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The Potential of Yellow Gum (*Eucalyptus leucoxylon* F. Muell.) as an Urban Street Tree: An Assessment of Species Performance in the City of Greater Melbourne, Australia

By G.M. Moore and A. Chandler

Abstract. Background: In contrast to trees from northern hemisphere genera, there has been little research into the selection and vegetative propagation of Australian native tree species for use as street trees. *Eucalyptus leucoxylon* F. Muell. is one of a few eucalypts occurring in south-eastern Australia with bright coloured flowers and is highly regarded as an ornamental tree that flowers readily. It is propagated from seed, but progeny typically show seedling variability and diversity. *Eucalyptus leucoxylon* was identified as the most widely planted eucalypt in the streets of the city of greater Melbourne, Australia. Methods: This research assessed 300 *E. leucoxylon* street trees growing across the city of greater Melbourne for their performance against arboricultural criteria relating to canopy structure and density, straightness of the trunk, health (assessed on canopy, trunk, and branch condition, production of exudates, and presence of fungal fruiting bodies), flower colour, and root systems. Results: The results showed that *E. leucoxylon* was a suitable street tree species with most specimens showing good habit, vigour, and health. Discussion: The trees had traits such as live crown ratio, height, flower colour, and capacity to cope with pruning that are considered appropriate for a street tree. Their dense canopies and high live crown ratios provide shade that can reduce the urban heat island (UHI) effect. Conclusion: This suggests the species has the potential to be a successful street tree not only in Australia, but in other parts of the world where it has been grown successfully in forestry plantations.

Keywords. Arboricultural Criteria; Eucalyptus; Flower Colour; Live Crown Ratio; Street Tree Performance; Urban Forest.

INTRODUCTION

In contrast to urban tree species from genera such as *Ulmus*, *Quercus*, *Platanus*, and *Fagus*, where elite specimens for urban use have been developed over centuries, there has been little research into the selection and vegetative propagation of Australian native tree species for amenity purposes (Beardsell et al. 1993; Moore 2003). Eucalypt species with the most brilliant flower colours are generally found in south-west and tropical Australia (Chippendale and Johnston 1983), but *Eucalyptus leucoxylon* F. Muell. is one of a few eucalypts occurring in south-eastern Australia with bright coloured flowers, and it is highly regarded as an ornamental tree that flowers readily and early (Williams and Brooker 1997; Brooker and Kleinig 2006). *Eucalyptus leucoxylon* is readily propagated from seed, but progeny show seedling variability. There has been a long interest in selecting superior phenotypes and propagating vegetatively, but many eucalypts have proven problematic for vegetative propagation, and so the *E. leucoxylon* specimens grown as street trees have been propagated from seed.

Melbourne, the capital city of the State of Victoria, has a long history of street tree plantings. The city (−37.814, 144.963), with a population of over 5 million people, covers an area of 10 × 10^3 km^2, and its Köppen climate classification is temperate oceanic. While temperatures can range from a low of −2.8 °C to a high of 46.4 °C, the average low and high are 11.6 °C and 20.8 °C, and average annual rainfall is 600 mm. Spencer (1986) describes 2 separate phases of amenity tree planting, with the first phase from

1850 to 1870 preferring evergreen trees with fast growth rates. Exotic conifers were the most popular, but a number of native species were also used, most notably the blue gum (*Eucalyptus globulus* Labill). The use of *E. globulus*, however, was short-lived, as many became unsightly by the late 1880s (Spencer 1986). The second phase of planting was from 1870 to 1910, using European species such as oaks, poplars, elms, and plane trees. Melbourne's spectacular avenues of tall elms, with their wide, overarching canopies unravaged by Dutch elm disease, were planted at this time (Spencer 1986).

From 1910, the rapid development of suburbs containing narrow streets within native bushland presented more challenges, and eucalypts, *Jacaranda*, *Prunus*, *Pittosporum*, *Tristania*, and *Lophostemon* species were planted (Spencer 1986). The use of eucalypts *Melaleuca* and *Callistemon* increased after the Second World War, when Australian native species became popular due to their ability to maintain native ecosystems within peri-urban zones and attract native fauna. This led to experimentation in the use of local indigenous species and the use of trees such as *Eucalyptus maculata*, *E. nicholli*, *E. linearis*, *E. leucoxylon*, *E. sideroxylon*, and *Corymbia citriodora* (Spencer 1986).

Interrogating the tree inventory data held by the 31 local municipal councils making up the city of greater Melbourne identified nearly a million trees from 1,127 different taxa, with the proportion of Australian species being 60%. Seventy percent of the most frequently planted species were native (Frank et al. 2006). There was greater taxonomic diversity among exotic species than native species, despite their lower proportion. Evergreen (71%) and broadleaf taxa (92%) were the most commonly planted trees, and the most popular native species were from the *Acacia*, *Callistemon*, *Eucalyptus*, *Melaleuca*, and *Lophostemon* genera, which comprised 43% of all trees (Frank et al. 2006). The genus with the highest number of taxa and the largest number of individuals overall was *Eucalyptus*, and the most common species was yellow gum, *E. leucoxylon*, with over 20,000 individuals making it the seventh most common of the 1,127 taxa identified (Frank et al. 2006). Despite its common occurrence, the performance of *E. leucoxylon* in streets can be quite variable (Beardsell et al. 1993).

Much is expected from urban street trees (Núñez-Florez et al. 2019). In an Australian context, street trees are planted for environmental, aesthetic, and statutory reasons, but when it comes to selection, species characteristics, site factors, costs, and management and maintenance issues drive the process. The availability of species, their pest and disease resistance, the appropriateness of the species for nearby ecosystems, and their biogeographical features are also significant factors in selection (Behrens 2011; Conway and Vander Vecht 2015; Moore 2021b). Many commonly planted urban trees have a wide phenotypic plasticity for stress tolerance, growth in restrictive urban space, and limb breakage and severance (Sæbø et al. 2003; Kendal et al. 2012).

There has been considerable research into the economic and environmental benefits provided by street trees as part of the urban forest, which demonstrates that these benefits exceed the costs associated with managing the trees (McPherson 2003; Nowak et al. 2010; Soares et al. 2011; Moore 2022). Generally, the larger a tree and the longer it lives, the greater the value of the carbon sequestered and its other environmental services (McPherson 2003; Moore 2022). Many street trees die (often 20% to 40%) within the first 2 to 5 years post-planting, but others die after about 3 decades, just when they reach a size that makes them valuable assets (Roman et al. 2015; Hilbert et al. 2019). *Eucalyptus leucoxylon* street trees are a significant component of the urban forest of the city of greater Melbourne, providing shade, sequestering carbon, reducing the urban heat island effect (UHI), and mitigating the effects of climate change. They need to be managed to maximise both their performance and life spans.

Whether they are excurrent or decurrent as adult trees, young trees tend to be excurrent. Later, decurrent species develop a canopy where the lateral branches outgrow the main leader or trunk and form a more rounded, spreading canopy (Harris et al. 2004). In selecting street trees, the usual aim is for trees that are tall and possess a straight trunk with a dense, spreading canopy above head height. The trees also need to be tolerant of environmental stresses, pests and diseases, urban pollutants, and regular pruning (Ryder and Moore 2013). They need to be neat and tidy so that soil surfaces and infrastructure are unaltered by root systems, and the shedding of flowers, fruits, foliage, and bark is unproblematic.

Tree performance is assessed by how the tree grows within the landscape over time and is often characterised by measures such as growth rate, height increment, canopy spread and density, and measurements of diameter increase. Other components of performance include crown condition and integrity, and tree health, which includes structural integrity and expected longevity (Harris et al. 2004; Day et al. 2009; Day et al. 2010; Gilman et al. 2010; Leers et al. 2018; Núñez-Florez et al. 2019). Consequently, this research was undertaken with 2 primary objectives. The first was to assess the characteristics and performance of *E. leucoxylon* currently growing across the city of greater Melbourne against arboricultural criteria that would provide a measure of their performance and suitability as street trees. The second objective was to use the data obtained to identify variability occurring between individuals and to establish criteria which could assist in selecting superior trees with an appealing urban phenotype for future propagation and planting across the city.

MATERIALS AND METHODS

All 31 municipalities within the city of greater Melbourne were contacted to inquire as to the details of the locations of *E. leucoxylon* plantings within their region. Extensive lists were provided by only 2 of these city councils, but responses from others mentioned a few selected streets with specimens. Initial assessments commenced in Frankston, but sampling single trees in different streets involved too much travel time to be practical, so sampling was based on choosing streets at random where at least 3 to 5 *E. leucoxylon* trees could be assessed (so that a total of 300 trees [n = 300] could be assessed). Suburbs were visited, and locations where there were sufficient trees were identified so that trees could then be selected randomly for assessment. Trees were sampled from a wide range of locations across the city, and the large numbers provided an indication of species performance within the city. Field work was undertaken between the months of April and October (Australian fall, winter, and spring), and it should be noted that under Australian conditions, evergreen species (such as eucalypts) can grow year-round but may have winter and/or summer dormancies depending on the temperatures in winter and the aridity of summer.

