**F U T U R E M E L B O U R N E ( E C O C I T Y ) C O M M I T T E E R E P O R T** **Agenda Item 5.8**

**URBAN FOREST STRATEGY** **4 September 2012**

**Presenter:** Ian Shears, Manager Urban Landscapes

## Purpose and background

1. The purpose of this report is to seek the Future Melbourne Committee's endorsement of the draft Urban Forest Strategy (Strategy) (refer Attachment 2) and the draft Urban Forest Diversity Guidelines (Guidelines) (refer Attachment 3).

2. On 10 July 2012, the Future Melbourne Committee noted the Consultation Report and the outcomes of community engagement activities undertaken as part of the development of the draft Strategy and Guidelines and allowed a further period for public comment or submissions on the revised documents.

## Key issues

3. An extensive community engagement process was undertaken on the draft Strategy and Guidelines from 9 November 2011 to 31 March 2012 to seek feedback from the community, agencies and stakeholders. The Strategy and Guidelines received widespread academic and industry support locally, nationally and internationally.

4. The documents were revised to reflect and incorporate community feedback. Additionally, several experts were commissioned to assist with the further development of the Strategy based on the outcomes of the consultation (refer Attachment 4).

5. Two new submissions have been received with additional feedback on the Strategy (refer Attachment 5).

6. Much of the new feedback has been incorporated into the Strategy and the details are outlined on pages 49 and 53 of the Community Consultation Report (refer Attachment 4).

7. Revisions have been made to refine the Strategy and incorporate elements of additional feedback.

## Recommendation from management

8. That the Future Melbourne Committee:

   8.1. recommend that Council note the additional submissions received;

   8.2. endorse the final draft of the Urban Forest Strategy and the draft Urban Forest Diversity Guidelines; and

   8.3. grant the Director City Design permission to make editorial amendments as required.

**Attachments:**
1. Supporting Attachment
2. Urban Forest Strategy
3. Urban Forest Diversity Guidelines
4. Community Consultation Report
5. New Submission

**SUPPORTING ATTACHMENT**

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**Legal**

1. No direct legal issues arise from the recommendation from management.

**Finance**

2. There is an operational budget allocated to the Urban Forest Strategy which covers costs incurred through the running of community engagement events and the scoping and development of Urban Forest Precinct Plans.

**Conflict of interest**

3. No member of Council staff, or other person engaged under a contract, involved in advising on or preparing this report has declared a direct or indirect interest in relation to the matter of the report.

**Stakeholder consultation**

4. The City of Melbourne Parks and Gardens Advisory Committee has provided valuable input into the identification of issues to be addressed by the Strategy and has provided feedback and direction at various stages in its development.

5. An extensive engagement process was undertaken from 9 November 2011 to 31 March 2012 to involve the community and all interested stakeholders in the further development of this Strategy.

6. A range of methods were employed during the engagement process to ensure that consultation and communications were as wide reaching as possible. This included a series of community meetings, an Urban Forest Forum, ten precinct based community meetings where a combined 110 community members and representatives from resident's groups attended.

7. Direct briefings and presentations on the Strategy were provided to Friends of the Elms, University of Melbourne, the Victorian Centre for Climate Change Research, State Government, Landcare, the National Urban Forest Alliance, VicHealth, and Australian Institute of Landscape Architects.

8. A permanent online forum was developed to provide information for the duration of the consultation. This online forum received 4249 individual visitors who made a combined total of 11,991 site visits with 20,316 page views. The Strategy was downloaded 818 times from the site and over 19,000 words in submissions and commentary was generated by 177 commentators.

9. Information was also available online at the City of Melbourne corporate website which received 7000 hits, with 5000 unique views.

10. A short video was developed to highlight the key issues and provide a brief overview of the Strategy. This video was viewed over 2500 times.

11. An Urban Forest Forum was held in the Town Hall on 30 November 2011 and 135 members of the community attended this event.

12. A detailed Consultation Report is attached (refer Attachment 4).

**Relation to Council policy**

13. The Urban Forest Strategy relates to and is consistent with the following policies and strategies:

    13.1. Future Melbourne – Eco City;

13.2. Open Space Strategy (2012);

13.3. Arden MacAulay Structure Plan & North Melbourne Structure Plan (2012);

13.4. Southbank Structure Plan (2010)

13.5. Climate Change Adaptation Strategy (2009); and

13.6. Total Watermark; City as a Catchment (2008).

**Environmental sustainability**

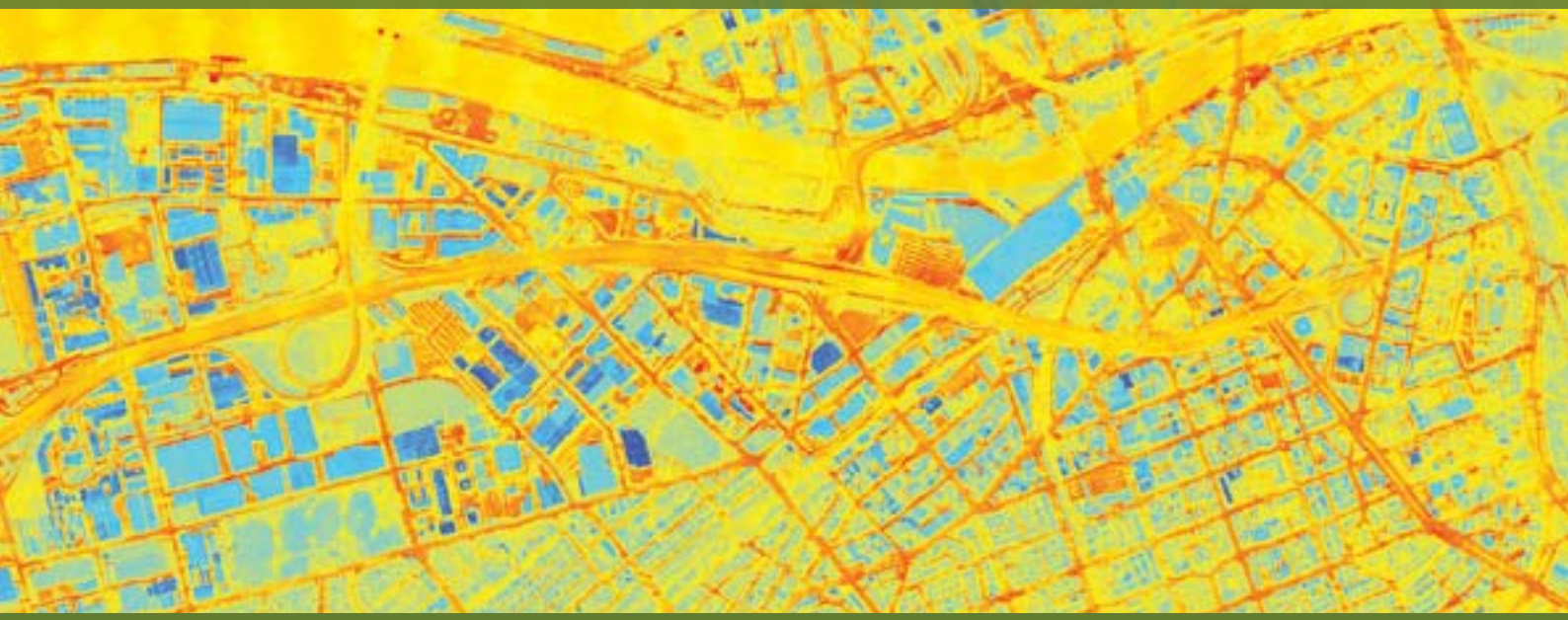
14. Environmental sustainability issues have been a priority in the development of this document. The implementation of the recommended actions and targets within the strategy will bring about multiple environmental benefits, including increasing the longevity of tree life, increasing canopy coverage and vegetation throughout the municipality, lowering air pollution, increasing carbon storage and sequestration, capture and reuse of stormwater, removing pollutants from water, reducing energy expenditure during summer months and periods of extreme heat, mitigating the urban heat island and adapting the municipality to climate change.

Attachment 2
Agenda Item 5.8
Future Melbourne Committee
4 September 2012

# Urban Forest Strategy

## Making a great city greener

2012-2032



melbourne.vic.gov.au/**urbanforest**

CITY OF MELBOURNE

# A message from the City of Melbourne

The City of Melbourne is renowned for its heritage-listed parks, gardens, reserves and boulevards. They have formed an essential part of Melbourne's identity for more than a century.

However, the circumstances for our urban forest are changing. Many of our trees are now reaching the end of their natural life span and the past decade of drought has accelerated decline for these and many of our other trees. We expect to lose 39% of the trees within our landscape within the next two decades.

This strategy embraces the opportunity to generate a new legacy for Melbourne and create a forest for future generations. This document sets out how our urban forest will become diverse, robust and resilient in the face of current and future challenges. We know that climate change and increasing density and growth within our city will place new pressures on our urban forest, but the targets we have set in this document will meet those challenges.

An increasing body of evidence and research informs us that urban forests and green space are vital to supporting a healthy community as well as providing a means to adapting to climate change.

This strategy sets a bold target of doubling our canopy cover by 2040 so that we can provide a greener and cooler city for those who live, work and play in our municipality. Most importantly, it articulates how we can enhance our urban forest to reflect and respond to the needs of the community and the city.

We have worked with our community and key stakeholders for two years to generate this strategy. We are confident that it will provide a sound strategic direction for our future urban forest while maintaining and enhancing Melbourne's existing and much loved character.

Robert Doyle
Lord Mayor

Cr Cathy Oke
Future Melbourne
(Eco-city) Committee Chair

# Contents

# Vision

**The City of Melbourne's urban forest will be resilient, healthy and diverse and will contribute to the health and wellbeing of our community and to the creation of a liveable city.**

*A visualisation of the possible future 'greening' of Melbourne.*

# 1 Executive summary

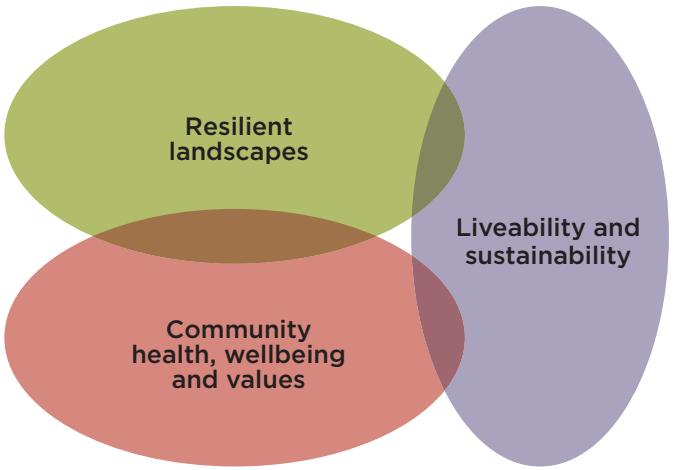
**This is the City of Melbourne's first Urban Forest Strategy. It is the product of a collaborative process, developed over two years with a large number of stakeholders including local and international academics, interest groups and the broader community in Melbourne.**

## Goals

At the core of this strategy is a vision to create a **resilient, healthy and diverse forest** for the future. That creation begins by building upon the present and the past. The City of Melbourne is renowned for its historical parks, gardens and boulevards. These contribute greatly to the city's character and are integral to its social and cultural life. It is important that the forest of the future maintains the essential character of the urban forest that Melburnian's love.

In developing this strategy, the City of Melbourne recognises the importance of a holistic, 'whole-of-forest' approach to understanding and managing this invaluable resource. Many of Melbourne's landscapes were created well over 100 years ago in a different climatic and social environment. A significant number of our trees are nearing the end of their lives and landscapes are struggling to adapt to a changing climate. Now is the time to design and plant the forest of the future in a way that **respects Melbourne's unique character, responds to climate change and urban expansion, and underpins the health, liveability and wellbeing** of the city and its inhabitants.

The goal of this strategy is to guide the transition of our landscape to one that is resilient, healthy and diverse, and that meets the needs of the community. Its intended outcomes are to create **resilient landscapes, community health and wellbeing** and a **liveable, sustainable city**. Central to this is the vision to make our great city greener – to create a city within a forest rather than a forest within a city.




*Three themes underpin the purpose of this strategy*

## Key challenges

The City of Melbourne is currently facing three significant challenges: **climate change, population growth and urban heating**. These will place significant pressure on the built fabric, services and people of the city. A healthy urban forest will play a critical role in maintaining the health and liveability of Melbourne.

Over the next 20 years and beyond, Melbourne will experience a changing climate, becoming increasingly warm, dry, and liable to more frequent extremes of heat and inundation. We can also expect that Melbourne's urban heat island effect will intensify. One of the important functions of the urban forest is to provide shade and cooling. Increased canopy coverage throughout the city will minimise the urban heat island effect and improve thermal comfort at street level for pedestrians. Increased water sensitive urban design will play an important role in managing inundation and providing soil moisture for healthy vegetation growth, as well as enhancing the city's ecology.

Climate change science and international urban forestry research both indicate that a range of threats facing the urban forest will increase in the future, particularly vulnerability to pests, disease and extremes of weather. This requires a new approach in how the urban forest is managed, so that future vulnerability can be minimised and benefits maximised.

We expect to see growth in Melbourne's residential, worker and visitor populations and increasingly dense built form. An associated growth in the urban forest, 'green infrastructure' and 'ecosystem services' will respond to these pressures, reduce the cost of grey infrastructure and improve the quality of the urban environment. Urban forests and associated ecosystem services will also yield benefits by attracting more people to live, work and visit in our city.

Our urban forest is undergoing unprecedented change. The recent period of drought and water restrictions triggered irreversible decline for many trees. This exaggerated the age-related decline of many significant elms and other trees. Modelling shows that within the next ten years, 23% of our current tree population will be at the end of their useful lives and within twenty years this figure will have reached 39%.[1]

The City of Melbourne is addressing these changes head on by looking at retention of existing trees and planning the urban forest of the future. To guide future planting, a series of tools and programs have been, and will continue to be, developed. Building the urban forest as a living ecosystem and ensuring that it provides the maximum benefits for our communities will rely on smart species selection, improving soil moisture retention, reducing stormwater flows, improving water quality and re-use, increasing shade and canopy cover, and reducing infrastructure conflicts.

Urban forestry is entering a new era in Australia and this strategy highlights how important it is, particularly in context of enhancing liveability and adapting to predicted climate change. An urban forest provides a multitude of benefits for ecosystems, the economy, and community health and wellbeing. It is essential that we acknowledge and build upon those benefits now to ensure the best future for our city – an urban forest loved and enjoyed by our children and their children. We now have a unique opportunity to create a healthy, resilient and diverse forest for the future.

*View of the Yarra and Southbank from near Federation Square*

*The renowned avenue of Lemon Scented Gums along Fraser Avenue in Kings Park, Perth*

## Principles, strategies & targets

Our vision is of a healthy, resilient and diverse urban forest that contributes to the health and wellbeing of our communities, and to a liveable city that will create better urban environments for everyone. The principles outlined in this strategy will guide decision-making to create our future forest and achieve this vision. The strategy highlights proactive and adaptive management, and will transform an asset that has a current amenity value estimated at $700 million and a future value that is potentially priceless.[2]

In order to build a resilient, healthy and diverse urban forest that can thrive in the future, the strategy's guiding principles are to:

- **mitigate and adapt to climate change**
- **reduce the urban heat island effect**
- **become a 'water sensitive' city**
- **design for health and wellbeing**
- **design for liveability and cultural integrity**
- **create healthier ecosystems**
- **position Melbourne as a leader in urban forestry**

The strategies and targets proposed to achieve this vision are:

**Strategy 1: Increase canopy cover**
**Target:** Increase public realm canopy cover from 22% at present to 40% by 2040.

**Strategy 2: Increase urban forest diversity**
**Target:** The urban forest will be composed of no more than 5% of any tree species, no more than 10% of any genus and no more than 20% of any one family.

**Strategy 3: Improve vegetation health**
**Target:** 90% of the City of Melbourne's tree population will be healthy by 2040.

**Strategy 4: Improve soil moisture and water quality**
**Target:** Soil moisture levels will be maintained at levels to provide healthy growth of vegetation.

**Strategy 5: Improve urban ecology**
**Target:** Protect and enhance a level of biodiversity that contributes to a healthy ecosystem.

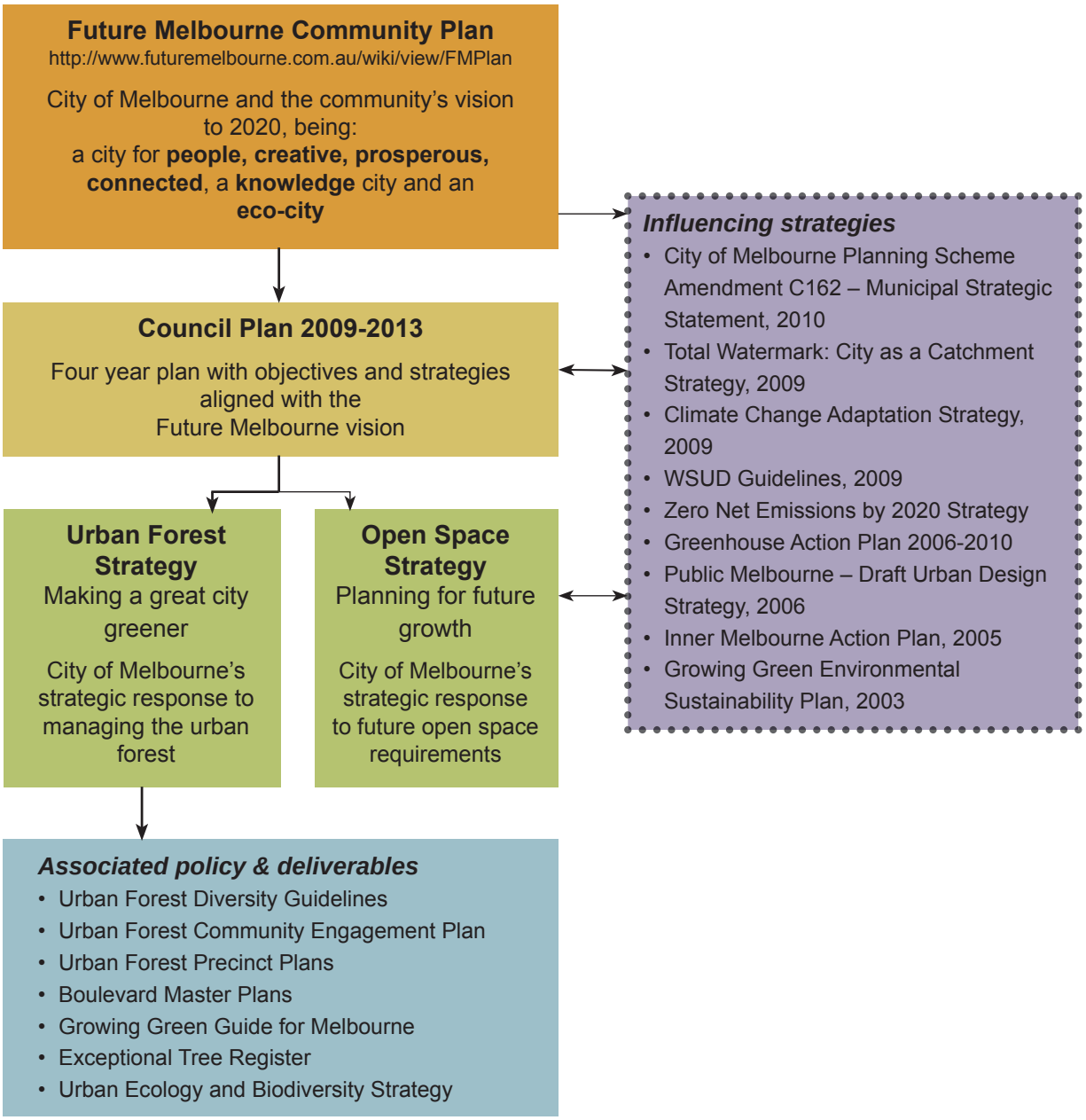
**Strategy 6: Inform and consult the community**
**Target:** The community will have a broader understanding of the importance of our urban forest, increase their connection to it and engage with its process of evolution.

Meeting these targets will provide many benefits. Most importantly they will ensure that we adapt for predicted climate change, manage the health of the urban forest, and provide the community with world class open spaces that provide benefits for public health and wellbeing and for the environment.

The City of Melbourne and its communities have a unique opportunity to work collaboratively to develop the future urban forest. The City of Melbourne has a leading role to play in urban forest advocacy. The principles and actions developed through this strategy can also be used and adapted across Melbourne, thereby reinforcing Greater Melbourne's urban forest.

*We often think of the trees as the lungs of our city, but they are also, in some ways, our heart and soul. The whole community owns our trees and our future trees... There are few political, budget or policy decisions that must deliver for people in 100 years. In politics, so much is driven by the artificial three- or four-year election cycle. Not this plan. Our trees are too important.*

Robert Doyle, *Herald Sun,* 9 January 2011




*This diagram illustrates the relationship of the Urban Forest Strategy to City of Melbourne policy documents and other strategies that underpin and inform it, and to companion documents that will support its implementation. Implementation of the Urban Forest Strategy will require coordination with a wide range of other initiatives, across the City's organisation as a whole.*

# 2 Background & context

## 2.1 What is an urban forest?

The City of Melbourne's urban forest comprises all of the trees and other vegetation – and the soil and water that supports it – within the municipality. It incorporates vegetation in streets, parks, gardens, plazas, campuses, river and creek embankments, wetlands, railway corridors, community gardens, green walls, balconies and roofs.

Urban forests provide critical ecosystem services such as air and water filtration, shade, habitat, oxygen, carbon sequestration and nutrient cycling. The urban forest also provides a connection to nature that is often perceived to be missing in urban areas.

Urban forestry can be described as the science and art of managing trees, forests and natural ecosystems in and around urban communities to maximise the physiological, sociological, economic and aesthetic benefits that trees provide society.[3]

Urban forestry, as distinct from arboriculture and horticulture, considers the cumulative benefits of an entire tree population across a town or city. Looking holistically at the urban forest and its associated ecosystem services allows for consideration of the broader issues of climate change, urban heat island effects and population growth that can be influenced by, and that can affect, an urban forest.

The management of an urban forest is often considered a local government responsibility but frequently extends well beyond that; local communities, schools, community groups, developers, business, industry and State and Federal Government all have important roles to play. Every part of the city contributes in some way to the urban forest as a whole. None-the-less, the primary focus of this strategy and the actions recommended in it is the public realm for which the City of Melbourne is directly responsible.

*A Docklands waterfront promenade. Local greening adds immeasurably to the quality of the city as a place to live.*

*Foresting the suburbs provides wider benefits for a healthy city.*

*Boston Ivy on the historic St Kilda Road Barracks.*
*All kinds of vegetation contribute to the urban forest.*

The discipline of urban forestry stemmed from research conducted by Erik Jorgensen at the University of Toronto, Canada in 1965. This was the first recognition that urban trees provide environmental benefits in addition to recreational and amenity value. With support from the International Society of Arboriculture and the US Department of Agriculture's Forestry Department, urban forestry gradually pervaded US urban policy. It reached the UK in the early 1980s – sparking the Forest of London project aimed at social, ecological and economic regeneration of UK cities – and flowed into the Netherlands in the mid 1980s. From there, Scandinavian, European and Asian cities have embraced the concept, broadening the depth of knowledge and research.[4]

*A Model of Urban Forest Sustainability*, by JR Clark et al. (1997), was one of the formative works applying principles of sustainability to urban trees. 'The most significant outcome of a sustainable urban forest is to maintain a maximum level of net environmental, ecological, social and economic benefits over time.' This paper:

- defined sustainable systems aligned with the (seminal) Brundtland Commission Report, 1987, and the characteristics of urban forest sustainability
- set criteria of urban forest sustainability for the vegetation resource, for the community framework and for resource management; and finally
- set criteria and performance indicators for the vegetation resource, for the community framework and for resource management

Urban forestry has yet to be well researched, implemented and evaluated in an Australian context. There is a reliance on research from the US, Europe, Scandinavia and Asia to supplement our thinking and programs. Whilst Australia is some way behind in providing robust research and literature on the topic, Australian cities are by no means behind in current management and planning of urban trees and vegetation. We have been practicing the art and science of urban forestry for years through tree and park planning, arboriculture, horticulture and urban design.

Defining what urban forestry means for Melbourne and Australia is important in determining visions for our future cities and how we will go about realising them. Essentially, urban forestry is the meeting of arboricultural and forestry with other disciplines such as urban planning, landscape architecture, architecture, engineering and economics. Ensuring these groups work collaboratively will be integral to a genuinely Australian concept of urban forestry.

*Urban and community forestry has transcended its original niche function in public policy as an aesthetic amenity to soften the urban landscape. It is increasingly perceived as a solution to many more pressing urban environmental problems and even as a tool for community and social development. …*

*Environmental benefits are also being quantified more accurately and more often in economic terms… Increasingly communities are realizing that green infrastructure is an economical long-term investment that reduces the need for much greater expenditures in gray infrastructure.*

JC Schwab (Ed.), 2009. *Planning the Urban Forest*

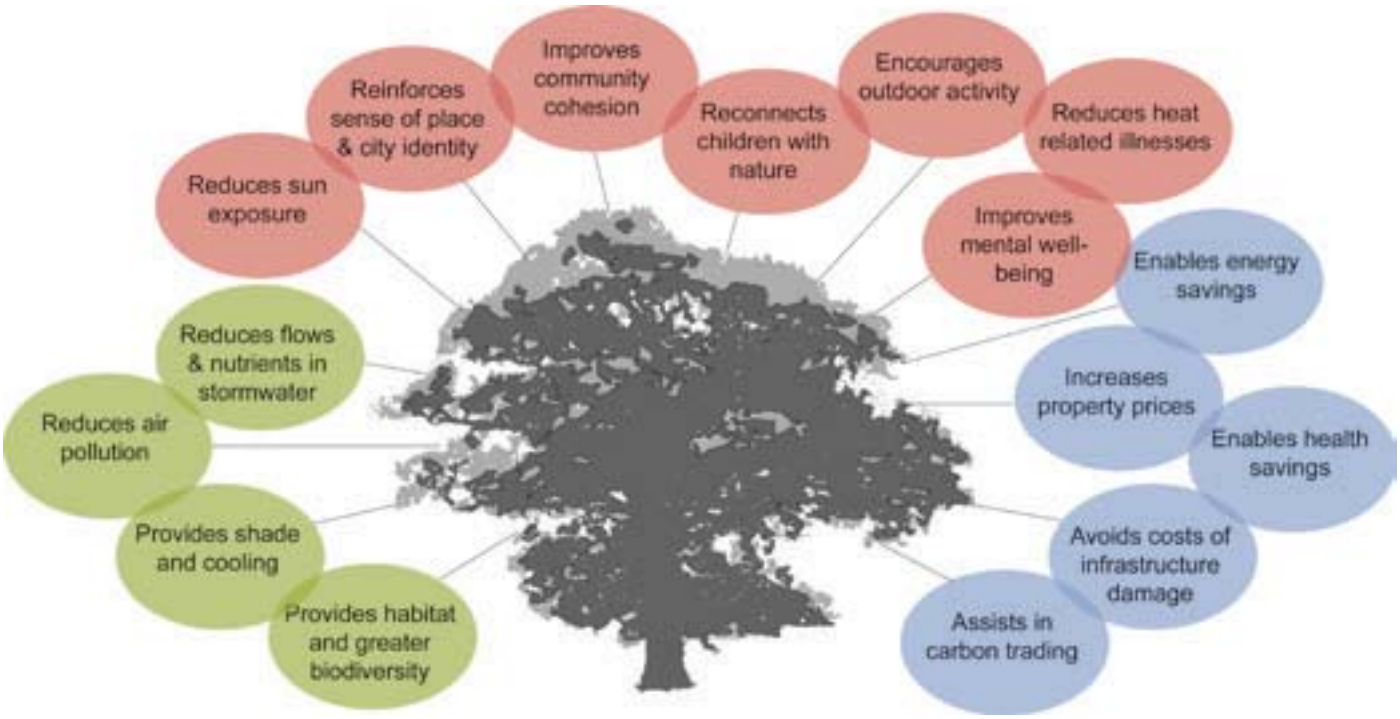
## 2.2 Benefits of the urban forest

Urban forests have been around for generations but only recently have they become valued for providing more than aesthetic and recreational values.

Cities around the world now regard trees and other vegetation as critical urban infrastructure – as important to how a city functions as roads or public transport and particularly vital to the health and wellbeing of communities.

The benefits of urban forests span **environmental, economic, cultural** and **political domains**. These benefits are interrelated, with each cumulatively feeding into the creation of resilient and sustainable urban landscapes.

Given the pressure on governments to plan for greater populations, increased urban density and climate change adaptation, there is a clear opportunity to communicate the importance and benefits of urban forests in creating resilient, sustainable cities that provide healthy and enjoyable places for people to live and work. Some of the major benefits of urban forests in supporting and providing essential services are explored in this section.




*Summary of the broad array of benefits offered by urban trees [adapted from the Woodland Trust, UK]*

## 2.2.1 Environmental benefits

The urban forest is the 'engine room' for urban ecosystems. Trees take in water, nutrients and carbon dioxide and process them through photosynthesis and transpiration, transforming them into clean air, oxygen, shade and habitat.

Environmental benefits of the urban forest include:

- **Provide shade and cool our cities**
  The addition of trees and other vegetation to the built environment provides the greatest benefit in mitigating the urban heat island effect. Through the process of transpiration and the provision of shade, trees help reduce day and night-time temperatures, especially during summer. They shade streets and footpaths, and their leaves reflect more sunlight and absorb less heat than built materials, reducing the heat absorbed by the built environment. During transpiration, plants draw water from the soil and release moisture through their leaves into the air.
- **Reduce stormwater flows and nutrient loads**
  Tree canopies and root systems reduce stormwater flows and nutrient loads that end up in our waterways. Tree canopies intercept and mitigate the impact of heavy rainfalls. Healthy tree roots help reduce the nitrogen, phosphorus and heavy metal content in stormwater. Green roofs retain rainwater, filter the water that does run off, and delay the time at which runoff occurs, resulting in decreased stress on sewer systems at peak flow periods. Wetlands and raingardens also trap stormwater, improve water quality and reduce nutrient loads.
- **Reduce air pollution, air-borne particulates and greenhouse gas emissions**
  Vegetation ameliorates air pollution and reduces greenhouse gases. Through the process of photosynthesis trees remove carbon dioxide, nitrous oxides, sulphur dioxide, carbon monoxide and ozone from the atmosphere. As trees reduce temperatures, they help improve air quality through energy savings and reducing the emission of pollutants that are temperature dependant. A New York study found that its urban forest removed 1,821 metric tonnes of air pollution at an estimated value to society of $9.3 million annually. Carbon dioxide is a greenhouse gas associated with trapping heat in the atmosphere and driving climate change, and the effectiveness with which many trees sequester and store carbon is considered a key mitigation strategy for reducing levels of atmospheric carbon dioxide. Studies show a typical mature tree can store as much as 10 tonnes of carbon.[5]
- **Provide habitat and enhance levels of biodiversity**
  Although few Australian cities have preserved large areas of natural habitat, a healthy urban forest contributes to biodiversity and habitat provision. Urban forests around the world have been shown to support a wide range of species, even endangered animals and other species of high conservation value. By planting and managing different age strata, biodiversity and wildlife habitat values can be enhanced. Green roofs and walls can also provide habitat for wildlife.

*The Trin Warren Tamboore wetland in Royal Park provides habitat, a rich experience for visitors, and captures and cleans stormwater to use for irrigating parkland.*

*A green wall in Southbank. Despite the persuasive business case for green roofs, they have not been widely implemented in Melbourne, although cities across North America, Europe and Asia have embraced green roof technology.*

## 2.2.2 Community benefits

Urban forests have many positive impacts for the community by forming shared points of reference within the urban environment and allowing daily interaction with nature. Specific benefits include:

- **Creation of local identity**
  A city's landscape helps define its character. Trees and vegetation can physically define a place. Landscapes are the setting for many everyday recreational opportunities such as organised sport, walking the dog or having a picnic and therefore help forge a sense of connection to place.
- **Improving community cohesion**
  Green open space provides places for events, festivals and celebrations throughout the city. These can bring diverse groups of people together within a public realm that is available for everyone to enjoy. Green spaces especially play an important role in the integration of minority groups and can assist in the adaptation of immigrants into their host country.
- **Encouraging outdoor activity**
  Well-vegetated parks, gardens and streets encourage the use of open spaces, with health benefits such as reduced obesity and improved general physical and mental wellbeing. This is important, as lifestyle-related illnesses are prevalent and 61% of Australian adults are overweight or obese (obesity costs Australia's health care industry $58 billion in 2008).[6]
- **Reconnecting children with nature**
  By enticing children into 'make believe worlds' of computer games, electronic technology is contributing to childhood obesity and inactivity. Studies have shown that green spaces provide therapy to children, allow creativity of mind, encourage exploration and adventure, promote physical activity, build resilience and enhance experiential learning.[7]
- **Reducing sun exposure**
  The prevalence of skin cancer and other illnesses due to sun exposure have shown that protection from sunlight's UV rays is vital. Shade alone can reduce overall exposure to UV radiation by up to 75%.[8] Trees provide the best form of natural shade, with broad canopied trees being the most effective.
- **Reducing heat related illnesses**
  The shade provided by trees on hot summer days helps to reduce localised temperatures by up to 2 degrees Celsius.[9] This is significant, as in Melbourne on days over 30 degrees Celsius, the risk of heat-related morbidity and mortality for people over 64 years of age increases significantly. Evidence suggests that people in buildings with little or no surrounding vegetation are at higher risk of heat related morbidity.[10]
- **Improving mental wellbeing**
  Access to, and views of, green spaces and trees have positive effects on people's wellbeing. Many studies have explored relationships between greenery in the landscape and levels of depression and wellbeing. In the Netherlands, disease rates, including mental disease, were shown to be less prevalent in areas with higher percentage of green space within a 1km radius than those with lower percentages.[11]

*Paved surfaces are everywhere in the city, but trees in and around them transform some into special places. The tan track around the Domain and Botanic Gardens is one of Melbourne's premier green spaces for active recreation for people of all ages and abilities, while the City Square provides respite and a meeting space for shoppers and workers in the heart of the CBD. Jan Gehl (2007) refers to 'moving', 'meeting' and 'market' as pervasive elements of cities over time – reflecting the dimensions of city life that are particularly supported by green infrastructure.*

## 2.2.3 Economic benefits

Urban forest benefits that can be quantified in dollar terms span a range of industries and disciplines including health, engineering, planning, sustainability, geology and real estate industries. Bringing these together to form a solid economic business case for urban forests is a powerful tool for decision makers, as most infrastructure and design decisions are based on economic cost benefit analysis. Some of the economic benefits of an urban forest include:

- **Reducing energy costs**
  Restoring natural systems is often more cost-effective than technological substitutes or building new infrastructure. Major economic benefits come through shading buildings in summer, reducing the need for air conditioning, in turn cutting energy costs. Increasing tree cover by 10% – or strategically planting about three shade trees per building lot – saves annual heating and cooling costs by an estimated $50 to $90 per dwelling.[12]
- **Increasing property values**
  Trees in streets enhance neighbourhood aesthetics and consequently are proven to increase property values. It is estimated that properties in tree-lined streets are valued around 30% higher than those in streets without trees.[13]
- **Avoiding costs of infrastructure damage and renewal**
  Urban forests that provide significant canopy coverage improve the lifespan of certain assets such as asphalt by shading them from harmful UV rays – potentially by 30%.[14] Tree canopies and root systems also help to mitigate flood levels during extreme events and have the ability to lower stormwater flows into drainage infrastructure.
- **Decreasing health costs**
  Research suggests that a healthy green city helps alleviate the burden on national health systems. While it is difficult to create a direct link and quantify dollar savings, it is likely that urban forests reduce health costs associated with sedentary behaviour, obesity and mental illness. A view of green space, including trees, can also encourage hospital patient recoveries, reducing the amount of time spent in hospital.
- **Marketing the City**
  Green spaces play a role in defining the culture and image of a city. A better image makes a city more competitive, thus expanding its political and economic influence. Tourism is of increasing importance to many cities, and green space can help to promote tourism, as main attractions or – more commonly – as attractive 'settings' for various types of events and activities that boost the local economy.
- **Storing and sequestering carbon**
  During photosynthesis, trees convert carbon dioxide and water into sugar and oxygen and store carbon within their biomass. Urban trees therefore make an impact in absorbing carbon from the atmosphere.

*The Chicago Trees Initiative, economic calculations indicated that a 17.2% canopy cover:*

- ***Stores $14.8M carbon***
- ***Sequesters carbon at a value of $521,000 per year***
- ***Filters air pollution at $6M per year***
- ***Has a structural value of $2.3 billion***

*Chicago's urban forest annually sequesters 318,800 tonnes of carbon from the atmosphere, equivalent to the annual greenhouse gas emissions from over 50,000 passenger vehicles.*

*Time and again, perceptions of the value of a local area and confidence in its future have been enhanced because of the physical improvements ... By contrast, under-investment in parks and green spaces has deterred investment in the area. Investment in green spaces reverses this spiral of decline, enhancing the well-being of out communities.*

CABE Space, 2005. *Does Money Grow on Trees?*

*[image: Michael Leunig]*

## 2.3 The evolution of Melbourne's urban forest

### 2.3.1 Historical development

It is hard to imagine exactly what Batman would have seen when he stepped off his boat in 1835. However, records suggest it was unlikely that he stepped into a dense forest. Instead, it was grasslands that caught his imagination, a landscape resulting from management by the Wurundjeri people. According to Batman there were not more 'than six [trees] to the acre', mostly sheoaks and wattle, in the region. Grasslands framed by lightly wooded hills stretched to the north of the river. To the south and west, swamps and lagoons dominated the landscape. The most forested land was significantly east of the place where Melbourne was first laid out, far enough away that Fawkner struggled to locate enough timber to build the permanent settlement.[15]

It is possible then, that today inner Melbourne's urban forest is as dense as it has ever been. However, it is an entirely different place than pre-colonisation. Today's trees are part of a conglomeration of processes, things and pressures that are unique to an urban world. The trees in Melbourne's parks, gardens and streets originated in forests from all corners of the world, or as is the case with the most common contemporary tree, the London Plane, the world's gardens. Other than some remnant river red gums the trees standing in central Melbourne today were planted with purpose by a person, and the story of Melbourne's urban forest is thus a tale of people and ideas. Today's landscape is the living result of a particular mix of human and plant migration with changing trends in science, morality, circumstance and aesthetics.[16]

#### Nineteenth century roots

In 1839, people were already concerned about the destruction of trees around the growing city. Surveyor Townsend wrote that people destroying Melbourne's trees must be hindered 'as the beauty of Melbourne will be destroyed if the land to the north of it is allowed to be cleared' and the trees growing on the city's boundaries were protected in one of Lonsdale's first pieces of legislation. Retaining unbuilt on land close to the city centre was part of a belief that these spaces were essential for people's health. 'It is of vital importance to the health of the inhabitants that there should be parks within a distance of the town' declared the Melbourne Town Council in the year it formed.[17]

Melbourne came to life at a time when cities were places to be feared by many people because they were thought to breed both disease and immorality. Preventing Melbourne from becoming too densely populated and an unhealthy place to live drove the desire to reserve land around the city from development. The parks and gardens in which Melbourne's urban forest grows today are the result of this nineteenth century fear and foresight.[18]

In 1846, the Botanic Gardens was reserved and laid out adjacent to the river where year-round water could be secured. The Carlton gardens were reserved in 1852, named by the Colonial Secretary as a 'recreation reserve'.[19]

*River Red Gums near the Yarra River in Burnley. Very little of the vegetation pre-dating European colonisation of the Melbourne region remains today.*

> *As well as their aesthetic qualities, the trees [of Melbourne's urban forests and magnificent public gardens] reflect a history of thoughtful city planning by leaders who looked to the future and imagined how the landscape would appear decades later when the young trees they planted were fully formed. It is a much-cherished legacy. … a new generation of leaders is working to ensure that trees remain a vital part of our landscape in the face of the ravages caused by time, disease and drought. … [This] strategy acknowledges and responds to the pressure on the city from both population growth and climate change. The council's commitment to ensuring even greater biodiversity, shade and beauty than exists at present is an important step towards ensuring a vibrant and beautiful cityscape for future generations to enjoy.*
>
> 'The trees that please' [editorial], *The Age*, 7 January 2012.

In 1854 the important Aboriginal camp, now Royal Park, was reserved, and also by 1856 the Fitzroy Gardens – around which Edward La Trobe Bateman planted a border of eucalypts and wattles.[20] Also popular during this first decade of park creation, were pines and other conifers. This was a legacy both of connections with Tasmania, where early settlement coincided with new species of conifers being celebrated Britain, and with a need to create a secure supply of timber.[21] Baron Ferdinand von Mueller, a key figure in the selection of tree species for in Melbourne, established a pinetum in his first year as director of the Botanic Gardens, with a goal of 'having these useful and noble pines planted copiously throughout the country'.[22] Often, popularity and availability of tree species in early Melbourne was connected to experiments for establishing larger rural industries, such as pines for timber. It also included a brief focus on mulberry trees for a proposed silk industry and various nut tree species.[23]

The trees grown in Melbourne's parks tended to be part of landscapes designed by a series of men, including Mueller, now famous in Melbourne's history. In 1860, Clement Hodgkinson began managing the city's reserves, including the Fitzroy Gardens. He designed the first major planting of these important spaces and used elms and other deciduous species to line various paths with shade trees. This brought relief from the hot summer and was also part of a desire to control the movement of people through these places, creating clear pathways to stroll through. Hodgkinson also believed that it was important to preserve as much remnant indigenous vegetation as possible in the city's reserves.[24] However, it is thought that by the time Hodgkinson started, this pre-settlement vegetation in and around the Hoddle Grid was already scarce.[25]

Melbourne's urban forest composition was not only driven by key designers and local leaders but also by citizens. Nineteenth century ideas of health drove individuals to request trees for their streets and in less formal spaces of the city. During the 1870s, almost one in three of the adult population in the city of Melbourne died of tuberculosis,[26] and more from other fever based disease. Prevailing medical science understood the source of such illness to arise from the landscape, from bad smells or miasmas that wafted from swamps, stagnant water and sewage. Particular trees were thought to absorb these odours and excess moisture. Leaving land poorly drained was considered irresponsible and dangerous, 'the existence of such a swamp on the margins of a populous city' wrote 'The Father of a Family' to the Argus newspaper, 'is a scandal and disgrace and must be remedied by creating a health-giving and life-sustaining garden'.[27]

Eucalyptus trees, promoted for their health-giving properties and quick timber growth by Mueller, were thought to be able to save the city from ill-health. Mueller led a cry of many voices recommending that Eucalyptus trees be planted on the streets.[28] Nurserymen agreed. William Adamson, one of the city's most prominent nurserymen, described the Blue Gum in his 1883/84 catalogue as being placed 'transcendentally above many other plants, if not ALL other plants in hygienic importance'.[29]

*Recognition of the value of mature trees meant that this indigenous tree was preserved in the Fitzroy Gardens.*
*[C. Nettleton, Latrobe Picture Collection, State Library of Victoria]*

*Conifers featured strongly in the early planting of Melbourne parks.*
*[C. Rudd, as in Whitehead, From Acclimatisation towards Ecology]*

*Hodgkinson used two rows of deciduous trees to shade pathways, although he knew they were not fashionable in contemporary landscape design thinking.*
*[Latrobe Picture Collection, State Library of Victoria]*

In the early 1880s, the Melbourne City Council received letters from residents requesting the planting of Blue Gums along Flinders Street. One author argued that as the tree was 'well ascertained to provide in staying and absorbing bad gasses as that evil to manure depot, the polluting influences of the Yarra and the Swamps of west Melbourne may in great measure be stayed by such rows of Trees'.[30] Thus, contrary to current popular belief, many nineteenth century Melburnians wanted eucalyptus trees in their urban forest.

Mueller is important not only for his promotion of eucalyptus trees worldwide but also because his involvement in the colonial seed trade was often the entry point through which new trees reached Melbourne. This trade marked the beginning of a world in which city gardeners or landscape designers could easily open a catalogue and gain access to hundreds of choices of trees to plant. The seeds gathered by Mueller from his contacts at Kew Gardens in London and elsewhere were sometimes provided directly to the city's gardeners for planting. Because of his great knowledge of trees of the world, through books and letters and conversation he regularly advised which tree to plant in the city. Included in one piece of advice in 1861 were the British Elm and both the American and Oriental Plane tree, the beginnings of the trend towards varieties of these genera now so prominent in the city's urban forest.[31]

In the founding decades of Melbourne's urban forest, debates of whether to plant native or exotic trees were not important. Instead, discussion centred around which trees would best make the city healthy, or whether deciduous or evergreen were preferable. 'It becomes of primary importance' wrote von Mueller in 1861, 'whether evergreen or deciduous trees should receive preference for this purpose [street trees]'.[32]

Many people believed that deciduous trees were dull and lifeless when bare-branched in winter, and Mueller recommended avoiding this by interspersing his beloved blue gums with elms or oaks, both for shade and aesthetic purposes.[33] Pines were loved because they were green all year and were often also recommended alongside the eucalypt to mix with deciduous trees.[34] As the century progressed, deciduous trees – their colours, the way their changes marked seasons, and their architectural form – became more popular.[35]

Seeds and seedlings for the city did not always come through the botanic gardens. Nurserymen were vital, yet are often unmentioned in Melbourne's tree histories. There is evidence that nurserymen sometimes accessed their seeds from the botanical networks, but they also had their own connections. In the 1870s, Thomas Lang imported seeds from his own contacts in California, which he then passed onto the Botanic Gardens.[36] Each year the nurserymen produced catalogues describing trees they had available and each year they grew seedlings, often in land in nearby hills, such as Mt Macedon, nursing into life before making them ready for planting in the city's streets. The choices made about what to plant in Melbourne's urban forest have always been limited by access to seed and healthy seedlings.

*On the Queen's Birthday in 1875 the Mayor of Melbourne planted the first elm in Collins Street.*
*[Latrobe Picture Collection. State Library of Victoria]*

*The grand avenue of London Planes (**Platanus x acerifolia**) in the Carlton Gardens dates from the redesign of the landscape for the 1880 Exhibition, when deciduous trees had become more popular in Melbourne.*

## Twentieth century changes

The turn of the twentieth century brought with it changes to the way trees in Melbourne were valued. The science of bacteriology slowly changed ideas of public health and trees were thought less valuable for ensuring human health. By the end of the nineteenth century issues of health were no longer present in public debates about urban trees and during the 1920s trees were removed from the Health Committee's portfolio and became instead the responsibility of the Parks and Gardens Committee.

Trees, however, were not less valued. They were just wanted for different purposes. Eucalyptus trees remained desired, but different species were planted. By the 1920s and 30s the red flowering gum from Western Australia had replaced the Tasmanian blue gum as one of the most highly requested urban trees. The Town Clerk received numerous letters requesting that the colourful Australian tree be planted. One writer wanted them along St Kilda road, to 'relieve the monotony' and address the 'want of colour'.[37] In the early 1930s, the curator of the city's Parks and Gardens tried to acquire 21 acres of land in the Government Domain for the purpose of planting Australian flowering gums. He believed that planting these trees would create 'a sanctuary for native birds and fauna' as well as creating a 'park of Flowering Gums which in due course will provide a very beautiful feature and be of considerable attraction to visitors and others'.[38]

The popularity of the flowering gums demonstrates two priorities and debates with implications for the city's urban forest during the 1910s, 20s and 30s. They had colourful flowers, a key characteristic of popular trees at this time, and they were native. As part of the furore surrounding Federation, Melbourne was keen to be seen by the world as both a modern and Australian city. The city thus required both the commonly planted deciduous trees that easily formed avenues and architectural shapes and colours popular in global urban landscaping trends as well as areas that show-cased the 'best' of Australian flora.

William Guilfoyle, who replaced Mueller as director of the Botanic Gardens in 1873, was renowned for bringing greater design flair to the Botanic Gardens. He was also important for Melbourne's urban forests due to his love for Australian plants, and his eye for design resulted in great changes to the city's landscape. His publication in 1912, Australian Plants suitable for Gardens, Parks, Timber Reserves, Etc. was highly influential and celebrated the 'splendour of the blossoms, the variety of forms and greenness of foliage, and their hardy nature' of the country's own flora. He argued in the introduction of his book that 'our Eucalypts, Acacias, Eugenias, Banksias, Hakeas, Grevilleas, Flindersias, Sterculias, Callistemoms, Melaleucas, Cupanias, Angophoras, and hundreds of other brilliant evergreen and gorgeous flowered trees and shrubs... are too often neglected, in the decoration of parks and gardens, in favour of exotic vegetation, which, in the majority of cases, is less hardy and not nearly so picturesque'.[39] This period of celebrating Australian trees, especially those with colourful and attractive flowers, was also the time when the golden wattle flower became the national floral emblem and this tree was also popular in the city's plantings.


MASTER BUILDERS WANT BLACK EMBARGO LIFTED—Page 3

The Sun
NEWS-PICTORIAL
THE MORNING POST

WARNING!

Firewood Is Treasure Trove In These Gardens

*A row of 'the despised ... Moreton Bay fig' was removed from along the Wellington Parade frontage of the Treasury Gardens in 1929, to be replaced by 'Australian flowering gums'.*
*[Sun, 20 May 1929, as reproduced in Whitehead, Civilising the City, 1997]*

*The Firewheel Tree (Stenocarpus sinuatus). William Guilfoyle admired 'brilliant evergreen and gorgeous flowered' Australian trees such as this, and they have been popular at various times in Melbourne's history.*

In addition to a love of Australian flowering trees, this was the time in which an organised town planning movement became important in Australia. The 1914 formation of the Victorian Town Planning and Parks Association brought with it goals to 'give the town a bit of the country and the country a bit of the town', 'to protect existing parks' and 'to safeguard native animals and plants'.[40] The first of these goals was the key to the Garden City movement and encouraged the creation of avenues, resulting, for example, in Royal Parade being planted with elms and a renewed sense of the need for urban citizens to access greenery.

The City Beautiful movement was also influential and 'beautification' efforts saw the reconsideration of trees involved in planting with an emphasis on shape and form as well as colour. Melburnians often reacted strongly to the heavy pruning of street trees, seeing it as vandalism rather than care.[41] For the urban forest the new formalised town planning movement was an important force protecting against tendencies to 'clip off little pieces' of the green spaces for development or sporting clubs. The post-war period, from 1945 to the early 1960s, was a time when Melbourne's inner city urban forest was regularly part of disputes. There was less discussion about which trees to plant during this period than there were fights over potential tree or park loss for building development. The shortage of quality housing for the post-war population boom placed great pressure on the ring of greenery surrounding the CBD. But Melburnians wanted their parks and trees, and regularly campaigned to keep the land as reserves.

The wave of energy in the early 1970s associated with the rise of both indigenous and environmental political movements brought with it new life for Melbourne's trees and parks. Rupert Hamer, the Victorian premier, revived the term 'Garden State' for Victoria and alongside this branding created new parks and public spaces throughout the state. In the centre of Melbourne trees also regained attention. The new political movements created a council in which green politics were at the centre, and key individuals such as Frank Keenan, horticulturalist and Director of the city's parks and gardens, fought for the council to think about the urban environment as an ecosystem. Trees were a key part of a vision the council held at this time, of restoring a balance between land and people, and Keenan was responsible for leading the planting of many trees during the 1970s and early 80s.

Importantly also to this time, was the rise of a different slant in debates of native versus exotic trees. The 'native' in discussions was more complicated than simply being any plant from the huge continent and nation of Australia, but for many was instead a plant that grew locally prior to colonisation. In conjunction with this the rise in the popularity of the science of ecology meant that more nuanced elements of a healthy landscape or environment were explored.

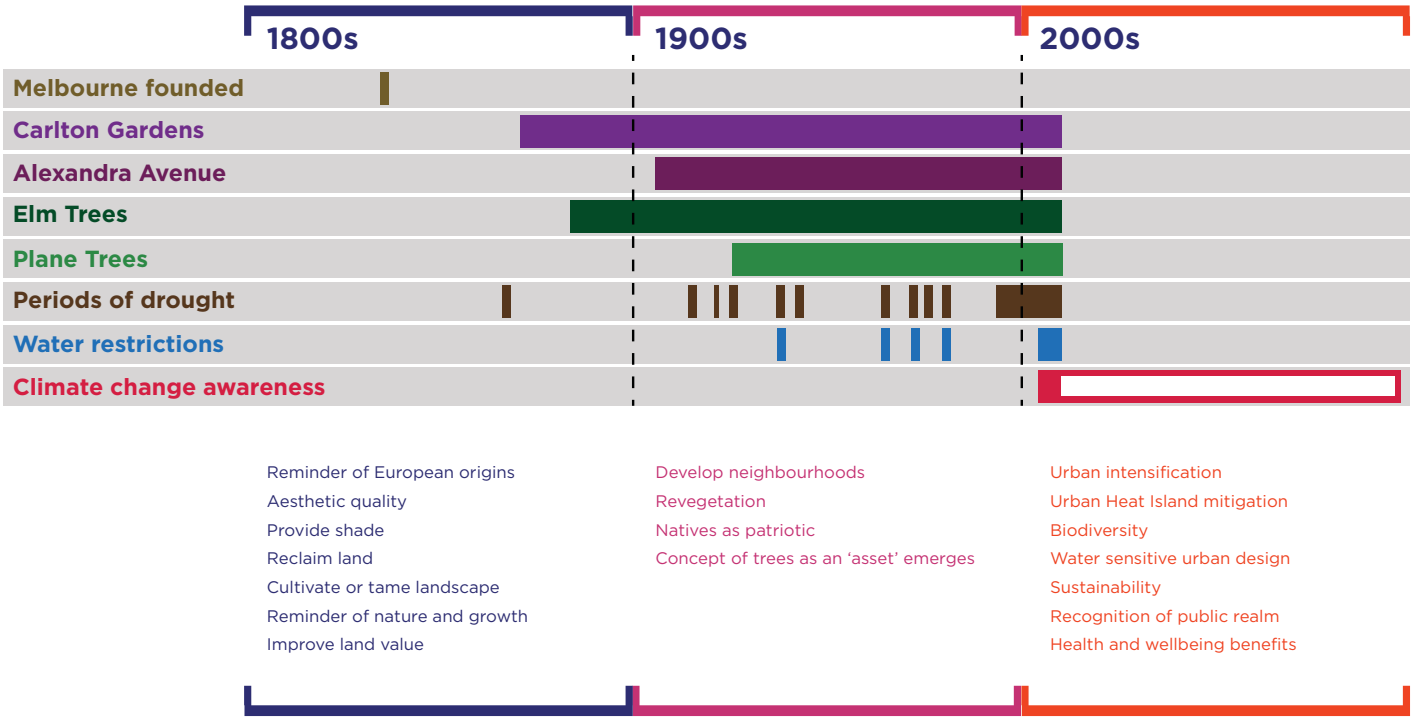
*Plants indigenous to Melbourne and the surrounding region, including Red Box (**Eucalyptus polyanthemos**, top) and Red Ironbark (**Eucalyptus sideroxylon**, centre), were added to the palette of cultivated species in the later 20th century.*

The question of what constitutes a healthy urban landscape has changed throughout Melbourne's history and how trees have fitted into this has depended on the science and politics of the day. Since the 1890s, when Melbourne's first horticultural school was founded in Burnley, the city's planting policies have been heavily influenced by this school. This focus from such an early time in Melbourne's history on the science of horticulture, and then more specifically arboriculture, has given the city a high level of professionalism in its approach to the trees. A former principal of the school, Dr Greg Moore, has been a champion for Melbourne's trees this century and is at the forefront of ensuring their role in the city's future. He has been instrumental in promoting ways to value trees economically, ensuring that they are treated as key pieces of Melbourne's infrastructure.

Despite the impact of various debates and changing fashions on which trees were planted, a very small number of species dominate inner Melbourne's contemporary urban forest. This is partly because most of the city's mature trees today were planted in three periods: the latter half of the nineteenth century, the first decades of the twentieth century, and the late 1960s and 1970s. Certain species were more available or fashionable than others at those moments, so they dominated planting at these times. Once a park, garden or streetscape has a set of mature trees, it is rare to change or remove them unless they become ill, dangerous, or exceptionally offensive to new science or fashion. The removal of mature trees from a landscape is not only expensive but usually met with fierce opposition from people who have grown attached to the trees and the presence they bring to their place.

More fundamentally, trees require two types of characteristics to survive in the city. The first includes characteristics that make them attractive for us to use – for shade, ornament or other purposes. The second, although often less discussed, is hardiness and adaptability to urban conditions life. In streets especially, only certain species are able to cope. There is evidence that many of the early plantings of eucalypts did not survive in streets due to insect damage, and that oaks and elms died without constant watering in the black cracking soils in the west of Melbourne. The London Plane, currently dominating street plantings in the city, was never a wild tree. It is a cross between two species from different corners of the world, the American and Oriental Plane trees, occurring first in a garden in the UK. It exists only because of human involvement moving trees around the world and then of selectively gardening. One could thus say that this tree is 'native' to a city.

The history of Melbourne's urban forest is the story of such interdependence between people and trees. It is a story of people planting, transplanting and caring for trees in a very different landscape than pre-settlement, an environment where, without people, most of them would fail to grow.




*Temporal evolution of Melbourne's urban forest*

## 2.3.2 The urban forest today

The City of Melbourne's urban forest comprises around 70,000 trees in streets and parks as well as approximately 20,000 trees located in the private realm, in addition to a growing number of green roofs and walls across the municipality.

The trees managed by the City of Melbourne in the public realm contribute significantly to the character and identity of Melbourne. There are over 388 different species of trees in our municipality ranging from the iconic elms and planes to River Red Gums, Melaleucas, Lemon Scented Gums, Spotted Gums and significant stands of conifers in our gardens. The tree population is dominated by three species: elms, planes and River Red Gums. This dominance is part of what creates the respected and unique character of Melbourne's urban forest. Plane trees alone make up 75% of the trees within our central city.

The majestic, but ageing, elms that form magnificent avenues along many of our grand boulevards and through our historic parks are among the last remaining examples of mature elm avenues in the world. Dutch Elm Disease (DED) has killed 40 million elms in the Northern Hemisphere and more recently, in New Zealand and Japan. Worldwide, elm trees are an endangered species, which places an even greater importance on Melbourne's elms.

Our urban forest is home to diverse animal species including the Powerful Owl, Tawny Frogmouth, Kookaburra, Kingfisher, Possum, White's Skink, Grey-headed Flying Fox, Striped Legless Lizard and Blue-tongued Lizard, Eltham Copper butterfly, and a variety of frogs and micro bats. Waterways across the municipality are used by birds for nesting and habitat. The urban forest is vulnerable from a range of perspectives. The dominance of a small group of species and genera, and the ageing of many of our elms, combine to render it vulnerable to significant loss due to potential pest and disease attack, heat-waves and ageing.

### Key urban forest indicators

We can examine our urban forest in a number of ways. In order to best manage existing vegetation and to guide the development of the forest of the future, we have undertaken extensive mapping of **tree health, species composition, canopy cover** and **useful life expectancy** for the trees now managed by the City of Melbourne. This mapping provides key indicators with which to benchmark the forest, set future targets and measure change over time.

The private realm requires a more collaborative approach with the community to gain a better understanding of vegetation health, diversity and distribution. The mapping of the private realm and landscapes managed by other agencies will be important for the on-going assessment and evaluation of the urban forest.

*Plane Trees in Swanston Street, at the City Square. Planes make up 75% of total number of trees in Melbourne's CBD.*

*Deodar Cedars (**Cedrus deodara**) in the Carlton Gardens.*

## Tree canopy cover

In the City of Melbourne we are seeking to increase summertime shade and biomass to combat the urban heat island effect, to adapt to climate change and to enhance our streetscapes for the comfort of people. Canopy cover is a measure of the physical coverage of the tree canopy over the land. It represents a way of expressing, as a percentage, how much of any given area is shaded by trees.

Canopy cover is an important way of measuring the character of any urban forest. Broad calculations suggest that large mature trees provide 75% more environmental benefits than smaller trees. As a single large tree can shade a larger area than several small trees, the measure of canopy cover is more valuable than simply counting the total number of trees. It is a repeatable benchmark that can be measured regularly and will guide future tree planting programs.

Across the City of Melbourne's public and private realm, canopy cover is estimated at 11%. This means 89% of the municipality is without natural shade. Tree canopy covers about 22% of Melbourne's public streets and park areas, while canopy cover in the private realm is only about 3%. There is also broad variability in canopy cover between suburbs, streets and parks.[42]

## Environmental values

The City of Melbourne has prepared a scientifically-based formula for calculating the amenity value of our trees. The formula is based on factors including tree condition, species type and growth rate, aesthetics value and locality values. A rough estimate of the City of Melbourne's urban forest amenity value is around $700 million.

We can also calculate the value of environmental benefits of trees through a tool called i-Tree Eco. Air pollution amelioration, carbon storage and sequestration, energy savings benefits of trees and structural values of the urban forest can be calculated using i-Tree.

Our initial results using i-Tree to assess trees in Royal Parade, Collins Street, Swanston Street, Lonsdale Street and Victoria Parade show that the 982 trees measured:

- remove 0.5 metric tonnes of air pollution per year at a dollar benefit of $3,820
- store 838 metric tonnes of carbon at a dollar value of $19,100
- sequester 24 metric tonnes of carbon each year at a value of $548 per year
- save $6,370 in energy costs each year through shading buildings in summer and providing solar access in winter
- avoid carbon emissions by reducing energy use by $114 per year
- have a structural value (replacement cost) of approximately $10.4 million.[43]

If we extrapolate these figures across the entire population of 70,000 trees, there is a clear indication that our urban forest is a very valuable environmental asset.

| Public realm canopy cover in the City of Melbourne | |
|---|---|
| Whole of Municipality | 22.2% |
| Road Network | 10.2% |
| All Parks and Gardens | 28.0% |

| Public realm canopy cover by precinct | |
|---|---|
| South Yarra | 33.4% |
| Carlton | 29.1% |
| CBD | 21.2% |
| East Melbourne & Jolimont | 20.7% |
| North & West Melbourne | 19.9% |
| Kensington | 19.7% |
| Parkville | 19.4% |
| Southbank | 14.2% |
| Fishermans Bend | 6.4% |
| Docklands | 4.7% |

| Canopy cover for major parks | |
|---|---|
| Carlton Gardens North | 62.3% |
| Carlton Gardens South | 58.0% |
| Kensington Reserves | 56.1% |
| Fitzroy Gardens | 53.1% |
| Kings Domain | 50.3% |
| Treasury Gardens | 50.1% |
| Alexandra Gardens | 48.0% |
| Flagstaff Gardens | 45.0% |
| Shrine Reserve | 42.5% |
| Fawkner Park | 38.4% |
| Birrarung Marr | 25.5% |
| Princes Park | 21.9% |
| Royal Park | 21.6% |
| JJ Holland Park | 20.2% |
| Docklands Park | 6.0% |

## Tree diversity & vulnerability

The urban environment is highly modified, with harsher conditions for plant growth than in natural landscapes in similar climates and terrain. Urban soils are compacted, root volumes reduced, heating and shading more severe, and regular disruptions of roots and canopies occur. Not every tree species copes well with these conditions. Spatial constraints, particularly the need for street trees tall enough that their branches are clear of traffic, also limit what is planted. As a consequence, cities often contain few tree species.

Reliance on a few species is risky. A lack of **species diversity** leaves the urban forest more vulnerable to threats from pests, disease, and stress due to climate change. When managing financial assets, diversification is a basic rule for reducing risk. The same principle applies to urban forests, and tree managers around the world are investigating urban forest diversity. A greater range of species provides greater resilience and long-term stability for the forest as a whole.

A robust urban forest also features **age diversity**, with species of varying life spans and growth rates. A uniform age profile makes it likely that many trees will decline and senesce at the same time. Some areas in Melbourne are vulnerable due to a lack of diversity:

- Almost 43% of our trees come from one family, the *Myrtaceae*, which includes *Eucalyptus, Corymbia, Callistemon, Angophora* and *Melaleuca*. Our tree population features a high percentage of *Eucalyptus*, and *Eucalyptus camaldulensis* in particular dominates Royal Park. All members of this family are vulnerable to Myrtle Rust, which has been found in Melbourne. Myrtle Rust has caused the rapid decline and death of some species of *Syzygium* and *Agonis*, and is likely to have a negative impact on other species including *E. camaldulensis*.
- Elm avenues line many Melbourne boulevards and park paths. Dutch Elm Disease has wiped out most elms in the northern hemisphere and it has recently been found in New Zealand. Ever-growing global trade means it may reach Melbourne. Better understanding of the disease may help to mitigate its effects, but many important Melbourne landscapes are vulnerable to catastrophic failure if Dutch Elm Disease arrives.
- Melbourne's CBD is dominated by plane trees, which comprise over 75% of the central city's forest. Planes are vulnerable to extreme heat, pests such Sycamore Lace Bug which has recently become established in Australia, and diseases such as anthracnose, cinnamon fungus and plane tree canker stain. Large scale loss of planes due to a pest or pathogen would remove significant visual and environmental benefits, and exacerbate the urban heat island effect.

In addition to species and age diversity, a lack of **spatial diversity** contributes to vulnerability within the urban forest. Melbourne is widely recognised for its magnificent avenues formed of single species such as elms. While it is the uniformity of species, age and size that makes these avenues such a striking landscape element, this inherently contributes to their vulnerability. Elms also have the attribute of root grafting between trees, and this can spread pathogens such a Dutch Elm Disease rapidly along an avenue.

| Most prominent trees in the City of Melbourne's streets | |
|---|---|
| Planes (Platanus x acerifolia, P. occidentalis, and P. orientalis 'digitata') | 24% |
| European elms (Ulmus cornubiensis, U. glabra, U. minor and U. procera, but excluding U. parvifolia) | 11% |
| Spotted Gum (Corymbia maculata) | 8% |
| Angophora costata | 4% |
| Lophostemon confertus | 3% |

*Note: The figures above indicate simple numbers of trees; the proportion of canopy cover that these trees represent is significantly higher, as they are among the largest in Melbourne's streets.*

| Most prominent species within the City of Melbourne | | | |
|---|---|---|---|
| **Family** | **Common name** | **Total** | **%** |
| Myrtaceae | Myrtle | 29742 | 42.3% |
| Mimosaceae | Acacia | 7920 | 11.3% |
| Ulmaceae | Elm | 7245 | 10.3% |
| Platanaceae | Plane | 6485 | 9.2% |
| Casuarinaceae | She-Oak | 4750 | 6.8% |
| Fagaceae | Beech | 1829 | 2.6% |
| Moraceae | Fig | 1440 | 2.0% |
| Rosaceae | Rose | 1164 | 1.7% |
| Meliaceae | Melia | 916 | 1.3% |
| Pinaceae | Pines | 832 | 1.2% |
| Oleaceae | Olives | 829 | 1.2% |
| Araucariaceae | Araucaria | 774 | 1.1% |
| Aceraceae | Maples | 696 | 1.0% |
| Proteaceae | Grevillia | 668 | 1.0% |
| Anacardiaceae | N/A | 609 | 0.9% |

Furthermore, in the natural landscape, a diverse ecosystem inclusive of groundcovers, shrubs, tree roots, trunks, branches and canopies provides the best possible array of benefits. **Structural diversity** in the landscape includes these different vegetation strata, in urban settings as well as natural ones, with avenues in parks, street trees, green walls, and green roofs and balconies. Every plant has its own benefits: large deciduous trees provide summer shade and allow the winter sunlight to penetrate buildings and streets; native trees (including deadwood) promote biodiversity and habitat; smaller trees can be planted in areas that are not able to accommodate larger trees; shrubs and herbs in parks and riparian areas provide screening, visual amenity and habitat for fauna; climbers can cover walls for shading and protection; and green roofs reduce stormwater flows and improve insulation.

The interactions between these layers of the urban forest provide an opportunity for everyone to connect to nature, and for the different forms of green infrastructure to integrate and thereby increase the impact of their ecosystem services.

## Useful life expectancy of Melbourne's trees

Useful life expectancy (ULE) is an estimate of how long a tree is likely to remain in the landscape based on health, amenity, environmental services contribution and risk to the community. It is not a measure of the biological life of the tree and it is not used as a timetable for scheduling tree removals. The primary benefit of a ULE assessment is that it facilitates strategic planning for the longevity of the urban forest. It allows for tree population decline to be identified and for long term responses to be developed.

A ULE assessment for the City of Melbourne's urban forest was undertaken between March 2011 and April 2012. 35,000 trees were assessed with results indicating that 23% of the tree population will be at the end of its useful life in the landscape within ten years and 39% within twenty years.

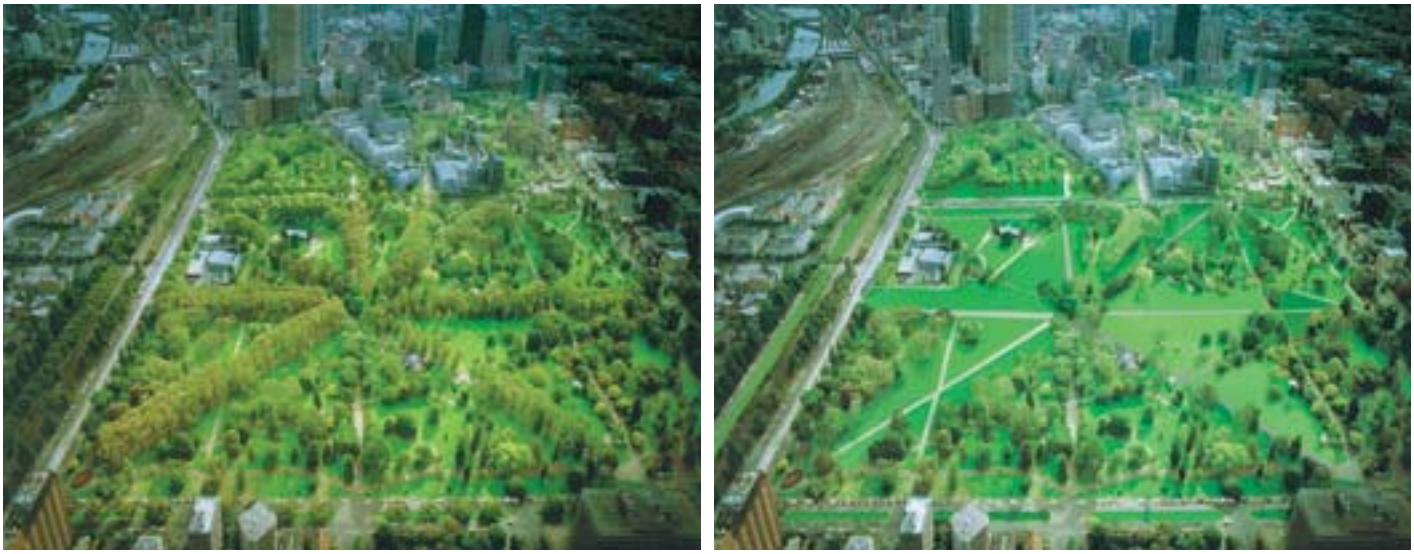
For heritage landscapes, excepting the Shrine of Remembrance Reserve, the findings are dramatic, with the ULE assessments indicating a likely 35% loss in ten years and a 58% loss in twenty years. The City of Melbourne's heritage landscapes include Kings Domain, Flagstaff Gardens, Speakers Corner, The Shrine of Remembrance, Royal Parade, Fitzroy Gardens, Carlton Gardens and Treasury Gardens. The reason why ULE assessments at the Shrine are not as alarming is due to the implementation of a five-year plan involving staged removal of dead and declining trees and a vigorous program of replanting. The approach was to plant en masse to allow for a natural reduction over time to ensure that landscape continues to be robust. The species selected for the Shrine Reserve are a diverse mix of native and exotic trees, with a focus on drought tolerance.

Most dramatically, ULE assessment of the City of Melbourne's elm trees indicated that 55% of Melbourne's elms are in a state of severe decline and will likely need to be removed from the landscape within the next ten years.

*Many of the magnificent elm avenues in Melbourne's heritage landscapes are approaching the end of their life.*

| Useful life expectancy of Melbourne's elm trees | |
|---|---|
| <1 year to 10 years | 55% |
| 11-20 years | 21% |
| 21-30 years | 11% |
| 31-60 years | 9% |
| 61+ years | 4% |


USEFUL LIFE EXPECTANCY TREE SURVEY
(FEB 2011 to SEPT 2011)
1< year to10 years
11-20 years
21-30 years
31-60 years
61+ years
To Be Determined



*Fitzroy Gardens modelling from aerial perspective, showing existing conditions (left) and potential effect if elm avenues were lost (right)*

*Fitzroy Gardens potential loss of avenues modelling at ground plane, showing existing conditions (left) and effect if elms were lost (right)*

*Royal Parade modelling of ground level view, showing existing conditions (left) and effect if elm avenues were lost (right)*

# 3 Issues & challenges

**In addition to the underlying vulnerability of our current urban forest resulting from a lack of diversity, the health of the tree population has been reduced by lack of rainfall, water restrictions, extreme heat, and development expansion and consolidation. We also have a tree population of which a very large proportion is reaching the end of its ULE at the same time.**

Three species dominate our tree population: elms, plane trees and River Red Gums. This exposes the population to a higher risk of ill health and mortality through pests, pathogens, extreme heat events and low rainfall futures.

There is pressure on all levels of government to plan for greater population, economic growth, expanded urban boundaries and densification to ensure that our cities remain liveable. Urban forests play a critical role in responding to these future challenges. Sound adaptation solutions will require actions that yield multiple benefits. Effective adaptation in the built environment needs to account for the fact that green infrastructure solutions can be highly cost effective and may sometimes take precedence over 'grey infrastructure' solutions.

Green infrastructure, including open space, green environmental corridors, canopy cover and ecosystem services are the most efficient tools that cities can utilise to remain healthy, robust and liveable.

The key challenges for Melbourne's urban forest are:

- **ageing tree population**
- **diminishing availability of water**
- **climate change**
- **urban heat island effect**
- **population increase and urban intensification**





*Examples of life stages of tree decline, highlighting degree of vulnerability, in various locations in the city.*

## 3.1 Ageing tree population

Many of Melbourne's trees, including those in our iconic boulevards and parks, are well over 100 years old and approaching the end of their useful life. Elms planted in the late 1800s such as those in Fitzroy Gardens, Royal Parade, Flemington Road, Fawkner Park, Alexandra Avenue and St Kilda Road were planted in socially, culturally and environmentally different times. They have performed remarkably well to date in faring against droughts, urbanisation and changing cultural trends. However the older a tree becomes, the less tolerant it is to change.

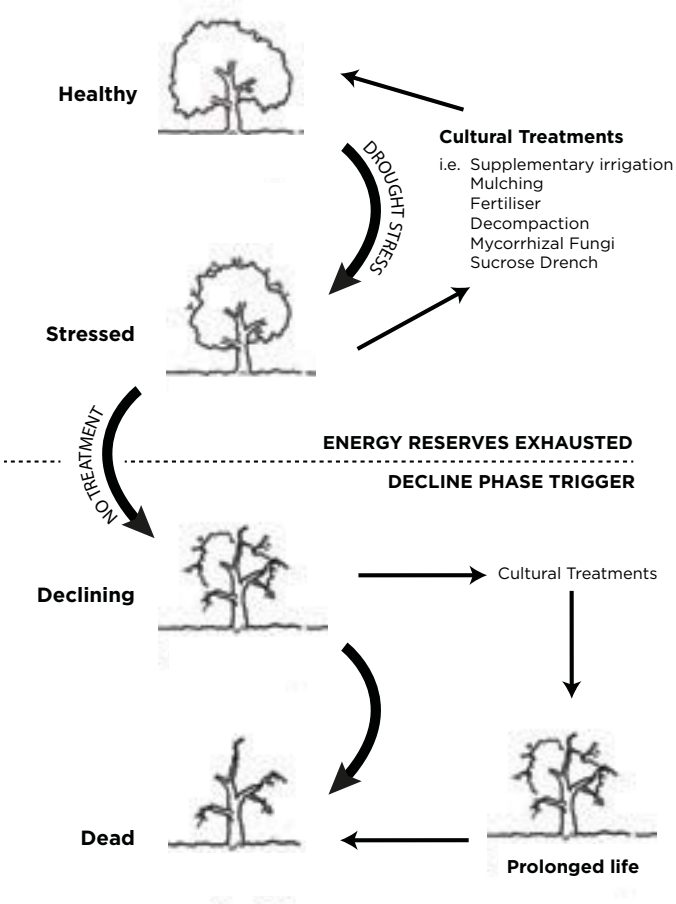
The City of Melbourne manages the population of ageing trees through regular assessments to determine which trees need to be treated or removed, and by planning when, how and with what trees they will be replaced. Managing ageing trees requires careful consideration. Urban tree renewal is not simply a question of replacing dying trees, but is also one of identifying the most resilient and appropriate replacement plan and engaging in a meaningful dialogue with a broad range of stakeholders and community members.

