy, moderate cost, moderate usage ease*.

I-Tree canopy is a free-use software canopy measurement tool that randomly lays points onto Google Earth imagery to measure canopies and vegetation. *Low accuracy, low cost, moderate usage ease*.

LiDAR + 3D photogrammetry involves using airborne measurements of earth's surface to accurately measure the landscape in three dimensions. *High accuracy, high cost, moderate usage ease*.
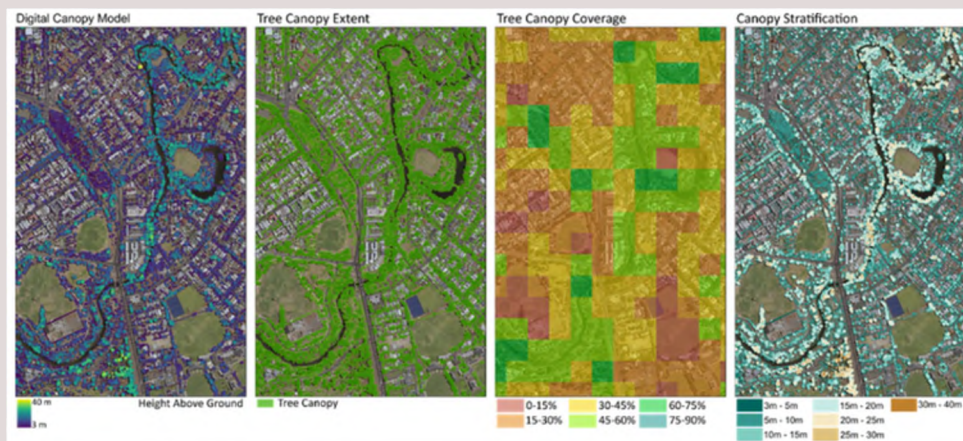
Relevant Banyule Strategic Areas

- Prioritise urban forest improvements in the most vulnerable suburbs and places across Banyule
- Take a long term, asset management approach to the urban forest

Related Actions

- S4.3: Adopt a canopy cover assessment method to measure canopy gains and losses (Two years initially, then annually thereafter)

"*The Tree Cities of the World programme is an international effort to recognise cities and towns committed to ensuring that their urban forests and trees are properly maintained, sustainably managed, and duly celebrated*."

Becoming a Tree City of the World can aid in building local, national and global recognition of a city's dedication to its healthy and sustainable urban forestry.

For a city to become a Tree City of the World, it must meet five standards, which include:

1. **Establish Responsibility** – for this standard to be met, the city must have clear, written delegation of tree care to a single person, department and/or community, which forms the 'Tree Board'.
2. **Set the Rules** – Tree management and protection is governed by law, or through official council policy. The rules may be shaped by industry best-practice, and there are penalties for non-compliance.
3. **Know What You Have** – The city has an up-to-date inventory of its trees, and this guides the long-term 'planting, care, and removal of city trees'.
4. **Allocate the Resources** – There is an annual budget which is dedicated to the city's tree management plan.
5. **Celebrate achievements** – there is an annual celebration of trees within the city, which raises the profile of the tree management plan for the city and showcases the staff and community members who are involved.

A number of Australian cities are currently recognised as Tree Cities of the World and most of these are in South Australia. No cities in Victoria have Tree City of the World status yet. Cities can apply for Tree City of the World status through

Strategic Area 5 - Build and Maintain Partnerships with Others in the Protection and Management of the Urban Forest

Overview

This strategic area is focussed on developing a strong network of urban forest 'actors' or 'champions' who can work collectively or individually to enhance and protect the urban forest across Banyule. It is focussed on future supporting the existing community programs and delivering urban forest outcomes through them.

Most of the research around best practice urban forestry highlights the need for the community to play a significant role. It is critical as to effect the significant change to urban planning and management and the social change needed to bring about a healthy urban forest, communities need to be part of the discourse and the decisions.

Fundamentally community engagement can be broad. In best practice urban forestry, the best form of engagement is where Council staff proactively seek out community. The values, concerns and aspirations of the community are heard while expert information about the problem is shared. In this way an ongoing partnership with the community is established and decision-making is well understood.

Research into the attitudes, values and behaviours of residents around trees shows that

- More people value both the personal and community benefits from trees on their properties
- There is a need to address landowners concerns about property damage
- Interpersonal communication is most preferred way to learn about urban trees and personal networks are invaluable in sharing information about tree care
- Women may play a crucial role in fostering urban forests
- Almost all parents believe it is important for their children to spend time in nature
- Millennials own fewer trees but are more likely to volunteer for trees
- Baby boomers have more concern with existing trees
- Reaching new audiences requires focusing on landowners with lower education and income levels

Proactive approaches to community engagement include public participation campaigns before and during the development of plans and co-management partnerships. Volunteer involvement in citizens science programs is positive shift from traditional approaches, with many potential benefits.[66]

Details of the major actions with their priority and resourcing are provided in Section 7. and their measures and indicators are in Section 8. .

Major Actions

Actions	Further Detail
S5.1 - Ensure advisory committees are engaged and informed throughout implementation of the Urban Forest Strategy.	Advisory committees will be updated on the progress and timing of actions being implemented and when new data on the success of the Strategy is available
S5.2 - Engage with community through a range of educational activities, such as Spring Outdoors, to build understanding & value of the urban forest.	Ensure events within the spring outdoor program inform the community about Urban Forestry.
S5.3 - Incorporate citizen science data into Banyule's annual monitoring programs.	Greater use will be made of data sourced from citizen science initiatives to report on biodiversity in Banyule and aid our annual monitoring programme. Sources such as Birdlife Australia, frog ID and iNaturalist.
S5.4 - Engage with Wurundjeri NARRAP team on the implementation of this strategy.	The Wurundjeri Narran team is an established Natural Resource Management team of the Wurundjeri Council.

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[66] Best Practice Urban Forest Planning and Management, Literature Review, Mosaic Insights 2021

S5.5 - Engage specific community groups in the design and delivery of particular urban forest projects, especially in priority areas.	These areas may be near encumbered open space or near sensitive biodiversity reserves.
S5.6 - Celebrate the neighbourhood character trees for each area.	Specific trees and avenues are vital to recognise to continue to have strong neighbourhood character in specific areas.
S5.7 - Celebrate trees and the urban forest through becoming a recognised Tree Cities of the World - apply for recognition in July 2023.	The Tree Cities of the World Program is an international effort to recognise cities and towns committed to ensuring that their urban forests and trees are properly maintained, sustainably managed, and duly celebrated. Currently 7 cities in Australia are recognised and none from Victoria.
S5.8 – Implement a program to give a free tree to all residents in Banyule	To increase vegetation on private land this program will be promoted through Council's channels offering a free tree to all residents who request one. The program will be supporting the planting of trees on private land and influencing the diversity and climate suitability of trees that are planted.

Case Study: Sutherland Shire's Community Consultation

Sutherland Shire Council (SSC) aim for no net canopy loss from a 2014 canopy cover baseline. However, competition for public space by urban programs and infrastructure projects (e.g., footpaths, electrical works, open space conflicts) was a key process affecting canopy cover. To address this competition, SSC had been on a seven-year community journey garnering support for its trees. To build strong community support, SSC developed a communication plan, including regular milestones and key messages targeted to SCC precincts, and a means of collecting public feedback through an interactive mapping tool.

The Community Consultation Interactive Map is a crucial tool for SSC's community engagement process. The Interactive Map (below) displays proposed trees around SSC, across the neighbourhood. Each proposed tree has an icon on the Interactive Map which expands to show images of the species, its species characteristics and tree growth. Using the tool, residents can submit an enquiry about trees on their frontage, requesting a call to discuss species, position, the program and any concerns. In this way SCC have increased awareness and appreciation for the street trees.

Banyule could build the profile of its trees and other vegetation and use targeted communication to inform and involve the broader Banyule community with urban canopy.

