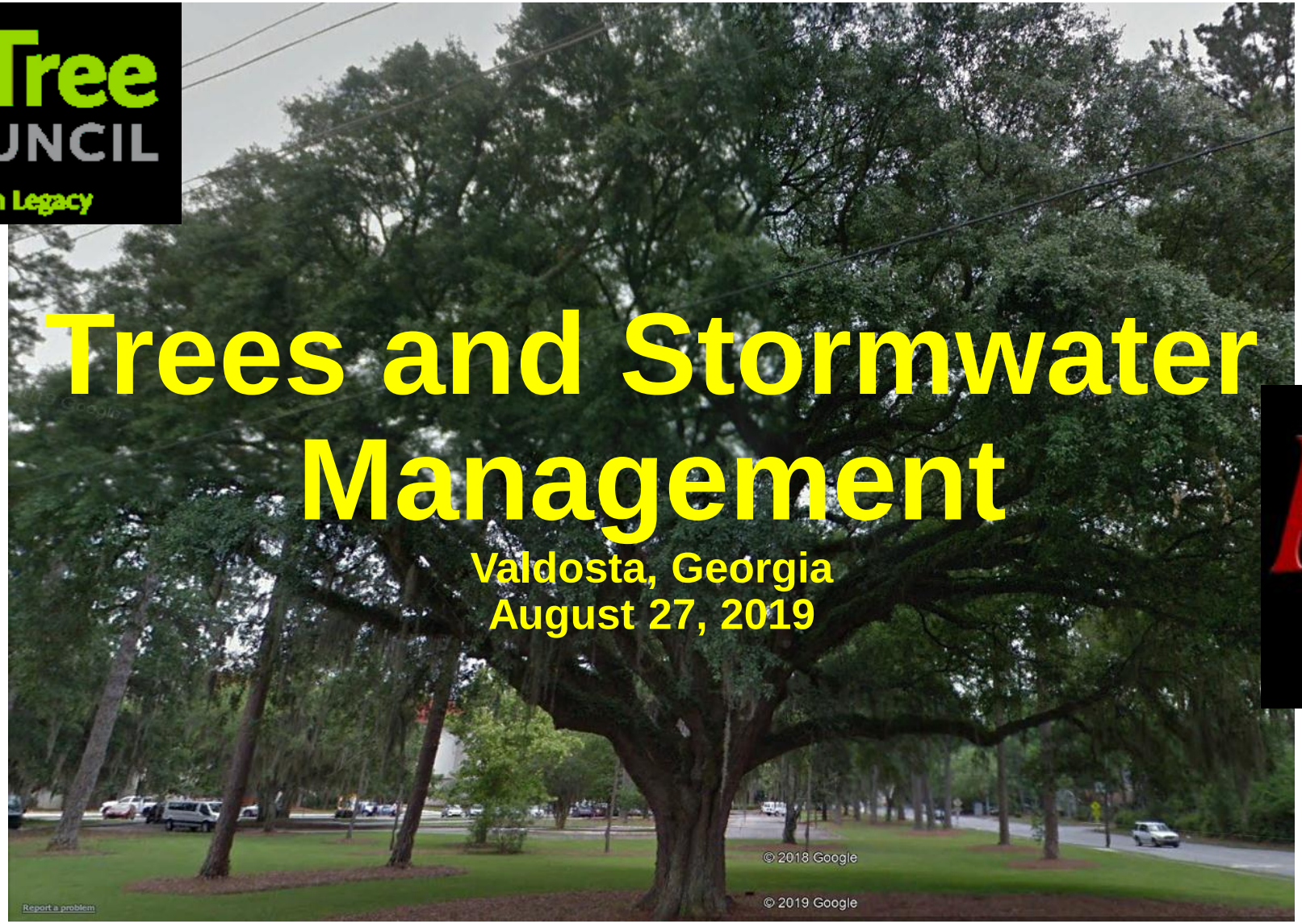
Georgia Tree Council
Sustaining Georgia's Green Legacy



Trees and Stormwater Management

Valdosta, Georgia
August 27, 2019

Georgia Forestry Commission

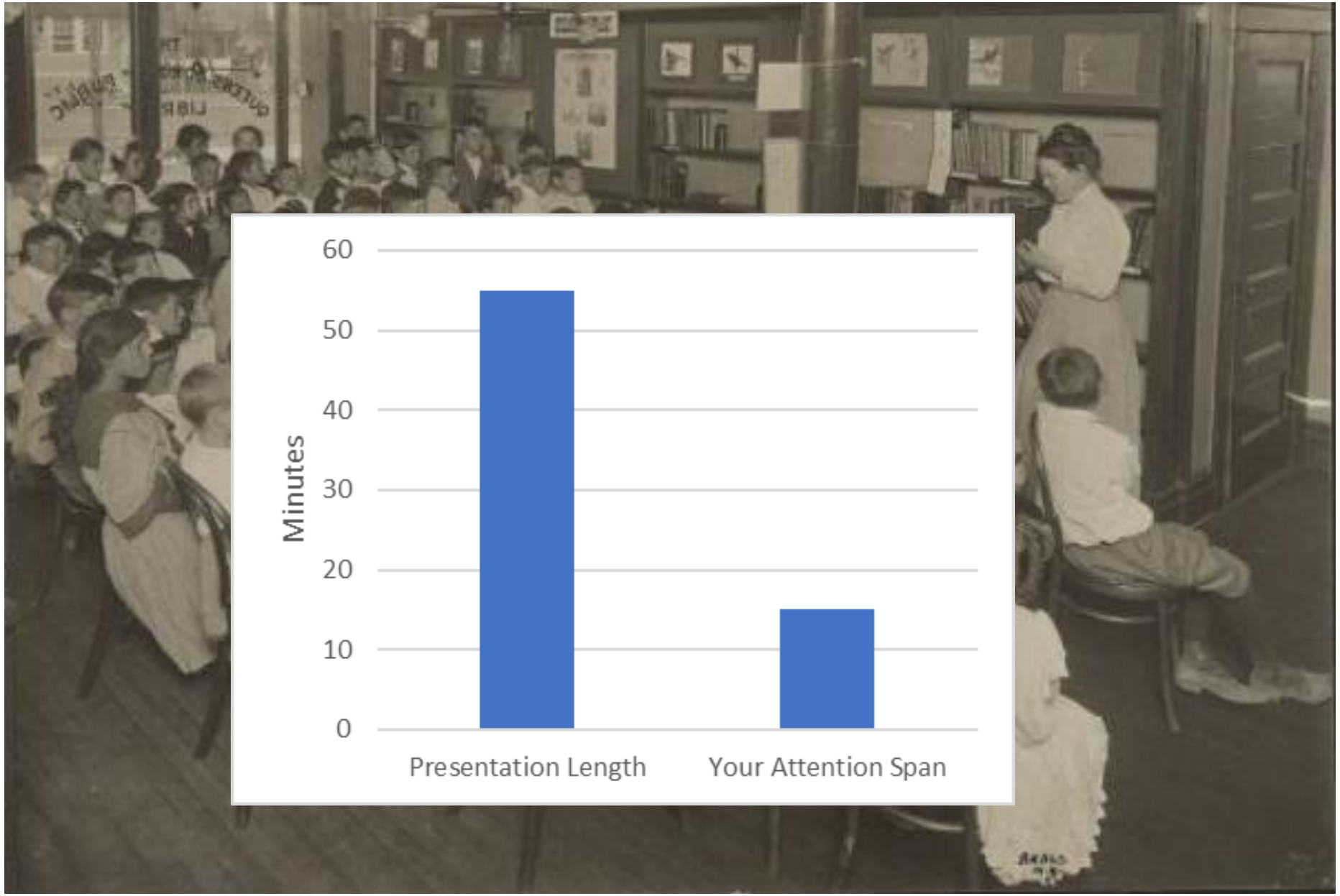
Austin's Cattle Company 1896
Steak, Seafood & Prime Rib