In selecting trees for assessment, the following criteria were applied: (1) trees must have a diameter at breast height (DBH at 1.3 m) of at least 10 cm; (2) there must be clear access to the base of the trunk; and (3) access must be available to measure the canopy spread in a north-south and east-west direction. Data were sought on the age of the trees, but the information was not available, and so DBH was used as the basis for selecting trees for assessment. In general, assessed trees were considered to be older than 10 years. Sufficient trees were identified to allow 300 specimens growing across the city to be assessed with the following information and data gathered.

Location, Site, and Soil

Tree position and a detailed description of the tree's location on the street were recorded (Table 1). The street tree environment included road type, soil profile, and compaction and physical constraints that might affect a tree, such as the presence of utility lines and competition from groundcover vegetation and from other trees. Site soil-surface and paving, as well as any root damage to landscape infrastructure, were also noted.

Soil compaction was measured by pushing a 10-mm-diameter, 1-m-long steel spike into the ground within 1 m of the base of the tree trunk, which is a common field assessment technique used by arborists in Australia. Pressure was stopped when resistance was met. This was done at least 3 times, to ensure there was no obstruction to penetration. If measurements differed within the 3 tests, the process was repeated until there were 3 consistent measurements. When pushing the spike into the ground, the resistance of the soil to its insertion was recorded on a 5-point descriptive scale: very soft, soft, medium, firm, and impenetrable.

In many cases, street trees were growing directly under electrical or telecommunication cables, and so the incidence of trees growing under or near service lines and whether tree canopies interfered with cables were recorded (Table 1). The position of street trees in relation to other trees and infrastructure, such as buildings and utility poles, and whether trees made contact by foliage or smaller or larger branches were recorded (Table 1).

Growth Habit and Phenotype

Data were collected to provide a phenotypic description of *E. leucoxylon* trees growing across the city of greater Melbourne (Table 2). Height was measured from soil surface to the highest living canopy point using a Silva® clinometer/heightmeter (Silva, Sandy, UT, USA), and DBH at 1.3 m was recorded. Canopy

Table 1. Phenotypic characteristics, their description, and the category or unit of measurement recorded for each *Eucalyptus leucoxylon* tree assessed.

Characteristic	Description	Categories/units
Position	Location of tree in relation to road	1. Median strip (running down the centre of the road)
		2. Road verge (area between private property and the road)
Road type	Estimation of traffic flow at each location	1. Local traffic (i.e., cul-de-sac, no through roads)
		2. Minor street
		3. Busy road (connector roads)
		4. Highway or freeway (high-traffic flow)
Ground surface	The percentage of vegetative cover directly surrounding tree	1. 0% coverage (bare ground)
		2. 1% to 20% coverage
		3. 21% to 40% coverage
		4. 41% to 60% coverage
		5. 61% to 80% coverage
		6. > 81% coverage
Compaction	Topsoil depth (1 m from tree base)	(mm)
	Soil compaction (independent of depth)	1. Very soft
		2. Soft
		3. Medium
		4. Firm
		5. Impenetrable
Root damage	Damage to surrounding infrastructure that may have been caused by tree roots	1. No damage
		2. Minor lifting of ground
		3. Minor lifting and cracks to infrastructure
		4. Major cracks and severe damage
Utility lines	Is the tree planted below power lines?	Yes/no
	Is there any interaction between utility lines and tree canopy?	Yes/no
Competition	Is there any competition between the tree and any surrounding object? If there is any direct competition, what is the tree interacting with?	Yes/no
		1. Another tree (canopy)
		2. Another tree (branches)
		3. Building
		4. Power pole
		5. Other
Soil profile	Is there any change in the soil profile around the base of the tree? (Excavation or fill)	1. No
		2. Ground surface is slightly raised
		3. Ground surface raised significantly
		4. Minor excavation
		5. Major excavation

Table 2. Phenotypic characteristics relating to tree size, canopy, trunk, branching, and flower colour, their descriptions, and the category or unit of measurement recorded for each *Eucalyptus leucoxylon* tree assessed. DBH (diameter at breast height).

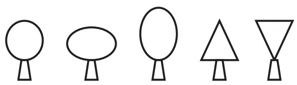
Characteristic	Description	Categories/units
Tree height	Using a Silva® clinometer (Silva, Sandy, UT, USA), the top of the tree was sighted from a predetermined distance (usually 20 m) and the correlating angle recorded. Observer height and ground slope were accommodated.	(m)
DBH	Measured at 1.3 m	(mm)
Canopy spread	Average of canopy spread in a north-south and east-west direction	(m)
Canopy density	Estimated by looking from below through the canopy	1. < 20%
		2. 21% to 40%
		3. 41% to 60%
		4. 61% to 80%
		5. > 81%
Canopy shape	Canopy shape 	1. Rounded
		2. Broadly round
		3. Oval
		4. Pyramidal
		5. Vase
Evenness	Estimated for both canopy (density evenness) and branches (radial evenness)	1. Even
		2. Minor unevenness
		3. Severely uneven
Number of main branches	Number of branches holding the majority of the canopy	1. One branch (single stem)
		2. 2 branches
		3. 3 branches
		4. 4 branches
		5. 5 + branches
Dominant leader	Does the tree have a dominant leader?	Yes/no
Main branch position	The height to the first main (lower order) branch, including missing branches. Can be measured either manually or with a clinometer.	(m)
Flower colour	Flower colour was described using the known flower colours for *E. leucoxylon*.	1. Red
		2. Dark pink
		3. Light pink
		4. Orange
		5. Yellow
		6. White
		7. Bicolour
Trunk taper	The taper as a ratio between the DBH at 1.3 m and the base of the trunk	DBH:diameter at base
Trunk straightness	The amount of twisting and kinks present in the main trunk	1. Very straight
		2. Reasonably straight
		3. Bark twisted, moderately straight
		4. Trunk moderately kinked and twisted
		5. Trunk severely kinked and twisted

Table 2. Continued.

Characteristic	Description	Categories/units
Trunk lean	Categories are independent of trunk straightness.	1. No lean
		2. Minor lean
		3. Major lean
		4. Extreme lean
Live crown ratio	When observing the full tree profile, the proportion of height which has live crown is deemed the live crown ratio.	1. < 20%
		2. 21% to 40%
		3. 41% to 60%
		4. 61% to 80%
		5. > 81%

spread was measured across the drip line along north-south and east-west axes, and the mean of the 2 values was used as the measure of spread. Data on height, stem diameter, and canopy spread were tested for normality using the Anderson Darling normality test. When $P < 0.05$, the data distribution failed the assumption of normality.

Canopy density was estimated by looking through the canopy from under the tree using a 5-point scale to categorise foliage density: < 20%, 21% to 40%, 41% to 60%, 61% to 80%, and > 81% (Table 2). This technique is used widely in canopy density measurement and is related to the measure of projected foliage cover that is widely used in botany and forestry, which use similar scales. Like most eucalypts, *E. leucoxylon* is decurrent with major second- or third-order branches forming the crown. General canopy habit was described using small images to ensure consistency, along with 5 descriptors: rounded, broadly round, oval, pyramidal, or vase shaped (Table 2). Whether or not the tree had a single dominant leader as well as the number of lower-order major lateral branches forming the crown were recorded. The height to the first branch from the ground was measured.

Flower colour was described using the known existing flower colours for *E. leucoxylon*, but an added category of bicolour was added to accommodate a specimen discovered during the assessment process (Table 2). Because pale yellow and white flowers were too difficult to distinguish, these categories were combined for final analysis. Trunk taper was determined by comparing the difference between the DBH and the stem diameter at ground level as a ratio (DBH:trunk diameter at ground level). The trunks of trees were assessed for their straightness and whether they tended to lean. Lean was determined by the deviation of the trunk from the vertical, and straightness of the trunk was determined by whether there were bends or twists in the trunk from ground level to the major lower-order branch scaffolds.

Canopy spread relative to the height of a tree is important in the impact that a tree has as part of an urban landscape. Accordingly, the live crown was measured as a proportion of the height of the tree measured to the highest living point in the canopy. The resulting live crown ratio indicated how much of the tree's height was occupied by its canopy.

Tree Health and Condition

Trees were surveyed to determine whether there were health or physical problems associated with their trunks (Table 3). The presence of decay was assessed in 298 of the 300 trees in an attempt to determine whether *E. leucoxylon* was susceptible to attack by decay causing organisms. In eucalypts, when damage occurs to a tree, a common response is the production of exudates called kinos that include resins (terpene based) and gums (carbohydrate based), so trunks and lower branches were assessed for the presence of resins and other exudates. The presence of fungal fruiting bodies which may indicate the presence of disease or decay in a tree was also noted.

The level of human-caused damage to tree trunks, such as evidence of vandalism, poor pruning, damage from line trimmers, vehicle damage, or wounds from ropes and cables was recorded. The loss of a leader or major lower-order branches was assessed, and the possible causes of the loss were recorded (Table 3).

Table 3. Trunk characteristics such as decay, presence of exudates, fungal activity, and vandalism, their descriptions, and the category or unit of measurement recorded for each *Eucalyptus leucoxylon* tree assessed.

