

# Re-Thinking Soil Screening



Change specs to allow a combined rocks, roots, sticks, debris up to 5% or maybe even 10%.

Eliminate **“free of”** from your spec.

*Light screening through 2 or 3 inch mesh may be needed on soil with large amounts of debris.*

*Control construction debris and trash by approval of soil source not by screening.*

# Soil screening machines.....



.....produces soil with few soil pedes

**Maintain macro pore space with soil ped retention**



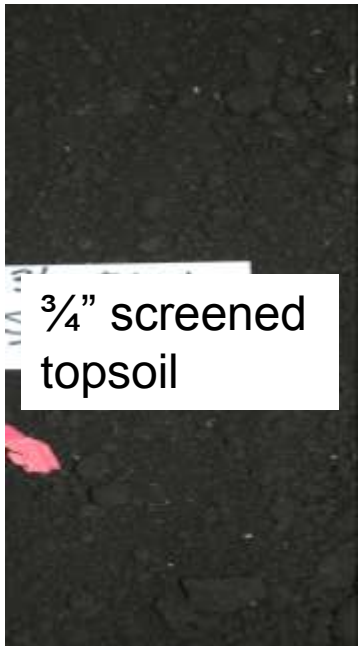
# Morton Arboretum soil mix / soil screening test 2014/15

Photos by Bryant Scharenbroch





2" screened topsoil



3/4" screened topsoil



Course sand



Compost



NATIVE SOIL  
100% - TOPSOIL  
(2")

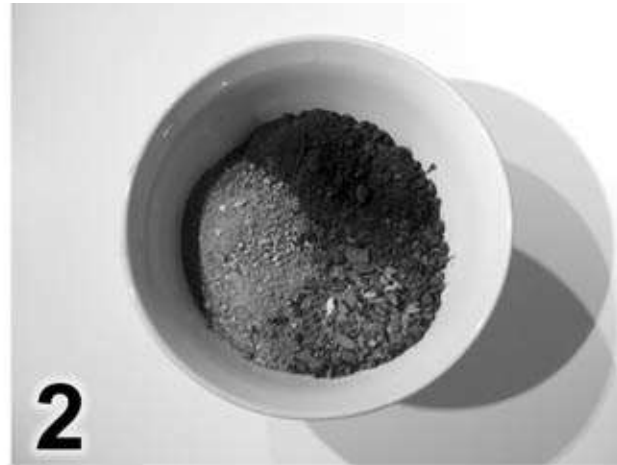


TREE SOIL  
60% - TOPSOIL (2")  
15% - COMPOST  
25% - SAND



URBAN SOIL  
25% - TOPSOIL (3/8")  
15% - COMPOST  
60% - SAND

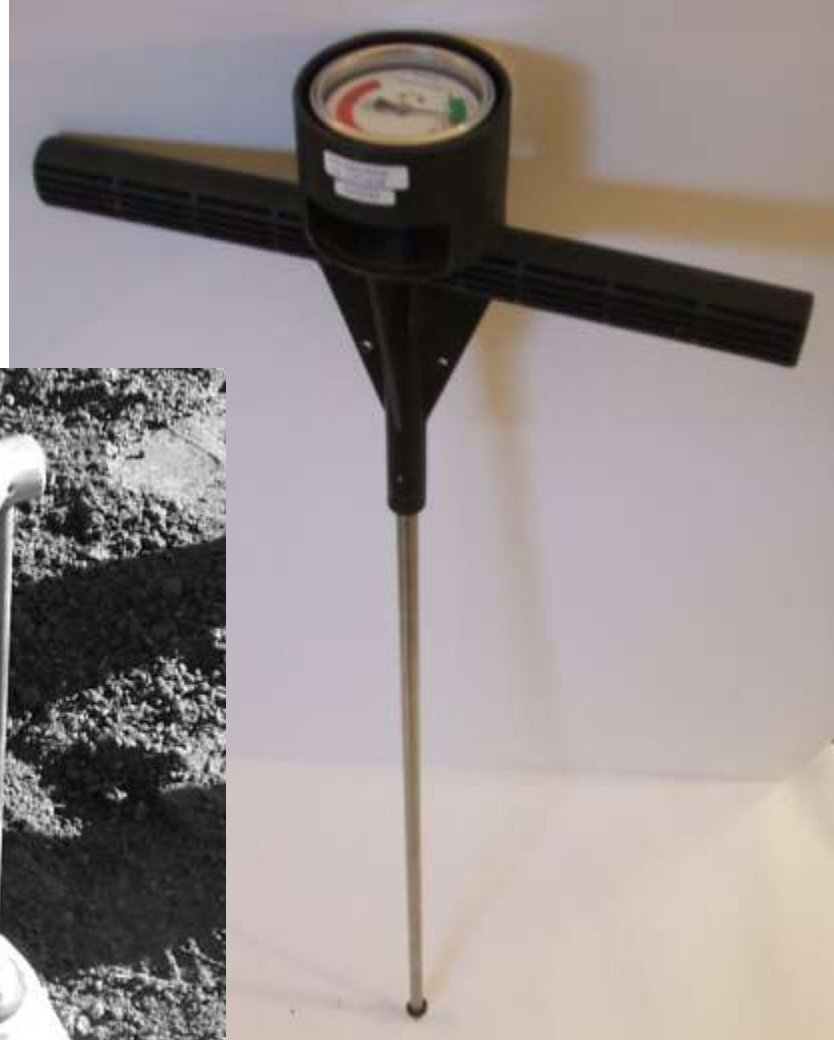
## Steps in office testing soil mix infiltration rate



Test several mix proportions to get mix into range  
Then send to Hummel Labs for drainage rate at  
80 and 85% proctor compaction