VALDOSTA
A City Without Limits

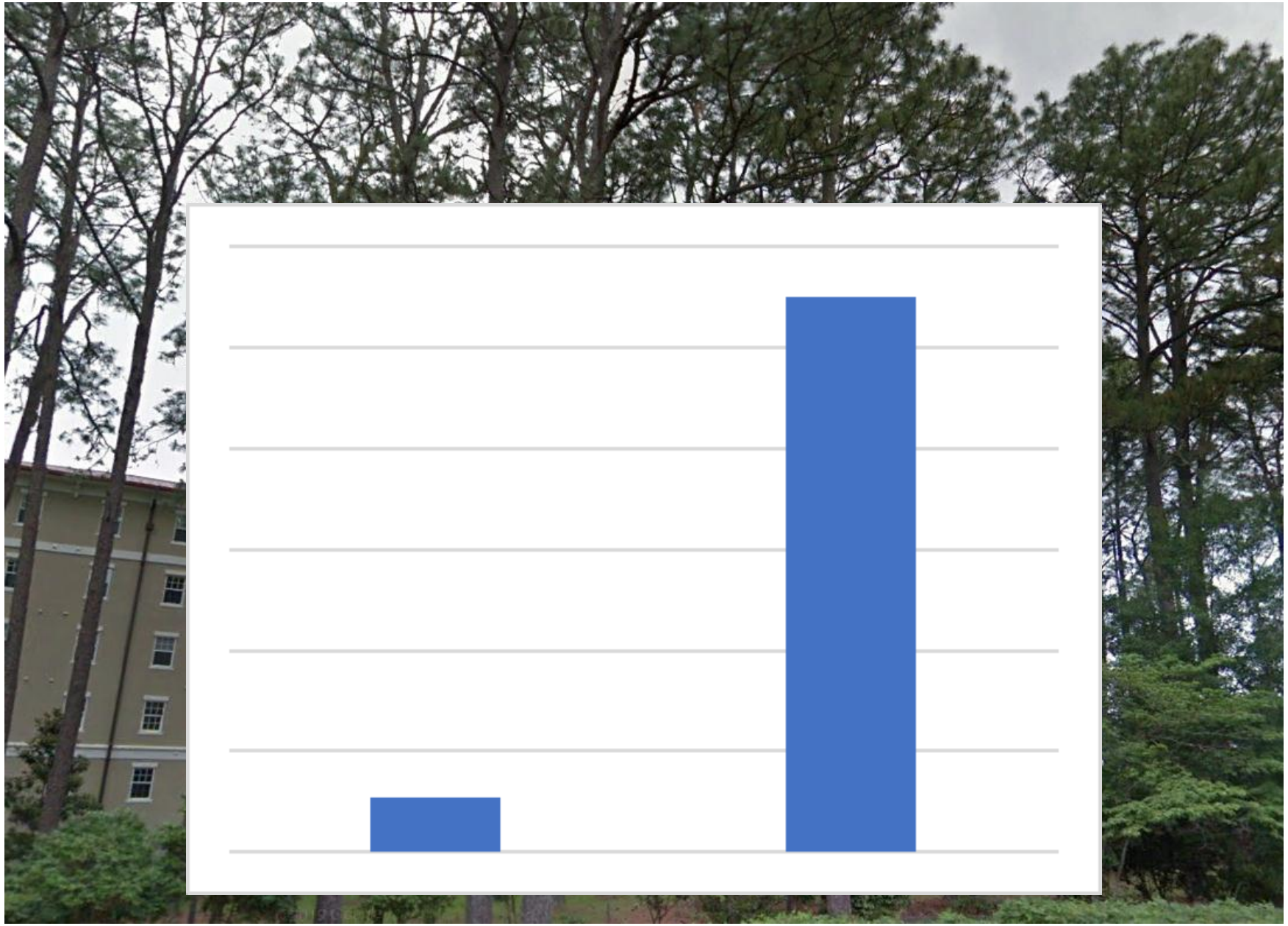
Charlie Marcus
Certified Arborist
Legacy Arborist Services
Tallahassee, FL

Legacy Arborist Services

Time Allotted vs Audience Attention Span



My Time vs Topic Material



Presentation Goals

Use Trees to Reduce:

- Stormwater Quantity
- Stormwater Pollution
- Infrastructure Needs

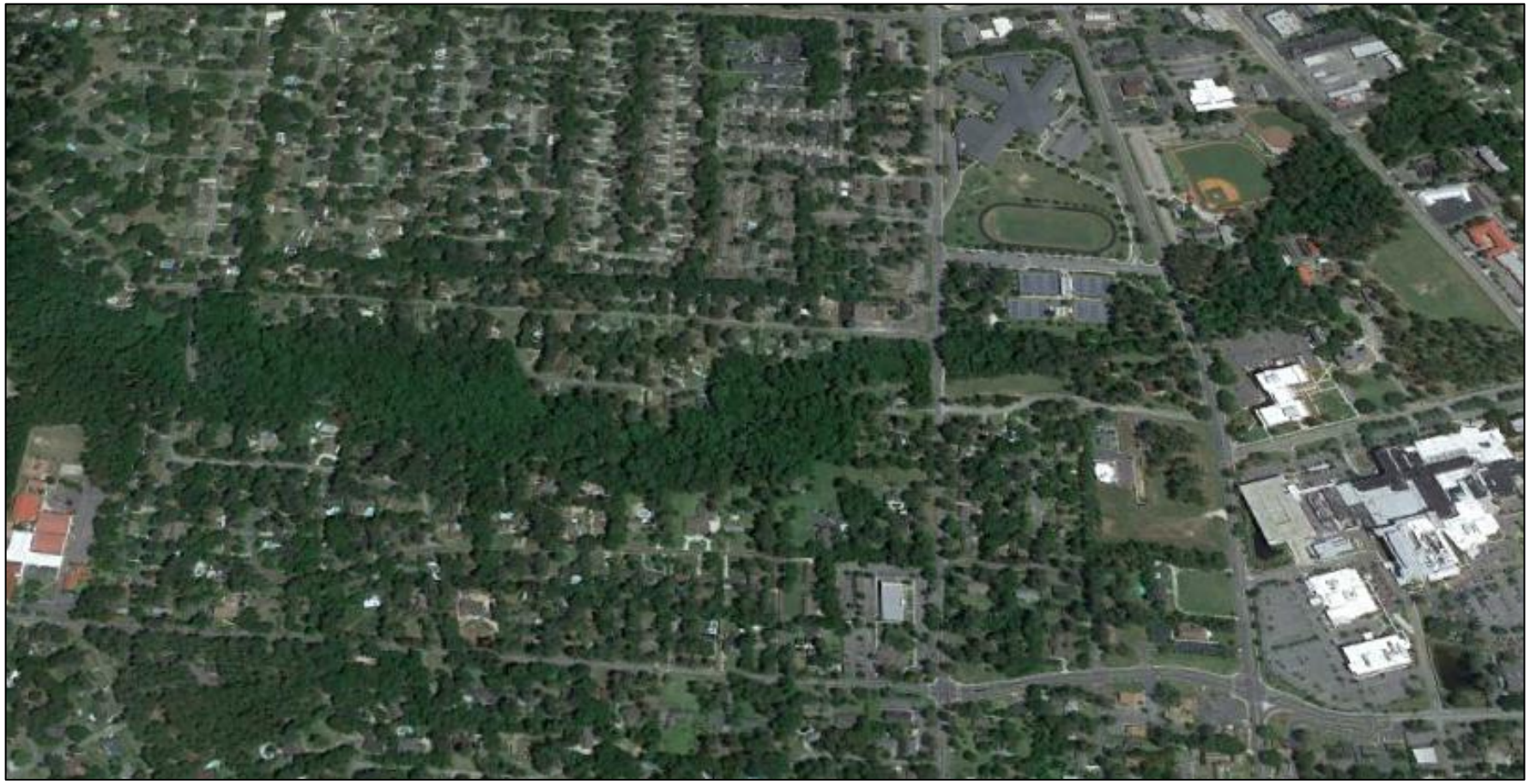
How Do Trees Mitigate Stormwater in Developed Communities?

