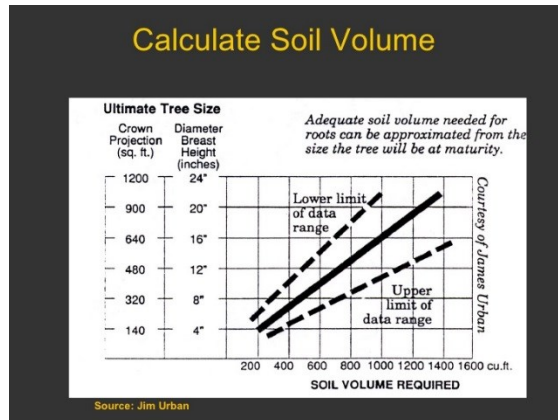
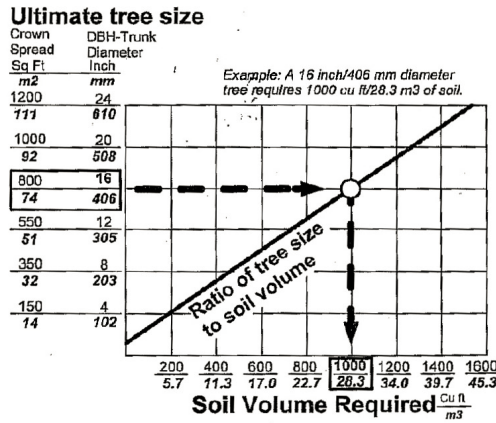




Urban Tree Soil requirements

Volume Requirements – The amount of urban tree soil used will in part determine the maximum size that a tree can grow in its lifetime. Soil Volume can be calculated by using our [volume calculator](#) or following the diagram posted below, prepared by James Urban (Up by Roots, ISA Press, 2008). Only the upper 3 feet of soil should be used in calculations through this table.

Table 2.4.1. Tree size to soil volume relationships (Urban 1992).



Depth specification – As a rule of thumb tree soils should have a minimum depth of 3 feet (1m), which can be composed of subsoil and topsoil layers. The soil can either be installed in lifts where the base soil surface is tilted or scarified between each lift, or through layers of < 12 inches (30cm) where a subsoil mix is installed first followed by a topsoil mix of at least 12 inches (30cm).

Texture – the top and subsoil layers or lifts should be a sandy loam soil comprising of 50 to 80% medium and coarse sand (<25% fine sand), 5-35% silt, and 5-20% clay.

Stones and rocks – the soil must contain no stones larger than 1 inch with stones ranging from 0.5 to 1 inch (1.25 to 2.5cm) not exceeding more than 5% of the soil volume, and gravel 0.25 to 0.5 inches (0.6 to 1.25 cm) not exceeding 5% of the soil volume.

Debris content – all particles in soil that are greater than 1 inch should be taken out of the soil, these include fragments of concrete, wood, brick, metal, glass, plastic and stone. Any debris less than 1 inch in diameter should not exceed 5% of the soil mix.

Contaminants – The main reason to use tree soil in urban areas is because of the costly effects of contamination often found in onsite topsoil's. The soil needs to have no heavy metals, herbicides, biological toxins or hydrocarbons than can affect the growth of a tree. All tree soils need to meet the EPA's standards for soil contaminants.

Clod size – when using a mixed soil any clods formed by high clay content between the sizes of 1 and 3 inches (2.5 to 7.5 cm) should not exceed 10% of the soil volume, and clods between 3 to 6 inches (7.5 to 15cm) should be less than 5%. Smaller soil peds less than 1 inch long allow for improved soil drainage and can make up the entirety of the soil volume.

Organic matter content – Is vital in providing nutrients for trees, retaining water, promoting biological diversity and maintaining stable soil aggregates. As a general quota, the soil used needs to have between 4 and 6% organic matter by weight, with compost used to add additional organic matter if needed. No mixture of soil to be used in tree planting must have more than 15% compost by volume so that subsidence or settling problems do not occur. Subsoil used should have between 1 and 3% organic matter but additional amounts won't cause a problem.

Density – topsoil needs to have a density between 1.0 and 1.4 g/cc and subsoil 1.2 to 1.5 g/cc in order to be high enough to avoid settling but not too high to discourage root growth. The soil needs to be settled between lifts with a vibrating plate compactor, typically two passes of a 20 inch (55cm) vibrating impact plate on moist soil will achieve the correct soil density.

Drainage – a percolation rate of 1 to 2 inches (2.5 to 5cm) per hour is preferred if an irrigation system is installed. If the native subsoil has a drainage rate less than 1 inch (2.5cm) per hour, a drainage system needs to be installed in the form of a corrugated/ slotted pipe. Slots at the top of the pipe should be covered by plastic sheeting to prevent soil contamination, but can be left open if facing downwards. The drainpipe should be facing downhill towards a drainage area, and should be surrounded in a coarse sand trench of at least 12 inches (30cm) wide and 10 inches (25cm) deep. The drainage pipe must not be wrapped in filter fabric to avoid future clogging.

Soil pH – The preferred pH range is dependent on the species of tree being planted and determines the availability of nutrients in the soil.

Nutrients – prior to soil installation the plant available nutrients should be tested, and if found to be at levels listed as medium or lower on a soil analysis report, appropriate fertilisers should be used to counteract any nutrient deficiencies. When nitrogen is required a nitrogen fertiliser containing at least 50% nitrogen should be applied in a water soluble form.

Soluble salt - soil must have less than 2 ds/m

Moisture levels – all new transplants need water to keep alive and thrive. Adequate soil moisture levels need to be monitored regularly and acted upon with irrigation systems if found lacking. As excess irrigation can harm plants it is advisable that moisture sensors be used during the time of soil installation on any new planting.

