Quality Soils for Healthy Trees

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The Importance of Quality Soils for Healthy Trees in Urban Environments

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INTRODUCTION

It is now widely accepted by green building professionals that healthy trees play a significant role in successful green infrastructure systems in urban environments. Trees provide a wide range of benefits to society at-large and to the urban dweller in particular.

Healthy trees:

- **Reduce the urban heat island effect;**
- **Help manage stormwater;**
- **Reduce air pollution;**
- **Provide shade that lengthens the life of building materials.**

Unfortunately, far too many urban projects across the globe are subject to entirely inadequate tree planting practices, resulting in failed or diminished results. These commonly accepted practices often lack the proper improvement of inherently poor soil, and fail to adequately address the impaired surrounding substratum. **The results are: severely restricted growth and habit, shortened life spans and costly re-plantings.**

Trees also serve an important purpose in the design of urban spaces and ultimatelyin the creation of healthy, purposeful, and aesthetically-pleasing places for human interaction.

QUALITY SOILS

Soil quality, also called soil health, is simply defined as: how well the soil performs and “does what we want it to do.” Specifically, soil quality is the capacity of a particular type of soil to function, within managed or natural ecosystems, to sustain plant and animal life, maintain and enhance water and air quality, and to support human health and habitation. Understanding soil quality involves the proper assessment and management of soil so it functions optimally now, and is not degraded for future use.

There are a number of factors that characterize typical urban soils and whereby reduce their productivity:

- **Little or no organic matter;**
- **Human artifacts that disrupt water movement;**
- **Elevated salt content;**
- **Interrupted nutrient cycling and modified micro-organism activity;**
- **higher pH values resulting from the introduction of cement, plaster and road salts, and compacted soil layers.**

Trees need significant volumes of low-compaction soils, with suitable pore space, drainage, and organic matter to provide for long-term growth. A good rule of thumb for preserving older trees and assuring the success of new plantings in urban environments is to use large amounts of loam soils; comprised of varying percentages of sand, organic compost, and clay silt.

Because individual project and site conditions vary so dramatically, it is often necessary to adjust the soil ingredient mixture accordingly. These “fit for purpose” soils will optimize the water, nutrient and aeration properties to be consistent with the intended use.

Developing effective soil is a science, and it should be customized to meet individual site-demands, but it is important to point out that certain traits are universal for all quality soils, regardless of the application. These traits should include:

- **A relatively high percolation rate to avoid prolonged surface ponding;**
- **A large capacity to sequester pollutants as water moves through it;**
- **The nutrients necessary for vigorous plant growth.**

IMPROVING THE SURROUNDING SUBSTRATUM

The other important aspect of proper tree planting in an urban context is the condition of the underground areas (substratum) surrounding the immediate “tree pit” or “tree trench” location. Trees, and all other landscape plants for that matter, require a certain amount of lateral space underground to accommodate the biological needs of the plants for optimum root volume. Also necessary in urban streetscape situations is structural integrity and support.

The need for adequate space and soil for healthy root growth and the need for various hardscaped areas, such as sidewalks, streets, and malls, are typically at odds because paved areas demand a certain compaction below them to function properly and compacted soil severely restricts root growth.

The use of quality soils is critically important for healthy trees, but without sufficient un-compacted, lateral space the root zone will be severely restricted and poor tree growth will result. The use of structural soil cells (discussed below) provides space for root growth in quality soil and the strong structural support necessary for successful urban infrastructure projects.

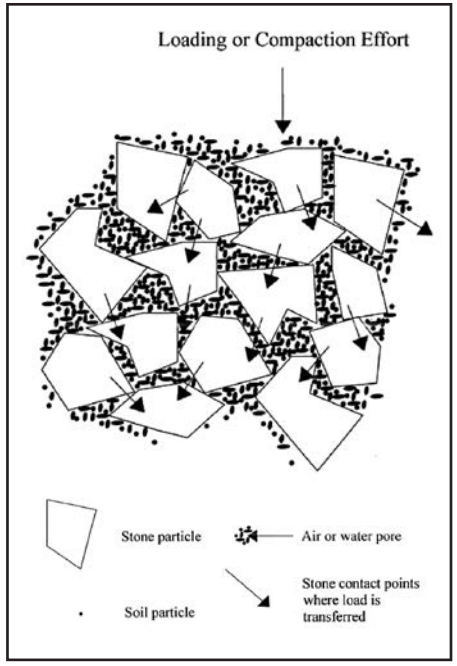
STRUCTURAL SOILS VS. STRUCTURAL SOIL CELLS

Structural Soil

Structural soil is a mixture of stone aggregate and soil, with a small amount of polymer gel to hold the mix together. This mix can be compacted to 95% dry density and support paving and yet allow for some tree root growth. The mix typically consists of: 20% loam soil, 80% angular gravel with no fines, and .03% polymer gel.

Drawbacks of Structural soil:

- **Limited success for good tree growth due to lack of actual soil content in the structural mix;**
- **Structural soil requires significant space (not usually available in urban areas) and substantial budgets to achieve the necessary soil volumes for healthy plant growth.**



Structural Soil Cells

These modular, pre-engineered structural cell systems, particularly those manufactured by CityGreen, are designed to accommodate irregular urban conditions and provide 95% of the space within the cells for tree-rooting soil. The structural cell provides for a “tree pit system” that allows for improved underground spaces for quality soils, optimum tree root volume, and superior structural support for urban hardscapes.

Benefits of Structural soil cells:

- **Constructed of recycled thermoplastic material that is relatively light-weight, extremely durable, and non-toxic;**
- **Allow stormwater to move more freely through the root zones, and ultimately into the aquifer,**
- **Much more efficient and cost-effective than previous approaches.**

CONCLUSION

Quite often trees are planted without quality loam soil and are “squeezed” into places that lack the proper space to develop healthy root structure. In the past, designers and engineers failed to address this problem resulting in multitudes of failed tree plantings across the world and unfortunately continues in some areas.

Simon Leake of SESL points out that there have been a number of advances in soil technology in recent years, including:

- **“Gap-graded” soils that cope with compaction issues from increasing population and resulting uses.**
- **Less use of “structural soils.” Even though these “soils” continue to have their applications, they only contain 20% of useful soil for root zone volume.**
- **Structural soil cell systems like those manufactured by CityGreen, are much more effective for optimal tree growth in urban situations.**
- **Improvement of urban stormwater runoff management by using sandy filtration-type soils to improve water quality for irrigation and other uses.**
- **Promotion of stormwater harvesting through the use of gap-graded soils that filter the runoff prior to discharge or storage.**

Today, green design and building professionals better understand the need for quality soil and improved substratum for healthy tree growth in difficult urban environments. Increased diligence by all of the key decision-makers in the approval, design, and installation of urban infrastructure will promote the use of quality soils and innovative support structures to insure the future long-term success of our urban forests.