Melbourne's key challenges in terms of ageing trees are:

- An ageing tree population requires increasing resources to manage and sustain. Over time, the environmental value of urban trees diminishes and they become hazardous to people using the city's public spaces. A high proportion of over-mature trees carries an element of public risk (and cost) and must be managed accordingly.
- Uniform, symmetrical avenues create wonderful vistas along our boulevards and main streets, and in Melbourne these are largely synonymous with broad-canopied deciduous trees such as elms and planes. This raises an issue that needs to be carefully managed in consultation with the community. To achieve these aesthetics, it is desirable to plant identically aged trees that will maintain the visual consistency of the avenues. However, this can pose challenges for the community when confronted with large numbers of trees that require replacement at the same time.

St Kilda Road and Royal Parade are examples of the aforementioned problem. They require special care and extensive, thoughtful planning. The elms are ageing and the planes are declining as a result of past water restrictions and periods of extreme heat. Community and stakeholder collaboration will be crucial in determining how we manage the loss of these trees and plan for their replacement.

While the ageing population in some cases suggests subsequent landscape change, opportunities arise for us to now 'retrofit' these landscapes to ensure better conditions for our future trees. Conditions that require improvement include those below ground (soil structure, ground water, and conflict with underground services) and above ground (access to stormwater, conflict with infrastructure, mulching and potential compaction).




*Tree mortality spiral: At some point, a tree in decline will pass the point of return back to good health*

## 3.2 Water & soil moisture

Water is the primary element needed for vegetation growth. The recent extended drought and water restrictions severely damaged the health of Melbourne's urban forest, resulting in a steep increase in tree mortality. The useful life expectancy mapping that has been undertaken shows that about 23% of our trees will reach the end of their useful lives within a ten year period. Much of this is due to long term effects of low water availability.

Mature trees help to ameliorate the urban heat island effect both through shading of urban surfaces and atmospheric cooling through evapotranspiration. Access to ample soil moisture enables trees to actively transpire and assist in atmospheric cooling. Maximising the potential for vegetation to cool the city through evapotranspiration is another important reason to maintain soil moisture.

Adequate available soil moisture is critical for healthy vegetation. Thirteen years of drought have left soil moisture levels morbidly low, affecting tree health throughout the municipality. In particular, trees in traditionally irrigated landscapes were affected by a combination of low rainfall and decreased irrigation due to watering restrictions.

While 2010/2011 and 2011/2012 summer rains have been valuable, soil moisture remains depleted and this poses an on-going threat to tree health. A number of active and passive approaches are currently undertaken to replenish soil moisture and ensure it is maintained at levels to provide healthy growth. Changes to irrigation practices, mulching, soil injection, water barrier and tanker watering have preserved the health of many trees. Tree health monitoring and measurement of soil moisture provide strategic guidance to direct resources and will be vital in ensuring the health of the future forest.

Fundamentally, the city has low levels of water permeability. Hard surfaces on roads and roofs shed stormwater rapidly into an extensive drainage system and direct it into Port Phillip Bay and the Yarra River. While this ensures the functionality of the city to some extent, it means that rain has little opportunity to infiltrate the soil. Ground surfaces need to allow rainfall to enter the soil, a huge reservoir that is ready made to provide for a healthy forest. Using soil as a reservoir has benefits in addition to vegetation health, including improved stream health, reduced damage to infrastructure from soil movement, and decreased flood damage.

Permeation of water through the entire soil profile is also critical. Surface irrigation exacerbates trees' vulnerability by encouraging shallow root systems. Deep watering encourages deep root growth better able to access soil moisture during low rainfall periods.

With expected long-term low water futures and a desired move away from reliance on costly potable water, alternative water sources are needed to ensure healthy vegetation growth. The capture and reuse of stormwater is an important way to decrease reliance on potable water, particularly given the great quantity of stormwater flowing into the river and bay. The city that has traditionally shed water needs to capture, store and reuse it. However, this presents challenges as well as opportunities. In particular, storing stormwater for reuse in dry periods is challenging in densely-built urban areas, but can be supported by wetlands, underground tanks and water sensitive urban design.

*Alexandra Avenue and riverfront with a healthy tree canopy in February 2004*

*The same area with the tree canopy in a severe state of decline due to several years of drought-related stress, in February 2010*

*Ensuring that trees are not reliant on potable water – which runs the risk of being restricted when running at low levels – and yet still have access to adequate soil moisture, particularly during periods of low rainfall, is crucial. We can learn from past practices in irrigation, particularly in parks, where supplemental irrigation via surface watering resulted in the development of shallow rooted, unstable trees wholly reliant on continued superficial irrigation.*

## 3.3 Climate change

The Australian Government's most recent report on climate change, the Critical Decade, states unequivocally that it is 'beyond doubt' that climate change is occurring.44 The primary cause of the observed warming and associated changes since the mid-20th century – human emissions of greenhouse gases – is also known with a high level of confidence.

The most widely used indicator of climate change is the global mean, annual average, near-surface air temperature – commonly referred to as the global average temperature. This has risen by about 0.17°C over the last three decades. More notably, the global average temperature from 2001-2010 was 0.46°C above the 1961–1990 average, making it the warmest decade on record.

Whilst the effects of climate change are just becoming discernible, they will become increasingly prominent. The effects over coming decades will include warmer average temperatures, heat waves, more extreme storm events and lower average annual rainfall. We have already observed the damage caused by extreme heat and floods in Australia in recent years, and it is likely that these events will become more prevalent.

The risks to cities of more severe weather conditions will increase, bringing with them high economic, social and environmental costs. For the urban forest, the impacts of climate change will include:

- The susceptibility of vegetation to **increasing and emerging pests and diseases** will challenge the urban forest's ability to withstand and recover from these outbreaks. Recent observations in NSW pine plantations have found that drought-stressed trees are suffering increased incidence of attack from insect stem borers, bark beetles and fungi. Changes in climate can affect pests' life cycles. Warmer summers can increase insects' development rate and reproductive potential, while warmer winters can increase over-winter survival. Many pests and diseases may have extended geographical ranges as warmer temperatures affect flight behaviour and vector spread. Introduced pests may also find conditions more favourable for population growth. Forests not previously at risk could become vulnerable as pests and disease ranges change.
- Extreme weather events directly affect vegetation health, generally leading to a reduction in canopy cover and overall decline. Heat extremes can lead to foliage and trunk scorch and canopy desiccation. Storms can shred foliage, break branches and uproot trees.
- Lower rainfall will result in increasing frequency of tree death in many species and overall forest health decline in response to frequent and severe drought.
- Inundation can lead to soil erosion, salinity, tree instability, tree mortality and damage to infrastructure. In southern Australia, more frequent extremes of wet and dry periods may increase the incidence of the root rot pathogen Phytophthora cinnamomi. Trees weakened by this disease have a reduced capacity to survive drought.

**Climate changes predicted in Australia by 2070**

| Climate Variable | | Now | Predicted by 2070 |
|---|---|---|---|
| **IPPCC (2007) Predictions for Melb** | | | **Estimate of Change** |
| Temperature | Annual average temperature | Max 18.7°C Min 8.3°C | +2.6°C (1.8 to 3.7°C) |
| Extreme Temperature | Annual av. no. of hot days (over 35°C) | 9 days | 20 days (15 to 26 days) |
| Rainfall | Annual average rainfall | 864mm | -11% (-24% to no change) |
| | Summer | 166mm | -7% (-31 to +21%) |
| | Autumn | 213mm | -5% (-24 to +16%) |
| | Winter | 245mm | -11% (-26 to +4%) |
| | Spring | 152mm | -21% (-41 to -1%) |
| Extreme Rainfall | Heavy rainfall intensity (99th percentile) | Not avail. | =5.9% (-24.9 to +48.9%) |
| Sea Level Rise | Average sea level rise | 3.2mm per year | +110cm (CSIRO) |

*The Bureau of Meteorology and CSIRO climate change modelling predicts that Melbourne is likely to experience an increase in more days of extreme heat. The city already experiences on average nine days per annum over 35°C but by 2030 it is predicted this will increase to 11 days, and then increase again to 20 days by 2070.*

*Projections for future changes in rainfall patterns are uncertain. It is likely that Melbourne will experience increasing extremes of lower average annual rainfall as well as extreme rainfall events. Rainfall patterns are likely to be more unpredictable, increasing risks of low for water availability during certain periods.*

*The high end CSIRO scenario predicts that current sea levels will increase by 1.1 metres at the end of the century. Inundation modelling hows that while few areas of the city will be vulnerable to permanent inundation at this level of increase, many areas in the municipality will be prone to inundation with the combination of extreme high tides, storm surges and a 1.1 metre rise in current sea levels.*

## 3.4 Urban heat island & extreme heat

The urban heat island effect is common worldwide, as cities become warmer than nearby suburban and regional areas, particularly at night. After a hot day parts of the city can be four to seven degrees hotter than surrounding rural areas. This phenomenon occurs all year round, but it becomes a problem during hot weather.

In periods of prolonged heat, the urban heat island effect increases pressure on the city. It exacerbates heat stress, particularly for vulnerable people such as the elderly, the very young, and those with pre-existing medical conditions. Heat waves already kill more Australians than any other natural disasters, and have led to many deaths in Melbourne, Adelaide, Brisbane, Sydney and Perth over the past 50 years. Victoria's Chief Health Officer found that the heat wave preceding the 2009 Black Saturday fires contributed to an increase above normal of 374 deaths in inner Melbourne – almost double those who died as a result of the fires.[45] People living in high-density areas are at greater risk during heat events as a result of the urban heat island effect.

This heat also contributes to the decline of certain tree species. Extreme heat, particularly if combined with low soil moisture, causes the foliage and even the bark of some trees to scorch, which can lead to decline as happened with many of the City of Melbourne's plane trees during the extreme heat event in 2009.

The urban heat island effect has three main causes:

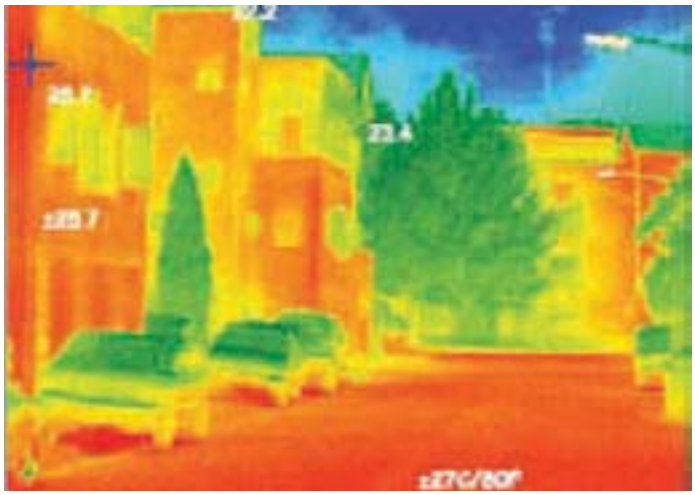
- **Impervious hard surfaces**: Buildings and pavements are typically impervious and have high heat absorption capabilities. Asphalt and concrete trap and store heat from the sun, while solar radiation is reflected off building surfaces along street canyons, causing greater absorption of solar energy and a reduction in the reflective power of these surfaces.
- **Human activity**: Motorised transport is a major contributor to increased greenhouse gas emissions. In hot weather, the use of air conditioners increases, generating more waste heat.
- **Low vegetation coverage**: With less vegetation, cities receive less natural cooling from shade and evapotranspiration.

Urban forests have proven to be one of the most effective methods for mitigating heat retention in urban areas, particularly central business districts. However, there are several challenges we face in tackling the urban heat island, including:

- The current urban heat island effect will be exacerbated by predicted climate changes.
- The existing tree canopy cumulatively covers 22% of public streets and park areas. This means 78% of Melbourne's streets and parks are without natural shade.
- It can take 20 years for a tree to grow to a size that will assist effectively in mitigating the urban heat island effect.
- Vegetation cover must be primarily composed of species that are able to survive and remain healthy under hotter conditions.
- Mitigating the urban heat island effect may require increased water use during dry periods to maintain tree health and maximise evapotranspiration.

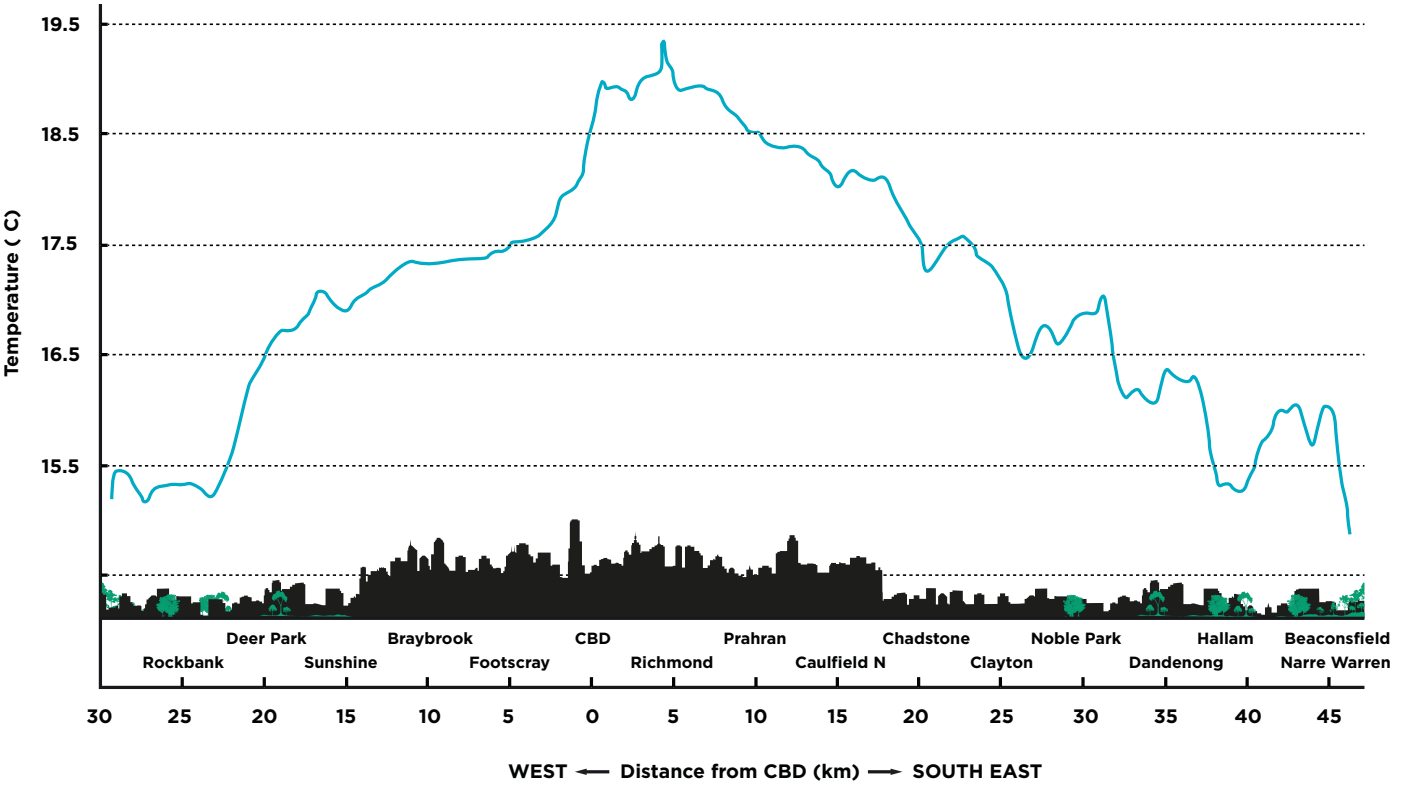
*Currently, heat related deaths in Victoria exceed the average annual road toll. Projections indicate that by 2050 an extreme heat event in Melbourne alone could kill over one thousand people in a few days if we don't improve the way we forecast, prepare for and manage these events.*

Protecting Human Health & Safety During Extreme Heat Events, Commonwealth Government & PWC, 2011



*Example of thermal imaging at streetscape level*


*Thermal imaging of central Melbourne, taken late at night, which shows how paved unshaded surfaces store heat from solar radiation and retain it long into the night, contributing to increased temperatures in urban areas.*




*The aerial photo above, from about 2005, shows Melbourne's CBD and its hinterland. Docklands is in the foreground; the intensive redevelopment of such areas will exacerbate the urban heat island effect unless significantly increased greening occurs as part of the redevelopment process.*

## 3.5 Population increase & urban intensification

In 2011, the City of Melbourne's residential population was 93,000. By 2030, the population may be 150,000, possibly even 208,000. The city's daytime population is also growing. There are now about 790,000 daily workers and visitors to the central city, and this figure is expected to exceed one million by 2030. In 2006 there were about 74,000 daily tourist visitors to the municipality, and by 2020 this is expected to increase to around 250,000 visitors daily.[46]

While metropolitan Melbourne has one of the largest per capita ecological footprints in the world – reflecting unsustainable trends of resource consumption, waste generation and greenhouse gas emission – the City of Melbourne is one of the most compact, dense and mixed use parts of the metropolitan area, with the best network of public transport services and generous public open spaces. These characteristics offer the potential to drive down per capita energy use for building and transport, and to make the city more robust against the predicted impacts of climate change, particularly water scarcity and heat waves.

In meeting the challenge of population increase and urban intensification, we need to acknowledge the following:[47]

- Transforming the urban area will not only involve rebuilding roads, transport networks and services, but will also require rationalisation and better use of existing infrastructure, and a strong focus on expanding green infrastructure.
- This will need to be integrated with the application of good urban design principles, such as high quality public realm, clear definition between public and private space, active street frontages, sun and weather protection.
- Trees and other green infrastructure are important integrative elements, not just potential buffers between established and developing areas. The urban forest will be central to delivering amenity and ecosystem services, and ensuring that the new growth and development of the city is functionally and visually integrated with existing neighbouring urban fabric.
- As urban areas are also generally expanding, the carbon stock of urban vegetation will become more relevant, although vegetation cleared during urban expansion will determine whether there is a net gain or loss in carbon stocks per hectare of urban land.[48]

While urban intensification makes the urban forest more important, it also adds significant challenges to the forest's future health and development. Increased development densities often result in greater site coverage by buildings and pavements, resulting in:

- Reductions in the extent of vegetation on private land, especially large canopy trees.
- Reduction of permeable ground surfaces that allow for the infiltration of rainwater into the soil.
- Increased shading of streets by buildings, potentially to the extent that tree growth suffers due to a lack of sunlight.
- Increased pressures on public spaces to accommodate more uses – whether for recreation in parks or for traffic and parking in streets – which can result in direct competition with plantings for space as well as making more demanding growth conditions due to more extensive hard or compacted surfaces.

*Visualisation showing the integrative role of landscape and the built environment in denser urban corridors - existing and future [Transforming Australian Cities]*

*Flagstaff Gardens. With increasing development density, the importance of parks and other public spaces as settings for active use will increase.*

*Existing conditions at Birrarung Marr and Yarra River southern bank with the trees colour coded to show existing ULE.*
*(Colours indicate: Red 0-5 years ULE; Orange 5-10 years ULE; Blue 10-20 years ULE; Green 20+ years ULE).*

*Modelling of Birrarung Marr and river bank in next 11-20+ years without replacement planting.*

*Modelling of Birrarung Marr where successional planting has been undertaking over the next 11-20+ years.*
*The series of images above illustrates the importance of successional planning to compensate for the future loss of trees.*

## 3.6 Towards our future forest

How do we set out to achieve our vision of a healthy, diverse and resilient urban forest that contributes to the health and wellbeing of our community and to the creation of a liveable city?

This strategy sets out the priorities to guide future decisions whilst responding to the three overarching themes of resilient landscapes, community health and wellbeing, and liveability and sustainability. The issues and challenges facing Melbourne that directly affect the urban forest have been outlined in tandem with a set of pragmatic solutions.

To achieve the forest of the future and leave a legacy for future generations requires a long term vision and a commitment to work in tree life cycles, not electoral cycles. Developing the urban forest requires expert input from multiple disciplines including planning, engineering, urban design, landscape architecture, economics, sustainability and most importantly from the general community.

The community's sense of place and capacity for change needs to be captured and nurtured to ensure a dynamic approach in managing Melbourne's urban forest.

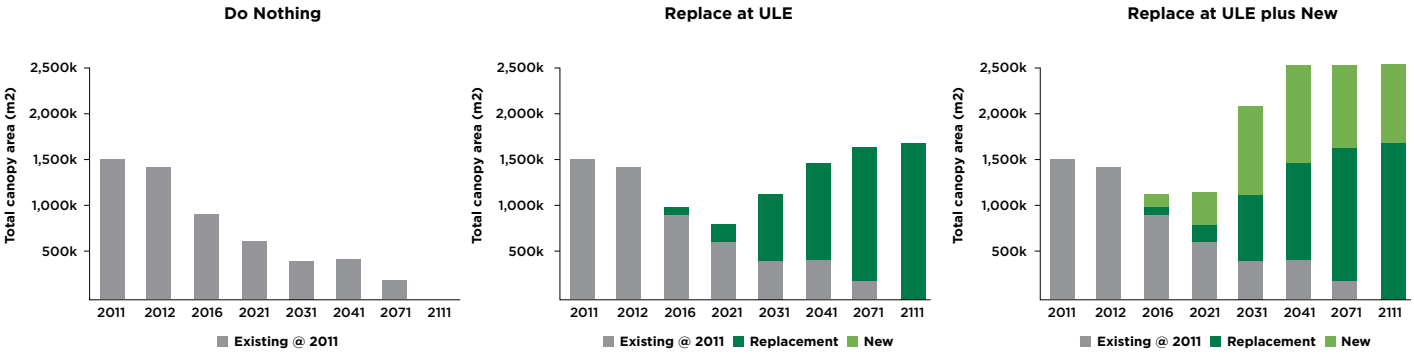
### Tools & research guide development of the urban forest

Taking the current (2012) composition of Melbourne's urban forest as a baseline we have established a series of processes and tools for measuring and modelling the future potential of our urban forest:

- On ground field data collections have provided a rich source of data relating to our trees and their environment.
- Spatial and temporal mapping using ArcGIS allows us to determine which trees we will lose, where, when and how much tree canopy will diminish.
- Geospatial tools such as Lidar, Quickbird, and High Resolution Aerial Photography enable analysis of spatial heterogeneity, the structure and composition of vegetation, vegetation health and carbon storage.
- Thermal imaging highlights the hot and cool areas of our city which guides our tree planting decision making.
- A detailed urban heat island study has recommended canopy cover levels to mitigate heat retention in the City of Melbourne.
- US-based valuation model, i-Tree Eco provides a means to attribute dollar values to the environmental benefits of our trees.
- Weather stations installed around the city allow for monitoring the effects of tree canopy on streetscape thermal comfort levels.
- Tabling of ULE results and canopy cover has provided the opportunity to determine when and where we can start to plant trees to overcome the inevitable tree loss of canopy cover.

Using this knowledge we can benchmark key urban forest attributes to ensure we are on track to achieve our vision.

**Future canopy projection (scenarios x2)**




*Analysis of the likely loss and replacement of canopy cover over time, under three alternative scenarios within Fawkner Park.*

*The first graph (at left) assumes that no new tree planting or replanting occurs, and illustrates the loss of canopy cover due to the decline and death of existing trees. A dramatic, rapid and long-lasting loss of canopy cover would occur with this 'do nothing' approach.*

*The second graph shows the impact of replacing existing trees as they reach the end of their useful life expectancy and are removed, without planting new trees in other locations. In this example, there will be an interim loss of canopy cover when large existing trees are replaced with small young trees, which will be recovered slowly as the new trees mature.*

*The third case (at right) assumes that some additional tree planting occurs, beyond replacing existing trees as they die. With this approach the interim reduction of canopy cover is reduced (but not eliminated) and the long term canopy cover is increased as there will be more mature trees in the park.*

*In many places where there is no space for additional planting, as in streets where there are existing trees, the centre option is the only feasible course of action. This makes it even more vital to pursue additional tree planting where space is available, if we are to meet our target of significantly increasing canopy cover across the city as a whole.*

# 4 Principles & strategies

**The City of Melbourne's urban forest will be resilient, healthy and diverse. It will contribute to the health and wellbeing of our community and to the creation of a liveable city.**

## 4.1 Priorities

The challenges facing Melbourne's urban forest provide the City of Melbourne and its diverse communities with a unique opportunity to genuinely connect with our urban forest.

The City of Melbourne has a leading role to play in encouraging other councils, development agencies and landholders to enhance the city's urban forest. The principles and actions developed through this strategy have the capacity to be used and adapted across Melbourne, thereby reinforcing Greater Melbourne's urban forest.

Our community also has an important role to play in building a more resilient urban landscape through their actions and decisions at home, in their own gardens. Private green spaces are an important component of our urban ecology that contribute to neighbourhood wellbeing, connectedness to nature and biodiversity, and help our city adapt to changing climates. These also need nurturing and growth.

Given the impact of the diminishing water supply for Melbourne's urban forest and the fact that many of the city's mature trees are ageing or in decline, the next ten years will be critical for how we adapt the landscape to make it more suited to Melbourne's future needs and more resilient to the anticipated impacts of climate change and population and urban growth generally.

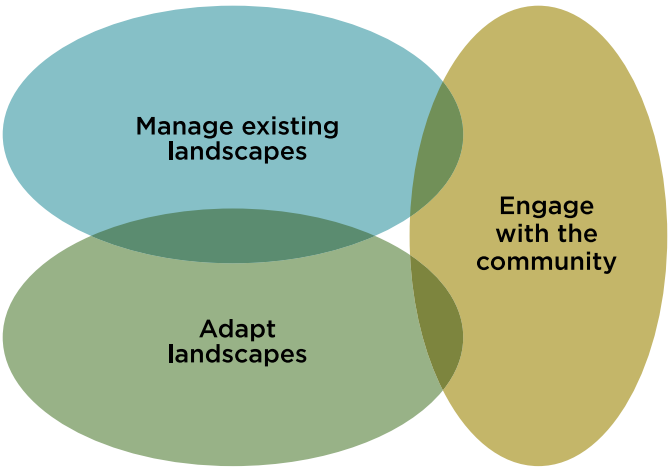
Vegetation is a key component of urban ecosystems. Various indicators highlight the relative health of cities such as biodiversity levels, vegetation species diversity, age diversity, soil moisture levels, and air and water pollution levels. Setting achievable benchmarks for these indicators will ensure we stay on track to achieve our vision.

Before we quantify these benchmarks, we need to establish principles that will guide our decisions. These principles respond directly to the challenges and opportunities that face our urban forest when we consider to the need to **manage our existing landscapes, adapt new landscapes** and involve and **engage with the community**.

*Design is an important part of the growth of our urban forest, in fact as development pressures use up more and more available soil, innovative design that is integral to the development process is increasingly essential. ... It is not enough to plant trees at every opportunity. Without careful consideration of the many influences on tree selection and placement we risk an outcome that is not sustainable. Horticultural, functional, wider environmental, local ecological, cultural, social, spatial, economic and aesthetic factors [collectively need to] be considered in order to achieve a mosaic of plantings which respond to the needs of each particular community and place.*

*In an increasingly dense urban environment innovative design solutions are necessary to ensure that trees remain a significant part of the fabric of the city and contribute to the daily experience of city dwellers.*

Kevin Taylor, 2006. *Improving the Urban Forest by Design*



## 4.2 Principles

**Mitigate and adapt to climate change**

- Build a resilient urban forest that can tolerate and continue to thrive in future climatic extremes
- Ensure a diversity of tree species and ages to maximise resilience against pests and diseases
- Increase overall vegetation biomass to assist in storage and sequestration of carbon

**Reduce the urban heat island effect**

- Build a functioning healthy urban forest canopy to provide shade and cooling to reduce heat absorption and emission by the built environment
- Develop public spaces to improve human thermal comfort and maximise health benefits
- Capture more stormwater to increase infiltration into the soil and enable maximum evapotranspiration

**Design for health and wellbeing**

- Provide cool shaded spaces in summer; sunlight access in winter
- Plan and manage the urban forest to ensure longevity of green spaces for future generations
- Create well-designed public spaces to encourage outdoor activity, social connectedness, respite, exercise and general sense of wellbeing

**Create healthier ecosystems**

- Support healthy ecosystems in order to provide maximum benefits in terms of clean air, water and soils
- Expand and improve biological and structural diversity

**Design for liveability and cultural integrity**

- Design landscapes to reflect the cultural integrity, identity and character of Melbourne and its neighbourhoods
- Create world class open spaces, parks and streetscapes
- Design spaces for people to reconnect with nature, that create a sense of place and enable reflection and tranquillity

**Become a water sensitive city**

- Promote the use of innovative techniques for water sensitive urban design, such as rain gardens, bioswales, underground storage reservoirs and biofilters
- Use alternative water sources for irrigation to reduce potable water use
- Ease stormwater flows and peaks by replacing impervious surfaces with porous materials to reduce heat absorption and encourage soil moisture retention

**Position Melbourne as a leader in urban forestry**

- Increase Australian-based urban forestry research
- Inform and involve the community in decision-making for landscape adaptation and change
- Increase the public profile and understanding of the attributes, role and benefits of the urban forest

## 4.3 Strategies

To achieve our vision of a healthy and resilient urban forest that contributes to the health and wellbeing of our communities and to a liveable city, we need to create better urban environments for everyone. The principles defined above highlight the importance of a well-designed city, and the following strategies list how we go about creating these 'living spaces':

- **increase canopy cover**
- **increase urban forest diversity**
- **improve vegetation health**
- **improve soil moisture and water quality**
- **improve urban ecology**
- **inform and consult with the community**

Each of these strategies have priority actions for implementation in order to achieve specific targets.

*Increasing the effective canopy cover above paved surfaces is an important strategy to mitigate the impacts of the urban heat island effect. These mature elms shading George Street, East Melbourne make a healthier place to live, not just a more attractive one.*

*Greater diversity can be achieved through the use of a variety of species, genera and families. For example, although rarely seen in Melbourne, the Dawn Redwood (**Metasequoia glyptostroboides**) has proven to be tolerant of quite hostile street conditions near the South Melbourne Town Hall, and may be suitable for more widespread use.*

### 4.3.1 Increase canopy cover

Canopy cover is a key criterion by which we measure the urban forest's ability to produce benefits for the community and the environment. Large canopied trees provide greater environmental and health benefits than smaller canopies – depending on the scale, up to 75% more benefit per tree.

Increasing the number of trees within our municipality is important, but we must plan properly to achieve the greatest environmental and health benefits. It is more important to improve the extent of canopy cover across the municipality than to simply increase the number of trees. Analysis of aerial imagery combined with canopy cover modelling suggests that the municipality can accommodate a significant increase in canopy cover.

Identification of new opportunities for tree plantings is central to increasing canopy cover throughout the municipality. A great proportion of the City of Melbourne's public space – and by far the most intensively used space – is in streets, providing the most important targets for increasing canopy cover. In precincts such as North and West Melbourne with only a 20% canopy cover, streets are an obvious priority for tree planting.

A recent study on the urban heat island effect in Melbourne recommends that one of the most cost efficient and effective mitigation strategies is to ensure a minimum canopy cover of 30% with a leaf area index (a measure of shade density) of 5.3 within the municipality. Thermal images taken of the city identify particular areas that absorb more heat than others and highlight the cooling effect of canopy cover and green spaces. This mapping also locates areas that are a high priority for increasing canopy cover.[49]

The City of Melbourne in partnership with Monash University is monitoring microclimate conditions at streetscape level beneath different tree canopy configurations. Weather stations have been installed in Bourke Street in the CBD, and Gipps and George Streets in East Melbourne. Data from these stations highlights temperature differentials between shaded and open streets. When used in conjunction with thermal imagery, this helps to identify opportunities to increase canopy cover where it will provide thermal comfort benefits to people during periods of heat. This data also provides guidance around spatial patterns of canopy distribution.[50]

The private realm occupies 68% of the area of the municipality and can therefore contribute significantly to the urban forest. However, a study conducted by three Melbourne councils suggests that private realm trees have reduced in number considerably since the 1970s. This is due largely to infill development, competing land uses and increasing land prices. Protection and enhancement of private realm vegetation is therefore an important component of the urban forest strategy.[51]

Modelling for the development of linear transport routes into medium-rise high density corridors demonstrates that development pressure on the surrounding suburbs can be alleviated. These lower-density suburbs can act as the 'green wedges' for increased green infrastructure, both in streetscapes and in private gardens.[52]

**Target:**
**The City of Melbourne's canopy cover will be 40% by 2040.**

**Actions:**

- Conduct a thorough spatial analysis to identify areas of low canopy and include selected areas in planting programs for the next 20 years.
- Provide the best planting conditions possible for new trees to ensure maximum canopy potential, including below ground spaces and water.
- Select the most appropriate vegetation type and species for each location given spatial and climatic constraints and neighbourhood character.
- Ensure that the overall urban design for places ensures that spaces and streets are best designed for our urban forest and for people.
- Review and update Council's Tree Precinct Plans which detail the locations and species for increasing canopy cover.
- Encourage increased canopy cover where possible in the private realm.
- Promote the retention of open space on private land, especially in areas and in configurations that allow for the planting of canopy trees.
- Ensure that management regimes over the urban forest are adaptive to reflect its dynamic nature.

## Case study:

### Prioritising the greening of streets - City Road, Southbank

The 2010 Southbank Structure Plan recommends the upgrade of City Road into an active pedestrian and cycling spine while maintaining its important traffic functions. Although the riverside promenade now has a higher profile as Southbank's key 'public space', City Road is actually a much larger space and the opportunity it presents for additional tree planting is significant.

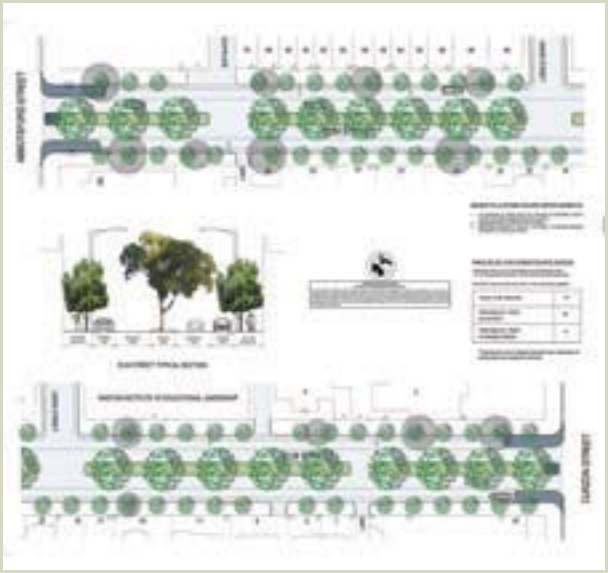
The visualisations below show existing conditions in City Road and the potential impact of increasing tree canopy cover.

## Case study:

### Increasing canopy cover, North Melbourne

A project in Elm Street, a residential street in North Melbourne, completed in 2011, will increase canopy cover from 18 to 65%. This has been achieved through the creation of a new central median, providing an opportunity for 13 large canopy trees to be planted. This, combined with 26 smaller trees in the footpath, will within 20 years decrease summer temperatures in the streetscape by 3-4 degrees Celsius, compared to a non-treed street.

Extensive community consultation with residents and residents' association contributed to a successful outcome, and notably there was majority support for this project by demonstrating that increased tree planting would not impair the integrity or functionality of the street.



## 4.3.2 Increase urban forest diversity

Our urban forest faces potential threats from Dutch Elm Disease, Myrtle Rust, plane tree canker stain, fireblight, elm leaf beetle, sycamore lace bug, emerald ash borer and fig psyllid. Diversifying the urban forest lowers the risk of significant loss in any individual or group of species due to these pests and diseases. What we choose to plant now must also have the resilience to tolerate hotter, drier conditions, and potentially also cope with major storm events.

Over the past few decades, various models for the composition of the urban forest have been proposed. The City of Melbourne intends that the urban forest population will be composed of no more than 5% of one tree species, no more than 10% of one genus and no more than 20% of any one family.[53]

While vulnerability can be reduced by planting a more diverse range of tree species, a number of Melbourne's vulnerable landscapes are affected by other concerns and policies that may not allow simple species substitutions. Heritage policies protect many Melbourne streetscapes and parks, in particular a number of elm avenues. The devastation caused by Dutch Elm Disease has left Melbourne's elm population as one of the most significant in the world, and our community is protective of this legacy. Changing demographic and cultural factors over the last fifty years have also increased pressure to preserve, restore and cultivate native vegetation in public landscapes. Native vegetation policies protect the tree communities in Royal Park, which is dominated by two genera (*Eucalyptus* and *Acacia*) and two families (*Myrtaceae* and *Fabaceae*).

Both of these factors require careful consideration, and consultation with authorities such as Heritage Victoria, community groups such as the Friends of the elms, and others. Melbourne's historic landscapes are particularly vulnerable due to the combination of the uniform old age of many trees, climate change, and the threat of Dutch Elm Disease. Like-for-like replacement of trees based on species is often insisted upon for many heritage landscapes, and obviously new plantings should respect the heritage values and character of any area, but appropriate responses may not be so obvious. For example, if elms are wiped out by Dutch Elm Disease, it would become evident that the heritage values of Melbourne's parks and boulevards had been poorly served by maintaining the current dominance of elms in the landscape.

Similarly, native trees will continue to play a critical role in broader biodiversity outcomes, and Melbourne will undoubtedly have a significant population of native trees into the future. However, where species choices are informed by indigenous vegetation policies, the species, genetic and spatial diversity should be maximised where possible. New plantings should also include trees from families other than the *Myrtaceae* (e.g. *Casuarinaceae* and *Proteaceae*). These guidelines may be revised as more information on the impact of Myrtle Rust on different species and genera becomes available and in respect of the development of knowledge of other pests and pathogens.

It is planned that character will be determined through the design of tree precinct plans and master plans to be developed through a collaborative and consultative process with the community.

**Target:**
**The City of Melbourne's urban forest population will be composed of no more than 5% of one tree species, no more than 10% of one genus and no more than 20% of any one family.**

**Actions:**

- Follow planting targets set out in the Urban Forest Diversity Guidelines.
- Undertake regular plantings across the municipality to reduce the risk of similar aged trees dying at the same time.
- Review and update Council's Tree Precinct Plans to achieve age, species and spatial diversity.
- Consistently monitor, treat and evaluate threats and attack from pest and pathogen as part of the tree maintenance program.
- Utilise a scientifically-based tree selection matrix when planting in different street and park typologies.
- Enhance the structural diversity in the urban forest through green walls, green roofs and green laneways, encourage design, funding and implementation where possible.
- Enhance vegetation strata diversity through the planting of shrubs, ground covers and grasses where appropriate.

*A newly planted Agathis robusta (**Queensland Kauri**) avenue in Fitzroy Gardens. This species is proven to grow well in Melbourne but relatively little used.*

## Case study:

### Vulnerability & species diversity, New York

New York's Urban Forest consists of 5.2 million trees, including 592,000 street trees. The street trees alone have an asset value of $2.3 billion and an average replacement value of $3,938 per tree. In 1995 New York recognised that limited species diversity exposed the urban forest to catastrophic loss from extreme weather events, pests and diseases. London Plane, Norway Maple and Callery Pear comprised nearly 39% of the street tree population with, for example, 44% of all trees vulnerable to the Asian Long-Horned Beetle. Active diversification over the past 16 years through the Million Trees NYC program has seen an increased range of species planted in place of the dominant species. This has been successful in decreasing Norway Maples comprising 23% of street trees to 13%.[54]

## Case Study:

### Shrine Reserve landscape management plan

The landscape management plan for the Shrine of Remembrance Reserve in Melbourne, prepared by Rush/Wright Associates for the Shrine Trustees, deals with one of Melbourne's most important designed landscapes. This is a place of extraordinary significance for many people. In any parkland trees play an important role, but here many have added meaning as commemorative plantings and as part of a setting for deeply emotional ceremonies.

It is in this context that the Landscape Management Plan was prepared. Building on a detailed inventory and study of the site, and extensive consultation with user groups and stakeholders, the Plan proposed a long tern vision that involves considerable, but gradual changes through selective removal of dead and declining trees, and replanting with a variety of drought tolerant species.

Even after a few years of implementation its effectiveness has been proven. Recent ULE assessments show a far healthier average condition for trees in the Shrine Reserve than in comparable areas of other heritage landscapes in the City of Melbourne.[55]

*The Shrine of Remembrance*
*[Photo: John Gollings, courtesy Rush/Wright Associates]*

### 4.3.3 Improve vegetation health

To maximise the ecosystem services, community health, and financial benefits that the urban forest provides it is imperative to ensure our trees and vegetation are healthy. Safeguarding the urban forest against extreme weather events such as drought, heat and flooding is vital to long term health. Integral to tree planning is ensuring that the most appropriate species is selected for each location, stock quality is assured, and best practice planting procedures are in place.

The City of Melbourne conducts a two year maintenance program for all newly planted trees. During this period it is vital to monitor any stress, pest and disease attacks. Throughout the lifecycle of each tree, annual analyses are carried out to ensure that data collection supports their on-going health and longevity.

Maintenance of our tree database regarding tree health, dieback, symptoms of stress, and pest and disease movements will highlight vulnerabilities and help to refine management programs. Given the current vulnerability of the urban forest and the relatively poor health of many trees, significant challenges are associated with canopy replacement and expansion.

Growing conditions in the urban environment are relatively harsher than those found in a natural landscape. It is therefore necessary that species selected for planting throughout the municipality are adaptable to current urban conditions as well as future conditions, which are likely to be even harsher in a changed climate. An improved irrigation regime, more frequent health assessments, removal of dying and dead trees, and continuous replacement with healthy stock is already being implemented.

**Target:**
**90% of the City of Melbourne's tree population will be healthy by 2040.**

**Actions:**

- Undertake annual health checks for every tree in the municipality.
- Reduce the number of stressed trees through regular watering, mulching and other cultural treatments, particularly over summer periods.
- Select species that are robust and resilient to the potential effects of climate changes and urbanisation.
- Implement best practice soil preparation before planting.
- Ensure the water needs of all vegetation are met, particularly during summer.
- Minimise conflict with above and below ground infrastructure.
- Create enhanced planting opportunities in streets, where possible, to allow for space for larger, healthier trees to grow.
- Remove asphalt and concrete where possible and replace with pervious surfaces to encourage healthy root growth for larger trees.
- Develop a forest health management plan to provide direction for managing diversity and forest health risks

*Healthy figs provide shade and wind protection in exposed areas near the waterfront in Docklands.*

*A well-placed tree with suitable below ground growing conditions maximises the benefits of trees in a city street*

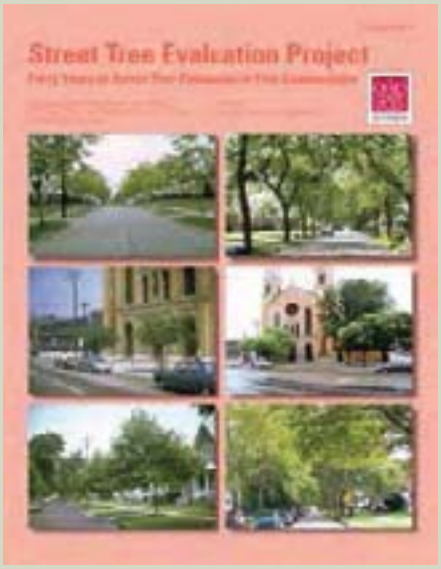
## Case study:

### Street tree evaluation project, Ohio

In 1971, the Ohio Department of Natural Resources initiated a project that assessed the long term performance of 53 tree species in five Ohio cities. The comprehensive study, entitled 'Street Tree Evaluation Project' or STEP, was developed as a tool to assist in the planning and management of appropriate tree species in the varied urban environmental conditions found across the state. At its onset, the trees were assessed for health and growth characteristics and the locations and photographs of each tree were documented.

In 1997, the potential values of the STEP project, established more than two decades before, were realised. Now, every ten years, survival data, tree measurements, and specific information on tree height, girth, and spread, along with a current photograph are collected. The information gathered has been used to inform urban forest planning and management by identifying optimal species to achieve various goals in various locations. Additionally, the four decades of documented change illustrate how different species have, over time, affected the character of the individual streets.

The knowledge gained by such long term studies, and the on-going attention and care given to the established and mature trees in these cities mean that the appearance, resilience and other important ecosystem services of the urban forest can be optimised.




## Case study:

### Street tree census & tree mortality, New York

The City of New York completes a street tree census every ten years. The census data is collected by volunteers, staff and urban forestry consultants and was most recently completed in 2006. Information recorded for each tree includes location, species, diameter at breast height, condition, tree pit type, soil level, foopath condition, presence of overhead wires and infrastructure conflicts. Results were reported through an interactive website application or submitted on paper.

The data highlighted a need for greater species diversification across the city and identified some of the trees' key conflicts with other infrastructure. Because property owners in NYC are responsible for maintaining footpaths adjoining their land, many removal requests or objections to new plantings reflect the potential for trees to cause utility service disturbance or pavement damage. Additionally, 15% of the tree population had trunk wounds. This data was useful for informing future tree planning to reduce the incidence of conflicts with property owners and to improve overall tree health. Data collection by survey area enabled consideration of disparities between boroughs in terms of canopy cover, tree health and species diversity. Because of the data, urban forest planning could target work to address these disparities directly.

The Young Tree Mortality Study was a separate study conducted in 2006 by NYC staff and interns. A random sample of street trees planted three to nine years previously was surveyed to examine how biological, social and urban design factors affected mortality. Findings indicated that survival was about 75% and identified factors influencing survival. This research provided valuable insight into how tree survival rates may be improved in the city and has provided a methodology that other cities can follow to assess their own performance.

## 4.3.4 Improve soil moisture & water quality

We have become experts in managing stormwater to prevent flooding. In Melbourne, we have paved over creeks and streams, diverted rivers, and installed millions of kilometres of pipes to ensure that rainfall is moved speedily into Port Phillip Bay. The increase in impervious surfaces across the city has consequences for depleting soil moisture, irrespective of the amount of current or past rainfall levels, simply due to the inability of water to reach and permeate the soil.

Trees will seek out water wherever possible, some of them being able to penetrate deep into the groundwater if they need to, thereby also slowly reducing groundwater levels.

While traditional engineering solutions for water capture and discharge are efficient, extreme weather events have proven that certain areas throughout the city, including the central city, are still prone to heavy inundation during major storm events.

Introducing measures to capture and retain stormwater in the soil, and to increase water availability for tree roots, will allow water to filter naturally into the soil in readiness for periods of low rainfall. As long as soil does not become waterlogged and deprived of oxygen, the higher the level of moisture in the soil, the more trees are able to transpire at maximum efficiency, allowing for cooling of the urban environment and combating the urban heat island effect.

Trees have the added benefit of collecting phosphorus, nitrogen and heavy metals from our stormwater through their root systems, lowering the levels of stormwater pollution.

Traditionally, surface irrigation has been employed in most of our parks and gardens and has been regarded as a temporary response to keep lawns green and to minimise tree mortality during summer. However this has encouraged trees to develop superficial root systems close to the surface and does little to recharge soil moisture reserves. If such irrigation has to cease, as it did during the recent water restrictions, the impact on these shallow-rooted trees can be catastrophic.

A range of innovative tools is required to increase permeability of our urban soil structure: to recharge groundwater; to reduce the amount of stormwater flowing into waterways; and to improve water quality. This will directly contribute to tree health, ensuring that trees provide the maximum benefits to support healthy landscapes and communities.

A range of water sensitive urban design measures are being implemented throughout Australian cities and towns. These include roadside tree pits and bioswales, stormwater capture systems and storage tanks beneath parks and streets, rain gardens and permeable paving. Implementation of these measures is generally adaptable to different locations and budgets. However it is fair to say that most landscape typologies, whether streets, laneways, parks, median strips, boulevards or individual trees, provide an opportunity for water sensitive design.

**Target:**
**Soil moisture levels will be maintained at levels to provide healthy growth of vegetation.**

**Actions:**

- Action the works detailed in *Total Watermark, City as a Catchment* encouraging Melbourne to become a water sensitive city.
- Incorporate and expand water sensitive urban design measures wherever possible.
- Ensure that available water content of soils in irrigated landscapes does not fall below 50% during vegetation growing seasons.
- Improve soil structures to allow for oxygenation and water movement for the benefit of tree roots.
- Replace asphalt and concrete with porous surfaces such as porous asphalt, turf, garden beds and rain gardens to reduce heat retention and encourage soil moisture retention.
- Seek alternative water sources for all major parks and gardens and treed boulevards, avenues, roads and streets.

*Examples of WSUD tree pits allowing rainwater runoff to increase soil moisture in tree root zones*

*Rain gardens outside the Dame Elisabeth Murdoch Building at the Victorian College of the Arts on St Kilda Rd*

## Case study:

### Darling Street stormwater harvesting

The stormwater harvesting project in Darling Street East Melbourne is a prototype for in-road stormwater capture and re-use. Completed in 2011 this system has been designed to capture and treat stormwater from surrounding streets to irrigate Darling Square, Powlett Reserve and median strips with trees in Grey, Simpson, Powlett and Albert Streets.

This system has the potential to harvest an estimated 24 million litres of stormwater each year, which is the equivalent of saving more than 18 Olympic swimming pools worth of water annually. As well as capturing water for irrigation, this system prevents gross pollutants such as soil, silt. clay and litter, and can aid in reduction of local flooding.

With funding from the Victorian Government and Melbourne Water, the system is being monitored to measure its on-going success.

*Darling Street stormwater harvesting project*

## Case study:

### Stormwater capture, Eades Place, Parkville

The Eades Place stormwater capture project uses porous asphalt and structural soil to capture roadway stormwater runoff. Moisture is retained in the structural soil to provide an optimal growing environment for new trees. The project involved reconstruction of a roadside parking area with a porous asphalt surface laid over a structural soil base, and the construction of ten new tree islands with parking spaces in between. The total surface area of porous paving and structural soil is 482 square metres, and the structural soil has a minimum depth of 600mm.

In drought years this area will capture 591,000 litres of stormwater annually, providing 162 litres of water per day to each tree. In average rainfall years 790,000 litres of stormwater will be captured, providing 217 litres per day to each tree. Pollution loads in the stormwater will be reduced by 90% and peak stormwater flows will be reduced by 90%, resulting in a reduction in local flooding.

A monitoring regime will be established to measure the project's success.

### 4.3.5 Improve urban ecology

Over 40% of nationally listed threatened ecological communities in Australia occur in urban areas. Loss of natural habitat, urbanisation, and air and water pollution have all threatened the survival of many plant and animal species.[56]

A 2009 study by the Victorian Environmental Assessment Council identified ten major threats to biodiversity in Melbourne including fragmented landscapes, connectivity loss due to major roads, pollution, human impacts (e.g. rubbish and trampling), predation from cats and dogs, and competition from introduced species. With potential urban growth into brown- and greenfield sites, the likely loss of biodiversity from these threats becomes even greater, highlighting the need to seriously regard biodiversity in our city.

Urban landscapes and biodiversity have often been seen to be mutually exclusive. However, research continues to demonstrate that urban areas can provide opportunities for protecting and enhancing vulnerable species. Urban ecosystems give rise to new habitat types which include green roofs and walls, gardens, reserves and parks.

The urban forest plays a crucial role in providing habitat, food and protection for wildlife in addition to providing a diversity of plant species. Healthy trees supported by adequate soil moisture and structural and biological diversity collectively contribute to healthy ecosystems. Public parks and gardens, golf courses, remnant vegetation and private gardens are all capable of providing habitat for a variety of species.

This is not to underestimate urbanisation's impact on biodiversity. Our imperative is to ensure protection and enhancement of vulnerable species. Biodiversity in the City of Melbourne includes a wide range of wildlife species. Whilst certain species (e.g. Eastern Quoll) face severe loss or even extinction due to loss of habitat, others (e.g. Brush Tail Possum) have adapted all too well to urbanisation, to the extent that many inner area parks are overpopulated.

**Target:**
**Protect and enhance urban ecology and biodiversity to contribute to the delivery of healthy ecosystem services.**

**Actions:**

- Develop an urban ecology and biodiversity strategy in collaboration with Australian Research Centre for Urban Ecology (ARCUE, University of Melbourne)
- Consult the community and stakeholders to inform measures regarding the enhancement of biodiversity in the municipality
- Further integrate biodiversity and urban ecology values into the planning of parks, green spaces, precincts and waterways through master plans, structure plans, precinct plans and Total Watermark – City as a Catchment
- Increase the diversity of trees and other plants to provide food sources, to protect habitat and to promote healthy ecosystems
- Use water sensitive urban design to improve groundwater levels and encourage biodiversity in our soils
- Maintain on-going relationships with key research organisations such as ARCUE and CSIRO Ecosystem Sciences.
- Develop programs to encourage the interaction between people and nature and to raise awareness
- Enhance ecological connectivity through urban forest corridors along streets and bio-links between larger green spaces.
- Develop productive urban landscapes, where possible in public spaces but mainly through encouragement for private gardens.
- Provide habitat through dead trees where possible, while ensuring health and safety for everyone

*Providing a diverse range of species and combining all vegetation strata (trees, shrubs and groundcovers) improves habitat value.*

## Case study:

### Conserving biodiversity, Adelaide

Adelaide's Urban Forest Biodiversity Program attempts to redress the loss of biodiversity across Adelaide. It has been delivered alongside two other programs: the Million Trees program - dedicated to planting three million local native trees and associated understorey species across the Adelaide metropolitan area by 2014 - and Backyards 4 Wildlife. Each program is aimed at improving the amount and type of vegetation across the city in both the public and private realms to provide more habitat, food and protection for Adelaide's native wildlife.

A study of Adelaide's biodiversity has found that only 12% of the area's original vegetation remains, and this is recognised as a contributor to the severe decline in native fauna and flora. The South Australian Government along with the Federal Government has responded to improve the biological diversity of the city, recognising that biodiversity conservation is crucial in ensuring a healthy and sustainable local environment for future generations.

**Four key actions were taken to kick-start this initiative:**

- A spatial analysis identified areas of high conservation significance.
- Implementation of on ground restoration projects. With support of local government, industry and the community, the aim is to restore approximately 2,000 hectares of native vegetation using suitable areas of public open space, including parks, reserves, transport corridors, water courses, coastline and council land.
- Provision of education, training and resources for everyone to improve biodiversity. Innovative resourcing, accredited training and support to schools are planned to maximise involvement in local projects and activities across the curriculum and to foster 'ecoliteracy'.
- Facilitating greater participation, raising greater awareness, and increasing skills and knowledge in the wider community through coordinated communication, education and involvement strategies.

There are currently fourteen projects taking place throughout Adelaide enhancing parks, waterways and corridors for biodiversity.

## 4.3.6 Engage with the community

The urban forest influences everyone in the community. Engaging the wider community involves not only informing them about the importance and benefits of green infrastructure, but also highlighting the role it plays in ensuring Melbourne's liveability, sustainability and support of cultural identity.

The success of an urban forestry program relies on the commitment of citizens and local businesses to support and enhance work done in the public realm, and to translate the benefits of urban forestry and increased tree canopy into action in the private realm.

Community support for the urban forest in the public realm can include: tree-related advocacy groups and trusts; associations that lobby for more street trees and greenery in their neighbourhoods; and others who demand open space and tree protection through better planning, new regulations, and public acquisition. Community groups and dedicated individuals can provide the 'glue' to link open space networks within larger metropolitan areas, and can provide the political backbone to sustain public investment in green infrastructure.[57]

On a larger scale, business-driven civic leadership can incorporate urban forestry visibly into much broader planning initiatives and thus build its legitimacy as a public policy issue. Similarly, educational institutions at all levels should be involved in any long-term communications strategy for urban forestry.[58]

Our aim is to have the urban forest included in a broader conversation about how Melbourne's cultural identity can be enhanced through revisioning, redesign and ultimately replanting. For example: Can Melbourne's increasing diversification of its landscapes reflect its multicultural plurality? This should open the space for the community to connect with the urban forest, to establish how it contributes to their sense of place, and to allow the community a role in growing and sustaining our urban forest.

The City of Melbourne will be a strong advocate for the benefits of a healthy urban forest and will continue, through various media, to seek the views of the wider community about how to protect, manage and enhance our urban forest asset for future generations. We will work with partners to build the profile of urban forestry in greater Melbourne and Australia, and to support action on canopy enhancement in the private realm. We will continue to build on-going research and measurement into management innovations and, above all, allow the local community to have their say in the way our landscapes are planned, designed and managed into the future.

**Target:**
**The community will have a broader understanding of the importance of our urban forest, increase their connection to it and engage with its process of evolution.**

**Actions:**

- Enable the community to 'have a say' in the design of landscapes of the future.
- Use innovative tools to engage and involve with the Urban Forest Strategy.
- Encourage 'diverse conversations' about the urban forest through a range of fora.
- Foster the emergence of urban forestry as an essential planning discipline in Australia.
- Align with other local municipalities to enhance the whole Melbourne urban forest.
- Encourage and support further research into Australian urban forestry.
- Create opportunities and co-benefits of producing this strategy: align with other strategies to ensure greater impact, increase fields of research, and develop relationships with private landholders.
- Work with traditional owners to develop community programs that increase knowledge of the cultural significance of landscapes in our environment.
- Develop health and wellbeing indicators to benchmark the role of our urban forests in contributing to human health.

*Planting days, such as this at Royal Park, provide an opportunity for our community to be directly involved in the establishment and on-going management of the urban forest*

## Case study:

### The Urban Forest Project, New York

In 2006, Times Square in New York City was brought to life by banners inspired by the form or metaphor of the tree, compiled by 185 acclaimed artists from around the globe. Entitled 'The Urban Forest Project', this was a visually stimulating, powerful community engagement event that both celebrated the urban forest, and stimulated discussions around sustainability and the environment.

Since its New York germination, The Urban Forest Project has spread to other US cities of Albuquerque, Baltimore, Denver, Portland, Toledo, San Francisco, Tacoma and Washington DC. In each city, local artists, designers and students have contributed their personal reflections on the tree to the outdoor exhibitions. The banners, inspired by and displayed in a unique local context of each city have proved a positive way to promote eco-city events and programs that exist in the local area, while opening up the community's imagination and motivation to stimulate new ones.

The Urban Forest Project and similar initiatives sprouting up alongside innovative approaches to the management of urban forests provide a platform from which to engage the public in urban forest planning and management strategies, to share narratives, and to celebrate art, community, and the environment.

## Case study:

### Engaging the community in Melbourne

Melbourne's Urban Forest Strategy was developed in consultation with the community between November 2011 and April 2012. An extensive community engagement process was undertaken to provide an opportunity for all members of the community to provide feedback through a variety of convenient channels. Publicity was sought across a broad range of media channels, including social media, to generate widespread community awareness of the strategy and the associated consultation period.

Activities during the consultation period included:

- An Urban Forest – Eco City Forum in the Town Hall in November 2011 with 135 participants.
- Nine precinct based community consultation meetings held between January and March 2012.
- A bespoke website was developed to provide a fulltime 'online forum' for the duration of the project, which generated 4249 individual visitors, a combined total of 11,991 site visits, 20,316 page views, and 818 downloads of the Strategy.
- Over 19,000 words in submissions and commentary were received from 177 commentators.
- A corporate website page for the strategy that received 5,034 unique views.
- A short video conveying key messages about on the Strategy viewed more than 2,500 times.
- More than 30 media articles, letters and editorials informing the community about the strategy on TV and radio and in the newspapers.
- Distribution of 10,000 copies of a specially designed Avant postcard by Michael Leunig to promote the consultation period throughout inner Melbourne.
- 419 entrants for the Urban Forest Art and Design Competition from 71 Melbourne suburbs and Victorian regional areas.
- Winning entries from the Urban Forest Art and Design Competition displayed throughout city in November to promote the consultation period and the strategy.

*Design from the City of Melbourne's 2011 Urban Forest Art and Design Competition*

# 5 Implementation framework

**This strategy puts forward principles and strategies that will guide the long-term planning, development and management of the City of Melbourne's urban forest. It also outlines a set of targets to evaluate the success of implementation.**

Evolution in urban forest planning will need to be based on solid research, well-informed options and best practice implementation tools and processes. With these foundations, the City of Melbourne will advocate for the practice of urban forestry in Australia.

Creating a resilient and robust urban forest requires forward planning in a similar manner to municipal strategic planning. The management and development of our urban forest needs to undertaken with a long-term vision.

Planning, development and implementation of urban tree policy takes place at two levels: long term (strategic and spatial planning) and shorter-term (project-focused planning). The success of the Urban Forest Strategy will rely on effective 'green governance' by the City of Melbourne, clear communications, and a widely understood implementation strategy that comprises programs that meet both short and long-term goals.

## 5.1 Green governance

Green governance shapes the plans and decisions that influence the development of urban forestry. A multitude of institutions, organisations and stakeholders are involved in shaping and making policy and management decisions that affect our urban forests.

Successful urban forestry requires creative and effective design at all levels, from metropolitan areas and regional ecosystems down to neighbourhoods and individual development sites.[59] Integrated planning, knowledge sharing and communication are critical components for successful green governance. They need to occur on a range of levels and work across administrative boundaries and disciplines within the municipality and beyond.

- **Intra-Council integration** involves internal stakeholder and interdepartmental cooperation. At a city scale, planners work directly with urban foresters to integrate policy, practices and analytical tools, coordinating input from many other departments related to managing growth.
- **Community and inter-professional integration** means the role of non-public proponents becomes more influential by raising public and bi-partisan political awareness. We recognise the impact that changes in the urban forest have on the values of communities and individual, and must therefore maintain and enhance interaction with the community to ensure these values are considered during planning and decision making.
- **Inter-municipal integration** involves the need for policy makers to link together with other local municipalities. At this scale, this calls for more systematic assessments of the urban forest across a larger bio-geographical area, beyond arbitrary political boundaries.
- Locally-led action on the urban forest potentially influences **national action**. The learning acquired from small scale autonomous urban forest projects can aid in steering policy-making and the quality and quantity of research across the country. The importance of comparable data would allow urban forests to be managed and have collective benchmarks established to ensure that national climate adaptation targets can be met.
- **International cooperation**. There is a need to network globally to drive uptake of the principles of contemporary urban forestry, to share research and technical knowledge, and to achieve better outcomes for our cities as our urban environment continues to expand.

## 5.2 Priority implementation actions

Priority implementation actions that have been identified include:

- Review and update tree precinct plans
- Develop boulevard master plans
- Implement urban forest diversity guidelines
- Valuing the urban forest
- Develop growing green guide for Melbourne
- Develop community engagement programs
- Maintain and develop exceptional tree register

A wide range of other initiatives may also be identified in the future.

## Review & update tree precinct plans

The City of Melbourne has a set of street tree precinct plans dating from 2002 that were developed through extensive community consultation. The plans have three primary aims:

- Protect and develop neighbourhood character
- Assist in prioritising works and budgets
- Support proactive and well planned planting to ensure a healthy stock of trees over the long term

A new set of precinct tree plans will build upon the aims above and respond to objectives of the Urban Forest Strategy.

The plans will assess and define the character of each precinct in collaboration with the community. They will identify opportunities to guide future street tree planting programs and provide an overarching framework to reference future tree species selections.

The plans can also incorporate a green infrastructure approach. GIS mapping and analysis can be used to consider the coordination of all green elements in a precinct, including:

- Urban character and heritage
- Street and open space trees
- Open space
- Water sensitive urban design
- Soil, topography, hydrology, stormwater, and permeability
- Street design
- Path networks
- Strategic integration with other council plans (i.e. built form, path networks, major infrastructure developments)

Specific outputs should include:

- Demonstrate where to plant (spatial distribution), how to plant (design guidelines) and when to plant.
- Communicate how this transition will occur over the suburb and by each street.
- Provide an implementation plan for priority of works over the next ten years.
- Provide design guidelines for integrated tree planning, WSUD and streetscape design.
- Provide recommended street tree species lists for each street.
- Provide a recommendation for the appropriate level of diversity of age and diversity.

These plans will be designed and developed through an extensive community engagement program, with a focus on collaboration.

Proposed timeframes for precinct plan implementation are:

**Year 1: July 2012 – June 2013**
Carlton, East Melbourne & Jolimont, South Yarra, CBD

**Year 2: July 2013 – June 2014**
North & West Melbourne, Kensington, Docklands

**Year 3: July 2013 – June 2015**
Parkville, Southbank, Fishermans Bend

## Develop boulevard master plans

In addition to the development of a new set of precinct plans, several master plans need to be developed to guide high profile sites including St Kilda Road, Flemington Road and Elizabeth Street.

Proposed timeframes for Boulevard Master Plan implementation are:

**Year 1: July 2012 – June 2013**
St Kilda Rd Master Plan – commence

**Year 2: July 2013 – June 2014**
Flemington Rd Master Plan – commence
St Kilda Rd Master Plan – complete

**Year 3: July 2014 – June 2015**
Elizabeth St (Haymarket – Victoria St) Master Plan
Flemington Rd Master Plan – complete

**Longer term**
Royal Parade, Victoria Parade

*Royal Parade*

## Implement urban forest diversity guidelines

Implement urban forest diversity guidelines Urban Forest Diversity Guidelines have been developed to accompany this document. These set out a basis for selecting the right trees and other vegetation for our future urban forest. A scientifically-based matrix has been created to support the selection of appropriate trees for each street typology within the municipality.

The guidelines also stipulate diversity targets to be set across the total urban forest in terms of vegetation form, species, age and health. These guidelines should be used to inform capital works programming and the development of the tree precinct plans. The selection matrix and list should be reviewed and updated by 2015.

In order to ensure species diversification, tree planning will be implemented both at precinct and city-wide scales in parallel. Annually, the species list may be altered and a planting maximum may be established for each species to ensure that age diversity is achieved across the population.

## Develop a forest health management plan

Declining forest health in Melbourne is of concern due to the expected increase in the frequency of extreme weather events, limited diversity within the current urban forest population and the threat of emerging pests and diseases. Additionally, Melbourne's elm population, which contributes significantly to the character of avenues and boulevards within the city, is in decline with 76% expected to reach the end of their useful life expectancy in the next 20 years. An integrated forest health management plan will improve long-term vegetation health across the city by providing strategies to:

- Manage diversity (genetic, species and age).
- Assess the risk to Melbourne's urban forest from known and potential forest health threats.
- Ensure the on-going viability of the elm population.
- Manage pathogens, insects and abiotic factors known to impact urban tree health in Victoria.
- Manage for pathogens and insects that could impact Melbourne's urban tree health in the future
- Outline best management practices for maintaining urban forest health
- Define indicators for success to be measured through forest health monitoring

## Valuing the urban forest

The City of Melbourne adopted the Mauer-Hoffman formula for assessing the monetary value of amenity trees in 1970. In 1990, Peter Yau developed the City of Melbourne amenity value formula, which council adopted for calculating the monetary value of urban trees. This has since been used successfully to acquire compensation for trees lost due to development, and has been adopted by other local government authorities in Australia for appraising values of Urban Trees (Adelaide City Council).

Amenity valuations establish City of Melbourne's urban forest as having an approximate worth of $700 million. Valuing the urban forest solely on the basis of an amenity formula does not account for the environmental benefits provided by the urban forest.

The i-Tree Eco tool is a free, peer-reviewed software suite from the United States Department of Agriculture's Forest Service, which provides an urban and community forestry analysis and benefits assessment tool (www.itreetools.org/about.php). It provides a broad picture of the entire urban forest and is designed to use field data along with local hourly air pollution and meteorological data to quantify urban forest structure, environmental effects, and value to communities.

i-Tree Eco will provide us with a more holistic dollar value for our urban forest. New York has used i-tree to evaluate that for every dollar they spend on trees, they receive a return of $5.60.

In 2010, the Victorian Local Sustainability Accord provided funding to the Cities of Melbourne, Port Phillip and Moonee Valley to develop and contextualise the i-tree Eco tool for Australian use. The National Urban Forest Alliance (NUFA) and Arboriculture Australia have partnered as joint custodians of the i-Tree Eco Australia to promote and develop tool's future use in Australia.

City of Melbourne has currently assessed over one thousand trees using i-Tree Eco. Continued use and development of the i-Tree Eco tool will be critical to evaluating and measuring the benefits of our urban forest.

*Spotted Gums in Erskine Street, North Melbourne*

## Develop 'Growing Green' guide for Melbourne

Green roofs, walls and facades have not yet been widely implemented in Melbourne, or indeed Australia. By contrast, cities across North America, Europe and Asia have widely embraced green roof technology and are encouraging and/or enforcing their installation through incentives and regulation.

In Australia we do not have policies or formal guidance requiring the installation of green roofs or walls. Standards for best practice in green roof, wall and facade design for the Australian climate have not been developed and there is a strong demand for such standards.

A project has recently commenced to respond to this demand and its delivery will be a critical element in bolstering the further development and expanding the benefits of the urban forest. Growing Green Guide for Melbourne: A how-to guide for green roofs, walls and facades will be developed collaboratively through representatives from the Inner Melbourne Action Plan partner councils (Cities of Melbourne, Port Phillip, Yarra and Stonnington), as well as The University of Melbourne and the Department of Sustainability and Environment and other stakeholders.

The Growing Green Guide for Melbourne project will develop a practical tool (best practice guidelines) that will increase the knowledge and reduce the technical barriers of green roof wall and facade construction. The project will also include a policy options paper that can be readily utilised by councils, building developers and planners across Victoria. An opportunities assessment will be carried out to identify potential sites to develop green roofs, walls or facades across the four council partner localities.

*Green roof on The Venny communal backyard, JJ Holland Park, Kensington*

## Develop community engagement programs

Community engagement programming will aim to include the broadest possible cross-section of the community, including federal, state and local governments, leaseholders, champions and environmental sector leaders, research and educational institutions, artists, industry forums, businesses, schools and developers.

The term 'urban forest' does not just encompass those green aspects of our city that are managed by City of Melbourne. In an ecological sense, all living components within the municipality, and spanning out to wider Melbourne, contribute to the function and benefits of the collective urban forest.

Unlike some forest systems in rural contexts, the attributes of our urban forest require coordination of many public and private land managers. In the City of Melbourne, a large percentage of land is under the management of independent organisations and private land owners. We need to better understand the current composition of the private realm, as future changes will significantly affect our functional, ecological and visual landscape, which will in turn influence the social and environmental benefits afforded by the urban forest.

Within our municipality, we have diverse property types ranging from tiny apartments to large house and garden plots. We also have a community with diverse cultural, socio-economic, and education backgrounds. As Melbourne continues to increase in density the private realm to the urban forest will need to be fostered and promoted.

Opportunities exist to partner with numerous stakeholders including other Councils, businesses, community groups, not for profit organisations and institutions to develop programs that will:

- Educate and support private land owners to plant and care for suitable trees on their property
- Celebrate events such as National Tree Day to raise the profile of urban forestry
- Develop self-guided walking tours for exceptional trees
- Market the benefits of trees to landowners, developers and businesses
- Educate the greater Melbourne community about the importance of managing and enhancing urban ecology across our city

## Maintain & develop exceptional tree register

One component of the long term planning for the urban forest and liveability of Melbourne is the protection of trees on private property. A study undertaken by Treelogic has found that tree protection in the private realm is most effective via significant tree registers.

As a result of this study, the City of Melbourne has undertaken an exceptional tree survey in the municipality and produced a register of exceptional trees that will be nominated for protection through an amendment to the Melbourne Planning Scheme in mid to late 2012. Protection of exceptional trees in the private realm will mean that to significantly prune, lop or destroy a tree listed on the Exceptional Tree Register will require a planning permit.

The aim of the register is to recognise, celebrate and protect the exceptional trees that exist in the municipality in the private realm, which contribute to the urban forest and city character as a whole.

*An exceptional Canary Island Pine (**Pinus canariensis**) at the Melbourne Zoological Gardens. Pines and other conifers were among the most popular trees for planting in Melbourne's parks in the 1860s and 1870s, but very few remain today.*

## 5.3 Measurement, monitoring & review

The development and efficient management of a resilient and robust urban forest requires on-going evaluation and assessment of the physical resources, the benefits they provide and their values – economic and non-economic.

At present the primary data collected includes species, life expectancy and infrastructure constraints for tree establishment and growth. Additional data needs are being identified to improve our ability to quantify the value of environmental services provided by the urban forest, assess tree survival, forest health and measure structural diversity, habitat characteristics and landscape connectivity. Ultimately, the data we collect will be focused on measuring the success of the urban forest strategy and improving urban forest practices at the local, regional and national level. Monitoring and research outcomes facilitate continual improvement in our management practices through an adaptive management approach.

Key areas for Information development include:

- **Total area of the urban forest** including canopy cover, density and vegetation per inhabitant in the public and private realm.
- **Urban forest composition, structure and age class** including species, diameter at breast height, height and age classes.
- **Urban forest landscape mapping** including recognition of corridors linking open spaces and contributing to connectivity at a metropolitan scale.
- **Urban forest effects on climate amelioration** including the effect of the right tree in the right place on reducing thermal discomfort, sun exposure and energy savings.
- **Urban forest habitat values** including tree traits and species that could provide habitat for fauna.
- **Urban forest productivity, health and vitality** including estimates of species growth and biomass, canopy growth over time and impacts of biotic and abiotic forest health factors.
- **Urban forest contribution to the carbon cycl**e including carbon storage and sequestration rates with consideration of the effect of events such as drought on tree productivity and health.
- **Contributions to air quality** including pollution removal, noise reduction, energy savings and cooling.
- **Contribution to conserving and maintaining soil and water resources**, by estimating values for infiltration and draining while considering soil properties such as pH, bulk density, water content and soil carbon.
- **Socioeconomic benefits** including outdoor activities, property values, wellbeing, sense of place, and cultural heritage.
- **Establish community connection** including the perceived benefits and nuisances.
- **Urban forest disservices** including species that have a high allergenicity index, are highly prone to pest and diseases, have low ULE, and are higher emitters of volatile organic compounds.
- **Economic value of the urban forest** in terms of property values, carbon stored, energy savings, health benefits etc.
- **Spatial distribution of urban forest ecosystem services**.
- **Spatial analysis of the urban heat island** using thermal, road density and population density mapping (or building density map) and normalized difference vegetation (NDVI) mapping.
- **Establish a thermal map relationship** between urbanization, UHI and canopy cover for the City of Melbourne.

## 5.4 Funding resources

True success in maintaining our urban forest depends on continuing support from the **public sector, developers, businesses** and **wider community**. The City of Melbourne recognises that effective implementation of green infrastructure throughout our urban environment depends on a coherent public policy supporting it – financially, administratively and legally – and that a long term funding commitment is required over the next two decades.

Development of the urban forest is also an area of public planning that government does not need to tackle alone. Developers have always looked for a marketing edge for their properties. The best developers understand that building green means not just structural design, but the entire development site and its relationship to its surroundings. Developer open space contributions are also an important means of supporting and advancing tree programs and other green infrastructure initiatives in newly developing areas.

Business partners can be powerful contributors to the expansion and success of urban forestry through financial support, planting and maintenance of trees on commercial property, and support of civic organizations involved in forestry. Some businesses have a direct stake in urban forestry as a function of their own enterprises. Others may be interested in offsetting environmental impacts, an area that is likely to grow as carbon credits become commoditised as a result of climate change policy.