What is Green Infrastructure?

What is Green Infrastructure?

"...is an approach to stormwater management that utilizes soils and vegetation to enhance and/or mimic the natural hydrological cycle processes of infiltration, evapotranspiration and reuse."

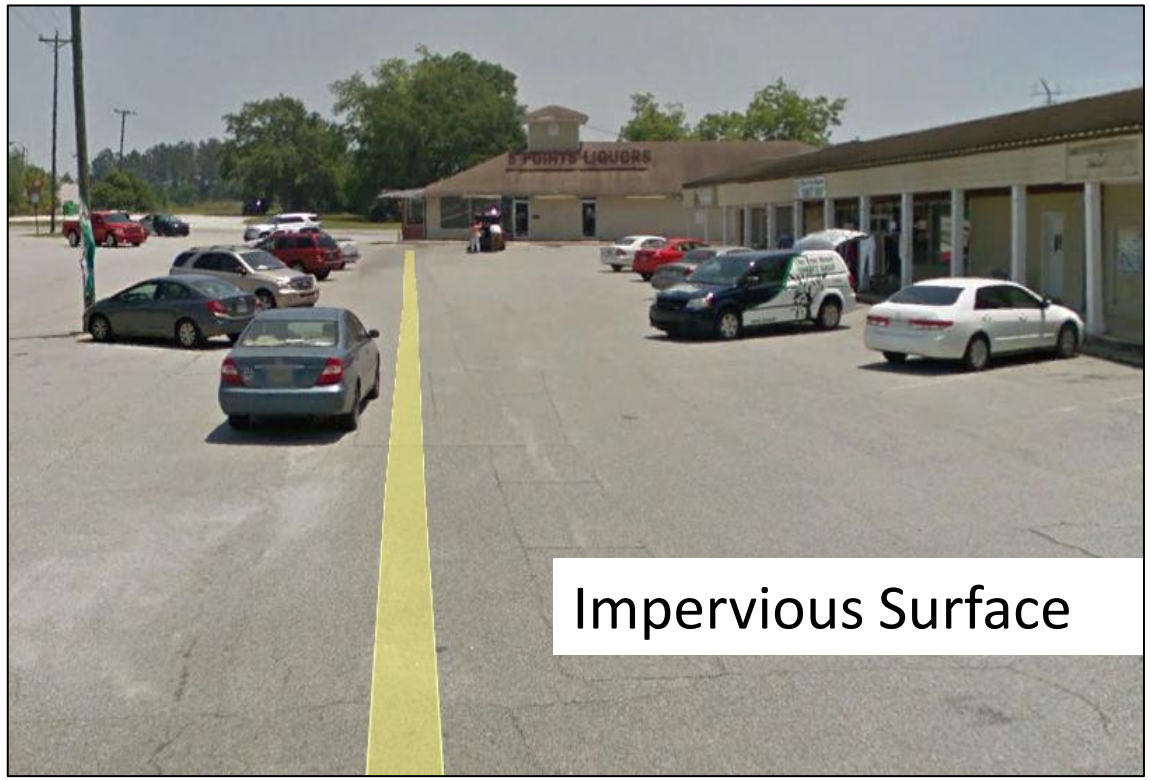
US Environmental Protection Agency (2008)



What is Infiltration?

Infiltration is the process by which precipitation or water soaks into subsurface soils.

- Reduces Sheet Flow
- Filters out Pollutants



Trees Promote Infiltration

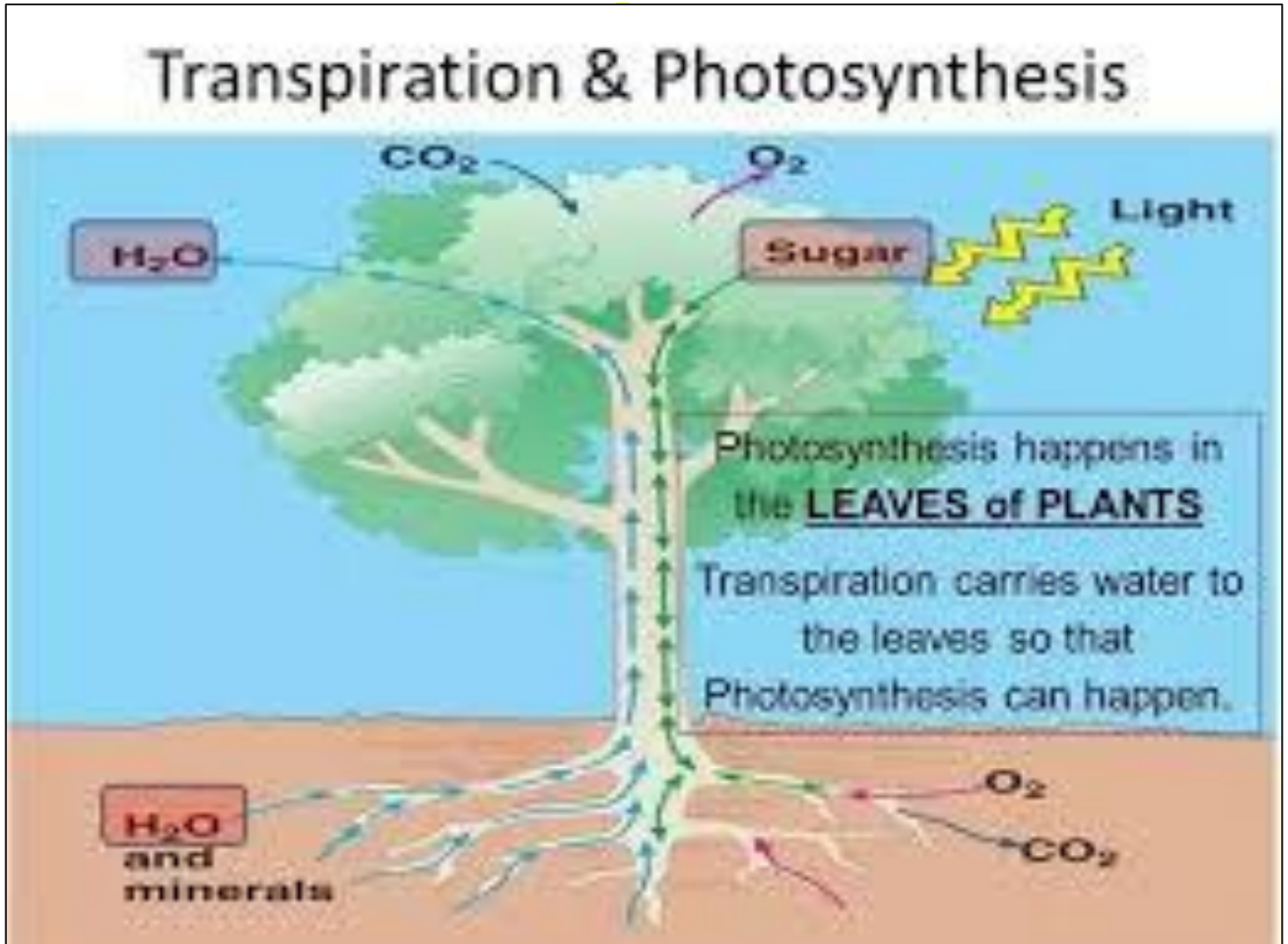
- Tree Rooting Zones Provides an Ideal Environment for Infiltration.
  - Duff/Mulch
  - Sod
  - Permeable Materials
  - Herbaceous Vegetation
  - Non-Compacted Soil

