

CLIMATE READY STREET TRIALS

Street trees are on the front line of urban forest service delivery, supporting neighbourhood character, human health, waterway health, biodiversity, tourism and business vitality. However, in order to deliver these benefits, street trees must be well suited to local climate and conditions now and into the future.

In order to guide planting decisions, a handy resource has been developed which helps growers design scientifically rigorous trials of street trees to ensure that plantings are climate ready and resilient. The guide is a collaboration between Which Plant Where, a consortium of researchers to investigate the suitability of various plant species under current and future climate scenarios and Treenet, an independent organisation dedicated to improving Australia's urban forests

Which Plant Where, a strategic, levy-funded investment, bringing together a consortium of researchers to investigate the suitability of various plant species under current and future climate scenarios and Treenet, an independent organisation dedicated to improving Australia's urban forests, have developed a guide to designing a scientifically rigorous trial of street trees to ensure that plantings are climate ready and resilient.

This nursery paper provides an overview of how production nurseries, councils and landscape architects can design and implement street tree trials to determine the suitability of specific species under certain conditions.

SUMMARY

- Understanding which horticultural species will survive in Australian urban landscapes, not only now but under future climates, is key to extracting maximum social, physical and economic benefit from trees.
- A user-friendly guide to conducting street trials has been developed in partnership between Macquarie University, Western Sydney University and Treenet. The guide is aimed at growers and local councils.
- Ultimately, the guide is designed to equip growers and local councils with the ability to apply basic scientific principles so that tree species' suitability to changing local conditions can be tested, measured and evaluated; results can be compared with similar trials in other locations and knowledge can be shared to increase species diversity and enhance urban forest resilience
- The guide can be used in tandem with other key resources such as the Which Plant Where plant selector tool - which can determine climate suitability for specific plant species. The tool was built as part of the Hort Innovation strategic levy-funded project **Which plant where, when and why database for growing urban green space** (GC15002).

What's in it for **THE GROWER**

Although street tree trials are likely to be led and implemented by local councils, urban planners and landscape architects, growers have an active and crucial role to play.

Street trials are best undertaken when all partners are actively involved, so it is key that growers have an understanding of how street tree trials should be implemented. By understanding the key elements, growers can ensure they work collaboratively with stakeholders, to ensure the best chance of street trial success and a meaningful contribution to the development of climate-wise urban forests.

Finally, the resources created by this project are vital resources for the customers of production nurseries. These can form crucial elements to sales and marketing strategies as growers work with councils to grow our urban forests.



BACKGROUND

To deliver these environmental, urban heat island mitigation, human health and ecosystem supporting benefits of urban canopy cover, street trees must be planted which will thrive in current and future conditions.

As climate change advances, our cities are heating up. At the same time, rainfall patterns have changed, becoming more unpredictable.

As a result, tree species which have previously been successful at growing in certain regions may not be appropriate for future plantings.

However, determining which tree species are 'climate-ready' for any given region or setting must be determined scientifically. Councils and landscapers can achieve this in partnership with growers by implementing street trials to assess the suitability of specific tree species.



How to implement a climate ready street tree trial

DEFINE YOUR OUTCOME

Why are we conducting a trial

The first step for any scientific trial is to determine your outcome. In order to achieve success a clear vision must be determined, and it must have buy-in from all contributing parties including the council, the grower and any other stakeholders. Some examples of a defined ideal outcome could include:

- I want to build a council-wide urban forest to last 30 years and I need to determine which species will be suitable until 2050
- I want to identify some new species that could be planted in a specific

region to complement existing canopy cover

- I want to determine the feasibility of replicating an existing urban canopy in another location

How much time will be needed

A scientific trial into street trees requires a significant time-commitment. As with the outcome, it needs buy-in and agreement from all parties.

At a minimum, a scientific trial would go for 2 years, with most taking even longer. A trial is a significant time commitment, but the surrounding areas are primed to reap the benefits.

SELECTING YOUR TRIAL SPECIES

Find species that are climate ready using Which Plant Where

Changes in rainfall and temperature are fundamentally changing the species of trees that are available for long-term planting projects in urban environments.

Which Plant Where is a culmination of 5 years of research investigating which horticultural species will survive in Australian urban landscapes, not only now but under future climates. This plant selection tool is underpinned by the latest scientific evidence, providing growers, nurseries, landscape architects and urban greening professionals with integrated tools and resources to develop resilient and sustainable urban green spaces for the future.