# Planting Soil Compaction

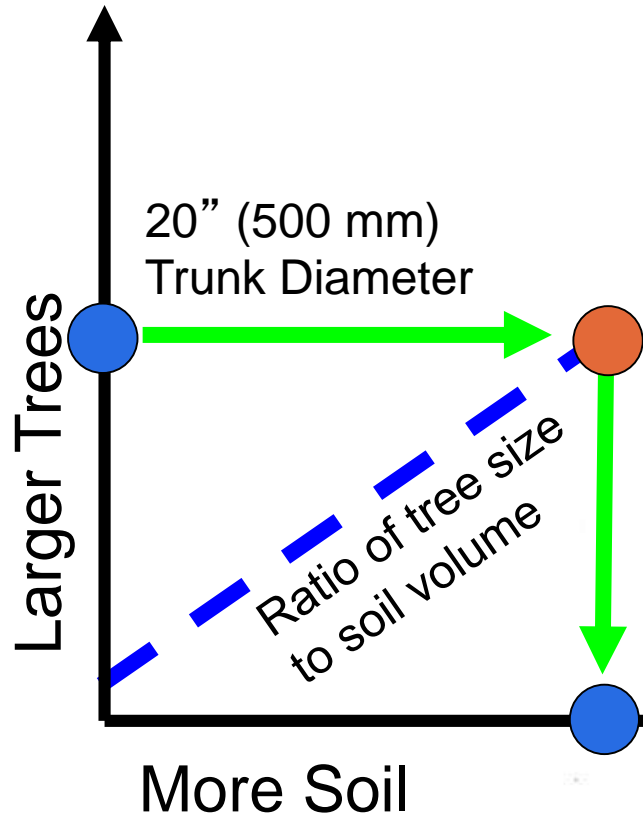
Densimeter  
accurate but expensive



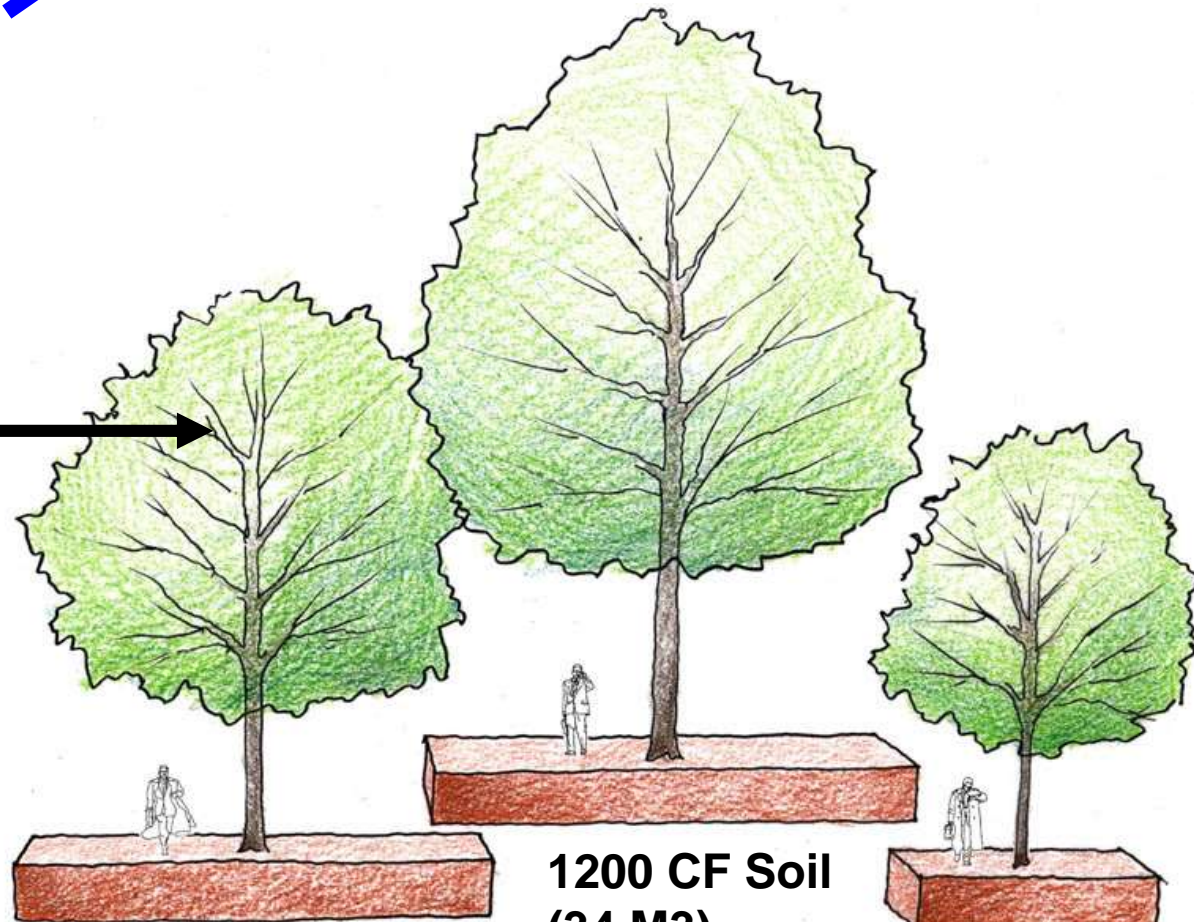
Penetrometer  
inexpensive but  
not accurate