Characteristic	Description	Categories/units
Decay	Any area of the trunk that appeared to be decayed	1. No decay detected
		2. Minor areas of decay
		3. Significant areas of decay
Exudates	Exudates or resin present	Yes/no
Fungal bodies or cavities	Present or absent	Yes/no
Vandalism	Damage caused by human interference	1. No damage detected
		2. Suspected damage from mower
		3. Damage from support structure
		4. Suspected vehicle damage
		5. Graffiti
		6. Other human interaction
Loss of codominant leader	Was there a codominant leader that is missing?	1. No. A codominant leader is not present, or if present, it is not missing.
		2. Yes. The codominant leader is missing.
	Possible reason for missing codominant leader	1. Codominant leader is dying
		2. Codominant leader is dead
		3. Codominant leader is missing (dead)
		4. Codominant leader is missing (pruned)
Epicormic shoots	Are there any lignotuberous or epicormic shoots on the lower branches or base of the trunk?	Yes/no

Given that most trees had a clear trunk which was designated as the primary structure (order 1), other branches were ordered from the trunk to the extremities of the canopy. Missing codominant leaders could be identified and distinguished from large lower-order branches (such as order 2 to 6 branches) by their size, the angle of the stub (if remaining), and their position. As a stress, damage, or wounding response, nearly all eucalypts produce epicormic shoots, and so the occurrence of epicormic shoots was recorded (Table 3).

To assess the condition of the main lower-order branching scaffold, the number of missing branches and the presence of decay as a response to branch loss or pruning were recorded (Table 4). The numbers of missing branches within 3 diameter classes (< 10 cm, 10 to 20 cm, and > 20 cm) were counted. Any pruning of the trees was noted, as was damage to the tree from pruning. The proportion of smaller branches and twigs within the canopy that were dead or dying, and the percentage of foliage that was either dead or unhealthy, were recorded along with suspected cause (Table 5). The proportion of new growth, which was clear as a new flush of growth with juvenile foliage characteristics and rapid shoot tip extension, was also estimated for each tree.

A limited assessment of the roots of *E. leucoxylon* trees was made but was confined to those roots that could be seen above ground within the drip line (Table 6). The number and diameter of roots that were exposed on the soil surface were recorded. At each site, observations were made of any damage caused by root systems to the infrastructure, such as cracking or lifting of footpath paving and roadside curbing. As trees mature, the soil surface in the vicinity of the root crown is often raised as soil is displaced upwards by expanding root volume. The raising or lifting of the soil surface around the trunk was noted, as it may contribute to infrastructure damage or maintenance issues (such as pedestrian tripping hazards or trimming of turf or undergrowth below the tree).

Table 4. Branching scaffold characteristics such as decay, presence of exudates, fungal activity, branch loss, pruning, and wounds, their descriptions, and the category or unit of measurement recorded for each *Eucalyptus leucoxylon* tree assessed.

<table>
<tr><th>Characteristic</th><th>Description</th><th>Categories/units</th></tr>
<tr><td rowspan="3">Decay</td><td rowspan="3">Does any area of the main branching scaffold appear to be decayed?</td><td>1. No decay detected</td></tr>
<tr><td>2. Minor areas of decay</td></tr>
<tr><td>3. Significant areas of decay</td></tr>
<tr><td>Exudates</td><td>Exudate or resin present?</td><td>Yes/no</td></tr>
<tr><td>Fungal fruiting bodies or cavities</td><td>Present?</td><td>Yes/no</td></tr>
<tr><td rowspan="4">Branch loss</td><td rowspan="4">The number of missing branches within 3 diameter classes (greater than 20 cm, 10 to 20 cm, and less than 10 cm)</td><td>1. No branches removed</td></tr>
<tr><td>2. 1 to 5 branches</td></tr>
<tr><td>3. 6 to 10 branches</td></tr>
<tr><td>4. Greater than 10 branches</td></tr>
<tr><td rowspan="3">Pruning</td><td rowspan="3">Was apparent pruning carried out on the observed tree?</td><td>1. No pruning apparent</td></tr>
<tr><td>2. Minor pruning (foliage and smaller branches)</td></tr>
<tr><td>3. Heavy pruning (large limbs or large portion of canopy)</td></tr>
<tr><td rowspan="4">Wound repair</td><td rowspan="4">Damage to the tree suspected to have occurred in response to pruning</td><td>1. Not applicable—no pruning evident</td></tr>
<tr><td>2. Excellent—no problems detected</td></tr>
<tr><td>3. Good—some problems, may be due to pruning</td></tr>
<tr><td>4. Poor—exudates are present, and the timber appears to be decaying</td></tr>
</table>

RESULTS

Location, Site, and Soil

A summary of the locations of the 300 trees surveyed across the city of greater Melbourne during winter is presented in Figure 1. Trees ranged in height from 4.3 to 26.5 m, with DBH ranging from 10 to 105 cm. Of the 300 trees surveyed, 99% (297) were situated on road verges, with the majority of trees positioned between the footpath and the road. The remaining 3 trees were located in the median strip down the centre of a road. Of the trees surveyed, 2% (6) grew on no-through roads, while 1.3% (4) grew on major roads and 96.7% (290) of the trees were located on residential streets. Some trees were excluded from parts of the assessment because of the danger of collecting data on roads. The majority of trees were growing in a roadside nature strip verge, and only one tree was surrounded by an impervious surface with an exposed area of soil around its base of 1.0 m × 0.8 m, enclosed by an asphalt footpath. For trees growing in a grassed verge, 36% (108) had a grass cover under them of > 81% (Figure 2).

The depth to which the 10-mm-diameter, 1-m-long steel spike could be inserted into the soil surrounding trees varied from 20 to 400 mm (Figure 3). Soils in which the spike could not be inserted more than 20 mm were recorded as being impenetrable. The 5-point scale used to describe the penetrative resistance of soil showed that 73% (221) of trees were growing in soil that was classified as either medium or firm (Table 7). Another 24% (74) of trees grew in soft and very soft soil, and < 2% (5) grew in impenetrable soil. Of the 300 trees, 77.3% (232) were growing in a level soil surface, and 20.7% (62) had slightly raised the site soil-surface level. The soil level was considerably raised by 1.3% (4) of trees, and 0.7% (2) had minor excavation work executed around the trunk during footpath repair.

In relation to root damage to infrastructure, of the 285 trees that could be safely observed, 98.2% (280) showed no evidence of soil lifting or infrastructure damage caused by roots. The remaining 1.8% (5) of trees had caused minor lifting of the ground, with 0.7% (2) of these causing cracks to surrounding

Table 5. Characteristics related to the proportion of dead or dying branches, abnormal foliage, and occurrence of new growth for small branches, twigs, and foliage, their descriptions, and the category or unit of measurement recorded for each *Eucalyptus leucoxylon* tree assessed.

Characteristic	Description	Categories/units
Dead or dying branches or twigs	Proportion of the branches and twigs within the canopy that are dead or dying	1. No death evident
		2. < 20%
		3. 21% to 40%
		4. 41% to 60%
		5. 61% to 80%
		6. > 81%
Abnormal foliage	Percentage of foliage that does not appear normal in appearance, including abnormal colour or form	1. Foliage appears normal
		2. < 20%
		3. 21% to 40%
		4. 41% to 60%
		5. 61% to 80%
		6. > 81%
	Suspected reason	1. Leaves are dead or dying
		2. Leaves are an unnatural colour
		3. Leaves have evidence of insect damage or disfigurement
New growth	Visual assessment of the amount of new growth	1. Significant amounts of new growth
		2. Some new growth evident
		3. No new growth evident
	Distribution	1. New growth is evenly distributed
		2. New growth is distributed evenly in most of the canopy
		3. There is an uneven distribution of new growth throughout the canopy
		4. New growth is very uneven and localised

Table 6. Exposed roots, their description, and the category or unit of measurement recorded for each *Eucalyptus leucoxylon* tree assessed.

Characteristic	Description	Categories/units
Root exposure	The base of the tree and surrounding soil were observed for exposed roots.	1. Roots exposed and girdling
		2. Major roots (≥ 10 cm) exposed
		3. Minor roots (< 10 cm) exposed
		4. It is suspected that the ground surface had been raised due to the roots

infrastructure. In relation to utility services, 43.7% (131) of 300 trees had been planted either directly under cables or in a position where canopy interference was likely. The remaining 56.3% (169) of 300 trees were located far enough from services that interference was unlikely. Of the 131 trees that were planted close to power lines, 83 (63.4%) were causing interference, usually by means of foliage coming into contact with the cable. In one instance a major branch (> 10 cm) was contacting the cable. Of the 300 trees assessed, 27.7% (83) were interfering with utility cables.