Relevant Banyule Strategic Areas
- Build and maintain partnerships with others in the protection and management of the urban forest
- Manage the urban forest across public and private land for resilience to climate change

Related Actions

- S5.5: Engage community in the design and delivery of particular urban forest projects, especially in vulnerable areas
- S4.5.4: Develop an "Our Trees App" using collected data for residents to engage

Strategic Area 6 - Integrate the Urban Forest Principles into All Parts of Council Services

Overview

For this Strategy to be successful it is critical that all parts of Council take a role. This strategic area focusses on the Council activities needed to embed the urban forest principles into the organisation, its culture, policies and practices.

The fundamental capacity for local governments to keep pace with society and community demands is of great importance in this area. Research tells us that local government has to support staff and communities to match the rapid societal change needed to respond to current urban pressures.

Solutions to better practice revolve around improvements to the way the urban forest is managed, specifically the capacity of Council around:

- Integration of the physical elements of urban tree planting and vegetation with biodiversity, climate, heat, water, social and cultural benefits
- Use and collection of appropriate information and knowledge
- Adequate resourcing planning, design and delivery, policies and procedures that respond to the vision
- Maintenance, evaluation and continuous improvement[67]

Details of the major actions with their priority and resourcing are provided in Section 7. and their measures and indicators are in Section 8. .

Major Actions

Actions	Further Detail
S6.1 - Integrate the Banyule urban forest principles into the operational plans for all teams across Council.	Integral to the Strategy being a living powerful document, we need Council to work as a holistic team for implementation.
S6.2 - Advocate with Vic Government agencies and public authorities about the Banyule Urban Forest Strategy and seek support for the vision and actions	This may include ensuring funding, protecting or planting vegetation on land not controlled by council.
S6.3 - Work with capital works and public realm design teams (parks, streets, town centres) to:	Many projects are already passed design stage for FY22-23 and FY23-24, and this will be reflected with limited influence until FY24-25.
S6.3.1 - Integrate urban forest principles and action into public domain design and delivery and make space for trees and vegetation in the design through a Blue-Green Working Group / Design Review Panel.	Design capital projects that will include successful tree canopy such as through passive irrigation, adequate root volumes, supplementary irrigation.
S6.3.2 - Program design work a year ahead of implementation to allow for value add, resourcing.	An integrated team during the design stage with lead in times is required to achieve Urban Forestry outcomes.
S6.3.3 - Create a future fund for canopy and greening enhancement to capital projects	The fund should have $250k for expenditure on capital projects to achieve 30% canopy cover where possible, and greening outcomes to improve human comfort when 30% canopy is not achievable. To be funding through budget allocation and revenue collected as amenity value for trees that are removed for external and internal projects.
S6.3.4 - Develop maintenance plans for the new works.	An allocation of resources for maintaining vegetation planted as part of capital projects is vital for high quality ongoing outcomes.
S6.4 - Develop guidelines and training for streetscape vegetation design and maintenance.	This will include technical planting specifications, passive irrigation and WSUD (Water Sensitive Urban Design).
S6.5 - Revise tree protection policies and procedures for private and public trees to make protection a key outcome.	This includes tree protection during development and other stage to ensure no gaps in protection.
S6.6 - Share data and analysis of canopy / tree losses in the private domain and focus responses on priority causes.	Using the canopy data acquired in S4.3 the results will be shared with the public to increase awareness of the drivers for the

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[67] Best Practice Urban Forest Planning and Management, Literature Review, Mosaic Insights 2021

	changes. Areas with losses will be targeted with information on how to make positive changes such as encouraging the take up of council tree give-away program (S1.8).
S6.7 - Regularly review and update approach to enforcement in response to trends in Urban Forest actions.	Currently audits take place, but numbers are conditioned and recorded. We require a target to measure success.
S6.8 - Removed	
S6.9 - Trial small scale passive irrigation to benefit tree growth with a long-term goal to move toward a new standard.	WSUD stand for water sensitive urban design.
S6.10 - Make space for large trees in urban places and plan for trees to maximise the use of the available space for tree canopy	If space allows, a canopy tree should be planted as many locations are under pressure from development and urbanisation.
S6.11 - Improve data and knowledge about the species that contribute to "neighbourhood character". To assist in planning for tree replacement in private and public spaces.	This will be part of the digital information available to residents.
S6.12 - Integrate urban forest principles and outcomes into initiatives, programs and strategies as they are developed and reviewed.	As strategies and initiatives are developed or reviewed the principles of the Urban Forest Strategy will be incorporated to ensure all parts of council are working towards the community's Urban Forest vision.
S6.13 - Investigate urban forest opportunities while considering current zones and overlays e.g., Environmental planning overlay.	Urban Forest principles should be considered with strategic planning work.
S6.14 - Masterplan avenues and gateways for urban forest.	Key avenues and gateway roads will have vegetation masterplans developed to ensure the long-term character is maintained and enhanced.
S6.15 - Guidance from Planning on vegetation selection through landscape plans and permit conditions will use the latest vegetation information.	Recommended species lists to guide landscape plans and tree replacement conditions will be through a living document.
S6.16 - Undertake analysis to determine reasons for tree loss through in the private realm and any related outcomes that affect the extent, health and diversity of the urban forest.	Accurate and ongoing mapping of the Urban Forest is required to aid in these investigations.
S6.17 - Update the Banyule Tree Planting Zone Guidelines January 2011 to best practice and to support the UFS. Include the guidelines in the Banyule Planning Scheme as an incorporated document (e.g., plantings to have access to water and deep soils, drip line and tree root protection).	Terminology such as drip lines requires modernisation and alignment with Australian standards.
S6.18 - Continue to use General Local Law No. 1 (2015) to recognise and protect street trees as a Council asset.	Local law will be the on-ground protection of public trees.

Case Study: Stonnington City Council - Tree Protection through Tree Bonds

The cumulative effect of individual developers and property owners felling or damaging trees with or without permission can result in significant loss of mature trees and canopy. Penalties, monitoring and enforcement by tree protection bylaws have not kept pace with the pressures of urban change and the scale of canopy loss that is being experienced in cities.

Stonnington City Council (SCC) has introduced a *Tree Bond* – a General Local Law that protects significant trees on private land. A tree bond requires the land developer to deposit a money guarantee protection for significant trees before starting development.

The tree bond is only returned if the developer has adequately protected existing trees. If the tree or trees are removed or damaged, the bond is lost. To date SCC only applies Tree Bonds to private urban land.

A key advantage of a tree bond for councils is the placement of the 'onus of proof' on private developers rather than on the council itself.

Banyule might work to introduce similar protections for trees on private land. Like SCC, Banyule might choose to apply this protection to trees defined as 'significant' or go further and apply the bond to other kinds of vegetation as well.

Relevant Banyule Strategic Areas

- Integrate the urban forest principles into all parts of Council service

Related Actions

- S6.5: Revise tree protection policies and procedures for private and public trees to make protection a key outcome
- S6.7 - Regularly review and update approach to enforcement in response to trends in Urban Forest actions.

Case Study: Passive Irrigation for Street Trees

Melton City Council (MCC) anticipated growing their street tree population by 130,000 new trees, predominantly within residential streets. As part of their Integrated Water Management (IWM) Plan (below), MCC aimed for as many of these new trees as possible to include water sensitive urban design (WSUD) and be planted with passive irrigation from stormwater. They were the first Council in Australia to require this.

Passive street tree designs aimed to:
- Use stormwater particularly during tree establishment
- Improve tree establishment, growth and health
- Improve amenity through improved tree health
- Drought-proof trees
- Reduce infrastructure damage from trees chasing water
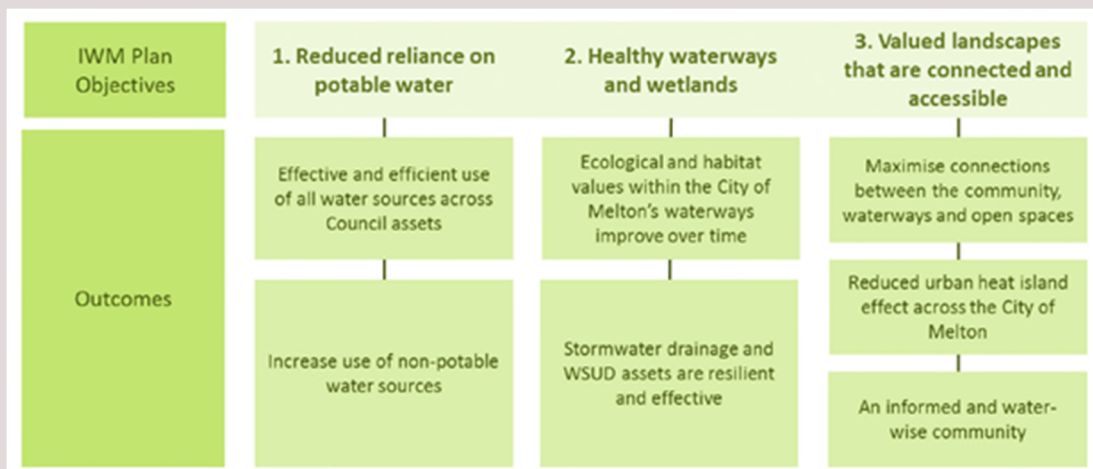
MCC invested substantially in early research and planning into passive irrigation, and this contributed to its widespread uptake within new estates. Since implementation, watering costs have significantly reduced, and passive irrigation may become a requirement of developer planning permits.

