How to successfully establish your new trees

By Gwilym Griffiths, November 20th, 2021

Planting trees represent a significant investment so it is critical that the process is done right! With increasing impacts from climate change, including variable rainfall and increased heat, it is no longer good enough to just plant a tree and hope for the best.

Successful tree planting and establishment can be divided into **4 key success factors**, 1. Planning and species selection 2. Quality stock 3. Correct planting 4. Establishment Maintenance, see figure 1 for a graphic representation of this.

Each of these key success factors are equal in their importance, if one step is ignored the whole process can be jeopardised. This can be described as the 'law of the minimum' which states that succes is not dictated by the process itself by the weakest link in that process (greatest limiting factor). The process should also be underpinned with good **communication** and **monitoring** throughout all stages to ensure that all stakeholders understand the process and that each stage is monitored for quality and or correct practices.

Image courtesy: Gwilym Griffiths

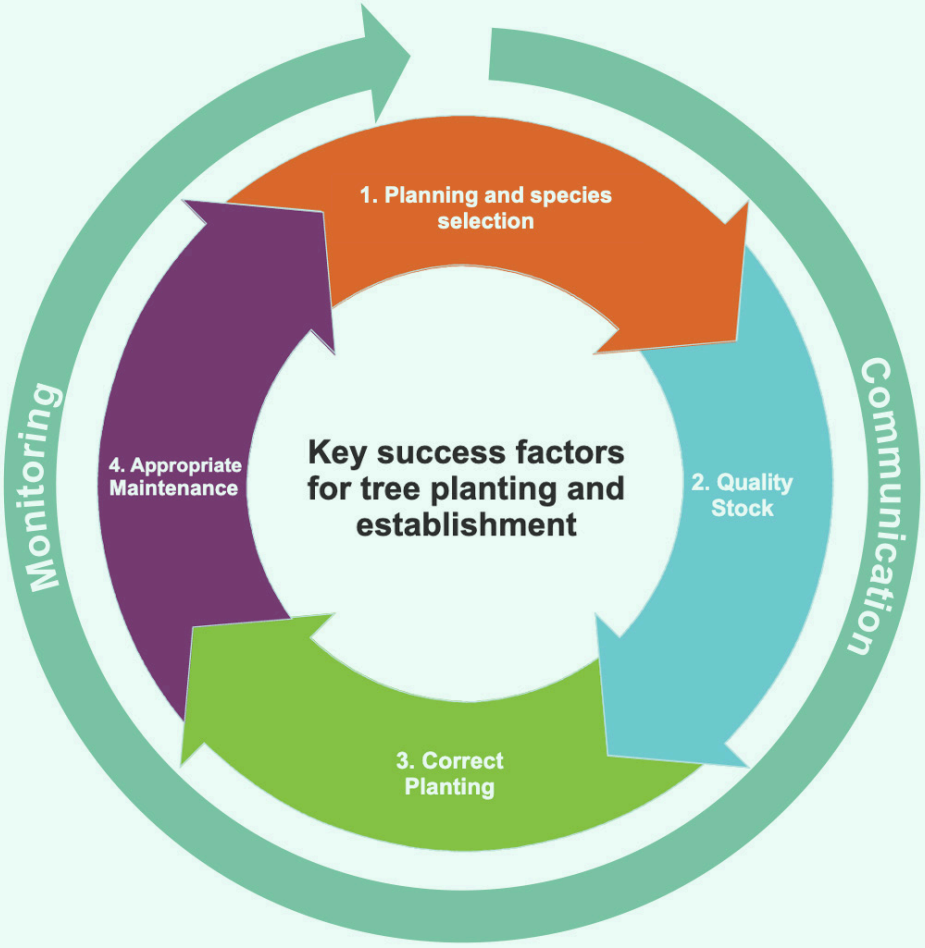

FIGURE 1 Representation of the key success factors for tree planting and establishment, critical to each stage is good communication with stakeholders and monitoring of outputs.

1. PLANNING AND SPECIES SELECTION

LOCATION - 'get the site right', especially if it is a street tree as there are usually many competing elements in the streetscape and it is essential that the location is suitable for the chosen tree. The tree will hopefully be in this location for many decades and allowing enough space for it to develop, uninhibited, to its full maturity is important. Consider proximity to services (above and below ground), distance from buildings and other built infrastructure. Sight lines and offsets from intersections are also important from a traffic safety point of view, in most scenarios' trees will need to be planted 10m away from intersections. Refer to your state or local road authority for guidance on this.