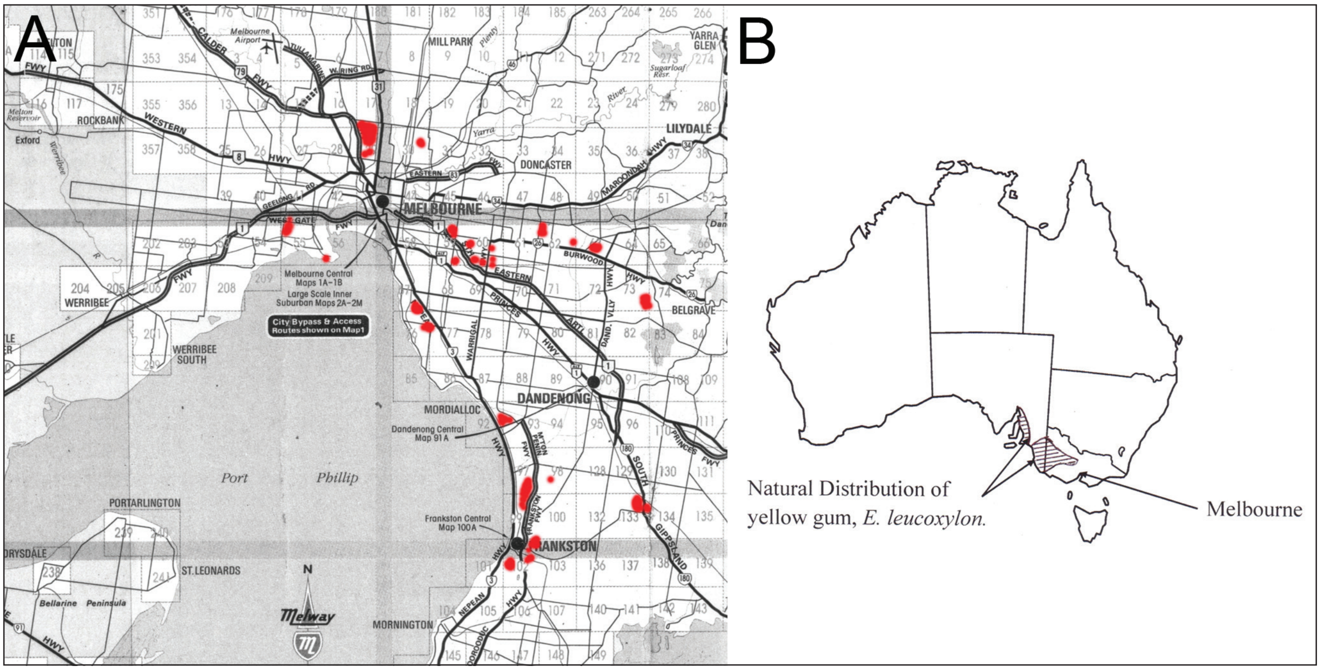


Figure 1. (A) Distribution of *E. leucoxylon* trees assessed across the greater city of Melbourne, Victoria, Australia. Red areas indicate tree location, with dot size approximating the number of trees assessed in each location. The area of this map is approximately 80 × 80 km or 50 × 50 m (*Melways* 2001). The inset map (B) shows the location of Melbourne within Australia, and the shaded area is the natural distribution of *E. leucoxylon*.

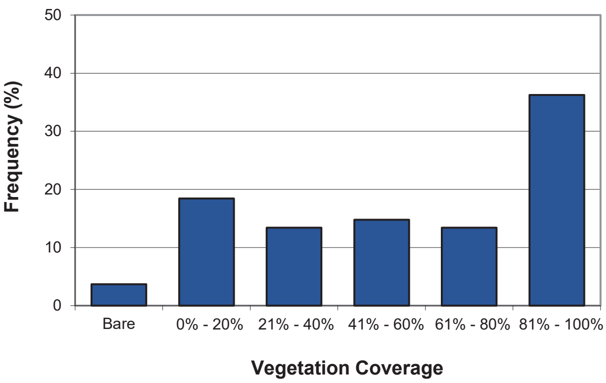


Figure 2. Frequency of vegetation coverage (%) growing below the drip line of *E. leucoxylon* trees (n = 300).

Table 7. Occurrence of different levels of compacted soil (determined by the depth to which a 10-mm-diameter, 1-m-long steel spike could be inserted into the soil) surrounding each *Eucalyptus leucoxylon* tree (n = 300).

Soil compaction	Number of trees	Frequency (%)
Impenetrable	5	1.7
Firm	123	41.0
Medium	98	32.7
Soft	40	13.3
Very soft	34	11.3

Of a total of 283 trees observed for close contact with other trees, buildings, or infrastructure, 6.4% (18) were standalone trees with no interference. Of the remaining 265 trees, 76.2% (202) had foliage or small canopy branches contacting another tree, 21.5% (57) interacted with the larger branches of another tree, and 2.1% (6) contacted a building.

Growth Habit and Phenotype

The DBH of 53% (159) of trees was between 20 and 40 cm in diameter (Figure 4A). The heights of 68% (204) of trees were between 5.5 and 10.9 m, with only 4% (12) of trees less than 5.5 m tall (Figure 4B). While the ranges of both stem diameter and height approximated a normal distribution, they did not conform to a normal distribution according to the Anderson Darling normality test ($P < 0.05$). A scatter graph (Figure 5) showed the correlation between the diameter and height of the assessed trees: height increased as DBH increased.

Canopy spread ranged from 3.5 to 20.5 m (Figure 6), with 9% (27) of trees under 5 m and only one tree above 20 m in spread, the majority of trees being between 5 and 11 m. However, only 56% (168) of trees had clear canopy access to both north-south and

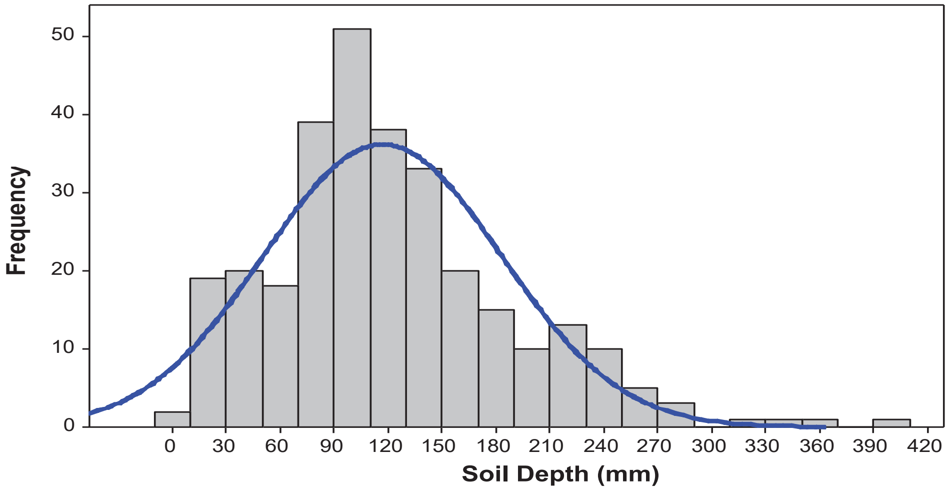


Figure 3. Frequency of soil depth (mm) under surveyed *E. leucoxylon* trees determined by the depth to which a 10-mm-diameter, 1-m-long steel spike could be inserted into the soil. The data distribution failed the assumption of normality, $P < 0.05$ Anderson Darling test ($n = 300$).

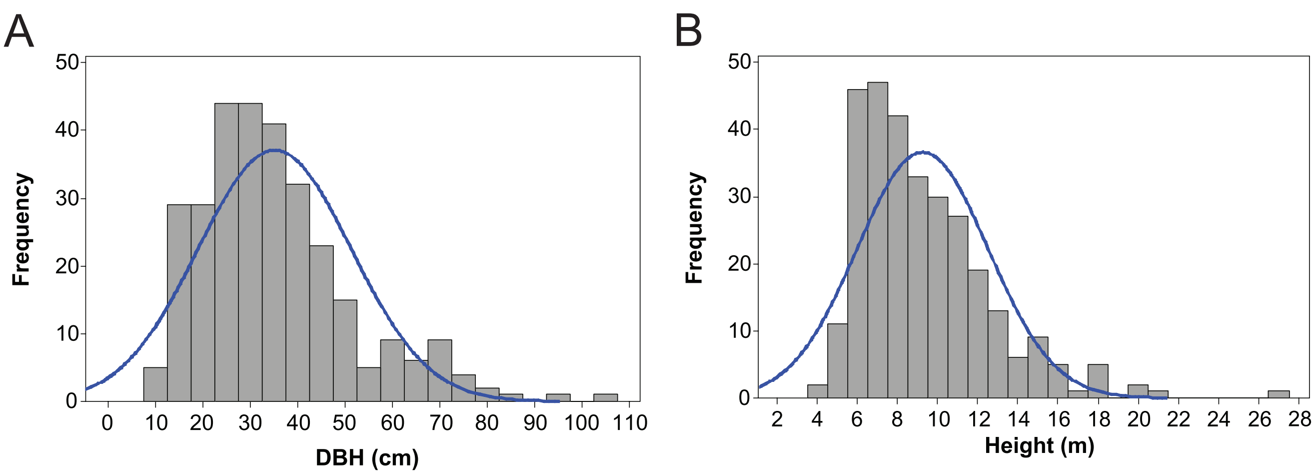


Figure 4. Frequencies of (A) diameter at breast height (DBH)(cm) and (B) height (m) of *E. leucoxylon* trees. The data distributions failed the assumption of normality, $P < 0.05$ Anderson Darling test ($n = 300$).

east-west directions. Canopy spread data did not follow a normal distribution according to the Anderson Darling normality test ($P < 0.05$). Scatter plots comparing the mean canopy spread with height and DBH (Figure 7) showed a stronger correlation between the DBH ($R^2 = 0.70$) and canopy spread than with height ($R^2 = 0.65$), but neither were significant ($P > 0.05$).