Banyule might aim to include passive irrigation as a feature in as many new street tree plantings as possible and integrate it as a design requirement in new and retrofitted developments.

Relevant Banyule Strategic Areas
- Manage the urban forest across public and private land for resilience to climate change
- Integrate urban forest principles into all parts of Council services

Related Actions
- Implement passive irrigation (WSUD) for public realm trees and make this business as usual for capital projects and new developments
- Integrate urban forest principles and action into public domain design and delivers and make space for trees and vegetation in the design though a Blue-Green Working Group – Design Review Panel
- Consider a 5% allocation from every capital project towards urban forest outcomes

Section 7. Implementation of Major Actions - 2022-2032

The details of the actions in each Strategic Area are listed in the following table with classification of their timeframe, investment commitment level, funding model and departments to lead the action.

The following classifications are used:

Existing	Council can adopt these actions within the current proposed budgets. They can be integrated into existing programs or investigated without additional staff or infrastructure requirements.
$	<$10k. Low-cost action
$$	$10k-$100k. Council should plan for budget beyond the current proposed budget. Investment in additional research, infrastructure, staffing or funding is required to realise the action.
$$$	>$100k. Council will require significant additional budget to realise the action, due to the need for new infrastructure, additional staff or introduction of regulations and / or requirements.
Short Term	1 - 3 years
Medium	4 - 8 years
Long term	9 – 18 years
Ongoing	Commencing from 2023. Note: Ongoing actions with budget requirement are counted in each short, medium and long-term column

Summary of Investment and Timeframe

No. of all actions	Actions using Existing capacity	Short term 2023 - 26	Medium term 2027 - 30	Long term 2030 - 40
67	25	31 actions over years 1 - 3 $900k – $1.3m ($300k – $450k pa)	23 actions over years 4 - 8 $800k - $1.7m ($200k - $400k pa)	15 actions over years 9 - 18 $1.8 – 2.6m ($300k + pa)

Actions detail: Investment, Timeframe and Project Lead

Actions	Timeframe	Investment	Project or Ongoing	Lead Department / Team	Additional Departments / Teams
Strategic Area 1: Prioritise urban forest improvements in the most vulnerable suburbs and places across Banyule					
S1.1 - Develop an agreed urban forest prioritisation method that is based on the Urban Forest Principles to identify areas in most need of planning and intervention.	Short	$$	Project	Urban Forestry	
S1.2 - Train staff in all areas about the prioritisation method and engage the key teams in the process to deliver increased understanding and integration into other programs and annual plans.	Ongoing	Existing	Ongoing	Urban Forestry	
S1.3 - Review the urban forest priorities every 3 years (using the prioritisation method) and include actions in asset management and annual operational plans.	Medium	Existing	Ongoing	Urban Forestry	

Actions	Timeframe	Investment	Project or Ongoing	Lead Department / Team	Additional Departments / Teams
S1.4 - Develop and improve the urban forest prioritisation method as new data become available.	Medium	$	Ongoing	Urban Forestry	
S1.5 - Program annual planting in areas with highest priority.	Ongoing	$	Ongoing	Urban Forestry	
S1.6 - Identify vacant street tree sites and program infill plantings to be completed in the medium to long term.	Medium - Long	$$$	Project	Urban Forestry	
S1.7 - Work with local indigenous plant nurseries or community nurseries to provide local provenance.	Short	$	Ongoing	Urban Forestry	Bushland
Strategic Area 2: Increase the diversity of the urban forest for biodiversity and habitat with ground cover and shrub layer plantings					
S2.1 - Identify suitable sites in reserves, roadsides and underutilised land where mown turf can be improved to include trees, shrubs, native grasses or groundcovers.	Ongoing	$	Project	Parks & Natural Environment	Open Space Planning, Environment
S2.2 - Establish and maintain new planting locations of shrubs, native grasses and groundcovers.	Short - Medium	$$$	Project	Parks & Natural Environment	Urban Forestry
S2.3 - Investigate the co-management of new planting sites within the Urban Forest with the community.	Ongoing	$	Ongoing	Urban Forestry	Community Engagement
S2.4 - Develop the nature strip planting program, provide guidelines, and promotion of the benefits to residents	Medium	$	Project	Open Space Design	Urban Forestry, Local Laws, Community Engagement
S2.5 - Map the ecological corridors (wildlife connection and known fauna movements) to integrate with the urban forest data to identify opportunities for planting sites	Short	$$	Project	Environment	Bushland / Urban Forestry
S2.6 - Provide recommended species lists for a fit for purpose urban forest i.e., the 'right-tree-right-place'. This will include species that are climate ready, suitable for the site and consider the benefit for urban ecology.	Short	$$	Project	Urban Forestry	Open Space Design
S2.7 - Provide training and information for Council staff on the urban forest - its definition, vision and principles and what it means for their work.	Short	$	Ongoing	Urban Forestry	

Actions	Timeframe	Investment	Project or Ongoing	Lead Department / Team	Additional Departments / Teams
Strategic Area 3: Manage the urban forest across public and private land for resilience to climate change					
S3.1 - Provide support for the protection and survival of listed significant trees on private lands, include tree owners and neighbours in the communication and engagement around significant trees.	Ongoing	$	Ongoing	Environment	Planning / Urban Forestry
S3.2 - Provide care and protection of listed significant trees on public land.	Ongoing	$	Ongoing	Urban Forestry	Environment / Planning
S3.3 - Work with private and non-council land holders to improve the urban forest on their land via place-based programs and development applications.	Ongoing	$	Ongoing	Urban Forestry	Environment / Planning
S3.4 - Implement passive irrigation (WSUD) for public realm trees and make this business as usual for capital projects and new developments.	Ongoing	$	Ongoing	Environmental Operations	Capital works / Urban Forestry
S3.5 - Provide the public with a recommended species lists for a fit for purpose urban forest i.e., the 'right-tree-right-place'. This will include species that are climate ready, suitable for the site and consider the benefit for urban ecology.	Short	$	Project	Urban Forestry	
S3.6 - Review the recommended species lists annually or when new information comes to light and communicate to community and Council staff.	Ongoing	$	Ongoing	Urban Forestry	Planning Arborists
Strategic Area 4: Take a long term, asset management approach to the urban forest					
S4.1 - Develop place-based plans to manage the urban forest taking into account use, neighbourhood character and climate. Including: In-fill planting program, maintenance, street tree renewal.	Short	$$	Project	Urban Forestry	
S4.2 - Implement a tree valuation policy including amenity value and ecological value.	Short	$	Project	Urban Forestry	Planning
S4.2.1 - Link the urban forest amenity value to current asset management processes.	Short	$	Project	Asset Management	Urban Forestry
S4.3 - Adopt a canopy cover assessment method to measure canopy gains and losses annually.	Short	$$$	Project -> Ongoing	Urban Forestry	Planning
S4.4 - Develop a comprehensive urban forest database to allow the analysis of effort and outcome of the urban forest strategy and asset management programs.	Short	$$$	Project -> Ongoing	Urban Forestry	IT
S4.5 - Develop a comprehensive urban forest interactive mapping portal that includes information on:	Medium	$$	Project	Urban Forestry	Urban Forestry
S4.5.1 - Street, facility and park trees.	Short	Existing			
S4.5.2 - Urban Forest understory plantings.	Medium	Existing			
S4.5 - Develop a comprehensive urban forest interactive mapping portal that includes information on:	Medium	$	Project -> Ongoing	Urban Forestry	IT

