Street Tree Guide 2020
Part One: Trees in the Urban Environment
City streets and the importance of trees

Streets make up most of the public space in our cities – Gehl Architects have estimated that this can be as high as 80 percent. Streets are where people most commonly experience and interact with each other and the city. Their design and quality influence how pleasurable that experience may be and can have an important impact on city liveability.

The City’s approach to street design is focused on prioritising pedestrians above other modes of mobility. Streets are designed to be experienced at walking speed with smells, sounds and textures that engage the human senses and provide an appealing sensory experience for all users.

A typical street ties the city together with a cohesive and well-designed urban aesthetic. It is important to provide the setting but not compete with a city’s rich fabric which evolves over time: great architecture, engaging window displays, outdoor dining and most importantly, the people using the streets provide colour, vibrancy and a sense of place. Timeless and standard elements within our city streets complement these characteristics and let them shine.

Street trees are one such element. Their functional and aesthetic qualities mean they have a significant role to play in the creation of a great city street.

Great streets:
- support and enhance character and heritage features
- maintain the city’s formal grid pattern
- have a limited palette which is long lasting with proven performance under high usage
- are cohesive and timeless
- are inclusive of all ages and abilities
- incorporate Water Sensitive Urban Design (WSUD)
- are safe and comfortable at all times of the day and night
- support and encourage different social interactions and activities.

In dense inner-city areas, where space is at a premium, street trees often offer the main opportunity for urban greening and much needed urban cooling. They play an important role in the creation of green pedestrian corridors across the city which can connect and improve accessibility to the city’s network of parks and open spaces.

In appropriate locations, street trees can also contribute to the creation of wildlife corridors to protect and improve biodiversity within the city.

Access to such spaces is becoming increasingly important to community health and well-being as cities continue to densify.

The City’s street and parkland trees are an important infrastructural asset. They have an estimated amenity value of over $100 million, based on research undertaken for the preparation of the City of Perth Urban Forest Plan (2016). Trees also provide tangible ecosystem services including carbon storage and sequestration, improved air quality, stormwater management and energy savings which add to their value.

In 2017 there were approximately 9,000 trees planted within the City’s streets. New trees have been added in subsequent years as part of the implementation of the Urban Forest Plan’s on-going street tree planting program and wherever opportunities may arise as part of other capital works initiatives.

There is a general presumption for trees to be included in all streets where adequate space is available.
Tree planting on Murray Street Mall, Central Perth
Figure 1: A great city street.
A great city street - trees

1 Shade

- Tree canopies provide shade and help cool the city, creating a comfortable and inviting pedestrian environment.
- Shading can also protect and extend the life of the City’s road surfaces (Center for Urban Forest Research).

2 Traffic calming

- Trees can help make a street feel narrower than it actually is, changing how drivers perceive and respond to the street environment; reducing vehicle speed and calming driving behaviour.
- Trees help to physically and psychologically separate pedestrians and moving traffic, creating a buffer that can improve a pedestrian’s sense of safety.

3 Human scale

- Trees help scale city streets to human dimensions and improve pedestrian comfort.
- Colour, texture and seasonal variation provided by street trees improve a pedestrian’s sensory experience and help connect city dwellers to nature.
How trees work

Unlike elements of city infrastructure such as roads, pathways and lighting, trees are dynamic, living organisms. An understanding of a tree’s key parts, how they work and what a tree needs to survive and thrive is important if they are to be grown successfully in the urban environment.

The key parts of a tree

Trees are essentially long lived perennial plants comprised of three key parts: the crown, trunk and roots (see Figure 2).

The crown

The crown is comprised of leaves, branches, twigs, flowers and fruit. Photosynthesis and evapotranspiration occur within the crown and are important for tree survival. There is a direct correlation between the quality and health of a tree’s crown and the level of community benefits.

The trunk

The trunk forms the plant’s main stem connecting the root system to the crown. It helps support the tree and contains a series of woody vessels that transport water, minerals and sap between the tree’s crown and roots.

The root system

The root system helps to both nourish a tree and anchor it in the ground. The development of a healthy root system is critical if a tree is to survive and thrive in the urban environment.

Figure 2: Key parts of a tree.
ROOTS

Tree roots generally have a large main root system to help stabilise the tree. This is supported by a network of smaller non-woody lateral roots extending horizontally from the main system.

Lateral roots are located parallel and close to the ground surface and can extend across an area two to three times the tree’s height. Their main function is to collect water and mineral nutrients from the soil, essential for a tree’s growth and development. The ability of a tree to absorb these elements is enhanced by a range of fungi (mycorrhizae) which develop on and around the root system, increasing its surface area.

The majority of a tree’s root system is found within the top metre of soil, with most located in the top 300-500 mm. This is because the top layer of soil typically contains the appropriate number of soil pores (open spaces between soil particles) and oxygen levels that trees require for growth.

TRUNK

A tree’s trunk and branches are covered with bark which protects the tree’s internal living tissue from a range of threats including pests and diseases, storms and extreme heat.

If a tree’s bark is damaged this can have a negative impact on tree health and vigour. In street trees this damage can occur because of vandalism or inappropriate management and maintenance procedures, such as careless use of whipper snippers or failure to enlarge the grate openings in tree pits to allow room for trunk growth.

CROWN

A number of important processes that are central to a tree’s health and survival occur in the crown.

During photosynthesis, the chlorophyll in a tree’s leaves captures energy from the sun and converts carbon dioxide from the air and water from the roots into sugar and oxygen. The sugar is stored and used as a source of food for the tree. Oxygen is released back into the atmosphere helping to improve air quality. Air quality is further improved by the ability of the crown to capture and filter dust and other particles.

Evapotranspiration also takes place in the crown. This brings the water needed for photosynthesis from the roots to the leaves. It also uses heat from the surrounding air to convert water to gas, releasing water vapour into the air which can help to cool city streets.

The shade provided by the crown also prevents the ground surface below the tree from heating up during the day and releasing heat back into the environment at night. This helps counteract the urban heat island effect and promote urban cooling.

The structure of a tree’s crown varies from species to species and its shape can have an important influence on the aesthetic quality of a tree, making it a key element to consider in the design of city streetscapes.
Supporting tree growth

Trees need access to the essential elements of space and sunlight. They also need soils that provide appropriate levels of water, oxygen and mineral nutrients if they are to survive and thrive.

These elements are readily available in natural environments but are harder to come by within highly modified city streets.

While it is not possible to recreate natural growing environments within city streets, there are some key measures that can be undertaken to help maximise growing conditions at each planting site and improve a tree’s chances of establishment and survival (see Figure 3).

Figure 3: Supporting tree growth.
The extent to which each planting site can be modified will vary depending on the character and function of the surrounding urban environment. This is particularly the case in high use, inner city streets where there is a need to accommodate other elements of urban infrastructure including underground services and durable, robust urban paving to create safe and comfortable conditions for walking.

The concentration of underground services below the surface can limit the City’s ability to maximise soil volumes and create optimum conditions for root growth. High levels of wear and tear can limit the effectiveness or practicality of introducing permeable or porous surfaces around trees to improve soil aeration.

Maximising growing conditions at each planting site alone is not enough to ensure the successful establishment and growth of vigorous and healthy trees within city streets. If trees are to survive and thrive in harsh urban environments it is of equal importance that a robust tree selection process is put in place to select the right tree for the right place, along with appropriate planting, management and maintenance procedures and processes. These issues are explored in more detail in Part Two and Part Three of this guide.