THE UNIVERSITY OF SYDNEY

TREE POPULATION STUDY 2013

prepared by: tree iQ

1.0 Introduction

The University of Sydney is Australia's oldest university. Its reputation for academic excellence must be matched by excellence in landscape management. Trees are the most dominant visual element in any landscape and their unique attributes in being living dynamic structures bring challenges for landscape managers.[1]

The trees at the University provide a significant contribution to the local landscape and form an important component of the wider urban forest within the City of Sydney LGA.

January 2001 saw the first comprehensive assessment of all trees on the University of Sydney's Camperdown and Darlington Campuses. In recent years, the University engaged ArborPlan to establish a detailed tree inventory database. The database is now continually updated to record all tree maintenance, removals and new plantings. In October 2013, the database had 1813 entries and included information on species, size, health, structural condition, age class, useful life expectancy, significance and risk.[2]

There are a range of pressures facing the University's tree population including vulnerability to pests and disease, climate change and intensification of land use. As these pressures are likely to increase in the future, the importance of maintaining a well-structured tree population is paramount. A well-structured tree population contains a diversity of species, age ranges and sizes which minimizes its vulnerability to environmental pressures, whilst maximizing the benefits which it provides.

This Tree Population Study provides an analysis of data from the most recent tree inventory to give an overview of the structure and quality of the University's tree population at the present time. The results of this Study also outline information against which future data can be compared.

The overall objective of this Study is to provide strategic direction to maintain and develop a well-structured, resilient, healthy and diverse tree population for the future.

[1] Fakes & Hopwood (2007).

[2] ArborSafe Australia Pty Ltd (2013).

2.0 Species Diversity

Broad species diversity is an essential element in maintaining a healthy tree population. Grouping the tree population by family, genus and species, which then can be expressed in percentage terms, is an effective way of providing an overview of species diversity.

A lack of species diversity predisposes a tree population to threats from pests, disease and environmental stresses. In severe cases, an outbreak of a particular pest or disease on a certain species or family can have significant impacts on a tree population. A wide range of species provides greater resilience and long-term stability for the tree population as a whole. In addition, broad species diversity helps to support greater fauna diversity by providing a variety of food and habitat.

The City of Sydney's *Urban Forest Strategy* aims for a species diversity comprising of no more than 40% for any particular family, 30% for any particular genus, and 10% for any one species.[3]

Similar aims in developing the species diversity within the University should provide a buffer against current or potential future threats from pests, disease and climate change.