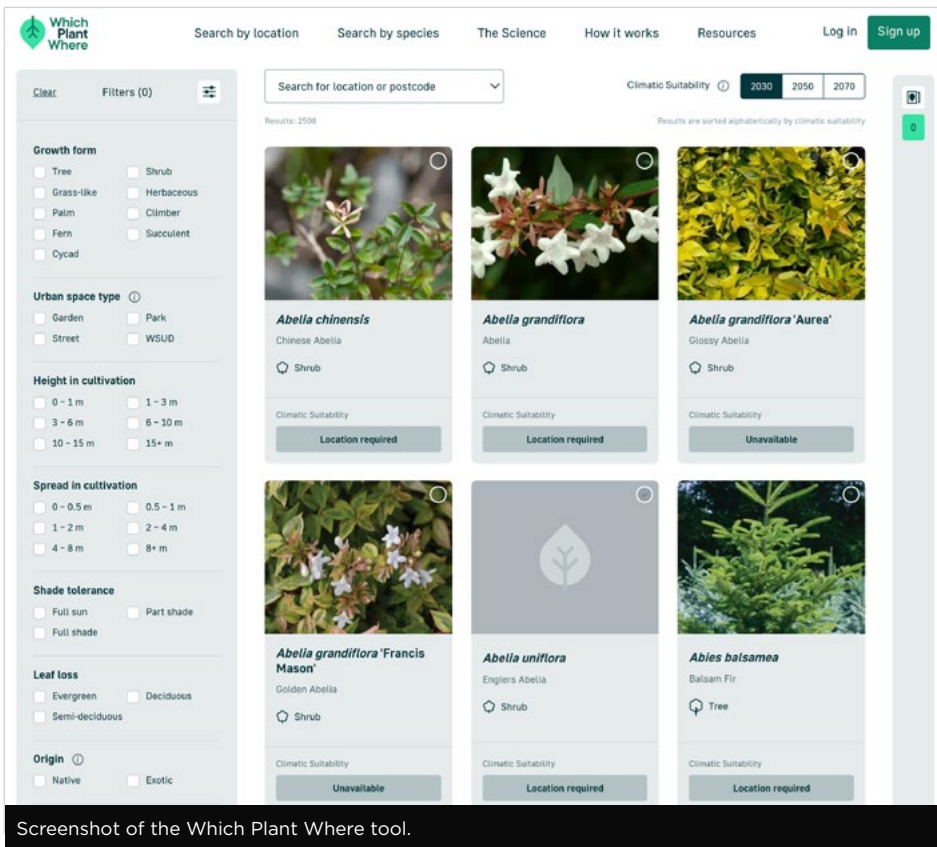
The tool uses climate projections that can then be used to identify locations with current conditions that match those forecast for your area. Species occurring naturally or succeeding as street trees in those locations may be good candidates for trialling in your area.

Identify space constraints

In urban areas small trees are spaced at 5m to 7m intervals, medium trees at 7m to 10m and large trees at 10m to 15m. In the long-term, this foresight will minimise maintenance costs (e.g. pruning, removal and replacement) and infrastructure damage (e.g. lifting and cracking of footpaths and roads).



The Which Plant Where team conducting studies



Growers and council customers should ensure these factors are considered in tandem with interference from urban infrastructure.

Understanding species diversity

An emphasis should be placed on increasing the species diversity within your urban area when selecting a trial species. Growers should work with customers to ensure that stock used for trials is diverse from existing flora.

Consult networks

It may be helpful to connect with councils, local bush regeneration groups, other growers, and botanic gardens to find out what species have already been trialed in the area and the lessons learnt from those trials.

IDENTIFYING TRIAL SITE

Finding a 'like for like' site

When selecting a site for a trial, it must be representative of the planned project site. At this point it is important to reference back to the original objective.

Soil type, water availability and space constraints are all important factors to consider when selecting a site. In practice, if the test is for trees

planted on a house-lined street, a trial shouldn't be conducted on the site of a nursery or open field.

Select a mix of high profile sites and low profile sites

Trials may fail. As such consider undertaking some trials in lower profile areas. Community engagement is key, to ensure that the trial is understood by the public.

Be flexible

Space in urban areas is at a premium, particularly in inner-city areas. The perfect site for a trial may require some compromise.