Actions	Timeframe	Investment	Project or Ongoing	Lead Department / Team	Additional Departments / Teams
Strategic Area 4: Take a long term, asset management approach to the urban forest					
S4.5.4 - Develop an "Our Trees App" using collected data for residents to engage with the urban forest.	Medium	$$	Project	Urban Forestry	Customer Service / IT
S4.6 - Prepare a communication and engagement plan and program that includes reporting to share information with internal and external audiences - focus reporting against elements of the vision.	Short	Existing	Project	Communications	Urban Forestry
S4.7 - Build relationships with key research partners to investigate the benefits of 'smart planting' programs for street trees and quantify the benefits of the urban forest including carbon sequestration.	Medium	$	Ongoing	Urban Forestry	Urban Forestry
S4.8 - Develop tree asset and risk management guidelines for the urban forest work on public lands.	Short	$$	Project	Urban Forestry	Risk
S4.8.1 - Continue to build on community engagement programs and educate the public about the importance of individual tree removal decisions on the urban forest.	Short	$	Ongoing	Environment / Planning	Urban Forestry / Comms
S4.8.2 - Review and refine Council's policy and process to manage resident requests for street tree removal.	Short	$	Ongoing	Urban Forestry	Risk
Strategic Area 5: Build and maintain partnerships with others in the protection and management of the urban forest					
S5.1 - Ensure advisory committees are engaged and informed throughout implementation of the Urban Forest Strategy.	Ongoing	Existing	Ongoing	Environment	Urban Forestry
S5.2 - Engage with community through a range of educational activities, such as Spring Outdoors, to build understanding & value of the urban forest.	Ongoing	$	Ongoing	Environment	Urban Forestry
S5.3 - Incorporate citizen science data into Banyule's annual monitoring programs.	Ongoing	$	Ongoing	Environment	Urban Forestry

Actions	Timeframe	Investment	Project or Ongoing	Lead Department / Team	Additional Departments / Teams
Strategic Area 5: Build and maintain partnerships with others in the protection and management of the urban forest					
S5.4 - Engage with Wurundjeri NARRAP team on the implementation of this strategy.	Ongoing	Existing		Bushland	
S5.5 - Engage specific community groups in the design and delivery of particular urban forest projects, especially in priority areas.	Short	Existing	Ongoing	Urban Forestry	Urban Forestry
S5.6 - Celebrate the neighbourhood character trees for each area.	Medium	$$	Project	Urban Forestry	Urban Forestry
S5.7 - Celebrate trees and the urban forest through becoming a recognised Tree Cities of the World - apply for recognition in July 2023.	Short	Existing	Project	Urban Forestry	Urban Forestry
S5.8 – Implement a program to give a free tree to all residents in Banyule	Short	$	Project	Urban Forestry	Environment
Strategic Area 6: Integrate the urban forest principles into all parts of Council services					
S6.1 - Integrate the Banyule urban forest principles into the operational plans for all teams across Council.	Ongoing	Existing	Ongoing	Urban Forestry	All
S6.2 - Advocate with Vic Government agencies and public authorities about the Banyule Urban Forest Strategy and seek support for the vision and actions	Ongoing	Existing	Ongoing	Strategic Planning	Urban Forestry
S6.3 - Work with capital works and public realm design teams (parks, streets, town centres) to:	Ongoing	Existing	Ongoing	Capital Works	Assets, Operations, Urban Forestry
S6.3.1 - Integrate urban forest principles and action into public domain design and delivery and make space for trees and vegetation in the design through a Blue-Green Working Group / Design Review Panel.	Ongoing	Existing	Ongoing	Capital Works	All
S6.3.2 - Program design work a year ahead of implementation to allow for value add, resourcing.	Ongoing	Existing	Ongoing	Capital Works	Urban Forestry
S6.3.3 - Create a future fund for canopy and greening enhancement to capital projects	Medium - Long	$$$	Project	Capital Works	Urban Forestry
S6.3.4 - Develop maintenance plans for the new works.	Ongoing	Existing	Ongoing	Capital Works	Urban Forestry, Open Space Planning
S6.4 - Develop guidelines and training for streetscape vegetation design and maintenance.	Short	Existing	Ongoing	Open Space Design	Urban Forestry
S6.5 - Revise tree protection policies and procedures for private and public trees to make protection a key outcome.	Short	existing	Project	Strategic Planning	
S6.6 - Share data and analysis of canopy / tree losses in the private domain and focus responses on priority causes.	Medium	Existing	Project	Planning	
S6.7 - Regularly review and update approach to enforcement in response to trends in Urban Forest actions.	Medium	Existing	Ongoing	Planning	
S6.8 - Removed					

Actions	Timeframe	Investment	Project or Ongoing	Lead Department / Team	Additional Departments / Teams
Strategic Area 6: Integrate the urban forest principles into all parts of Council services					
S6.9 - Trial small scale passive irrigation to benefit tree growth with a long-term goal to move toward a new standard.	Short	$$	Project	Environmental Operations	Urban Forestry
S6.10 - Make space for large trees in urban places and plan for trees to maximise the use of the available space for tree canopy	Ongoing	Existing	Ongoing	Urban Forestry	
S6.11 - Improve data and knowledge about the species that contribute to "neighbourhood character". To assist in planning for tree replacement in private and public spaces.	Short	Existing	Project	Urban Forestry	
S6.12 - Integrate urban forest principles and outcomes into initiatives, programs and strategies as they are developed and reviewed.	Ongoing	Existing	Ongoing	All	
S6.13 - Investigate urban forest opportunities while considering current zones and overlays e.g., Environmental planning overlay.	Ongoing	Existing	Project	Strategic Planning	
S6.14 - Masterplan avenues and gateways for urban forest.	Medium	$$	Project	City Futures	Urban Forestry
S6.15 - Guidance from Planning on vegetation selection through landscape plans and permit conditions will use the latest vegetation information.	Ongoing	Existing	Project	Planning	
S6.16 - Undertake analysis to determine reasons for tree loss through in the private realm and any related outcomes that affect the extent, health and diversity of the urban forest.	Medium	$$	Project	Strategic Planning	
S6.17 - Update the Banyule Tree Planting Zone Guidelines January 2011 to best practice and to support the UFS. Include the guidelines in the Banyule Planning Scheme as an incorporated document (e.g., plantings to have access to water and deep soils, drip line and tree root protection).	Short	$	Project	Strategic Planning	Urban Forestry
S6.18 - Continue to use General Local Law No. 1 (2015) and Planning conditions to recognise and protect street trees as a Council asset.	Ongoing	Existing	Ongoing	Local Laws / Development Planning	Urban Forestry

Section 8. Monitoring and Evaluation of this Strategy

This Urban Forest Strategy has been prepared with a vision for the far-future (50 years +) and with a set of principles, strategic areas and major actions to be implemented over a ten-year period. The implementation of the Strategy is to be managed by the Parks and Natural Environment department, however there is a role for all areas of Council. Being accountable to the community on the delivery of the strategy is to be done through measures of success that will be reported, with the timeframes and data sources detailed below.

It is recommended that the Strategy is reviewed after five years to assess, refine and update major actions.

It is important that Council can track its progress towards the Urban Forest Vision, against the achievement of the ten-year strategic areas and against the major actions.

To support the monitoring and evaluation of the Strategy there are three scales of measures:

1. A series of **Key Performance Indicators** (KPIs) against each of the major – to be measured throughout the life of this Strategy.
2. A series of **indicators** to measure progress on the Vision – these are to be measured throughout the life of this Strategy and beyond
3. A series of **measures** that have been carried over from the 2015 Urban Forest Strategic Plan

Key Performance Indicators of Major Actions

Suburb Canopy Cover Target

Through being a signatory to the Northern Metropolitan Framework Plan Banyule has committed to achieving the target of 27% canopy by 2050[68]. With the principle that the Urban Forest should be shared by all the communities in Banyule this level of canopy cover should be the minimum target for all suburbs, not just for Banyule as a whole.