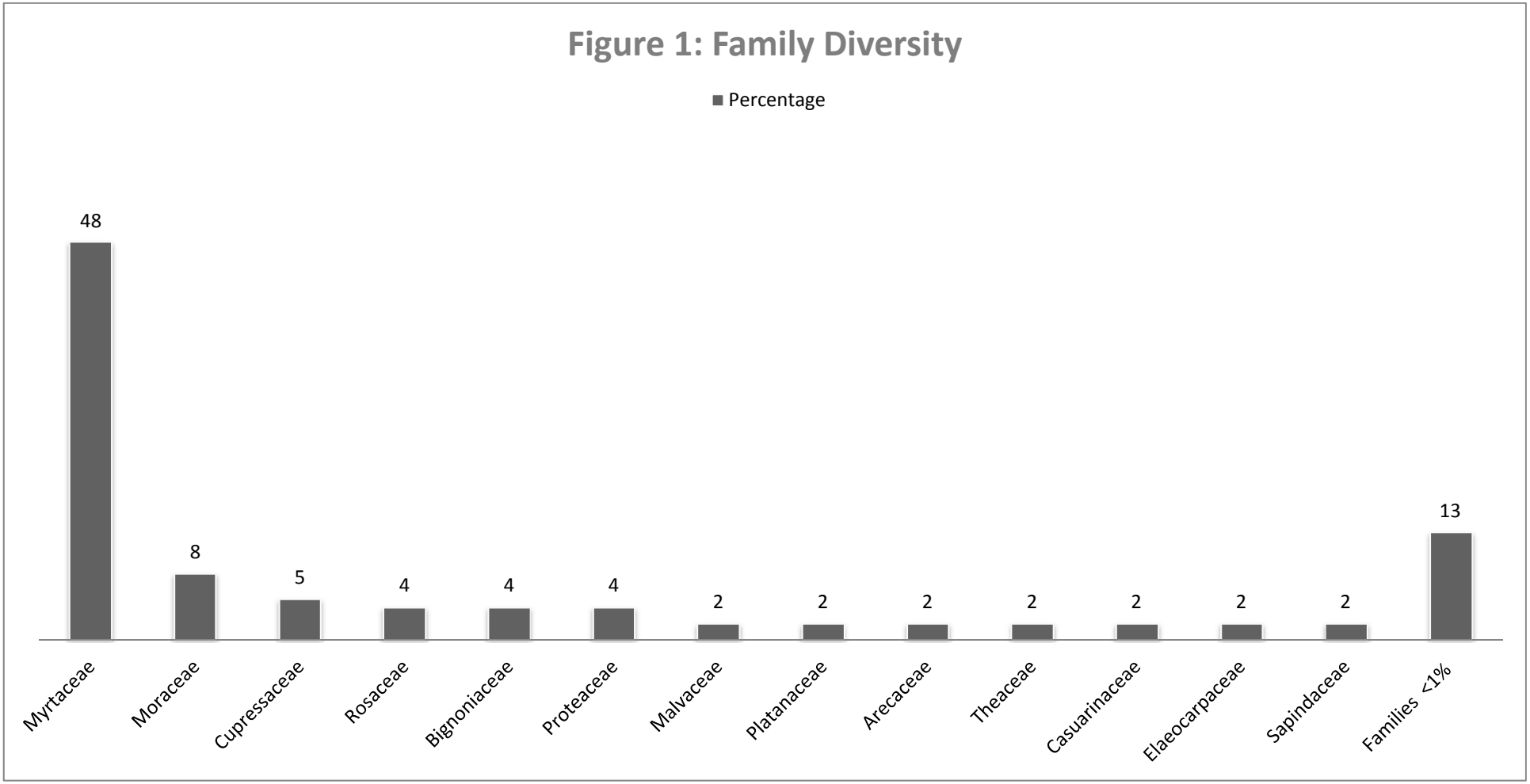
Analysis of the data from the latest tree inventory indicates 48% of the University's trees come from the *Myrtaceae* family which includes *Eucalyptus, Corymbia, Callistemon, Angophora, Melaleuca* and *Lophostemon*.[4] In addition to the Myrtaceae family being above the recommended percentage, all members of this family are vulnerable to Myrtle Rust, a pathogen recently introduced into Australia. Myrtle Rust has the potential to significantly impact the health of Myrtaceous species and could potentially have far reaching implications for the health and structure of Australia's urban forests.

Analysis of the tree inventory data also shows the University is approaching the maximum advisable percentage range for the species *Lophostemon confertus* - Brush Box (9%).[5]

[3] City of Sydney (2013).