Achieving funding stability ultimately depends on on-going support by the public such that the City of Melbourne remains committed to the program. Much of this hinges on communicating and disseminating information about benefits of Melbourne's urban forest in terms of reduced stormwater pollution, electricity saved, carbon and water savings from lower energy use in buildings, lower demands on power plants, biodiversity benefits, and temperature reductions in city as a whole – not to mention the city's aesthetic enhancement and wide-ranging social and economic advantages.

Project costs can be more easily justified when they can be linked to benefits derived from specific green infrastructure implementation strategies, and the provision of a robust cost benefit analysis for the urban forest will help ensure that it remains competitive as a high value land use amongst hard infrastructure and transport. In other words, stable support from the community is generated by a long-term track record of documenting and disseminating those benefits.

*Trees are not merely amenities; they are assets that pay regular dividends when well managed. As such, the urban forest should become a magnet for public investment.*

JC Schwab (Ed.), 2009. *Planning the Urban Forest*

# Glossary

**Adaptive management** is an interdisciplinary process that refers to the application of new knowledge in updates and changes to a program. In this approach, 'the best science, albeit incomplete, is brought to bear on an ecosystem, management is implemented under rigorously monitored conditions, and adaptations in management are made as the feedback from monitoring teaches us ore about the way the ecosystem behaves.' (Rowntree, 1995) The process of management yields new lessons as an urban forestry program moves forward, (e.g. the ways in which trees respond to new stresses as well as new treatments for those stresses). Applying the new knowledge helps improve the accuracy in predicting how an ecosystem will respond to new managerial approaches. Adaptive management is also a very interdisciplinary process. (Schwab, 2009)

**Biodiversity** refers to the wide variety of ecosystems and living organisms from all sources including terrestrial, marine and other aquatic ecosystems, their habitats and their genes, and the ecological complexes of which they are part. Biodiversity also refers to the degree of variation of life forms within a given species or ecosystem, and is a measure of the health of ecosystems.

**Biomass**, in ecology, is the mass of living biological organisms in a given area or ecosystem at a given time. As a renewable energy source, biomass refers to biological material from living, or recently living organisms. As an energy source, biomass can either be used directly, or converted into other energy products.

**Botanical family (pl. families)**. A taxonomic group composed of one or more genera. The names of most botanical families end in '-aceae' (e.g., Myrtaceae, Ulmaceae, Plantanaceae etc.), however, there are some exceptions. Groups of similar families are placed in orders.

**Botanical genus (pl. genera)**. A taxonomic group consisting of related species that resemble each other more closely than they resemble other groups. Genus is subordinate to family and ranked above species. The genus name forms the first part of a scientific name (e.g., Eucalyptus leucoxylon) and is written in Latin with the first letter capitalized. Collections of similar genera are grouped into families.

**Botanical species**. A taxonomic group that unites like individuals within the same genus that breed among themselves, produce fertile offspring and are distinguishable from other closely related groups. Species is the basic unit of classification. The scientific name is formed by the genus name followed by the species name (e.g., Eucalyptus leucoxylon) and is always written in lower case. Collections of similar species are grouped into genera.

**Brownfield sites** generally refer to previously developed land that has the potential for being redeveloped – often in terms of redevelopment for housing and commercial buildings, but also as open spaces for recreation, conservation, woodland and other community areas. Specifically, it is often (but not always) land that has been used for industrial and/or commercial purposes that has been abandoned, derelict and possibly contaminated

**A carbon sink** is a natural or artificial reservoir process that accumulates and stores any carbon-containing chemical compound for an indefinite period, thus lowering the amount of carbon dioxide in the atmosphere. Photosynthesis by terrestrial plants is a major natural carbon sink.

**Climate change adaptation** refers to the ability of natural or human systems (i.e. ecosystems or communities) to adjust in response to actual or expected climate change, including climate variability and extremes. It involves a process (or outcome of processes) of anticipating or monitoring change and undertaking actions to address the consequences of that change – such as moderating potential damage, reducing harm or risk of harm, coping with the consequences, and taking advantage of beneficial opportunities (evident or unforeseen) of climate events, variability and climate change.

**Climate change mitigation** refers to human intervention to reduce or ultimately permanently eliminate or reduce the long-term risk and hazards of climate change to life and property. Most often, climate change mitigation scenarios involve reductions in the concentrations of greenhouse gases, either by reducing their sources or by increasing their sinks. While adaptation tackles the effects of climate change, mitigation tackles its causes.

**Ecosystem resilience** is a measure of how much disturbance (such as from storms, fire or pollutants) an ecosystem can handle without shifting into a qualitatively different state. It refers to the capacity of a system to both withstand shocks and to rebuild itself if damaged. In a resilient ecosystem, the process of rebuilding after disturbance promotes renewal and innovation; without resilience, ecosystems become vulnerable to adverse effects and may not only be biologically and economically impoverished, but also irreversible

**Ecosystem services** refer to transformation of natural assets (soil, plants and animals, air and water) into things that we value through natural or enhanced ecological processes; i.e. those organisms and processes which clean our air and water, pollinate plants, filter and recycle nutrients, modify our climate, control floods and improve soil fertility, and enhance the aesthetic and cultural benefits that derive from nature.

**Environmental justice** seeks to protect disadvantaged (e.g. socially and economically) people from unfair environmental impacts. Often closely correlated with community development, participatory environmental projects can help to increase community capacity and build social structure.

**Green infrastructure** describes the network of natural landscape assets which underpin the economic, socio-cultural and environmental functionality of our cities and towns; i.e. the green spaces, water systems and built environment landscapes which intersperse and increase connectivity, multi-functionality and landscape performance in urban environments. Individual components of this network can be referred to as 'green infrastructure assets', and these occur across a range of landscape scales from residential gardens to local parks and housing estates, streetscapes and highway verges, services and communications corridors, waterways and regional recreation areas. Green infrastructure comprises an important innovation in the integrative planning of forests and other green space, and has become frequently used in reference to urban renaissance and green space regeneration. It can be defined as creating networks of multifunctional green spaces that are carefully planned to meet the environmental, social and economic needs of a community.

**Green governance** involves the development of robust processes directed towards achieving the transformation of cities to sustainability through continual improvement, ethical urban responsibility, and strategically planning and working across administrative boundaries and disciplines. It broadly includes visionary leadership, developing innovative strategies, programs and technologies, advocacy for sustainable production and consumption, and balancing local and strategic initiatives. Green governance is committed to participatory leadership and open source management.

**Green wedges** are generally non-urban or peri-urban areas of environmental or scenic sensitivity and strategic locations for uses that require separation from residential, industrial or commercial uses. They may include public land, catchments or agricultural areas that support biodiversity, farming, open space, attractive landscapes, tourism and recreation, and cultural heritage.

**Greenfield sites** are areas of land, often in rural or countryside areas in proximity to towns and cities, that have not been built on before but are being considered for urban development. While these areas usually support agricultural or environmental amenity, as development potential they offer better access, have less congestion, a more pleasant environment, and have more space to expand.

**Grey infrastructure** refers to man-made, constructed assets such as transport infrastructure (e.g. motorways, roads, car parks, railways, bridges, ports/freight terminals, canals, airports, dams), utilities and services distribution (e.g. conventional piped drainage, cables, water and waste management systems, energy generation networks) and commercial infrastructure (e.g. factories and industrial offices).

**Natural capital** is an extension of the traditional economic notion of capital, but represents natural assets such as non-renewable resources (e.g. fossil fuels and mineral deposits), renewable resources (e.g. fish or timber) or ecosystem services (e.g. the generation of fertile soils, pollination, or purification of air and water).

**Nutrient cycling (or ecological recycling)** is the movement and exchange of organic and inorganic matter back into the production of living matter within ecosystems. Ecosystems recycle locally, converting mineral nutrients into the production of biomass, and globally where matter is exchanged and transported through a larger system of inputs and outputs (biogeochemical cycles).

**Productive urban landscapes** make use of urban and peri-urban spaces – including residential properties, green roofs, 'food forests' and community gardens – to provide sustainable, food-producing cityscapes, where food is grown locally and organically within communities and suburbs. 'Food-sensitive urban design' can contribute to resilient, sustainable communities by diversifying food sources and making use of local resources. To make it ultimately viable, the same level of investment put into broadacre agriculture needs to be put into urban production systems.

**Resilience** is the capacity to deal with change and continue to develop. Ecological resilience refers to the capacity of an ecosystem or natural population to resist or recover from major changes in structure and function following natural or human-caused disturbances, without undergoing a shift to a vastly different regime but remain within its natural variability and viability. Social resilience is the ability of human communities to withstand and recover from stresses, such as environmental change or social, economic or political upheaval. Resilience in societies and their life-supporting ecosystems is the key to sustainable development and is crucial in maintaining options for future human development.

**Sequestration** describes the removal of greenhouse gases from the atmosphere, and absorption and long-term storage of carbon dioxide or other forms of carbon, usually by biomass such as trees, soils and crops, or technological measures over a period of time. It has been proposed as a way to slow the atmospheric and marine accumulation of greenhouse gases, which are released by burning fossil fuels, to either mitigate or defer global warming and avoid dangerous climate change.

**Social Capital** is a concept used in various fields, from economics and political science to sociology and natural resources management. Broadly, it refers to social relations and among individuals and the norms and social trust which they generate and which facilitate coordination and cooperation for mutual benefit.

**Social resilience** is the ability of human communities to withstand and recover from stresses, such as environmental change or social, economic or political upheaval. Resilience in societies and their life-supporting ecosystems is crucial in maintaining options for future human development.

**Social-ecological systems** are linked systems of people and nature. The term emphasises that humans must be seen as a part of, not apart from, nature, and has been supported by concepts such as 'human-environment systems','ecosocial systems' and 'socio-ecological systems' to illustrate the interplay between them.

**Sustainable urban development** focuses on creating urban communities where both the current and the needs of future generations are met. It is a pattern of economic growth in which resource use aims to meet human needs while preserving the environment. There are two important principles – resilience and connectivity – that underpin sustainable urban development. There is an additional focus on the responsibility of the present to improve the life of future generations by restoring the previous ecosystem damage and resisting to contribute to further ecosystem damage. In recent times, sustainable development principles have been developed through concepts such as new urbanism, smart growth, low impact development, walkable neighbourhoods, multimodal transport systems, and transport oriented development.

**Urban ecology** describes how ecological models from natural environments are applied to urban areas, including the interactions between organisms and environments, energy and food sources.

**Urban ecosystems** are the product of multidisciplinary development incorporating the natural, physical and social sciences, and consist of various components including: the physical environment (both natural features and built infrastructure), the spatial and social context of urban people, and the biotic community. It is a human-based ecology that recognises the critical aspects of urban systems of governance in sustaining urban quality of life.

**Urban forest** (in addition to definition in Section 2.1). 'The art, science and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic and aesthetic benefits trees provide society'. (Helms, 1998) 'The art, science and technology of managing trees, forests and natural systems in and around cities, suburbs and towns for the health and wellbeing of all people'. (USDA Forest Service). 'The aggregate of all community vegetation and green spaces that provide benefits vital to enriching the quality of life.' (Sustainable Urban Forests Coalition)

**Urban forestry** is a planned and programmatic approach to the development and maintenance of an urban forest, including all elements of green infrastructure within the community, especially when resulting from a community visioning and goal-setting process. (Schwab, 2009). In its broadest sense, it is a multidisciplinary process that takes account of water municipal water catchments, wildlife habitats, outdoor recreation opportunities, design, and care of trees and cultivated landscapes.

**Urban greening** refers to the process of establishing the components of green infrastructure in the urban landscape. From a design perspective it principally refers to plants growing in creative adaptations with built infrastructure.

**Urban sprawl** is a phenomenon that plagues cities in both developing and industrial countries. It is an uncontrolled or unplanned extension of urban areas into the countryside that tends to result in an inefficient and wasteful use of land and its associated natural resources.

**Vulnerability** refers to the propensity and degree of sensitivity of social and ecological systems to suffer from exposure to external stresses and shocks. It is generally regarded as the antithesis of resilience.

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# Urban Forest
# Diversity Guidelines

2011 Tree Species Selection Strategy for the City of Melbourne
















Prepared on behalf of City of Melbourne by ASPECT Studios and Tree Logic.

# Contents

## Executive Summary

The Urban Forest Diversity Guidelines is a subsidiary document to the City of Melbourne Urban Forest Strategy. The guidelines are intended to inform the Tree Precinct Plans that in turn will determine locations for street tree plantings. Park trees will be planted using existing Masterplans and site specific plans.

The urban forest is a significant asset for the City of Melbourne and to protect that asset it is necessary to diversify its content. Urban forest diversity will make a more resilient and robust forest, help protect the forest as a whole from pests and pathogens, streamline maintenance programs, and even out annual budgetary requirements.

Without diversity, the urban forest is at greater risk from extreme events such as drought and climate change, and from the urban heat island effect.

The urban Forest Diversity Guidelines recommend that by 2040 no more than 5 percent of the forest is to be of any single species, no more than 10 percent is to be of any one genus, and no more than 20 percent is to be of any one Family.

The current profile of the urban forest contains an overproportion of the Family *Myrtaceae*, as well as the genus *Eucalyptus*. Regular annual tree planting to 2040 is proposed to reduce this predominance, and to create a forest with greater age spread.

This document also recommends a full review of the City's Elm and Plane Tree populations, to determine best locations to grow these species.

The Urban Forest Diversity Guidelines provide a non-subjective, scientifically based set of criteria for establishing what tree species are suitable for the urban conditions found in the City of Melbourne.

The Master List of Street and Park Trees provides a broad selection of trees that can meet all of the needs of the City in terms of adaptability, heritage and character.

Trees that are suitable for one location may not be suitable to another location. In order to find the right tree for the right place, a typology of street and park tree locations has been developed, with each Location Type accompanied by minimum criteria necessary for successful tree growth in that location.

By crossreferencing The Master List of Street and Park Trees with the Location Types, a set of tree lists for the diverse locations across the City of Melbourne has been established.

These Location Type Tree Lists can be further refined according to additional criteria such as neighbourhood character, heritage, and degree of shade, and it is such site specificity that will be investigated in the Precinct Street Tree Master Plans.

The Urban Forest Diversity Guidelines are considered a live document, for regular review, and capable of being updated as new knowledge and understanding of the City's requirements develops.

## How to use this document

The information in this document is structured to facilitate clear decision making for street tree selection.

### Chapter 1 – Introduction

The introduction outlines the relationship between the Urban Forest Strategy and the Urban Forest Diversity Guidelines.

It also summarises some of the key issues facing the growth of trees in Melbourne both today and in the future.

### Chapter 2 – Tree Species Selection Criteria

This chapter outlines the selection criteria that have been chosen to identify which tree species are most suitable for the City of Melbourne's diverse types of streets and parks.

### Chapter 3 – Tree Planting in Melbourne

This chapter identifies the typical tree growing conditions across the types of street and park environment in Melbourne, with a focus on street trees and streetscapes.

### Chapter 4 – Choosing the Right Tree

This chapter identifies the process for selecting the most appropriate tree species for a particular location.

# 1. Introduction

**This chapter outlines the relationship between the Urban Forest Strategy and the Urban Forest Diversity Guidelines. It also summarises some of the key issues facing the growth of trees in Melbourne both today and in the future.**

## 1.1 Overview

The City of Melbourne's Urban Forest Strategy sets out the blueprint for achieving our vision of a resilient, healthy and diverse urban forest that will contribute to the health and wellbeing of our community and to the creation of a liveable city. A series of challenges currently faces our urban forest, and the City of Melbourne must now manage and transform our urban forest in a holistic and multidisciplinary manner in order to achieve our vision. The challenges we face include the fact that many boulevard and specimen trees are reaching the end of their natural life. Coupled with the effects of drought, increasing intensity of heat during summer, and water restrictions, this decline has been accelerated and in many cases is irreversible. The opportunity now exists to transform our public and private urban forest into a healthy, diverse, resilient and well designed forest that will enable our City to adapt to a changing climate, mitigate urban heat island effects and provide protection and wellbeing to the community.

The work that this opportunity provides will be guided by 6 principles developed to ensure all future work contributes to achieving our vision. These are:

- Adapt to climate change.
- Mitigate urban heat island effects.
- Create a water sensitive city.
- Create healthy ecosystems.
- Design our urban landscapes for community health, wellbeing and liveability.
- Position Melbourne as a leader in urban forestry.

As part of this process, a need has been identified to produce a scientifically based suite of tree species lists that highlight suitable tree species to suit various Location Types in Melbourne. This document will form the basis for ensuring diversity within our urban forest: diversity in species, age and growth rates. The scientifically based approach will ensure that overall tree selection is fit for purpose, within the context of individual sites and also of the municipality as a whole. Building the urban forest as a living ecosystem will rely on smart species selection to deal with issues such as improving biodiversity, improving soil moisture retention, reducing stormwater flows, increasing shade and canopy cover, reducing infrastructure conflicts and ensuring our urban forest provides the maximum benefits for our communities. This work will further inform species selection within all future park masterplans, precinct plans and capital works and renewal programs.

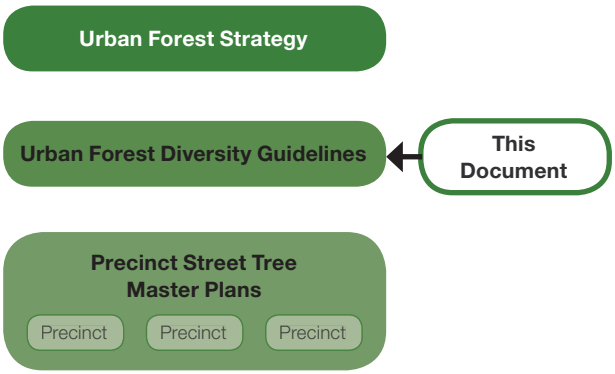



Figure 3: Relationship of this document to the Urban Forest Strategy and Precinct Street Tree Master Plans.

### Objectives of the Urban Forest Diversity Guidelines

- Ensure urban forest diversification in age, species and health across the municipality.
- Provide scientifically based criteria for selecting tree species in urban Melbourne.
- Mitigate risk of pest and disease attacks.
- Develop a typology of City of Melbourne street and park locations and allocate relevant species for each Location Type.
- Ensure that nominated species are likely to survive and succeed in the face of predicted climate change.

### Values of Diversity

To mitigate the risk of economic loss, financial advisors recommend asset diversification. The same principle applies for an environmental asset such as an urban forest. The greater the diversification within a forest, the lower the risk of losing the entire forest in one event, such as a pest and disease attack or an extreme heat event. By diversification we mean a variety of:

- Tree species.
- Ages of trees.
- Growth rates of trees.

By ensuring that these types of diversity are fostered in our urban forest, we are able to reduce overall vulnerability of our tree population.

## History of Species Diversity

Adapted from Carver (1989), Spencer (1986), and Yau (1982).

After the initial settlement of Melbourne, when indigenous bushland was cleared to make way for a burgeoning township, trees were given little priority. In the early days they were seen as a resource to be utilised and little emphasis was given to the beautification of the town.

By the 1850s, Blue Gums were the main planting along the Yarra and St Kilda Rd due to their quick growing nature and their ability to withstand the extremes of Melbourne's cool wet winters and hot dry summers. Avenues of Silky Oak, *Grevillea robusta*, were also planted between the Botanic Gardens and Princes Bridge. Plane trees, American Ash and *Pinus radiata* were all trialled throughout this period as avenues, proving themselves to be hardy specimens for the Melbourne landscape. Conifers also played a large role in forming the larger Victorian landscape around this time, with over 355,000 plants being custom grown at the Botanic Gardens for distribution to Governmental public reserves, schools, cemeteries, and churches throughout the state. Peppercorns were also favoured due to their lush foliage and heritage values.

Interestingly, by the 1870s, through Baron Von Mueller's influence, the gentleman of society – including Municipal Mayors – fully recognised the benefits of street tree plantings in the city and in principal towns. Many of Melbourne's reserves and parks were laid out at this time and many still reflect the preference for Conifers. By the 1880s however, Pines and Blue Gums had lost their popularity and replacement with other species had begun. Blue Gums in Victoria Parade were ringbarked by a local gardener, and many considered both Pines and Blue Gums too gloomy and dense. The Peppercorns also fell out of favour due, their large weeping habit considered inappropriate for successful street trees. The nature of deciduous trees' shading during summer and allowing sunlight in winter was a new way of thinking in urban streetscape design to allow for the comfort of people. This was the beginning of the planting of Elms as shade trees.

By the early twentieth century, Planes, Elms, Oaks, Poplars, *Lagunarias*, Chestnuts and *Phoenix canariensis* were prescribed for the boulevards, streets and parks of Melbourne. For the drier areas north of Melbourne, Kurrajongs, Silky Oaks, Moreton Bay Figs, She-oaks and Golden Wattles were recommended. This period shows a much more diverse range of trees used in the more cultivated areas and highlights the thought that was given to trees environmental benefits and their abilities to withstand the Melbourne climate.

The rapid expansion of Melbourne's suburbs after the First and Second World Wars saw bushland retreat and small scale trees being planted along the streets. Trees such as the Red Flowering Gum, *Pittosporum*, *Lophostemon confertus* and *Prunus* were popular, gracing newer suburbs. Particularly after the Second World War, natives had a resurgence in popularity with more *Eucalypts*, *Melaleucas* and *Callistemons* being introduced into Melbourne as street trees. Plane trees were particularly favoured for the ability to withstand harsh urban conditions such as air pollution and poor soil conditions. Planes replaced the St Kilda Poplars during the 1960s. During the 1980s, there was another wave of indigenous tree species selection and they were encouraged as plantings to promote native ecosystems and attract wildlife. Such trees included *Eucalyptus maculata*, *E. nicholii*, *E. leucoxylon*, *E. sideroxylon* and *E. citriodora*.

Melbourne's climate, hydrology patterns and soil types provide the opportunity for many species of trees, both native and exotic, to grow well. The many types of space within our urban fabric further provide opportunity for various species such as park specimens, smaller fastigiates for narrow laneways and streets, large shade trees for medians, specimens for boulevards and natives for our indigenous landscapes. Compared to the northern hemisphere our history of species diversity amongst our urban forest appears to be relatively short, however various articles certainly highlight the changes in cultural trends, succession of tree species trials, and the recognition of the importance of diversity.

Given the immense value of Melbourne's existing tree population, and the potential vulnerability to the future challenges such as climate change and the urban heat island effect, working towards greater species diversity is a high priority.

## Measures of Diversity

In Melbourne's existing stock of trees, River Red Gums represent 11.7% of our total tree population whilst Plane trees 8% and Elms 4.7%. Frequently cited, though not scientifically based, rules of thumb in the United States suggest:

- Plant no more than 30% of a family.
- Plant no more than 20% of a genus.
- Plant no more than 10% of a species.

These rules predate the rise of concern about impacts of climate change, which is likely to increase the risk of planting urban monocultures. They also omit any consideration given to the use of cultivars and clones. Clones are genetically identical to their mother stock and therefore further increase the risks associated with planting monocultures.

The rules above are therefore best seen as conservative guides only within the City of Melbourne context. The emphasis should be on a diversity greater than that suggested by these rules.

Given the immense value of Melbourne's existing tree population, and its potential vulnerability to such future challenges as climate change and the urban heat island effect, working towards greater species diversity is a high priority.

## Species Diversity

If we cumulate the planes and elms:

Table 1: Top fifteen species within the City of Melbourne

| Species | % |
|---|---|
| *Eucalyptus camaldulensis* | 11.7 |
| *Platanus x acerifolia* | 8 |
| *Ulmus* sp. | 4.7 |
| *Corymbia maculata* | 4.5 |
| *Eucalyptus melliodora* | 3.7 |
| *Allocasuarina verticillata* | 3.4 |
| *Acacia sp.* | 2.9 |
| *Acacia mearnsii* | 2.6 |
| *Ulmus* procera | 2.6 |
| *Corymbia citriodora* | 2.3 |
| *Eucalyptus leucoxylon* | 2.3 |
| *Casuarina glauca* | 2.1 |
| *Melaleuca ericifolia* | 2.1 |
| *Eucalyptus sp.* | 1.9 |
| *Angophora costata* | 1.7 |

## Genus Diversity

Table 2: Top fifteen genera within the City of Melbourne

| Genus | % | Genus | % |
|---|---|---|---|
| *Eucalyptus* | 24.9 | Quercus | 2.6 |
| *Acacia* | 11.3 | Ficus | 2.0 |
| *Platanus* | 9.2 | Angophora | 1.7 |
| *Ulmus* | 9.2 | Callistemon | 1.5 |
| *Corymbia* | 7.1 | Lophostemon | 1.3 |
| *Melaleuca* | 4.0 | Melia | 1.3 |
| *Allocasuarina* | 3.8 | Fraxinus | 1.1 |
| *Casuarina* | 2.9 | | |

## Family Diversity

Table 3: Top fifteen Families within the City of Melbourne

| Family | % | Family | % |
|---|---|---|---|
| *Myrtaceae* | 42.3 | Meliaceae | 1.3 |
| *Mimosaceae* | 11.3 | Pinaceae | 1.2 |
| *Ulmaceae* | 10.3 | Oleaceae | 1.2 |
| *Platanaceae* | 9.2 | Araucariaceae | 1.1 |
| *Casuarinaceae* | 6.8 | Aceraceae | 1.0 |
| *Fagaceae* | 2.6 | Proteaceae | 1.0 |
| *Moraceae* | 2.0 | Anacardiaceae | 0.9 |
| *Rosaceae* | 1.7 | | |

Having a large representation of any one particular family leaves Melbourne's urban forest vulnerable to pest and disease outbreaks that are family specific. The *Myrtaceae* family accounts for forty three per cent of Melbourne's tree base, a proportion which could potentially be devastated if plant pathogens targeting this family, such as Myrtle rust, take hold.

There is a noted high percentage of the genus *Eucalyptus* and the Family *Myrtaceae* within our tree population. This is due in part to the fact that many different species make up this genus and Family, many of which are native to Victoria and also to the fact that these species have proven successful as urban trees. It should be noted that Royal Park, Melbourne's largest park at 170 hectares and maintained primarily as native bushland, houses many of these *Eucalypts* and *Myrtaceae* Family, including a large proportion of our 5,400 *Eucalyptus camaldulensis*. Whilst we note the level of vulnerability amongst the tree population due to these high percentages of one genus and one Family, they form very important indigenous landscapes within our municipality that are healthy, robust and iconic for Melbourne.

## Useful Life Expectancy of Melbourne's Trees

Table 4: Life expectancy of trees within the City of Melbourne
Based on an assessment of 50% of the tree population

| Time Until Senescence | % |
|---|---|
| < 1 year | 3 |
| 1-5 years | 11 |
| 6-10 years | 15 |
| 11-20 years | 18 |
| 21-30 years | 17 |
| 31-60 years | 24 |
| 61+ years | 12 |

Useful Life Expectancy is a year bracket attributed to each tree for which we expect that tree to remain as a healthy robust specimen in the landscape. During the assessment, the age of the tree, and its health, form and growth patterns, are taken into account to determine its life expectancy. From this analysis we can derive that approximately thirty percent of Melbourne's tree population will not survive in the landscape for another 10 years and forty eight percent will not last 20 years.

## Useful Life Expectancy Of Melbourne's Elms

Table 5: Life expectancy of Elm trees within the City of Melbourne

| Time Until Senescence | % |
|---|---|
| < 1 year | 6 |
| 1-5 years | 22 |
| 6-10 years | 26 |
| 11-20 years | 21 |
| 21-30 years | 11 |
| 31-60 years | 10 |
| 61+ years | 4 |

Fifty five percent of Melbourne's Elm population will not remain in the landscape after ten years due to their age.

In a cumulative analysis of our species diversity, Elms make up just over twelve percent of our tree population. Of these Elms, approximately fifty five percent are coming to the end of their natural lives and will senesce in the next 10 years. That means that 3000 elms will need to be removed from our parks and streets within the next 10 years; 700 of these will be lost within one year. However, Elm trees are an essential and iconic component of the diverse future mix of Melbourne's trees.

## Conclusions

It is clear then that the City of Melbourne's current urban forest is vulnerable. Elms and Planes dominate our boulevards and CBD streets and we hold a high percentage of the genus *Eucalyptus* and the *Myrtaceae* Family, all of which contributes to an uneven spread of tree types within our urban forest. This makes our urban forest vulnerable to pest and disease attacks, mass senescence of certain species is likely to occur, and can magnify the deleterious effects of specific weather conditions such as heat waves: and all of which can contribute to large costs in removals and replacements.

As a result the City of Melbourne proposes to implement the following benchmarks to reduce vulnerability:

Species:

By 2040 the urban forest will be composed of:

- No more than 5% of any one Species.
- No more than 10% of any one Genus.
- No more than 20% of any one Family.

Age and growth rates:

- Diversity of tree age and growth rates will be encouraged through regular plantings each year to 2040. These regular plantings are to be much greater than the numbers of trees removed each year.

Health:

- No more than 10% of our tree population will be in poor health by 2040.

Whilst this analysis looks at the City's urban forest as a whole and sets strategic targets for managing vulnerability, the implementation of diversity actions at street and park level must reflect the larger vision.

The concept of reducing the percentage of the *Myrtaceae* Family from forty three percent to twenty percent of the entire population may seem drastic, but it is a long term benchmark that spans the life of a tree, not that of an electoral cycle. By increasing street and park tree plantings each year, the City of Melbourne intends to increase the overall population of trees incrementally over a number of years, whilst ensuring that the *Myrtaceae* Family dominate the total percentage less and less each year.

Therefore, operational plans, such as the precinct planting plans will be reviewed and developed to bridge the gap between strategic targets and day to day management of tree removal and planting. These precinct plans, along with supporting research papers and landscape implementation plans, will help us to determine how to best replace declining trees and increase street and park plantings within our targets that all align with the broader Urban Forest Strategy principles.

## Key Outcomes from this Report

- A full review will be conducted of Melbourne's Elm and Plane populations, determining best locations within the city to grow each species, with each species comprising no more than 5% of the total tree population. An historical and character review of each of our prominent Boulevards should also be conducted to ensure we maintain their integrity and identity through specimen plantings.
- Over time and through increased planting regimes, the percentage of *Myrtaceae* will be required to be gradually reduced to encompass no more than twenty percent of Melbourne's total tree population.
- Regular tree planting each planting season until 2040 will ensure the number of mature trees within the overall population is reduced to a more even spread of ages.
- The review of each Council Tree Precinct Plan in conjunction with overall targets will determine the spread of species, genus and Family down to individual streets and parks. These precinct plans will also highlight opportunities for increased plantings.

## 1.2 Project Process

### The Development of the Urban Forest Diversity Guidelines to Date

Project consultants ASPECT Studios and Tree Logic developed a tree list of potential future-proof street and park trees. The Preliminary Tree Selection List needed to provide a diverse range of species options that work alongside the principles set out in the City of Melbourne's Urban Forestry Strategy.

There was no use of subjective criteria such as personal taste, aesthetic and cultural values, perceptions, design requirements or any site based constraint, in the development of the initial tree selection list.

The Preliminary Tree Selection List was large, informed by Tree Logic's experience as one of Victoria's leading arboricultural companies.

An internal committee at the City of Melbourne contributed information including success rates of tree species growing within the existing urban forest.

The extensive Preliminary Tree Selection List was reduced to make it more workable and enable critical evaluation of suitable species.

Species that did not meet the urban forestry criteria, for instance drought tolerance, heat tolerance, wind tolerance or susceptibility to pathogens, were removed.


Figure 4: Process and outcomes in developing the tree selection process for the Urban Forest Diversity Guidelines.

## 1.3 Status of document

### A 'live' document

This document is envisaged as a live document with the ability to be updated as more data and information becomes available.

It is a requirement that this document be interactive and flexible for the user. Street tree management and urban forestry is a concept that is quickly developing, both from practical experience and scientific research. As a consequence the limitations of the tree selection process are carefully considered. The document will be updated as information, data and research become available.

Following are some examples:

- Potential tree pathogens may affect a particular selected species. If this is unmanageable then the tree species will be taken off the list. Similarly new cultivars and selections that are more disease resistant may be added.
- Species with reduced litter drop may be included at a later time.
- Climate change results in further extremes in weather and the status and suitability of species needs to be updated.
- Reassessment of on-site conditions such as greater incorporation of 'positive' planting innovations including structural soil beneath porous paving, infiltration, pits, and WSUD basins, may lead to species additions.

### Formal review

A formal review will take place every five years. The next review should analyse the following aspects:

- Diversity Guidelines objectives: including how diversity targets are distributed amongst the Precinct Planting Design Plans and the distribution of percentage based targets.
- The Diversity Guideline's relationship to the Urban Forest Strategy and other City of Melbourne policies.
- The ten base criteria used to establish suitability to urban conditions. These criteria are not fixed.

In addition, changing community perceptions can be incorporated, including any community consultation outcomes.

## 1.4 Overview of Urban Forest Diversity Issues within the City of Melbourne

There are a number of issues confronting diversity of tree species in Melbourne. These issues have directly informed the selection criteria by which the preferred tree species have been identified. Species age, health and growth rates are key issues.

### Species Diversity

Tree diversity within an urban forest landscape provides functional and aesthetic benefits as well as biological and ecological advantages. “A common tenet of popular ecology is that high species diversity contributes to the stability of ecosystems by reducing hazards of catastrophic loss of a particular species” (Richards, 1983). However, there is much evidence from plant ecological studies that relationships between diversity and stability cannot be as simply expressed as this premise suggests.

Whilst street tree species do not occur in monocultures to the same extent as agricultural crops or forest plantations, the presence of grand boulevards, and neighbourhood heritage and character can mean that urban areas are dominated by relatively few species. Whilst these species have proven adaptable to changing urban environs there is an inherent risk in planting few species throughout a city.

Miller and Miller (1991) recommend that “liberal use” of a species should not exceed 10% of the total tree population. Jaenson et. al. (1992) suggest that city foresters should use species percentages derived from rapid, sample surveys to “reassess their recommended species lists to achieve a 5%-10% ceiling on any one tree species”. Whilst these simple numerical limits have no scientific basis they form a well used rule of thumb for essentially not putting all of your eggs in one basket.

As discussed, the 10% rule may appear to be outdated when considering the enormity of climate change issues and the increased use of clones and cultivars.

The following factors will dictate species diversity:

- Existing landscape character.
- Proven adaptability and tolerances of species.
- Availability.
- Ability to fulfil functional requirements.

In street tree populations, stability depends primarily on the longevity of individual trees and sufficient numbers of successfully planted replacements.

### Age Diversity

Good age diversity is essential for future population stability. Most importantly, species that have been proven to be adapted should be stabilised through ensuring the population of that species has a good age range. When replacing older trees, this is more important than encouraging species diversity. As Richards (1983) states, to do otherwise “is a misuse of ecological concepts. Species diversity contributes to the stability of a street tree population only to the extent that individual species or cultivars prove successful”.

On an economic level, diversity of age means that maintaining the urban forest becomes a more evenly paced process. Extremes – for instance those associated with sudden mass senescence – are minimised, allowing for budgets to be more easily managed and regulated.

### Size Matters

A strategically located large-stature tree has a bigger impact on conserving energy and mitigating the urban heat island effect than a corresponding quantity of smaller trees. Larger trees do more to:

- Reduce stormwater run off.
- Extend the life of street surfaces.
- Improve local air, soil and water quality.
- Reduce atmospheric carbon dioxide.
- Provide wildlife habitat.
- Increase property values.
- Enhance the attractiveness of an area.
- Promote human health and well being.

The bigger the tree, the larger the benefits and, ultimately, the better the community’s quality of life.

## Planting Sites

Species diversity may be constrained by the range and availability of planting sites. In particular, the number and type of planting sites that allow plantings to attain larger sizes needs to be addressed.

An optimal planting site allows space for uninhibited root growth (in volume, surface area and shape of surface area), provides uncompacted soil, good solar access, sufficient space away from adjacent structures such as walls and from vehicular traffic, and is not limited by overhead conditions (e.g. power lines).

New planting sites can be developed within established avenues and landscapes to allow the planting of species different to the established species. In addition to increasing species diversity, such plantings may provide a highlight (for instance at roundabouts, medians, or in kerb outstands), or additional aesthetic value.

Above and below ground restrictions mean there will always be sites in the City of Melbourne that require the use of small stature trees.

## Genetic Diversity and the Use of Cultivars

Plant breeding is the science of adapting the genetics of plants for the benefit of humankind and has been in practice since the beginning of civilisation. The overall aim of plant breeding is to improve the quality and performance of plants with the objective, in this case, of developing trees better adapted to the urban environment and ultimately for the benefit of the community.

The London Plane (*Platanus* x *acerifolia*) and Dutch Elm (*Ulmus* x *hollandica*) growing in Melbourne are cloned populations, so the concept of plant breeding it is not a new occurrence to Melbourne's streets.

Genetic diversity means a population is comprised of a broad range of individuals expressing different characteristics.

Genetic diversity is important because:

- Through artificial selection for specific characteristics, for instance quick growth, we may unintentionally select against other desirable characteristics, for example disease resistance. Wild populations provide a gene bank that can reinvigorate and strengthen domesticated populations.
- Ecosystem diversity requires species diversity.
- Adaptability can only occur in diverse populations and ecosystems. Diversity is essential for survival. Diversity is the basis for a robust and resilient population.
- Local wild populations are more likely to be adapted to local conditions than populations from elsewhere.

The maintenance of wild relatives of domesticated species is essential to plant breeding and sustainable agriculture and horticulture.

Cultivars – specially bred and domesticated varieties of wild populations – are bred because they possess desirable characteristics. While this can be good, in doing so we reduce the overall population's genetic diversity, leaving it less adaptable in the longer term.

Cultivars developed and grown in areas where the local conditions are different to those of the City of Melbourne must be regarded as unproven until they have been adequately tested under local site and cultural conditions.

Cloning is an extreme example of cultivation. Cloned populations have in the past been encouraged by some because the individuals "all look the same", hence present more neatly, are all guaranteed to have the same characteristics of disease resistance and so on. Cloned populations however, because their genetic diversity is nil, are more at risk, and minimise the adaptability and survivability of the urban forest.

A balance needs to be maintained between the use of cultivars (and clones) and stock grown from wild populations of local provenance.

## Climate Change

Climate change requires consideration in the tree selection process. Climate model projections for the coming decades indicate an increasing risk of below average rainfall for southern and eastern mainland Australia, higher temperatures and evaporation, and below average runoff. In particular there is a significant projected increase in frequency of extremely hot years and extremely dry years (CSIRO, 2010). The selection of species more suited to extended dry periods and high heat will be beneficial. Other stresses caused by warming will include more pests, pathogens and fires.

In urban environments reducing the effects of climate change, for example the heat island effect, can be achieved by planting more trees. Not only do trees supply shade, reducing ground temperatures, but also trees evapotranspire – that is they release water into the air – which not only reduces urban temperatures but also improves the quality of the microclimate. Water needs to be retained in the landscape in order for evapotranspiration to occur and for the benefits of the urban forest to be maximised. Incorporating water sensitive urban design initiatives is another strategy that can be incorporated into tree planting systems.

## Native and Exotic Species

Urban areas are highly contrived and very little of the original landscape – including soil and water conditions – remains. Just because a plant is indigenous to a site does not necessarily mean that the current site conditions are optimal for its growth. Urban soils and other conditions are often very different to the conditions in which both indigenous and exotic trees are found in the wild.

The focus should be on tree species adapted to a site and with acceptable characteristics relative to the desired purpose.

Non-local Australian species, and exotic species, can make positive contributions to the landscape. In some cases, these species are better adapted to the conditions of the highly modified urban environment. They may have positive attributes and are able to fulfil specific landscape functions.

The planting of the wrong choice of species, and planting in inappropriate locations, is an indication of poor planning rather than poor tree selection. In many instances the requirements set out by policy or the brief prevent the selection of suitable site-tolerant species.

Much of the character of the City of Melbourne is created by the presence of iconic exotic trees.

Remnant, indigenous and native vegetation has an important role to play in urban landscapes. It should be noted, however, that the maturity of existing vegetation is impossible to replace and the diversity of natural plant communities is difficult to replicate. Preservation of existing natural and remnant vegetation is the most efficient way to incorporate biodiversity in urban landscapes.

The use of indigenous tree species in streets will have greater impact and benefit when used adjacent to open space that has significant remnant vegetation.

## Vulnerability to Pathogens and Pests

Pest and diseases are a component of the urban landscape and the City of Melbourne recognises that control measures will be required at times to maintain healthy and aesthetically pleasing landscapes.

The City of Melbourne will focus on problem prevention through appropriate tree selection, planting and tree maintenance.

When selecting tree species for Melbourne's streets all effort will be made to select species that are known to be pest and disease resistant.

We do not know, however, the extent of pest and disease resistance in many tree species, especially within the urban environment.

Moreover, there will be situations where the existing street tree species may be under threat but their ongoing use is imperative considering the strong landscape character or cultural importance they represent.

It is not possible to select a palette of tree species for urban streets that are immune from potential infestation from pathogens, particularly when some potential threats could impact on entire plant families such as *Myrtaceae* (*Eucalyptus* spp., *Corymbia* spp., *Callistemon* spp., *Melalueca* spp., *Tristaniopsis* spp., and *Lophostemon confertus*).

A number of approaches will help minimise the impact of pests and disease on the urban forest, for instance: constant monitoring of the urban forest and including the involvement of the Department of Primary Industries in that monitoring, ensuring the general health and vitality of urban forest, providing greater diversity, building a database of pest and disease, making sure of hygiene controls during maintenance, and ensuring good communication and working links with bordering councils.

Table 7: Existing pathogens and pests affecting trees within the City of Melbourne

| Pathogen | Species Affected | Comment |
|---|---|---|
| *Armillaria luteobubalina* | A soil-borne fungus that causes root rot in a wide variety of plants including many native plants and introduced ornamental plants. | At present there is no one simple method for controlling *Armillaria*. A combination of sanitation measures, good horticultural management and the addition of organic matter to soils can be expected to retard the activity of *Armillaria*. |
| Brushtail Possums | A range of native and exotic tree species. | Possums, flying foxes and other native animals are protected species under the *Wildlife Act 1975*. A possum management strategy will be developed to manage the possum population on the particular site. |
| Elm Leaf Beetle (*Pyrrhalta luteola, Xanthogaleruca luteola* (Müller, 1766)) | Most species of *Ulmus*, also *Zelkova serrata*. Chinese Elm (*U. parvifolia*) is relatively resistant. | A range of management options are utilised in the control of Elm Leaf Beetle. |
| Elm Bark Beetle (*Scolytus multistriatus*) | *Ulmus* spp. particularly English Elm (*U. procera*) and Wych Elm (*U. glabra*). | The Elm Bark Beetle causes no serious damage to elms. However, it is the carrier of Dutch Elm Disease. |
| Exotic nematodes (microscopic worm like organisms, or eelworms), belonging to the *Aphelenchoididae* Family of nematodes such as *Bursaphelenchus hunanensis* | Pine trees. An infestation by a pathogenic *Aphelenchoididae* species may result in a rapid decline in tree health, with the needles turning yellow to brown and the twigs becoming dry and brittle. Symptoms first appear in late spring/early summer. Dead pines killed by the nematode tend to retain their needles for six to twelve months. | The only available control is removal of the tree and either burning the wood or deep burial well away from other trees, to kill the nematode and any potential vectors.<br>Not known to be an ongoing threat to pines in Victoria. |
| Fusarium Wilt (*Fusarium oxysporum* f.sp. *canariensis*) | *Phoenix* spp., *Washingtonia filifera*. | Management is dependent upon rapid and accurate diagnosis. Once correctly diagnosed appropriate management can be implemented. |
| Fig Psyllid (*Mycopsylla fici*) | Periodic defoliation of Moreton Bay Fig trees (*Ficus macrophylla*). | Council will continue to support Fig Psyllid research. |
| *Phytophthora cinnamomi* | Causes root rot of a wide variety of plant species including many native plants and introduced plants. | Implement model of national best practice guidelines for management (http://www.environment.gov.au/biodiversity/invasive/publications/p-cinnamomi.html). |
| Psyllid (*Cardiaspina* spp.) | *Cardiaspina* cause the most damage to eucalypt foliage, especially to *Eucalyptus camaldulensis*. | Outbreaks occur periodically. Most native species of psyllids require no management; even when psyllid populations are abundant, plants can tolerate substantial feeding and psyllid populations will decline naturally. Develop integrated program for badly infested trees; monitor, cultural and chemical (imidacloprid stem or soil inject). |

Table 8: Potential pathogens and pests that may affect trees within the City of Melbourne

| Pathogen | Species Affected | Comment |
|---|---|---|
| Dutch Elm Disease (*Ophiostoma ulmi (Buism.)* Nannf., *Ophiostoma novo-ulmi*) | *Ulmus* spp., Asian elms more resistant. | Australia does not have Dutch Elm Disease (DED), however Elm population needs to be constantly monitored for this disease. The Australian government-backed, DED Contingency Plan should be implemented if DED is ever discovered in Australia. |
| Eucalyptus rust or guava rust (*Puccina psidii*) | A very wide host range in the plant family *Myrtaceae*. The disease is particularly severe on susceptible eucalypt seedlings, cuttings, young trees, coppiced or damaged mature trees. | Highly susceptible trees may be grossly malformed or even killed. Growth rates of infected trees are diminished.<br>It is currently not present in Australia. |
| Fire Blight (*Erwinia amylovora*) | Causes disease mostly on plants belonging to the *Maloideae* (e.g. apple, pear, cotoneaster, hawthorn, quince and loquat). | Draft Contingency Plan for Fire Blight 1996: the diagnostic protocol is considered to represent best practice for the isolation and identification of *Erwinia amylovora*. Disease present in New Zealand. |
| Myrtle rust (*Uredo rangelii*) | A very wide host range in the plant family *Myrtaceae*. Myrtle rust produces lesions on young, actively growing leaves and shoots as well as on fruits and sepals. Leaves may become buckled or twisted as a result of infection. | Closely related to Eucalyptus rust.<br>Myrtle rust typically attacks young plants and new growth on established plants. Can be controlled in commercial operations with the use of fungicides. |

## Tree Maintenance

Sustainable urban forests require human intervention in order to regenerate and maintain them in a safe and aesthetically pleasing manner. The City of Melbourne maintains trees on Council managed land to fulfil its legislative and management obligations to residents and visitors to the area. The key to maintaining and enhancing the urban forest is ensuring quality tree maintenance. Maintenance work performed on Melbourne's trees aims to manage tree health and enhance the quality of the treed landscape across the city as well as reducing the inherent risks associated with trees in an urban area.

Council undertakes routine maintenance on publicly managed trees to:

- Reduce the risk to public safety.
- Decrease potential damage to property.
- Provide adequate clearances for pedestrians, vehicles, private property and sight lines.
- Provide clearances around services and utility lines.
- Manage tree health.
- To formatively shape young trees.

Regular maintenance also includes activities such as monitoring soil moisture, mulching, decompacting soils, upgrading irrigation and making health assessments.

Maintenance work on trees will also occur in response to unexpected events or emergencies, such as tree or branch failure resulting from severe storms.

Certain trees within the municipality may require specialist maintenance work. Palms also require specific maintenance works and some trees may require specialised tree surgery works.

Australian Standards and known best practice relating to tree management will be implemented and any operation known to be detrimental to long-term tree health is not appropriate.

Tree selection will consider a tree's ability to be pruned in order to meet the above ground site constraints presented by the tree's location. Tree selection will endeavour to utilise tree size and form (shape of the canopy) in order to reduce maintenance requirements.

## Tree Litter

All trees will shed litter – leaves, bark, flowers, fruit – at some time during a given growing season. Tree selection will aim to avoid the use of trees that drop excessive litter, particularly fruit, which can cause trip hazards.

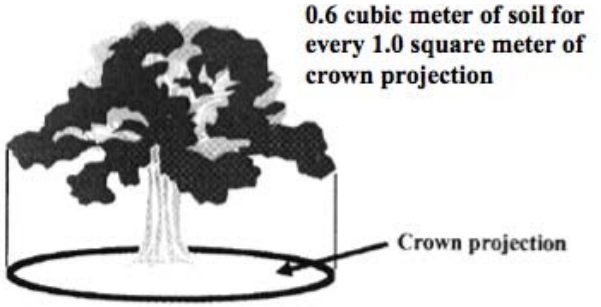



Figure 6: How much soil does a tree need? Diagram adapted from Grabosky, Bassuk & Towbridge (2002).

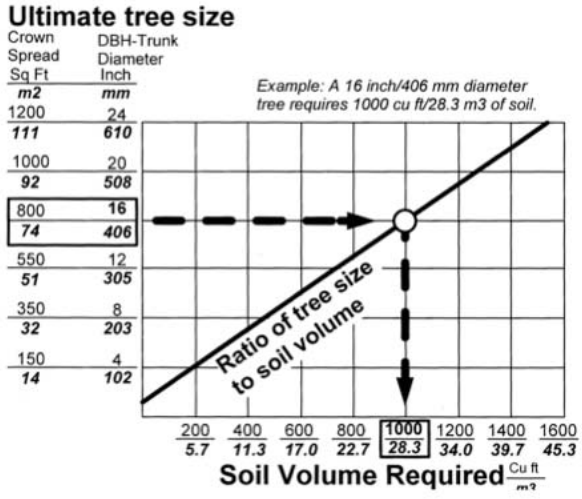



Figure 5: Soil volume and ultimate tree size relationships (Urban, 2008).

## Containerisation and Tree Vaults

Containerisation is the practice of growing trees within structures that limit tree root growth to within a constrained volume of soil. It is not horticultural best practice to have street trees in containers and within vaults. This type of planting is not encouraged as it does not allow for long-term and sustainable street tree performance. The limited soil volumes will require either early replacement of trees when they have 'exhausted' their limited resources or intensive maintenance, such as root pruning and soil treatment. Trees in vaults and containers are heavily reliant on supplementary irrigation and effective drainage.

There are instances in the public domain where planting over structures is unavoidable. In these instances containerisation and vaults are unavoidable to allow street tree planting. In these instances maximizing soil volume is imperative. This soil volume needs to be provided in a 'plate' volume not as depth. This is to enable healthy root growth and adequate gaseous exchange. In these scenarios a tree's soil volume may need to be a combination of below and above grade. This can provide urban design opportunities, for example using the raised edge of a container as a strong seating edge. In such instances, it will also be necessary for City of Melbourne's arborists to advise on tree species selection, planting methodology and ongoing maintenance regimes.

Successful urban tree planting depends on the consideration of many features including species selection, site constraints, planting procedure, and post-planting maintenance. One essential site component directly affecting tree growth and performance is open soil area and soil volumes. If trees are expected to continue to maintain high levels of health and vigour (growth performance) post-planting they need to be able to access large volumes of soil as they continue to grow and their need for resources increases.

A plant grown in a container has limited root growth due to the volume of available soil. Crown growth will slow as a result, but not necessarily stop (Watson & Himelick, 1997). The same principal applies to trees planted in urban sites. Trees that have limited root space develop smaller root systems in proportion to canopy growth. This results in water stress that can subsequently predispose the tree to secondary pest and disease problems (Watson & Himelick, 1997).

Soil type, and irrigation are equally important considerations for successful containerisation.

See Appendix 6.

## Water

Water stress affects most of the physiological processes involved in plant growth. As well as physical space, air and nutrient availability, a tree's moisture requirements need to be addressed in order to allow it to realise its full potential.

Strategies to maximise plant water availability include:

- Water Sensitive Urban Design (WSUD) initiatives, such as storm water harvest systems.
- Porous and permeable pavements.
- Bioretention basins (smaller areas like kerb outstands) and swales (for larger areas such as centre medians).
- Tree selection focussed on species that can tolerate extended dry periods and exposure to heat and wind.
- Supplementary irrigation systems.

In order to establish and successfully manage a tree in the urban landscape, it is important to have an appreciation of both the peak daily demand and the total amount of water required by the tree (Connellan, 2008). Any applied irrigation must be based on a planned approach with defined landscape outcomes.

## Character, Community Values and Urban Design

The City of Melbourne has a long tradition of successful urban street and park characteristics that are highly valued and identifiable by the community.

This character includes the substantial avenues of Elms in Royal Parade, for example, heritage-style plantings within parks such as the Carlton Gardens, and the indigenous woodland of Royal Park.

The developed Master List of Street and Park Trees provides the substantial diversity of trees, and enough scope, to support the objectives of these valued "character streets and parks".

In developing selection criteria for street trees and the main avenue trees in parks, intelligent consideration must be given to both horticultural issues and urban character. While this report is limited to identifying the most appropriate tree species for Melbourne, the final choice of tree species is highly dependant on the existing and desired streetscape or park character and existing heritage controls.

The Precinct Street Tree Master Plans will be the primary documents through which this local character will be explored and balanced with the urban forest diversity needs of the City of Melbourne.

## Strategies and Technologies for Improving Tree Growth

There are a number of strategies and technologies that are being investigated by land managers around the globe to improve the performance of urban trees. Some significant approaches are outlined in the table below.

This document has not sought to consider the effect of new tree planting technologies on the appropriate selection of the City's trees. The City of Melbourne's urban forestry principles do not rely on improvements in planting technologies as a determinant of street tree performance. It is however expected that such technologies will only improve and build upon existing street tree performance.

Table 6: Strategies and technologies for improving tree growth

| Objective | Technology |
|---|---|
| Increasing useable soil root volumes to maximise tree growth. | Street kerb extensions and blisters. Use of structural soil tree pits. |
| Increase opportunities for gaseous exchange of water and oxygen to maximise tree growth. | Use of porous or permeable pavements over structural soil. |
| Reduce conflicts between tree growth and providing free pedestrian access. | Use of porous or permeable pavements over structural soil. |
| Enable opportunities for passive irrigation in the street from stormwater drainage. | Use of tree pit kerb inlets. |

### Other Tree Planting Technologies

- Genetic selection, manipulation and tissue culture.
- Cultural treatments.
- Retrofitted growing systems.
- Structural soils and the use of structural cells.
- Planting site preparation.

## Formal Street Tree Trials

Formal street tree trials enable new tree species to be tested and reduce the risk of trees planted within streetscapes failing. There has been little increase in the diversity of street tree species trialing since the formative street tree planting that gained traction with Clement Hodgkinson in the 1860s and with others in the early twentieth century. With the decline in the overall urban forest population and the onset of climate induced challenges, the selection of vigorous new species from around the world is urgent. Factors to consider in such evaluations should include:

- The evaluation of 'trial' trees after growing in street conditions. Can they be upgraded or downgraded? Growing of trial trees can be carried out in conjunction with university research.
- The reason for trees either succeeding or failing can be carefully monitored and recorded to eliminate anecdotal or subjective information. While interactive web pages such as TREENET and AUSTEP can be useful, their inputs cannot be qualified easily.

Trialling will be conducted in small and industrial streets to minimise impacts of any unsuccessful trials.

A Master List of Trial Trees is provided in Appendix 7.

# 2. Tree Species Selection Criteria

**This chapter outlines the selection criteria that have been chosen to identify which tree species are most suitable for the City of Melbourne's diverse types of streets and parks.**

## 2.1 There is No Perfect Tree

Selection criteria was developed to provide a quantitative and qualitative basis for the Master List of Street and Park Trees for the City of Melbourne.

It should be noted that the City of Melbourne has many constraints on, and requirements of, its trees. No one tree can manage these constraints and meet all of these requirements in a perfect way.

There is no one perfect urban tree.

It is also important to understand that there is no one type of urban environment. The urban environment is a varied conglomeration of microclimates and heterogeneous soil conditions. Above ground or below ground site conditions can change dramatically within the space of a few metres.

Consequently, a site analysis of each planting site will aid appropriate tree selection.

Climate change and increases in temperatures will also require consideration when selecting tree species.

The most successful strategy is to match the planting site limitations with the right tree for that site.

Appropriate site assessment and tree selection can have the following benefits:

- Minimised conflict between tree roots and adjacent infrastructure and buildings.
- Reduced incidence of pest and disease outbreaks. This can be achieved through selecting resistant varieties of trees and increasing species diversity through the City.
- Increased plant performance.
- Improved drought survival.
- Increased tree longevity so that tree benefits exceed costs. The benefit of an urban tree is directly proportional to its crown size or volume and longevity in the landscape.
- Reduced maintenance costs, particularly pruning. Pruning requirements can be reduced by selecting smaller trees under powerlines or narrow canopy form for main roads.
- Increased attractiveness of streetscapes, reinforcing the pervading landscape and architectural character.
- Reduced environmental demand – trees that have tolerance of drought and generally do not require additional resource inputs, such as irrigation or fertiliser, in order to perform satisfactorily.

Tree selection will take into account relative plant tolerances and adaptability, and integration into surrounding planting themes.

The basic issues regarding tree selection can be summarised as follows:

- Biological requirements relate to a tree's ability to tolerate urban conditions. The species selected should have high tolerance levels that will allow establishment and sustained growth while producing desired benefits with low management inputs. Biological requirements also relate to available root space to sustain the potential tree size.
- Ecological issues include tree diversity, maintaining and enhancing existing significant areas of native and remnant indigenous vegetation, selecting plants that do not have the potential to become woody weeds that impact on natural systems.
- Functional and spatial issues include the trees' ability to be pruned to provide required clearances, the trees root system and the degree of its impact on adjacent infrastructure, and above ground and below ground restrictions.
- Aesthetic issues consider the ability for trees to enhance the visual or other sensory (for example, olfactory) amenity of a streetscape or area.
- Tree longevity: the longer a tree is allowed to grow in a site the greater the benefits to the landscape and return on initial investment.
- Availability: selected trees will need to be commercially available in the desired numbers and size for planting programs.
- Litter drop: leaves, flowers, fruit and bark can cause maintenance issues and trip hazards.
- Structural integrity: stock should be known to have received appropriate formative treatment whilst in the production nursery.

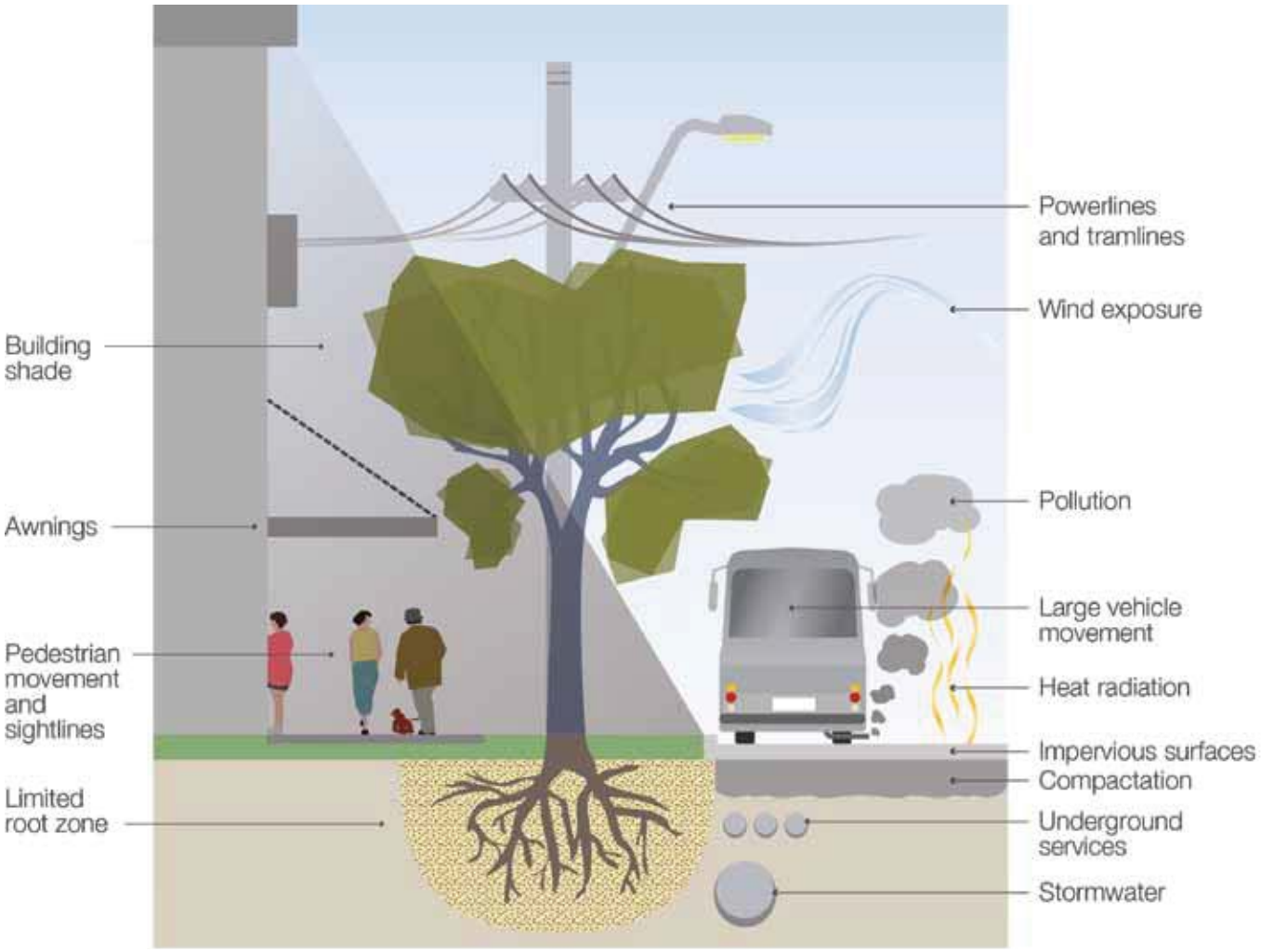



Figure 7: There is no perfect tree. The many constraints a tree must contend with to grow in inner Melbourne.

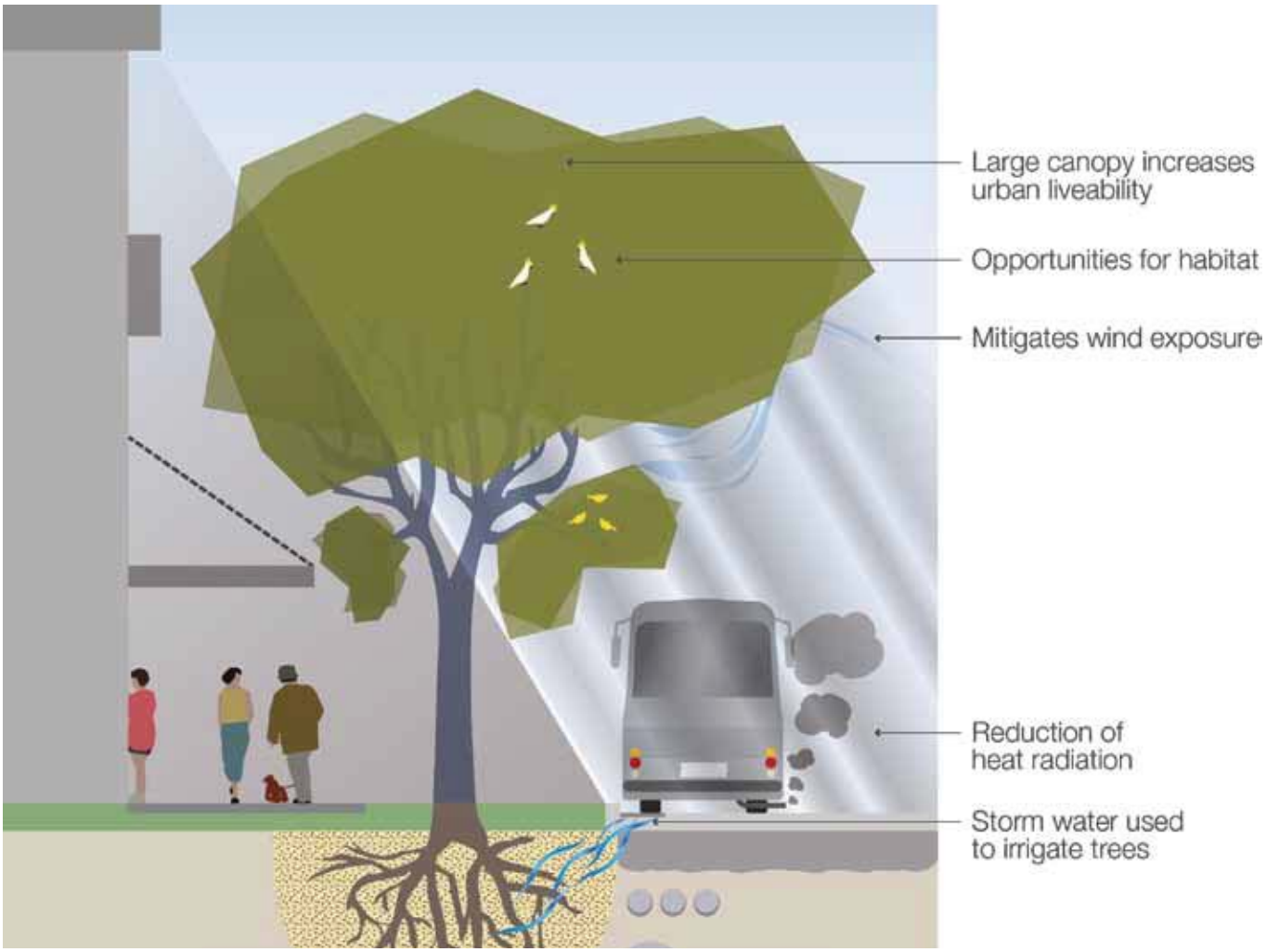



Figure 8: Tree opportunities. The preferred growing conditions and benefits of large canopy street trees.

## 2.2 Overview of Selection Criteria

The base selection criteria for determining the suitability of a street tree in Melbourne's urban environment and changing climatic conditions are those that affect its ability to adapt to urban conditions.

A broad range of species from varied habitats have been tested against these base selection criteria to ensure the best possible outcome given specific individual site outcomes and constraints.

### Ten base selection criteria for adaptability to urban conditions

Ten base selection criteria for adaptability to urban conditions have been identified. They reflect the species' ability to respond to drought, heat, wind and pollution the species' lifespan, pathogen and pest susceptibility and manageability, affect on community health and allergies, the degree and quality of shade cast, maintenance requirements and extent of tree litter produced.

These 10 criteria that affect a species' adaptability to urban conditions are discussed more fully in the following pages.

As an aid to decision making, each species is given an overall numerical score from 1 to 50. This score is derived by assigning a value of 1 (low) to 5 (high) for each of the 10 base criteria.

While there is no such thing as the 'perfect street tree', a score of 50 points represents a highly adaptable and useful species.

The ten criteria were selected after lengthy discussion and review. The number of criteria was not selected as a neat '10'. Further review (in 5 years, or sooner if required) may conclude that the number and nature of these criteria can change. The higher the number of criteria the more accurate the scoring.

The ten identified base criteria are strictly performance or adaptability based.

Species that did not rank well against the ten base selection criteria were removed from the Master List of Street and Park Trees – the list of trees adaptable to urban conditions.

The Master List of Street and Park Trees includes all species that ranked well for being adaptable to urban conditions.

The highest scoring tree for urban adaptability is the Kurrajong (*Brachychiton populneus*).

As a street tree the Kurrajong may not be to everyone's aesthetic tastes or provide the streetscape amenity that other lesser scoring trees can provide.

Moreover, it may not be suitable for many specific locations within the City of Melbourne – for instance in a shady laneway.

Additional criteria are needed to choose a street tree.

### Additional criteria

These criteria guide selection of the 'right tree for the right place'. They consider a trees suitability for being grown beneath power lines, in building shade, being pruned to allow vehicular and pedestrian movement, adaptability to waterlogged soils, and tolerance of soil compaction.

These additional criteria are discussed more fully in the following pages.

### Location Types

This strategy identifies 13 street location types and 2 park location types within the City of Melbourne.

Each of the 15 Location Types is associated with a set of minimum conditions necessary for the success of a street tree in that environment. Species can be rated for their suitability against each of the 15 Location Types. Tree lists for each of the 15 Location Types can thus be generated.

These species lists for each Location Type can be used by Council in precinct plan applications in which further considerations are then overlaid on this these general and more specific species selection criteria.

The City of Melbourne Street and Park Location Types are discussed more fully in Section 3.

### Non-rated Criteria

Additional considerations that may be used to further refine the selection of a street tree include, for example, heritage, biodiversity goals, microclimate goals, aesthetics and character. This strategy does not rate tree species against these criteria.

### Park Trees

While most street trees can be grown in parks, the reverse is not always possible. Park trees include species that require greater root volumes than those generally achievable in the streetscape environment, and species of large size.

The list of park trees considered adaptable to urban conditions is different to the list of street trees considered adaptable to urban conditions. Not all of the ten base criteria for adaptability to urban conditions have been applied to determine an appropriate Master List of Park Trees. The criteria for selection do not include pollution tolerance, potential as allergen, and tree litter.

Park trees are generally larger tree species and cultivars suitable for planting in larger open spaces with reduced above and below ground constraints. Trees are generally able to develop natural form.

## 2.3 The Ten Base Selection Criteria Affecting Adaptability to Urban Conditions

Adaptability to urban conditions is a culmination of various plant tolerances that make a particular species or cultivar more or less suited to planting in urban landscapes, and here specifically the urban landscape of the City of Melbourne.

Each species' adaptability to urban conditions was given an overall numerical score from 1 to 50. This score was derived by assigning a value of 1 (low) to 5 (high) for each of the 10 base criteria.

**The ten base criteria are:**

- **Drought tolerance**
- **Heat tolerance**
- **Wind tolerance**
- **Longetivity**
- **Pollution tolerance**
- **Pathogen and pest susceptibility and manageability**
- **Potential as allergen**
- **Shade cast**
- **Maintenance required**
- **Tree litter**

*Anthracnose* infected leaf.

Possum grazing.

### Drought Tolerance

Drought tolerance is defined as the ability of a species to withstand extended dry periods. Generally plants that require less water (once they are established) are drought tolerant because they are adapted to regions with frequent drought or to soils with low water-holding capacity.

**Value rating:**
1 = not tolerant of extended dry periods.
5 = Highly tolerant of extended dry periods

### Heat Tolerance

Heat stress can be defined as the rise in temperature beyond a threshold level for a period of time sufficient to cause irreversible damage to plant growth and development. Transitory or constantly high temperatures cause an array of changes to plant growth.

**Value rating:**
**1 =** Low = not tolerant of transitory or constantly high temperatures.
5 = High = Highly tolerant of transitory or constantly high temperatures.

## Wind Tolerance

Degree to which species/variety is susceptible to limb breakage.

**Value rating:**
1 = Low tolerance to wind loads and generally resistant to limb breakage.
3 = Moderate tolerance to wind loads and generally resistant to limb breakage.
5 = High tolerance to wind loads and generally resistant to limb breakage.

## Longevity

Expected life span that a tree species can be retained in a safe and aesthetically pleasing manner in the situation (providing site conditions remain unchanged). Most urban trees have reduced life spans compared to those found in natural habitats.

**Value rating:**
1 = short lived (< 50 years).
2 = Moderate life span (50-100 years).
3 = Moderate to long-lived species (100-150 years).
what about 5?
4 = Long-lived species (> 150 years).

## Pollution Tolerance

Air pollutants can harm trees by two means; by being absorbed as chemical contaminants through stomata, and by being absorbed as dust and particulate matter on the surface of the leaf. Virtually all of the pollutants to trees are airborne, and include fluorides, oxidants, sulfur dioxide and carbon monoxide. Sunlight reacts with oxidants to form tree pollutants, like ozone and PAN (peroxyl acetyl nitrate). The effects of pollutants on trees can cause the tree to weaken and die.

The tolerance of species to pollution is largely related to their avoidance (or not) of uptake of pollutants by the leaves or in a biochemical tolerance of pollutants. Some plants can metabolize pollutants into less toxic substances. There is enormous variability between species as to their tolerance to pollution.

Pollution ratings are primarily based on referenced literature and experience.

Value rating:
5 = High = Highly tolerant of pollution
3 = Moderate = Moderately tolerant of pollution
1 = Low = poorly tolerant of pollution).

Heat stress.

Plastic bags trapped by tree branches: visual pollution.

## Pathogen and Pest Susceptibility and Manageability

This rating considers a particular species susceptibility to pests and pathogens. Major pests currently requiring management input are listed in Table 7. Potential pathogens that currently are not present but could impact on species have also been listed (see Table 8).

Value rating:
1 = High susceptibility to pathogens or pests, with control difficult.
5 = Low susceptibility to pathogens and pests, and control easy.

## Potential as Allergen

Of the 50,000 different kinds of trees, less than 100 have been shown to cause allergies. Most allergies are specific to one type of tree or to the male cultivar of certain trees. The degree of allergic reaction, and the physical origin of the allergen (for instance, sap) known to cause allergic reaction, are indicated on the tree matrix.

Value rating:
1 = High potential as an allergen.
5 = Low potential as an allergen.

## Shade Cast

This rating represents a qualitative estimate of the degree of shade cast projected by a tree. This rating also considers the form of the tree, for instance a broad tree will cast greater shade compared to a fastigiate tree.

Value rating:
1 = low shade cast.
2 = Moderate to low shade cast.
3 = Moderate shade cast.
4 = Moderate to high shade cast.
5 = Heavy shade cast.

## Maintenance Required

This rating assumes typical pruning maintenance works such as pruning for sight clearances and clearance of powerlines. Maintenance activities are generally higher in a younger tree in order to attain the form to suit site constraints. This rating also indicates any specific maintenance requirements that may be required.

**Levels:**
**5 =** Low – Due to size or growth habit of the plant the degree of maintenance required would be less than the perceived maintenance inputs.
3 = Moderate – Typical assumes current cyclic pruning programs to meet site constraints, risk management and legislative requirements.
1 = High – Expected maintenance levels are higher than current maintenance standards, representing greater potential impacts with infrastructure or additional seasonal requirements.


Moderate to Heavy Shade: Eg. *Ulmus procera*


Moderate Shade: Eg. *Melia azaderach* and *Celtis australis*


Moderate to Light Shade: Eg. *Angophora costata*


Light Shade: Eg. *Corymbia citriodora*


Heavy Shade: Eg. *Ficus microcarpa* 'Hillii' and Waterhousia

## Tree Litter

All trees will shed litter, leaves, bark, flowers or fruit at some time during a given growing season. As far as is possible the tree selections generally do not drop excessive litter. There are exceptions however, such as Magenta Brush Cherry, as these trees have other characteristics which make them suitable for certain planting situations.

Where excessive litter is a known for a particular species or cultivar, it has been noted on the tree matrix.

Value rating:
1 = Produces a considerable amount of troublesome litter.
5 = produces little troublesome litter.

## 2.4 Additional Criteria

Street type criteria are a further set of criteria that determine the tree selection for a specific type of street. Various types of street have specific affects on light availability, or restrictions such as the presence of overhead powerlines. These criteria guide selection of the 'right tree for the right place'.

### Shade Tolerance

Most tree species require full sun. There are some species that will tolerate lower light levels of part shade. There are no species selected in the matrix that tolerate full shade (less than 6 hours of filtered sunlight per day).

**Categories:**
Full sun – More than 6 hours of direct sunlight.
Full sun to part-shade – Either more than 6 hours of direct sunlight a day or filtered light for most of the day. (These species would be more suitable for streets that have low direct sun through a day.

### Power Lines

Tree species were rated as being suitable for planting under power lines without pruning, with pruning (if specifically known, for instance Smooth-barked Apple (*Angophora costata*), or not suitable.

### Soil Compaction Tolerance

Tree species were rated for their ability to withstand the highly compacted soils that often occur in the urban environment.

### Waterlogged Soil Tolerance

Trees that can tolerate waterlogged soils are particularly useful for WSUD applications. Soils temporarily inundated with water lead to poor aeration. Species tolerant of waterlogged soils are often also tolerant of compacted soil conditions.

Value rating:
1 = not tolerant of periodic inundation.
3 = Moderate tolerance of periodic inundation.
5 = Highly tolerant of periodic inundation (and of low oxygen in soils).

### Prunability for Vehicle Clearance

Trees often need to be pruned to allow clear passage of adjacent vehicular traffic.

Trees in laneway that must withstand heavy shade

Trees pruned heavily around power lines

## Small, Medium and Large Planting Sites

Small, medium and large sites relate to the size of the potential tree planting sites. Note that a smaller site could sustain a larger tree species if the site and soils (planting system) were modified to allow a larger tree size.