# Improving rooting conditions and providing planting soil under pavement





## Tree size to Soil volume



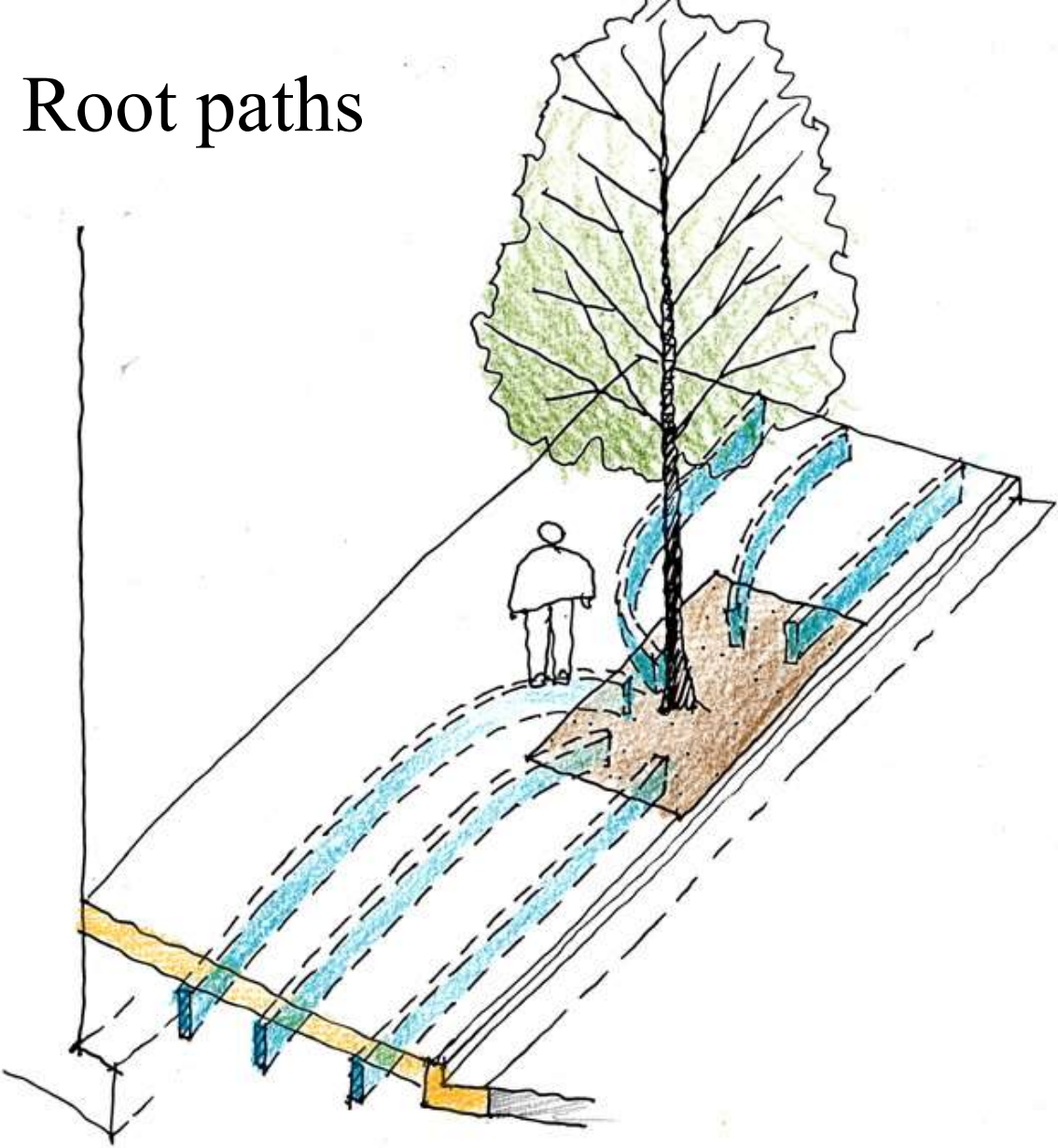
**800 CF Soil**  
**(22.6 M3)**

**1200 CF Soil**  
**(34 M3)**

**400 CF Soil**  
**(11.3 M3)**

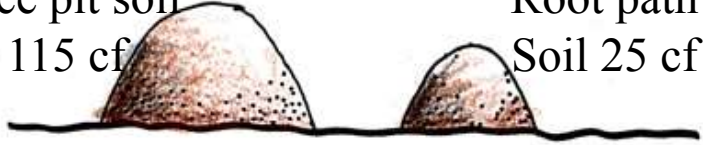


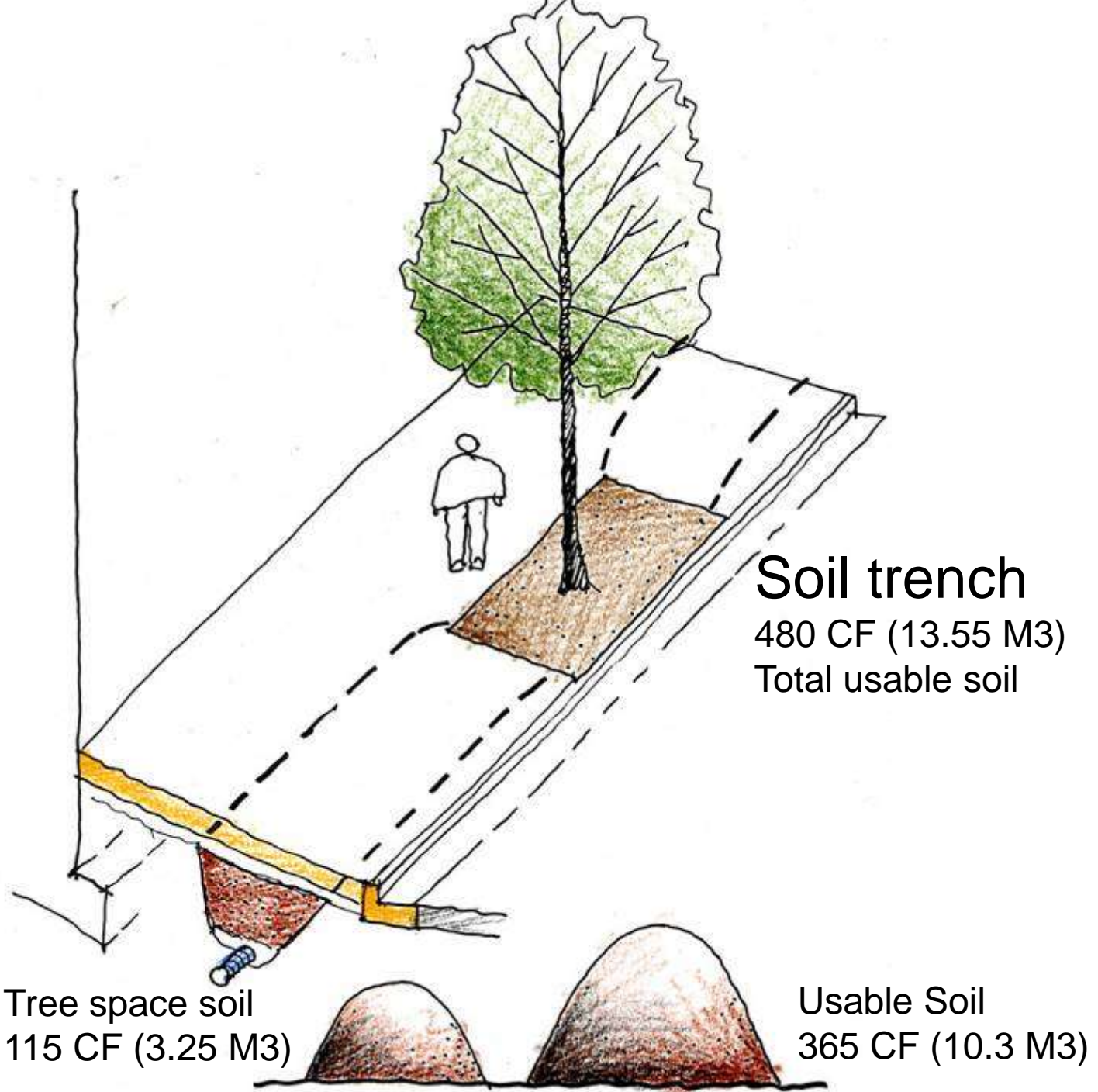
# Root paths



Tree pit soil  
115 cf

Root path  
Soil 25 cf

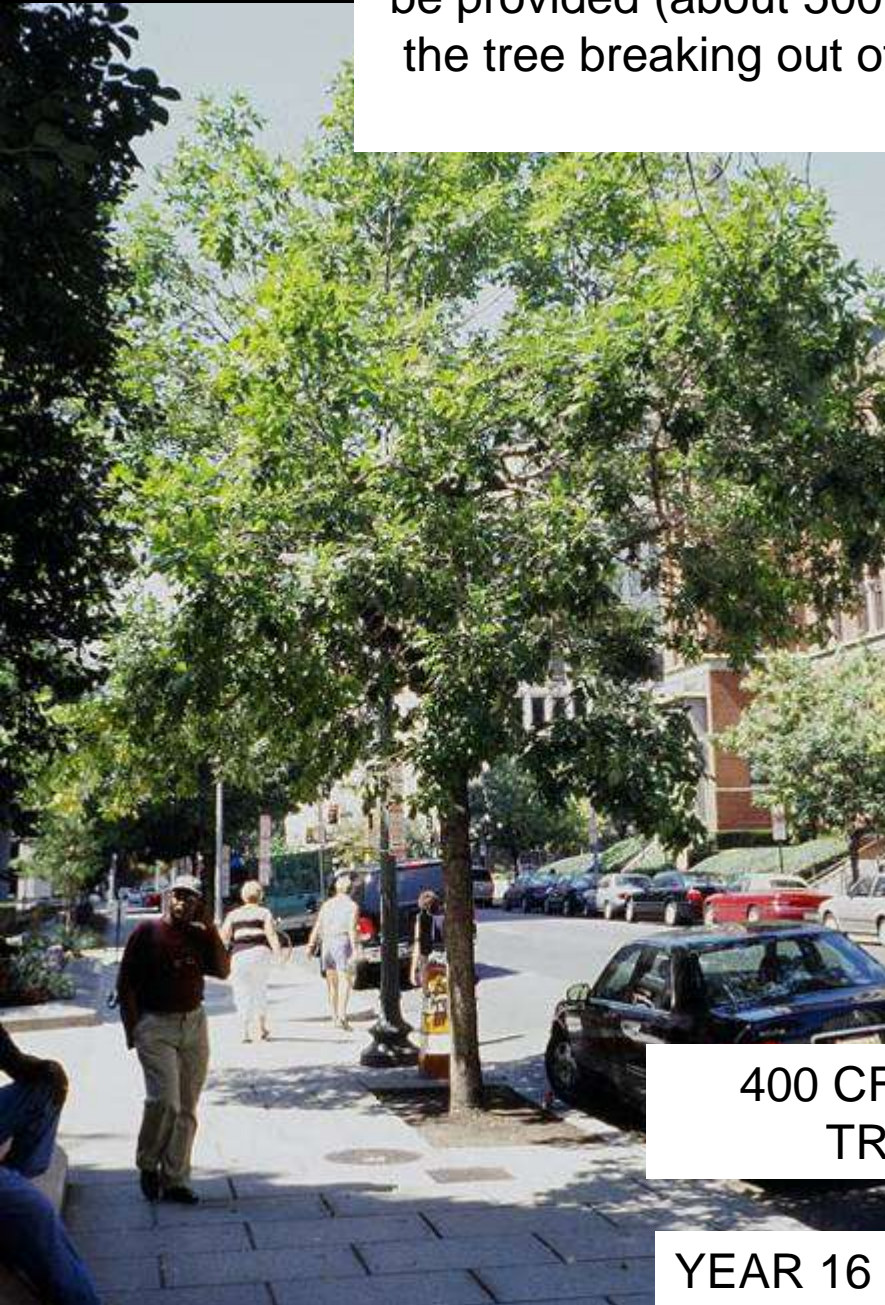






400 CF (11.3 M3) TRENCH  
AT YEAR 12

This system is limited in the amount of soil that can be provided (about 500 cf max) and is dependant on the tree breaking out of the trench into the adjacent soil



400 CF (11.3 M3)  
TRENCH

YEAR 16



YEAR 25



Sand based Structural Soils in Boston  
Similar to A' Dam Tree Soil but with  
more soil and compacted to 95%