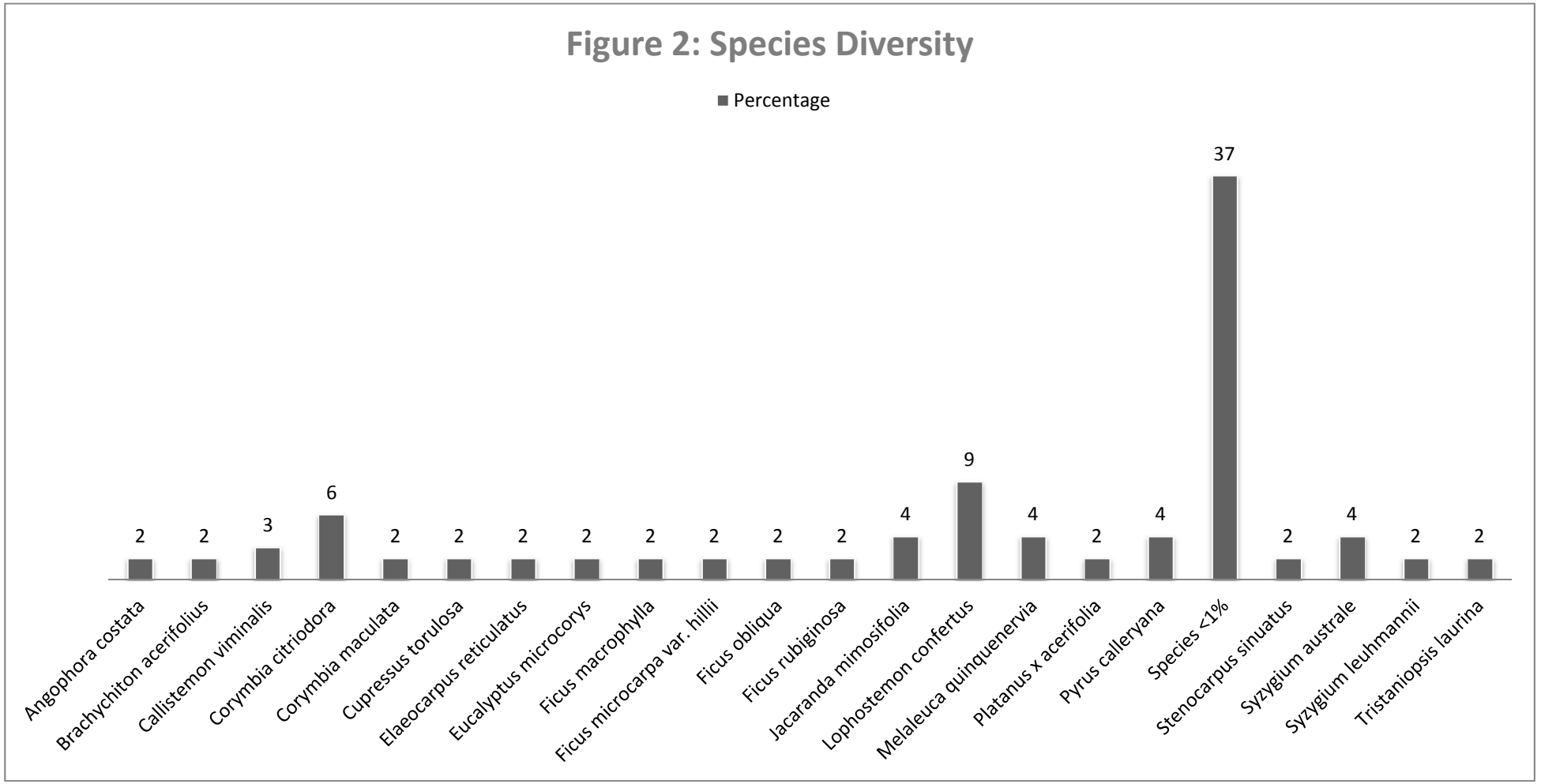
[4] ArborSafe Australia Pty Ltd (2013).
[5] ArborSafe Australia Pty Ltd (2013).

Figure 1: Family Diversity



Data Source: ArborSafe Australia Pty Ltd (2013). *University of Sydney, ArborPlan Tree Inventory Assessments.*

Figure 2: Species Diversity



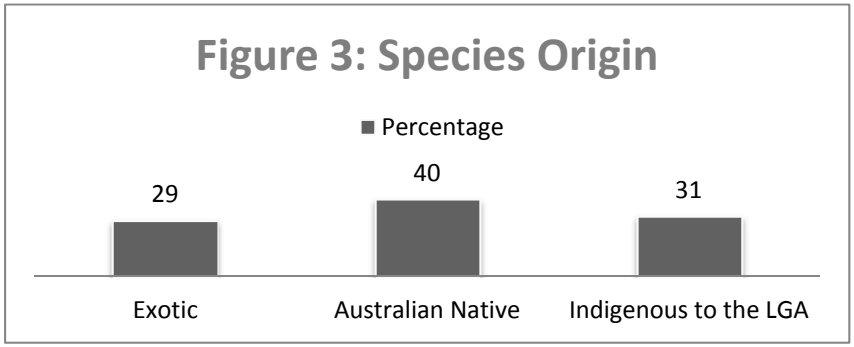
Data Source: ArborSafe Australia Pty Ltd (2013). *University of Sydney, ArborPlan Tree Inventory Assessments.*

3.0 Species Composition

With appropriate species selection, trees provide a significant contribution to the enhancement of the urban environment. Within the University, the use of locally indigenous species maintains and enhances biodiversity, whilst exotic deciduous trees provide summer shade and winter sun, and many species have important heritage and cultural associations. Most importantly, the tree species should be selected to provide the right tree for the right place.

When selecting species indigenous to the LGA for new plantings, the use of species of local provenance is increasingly recognised as being important to ensure the genetic integrity of the local environment is maintained.

Analysis of the data from the latest tree inventory indicates a roughly even distribution between species indigenous to the LGA, Australian native and exotic species.[6] The provenance of the existing trees indigenous to the LGA is not known.



Data Source: ArborSafe Australia Pty Ltd (2013). *University of Sydney, ArborPlan Tree Inventory Assessments.*

4.0 Age Class

Effective tree management recognises that trees are living organisms and that the process of senescence is a natural stage of tree development. This process may take many decades.

