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## Making room for trees in the urban landscape

*Designers, contractors and developers should know what's going on below the soil to ensure trees grow healthy.*

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As Seattle becomes a denser urban environment, more of its surface is being covered by buildings or pavement. At the same time, the city of Seattle and many other municipalities are trying to preserve existing trees and ensure that new trees are planted.

In Seattle, the city is trying to preserve existing street trees that are in good condition, even if a major project is occurring on the adjacent property. There are good reasons for this approach, including the time needed to establish any tree in a sidewalk area and the inevitable outcry from neighbors when trees are removed.

For the developer and contractor, working around such trees often presents challenges. Most people would agree that successful retention of existing trees and well planned and executed new tree plantings add value to development projects. The way to turn your trees into an asset is to plan ahead using an understanding of the site conditions and how tree roots grow to ensure a long life for the trees that will not be compromised by infrastructure conflicts with roots.

Have you ever wondered how trees that are surrounded by buildings and paved surfaces survive and grow?

Many people are not aware that tree roots in the majority of situations are located within the top three feet of soil or less. The most important roots for trees' health and survival are the fine absorbing roots, which are generally concentrated in the top 12 inches of soil. Tree root systems are, generally speaking, broad and shallow and extend well beyond the canopy of the tree.

Tree roots require soil with free air and water. If the soil is saturated with water or is compacted with no pore spaces, tree roots will not grow. Soils that form naturally beneath trees are composed of the shed parts of trees and other plants that decompose into humus. Excessive clean up of urban landscapes eliminates this natural process.

Trees with roots that are confined by soil conditions often exploit areas where they can survive. As they grow larger, tree roots can conflict with infrastructure.

When developers install new trees as part of an urban project, it is not uncommon that the trees are planted into a confined area with disturbed and compacted soils that may not be conducive to root growth. Tree roots are often left with few options but to grow into places where people don't expect them to.



**Most of these oak trees will be preserved when the lot next to them is developed and the planting areas are combined and improved.**

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*“Valuable Knowledge of Trees”*

A common example is a tree planted in a sidewalk planting pit where the sub soils are compacted and inhospitable to tree roots. The area just below the paved surface often has the pore space, with air and water present — where a root can survive. If the root finds conditions that allow growth, the sidewalk is likely to be in trouble over time. Tree roots can move or break strong objects that weigh a lot.

There are many strategies in use for planting trees in urban settings.

Landscape architect and arborist James Urban has worked for many years to understand, develop and document tree planting strategies and to educate arborists, landscape architects and landscape installers in their use. Urban's recent publication, "Up by Roots," is long-awaited treatise on the subject of trees' needs below ground and how to accommodate them in the built environment.

Urban suggests that a basic understanding of tree biology is needed in order to design planting spaces that will support trees for a long time without conflicts with urban infrastructure. Some basic tree biology concepts are listed in Urban's book. They are simple concepts, but as one looks around at city trees, it is clear that they are often overlooked:

1. Trees grow every year until they die. Essentially, trees grow a new tree around themselves every year. They will get fatter and taller above and below ground every year.

2. Leaf to root balance. Like other plants, trees must have a surface area of leaves for photosynthesis that is in balance with the area of the fine absorbing roots that take up water and nutrients. If the tree's roots are removed or there is no more room for expansion, then the crown of the tree will grow slowly or die back.

3. Trees have horizontal root systems that are limited in depth by the soil characteristics. Depending on the availability of air and water in the soil, tree roots may be limited to the very top layers of soil or may be found many feet down. It is common in cities to see deep roots that have found conditions that they can grow in that were created by old construction or grading activities. Conversely, there are many city trees that survive in the very top layer of soil or under pavement with no deep roots.

4. Tree roots are opportunistic and can be aggressive in exploiting opportunities! It is common to see assumptions made about where tree roots will be located that turn out to be wrong when excavation reveals the landscape below ground.

5. Tree roots can be strong or fragile. The fine roots that are so important to trees are often disturbed or removed by construction activities. These absorbing roots are not easily noticed. It is possible to severely stress or kill a tree without removing any of the larger and stronger woody roots by removing fine roots or compacting the porous soil that they require.

6. Trees are dynamic structures. From an engineering point of view, a tree is a vertical cantilever which resists the forces of wind and gravity. The root system provides the anchor for the cantilever. Trees grow their structure to accommodate the loads that they encounter, producing swelling at the base or trunk flare. Designers must understand this fact in order for the trees they plant to have adequate room to grow their structure.

7. Trees require light. Urban settings often result in artificially shaded locations. Selection of species for tolerance of low-light "urban canyons" or for under planting where existing tree canopy shades young trees is essential.

With these basic concepts in mind, Urban has developed 10 design principles that he feels will help landscape professionals develop planting spaces that will support trees for a long service life. He breaks them into soil-, tree- and management-based strategies.

#### **Soil-based strategies:**

- Plant the easy places first
- Make larger planting spaces
- Preserve and reuse existing soil resources
- Improve soil and drainage

#### **Tree-based strategies:**

- Respect the base of the tree
- Make space for roots
- Select the right tree

#### **Management-based strategies:**

- Establish reasonable tree and soil budgets
- Create detailed tree and soil construction documents
- Design for maintenance

I hope that this article gets you thinking about successful tree planting in urban settings. I have barely scratched the surface of this subject here. Resources like Urban's book, along with help from local professionals, can lead to a new tree planting approach that will result in large healthy trees for our cities' futures.

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