Table 10 provides general guidelines for planting site sizes.

Table 9: Planting site size and dimensions and maximum tree size at maturity (adapted from Gilman, 1997)

| Planting site | Total planting area (lawn, island, or soil strip) | Planting strip width | Distance from trunk to pavement or wall | Maximum tree size at maturity |
|---|---|---|---|---|
| Small | Less than 9.5m2 | 1.0m to 1.3m | 0.6m | Small (less than 9m tall) |
| Medium | 9.5m2 to 18.5m2 | 1.3m to 2.5m | 1.2m | Medium (less than 15m tall) |
| Large | More than 18.5m2 | > 2.5m | > 1.5m | Large (taller than 15m) |

# 3. Tree Planting in Melbourne

**This chapter identifies the typical tree growing conditions across the types of street and park environment in Melbourne, with a focus on street trees and streetscapes.**

## 3.1 Introduction

The streets of Melbourne support a robust urban forest of approximately 22,800 trees. The streets have been planned with the intention of trees being an integral component. The street geometries of Melbourne have traditionally allowed for relatively generous growing areas. During the 1860s when Melbourne rapidly expanded, boulevards, wide medians and verges within the city areas and the main thoroughfares into the city were intentionally set out to allow tree planting to contribute to the streetscape character. Surveyor Robert Hoddle, at odds with Governor King, managed to ensure that every second north-south street be 95 feet (28.96m) wide.

The north-south and east-west grid has allowed strong linear avenue planting of consistent species that gives Melbourne a particular character not achieved in other Australian capitals.

There have been a number of spikes of diversification of street and park trees in Melbourne's history. These spikes in experimentation were championed by a number of motivated directors of the Royal Botanic Gardens and landscape designers. In most of these instances a desire for botanical experimentation and trialing resulted in higher species diversity. Trees that were grown in the parks were used in the streetscapes. Curious botanists like Ferdinand von Mueller experimented with a number of conifers from around the world. With climatic change and more extreme weather events expected in Melbourne, it is interesting to note how well conifers are adapted to such extremes.

In the 1920s and 1930s there was experimentation with Australian rainforest species and myrtaceous species. Deciduous trees were also extensively planted, including many of the Elms currently part of the urban forest. This period of planting has contributed to many of the mature trees that are now in decline within the city and parks. During the 1970s the resurgence of interest in native and endemic plants contributed greater species diversity to the streetscape. Ironically, some of the earlier plantings of *Melaleucas* were also condemned in the same period, blamed for infrastructure damage. Retrospectively, the damage that these smaller *Melaleucas* have caused is in dispute. This strategy recommends that some *Melaleucas* species continue contributing to the urban forest.

*Platanus* x *acerifolia* is a tree species that is fast growing, deciduous, and adaptable, and has been perceived as close to being the 'perfect street tree'. As a consequence huge numbers of Plane trees were planted in Melbourne in the 1980s and 1990s in Melbourne and across the globe in temperate climate cities. However, in recent years the *Platanus x acerifolia* has proved itself to be highly

vulnerable to extremes of high temperature in Melbourne's climate. The hot summer of 2009 catalysed a severe decline for many of the city's Plane trees.

The risk of creating an urban forest monoculture is becoming apparent in Melbourne with increasingly frequent droughts. In Sydney, the combination of Sycamore Lacebug and *anthracnose* infestation results in the uban forest of Plane tress developing a distinct khaki haze in February-April. It is as characteristic a seasonal event as the November purple haze of the Jacarandas in the suburbs.

The City of Melbourne Urban Forest Strategy and Urban Forest Diversity Guidelines aim to create another spike of diversification and trialing in the history of Melbourne's park and street trees.

## Central Activity District (CAD), Mixed Use, and Commercial Streets

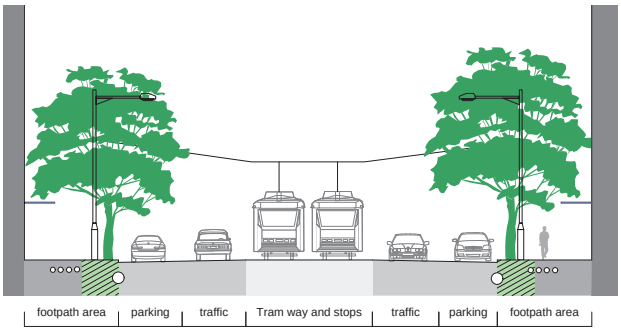
The city streets and boulevards, surveyed by Hoddle, have space for growing street trees. As development has increased post World War Two there is greater pressure for space in the street. Space for advertising, and increase in the amount of services conduits and car parking, have created greater competition with tree growing space. An increase in building height has also resulted in longer periods of overshadowing, and increased building density has produced hotter microclimates.

Generally, medians where they exist provide more space for growing trees in than the street's verges. Verge trees compete more for space than median trees, and so verge trees are more in conflict with human needs. Fortunately most of the overhead powerlines have been undergrounded, and while such undergrounding can cause restrictions to root growth area, it has eliminated canopy conflicts and so the potential for large trees is maintained.

The laneways are very narrow, and it is generally agreed that tree planting opportunities in these environments are limited due to space restrictions, low light, conflict with access requirements and commercial uses. Certain opportunities may still occur and the right tree species for the site will need close scrutiny.

Unfortunately, it is the trees in verges that are the most important for creating street tree amenity and shade. The north-south wide streets are congenial to large street tree planting, the east west streets and narrow streets have greater challenges, such as overshadowing and limited space. There are increasingly more opportunities for street tree planting as urban designers, politicians and Council planners are now prepared to change the internal geometries of streets to make them both more liveable and allow new opportunities for tree planting. Greater street tree diversity enables trees to be selected that can adapt to a variety of growing conditions, constraints and opportunities.

**Refer to Chapter 4 for fact sheet on each Location Type.**




## Residential Streets

The residential streets of the City of Melbourne have huge potential for species diversification.

While more overhead services exist, particularly Optus cables, and in some instances the verges are narrower, the conditions for growing street trees in general provide greater opportunities than in the CAD.

Many residential streets have wide verges with no power lines, and have traffic calming 'blisters', parking lanes with lower frequency usage, little soil compaction from pedestrian traffic, and good solar access year round.

Medians are well populated with trees, but there is considerable potential for verge street tree diversification and better tree growth generally.

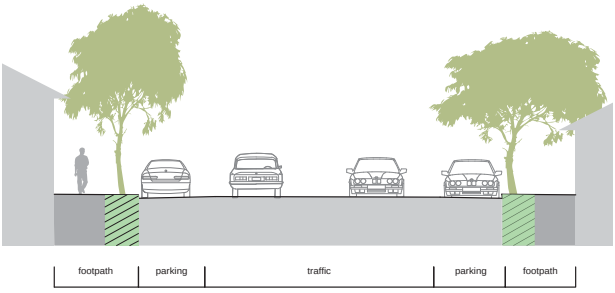
As with the city streets and boulevards, it is the street verges that are the most inhabited, so ideally this is where tree canopy cover should be located.

Residential streets provide a range of street conditions and types. The street geometry and width, overhead services or not, aspect, building awnings, access to adjacent soil volumes, parking arrangements, precinct character, water sensitive urban design opportunities, the age of the suburb, and streetscape design provide a multitude of scenarios.

Consequently, a large selection of tree species is required to reflect this broad range of planting situations.

Shorter streets and more diverse streetscape characters both enable and suit a finer grain of species implementation than is possible within the CAD.

**Refer to Chapter 4 for fact sheet on each Location Type.**

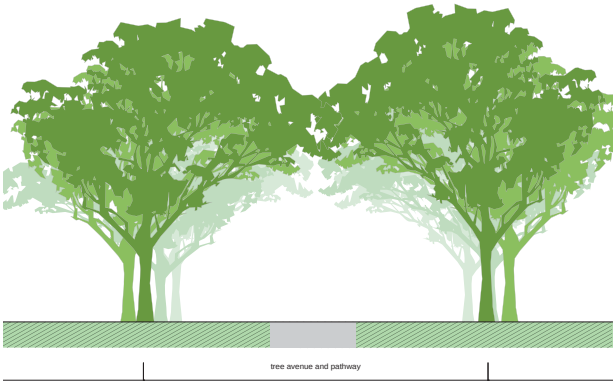



## Park Types

The parks of Melbourne have a strong 'Victorian' era character that defines the city. The parks were opportunities for trialling Australian species, new species from other Botanical gardens, and recently discovered species from plant hunting expeditions. Fashions, environmental awareness, heritage, architectural styles and aesthetics have also influenced the composition of the City's tree species population.

In marked contrast to these 'Victorian' parks, parks such as Royal Park have a character with greater emphasis on ecological goals, habitat provision, preservation of the remnant vegetation, and a celebration of space.

**Refer to Chapter 4 for fact sheet on each Location Type.**




# 4. Choosing the Right Tree

**This chapter identifies the process for selecting the most appropriate tree species for a particular location.**

## 4.1 Introduction

To successfully choose a street tree it is necessary to determine the type of location in which the tree is to be grown.

The right choice of species for a street tree will depend on a number of factors. Consideration needs to be given to:

- Zoning: whether the tree is in a residential area or the CAD.
- The street's form and use: Is the street wide or narrow, does it have powerlines? What type of vehicles use the street?
- The location within the street: Is the tree on the street's edge or does the street have a median in which the tree is to be positioned.
- Desired qualities: How much maintenance can be provided? How long-lived is the desired tree? How drought tolerant should the tree be? Pollution tolerant? How much shade is to be provided by the tree?

As discussed in Section 3, this strategy identifies 13 street location types and 2 park location types within the City of Melbourne.

Each of the 15 Location Types is associated with a set of minimum conditions necessary for the success of a tree in that environment.

For instance, the criteria for a tree in the wide verge of a CAD street are: canopy > 8m, height > 10m, shade rating > 2, pollution rating > 2, no overhead powerlines.

Species have been rated for their suitability against each of the 15 Location Types.

Tree lists for each Location Type can be found in the following pages.

These species lists for each Location Type can be used by Council in precinct plan applications in which further considerations are then overlaid on this these general and more specific species selection criteria.

The choice of tree can then be refined by considering additional criteria such as heritage and neighbourhood character.

**Step 1** — Use the diagram on the following page to determine which of the 13 Street and 2 Park Location Types best describes the location.

**Step 2** — Look up the list of species appropriate to location

**Step 3** — Consider additional criteria that might refine the species selection, for instance heritage or neighbourhood character

**Step 4** — Choose from the tree/s species

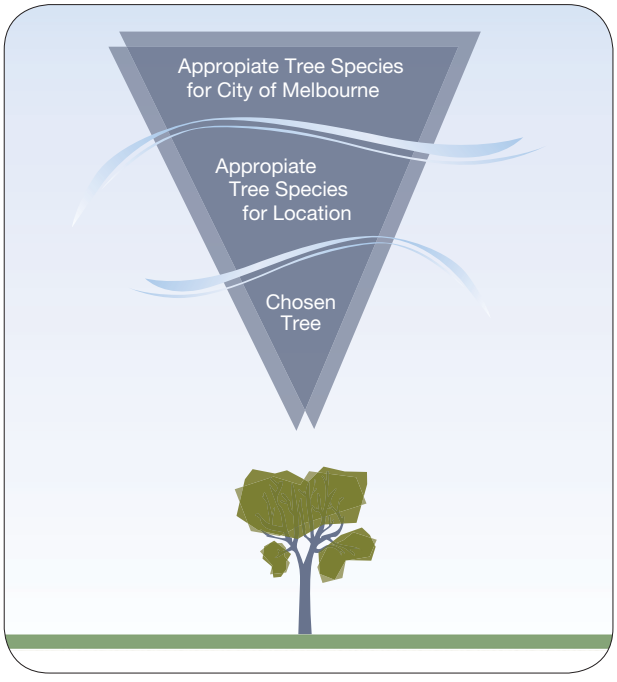
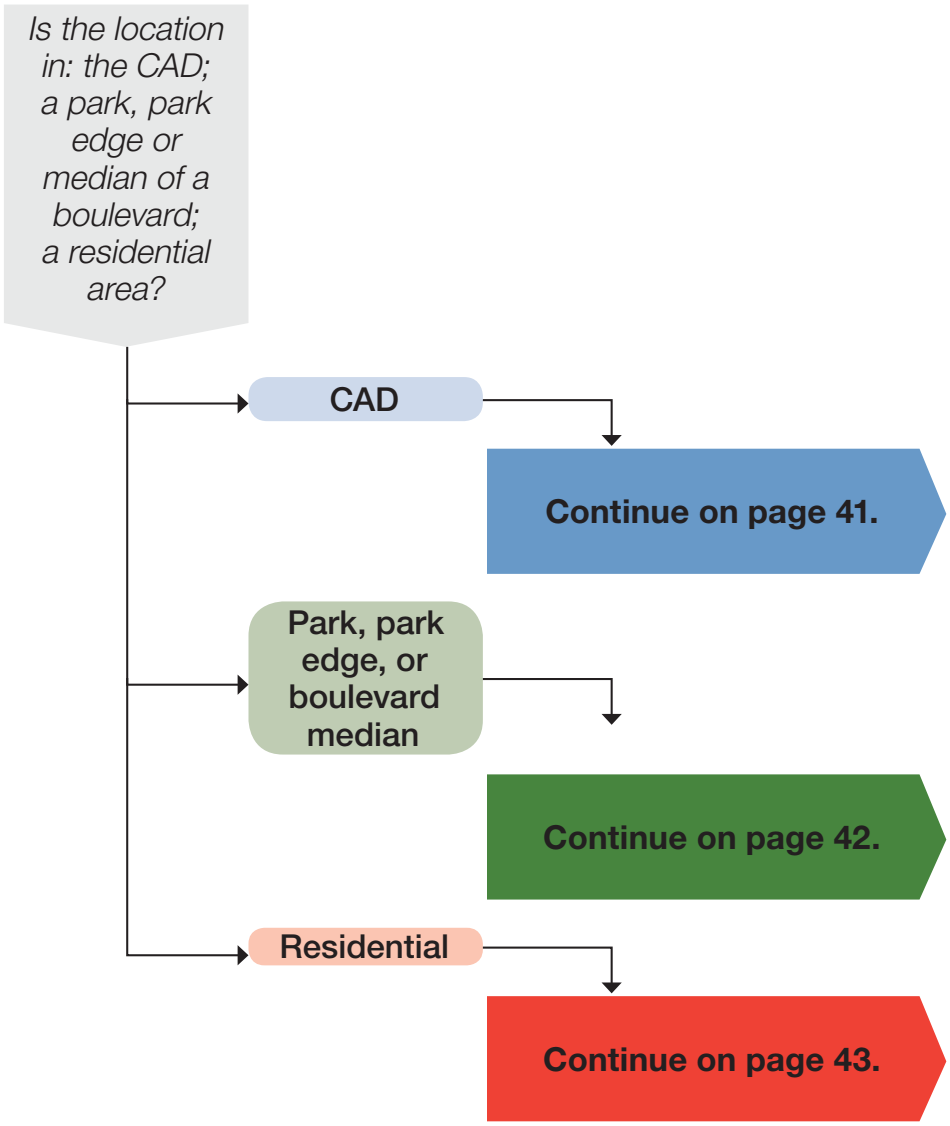



Figure 9: How to choose the right tree for the right location.

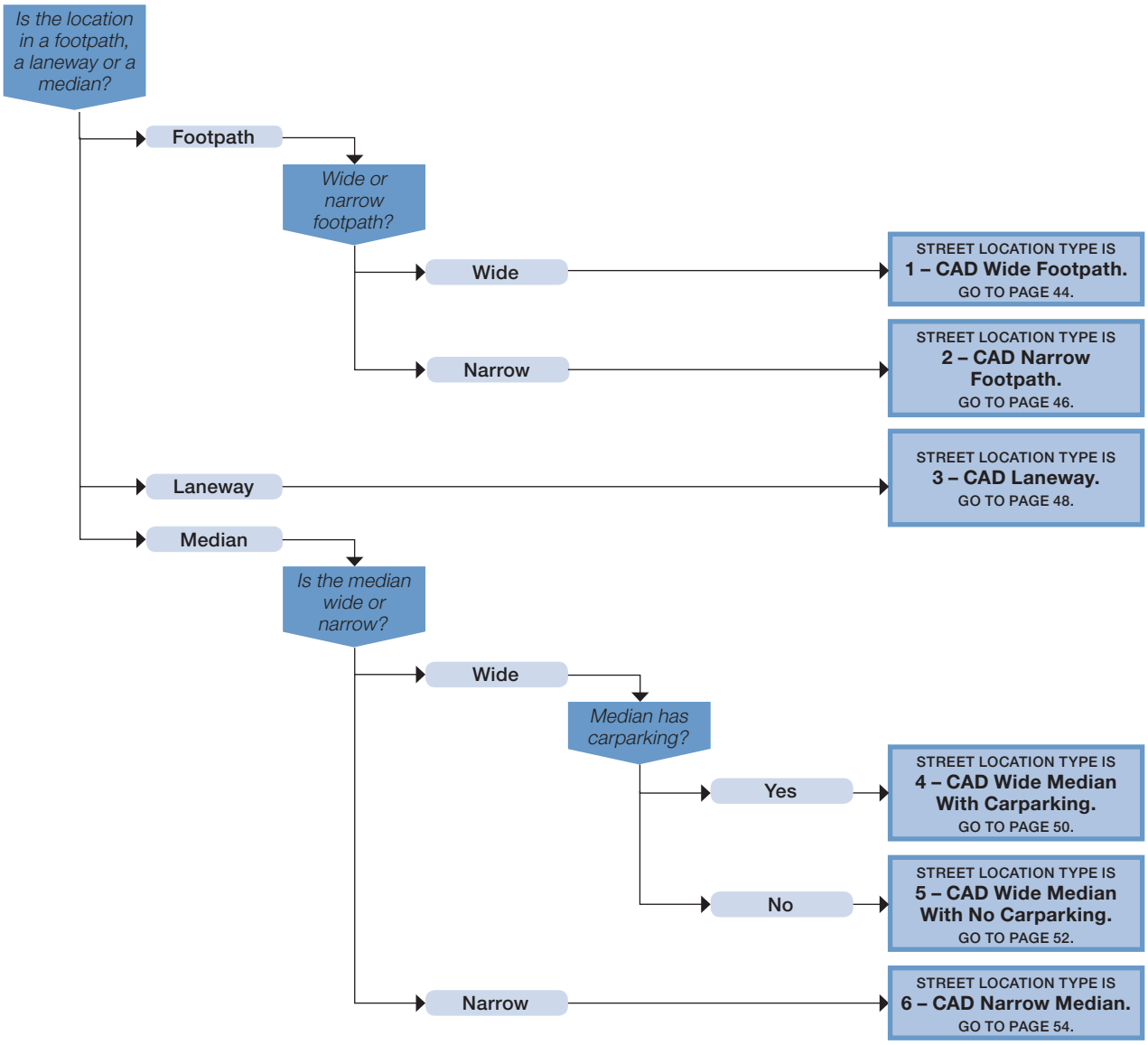
## 4.2 Determining Location Type

To determine the type of location in which the tree is to be grown, follow the diagram on this page and over the following 3 pages.

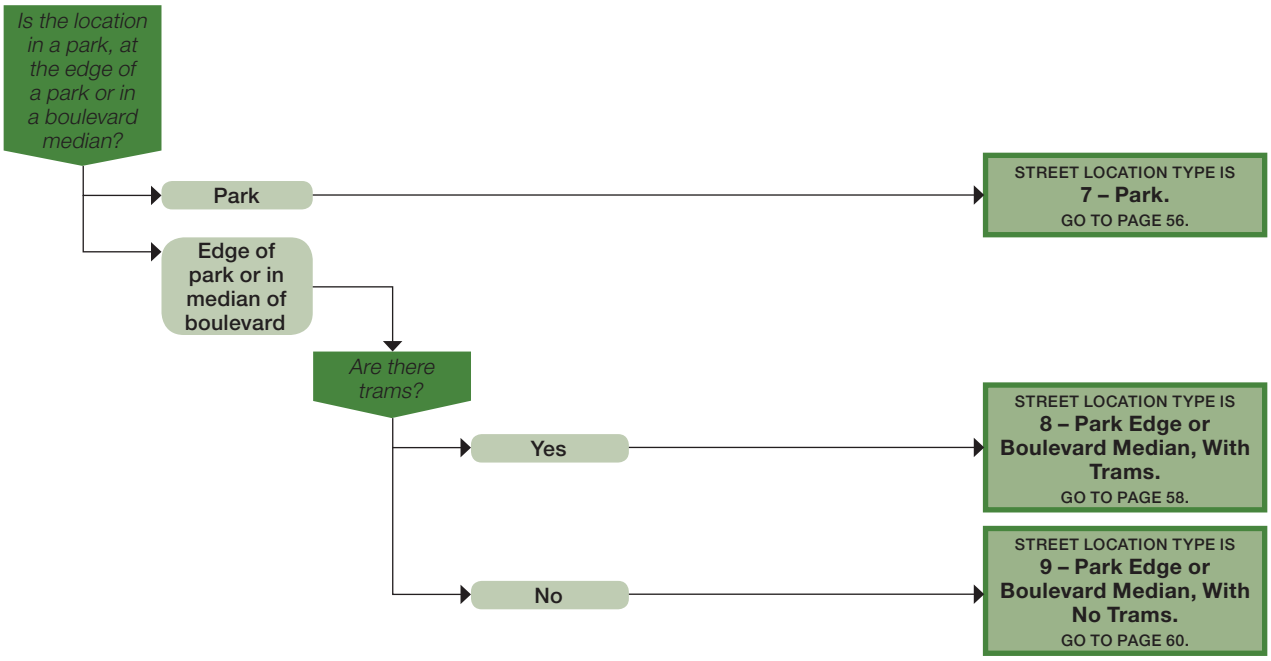
### Zoning of Street or Park Location



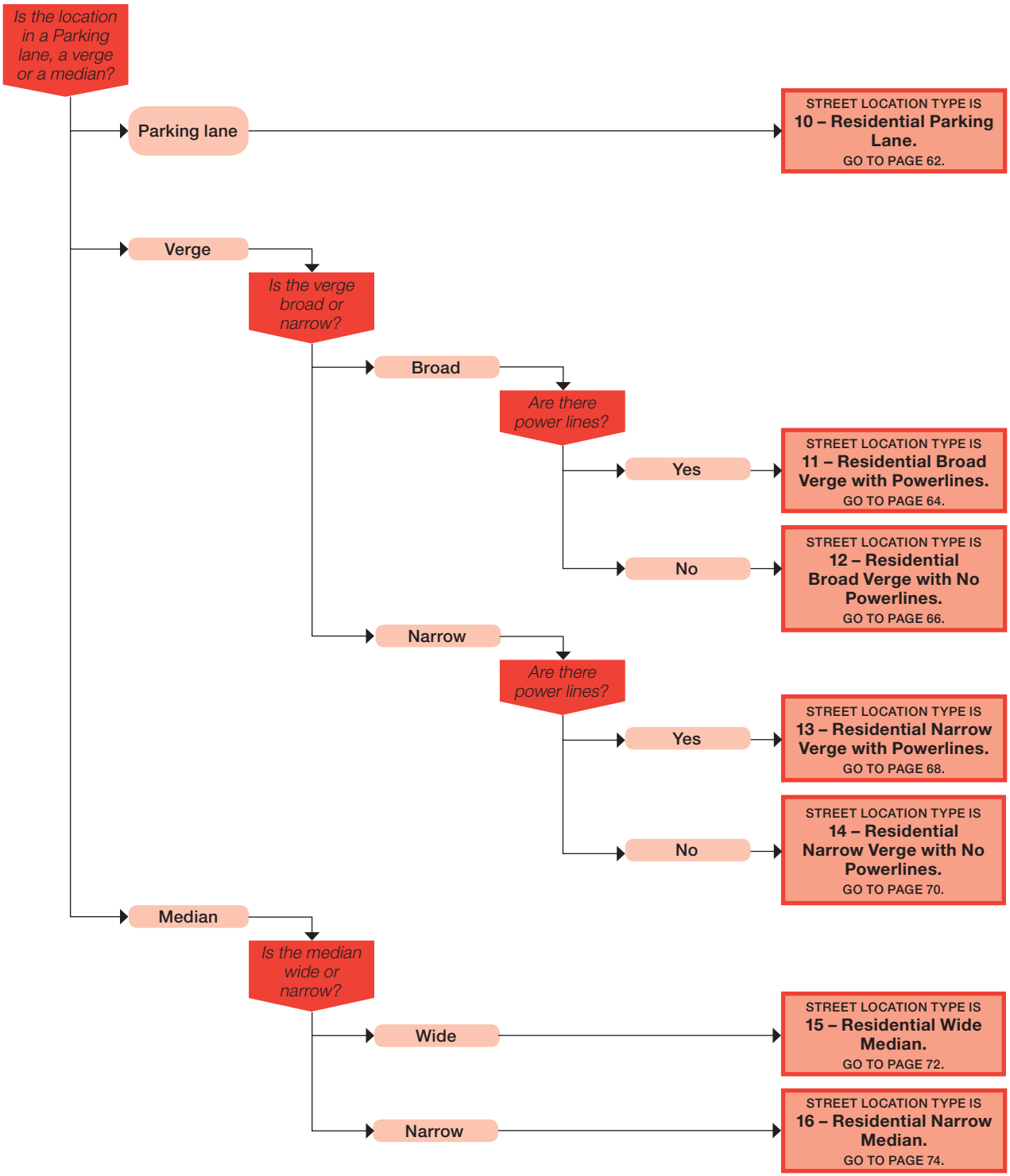
## CAD Street Type Location



## Park, Park Edge, or Boulevard Median Type Location



## Residential Street Type Location

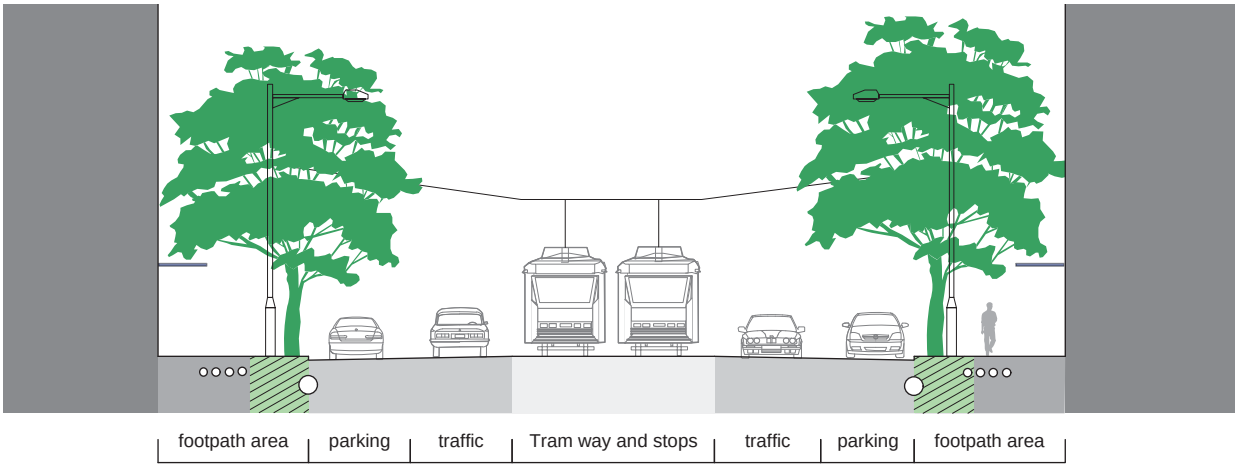


# 4.3 Location Types and Tree Selection Lists

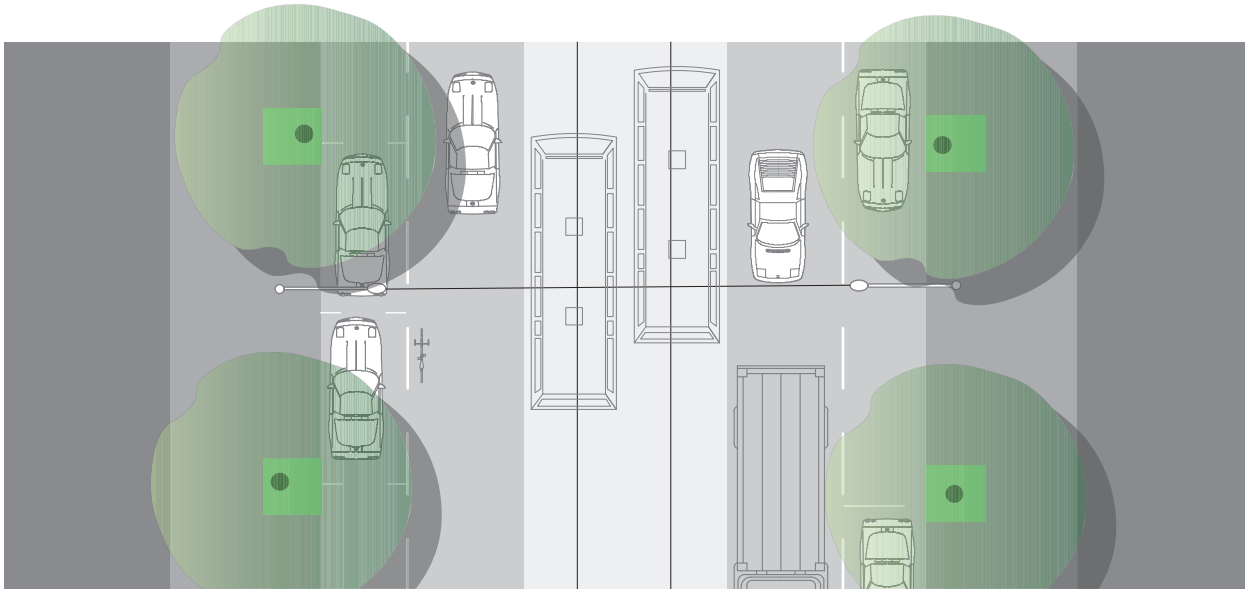
## Location Type 1 – CAD Wide Footpath

### Description of Key Characteristics

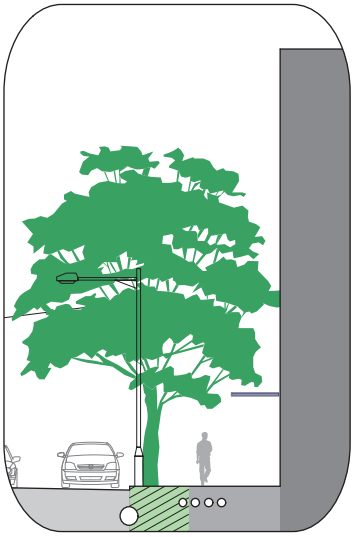
| | |
|---|---|
| Street Width | 30 metres |
| Traffic Lanes | 2 lanes with central tramway, and bike lanes. Predominantly running east/west |
| Overhead | Powerlines, tram cabling |
| Buildings | High, awnings |
| Parking | Parallel kerbside |
| Road centre | Tramway |
| Pathways | 5.4 metre footpath |
| Trees | Kerb edge avenue |
| Examples | Collins Street, Bourke Street |




Typical Section



Typical Plan



## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy > 8m |
| Height > 10m |
| Shade rating >2 |
| Pollution rating >2 |
| No powerlines |

## Street Tree Considerations

| |
|---|
| Requires formative pruning |
| Minimum height clearance of 4.6 m on road |
| Minimum height clearance of 2.5 m on footpath |
| Requires shade rating greater than 3 |
| Requires high maintenance |
| Low litter drop |

Successful Tree Application

Problematic Tree Application

## Recommended Trees

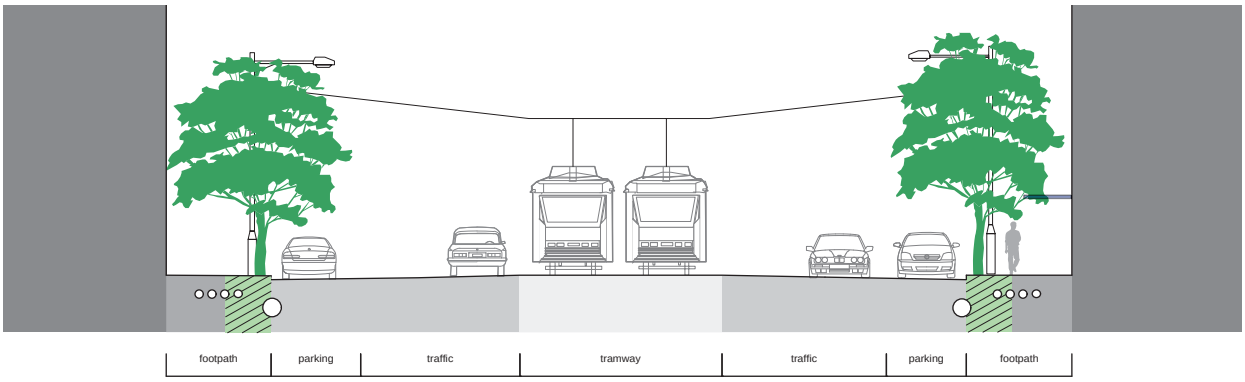
(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer x freemanii 'Autumn Blaze'
Afrocarpus falcata
Agathis robusta
Allocasuarina torulosa
Angophora costata
Angophora floribunda
Araucaria cunninghamii
Araucaria heterophylla
Banksia integrifolia subsp. integrifolia
Banksia serrata
Casuarina cunninghamiana
Cedrus atlantica
Cedrus deodara
Celtis australis
Celtis occidentalis
Corymbia maculata
Cupressus glabra (syn. C. arizonica)
Cupressus torulosa
Eucalyptus bancroftii
Eucalyptus camaldulensis
Eucalyptus cinerea
Eucalyptus leucoxylon
Eucalyptus melliodora
Eucalyptus polyanthemos
Eucalyptus scoparia
Eucalyptus sideroxylon
Ficus macrophylla
Ficus microcarpa var. hillii
Fraxinus excelsior 'Aurea'
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Ginkgo biloba
Gleditsia triacanthos var.inermis Varieties
Jacaranda mimosifolia
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Lophostemon confertus
Maclura pomifera 'Wichita'
Metasequoia glyptostroboides
Paulownia tomentosa
Pinus canariensis
Pinus halepensis
Pinus patula
Pinus pinaster
Pinus pinea
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Pyrus nivalis
Quercus acutissima
Quercus agrifolia
Quercus bicolor
Quercus canariensis
Quercus cerris
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus palustris
Quercus phellos
Quercus robur
Quercus rubra
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Schinus areira
Syzygium paniculatum
Taxodium distichum
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus procera
Ulmus x hollandica
Waterhousea floribunda
Zelkova serrata 'Green Vase'

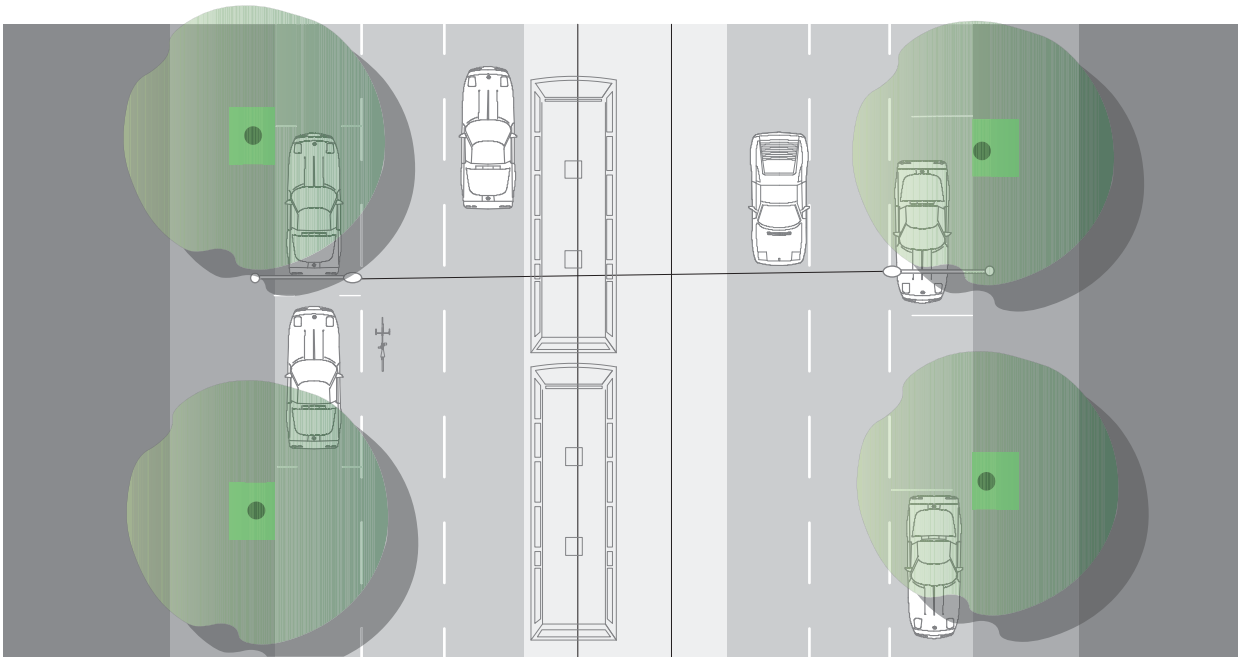
## Location Type 2 – CAD Narrow Footpath

### Description of Key Characteristics

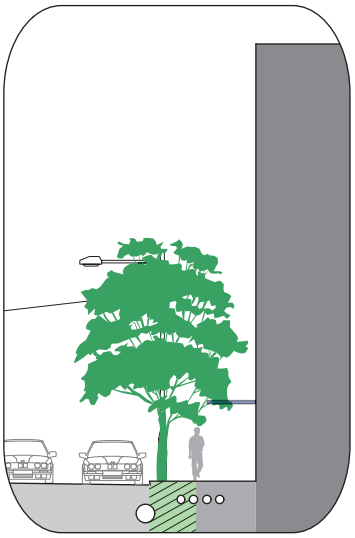
| | |
|---|---|
| Street Width | 30 metre |
| Traffic Lanes | 4 lanes with central tramway, and bike lanes. Predominantly running east/west. |
| Overhead | Street lights, tram cabling |
| Buildings | Medium to high buildings at footpath edge |
| Parking | Parallel kerbside |
| Road centre | Tramway |
| Pathways | 3.6 metre footpath |
| Trees | Footpath avenue |
| Example | Latrobe Street |




Typical Section



Typical Plan



## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy < 10m |
| Height any |
| Shade rating >2 |
| Pollution rating >2 |
| No powerlines |
| Litter drop >2 |

## Street Tree Considerations

| |
|---|
| Requires formative pruning |
| Limited canopy spread 5-12 m (close to buildings/awnings) |
| Minimum height clearance of 4.6 m on road |
| Minimum height clearance of 2.5 m on footpath |
| Requires shade rating greater than 3 |
| Requires high maintenance |
| Cope with part shade from building |
| Low litter drop |

## Recommended Trees

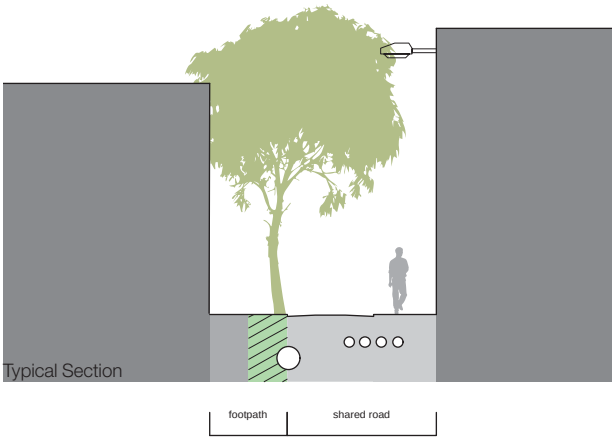
(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer buergerianum
Acer campestre 'Elsrijk'
Acer campestre 'Evelyn'
Acer platanoides 'Crimson Sentry'
Acer platanoides 'Globosum'
Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Agonis flexuosa
Allocasuarina littoralis
Allocasuarina verticillata
Brachychiton acerifolius
Brachychiton populneus
Brachychiton rupestris
Brachychiton x roseus
Callistemon 'Harkness'
Callistemon salignus
Callistemon viminalis
Casuarina glauca
Catalpa bignonioides 'Nana'
Celtis occidentalis
Cercis siliquastrum
Cinnamomum camphora
Corymbia ficifolia
Cupaniopsis anachardioides
Cupressus glabra (syn. C. arizonica)
Cupressus sempervirens
Eucalyptus bancroftii
Eucalyptus cosmophylla
Eucalyptus gregsoniana
Eucalyptus leucoxylon dwarf form
Eucalyptus leucoxylon ssp. megalocarpa
Eucalyptus mannifera subsp. maculosa
Eucalyptus melliodora
Eucalyptus nicholii
Eucalyptus pulchella
Eucalyptus sideroxylon
Eucalyptus spathulata
Eucalyptus stoatei
Ficus microcarpa var. hillii
Ficus platypoda
Ficus rubiginosa
Fraxinus excelsior 'Aurea'
Fraxinus ornus
Fraxinus ornus 'Meczek'
Fraxinus pennsylvanica 'Aerial'
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Fraxinus velutina
Geijera parviflora
Ginkgo biloba 'Princeton Sentry'
Gleditsia triacanthos var.inermis Varieties
Jacaranda mimosifolia
Lagerstroemia indica x L. fauriei varieties
Leptospermum petersonii
Liquidambar formosana
Lophostemon confertus
Magnolia grandiflora 'Exmouth'
Melia azedarach
Metasequoia glyptostroboides
Phoenix canariensis
Pistacia chinensis
Pyrus calleryana varieties
Quercus robur 'Fastigiata'
Robinia pseudoacacia (Varieties)
Schinus areira
Sophora japonica 'Princeton Upright'
Stenocarpus sinuatus
Syzygium australe 'Pinnacle'
Syzygium paniculatum
Tilia cordata 'Greenspire'
Trachycarpus fortunei
Tristaniopsis laurina
Ulmus parvifolia
Ulmus procera
Ulmus x hollandica
Washingtonia filifera
Washingtonia robusta
Waterhousea floribunda

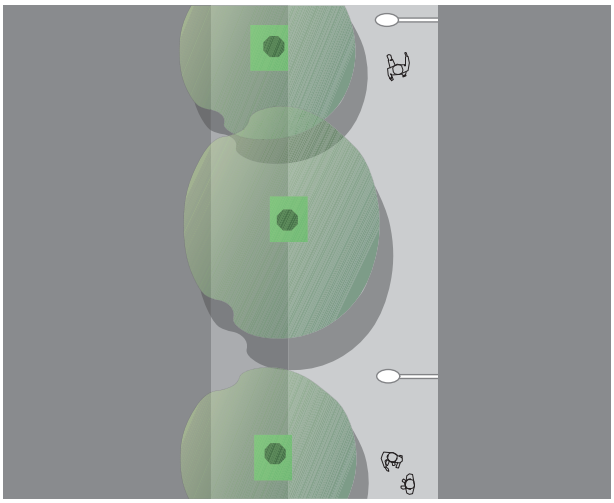
## Location Type 3 – CAD Laneway

### Description of Key Characteristics

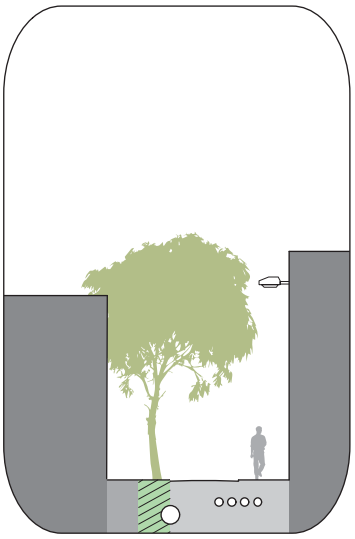
| | |
|---|---|
| Street Width | 6-8 metre |
| Traffic Lanes | Single lane, often running south/north. Often shared with pedestrians and bike lane |
| Overhead | |
| Buildings | Medium to high |
| Parking | None |
| Road centre | – |
| Pathways | 1-2 metre footpath, building |
| Trees | Mostly on single side |
| Example | Royal Lane, Hardware Lane |




Typical Section



Typical Plan



## Street Tree Considerations

| |
|---|
| Limited canopy spread 6-8 m |
| Tolerate shade |
| Minimum height clearance of 4.6 m |

## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy < 10m |
| Height any |
| Pollution rating >2 |
| No powerlines |
| Litter drop >2 |
| Building shade tolerance -yes |

## Recommended Trees

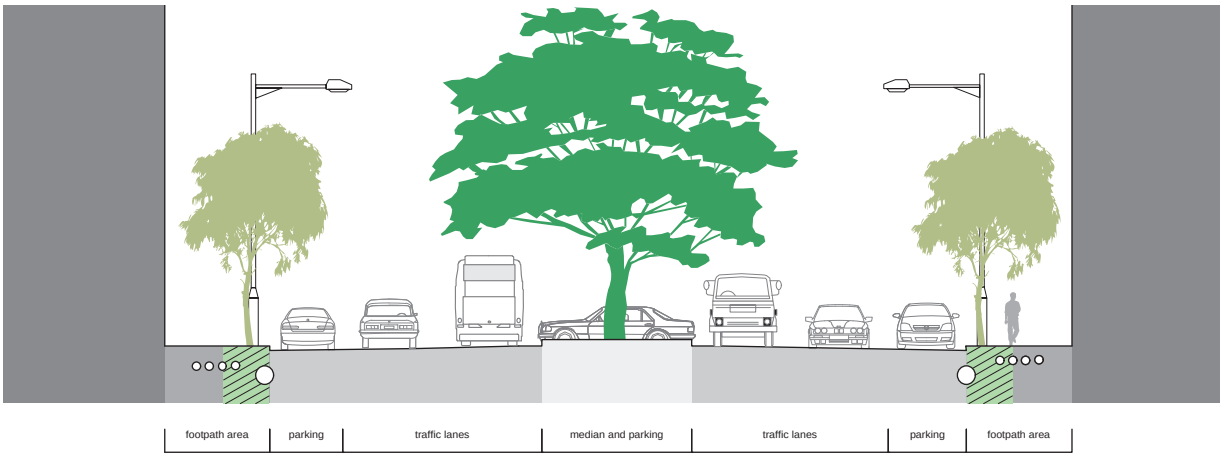
(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer campestre 'Elsrijk'
Acer campestre 'Evelyn'
Catalpa bignonioides 'Nana'
Cercis siliquastrum
Cupaniopsis anachardioides
Eucalyptus leucoxylon dwarf form
Ficus rubiginosa
Ginkgo biloba 'Princeton Sentry'
Gleditsia triacanthos var.inermis Varieties
Koelreuteria paniculata
Liquidambar formosana
Magnolia grandiflora 'Exmouth'
Melia azedarach
Robinia pseudoacacia (Varieties)
Sophora japonica 'Princeton Upright'
Syzygium australe 'Pinnacle'
Tilia cordata 'Greenspire'
Trachycarpus fortunei
Washingtonia filifera
Washingtonia robusta

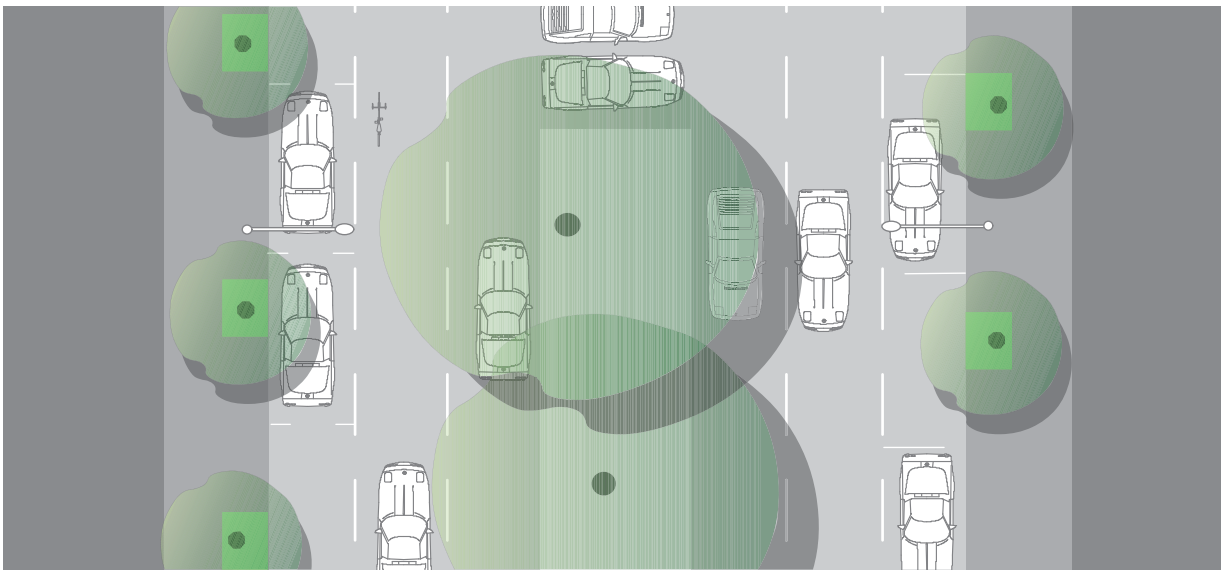
## Location Type 4 – CAD Wide Median With Carparking


### Description of Key Characteristics

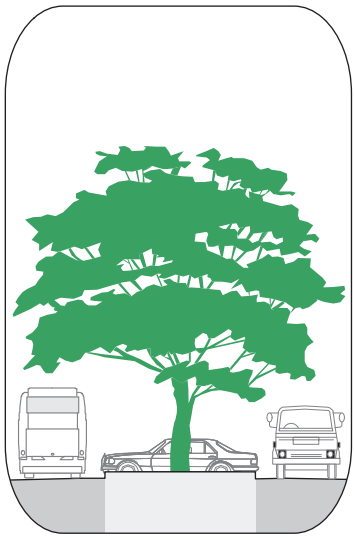
| | |
|---|---|
| Street Width | 30 metre |
| Traffic Lanes | 4 lanes with central median, and bike lanes. Predominantly running north/south |
| Overhead | Lighting |
| Buildings | Medium to high. Awnings |
| Parking | Parallel kerbside. Central median |
| Road centre | 5m median with intermittent parking and trees |
| Pathways | 3.6 metre footpath |
| Trees | Kerb edge. Central median |
| Example | Russell Street, Lonsdale Street |




Typical Section



Typical Plan



## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy > 8m |
| Height > 10m |
| Shade rating any |
| Pollution rating >2 |
| No powerlines |
| Litter drop >2 |

## Street Tree Considerations

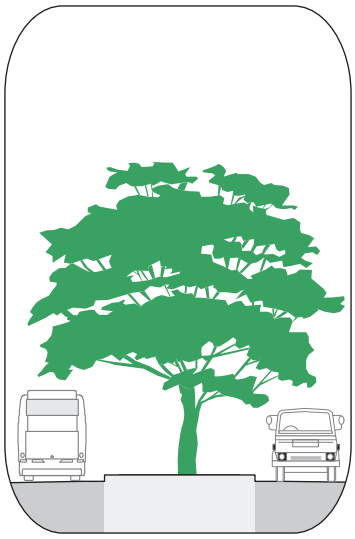
| |
|---|
| Tolerate full sun |
| High Crown/ large canopy spread required |
| Minimum height clearance of 4.6 m |
| Longevity |

## Recommended Trees

(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer buergerianum
Acer campestre 'Elsrijk'
Acer platanoides 'Crimson Sentry'
Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Allocasuarina torulosa
Angophora costata
Araucaria cunninghamii
Banksia integrifolia subsp. integrifolia
Brachychiton acerifolius
Brachychiton populneus
Brachychiton x roseus
Casuarina cunninghamiana
Casuarina glauca
Cedrus atlantica
Celtis australis
Celtis occidentalis
Corymbia citriodora
Corymbia maculata
Cupressus glabra (syn. C. arizonica)
Cupressus sempervirens
Cupressus torulosa
Eucalyptus bancroftii
Eucalyptus camaldulensis
Eucalyptus cinerea
Eucalyptus leucoxylon
Eucalyptus mannifera subsp. maculosa
Eucalyptus melliodora
Eucalyptus polyanthemos
Eucalyptus pulchella
Eucalyptus scoparia
Eucalyptus sideroxylon
Ficus microcarpa var. hillii
Ficus platypoda
Ficus rubiginosa
Fraxinus excelsior 'Aurea'
Fraxinus ornus
Fraxinus pennsylvanica 'Aerial'
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Fraxinus velutina
Geijera parviflora
Jacaranda mimosifolia
Lagerstroemia indica x L. fauriei varieties
Leptospermum petersonii
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Lophostemon confertus
Maclura pomifera 'Wichita'
Magnolia grandiflora 'Exmouth'
Melia azedarach
Metasequoia glyptostroboides
Olea europea
Paulownia tomentosa
Phoenix canariensis
Pinus canariensis
Pinus halepensis
Pinus patula
Pinus pinaster
Pinus pinea
Pistacia chinensis
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Pyrus nivalis
Quercus acutissima
Quercus agrifolia
Quercus bicolor
Quercus cerris
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus palustris
Quercus phellos
Quercus robur
Quercus rubra
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Schinus areira
Syzygium paniculatum
Taxodium distichum
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus procera
Waterhousea floribunda
Zelkova serrata 'Green Vase'

## Location Type 5 – CAD Wide Median With No Carparking



## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy > 8m |
| Height > 10m |
| Shade rating >2 |
| Pollution rating >2 |
| No powerlines |
| Litter drop >2 |

## Street Tree Considerations

| |
|---|
| Tolerate full sun |
| High Crown/ large canopy spread required |
| Minimum height clearance of 4.6 m |
| Longevity |

## Recommended Trees

(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer x freemanii 'Autumn Blaze'
Afrocarpus falcata
Agathis robusta
Allocasuarina torulosa
Angophora costata
Angophora floribunda
Araucaria cunninghamii
Araucaria heterophylla
Banksia integrifolia subsp. integrifolia
Banksia serrata
Casuarina cunninghamiana
Cedrus atlantica
Cedrus deodara
Celtis australis
Celtis occidentalis
Corymbia maculata
Cupressus glabra (syn. C. arizonica)
Cupressus torulosa
Eucalyptus bancroftii
Eucalyptus camaldulensis
Eucalyptus cinerea
Eucalyptus leucoxylon
Eucalyptus leucoxylon ssp. megalocarpa
Eucalyptus melliodora
Eucalyptus polyanthemos
Eucalyptus scoparia
Eucalyptus sideroxylon
Ficus macrophylla
Ficus microcarpa var. hillii
Fraxinus excelsior 'Aurea'
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Ginkgo biloba
Gleditsia triacanthos var.inermis Varieties
Jacaranda mimosifolia
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Lophostemon confertus
Maclura pomifera 'Wichita'
Metasequoia glyptostroboides
Paulownia tomentosa
Pinus canariensis
Pinus halepensis
Pinus patula
Pinus pinaster
Pinus pinea
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Pyrus nivalis
Quercus acutissima
Quercus agrifolia
Quercus bicolor
Quercus canariensis
Quercus cerris
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus palustris
Quercus phellos
Quercus robur
Quercus rubra
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Schinus areira
Syzygium paniculatum
Taxodium distichum
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus procera
Ulmus x hollandica
Waterhousea floribunda
Zelkova serrata 'Green Vase'

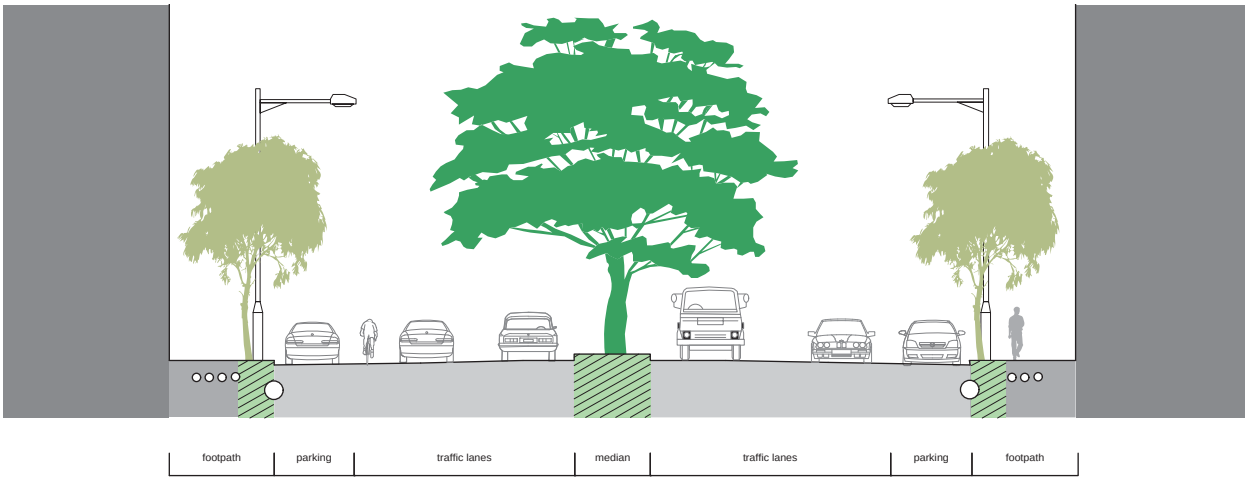
Successful Tree Application

Problematic Tree Application

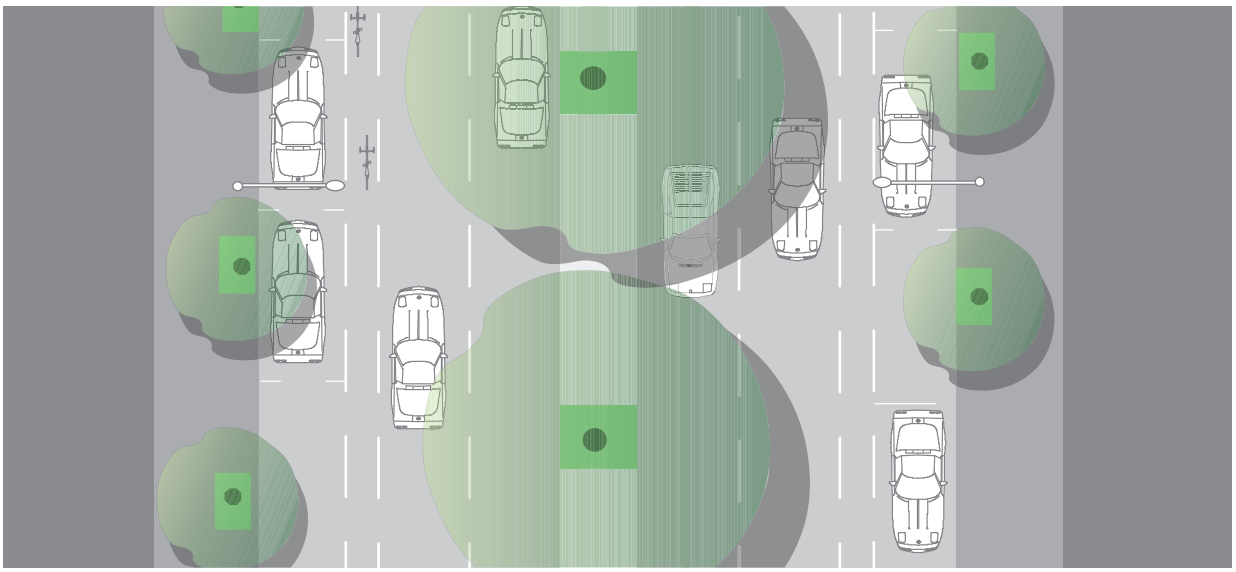
## Location Type 6 – CAD Narrow Median

### Description of Key Characteristics

| | |
|---|---|
| Street Width | 30 metre |
| Traffic Lanes | 4 lanes with central median, and bike lanes. Predominantly running north/south. |
| Overhead | Lighting |
| Buildings | Medium to high. Awnings |
| Parking | Parallel kerbside |
| Road centre | 2.5m planted median |
| Pathways | 3.6 metre footpath |
| Trees | Kerb edge and central median |
| Example | King Street |




Typical Section



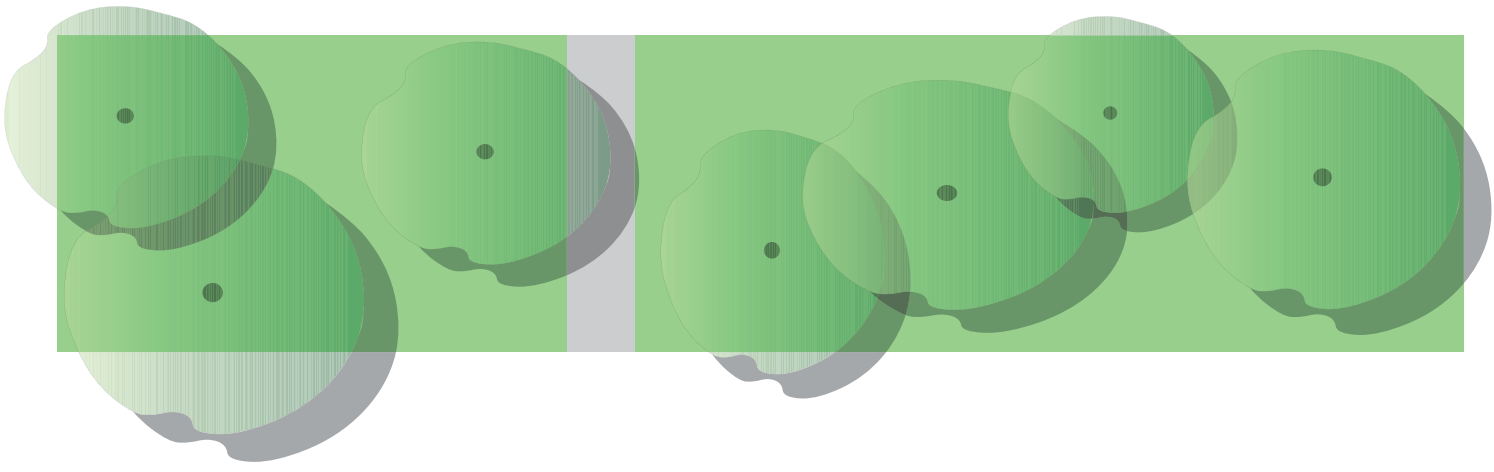
Typical Plan

## Location Type 7 – Park

### Description of Key Characteristics

| | |
|---|---|
| Street Width | – |
| Traffic Lanes | – |
| Overhead | None |
| Buildings | – |
| Parking | Varied |
| Road centre | – |
| Pathways | Various pathways from road |
| Trees | Specimen plantings, mixed |
| Example | Botanic Park |


Typical Section



Typical Plan

## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy > 8m |
| Height > 10m |

## Street Tree Considerations

| |
|---|
| Unlimited canopy spread |
| Tolerate full sun |
| Longevity |
| Biodiversity potential – foraging habitat |

## Recommended Trees

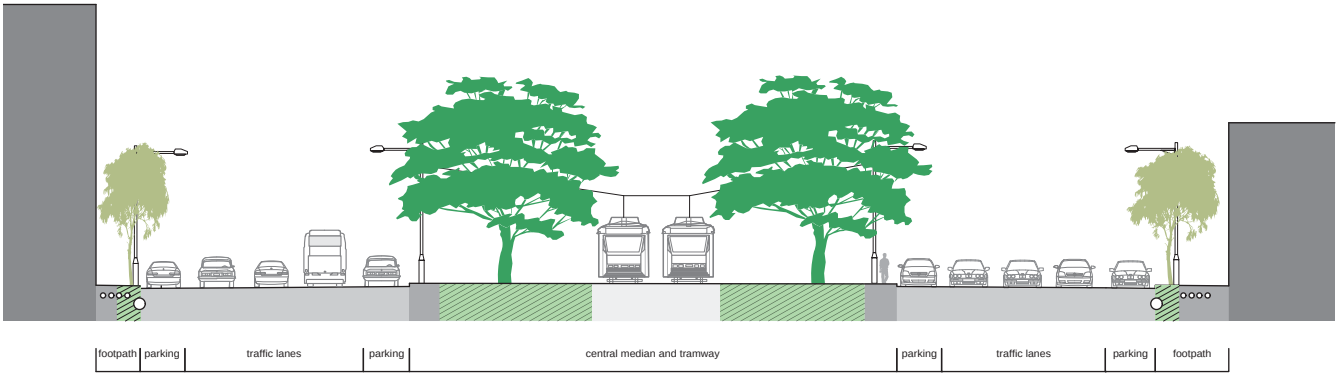
(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer rubrum 'October Glory'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Agathis robusta
Angophora costata
Angophora floribunda
Araucaria cunninghamii
Araucaria heterophylla
Brachychiton acerifolius
Catalpa bignonioides
Cedrus atlantica
Cedrus deodara
Corymbia citriodora
Corymbia maculata
Cupressus torulosa
Ficus macrophylla
Fraxinus pennsylvanica 'Cimmaron'
Liquidambar styraciflua 'Rotundiloba'
Metasequoia glyptostroboides
Phoenix canariensis
Pinus canariensis
Pinus patula
Pinus pinea
Podocarpus falcatus
Quercus coccinea
Quercus phellos
Taxodium distichum
Ulmus parvifolia
Washingtonia filifera
Washingtonia robusta
Zelkova serrata 'Green Vase'

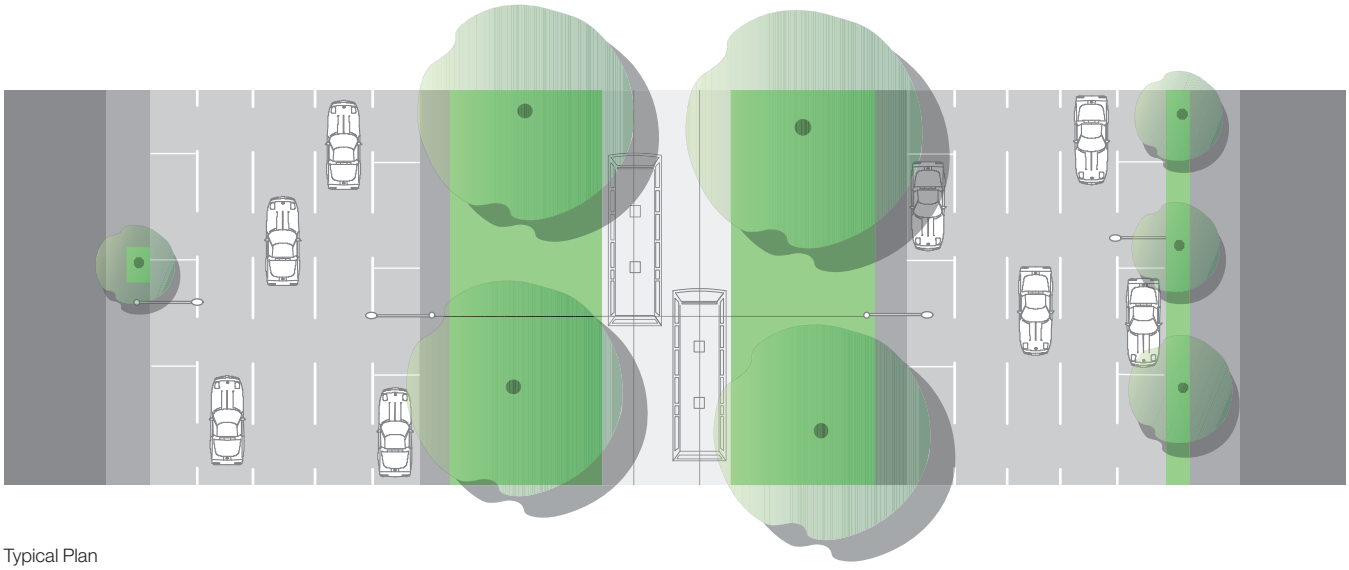
## Location Type 8 – Park Edge or Boulevard Median, With Trams

### Description of Key Characteristics

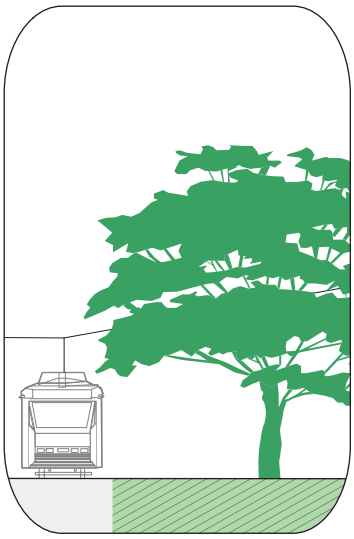
| | |
|---|---|
| Street Width | 60 metres |
| Traffic Lanes | 6 lanes with central boulevard and tramway |
| Overhead | Lighting, Tram cabelling |
| Buildings | Medium to high |
| Parking | Parallel kerb and median edge |
| Road centre | 25m wide with tramline, footpath and median tree avenue |
| Pathways | 3.6m roadside footpaths, narrow along median |
| Trees | Key central avenue, kerbside |
| Example | Victoria Parade |




Typical Section



Typical Plan



## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy > 8m |
| Height > 10m |
| Shade rating any |
| No powerlines |

## Street Tree Considerations

| |
|---|
| Tolerate crown pruning to tram wires |
| Tolerate full sun |
| Longevity |

## Recommended Trees

(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer platanoides 'Crimson Sentry'
Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Afrocarpus falcata
Agathis robusta
Allocasuarina torulosa
Angophora costata
Angophora floribunda
Banksia integrifolia subsp. integrifolia
Banksia serrata
Casuarina cunninghamiana
Casuarina glauca
Cedrus atlantica
Cedrus deodara
Celtis occidentalis
Cercis siliquastrum
Cinnamomum camphora
Corymbia citriodora
Corymbia maculata
Cupaniopsis anachardioides
Cupressus sempervirens
Cupressus torulosa
Eucalyptus bancroftii
Eucalyptus camaldulensis
Eucalyptus cinerea
Eucalyptus cosmophylla
Eucalyptus gregsoniana
Eucalyptus leucoxylon
Eucalyptus mannifera subsp. maculosa
Eucalyptus melliodora
Eucalyptus nicholii
Eucalyptus polyanthemos
Eucalyptus pulchella
Eucalyptus scoparia
Eucalyptus sideroxylon
Eucalyptus spathulata
Ficus macrophylla
Ficus microcarpa var. hillii
Ficus platypoda
Ficus rubiginosa
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Fraxinus velutina
Geijera parviflora
Ginkgo biloba 'Princeton Sentry'
Gleditsia triacanthos var.inermis Varieties
Jacaranda mimosifolia
Lagerstroemia indica x L. fauriei varieties
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Lophostemon confertus
Maclura pomifera 'Wichita'
Metasequoia glyptostroboides
Paulownia tomentosa
Pinus canariensis
Pinus pinea
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Pyrus nivalis
Quercus acutissima
Quercus agrifolia
Quercus bicolor
Quercus canariensis
Quercus cerris
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus palustris
Quercus phellos
Quercus robur
Quercus rubra
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Schinus areira
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus procera
Zelkova serrata 'Green Vase'

## Location Type 9 – Park Edge or Boulevard Median, With No Trams

## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy > 8m |
| Height > 10m |
| Shade rating >3 |

## Street Tree Considerations

| |
|---|
| Tolerate full sun |
| Unlimited canopy spread |
| Minimum height clearance of 4.6 m over road |

## Recommended Trees

(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer rubrum 'October Glory'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Agathis robusta
Araucaria cunninghamii
Catalpa bignonioides
Cedrus atlantica
Cedrus deodara
Corymbia citriodora
Corymbia maculata
Cupressus torulosa
Fraxinus pennsylvanica 'Cimmaron'
Liquidambar styraciflua 'Rotundiloba'
Metasequoia glyptostroboides
Phoenix canariensis
Pinus canariensis
Pinus patula
Pinus pinea
Podocarpus falcatus
Quercus coccinea
Quercus phellos
Taxodium distichum
Ulmus parvifolia
Zelkova serrata 'Green Vase'

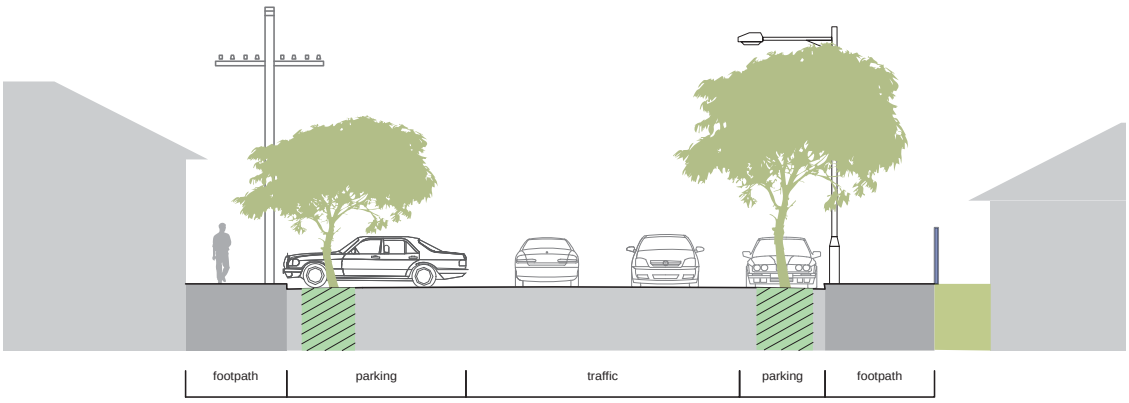
Successful Tree Application

Problematic Tree Application

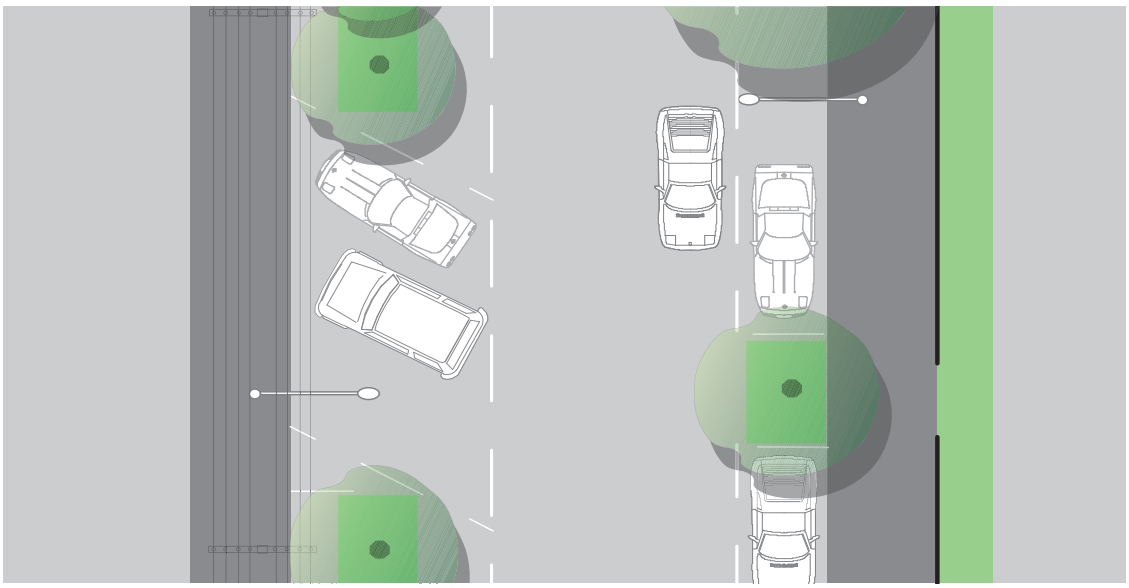
## Location Type 10 – Residential Parking Lane