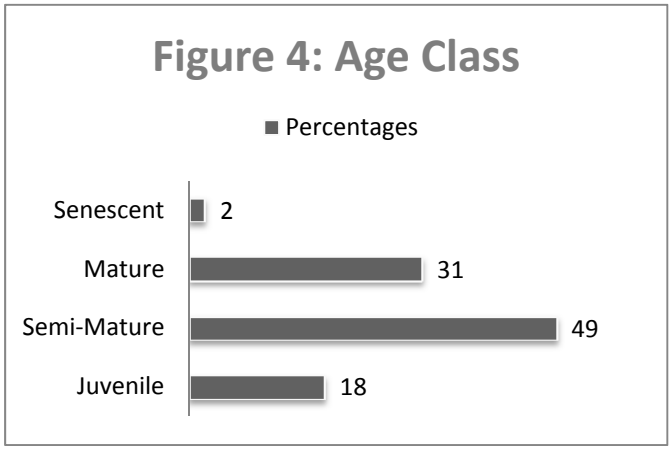
Where a uniform age profile within a tree population exists, it is likely that many trees will decline and senesce within a similar timeframe. The removal of large numbers of trees at any one time can have significant impacts on visual amenity, raise community concerns and incur significant costs.[7] A high proportion of senescent trees may also carry an element of increased risk to the public and must be managed accordingly.

In a well-managed tree population, the impacts of individual tree removal can be minimized through a well-structured diversity of age ranges. An analysis of age class aids in the development of a long term strategy for the management of ageing trees within the population.

By maintaining a mixture of age classes, tree removal and replacement becomes an ongoing process. This lessens the overall visual impacts from tree removals, minimizes community concerns and spreads financial costs.

Data from the latest ArborPlan inventory lists five age class categories, including juvenile and young. For the purpose of data analysis for this Study, these categories have been combined.

Analysis of the data from the latest tree inventory indicates the highest percentage of trees within the tree population to be semi-mature (49%). By far the lowest percentage is represented by senescent trees (2%).[8] The distribution of age classes is considered to be well structured and indicates a well implemented proactive tree management strategy.



Data Source: ArborSafe Australia Pty Ltd (2013). *University of Sydney, ArborPlan Tree Inventory Assessments.*

[7] City of Sydney (2013).

[8] ArborSafe Australia Pty Ltd (2013).

5.0 Useful Life Expectancy

Useful Life Expectancy (ULE) is an estimate of how long a tree is likely to remain in the landscape based on its health and structural condition, site suitability, and its contribution and risk to the community. The latest AborPlan tree inventory uses the acronym TLE however for the purposes of this Study, the term ULE has been used to reflect standard industry terminology.

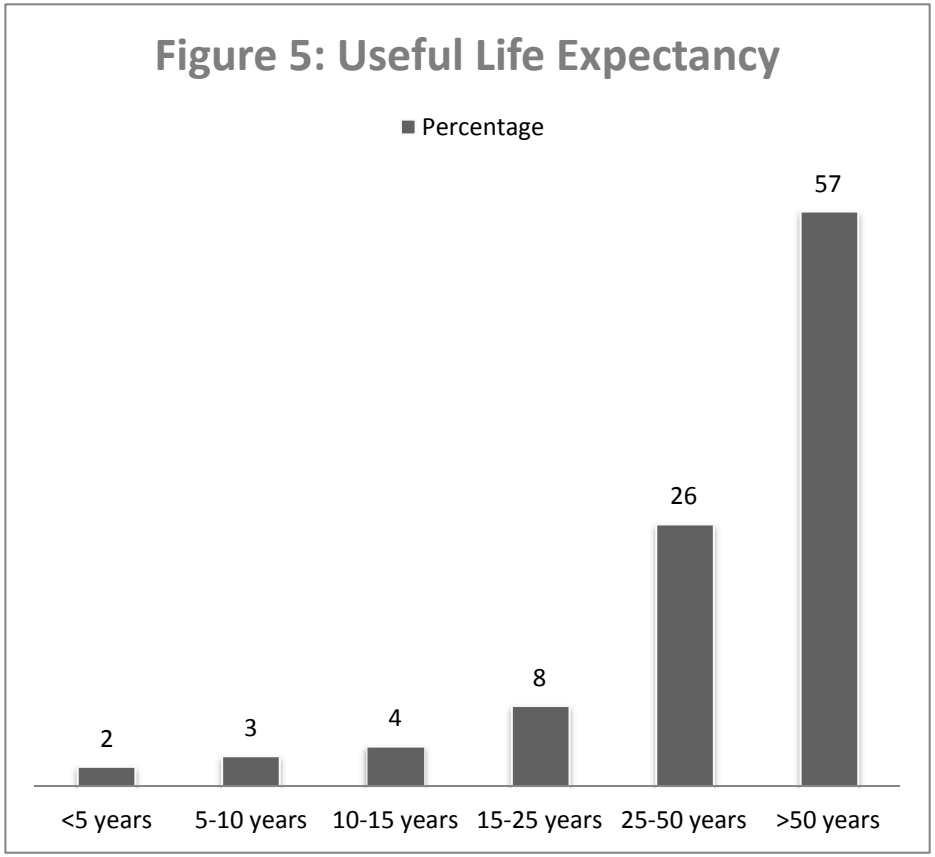
Due to harsh growing conditions, conflict with infrastructure, and the requirement to manage risk, trees within the urbanized environments will often have a shorter ULE than those of the same species growing in their natural environment. The ULE ratings are not a measure of the trees' estimated biological lifespan but rather provide an estimation of timeframe over which the trees may safely contribute to their local environment.[9]