Oak trees planted in 2005 @ 300mm CLP

Beds  
CLP 390mm  
14mm/yr

Pavers  
CLP 335mm  
5mm/yr

**Beds**



**Pavers**

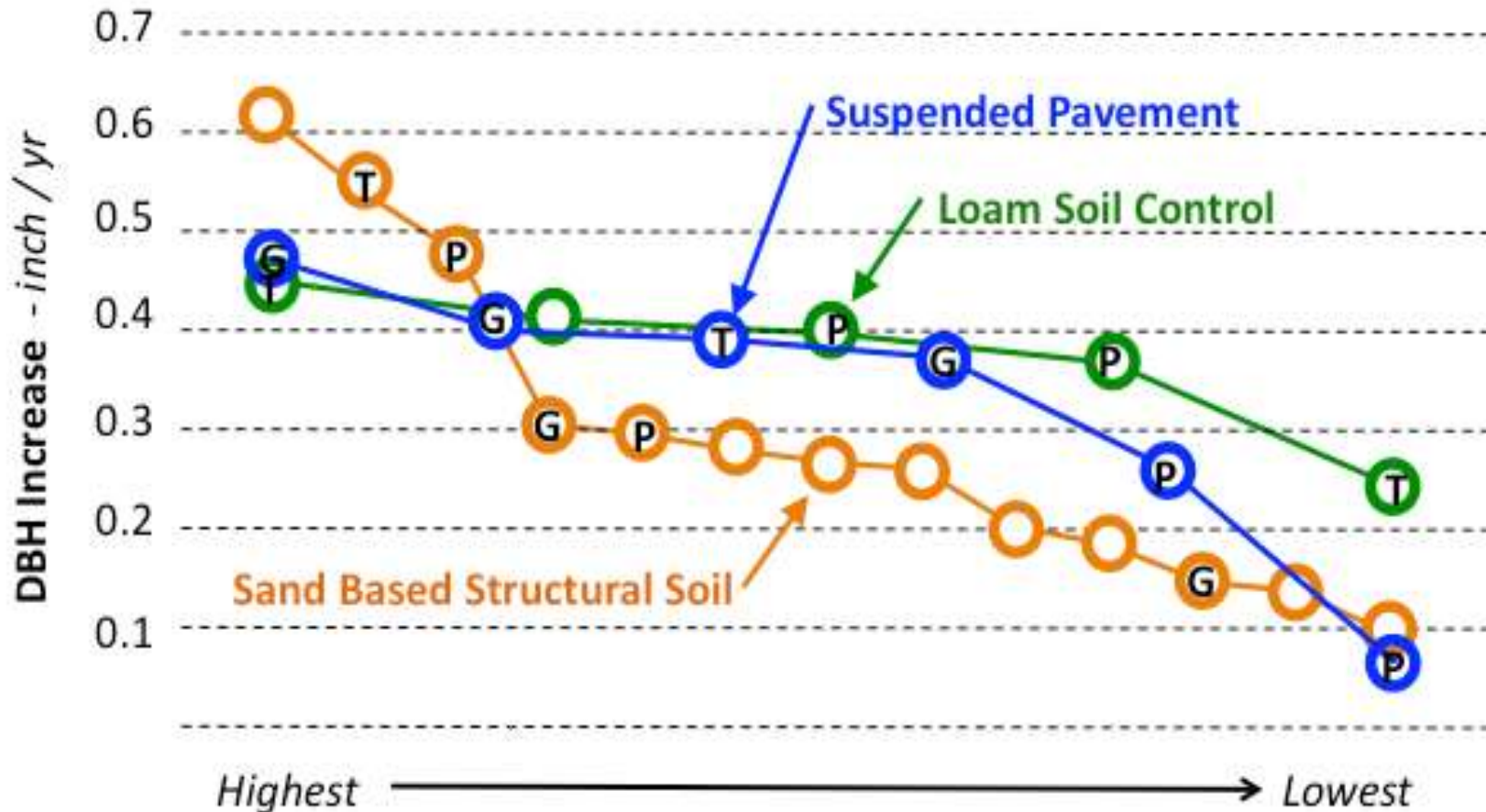


**Sand Based Structural Soils**

Significant differences in canopy density over trees in loam soil beds  
In just 6 years.

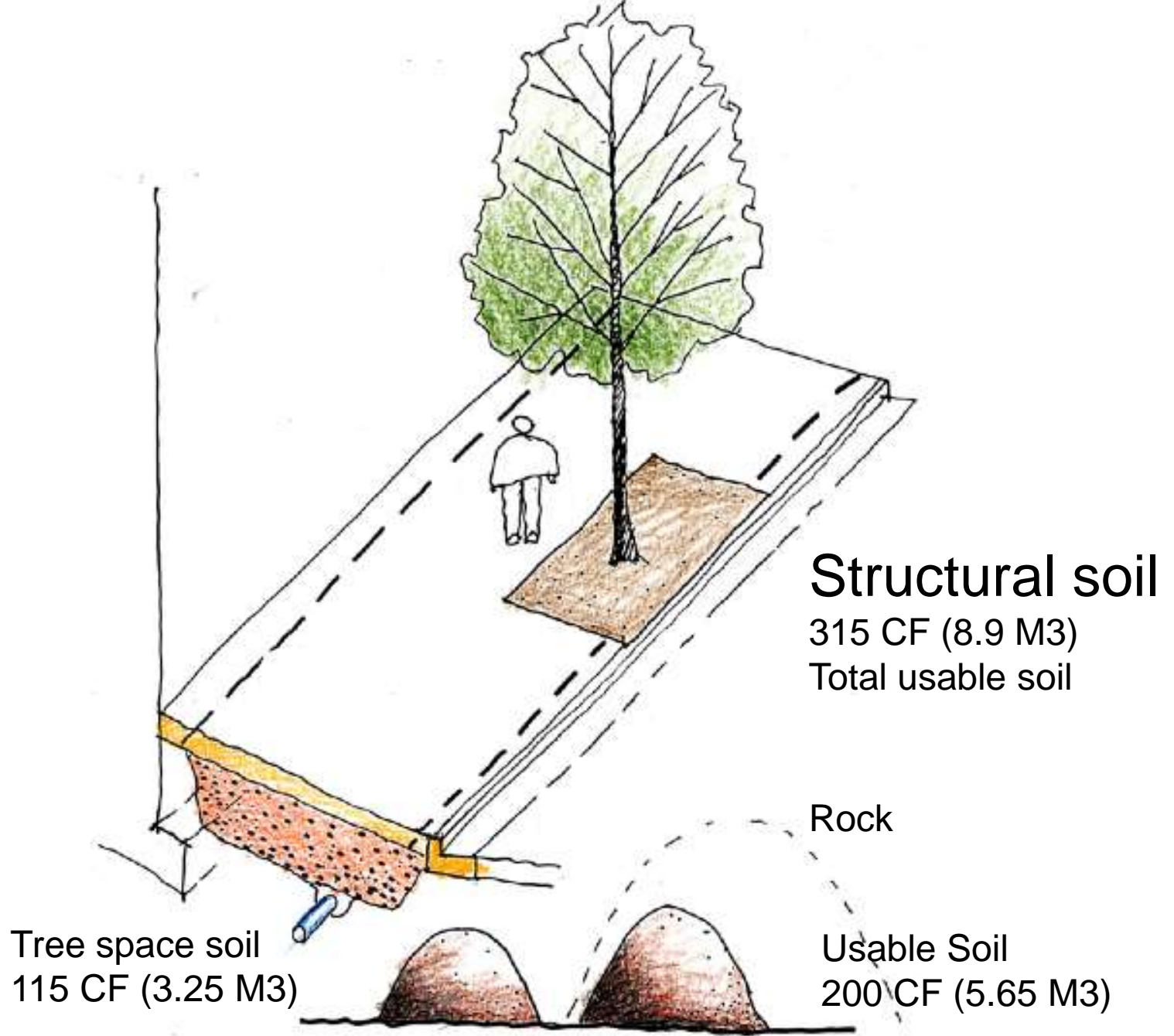
# Boston Study – Data summary

Tom Smiley and James Urban presented at the 2014 ISA Annual meeting



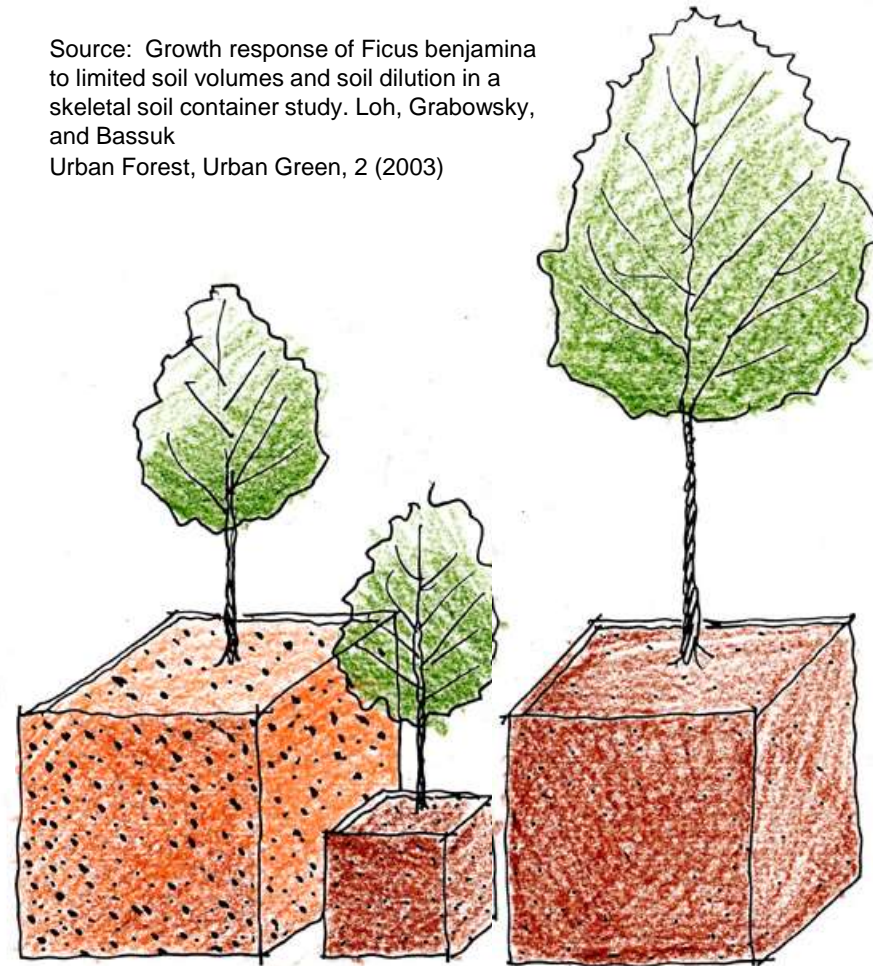
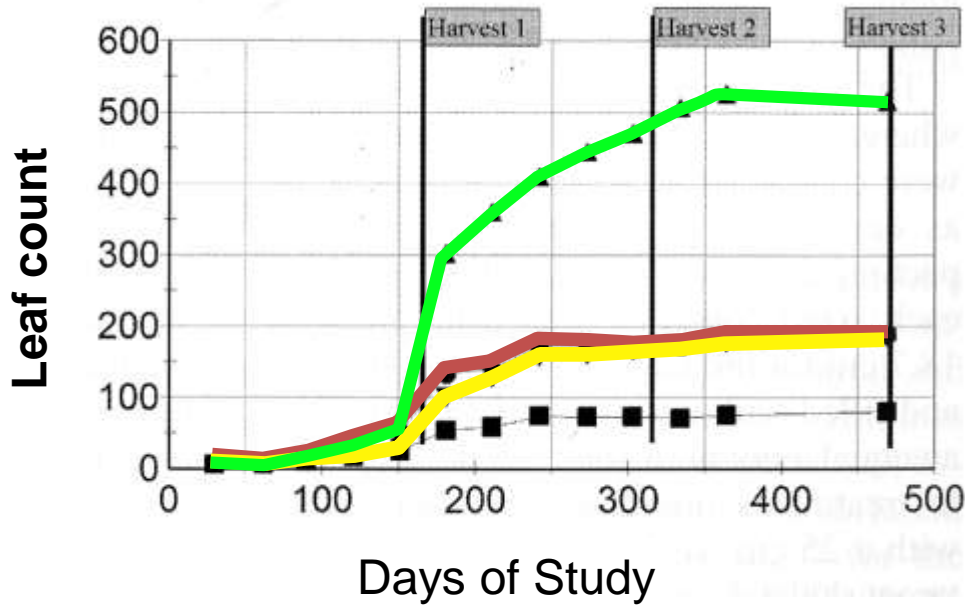
## Tree growth rates by site