What is Evapotranspiration?

- Significant source of atmospheric water vapor.
- Combination of:
  - Evaporation from the soil surface and water bodies plus___
  - ***Transpiration from the leaf surfaces and the stomates of plants.***
    - ***Cools the leaf surface***
    - ***Moves water and nutrients up the trunk***

Photosynthesis

$6CO_2$ Carbon dioxide + $6H_2O$ Water —Light→ $C_6H_{12}O_6$ Sugar + $6O_2$ Oxygen



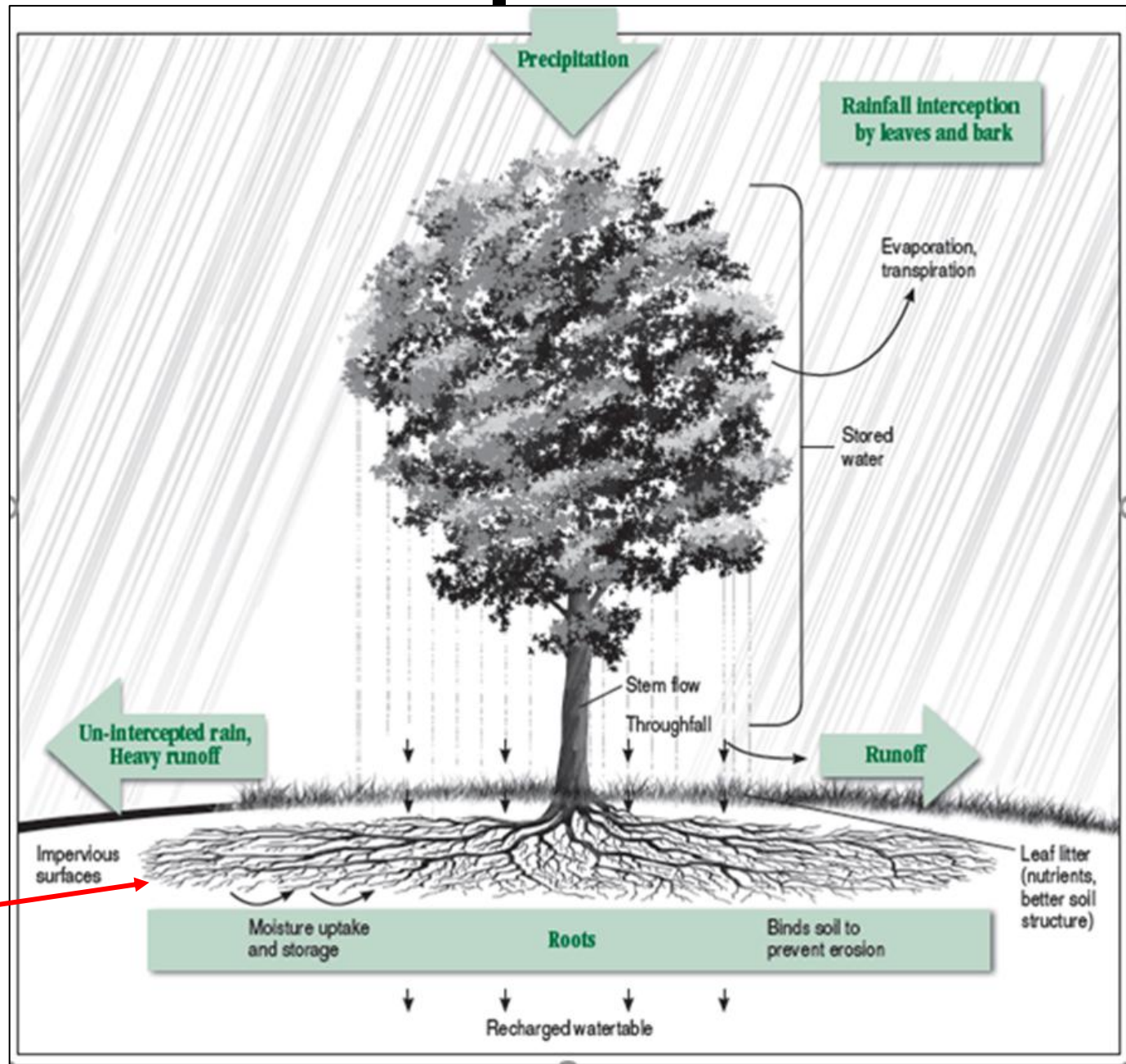
Interception and Absorption

Interception = *Stormwater that stays on the surfaces of the leaves and never reaches the ground before it evaporates.*

Absorption = *Stormwater that reaches the soil and is absorbed by tree roots.*

Interception and Absorption

85% of a Tree's Root Volume Lies Within Three Feet of the Soil Surface.



