Trees in Urban Environments

Jimmy Socash, Landscape Architect,
JFS Design Inc, Miramar, Fl.
Henry Mayer, Miami-Dade County
Cooperative Extension Agency
2008
The sorry status of our urban tree canopy...

33% - Nation-wide Average
10% - Miami-Dade County Average
3% - Hialeah (American Forests Survey, 1996)

30% TREE CANOPY GOAL for MIAMI-DADE STREET TREE MASTER PLAN

By 2020...12 years !!!
Shade Value for our sub-tropical urban landscape
Preserve existing trees...
“Meeting the Goals of the Miami-Dade County Street Tree Master Plan”

• Planning
• Planting
• Pruning
• Education and Growth
• Best Management Practices (BMP)

ROOT ZONE GROWING AREA

“Design the soil space under and adjacent to the hardscape to sustain root growth – good trees well connected to the ground only develop if the roots have room to grow”
“The major impediment to establishing trees in paved urban areas is the lack of an adequate volume of soil for tree root growth.”

Urban Horticulture Institute
December 2000
“Better to plant a 50 cent tree in a 5 dollar hole than a 5 dollar tree in a 50 cent hole”

Trees Growing in Confined Soil Spaces

are Prone to Toppling...

...Rate of growth is greatly reduced...and... will be short-lived.
Plant the Easy Places First.

Develop design options that plant trees in large soil resources.
Make Bigger Planting Spaces.

Balance the size of paved and soil areas.
How Much Soil?

1200 CF
Soil Volume =
20’ x 20’ x 3’ depth

20” Trunk Diameter Tree will require
20’ x 20’ x 3’ deep soil volume (min.).
**Ultimate tree size**

<table>
<thead>
<tr>
<th>Crown Spread Sq Ft</th>
<th>DBH - Trunk Diameter Inch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M2</td>
</tr>
<tr>
<td>1200</td>
<td>24</td>
</tr>
<tr>
<td>111.5</td>
<td>640</td>
</tr>
<tr>
<td>900</td>
<td>20</td>
</tr>
<tr>
<td>83.6</td>
<td>508</td>
</tr>
<tr>
<td></td>
<td>640</td>
</tr>
<tr>
<td></td>
<td>59.5</td>
</tr>
<tr>
<td></td>
<td>406</td>
</tr>
<tr>
<td>400</td>
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<td>44.6</td>
<td>365</td>
</tr>
<tr>
<td>320</td>
<td>8</td>
</tr>
<tr>
<td>29.7</td>
<td>203</td>
</tr>
<tr>
<td>140</td>
<td>4</td>
</tr>
<tr>
<td>13.0</td>
<td>102</td>
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</tbody>
</table>

Example: A 16 inch/406 mm diameter tree requires 1000 cf/28.3 M3 of soil.

**Soil Volume Required**

Tree/soil volume requirements

**Figure 1.3.1c**
Make Space for Roots.

Design spaces for roots under the pavement and utilize different approaches to root space design as conditions change

JAMES URBAN, FASLA, ISA
Roots grow well beyond canopy edge

- Trees that normally grow a very expansive root system can become stressed and grow poorly in urban landscapes where soil space is limited

- The result can be poor tree health, damaged sidewalks and curbs, and other problems

Dr. Ed Gilman, U of Florida
“Downtown Kendall Urban Center District”

“Street Trees: ...minimum caliper of six (6) inches and a minimum clear trunk of eight (8) feet at the time of planting.”

TYPICAL MINIMUM SIZE OF 18’ OVERALL HEIGHT

SITE PLAN PROVIDES STREET TREES BUT...
IN 3’ X 3’ SQUARES...(27 C.F. OF SOIL VOLUME )!

WILL THESE TREES GROW?

HOW LONG WILL THEY LAST?