*330 trees at 11 projects*





Source: Growth response of *Ficus benjamina* to limited soil volumes and soil dilution in a skeletal soil container study. Loh, Grabowsky, and Bassuk  
 Urban Forest, Urban Green, 2 (2003)



Large structural soil      Small Loam soil      Large Loam soil

Large structural soil and small loam soil have equal amounts of loam soil.

What is the value of the **soil** in structural soil vs the rock.

# Stone Based Structural Soil



**Tree in open planter**

**Loam soil 275 - 300 ft<sup>3</sup> / tree**



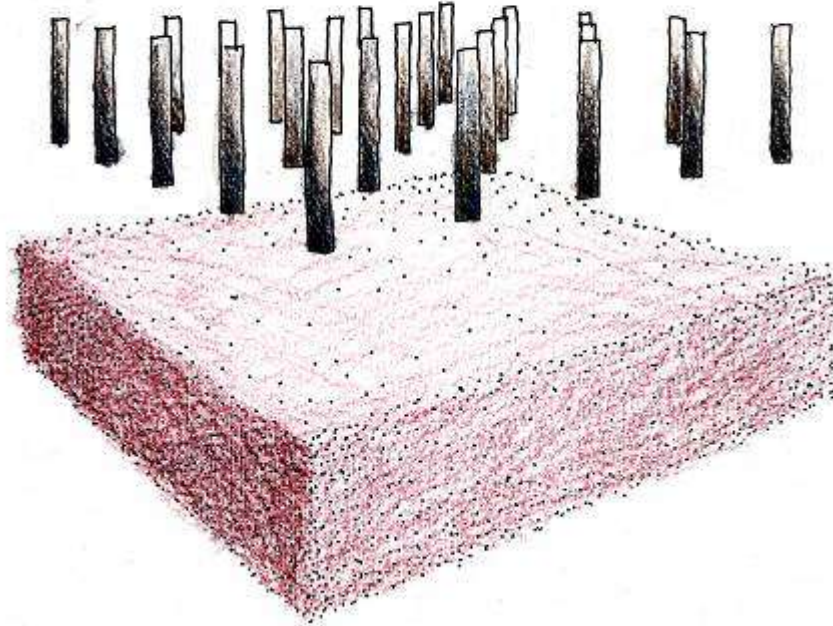
**6ft wide structural soil trench**

<b>Structural soil</b>	<b>350 ft<sup>3</sup> / tree</b>
<b>Loam soil in pit</b>	<b>55 ft<sup>3</sup> / tree</b>
<b>Total soil</b>	<b>405 ft<sup>3</sup> / tree</b>

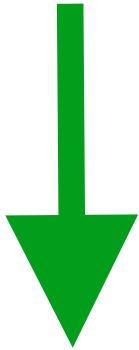
**Pavement**



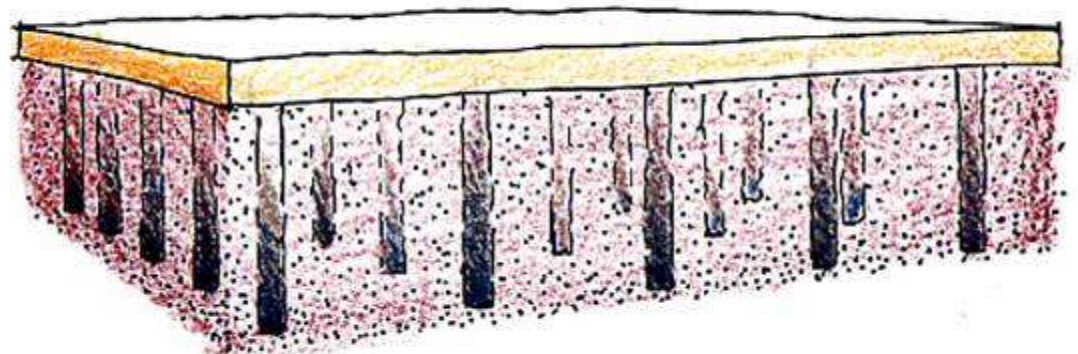
**Structure**



**Soil**



**Silva Cell**



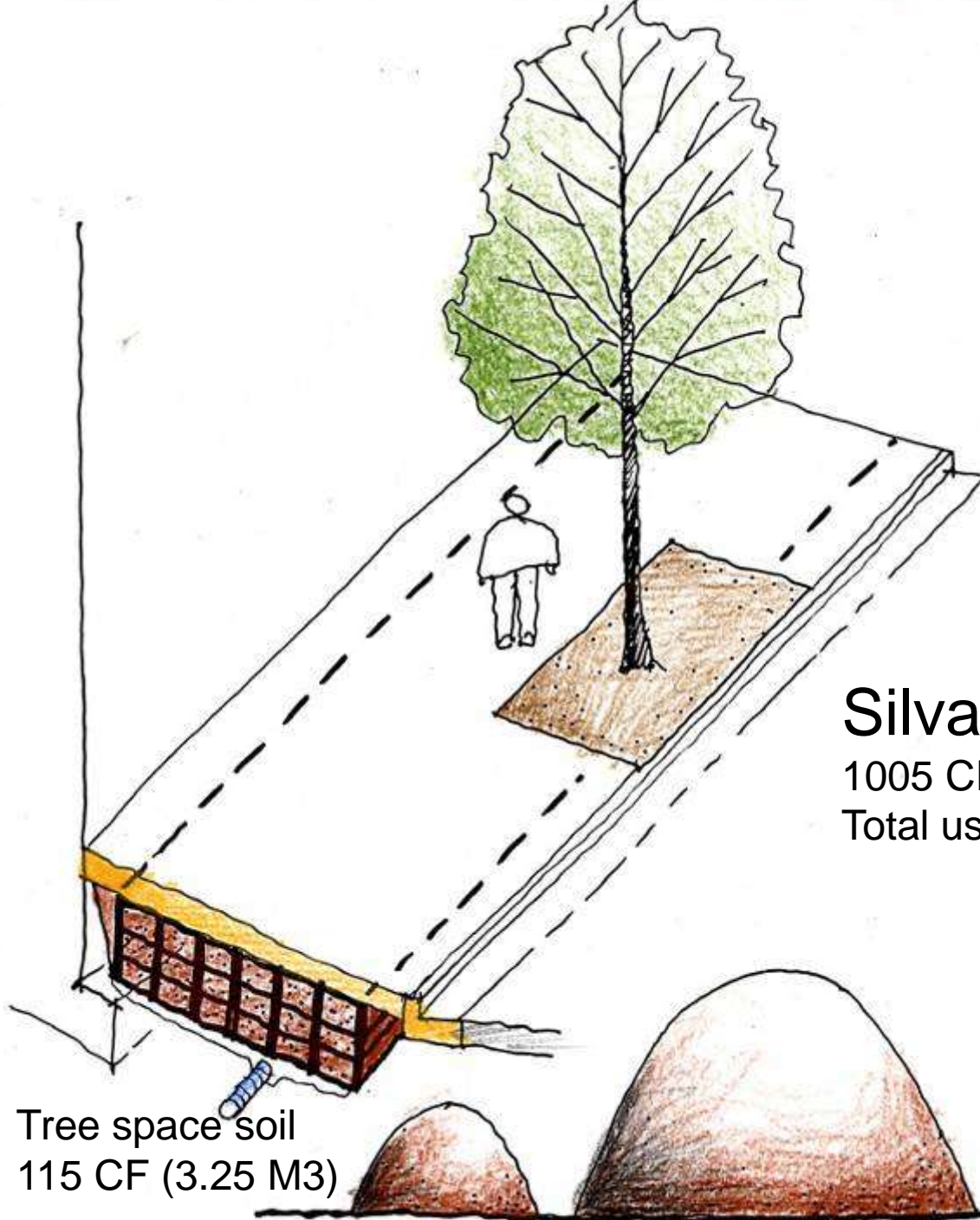
# DeepRoot<sup>®</sup>

URBAN LANDSCAPE PRODUCTS



Silva cells





## Silva Cells

1005 CF (28.25 M3)

Total usable soil

Tree space soil  
115 CF (3.25 M3)