Most trees had a high canopy density, with 30% (90) having an estimated density of > 80%, closely followed by 28% (84) with 61% to 80% density (Figure 8A). Few trees had a sparse canopy, with only 20% (60) having less than 40% foliage density. Most of the trees, 75% (225), had a rounded canopy habit, and

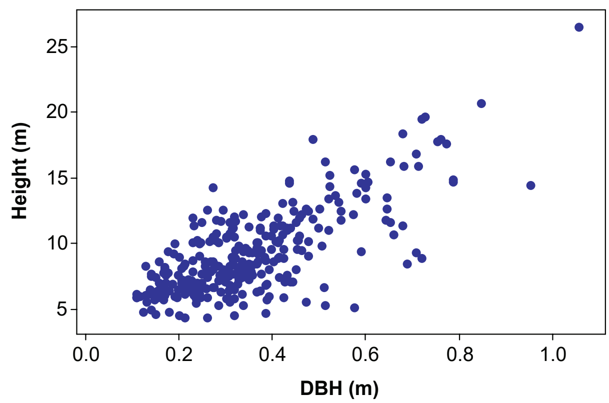


Figure 5. Correlation between diameter at breast height (DBH) (m) and height (m)($R^2 = 0.55$) of *E. leucoxylon* trees ($n = 300$).

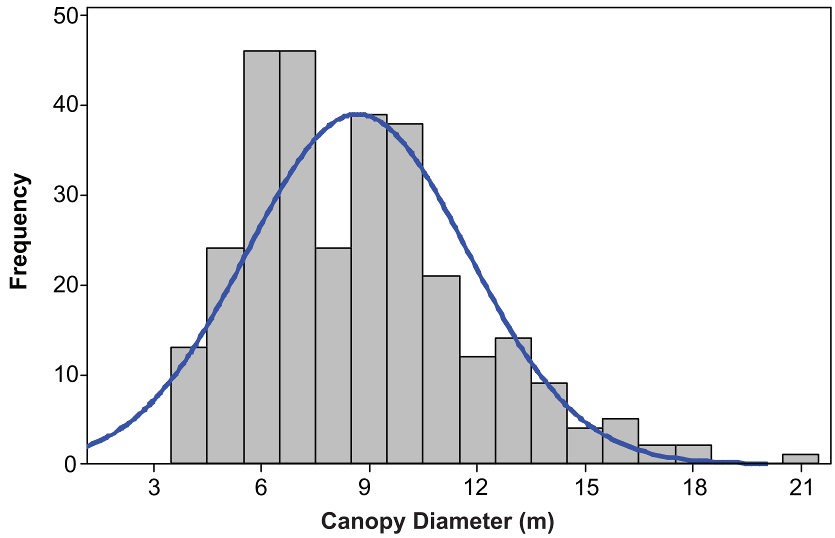


Figure 6. Frequency distribution of canopy diameter (m) of *E. leucoxylon* trees. The data distribution failed the assumption of normality, $P < 0.05$ Anderson Darling test ($n = 300$).

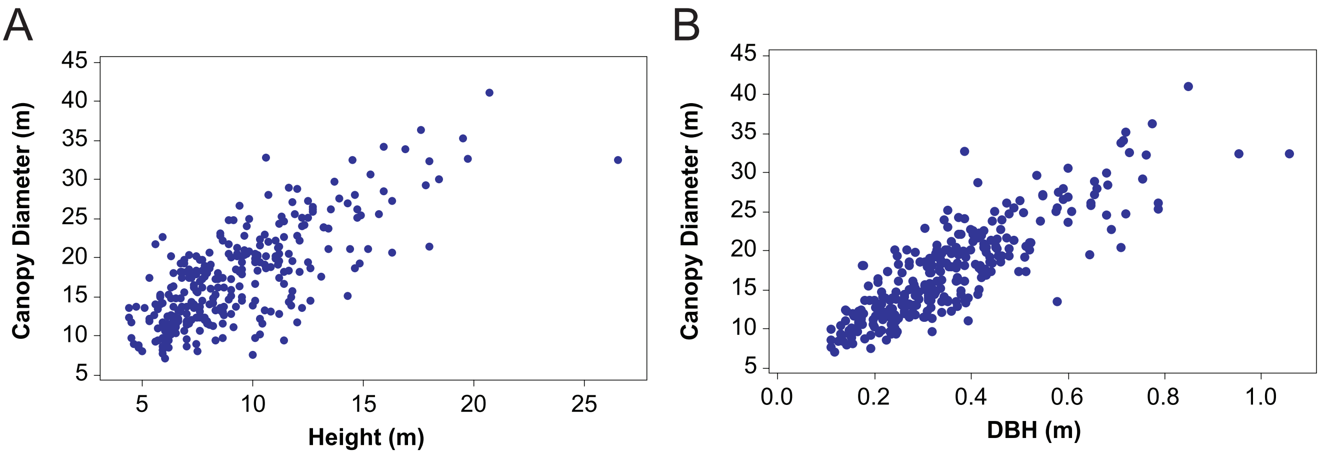


Figure 7. Scatter plots comparing (A) tree height (m)($R^2 = 0.65$) and (B) stem diameter at breast height (DBH)(m)($R^2 = 0.70$) with mean canopy diameter (m) of *E. leucoxylon* trees ($n = 300$).

only 4% (12) had a vase or pyramidal shape (Figure 8B). Observations on the evenness of the canopy and radial distribution of branches found that about 80% (240) of trees had a canopy and branches that were evenly distributed or were slightly uneven (Table 8). Of the 48% of trees (144) with an even canopy distribution, 77% (111) had even branching, and conversely, for the 22.3% of trees (67) with an uneven canopy distribution, 83.6% (56) had uneven branching.

Eucalyptus leucoxylon tends to be a multi-trunked and, less often, a single-stemmed tree (Figure 9). Differences existed in the number of lower-order lateral branches that held the majority of the canopy, varying from one (single-stemmed tree) to 8 (multi-branched, decurrent tree). The most common occurrence was a canopy composed of between 2 and 4 lower-order lateral branches in 77% (231) of trees (Figure 10). Of the trees surveyed, only 22.6% (68) had a leader that could be described as dominant. The remaining 77.4% (232) of trees had an even canopy habit where growth was shared between several large, lower-order branches (Figure 11). The height above ground to the first branch ranged from 0 to 5.4 m (Figure 12), including pruned trees. Branching occurred at the base of the tree (within 1 m of surface level) in only 3.7% (11) of trees, while 80% (240) of trees

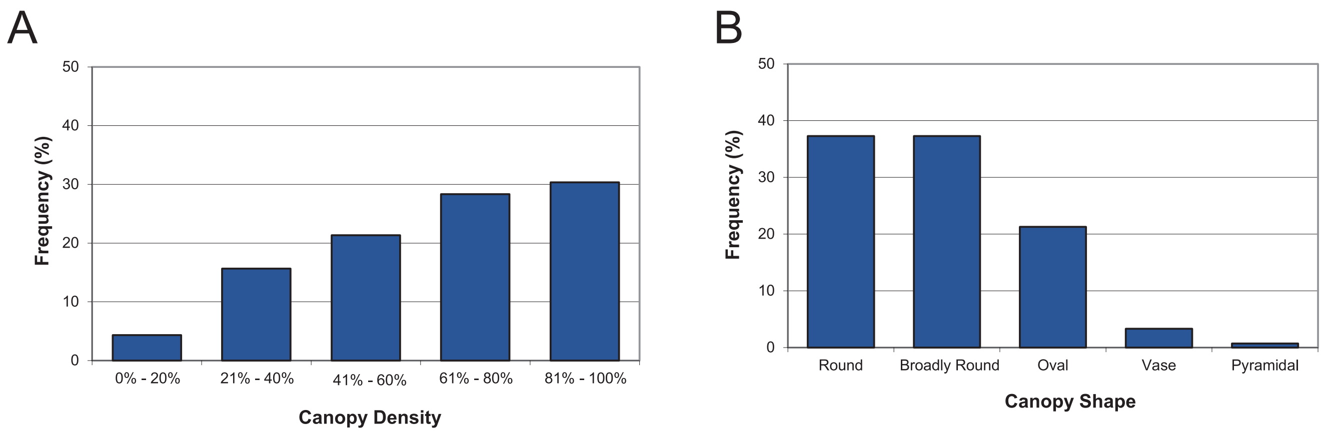


Figure 8. Frequency (%) of canopy density (A) and canopy shape (B) of assessed *E. leucoxylon* trees (*n* = 300).