WHERE IS THE 1200 C.F. OF SOIL VOLUME?
1. INCREASE ROOT ZONE AREA...
   Use “CU Structural Soils” or
   “Deeproot Silva Cell” Applications

2. USE PERMEABLE PAVEMENTS...
"CU-Structural Soils"...

Comprised of two main components:
1. **Rigid Stone “lattice”**
   Lattice are load-bearing stones for stability and interconnected voids that allows root penetration, air and water movement.
2. **Quantity soil (heavy clay loam or loam)**
   Clay holds most of the water and nutrients.

with...
**Gelscape Hydrogel** combines with the mix and works as a non-toxic, non-phytotoxic tackifier.
“CU-Structural Soils” with permeable pavements...
“DeepRoot Silva Cell”...

Urban Trees + Soils
Consulting to Site Designers

Urban Trees
- Planting Specifications
- Root System Design
- Tree Preservation
- Tree Selection

Urban Soils
- Design and Specifications
- Site Assessment
- Soil Testing
- Drainage

Up by Roots
Healthy Soils and Trees in the Built Environment

James Urban
“Deepproot Silva Cells”...

Load-bearing structural cells...

With frame and deck...

Backfilled with planting soil...

JAMES URBAN, FASLA, ISA
"Deeproot Silva Cells"...
“Deeproot Silva Cells”...

www.deeproot.com
1 (800) 458-7668

JAMES URBAN, FASLA, ISA
Set grades 3" (75mm) or greater above walk to accommodate future settlement.

Till 3"-4" (75-100mm) organic compost into top 6" (150mm) of planting soil.

Compact planting soil in 8" (200mm) to 12" (300mm) lifts.

Slope toward drain line @ 1% min.

Roughen bottom of bed prior to adding planting soil.

Slope side of excavation away from walk @ 1/2:1 slope.

Compaction Levels in Planting Soil

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Compaction Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy loams</td>
<td>1.4 - 1.55 gr/cm</td>
</tr>
<tr>
<td>Sandy clay loams</td>
<td>1.1 - 1.3 gr/cm</td>
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</table>

JAMES URBAN, FASLA, ISA
“Deeproot Silva Cells”...

1. Increased Soil volumes enable large trees to flourish...

2. Healthy trees...increase real estate values...

3. Underground bioretention areas manage stormwater on-site...

4. Large tree canopies reduce urban heat-island effect and improve air quality...

5. Expanded soil-volumes reduce rainfall runoff...
“Deeproot Silva Cells”...
Structural Cell Applications

Trees and Rainwater Harvesting
Permeable Pavements...

When integrated with “CU-Structural Soils” or “Deeproot Silva Cells” ...

“Vegetation is watered, reducing the need for irrigation ...

Ground water is recharged

Water resources are preserved

Stormwater runoff is reduced

Stormwater runoff quality is improved.”

www.CoolCommunities.org
Permeable Pavements...

U.S. GREEN BUILDING COUNCIL (USGBC)
LEED (Leadership in Energy and Environmental Design) CERTIFIABLE

"Pervious pavements can be made of concrete, asphalt, open-celled stones, and gravel, that are mixed in a manner that creates an open cell structure allowing water and air to pass through. For example, porous concrete can pass 3-5 gallons of water per minute, which is far greater than most conceivable rain events and highly effective in controlling storm water drainage."

www.CoolCommunities.org
Respect the Base of the Tree.

Do not pave in the area of the tree’s future trunk flare.
Mulch or loose gravel

Ground cover with low barriers

Mulch or loose gravel

Sand set pavers ½” (13mm) joints

Tree Friendly Trunk Flare Transition Areas

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Tree Grates...
Tree Grates...

Tree grates. Many cities install decorative metal grates around newly planted trees. As the trunk grows, it may end up fighting the encircling obstacle. Though some tree grates are designed so that the innermost section can be removed as the trunk expands, rarely do municipalities remove them promptly enough. The grate girdles the trunk, stopping the flow of water and chemicals between the top and bottom of the tree. If the tree doesn’t die first, it may lift the grate and create a hazard for pedestrians.

"New Urban News"
February 2005
Landscape code changes are oftentimes tedious and lengthy...

Departmental Policy Decisions can bypass this...