Restoring and Preserving Urban Tree Canopy for Stormwater Management in Wilmington, North Carolina

Community Meeting July 26, 2017

Green Infrastructure Center

CITY OF WILMINGTON NORTH CAROLINA

NORTH CAROLINA FOREST SERVICE N C

Tonight

1. Project Overview
2. Trees are Green Infrastructure
3. Data – How are we doing?
4. Community Input

Green Infrastructure and Wildlife in North Carolina

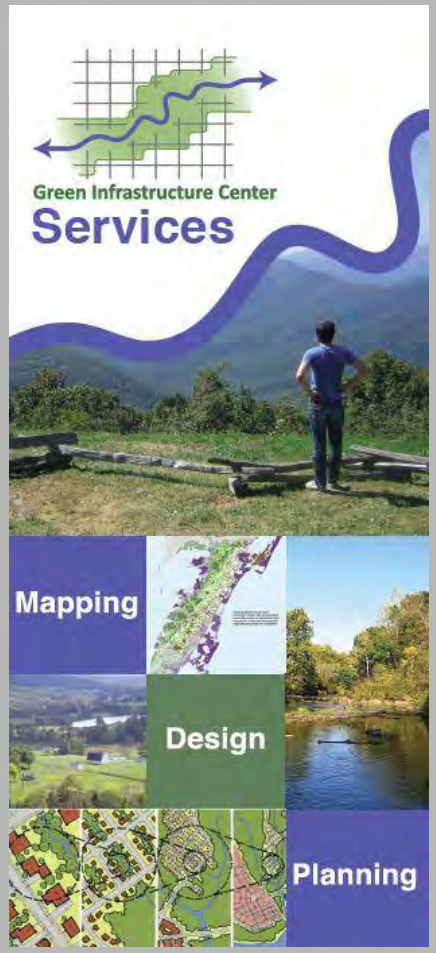
Pilot Tree Canopy Project

GIC and state forestry agencies concerned about flooding and implementing cost effective solutions have funded 7 states to develop pilot projects. These projects demonstrate how we can best utilize trees for stormwater management.

Flooding along Water Street in Wilmington

7 southern states:

SC, NC, GA, FL, AL, OK, VA



Who are the project partners?

The Green Infrastructure Center and the North Carolina Forest Service are helping the city!

The GIC is the technical service provider. The GIC helps communities evaluate green assets and manage them to maximize ecology, economy and culture. We:

Provide community assistance

Build landscape models

Teach courses and workshops

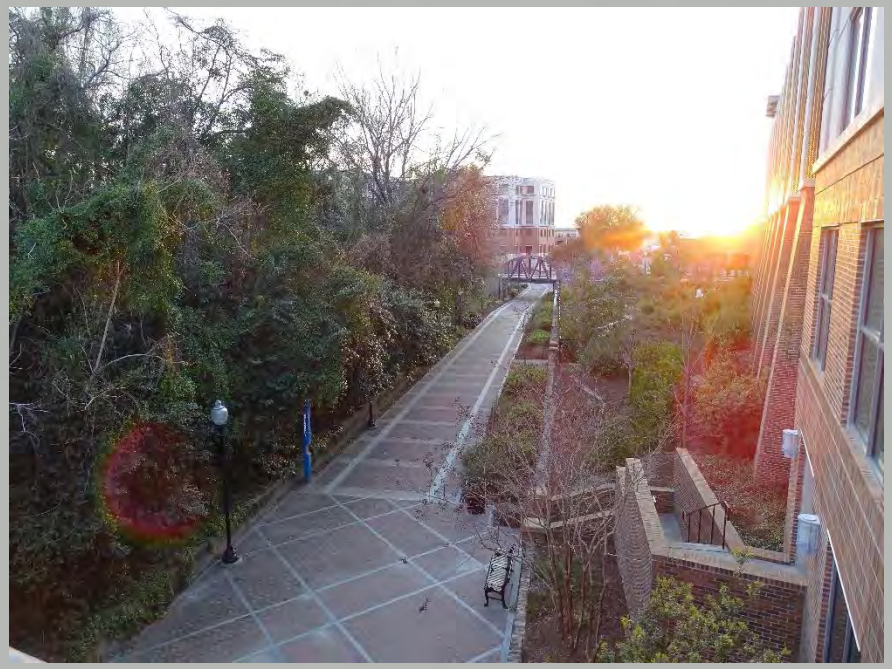
Research new methods

www.gicinc.org

Project Goals

This project is helping Wilmington map, evaluate, protect and restore its urban forests for improved stormwater management and clean water.

Urban forests are a vital tool in managing and reducing runoff.