Without Interception and Absorption:

- Soil Becomes Saturated Faster
- Sheet Flow Volume Increases
- Dissolved Sediment and Pollutant Levels Increase
- Need for Stormwater Containment and Treatment Increases

Green Infrastructure vs Gray Infrastructure

both provide benefits – both require maintenance

Green Infrastructure

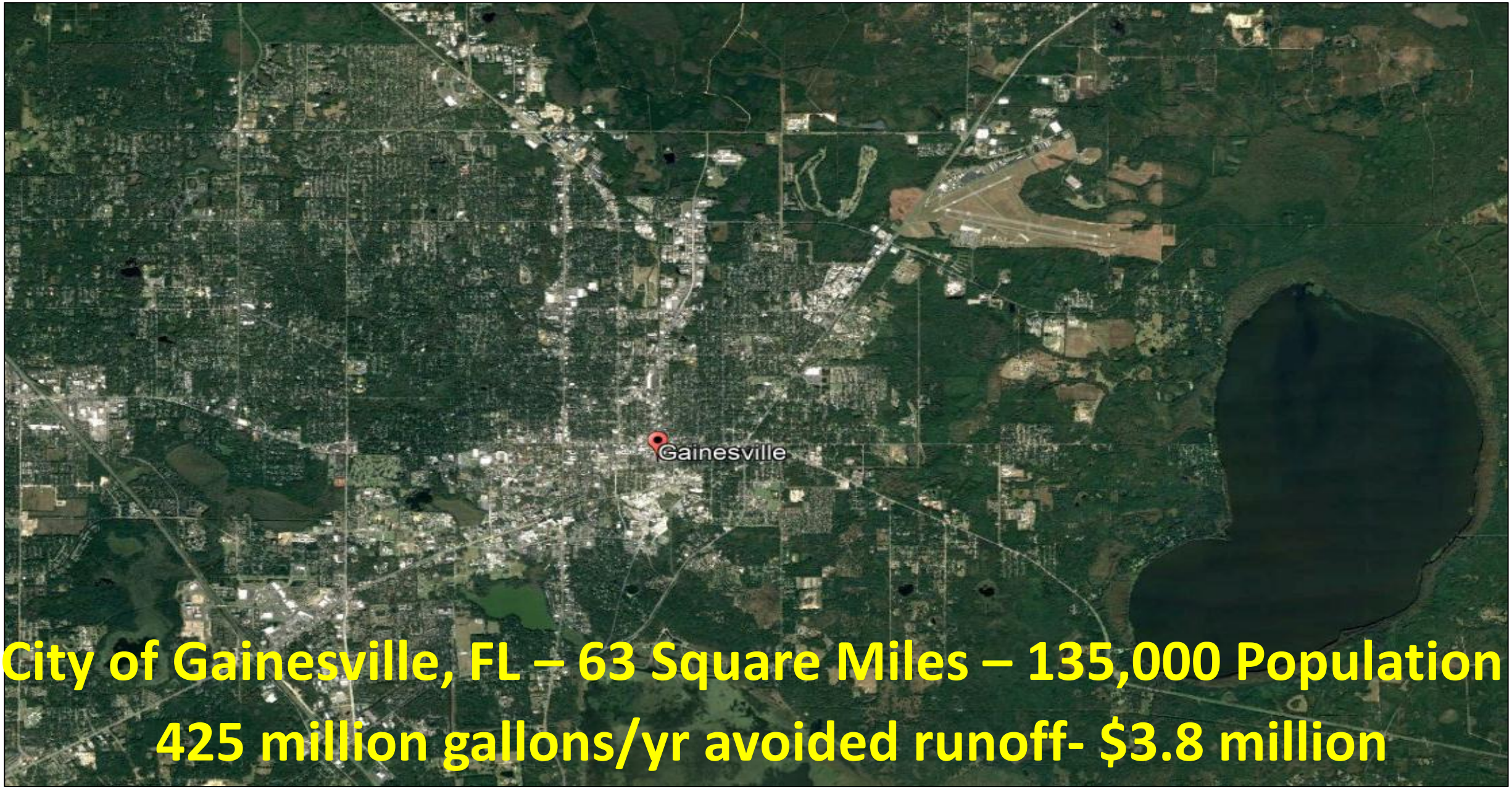
- Trees
- Shrubs
- Herbaceous Plants
- Grasses

Gray Infrastructure

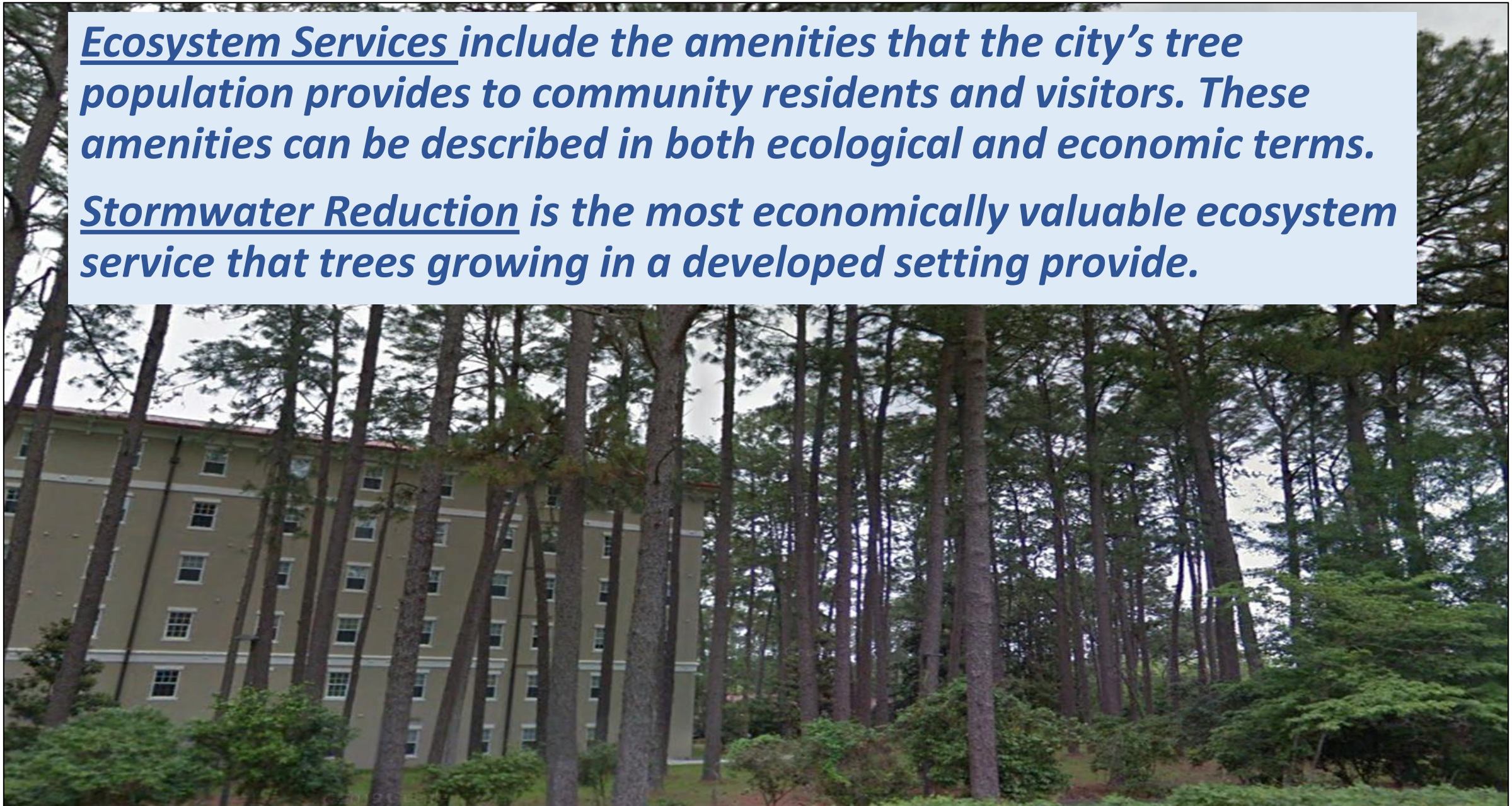
- Storm Drains
- Sewer Pipes
- Retention Structures
- Pumps
- Filters
- Treatment Facilities

Can We Quantify the Potential Benefits?

