IS THE TREE STOCK STANDARD FOR LANDSCAPE USE A VALID TEST OF AUSTRALIAN TREE QUALITY?

Between April 2016 and January 2017, researchers from the Hawkesbury Institute for the Environment at Western Sydney University assessed more than 13,000 trees to see how closely the current standard matches trees of different species and climates in nurseries across Australia.

Background

The Australian Standard for Tree Stock for landscape use AS2303:2015 has 3 sections for quality assessment of containerised trees:

- Above-ground testing
- Below-ground testing
- Evaluation of root to shoot balance

This Horticulture Innovation Australia levy-funded research project has two goals:

1. Conduct a literature review investigating the factors affecting root to shoot balance in containerized trees, and the importance of root to shoot balance for out-planting success.
2. Create an extensive database of measured variables to assess root to shoot balance, via Size Index, in containerized Australian tree stock grown in each major climate region.

Scope of Research

23 WHOLESALE NURSERIES	13,820 TREES MEASURED	18 TO 3000L CONTAINER SIZES
113 TREE SPECIES MEASURED	NATIVE TREE SPECIES	NON-NATIVE TREE SPECIES
EVERGREEN TREE SPECIES	DECIDUOUS TREE SPECIES	

Research Methodology

1. Identify batches of trees ready for sale by consultation with nursery.
2. Complete visual assessments of above and below-ground morphological quality.
3. Measure the tree's height and calliper on a large selection of trees that have passed step 2.
4. Measure additional factors such as canopy width and leaf sizes.
5. Collect climate, production information from each nursery.

Why? *This methodology ensures that the trees being measured possess the quality morphological attributes required at dispatch. From this database we can assess variation in above-ground tree size in relation to container size, species, climate and nursery.*

The Literature Review

Tree quality is the foundation of out-planting success and the capacity for growth following establishment, yet there is no single assessment which can be used to accurately evaluate nursery tree stock quality.

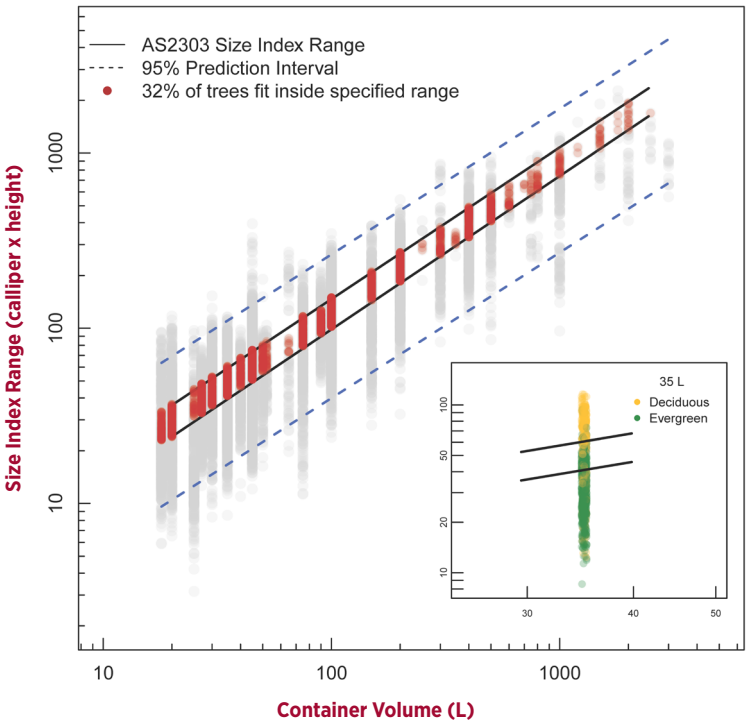
- The 3 most common assessments are height, diameter and root system size.
- Single assessments of nursery quality poorly relate to planting success.
- Evaluating combinations of above and below ground parameters (balance) may better represent tree quality and predict future success.
- However, each of these parameters is influenced by watering, nutrition, climate, species variation and nursery practices.

This makes developing a unified tree balance assessment criteria challenging.

Key Findings

- The specified range of Size Index in AS2303 does not adequately capture the natural variation in 'ready for dispatch' trees in Australian nurseries (Figure 1).
- Small, non-native, deciduous trees in containers less than 50L tended to have greater Size Index values than native evergreen trees.
- Small to medium trees in containers 50 to 500L showed the greatest variability in Size Index which is mostly due to the differences in species.
- Larger trees in containers over 500L typically had a smaller Size Index range than the current standard.
- About one-third of trees measured fit within the current standard's data range across all container sizes of 18 to 3000L.
- 45% of trees measured fall under the acceptable minimum limits of the current standard.
- 23% of trees measured fall over the acceptable maximum limits of the current standard.
- The differences between species was more important than climatic or nursery differences in explaining the variation in Size Index.
- Tree height was much more variable than calliper diameter in the measured trees.

Figure 1. *Above-ground size index across a range of container sizes for trees measured across 23 Australian nurseries*



- Black lines represent the minimum and maximum acceptable range as specified in the existing AS2303.
- Grey circles represent each of the 13,820 trees measured.
- Red circles represent only the trees that fit in the specified range.
- Blue dotted lines indicate where 95% of the measured trees would fit.
- The inset shows the difference between deciduous and evergreen trees in smaller sized containers.
- If only 32% of trees fit into the current standard, there is potential that industry could be rejecting 68% of trees that are otherwise healthy and good quality.

Summary

In summary, the measurements taken across Australia show that landscape trees have a much greater variation in Size Index than the currently adopted standard indicates.

For people selecting trees, this might mean that they are now rejecting trees based on a standard that is too limited for real-world tree production.

The research undertaken has also provided a rare opportunity to develop a rich data set specific to Australian tree stock production nurseries. This data could be used in future research to examine how climate, species and nursery practices contribute to variations in tree stock size and influence tree quality.

A complete report on this research project will be delivered to Industry and Horticulture Innovation Australia by the end of April 2017.

Nursery & Garden Industry Australia

Horticulture Innovation Australia

WESTERN SYDNEY UNIVERSITY

Hawkesbury Institute for the Environment

For more information on the Tree Stock Standards project please visit www.bit.ly/TreeStocks

This project has been funded by Horticulture Innovation Australia Limited using the research and development nursery levy and funds from the Australian Government.