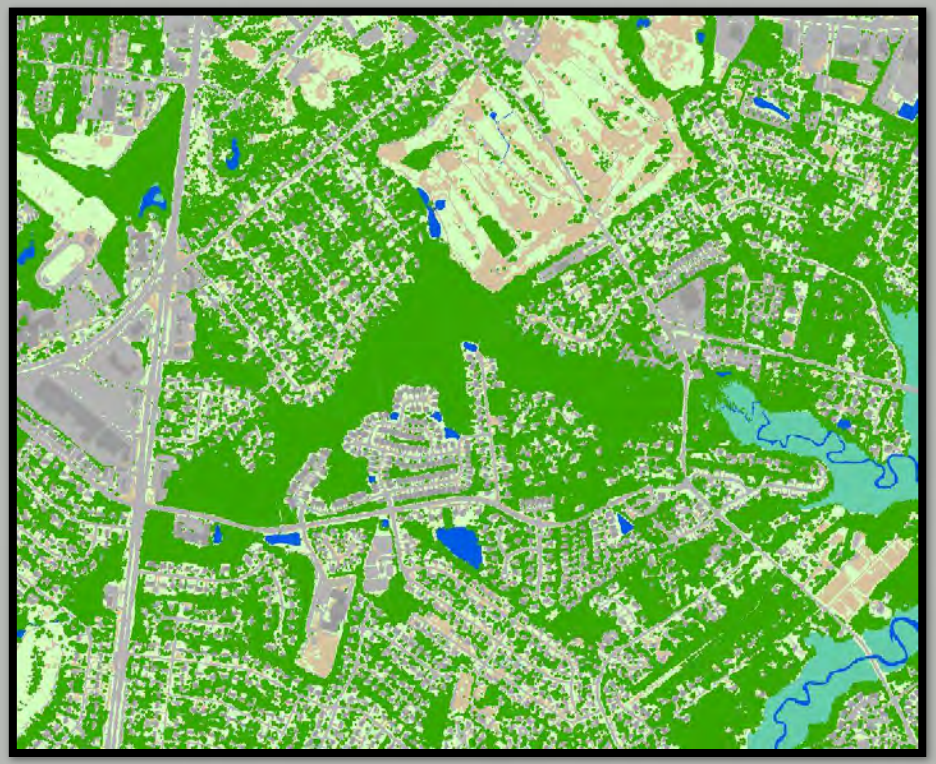


Urban Forest in Wilmington

Project Outcomes

- ✓ Map of the city's urban forest and possible planting areas.
- ✓ Written step by step methodology for linking urban forest systems to urban stormwater management.
- ✓ Calculating stormwater uptake by trees
- ✓ Recommendations for how the city can adopt new programs, codes, processes to better integrate the city's trees as part of stormwater management
- ✓ Sharing the work – a case booklet and presentation detailing methodology, lessons learned, best practices

What is green infrastructure?

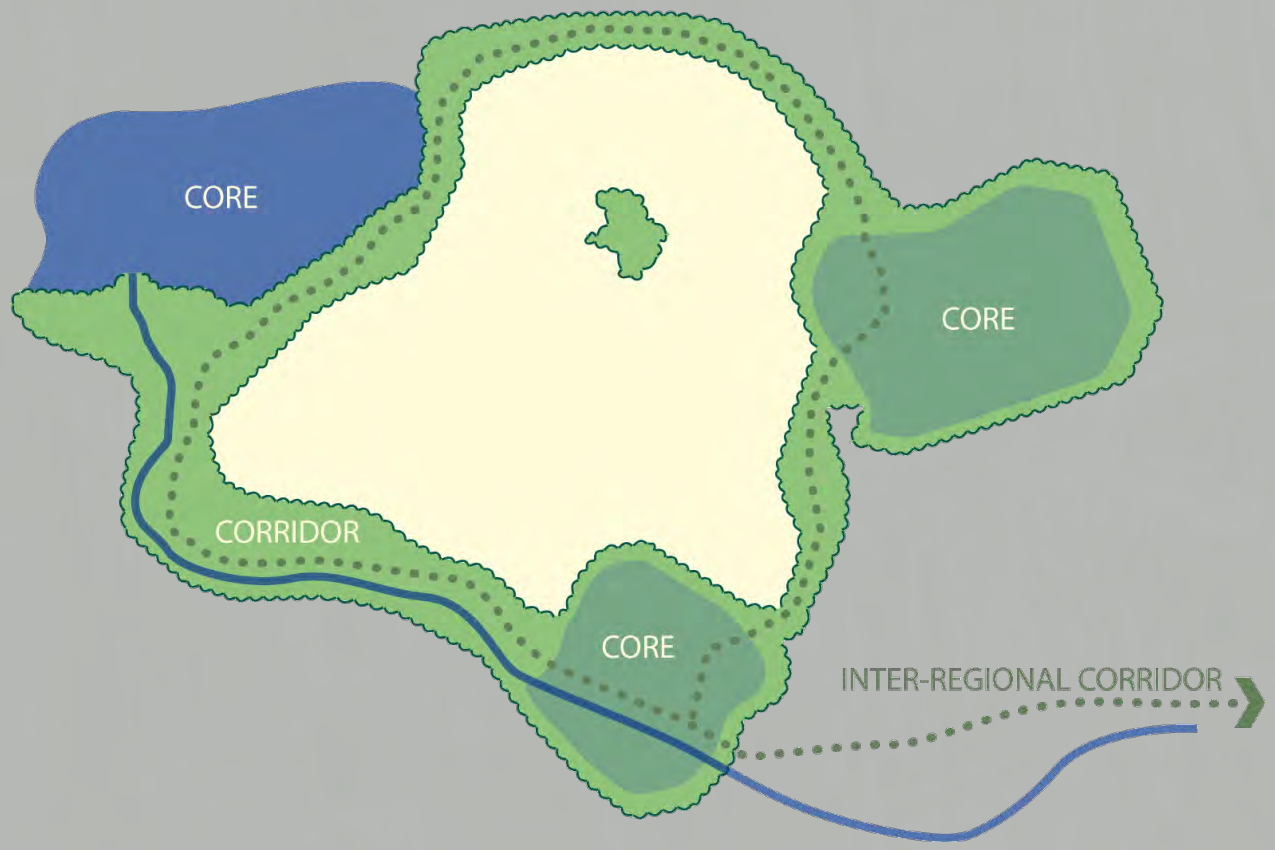


Map of a portion of Wilmington showing gray infrastructure including buildings and roads (left). Classified high-resolution satellite imagery (right) adds a green infrastructure data layer (trees and other vegetation) .

Green Infrastructure Planning Requires Thinking About How to Connect the Landscape

It's about connecting the landscape!

Not just key habitat patches but how we connect them!



The problem of developments that protect green space without thinking about connections beyond parcel boundaries ...