Can We Quantify the Potential Benefits?



Ecosystem Services



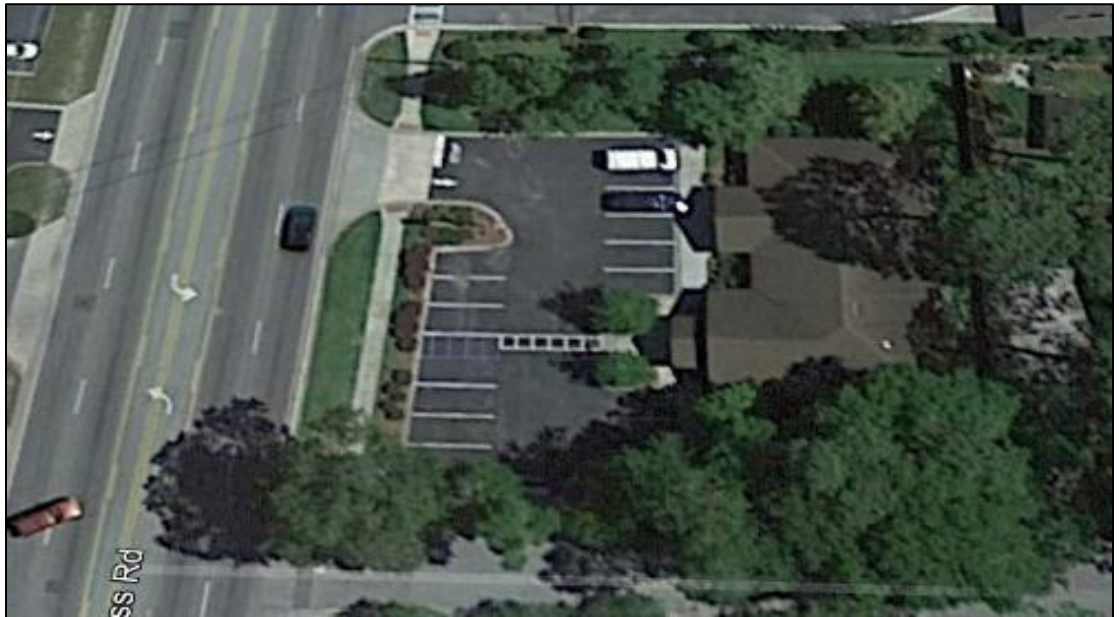
<u>Ecosystem Services</u> include the amenities that the city's tree population provides to community residents and visitors. These amenities can be described in both ecological and economic terms.

<u>Stormwater Reduction</u> is the most economically valuable ecosystem service that trees growing in a developed setting provide.

What's Our Strategy for Using Trees to Reduce Stormwater Runoff?

- Conserving Forested Areas
- Protecting Large Canopy Trees/Groups of Canopy Trees
- Retaining Pervious Surfaces
- Utilizing Pervious Materials
- Creating/Retaining Sufficient Sized Planting Spaces for Canopy Trees
- Right Tree/Right Place – Conflicts Between Trees & Infrastructure
- Invest in Keeping Trees Healthy
- Engineering Solutions

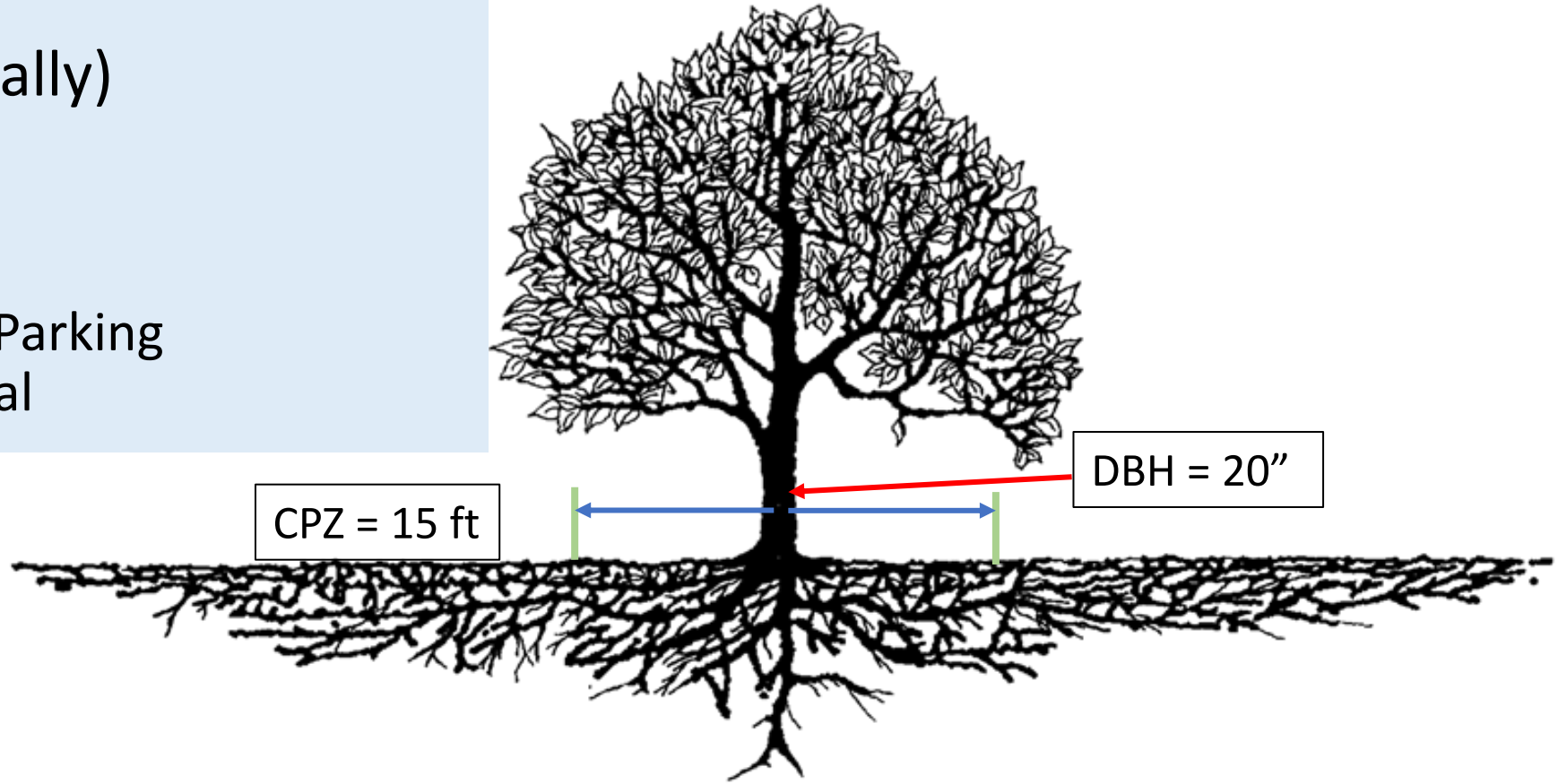
Conserving Forested Areas



Zero Lot Line Development

Protecting Canopy Trees During Construction

- It’s All About the Roots!
- Protect the Critical Protection Zone
  CPZ = DBH x 9
- Fence the CPZ
- Prohibited Activities (Ideally)
  - Excavations
  - Trenching
  - Fill > 4 inches
  - Equipment Operation and Parking
  - Material Storage or Disposal