Usable Soil  
890 CF (25 M3)

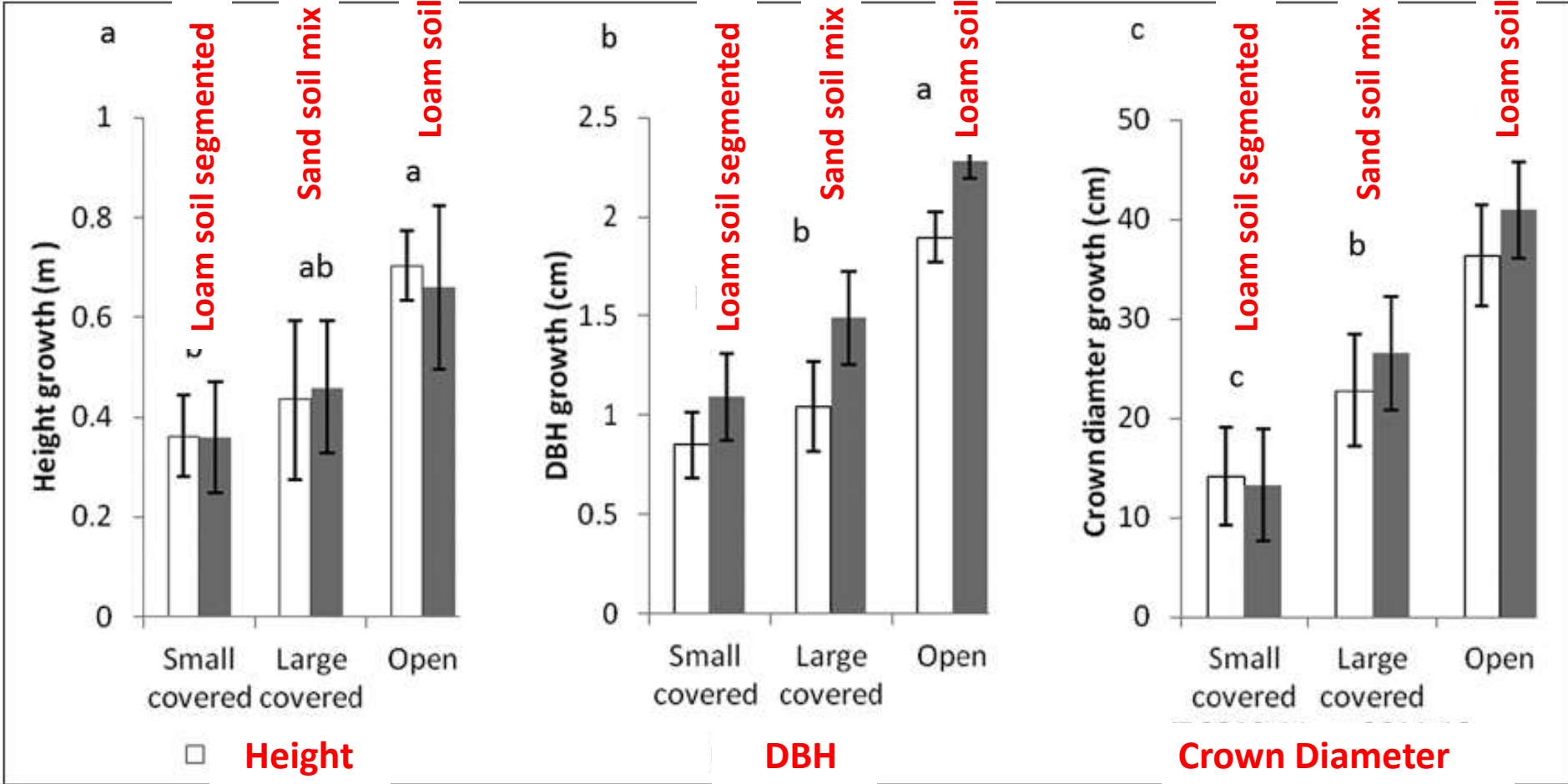
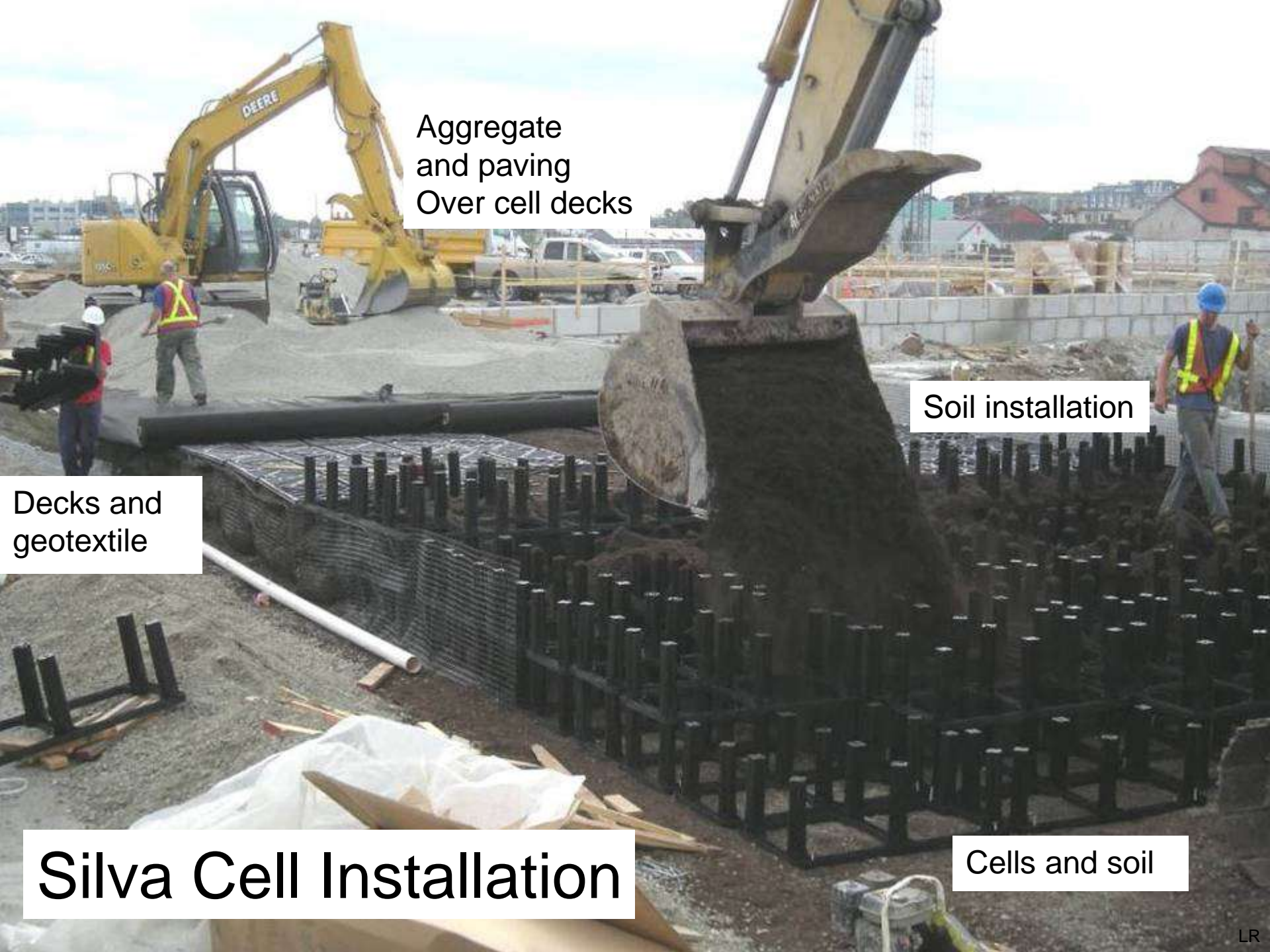


Figure 2. Annual growth rate in *Pyrus calleryana* trees grown in the three pit types in 2010–2012 (n = 5): (a) height, (b) DBH, (c) crown diameter increment.