Green Infrastructure Definition Expands

In 1994, Florida coined the term *green infrastructure* to describe its wetlands, rivers, dunes, and forest habitats. In 2006, EPA added BMPs such as raingardens to the definition. The key is to first consider natural infrastructure (trees, forests, rivers) protect them and connect them, build in the least impactful manner, then mitigate impacts.
So, *first conservation, then mitigation.*

Rain gardens

Permeable pavers

Filterra Boxes

Trees: the original – and best – green infrastructure!

Trees give us cleaner air, shade, beauty and stormwater benefits at a cost that is far cheaper than engineered systems!

Estimates for the amount of water a typical street tree can intercept in its crown, range from 760 gallons to 4000 gallons per tree per year, depending on species.

Trees: Create Healthy Communities

- Access to fitness opportunities. (addresses obesity, nature deficit disorders)
- Clean air – trees absorb pollutants, VOCs, filter runoff, cool the city. (combat asthma)
- Well being and mental health - - people heal faster when they can see or access green. (hospitals need this for patients, reduces absenteeism of workers)
- Less crime occurs near trees. (issue especially for downtowns and public housing areas)
- Employees will exercise if they can access green where they work and on the way to work. (addresses employee health)

Urban Tree Canopy Values

Trees provide more attractive areas for development, historic districts, commercial areas opportunities for people to interact with nature.

A study by the University of Washington found that people shopped longer and more often in tree-lined retail areas and spent about 12 percent more money.

Trees = more tax revenue even in developed commercial districts!

Job Development

Small companies, especially those that are have well paid and skilled workforce place a strong importance on the "green" of the local environment.
Crompton Love and Moore, 1997

The creative class: artists, media, lawyers, analysts, make up 30 percent of the U.S. workforce and they place a premium on outdoor recreation and access to nature.
Florida, 2002

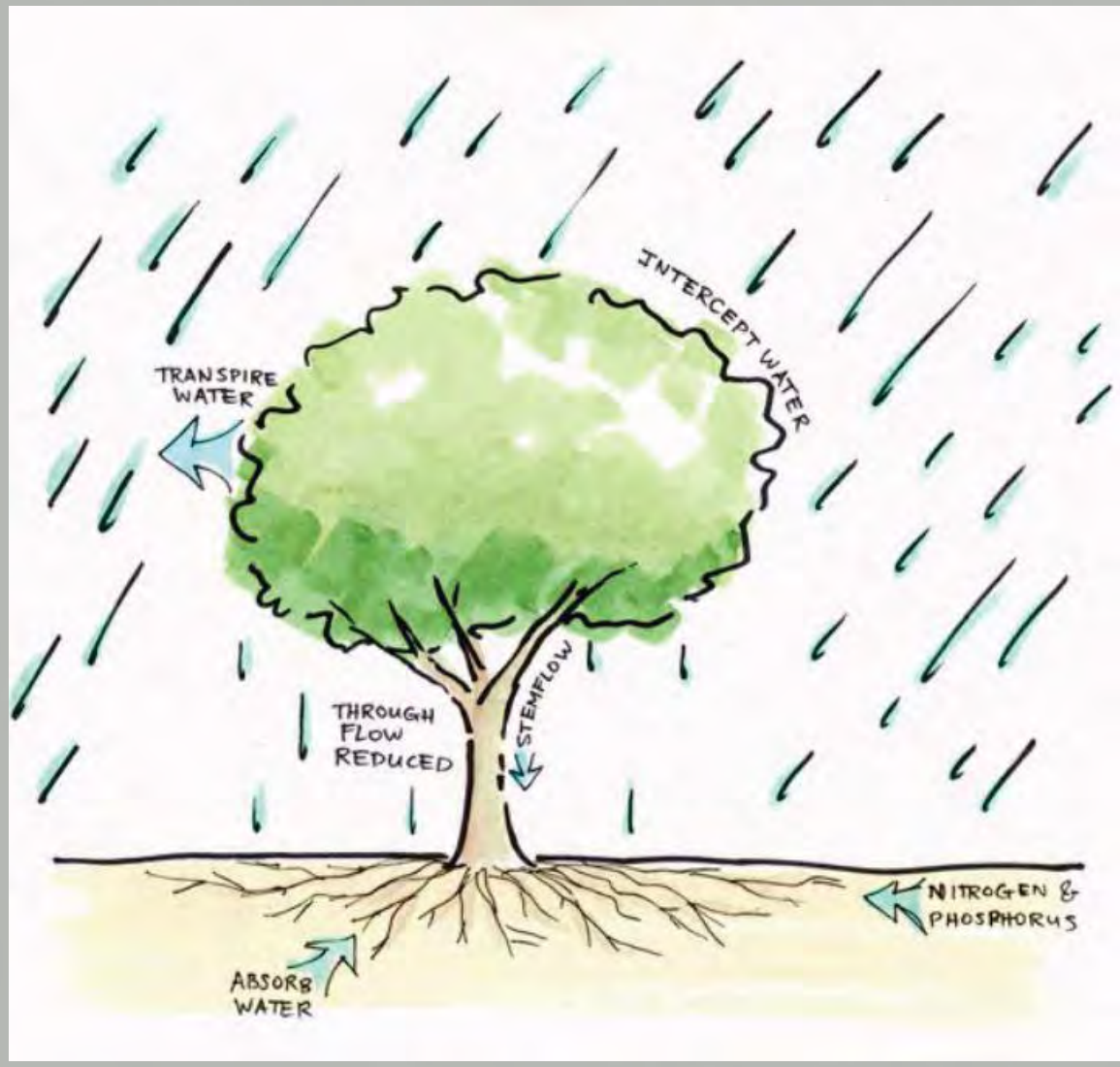
Trees and parks attract better paid jobs and thus a better tax base = $