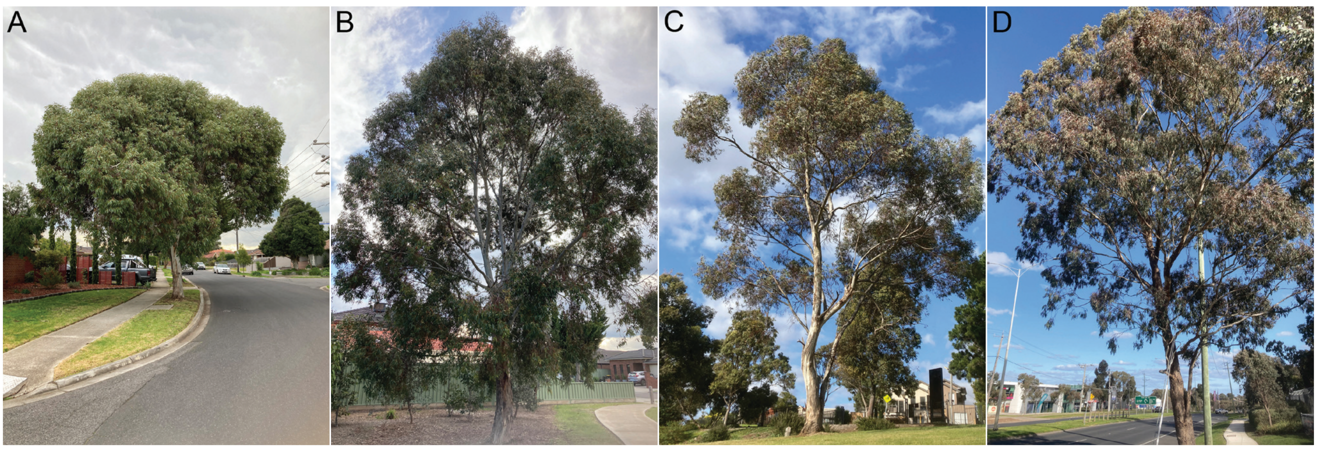


Figure 9. The form of some typical *E. leucoxylon* trees growing as street trees across the greater city of Melbourne. Figure (A) demonstrates the dense rounded canopy; (B) a more open and rounded canopy composed of multiple lower-order large branches; (C) a taller, more upright, straight, single-stemmed tree; and (D) a tree encroaching upon, but not touching, power lines. The utility poles shown are 6 to 7 m high.

branched between 1 and 3 m. The majority of trees (68% [204]) branched below the canopy line, with the remaining 32% (96) branching within the canopy.

During assessments, 81% (243) of trees were in flower, and 5 different flower colours were observed (Table 9). There appeared to be little difference between white and yellow flowers. The most common colours accounting for 83% of trees were white/yellow and dark pink, which was distinct from red, followed by light pink (Figure 13). Only one tree was observed with bicoloured flowers, where the stamens were cream at the base, tending towards pink at the tips.

Trunk taper was determined by comparing the difference (or ratio) between DBH and the stem diameter at ground level. Of 300 trees assessed, 90.3% (271) had a base stem diameter that was either equal to or larger than DBH. The mean DBH for all trees was 35.21 ± 0.93 cm, with a diameter at base of 41.79 ± 1.02 cm. For 35% (105) of the trees, trunks were assessed as being straight, and 32.3% (97) had little or no lean. Another 47.7% (143) of trees had reasonably straight trunks, and 47.3% (142) had a minor lean (Table 10). Of the 300 trees, 17.3% (52) had excellent stem form, being both straight and without any lean. There was

Table 8. Distribution of the canopy and branches; number of branches; live crown ratio; response to pruning; and presence of girdling, surface, and exposed roots and raising of soil of *Eucalyptus leucoxylon* trees (*n* = 300).

	Number of trees	Frequency (%)
Evenness category	**Canopy**	
Even	144	48.0
Minor unevenness	89	29.7
Severely uneven	67	22.3
Evenness category	**Branches**	
Even	111	37.0
Minor unevenness	133	44.3
Severely uneven	56	18.7
Number of branches lost with diameter < 10 cm		
0	14	4.7
1–5	142	47.3
6–10	148	49.3
11–15	4	1.3
16–20	5	1.7
> 21	1	0.3
Live crown ratio		
< 20	0	0
21–40	22	7.4
41–60	183	61.2
61–80	55	18.4
> 81	39	13.0
Response to pruning		
No pruning evident	25	8.3
Excellent	129	43.0
Good	99	33.0
Poor	47	15.7
Roots and soil assessment		
Surface roots	75	25.0
Girdling roots	2	0.7
Exposed roots	48	16.0
Raised soil	25	8.3

Figure 10. Examples of *E. leucoxylon* trees with a variable number of main branches. (A) Single stem; (B) 2 main branches; and (C) 5 main branches.

only one tree with an extreme lean and a severely twisted trunk. The majority of trees exhibited a minor lean and a reasonably straight form. For 61% (183) of trees, the live crown ratio was between 41 and 60. The live crown ratio for 13% (39) of trees was 81 to 100, indicating a canopy that was close to ground level, and there were no trees where the canopy was held in the top 20% of the tree (Table 8; Figure 14).

Tree Health and Condition

Health and general plant condition were assessed in 298 trees, with no decay evident in 46.6% (139), but minor decay was detected in 53.4% (159) of trees, and 11.4% (34) showed significant levels of decay (Table 11). Exudates such as resin and gum were observed on the trunks of 55% (164) of trees, while fungal fruiting bodies were found on only 1% (3)(Table 11).

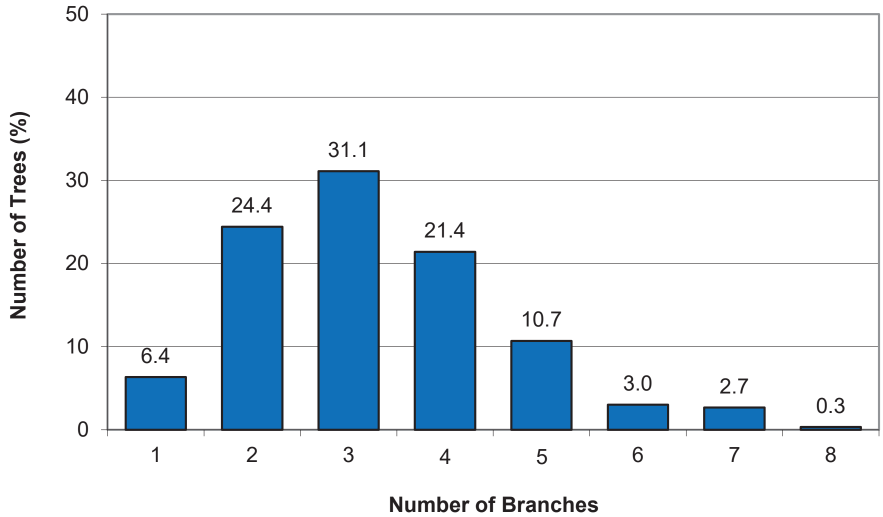


Figure 11. The number of trees (%) with different numbers of lower-order branches making up the canopy of *E. leucoxylon* trees (n = 300).

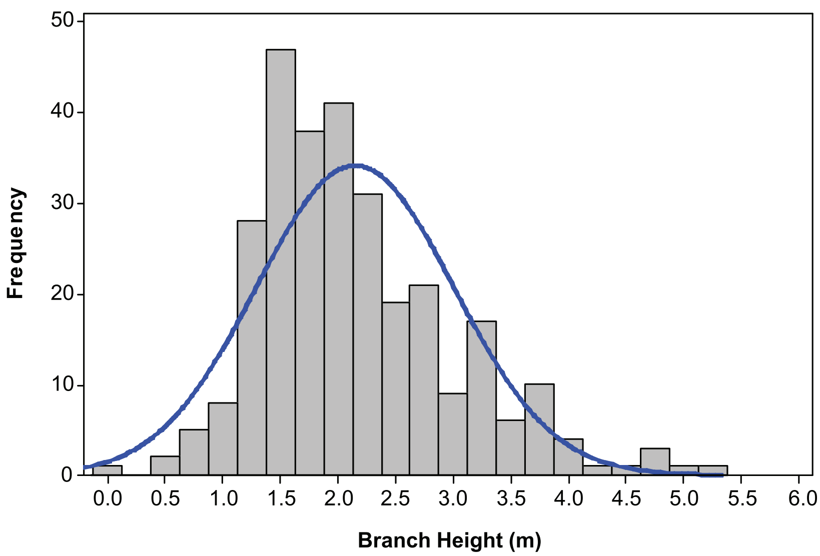


Figure 12. Frequency of the distribution of height (m) to first branch in assessed *E. leucoxylon* trees. The data distribution failed the assumption of normality, $P < 0.05$ Anderson Darling test (n = 300).

Table 9. Proportions of the different flower colours observed from April until October (autumn, winter, and spring) in *Eucalyptus leucoxylon* trees (n = 243).

Flower colour	Number of trees	Frequency (%)
Dark pink	124	51.0
White/yellow	78	32.1
Light pink	22	9.1
Red	18	7.4
Bicolour	1	0.4

Figure 13. The most frequent flower colours observed in *E. leucoxylon* trees. (A) Dark pink; (B) white/yellow; (C) light pink; and (D) red.

Figure 14. Examples of live crown ratios for *E. leucoxylon* trees growing across the greater city of Melbourne. (A) 81 to 100; (B) 61 to 80; and (C) 41 to 60.

Table 10. Trunk characteristics described by lean and straightness of *Eucalyptus leucoxylon* trees (*n* = 300).

Trunk lean	**Number of trees**	**Frequency (%)**
No lean	97	32.3
Minor lean	142	47.3
Major lean	56	18.7
Extreme lean	5	1.7
Trunk straightness		
Very straight	105	35.0
Reasonably straight	143	47.7
Bark twisted, moderately straight	33	11.0
Trunk moderately kinked and twisted	14	4.7
Trunk severely kinked and twisted	5	1.7

Only 5% (15) of trees showed evidence of human-inflicted damage. Where there was grass coverage, damage to the base of the trunk appeared to be caused by lawn mowers or line trimmers. One tree had been hit by a car, and in a few cases, ropes and cables had become embedded in trunks or branches. Another tree had been spray-painted (vandalism), and a few trees had nails embedded in their trunks, probably from attachment of temporary signage.