UK Study of tree growth in segmented loam soil / sand soil / Loam soil

Source: Effect of Pit Design and Soil Composition; Rahman et al  
 Arboriculture & Urban Forestry, Volume 39, No 6, November 2013



Aggregate  
and paving  
Over cell decks

Soil installation

Decks and  
geotextile

# Silva Cell Installation

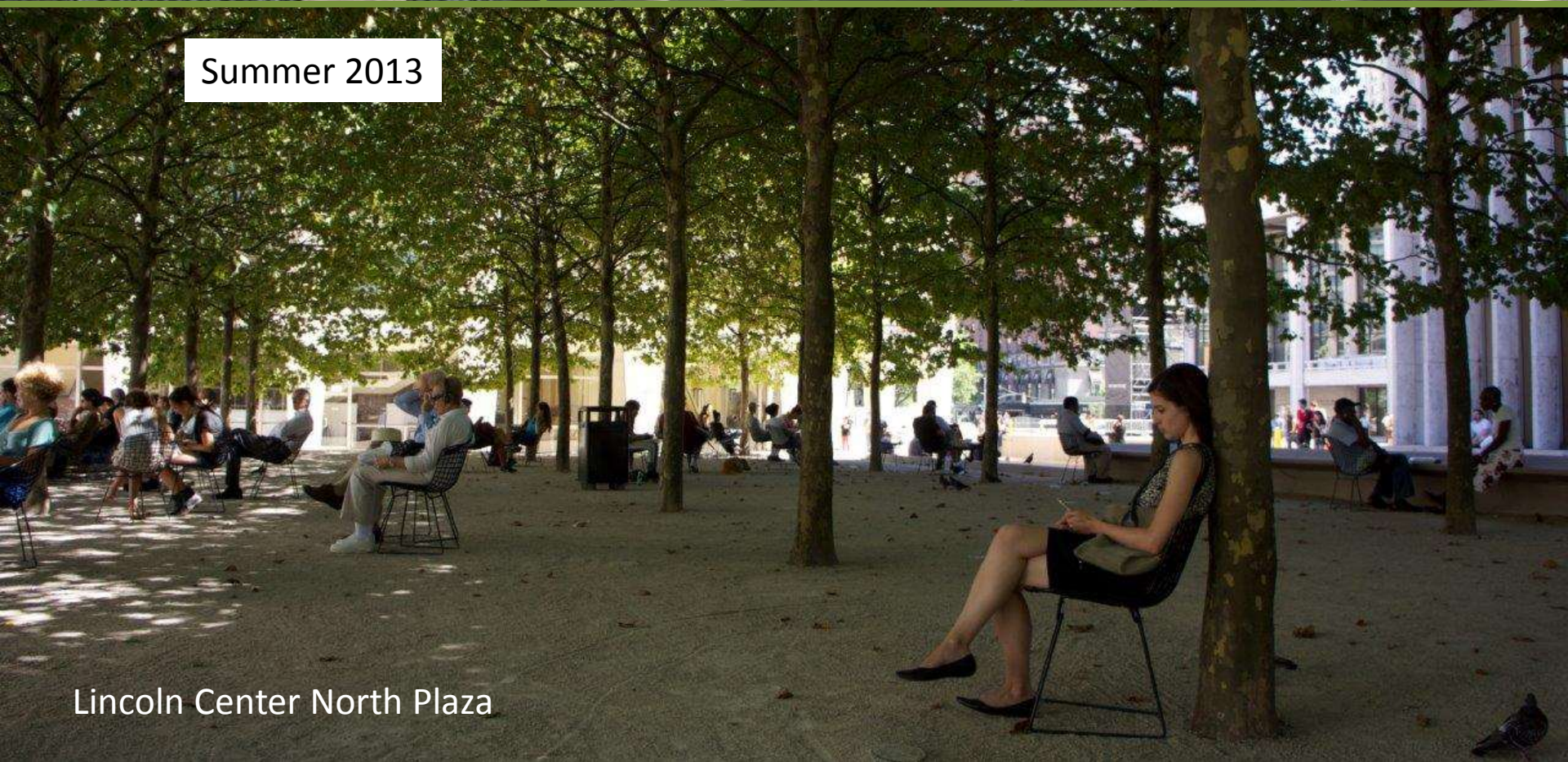
Cells and soil



Spring 2008



Summer 2013



Lincoln Center North Plaza



June 2008  
0.5 years after planting



July 2009  
1.5 years after planting



June 2010  
2.5 years after planting



July 2011  
3.5 years after planting



July 2012  
4.5 years after planting



### Vancouver Olympic Village 2008-2012

Shared Soil Volume Per Tree **706 cf /20 m3**

DBH **2008** : Avg **2.75"**)