If You Have to Enter the CPZ:

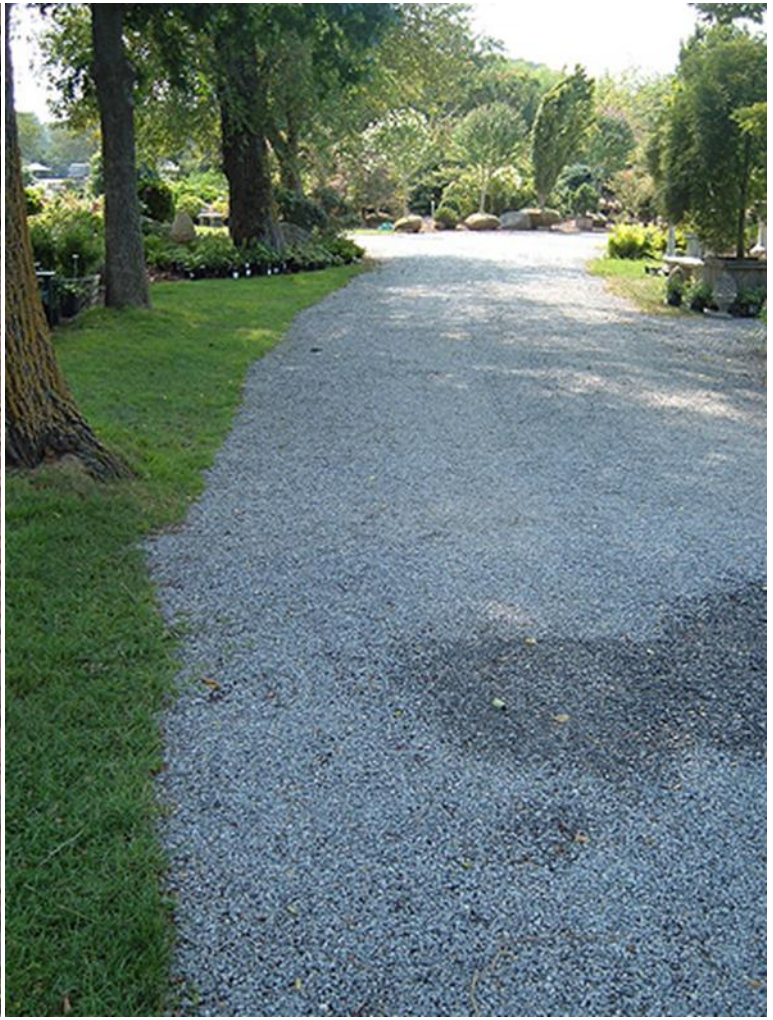
- Protect the Trunk
- Leave the Pavement in Place
- Apply 8-12 inches Mulch over Geotextile
- Tunnel, Don’t Trench