Urban Tree Canopy

20% of annual rainfall or > retained in crown
(Xiao et al., 2000)

Delays runoff up to 3.7 hours

⇧ infiltration capacity of soils

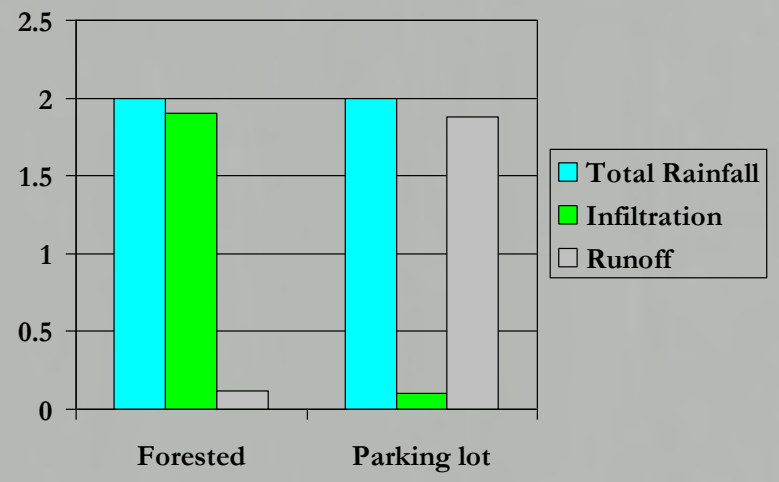


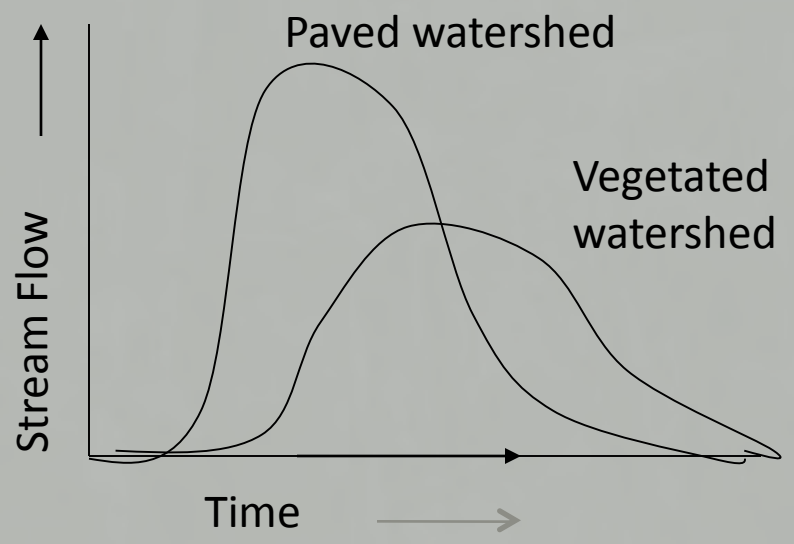
Paved Areas Can Cause Extreme Flows

1. Impervious surfaces prevent rain infiltration, causing greater runoff volume and velocity.

2. Storm flows peak sooner in the stream at higher volumes.

3. Higher volumes and velocities of runoff lead to more flooding and damages – the firehose effect!





Water flow strategies

How do we make this…

function like this?

This parking lot could be retrofitted so we get less of this …

One acre of pavement releases 36 times more runoff than a forest.

During a rainfall event of one inch, one acre of forest will release 750 gallons of runoff, while a parking lot will release 27,000 gallons.

(PennState Extension).

