Choosing and Designing for Healthy Urban Trees

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This series of posts is intended for municipal staff and city stakeholders as they consider what trees to plant in their communities and how to care for them. In particular, the focus is on those trees that are in tree pits in downtown sidewalks or in narrow tree strips in urban settings. The first article below presents an introduction and a discussion of tree species, arboriculture, and planting methods. Following articles will deal with soils, amendments, and planning for root growth; irrigation, drainage, and pollution; paving, utilities and drainage near urban trees; and maintenance.

Trees installed in bumpouts in Columbia, SC

Nearly everyone loves, or at least appreciates, the value of trees in urban settings. They cool the air, filter up to 50% of nearby air pollution, produce oxygen, and provide shade (especially appreciated here in our southern climate). So it is a cruel irony that such useful organisms planted in urban settings are often tortured, starved, and deprived of water, stunting their growth and shortening their lives. Once landscape architects and allied professionals (Arboriculturists, soil scientists, etc.)

faced up to this neglect and abuse, we began to formulate ways to correct it. In the past few decades a wide variety of approaches to improving the health of urban trees have been developed. Some of the specialized solutions are to address planting trees over structures (subways, utilities, basements, parking structures), and although these solutions are innovative and no doubt work (we will really know if they work in 20 years of so), they are also very expensive. Other advancements are less expensive and more widely used to prolong the life of urban trees.

The correct choice for urban trees and the means to keep them healthy includes the following considerations:

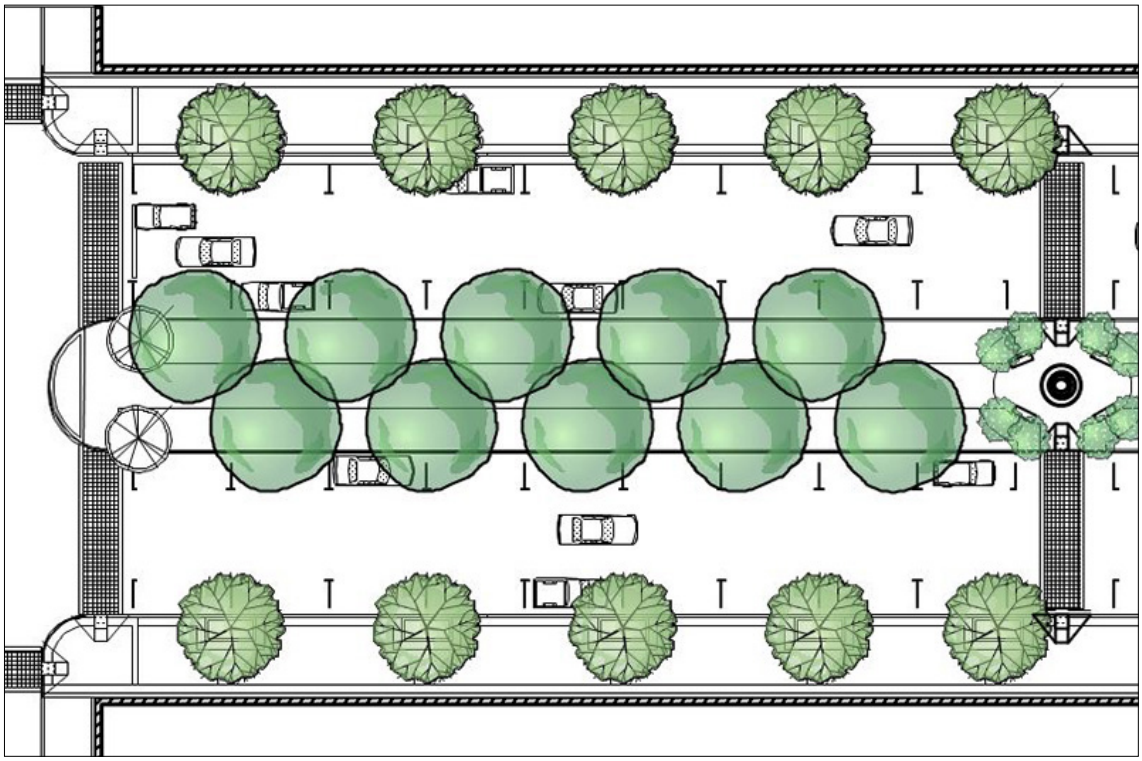
1. Tree species, size, arboriculture, transport, and planting methods;
2. Existing soil, soil amendments or replacement, planning for root growth, prevention of soil compaction and pollution;
3. Access to water;
4. If planted in the sidewalk, materials used, porosity, depth of pavement and base;
5. Maintenance, trimming, feeding.

Building urban streetscapes is a complicated endeavor, and most design professionals and urban stakeholders are focused on the design of infrastructure and surface materials, especially since these elements account for the significant majority of costs. In this context, a 2.5"-3.5" caliper tree costing about $250-$300 seems insignificant. And yet, when the streetscape is installed and the trees are able to grow and achieve mature (and appropriate) size, they are one of the most prominent, enjoyable and memorable contributors to the urban setting.