As a general rule, trees with a shorter ULE may require greater management inputs until removal. The allocation of a ULE rating is an effective landscape management strategy which allows a phased, proactive approach to tree removal and replacement. A ULE rating also assists when budgeting for future management costs.

An assessment of the tree inventory data shows by far the greatest percentage (57%) of the University's tree population falls within the longest ULE range of >50 years.[10] This figure correlates with the high percentages of semi-mature trees within the population.

The lowest ULE range of <5 years contains the smallest percentage (2%) of trees indicating the management, removal and replacement of the tree population has been proactive and that there should be no requirement for the removal and replacement of a large percentage of the tree population in the short to medium term.

Figure 5: Useful Life Expectancy



Data Source: ArborSafe Australia Pty Ltd (2013). *University of Sydney, ArborPlan Tree Inventory Assessments.*

[9] City of Melbourne (2013).
[10] ArborSafe Australia Pty Ltd (2013).

6.0 Size & Habit

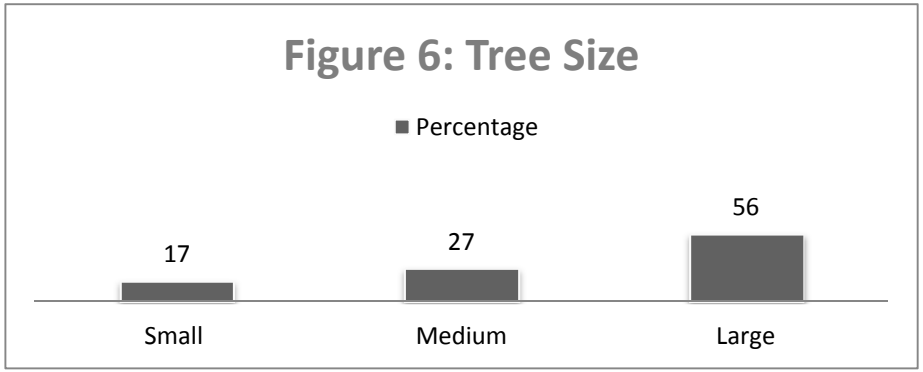
Within a tree population, a range of tree sizes and habits adds a level of structure and complexity which when used effectively can complement and enhance the surrounding built environment.

Small and upright, columnar and fastigiate trees can be utilized in restricted growing environments to provide the greening of a space whilst minimizing ongoing maintenance requirements and conflict with adjacent structures. Whilst small tree species can be important design elements in the landscape, their contribution to the primary urban forest canopy is minimal.

Whilst the costs associated with maintaining large trees are in general higher than those for smaller trees, research shows the cost benefits provided by large trees to be proportionately much greater than that of small trees due to their ability to shade, screen, absorb greater volumes of carbon dioxide and pollutants and help reduce the scale of large buildings.

Given the long timeframe in which a healthy well managed tree can contribute socially, environmentally and economically to its surrounding environment, selecting a tree species of an appropriate size can minimise unnecessary maintenance costs.