> The Draft UFS proposes a minimum canopy target of at least 27% for all Banyule suburbs by 2050, and ensuring no net canopy loss for suburbs that currently meet or exceed 27%

Figure 35 shows the current canopy cover in Banyule's suburbs and the results of modelling additional canopy gain from new and vacant street tree plantings. While three suburbs currently exceed the 27% target, and others only require a small addition of canopy by 2050 to achieve it, the majority need huge increases over current canopy to achieve the target of 27%. Bundoora needs a 143% change increase, Bellfield needs 100% change and Watsonia/Yallambie need 86%. Major canopy gain outside of street tree and open space planting is required to achieve the target.

The additional canopy needed to reach the desired 27% target across all suburbs will need to be met through:

- Private land canopy gain and gains on land held by other authorities
- Growth of canopy from existing established trees
- Growth of canopy in open space and council managed sites from the established trees
- Changing the way that public trees are planted in roadways and other council land that would require significant infrastructure changes to give them more space and water

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[68] Northern Metro Land Use Framework Plan – Chapter 09 Sustainability and Resilience
https://engage.vic.gov.au/download/document/17948

Suburb Canopy - Gap to Target

Canopy Cover % for Suburb

- 2020 Canopy
- Impact from Street New & Vacant
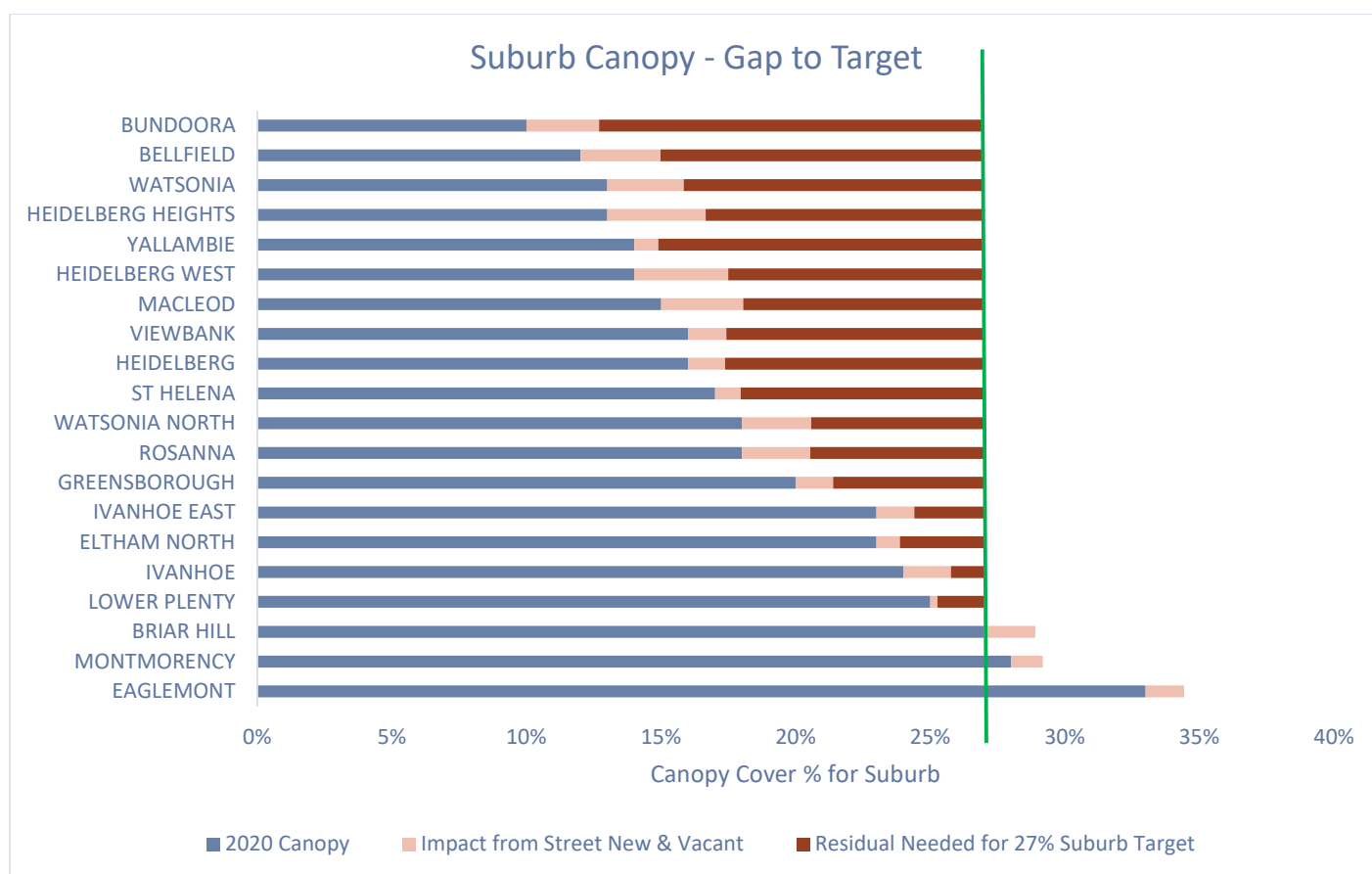- Residual Needed for 27% Suburb Target

Figure 35: Suburb Canopy Cover - Gap to 27% Target (blue bars indicate current canopy, blush bars indicate projected canopy increase from street tree planting, brown bars indicate the gap between projected canopy cover and needed canopy cover)

Footpath Canopy Cover Target

Trees in streets provide shade for daily activities and influence the way that people access and experience active travel options such as walking and cycling[69]. Shade from trees provide protection from UV exposure and a comfortable walking environment[70]. Closely spaced shade trees are described as an essential ingredient for designing 'walkable communities for pedestrians'[71]. Street trees also make a substantial contribution to the visual attractiveness of the streetscape and provide important habitat and movement pathways animals. The value the community places on trees in streets is reflected in the higher prices paid for houses on leafy streets[72].

The current extent of tree canopy cover of public footpaths across the city was measured by analysing data sets that map the current urban forest canopy and footpaths along streets and in parks and reserves. The inequality of that canopy by suburb was in line with the canopy cover of the suburb as a whole described above. Suburbs with long established street trees have much better canopy cover of footpaths making walking more accessible and inviting Figure 36.

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[69] Sun, Q *et al* 2021, A human-centred assessment framework to prioritise heat mitigation efforts for active travel at city scale, *Science of The Total Environment*, 763

[70] White, M and Langenheim, N 2014, Impact assessment of street trees in the City of Melbourne using temporal high polygon 3D canopy modelling, 7th *International Urban Design Conference Designing Productive Cities*

