

NURSERY PAPERS

APRIL
2025

GETTING TO THE ROOTS OF GROWING TREES

Background

Landscaping is a vital market for the greenlife supply chain. The success of trees planted in landscaping projects is significantly influenced by how they are grown in the production nursery. Best management growing practices are vital for ensuring trees are healthy, well-structured and able to thrive after transplanting.

Root pruning plays a critical role in improving root structure as well as preventing root defects that affect tree establishment and longevity.

The Nursery Industry Accreditation Scheme Australia (NIASA) sub-program, Landscape Tree Stock Specification (LTSS), provides essential guidelines for ensuring that trees are grown to meet industry and national standards.

Drawing from local and international research, this nursery paper explores the key practices of root inspections and pruning during tree staging to meet these guidelines.

Root pruning

Root pruning is not a new concept in nursery production, but it has seen continual research and improvement over the years, reinforcing the benefits of this practice.

Root pruning involves the cutting back or removing parts of a tree's root system, typically to improve the tree's root structure and prepare it for transplanting. Research consistently shows that root pruning improves the root ball's health, helping to avoid root circling and girdling issues in container-grown trees. Root pruning encourages lateral root growth, which is vital for long-term tree health (Gilman, et. al. 2016). Effective root pruning at seedling stages has been shown to improve the overall quality and stability of container-grown trees, (Harris, et. al., 1971).

Root pruning benefits

IMPROVES ROOT STRUCTURE

By cutting back poorly formed or circling roots, the root system becomes more fibrous and extensive, allowing for improved anchorage as well as water and nutrient absorption.

REDUCES LANDSCAPE FAILURE

Pruning problematic roots helps the tree establish more quickly in the landscape, minimising failure.

PREVENTS ROOT GIRDLING

One of the key challenges with container-grown trees is root circling, which can eventually strangle the tree's own trunk. Pruning is essential for encouraging outward root growth.



This tree failure was caused by circling roots present in the container. As the trunk and roots increased in size they rested against each other causing the trunk to be thinner below ground, or girdled. Image used with permission Gilman, E. F. and Kempf, B. (2009).

Timing and methods

Root pruning should be done at every staging event with careful attention to timing and technique.

TIMING

Seedling trees being potted into tubes are at risk of J root formation. To mitigate this, prune back long taproots. After initial tubing, prune roots every time a tree is staged (potted on). Pruning during seasons of least growth activity – typically autumn, winter, or early spring – minimises stress on the tree.

METHOD

Remove the outer layer and base of the root system that contains any circling or deflected roots. Use sharp, clean tools (dipped into a disinfectant) to make cuts, ensuring smooth edges that heal quickly and reduce the risk of disease (Gilman and Kempf, 2009).



This young tree has a J root and kinked roots because of poor tubing technique.



J. Amer. Soc. Hort. Sci. 96(1): 105-108. 1971

Seedling Eucalyptus with taproot pruned to allow for tubing and development of more lateral root growth.

What is tree staging?

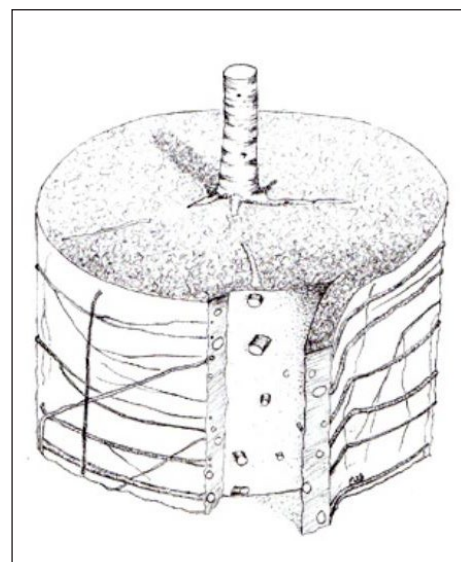
Tree staging involves preparing and managing trees at every potting event during their production in the nursery and at final plant out into the landscape. This ensures trees have strong well-formed root systems, good stem and branch structures, and balanced canopies. The NIASA Landscape Tree Stock Specification outlines the practices, inspections and associated recordkeeping you need to achieve this (NIASA, 2023).

Staging practices

We recommend implementing practices for staging trees that meet NIASA Landscape Tree Stock Specification.

PROPER CONTAINERISATION

Knowing your tree's growth capabilities is vital. Ensure that trees are placed into containers that allow for appropriate root development to meet your production timing. Containers that are too small can restrict root growth and will need to be staged more often, while planting into excessively large containers can lead to media deterioration before the root system occupies the space.