### Description of Key Characteristics

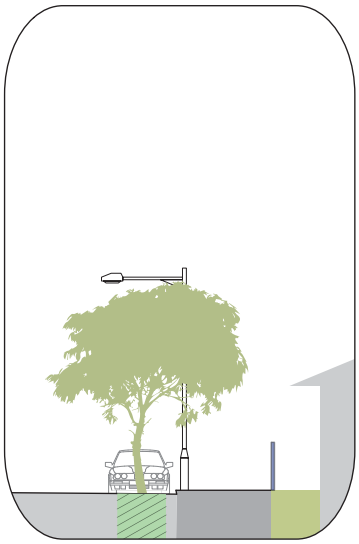
| | |
|---|---|
| Street Width | 20 metre |
| Traffic Lanes | 2 lane |
| Overhead | Powerlines, lighting |
| Buildings | Residential, setback |
| Parking | Mixed |
| Road centre | – |
| Pathways | < 2.5 metre footpath |
| Trees | In roadway between parking bays. Occasional WSUD |
| Example | Acland Street South Yarra, George Street East Melbourne |




Typical Section



Typical Plan



## Street Tree Considerations

| |
|---|
| Potential large and high canopy |
| Minimum height clearance of 4.6 m |
| Tolerate full sun |
| Variety of shade rating |
| Potential tolerance to water logging (WSUD) |

Successful Tree Application

## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

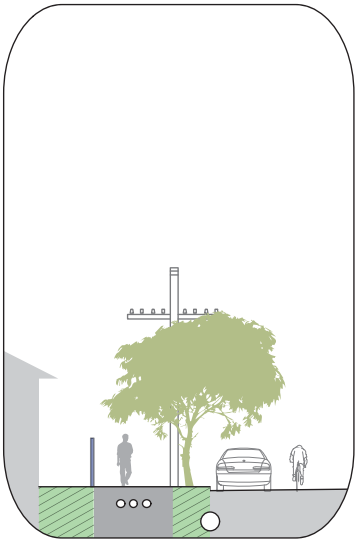
| |
|---|
| Canopy > 8m |
| Height > 10m |
| Shade rating any |
| WSUD > 3 |
| Pollution rating >3 |
| No powerlines |
| Litter drop >3 |
| Maintenance >3 |

## Recommended Trees

(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer x freemanii 'Autumn Blaze'
Allocasuarina torulosa
Angophora costata
Araucaria cunninghamii
Banksia integrifolia subsp. integrifolia
Celtis australis
Celtis occidentalis
Cupressus glabra (syn. C. arizonica)
Eucalyptus bancroftii
Eucalyptus leucoxylon
Eucalyptus leucoxylon ssp. megalocarpa
Eucalyptus melliodora
Eucalyptus platypus
Eucalyptus polyanthemos
Eucalyptus scoparia
Eucalyptus sideroxylon
Ficus microcarpa var. hillii
Fraxinus excelsior 'Aurea'
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Fraxinus velutina
Jacaranda mimosifolia
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Lophostemon confertus
Metasequoia glyptostroboides
Olea europea
Paulownia tomentosa
Pinus canariensis
Pinus halepensis
Pinus patula
Pinus pinaster
Pinus pinea
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Pyrus nivalis
Quercus acutissima
Quercus agrifolia
Quercus bicolor
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus palustris
Quercus phellos
Quercus robur
Quercus rubra
Syzygium paniculatum
Taxodium distichum
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus procera
Waterhousea floribunda
Zelkova serrata 'Green Vase'

## Location Type 11 – Residential Broad Verge With Powerlines



## Street Tree Considerations

| |
|---|
| Tolerate crown pruning to powerlines |
| Tolerate full sun |
| Minimum height clearance of 2.5 m |
| Restricted height under powerlines |
| Tolerate crown pruning to powerlines |

## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy <10m |
| Height any |
| Shade rating >2 |
| Powerlines |

## Recommended Trees

(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer buergerianum
Acer campestre 'Elsrijk'
Acer campestre 'Evelyn'
Acer platanoides 'Globosum'
Acer truncatum x A. platanoides 'Keithsform'
Agonis flexuosa
Allocasuarina littoralis
Allocasuarina verticillata
Angophora hispida (Syn. A. cordifolia)
Banksia integrifolia subsp. integrifolia
Banksia serrata
Brachychiton populneus
Brachychiton rupestris
Callistemon 'Harkness'
Callistemon salignus
Callistemon viminalis
Catalpa bignonioides 'Nana'
Celtis australis
Celtis occidentalis
Cercis siliquastrum
Corymbia eximia
Corymbia ficifolia
Cupaniopsis anachardioides
Eucalyptus cosmophylla
Eucalyptus gregsoniana
Eucalyptus leucoxylon dwarf form
Eucalyptus leucoxylon ssp. megalocarpa
Eucalyptus platypus
Eucalyptus stoatei
Ficus platypoda
Fraxinus excelsior 'Aurea'
Fraxinus ornus
Fraxinus ornus 'Meczek'
Fraxinus pennsylvanica 'Urbanite'
Geijera parviflora
Hakea francisiana
Jacaranda mimosifolia
Koelreuteria paniculata
Lagerstroemia indica x L. fauriei varieties
Leptospermum petersonii
Liquidambar formosana
Lophostemon confertus
Magnolia grandiflora 'Exmouth'
Melia azedarach
Olea europea
Pistacia chinensis
Pyrus nivalis
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Tilia cordata 'Greenspire'
Tristaniopsis laurina
Ulmus x hollandica
Zelkova serrata 'Green Vase'

## Location Type 12 – Residential Broad Verge With No Powerlines

To come

## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy >6m |
| Height > 10m |
| Shade rating >2 |
| No powerlines |

## Street Tree Considerations

| |
|---|
| Tolerate crown pruning to powerlines |
| Tolerate full sun |
| Minimum height clearance of 2.5 m |

## Recommended Trees

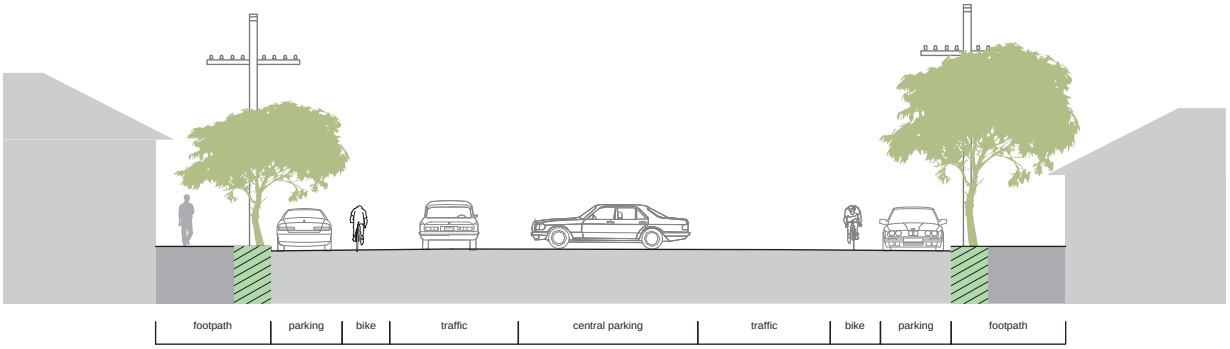
(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer x freemanii 'Autumn Blaze'
Afrocarpus falcata
Agathis robusta
Allocasuarina torulosa
Allocasuarina verticillata
Angophora costata
Angophora floribunda
Banksia integrifolia subsp. integrifolia
Banksia serrata
Brachychiton populneus
Brachychiton rupestris
Brachychiton x roseus
Casuarina cunninghamiana
Casuarina glauca
Cedrus atlantica
Cedrus deodara
Celtis australis
Celtis occidentalis
Cinnamomum camphora
Corymbia eximia
Corymbia ficifolia
Corymbia maculata
Cupaniopsis anachardioides
Cupressus glabra (syn. C. arizonica)
Cupressus torulosa
Eucalyptus bancroftii
Eucalyptus camaldulensis
Eucalyptus cinerea
Eucalyptus cosmophylla
Eucalyptus leucoxylon
Eucalyptus leucoxylon ssp. megalocarpa
Eucalyptus melliodora
Eucalyptus platypus
Eucalyptus polyanthemos
Eucalyptus pulchella
Eucalyptus scoparia
Eucalyptus sideroxylon
Eucalyptus spathulata
Ficus macrophylla
Ficus microcarpa var. hillii
Ficus rubiginosa
Fraxinus excelsior 'Aurea'
Fraxinus pennsylvanica 'Aerial'
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Fraxinus velutina
Ginkgo biloba
Gleditsia triacanthos var.inermis Varieties
Jacaranda mimosifolia
Koelreuteria paniculata
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Lophostemon confertus
Maclura pomifera 'Wichita'
Magnolia grandiflora 'Exmouth'
Metasequoia glyptostroboides
Olea europea
Phoenix canariensis
Pinus canariensis
Pinus halepensis
Pinus patula
Pinus pinaster
Pinus pinea
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Pyrus nivalis
Quercus acutissima
Quercus agrifolia
Quercus bicolor
Quercus canariensis
Quercus cerris
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus palustris
Quercus phellos
Quercus robur
Quercus rubra
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Schinus areira
Syzygium paniculatum
Taxodium distichum
Tilia cordata 'Greenspire'
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus procera
Ulmus x hollandica
Waterhousea floribunda
Zelkova serrata 'Green Vase'

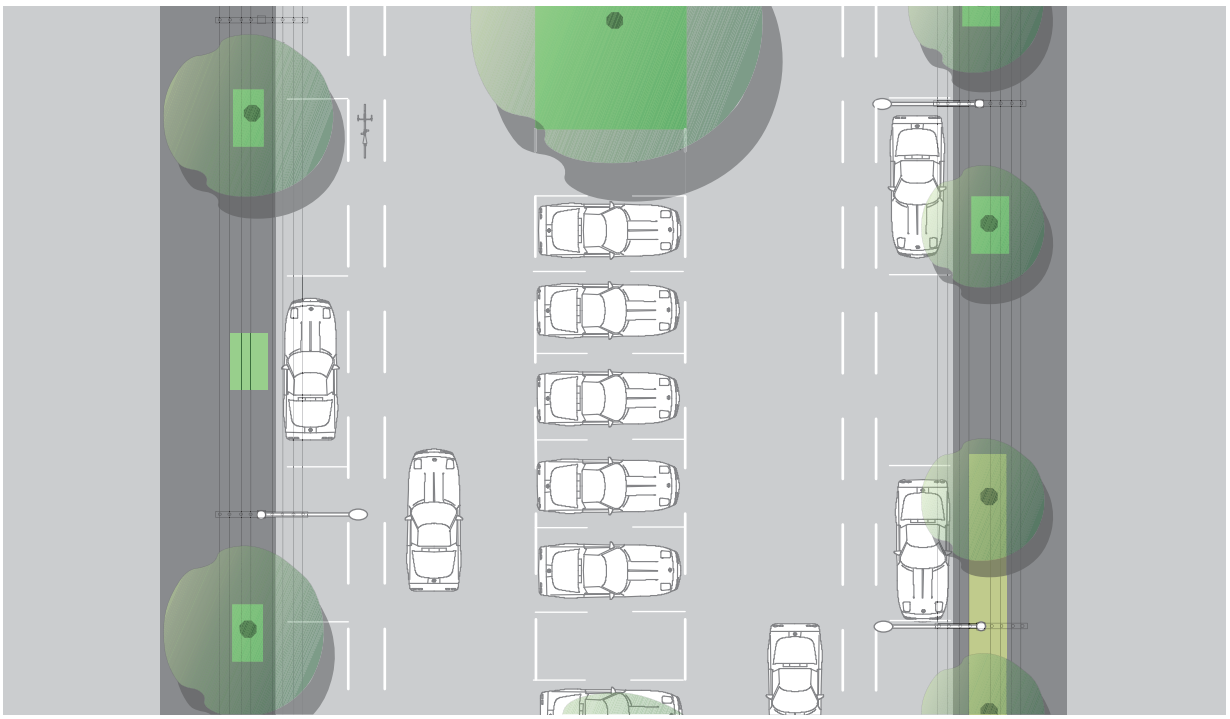
## Location Type 13 – Residential Narrow Verge With Powerlines

### Description of Key Characteristics

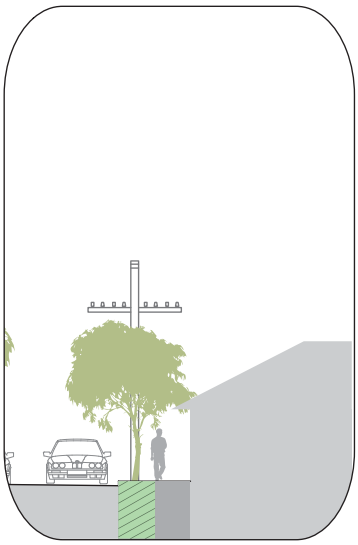
| | |
|---|---|
| Street Width | 30 metre |
| Traffic Lanes | 2 lane with central parking/median area, and bike lanes |
| Overhead | Powerlines, lighting |
| Buildings | Residential, setback |
| Parking | Parallel kerb and perpendicular median parking |
| Road centre | Median parking. Occasional planting |
| Pathways | < 3.6 metre footpath |
| Trees | Kerb edge |
| Example | Faraday Street, Carlton |




Typical Section



Typical Plan



## Street Tree Considerations

| |
|---|
| Limited canopy spread |
| Tolerate part shade to full sun |
| Minimum height clearance of 2.5 m |
| Restricted height under powerlines |
| Tolerate crown pruning to powerlines |

Problematic Tree Application

## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy <10m |
| Height any |
| Shade rating >2 |
| Community health >3 |
| No powerlines |

## Recommended Trees

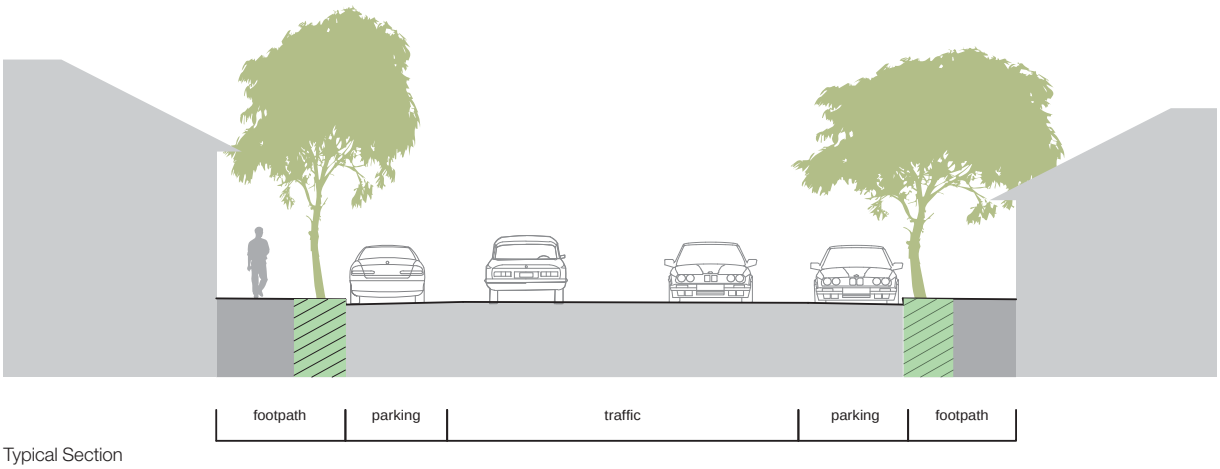
(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer buergerianum
Acer campestre 'Elsrijk'
Acer campestre 'Evelyn'
Acer platanoides 'Globosum'
Acer truncatum x A. platanoides 'Keithsform'
Agonis flexuosa
Allocasuarina littoralis
Allocasuarina verticillata
Angophora hispida (Syn. A. cordifolia)
Banksia integrifolia subsp. integrifolia
Banksia serrata
Brachychiton populneus
Brachychiton rupestris
Callistemon 'Harkness'
Callistemon salignus
Callistemon viminalis
Catalpa bignonioides 'Nana'
Celtis australis
Celtis occidentalis
Cercis siliquastrum
Corymbia eximia
Corymbia ficifolia
Cupaniopsis anachardioides
Eucalyptus cosmophylla
Eucalyptus gregsoniana
Eucalyptus leucoxylon ssp. megalocarpa
Eucalyptus platypus
Eucalyptus stoatei
Ficus platypoda
Fraxinus excelsior 'Aurea'
Fraxinus ornus
Fraxinus ornus 'Meczek'
Fraxinus pennsylvanica 'Urbanite'
Geijera parviflora
Jacaranda mimosifolia
Koelreuteria paniculata
Lagerstroemia indica x L. fauriei varieties
Leptospermum petersonii
Liquidambar formosana
Lophostemon confertus
Magnolia grandiflora 'Exmouth'
Melia azedarach
Olea europea
Pistacia chinensis
Pyrus nivalis
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Tilia cordata 'Greenspire'
Tristaniopsis laurina
Ulmus x hollandica
Zelkova serrata 'Green Vase'

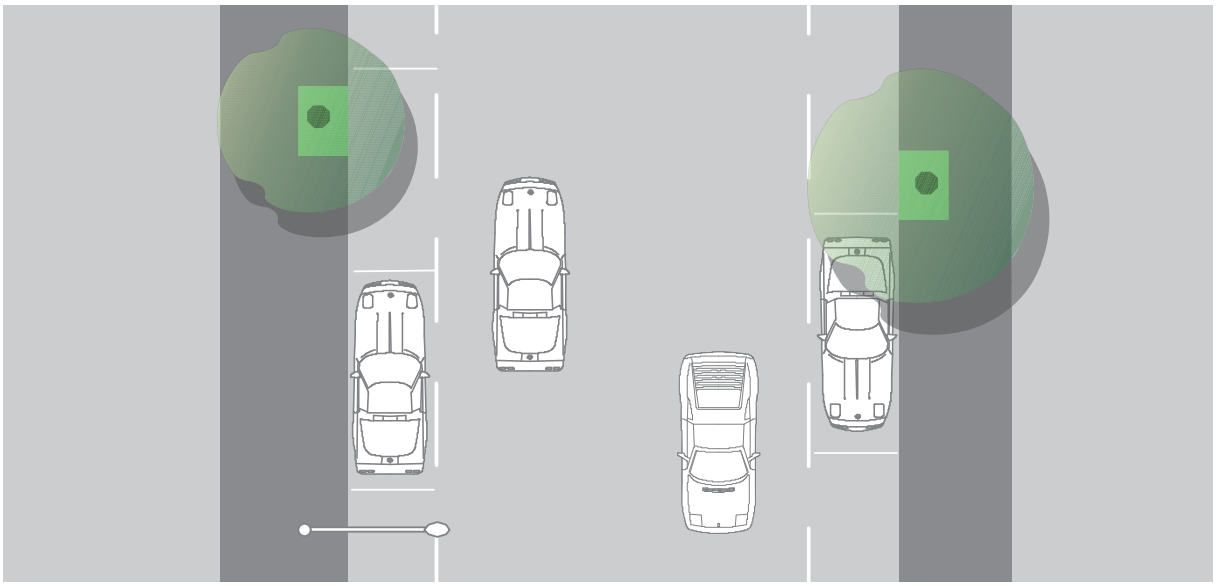
## Location Type 14 – Residential Narrow Verge With No Powerlines

### Description of Key Characteristics

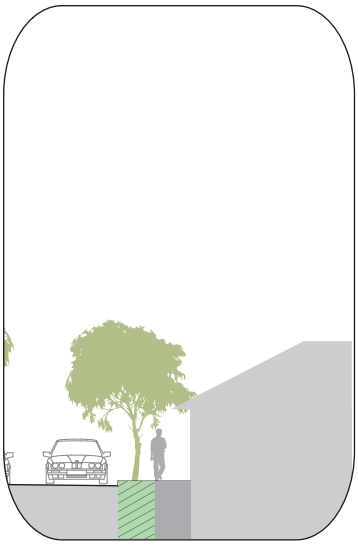
| | |
|---|---|
| Street Width | 20 metre |
| Traffic Lanes | 2 lane |
| Overhead | Powerlines, lighting |
| Buildings | Residential, setback |
| Parking | Parallel or perpendicular kerb parking |
| Road centre | – |
| Pathways | 2.5 metre footpath |
| Trees | Kerb planting |
| Example | Stawell Street North Melbourne |




Typical Section



Typical Plan



## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy 5-10m |
| Height 5-20m |
| Shade rating >3 |
| Community health >3 |
| No powerlines |

## Street Tree Considerations

| |
|---|
| Limited canopy spread |
| Tolerate part shade to full sun |
| Minimum height clearance of 2.5 m |

## Recommended Trees

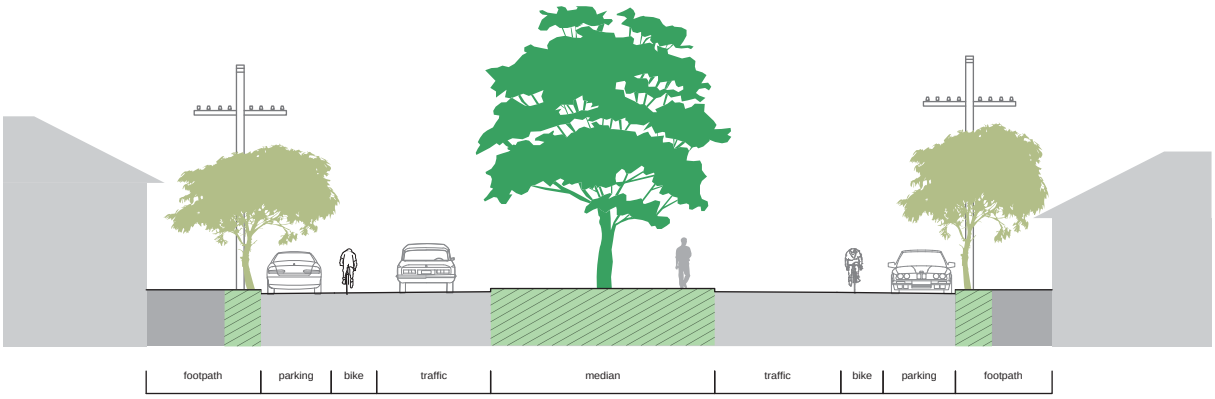
(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer buergerianum
Acer campestre 'Elsrijk'
Acer campestre 'Evelyn'
Acer platanoides 'Crimson Sentry'
Acer platanoides 'Globosum'
Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Afrocarpus falcata
Agathis robusta
Agonis flexuosa
Allocasuarina littoralis
Allocasuarina torulosa
Allocasuarina verticillata
Angophora costata
Angophora floribunda
Angophora hispida (Syn. A. cordifolia)
Araucaria cunninghamii
Araucaria heterophylla
Banksia integrifolia subsp. integrifolia
Banksia serrata
Brachychiton acerifolius
Brachychiton populneus
Brachychiton rupestris
Brachychiton x roseus
Callistemon 'Harkness'
Callistemon salignus
Callistemon viminalis
Casuarina cunninghamiana
Casuarina glauca
Catalpa bignonioides 'Nana'
Cedrus atlantica
Cedrus deodara
Celtis australis
Celtis occidentalis
Cercis siliquastrum
Cinnamomum camphora
Corymbia eximia
Corymbia ficifolia
Corymbia maculata
Cupaniopsis anachardioides
Cupressus glabra (syn. C. arizonica)
Cupressus sempervirens
Cupressus torulosa
Eucalyptus bancroftii
Eucalyptus cinerea
Eucalyptus cosmophylla
Eucalyptus gregsoniana
Eucalyptus leucoxylon
Eucalyptus leucoxylon ssp. megalocarpa
Eucalyptus mannifera subsp. maculosa
Eucalyptus melliodora
Eucalyptus nicholii
Eucalyptus platypus
Eucalyptus polyanthemos
Eucalyptus pulchella
Eucalyptus scoparia
Eucalyptus sideroxylon
Eucalyptus spathulata
Eucalyptus stoatei
Ficus macrophylla
Ficus microcarpa var. hillii
Ficus platypoda
Ficus rubiginosa
Fraxinus excelsior 'Aurea'
Fraxinus ornus
Fraxinus ornus 'Meczek'
Fraxinus pennsylvanica 'Aerial'
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Fraxinus velutina
Geijera parviflora
Ginkgo biloba
Gleditsia triacanthos var.inermis Varieties
Jacaranda mimosifolia
Koelreuteria paniculata
Lagerstroemia indica x L. fauriei varieties
Leptospermum petersonii
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Lophostemon confertus
Maclura pomifera 'Wichita'
Magnolia grandiflora 'Exmouth'
Melia azedarach
Metasequoia glyptostroboides
Olea europea
Phoenix canariensis
Pinus canariensis
Pinus halepensis
Pinus patula
Pinus pinaster
Pistacia chinensis
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Pyrus nivalis
Quercus acutissima
Quercus bicolor
Quercus cerris
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus palustris
Quercus phellos
Quercus robur
Quercus robur 'Fastigiata'
Quercus rubra
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Schinus areira
Sophora japonica 'Princeton Upright'
Stenocarpus sinuatus
Syzygium paniculatum
Taxodium distichum
Tilia cordata 'Greenspire'
Trachycarpus fortunei
Tristaniopsis laurina
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus x hollandica
Waterhousea floribunda
Zelkova serrata 'Green Vase'

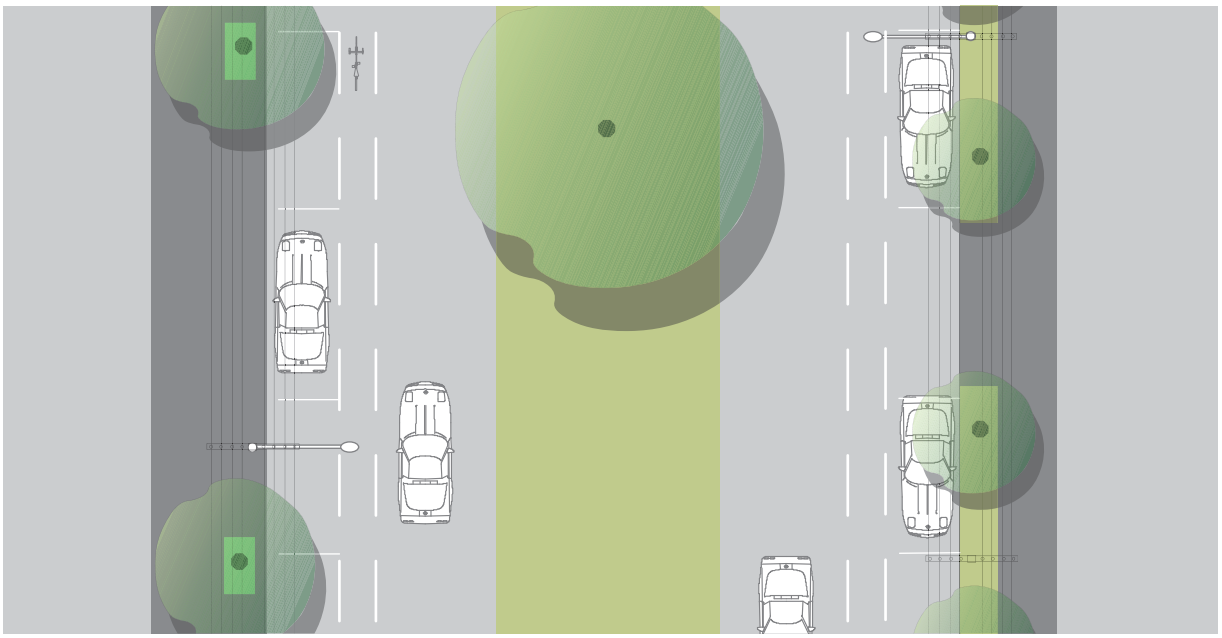
## Location Type 15 – Residential Wide Median

### Description of Key Characteristics

| | |
|---|---|
| Street Width | 30 metre |
| Traffic Lanes | 2 lane with central median, and bike lanes |
| Overhead | Powerlines, lighting |
| Buildings | Residential, setback |
| Parking | Parallel kerb |
| Road centre | 3-8m wide planted median |
| Pathways | < 3.6 metre footpath |
| Trees | Kerb edge and central median |
| Example | Canning street, Drummond Street, Carlton |




Typical Section



Typical Plan

## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy > 8m |
| Height > 10m |
| Shade rating any |
| Community health >3 |
| No powerlines |

## Street Tree Considerations

| |
|---|
| Potential large and high canopy |
| Tolerate full sun |
| Minimum height clearance of 2.5m |
| Variety of shade rating |

## Recommended Trees

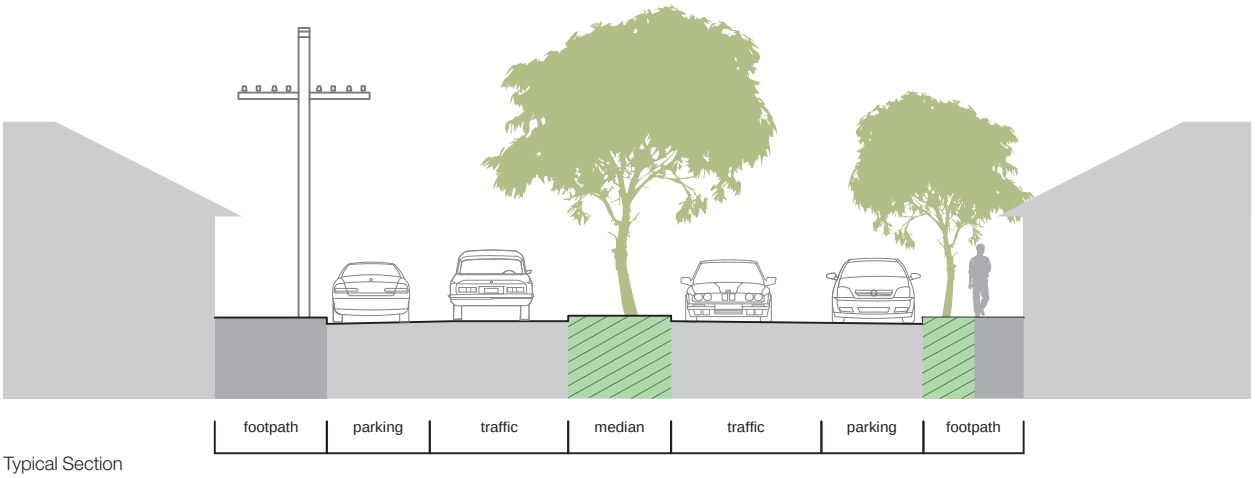
(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer platanoides 'Crimson Sentry'
Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Afrocarpus falcata
Agathis robusta
Allocasuarina torulosa
Angophora costata
Angophora floribunda
Araucaria cunninghamii
Araucaria heterophylla
Banksia integrifolia subsp. integrifolia
Casuarina cunninghamiana
Casuarina glauca
Cedrus atlantica
Cedrus deodara
Celtis occidentalis
Cercis siliquastrum
Cinnamomum camphora
Corymbia citriodora
Corymbia maculata
Cupaniopsis anachardioides
Cupressus sempervirens
Cupressus torulosa
Eucalyptus bancroftii
Eucalyptus camaldulensis
Eucalyptus cinerea
Eucalyptus cosmophylla
Eucalyptus gregsoniana
Eucalyptus leucoxylon
Eucalyptus mannifera subsp. maculosa
Eucalyptus melliodora
Eucalyptus nicholii
Eucalyptus polyanthemos
Eucalyptus pulchella
Eucalyptus scoparia
Eucalyptus sideroxylon
Eucalyptus spathulata
Ficus microcarpa var. hillii
Ficus platypoda
Ficus rubiginosa
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Fraxinus velutina
Geijera parviflora
Ginkgo biloba 'Princeton Sentry'
Gleditsia triacanthos var.inermis Varieties
Jacaranda mimosifolia
Lagerstroemia indica x L. fauriei varieties
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Lophostemon confertus
Maclura pomifera 'Wichita'
Metasequoia glyptostroboides
Paulownia tomentosa
Pinus canariensis
Pinus pinea
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Pyrus nivalis
Quercus acutissima
Quercus agrifolia
Quercus bicolor
Quercus canariensis
Quercus cerris
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus palustris
Quercus phellos
Quercus robur
Quercus rubra
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Schinus areira
Tilia cordata 'Greenspire'
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus procera
Zelkova serrata 'Green Vase'

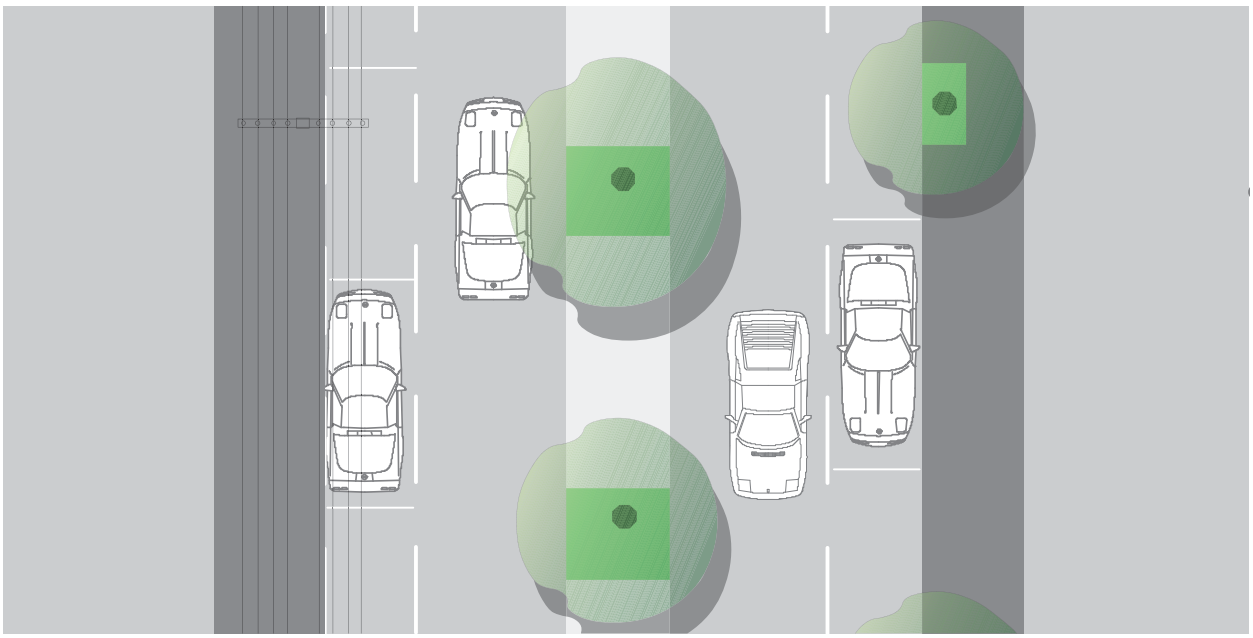
## Location Type 16 – Residential Narrow Median

### Description of Key Characteristics

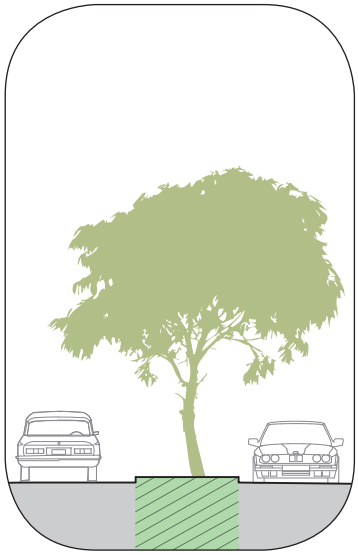
| | |
|---|---|
| Street Width | 20 metre |
| Traffic Lanes | 2 lane with central median |
| Overhead | Powerlines, lighting |
| Buildings | Residential, setback |
| Parking | Parallel kerb |
| Road centre | 2-3m planted/infill median or intermittent parking/median |
| Pathways | 2.5 metre footpath |
| Trees | Larger median planting, kerb planting |
| Example | Pitt Street Carlton, Lothian Street North Melbourne |




Typical Section



Typical Plan



## Tree Selection Criteria

(Key requirements for generating suitable street trees from matrix)

| |
|---|
| Canopy <15 |
| Height > 10m |
| Shade rating any |
| No powerlines |

## Street Tree Considerations

| |
|---|
| Potential large and high canopy |
| Tolerate full sun |
| Minimum height clearance of 4.5m |
| Variety of shade rating |

## Recommended Trees

(Based on Tree Selection Criteria relevant to Street Tree Considerations)

Acer buergerianum
Acer campestre 'Elsrijk'
Acer campestre 'Evelyn'
Acer platanoides 'Crimson Sentry'
Acer platanoides 'Globosum'
Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Afrocarpus falcata
Agathis robusta
Agonis flexuosa
Allocasuarina littoralis
Allocasuarina torulosa
Allocasuarina verticillata
Angophora costata
Angophora floribunda
Brachychiton acerifolius
Callistemon salignus
Callistemon viminalis
Casuarina glauca
Cedrus deodara
Corymbia citriodora
Corymbia maculata
Cupressus sempervirens
Eucalyptus bancroftii
Eucalyptus camaldulensis
Eucalyptus cinerea
Eucalyptus leucoxylon
Eucalyptus leucoxylon ssp. megalocarpa
Eucalyptus mannifera subsp. maculosa
Eucalyptus melliodora
Eucalyptus nicholii
Eucalyptus platypus
Eucalyptus polyanthemos
Eucalyptus pulchella
Eucalyptus scoparia
Eucalyptus sideroxylon
Eucalyptus spathulata
Ficus microcarpa var. hillii
Fraxinus pennsylvanica 'Aerial'
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Fraxinus velutina
Ginkgo biloba 'Princeton Sentry'
Gleditsia triacanthos var.inermis Varieties
Jacaranda mimosifolia
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Maclura pomifera 'Wichita'
Metasequoia glyptostroboides
Paulownia tomentosa
Phoenix canariensis
Pinus pinea
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Quercus acutissima
Quercus agrifolia
Quercus bicolor
Quercus canariensis
Quercus cerris
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus phellos
Quercus robur
Quercus robur 'Fastigiata'
Quercus rubra
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Schinus areira
Sophora japonica 'Princeton Upright'
Stenocarpus sinuatus
Tilia cordata 'Greenspire'
Tristaniopsis laurina
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus procera
Washingtonia filifera
Washingtonia robusta

# Appendices

# Appendix 1: References

Asterisked references refer to works not mentioned within the body of the document.

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Grabosky, Bassuk, & Towbridge (2002).

(Connellan, 2008)

(Rich, P.M. 1990. Characterizing plant canopies with hemispherical photographs.)

# Appendix 2: The Tree Selection Matrix as Interactive Tool

The Urban Forest Tree Diversity Guidelines employ a tree selection matrix as the interactive tool for tree species selection.

It is this interactive tool that has produced the tree lists by Location Type.

However, because the Tree Selection Matrix can be used interactively, it is able to generate additional specific tree lists for a wide range of criteria above and beyond those used to produce the tree lists presented within the main body of this report.

The Tree Selection Matrix provides an effective was of organising, sorting and prioritising tree species characteristics, tolerances and susceptibilities so as to provide informed and useful tree species selections.

The Tree Selection Matrix requires the user to determine the characteristics required for tree species within a given environment – for instance the verge of a busy east-west CAD street – thus encouraging a relationship to be established between tree selection and site specifics across the City's streetscapes and parks.

In order to aid the City of Melbourne's objectives, the Tree Selection Matrix provides three distinct tree lists from which appropriate tree selections can be made. The range of selection criteria across the three tree species lists is consistent. The three tree species lists are:

- Street trees: The principle component of the urban forest within the public domain.
- Park trees: These contribute significant avenues of tree planting to the cities greenery. While most street trees can be grown in parks, the reverse is not always possible. The park tree list includes species that require greater root volumes than those generally achievable in the streetscape environment, and species of large size.
- Trial trees: Included to expand the diversity of the tree species population, through streetscape trialing. Once the performance of these trees can be determined the matrix can be updated to reflect this new knowledge – the Tree Selection Matrix is a 'live' tool, intended to be reviewed on a regular basis.

Detailed instructions on how to use the Tree Selection Matrix follow.

## Using the Matrix

To understand how to use the matrix as an interactive tool, these Guidelines demonstrate a simple staged process of producing the street tree list for one Location Type (in the example the location is Location Type 1 – CAD Wide Footpath), and then further refining that list (in the example, the list is refined to show only trees suitable for shady conditions).

The matrix is a highly flexible tool able to generate plant lists for effectively all locations and conditions throughout the City of Melbourne.

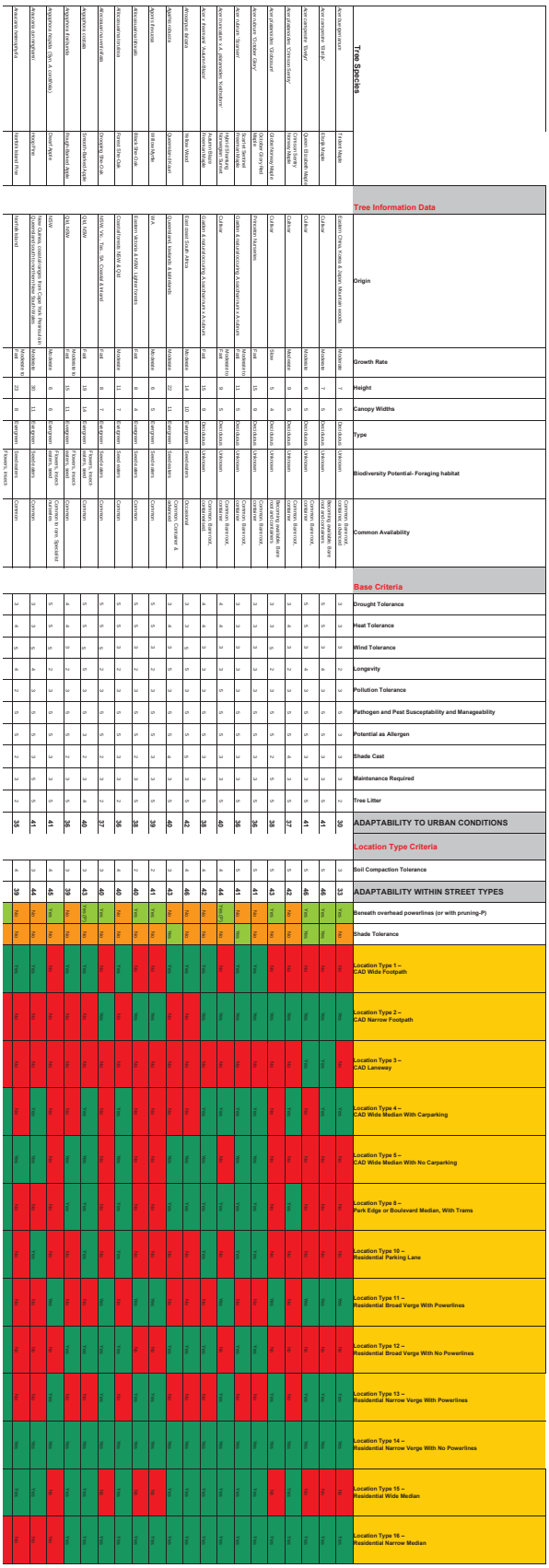
A profile of a typical street can be constructed using the type parts much like a mix and match book. This can help profile any typical scenario in a street type and provide a tree list that is flexible to cover differing scenarios such as powerlines, narrow verge, median planting opportunities. Therefore a truly diverse list of trees can be generated for any given street. This list can then be filtered further in the precinct plans.

Dimensional criteria are probably the most important, and the best place to start when refining tree lists. Remember trees may fail the criteria by being, for example, 1 metre too short or narrow. It is up to the discretion of Council to change the field to capture trees that are perceived as still being useful in this application and satisfying the objectives.

The selection criteria are supplemented by further information included in the Tree Selection Matrix that can be used by Council to scrutinise the tree candidates for the application after initial sorting and refining.

It is anticipated that this matrix will be supported by the graphic cross sections and that a street cross section can be generated to cover most variables found in the extent of a street, such as awnings, powerlines that switch verges, etc. The inclusion of such Location Types is a future exercise that may be explored.

## The Matrix at a Glance




**Tree Species**
Botanical and common name

**Tree Information Data**
Botanical and horticultural information

**Base Criteria for Adaptability to Urban Conditions**
The criteria by which each street species must fulfill to be acceptable for planting in City of Melbourne.

**Adaptability to Urban Conditions Rating**

**Additional Selection Criteria**

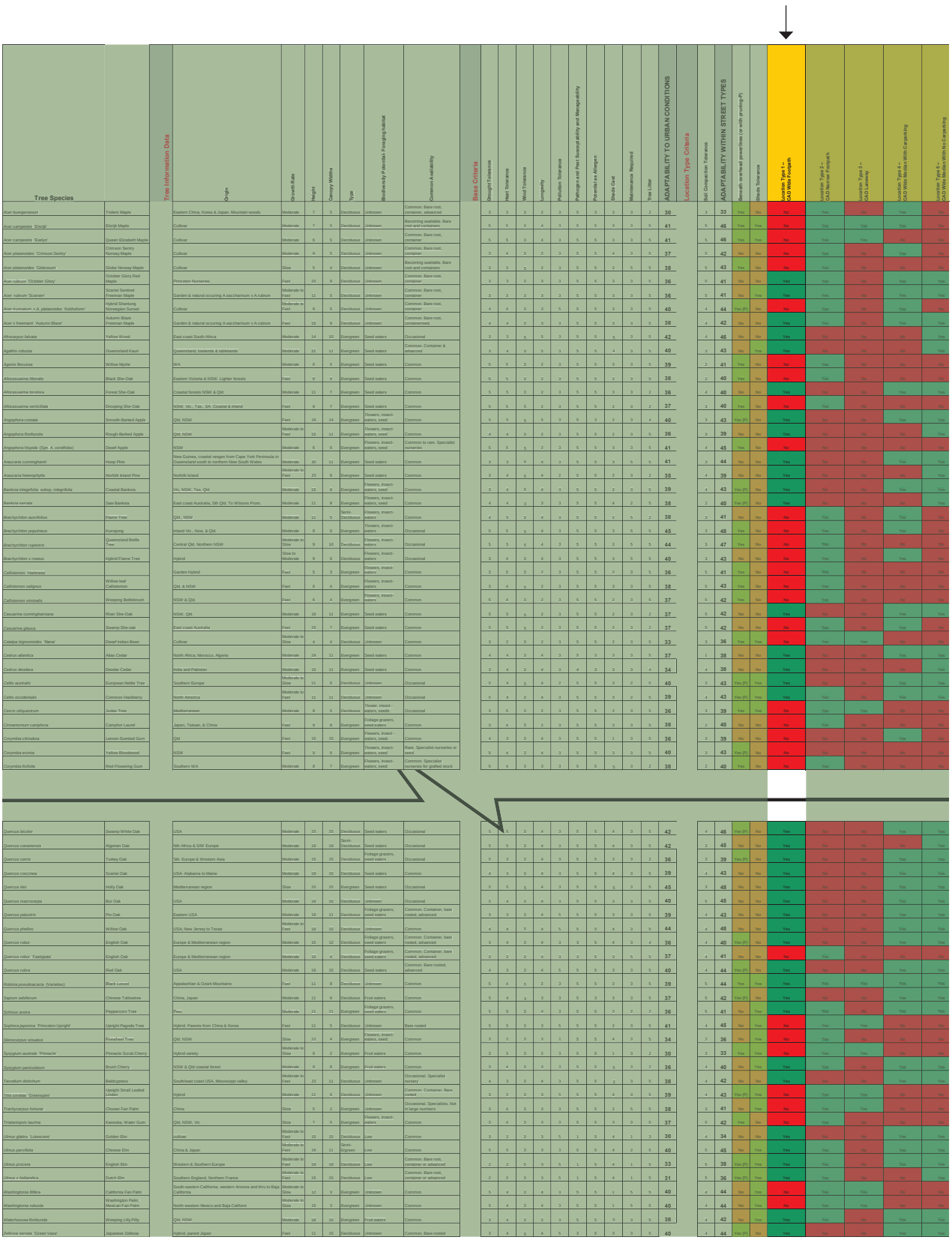
**Location Types**
Showing which trees are suitable.

## Example

**Demonstrating how to produce a street tree list for Location Type 1 – CAD Wide Footpath, and refine that list to sho only trees suitable for shady conditions.**

### Step 1

Identify the column on the Tree Selection Matrix that shows Location Type 1 – CAD Wide Footpath



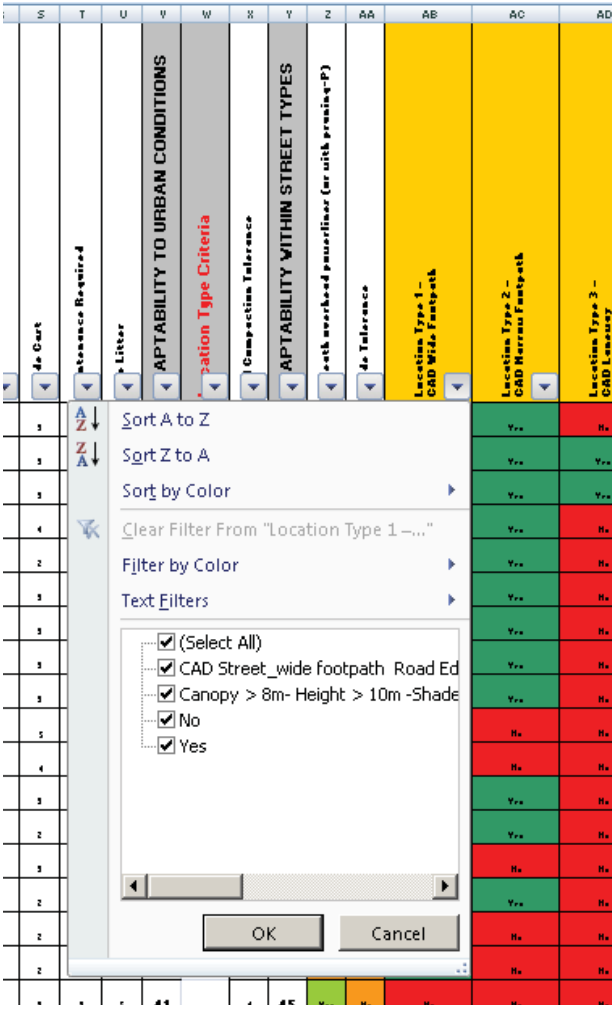
### Step 2

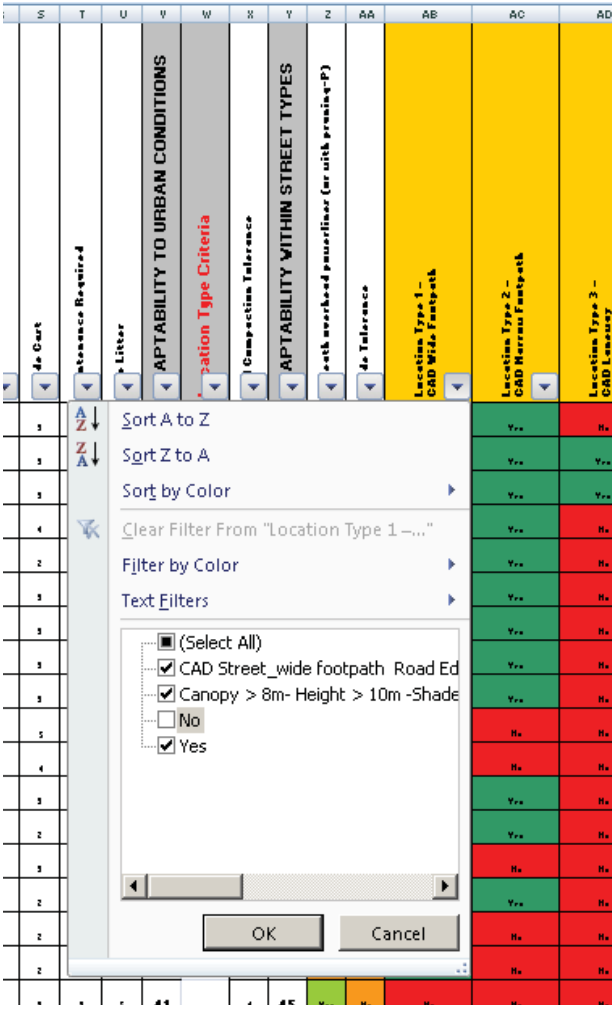
Alter the sort criteria for this column of the Matrix to exclude all trees maked “No”.

To do this click on the ▾ symbol in the top cell of the Location Type 1 – CAD Wide Footpath column. Click on the checkbox next to “No” to deselect that sort option and thus exclude all trees marked “No” from being displayed. Click OK to finish this step.

Note that here you can identify the selection criteria used to establish which trees are marked suitable (yes) and unsuitable (no).

In this example the criteria are Canopy >8m, Height > 10m, Shade rating > 2, Pollution rating > 2, and suitable for growing where there are no powerlines.



## Step 2 continued

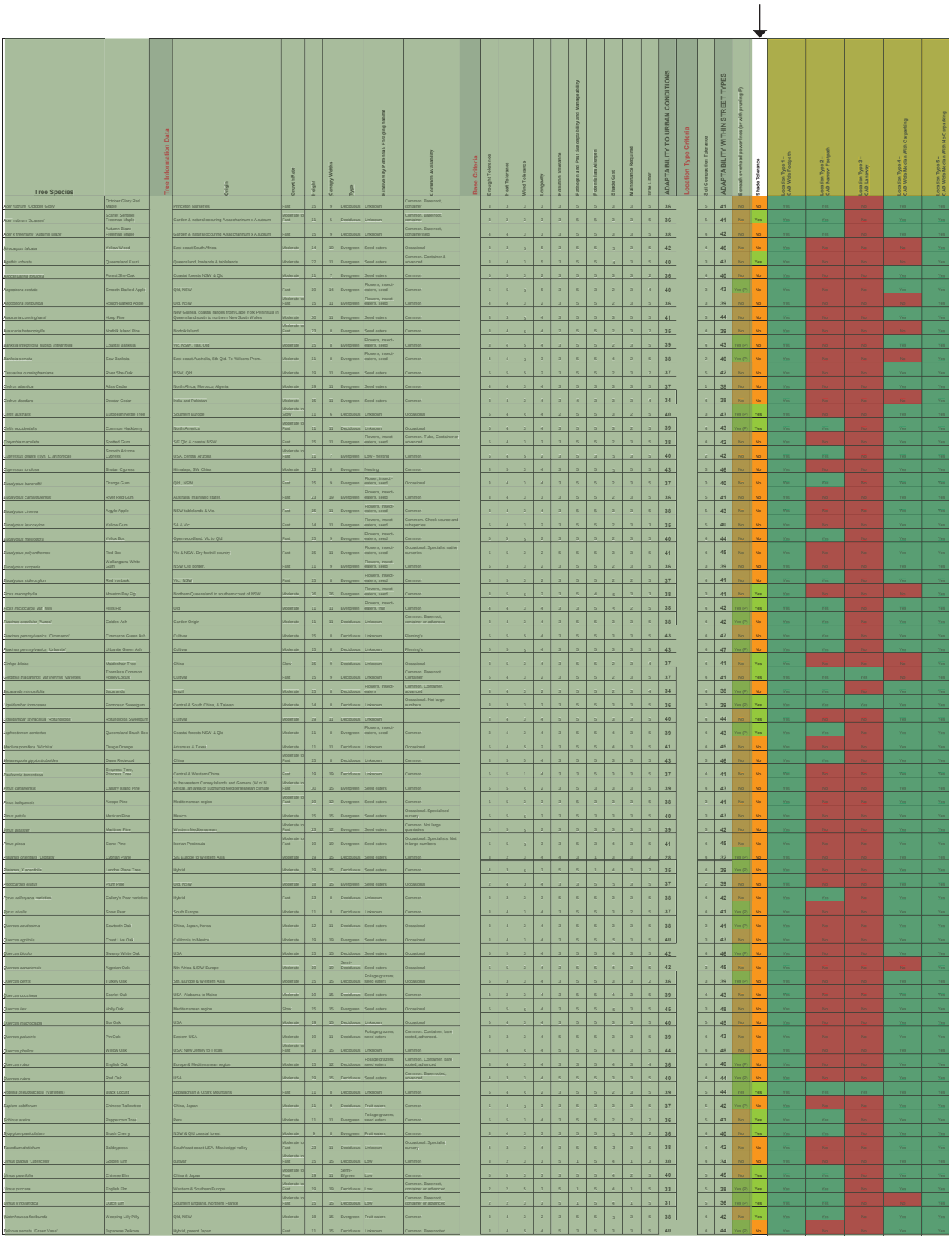
You can see here that only trees marked “Yes” in the Location Type 1 – CAD Wide Footpath column are being displayed.

This is the list of trees considered adaptable to urban conditions and suitable to Location Type 1 – CAD Wide Footpath, and shown on page 45.

| Tree Species | | Tree Information Data | Origin | Growth Rate | Height | Canopy Width | Type | Biodiversity Potential- Foraging habitat | Common Availability | Base Criteria | Drought Tolerance | Heat Tolerance | Wind Tolerance | Longevity | Pollution Tolerance | Pathogen and Pest Susceptability and Manageability | Palatinitas Allergen | Shade Cast | Maintenance Required | Tree Litter | ADAPTABILITY TO URBAN CONDITIONS | Location Type Criteria | Soil Compaction Tolerance | ADAPTABILITY WITHIN STREET TYPES | Branch overhead powerlines (or with pruning-P) | Shade Tolerance | Location Type 1 – CAD Wide Footpath | Location Type 2 – CAD Narrow Footpath | Location Type 3 – CAD Laneway | Location Type 4 – CAD Wide Median With Carparking | Location Type 5 – CAD Wide Median With No Carparking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Acer rubrum* 'October Glory' | October Glory Red Maple | | Princeton Nurseries | Fast | 15 | 9 | Deciduous | Unknown | Common. Bare root, container | | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 36 | | 5 | 41 | No | No | Yes | Yes | No | Yes | Yes |
| *Acer rubrum* 'Scarsen' | Scarlet Sentinel Freeman Maple | | Garden & natural occuring A.xaccharinum x A.rubrum | Moderate to Fast | 11 | 5 | Deciduous | Unknown | Common. Bare root, container | | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 36 | | 5 | 41 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Acer x freemanii* 'Autumn Blaze' | Autumn Blaze Freeman Maple | | Garden & natural occuring A.xaccharinum x A.rubrum | Fast | 15 | 9 | Deciduous | Unknown | Common. Bare root, container/seed. | | 4 | 4 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | No | No | Yes | Yes | No | Yes | Yes |
| *Afrocarpus falcata* | Yellow Wood | | East coast South Africa | Moderate | 14 | 10 | Evergreen | Seed eaters | Occasional | | 3 | 3 | 5 | 5 | 3 | 5 | 5 | 5 | 3 | 5 | 42 | | 4 | 46 | No | No | Yes | No | No | No | Yes |
| *Agathis robusta* | Queensland Kauri | | Queensland, lowlands & tablelands | Moderate | 22 | 11 | Evergreen | Seed eaters | Common. Container & advanced | | 3 | 4 | 3 | 5 | 3 | 5 | 5 | 4 | 3 | 5 | 40 | | 3 | 43 | No | Yes | Yes | No | No | No | Yes |
| *Allocasuarina torulosa* | Forest She-Oak | | Coastal forests NSW & Qld | Moderate | 11 | 7 | Evergreen | Seed eaters | Common | | 5 | 5 | 3 | 2 | 3 | 5 | 5 | 3 | 3 | 2 | 36 | | 4 | 40 | No | No | Yes | No | No | Yes | Yes |
| *Angophora costata* | Smooth-Barked Apple | | Qld, NSW | Fast | 19 | 14 | Evergreen | Flowers, insect-eaters, seed | Common | | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 3 | 3 | 4 | 40 | | 3 | 43 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Angophora floribunda* | Rough-Barked Apple | | Qld, NSW | Moderate to Fast | 15 | 11 | Evergreen | Flowers, insect-eaters, seed | Common | | 4 | 4 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 36 | | 3 | 39 | No | No | Yes | No | No | No | Yes |
| *Araucaria cunninghamii* | Hoop Pine | | New Guinea, coastal ranges from Cape York Peninsula in Queensland south to northern New South Wales | Moderate | 30 | 11 | Evergreen | Seed eaters | Common | | 3 | 3 | 5 | 4 | 3 | 5 | 5 | 3 | 5 | 5 | 41 | | 3 | 44 | No | No | Yes | No | No | Yes | Yes |
| *Araucaria heterophylla* | Norfolk Island Pine | | Norfolk Island | Moderate to Fast | 23 | 8 | Evergreen | Seed eaters | Common | | 3 | 4 | 5 | 4 | 2 | 5 | 5 | 2 | 3 | 2 | 35 | | 4 | 39 | No | No | Yes | No | No | No | Yes |
| *Banksia integrifolia subsp. integrifolia* | Coastal Banksia | | Vic, NSW, Tas, Qld | Moderate | 15 | 8 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 4 | 5 | 4 | 3 | 5 | 5 | 2 | 3 | 5 | 39 | | 4 | 43 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Banksia serrata* | Saw Banksia | | East coast Australia, Sth Qld. To Wilsons Prom. | Moderate | 11 | 8 | Evergreen | Flowers, insect-eaters, seed | Common | | 4 | 4 | 3 | 3 | 3 | 5 | 5 | 4 | 2 | 5 | 38 | | 2 | 40 | Yes (P) | No | Yes | No | No | No | Yes |
| *Casuarina cunninghamiana* | River She-Oak | | NSW, Qld. | Moderate | 19 | 11 | Evergreen | Seed eaters | Common | | 5 | 5 | 5 | 2 | 3 | 5 | 5 | 2 | 3 | 2 | 37 | | 5 | 42 | No | No | Yes | No | No | Yes | Yes |
| *Cedrus atlantica* | Atlas Cedar | | North Africa, Morocco, Algeria | Moderate | 19 | 11 | Evergreen | Seed eaters | Common | | 4 | 4 | 3 | 4 | 3 | 5 | 3 | 3 | 3 | 5 | 37 | | 1 | 38 | No | No | Yes | No | No | Yes | Yes |
| *Cedrus deodara* | Deodar Cedar | | India and Pakistan | Moderate | 15 | 11 | Evergreen | Seed eaters | Common | | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 34 | | 4 | 38 | No | No | Yes | No | No | No | Yes |
| *Celtis australis* | European Nettle Tree | | Southern Europe | Moderate to Slow | 11 | 6 | Deciduous | Unknown | Occasional | | 5 | 4 | 5 | 4 | 2 | 5 | 5 | 3 | 2 | 5 | 40 | | 3 | 43 | Yes (P) | Yes | Yes | No | No | Yes | Yes |
| *Celtis occidentalis* | Common Hackberry | | North America | Moderate to Fast | 11 | 11 | Deciduous | Unknown | Occasional | | 5 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 2 | 5 | 39 | | 4 | 43 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Corymbia maculata* | Spotted Gum | | SE Qld & coastal NSW | Fast | 15 | 11 | Evergreen | Flowers, insect-eaters, seed | Common. Tube, Container or advanced | | 5 | 4 | 3 | 3 | 3 | 5 | 5 | 2 | 3 | 5 | 38 | | 4 | 42 | No | No | Yes | No | No | Yes | Yes |
| *Cupressus glabra* (syn. *C. arizonica*) | Smooth Arizona Cypress | | USA, central Arizona | Moderate to Fast | 11 | 7 | Evergreen | Low - nesting | Common | | 5 | 4 | 5 | 2 | 3 | 5 | 3 | 5 | 3 | 5 | 40 | | 2 | 42 | No | No | Yes | No | No | Yes | Yes |
| *Cupressus torulosa* | Bhutan Cypress | | Himalaya, SW China | Moderate | 23 | 8 | Evergreen | Nesting | Common | | 3 | 5 | 3 | 4 | 3 | 5 | 5 | 5 | 5 | 5 | 43 | | 3 | 46 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus bancroftii* | Orange Gum | | Qld., NSW | Fast | 15 | 9 | Evergreen | Flower, insect-eaters, seed. | Occasional | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 2 | 3 | 5 | 37 | | 3 | 40 | No | No | Yes | Yes | No | Yes | Yes |
| *Eucalyptus camaldulensis* | River Red Gum | | Australia, mainland states | Fast | 23 | 19 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 4 | 3 | 3 | 3 | 5 | 5 | 2 | 3 | 5 | 36 | | 5 | 41 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus cinerea* | Argyle Apple | | NSW tablelands & Vic. | Fast | 15 | 11 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 5 | 43 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus leucoxylon* | Yellow Gum | | SA & Vic | Fast | 14 | 11 | Evergreen | Flowers, insect-eaters, seed | Common. Check source and subspecies | | 5 | 4 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 3 | 35 | | 5 | 40 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus melliodora* | Yellow Box | | Open woodland. Vic to Qld. | Fast | 15 | 9 | Evergreen | Flowers, insect-eaters, seed | Common | | 5 | 5 | 5 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 40 | | 4 | 44 | No | No | Yes | Yes | No | Yes | Yes |
| *Eucalyptus polyanthemos* | Red Box | | Vic & NSW. Dry foothill country | Fast | 15 | 11 | Evergreen | Flowers, insect-eaters, seed | Occasional. Specialist native nurseries | | 5 | 5 | 3 | 2 | 5 | 5 | 5 | 3 | 3 | 5 | 41 | | 4 | 45 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus scoparia* | Wallangarra White Gum | | NSW Qld border. | Fast | 11 | 9 | Evergreen | Flowers, insect-eaters, seed | Common | | 5 | 3 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 36 | | 3 | 39 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus sideroxylon* | Red Ironbark | | Vic., NSW | Fast | 15 | 8 | Evergreen | Flowers, insect-eaters, seed | Common | | 5 | 5 | 3 | 2 | 3 | 5 | 5 | 2 | 2 | 5 | 37 | | 4 | 41 | No | No | Yes | Yes | No | Yes | Yes |
| *Ficus macrophylla* | Moreton Bay Fig | | Northern Queensland to southern coast of NSW | Moderate | 26 | 26 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 5 | 5 | 2 | 3 | 5 | 4 | 5 | 3 | 3 | 38 | | 3 | 41 | No | Yes | Yes | Yes | No | No | Yes |
| *Ficus microcarpa* var. *hillii* | Hill's Fig | | Qld | Moderate | 11 | 11 | Evergreen | Flowers, insect-eaters, fruit | Common | | 4 | 4 | 3 | 4 | 3 | 3 | 5 | 5 | 2 | 5 | 38 | | 4 | 42 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Fraxinus excelsior* 'Aurea' | Golden Ash | | Garden Origin | Moderate | 11 | 11 | Deciduous | Unknown | Common. Bare root, container or advanced | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Fraxinus pennsylvanica* 'Cimmaron' | Cimmaron Green Ash | | Cultivar | Moderate | 15 | 8 | Deciduous | Unknown | Fleming's | | 5 | 5 | 5 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 43 | | 4 | 47 | No | No | Yes | Yes | No | Yes | Yes |
| *Fraxinus pennsylvanica* 'Urbanite' | Urbanite Green Ash | | Cultivar | Moderate | 15 | 8 | Deciduous | Unknown | Fleming's | | 5 | 5 | 5 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 43 | | 4 | 47 | Yes (P) | No | Yes | Yes | No | Yes | Yes |
| *Ginkgo biloba* | Maidenhair Tree | | China | Slow | 15 | 9 | Deciduous | Unknown | Occasional | | 3 | 5 | 3 | 4 | 3 | 5 | 5 | 2 | 3 | 4 | 37 | | 4 | 41 | No | Yes | Yes | No | No | No | Yes |
| *Gleditsia triacanthos var.inermis* Varieties | Thornless Common Honey Locust | | Cultivar | Fast | 15 | 9 | Deciduous | Unknown | Common. Bare root, container | | 5 | 4 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 37 | | 4 | 41 | No | Yes | Yes | Yes | Yes | No | Yes |
| *Jacaranda mimosifolia* | Jacaranda | | Brazil | Moderate | 15 | 8 | Deciduous | Flowers, insect-eaters | Common. Container, advanced | | 3 | 4 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 4 | 34 | | 4 | 38 | Yes (P) | No | Yes | Yes | No | Yes | Yes |
| *Liquidambar formosana* | Formosan Sweetgum | | Central & South China, & Taiwan | Moderate | 14 | 8 | Deciduous | Unknown | Occasional. Not large numbers | | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 36 | | 3 | 39 | Yes (P) | Yes | Yes | Yes | Yes | Yes | Yes |
| *Liquidambar styraciflua* 'Rotundiloba' | Rotundiloba Sweetgum | | Cultivar | Moderate | 19 | 11 | Deciduous | Unknown | | | 3 | 4 | 3 | 4 | 5 | 5 | 5 | 3 | 3 | 5 | 40 | | 4 | 44 | No | Yes | Yes | No | No | Yes | Yes |
| *Lophostemon confertus* | Queensland Brush Box | | Coastal forests NSW & Qld | Moderate | 11 | 8 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 39 | | 4 | 43 | Yes (P) | Yes | Yes | No | No | Yes | Yes |
| *Maclura pomifera* 'Wichita' | Osage Orange | | Arkansas & Texas | Moderate | 11 | 11 | Deciduous | Unknown | Occasional | | 5 | 4 | 5 | 2 | 3 | 5 | 5 | 4 | 3 | 5 | 41 | | 4 | 45 | No | No | Yes | No | No | Yes | Yes |
| *Metasequoia glyptostroboides* | Dawn Redwood | | China | Moderate to Fast | 15 | 8 | Deciduous | Unknown | Common | | 3 | 5 | 5 | 4 | 3 | 5 | 5 | 3 | 5 | 5 | 43 | | 3 | 46 | No | No | Yes | Yes | No | Yes | Yes |
| *Paulownia tomentosa* | Empress Tree, Princess Tree | | Central & Western China | Fast | 19 | 19 | Deciduous | Unknown | Common | | 5 | 5 | 1 | 4 | 3 | 3 | 5 | 3 | 3 | 5 | 37 | | 4 | 41 | No | No | Yes | No | No | No | Yes |
| *Pinus canariensis* | Canary Island Pine | | In the western Canary Islands and Gomera (W of N Africa), an area of subhumid Mediterranean climate | Moderate to Fast | 30 | 15 | Evergreen | Seed eaters | Common | | 5 | 5 | 5 | 2 | 3 | 5 | 3 | 3 | 3 | 5 | 39 | | 4 | 43 | No | No | Yes | No | No | No | Yes |
| *Pinus halepensis* | Aleppo Pine | | Mediterranean region | Moderate to Fast | 19 | 12 | Evergreen | Seed eaters | Common | | 5 | 5 | 3 | 3 | 3 | 5 | 3 | 3 | 3 | 5 | 38 | | 3 | 41 | No | No | Yes | No | No | Yes | Yes |
| *Pinus patula* | Mexican Pine | | Mexico | Moderate | 15 | 15 | Evergreen | Seed eaters | Occasional. Specialised nursery | | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 40 | | 3 | 43 | No | No | Yes | No | No | No | Yes |
| *Pinus pinaster* | Maritime Pine | | Western Mediterranean | Moderate to Fast | 23 | 12 | Evergreen | Seed eaters | Common. Not large quantaties | | 5 | 5 | 5 | 2 | 3 | 5 | 5 | 3 | 3 | 5 | 39 | | 3 | 42 | No | No | Yes | No | No | Yes | Yes |
| *Pinus pinea* | Stone Pine | | Iberian Peninsula. | Moderate to Fast | 19 | 19 | Evergreen | Seed eaters | Occasional. Specialists. Not in large numbers | | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 3 | 4 | 3 | 5 | 41 | | 4 | 45 | No | No | Yes | No | No | Yes | Yes |
| *Platanus orientalis* 'Digitata' | Cyprian Plane | | SE Europe to Western Asia | Moderate | 19 | 15 | Deciduous | Seed eaters | Common | | 3 | 2 | 3 | 4 | 4 | 3 | 1 | 3 | 3 | 2 | 28 | | 4 | 32 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Platanus* X *acerifolia* | London Plane Tree | | Hybrid | Moderate | 19 | 15 | Deciduous | Seed eaters | Common | | 4 | 3 | 5 | 3 | 5 | 5 | 1 | 4 | 3 | 2 | 35 | | 4 | 39 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Podocarpus elatus* | Plum Pine | | Qld, NSW | Moderate | 18 | 15 | Evergreen | Seed eaters | Occasional | | 2 | 4 | 3 | 4 | 3 | 3 | 5 | 5 | 3 | 5 | 37 | | 2 | 39 | No | No | Yes | No | No | Yes | Yes |
| *Pyrus calleryana* varieties | Callery's Pear varieties | | Hybrid | Fast | 13 | 8 | Deciduous | Unknown | Common | | 3 | 3 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | No | No | Yes | Yes | No | Yes | Yes |
| *Pyrus nivalis* | Snow Pear | | South Europe | Moderate | 11 | 8 | Deciduous | Unknown | Common | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 2 | 5 | 37 | | 4 | 41 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Quercus acutissima* | Sawtooth Oak | | China, Japan, Korea | Moderate | 12 | 11 | Deciduous | Seed eaters | Occasional | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 3 | 41 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Quercus agrifolia* | Coast Live Oak | | California to Mexico | Moderate | 19 | 19 | Evergreen | Seed eaters | Occasional | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 5 | 3 | 5 | 40 | | 3 | 43 | No | No | Yes | No | No | No | Yes |
| *Quercus bicolor* | Swamp White Oak | | USA | Moderate | 15 | 15 | Deciduous | Seed eaters | Occasional | | 5 | 5 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 42 | | 4 | 46 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Quercus canariensis* | Algerian Oak | | Nth Africa & SW Europe | Moderate | 19 | 19 | Semi-Deciduous | Seed eaters | Occasional | | 5 | 5 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 42 | | 3 | 45 | No | No | Yes | No | No | No | Yes |
| *Quercus cerris* | Turkey Oak | | Sth. Europe & Western Asia | Moderate | 15 | 15 | Deciduous | Foliage grazers, seed eaters | Occasional | | 5 | 3 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 2 | 36 | | 3 | 39 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Quercus coccinea* | Scarlet Oak | | USA- Alabama to Maine | Moderate | 19 | 15 | Deciduous | Seed eaters | Common | | 4 | 3 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 39 | | 4 | 43 | No | No | Yes | No | No | No | Yes |
| *Quercus ilex* | Holly Oak | | Mediterranean region | Slow | 15 | 15 | Evergreen | Seed eaters | Occasional | | 5 | 5 | 5 | 4 | 3 | 5 | 5 | 5 | 3 | 5 | 45 | | 3 | 48 | No | No | Yes | No | No | No | Yes |
| *Quercus macrocarpa* | Bur Oak | | USA | Moderate | 19 | 15 | Deciduous | Unknown | Occasional | | 5 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 40 | | 5 | 45 | No | No | Yes | No | No | Yes | Yes |
| *Quercus palustris* | Pin Oak | | Eastern USA | Moderate | 19 | 11 | Deciduous | Foliage grazers, seed eaters | Common. Container, bare rooted, advanced. | | 3 | 3 | 3 | 4 | 5 | 5 | 5 | 3 | 3 | 5 | 39 | | 4 | 43 | No | No | Yes | No | No | No | Yes |
| *Quercus phellos* | Willow Oak | | USA, New Jersey to Texas | Moderate to Fast | 19 | 15 | Deciduous | Unknown | Common | | 4 | 4 | 5 | 4 | 5 | 5 | 4 | 3 | 5 | 44 | | 4 | 48 | No | No | Yes | No | No | No | Yes |
| *Quercus robur* | English Oak | | Europe & Mediterranean region | Moderate | 15 | 12 | Deciduous | Foliage grazers, seed eaters | Common. Container, bare rooted, advanced | | 3 | 4 | 3 | 4 | 3 | 3 | 5 | 4 | 3 | 4 | 36 | | 4 | 40 | Yes (P) | No | Yes | No | No | No | Yes |
| *Quercus rubra* | Red Oak | | USA | Moderate | 19 | 15 | Deciduous | Seed eaters | Common. Bare rooted, advanced | | 4 | 3 | 3 | 4 | 5 | 5 | 5 | 3 | 3 | 5 | 40 | | 4 | 44 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Robinia pseudoacacia* (Varieties) | Black Locust | | Appalachian & Ozark Mountains | Fast | 11 | 8 | Deciduous | Unknown | Common | | 5 | 4 | 5 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 39 | | 5 | 44 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Sapium sebiferum* | Chinese Tallowtree | | China, Japan | Moderate | 11 | 9 | Deciduous | Fruit eaters | Common | | 5 | 4 | 3 | 3 | 3 | 5 | 3 | 3 | 3 | 5 | 42 | | 5 | 42 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Schinus areira* | Peppercorn Tree | | Peru | Moderate | 11 | 11 | Evergreen | Foliage grazers, seed eaters | Common | | 5 | 5 | 3 | 4 | 3 | 5 | 5 | 2 | 2 | 2 | 36 | | 5 | 41 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Syzygium paniculatum* | Brush Cherry | | NSW & Qld coastal forest | Moderate | 9 | 6 | Evergreen | Fruit eaters | Common | | 3 | 4 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 2 | 36 | | 4 | 40 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Taxodium distichum* | Baldcypress | | South/east coast USA, Mississippi valley | Moderate to Fast | 23 | 11 | Deciduous | Unknown | Occasional. Specialist nursery | | 4 | 3 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | No | No | Yes | No | No | No | Yes |
| *Ulmus glabra* 'Lutescens' | Golden Elm | | cultivar | Moderate to Fast | 15 | 15 | Deciduous | Low | Common | | 3 | 2 | 3 | 3 | 5 | 1 | 5 | 4 | 1 | 3 | 30 | | 4 | 34 | No | No | Yes | No | No | Yes | Yes |
| *Ulmus parvifolia* | Chinese Elm | | China & Japan | Moderate to Fast | 19 | 11 | Semi-Elgreen | Low | Common | | 5 | 5 | 3 | 3 | 3 | 5 | 5 | 4 | 2 | 5 | 40 | | 5 | 45 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Ulmus procera* | English Elm | | Western & Southern Europe | Moderate to Fast | 19 | 19 | Deciduous | Low | Common. Bare root, container or advanced | | 2 | 2 | 5 | 3 | 5 | 1 | 5 | 4 | 1 | 5 | 33 | | 5 | 38 | Yes (P) | Yes | Yes | Yes | No | No | Yes |
| *Ulmus* x *hollandica* | Dutch Elm | | Southern England, Northern France | Moderate to Fast | 15 | 15 | Deciduous | Low | Common. Bare root, container or advanced | | 2 | 2 | 3 | 3 | 5 | 1 | 5 | 4 | 1 | 5 | 31 | | 5 | 36 | Yes (P) | Yes | Yes | Yes | No | No | Yes |
| *Waterhousea floribunda* | Weeping Lilly Pilly | | Qld, NSW | Moderate | 18 | 15 | Evergreen | Fruit eaters | Common | | 3 | 4 | 3 | 2 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Zelkova serrata* 'Green Vase' | Japanese Zelkova | | Hybrid, parent Japan | Fast | 11 | 15 | Deciduous | Unknown | Common. Bare rooted | | 3 | 4 | 5 | 4 | 5 | 3 | 5 | 3 | 3 | 5 | 40 | | 4 | 44 | Yes (P) | No | Yes | No | No | Yes | Yes |