TIMING - Planting time matters! Make sure you are planning your planting program to align with the best season to plant. Autumn is generally the best time to plant due to maximum root growth and caliper growth during this time. Planting during autumn will ensure that when it comes to the following summer that your trees have had time to establish a root system and will require less watering and maintenance during the summer heat. Spring is also fine to plant but trees are generally focusing on foliage growth at this time and may not establish roots as readily in time for the harsh conditions of summer.

SOIL VOLUME – does the location have enough available soil volume to sustain the tree into maturity? Trees will only grow to their full potential size if there is the soil to support sustained growth. There are numerous methods available for calculating soil volume, one of the earliest methods was developed by Lindsay and Bassuk which calculated a minimum required soil volume based on the projected canopy area of the mature tree (0.6 x m^2 projected canopy). More recent methodologies have been developed that utilise tree height instead of width. Simon Leake and Elke Haege have developed the 'Soils Volume Simulator' which incorporates tree height and other environmental and growing conditions to formulate required soil volume, it can be viewed here https://www.elkeh.com.au/soils/.

SOIL QUALITY – Take a soil sample! Look at your soil to see what properties it has. Is it a heavy clay or well drained sand? Do you need to incorporate any soil additives to improve soil quality? Soil science is a complex field and you may require the expertise of a soil scientist to provide the best advice for your site. What is the drainage like, will you need to incorporate additional drainage into the tree pit design. These questions are important to consider early on in the planning phase so that allowance can be made during planting.

SPECIES SELECTION – 'The right tree for the right location'. Selecting the right tree is essential for the success of the planting. Factors to consider include soil type, drainage, climate, available water and available space (above and below ground). Maximise each location by selecting the biggest size tree suitable for that location, there is little value in planting and small Blueberry Ash in a location that could sustain a large Eucalypt.

Selecting a species that will be suitable to future climate extremes is also essential to consider, our cities are getting hotter and selecting the right species will mean the difference between success and failure. The 'Which Plant Where' web tool enables this enhanced decision making and is a valuable resource to ensure success of your planting. Refer Also to the article '*Best practice species selection*' in the resources page of the Which Plant Where website for more information.

2. QUALITY STOCK

Buying a tree is a long-term investment. Trees are a structural asset that require structural integrity to perform, this integrity starts in the nursey and if the quality isn't right when planted it will never be right. Poor quality trees might grow well in the early years but if the structure isn't right, either below or above ground, there will be issues later on.

The tree itself is generally the smallest cost of the project when compared to labour costs to plant and maintain the tree, however the quality of the tree itself can make or break the project. To buy anything other than the best available tree is a false economy.

There is one way to ensure your tree is good quality, ensure it has been grown in accordance with **AS2303:2018 Tree stock for landscape use**. This standard has been developed over many years and is tried and tested in the industry. Go to the nursery before you purchase your trees, talk to the grower and find out what quality of trees are available.

"You either plant trees that have been grown to AS2303 or you don't plant at all. The cost of the tree is generally a relatively small % of the total costs of new trees in our urban landscapes. Design costs, site works, planting and establishment costs etc. will form the bulk of the costs involved. To plant sub-standard trees is to risk all those other costs, the time lost when new trees fail and the costs involved with replacing them."

Ross Clark

Assessing stock quality prior to purchasing your tree is important. It is not good enough to simply specify the standard without checking compliance with it.

The 'Tree Stock Standard Project', a collaboration between Hort Innovation, Nursery and Garden Industry Australia and Western Sydney University, developed a simple to follow non-destructive method of assessing tree stock against the standard, it considers a 'Preferred Percentile Range' for size index values that account for stem diameter, height and container size. This assessment method can be found here:

www.westernsydney.edu.au/__data/assets/pdf_file/0011/1484282/HIE-card-A5.pdf

One element on tree quality that is often overlooked in the nursery industry is the staking of young trees directly to the stem, see figure 2 below. This promotes tree height but not stem diameter, in extreme cases once the bamboo stake is removed the tree will fall over as it has not developed its own strength, this is especially true with eucalypt species. Trees are opportunistic and will not develop strength or lay down wood where they don't need to.