DBH **2011**: **4.78"** to **6.2"** Almost **1"/year**



2010



2011

Sugar Beach, Toronto



2012



2013

# Trees / Rain Water and Structural Cells Parking areas

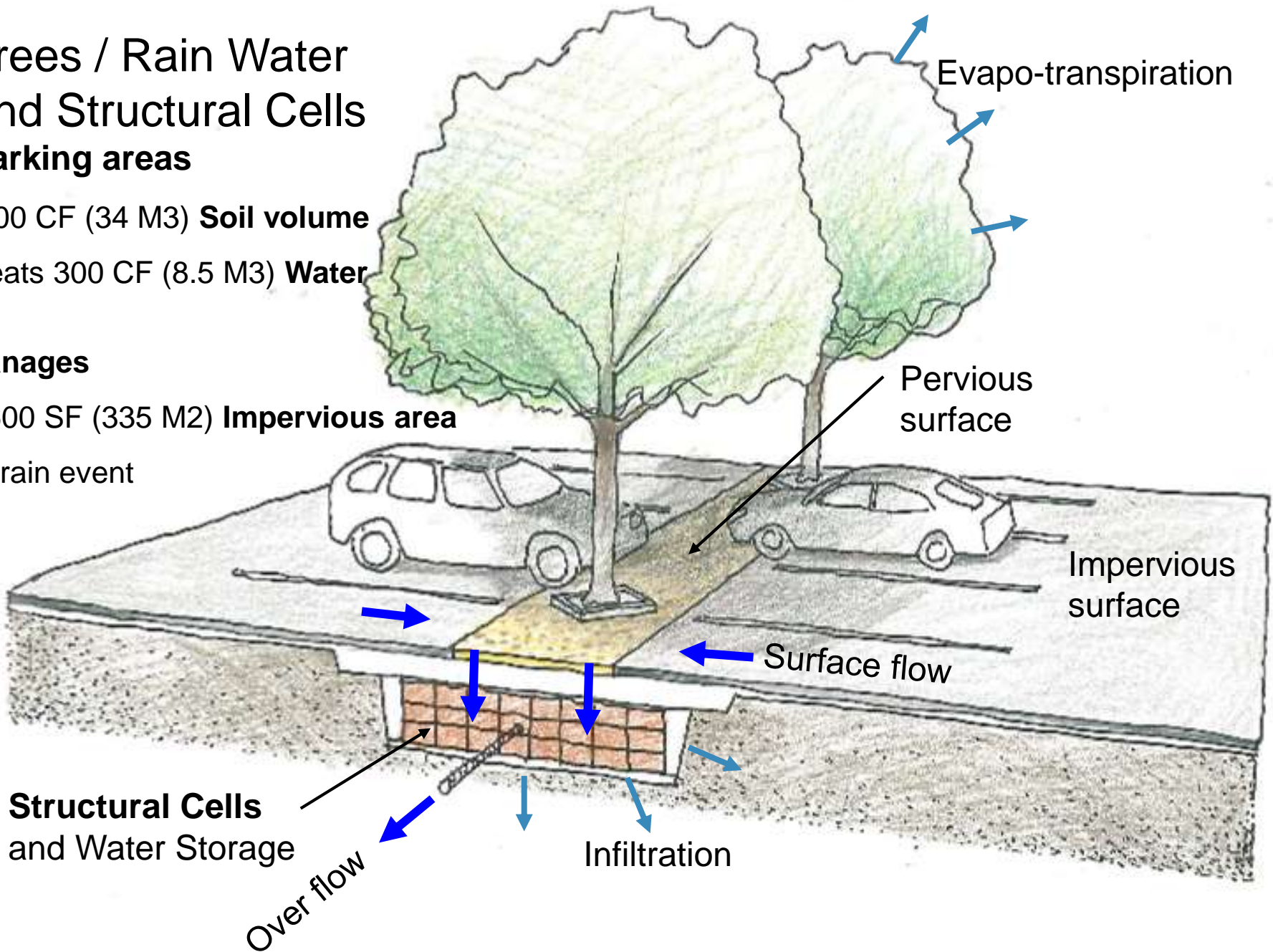
1200 CF (34 M3) **Soil volume**

Treats 300 CF (8.5 M3) **Water**

## Manages

3,600 SF (335 M2) **Impervious area**

1" rain event



**Structural Cells**  
and Water Storage

Over flow

Infiltration



# Water access options through pavements

Pervious Pavers

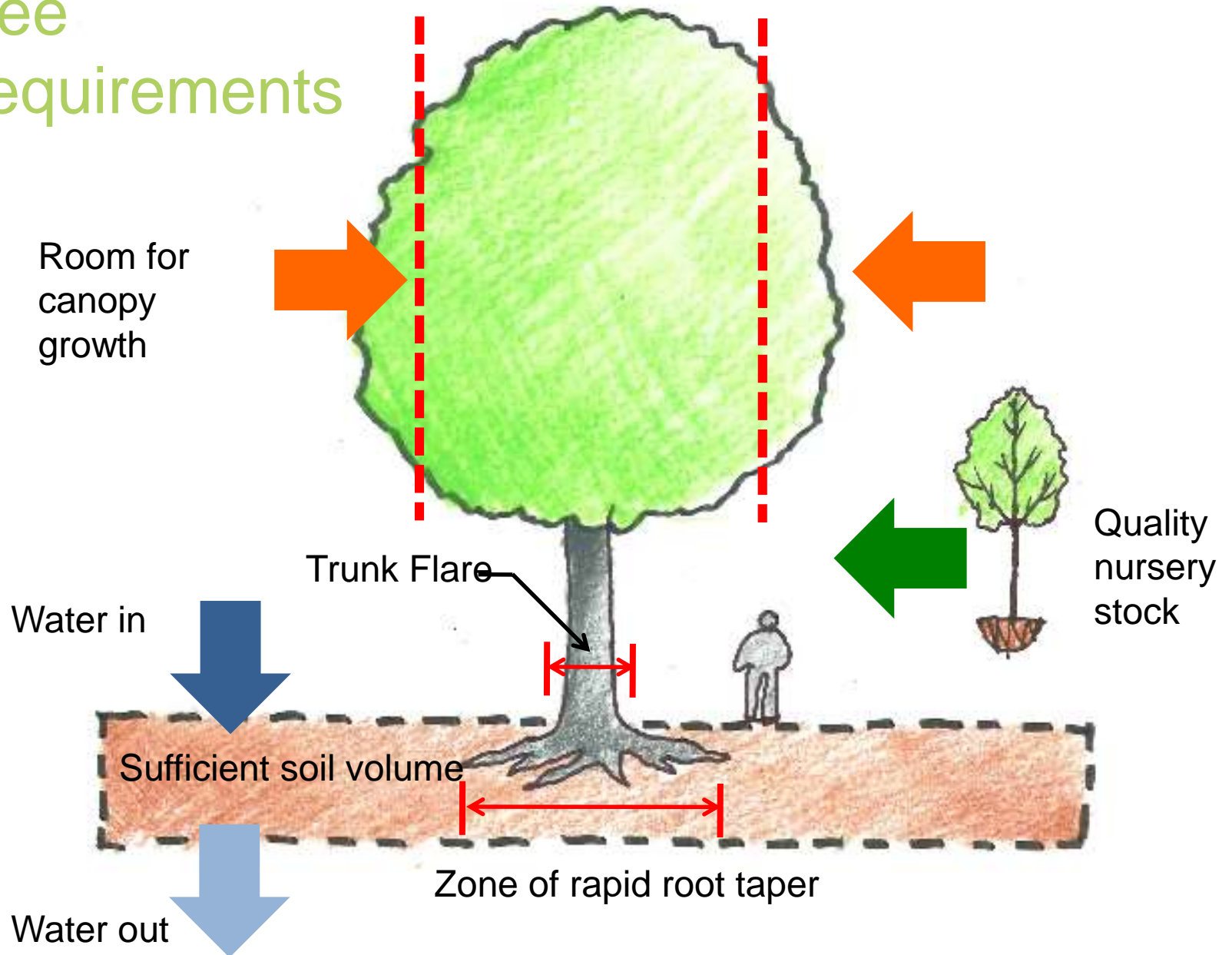


Curb inlets



Trench Drains

# Tree Requirements



# New MS Word **Specifications** and dwg **Details** for:

**Planting  
Soil  
Irrigation  
Tree preservation**

**Urban Tree Foundation**  
700 East Murray  
Visalia, CA 93292

559.713.0631

**www.urbantree.org**

SECTION 32 9100

PLANTING SOIL

## PART 1 – GENERAL

### 1.1 SUMMARY

**Note to specifier:** Remove parts of this work description that do not apply.

- A. The scope of work includes all labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of Planting Soil and /or the modification of existing site soil for use as Planting Soil, complete as shown on the drawings and as specified herein.
- B. The scope of work in this section includes, but is not limited to, the following:
  - 1. Locate, purchase, deliver and install Imported Planting Soil and soil amendments.
  - 2. Harvest and stockpile existing site soils suitable for Planting Soil.
  - 3. Modify existing stockpiled site soil.
    - a. Modify existing site soil in place for use as Planting Soil.
    - b. Install existing or modified existing soil for use as Planting Soil.
  - 4. Locate, purchase, deliver and install subsurface Drain Lines.
  - 5. Fine grade Planting Soil.
  - 6. Install Compost into Planting Soil.
  - 7. Clean up and disposal of all excess and surplus material.

### 1.2 CONTRACT DOCUMENTS

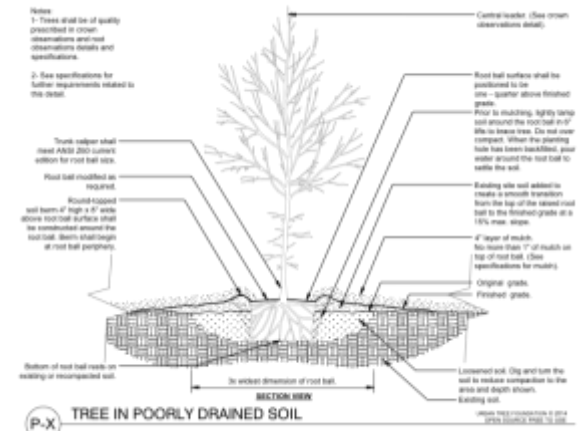
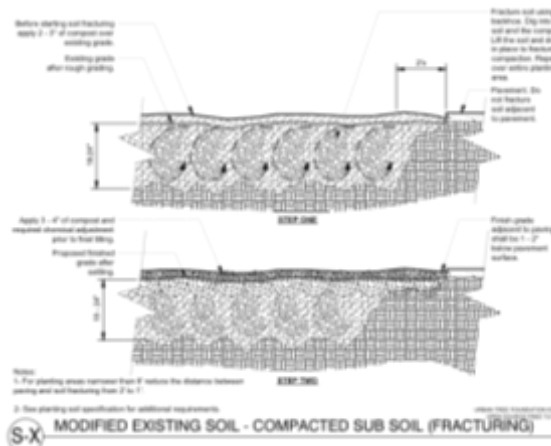
- A. Shall consist of specifications, general conditions, and the drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

### 1.3 RELATED DOCUMENTS AND REFERENCES

- A. Related Documents:

**Note to specifier:** Coordinate this list with the other related specification sections. Add or delete sections as appropriate.

- 1. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.
- 2. Related Specification Section
  - a. Section - Planting



# Up By Roots

Healthy Soils and Trees in the  
Built Environment

## **James Urban**

Urban Tree + Soils

[Urbantree@toad.net](mailto:Urbantree@toad.net)

## **Daniel Vogt**

University of Washington

[dvogt@uw.edu](mailto:dvogt@uw.edu)

## **Roy Farrow**

University of Washington

[farrow@uw.edu](mailto:farrow@uw.edu)

## **David McDonald**

Seattle Public Utilities

[David.McDonald@seattle.go](mailto:David.McDonald@seattle.go)

## **Scott Baker**

Tree Solutions, Inc

[scott@treesolutions.net](mailto:scott@treesolutions.net)

## **Sara Shores**

University of Washington

[shoress@uw.edu](mailto:shoress@uw.edu)

## **Kristine Kenney**

University of Washington

[kkenney@uw.edu](mailto:kkenney@uw.edu)

**2009 ASLA Honor Award**



# Up BY ROOTS

Healthy Soils and Trees in the Built Environment

James Urban



Thank you