DESIGNING AND IMPLEMENTING A TRIAL

Treatments and controls

Treatments are things you may wish to test, such as the watering regime, mulching and fertiliser additions. For example, if you want to trial a species that has been identified as drought tolerant, you may want to test plant performance under different watering conditions (or treatments). To test this, get 20 plants of the same species. 10 will be the "control" plants and receive

business as usual watering. 10 will be the "treatment" plants and receive (for example) 50% less water.

Replication

Plants from the same species still display some degree of genetic variation. This means that even when you grow plants under the same environmental conditions, they will still vary in their growth and appearance. To capture this variability, multiple individual plants per treatment are required. For street tree trials, 8-10 plants per species is desired.

Randomisation

To minimise the effects of environmental factors on your trial, individuals from different treatments must be randomly allocated positions within your trial site. For example, if 20 trees in total are being planted, 10 with reduced watering (treatment) and 10 with regular watering (control), they should be randomly assigned placements rather than next to each other.

There are many easy ways to randomise selection. You could flip a coin to determine whether a treatment or control is available in the next available plot, pull out species out of a hat, access online 'random number generators' or assign control/treatment to a specific colour of marble which can be randomly pulled out of your pocket.

Consistency

Every potential variable should be kept as consistent as feasibly possible. Pot size, preparation of each sample size (size and shape of hole), and treatments given (water and fertiliser etc) should all be identical. The only variable in the trial should be the treatment you are testing.

MONITORING

Recording success or failure

Trial success will be determined by its ability to survive and thrive beyond the establishment phase. Accurate measurement of success is not entirely straight forward. Some plants may look dead but are actually laying dormant until better conditions arrive. Councils and growers should compare



knowledge of trial species to help determine success. Trees should also be monitored for the entire trial, even if they look dead.

Beyond survival, tree species should also be assessed on their overall health and growth. Two common measures of plant growth are height and stem diameter at breast height (1.3m above the surface of the soil). Keep measurements consistent and track growth of trial plantings over time.

A good indicator of plant health is canopy density. A quick visual assessment can suffice, as long as the same scale is used throughout the project.

Timing

Plantings are most vulnerable to mortality or declines in health during winter and summer when climatic conditions are at their most extreme. Monitoring at these times, or at the end of harsh times is more appropriate than when conditions are milder.

Monitoring of deciduous species should be carried out during the “leaf on” stage of their annual growth cycle because visually assessing the health of a plant with no leaves is near impossible.

Frequency

Plantings are most vulnerable to mortality or health declines during their initial establishment period, which is typically the first two years after planting. This means monitoring

should be more frequent during this time (e.g. quarterly) but then can be progressively scaled back (e.g. yearly) through time.

Document your trial with photos

Photos should be taken at every stage of the trial from site preparation through to monitoring. It is important that your plants are photographed from the same position through time and that each photo has a date stamp, so that plant progress is easy to track.

Data sharing

To help inform the selection of appropriate species for future trials, it is important that you share the findings of your trial. This can be done at by either sharing it with the Which Plant Where team or you can register your trial in the Treenet case study portal, which will give users the basic information about your trial as well as your contact information, so they can make enquiries

Acknowledgements

This nursery paper was derived from the full version of the “Climate ready street tree trials A best practice guide”. The “How-to” guide for climate ready street tree trials was developed in collaboration between the Which Plant Where (Macquarie University, Western Sydney University) and Treenet – available here: https://cms.whichplantwhere.com.au/app/uploads/2022/02/10.-WPW_Climate-ready-street-tree-trials.pdf.



Climate ready street tree trials A best practice guide



For more information on adhering to robust consistency procedures in a trial make sure you review the full Climate ready street tree trials A best practice guide available here: <https://www.whichplantwhere.com.au/the-science>

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LINKS TO RESOURCES

Find out more about Which Plant Where: <https://www.whichplantwhere.com.au/>

Find out more about Treenet: <https://treenet.org/>

Read more about Hort Frontiers here: <https://hortfrontiers.com.au/>

Read the Hort Frontiers Green Cities Fund here:
<https://hortfrontiers.com.au/wp-content/uploads/2018/03/CSI-Green-Cities-Fund.pdf>

Links to more resources created by Which Plant Where and its partners:
<https://www.whichplantwhere.com.au/the-science>

Past editions of nursery papers are available online on the Greenlife Industry Australia website:
https://www.greenlifeindustry.com.au/Section?Action=View&Section_id=46