## Step 3

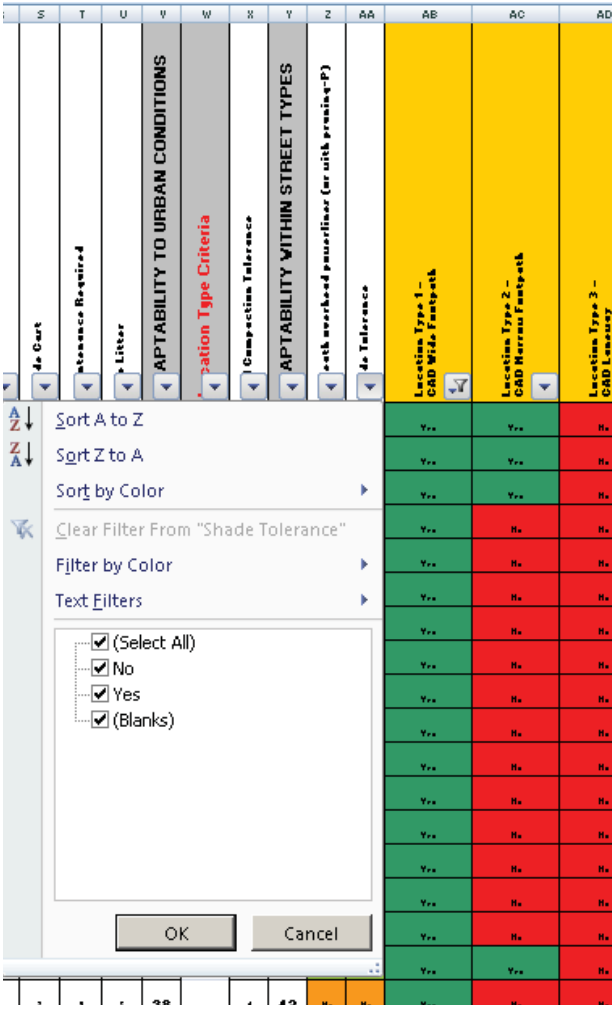
To further refine this list to show only trees suitable to shady conditions, it is necessary now to sort the Matrix by the column “Shade Tolerance”

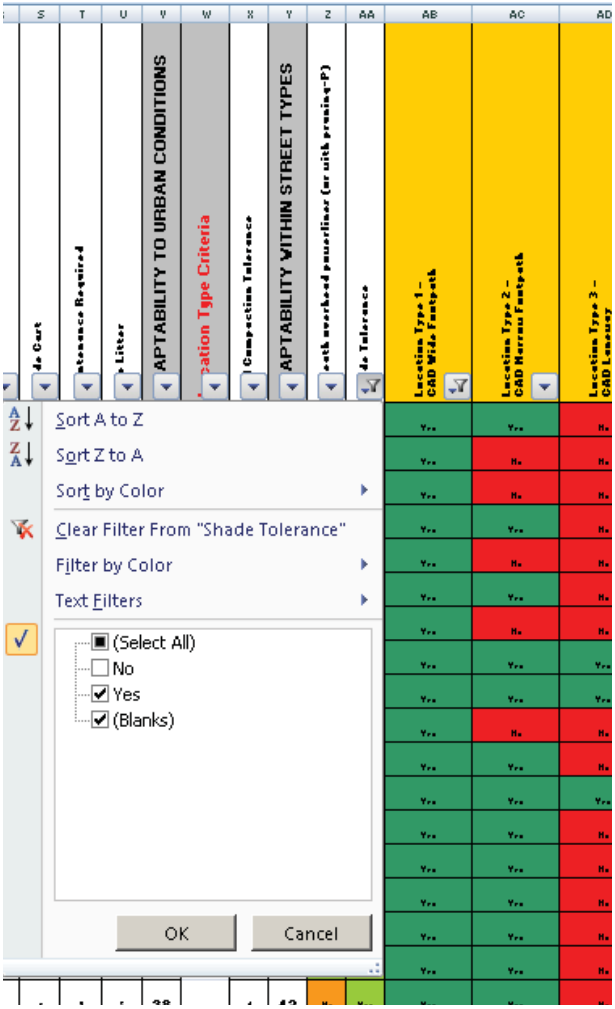


| Tree Species | | Tree Information Data | Origin | Growth Rate | Height | Canopy Width | Type | Biodiversity Potential- Foraging habitat | Common Availability | Base Criteria | Drought Tolerance | Heat Tolerance | Wind Tolerance | Longevity | Pollution Tolerance | Pathogen and Pest Susceptability and Manageability | Palatability as Allergen | Shade Cast | Maintenance Required | Tree Litter | ADAPTABILITY TO URBAN CONDITIONS | Location Type Criteria | Soil Compaction Tolerance | ADAPTABILITY WITHIN STREET TYPES | Branch overhead powerlines (or with pruning P) | Shade Tolerance | Location Type 1 – CAD Wide Medium | Location Type 2 – CAD Narrow Footpath | Location Type 3 – CAD Laneway | Location Type 4 – CAD Wide Medium With Carparking | Location Type 5 – CAD Wide Medium No Carparking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Acer rubrum 'October Glory'* | October Glory Red Maple | | Princeton Nurseries | Fast | 15 | 9 | Deciduous | Unknown | Common. Bare root, container | | 3 | 3 | 3 | 3 | 3 | 5 | 3 | 3 | 5 | 36 | | 5 | 41 | No | No | Yes | Yes | No | Yes | Yes |
| *Acer rubrum 'Scanlon'* | Scarlet Sentinel Freeman Maple | | Garden & natural occuring A.saccharinum x A.rubrum | Moderate to Fast | 11 | 5 | Deciduous | Unknown | Common. Bare root, container | | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 36 | | 5 | 41 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Acer x freemanii 'Autumn Blaze'* | Autumn Blaze Freeman Maple | | Garden & natural occuring A.saccharinum x A.rubrum | Fast | 15 | 9 | Deciduous | Unknown | Common. Bare root, container/seed. | | 4 | 4 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | No | No | Yes | Yes | No | Yes | Yes |
| *Afrocarpus falcata* | Yellow Wood | | East coast South Africa | Moderate | 14 | 10 | Evergreen | Seed eaters | Occasional | | 3 | 3 | 5 | 5 | 3 | 5 | 5 | 5 | 3 | 5 | 42 | | 4 | 46 | No | No | No | No | No | No | Yes |
| *Agathis robusta* | Queensland Kauri | | Queensland, lowlands & tablelands | Moderate | 22 | 11 | Evergreen | Seed eaters | Common. Container & advanced. | | 3 | 4 | 3 | 5 | 3 | 5 | 5 | 4 | 3 | 5 | 40 | | 3 | 43 | No | Yes | Yes | No | No | No | Yes |
| *Allocasuarina torulosa* | Forest She-Oak | | Coastal forests NSW & Qld | Moderate | 11 | 7 | Evergreen | Seed eaters | Common | | 5 | 5 | 3 | 2 | 3 | 5 | 5 | 3 | 3 | 2 | 36 | | 4 | 40 | No | No | Yes | No | No | Yes | Yes |
| *Angophora costata* | Smooth-Barked Apple | | Qld, NSW | Fast | 19 | 14 | Evergreen | Flowers, insect-eaters, seed | Common | | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 3 | 3 | 4 | 40 | | 3 | 43 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Angophora floribunda* | Rough-Barked Apple | | Qld, NSW | Moderate to Fast | 15 | 11 | Evergreen | Flowers, insect-eaters, seed | Common | | 4 | 4 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 36 | | 3 | 39 | No | No | Yes | No | No | No | Yes |
| *Araucaria cunninghamii* | Hoop Pine | | New Guinea, coastal ranges from Cape York Peninsula in Queensland south to northern New South Wales | Moderate | 30 | 11 | Evergreen | Seed eaters | Common | | 3 | 3 | 5 | 4 | 3 | 5 | 5 | 3 | 5 | 5 | 41 | | 3 | 44 | No | No | Yes | No | No | Yes | Yes |
| *Araucaria heterophylla* | Norfolk Island Pine | | Norfolk Island | Moderate to Fast | 23 | 9 | Evergreen | Seed eaters | Common | | 3 | 4 | 5 | 4 | 2 | 5 | 5 | 2 | 3 | 2 | 35 | | 4 | 39 | No | No | Yes | No | No | No | Yes |
| *Banksia integrifolia subsp. integrifolia* | Coastal Banksia | | Vic, NSW, Tas, Qld | Moderate | 15 | 8 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 4 | 5 | 4 | 3 | 5 | 5 | 2 | 3 | 5 | 39 | | 4 | 43 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Banksia serrata* | Saw Banksia | | East coast Australia, Sth Qld. To Wilsons Prom. | Moderate | 11 | 8 | Evergreen | Flowers, insect-eaters, seed | Common | | 4 | 4 | 3 | 3 | 3 | 5 | 5 | 4 | 2 | 5 | 38 | | 2 | 40 | Yes (P) | No | Yes | No | No | No | Yes |
| *Casuarina cunninghamiana* | River She-Oak | | NSW, Qld. | Moderate | 19 | 11 | Evergreen | Seed eaters | Common | | 5 | 5 | 5 | 2 | 3 | 5 | 5 | 2 | 3 | 2 | 37 | | 5 | 42 | No | No | Yes | No | No | Yes | Yes |
| *Cedrus atlantica* | Atlas Cedar | | North Africa, Morocco, Algeria | Moderate | 19 | 11 | Evergreen | Seed eaters | Common | | 4 | 4 | 3 | 4 | 3 | 5 | 3 | 3 | 3 | 5 | 37 | | 1 | 38 | No | No | Yes | No | No | Yes | Yes |
| *Cedrus deodara* | Deodar Cedar | | India and Pakistan | Moderate | 15 | 11 | Evergreen | Seed eaters | Common | | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 34 | | 4 | 38 | No | No | Yes | No | No | No | Yes |
| *Celtis australis* | European Nettle Tree | | Southern Europe | Moderate to Slow | 11 | 6 | Deciduous | Unknown | Occasional | | 5 | 4 | 5 | 4 | 2 | 5 | 5 | 3 | 2 | 5 | 40 | | 3 | 43 | Yes (P) | Yes | Yes | No | No | Yes | Yes |
| *Celtis occidentalis* | Common Hackberry | | North America | Moderate to Fast | 12 | 11 | Deciduous | Unknown | Occasional | | 5 | 4 | 2 | 4 | 3 | 5 | 5 | 3 | 2 | 5 | 39 | | 4 | 43 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Corymbia maculata* | Spotted Gum | | SE Qld & coastal NSW | Fast | 15 | 11 | Evergreen | Flowers, insect-eaters, seed | Common. Tube, Container or advanced | | 5 | 4 | 3 | 3 | 3 | 5 | 5 | 2 | 3 | 5 | 38 | | 4 | 42 | No | No | Yes | No | No | Yes | Yes |
| *Cupressus glabra (syn. C. arizonica)* | Smooth Arizona Cypress | | USA, central Arizona | Moderate to Fast | 11 | 7 | Evergreen | Low - nesting | Common | | 5 | 4 | 5 | 2 | 3 | 5 | 3 | 5 | 3 | 5 | 40 | | 2 | 42 | No | No | Yes | No | No | Yes | Yes |
| *Cupressus torulosa* | Rhutan Cypress | | Himalaya, SW China | Moderate | 23 | 8 | Evergreen | Nesting | Common | | 3 | 5 | 3 | 4 | 3 | 5 | 5 | 5 | 5 | 5 | 43 | | 3 | 46 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus bancroftii* | Orange Gum | | Qld., NSW | Fast | 15 | 9 | Evergreen | Flower, insect-eaters, seed. | Occasional | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 2 | 3 | 5 | 37 | | 3 | 40 | No | No | Yes | Yes | No | Yes | Yes |
| *Eucalyptus camaldulensis* | River Red Gum | | Australia, mainland states | Fast | 23 | 19 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 4 | 3 | 3 | 3 | 5 | 5 | 2 | 3 | 5 | 36 | | 5 | 41 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus cinerea* | Argyle Apple | | NSW tablelands & Vic. | Fast | 16 | 11 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 5 | 43 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus leucoxylon* | Yellow Gum | | SA & Vic | Fast | 14 | 11 | Evergreen | Flowers, insect-eaters, seed | Common. Check source and subspecies | | 5 | 4 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 3 | 35 | | 5 | 40 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus melliodora* | Yellow Box | | Open woodland. Vic to Qld. | Fast | 15 | 9 | Evergreen | Flowers, insect-eaters, seed | Common | | 5 | 5 | 5 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 40 | | 4 | 44 | No | No | Yes | Yes | No | Yes | Yes |
| *Eucalyptus polyanthemos* | Red Box | | Vic & NSW. Dry foothill country | Fast | 15 | 11 | Evergreen | Flowers, insect-eaters, seed | Occasional. Specialist native nurseries | | 5 | 5 | 3 | 2 | 5 | 5 | 5 | 3 | 3 | 5 | 41 | | 4 | 45 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus scoparia* | Wallangarra White Gum | | NSW Qld border. | Fast | 11 | 9 | Evergreen | Flowers, insect-eaters, seed | Common | | 5 | 3 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 36 | | 3 | 39 | No | No | Yes | No | No | Yes | Yes |
| *Eucalyptus sideroxylon* | Red Ironbark | | Vic., NSW | Fast | 15 | 8 | Evergreen | Flowers, insect-eaters, seed | Common | | 5 | 5 | 3 | 2 | 3 | 5 | 5 | 2 | 2 | 5 | 37 | | 4 | 41 | No | No | Yes | Yes | No | Yes | Yes |
| *Ficus macrophylla* | Moreton Bay Fig | | Northern Queensland to southern coast of NSW | Moderate | 26 | 26 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 5 | 5 | 2 | 3 | 5 | 4 | 5 | 3 | 3 | 38 | | 3 | 41 | No | Yes | Yes | No | No | No | Yes |
| *Ficus microcarpa var. hillii* | Hill's Fig | | Qld | Moderate | 11 | 11 | Evergreen | Flowers, insect-eaters, fruit | Common | | 4 | 4 | 3 | 4 | 3 | 5 | 5 | 2 | 5 | 5 | 38 | | 4 | 42 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Fraxinus excelsior 'Aurea'* | Golden Ash | | Garden Origin | Moderate | 11 | 11 | Deciduous | Unknown | Common. Bare root, container or advanced | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | Yes (P) | No | Yes | Yes | No | Yes | Yes |
| *Fraxinus pennsylvanica 'Cimmaron'* | Cimmaron Green Ash | | Cultivar | Moderate | 15 | 8 | Deciduous | Unknown | Fleming's | | 5 | 5 | 5 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 43 | | 4 | 47 | No | No | Yes | Yes | No | Yes | Yes |
| *Fraxinus pennsylvanica 'Urbanite'* | Urbanite Green Ash | | Cultivar | Moderate | 15 | 8 | Deciduous | Unknown | Fleming's | | 5 | 5 | 5 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 43 | | 4 | 47 | Yes (P) | No | Yes | Yes | No | Yes | Yes |
| *Ginkgo biloba* | Maidenhair Tree | | China | Slow | 15 | 9 | Deciduous | Unknown | Occasional | | 3 | 5 | 2 | 4 | 3 | 5 | 5 | 2 | 3 | 4 | 37 | | 4 | 41 | No | Yes | Yes | Yes | No | No | Yes |
| *Gleditsia triacanthos 'var inermis' Varieties* | Thornless Common Honey Locust | | Cultivar | Fast | 15 | 9 | Deciduous | Unknown | Common. Bare root, container | | 5 | 4 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 37 | | 4 | 41 | No | Yes | Yes | Yes | Yes | No | Yes |
| *Jacaranda mimosifolia* | Jacaranda | | Brazil | Moderate | 15 | 8 | Deciduous | Flowers, insect-eaters | Common. Container, advanced. | | 3 | 4 | 2 | 2 | 3 | 5 | 5 | 2 | 3 | 4 | 34 | | 4 | 38 | Yes (P) | No | Yes | Yes | No | Yes | Yes |
| *Liquidambar formosana* | Formosan Sweetgum | | Central & South China, & Taiwan | Moderate | 14 | 8 | Deciduous | Unknown | Occasional. Not large numbers. | | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 36 | | 3 | 39 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Liquidambar styraciflua 'Rotundiloba'* | Rotundiloba Sweetgum | | Cultivar | Moderate | 19 | 11 | Deciduous | Unknown | | | 3 | 4 | 3 | 4 | 5 | 5 | 5 | 3 | 3 | 5 | 40 | | 4 | 44 | No | Yes | Yes | No | No | Yes | Yes |
| *Lophostemon confertus* | Queensland Brush Box | | Coastal forests NSW & Qld | Moderate | 11 | 8 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 39 | | 4 | 43 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Maclura pomifera 'Wichita'* | Osage Orange | | Arkansas & Texas | Moderate | 11 | 11 | Deciduous | Unknown | Occasional | | 5 | 4 | 5 | 2 | 3 | 5 | 5 | 4 | 3 | 5 | 41 | | 4 | 45 | No | No | Yes | No | No | Yes | Yes |
| *Metasequoia glyptostroboides* | Dawn Redwood | | China | Moderate to Fast | 15 | 8 | Deciduous | Unknown | Common | | 3 | 5 | 5 | 4 | 3 | 5 | 5 | 3 | 5 | 5 | 43 | | 3 | 46 | No | No | Yes | Yes | No | Yes | Yes |
| *Paulownia tomentosa* | Empress Tree, Princess Tree | | Central & Western China | Fast | 19 | 18 | Deciduous | Unknown | Common | | 5 | 5 | 1 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 37 | | 4 | 41 | No | No | Yes | No | No | Yes | Yes |
| *Pinus canariensis* | Canary Island Pine | | In the western Canary Islands and Gomera (W of N Africa), an area of subhumid Mediterranean climate | Moderate to Fast | 30 | 15 | Evergreen | Seed eaters | Common | | 5 | 5 | 5 | 2 | 3 | 5 | 3 | 3 | 3 | 5 | 39 | | 4 | 43 | No | No | Yes | No | No | Yes | Yes |
| *Pinus halepensis* | Aleppo Pine | | Mediterranean region | Moderate to Fast | 19 | 12 | Evergreen | Seed eaters | Common | | 5 | 5 | 3 | 3 | 3 | 5 | 3 | 3 | 3 | 5 | 38 | | 3 | 41 | No | No | Yes | No | No | Yes | Yes |
| *Pinus patula* | Mexican Pine | | Mexico | Moderate | 15 | 15 | Evergreen | Seed eaters | Occasional. Specialised nursery | | 5 | 5 | 5 | 3 | 3 | 5 | 3 | 3 | 3 | 5 | 40 | | 3 | 43 | No | No | Yes | No | No | Yes | Yes |
| *Pinus pinaster* | Maritime Pine | | Western Mediterranean | Moderate to Fast | 23 | 12 | Evergreen | Seed eaters | Common. Not large quantities | | 5 | 5 | 5 | 2 | 3 | 5 | 3 | 3 | 3 | 5 | 39 | | 3 | 42 | No | No | Yes | No | No | Yes | Yes |
| *Pinus pinea* | Stone Pine | | Iberian Peninsula | Moderate to Fast | 19 | 19 | Evergreen | Seed eaters | Occasional. Specialists. Not in large numbers | | 5 | 5 | 5 | 3 | 3 | 5 | 3 | 4 | 3 | 5 | 41 | | 4 | 45 | No | No | Yes | No | No | Yes | Yes |
| *Platanus orientalis 'Digitata'* | Cyprian Plane | | SE Europe to Western Asia | Moderate | 19 | 15 | Deciduous | Seed eaters | Common | | 3 | 2 | 3 | 4 | 4 | 3 | 1 | 3 | 3 | 2 | 28 | | 4 | 32 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Platanus X acerifolia* | London Plane Tree | | Hybrid | Moderate | 19 | 15 | Deciduous | Seed eaters | Common | | 4 | 3 | 5 | 3 | 5 | 5 | 1 | 4 | 3 | 2 | 35 | | 4 | 39 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Podocarpus elatus* | Plum Pine | | Qld, NSW | Moderate | 18 | 15 | Evergreen | Seed eaters | Occasional | | 2 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 5 | 5 | 37 | | 2 | 39 | No | No | Yes | No | No | Yes | Yes |
| *Pyrus calleryana varieties* | Callery's Pear varieties | | Hybrid | Fast | 13 | 9 | Deciduous | Unknown | Common | | 3 | 3 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | No | No | Yes | Yes | No | Yes | Yes |
| *Pyrus nivalis* | Snow Pear | | South Europe | Moderate | 11 | 8 | Deciduous | Unknown | Common | | 3 | 4 | 2 | 4 | 3 | 5 | 5 | 3 | 2 | 5 | 37 | | 4 | 41 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Quercus acutissima* | Sawtooth Oak | | China, Japan, Korea | Moderate | 12 | 11 | Deciduous | Seed eaters | Occasional | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 3 | 41 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Quercus agrifolia* | Coast Live Oak | | California to Mexico | Moderate | 19 | 19 | Evergreen | Seed eaters | Occasional | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 5 | 3 | 5 | 40 | | 3 | 43 | No | Yes | Yes | No | No | Yes | Yes |
| *Quercus bicolor* | Swamp White Oak | | USA | Moderate | 15 | 15 | Deciduous | Seed eaters | Occasional | | 5 | 5 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 42 | | 4 | 46 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Quercus canariensis* | Algerian Oak | | Nth Africa & SW Europe | Moderate | 19 | 19 | Semi-Deciduous | Seed eaters | Occasional | | 5 | 5 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 42 | | 3 | 45 | No | No | Yes | No | No | No | Yes |
| *Quercus cerris* | Turkey Oak | | Sth. Europe & Western Asia | Moderate | 15 | 15 | Deciduous | Foliage grazers, seed eaters | Occasional | | 5 | 3 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 2 | 36 | | 3 | 39 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Quercus coccinea* | Scarlet Oak | | USA- Alabama to Maine | Moderate | 19 | 15 | Deciduous | Seed eaters | Common | | 4 | 3 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 39 | | 4 | 43 | No | No | Yes | No | No | Yes | Yes |
| *Quercus ilex* | Holly Oak | | Mediterranean region | Slow | 15 | 15 | Evergreen | Seed eaters | Occasional | | 5 | 5 | 5 | 4 | 3 | 5 | 5 | 5 | 3 | 5 | 45 | | 3 | 48 | No | No | Yes | No | No | Yes | Yes |
| *Quercus macrocarpa* | Bur Oak | | USA | Moderate | 19 | 15 | Deciduous | Unknown | Occasional | | 5 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 40 | | 5 | 45 | No | No | Yes | No | No | Yes | Yes |
| *Quercus palustris* | Pin Oak | | Eastern USA | Moderate | 19 | 11 | Deciduous | Foliage grazers, seed eaters | Common. Container, bare rooted, advanced. | | 3 | 3 | 3 | 4 | 5 | 5 | 5 | 3 | 3 | 5 | 39 | | 4 | 43 | No | No | Yes | No | No | Yes | Yes |
| *Quercus phellos* | Willow Oak | | USA, New Jersey to Texas | Moderate to Fast | 19 | 15 | Deciduous | Unknown | Common | | 4 | 4 | 5 | 4 | 5 | 5 | 5 | 4 | 3 | 5 | 44 | | 4 | 48 | No | No | Yes | No | No | Yes | Yes |
| *Quercus robur* | English Oak | | Europe & Mediterranean region | Moderate | 15 | 12 | Deciduous | Foliage grazers, seed eaters | Common. Container, bare rooted, advanced | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 4 | 36 | | 4 | 40 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Quercus rubra* | Red Oak | | USA | Moderate | 19 | 15 | Deciduous | Seed eaters | Common. Bare rooted, advanced. | | 4 | 3 | 3 | 4 | 5 | 5 | 5 | 3 | 3 | 5 | 40 | | 4 | 44 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Robinia pseudoacacia 'Varieties'* | Black Locust | | Appalachian & Ozark Mountains | Fast | 11 | 8 | Deciduous | Unknown | Common | | 5 | 4 | 5 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 39 | | 5 | 44 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Sapium sebiferum* | Chinese Tallowtree | | China, Japan | Moderate | 11 | 9 | Deciduous | Fruit eaters | Common | | 5 | 4 | 3 | 3 | 3 | 5 | 3 | 3 | 3 | 5 | 37 | | 5 | 42 | Yes (P) | No | Yes | No | No | Yes | Yes |
| *Schinus areira* | Peppercorn Tree | | Peru | Moderate | 11 | 11 | Evergreen | Foliage grazers, seed eaters | Common | | 5 | 5 | 3 | 4 | 3 | 5 | 5 | 2 | 2 | 2 | 36 | | 5 | 41 | No | Yes | Yes | No | No | Yes | Yes |
| *Syzygium paniculatum* | Brush Cherry | | NSW & Qld coastal forest | Moderate | 9 | 6 | Evergreen | Fruit eaters | Common | | 3 | 4 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 2 | 36 | | 4 | 40 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Taxodium distichum* | Baldcypress | | Southeast coast USA, Mississippi valley | Moderate to Fast | 23 | 11 | Deciduous | Unknown | Occasional. Specialist nursery | | 4 | 3 | 3 | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | No | No | Yes | No | No | Yes | Yes |
| *Ulmus glabra 'Lutescens'* | Golden Elm | | cultivar | Moderate to Fast | 15 | 15 | Deciduous | Low | Common | | 3 | 2 | 3 | 3 | 5 | 1 | 5 | 4 | 1 | 3 | 30 | | 4 | 34 | No | No | Yes | No | No | Yes | Yes |
| *Ulmus parvifolia* | Chinese Elm | | China & Japan | Moderate to Fast | 19 | 11 | Semi-Elgreen | Low | Common | | 5 | 5 | 3 | 2 | 3 | 5 | 5 | 4 | 2 | 5 | 40 | | 5 | 45 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Ulmus procera* | English Elm | | Western & Southern Europe | Moderate to Fast | 19 | 19 | Deciduous | Low | Common. Bare root, container or advanced | | 2 | 2 | 5 | 3 | 5 | 1 | 5 | 4 | 1 | 5 | 33 | | 5 | 38 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Ulmus x hollandica* | Dutch Elm | | Southern England, Northern France | Moderate to Fast | 15 | 15 | Deciduous | Low | Common. Bare root, container or advanced | | 2 | 2 | 3 | 3 | 5 | 1 | 5 | 4 | 1 | 5 | 31 | | 5 | 36 | Yes (P) | Yes | Yes | Yes | No | No | Yes |
| *Waterhousea floribunda* | Weeping Lilly Pilly | | Qld, NSW | Moderate | 18 | 15 | Evergreen | Fruit eaters | Common | | 3 | 4 | 3 | 2 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Zelkova serrata 'Green Vase'* | Japanese Zelkova | | Hybrid, parent Japan | Fast | 11 | 15 | Deciduous | Unknown | Common. Bare rooted | | 2 | 4 | 5 | 4 | 5 | 3 | 5 | 3 | 3 | 5 | 40 | | 4 | 44 | Yes (P) | No | Yes | No | No | Yes | Yes |

### Step 3 Continued

To sort the Shade Tolerance column click on the ▾ symbol in the top cell of the Shade Tolerance column. Click on the checkbox next to “No” to deselect that sort option and thus exclude all trees marked “No” from being displayed. Click OK to finish this step.

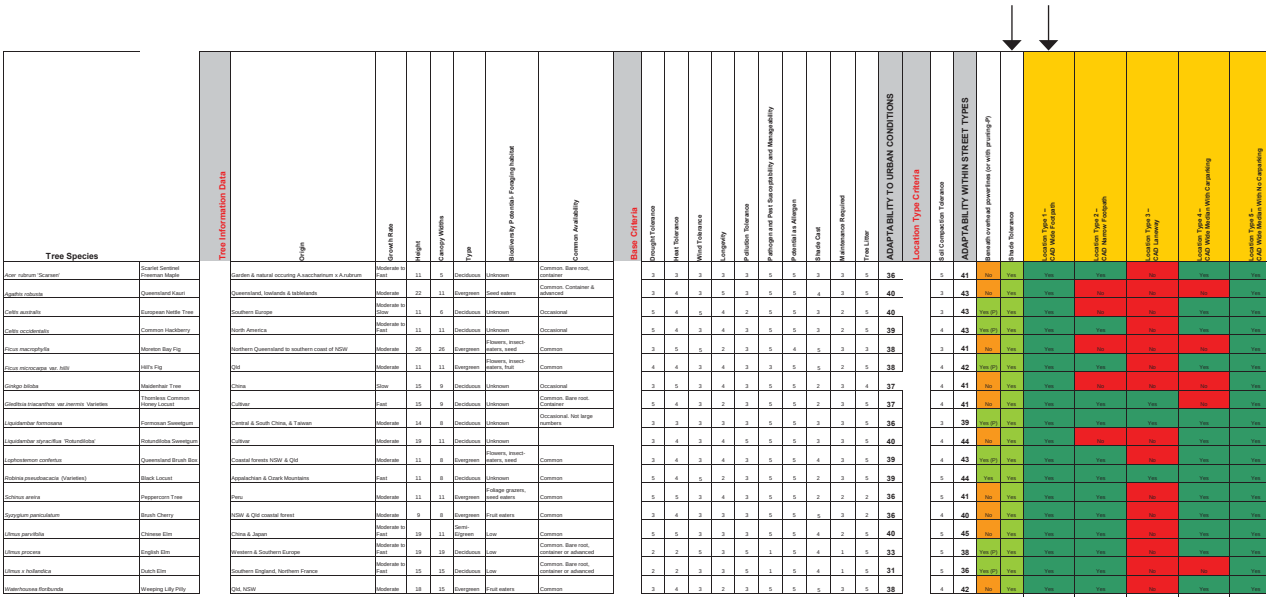


## Step 3 Continued

You can see here that only trees both marked “Yes” in the Shade Tolerance column and in the Location Type 1 – CAD Wide Footpath column are being displayed.

This is the list of trees considered adaptable to urban conditions and suitable to Location Type 1 – CAD Wide Footpath, and suitable for being grown in shady conditions.



| Tree Species | | Tree Information Data | Origin | Growth Rate | Height | Canopy Width | Type | Biodiversity Potential Foraging Habitat | Common Availability | Base Criteria | Drought Tolerance | Heat Tolerance | Wind Tolerance | Longevity | Pollution Tolerance | Pathogen and Pest Susceptability and Manageability | Potential as Allergen | Shade Cast | Maintenance Required | Tree Litter | ADAPTABILITY TO URBAN CONDITIONS | Location Type Criteria | Soil Compaction Tolerance | ADAPTABILITY WITHIN STREET TYPES | Branch overhead powerlines (or with pruning?) | Shade Tolerance | Location Type 1 – CAD Wide Footpath | Location Type 2 – CAD Narrow Footpath | Location Type 3 – CAD Laneway | Location Type 4 – CAD Wide Median With No Carparking | Location Type 5 – CAD Wide Median With No Carparking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Acer rubrum 'Scarsen'* | Scarlet Sentinel Freeman Maple | | Garden & natural occuring A.saccharinum x A.rubrum | Moderate to Fast | 11 | 5 | Deciduous | Unknown | Common. Bare root, container | | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 36 | | 5 | 41 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Agathis robusta* | Queensland Kauri | | Queensland, lowlands & tablelands | Moderate | 22 | 11 | Evergreen | Seed eaters | Common. Container & advanced | | 3 | 4 | 3 | 5 | 3 | 5 | 5 | 4 | 3 | 5 | 40 | | 3 | 43 | No | Yes | Yes | No | No | No | Yes |
| *Celtis australis* | European Nettle Tree | | Southern Europe | Moderate to Slow | 11 | 6 | Deciduous | Unknown | Occasional | | 5 | 4 | 5 | 4 | 2 | 5 | 5 | 3 | 2 | 5 | 40 | | 3 | 43 | Yes (P) | Yes | Yes | No | No | Yes | Yes |
| *Celtis occidentalis* | Common Hackberry | | North America | Moderate to Fast | 11 | 11 | Deciduous | Unknown | Occasional | | 5 | 4 | 3 | 4 | 3 | 5 | 5 | 3 | 2 | 5 | 39 | | 4 | 43 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Ficus macrophylla* | Moreton Bay Fig | | Northern Queensland to southern coast of NSW | Moderate | 26 | 26 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 5 | 5 | 2 | 3 | 5 | 4 | 5 | 3 | 3 | 38 | | 3 | 41 | No | Yes | Yes | No | No | No | Yes |
| *Ficus microcarpa var. hillii* | Hill's Fig | | Qld | Moderate | 11 | 11 | Evergreen | Flowers, insect-eaters, fruit | Common | | 4 | 4 | 3 | 4 | 3 | 3 | 5 | 5 | 2 | 5 | 38 | | 4 | 42 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Ginkgo biloba* | Maidenhair Tree | | China | Slow | 15 | 9 | Deciduous | Unknown | Occasional | | 3 | 5 | 3 | 4 | 3 | 5 | 5 | 2 | 3 | 4 | 37 | | 4 | 41 | No | Yes | Yes | No | No | No | Yes |
| *Gleditsia triacanthos var.inermis* Varieties | Thornless Common Honey Locust | | Cultivar | Fast | 15 | 9 | Deciduous | Unknown | Common. Bare root. Container | | 5 | 4 | 3 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 37 | | 4 | 41 | No | Yes | Yes | Yes | Yes | No | Yes |
| *Liquidambar formosana* | Formosan Sweetgum | | Central & South China, & Taiwan | Moderate | 14 | 8 | Deciduous | Unknown | Occasional. Not large numbers | | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 36 | | 3 | 39 | Yes (P) | Yes | Yes | Yes | Yes | Yes | Yes |
| *Liquidambar styraciflua 'Rotundiloba'* | Rotundiloba Sweetgum | | Cultivar | Moderate | 19 | 11 | Deciduous | Unknown | | | 3 | 4 | 3 | 4 | 5 | 5 | 5 | 3 | 3 | 5 | 40 | | 4 | 44 | No | Yes | Yes | No | No | Yes | Yes |
| *Lophostemon confertus* | Queensland Brush Box | | Coastal forests NSW & Qld | Moderate | 11 | 8 | Evergreen | Flowers, insect-eaters, seed | Common | | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 39 | | 4 | 43 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Robinia pseudoacacia* (Varieties) | Black Locust | | Appalachian & Ozark Mountains | Fast | 11 | 8 | Deciduous | Unknown | Common | | 5 | 4 | 5 | 2 | 3 | 5 | 5 | 2 | 3 | 5 | 39 | | 5 | 44 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Schinus areira* | Peppercorn Tree | | Peru | Moderate | 11 | 11 | Evergreen | Foliage grazers, seed eaters | Common | | 5 | 5 | 3 | 4 | 3 | 5 | 5 | 2 | 2 | 2 | 36 | | 5 | 41 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Syzygium paniculatum* | Brush Cherry | | NSW & Qld coastal forest | Moderate | 9 | 8 | Evergreen | Fruit eaters | Common | | 3 | 4 | 3 | 3 | 3 | 5 | 5 | 5 | 3 | 2 | 36 | | 4 | 40 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Ulmus parvifolia* | Chinese Elm | | China & Japan | Moderate to Fast | 19 | 11 | Semi-Elgreen | Low | Common | | 5 | 5 | 3 | 3 | 3 | 5 | 5 | 4 | 2 | 5 | 40 | | 5 | 45 | No | Yes | Yes | Yes | No | Yes | Yes |
| *Ulmus procera* | English Elm | | Western & Southern Europe | Moderate to Fast | 19 | 19 | Deciduous | Low | Common. Bare root, container or advanced | | 2 | 2 | 5 | 3 | 5 | 1 | 5 | 4 | 1 | 5 | 33 | | 5 | 38 | Yes (P) | Yes | Yes | Yes | No | Yes | Yes |
| *Ulmus x hollandica* | Dutch Elm | | Southern England, Northern France | Moderate to Fast | 15 | 15 | Deciduous | Low | Common. Bare root, container or advanced | | 2 | 2 | 3 | 3 | 5 | 1 | 5 | 4 | 1 | 5 | 31 | | 5 | 36 | Yes (P) | Yes | Yes | Yes | No | No | Yes |
| *Waterhousea floribunda* | Weeping Lilly Pilly | | Qld, NSW | Moderate | 18 | 15 | Evergreen | Fruit eaters | Common | | 3 | 4 | 3 | 2 | 3 | 5 | 5 | 3 | 3 | 5 | 38 | | 4 | 42 | No | Yes | Yes | Yes | No | Yes | Yes |

## Tree information data

### Tree name

Provides botanical name, (genus, species, variety and cultivar) according to accepted international code of taxonomic classification, and common name.

### Origin

Country or region where tree species grows naturally. Cultivated plants (cultigens) have been listed as cultivars – plants bred or selected for certain characteristics.

### Rate

Estimated growth rate of particular tree species. Based on expected extension growth; slow 100mm to 300mm per annum, moderate 300mm to 500mm per annum, fast up to or greater than 500mm per annum.

### Height and width

Estimated canopy height and width, in metres, of the species or cultivar growing in urban landscapes in Melbourne. Estimation based on referenced literature and experience.

### Tree form

Broad domed = Broad spread, rounded.

Generally crown is as wide as it is high.

Sub form – Broad domed, pendulous. As above with pendulous branchlets.

Broad domed, ascending. As above with ascending, upright branches

Narrow domed = narrow spread, oval, ovoid.

Generally crown taller than it is wide.

Sub form – Narrow domed, pendulous. As above with pendulous branchlets.

Narrow domed, ascending. As above with ascending, upright branches

Pyramidal = conical.

Crown generally wider at base than at apex.

Sub form – Pyramidal, tiered. Branches layered or arranged in whorls

Columnar = fastigiate, spired

Vase = ascending branches, fanning out from trunk. Crown wider at top than at base.

Palm. Generally, one straight stem and crown of large evergreen leaves that are either palmately ('fan-leaved') or pinnately ('feather-leaved').

### Availability

Indicates whether species or variety is commonly available from commercial nurseries in sufficient numbers, or is rarely available from specialist nurseries. This may indicate whether a desired species or cultivar should be contract grown. Also indicates different production methods.

### Biodiversity Potential

The study of urban ecology is relatively recent, with research on how living organisms interact with each other in cities relatively limited. Climate change and the planning of the built environment have resulted in shifts within the urban ecology. Urban ecology research has, as an example, been able to explain the presence of the normally warm temperate and subtropical Grey Headed Flying Fox set up in permanent camps in the city. Research by the Australian Research Centre for Urban Ecology has shown that the heat island effect, reduction in frosts, increased planting of flowering eucalypts (whose flowering is stimulated by irrigation and a lack of natural pests) has allowed these mammals to colonise Melbourne. It is information such as this that can inform how planning for the urban forest can be beneficial in achieving biodiversity goals. As with research input generally, more data is required to better define these goals. Information has been provided in the tree selection that does provide some guidance on trees that have a value for food or foraging.

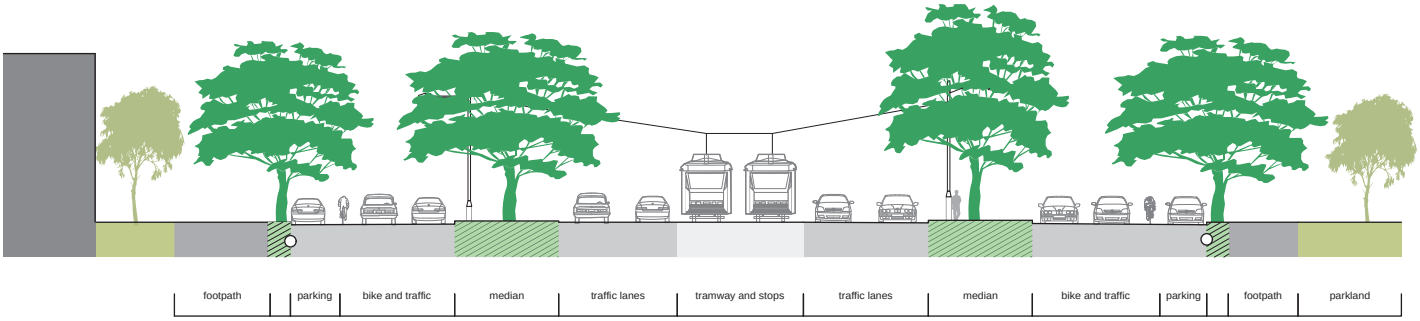
# Appendix 3: Location Typology – Additional Location Types

The following pages show Location Types considered for, but not included in, the final Location Typology for Trees Within City of Melbourne Streets and Parks.

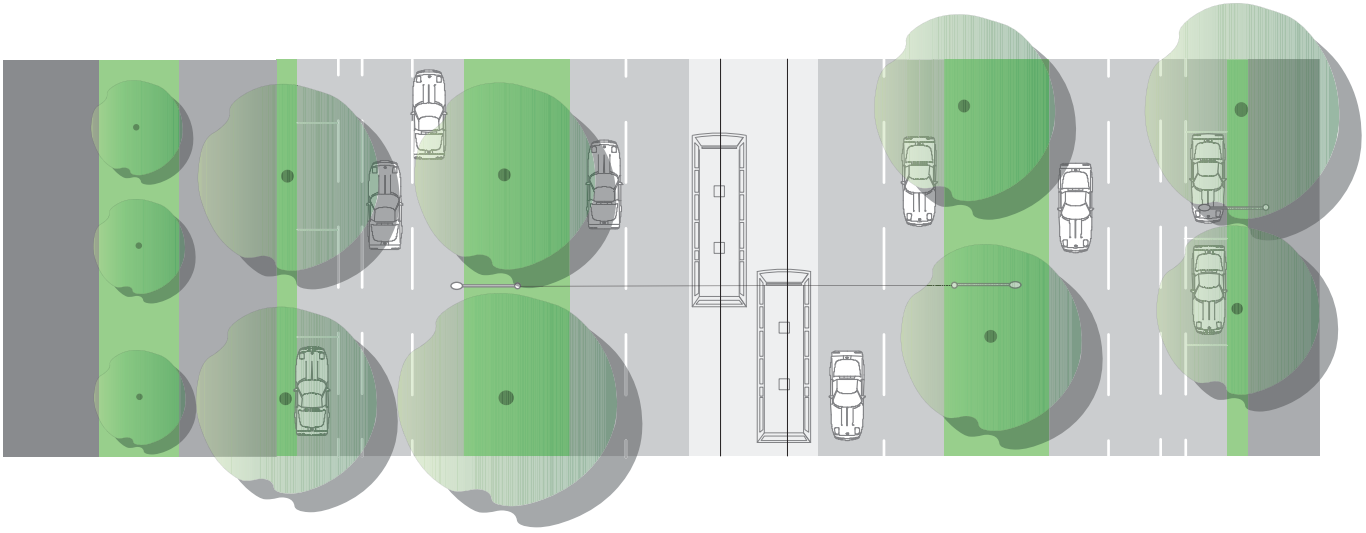
## CAD Boulevard Median With No Trams near Median Planting

### Description of Key Characteristics

| | |
|---|---|
| Street Width | 60 metre |
| Traffic Lanes | 8 lane boulevard with double medians and central tramway. Bike lanes at road edge. |
| Overhead | Lighting, Tram cabelling in centre |
| Buildings | Medium and/or parkland |
| Parking | Parallel kerbside |
| Road centre | Two planted and grassed medians |
| Pathways | 3 metre/various width footpath. Setback from road edge |
| Trees | 4 main avenues |
| Example | St Kilda Road, Royal Parade, Flemington Road |




Typical Section

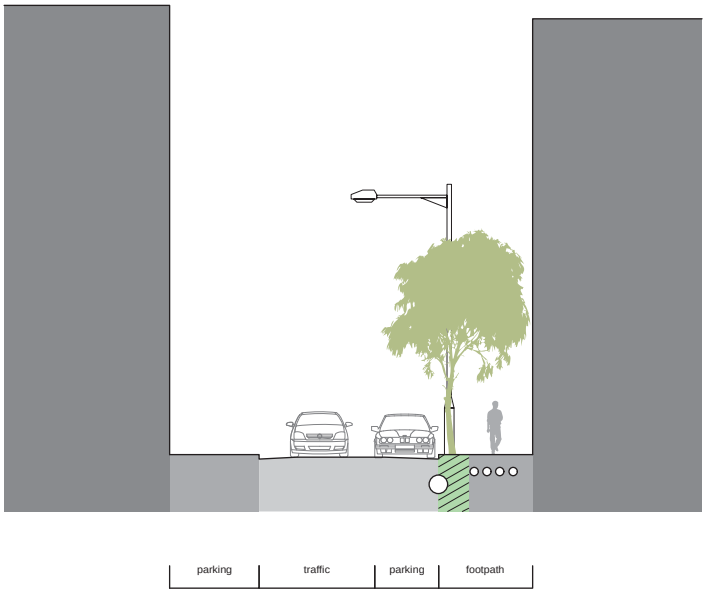


Typical Plan

## CAD Laneway Wide

### Description of Key Characteristics

| | |
|---|---|
| Street Width | 10-12 metres |
| Traffic Lanes | Mostly single lane. Often running east/west |
| Overhead | Lighting |
| Buildings | Medium to high at footpath edge |
| Parking | Parallel kerbside mostly on one side |
| Road centre | – |
| Pathways | < 3 metre footpath at roadside |
| Trees | Often on one side of street |
| Example | Little Collins Street, Flinders Lane |

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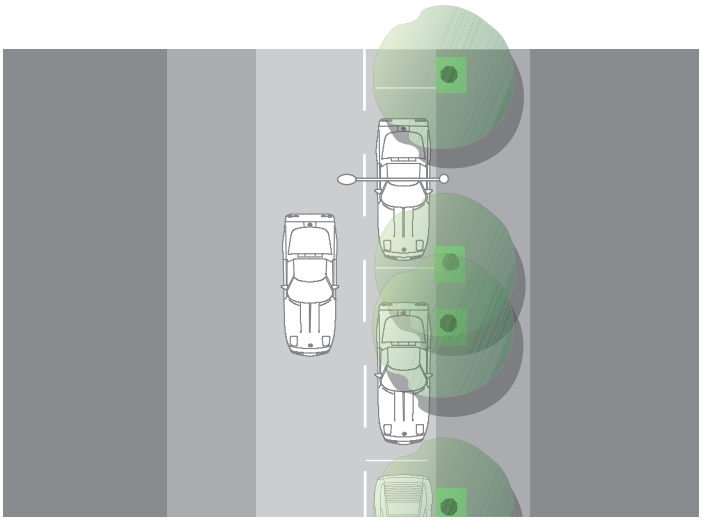
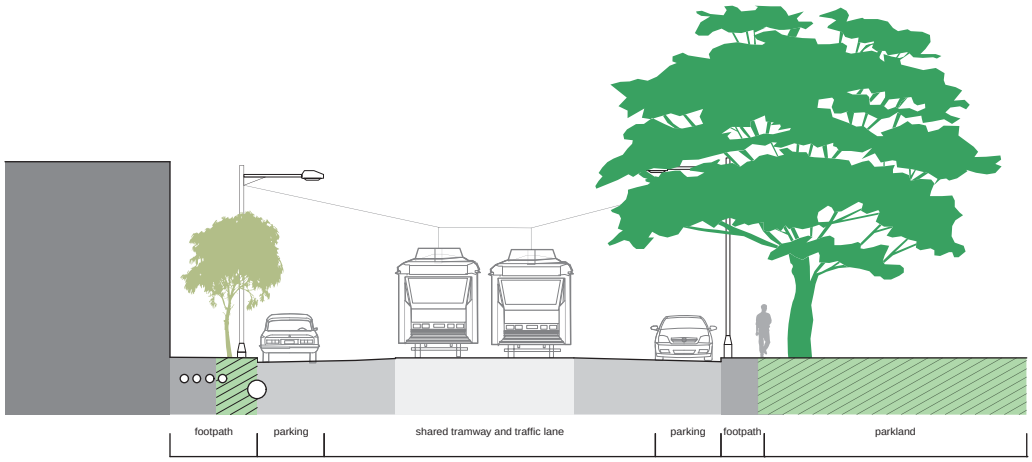


Typical Plan

## Park and Road

### Description of Key Characteristics

| | |
|---|---|
| Street Width | 20 -30 metres |
| Traffic Lanes | 2 lane shared with tramway |
| Overhead | Lighting, tram cabling |
| Buildings | Medium height and parkland |
| Parking | Parallel kerbside |
| Road centre | May have tramway |
| Pathways | Narrow to wide. Often setback off road |
| Trees | Larger trees in park |
| Examples | The Avenue Parkville, Rathdowne Street, Domain Road |

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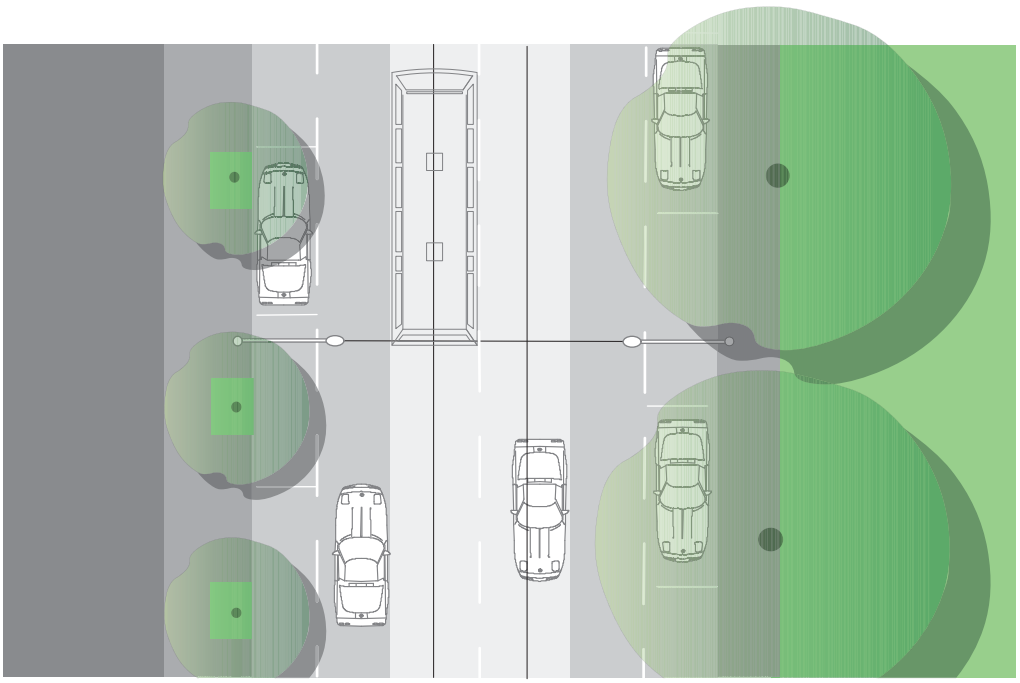
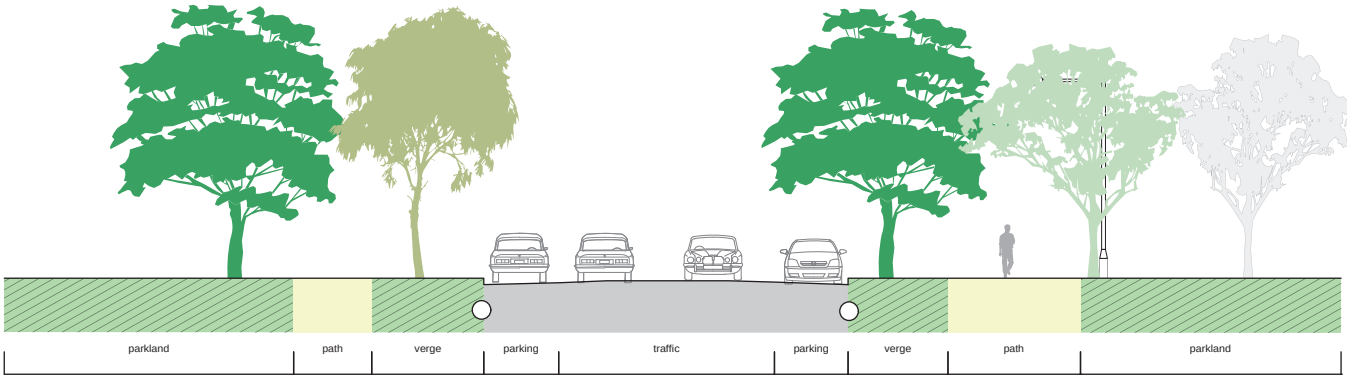


Typical Plan

## Park Road Through

### Description of Key Characteristics

| | |
|---|---|
| Street Width | 20 metre |
| Traffic Lanes | 2 lane |
| Overhead | Lighting |
| Buildings | None |
| Parking | Varied or none |
| Road centre | – |
| Pathways | Varied pathways, with setback from road edge |
| Trees | Avenues along road and pathways |
| Example | Birdwood Avenue |

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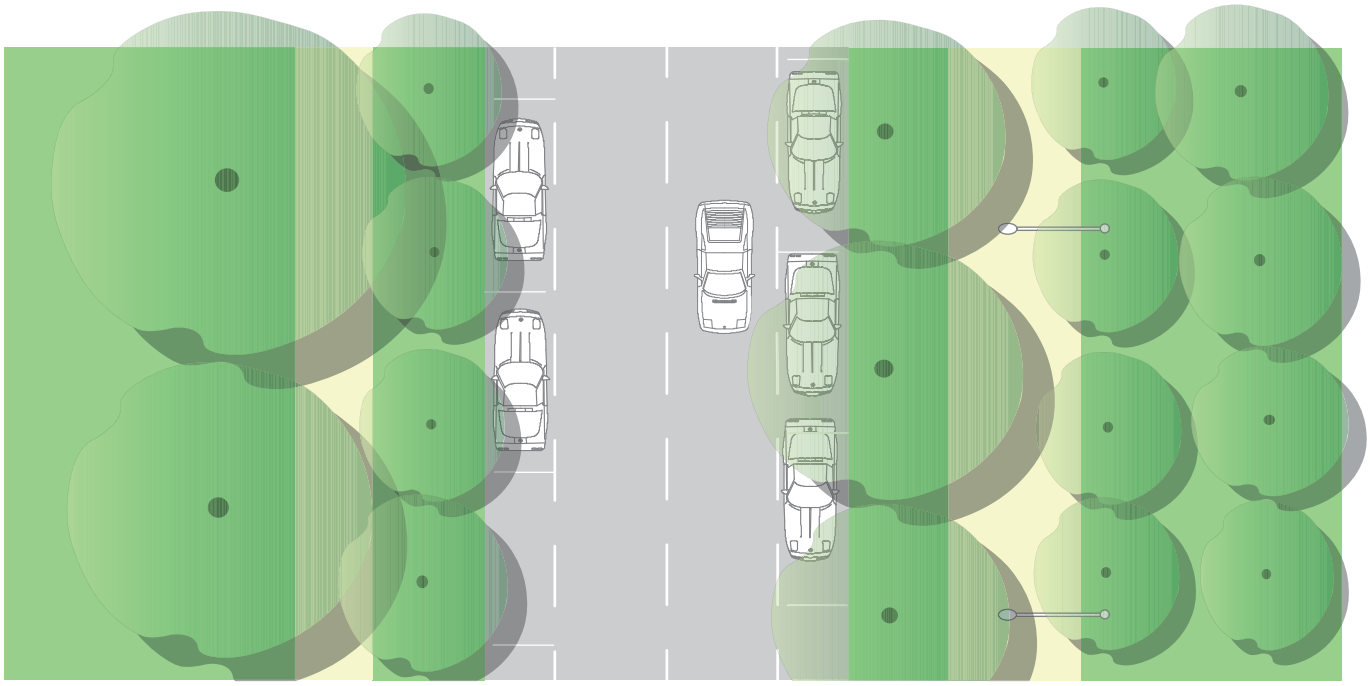


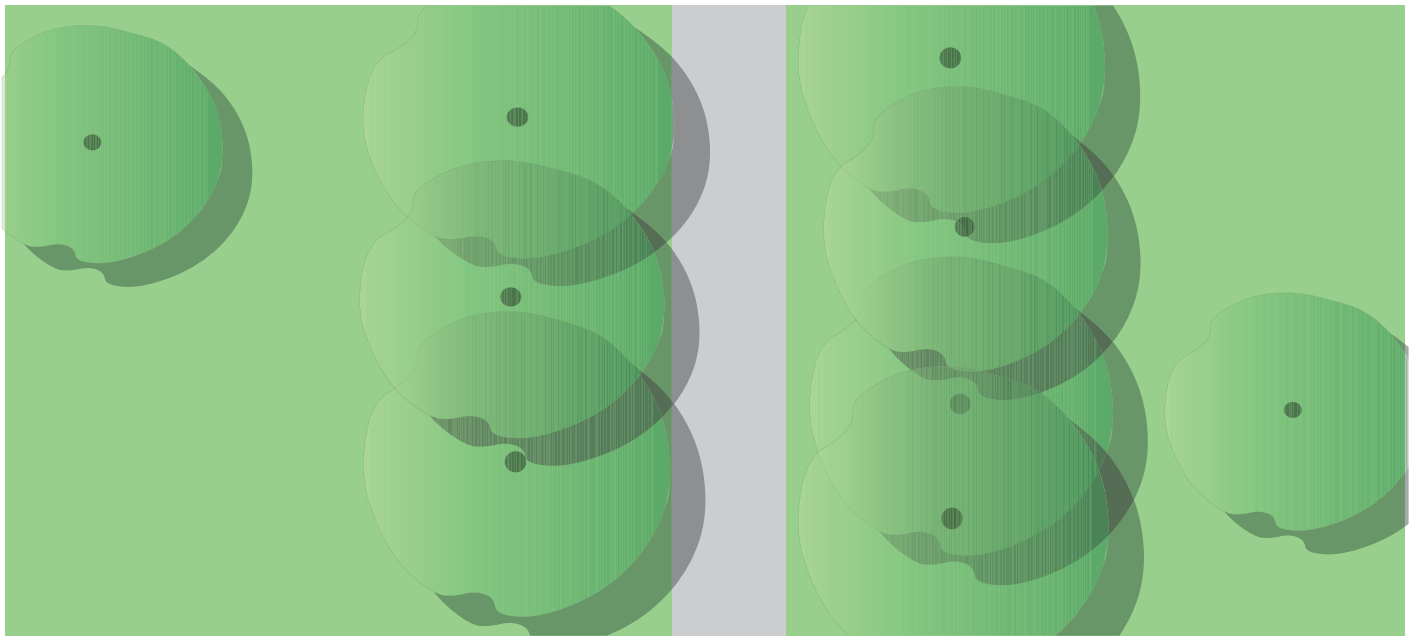
Typical Plan

## Park Avenue

### Description of Key Characteristics

| | |
|---|---|
| Street Width | – |
| Traffic Lanes | – |
| Overhead | – |
| Buildings | – |
| Parking | – |
| Road centre | – |
| Pathways | Narrow to wide pedestrian pathway network |
| Trees | Avenue plantings |
| Example | University Square |


Typical Section

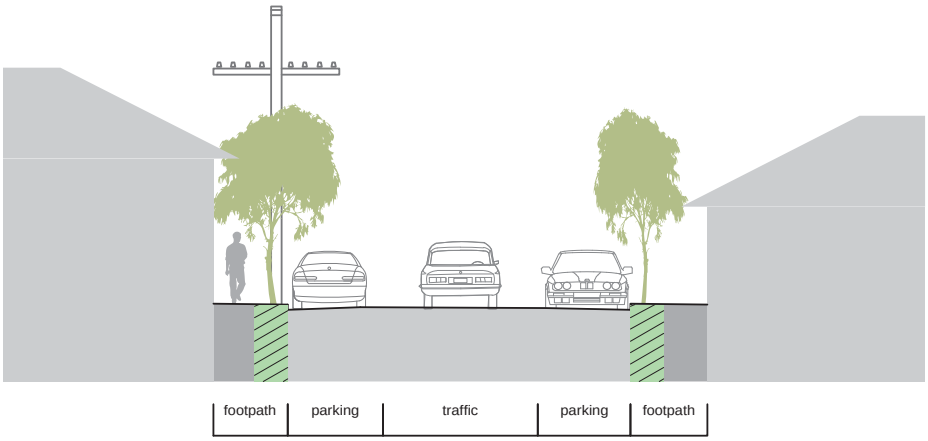


Typical Plan

## Residential Narrow Street

### Description of Key Characteristics

| | |
|---|---|
| Street Width | 12-15 metres |
| Traffic Lanes | Single lane, or shared |
| Overhead | Powerlines, lighting |
| Buildings | Residential |
| Parking | Parallel kerb |
| Road centre | – |
| Pathways | < 2.5 metre footpath at road edge |
| Trees | Kerb edge |
| Example | Bayswater Road Kensington |

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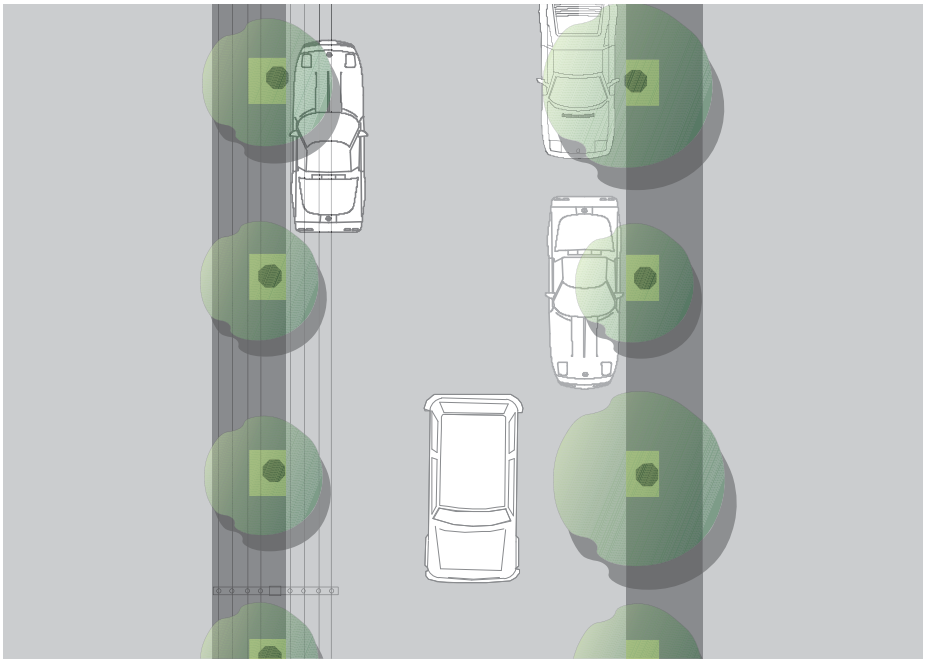
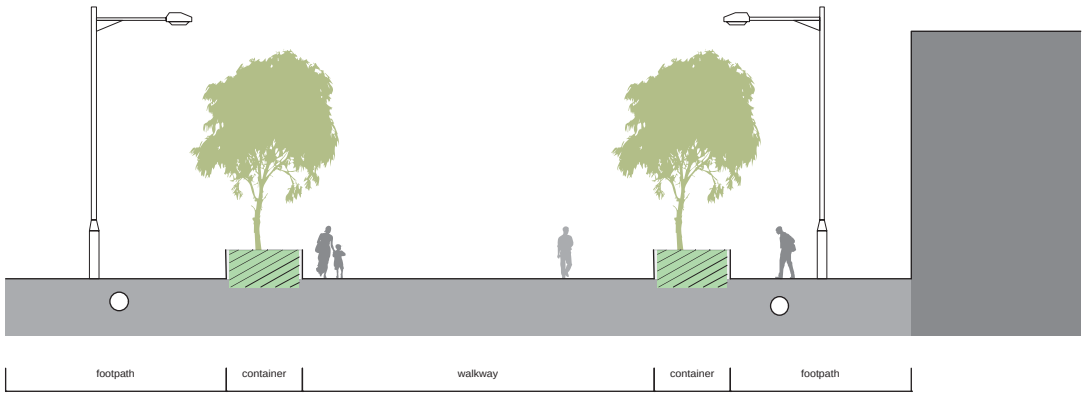


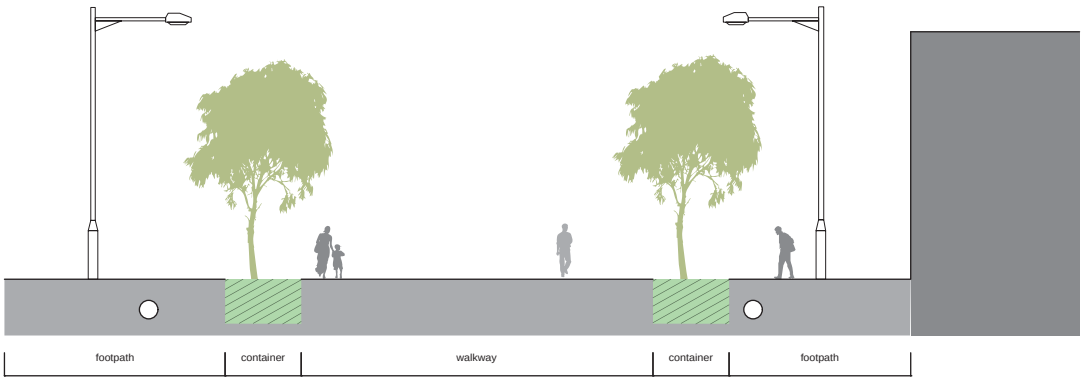
Typical Plan

## Container

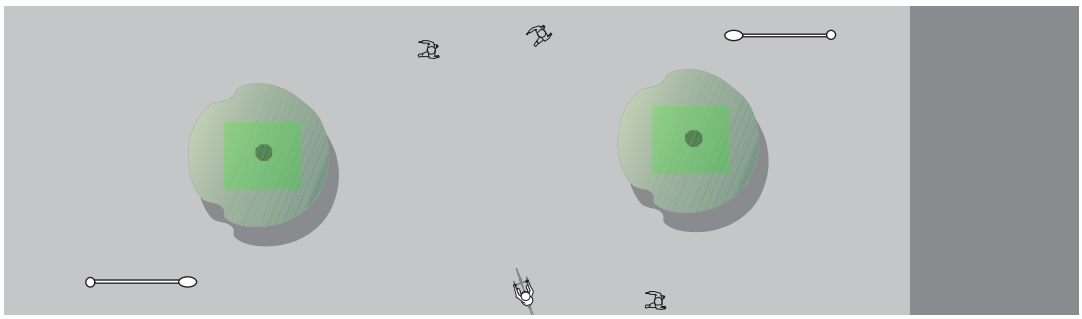
### Description of Key Characteristics

| | |
|---|---|
| Street Width | Varied |
| Traffic Lanes | Pedestrian traffic primarily |
| Overhead | Lighting |
| Buildings | Varied heights |
| Parking | – |
| Road centre | – |
| Pathways | Varied width pathway and open space |
| Trees | Container plantings |
| Example | Bourke St Mall, Docklands, Roof Gardens, Southbank. |




Typical Sections



Typical Plan

# Appendix 4: Adaptability and Vigour

What makes a useful street tree for Melbourne according to the tree selection matrix ?

An adaptable street tree that is vigorous is desirable in Melbourne's future urban forest. The scoring of the Base Criteria shows that careful consideration of the species was considered initially. All the 148 species pass. There are no trees that can be considered as having a low adaptability as they have been culled in the first instance. All trees have a moderate adaptability or higher. The trees can be given intervals of adaptability to help analyse the list and determine which trees can be used in priority tree replacement streets.

Intervals for analysis can include:

1) Moderate Adaptability: 25-33. Examples of species in this lower ranking bracket that comprises 10% of the list include:

- Trident Maple
- Lilly Pilly
- Norfolk Island Pine
- Moreton Bay Fig
- Pistachio
- *Stenocarpus*
- Golden, English and Dutch Elms

There are no clear patterns, as there are many genera found in the moderate adaptability found in the next higher. However trees that benefit from water and shelter such as the cool climate Maples, Australian rainforest species and Elms tend to be found in this range.

2) Moderate to High Adaptability: 33-41. Examples of species in this median range bracket comprising 71% of the list include:

- Norway Maple
- She-Oak
- Coastal Banksia
- Common Hackberry
- Bottlebrush
- *Corymbia* sp.
- *Eucalyptus* sp.
- Port Jackson Fig
- Ash
- *Melaleuca*
- Pines
- Pears
- Oaks
- Fan Palms
- Weeping Lilly Pilly

A large representation of the Australian myrtaceous trees such as *Eucalypts*, *Corymbias* and *Melaleucas*. There are also number of hardier deciduous trees from Asia, southern Europe, the Mediterranean and America. Piles also dominate.

3) High Adaptability: 42-50. Examples of species in this higher range bracket comprising 5% of the list include:

- Kurrajong
- Cypress Pines
- Cypress
- Liquidamber
- Holly Oak

An eclectic group of trees, this includes Australian native trees from the interior and dry slopes, the Cypress from USA and the Middle East and evergreen oaks. All trees from harsh dry climates.

# Appendix 5: Limitations, Qualitative Judgments and Research Data

The assessment criteria for the street tree diversity list have been developed with expert technical opinion that covers arboricultural experience, from landscape architectural advice and also from Council's own experience and input. The application of urban forest management practice within Australian cities is relatively recent. There is a lack of critical data and research. As a consequence, to make the assessment of the tree selection criteria the limitations need to be identified to define qualitative judgment.

## Research Data

The performance of street trees in Melbourne is based on what has been growing in the City's streets over time and what has been growing in similar climates in adjoining Council Local Government Areas with similar climates. There are horticultural factors such as frosts, soil types and planting methods and practices that vary across the Greater Melbourne area. The tree diversity list is intentionally 'live' to allow trialing of new species and consequent research data to be incorporated. Research from universities and technical institutes is limited by funding provided both publicly and privately. It is unfortunate in Australia that such funding is limited, though it is hoped that this will change. Research data is critical for Council to manage the urban forest effectively.

## Shade Rating

The quality of shade that trees provide in the city is an important attribute. The quality and extent of shade has a direct impact on street microclimate, personal comfort and ultimately the liveability and success of our streets. Shade rating like biodiversity potential is an important goal for planning the urban forest. However the methods for determining shade quality are not easily qualified by scientific data. While the Leaf Area Index (LAI) is a measurement of leaf area per unit ground surface area, it is not a determinant for shade quality. LAI is used in agriculture and forestry to predict crop and tree growth for production. Other techniques include hemispherical (or fisheye) photography. This technique involves analyzing tree canopy photography, however is applicable to ecological or canopy forest cover. It measures the amount of solar penetration in the canopy, not for individual street trees. Light sensors can be used for individual trees, however data would need to be logged over time to determine solar radiation levels and canopy architecture. (Rich, P.M. 1990. Characterizing plant canopies with hemispherical photographs.)

For this study the shade quality is determined by what we assess to be a comfortable shade level. The shade levels were defined in intervals from heavy to light. These patterns of shade have been identified with photographs as a gauge of shade intensity.

# Appendix 6: Crown Projection Method

To calculate how much soil is needed for a given size tree, the Urban Horticulture Institute (2003) based at Cornell University in the United States has developed a step-by-step methodology. The following is a shortcut version of that methodology that can be used to approximate soil volume requirements.

1. Measure the distance from the tree's main trunk to the dripline, or consult a reference book to find the optimum mature spread of the tree you are considering. Estimate that the tree will reach 75% of the optimum. Take half of the realistic spread, which is the radius, r.
2. Calculate 3.1416 x r2. That's the crown projection, the area under the dripline of the tree.
3. For every square meter of crown projection, provide 0.6m3 of soil.

Example: *Platanus x acerifolia* (London Plane) has the ability to reach 20m height x 18m canopy width (avg.) with a trunk diameter of 45cm measured at 1.4m from ground level. Tree is growing in Melbourne with no irrigation. The canopy radius would be 9.0m.

The crown projection would be (3.14)x(9.0 x 9.0)= 254.46m2

254.46m2 x 0.6 = 152.68 cubic meters of soil volume needed.

Tree roots generally will not be found deeper than one meter; consequently one meter is used as a depth dimension (unless you know the planting site will be shallower). 15270cm/100cm = 152.7m2; the area of useable soil in your planter (equivalent to a planting site that's approximately 12.3 meters wide, 12.3 meters long, and 1.0 meter deep).

(http://www.hort.cornell.edu/department/faculty/bassuk/uhi/walk5.html)

Watson & Himelick (1997) also use the crown projection method and suggest as a general guide that root space should be 60cm deep within the projected crown area. This method is also supported in part by the notion that fine root density is usually greater beneath the canopy than beyond (Gilman, 1997).