[71] Ewing, R and Bartholomew, K 2013, *Pedestrian & Transit-Oriented Design*

[72] Pandit *et al* 2013, 'The Effect of Street Trees on Property Value in Perth', *Landscape and Urban Planning* 110 (1), pp. 134-142
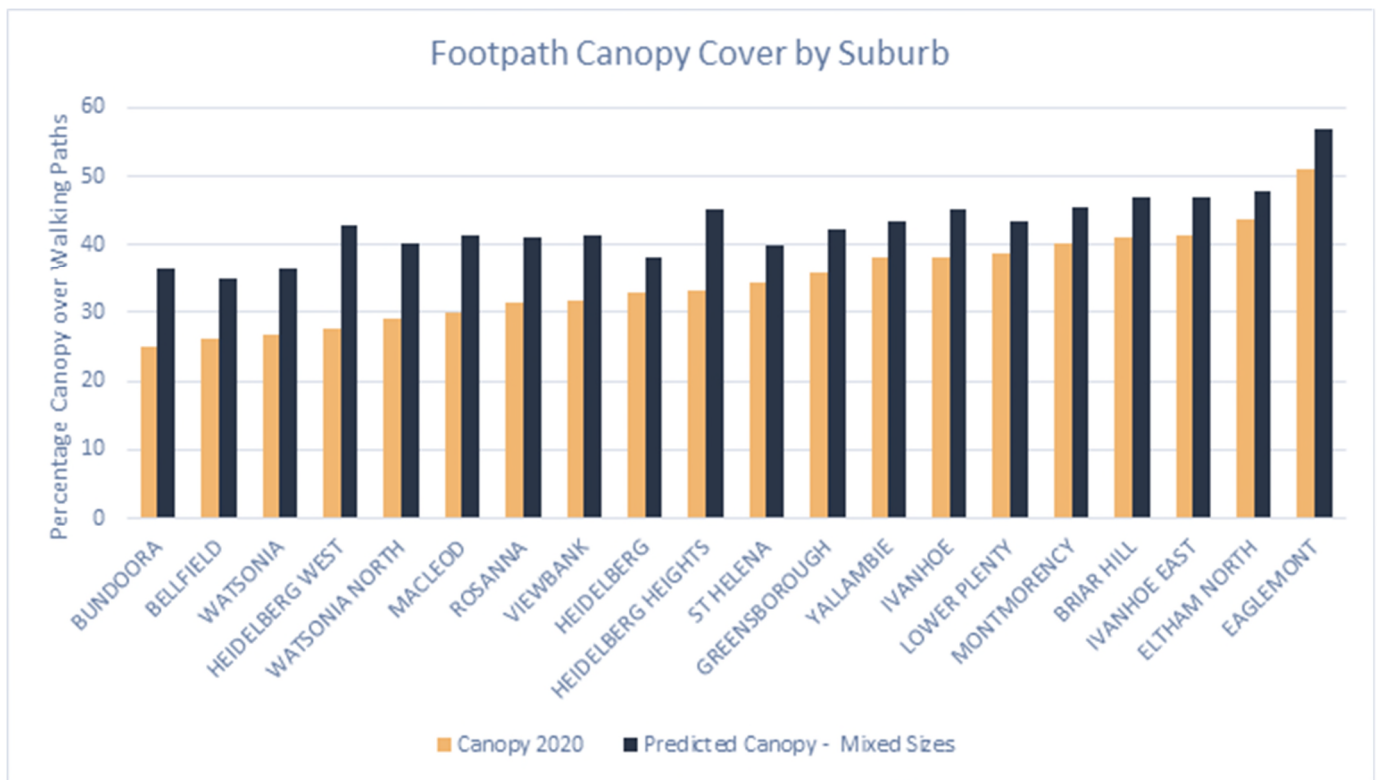
Figure 36: Footpath Canopy Cover - Current and Predicted

The potential future increase in footpath canopy cover was estimated by creating a 'future canopy' data set that modelled future canopy increases from tree planting in known vacant tree planting sites and the growth of trees that have been planted recently.

The Draft UFS proposes the footpath canopy target is that 45% of footpaths in every suburb will be shaded by tree canopy by 2050.

Accelerated Infill Planting Program

Action S1.6 is for the delivery of a program to promptly plant street trees in all vacant viable spaces. In 2022 the street tree inventory has a figure of nearly 10,000 vacant sites.

Each year there are removals from the streets that need replacing, either trees that have been removed as they have less than 5 years useful life expectancy or that have prematurely been lost from pest, weather or other damage.

The current capability of the Parks and Natural Environment depot nursery and the contractor panel arrangements does not allow jumping from the current planting level to 5,000 trees per annum. It is proposed to increase capability progressively to allow time to improve facilities and to ensure that all sites are mapped with appropriate species in line with the numerous actions that deliver recommended species lists, decision making guidelines and place-based plans.

The progressive increase in planting numbers and the impact on vacancies is shown in Figure 37. Rising to 5,000p.a. in 2026 and 2027 would fill all vacancies, the total number of trees to be planted in the initiative period is 16,000. After 2027 the planting level would return to the current funding level of approximately 2,000 trees which enables the continued maintenance of the inventory.
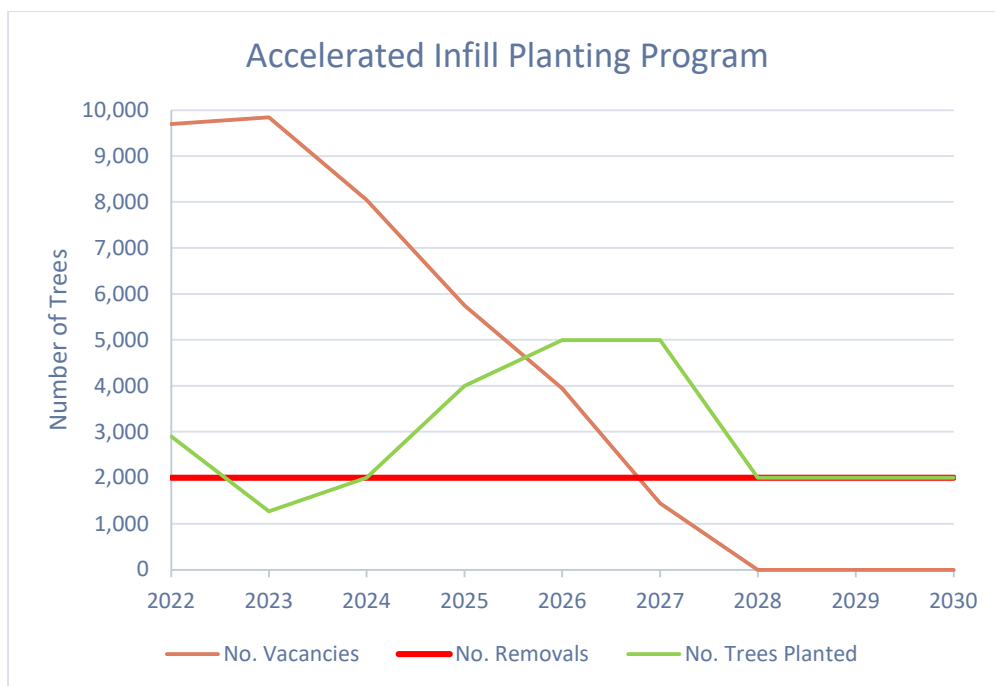
Figure 37: Proposed Accelerated Infill Planting Program for Action S1.6

Monitoring Progress Towards the Urban Forest Vision

The Banyule vision for the urban forest is a long-term statement.

Indicators for the four core aspects to the vision have been developed to assist Council monitor and report on progress (Figure 38). The indicators, source of information and frequency of collection are outlined in Table 4.

INDICATORS / MEASURES
- Diversity: species, structure, size
- Climate ready species
- Abundant urban ecology
- Equitable distribution
- Contributions from all land uses
- Access to water and deep healthy soils

INDICATORS / MEASURES
- Citizens who share the motivation to care for the urban forest
- Collaboration across sectors to plan, manage grow and monitor the urban forest
- A knowledgeable community
- Species that are loved and create neighbourhood character

INDICATORS / MEASURES
- Good data and information
- A clear management plan
- Real ecosystem services and natural capital – dense shade, native fauna, stormwater uptake, carbon sequestration

INDICATORS / MEASURES
- Council lives by the urban forest principles
- All its projects and activities make a net positive contribution to the urban forest
- Skilled staff in urban forestry, design, engagement, codesign and communications
- Robust policies with controls and process for protection