Removing outer circling roots from the periphery and base of the root ball at each staging event allows for lateral growth of the regenerated new roots. Image used with permission - Gilman, E. F. and Kempf, B. (2009)



Examples of air pruning pots.

ROOT PRUNING DURING STAGING

Undertake regular root inspection and pruning throughout the staging process to ensure that the tree's root system remains healthy and free from defects including J roots, kinked roots and circling or girdling roots.

SPACING AND GROWTH CONDITIONS

Trees should be spaced adequately after staging to avoid competition for light, ensuring that each tree has enough space to develop a healthy trunk and canopy.

WATERING AND FERTILISATION

Proper irrigation and fertilisation are necessary to maintain optimal growth conditions. It is important to avoid overwatering, which can impede healthy root development and increase root disease issues.

Container choices

Choosing the right container to suit your crop and your production methods is important.

PLAIN WALLED NURSERY POTS

Standard nursery pots come in many shapes and sizes but tend not to have any positive impact on tree root structure when compared with other types. Roots tend to circle and deflect.

AIR PRUNING POTS

These pots also come in a variety of shapes and sizes but tend to have positive impacts on tree root structure. Roots that get to the outer edge of the pot are dried out by the air and effectively pruned, limiting circling roots. They tend to dry out more quickly than plain pots.

OPEN BASE POTS

Some pot styles mentioned above have very open bases. These generally air prune large downward growing roots if they are not sitting directly on the growing bed. The development of lateral roots along the length of these roots is then encouraged. Most tree tubes used by propagators have this base type.

WOVEN BAGS

These come in both closed weave poly types and more open fabric types. The open fabric types can air prune whereas the woven poly bags tend not to. As these are generally cost-effective they are often used as the finishing container before landscape planting. It is important that at this final stage, trees are planted before major root defects can develop. Those planting these trees out should also be checking and pruning roots, as required, to improve root development during establishment in the landscape. Additionally, planting trees too deeply can encourage girdling root formation.

Health monitoring and management

Monitoring crop health is vital during tree production.

PEST AND DISEASE MANAGEMENT

Regularly check trees for pests and diseases, both above and below the media surface, to ensure that they are not compromised during production.

ROOT INSPECTIONS

Carry out routine inspections of the root ball during staging events. This simple task can help identify signs of circling, girdling or other root issues before they impact tree growth (NIASA, 2023)

Documentation and traceability

Maintaining records is essential for demonstrating crop source and compliance with specifications or standards. This includes detailed documentation of:

- » propagation
- » staging events
- » tree inspections and pruning activities
- » treatment for any pests or diseases (NIASA, 2023).



Conclusion

Root pruning and staging are critical components of growing high-quality landscape trees. By following the research-based guidance in the NIASA Landscape Tree Stock Specification, production nurseries can produce trees that meet the Australian standard, are healthy, well-formed, and ready to perform in urban landscapes.



An example of a well formed root system with many lateral roots formed and maintained after initial root pruning.



Well structured, healthy trees ready for landscape planting.

ATTRIBUTION

Hort Innovation funded project 'National biosecurity and sustainable plant production program' (NY20001), using the Hort Innovation nursery levy, matched by the Australian Government.

REFERENCES

- Gilman, E. F. and Kempf, B. (2009). "Strategies for Growing a High-Quality Root System, Trunk, and Crown in a Container Nursery." Urban Tree Foundation. <https://hort.ifas.ufl.edu/woody/documents/bmp-container-production.pdf>
- Gilman, E.F., Harchick, C., & Paz, M.D. (2010). Effect of Container Type on Root Form and Growth of Red Maple 1. J. Environ. Hort. 28(1):1-7.
- Edward F. Gilman, Maria Paz, and Chris Harchick. (2010) "Root Ball Shaving Improves Root Systems on Seven Tree Species in Containers" J. Environ. Hort. 28(1):13-18.
- Edward F. Gilman, Maria Paz, Chris Harchick (2016) "Effect of Container Type and Root Pruning on Growth and Anchorage After Planting Acer rubrum L. into Landscape Soil" Arboriculture & Urban Forestry Mar 2016, 42 (2) 73-83.
- Harris, R. W., Davis, W. B., Stice, N. W., & Long, D. (1971). "Root Pruning Improves Nursery Tree Quality." *Journal of the American Society for Horticultural Science*, 96(1), 105-108.
- NIASA. (2023). *NIASA Guidelines, Appendix 14 - Landscape Tree Stock Specification*. Greenlife Industry Australia.

MORE INFORMATION, LINKS AND FURTHER RESOURCES

Past editions of nursery papers are available online on the Greenlife Industry Australia website: www.greenlifeindustry.com.au/communications-centre?category=nursery-papers