Tree Species, Specifications, Arboriculture, and Planting

There are many excellent publications that recommend ***appropriate tree species*** for urban settings based on climate zone. In this article, since I am concentrating on urban trees in down-

town sidewalks, there are some additional considerations such as form. Storefront visibility is essential to the small businesses on our Main Streets, so "vase-shaped" trees such as Zelkovas, Bosque Elms, and Hybrid Elms are a good choice for these areas. Trees with larger canopies can be used where sidewalk width allows reasonable growth of the canopies without crowding the upper stories of buildings. I have often seen Holly Trees planted in older downtown streetscape, and these are not a good choice because they are usually branch close to the ground, the leaves are prickly, and they block views. In Goldsboro there is a very wide right of way, so Bosque Elms were used in the sidewalks and Willow Oaks were used in the grassed median. This allows views to the storefront and promises that as the Willow Oaks mature, they will create a high wide canopy to shade the street. Willow oaks or similar large trees on the sidewalks would eventually grow too wide next to the upper floors of buildings.



Concept showing large trees (Willow Oaks) in the median, and medium trees (Bosque Elms) in the sidewalk. Mature canopy size should be used in planning.

This assumes (or perhaps is hopeful) that there are no overhead utility lines on the streets where shade trees will be planted. Burying and upgrading utilities is an expensive but essential part of improving downtown streets, and should be

included in cost calculations. If burying the lines is impossible, sometimes they can be relocated to the backs of buildings instead. If the lines must remain, there are far fewer options for trees, and trees that are small enough to remain manageable will never provide a desirable shade canopy.

Very narrow urban sidewalks also present a challenge. There are columnar or upright trees that can be used in these conditions, but as with overhead lines, such trees will never provide desirable shade. There are examples of narrower sidewalks (see photo above of Main Street in Columbia, SC) where larger trees are planted in bumpouts at several locations along each block, creating abundant shade and great character.

These narrow streets in New Bern, NC require medium-size trees such as the Zelkovas in grates shown here.

Books on urban trees will probably also offer information on mature height and width, pest and disease problems, and growth habits. Trees with shallow roots such as Maples may heave pavements as the trees mature. Some formerly popular choices (Dutch Elms being the classic example) can develop problems that can wipe out an entire population of trees within a decade. Green Ash borers have eliminated the widespread use of these attractive trees, and American Sycamores (*Platinus*

occidentalis) have developed problems with anthracnose, while London Plane Trees (*Platinus x acerifolia*) seems less susceptible. Red Oaks and Pin Oaks are susceptible to leaf scorch which will eventually kill these trees. Some of these problems can be minimized through proper care, but unfortunately most urban trees are planted and promptly neglected, so best to start with the most tolerant of species. There is no guarantee that other trees won't develop problems over time, so the best approach is to avoid using only one type of tree over a large area. It is also best to purchase trees grown locally to ensure they are acclimated to the soil and climate of your area.

What ***tree size*** (caliper) should be purchased for urban locations? Usually a minimum size for a shade tree would be 2" caliper, although I prefer 2 1/2"-3". The difference in price between 2" and larger is minimal, but the immediate impact of larger trees is greater, and larger trees are less prone to vandalism. Trees of this size will either be field grown or container grown (see photos below). I have not seen a big difference

Container-grown trees.

Field-grown trees awaiting installation.

in survival rate between the two, but generally I would prefer container grown trees because they are not affected by the time of year, so they can be used most of the year. Field grown trees are more sensitive to time of year and must recover from the shock and root loss from being dug. Container grown trees should be inspected to ensure the roots are not girdled. With field-grown trees you can sometimes work with the nursery to have the trees treated with beneficial bacteria before digging to lessen shock. With either form of arboriculture, during the first year after installation the trees will be a little slow to take hold, and the canopy may be sparse. By the second year the canopy should begin to fill in. And for every 30 or so trees planted, you may lose one or two.

Construction drawings and specifications should specify ***planting methods***. The International Society of Arboriculture has the most up to date drawings and specification for tree planting methods and more (http://www.isa-arbor.com/education/onlineresources). Drawings and specifications should be followed up with construction observation when the trees are installed to ensure the specifications are followed. Many landscapers (in my experience) will leave too much of the wire basket around field-dug trees, or minimally loosen only the top portion. This makes it harder for the roots to break through the burlap wrapping and the wire cage to become firmly rooted during the first few critical years. In hurricane-prone areas the tree is likely to more easily pitch over in a strong wind. Although the wire basket does not need to be completely removed, it should, in my opinion, be completely loosened and cut a minimum of 6-8" down from the top of the root ball.

This tree had to fit between the walk and the street, with conduits for electic service, low-voltage lighting, and irrigation running inside the curb. The top of the root ball is also too high and had to be lowered.

Staking can help stabilize the roots until they take hold in the soil, but methods and maintenance are important. If knowledgeable maintenance is not available, there is a good chance

the guys will girdle the tree within a few years. Wire with a section of hose around it to protect the trunk was often used in the past, but now woven webbing is preferred. But either can girdle the trunk if left in place too long. There are new staking systems that are placed below the surface of the soil, and although they might be worth trying in a park or tree planting strip, they would probably not work in the confined space of a sidewalk tree pit.

In the next post, I will review existing urban soils, soil amendments, and planning for root growth with structural soil and suspended pavement systems.