Flooding in Wilmington, NC

Calculating Stormwater Uptake by Trees – **It's complicated!**

Tree Over Parking Lot

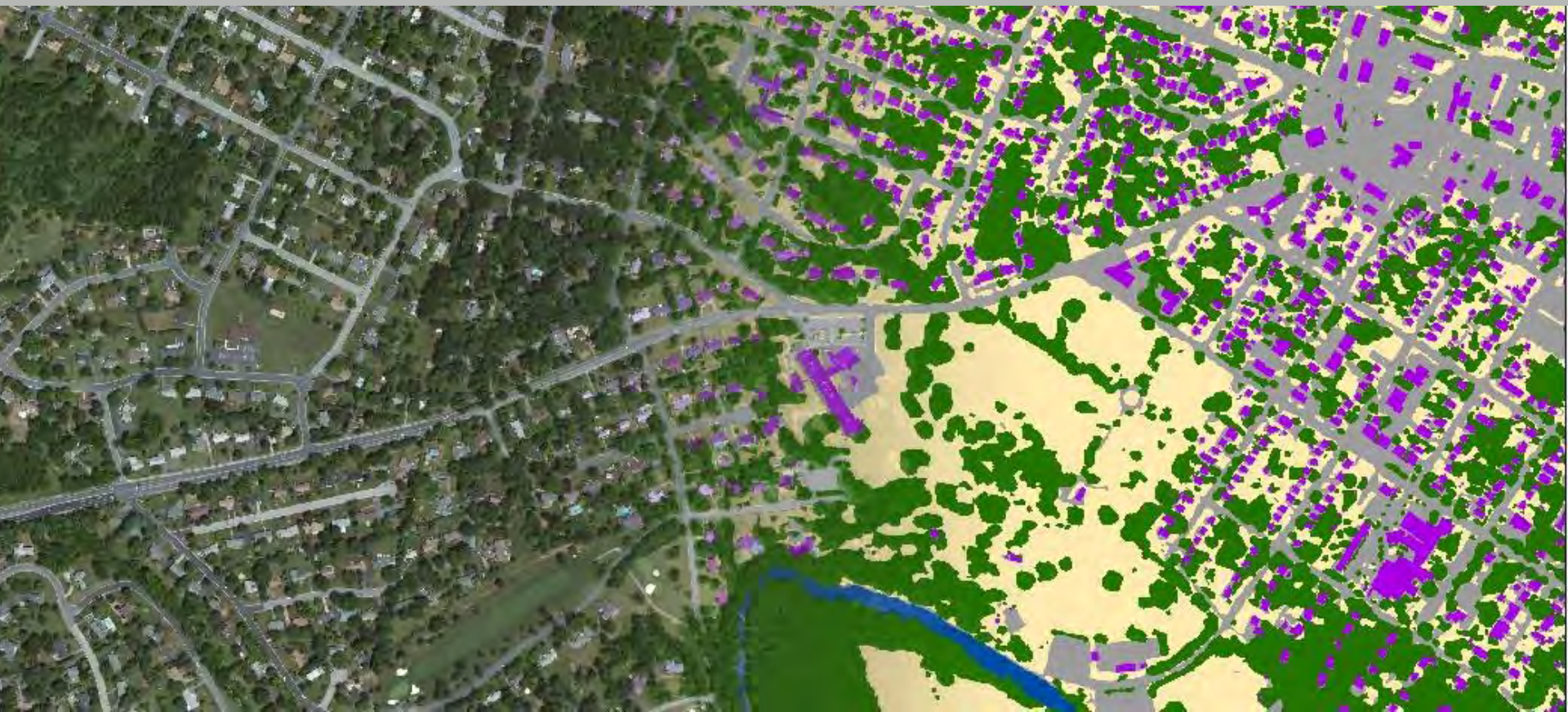
Tree Over Natural Forest Cover

Tree Over Lawn

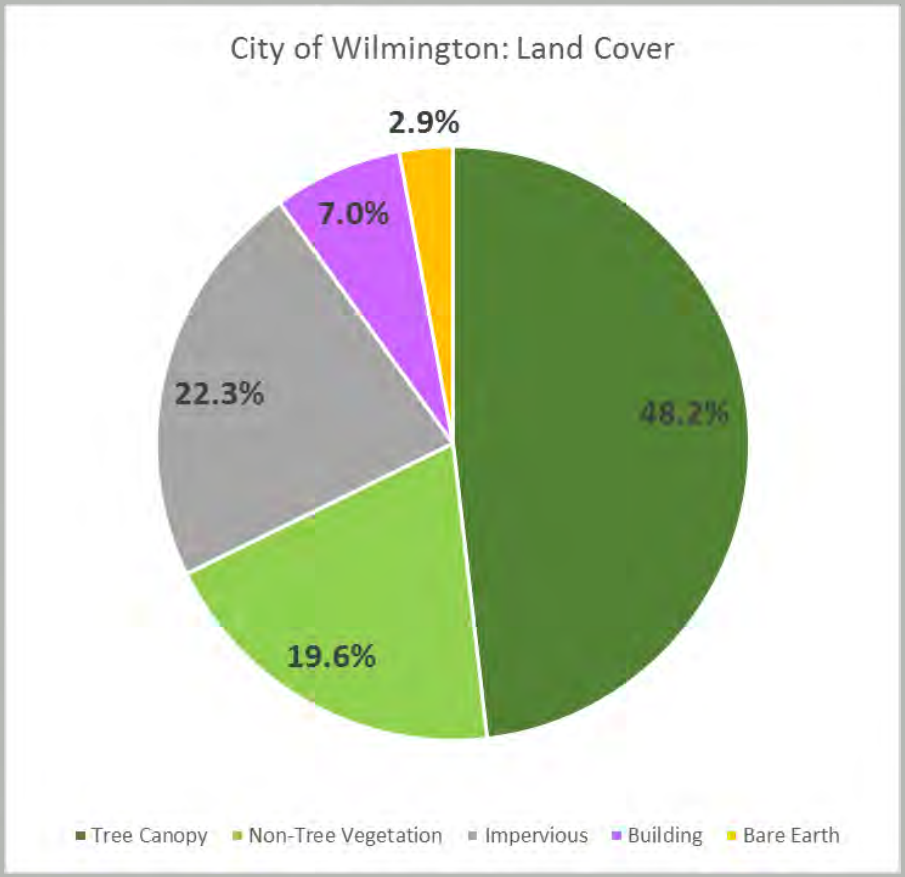
Tree Over Street and Sidewalk

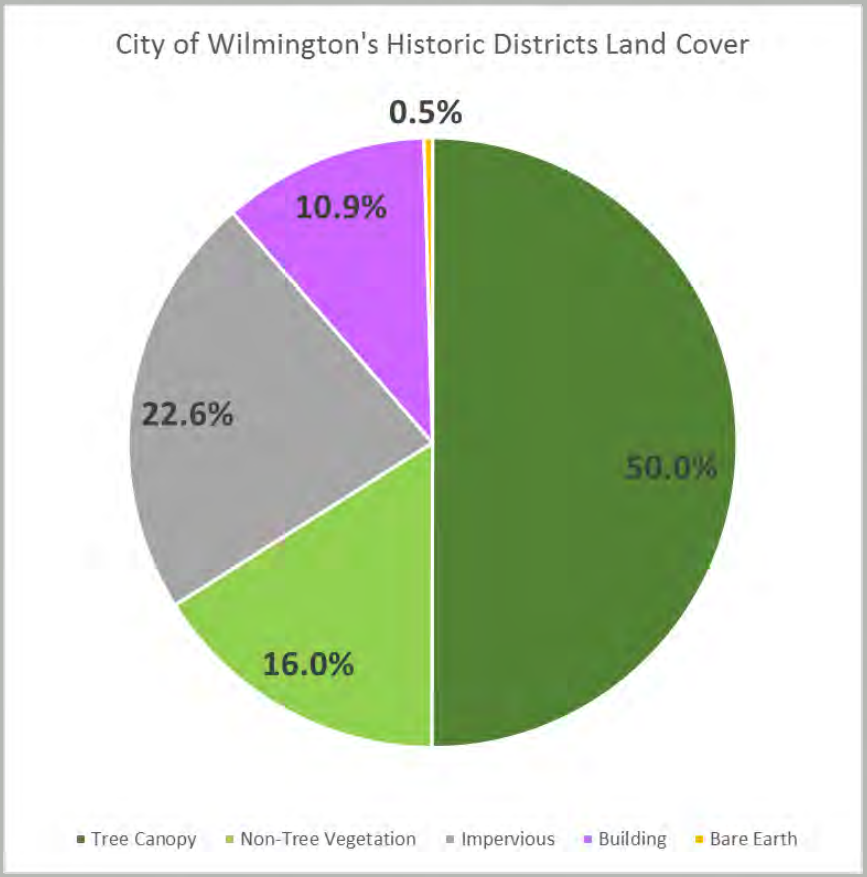
How Much Canopy Do We Have? Using Image Classification