# Appendix 7: Master Lists of All Street Trees, Park Trees and Trial Trees

## Master List of Street Trees

Acer buergerianum
Acer campestre 'Elsrijk'
Acer campestre 'Evelyn'
Acer platanoides 'Crimson Sentry'
Acer platanoides 'Globosum'
Acer rubrum 'October Glory'
Acer rubrum 'Scarsen'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Afrocarpus falcata
Agathis robusta
Agonis flexuosa
Allocasuarina littoralis
Allocasuarina torulosa
Allocasuarina verticillata
Angophora costata
Angophora floribunda
Angophora hispida (Syn. A. cordifolia)
Araucaria cunninghamii
Araucaria heterophylla
Banksia integrifolia subsp. integrifolia
Banksia serrata
Brachychiton acerifolius
Brachychiton populneus
Brachychiton rupestris
Brachychiton x roseus
Callistemon 'Harkness'
Callistemon salignus
Callistemon viminalis
Casuarina cunninghamiana
Casuarina glauca
Catalpa bignonioides 'Nana'
Cedrus atlantica
Cedrus deodara
Celtis australis
Celtis occidentalis
Cercis siliquastrum
Cinnamomum camphora
Corymbia citriodora
Corymbia eximia
Corymbia ficifolia
Corymbia maculata
Cupaniopsis anachardioides
Cupressus glabra (syn. C. arizonica)
Cupressus sempervirens
Cupressus torulosa
Eucalyptus bancroftii
Eucalyptus camaldulensis
Eucalyptus cinerea
Eucalyptus cosmophylla
Eucalyptus gregsoniana
Eucalyptus leucoxylon
Eucalyptus leucoxylon dwarf form
Eucalyptus leucoxylon ssp. megalocarpa
Eucalyptus mannifera subsp. maculosa
Eucalyptus melliodora
Eucalyptus nicholii
Eucalyptus platypus
Eucalyptus polyanthemos
Eucalyptus pulchella
Eucalyptus scoparia
Eucalyptus sideroxylon
Eucalyptus spathulata
Eucalyptus stoatei
Ficus macrophylla
Ficus microcarpa var. hillii
Ficus platypoda
Ficus rubiginosa
Fraxinus excelsior 'Aurea'
Fraxinus ornus
Fraxinus ornus 'Meczek'
Fraxinus pennsylvanica 'Aerial'
Fraxinus pennsylvanica 'Cimmaron'
Fraxinus pennsylvanica 'Urbanite'
Fraxinus velutina
Geijera parviflora
Ginkgo biloba
Ginkgo biloba 'Princeton Sentry'
Gleditsia triacanthos var.inermis Varieties
Hakea francisiana
Jacaranda mimosifolia
Koelreuteria paniculata
Lagerstroemia indica x L. fauriei varieties
Leptospermum petersonii
Liquidambar formosana
Liquidambar styraciflua 'Rotundiloba'
Lophostemon confertus
Maclura pomifera 'Wichita'
Magnolia grandiflora 'Exmouth'
Melia azedarach
Metasequoia glyptostroboides
Olea europea
Paulownia tomentosa
Phoenix canariensis
Pinus canariensis
Pinus halepensis
Pinus patula
Pinus pinaster
Pinus pinea
Pistacia chinensis
Platanus orientalis 'Digitata'
Platanus X acerifolia
Podocarpus elatus
Pyrus calleryana varieties
Pyrus nivalis
Quercus acutissima
Quercus agrifolia
Quercus bicolor
Quercus canariensis
Quercus cerris
Quercus coccinea
Quercus ilex
Quercus macrocarpa
Quercus palustris
Quercus phellos
Quercus robur
Quercus robur 'Fastigiata'
Quercus rubra
Robinia pseudoacacia (Varieties)
Sapium sebiferum
Schinus areira
Sophora japonica 'Princeton Upright'
Stenocarpus sinuatus
Syzygium australe 'Pinnacle'
Syzygium paniculatum
Taxodium distichum
Tilia cordata 'Greenspire'
Trachycarpus fortunei
Tristaniopsis laurina
Ulmus glabra 'Lutescens'
Ulmus parvifolia
Ulmus procera
Ulmus x hollandica
Washingtonia filifera
Washingtonia robusta
Waterhousea floribunda
Zelkova serrata 'Green Vase'

## Master List of Park Trees

Acer rubrum 'October Glory'
Acer truncatum x A. platanoides 'Keithsform'
Acer x freemanii 'Autumn Blaze'
Agathis robusta
Angophora costata
Angophora floribunda
Araucaria cunninghamii
Araucaria heterophylla
Brachychiton acerifolius
Catalpa bignonioides
Cedrus atlantica
Cedrus deodara
Corymbia citriodora
Corymbia maculata
Cupressus torulosa
Ficus macrophylla
Fraxinus pennsylvanica 'Cimmaron'
Liquidambar styraciflua 'Rotundiloba'
Metasequoia glyptostroboides
Phoenix canariensis
Pinus canariensis
Pinus patula
Pinus pinea
Podocarpus falcatus
Quercus coccinea
Quercus phellos
Taxodium distichum
Ulmus parvifolia
Washingtonia filifera
Washingtonia robusta
Zelkova serrata 'Green Vase'

## Master List of Trial Trees

Abies pinsapo 'Glauca'
Acer monspessulanum
Alnus cordata
Callitris glaucophylla (formerly C. columellaris)
Callitris preissii
Carpinus betulus 'Fastigiata'
Cercis canadensis 'Forest Pansy'
Eucalyptus curtisii
Eucalyptus gardneri
Eucalyptus haemastoma
Eucalyptus polybractea
Eucalyptus risdonii
Eucalyptus wimmerensis 'Honey Pots'
Flidersia maculosa
Flindersia australis
Fraxinus americana var.
Lithocarpus densiflorus
Phellodendron amurense
Pyrus betulaefolia 'Southworth'
Dancer™
Searsia pendulina
Tilia tomentosa 'Sterling'
Tipuana tipu

Attachment 4
Agenda Item 5.8
Future Melbourne Committee
4 September 2012

# Community Consultation Report:

# City of Melbourne

# Draft Urban Forest Strategy

September 2012

# Contents

# 1. Introduction

## 1.1. Background

A draft Urban Forest Strategy (Strategy) has been prepared in response to three key challenges - climate change, population growth and urban heating and the fact that significant numbers of Melbourne's trees are now in decline. This decline is due to trees approaching the end of their natural lifespan and many trees having been severely affected by prolonged drought and water restriction. Almost 39% of municipal trees are expected to be lost within 20 years.

The draft Strategy sets out how the City of Melbourne can transition the urban forest to a future forest that is diverse, resilient and responsive to the varied needs of the community and the city. Its vision is to become a city within a forest rather than a city with a forest.

Once the draft Urban Forest Strategy has been adopted by Council, Council Officers will commence the implementation of this strategy through the development of Tree Precinct Plans and Boulevard Master Plans. These plans will be developed via a collaborative process with the community.

## 1.2. Overview of consultation process

Council endorsed the Draft Urban Forest Strategy for consultation on 8 November 2011.The Strategy subsequently became available for public consultation from 9 November 2011 until 31 March 2012.

Acknowledging that community interest in the Strategy would be high, an extensive community engagement process was undertaken to provide an opportunity for all members of the community to provide feedback through a variety of convenient channels.

Additionally, endeavours were made to seek publicity across a broad range of media channels to generate widespread community awareness of the strategy and associated consultation period so that all members of the community knew that they had an opportunity to be involved. Social media networks were also used.

Highlights during the consultation period included:

1. An Urban Forest – Eco City Forum in the Town Hall on 20 November 2011 with 135 participants.

2. 110 community members attended nine precinct based consultation meetings held between January and March 2012.

3. A bespoke website was developed to provide a fulltime 'online forum' for the duration of the project, which generated:

    a. 4249 individual visitors

    b. a combined total of 11,991 site visits

    c. 20,316 page views

    d. 818 downloads of the Strategy

    e. over 19,000 words in submissions and commentary from 177 commentators.

4. 5,034 unique views of the strategy information on the corporate website.

5. A short video conveying key messages about on the Strategy was view over 2,500 times.

6. More than 30 media articles, letters and editorials informing the community about the strategy on TV and radio and in the newspapers.

7. 10,000 copies of a specially designed Avant postcard by Michael Leunig to promote the consultation period were distributed throughout inner Melbourne.

8. 419 entrants submitted art works to the Urban Forest Art and Design Competition from across 71 Melbourne suburbs and Victorian regional areas.

9. Winning entries from the Urban Forest Art and Design Competition displayed throughout city in November to promote the consultation period and the strategy.

# 2. Outcomes

## 2.1. Summary of Feedback

Feedback revealed that the community predominantly supports the Strategy. Indeed, the Strategy received widespread academic and industry support both locally, nationally and internationally. With notable commendations from world leading urban forest expert from the University of Copenhagen, Prof Cecil Konijnendijk and from Prof. Lindsey Falvey, formerly Dean of the Faculty of Agriculture, Forestry and Horticulture, University of Melbourne.

The Strategy has been revised to reflect feedback received during the consultation period where appropriate. However, it must be noted that many comments received during the consultation pertained to expressions of preference on the topic of species origin which was not pertinent to consultation on the Strategy.

Green roofs and walls were a significant topic of focus during the consultation. It was highlighted by many community members that more needed to be mentioned in the Strategy about the role of green roofs and walls. It was also noted on several occasions that the Strategy predominantly referred to trees alone instead of trees and vegetation. Efforts have been made to address these omissions within the Strategy.

Another topic of significant community focus was the diversity targets outlined within the Strategy. In particular, many members of the community were concerned about what a target of no more than 5 per cent of one species would mean for Melbourne's iconic Elm trees. There was also a keen focus on the cultural identity and heritage of Melbourne's urban forest.

In response to feedback provided by Friends of the Elms, Cynnamon Dobbs, Urban Forester and PhD candidate with ARCUE, University of Melbourne was engaged to undertake further assessment and modelling of the composition of the urban forest and Arboricultural Consultant Steve Frank was commissioned to collect additional field data on our elm trees. As a result of this work, the species, genus and family tables within the document have been revised. Dr Dave Kendal, ARCUE, University of Melbourne and Dr Peter May were also engaged to assist with the further development and refinement of the articulation and considerations of the diversity target.

Almost all commentators on the Strategy expressed opinion about species preference for Melbourne's tree population. Most were polarized in their options. It is not the intention of the Strategy to provide detail on actual species selection for any location in the municipality. This is a matter that was addressed in all consultation meetings. Species is a topic that will

be dealt with in the implementation phase of this strategy if it is endorsed through the development of Tree Precinct Plans. To address the feedback that was received, Section 6 of the strategy has been fully revised. Detailed information is now provided on the Tree Precinct Plans and how and when they will be developed. It is intended that these plans be developed collaboratively with the community.

During the consultation period, it also became apparent that the history section within the Strategy was lacking. Anna Egan, PhD candidate, University of Tasmania was commissioned to provide a more comprehensive overview of the history of Melbourne's urban forest.

## 2.2. Resulting Amendments to the Strategy

The Strategy has been revised to reflect feedback received during the consultation period. The following table provides details of what sections have been revised and the extent of those revisions:

**Table 1: Summary of revisions**

| Strategy Contents | Comments |
|---|---|
| 1 Introduction | Minor wording changes. |
| 2 Executive Summary | Minor wording changes. |
| 3 Background & Context<br><br>*3.1 What is an Urban Forest?*<br><br>*3.2 Benefits of the Urban Forest*<br><br>*3.2.1 Environmental benefits*<br><br>*3.2.2 Community benefits*<br><br>*3.2.3 Economic benefits*<br><br>*3.3 Evolution of Melbourne's Urban Forest*<br><br>*3.3.1 Historical development*<br><br>*3.3.2 The urban forest today*<br><br>*3.3.3 Policy context* | Extensive change has occurred.<br><br>Section 3.2 Benefits of the Urban Forest has been updated to include references to green roofs, green walls and vegetation in general.<br><br>3.3.1 Historical development has been completely rewritten by Anna Egan, PhD candidate from University of Tasmania. This section was rewritten to reflect community concern regarding Melbourne's cultural heritage. This section now elaborates the evolution of Melbourne's urban forest in a manner that provides a reference point of the development of a new set of Tree Precinct Plans and Master Plans.<br><br>Section 3.3.2 The urban forest today – all tables in this section have been updated with new data that has been collected during the consultation period. The ULE map has also been updated |

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| | based on new data.<br><br>Section 3.3.3 Policy context now contains a simple diagram instead of text. |
| 4 Issues & Challenges<br><br>*4.1 Ageing tree population*<br><br>*4.2 Water*<br><br>*4.3 Climate change*<br><br>*4.4 The urban heat island effect*<br><br>*4.5 Population increase and urban intensification*<br><br>*4.6 Towards our Future Forest* | Minor wording changes. |
| 5 Principles & Strategies<br><br>*5.1 Our priorities*<br><br>*5.2 Principles*<br><br>*5.3 Strategies*<br><br>*5.3.1 Increase canopy cover*<br><br>*5.3.2 Increase urban forest diversity*<br><br>*5.3.3 Improve vegetation health*<br><br>*5.3.4 Improve soil moisture and water quality*<br><br>*5.3.5 Improve urban ecology*<br><br>*5.3.6 Engage and collaborate with the wider community* | This section remains predominantly the same; however section 5.2.3 has been notably revised by Dr Dave Kendal and Dr Peter May.<br><br>Section 5.3.5 has been revised to amend the word biodiversity to urban ecology to address confusion between diversity and biodiversity highlighted during community consultation. The term urban ecology is broader and encompasses traditional biodiversity and other ecological perspectives. |
| 6. Implementation Framework<br><br>*6.1 Green Governance*<br><br>*6.2 Priority Implementation Actions*<br><br>*6.3 Measurement, monitoring and review*<br><br>*6.4 Funding resources* | Significantly revised.<br><br>Fuller detail has been provided in sections 6.2 and 6.3.<br><br>The Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. This was a core focus during community consultation. Section 6.2 now states that the community will have an opportunity to collaborate on the development of these plans. It also |

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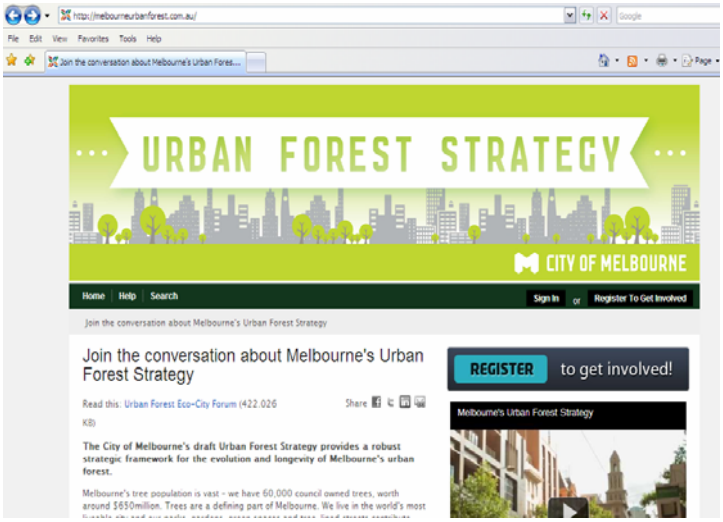
| | provides details on timeframes and the proposed method of development for the Tree Precinct Plans and the Boulevard Master Plans.<br><br>6.2 now contains new information on the Exceptional Tree Register and the importance of trees in the private realm. It also includes the Growing Green Guide and expresses a critical need to develop more information on green roofs and green walls. The section in i-Tree has been updated.<br><br>Section 6.3 now contains comprehensive details on plans for Measurement, monitoring and review of the urban forest. |
| Glossary<br><br>Selected References | Minor updates. |

# 3. Website Submissions

## 3.1. Overview

A bespoke website was created to provide an online forum for the duration of the consultation period and was open to all members of the community. The website received 11,991 site visits from 4,249 unique visitors. Of these visitors, 177 became website members to make comments and submissions on the strategy.

- **4,249 Visitors**
- **11,991 Site visits**
- **20,316 Page views**
- **1,595 Document Downloads**
- **818 Strategy Downloads**
- **177 Commentators**
- **19,000 Words**




## 3.2. Comments and submissions

The following section provides an overview of the comments make on the website. Comments have been abbreviated in some instances and they have attributed to the public usernames that were published on the site. Anything not regarded as direct feedback

specifically on the strategy has not been included – this includes general conversation on the site and general commentary on other people's postings.

It should be noted that strong preferences were expressed about native and exotic tree selections but it is not the aim of this Strategy to deal with the micro level of what occurs on each street.

Comments have been categorised, based on reoccurring themes, into the following sub-headings:

- Endorsements
- Species Diversity
- Biodiversity
- Productive landscapes
- Green Infrastructure and private realm contribution
- Various

## 3.2.1. Endorsements

| No. | Submitter/Username | Summary of comments |
|---|---|---|
| 1. | **Prof. Lindsay Falvey, formerly Dean of the Faculty of Agriculture, Forestry and Horticulture, University of Melbourne.** | A COMMENDABLE AND VISIONARY PLAN WORTH READING BEFORE ENGAGING IN EMOTIVE REACTION<br>It is pleasing to see a plan with a 60 year time horizon that is based on maintaining our heritage in the light of experience of more than a century, and is informed by applied science. The subject is difficult to relay in short public gatherings, such as the recent Residents 3000 meeting, simply because it is complex and emotive. Emotional responses about 'our' Plane trees, denial of long evidence of dying Elm trees, and assumptions that the majority of the City's trees are popular European species may be normal for many of us who have grown up in an around the City - but they seem to be misconceptions. Planned replacement, with multi-decade budgetary commitments, is the only responsible response that I can see; the authors of the report are to be commended. Failure to act would be to deny the legacy of even greater foresight by our forefathers and their adventurous vision for what has become a fine City.<br>20 Nov 2011 |
| 2. | **BB46** | I am so impressed with the plan to ensure Melbourne's 'urban forest'. The science is convincing enough to support |

| No. | Submitter/Username | Summary of comments |
|---|---|---|
| | | this kind of planning as a survival strategy.<br>Even if we were not facing potentially damaging climate change, the U/forest strategy is warranted as social-cultural policy - something that seems to have been central to the strategies of our forebears.<br>27 Nov 2011 |
| 3. | **Rafael Katigbak** | I applaud the City of Melbourne for coming up with this forward-thinking initiative.<br>21 Nov 2011 |
| 4. | **Simone** | This is a fantastic and comprehensive strategy. I am so pleased. There will be a lot of angst about the loss of some elm trees, however there are many beautiful sculptural trees that are better adapted to current and future conditions that can be mixed in to great effect.<br>Also a property owner I know that trees increase the value of my property so all Melbourne residents should be very pleased with the new strategy. And realize that few other councils are so future orientated and well informed. |
| 5. | **Ben** | I strongly support this strategy. I particularly support the push for greater diversity of species. I greatly value Melbourne's "avenues" of exotic trees; however, I don't see this strategy as a threat to these avenues. If applied sensitively, I can't see why our streetscapes would be greatly changed by this strategy. Indeed, a greater diversity would make it easier to maintain a stock of exotic trees. Greater diversity would also add to our "urban forest" by increasing the amount and diversity of wildlife attracted to our streets and backyards. |
| 6. | **Gregg** | I think it's a great idea and one that I'm sure we'll see replicated in Sydney in the not too distant future. |
| 7. | **JaneB** | I commend you for the vision and the planning and research, which underpins the strategy. As you point out, we are now enjoying the realisation of the vision our predecessors had, with the wonderful avenues of mature trees in so many of our parks. But trees don't live forever - would that they did.<br><br>The emotive aspects of the issue are evident, not least in a few of the responses. And it's so superficially easy and attractive to cling to the "just replace a dying one with the same type' or to reduce the complexity of the discussion to a simplistic line like 'Council plans to chop down trees!!!' |

| No. | Submitter/Username | Summary of comments |
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| | | Tough issue. I applaud the principles... I support the strategy. But I also will mourn losses when they come, fully acknowledging how much I love the look and the feel of the avenues of deciduous trees in so many parts of Melbourne city. We'll need courage and conviction and yes, much vision and commitment to future generations.<br><br>But oh yes, a city in a forest - how glorious an idea. |
| 8. | **AlanW** | This sounds like a good plan to me. It's a shame that it had not been started sooner. |
| 9. | **Zara** | I support a move toward a greener city that supports biodiversity. |
| 10. | **GemmaBC** | I think it is great that City Of Melbourne are taking the steps towards developing an Urban Forest Strategy for Melbourne.<br>With all the information that was presented in the short video from health and well-being, environmental sustainability and urban design, it absolutely makes sense to adopt a strategy like this one.<br>I love living in Melbourne and adore the all the trees and parks that contribute so much beauty to our city. To see planning and development by the City of Melbourne toward strategies that will allow this to beauty to continue flourish is innovative and exciting. It is exciting because with a strategy like this is place hopefully Melbourne will continue to remain most of the most liveable cities in the world. |
| 11. | **RLB** | The strategy offers a refreshing approach for challenges facing Melbourne's urban forest. I think attempts to introduce a new range of appropriate tree species, regardless of origin, is wise and reflects the social diversity within the city. Whilst I accept many plantings may fail as we learn what works and what doesn't, much of the public may not. It will therefore be important to learn as much as possible about these species prior to planting in urban environments. Regardless of selected species, I suspect energy savings will be worth much less than increased social benefits. |
| 12. | **loafingoaf** | I'm personally very supportive of the plan - particularly the diversity elements. Obviously certain streetscapes and boulevards benefit enormously from a uniformity of planting - I'd hate to see St Kilda Rd or Royal Parade lose their elms. |
| 13. | **Susan** | Congratulations to the Melbourne City Council for having the vision to promote an urban forest. The |

| No. | Submitter/Username | Summary of comments |
|---|---|---|
| | | concept is wonderful. As an Australian, I would like to see a reversal of the cultural cringe. Just because previous generations ripped out our native trees and replaced them with, mostly, European trees, does not mean that that has to be the way forever. It would be fabulous if more indigenous trees and shrubs could be introduced into the plan. Our trees are built for our climate. Our native birdlife needs our indigenous vegetation. Furthermore, our native indigenous trees and shrubs are beautiful. |
| 14. | **Vic** | I totally agree with the Strategy, mainly because it has been designed as the best possible response to the Climate Change. |
| 15. | **GreenTumbsUp** | I congratulate the council for attempting to have a strategy.<br><br>As already confirmed, I fully agree with seeing the urban forest strategy being incorporated into "greening" buildings and other infrastructure. To extend this point further, it is critical to see this strategy become more integrated (with a longer term goal to make it mandatory) with future building/infrastructure and planning (eg: the recent Arden-Macaulay plan) and not just retro-fitted on/into what is leftover.<br><br>Also. I can't see how graphic "visions" printed in the 1st pages of this strategy (of bountiful green rooftoops) are realised? These graphics are what (I think) people want to see and the ultimate goal, so the strategy needs to actively encourage this "vision" and enforce this level of active (rather than passive) thinking and design with developers, planners , architecture, council leaders and policy makers. This strategy must work its way to the forefront of future thinking and a plan of how this will be done would be great.<br><br>In regards to the Hundertwasser's Waldspirale housing in Germany...why has this been stated as being the "aspriational" position? This is the essence of what an urban forest is all about! The strategy will only succeed (in the long term) if it actively works towards building bold "inspirational" output and not "aspriational" (which only encourages back-peddling).<br><br>The plan to look after our existing forest is excellent as an ongoing activity and I can see things happening already, which is a great thing to see and feel. Great |

| No. | Submitter/Username | Summary of comments |
|---|---|---|
| | | Stuff! |
| 16. | Mara Ripani | I often find the City of Melbourne to be an exceptional leader, with a strong progressive vision and open minded to issues facing contemporary society. Congratulations on your Urban Forest Strategy. I look forward to experiencing a higher quality of life as a result of its implementation. I look forward to: a cooler microclimate, shade on hot summer days, and a more aesthetic journey as I commute by bike. |
| 17. | **Ros** | Good work Melbourne.. please bring your concept to City of Greater Bendigo!!! |

## 3.2.2. Species Diversity

| No. | Summary of comments | Response |
|---|---|---|
| 18. | **Username: Fitzroy14**<br><br>"A lack of diversity in plant species and age is putting our tree stock at great risk. Just as you would diversify financial assets, a diverse urban forest with many plant species and varying life expectancies reduces vulnerability and risk. Melbourne's trees are highly vulnerable to disease. Myrtle Rust, a disease that has spread in Queensland, has the potential to infect and possibly kill more than 45 percent of our trees." | ***Species diversity has been further addressed within the new draft.***<br><br>***This comment is not false, but it has been removed.*** |

| No. | Summary of comments | Response |
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| | You should remove this misleading statement, as it's false. This is a scare tactics and we don't need that here. Myrtle Rust, yes its in Queensland and can effect trees of the Myrtaceae family, like Eucalyptus, Callistemon, Melaleuca etc. These are small to large trees. This family represents around 30% planted in Melbourne. So the plan would be not to plant any more of this family of trees? If you think this disease is a risk to our trees? | |
| 19. | **Username: Rubisco**<br>"We are saying that we should not have more than 5% of any one species of tree in the municipality so that we can reduce our exposure from threats such as attack from pest and disease and extreme weather".<br>Are there any references to support the 5% figure?<br>Is there any survey data to support to the notion that there is a significant pest & disease problem in the urban canopies?<br>Plants that resist "extreme" weather are unlikely to be exotics so this provides a good "out" for the claim that exotics will not be replaced with natives.<br>Even using the last 15 years rainfall data, we have enough water to support deciduous trees. This is so because of the NS pipeline and the desal and it does not even include recycled waste water and recovered storm water which are highly underutilised. | ***Species diversity has been further addressed within the new draft.*** |
| 20. | **Username: Clancy**<br>I would also like to see the incorporation of indigenous species, would this not also help with issues surrounding adaptation to climate change? Delving even deeper, how about edible indigenous species in our landscapes. There's is part of the food security solution. | ***The strategy does not differentiate or express preference between native, indigenous or exotic trees.*** |
| 21. | **Username: native trees**<br>I would really like to see that if there is going to be an even spread of varying species that there be a greater emphasis on utilising native species. | ***The strategy does not differentiate or express preference between native, indigenous or exotic trees.*** |
| 22. | **Username: Dr Dave Kendal**<br>**Australian Research Centre for Urban Ecology (RBG/University of Melbourne)**<br>IMPACTS OF TOO MUCH DIVERSITY?<br>In general, a thorough and well researched strategy that will improve the health and wellbeing of both the vegetation and the people of Melbourne.<br>However, I am concerned about the somewhat arbitrary benchmarks proposed for species/genus/family diversity. The original 'rule of thumb' (not strongly scientifically | ***Author of this comment was Invited to assist in redrafting the diversity section.*** |

| No. | Summary of comments | Response |
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| | based) from the US suggests that no more than 10% of street trees should come from any one species, 20% from any one genus and 30% from any one family. These are halved in the strategy which proposes that the urban forest should be composed of no more than 5% of one species, 10% of one genus and 20% of one family. This means that the proportion of trees coming from the dominant native family (Myrtaceae) would be more than halved by 2040. My specific concerns about this are:<br>- the US guidelines are from places with a much greater diversity of native and urban trees at the genus and family level. South-east Australian trees (particularly outside rainforests) are totally dominated by two families (Myrtaceae and Fabaceae) and two genus (Eucalyptus and Acacia).<br>- In contrast, species diversity is much higher in the Myrtaceae than most other tree families, both in urban and native forests. There is also much greater diversity within species as many Eucalypts and Acacias are grown from seed, or naturally recruited in natural areas in parks or riparian corridors. This results in much greater resilience at the species level than for species from many other families.<br>- These factors mean that the US guidelines cannot be directly translated to an Australian context due to the difference patterns of diversity in native forests, and certainly not halved at the family and genus level.<br>The proposed benchmarks would results in a substantially lower proportion of native trees in the City of Melbourne.<br>- This is likely to have a detrimental impact on many native fauna species (particularly birds) as a number of scientific studies show that some native species are advantaged by the planting of native street trees.<br>- This may also have a detrimental impact on the people living in and visiting the City of Melbourne, as studies show a significant proportion of the population prefer native vegetation over exotic vegetation. This has been related to demographic characteristics such as education level, which are increasing in the population generally, and suggests that native trees will become more preferred in the future.<br>The strategy as a whole is welcome with excellent guiding principles, but these apparently minor benchmark recommendations have potentially large and possibly detrimental effects on the composition of Melbourne's urban forest.<br>. | |
| 23. | **Username: JamesP**<br>An allowance needs to be made for the fact that the distinctive character of elms shapes the face of central Melbourne, and they're as much a part of our heritage as | ***The strategy does not differentiate or express*** |

| No. | Summary of comments | Response |
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| | any Victorian building. So the 5% diversity allowance doesn't allow for this critical heritage value to be maintained to the degree necessary to retain the stunning character they impart to the central area. The figure needs to be significantly increased in their case, while taking the critical steps necessary to ensure genetic diversity and disease resistance in the variety of elms planted. Otherwise it's vandalism in the guise of well-meant policy. | ***preference between native, indigenous or exotic trees.*** |
| 24. | **Username: AlanW**<br><br>Remembering also that the recent drought nearly wiped the elms out and has left them looking a shadow of their former selves. What happens if such droughts become more common? It would be a shame to carry all our eggs in a few baskets and find ourselves with whole areas without mature trees because we failed to learn from experience. I would like to think that there are ways we can better nurture and protect the elms in the future but we should remember that they may be more vulnerable than we would like. | ***Species diversity has been further addressed within the new draft.*** |
| 25. | **Username: Fitzroy14**<br>Melbourne has a huge range of both exotics and native trees, many different varieties of tree have been planted over 100 years in many parks, gardens and streets. Do we introduce another 20 species, to say its more diverse? We need to plant trees both evergreen and deciduous, exotic and native. Plant the tree for the location not because its native or deciduous. | ***Species diversity has been further addressed within the new draft.*** |
| 26. | **Username: Philgreen**<br>The "just plant natives" is a narrow and misinformed approach. Endemic vegetation has it's place but Melbourne's treescape deserves to retain a solid mix of deciduous species. This is particularly important when you consider that Melbourne is one of the last refuges for the genus Ulmus. Melbourne currently has one of the worlds largest and most impressive elm populations on the planet | ***The strategy does not differentiate or express preference between native, indigenous or exotic trees.*** |
| 27. | **Username: Native Trees**<br>I think over all this is an exciting initiative, one that I fully support! However, I'm wondering what percentage of native trees are going to be planted under the strategy? Seems to me that there should be a strong commitment focused on planting as many native trees as possible. | ***The strategy does not differentiate or express preference between native, indigenous or exotic trees.***<br>***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The*** |

| No. | Summary of comments | Response |
|---|---|---|
| | | ***community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |
| 28. | **Username: Jake**<br>Out of all the trees to be removed, how many are being replaced with exact species and how many are to be replaced with natives? What makes Melbourne so beautiful is the structured landscapes and the elm lined boulevards.<br>if a tree is dead, why not replace it with a like tree? | ***The strategy does not differentiate or express preference between native, indigenous or exotic trees.***<br>***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |
| 29. | **Username: timbrown13**<br>I really like the drive behind the report. Green up our city, make Melbourne a green city filled with trees and birds. I do have a big problem with placing arbitrary limits on the number trees from a species, genus or family. There are good reasons for doing so, which are clearly spelt out in the report. There are other factors to also consider. Given the decline of the River Red Gum across Victoria, Melbourne could keep up the relatively high numbers it has in the city. These trees will look grand in 400 years when they reach the age of the current specimens in the botanical gardens and other places. Other eucalypt species will provide nesting hollows in time. If the nesting hollows are managed the brushtail possum pest issues might not be such a pest, with ringtail possums and birds residing.<br>If the Myrtaceae family is to be reduced to 20% representation by 2040 from the current 43% levels, this means letting half of the trees die before thinking about planting replacements. There will only be really old trees representing the family at this point. The Myrtaceae family represents a massive proportion of the native species of trees from the Melbourne area and I think that having a 40% limit on this family is about the right mix. | ***Species diversity has been further addressed within the new draft.*** |

| No. | Summary of comments | Response |
|---|---|---|
| | The report states that<br>By 2040 the urban forest will be composed of: No more than 5% of any one Species. No more than 10% of any one Genus. No more than 20% of any one Family. I think that this should apply to exotic species and the native species should be double that. 10% for species, 20% for genus and 40% for family. (I would say triple if the COM was going compromise and meet me half way).<br>The position of the exotic trees should be for street trees, as Melbourne is characteristically known, and the natives can be used in the parks. However this should be mixed up a little as is currently done. This way the Elm lined streets do not loose their value. If every street was Elm lined the would be no demand and hence the price would drop. Elms work well in parks too.<br>Sustainable futures are balanced futures, with the expectation of less rainfall, disease outbreak, increased population, increase car travel, the COM can not put all its eggs in one basket, but I think that they need to rethink about the right mix of trees that will suit the opinions of the people and the unknown conditions of the future. Thank you for the opportunity to contribute to the discussion.<br>Is 90,000 trees in the City of Melbourne by 2040 enough? I would like to see many more trees than that | |
| 30. | **Username: choking on plane trees**<br><br>Diversity is crucial - in the inner urbs we are living in a Plane tree forest. Why are we so hung up on single-species avenues? Whilst plane trees provide brilliant summer shade, so do other species. You only have to stand in the street outside my house to see how their fine particles cast off at certain times of the year cause people to cough and almost choke as they walk. Let's identify alternatives and replace them over the next 2 decades. Furthermore, let's prune the remaining ones so they don't monopolise all the ground water and develop into giant monsters (20 years ago our council had an active program of annual pruning, now they've given up!). | ***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |
| 31. | **Urbanite**<br><br>I want to see a bigger variety of trees being planted. Why isn't there more flowering trees - think Singapore and Japan. I'd also like to see more ambitious planting styles- be a contemporary capital city. Not everything has to be a monotonous monoculture, particularly in locations where you plant trees where there has been nothing before. And what about Docklands? There's a good opportunity to rescue a desolate concrete jungle from obscurity with some bold choices in plantings. Also what about flowers? Apart from the Town Hall and on a section of St Kilda Rd I can't think of any nice arrangements in the city. Why isn't it worth investing in some beautiful flowers? The city | ***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |

| No. | Summary of comments | Response |
|---|---|---|
| | needs more colour and vibrancy, especially in the laneways. | |
| 32. | **Margaret Morley**<br><br>I would like to see oaks replaced by oaks elms replaced by elms etc.These trees were planted 100 years ago and have survived many droughts and if a tree dies replace it with like for like and do not rip out beautiful trees just in case there is another drought. What makes Melbourne so beautiful are the trees. The Elms and oaks add a beauty and lushness that natives just dont give. A case in point is the replacement of poplars with natives around the shrine. I am over 50 years old and if you pull out and relace those trres in St Kilda rd then I will never again see them in their splenour in my lifetime. I am opposed to the wilful destruction of these beautiful trees just to help some greenie beaucrat justify there position. | ***Species diversity has been further addressed within the new draft.***<br>***It has also been made cear throughout the consultation process that St Kilda Road will always have Elms..*** |
| 33. | **Marg Jungwirth**<br><br>Melbourne is famous for it's beautiful parks and trees; the city's elms and plane trees in particular, because they give great shade with their canopy cover. Keep them. Water recapture from the city should be able to adequately water them. Eaucalypts and native trees / bushes aren't suitable for our city. They provide little shade, limbs regularly fall and "rubbish" drops from the trees making them unsuitable to sit under. Ants often accompany them, adding further danger. Separate bush parkland is vital, on the city outskirts, as in Royal Park - the vital lungs of theCity and home to native fauna and flora. More parks need to be created. More trees need to be planted to offset the rapidly increasing population of Melbourne and it's fringes - both the resident population and the visitors and workers, who create much of the "pollution". I DON'T agree with the wide variety of trees proposed, as replacements for our avenues. Trees need to be appropriately placed. Footpath trees are a hazard for pedestrians and a nuisance and danger to traffic - particularly as they are not adequately maintained by Council. | ***The Open Space Strategy deals comprehensively with the topic of more parks for the municipality.***<br><br>***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |

| No. | Summary of comments | Response |
|---|---|---|
| 34. | **Bev Walshe**<br><br>I understand that some trees will need to come down, because they are stressed. I do hope that in the process of thinning them, they will be removed in stages, so we don't lose too much shade in Summer. The choice of tree is very important. To maintain sunshine and light in winter, deciduous trees are important. Elms and plane trees are best suited to the task. | ***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |

## 3.2.3. Biodiversity

| No. | Summary of comments | Response |
|---|---|---|
| 35. | **Username: Gregg**<br><br>How you are going to encourage birds to breed in this new look forest. Given that many Australian birds need hollow trunks to breed, how do you see this working since many of the older trees will be removed? | ***A biodiversity and urban ecology strategy is currently under development. That strategy will consider this issue more appropriately.*** |
| 36. | **Username: Simone**<br><br>Increasing biodiversity is very important there are very few gardens in the inner city and I find that it is more difficult to grown vegetables and herbs in my own small garden because there are not enough 'good-guys' like native birds, frogs etc. to keep the bad bugs at bay. Increasing biodiversity in the inner city would improve productivity in small gardens. | ***A key target within the strategy is to Protect and enhance a level of biodiversity which contributes to the delivery of healthy ecosystem services.*** |
| 37. | **Username: Timbrown13**<br><br>Are tree hollows being considered as a part of this plan? | ***A biodiversity and urban ecology strategy is currently under development. That strategy will consider this issue more appropriately.*** |

| No. | Summary of comments | Response |
|---|---|---|
| 38. | **Username: Fred**<br><br>The aesthetic and environmental benefits are pretty much a "no brainer"! Surely, a primary focus must be to plant local, NATIVE species to encourage our struggling birds back into the metropolitan area. Parrots, finches, etc. would be a great addition to Melbourne as well as other fauna dependent on native vegetation. | ***A biodiversity and urban ecology strategy is currently under development. That strategy will consider this issue more appropriately.*** |

## 3.2.4. Green Infrastructure and private realm contribution

| No. | Summary of comments | Response |
|---|---|---|
| 39. | **Username: HWR**<br>I would love to hear the council's view on increasing the scope of the urban forest via living walls, green roofs and other urban greening infrastructure in the city. | ***We share the view that greening the private realm is a very important factor in helping to increase our urban forest. We have incorporated more on green infrastructure throughout various sections of the revised draft.*** |
| 40. | **Username: Simone**<br>I would strongly agree with another post which commented on the need to 'enforce' green space in new developments in Melbourne city. Developers will never do this without being bound to do so. This would ensure that works done in public spaces are complimented by works done in private spaces. | ***We share the view that greening the private realm is a very important factor in helping to increase our urban forest. We have incorporated more on green infrastructure throughout various sections of the revised draft. However, enforcement of green space is beyond the scope of this strategy.*** |
| 41. | **Username: Jane B**<br>Perhaps it would help to have some illustrations or examples of what some future streetscapes or parkscapes could or might look like using the strategy, to help with visualisation and ease those fears of loss? I | ***Several illustrations and examples of what some future streetscapes look like are currently contained within the document.*** |

| No. | Summary of comments | Response |
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| | imagine our forbears had a pretty good idea of what their future avenues and gardens would look like when those magnificent trees matured. I'm not sure we do yet. | |
| 42. | **Username: Nedsfield**<br>I agree with Dr.Greg Moore, and hope that residents will be consulted and that roof top gardens or green walls become mandatory on future high density projects. | ***We share the view that greening the private realm is a very important factor in helping to increase our urban forest. We have incorporated more on green infrastructure throughout various sections of the revised draft. However, enforcement of green space is beyond the scope of this strategy.*** |
| 43. | Username: **deanne**<br><br>I am looking forward to this plan including not only street trees, parks and significant trees on private property but also engaging with workers and residents to make the best use of spaces which could be 'greened'. As a CBD resident and worker I observe people actively using public and private city spaces which in some cases are quite ugly but the only choice in a short break from work. It is quite simple to beautify an area through planting not only trees but shrubs and vertical gardens. The smallest space can become more attractive and contribute to reducing the heat island effect. Council is challenged by developers and at times the street trees lose the battle to remain on the condition the developer replaces the tree post building. Council must be more vigilant in maintaining trees remain even during development. The core reason for insisting on an Urban Forest Strategy is to maintain the vibrancy and health of the citizens of the city. The trees contribute to the beauty of the city and in turn positively affect the citizens. | ***We share the view that greening the private realm is a very important factor in helping to increase our urban forest. We have incorporated more on green infrastructure throughout various sections of the revised draft. However, enforcement of green space is beyond the scope of this strategy.*** |
| 44. | **Sue Saunders**<br><br>I support the strategy wholeheartedly. I like the idea of diversity of species. However, I think there should be more emphasis on the establishment of roof top gardens and small trees. Many buildings in the CBD look down on others and they are ugly with air conditioning units, old tanks, rubbish. The building owners are not aware, it seems that other have to look at the mess all day long. | ***We share the view that greening the private realm is a very important factor in helping to increase our urban forest. We have incorporated more on green infrastructure*** |

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| | I think the plan should include a campaign whereby every corporate body - both commercial and residential - is contacted to take part in a roof top initiative. Perhaps along the lines of "plant a square metre". Maybe there could be a rate incentive to do so or a prize for the best.<br><br>What body corporates need is a "how to" set of information. What species to plant. What low density soils can be used. Can the plants rely on natural rainfall. What are the safety requirements etc...<br><br>What has been learned from the roof top gardens that already exist?<br><br>The benefits are better air quality. More oxygen. Better roof top aesthetics. | ***throughout various sections of the revised draft.*** |
| 45. | **GreenGnomie**<br>Small trees/shrubs/groundcovers and grasses can be more integrated within this strategy. Trees obviously provide more shade, better evaporation etc, however where space or other constraints do not permit the planting of a tree the usefulness of a simple shrub or groundcover should not be underestimated!! | ***We have incorporated more on green infrastructure and vegetation in general throughout various sections of the revised draft.*** |
| 46. | **Urbanite**<br><br>There needs to be a stronger focus on green infrastructure in this document because it is a key component of the urban forest. Imagine if all of our buildings had green roofs- we'd have a different city. We could play and dream in the sky! | ***We have incorporated more on green infrastructure and vegetation in general throughout various sections of the revised draft.*** |

## 3.2.5. Productive landscapes

| No. | Summary of comments | Response |
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| 47. | **Username: fgiorlando**<br><br>I believe that we need to actively consider how urban forests can be productive as well as aesthetically pleasing. I have been dismayed, for instance, by the planting of ornamental pears, where productive trees | ***Tree Precinct Plans, which are yet to be developed, will inform species selections for*** |

| No. | Summary of comments | Response |
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| | could give fruit too.<br><br>While I understand that the use of fruiting trees may increase maintenance costs, and that consideration needs to be made to species requiring only moderate watering, the benefits appear to outweigh the costs, for instance:<br><br>- an increased awareness of food transport issues and how these can be mitigated by growing food locally<br><br>- consideration for how motor vehicle pollution affects amenity and health<br><br>- increased community building by sharing of local food<br><br>- providing native habitat<br><br>I have actively planted native and introduced fruiting trees in my small urban plot (persimmon, apple, citrus, etc.) and am amazed by the productivity of such an approach and the pleasure of sharing fruit with my neighbours. The plants considered do not need to be only fruit trees, and some could even provide a valuable harvest when the plant has reached maturity. For example, the use of cork oaks in the Canberra plantings were of considerable value (unfortunately most burned in bushfire). Other types of vegetation are well suited to urban environments and also provide harvest, for example pergolas of passionfruit, kiwi or grape.<br><br>I believe that consideration needs to be given to the values of this type of planting rather than the current blanket disapproval of productive species. | ***each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |
| 48. | **Username: Alan W**<br><br>I see no reason why we couldn't plans all kinds of productive varieties of trees around the city. However, I would expect that some people will see something wrong with the idea of free fruit growing in city trees because no one is making money from it. | ***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |
| 49. | **Username: David Hancocks**<br><br>I have been very impressed with the extent to which the | ***Tree Precinct Plans, which are yet to be*** |

| No. | Summary of comments | Response |
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| | City Council is supporting and encouraging people to develop and maintain both productive and decorative gardening on the nature strips alongside neighborhood streets. The results are visually as well as practically delightful. | ***developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |
| 50. | **Username: Cheli**<br>I was wondering if consideration had been made towards planting food trees as part of the strategy - a mix of fruit and nut trees (native or otherwise) could be useful in the future for all residents, even considering flowering trees for honey production as I know there are now a few urban honey producers in the city? | ***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |
| 51. | **Username: Llamas**<br><br>As much as I like the city there is one thing that bugs me. It's the parks. All the parks in the city are really boring. Like, REALLY boring. One of the main reasons is that there is major flaws in how these parks are designed. Most children ( and teens for that matter.) like having some sort of thing they can interact with in parks, like playgrounds. Now Im not against playgrounds, but the problem with that is not everyone wants to use them. Many children love to climb trees. As a matter of fact I do too. It's nice to sit up in a tree watching the world pass by below; being unseen in the open park. The problem in the city though, is that many of the trees are gum trees, or something that has no branches. I also live in the city, but as we all know many families will come to the city for a day out; bringing children and teens. So my final request is this: Could you please, please, please plant climbable trees? | ***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.*** |

## 3.2.6. Various

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| 52. | **Username: James**<br><br>Kindly keep the observance of your global warming faith to your private life. Only the spectacularly arrogant or deluded feel the need to impose their beliefs on us poor misguided non-believers. | ***No change. Adapting to climate change is a core focus within the strategy.*** |
| 53. | **Username: Bilby**<br><br>Personally, I would love to see a huge increase in tree cover - why the long timescale on achieving this? All we need to do is identify sites and develop an online plan. I would like to see an online map devised with potential planting sites identified, so that individuals, organisations and residents can take action and plant trees legally should they so desire. Such a map would also allow residents to calculate the canopy cover, cooling and economic benefits of the trees in their street / block and take action to improve things at the local level. There also needs to be a system whereby home owners can redirect excess tank and roof rainwater to street trees. | ***Section 6 on implementation has been extensively revised within the new draft.*** |
| 54. | **Username: Ben**<br><br>While I agree with spirit of Bilby's comments, I would worry that allowing individuals to plant trees in public spaces would cause a lot of conflict and ultimately undermine the aims of the strategy. | ***This is not a sentiment reflected in the strategy.*** |
| 55. | **Username: Steve**<br><br>Great idea re community involvement - decentralising some of the systems to fulfill the project would seem to facilitate a quicker rollout and would enable communities to have hands on control of some aspects of the project. These wouldn't need to be at odds with the central rules behind the urban forest itself as any planting could reflect the strategy. | ***Section 6 on implementation has been extensively revised within the new draft.*** |
| 56. | **Username: Alan W**<br><br>I think there is plenty of room for more trees, on hot and sunny days a lack of shade becomes obvious. I would even suggest that we could have even more trees than the future target set in this plan. | ***Section 6 on implementation has been extensively revised within the new draft.*** |

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| | One thing I would like to see in the future is more larger and taller trees than we have now. Fraser Ave in Perth's Kings Park, is lined with spectacular lemon-scented gums. These trees are not only impressive in size and appearance but also provide considerable shade without overshadowing the avenue with low dense foliage. | |
| 57. | **Username: JamesP**<br>Watering - During the drought summer I watched, day after day, as a cricket pitch in Fawkner Park was lushly watered while trees only 50 metres away suffered and died due to lack of it. It was enraging and surreal. Similarly, the complete shedding of leaves by drought-stressed planes in the CBD could have been reduced by a better summer management policy. Council needs to get their act together on this one, and commit the resources to it, because all the planting in the world is pointless if the maintenance isn't up to scratch. And it clearly isn't. More funds, better policy, better management. | ***Section 6 on implementation has been extensively revised within the new draft.*** |
| 58. | **Username: Fitzroy14**<br>One of the biggest problems now with Council is it does not have its staff to maintain the parks and gardens.<br>There was a time City of Melbourne was a leader in parks and gardens. Sound horticultural and basic knowledge of running the best parks and gardens. Trees in the CBD and centre medians were watered on a regular basis. But the tree islands have now been filled with granite gravel. So any rain just runs off.<br>I would like to know where you think Council can plant tens of thousands of extra trees? | ***Section 6 on implementation has been extensively revised within the new draft.*** |
| 59. | **Username: Philgreen**<br>If the Melbourne Urban Forest Strategy is to really work Melbourne City must employ it own garden staff and arborists.<br>Personally I believe we Melbournians have to begin to act along the lines of the strategy...but.... I want to see a committed budget, long term staffing and long term community involvement in planning, planting, removals and re-planting.<br>We owe a legacy to the next 150+ years, especially after we have been benefiting from the legacy of our forebears. Come on council and strategy team. | ***Section 6 on implementation has been extensively revised within the new draft.*** |
| 60. | **Username: JamesP**<br>Unlike say 'city in a garden' Singapore, I don't believe Council is prepared to make the longterm deep financial and resources commitment to provide the proper watering and maintenance the project demands to be truly great. Let's remember: this is Council so petty minded it even turned off its fountains in the last drought, while Sydney's played nonstop. | ***Section 6 on implementation has been extensively revised within the new draft.*** |

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| 61. | **Username: Sarah Yeomans**<br><br>The goals are undeniably the right way to go - canopy, water conservation, etc. But I have observed that actions by councils do not support the goals. Trees are removed rather than shaped around wires, and never replaced, unless by an occasional pathetic pear shrub. Nature strips on the non-wire side of streets are underplanted. Councils pander to tree fear among the rate payers, and happily remove trees for no better reason than a crack appeared in a footpath, or a drain was blocked, rather than provide education on foresting goals - including the need to factor in a plumber's eel every year or two. And as long as councils continue to approve developments without room for, and requirement of, several large trees, we are done for. We need trees of all ages for different reasons - habitat and beauty and shade by mature trees, higher carbon removal by teenage trees. I would like to see more citizens plant bigger trees on their own property, and councils take the lead in education and in planning legislation. | ***Section 6 on implementation has been extensively revised within the new draft.*** |
| 62. | **Username: Reubsinit`**<br>This city that we all share, love and live in is by far one of the most beautiful cities I've seen in the world and most certainly one of the most liveable.<br>I agree with the approach that is being made here, the council needs to offer more incentive for the community to be involved with the planning of the city scape, especially when it comes to parks and gardens. Perhaps the council could be more involved in creating public awareness about the benefits that come from such a project to the city as a whole and the individual. There is so much reward in being able to create and utilise facilites that the public desire at heart. The biggest problem with living in a metropolis is the isolation and separation of the a natural being (which we are) from the wilderness and our natural surroundings. It would be interesting to know, whether or not you included it in your research; how much space there is available for roof top gardens. I've worked in the city before and as Sue said, it's dreary and depressing and there's no excuse as to why that space can't be utilised. And what a difference it would make to the sight of the city. | ***Section 6 on implementation has been extensively revised within the new draft.*** |

# 4. Written Submissions

## 4.1. Individuals

| Name | Summary of comments | Response |
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| Gabby Stannus | Congratulations for taking a long-term planning perspective. I have a few suggestions to make.... If not already doing so, I encourage you to work through Council's capital works process to increase our urban forest and open space. It should become standard that our engineers have to factor in urban forest creation into their tenders, not only replace 'like' for 'like'. Does a road need to remain a road? It would be great to see a productive urban forest. Growing such a forest would help meet the need to feed and resource our increasing inner-city human population, especially in response to peak oil. Allowing for what we know about the life span of species already planted and those to be planted in the future, we could plan for their eventual decline and removal from the landscape when they could be used for other purposes, e.g. furniture, construction. We could also harvest edible produce from our forest. Habitat values of course would need to be considered if we are to take a truly ecological perspective. This productive aspect of an urban forest is missing from the section on economic values. If you haven't already, you may like to speak to Adam Zaborszczyk, Senior Sustainability Officer, City of Melbourne re: the CSIRO Smart Grid project he is working on. They are mapping energy infrastructure in the municipality. Perhaps an opportunity to identify/prioritise those areas of our municipality where you would like trees to grow better that are currently constrained by archaic infrastructure, i.e. overhead electricity wires. In addition, you may like to consider how to work with building owners whose properties are nearing the end of their life-span in order to increase the amount of open space and urban forest opportunities. We don't need to replace 'like' with 'like', i.e. another high-rise building. Perhaps these buildings could come down, materials be reused elsewhere and the site purchased to help green our city? Maybe there are other ways to achieve this objective that don't involve purchasing the site? I realise that this may require a long term strategy, but perhaps you could start by exploring opportunities through the City of Melbourne's 1200 Buildings program? I wish you the best of luck in your goal to create an urban forest. I look forward to living in a city within a forest! | ***Productive trees shall be fully considered as part of Council's food policy.*** |
| Nina Earl | This Urban Forest Strategy is, in principle, an ambitious, commendable, and sensible plan that, if adopted, would greatly benefit the natural and built environment and amenity for the people of Melbourne, and may encourage greening of other municipalities. | ***The strategy does not differentiate or express preference between native, indigenous or*** |

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| | However, as a conservation volunteer, I find the recommended species list highly disappointing in that it favours introduced trees of which many are deciduous that, yes, would increase species diversity in the CBD, but is a lost opportunity to increase local biodiversity for the greater benefit of our local natural environment. Australia has few native deciduous trees, so the recommended species would not respect the landscape character of this country, and certainly not Melbourne and surrounds.<br><br>Our unique native flora are found nowhere else in the world and, together with associated fauna, give Melbourne and Victoria its distinct landscape character. For too long now, planners, developers, landscapers, the horticultural industry and colleges have favoured introduced plants, often creating ubiquitous or generic landscapes and urban plantings that can be seen in many parts of the world. It is time to restore and showcase our local native flora (and fauna) that would also bring back iconic aromatic fragrances of the Victorian bush that once signalled arrival in Melbourne.<br><br>Much will be revealed in the detail of this Strategy, and aspects may change as plans are implemented. However, please ensure:<br><br>1. Successive Councils continuing support.<br><br>2. The intent remains for greening to relieve the built environment, rather than disguise an increase in it.<br><br>3. Predominance of Australian and local native trees in the recommended species.<br><br>Otherwise, specific comments on this Strategy follow:<br><br>5.1 Our priorities. It is good to see proper recognition of the contribution of private green spaces and urban forests to urban greening:<br><br>Private green spaces across Melbourne are an important component of our urban ecology that contribute to neighbourhood wellbeing, connectedness to nature and biodiversity, and help our city adapt to changing climates. These private urban forests also need nurturing and growth.<br><br>5.2 Principles. These seven Principles are excellent. Suggested inclusions or requests in bold:<br><br>To mitigate and adapt to climate change<br><br>Build a resilient urban forest that can tolerate and continue to thrive in future climatic extremes.<br><br>Ensure a diversity of tree species and ages to maximise resilience against pests and diseases.<br><br>Increase overall vegetation biomass to assist in storage and | ***exotic trees.***<br><br>***The species list provided will not be rejected from the diversity guidelines as requested because the forest of the future needs to include both exotic and native species. This is part of Melbourne's cultural identity and is clearly articulated within the Strategy.***<br><br>***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.***<br><br>***A key target within the strategy is to Protect and enhance a level of biodiversity which contributes to the delivery of healthy ecosystem services. A biodiversity and*** |

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| | sequestration of carbon.<br><br>To reduce the urban heat island effect<br><br>Build a functioning healthy urban forest canopy to provide shade and cooling to reduce heat absorption and emission by the built environment.<br><br>Develop green public spaces to improve human thermal comfort and maximise health benefits.<br><br>Capture more stormwater to increase filtration into the soil and enable maximum evapotranspiration.<br><br>To become a Water Sensitive City<br><br>Promote use of innovative techniques for Water.<br><br>Sensitive Urban Design, such as rain gardens, bioswales, underground storage reservoirs and biofilters.<br><br>Use alternative water sources for irrigation to reduce potable water use.<br><br>Ease stormwater flows and peaks by replacing impervious surfaces with porous materials to reduce heat absorption and encourage soil moisture retention.<br><br>To design for health and wellbeing<br><br>Provide cool shaded spaces in summer; sunlight access in winter.<br><br>Plan and manage the urban forest to ensure longevity of green spaces for future generations.<br><br>Create well-designed public spaces to encourage outdoor activity, social connectedness, respite, exercise and general sense of wellbeing.<br><br>Design for Liveability and Cultural Integrity<br><br>Design landscapes to reflect the cultural integrity, identity and character of Melbourne. Request: please define 'cultural'; is it European/multicultural/Koori? Suggest: a few non-invasive but hardy trees and vegetation that have historical significance.<br><br>Lead by example in the creation of world class spaces, parks and streetscapes.<br><br>Design spaces for people to reconnect with nature.<br><br>Design spaces that create a sense of place and enable reflection and tranquillity.<br><br>To create healthier ecosystems<br><br>Support healthy ecosystems in order to provide maximum benefits | ***urban ecology strategy is currently under development. That strategy will consider this issue more appropriately.*** |

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| | in terms of clean air, water and soils.<br><br>Expand and improve biological and structural diversity.<br><br>To position Melbourne as a leader in urban forestry<br><br>Create world class open spaces, parks and streetscapes.<br><br>Increase Australian-based urban forestry research.<br><br>Inform and involve the community in decision-making for landscape adaptation and change.<br><br>Increase the public profile and understanding of the attributes, role and benefits of the urban forest.<br><br>5.3 Strategies. These five Strategies are excellent, and all are of equal importance:<br><br>(1) increase canopy cover; (2) increase urban forest diversity; (3) improve vegetation health; (4) improve soil moisture and water quality; (5) improve biodiversity; (6) inform and consult the community.<br><br>5.3.1 Increase canopy cover<br><br>Map of municipality's canopy cover. Suggest: colour key under map for easy interpretation.<br><br>Large canopy trees. This canopy cover Strategy favours wide canopy trees; however, such selection would limit the species used. Suggest: for biodiversity reasons and where space allows, canopy spread could be achieved with group plantings of smaller/narrower canopy trees.<br><br>Target: City of Melbourne's Canopy Cover will be 40 per cent by 2040. Suggest: for clarity, state the current % of canopy cover. Actions. Good.<br><br>5.3.2 Increase urban forest diversity. Target and Actions. Good, in principle, except for the unacceptable recommended species lists in the Urban Forest Diversity Guidelines as follows:<br><br>Urban Forest Diversity Guidelines 2011<br><br>Recommended Species. Strongly disagree: the lists of recommended species for given criteria is a disgrace! These trees will do little to increase local biodiversity or native wildlife habitat, which makes the claims in this Urban Forest Strategy disingenuous. The recommended introduced species would increase habitat for starlings and Indian mynahs, etc, but not for local native animals. In the sample list (below) of 73 tree species, 20 are Australian and only eight are Victorian, and the remainder are from other continents. About half are deciduous so leaf drop would be enormous and an unnecessary expense in keeping streets and paths clear of leaves, and many become invasive and | |

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| | some are toxic.<br><br>Suggest: for clarity, the species criteria lists should have ratings per tree shown.<br><br>The need to consider site conditions, senescent tree stock, disease, and climate tolerance in species selection is understandable. But request: for local biodiversity and potential invasive species reasons, please reconsider this species list in favour of a predominance of Australian and local native trees, including the attractive Kurrajong (Brachychiton populneus) that this Diversity Guideline rejects*: (list provided is not included for the purposes of brevity)*<br><br>5.3.3 Improve Vegetation Health. Actions. Good. All are important, but it is great to see the intent to create median strips for tree space, and to replace asphalt and concrete with pervious surfaces.<br><br>5.3.4 Improve soil moisture and water quality. At last, the wisdom and value is realised, in this Strategy, of retaining rainwater in the landscape or harvesting it for later use—even in a city—instead of utilitarian diversion of it to waterways. Thank you.<br><br>Target. Suggest: reference in this target to climate, Soil moisture levels will be maintained at levels to provide healthy growth of vegetation and cooling of the urban environment.<br><br>Actions. Good. Suggest: mandatory permeable surfaces for new works and developments.<br><br>5.3.5 Improve biodiversity. It is inflexible thinking that has led to cities versus biodiversity protection when they can, indeed, co-exist. Whilst this Strategy recognises the need for, protection of and value of biodiversity within Melbourne, it is vague about what biodiversity means as it does not refer to local biodiversity. Request: (1) for clarity, define the term 'biodiversity' in the context of this Strategy; (2) ensure an increase in biodiversity levels of Australian or local native vegetation.<br><br>Request: that the unfortunate emergence of introduced myrtle rust does not overly affect choices of species, genus and family plantings for this Strategy, as some adaptation to the disease is likely.<br><br>Target. Request: insert a reference to Australian and local biodiversity, to ensure an increase in local biodiversity that would improve local ecosystem services: Melbourne's green spaces will protect and enhance a level of Australian and local Melbourne biodiversity which contributes to the delivery of ecosystem services.<br><br>Actions. These are excellent actions:<br><br>• Review City of Melbourne's Biodiversity Action Plan and conduct | |

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| | an opportunity assessment.<br><br>• Integrate biodiversity values into the planning of parks, green spaces, precinct and waterways through Master Plans, Structure Plans, Precinct Plans and the Total Watermark–City as a Catchment Review.<br><br>• Increase the diversity of tree species amongst the tree population to provide diversity of food sources, protection and habitat.<br><br>• Utilise water sensitive urban design to encourage biodiversity in our soils through the improvement of groundwater levels.<br><br>• Provide habitat through dead trees where possible, ensuring health and safety for everyone. Yes, important—the role of dead trees in ecosystems is misunderstood and, therefore, undervalued in the general community.<br><br>• Maintain ongoing relationships with key research institutes such as ARCUE (University of Melbourne)4 and CSIRO Ecosystem Sciences. Yes, it is essential to maintain liaison with the valuable ARCUE and CSIRO.<br><br>• Develop programs to encourage the interaction between people and nature and to raise awareness. Yes, very necessary.<br><br>• Enhance ecological connectivity through the provision of urban forest corridors along streetscapes between our green spaces. Yes, streetscapes provide great opportunity for ecological links.<br><br>• Develop productive urban landscapes – where possible in the public realm, but primarily through encouragement and incentives for private realm gardens. Suggest: encouraging public and private landholders to lend or donate their land for pocket parks, green corridors, and urban forests for the greater good. The Adelaide 'Backyards 4 Wildlife' program is a great model.<br><br>Additional biodiversity actions. Please add or consider the following actions:<br><br>1. Re-establish Ecological Vegetation Classes (local native plant communities) where possible.<br><br>2. Possible links for endangered flora and fauna—especially for vulnerable grasslands. Suggest (a) some local native grassland meadows are re-established in some city parks; (b) re-introduce Lowland Snowgums where possible.<br><br>3. Ecological links between the coast and hinterland.<br><br>4. Introduce local native understorey vegetation, where possible, to aid survival of canopy trees.<br><br>5.3.6 Inform and consult with the wider community. Yes, seeking support from the general community would be vital for the success | |

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| | and appreciation of this Strategy.<br><br>Target. The community will have a broader understanding of the importance of our urban forest, increase their connection to it and engage with its process of evolution. Yes, this is a very important aim for continued community support.<br><br>Actions. These are excellent actions to involve the general community in the implementation of this Strategy:<br><br>• Enable the community to have a say in the design of landscapes of the future. Admirable but difficult! Australia is a nation of migrants, some of whom want to see familiar plants from their homeland, but many of these plants have become invasive, displaced native flora and fauna and disrupted ecosystems. Suggest: public comment is sought within defined species lists.<br><br>• Use innovative tools to engage and involve with this strategy.<br><br>• Encourage diverse conversations about the urban forest.<br><br>• Direct the emergence of urban forestry as an essential planning discipline.<br><br>• Align with other local municipalities to enhance the whole Melbourne urban forest. Yes, a good thing, if Australian and local natives are promoted.<br><br>• Encourage and support further research into Australian urban forestry.<br><br>• Create opportunities and co-benefits of producing this strategy: align with other strategies to ensure greater impact, increase field of research, and develop relationships with private landholders. Yes, there would be much to learn during implementation of this Strategy and from liaising with others.<br><br>• Work with the traditional owner groups within the City of Melbourne to develop community programs that increase community knowledge of the cultural significance of treed landscapes in our Environment. Yes, delighted to see intent to involve traditional owners. Request: traditional owner groups to advise on the creation of local native bush food and medicine gardens as an educational tool.<br><br>• Develop health and wellbeing indicators to benchmark the role of our urban forests in contributing to human health. Yes, this does need to be better understood by urban planners, responsible authorities, governments and agencies.<br><br>Additional community action: please set up Friends groups to assist with implementation of this Strategy and with ongoing care of parks, gardens, reserves and streetscapes.<br><br>6 Implementation Framework. Yes, it would be wonderful, indeed, if the City of Melbourne does 'lead the practice of urban forestry in | |

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| | Australia'. The greening of all our municipalities, regional centres and villages would be fabulous and represent a remarkable shift in our development culture but, again, request Australian and local natives are promoted.<br><br>6.1 Integrated planning<br><br>Intra-Council integration. Yes, it is vital to this Strategy that there is sharing of information and cooperation between relevant Council departments. This is sometimes lacking in local government and can result in competing interests and financing, or good initiatives being stymied or undone.<br><br>Community and inter-professional integration. Request: please clarify this ambiguous statement: 'role of non-public proponents becomes more influential by raising public and bi-partisan political awareness'.<br><br>Inter-municipal integration. Yes, 'systematic assessments of the urban forest across a larger bio-geographical area', regardless of political or other boundaries, would be very worthwhile.<br><br>National action. Yes, local action, such as the implementation of this Urban Forest Strategy, may result in similar national action.<br><br>6.2 Implementation tools<br><br>Online access. Yes, these days, online access is everything!<br><br>Documents. City of Melbourne's Tree Precinct Plans; Urban Forest Diversity Guideline; and Urban Forest Community Engagement Plan. Yes, principal guiding documents would be needed to support and inform this Strategy.<br><br>Main supporting documents. Biodiversity Action Plan; Community Health and Wellbeing indicators; Pest and Disease Risk Management Strategies; Significant Trees Register (Heritage, Significant Private); Open Space Strategy; Green Infrastructure Implementation Guide; Parks and Gardens Master Plan Reviews; and Draft Urban Agriculture Policy. These eight additional documents would seem to comprehensively support and inform this Strategy.<br><br>Suggest: careful cross-referencing of all the above documents, which can be overlooked in preparation of such a large Strategy.<br><br>Technical tools—I-tree Eco. Using a measure of environmental and financial values to assess urban forests may be useful, providing they are applied equally and that the dollar value alone does not determine outcomes. Suggest: the evolving Atlas of Living Australia web tool might be useful in informing this Strategy about known flora and fauna in Melbourne and surrounds and any attention required to particular species. Other tools—ULE/Tree health assessments; Thermal imaging; and Weather stations. These would seem to provide useful information for this Strategy. | |

| Name | Summary of comments | Response |
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| | 6.3 Measurement, monitoring and review. Yes, all are essential to a sustainable development approach for this future 'city within a forest'.<br><br>6.4 Funding resources. Yes, agree with seeking unconditional funds from sources other than Council's budget—developers, businesses, grants, perhaps philanthropy. Suggest: developer open space contributions for new developments should also have a levy to improve existing infrastructure of roads, sewerage, and stormwater.<br><br>Glossary<br><br>Ecosystem services. Request: to ensure correct understanding of this term, please change this statement: 'Ecosystem services are the benefits all living things, including people, obtain from ecosystem processes'.<br><br>Add glossary definitions. To assist understanding, please add definitions of plant species, genus and family.<br><br>Additions to this Strategy. Please add or consider the following for this Strategy:<br><br>Night lighting—pollution and insects. Light pollution is an increasing blight on the environment due to people's obsession with uplights, downlights, spotlights, security lights, neon lights, architectural lights, garden lights, etc.<br><br>Light pollution decreases visibility of the night sky; uses enormous amounts of energy that emits greenhouse gases and contributes to global warming; disrupts sleep patterns of people and animals; disrupts wildlife behaviour; and kills enormous numbers of insects that are essential in the wildlife food chain and for ecosystem services, including pollination. The increasing use of bug zappers also kills too many insects. People must learn to live with insects.<br><br>ARCUE stated in The Age Sunday 5 June 2011:<br><br>'Light pollution is a threat to biodiversity and alters animal behaviour and feeding habits. Night-flying insects cannot resist light. Research from Europe has shown a dramatic reduction in the number of and diversity of insects, particularly moths, in cities when compared to the village-farmland edge. They estimate billions of insects are dying. It not only reduces food sources for animals, but also it reduces the number of pollinators. Light pollution also affects when plants flower and when they go dormant in winter.'<br><br>This Strategy will increase habitat for insects, which is desirable, but it must also include measures to protect them. Request: (1) Minimal night lighting, with essential lights hooded or insect-friendly-lighting; and (2) a ban on bug zappers. Insect-friendly lighting design and colours are available now.<br><br>Community Produce Gardens. Suggest: community produce gardens amongst apartments in areas such as at Docklands would | |

| Name | Summary of comments | Response |
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| | relieve the built environment and unite the local community.<br><br>Pocket Parks. Suggest: new green pocket parks—even a single canopy tree—amongst built-up areas would provide green relief and a place for local people to gather. There are unused spaces and brownfield sites in the CBD that owners may be willing to sell, lend or lease for pocket parks, particularly if a site is being redeveloped.<br><br>Mandatory green cover for new developments or redevelopments. Suggest: mandatory 10-20% green cover per lot for new developments or redevelopments.<br><br>This Urban Forest Strategy has the potential to be very influential on the amenity, character and local native biodiversity of the City of Melbourne, in positive and negative ways. Regarding local biodiversity, every care must be taken to enhance our local native flora and fauna diversity and habitat. | |
| Allan roger | Fully support the overall goal. The most obvious situation is what the City does about its existing trees and in particular how it replants. Current practices may or may not accord with these expectations. Recent examples may serve to illustrate how, with the best of intentions, mis-steps can be taken.<br><br>Example 1: Over recent years the original paper barks in the pavement were removed (because of the damage that their root systems were doing to adjoining buildings). New trees were installed within the car-parking zone. These proved unsatisfactory because of the high ground water level in that area. Before the present trees were planted there was an extensive process of consultation and various option were presented. Opinions were canvassed from everyone in the adjoining area but no strategic vision was presented. The outcome was presumably largely based on aesthetics and oak trees were selected on the basis of a popular vote. The consultation process was commendable but the outcome, in the absence of vision and leadership, was not. The oaks are thriving but they will contribute to the overall ecological well being of the area or the metropolis. Similarly, oaks have been planted in the central reservation of Canning Street to replace the original elms. In marked contrast the central reservation in Pitt Street was planted with eucalypts. They have established themselves very quickly and are now alive with local birds.<br><br>Example 2: The City has a practice of lifting and re-laying blue stone sets along the side of roads and in the many laneways. The sets are dug up and set aside. The space is then excavated down s further 80 to 100 mms. A concrete base is then installed and the sets are re-laid and grouted. But, of course they are not re-laid with the same surfaces pointing up or in exactly the same positions as before. The result is that all the wear marks that carry the information of the past – the cultural heritage - is lost. What results is a system the merely looks old but no longer tells its story. Where are the worn tracks of the steel wheeled night soil lorries? Gone in a jumble of blue stones. The other effect of this process is that the | ***Mandatory greening in the public realm is not a focus of this strategy, however efforts have been made to include better reference to the private ream with specific inclusions in Section 6 relating to green roofs, green walls and exceptional trees in the private realm.***<br><br>***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include*** |

| Name | Summary of comments | Response |
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| | root systems of any nearby trees that lay immediately below the blue stones and that were fed by the water filtering down through the joints have been destroyed. In addition that area now drains more quickly. All infiltration has ceased and the capacity of the area to contribute to a healthy urban forest has been reduced.<br><br>If we take the broad ecologically relevant urban forest as the over arching conceptual framework it can then be argued that:<br><br>the City of Melbourne, through its Urban Forest Strategy should:<br><br>1. Set out to establish an ecosystem-wide approach - a continuous system of eco-system corridors and nodes - as the overarching framework within which it and other local governments, within the metropolitan area and more widely, operate.<br><br>2. Within its own area of responsibility adopt an eco-system corridor and node approach as its own land use and urban forest strategy.<br><br>3. Ensure that all its operational construction and reconstruction activities are consistent with the declared urban forest strategy.<br><br>4. Recognise that the appropriate planting regime for these corridors and nodes would ensure that the flora and fauna indigenous to the area are sufficiently dominant to secure the functional integrity of the indigenous bio-system as a whole. (eg This can be achieved by small plantings along a street or a larger project in a Council owned Reserve.)<br><br>5. Acknowledge that there may be a few situations where overarching cultural considerations suggest that iconic non-indigenous species and eco-system environments be maintained (The Botanic Gardens is an obvious example and perhaps Royal Parade and a few other sites).<br><br>6. Accept responsibility to provide appropriate supplementary life-supporting feeding, breeding and nesting environments for indigenous species (invertebrates, animals and plants) that would not normally be acceptable within an urban forest. (For example safety considerations may preclude the retention of very old hollow trees that are likely to collapse or lose limbs. That being the case it is necessary to provide the required facilities | ***this detail.***<br><br>***A key target within the strategy is to Protect and enhance a level of biodiversity which contributes to the delivery of healthy ecosystem services. A biodiversity and urban ecology strategy is currently under development. That strategy will consider this issue more appropriately.*** |
| Kay Oddie – Submission 1 | An 'urban forest' is broadly defined as "the sum of all trees and vegetation, soil and water that provides valuable ecosystem services which are essential for a healthy liveable city." And "Our trees are the most recognisable and important element within the urban forest". It is acknowledged that the Strategy should concentrate on trees, however 'other vegetation' including shrubs, ground covers and grasses already comprises a significant part of Melbourne's green spaces: in public parks, gardens and extensive sporting fields; embankments and wetlands; in the | **Many of these suggested amendments have been included.** |

| Name | Summary of comments | Response |
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| | private realm - gardens. Proposed planning for increased density in Melbourne calls for roof top gardens, balcony and vertical gardens – these will be predominantly be planted with 'other vegetation' types.<br><br>'Other vegetation' types are significant contributors to the positive/desired environmental parameters set out in the Strategy, including biodiversity, habitat, cooling and shade, water and soil moisture retention, water quality and re-use, mitigation of heat island effects, vegetation and soil health and community health and wellbeing.<br><br>The *ecological* health of an urban forest is dependent on the different vegetation types; the aim of the Strategy should encompass the wider ecological role of the urban forest. More attention should be given to 'other vegetation' throughout the document. The Strategy would be greatly improved if a whole section was devoted to the recognition and roles of the other types of vegetation. As the companion document "*Urban Forest Diversity Guidelines - 2011 Tree Species Selection Strategy for the City of Melbourne*" (ASPECT Studios & Tree Logic 2011) sets out for trees, so could a similar document be prepared giving guidance for the roles and use of shrubs, ground covers, grasses and aquatic plants in the urban setting.<br><br>The second document would have particular relevance for parks, gardens, reserves, many smaller local green spaces as well as future rooftop gardens, vertical gardens, balconies. Swales, wetlands and rain gardens could also be included. Sports fields and summer/winter grass species selection, which have relevance to lawn areas in parks and gardens (public and private) could be included. All of these are locations for 'other vegetation' and deserve more attention in the Urban Forest Strategy.<br><br>**Wide Canopies, Shading, Cooling and Mitigation of Heat Island Effect / Solar Access in Winter**<br>The benefits of wide canopies are emphasised in the draft Strategy for their summer shade, cooling and mitigation of heat island effect. However, solar access in winter in our parks, other open spaces and streets is also very important in Melbourne – for community health and wellbeing and for energy efficiency in buildings. Vitamin D deficiency is becoming more prevalent in our population. Denying adequate solar access in winter in parks and other open spaces by selectively referring to 'wide canopy trees', 'shading and cooling' and 'mitigation of heat island effect' in the draft document is not justified from a community health | |

| Name | Summary of comments | Response |
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| | and wellbeing point of view. For buildings, solar access in winter has demonstrable light and heat benefits and energy efficiency. The ability of trees to provide both summer shade and winter solar access is not mutually exclusive. Deciduous trees, light or open canopies will serve both functions.<br><br>Solar access in winter is not mentioned in the draft document as an Environmental benefit (3.2.1), Community benefit (3.2.2) or Economic benefit (3.2.3) – but should be. And although mentioned in 5.2 Principles, it is not elaborated upon in the subsequent Strategies – but again should be.<br><br>**Trees in Streets versus Trees in Parks, Gardens and Other Open Spaces**<br><br>Another issue where the draft Strategy fails to appropriately differentiate trees is street trees and trees in parks/gardens/other open spaces. Besides location, they do not necessarily share the same function or relationships to their settings. The Strategies in Chapter 5 overly concentrate on trees in the street setting in contrast to the companion document "*Urban Forest Diversity Guidelines"* (ASPECT Studios & Tree Logic 2011), which recognises other settings. Many of the concerns raised above relate to the first part of the draft Strategy. It certainly doesn't present as a document relating to an 'urban forest' as defined in its introduction. The companion document "*Urban Forest Diversity Guidelines"* (ASPECT Studios & Tree Logic 2011) provides a wider understanding and more comprehensive analysis of what constitutes Melbourne's 'urban forest'. It is recommended that this document set the example for the first part of the Strategy. The first part of the draft Strategy appears overly repetitive; it would benefit from expert editing. In addition, corrections are required to the End Notes: Text numbers are missing or out of order; End Note references are missing; references in End Notes are not all included in the Glossary.<br><br>**Specific comments** In the light of the general comments above, the following specific suggestions are made:<br><br>**Introduction** page 1 para 1: Surely, Melbourne's 'renowned' parks beyond the Central City and to the north and west deserve to be included, namely Royal Park, Princes Park, Flagstaff Gardens and Fawkner Park. They also 'contribute greatly to the city's character, social and cultural life'. para 5: Creating Melbourne's urban forest has another purpose that should be mentioned: to promote | |

| Name | Summary of comments | Response |
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| | healthy ecosystems. para 7: Add: At the same time, it is important to maximise solar access in winter for the health and wellbeing of the community and for energy efficiency of buildings. Another important attribute of an urban forest is to enhance ecology, including biodiversity and habitat. page 2 para 3: Add: Building the urban forest ... improving biodiversity and habitat .... reducing stormwater flows, improving water quality and re-use .... increasing shade and canopy cover in summer and allowing solar access in winter<br><br>**Executive summary** page 3 Strategy 4: Add: Improve soil moisture, water quality and re-use. Target: ... and storm water re-use will be promoted. Another benefit of an urban forest is the ability to improve water quality and re-use, e.g. through diminution of stormwater run-off by processing through swales and wetlands (which are integral parts of the urban forest) and through re-use for irrigation. Strategy 5: Add: Melbourne's green spaces will ... which contributes to healthy ecological systems and the delivery of ecosystem services. It is noted that the ecological role of an urban forest is not defined in the draft Strategy (i.e. the relationships of plants and animals and the promotion of biodiversity and habitat). 'Ecosystem services' only relate to people (see Glossary). 3rd last paragraph: Add: Most importantly ... that provide multiple benefits for public health and wellbeing and for the environment.<br><br>**Background & Context 3.1 What is an Urban Forest?** para 1: Must add: It incorporates ... river and creek embankments, wetlands and other waterways ... The aquatic vegetation of wetlands and waterways is also important. para 3: 1st sentence: Should add: Urban forestry ... sociological, environmental, economic ... benefits ... and last sentence: developers, business, industry ... Businesses should also be expected to participate in the greening of the City and development of its Urban Forest. Retrospective greening of buildings and places should be encouraged. para 5: 3rd sentence: Add: ... planning of urban trees and vegetation. 4th sentence: Add: ... arboriculture, horticulture and urban design. Melbourne's urban forestry history very much includes the horticultural aspects of its parks and gardens, e.g. the shrub and floral beds. para 6: 2nd sentence: Add: Essentially ... such as ... environment, conservation, ...<br><br>**3.2.1 Environmental benefits • Reduce stormwater flows and nutrient loads** It is not only trees that can perform these functions. Add: Wetlands and swales with their different types of vegetation are also important means | |

| Name | Summary of comments | Response |
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| | for trapping stormwater, improving water quality and reducing nutrient loads.<br><br>• **Provide habitat and enhance biodiversity** 1st sentence: Habitat provision applies to plants as well as animals. For example, nitrogen-fixing acacias provide a supportive habitat as 'primers' for eucalypts' growth. And water habitat (cf definition of urban forest (3.2.1)) in the form of wetlands very much applies to plants as well as animals (cf lower photograph on same page). Therefore add to sentence: Although few cities ... and provides habitat for plants and animals. Last sentence: By planting ... biodiversity and a wider range of habitats can be enhanced.<br><br>**3.2.2 Community benefits • Providing a sense of place and creation of local identity** Trees and other vegetation types (shrubs, ground covers, grasses) also physically define a place, e.g. the shrub and floral beds of the Fitzroy Gardens, the Flagstaff Gardens and the Australian Native Gardens and the extensive lawn areas of the City's parks and gardens. Therefore add: A city's landscape ... because trees and vegetation physically define a place.<br><br>• **Reducing sun exposure to people** Must recognise that **providing solar access in winter is a desirable attribute** for community health and wellbeing for an urban forest in Melbourne and include as a Community benefit in this section. Why is solar access in winter being totally ignored by the Urban Forest Strategy?<br><br>• **Reducing heat related illnesses** Are buildings really at "higher risk of heat related morbidity"!<br><br>**3.2.3 Economic benefits • Reducing energy costs** Solar access in winter is "***a good thing***" when it comes to sunlight and solar heat to contribute to a building's energy efficiency in winter. The question is repeated: Why are the benefits of solar access in winter being totally ignored by the Urban Forest Strategy?<br><br>• **Storing and sequestering carbon** The abbreviation for carbon dioxide is written with a subscript - **$CO_2$**<br><br>• **Reducing water costs** Surely this should be an economic benefit of an urban forest? By collecting, purifying and re-using rainwater and stormwater through wetlands, swales, rain gardens, vertical gardens, etc. the cost of potable water use can be saved. Examples of re-use of water includes irrigation of sports fields, use in fountains | |

| Name | Summary of comments | Response |
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| | and ornamental ponds.<br><br>**Evolution of Melbourne's Urban Forest - 3.3.1 Historic development** para 3: Melbourne's "highly valued" green spaces include its many grassed and treed streetscapes. They have greater historical relevance than more recent and far less prevalent 'green roofs and walls' and should be included in the last sentence. para 3: Part of the historic development of Melbourne's urban forest, has been the Council's recognition of the significance of its parks and gardens that form part of the City's "rich palette of green spaces". This has been done through the preparation of master plans for these major parks and gardens. Thus it would be appropriate to include such recognition by adding to the paragraph: Melbourne has taken significant steps to recognise the historic, cultural, arboricultural, horticultural and ecological importance of its major parks and gardens by preparing master plans to guide their ongoing management and development.<br><br>**3.3.2 The urban forest today** para 1: Surely Royal Park as "a highly valued (and distinctive) landscape" should be included? para 4: What about including the more common birds, e.g. rainbow lorikeets and wattle birds that frequent our trees (especially following the extensive planting of native tree species in the 1970s/1980s), instead of the less common Kookaburras and Kingfishers? para 4: Last sentence: Not all birds on our waterways are "migratory" – swans and ducks are just two examples. And what about birds feeding in our waterways? Please reword: Various waterways across the municipality provide valuable habitat for birds, also providing food sources and nesting sites.<br><br>**Tree canopy cover** page 12 This section makes no mention of deciduous versus evergreen trees, which as previously mentioned, is important when considering good solar access in winter. It is also important when considering levels of openness of a canopy – a factor recognised in the companion "*Urban Forest Diversity Guidelines - Tree Species Selection Strategy for the City of Melbourne"* which will inform tree planting in Melbourne's urban forest over the next 20 years. 'Canopy cover' is not the only benchmark that should be considered. Where are the attributes of shrub and ground covers in contributing to a resilient and sustainable urban forest mentioned?<br><br>**Tree species** page 13, 2nd para: It is incorrect that Royal Park "houses our entire population of River Red Gums". This species also occurs along the Moonee Ponds Creek | |

| Name | Summary of comments | Response |
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| | and Maribyrnong River. Upper RH table: Tea-tree belongs to the Leptospermum Genus; Paperbarks belong to Melaleuca Genus. Which species/which genus should be in the table??<br><br>**Useful Life Expectancy (ULE) of City of Melbourne trees** page 14 Why is 'Useful Life Expectancy' not defined in the Glossary? Given the dramatic estimates of loss of Melbourne's existing population of trees, the Strategy's ULEs should have scientific credibility. The parameters for estimating ULE should be given in more detail; also the scientific validity of the assessment process used and the professional qualifications and experience of the assessors. The assessments should be made publicly available. Without the methodology being provided, the assigned ULEs cannot be verified and are likely to face challenge. As a resident of Shiel Street, North Melbourne, I certainly question the 10 year ULE put on the trees in the street. A disturbing 'chain-saw'/'chop it down' appears to be the default situation in the Strategy. Where does the Strategy spell out a process whereby the viability of a tree can be prolonged by prudent tree surgery or other measures; pro-active pest/disease treatment; improvement in site conditions, etc? Similarly, there is no process relating to infill plantings in existing tree avenues; it would appear to be 'chop them **all** down', rather than infill plant where appropriate. In a 60-100+ year lifetime of a tree, infill trees will catch up, continuing the integrity of the tree avenue and, in heritage areas, preserving the heritage streetscape value. The diagram on page 14 is far too small to be clearly read.<br><br>**4.1 Ageing tree population** The last paragraph ventures into planning issues and "retrofitting landscapes for better conditions for future trees". An important addition would be to call for new developments to have lower site coverages or to adhere to planning scheme guidelines so as to allow greater permeability of soils and enable better conditions for tree and other vegetation growth and viability. Clauses 54 and 55 of the Melbourne Planning Scheme recommend maximum residential site coverages of 60%. It would be great if this could be strongly recommended in the Urban Forest Strategy for the City's projected urban renewal areas.<br><br>The above comment is also relevant to the following section: **4.5 Population increase and urban intensification** There is *every* reason why the urban renewal areas - Urban Renewal Areas and Areas of Ongoing Change - *must* also become part of the "green lungs" of the City. | |