Resilient and thriving

Supported by engaged and empowered citizens

Managed as an essential asset

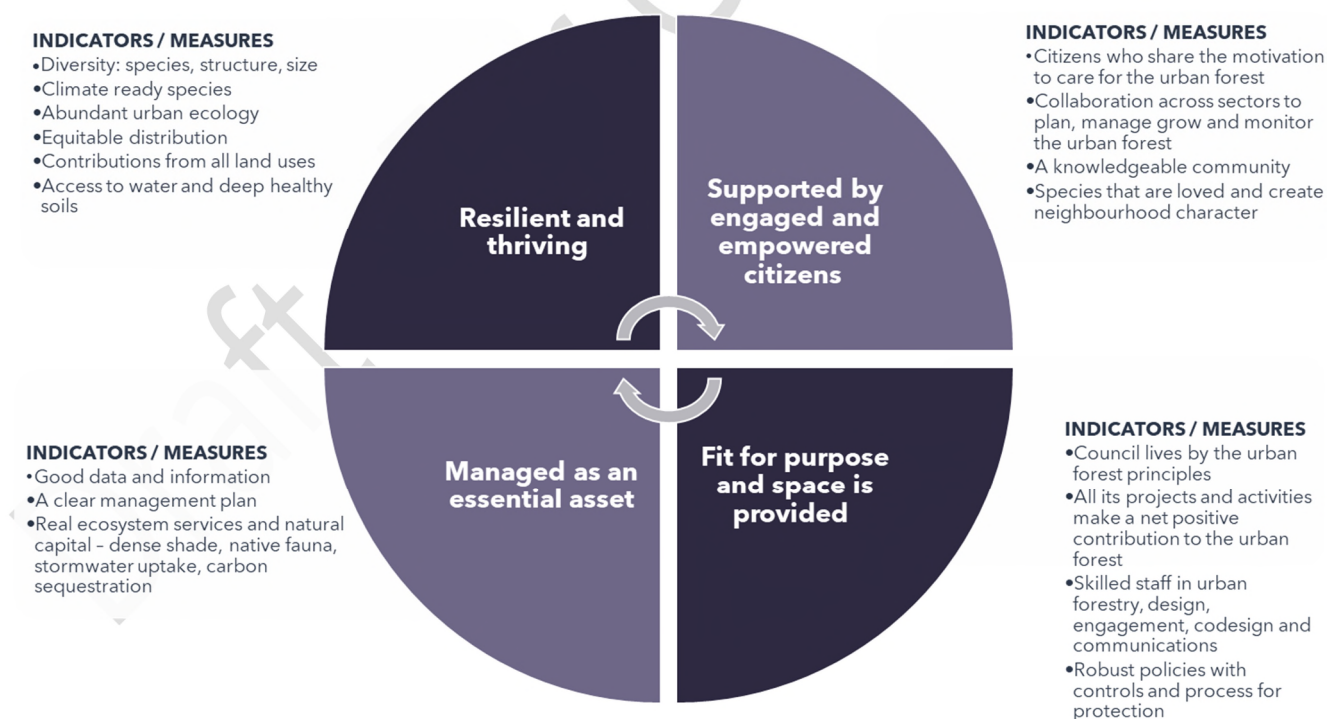Fit for purpose and space is provided

Figure 38: Indicators to assist Council track progress towards achieving the Urban Forest Vision

Table 4: Measuring progress towards the Urban Forest vision

	Indicator	Data source	Frequency	Channel
Resilient and thriving	Diversity - species, structure, size	Tree inventory + maintenance program data	Annual	State of the Environment
	Climate ready species	Tree inventory Recommended Species lists	Annual	State of the Environment
	Abundant urban ecology	Flora and Fauna analysis Citizen science	5 years Annual	State of the Environment
	Equitable distribution	Canopy Analysis Prioritisation method	5 years	UFS Update
	Contributions from all land uses	Canopy Data	Annual	State of the Environment
	Access to water and deep healthy soils	# capital works integrating WSUD and UF	Annual	Annual Report
Supported by engaged and empowered citizens	Citizens who share the motivation to care for the urban forest	# participants in urban forest programs	Annual	State of the Environment
	Collaboration across sectors to plan, manage grow and monitor the urban forest	# partners or projects initiated for urban forest development not delivered by Council	Annual	State of the Environment
	A knowledgeable community	Community satisfaction (attitudes, values) survey	2 years	Annual Report
	Species that are loved and create neighbourhood character	Community satisfaction (attitudes, values) survey Change in attitude to trees and species selection – sentiment tracking	2 years Continuous	Annual Report
Managed as an essential asset	A clear management plan	Asset management plan for the urban forest is in place A renewal plan is in place for increasing the urban forest in the most vulnerable areas	Annual Annual	Annual Report
	Good data and information	Systems to prioritise, measure, monitor, resource and report for assets are in place	Annual	Annual Report
	Real ecosystem services and natural capital – dappled shade, native fauna, stormwater uptake, carbon sequestration	A valuation method is adopted and used to measure / estimate the benefits from urban forest assets	5 years	UFS Update
Fit for purpose and space is provided	Council lives by the urban forest principles	Internal L+D program results - attendance at training Areas in Council that include UF action in plans and programs % spent on UF actions	Annual	Annual Report
	All its projects and activities make a net positive contribution to the urban forest	# of projects including UF outcomes	Annual	Annual report
	Skilled staff in urban forestry, design, engagement, codesign and communications	Internal L+D program results - attendance at training Areas in Council that include UF action in plans and programs % spent on UF actions	Annual	State of the Environment
	Robust policies with controls and process for protection	Regular policy review Thorough policy review (evidence, review, update, communicate, train/inform, monitor)	5 years	UFS Update

Appendix 1. Measures from the 2015 Urban Forest Strategic Plan

The matching of Urban Forest Strategic Plan measures to the UFS is in Table 5. The Urban Forest Strategic Plan had 40 measures for reporting on progress towards the goals. 26 of the measures are carried over (Table 5) and 7 have been replaced with an alternative (Table 7). 7 of the measures have been discarded as no longer relevant to the UFS (Table 8).

Table 5: Summary of Urban Forest Strategic Plan Measures in the Urban Forest Strategy

2015 UFSP Measures	Retained/Enhanced in 2022 UFS	Discarded for 2022 UFS	Replaced/Improved in 2022 UFS
40	26	7	7

Example of replaced/improved measure: 2015 UFSP sought 50% canopy cover in all open space. 2022 UFS sets a targeted canopy over open space paths and play spaces of 50%.

Example of discarded measure - iTree Eco score for eco-system services mature trees. 2022 UFS sets goals for a diverse and healthy forest and has measures to report on those elements, making specific iTreeEco software scoring redundant.

Table 6: Urban Forest Strategic Plan Measures Retained in the Urban Forest Strategy

2015 UFSP Goal	2015 UFSP Measure
Increase environmental benefits of urban forest	Reduce urban heat island in industrial and low tree density areas
Improve biodiversity and increase habitat	Greater native tree species diversity in bushland reserves
	Greater native tree species diversity in streets around bushland
	Reduction in significant weed species in bushland reserves
	Increased creation and retention of habitat trees and logs
Increase canopy cover in available open space	Improved tree planting mortality to less than 5% after 24 months for all public planting projects
	Reduce vacancy rates in streets to less than 1 vacancy per 100 trees within 15 years
	Increased canopy cover on non-council managed land by 20% within 15 years
	Reduce tree removal on non-council land by 20% within 10 years
Improve health of urban forest	Improve canopy vigour across entire tree population
	Increase average estimated life expectancy of street tree to greater than 30 years
	Reduce tree planting mortality to less than 5% after 24 months
Maintain and improve urban character	Maintained and improved Heritage overlay conformance
	Neighbourhood Character strategy is maintained
Raise the profile of the urban forest within Council	Greater consideration for trees within Council developments
Improve community engagement with the urban forest	Greater community connection with urban forest management
Improve establishment rate of new tree plantings	Reduce new tree planting mortality to less than 5% after 24 months
	Reduce vandalism and criminal damage

Improve species diversity	Greater species diversity in streets and parks
	Improved species diversity across entire municipality
	Improved species diversity in suburbs identified with low diversity
Apply Best Practice	All Council work conducted in accordance with Australian Standards and Best Management Practices
	Development of Water Sensitive Urban Design Guidelines
	Improved education of all Council arboriculture staff
	Manage the urban forest in accordance with best international arboriculture practices with annual budgets that reflect its true value as a living asset
	Reduced tree loss from conflicts with infrastructure

Table 7: Urban Forest Strategic Plan Measures Replaced in the Urban Forest Strategy

2015 UFSP Goal	2015 UFSP Measure	UFS Action
Increase canopy cover in available open space	Tree planting increased in parks to achieve 50% canopy cover at maturity (an increase of 15%)	Not being pursued, leave to Open Space Plan to ensure best mix of park space. Target 50% canopy over walking/bike paths and play spaces.
	Tree planting increased in streets to achieve 75% canopy cover at maturity	To be replaced by canopy target over footpath network, 40% cover by 2040. Some suburbs will reach 50-60% as they are already at 40%, other suburbs will be lifted from 20% to 40%.
Raise the profile of the urban forest within Council	Annual tree planting budget is increased to accommodate the planting of 4000 trees per annum for the next 15 years	Action S1.6 seeks funding for increasing to 5,000 p.a. until vacancies fulfilled and then returning to 2,000 p.a. replacements.
	Develop and implement Street Tree Master Plan	This outcome is being achieved in different ways, through a series of components. Action S2.6 is developing the list of species, S3.5 is maintaining that list with incoming data on climate suitability. Action S4.1 will include a decision-making flow-chart on species selection including if there's a neighbourhood character tree that is location and climate suitable then continue to use it, else use the identified species that is the suitable renewal replacement that is more climate suitable. Action S4.5.4 - a public facing app that shares the tree data, showing the community what trees are in their space and what the future species will be.
	Development of Urban Forest Management Plan	Met through action S4.8
	Annual tree maintenance budget is increased over the next 15 years to allow sufficient funds to proactively manage 280,000 trees annually in streets, parks and bushland reserves	