FIGURE 2 Image of a tree that should never have gone in the ground. There are two key things wrong here, the first is the girdled root system which will never repair itself and will eventually strangle the tree and the second is the bamboo stake tied directly to the stem, which promotes tree height but not stem diameter and therefore structural weakness. (Image credit: G.Griffiths)

3. CORRECT PLANTING

The correct way to plant a tree is often not clearly understood, there are several key elements to consider when planting the tree, they are; (refer to figure 3 tree planting detail for a graphic representation of this information)

SAFE HANDLING OF TREES AT DELIVERY - Move trees by using the handles on the bags / pots. Avoid handling or lifting via the trunk as this can damage fine root systems or ringbark the soft tissue on the tree trunk. Machine handling is recommended for larger stock > 100L as long as majority of weight is taken by the rootball. Lifting via single 'choker' slings around the trunk is not advised. Crossing slings should be placed around the rootball to take the weight of the tree and a secondary 'balancing' sling used around the trunk with protection such as hessian

LOCATION AND SIZE OF HOLE - The tree should be located in the centre of the hole with adequate setback from roads or buildings. The hole should be excavated to **three times** the diameter of the container, this is important to provide enough 'good' soil around the rootball to allow for unimpeded root development during the early life of the tree – this early root development is import to set the tree up for the future by ensuring an even structural root crown is established.

The tree should be planted facing the same direction as they were grown in the nursery. Most good growers mark the north point on the bag of tree when it is supplied – this north point should be replicated on site.

DRAINAGE - Ensure the planting hole is free draining and does not retain excessive water. Correct if necessary. Root systems will suffocate and die if the planting hole retains water due to the exclusion of oxygen and creation of toxic anaerobic conditions.

ROOT BALL HEIGHT AND BASE OF HOLE - The root ball should be placed onto a **consolidated base** at the bottom of the planting hole, this ensures the weight of the tree itself will not cause subsidence and affect the level at which the tree is planted. The top of the root ball should be level with the surrounding ground. If the rootball is too low in the ground this may lead to collar rot, if the root ball it too high in the ground this may cause the root ball to dry out.

SOIL IMPROVEMENT – A healthy soil provides for optimum tree growth and the successful establishment of the tree. Ideally you have identified the necessary soil improvement required for the site during the planning process. Often with planting in urban areas the soil can be compacted or high disturbed. Effort should be placed on soil decompaction and consider adding composted organic matter to improve structure and soil composition.

ROOT PRUNING - Prior to planting the root ball should be inspected for any pot bound roots, these roots should be cleanly pruned with a sharp knife or secateurs to promote even root extension growth. Roots that are circling in the pot will never straighten themselves out in the ground and will generally just keep circling, this is why this step is so important. Most good nurseries ensure this step of root pruning is done prior to delivery so it is not forgotten on site. Well grown stock will not require much root pruning however it is still likely to be needed to some extent.

STAKING - 'Protective' staking is encouraged to provide a buffer around the tree to prevent any damage, especially in highly urbanized areas. The stakes are not there to provide support and if the tree is not self-supporting is should not be planted. 'Figure of eight' strapping around the trunk is not encouraged as it does not allow for enough movement and can wear away at the outer cambium of the tree. If the tree arrived with nursery stakes directly against the stem (which they should not) these need to be removed before planting. If the tree does not support itself after the stake is remove then it should not be planted as it does not conform to AS2303.

WATERING - The tree must be watered in the pot prior to planting to ensure the root ball is soaked and immediately once planted in the ground. The formation of a 'bund' or 'bermed dish' close to the edge of the root ball with assist with establishment watering. See below for more information on ongoing establishment watering.