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| | **Chapter 5**<br><br>**5.2 Principles** These are admirable principles. It would be nice to see them better reflected in the Strategies that follow.<br><br>**5.3.1 Increase canopy cover** Thermal images should be provided for *both* summer and winter situations. The summer images would show the heat island effect and indicate where increased canopy cover would be beneficial. The winter images would show the buildings and spaces where solar access/beneficial effects of solar energy should be promoted. The images should be read in conjunction with each other in selecting tree species for the street and park typologies. This needs to be spelt out in this section and its Actions. **Actions**: 3rd dot point: Add: Select the most appropriate vegetation type and species for each location given spatial and climatic constraints, desired climatic outcomes and neighbourhood character. 4th dot point: Add: Ensure that the overall urban design for places ... best designed for our urban forest, for people and for the environment.<br><br>**5.3.2 Increase urban forest diversity** para 2: Needs reworking/expert editing - avoiding mixing the metaphors/grouping unlike with unlike/'avenues' in parks but not streets?? .... para 3: 1st sentence: add: Every plant .... penetrate buildings, streets, parks and other open spaces; Last sentence: add: The interactions ... to connect to nature, for promotion of biodiversity and habitat and for the different forms ... **Actions**: Not forgetting 'other vegetation', an additional dot point should be added: Enhance the strata diversity in our urban forest through the planting of shrubs, ground covers, grasses and aquatic plants where appropriate. Where does respect for *heritage* streetscapes, parks, gardens and conservation areas and their plantings receive recognition in the Strategy? The companion document recognises this, why not the Strategy itself? The Urban Forest Strategy and heritage should not be mutually exclusive.<br><br>**5.3.3 Improve vegetation health** 1st para: Add: To maximise ... it is imperative to ensure that our trees and vegetation are healthy. **Actions**: 7th dot point: This dot point could be expanded to include other locations in addition to median strips where large healthier trees could be grown. Other opportunities include extending nature strips (e.g. Roden St, West Melbourne) and creating pocket parks – which have often been formed from former/unused road reservations (e.g. the pocket park at the junction of | |

| Name | Summary of comments | Response |
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| | Courtney/O'Shanassy/Leveson Sts, North Melbourne).<br><br>**5.3.4 Improve soil moisture and water quality** Add dot point: Install swales and wetlands to increase stormwater capture, improve water quality and re-use.<br><br>**5.3.5 Improve biodiversity Target**: Add: Melbourne's green spaces ... to the delivery of ecosystem and ecosystem services. As noted in comments above, 'ecosystem services' applies to people; 'ecosystem' includes plants, animals and the environment. **Actions**: 3rd dot point: add/reword: Increase the diversity of tree and other plant species to provide increased biodiversity, habitat and to promote healthy ecosystems. 8th dot point; add: Enhance biological connectivity through the provision of urban forest corridors along streetscapes and biolinks between green spaces.<br><br>**Chapter 6- 6.2 Implementation tools 3. Urban Forest Community Engagement Plan** Correct: Parks and Gardens Master Plans. In the lifespan of the Urban Forest Strategy, all the documents in the list are likely to be subjected to review, so the Master Plans should not be singled out. | |
| Kay Oddie – Submission 2 | The Revised Urban Forest Strategy has pleasingly expanded the historical context and, together with the companion Diversity Guidelines document, provides a strategy set in the context of Melbourne's planting history plus new research. Melbourne's urban forest of the future will respect its urban forest of the past but be able to build and renew urban forests in the 21stC with much greater knowledge and understanding.<br><br>**3.2.1 Environmental benefits** page 11<br><br>Reiterating the comment from my original submission – that habitat provision applies to plants as well as animals, e.g. nitrogen-fixing acacias provide supportive habitat for promoting eucalyptus growth, perhaps a compromise wording could be:<br><br>• **Provide habitat and enhance levels of biodiversity** Although few Australian cities have preserved large areas of natural habitat, a healthy urban forest contributes to biodiversity and habitat provision. *(deletion of 'for a variety of wildlife' allows for both plant and animal habitat)* & By planting and managing different age strata, biodiversity and a wider range of habitats can be enhanced. (*delete animal*) | ***Everything has been incorporated with the exception of one note regarding winter solar access.*** |

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| | To better reflect the biodiversity/habitat point, the legend of the accompanying photo of the wetlands in Royal Park could be reworded: *The Trin Warren Tamboore Wetlands in Royal Park provides valuable biodiverse habitat whilst also improving water quality.*<br><br>**3.2.2 Community benefits** page 12<br><br>• **Reducing sun exposure** Melbourne is not Queensland! Children and adults in Melbourne need adequate sun exposure in winter to maintain their Vitamin D levels. Where appropriate, tree selection and planting guidelines could allow for both summer shade and winter solar access with deciduous species and selected site locations. Please could this be recognised in the Strategy by adding a sentence to this dot point along lines of: **.....** It is recognised that an urban forest can also provide for solar access in winter, where appropriate, as an added measure of community health and well-being.<br><br>Correct typo in this dot point: Sun exposure illnesses such as skin cancer have long **d**etermined that the importance of protection from sunlight's UV rays is paramount.<br><br>• **Reducing heat related illnesses** *Buildings* cannot be at a higher risk of heat related morbidity ... *people* can be at risk, yes. Suggest rewording: Evidence suggests that buildings with little or no surrounding vegetation pose a higher risk of heat related morbidity.[5]<br><br>**3.2.3 Economic benefits** page 13<br><br>• **Storing and sequestering carbon** The chemical formula for carbon dioxide is written with a subscript ' 2' after the O, i.e. During photosynthesis, trees convert carbon dioxide ($CO_2$) ....<br><br>**3.3 Evolution of Melbourne's urban forest. The nineteenth century foundation of Melbourne's contemporary urban forest** page 15 Correct names in reference: Lovell Chen<br><br>**3.3.2 Tree canopy cover** page 20<br><br>Still harping on the importance of solar access during winter – this could be included, by default so to speak, by adding 'to' to *enhance* (and to *adapt*) in the sentence, making the '*we are seeking'* the main action: In the City of Melbourne we are seeking to increase summertime shade and biomass | |

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| | in the municipality to combat urban heat island effects, to adapt to climate change, and to enhance our streetscapes for the comfort of people. | |

## 4.2. Groups

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| Julianne Bell, Protectors of Public Lands Victoria Inc. (PPL VIC) | Our organisation applauds the objectives expressed in the document of the Draft Urban Forest policy. The trendy name tends to conceal the fact that we are dealing mostly with street trees.<br><br>We recognise that the drought has impacted badly on Melbourne's trees and that it was the intransigence of the Bracks Government for refusing to assist the City of Melbourne to drought proof the trees by. for instance, building a sewer mining project in Princes Park which would have supplied water to Melbourne's parks and street trees.<br><br>We are alarmed, however about suggestions that there will be a wholesale felling of trees classified as nearing the end of their lives. In particular we are concerned over the fate of avenues<br><br>Staff of the City of Melbourne appears to have a purist view about removal of avenues of trees and maintain that the entire avenue should be removed rather than attempting removal of failing trees and interstitial planting of the gaps. At a hearing on the World Heritage Management Plan of the Royal Exhibition Building and Carlton Gardens held by heritage Victoria, Mr Rob Adams suggested that as the Plane Tree avenue on the Carlton Gardens was nearly the end of its life then the whole avenue should be removed. Our arborist Mr Rob Galbraith, who gave evidence, was of the opinion it was the finest avenue of plane trees in Victoria are healthy and have another 20 years or so lifespan.<br><br>Several years ago we had the unfortunate example of the avenue of Camperdown elms - 550 elms in the main street – which a Committee of representatives including Heritage Victoria and Friends of the Elms with I believe the support of the City of Melbourne arborist recommending the whole avenue be felled. The Corangamite Shire Council accepted the recommendations our consultant arborist that the few gaps be filled by interstitial plantings. Consequently a moratorium has been placed on the destruction of the elm avenue and elm avenues in side streets. They have adopted a policy of interstitial planting in any gaps. between trees.<br><br>We would request that the City of Melbourne identify exactly what trees you are proposing to remove and what species you are proposing to plant in their stead. Additionally with regard to avenues we would like explanations as to why healthy trees cannot be saved and replacement trees of the same species planted in the gaps. (Wwe realise that there may be problems with this approach | ***The document does not suggest the wholesale felling of trees. The section on useful life expectancy has been revised to clearly express that it not a tameable for removals.***<br><br>***With respect to the history and heritage of the urban forest, the history section has been extensively revised and rewritten.***<br><br>***List of tree removals are update on the corporate website monthly.*** |

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| | in St Kilda Road.) | |
| Jo Grigg, Friends of the Elms | We would like to stress the unique character of Melbourne as a Victorian-era city and the global significance of Melbourne's elm trees. Dutch Elm Disease (DED) has killed 40 million elms in the Northern Hemisphere and more recently, in New Zealand and Japan. Worldwide, elm trees are an endangered species.<br><br>We think the Urban Forest Diversity Guidelines document, needs to state that Australia does not have Dutch Elm Disease, (chart at top of p18) It should also state the existence of the government-backed, DED Contingency Plan, for action if DED is ever discovered in Australia.<br><br>We believe the document needs to give a greater emphasis to elm trees being an essential component of the diverse future mix of Melbourne's trees.<br><br>We are pleased to note that the planned future composition profile of Melbourne's trees allows for the same number of elm trees as at present. However, with an increased number of trees overall the percentage of elm trees will decline. We would like to see some flexibility on this issue.<br><br>We are also pleased to note the intention to retain elms as the trees to line iconic boulevards (Royal Parade, Victoria Parade). It needs to be noted that Melbourne's elm avenues are the last remaining examples of mature elm avenues in the world.<br><br>In fairness to the structure of Melbourne's elm trees, it needs to be noted that poor and extensive pruning 50 years ago, caused immense damage and has reduced the life of many of Melbourne's elm trees.<br><br>We do not agree with the statement (p34 – Urban Forest Diversity Guidelines) that refers to Plane trees as the 'perfect street tree' and would like to see this reference deleted.<br><br>We appreciate the use of the concept ULE in managing the tree population of Melbourne. We understand ULE cannot be an exact tool and in the final analysis a judgement has to be made about what (or if) a tree is to be removed. In this respect we would recommend to err on the side of caution.<br><br>We strongly support the initiatives that have been taken (or will be taken) to harvest storm water. We appreciate the effect such moves will have on the long-term health of Melbourne's trees. We would urge Melbourne City Council to make adequate provision in their budget to implement these measures.<br><br>The future success of the proposed measures will depend on the skill level of the contractors engaged. This will also apply to the future maintenance of the trees. We have observed many unnecessary losses of trees, due to poor contract work.<br><br>Finally, we would like to congratulate the authors of the document, | **The suggested amendments have been included.** |

| No. | Summary of comments | Response |
|---|---|---|
| | for having the foresight, of not only tackling the difficult situation of an aging tree population, but also to double the number of trees and canopy cover, in the city. We also appreciate the nature of the consultative process and value the opportunity we have been given to respond. | |
| Gabrielle Stannus, Friends of Royal Park<br>**Submission 2** | We are most concerned that our group's submission to the first draft appears not to have been considered (cf Attachment 4 Community Consultation Report) and therefore the many valid points we raised have not been addressed. We therefore request that our original submission should be retrospectively considered with changes incorporated, as appropriate, into the final Strategy. Based on the Revised Draft of the Urban Forest Strategy, we reiterate our concerns that the special nature of Royal Park, which is unlike any other park in the City of Melbourne, and with its objectives - *to evoke the original Australian landscape character of open spaciousness, with typical plant associations of open woodland, grassland and pockets of wetland and predominantly indigenous plant species* - has being subsumed into overarching blanket strategies of the Urban Forest Strategy. Application of blanket targets in the Urban Forest Strategy go against Royal Park Master Plan objectives, for example, to specify 40% canopy cover; no more than 5% of one tree species; and 90% of the tree population will be healthy in 2040 (cf sections 5.3.1, 5.3.2 and 5.3.3). Insertion of simple statements into the Strategy would allow Royal Park's particular type of 'urban forest' to be acknowledged.<br><br>**5.3 Strategies**<br><br>**5.3.1 Increase canopy cover**<br><br>Royal Park presently comprises 21.64% canopy cover (cf section 3.3.2, Table 3, page 20). However, this can be broken down into the projective covers for the various vegetation associations (cf "Royal Park Planting Plan", City of Melbourne & Serco, 2007):<br><br>- 0% (grassland)<br><br>- < 20% (open woodland)<br><br>- < 25% (swamp woodland)<br><br>- < 35% (woodland with understorey, riparian woodland)<br><br>A blanket application of 40% canopy cover would not be in keeping with Royal Park's existing and intended landscape character. We therefore suggest the addition of the following dot point: **Actions** Allow appropriate vegetation types and species and spatial requirements in Royal Park in keeping with its designated open woodland landscape character.<br><br>**5.3.2 Increase urban forest diversity**<br><br>We reiterate the point made in our original submission that Royal Park "houses many eucalypts, including (nearly) the entire population of River Red Gums (*Eucalyptus camaldulensis*)" and that this species comprises 11.7% of the total tree species in the | **A new section outlining the details of a Forest Health Management Plan has been included to outline how the health target will be managed.**<br><br>**As several of these items had sections in the document had been previously amended, they have been edited to provide addition clarity of intention.** |

| No. | Summary of comments | Response |
|---|---|---|
| | City of Melbourne (cf section 3.3.2, Table 4, page 21). Royal Park's character is conspicuous for its River Red Gums. In implementing the Urban Forest Strategy it would be important that the Strategy's blanket target of "no more than 5% of any one species" does not compromise Royal Park's population of River Red Gums or the Park's identified character. We therefore recommend the additional dot point under **Actions**: Recognise identified park character and master plan objectives in formulating planting targets.<br><br>**5.3.3 Improve vegetation health**<br><br>Placing a blanket target of 90% of the City's tree population to be healthy in 2040 ignores the fact that Royal Park's key objective is to evoke the original native vegetation landscape character. This would include a natural progression of tree ageing and regeneration, which should be allowed to occur consistent with the objective and not subject to arbitrary percentage targets and timeframes. We recommend the following paragraph be added to the text: *In Royal Park, where the objective is to evoke the original native vegetation landscapecharacter, a more natural ecological progression of ageing, regeneration and replacement of trees may be allowed to occur*.<br><br>**5.3.4 Improve soil moisture and water quality**<br><br>The Trin Warren Tamboore wetlands functions to firstly purify storm water and secondly to store the water for reuse. Therefore legend to the photograph would better read, and be more in keeping with the direction of this section: *Storm water purification and storage at Trin Warren Tamboore wetlands in Royal Park, affording enhanced ecological values.* | |

# 5. Precinct Meetings

## 5.1. Overview

Nine precinct based community consultations were held between 6 February and 28 March 2012. All residents groups were contacted in December 2011 to provide advance notice about these meeting. All residents groups were also invited to participate in the planning of these precinct based meetings. Some did not respond, some declined and some assisted in the organisation of the meetings.

Over 110 attendees participated in nine precinct based meetings. Representatives from the respective residents groups were present at a precinct meeting, excepting representation from the East Melbourne residents group.

These meetings provided an opportunity to precinct the urban forest strategy and to have a group discussion with a focus on the precinct. All attendees were invite to make submissions via the online forum or in writing.

The table below provides the details of each meeting.

| Precinct | Location | Date |
|---|---|---|
| Kensington | Kensington Association, Holy Rosary Primary School | 06 February 2012 |
| North Melbourne | North Melbourne Library | 21 February 2012 |
| Docklands | The Hub, Docklands | 07 March 2012 |
| Royal Park | Walmsley House, Royal Park, Parkville | 13 March 2012 |
| South Yarra | South Yarra Senior Citizens Centre, Fawkner Park | 14 March 2012 |
| CBD | Residents 3000, Multicultural Hub | 19 March 2012 |
| Southbank | MICM Property, City Rd | 20 March 2012 |
| East Melbourne | East Melbourne Maternal and Child Health Centre at Powlett Reserve | 27 March 2012 |
| Carlton | Carlton Family Resource Centre | 28 March 2012 |

# 6. Urban Forest –Eco City Forum

## 6.1. Setting the scene

On November 28th 2011, a world café style event was held to outline the Urban Forest Strategy. 135 members of the community attended this forum.

The night was promoted via email and advertisement. In order to encourage conversation, information about the strategy was sent to attendees prior to the forum.

The evening was conducted by an independent facilitator supported by City of Melbourne staff as table facilitators. The format of the evening was small table conversations responding to a presentation and questions. Attendees were encouraged to raise their own questions as well.

## 6.2. The process

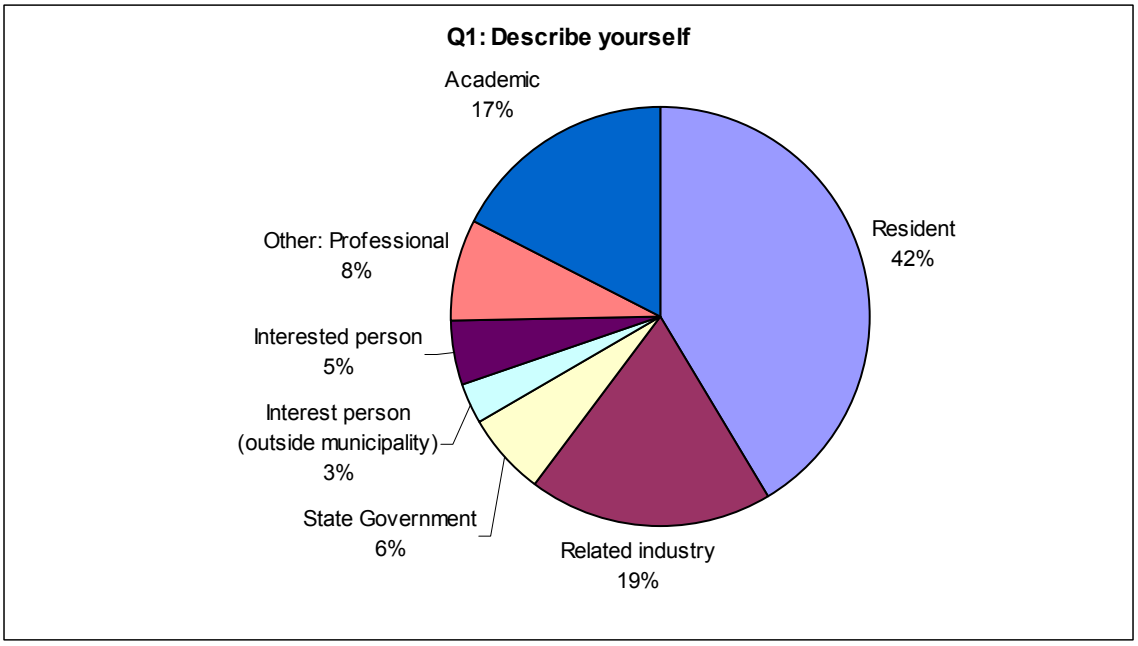
After an introduction to the Forum by Cr Cathy Oke and workshop facilitator Kimbra White, participants moved through the following series of steps:

1. Introductions – participants were invited to share their names, reasons for coming and what is important to them about the forest strategy, with the other members of their table. (Responses appear in Part 3.1 of this Report.)
2. Presentation - An overview of the key elements of the draft Strategy was presented by Ian Shears accompanied by a power point presentation containing visual images extracted from the Strategy.
3. Key responses to the strategy - The members of each table discussed what they liked in the draft Strategy and what aspects could be improved, to provide feedback to Council. (Responses appear in Part 3.2 of this Report.)
4. Focussed discussions - followed on key topics including biodiversity, cultural identity and heritage, and others suggested by participants. Individuals were invited to move to the discussion table of most interest to them and move between tables freely. Ian Shears, Rob Adams and Yvonne Lynch were available throughout this period to answer any questions that arose. (Key points discussed and suggestions made appear in Part 3.3 of this Report.)
5. Q & A Panel - comprising Cr Cathy Oke, Ian Shears and Prof Rob Adams, addressed as many as possible of the questions put to the panel via the index cards.
6. Evaluation forms were completed
7. Cr Oke addressed participants about the next steps to be taken including that their feedback would be collated into a report of the Forum and a full set of answers to the questions posed would be posted on the Urban Forest Strategy website.

## 6.3. Overview of Evaluation Forms

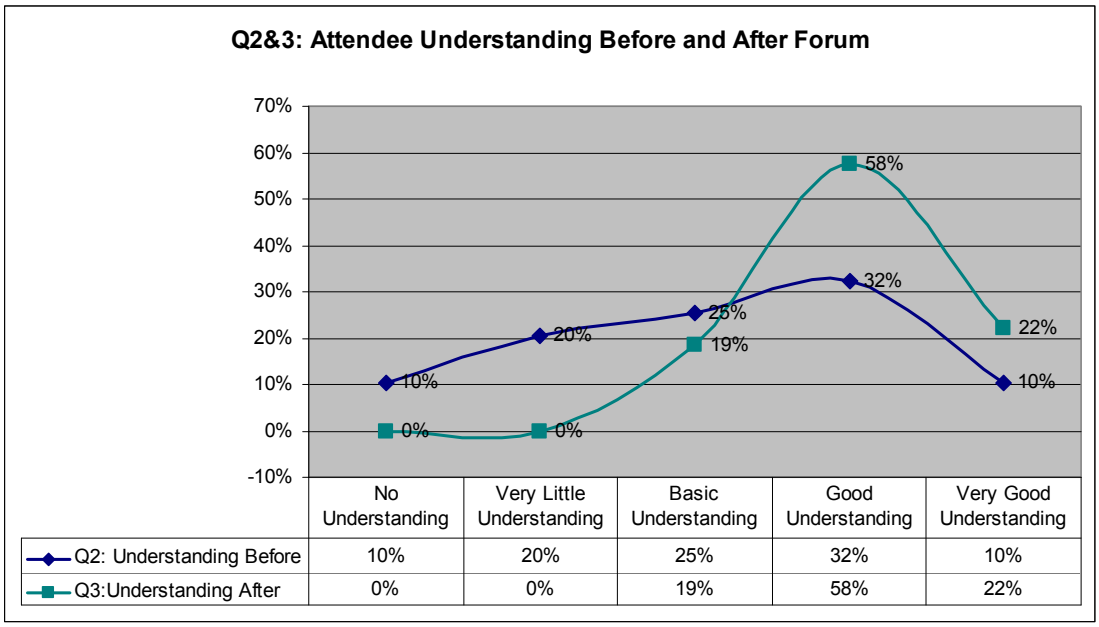
A survey of participants was handed out at the conclusion of the evening to gauge attendees feedback about the event.

The majority of attendees identified themselves as Residents with the next two most represented groups being “Related Industry” and “Academic”




**Attendee Understanding**

Attendees were asked for their perception of their understanding of the strategy before the forum and after. A five point scale was used, ranging from “no understanding” to “very good understanding” of the strategy. The forum can be seen to have a generally positive impact on attendees understanding.




| | No Understanding | Very Little Understanding | Basic Understanding | Good Understanding | Very Good Understanding |
|---|---|---|---|---|---|
| Q2: Understanding Before | 10% | 20% | 25% | 32% | 10% |
| Q3:Understanding After | 0% | 0% | 19% | 58% | 22% |

**General comments**

In order to encourage broad commentary, a free text option was offered where general comments were encouraged. These were then analysed for themes.

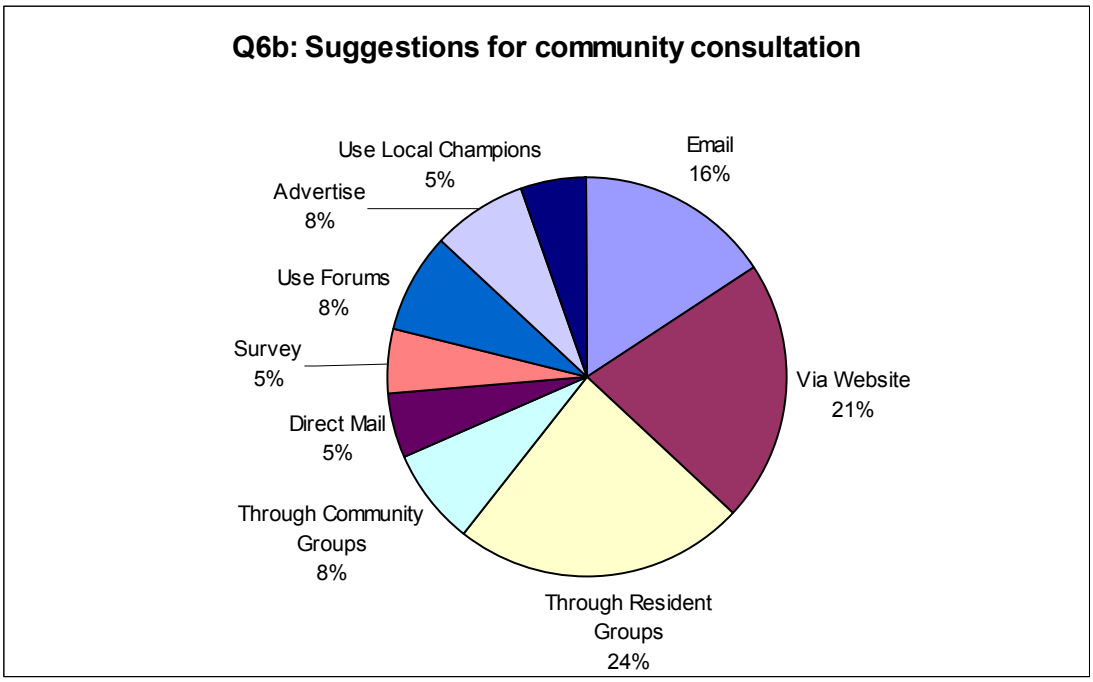
The most common themes were that people appreciated the opportunity to discuss the strategy with the City of Melbourne and the attendees. While a significant number felt the evening was planned and delivered well, a number also had a converse view, with the most common issue being confusion about the purpose of the forum.

A number felt the evening was too short to cover all the issues, however a number felt the evening was informative and there was commentary to the effect that the evening has whetted attendees' appetite for further engagement.

**Community Consultation Suggestions**

Attendees were asked if they had suggestions for further community consultation with regard to smaller areas of the City.

Electronic means including website and email were well represented, however a significant number felt that community involvement would assist, including Resident Groups' other community groups and local champions involvement.




## 6.4. Forum participants' feedback

Given the substantial amount of feedback provided by Forum participants, responses have been grouped under headings created by the author and duplications removed and duly noted.

## 6.5. What we like

| | |
|---|---|
| Nature of the Strategy | Whole concept (*4)<br>Thinking from a whole range of directions – nutrients into soil, water approach (*3)<br>Identifies an important issue and planning suitable action (*3)<br>Plans for a future of 50-100 years (*3)<br>Like that its evidence based (*3)<br>Plan for future resilience<br>More aspirational than other cities (eg Sydney)<br>Proactive – recognises Melbourne's unique character, especially Elm trees<br>Metrics – data collecting, value of trees |

| | |
|---|---|
| | Broad source of data<br>Detail in the document – applaud “meat on the bones”<br>Looks impressive and scientific<br>Impressed by data collection<br>Holistic approach – first slide: Cultural Context<br>Applaud the initiative – should be worked on over time<br>Solid principles<br>Good coverage of issues<br>Not just a conversation about native vs exotic trees but diversity, functionality<br>Implantation tools will be driven by community at local level<br>A well-considered process and strategy – educating the public, open and transparent in delivery<br>(the idea of) city in a forest<br>Targets for species – creating diversity<br>Great it’s happening<br>Its about placement of trees in streets and other areas; achieving the canopy is the most important. Need variety to achieve practical objectives.<br>Process rather than responding to emergencies<br>“Stopping the rot” |
| Presentation | Visuals – before and after – better than words<br>Challenges and risks clear – a bit confronting but necessary<br>Basic facts re why important |
| Components of Strategy | Increase of trees (*3)<br>Diversity of trees (*3)<br>Replacement of trees (*2)<br>Realistic re diversity<br>The Exceptional Tree Register<br>Increasing canopy coverage<br>Canopy cover idea good, particularly in Carlton – median strip planting provides shading on both sides of the street<br>Co-existing with nature – objective<br>Creating spaces and attracting people<br>Phasing out, constantly green space |

| | |
|---|---|
| | Use of the 15 criteria for tree selection<br>Consideration of water<br>Integration of “place making”<br>Involving people in the hardscaping (eg recreation use)<br>Address biodiversity<br>Combined with WSUD<br>Storm water catchment is great. Keep it local<br>Tree life expectancy map<br>Communication of tree removal<br>WSUD preparing ground<br>Different ways of planting trees<br>Forest rather than rows of trees<br>Opportunities re planting in different ways |
| Questions and suggestions | Want interstitial planting, where possible.<br>Stormwater harvesting is good – good to spend $ on it<br>Birrarung Marr landscape could be applied elsewhere<br>Roof top gardens and green walls – cooling effect<br>Pollution link in UFS – range chemical, light (could need more detail)<br>VicRoads – distance trees to curbs ~ 3 metres – what will Council do about that?<br>Wind tunnels |

## 6.6. What needs improving

| | |
|---|---|
| The Strategy and its presentation | Accessibility of information<br>Title – not sure about "Urban Forest"<br>Massive over-reaction – …. are sensationalising<br>- What CoM is saying is dramatic<br>- It's getting our attention<br>More information on the strategy<br>Require the specifics<br>More table information provided – too brief and more detail needed<br>The draft strategy is too difficult to read<br>5 page summary should be distributed before the forum takes place (*2)<br>Roles and responsibilities of all involved?<br>Scare tactics used<br>More information about the strategy's projects – the implementation and types of trees |
| Implementation | Ian provided the policy, not strategy – should have been presented<br>How will Council communicate over time on-going information?<br>Will they be removing healthy trees from avenues?<br>Will they be cutting down whole avenues, or phased? – Interstitial planting? Not included as a guiding principle. Would like it included. |
| Research | Not enough effort – research – to save the Elms. Should not be defeatist.<br>Address diseases – cure. Save the Elms and plant new Elms. More research. |
| Community engagement and education | People's awareness and education needs to be part of the strategy<br>Concerned that Council will/may neglect to engage community – challenge for implementation phase<br>Communication and education of strategy – too isolated in audience<br>More information – good over period of time |
| Species | Apprehensive about species – if canopies are important, then Northern Hemisphere<br>Should not necessarily abandon Melbourne's historic tree avenue plantings for 'eclectic' mixes and plantings |

| | |
|---|---|
| | Species – same concern about indigenous trees.<br>- This issue is important to the character of Melbourne (conflict with indigenous trees)<br>- Look and how brittle.<br>Need more talking about specific species<br>- Melbourne = uniformity wanted = European architecture<br>- Impact of avenues<br>Elms – what is in mind?<br>Suggest more natives<br>15 criteria / diversity. Do we have trees that fit the criteria, including indigenous?<br>Complexity of variety of trees difficult to look after and costly<br>Rapid canopy planting – Maculatas in Birrarung Marr planted closely<br>2 year estimate for trees; 3-4 years required for some species<br>Species diversity – why 5%? Who came up with the number?<br>Concerned by the numbers associated with increased diversity (ie 5,10,20) Very difficult in urban situation. Very aspirational.<br>More attention to aesthetics – colour and texture – for replacement trees.<br>Not clear on role of indigenous species<br>Tree health / soil health though balance of species diversity?<br>Diversity – need to retain historical aspects but also need to change |
| Tree removal | Concerned about removal of trees – which ones will go?<br>Communication of tree removal |
| Water | Question – what's our capacity to water these trees? Why aren't we pumping water from the Yarra?<br>Water – permeable surfaces (is it an afterthought?) need to be in planning scheme<br>Emphasis WSUD and therefore increase biodiversity<br>Link to City as a Catchment principles |
| Fauna | Possums – more about the management of them and impact increasing tree numbers will have on population of possums increasing<br>- Strategy to keep them out of private gardens<br>? has fauna been included?<br>Has habitat been considered – for invertebrates, insects, birds?<br>Management of possums – more information on biodiversity |
| Other plantings | Street trees do not have undergrowth |

| | |
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| | Consider vegetation other than trees and grass - linking elements<br>Biodiversity corridors linking parks<br>Understanding of vegetation's relevance<br>Forest strategy should acknowledge other layers in a forest – middle (shrub) layer and ground cover |
| Other greening approaches | Green roof image – remove as its not a reality and reinforces concept of landscapes need to be 'European'<br>Want more mix of other options. WSUD, vertical planting, green walls, roofs etc. Not just trees |
| Urban canopy | 22% to 40% - conservative target. Think it should be higher, ~60% over 30 years<br>(canopy lag) be managed?<br>If trees are taken out now, there will be an increase in the Heat Island Effect in the interim – how will it ….. |
| Planning and regulation | Will there be planning guidelines that will be enforced? (Eg set-backs so that trees can be planted)<br>Integrated policies (eg requiring developers to plant trees)<br>No provisions as yet for developers to green their sites (eg roof top gardens) |
| Private land | Focus only on public land – what can city do with trees in other areas?<br>How strategic land could be bought back by the municipality for green wedges and green corridors<br>Need to identify areas of under used land (eg 'dero' buildings) and green them<br>Include land owners' engagement (not just CoM space) and adjacent councils |
| Limitations and risks | Physical resources – manpower<br>How do we maintain the trees?<br>Managing future problems – does the UFS consider all potential threats?<br>Commitment to IT resourcing<br>Silos exist within council – only starting to be overcome – shared teams. |
| Challenges | Asking today's residents to sacrifice trees that give shade for future generations<br>What impact on street scapes, especially avenues and consistency? |
| Suggestions and comments | Further consideration of permeable surfaces<br>Community caretaking role considered<br>Urban composting<br>Laneways and recycled water |

| | |
|---|---|
| | With higher density of development, more green is needed<br>Greater development of suitable activities in Royal Park and other under-used parks<br>Street trees and cars – issues with damage and hassle to cars from bird droppings etc<br>Canopy cover to be included in Carlton at the cost of car park spaces<br>Heat canopy<br>Improve data capture GIS info capture (Info Tech resources)<br>Make data collected (like ULE) available<br>UFS – idiotic – we create the problem (global warming focus) and patch it up with trees. Need greater strategic approach to address the cause.<br>Encouraging people to walk, finding walking spots<br>Density increasing : less space for trees<br>Conflicting ideas: population growth (issue for trees) VS bringing more people into the city to see trees |

## 6.7. Detailed discussion on key topics

The key points discussed and recommendations proposed by each of the groups follow. Topics are arranged in order of the amount of comment recorded for each.

### 6.7.1. Biodiversity

***Key discussion points***

- Biodiversity involves balance between all species, big fauna, insects and birds etc
- Vertical walls and roofs have a role to play in encouraging biodiversity – insects and birds
- Forest strategy to take more ecological approach where possible
- Urban Forest Strategy, but it doesn't consider the forest very much. Its mainly an urban tree strategy. More scope for forests – biodiversity.
- Growth areas (provide) opportunity to incorporate biodiversity / forest. Set aside land, requirements for developments to incorporate habitat, bees, insects, green walls etc
- Measures for ensuring biodiversity. (eg how far does a bee need to fly to find a flower or flowering tree?)
- How do trees support biodiversity? Animal life?
- Need wildlife corridors to connect vegetation – divided by roads
- Concerned about native biodiversity – concerned that exotic trees won't support native fauna species.
- Species that attract fauna – location. (Food attracts animals)

- Road safety – some trees are dangerous (limbs). Public safety (Caryimia)
- Creating / enhancing habitat and biodiversity.
- Urban forest can provide habitat for more than just bats and possums. Need understorey to encourage birds, insects.
- Maintenance is important – impacts on biodiversity.
- Mowing, dogs off leashes
- When trees removed, should be replaced with bird attracting species.
- Dogs and foxes
- Risk that a species of tree could be favoured in tree selection because of its ability to thrive in urban environment. This could lead to a decrease in biodiversity.
- An opportunity to create habitats in dry areas under trees – rocks, grass clumps – to encourage lizards, birds. Plant appropriate species eg kangaroo paw. To create habitat for smaller species – insects, lizards, birds etc
- Capture/ knowledge of biodiversity values
- Value of a 'full strata of vegetation' (Healthy ecosystems)
- Competing uses in the landscape
- Role of streets for biodiversity
- How can we connect people to nature?
- Price difference living …to a park
- Use installations and ….

***Suggestions***

- Biodiversity Conservation Act. Are there opportunities to protect endangered species in Melbourne? Use this as an opportunity to encourage urban forest. London – decline of a particular bird species led to promotion and encouragement of green roofs. Developers required to provide 'grasslands' on roof.
- Require developers to incorporate biodiversity in developments. Use EPBC to require developers to do this.
- Plant bird attracting species
- Look at creating wildlife corridors
- Location of species needs to be considered carefully so that animal species (eg bats and possums) don't have negative impact on people. (eg trees in fruit – food availability needs to be considered)
- Appropriate trees (function) for location
- How do you manage interaction between wildlife and impact on health of trees? (eg possums impacting on trees)
- How does council know the biodiversity values of existing trees?
- Control of natural pests
- Integration of planning scheme with UFS – knowing the context
- How can the UFS address carbon sequestration?
- Preserve and increase existing bio diversity

- Mobile forest (cluster of trees community can use for attractive Moomba float … - use insect attracting trees, half in flower and show people
- Use charismatic insects – interpretation; biodiversity = more insects; street trees/public trees underpin city biodiversity – need to think about implications of planting
- Water – key to biodiversity – increase in flying foxes through planting of more flowering trees

## Actions resulting from suggestions

- ***A biodiversity and urban ecology strategy is currently under development. That strategy will consider the biodiversity issues more appropriately.***

## 6.7.2. Species Diversity

***Key discussion points***

- Understand that we need greater diversity but what are the species?
- What species are being proposed?
- Are species being trialled so we can learn – maintenance requirements
- Natives – need more maintenance budgets
- What's the basis of the 5%?
    - We have a consistency that creates the character / aesthetic value
    - Important to keep avenues
    - Who's to say variety is best?
- Indigenous tree species offer aesthetic value if grouped
- Need to consider under stories (bird habitat, clears up pests)
- Oaks and Elms do not drop leaves and branches as often as gums
    - They are our history – our life blood
    - Been poorly maintained and looked after
    - Beautiful varieties that we are not using and should be
    - Oaks have a strong structure
- Stagger tree removal and replacement
- Docklands – recently planted Norfolk Island Pines (Docklands Boulevard) – large canopy and trees were planted too close together. Planted too many trees, remove 2 out of every 3.
- We need to know about species, canopy cover and space between trees.
- Are there policy/design guidelines that ..(unfinished)
- How do we manage our future requirement and mange short term enjoyment?
- Further afield looking for tree species – beyond old continents Euro avenues
- Further diversity in the population
- Retaining key landscapes (eg key boulevards) not necessarily to save the species but unified theme
- Ability to use trees in different ways
- Combining species
- As we increase growing capacity (WSUD, soil etc) we increase species diversity
- Native/exotic – out of date idea
- More locally specific planting in Kensington North along Moonee Ponds Creek.

***Suggestions***

- Streets in Port Phillip – trees are magnificent; trees on both sides
- Trees will have to be cut down but its necessary (ruthless but needed)
- Budgets – buy property and turn it into parkland

- Garden origin species
- Bette an ugly tree that survives than a heritage ‘beautiful’
- Things are moving
- Not just traditional route – hedges, other shade
- Structural diversity
- Respond to how trees respond, as some won’t do well

## Actions resulting from suggestions

- **Budgets/developer contributions to buy property and turn it into parkland are addressed specifically in the Open Space Strategy 2012.**
- ***The species diversity section with in the strategy has been addressed.***
- ***The strategy does not differentiate or express preference between native, indigenous or exotic trees. Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.***

## 6.7.3. Water recycling (WSUD)

***Key discussion points***

- Increase median width (remove car parking road width)
- Tree in median clash less with buildings and footpaths
- What happens to budgets if councillors change and don't support?
- Concerns that it took 10 years to come to this
- Lack of community interest in water
- Must water world significant Elms
- Culture and attitude towards tree
- Intensify the median planting / more understorey
- Replicate the success of the Russell St tree
- Large and new building water recovery systems
- What is Melbourne doing to recycle water?
- Modify gutters to allow water through to soil
- Review Princes Park recycling scheme
- Sewer mining power intensive and expensive?
- Increase growing zone of trees (medians)
- Replicate stormwater harvesting scheme in Fitzroy Gardens in other parks
- Revert back to non-cemented pitcher laying gutters and laneways
- Basement pumps – use water for vegetation
- WSUD in Kensington
- Stubb St for WSUD

***Suggestions***

- Residents encourage stay involved and combined advocacy
- Is there a role for council to advocate to state government against water restrictions/modified water restrictions to allow for tree watering?
- Educate community/business of value of trees/vegetation
- Identify what the trees need (eg key nutrients, soil conditions)
- Little sprinklers on the edge of buildings to cool street
- Capture stormwater locally (WSUD)
- Inexpensive technology
- Increase soil infiltration
- Replicate Bellair St implementation
- Increase opening around tree basins
- Improve permeability

- Permeable road

## Actions resulting from suggestions

- ***A core focus within the Strategy is to improve the health of vegetation and to implement water sensitive urban design measures where possible and feasible and to utilise water sensitive urban design to encourage biodiversity in our soils through the improvement of groundwater levels.***
- ***Tree Precinct Plans, which are yet to be developed, will inform opportunities for further water sensitive urban design opportunities for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.***

## 6.7.4. Cultural Identity and Heritage

***Key discussion points***

- Other means of stopping disease than species diversity
- What makes and avenue and avenue? It's not mixed
- Complementary to heritage Victoriana
- Water finite, trees have to be more independent of water, cf olive trees
- Species of trees that can survive in adverse conditions
- Found Urban Forest term a bit misleading, new, not something that jumps into people's minds like parks. Could use a different term?
- Presented with problem, strategies are sound
- More information on tree species
- Applauded strategies
- We need an inventory of heritage trees
- Strive to maintain the status quo (in heritage places such as Carlton/Fitzroy Gardens)
- Natural heritage, pre-Captain Cook/Port Phillip landscapes – good for tourism
- Melbourne needs to have an identity. Some uniformity in trees, repetition. Significant because of avenue of trees, European avenues. Relationship between trees and buildings.
- How will we maintain Melbourne identity?
- Species complementary to identity
- How will achieve maintenance of identity in a complementary way with an edict of 5% of species
- Important to maintain 'green' in Melb, including colour in our trees

***Suggestions***

- Where is the water going to come from?
- Can you plant trees on top of roof tops?
- What impact can roof top gardens have?
- Both Aboriginal and European heritages should be preserved
- Accommodation with climate change
- Surface watering?
- Planting around Birrarung Marr looks good, too much has died at Carlton Gardens.
- Love the Australian landscapes
- Vision and courage to bring together native and European in a particularly Melbourne identity
- Gums may not be an applicable street tree, beautiful park tree – different species have different roles

## Actions resulting from suggestions

- ***Section 3.2 of the strategy has been extensively revised and rewritten to acknowledge respect for the cultural identity and influences on of Melbourne's urban forest. A more complete history and evolution has been articulated.***
- ***More on rooftop gardens/ green roofs has been included in the strategy.***
- ***The species diversity section with in the strategy has been addressed.***
- ***The strategy does not differentiate or express preference between native, indigenous or exotic trees. Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.***

## 6.7.5. Cultural Identity

***Key discussion points***

- Spaces for interaction – street trees won't provide that – surrounded by concrete
- Can we reclaim more space for parks and trees – West and Docklands? – equity is important – access to trees
- MSS and Structure Plans need to provide more green spaces
- Fisherman's Bend opportunity – Planning creates our future heritage
- Diversity is true representation of heritage – presettlement to Victoria city
- Strategy represents the issue well
- Return entirely to indigenous with strategic iconic areas to maintain visual cultural heritage
- Indigenous don't give shade as much – important element
- Need more food trees – maintenance issues should not be an excuse
- Productive street scapes – volunteers to maintain (Castlemaine example)

***Suggestions***

- Interpretive material can help public experience the parks, the heritage issues
- Heritage is an evolving issue – mix is evolving
- Have protected areas for heritage
- More green spaces for people to connect to nature, sit, congregate
- Attracting people to use spaces through interacting with public spaces – volunteers – Green Army to look after trees – urban landcare

### Actions resulting from suggestions

- ***Heritage Victoria has been consulted as part of this consultation process.***
- ***Measures are already in place to protect areas of heritage significance. The species diversity section with in the strategy has been addressed.***
- ***The Open Space Strategy deals specifically with more green spaces for people.***
- ***The strategy does not differentiate or express preference between native, indigenous or exotic trees. Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.***

## 6.7.6. Contested Spaces

***Key discussion points***

- Business should be rewarded for improving Green Spaces
- How can individuals encourage building owners to construct Green roofs/vertical gardens?
- Helsinki – silver birch tree planting proves high density and UF is possible
- Private space is decreasing with increasing house sizes. There should be a debate about whether the public pay for the loss.
- When designing spaces (eg landscape arch), trees are low in priority – we need to raise their status! And how do we do this?
- How do we get developers to include UF in their projects?
- How do we get authorities to require it?
- What strategies (eg Metro Consultation) can we as a community influence?
- Docklands example – commercial priorities dominate and commentary from the public demonstrate this.
- We need trees but also discrete spaces for UF (chunks of trees, plazas, non-commercial public spaces)
- Plazas (paved spaces) that are in private spaces need to provide public amenity
- Street trees are critically important where there are reduced house gardens
- Targets need to be binding on both council and state government

***Suggestions***

- Local roads (80% of the public domain) need to be returned to the non-transport public use (a useable public space) – Nature Deficit Syndrome
- Consult young children and parents
- Getting people together in cooperation (prof disciplines) will help
- Legislation and regulation is needed to require developments to meet agreed targets (eg green star)
- Start aspirational and these should eventually become minimum standards
- Maintenance and management (whole of life) is critical
- City of Melbourne needs to advocate to state government
- The inner metro councils (IMAP) should advocate for state to adopt UF targets

### Actions resulting from suggestions

- **Further collaboration with the community and other agencies has been addressed within sections 5 and 6 of the strategy.**

## 6.7.7. Money and resources

***Key discussion points***

- Issues with co-ordination with state government budgets – to fund large-scale projects such as sewer mining (as suggested 2005) for drought proofing
- $10,000/tree valuation. This is a very low number. Does this account for the carbon sink effect?
- Volume of tree replacement in a short period of time and whether Council/community has the resources. Is there money?
- Even if there is money, is there the capacity to deliver? Are there enough experts? People on the ground?
- Within council how does doubling the number of tree planted (for example) get signed off by Council?
- Concern of wastage of resources with planning too close together.
- Problems with planting according to financial management, particularly at the end of the financial year when needing to expend – getting trees that are available, not best. (eg Royal Park – inappropriate species)
- Tender for purchase of trees should be open, and open for public inspection.
- A lot of resources involved – massive project.

***Suggestions***

- Dovetail UFS into broader Council management. Coordination across functional barriers – with roads, infrastructure etc
- Guard against any conflicts of interest – probity
- Need to consider private land more especially in CBD. 60% of the area in East Melbourne.

### Actions resulting from suggestions

- **Section 6.4 within the strategy addresses funding resources specifically.**

## 6.7.8. Staging and sequencing

***Key discussion points***

- More detail in regards to replanting, concerned about how and when it will happen
- Didn't answer the questions
- Needs some principles in the strategy to guide
- Only replace when it is critical
- Fear factor – is it going to be 'blocked clearing'? Stages need to be communicated.
- Precinct replacement
- Concerned about the facts
- Hard to commit to consultation
- Unnecessarily early removal
- How will the planting be affected? Big and little trees – tree survival.

***Suggestions***

- More transparency and specifics on what will happen
- Provide examples of how it's going to happen
- Assurance that the trees won't be removed in one go
- Informing and consulting the community
- Pictures and mock-ups of scenarios will help people visualise
- Acknowledge controversial topics
- Staged replacements

### Actions resulting from suggestions

- **Several illustrations of future scenarios for Melbourne are contained within the strategy.**
- **Sections 5 and 6 address consultation and collaboration with the community.**
- ***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.***

## 6.7.9. Research

***Key discussion points***

- Research gaps – quantifying ecosystem services (info from Nth America) ie air quality (compounds worse than traffic)
- Looking at interaction between people and trees
- Comparative heat studies related back to thermal studies
- Different people relate to different trees (like/hate; ornamental/growth)
- Increase in canopy cover to 40% - differing degrees of shade create different qualities/capabilities
- Shade – evergreen vs deciduous; evergreen transpire more; deciduous – important when in leaf
- Cultural shift in attitudes towards trees – conifers in streets; seasonality – Melbourne specific ie early summer shade, late maples and elms – species selection – testing in the city
- Toulouse as an analogue – similar geomorphology (Eur Mediterranean climates much wetter and drier summers)
- Money (public) vs experimental planting

***Suggestions***

- Social research – human dimensions; anthropology? Sociology? Etc
- What other climates are similar? What are the natural comparators? Difficult to find somewhere with similar transpiration processes for trees
- Biodiversity research usually in remnant vegetation – should relate to streetscapes and cultivated vegetation
- Just need to try some species with diversity. If it fails, it doesn't matter.

### Actions resulting from suggestions

- **Section 6 has been revised to address research gaps.**
- ***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.***

## 6.7.10. Undergrowth

***Key discussion points***

- The urban forest is not just about the trees
- The urban forest includes the middle (shrub) and ground covers too
- To increase biodiversity and habitat: Ecology
- Heritage streetscapes are important to retain
- Recreate ecosystems to encourage insects and birds
- Greening streets will make people want to walk/cycle in them
- Green factor style required eg green walls
- Developments do not provide for any greening. They should be made to in the planning scheme.
- More permeable surfaces in the streets
- Could they be more costly to maintain undergrowth.
- The amount of open space provided by developments should relate to the size of the development
- The planning scheme should charge to reflect the UFS
- Very important to biodiversity.

***Suggestions***

- Put in road closures, parks, gardens and reserves and waterway corridors
- Get a diversity of plants within the municipality
- Growing trees and other plants in clumps, sections
- Provide guidelines to people about what to grow in their gardens
- Adopt their own naturestrip to plant out.
- Window boxes in streets to improve the look of the street
- Should be requirement under the planning scheme to require treed/grasses streets (Green Street)
- Review the large areas of road and land and reduce.

### Actions resulting from suggestions

- ***The strategy has a target of achieving diversity within the municipality***
- ***A Sustainable Gardening in the City booklet has been produced and was launched in June 2012 to provide guidelines to people about what to grow in their gardens and is available on the website.***
- ***This strategy does not make recommendations for the planning scheme.***
- ***Tree Precinct Plans, which are yet to be developed, will inform species selections for each precinct. The community will have an opportunity to collaborate on the development of these plans. Section 6 of the strategy has been revised to include this detail.***

## 6.7.11. Community Participation

***Key discussion points***

- CoM can do this but we need to inform – private (balconies) as well as public (open spaces)
- Need to inform community/get the message out – participation increases understanding
- Melbourne News is good, but we need information in the language of students
- Different ways of getting people involved and linking things eg landcare for singles (a way to meet)

***Suggestions***

- Family Fun Days – linking to the UF activities – getting Chinese people to talk about their approach to…
- Build into everything we do – festivals
- Spring planting days – improve reach and expression of activities (make sure we are reaching multi-cultural groups/renters/students)
- Interactive – education and awareness
- Putting all activities into the context of the UF strategy
- Ambassadors: like the previous possum lady in schools
- The strategy is about public space
    - Its also about private spaces
    - Issue: renters – how do we build sense of working as a community (sustaining street)?
- Clash of building codes/planning schemes/environmental goals
- Community participation
    - In finalising strategy
    - And into the roll out/implementation of the plan. Essential if it is going to work.
    - CoM to work out effective way/s to enlist us in the rollout (as ambassadors, in projects, as water carriers …)
    - We need daytime meetings
    - Enlisting local businesses: to get their staff to help with projects/plantings
- Got to get out to the people

### Actions resulting from suggestions

- **Sections 5 and 6 address consultation and collaboration with the community.**
- **Community planting days are held twice a year.**

## 6.7.12. Urban Heat Island

***Key discussion points***

- If Melbourne's population growth increases, especially in inner city and outer suburbs, how do we manage URI?
- Do we need yet more expansion of Melbourne Metro Area or a separate city?
- CoM need to work more with its neighbouring LGAs to get a more coordinated approach.
- What are the best intervention methods for reducing URI in the central city?
- What international examples are there that CoM wants to benchmark against? 9eg Chicago)
- Reference: Graham (?) Hopkins (Adelaide)" Living Architecture" – about green roofs and walls

***Suggestions***

- Key interest in the benefit of all green 'types' to URI (not only trees) – CSIRO have collected 30 years data from CBD (shows 1.5-2.0◦C increase in temp)
- Agrees with point about population growth in Melbourne Metro – should we increase growth boundaries?
- Greater opportunity for LGAs to play a much more investigative role (and not just pursue inappropriate policy)
- If density increases then we need to increase GI
- CSIRO really wants to share more research
- What other things have been taken into regard with respect to human and other species' health?
- What's being done to reduce vehicle movements and other impacts that compromise street vegetation health?
- Victorian Government needs to support LGAs.
- Concrete surfaces (including slab construction development) are very bad for radiation. Very important to see how the City works with developers.
- Reflective heat (eg from Rialto) is enormous – adjacent buildings when Rialto constructed heated up by several degrees (leading to more air conditioning being required). Radiation heat as important as heat absorption.
- Lots of knowledge in this room – how can we keep in touch? Assist one another?
- Can we distribute participants' details?
- Case Study – Readers Digest Building (Surry Hills NSW) roof garden (40 years ago)

### Actions resulting from suggestions

- Mitigating the urban heat island effect is a core focus of the Strategy. Section 6 has been revised to articulate gaps for further research and the importance of collaborating further to build the urban forest for the future.

## 6.7.13. Canopy Cover

***Key discussion points***

- Trees changing colour in the parks is beautiful
- Need to plan for future
- This is an opportunity for future - need education to understand
- How do you manage canopy cover properly – need proper free maintenance
- Conclusive that need more – increase
- Need deciduous – winter necessary – important in Melba for cold winters and hot summers
- Buildings getting higher, creating more shade

***Suggestions***

- Kensington banks area – new park – needs attention
- Diversity important to protect from disease
- Need people and budget
- How about vertical planting? What is happening?
- Like to see research – density and shade of old deciduous tree vs evergreen like red river gum
- Maintain the 'spirit' of Melbourne's landscape
- Trees in Holland Park – mainly eucalypts have bare dirt under them. Need to choose trees that let things grow under them. Turn off in summer particularly in recreation areas.

### Actions resulting from suggestions

- **The Strategy has been revised to include more on green roof and walls.**

## 6.7.14. General Discussion

***Key discussion points***

- Strong move towards greening the city
- Heritage – make sure character of Melbourne is not compromised. Victorian architecture city.
- Very sad to see trees in decline (map) but well done CoM for taking action.
- Drought preparedness – water tanks. Very good.

***Suggestions***

- See planting happen as soon as possible. Don't be gung ho about new planting.
- Can't change the building so why change the planting?

### Actions resulting from suggestions

- **Heritage will to be compromised, a principle within the strategy is to maintain Melbourne's cultural identity and heritage.**

# 7. Urban Forest Art & Design Competition

The urban forest Art and design competition was organised to raise awareness in the community about the importance of our urban forest and to set the scene for the urban forest strategy consultation period.

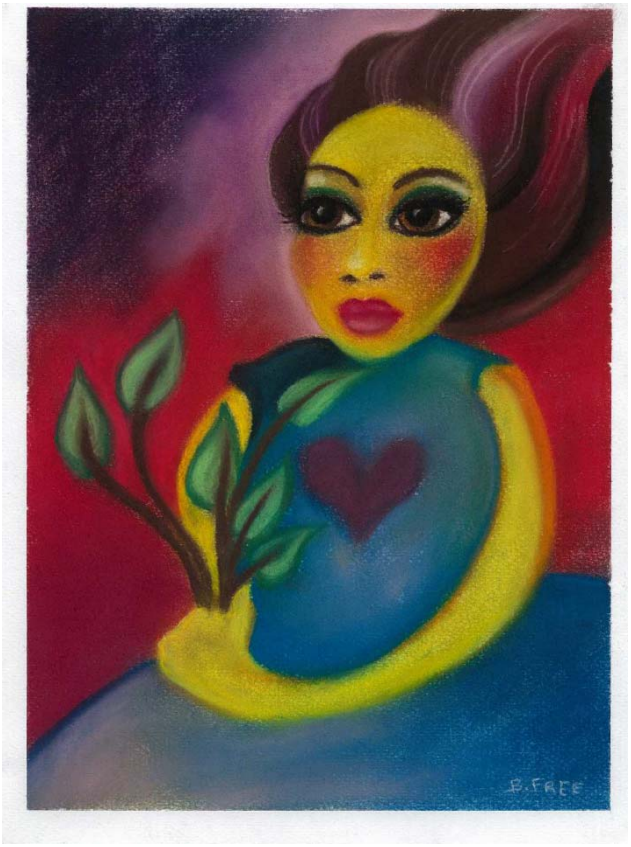
The competition was launched on 29 August 2011 with a closing deadline of 14 October 2011. Winners were announced on 18 November 2011 and the winning designs were displayed in various public locations around the city.

**CATEGORIES**

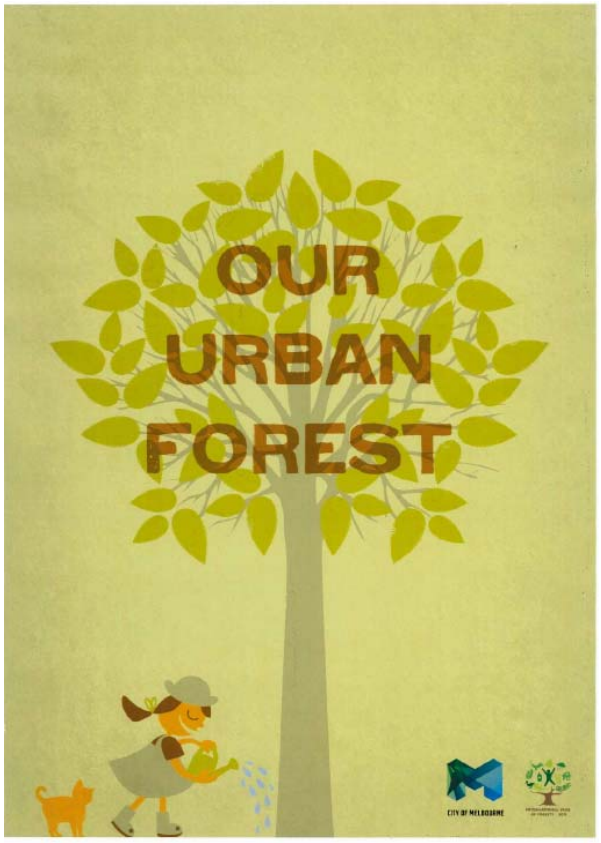
- Open (over 18 years old)
- Secondary school students (13 years to 18 years old)
- Primary school students ( 5 years to 12 years old )
- Kindergarten -Under 5's

The 4 winning entries receive the following prizes:

- Winner Open: $5,000
- Winner Secondary: $1,000 for their school for sustainability purposes.
- Winner Primary: $1,000 for their school for sustainability purposes.
- Winner Kinder Under 5's: $1,000 for their kindergarten/child care centre / for sustainability purposes.




## Urban Forest Art & Design Competition 2011



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29 July 2012

Dr Kathy Alexander
Chief Executive Officer
City of Melbourne
PO Box 1603
Melbourne VIC 3001

Attention: Mr. Ian Shears

Dear Madam, Ian

**RE: REVISED DRAFT URBAN FOREST STRATEGY**

The Friends of Royal Park, Parkville Inc. would like to make the following comments on the Revised Draft of the Urban Forest Strategy as presented at the Future Melbourne (Eco-City) Committee meeting on 10 July 2012.

We are most concerned that our group's submission to the first draft appears not to have been considered (cf Attachment 4 Community Consultation Report) and therefore the many valid points we raised have not been addressed. We therefore request that our original submission should be retrospectively considered with changes incorporated, as appropriate, into the final Strategy.

Based on the Revised Draft of the Urban Forest Strategy, we reiterate our concerns that the special nature of Royal Park, which is unlike any other park in the City of Melbourne, and with its objectives - *to evoke the original Australian landscape character of open spaciousness, with typical plant associations of open woodland, grassland and pockets of wetland and predominantly indigenous plant species* - has being subsumed into overarching blanket strategies of the Urban Forest Strategy.

Application of blanket targets in the Urban Forest Strategy go against Royal Park Master Plan objectives, for example, to specify 40% canopy cover; no more than 5% of one tree species; and 90% of the tree population will be healthy in 2040 (cf sections 5.3.1, 5.3.2 and 5.3.3). Insertion of simple statements into the Strategy would allow Royal Park's particular type of 'urban forest' to be acknowledged.

50 Shiel Street
North Melbourne VIC 3051
koddie@bigpond.com

July 14, 2012

Mr Ian Shears
Manager
Urban Landscapes
City of Melbourne
PO Box 1603
Melbourne VIC 3001

Dear Ian,

**RE: REVISED URBAN FOREST STRATEGY**

May I firstly thank you and your team for incorporating a number of changes from my submission into the first draft of the Urban Forest Strategy – sometimes just a word here and there, but which clarified or strengthened the point being made ... and in turn the Strategy itself. My comments on the Revised Draft below can be seen as 'fine tuning'.

The Revised Urban Forest Strategy has pleasingly expanded the historical context and, together with the companion Diversity Guidelines document, provides a strategy set in the context of Melbourne's planting history plus new research. Melbourne's urban forest of the future will respect its urban forest of the past but be able to build and renew urban forests in the 21$^{st}$C with much greater knowledge and understanding.

**3.2.1 Environmental benefits** page 11

Reiterating the comment from my original submission – that habitat provision applies to plants as well as animals, e.g. nitrogen-fixing acacias provide supportive habitat for promoting eucalyptus growth, perhaps a compromise wording could be:

**• Provide habitat and enhance levels of biodiversity**

Although few Australian cities have preserved large areas of natural habitat, a healthy urban forest contributes to biodiversity and habitat provision. *(deletion of 'for a variety of wildlife' allows for both plant and animal habitat)*
&
By planting and managing different age strata, biodiversity and a wider range of habitats can be enhanced. (*delete animal*)

To better reflect the biodiversity/habitat point, the legend of the accompanying photo of the wetlands in Royal Park could be reworded:

*The Trin Warren Tamboore Wetlands in Royal Park provides valuable biodiverse habitat whilst also improving water quality.*

### 3.2.2 Community benefits page 12

**• Reducing sun exposure**

Melbourne is not Queensland! Children and adults in Melbourne need adequate sun exposure in winter to maintain their Vitamin D levels. Where appropriate, tree selection and planting guidelines could allow for both summer shade and winter solar access with deciduous species and selected site locations. Please could this be recognised in the Strategy by adding a sentence to this dot point along lines of:

**.....** It is recognised that an urban forest can also provide for solar access in winter, where appropriate, as an added measure of community health and well-being.

Correct typo in this dot point:

Sun exposure illnesses such as skin cancer have long **d**etermined that the importance of protection from sunlight's UV rays is paramount.

**• Reducing heat related illnesses**

*Buildings* cannot be at a higher risk of heat related morbidity ... *people* can be at risk, yes. Suggest rewording:

Evidence suggests that buildings with little or no surrounding vegetation pose a higher risk of heat related morbidity.[5]

### 3.2.3 Economic benefits page 13

**• Storing and sequestering carbon**

The chemical formula for carbon dioxide is written with a subscript ' 2' after the O, i.e.

During photosynthesis, trees convert carbon dioxide ($CO_2$) ....

### 3.3 Evolution of Melbourne's urban forest

**The nineteenth century foundation of Melbourne's contemporary urban forest** page 15

Correct names in reference: Lovell Chen

### 3.3.2 Tree canopy cover page 20

Still harping on the importance of solar access during winter – this could be included, by default so to speak, by adding 'to' to *enhance* (and to *adapt*) in the sentence, making the '*we are seeking'* the main action:

In the City of Melbourne we are seeking to increase summertime shade and biomass in the municipality to combat urban heat island effects, to adapt to climate change, and to enhance our streetscapes for the comfort of people.

- o –

Yours sincerely,
Kaye Oddie

### 5.3 Strategies

#### 5.3.1 Increase canopy cover

Royal Park presently comprises 21.64% canopy cover (cf section 3.3.2, Table 3, page 20). However, this can be broken down into the projective covers for the various vegetation associations (cf "Royal Park Planting Plan", City of Melbourne & Serco, 2007):

- 0% (grassland)
- < 20% (open woodland)
- < 25% (swamp woodland)
- < 35% (woodland with understorey, riparian woodland)

A blanket application of 40% canopy cover would not be in keeping with Royal Park's existing and intended landscape character. We therefore suggest the addition of the following dot point:

**Actions**

- Allow appropriate vegetation types and species and spatial requirements in Royal Park in keeping with its designated open woodland landscape character.

#### 5.3.2 Increase urban forest diversity

We reiterate the point made in our original submission that Royal Park "houses many eucalypts, including (nearly) the entire population of River Red Gums (*Eucalyptus camaldulensis*)" and that this species comprises 11.7% of the total tree species in the City of Melbourne (cf section 3.3.2, Table 4, page 21). Royal Park's character is conspicuous for its River Red Gums. In implementing the Urban Forest Strategy it would be important that the Strategy's blanket target of "no more than 5% of any one species" does not compromise Royal Park's population of River Red Gums or the Park's identified character.

We therefore recommend the additional dot point under **Actions**:

- Recognise identified park character and master plan objectives in formulating planting targets.

#### 5.3.3 Improve vegetation health

Placing a blanket target of 90% of the City's tree population to be healthy in 2040 ignores the fact that Royal Park's key objective is to evoke the original native vegetation landscape character. This would include a natural progression of tree ageing and regeneration, which should be allowed to occur consistent with the objective and not subject to arbitrary percentage targets and timeframes.

We recommend the following paragraph be added to the text:

*In Royal Park, where the objective is to evoke the original native vegetation landscape character, a more natural ecological progression of ageing, regeneration and replacement of trees may be allowed to occur*.

### 5.3.4 Improve soil moisture and water quality

The Trin Warren Tamboore wetlands functions to firstly purify storm water and secondly to store the water for reuse. Therefore legend to the photograph would better read, and be more in keeping with the direction of this section:

*Storm water purification and storage at Trin Warren Tamboore wetlands in Royal Park, affording enhanced ecological values.*

We would appreciate acknowledgment of receipt and consideration of these comments on the Revised Draft of the Urban Forest Strategy.

Yours sincerely,

Gabrielle Stannus
Convenor
Friends of Royal Park, Parkville Inc.