Image classification is the process of breaking an image into spatial land coverages (including tree canopy, other vegetation, impervious surfaces such as buildings, streets and parking lots).

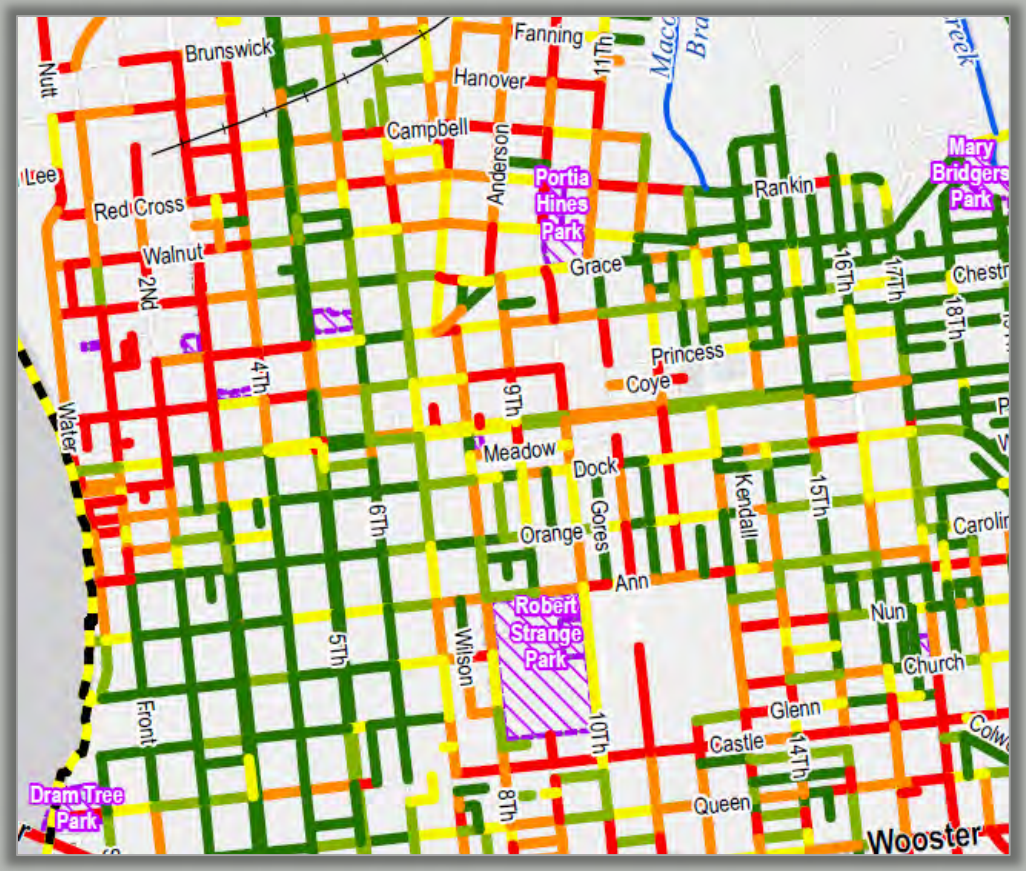


Results!
How well canopied are we?





We'll do a street by street analysis. How green are the **city's** streets?



Tree Canopy Coverage (within 50 feet of street centerline)

- 0% - 10%
- 10.1% - 20%
- 20.1% - 30%
- 30.1% - 40%
- 40.1% - 100%

Where Can We Fit Trees?

