

How we calculated soil volume in Which Plant Where

By Samantha Newton & Michelle Leishman, March 18th, 2024

In the Which Plant Where plant selection tool we calculate the minimum and maximum soil volume required for each species. The soil volume is based on the projected canopy cover, which is based on the width of the species' canopy at maturity.

WHY IS SOIL VOLUME IMPORTANT?

Trees need sufficient space below ground to develop roots for support and to access water, air and nutrients. Maximising access to soil allows trees to thrive, maximising health and longevity, which in turn maximises canopy development for shading, carbon capture, urban cooling and improved air quality. We calculate soil volume to indicate the amount of soil that is accessible to a tree's roots.

Most tree roots occupy the top 600 mm of the soil profile. Air and soil water availability decrease with increased depth due to compaction by the weight of soil above. In an urban context, soil compaction may be much greater due to the construction of roads, pavements and other hard surfaces that require a high level of compaction to ensure stability of the surface layer.

The amount of soil required for an individual tree will depend on the size of the tree, and the size that a tree attains is influenced by the amount of soil it can access.

If we want to maximise tree growth, we should aim to provide the maximum soil volume. Generally, specifiers such as councils and landscape architects will nominate a minimum soil volume required for each species. Minimum soil volumes are based on the minimum canopy width of the species at maturity. However, if we want to maximise tree growth, a larger soil volume than the 'minimum' should be provided. Ideally each tree species will have the largest soil volume possible to maximise performance.

The *Which Plant Where* database includes information on the range of maximum sizes that trees can attain. Maximum tree size at maturity can vary due to soil type, temperature and rainfall as well as other climatic parameters. This information allows us to provide a range (minimum, maximum) of soil volume requirements for each tree species.

CALCULATING REQUIRED SOIL VOLUME



In *Which Plant Where*, we use the [Lindsay and Bassuk, 1991](#) method. This is the simplest method and is widely used and accepted.

$\text{Required soil volume (m}^3\text{)} = \text{canopy cover (m}^2\text{)} \times 0.6$

where canopy cover is calculated as the area of canopy based on maximum canopy diameter and it is assumed that the canopy is circular when projected onto the ground (see [How we calculated canopy cover in Which Plant Where](#)).

The soil volume value is an estimate of a tree species' requirements and should be used as a guide.