From this assessment, 23% (69) of trees had one of their lower-order branch scaffolds missing, mainly from pruning, but in 3% (9), branches had died, and for another 3.3% (10), the method of loss was unclear. *Eucalyptus leucoxylon* can be multi-trunked, which may cause problems when trees are located in public areas such as streets, especially if branching occurs lower down the stem and obstructs visibility for either pedestrians or vehicles. Epicormic shoots were observed on 7.3% (22) of trees, and of these, 63.6% (14) exhibited some level of decay. There also appeared to be a correlation between the presence of epicormic shoots and resin, with 11 trees (50%) exhibiting both. The loss of a leader or major branch correlated with epicormic shoot production in 36.4% (8) of trees. The amount of decay and exudates present in the branches was lower than in the main stem. Of the 300 trees,

Table 11. Health and condition of small branches, twigs, and foliage described by the number of dead or dying branches and the presence of abnormal foliage of *Eucalyptus leucoxylon* (*n* = 298).

Dead or dying branches and/or twigs	Number of trees	Frequency (%)
1. No death evident	22	7.3
2. 0% to 20%	205	68.3
3. 21% to 40%	66	22.0
4. 41% to 60%	3	1.0
5. 61% to 80%	1	0.3
6. 81% to 100%	2	0.7
Abnormal foliage		
1. Appears normal	280	93.3
2. 0% to 20%	8	2.7
3. 21% to 40%	5	1.7
4. 41% to 60%	0	0.0
5. 61% to 80%	1	0.3
6. 81% to 100%	6	2.0
Presence of decay and exudates		
1. No decay detected	139	46.6
2. Minor areas of decay	159	53.4
3. Significant areas of decay	34	11.4
4. Exudates or resin present	164	55.0
5. Fungal fruiting bodies or cavities present	3	1.0

decay was found in 37.3% (112), with 5.7% (17) having areas of significant decay. Of the 112, 25.9% (29) of trees were exuding resin from main branches.

Branches can be lost due to storms, poor health, or pruning. Missing lower branches were identified from post-pruning stubs or broken remains, and 22.7% (68) of trees had lost a branch greater than 20 cm in diameter. Of these 68 trees, 69.1% (47) had only one 20-cm or greater branch missing, and 19.1% (13) had 2 branches greater than 20 cm missing, while 11.8% (8) had 3 or more branches missing. Branches estimated to be between 10 and 20 cm in size were identified as missing in 47% (141) of all trees, and 41.8% (59) of these had just one branch of this size missing; 27.7% (39) of trees had 2 missing; and 30.5% (43) had 3 or more missing branches. Branches in the smallest size category, less than 10-cm diameter, were identified as being lost in 95.3% (286) of all trees (Table 8).

While 34.3% (103) of trees did not appear to have been maintained, 49% (147) had evidence of pruning of small branches, and 16.7% (50) had large limbs pruned, usually due to the presence of power lines. The response of trees to pruning was noted (Table 8), and most trees appeared to respond well, with 228 of the 275 trees pruned (82.9%) having excellent to good responses and producing epicormic shoots. The general condition of the canopy for each tree was assessed (Table 11), and 93.3% (280) of trees had normal, healthy foliage, with 75% (225) of trees demonstrating minor problems related to dead or dying branches or foliage. Of the 6.7% (20) of trees with serious health problems, 0.7% (2) had dead or dying leaves, 3.3% (10) showed evidence of serious insect damage, and 2.7% (8) had foliage of abnormal colour. Of these 8 trees, 75% (6) had greater than 80% abnormal foliage, almost certainly due to viral infection, and 50% (4) of these also had serious insect damage.

Trees were assessed for new growth between May and September. New growth was observed on 43% (129) of trees, and of these, 26.4% (34) had significant new growth. A majority of trees had some new growth in all months assessed, but there was considerably less new growth in August, which is in the Australian winter (starting on 1 June and concluding on 31 August). There was a lower proportion of trees that had heavy new growth in August than in other months (Table 12). In assessing the distribution of new growth across the canopy, 53.5% (69) of trees had new growth evenly through the canopy, 38.8% (50) had unevenly distributed new growth, and for the remaining 7.8% (10), growth was localised to epicormic shoot responses to damage.

Trees were assessed to determine whether tree roots were exposed or whether there was movement of the surface caused by the roots (Table 8). Of the 300 trees, 25% (75) were identified as having a surface impact from the roots. Girdling roots were found on 2 (0.7%) of trees, and both had a DBH greater than 40 cm. The soil surface around the base of 8.3% (25) of trees was raised, possibly due to roots. Exposed roots were evident on 16% (48) of trees, 7.7% (23) had roots that were greater in diameter than 10 cm, and 8.3% (25) had roots that were less than 10 cm in diameter.

Table 12. New growth (%) observed from May until September (Australian fall, winter, and spring) of *Eucalyptus leucoxylon* (*n* = 129).

Amount of new growth	May (*n* = 67)	June (*n* = 76)	July (*n* = 18)	Aug (*n* = 24)	Sept (*n* = 14)
None	1.5	8.0	5.6	41.7	7.1
Minor	29.9	29.0	44.4	35.3	64.3
Heavy	68.7	63.1	50.0	16.7	28.6

DISCUSSION

Eucalyptus leucoxylon as a street tree is widespread throughout the city of greater Melbourne (Frank et al. 2006) and in some suburbs was a major contributor to the landscape. Trees were most commonly found on road verges or medium strips where they had been planted as street trees and where they tolerated varying degrees of soil compaction and grass as the main groundcover. Trees were growing along traffic corridors, which may indicate that they are tolerant to environmental pollution. While this research focused on the performance of *E. leucoxylon* in the region of the city of greater Melbourne, the species' wider distribution across south-eastern Australia where climatic conditions are warmer and drier would suggest that *E. leucoxylon* may be capable of coping with predicted climate changes for this part of Australia (Nicolle 2006; Kendal et al. 2012; Esperon-Rodriguez et al. 2019).

The dense canopies of *E. leucoxylon*, where nearly 60% of observed trees had a canopy density greater than 61% and generally high crown ratios (with 92% of trees with a ratio above 41), indicate that the trees provide valuable shade in a compact canopy, which can reduce the UHI effect and enhance the species' role in the city's capacity to respond to a warming climate (Sanusi et al. 2017; Helletsgruber et al. 2020; Speak et al. 2020). This assessment also found that *E. leucoxylon* was an attractive tree, and that 78% of trees had a spreading, rounded canopy that is formed by a number of lower-order branches. These main branches typically occurred between 1 and 3 m above the ground, and combined with a high canopy density, provided good shade year-round. The majority of the trees surveyed were between 4 and 20 m in height, up to a maximum of 26.5 m, with a DBH between 10 and 106 cm and a canopy spread of up to 21 m. There was a stronger relationship between canopy spread and DBH than with height, supporting the use of DBH as a practical measure of tree size.

Typical of most eucalypts, the *E. leucoxylon* trees showed a very strong epicormic shoot response to pruning and branch loss, with 83% of pruned trees initiating epicormic growth (Moore 2021a). The species can also rapidly regenerate from lignotuberous shoots after major trunk damage (Moore 2015), which not only allows a rapid renewal of the canopy and restoration of foliage density, but also demonstrates an ongoing capacity for carbon sequestration. While most of the trees assessed were mature specimens, none were considered to be senescing, and so their contributions to urban environmental services can continue for many decades into the future, as *E. leucoxylon* trees have life spans that often exceed 150 to 200 years or more. The National Trust of Australia (Victoria) lists 2 *E. leucoxylon* specimens, each over 200 years old and in excellent condition, which suggests that they have decades of useful life expectancy (ULE) ahead of them (National Trust of Australia 2022a, 2022b).

While tree age is related to tree size, within this species there is considerable variation between subspecies, ranging from small, compact, bushy trees (*E. leucoxylon* ssp. *megalocarpa*) to tall forest trees of up to 25 m (*E. leucoxylon* ssp. *leucoxylon* and ssp. *pruinosa*)(Nicolle 2006). The most commonly selected *E. leucoxylon* for use within urban areas is usually ssp. *megalocarpa*, which is a smaller, more compact, multi-stemmed tree with larger fruit and flowers. However, while most of the trees observed in Melbourne streetscapes tended to be ssp. *megalocarpa*, some showed a variety of characteristics typically associated with some of the other subspecies, which suggested that seed had been sourced from trees exposed to other subspecies and probably from already established street trees, which may account for some of the variation observed.

It might be expected that the predicted height of *E. leucoxylon* trees would influence where they were planted, but almost 50% of the trees were planted directly below or close to power lines, with over 60% of these trees interfering with cables. This did not include trees that were still young and which may cause future problems. Inappropriate tree planting will increase maintenance, which is already high, with over 65% of the observed trees having been pruned, which can increase the chance of insect and fungal attack (Fazio and Krumpe 1999; Montagu et al. 2003).

The form and habit of *E. leucoxylon* and its capacity to cope with regular pruning means that it is suitable for planting where power lines exist. The rapid growth of epicormic shoots in response to pruning for line clearance also means that shade and habitat value are quickly restored, as is carbon sequestration in the canopy. There is also an opportunity for selecting lower growing *E. leucoxylon* varieties from known seed sources. However, given the large number of trees planted across the city of greater Melbourne, it could also be argued that undergrounding of power lines with the consequent lower tree maintenance costs could be cost-effective.