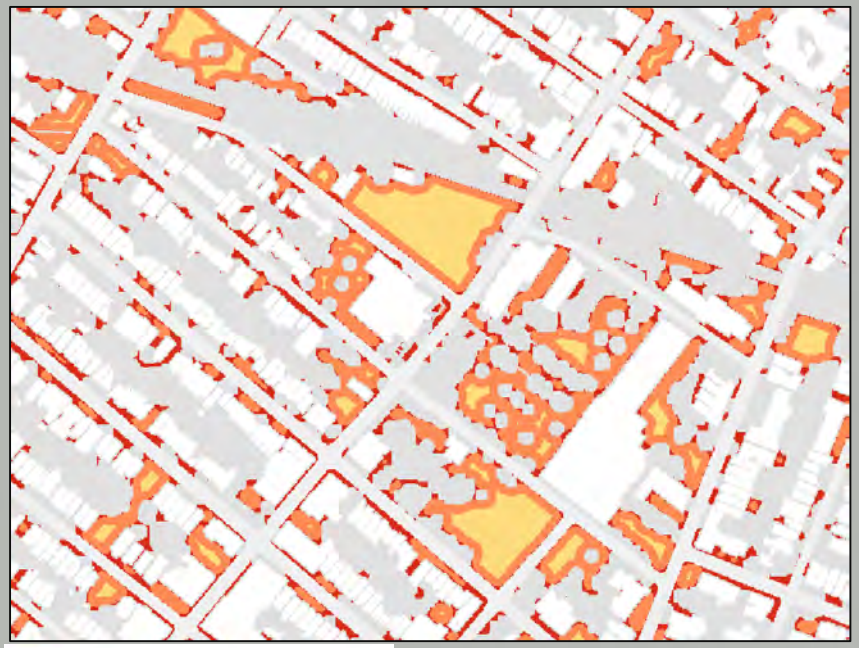
Possible Planting Areas

Possible Planting Area vs. Potential Tree Canopy

Annual Average Benefits

USDA Forest Service, Center for Urban Forest Research

Using GIS, we can estimate where it's possible to plant trees, and the benefits of doing so.



Small (25 ft canopy spread)

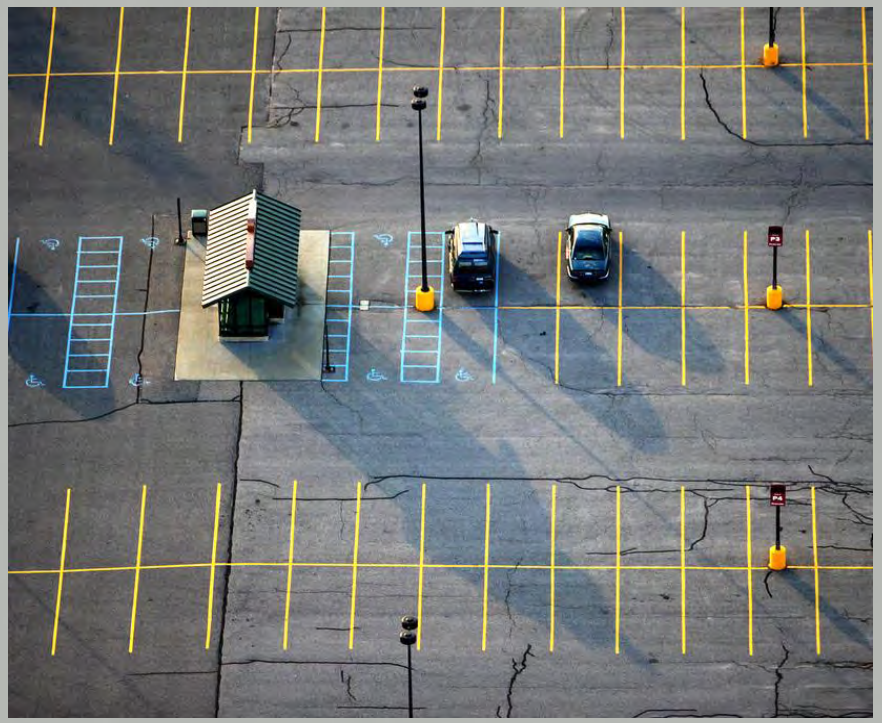
Medium (35 ft canopy spread)

Large (50 ft canopy spread)

Strategy:
Plant more trees

Fall Tree Sale, Image: Local tree stewards grow trees

Reduce Imperviousness in Parking Lots



How?

- Match parking requirements to demand requirements
- Incentivize permeable pavement especially at city's higher elevations

Variable Space Sizing

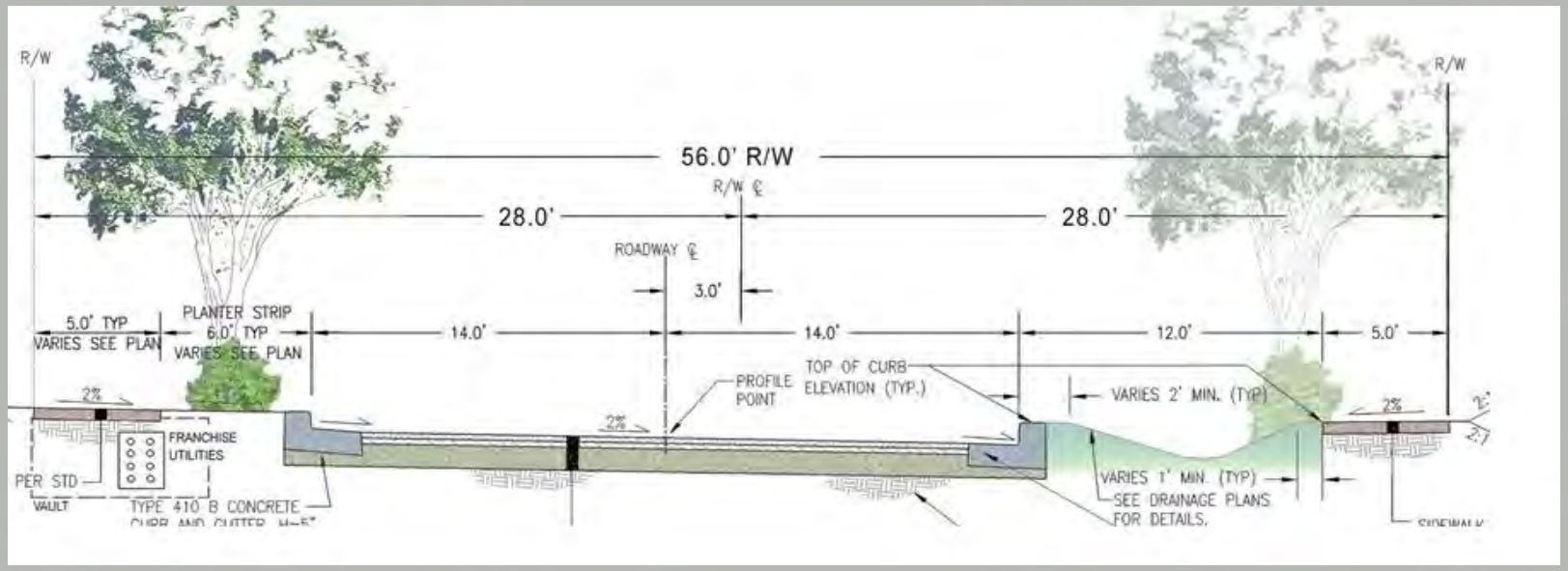
Not all of us drive this

Some of us drive this.