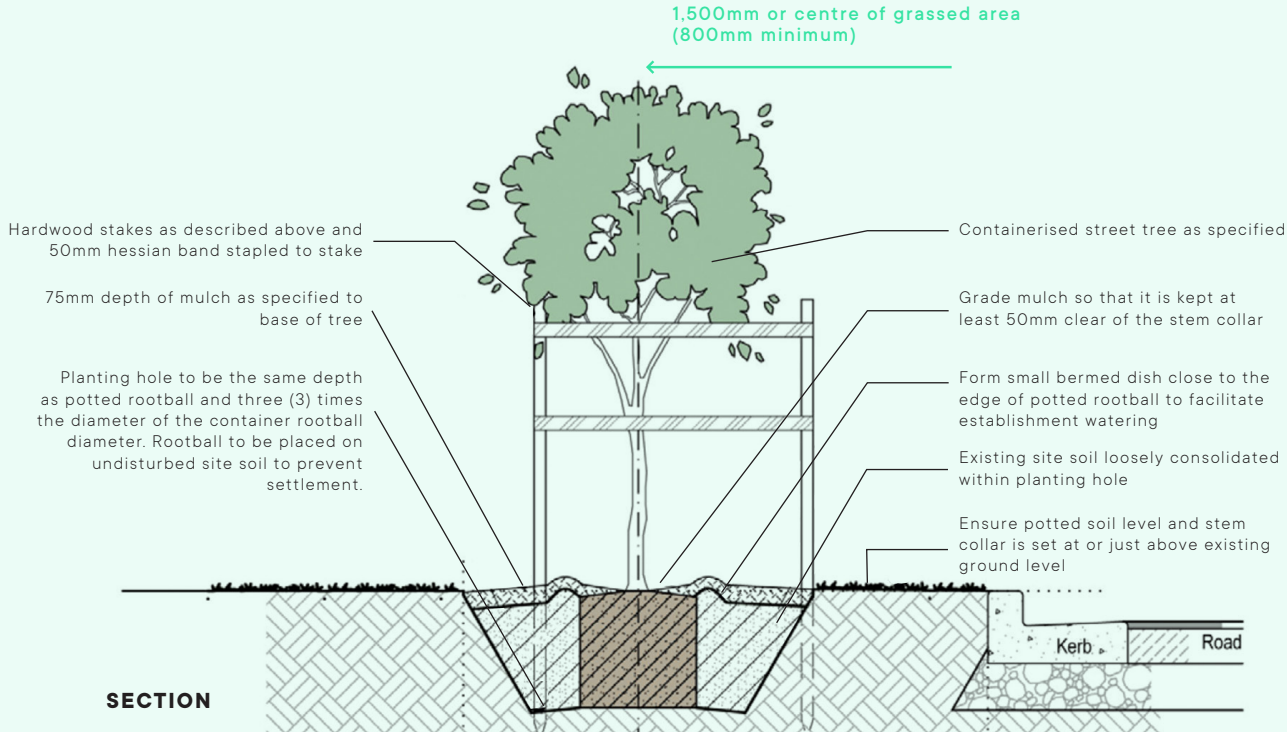

FIGURE 3 The correct way to plant a tree. Note the level of the rootball in relation to the surrounding ground and the consolidated base on which the rootball is placed. (Image credit: Arterra Landscape Architects)

MULCHING – mulch is a trees' best friend and should be applied immediately after planting. It will help retain moisture in the soil and provide organic matter to replenish the soil as it breaks down. The best mulch is the 'leaf mulch' that comes from the back of a chipper as it has a variation of particle sizes that allow for aeration and different rates of decomposition. Ideally the mulch is not green and has had time to compost somewhat before it is placed around the tree.

4. ESTABLISHMENT MAINTENANCE

It is essential to provide a tree establishment period for newly planted trees, significant effort has gone into planting the tree but the job isn't finished yet! The duration of the established period can vary and is influenced by climate and the size of tree at the time of the planting. The larger the tree at the time of planting the longer the establishment period. Ideally the establishment period is somewhere between 12 and 24 months. This obviously has financial impacts but this should be factored in during the planning phase - if you can't afford to establish the number of trees you want to plant then plant less trees. In some cases, less is more and the allocation of the correct resources is critical.

WATERING – is undoubtedly the most important element of establishing a newly planted tree. Planting a tree and relying solely on rainfall is not an option, especially with large tree stock.

A new tree can only access moisture that is within its rootball. The amount of water is determined by the size of the root ball and is generally 20% of root ball volume, so for a 45L tree it would be a volume of 9L of water at each application, this can vary depending on soil type. Frequency of watering is a sliding scale and is dependent on the time of year, generally less in cooler months and more in hotter months, depending on time of year the tree is planted. The tree will need more water directly after planting and less as the tree establishes.

It is important to check drainage each time you water the tree, if the tree pit is not draining there could be issues and watering may need to be adjusted or the tree pit modified to improve drainage.

Ross Clark has developed a comprehensive guide to watering new trees which is available here https://www.treesimpact.com.au/articles/watering-newly-planted-trees

Other elements of tree establishment maintenance that should be undertaken during the establishment period include the following:

- Weeding and rubbish removal from tree surrounds
- fertilising
- pest and disease control
- adjustment, removal or replacement of protective staking
- formative and selective pruning to AS 4373
- mulching to maintain and reinstate to depth specified

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