Generally, trees were healthy, but some were decayed and exuding resin mainly associated with damage to the trunk or the removal of limbs. Epicormic shoots were present in response to damage or pruning. Typically, eucalypts respond to fire damage, branch losses, and pruning by producing fast growing epicormic shoots, and *E. leucoxylon* possesses large numbers of epicormic buds on its trunk and branches (Moore 2021a). Many of the larger limbs removed were at a height that was intended to improve visibility and sight lines for vehicles and pedestrians.

The canopy of *E. leucoxylon* was usually distributed over a number of substantial lower-order branches, which contributed to the round to broadly round canopy that occurred in most trees (75%). The canopy and radial branches were evenly distributed in this multi-branched habit, and the canopy typically occupied at least half the height of the tree. There were very few trees that had dominant leaders (22.6%) and even fewer trees that had a single leader (6.4%). An important characteristic of street trees is the form of the trunk. The grand majority of trees (32.3% [97]) had an upright trunk without a lean, but the remainder were leaning to some degree. This lean, combined with any twisting and kinking of the trunk, exposed the patterning of the different mottled bark colours typical of this species. This was especially prominent where the smooth bark was exposed, adding to the uniqueness and aesthetics of each tree.

Flower colour does not breed true in *E. leucoxylon* (Nicolle 2006), but most trees (67.3% [202]) had flowers that were a variant of red or pink, which are the popularly preferred colours for this species as a street tree. *Eucalyptus leucoxylon* is known to flower throughout the year, and flowering has been reported in every month (Hall 1972; Brooker and Kleinig 2006; Nicolle 2006). In this research, the flowering period of *E. leucoxylon* ranged over 6 months, with most flowering occurring in the period from August to October. The trees provide a significant source of pollen, nectar, and seed, which attract large numbers of insects in the warmer months, including bees, and significant numbers of native honey-eaters and seed-eating parrots, such as rainbow lorikeets and sulphur-crested cockatoos (Hall 1972; Nicolle 2006). They are an important food source, particularly over winter. The large numbers of trees growing along streets provide valuable wildlife corridors that link other larger green spaces within the city of greater Melbourne.

CONCLUSION

This research assessed 300 *E. leucoxylon* street trees growing across the city of greater Melbourne for their performance against arboricultural criteria relating to canopy structure and density; straightness of the trunk; health; flower colour; and root systems. The results confirmed its suitability as a street tree and revealed that most specimens exhibited good habit, vigour, and health (assessed on canopy, trunk and branch condition, production of exudates, and presence of fungal fruiting bodies). The trees had traits such as live crown ratio, height, flower colour, and capacity to cope with pruning that are considered arboriculturally appropriate for a street tree. It seems likely that the species has the potential to be a successful street tree not only in Melbourne, Australia, but in other parts of the world where it has been grown successfully in forestry plantations under warmer and drier conditions.

The dense canopies and high live crown ratios of *E. leucoxylon* street trees provide shade that can reduce the urban heat island (UHI) effect. As so many trees have been planted across the city of greater Melbourne, this could be important, as the city's temperatures are predicted to rise significantly under climate change. The assessment also allowed the identification of specimens that performed well against the criteria described. The selection of appropriate subspecies and individuals for the propagation of trees intended for street tree planting can contribute to improved tree viability, health, and overall performance. The selection and successful vegetative propagation of *E. leucoxylon* was another component of this research, which sought to develop the potential of *E. leucoxylon* as an urban street tree.

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Résumé. Contexte: Par contraste avec les genres d'arbres présents dans l'hémisphère Nord, il y a eu peu de recherches sur la sélection et la propagation végétative d'espèces d'arbres indigènes australiennes aux fins de leur utilisation en tant qu'arbres de rue. L'*Eucalyptus leucoxylon* F. Muell. est l'un des rares eucalyptus présents dans le sud-est de l'Australie à arborer des fleurs de couleur vive et il est très apprécié comme arbre d'ornement fleurissant aisément. Il se propage à partir de graines, mais la progéniture présente généralement une variabilité et une diversité de semis. *E. leucoxylon* a été identifié comme l'eucalyptus le plus largement planté dans les rues du Grand Melbourne, en Australie. Méthodes: Cette recherche a évalué 300 arbres de rue *E. leucoxylon* croissant dans la ville de Melbourne pour leur performance en fonction de critères arboricoles relatifs à la structure et à la densité de la canopée, à la rectitude du tronc, à la santé (basée sur le feuillage, la condition du tronc et des branches, la production d'exsudats et la présence de fructifications fongiques), la couleur de la floraison et le système racinaire. Résultats: Les résultats ont montré que *E. leucoxylon* était un arbre de rue convenable dont la plupart des spécimens présentaient un port, une vigueur et une santé adéquats. Discussion: Les arbres possédaient des traits de caractère tels que le ratio houppier/hauteur totale, la hauteur, la couleur de la floraison et la capacité à tolérer l'élagage qui sont considérés comme appropriés pour un arbre de rue. La densité de leur canopée et le ratio élevé de leurs houppiers/hauteur totale génèrent de l'ombrage pouvant réduire l'effet d'îlot de chaleur urbain (ICU). Conclusion: Il est reconnu à cette espèce, le potentiel pour être un arbre de rue convenable, non seulement en Australie, mais dans d'autres parties du monde où elle a été cultivée avec succès dans des plantations forestières.

Zusammenfassung. Hintergrund: Im Gegensatz zu Bäumen aus Gattungen der nördlichen Hemisphäre wurde die Auswahl und vegetative Vermehrung australischer Baumarten für die Verwendung als Straßenbäume bisher kaum erforscht. *Eucalyptus leucoxylon* F. Muell. ist einer der wenigen in Südostaustralien vorkommenden Eukalyptusbäume mit leuchtend bunten Blüten und wird als blühfreudiger Zierbaum sehr geschätzt. Er wird aus Samen vermehrt, aber die Nachkommenschaft weist typischerweise eine Variabilität und Vielfalt der Sämlinge auf. *E. leucoxylon* wurde als der am weitesten verbreitete Eukalyptus in den Straßen der Stadt Melbourne (Australien) identifiziert. Methoden:

Im Rahmen dieser Untersuchung wurden 300 *E. leucoxylon*-Straßenbäume, die im Großraum Melbourne gepflanzt wurden, nach baumpflegerischen Kriterien in Bezug auf Kronenstruktur und -dichte, Geradheit des Stammes, Gesundheit (bewertet anhand des Zustands von Kronen, Stamm und Ästen, Produktion von Exsudaten und Vorhandensein von Pilzfruchtkörpern), Blütenfarbe und Wurzelsystem beurteilt. Ergebnisse: Die Ergebnisse zeigten, dass *E. leucoxylon* eine geeignete Straßenbaumart ist, wobei die meisten Exemplare einen guten Wuchs, eine gute Wuchskraft und einen guten Gesundheitszustand aufwiesen. Diskussion: Die Bäume wiesen Eigenschaften wie Kronenverhältnis, Höhe, Blütenfarbe und Schnittverträglichkeit auf, die für einen Straßenbaum als geeignet gelten. Ihr dichtes Kronendach und ihr hoher Kronenanteil spenden Schatten, der den Effekt der städtischen Wärmeinsel (UHI) verringern kann. Schlussfolgerung: Dies deutet darauf hin, dass die Art das Potenzial hat, ein erfolgreicher Straßenbaum zu sein, nicht nur in Australien, sondern auch in anderen Teilen der Welt, wo sie erfolgreich in forstwirtschaftlichen Plantagen angebaut wurde.

Resumen. Antecedentes: A diferencia de los árboles de géneros del hemisferio norte, ha habido poca investigación sobre la selección y propagación vegetativa de especies de árboles nativos australianos para su uso como árboles urbanos. *Eucalyptus leucoxylon* F. Muell. es uno de los pocos eucaliptos que se encuentran en el sureste de Australia con flores de colores brillantes y es considerado como un árbol ornamental que florece fácilmente. Se propaga a partir de semillas, pero la progenie generalmente muestra variabilidad y diversidad de plántulas. *E. leucoxylon* fue identificado como el eucalipto más ampliamente plantado en las calles de la ciudad de Melbourne, Australia. Métodos: esta investigación evaluó 300 árboles urbanos de *E. leucoxylon* que crecen en toda la ciudad de Melbourne por su desempeño contra criterios arboriculturales relacionados con la estructura y densidad del dosel, la rectitud del tronco, la salud (evaluada en el dosel, el tronco y la condición de las ramas, la producción de exudados y la presencia de cuerpos fructíferos fúngicos), el color de las flores y los sistemas de raíces. Resultados: Los resultados mostraron que *E. leucoxylon* era una especie de árbol urbano adecuada con la mayoría de los especímenes mostrando buen hábito, vigor y salud. Discusión: Los árboles tenían rasgos como la proporción de corona viva, la altura, el color de la flor y la capacidad para hacer frente a la poda que se consideran apropiados para un árbol urbano. Sus densas copas y sus altas proporciones de coronas vivas proporcionan sombra que puede reducir el efecto de isla de calor urbano (UHI). Conclusión: esto sugiere que la especie tiene el potencial de ser un árbol urbano exitoso no solo en Australia, sino en otras partes del mundo donde se ha cultivado con éxito en plantaciones forestales.