Redesign Streets as Complete **'Green' Streets**

- Complete streets are great, but where is the green?
- Complete green streets allow for
  - *Treatment of stormwater in-situ*
  - *Reduction of urban heat island effect*
  - *Beautification: increase in downtown foot traffic*
  - *Habitat corridors*

Water Flow Strategy



- Widen and deepen planting strip
- Streets may drain to one side
- Planting strips can be mown lawn or include perennials

Urban Trees Often Need Better Care and More Room to Grow

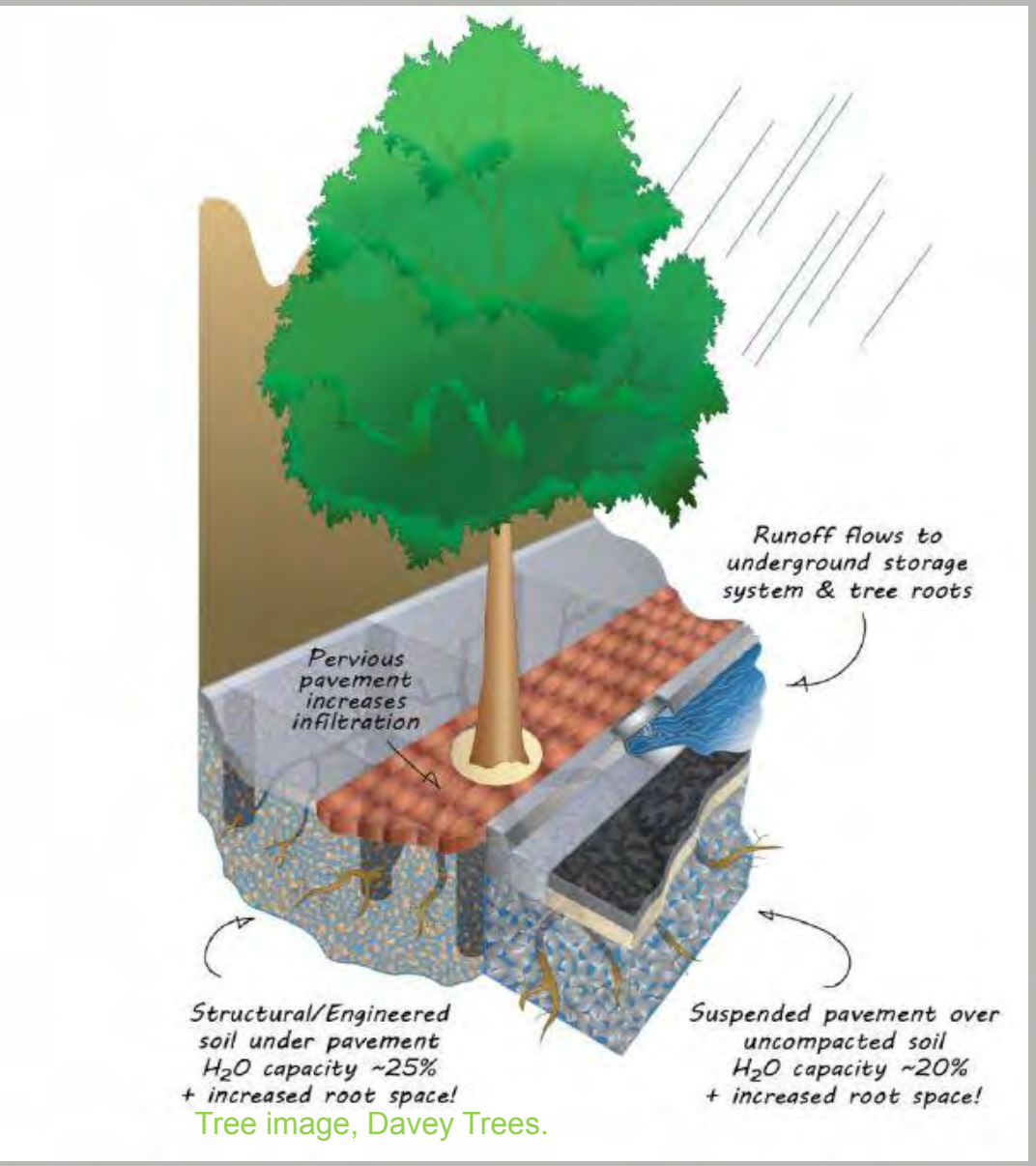
Adequate Planting Area

This small tree has permeable space in which to expand.

In highly trafficked areas, permeable pavers can be placed near the tree and removed as the trunk grows, while air and water can still reach the roots.

A general rule: 1000 cubic feet soil vol. per tree.

Accommodate Large Trees



Tree image, Davey Trees.

Larger trees offer greater benefits – so think carefully when setting planting goals for streets!

Consider using structural soils and permeable pavement, rather than just choosing small trees! Trees will pay back your investment!

Discussion – at maps

- ✓ How green is your area of the city (see maps)?
- ✓ What challenges do you see for our trees?
- ✓ Where is flooding a problem?
- ✓ Where could we plant more trees?
- ✓ How can we encourage more tree plantings?

Let’s look at maps – provide comments!

END

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