To provide an overview of the component tree species at the University, the tree species have been divided into three groups based on their approximate size at maturity. An assessment of the tree inventory data shows the distribution of small, medium and large species to be fairly evenly distributed.[11] Given the diversity of growing environments and available spaces at University, the maintenance of similar ratios should be continued as part of the future management of the tree population.



Data Source: ArborSafe Australia Pty Ltd (2013). *University of Sydney, ArborPlan Tree Inventory Assessments.*

[11] ArborSafe Australia Pty Ltd (2013).

7.0 Canopy Cover

Canopy cover is simply a measure of the physical coverage of the combined tree canopy over the land.[12] Square metre measurements are taken periodically to determine how the canopy cover has changed over time.

Canopy mapping undertaken by ArborPlan during May 2013 shows the canopy cover for the Camperdown Campus as 93,708m² or 27.97%. For the Darlington Campus, the cover is 42,456 m² or 23.19%.[13]

The *City of Sydney Urban Forest Strategy* aims to achieve a general canopy cover of 23% within the LGA by 2023.[14] The latest canopy cover data indicates the Camperdown and Darlington campuses generally meet this target. However, given the wide variety of open space areas within the University, the opportunity exists to further increase these percentages as part of the ongoing management of the tree population and future development of the University.

Maintaining canopy cover requires the retention of good quality trees wherever possible and the gradual removal and replacement of trees reaching the end of their ULE. The use of high quality replacement trees selected for their appropriateness to their growing environment ensures the maximum cost benefits can be attained for each new tree.

Identifying opportunities for new tree planting is essential if canopy cover is to be increased. This may require the removal of smaller and low quality trees to create additional space and identifying underutilized areas.

[12] City of Melbourne (2013).
[13] ArborSafe Australia Pty Ltd (2013).
[14] City of Sydney (2013).

8.0 Actions & Strategies

There are many complex issues to be considered when managing a population of trees. By adopting the holistic principles of urban forest management a tree population can be managed to provide the maximum benefits both socially, economically and environmentally.

Based upon each of the data sets analyzed within this Study, the following management strategies are recommended:

Diversity

- Adopt the broad aims of the City of Sydney's Urban Forest Strategy 2013 as a model framework on which to base the University's long term tree management strategy.
- Select tree species to meet the accepted diversity standards of the Urban Forest Strategy 2013 with a maximum species diversity composition of no more than 40% for families, 30% genera and 10% for any one species.
- Reduce the reliance on the family Mytacece when selecting future plantings to minimise the potential threats posed by Myrtle rust.
- Avoid the planting of *Lophostemon confertus* - Brush Box in new planting areas.
- Collaborate with the Royal Botanical Gardens regarding the procurement of rare and interesting tree species.
- Broaden diversity within the tree population through the use of new genera and species.

Composition

- Ensure new tree plantings conserve heritage values of the buildings, precincts and associated views, and acknowledge historic species associations that have evolved over the course of the University's history.
- Maintain the current distribution at similar levels whilst reducing the reliance on species from the family Myrtacece.
- Use trees of local provenance for all new plantings of species indigenous to the LGA.

Age Class

- Continue the current proactive approach to tree management and replacement to maintain levels of age class diversity similar to those currently found within the University.

Useful Life Expectancy

- Use quality plant material grown in accordance with NATSPEC Guide for Specifying Trees.
- Utilize best practice planting methods and adequate maintenance, particularly during the establishment phase, to ensure the quality and longevity of new trees.
- Provide adequate soil volumes to support each new tree into maturity when designing new planting areas.
- Use tree friendly materials such as structural soil cells, structural soils, permeable pavements and linked tree planting pits when designing new planting areas.
- Continue to undertake regular inventories combined with periodic broad scale studies to monitor the overall condition of the University's tree population and to aid with future budgeting.

Size & Habit

- As a minimum, maintain the current distribution of mature sizes of species within the tree population.
- Select species with an appropriate mature size and habit for the constraints of the growing environment for all new plantings.
- Where possible expand the planting of large species to gain maximum cost benefits over the lifetime of a tree.

Canopy Cover

- Promote the maintenance and protection of existing trees, especially those large or old trees that are difficult to replace.
- Identify and consider the removal of smaller and low quality trees to provide additional space for larger more significant trees where space permits.
- Identify new or underutilized areas for new plantings.
- Analyze and promote the value of the University's tree population more widely by employing the latest urban forestry modeling tools such as i-Tree Eco to attribute a dollar value to the environmental benefits of the University's trees.

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10.0 References

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