Table 8: Urban Forest Strategic Plan Measures Discarded in Urban Forest Strategy

2015 UFSP Goal	2015 UFSP Measure
Increase environmental benefits of urban forest	Average street tree annual iTree Eco benefit increased by 20% at maturity
	Average park tree annual iTree Eco benefit increased by 15% at maturity
	Average park tree annual iTree Eco benefit increased by 15% at maturity
	Annual carbon sequestration increased by 20% across municipality within 15 years
	Reduce Annual pollution removal increased by 25% within 15 years
Maintain and improve urban character	Average street tree annual iTree Eco benefit increased by 20% at maturity
	Average street tree amenity value increased by 20% at maturity
Improve species diversity	Average street tree annual iTree Eco benefit increased by 20% at maturity

Appendix 2. Matching Actions from the 2015 Urban Forest Strategic Plan to the 2022 Urban Forest Strategy

The 2015 Urban Forest Strategic Plan set 96 actions to achieve the goals of the plan. Table 9 is the summary of how those actions match the UFS and Table 10 details the equivalent actions in the UFS which is the majority.

Table 9: Summary of Urban Forest Strategic Plan Actions in the Urban Forst Strategy

2015 UFSP Actions	Achieved	Retained/Enhanced 2022 UFS	Replaced/Improved in 2022 UFS	Discarded for 2022 UFS
94	15	41	34	4

Example of action achieved is that Australian Standards for planting and pruning work are now specified within business-as-usual procedures and contract specifications. Compliance is audited.

Example of action replaced/improved is that 2015 UFSP asked for a Street Tree Masterplan to provide defined species lists. The 2022 UFS sets actions to establish species selection criteria, species matching to streetscapes and existing character, a decision-making framework, and setting publicly-available detail lists of appropriate species.

Table 10: UFSP actions matched to UFS actions

2015 UFSP Action	Link to 2022 UFS Action
Plan and prioritise avenue replacement where trees are over-maturing or senescing.	S6.14
Adhere and enforce Best Management Practices for tree planting and risk management.	S4.8
Assess and geographically locate all street trees.	UFS 2022 has actions that will improve this data and share it with public S4.4 & S4.5
Conduct annual community planting day on National Tree Planting Day.	S5.7
Conduct canopy cover assessment of current private land.	S4.3 - the method S6.6 - the reporting to the public
Conduct canopy cover assessments of streets, parks and bushland reserves.	S4.3 - the method S6.6 - the reporting to the public
Conduct periodic canopy cover assessments to measure efficacy of programs.	S4.3 - the method S6.6 - the reporting to the public
Consult committees and relevant stakeholders on major planting projects.	S5.5
Develop and implement integrated pest and disease management program.	Outcome of improved, targeted biodiversity plantings (S2.1, S2.2). Actions focussed on significant trees on public land (S3.1)
Develop and implement proactive tree maintenance program.	S4.8
Develop Street Tree Master Plan to provide preferred species list.	UFS 2022 has action for species and street design S3.5, S4.1 & S6.14
Develop Urban Forest Management Plan.	S4.8 - Develop risk management framework and plan for urban forest work on public lands
Develop water sensitive urban design principles and guidelines for council.	S3.4, S6.3.1, S6.9
Diversify environmental benefits through strategic species selection and planting.	S2.1, S2.5, S2.6, S3.6
Educate and promote communities of the benefits of the urban forest.	S5.2, S5.7
Educate and promote communities of the importance of remnant vegetation.	S5.2, S5.7

2015 UFSP Action	Link to 2022 UFS Action
Encourage private planting plantings through community engagement and education programs	S5.2, S5.7
Encourage private realm tree and garden plantings.	S3.5, S6.17
Ensure Banyule's community Garden Policy/Guidelines reflects the directions of the Urban Forest Strategic Plan.	S6.12
Ensure correct species selection and provenance where applicable.	S2.6, S1.7
Ensure nature strip Planting Policy/Guidelines compliments the direct of the Urban Forest Strategic Plan.	S2.4
Ensure tree establishment and maintenance guidelines are included in relevant council design and construction guidelines.	S6.3.4, S6.4
Ensure trees are established within the landscape during maintenance period.	S6.3.4, S6.4
Ensure updated Public Open Space Strategy reflects the directions of the Urban Forest Strategic Plan.	S6.12
Facilitate school programs to promote the benefits of the urban forest.	S5.5
Identify areas of low planting density.	S1.1
Identify areas of poor tree health and short life expectancy.	S4.4
Identify suburbs and areas that have declining tree health, poor species selection, or low planting density.	S1.1
Identify suitable sites for annual community planting day.	S5.2
Improve planting opportunities in high imperviousness and industrial areas.	S1.1, S4.1, S6.3.2
Improve planting survival across municipality.	S6.4
Improve tree planting stock selection, planting procedures and maintenance programs	S6.4
Increase annual planting program to approximately 4000 trees per year.	S1.6
Increase annual planting program.	S1.6
Increase planting density in streets and parks.	Currently happening, multiple small trees where larger trees are not possible. S6.4
Increase planting density under power lines.	Currently happening, multiple small trees where larger trees are not possible. S6.4
Investigate and utilise water sensitive urban design to facilitate the integration of larger trees in streets and improve longevity.	S6.3.1, S6.9
Maintain and enforce planning protections within relevant EPO, HO, SLO, and VPO	S6.7, S6.8, S6.11, S6.14
Maintain Council's tree removal and pruning policy.	S4.8
Measure and monitor urban heat island through use of thermal imaging.	S4.3, S4.3, S6.6
Plan and prioritise streetscape rejuvenation projects according to areas of need.	S1.1
Plant all identified vacant planting sites with suitable tree species.	S1.6 is to plant out all vacant street sites, approx. 18,250 trees including the removals in the surge planting period
Plant tree species with larger canopies in parks and around sports grounds.	S2.6 - species lists where canopy will be a priority S6.10 - planting of outlier trees with very large canopies
Plant tree species with larger canopies in suitable Council developments.	S2.6 - species lists where canopy will be a priority S6.10 - planting of outlier trees with very large canopies
Plant tree species with larger canopies in suitable streetscapes.	S2.6 - species lists where canopy will be a priority S6.10 - planting of outlier trees with very large canopies
Prioritise all streets, suburbs and parks for maintenance and improving tree canopy cover.	S1.1

2015 UFSP Action	Link to 2022 UFS Action
Prioritise and increase planting in areas of low canopy coverage.	S1.1
Promote Council and community planting programs.	S5.2
Promote the environmental and functional values and benefits of the urban forest.	S5.7
Reduce effects of urban heat island in areas of low canopy coverage.	S1.1
Remove underperforming trees in key locations	S4.4
Review and compare canopy cover on private land after 15 years.	S4.3, S6.6
Strategically improve species and age diversity in bushland reserves.	S1.1
Strategically improve species and age diversity in parks with additional plantings.	S1.1
Strategically improve species and age diversity in streets with additional plantings.	S1.1
Strategically plan new planting programs within groups of streets to improve the efficacy of 2-year maintenance processes.	S1.1
Systematically remove over-maturing trees to facilitate generation transition.	S1.1
Use local streetscapes to improve connectivity and buffering of bushland reserves.	S1.7, S2.1, S2.5
Use location vegetation community information to assist in planting selection.	S1.7, S2.1, S2.5
Work with development to improve retention of mature trees on private property.	S6.5, S6.17
Work with development to improve tree planting on private property.	S3.5