Retain/Create Pervious Surfaces

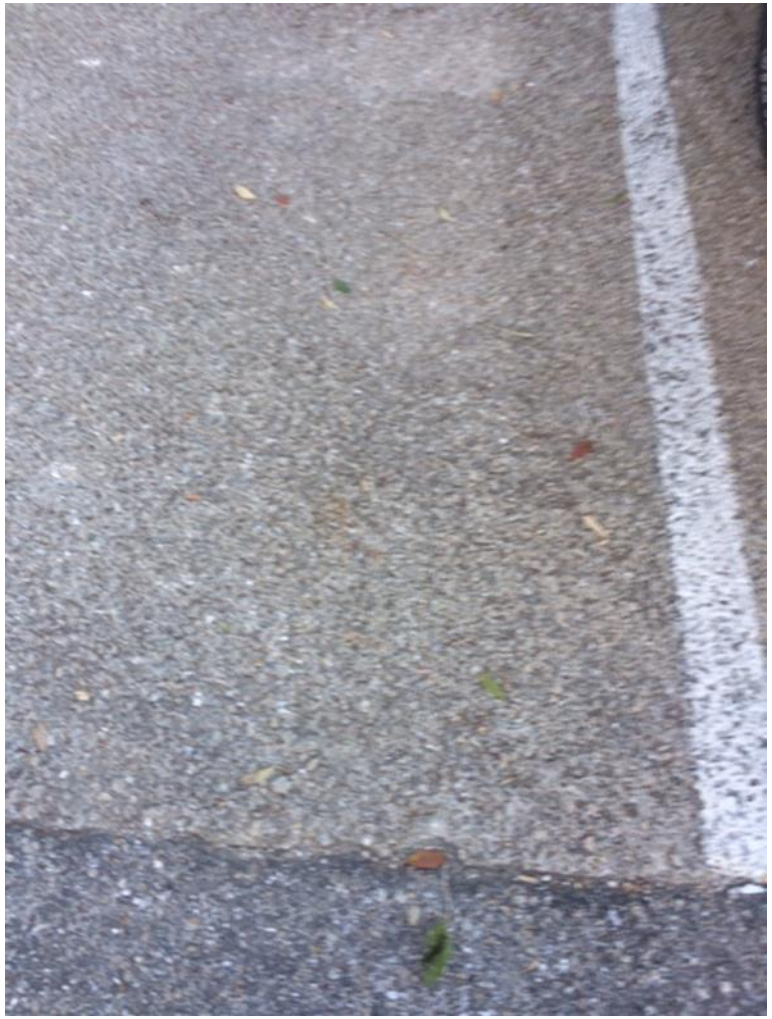
Utilizing Pervious Materials

- Mulch
- Brick Pavers
- Permeable Pavers
- Gravel
- Pervious Concrete
- Asphalt

Brick



Gravel



Pervious Concrete

Asphalt

Permeable Pavers

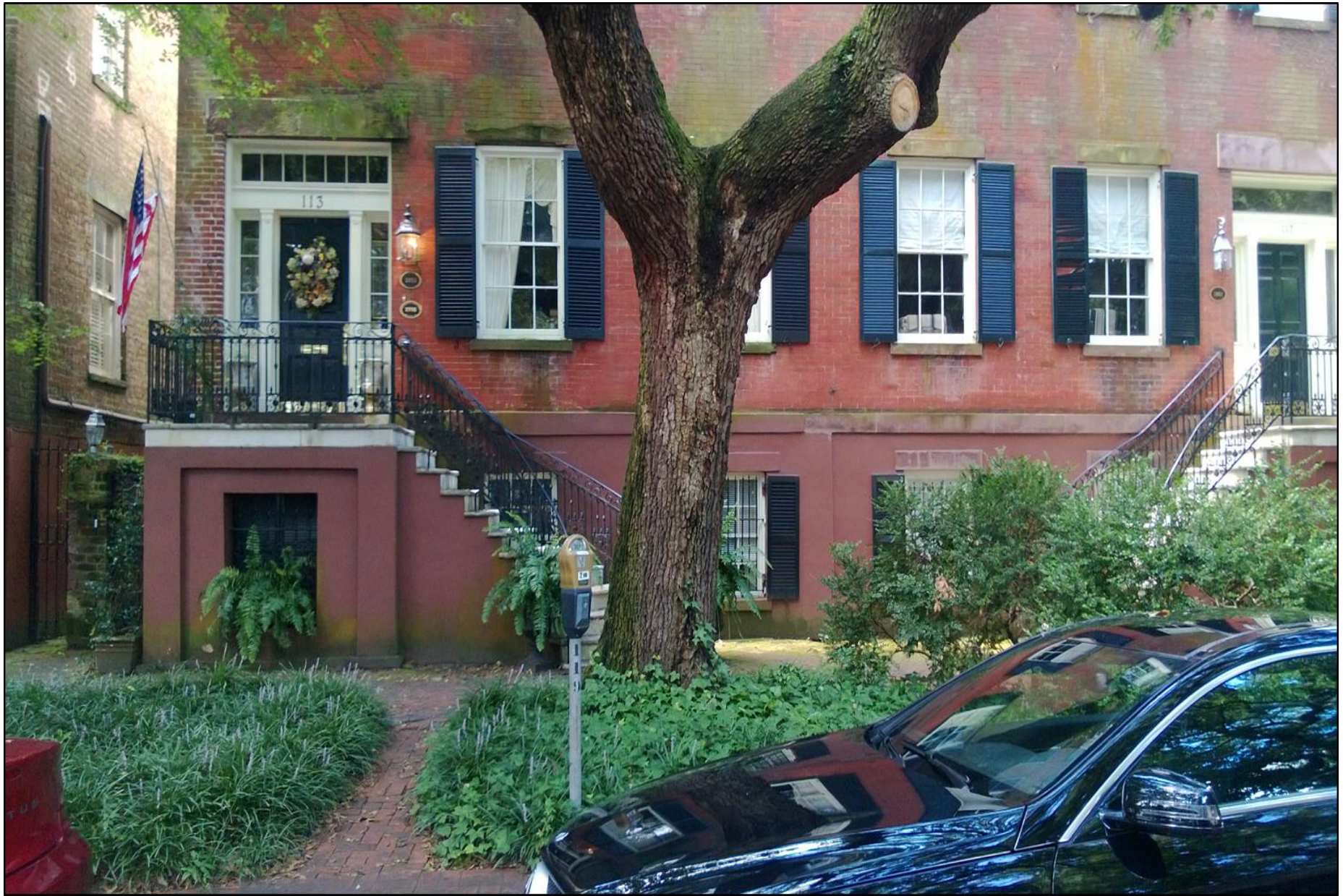
Crushed Granite

Not Good for Trees or Stormwater

Expand Your Mulch Bed

Stormwater Bumpout

Install Herbaceous Plants

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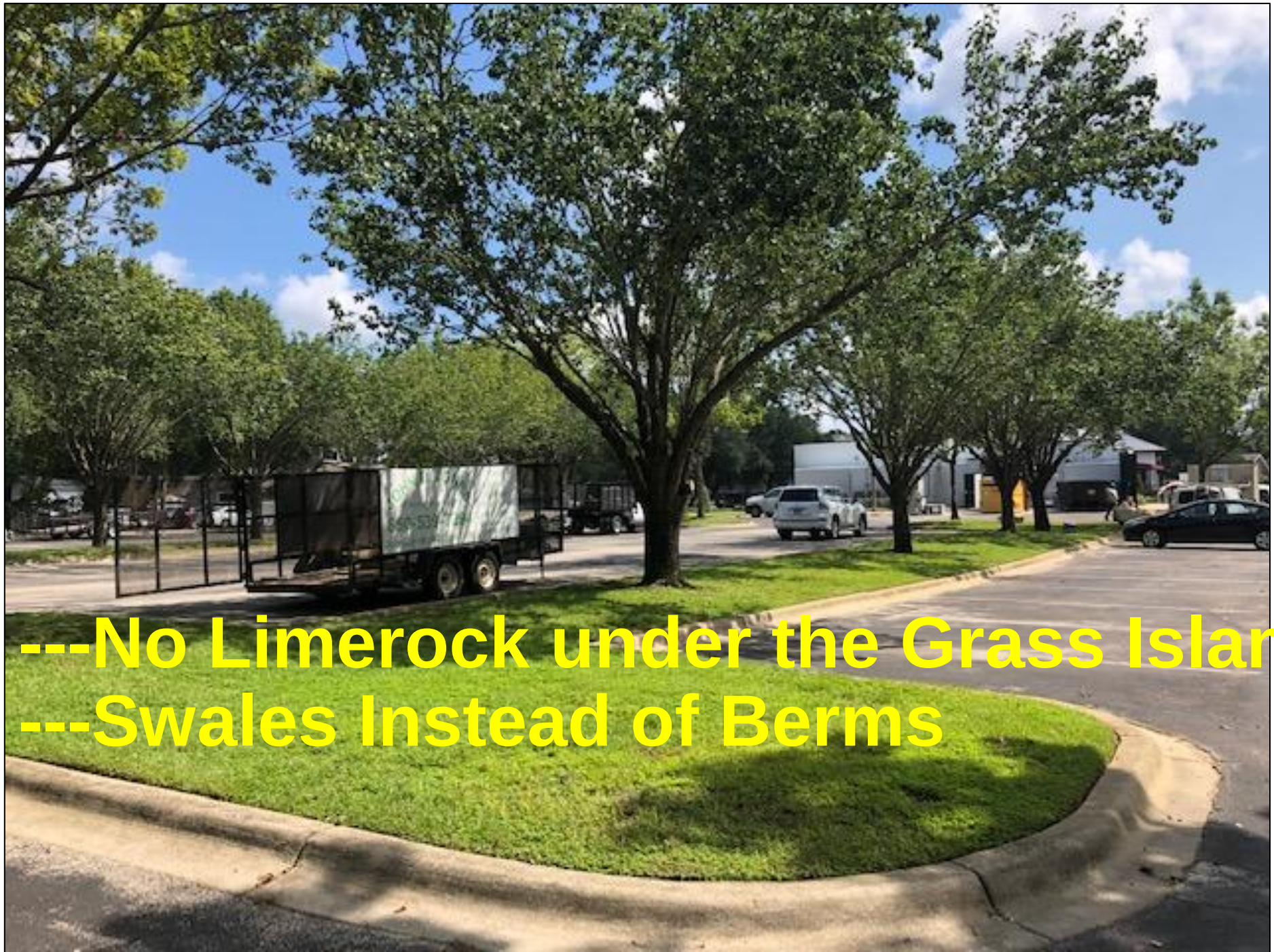
Trees and Parking Lots


---No Limerock under the Grass Island
---Swales Instead of Berms

Rain Garden

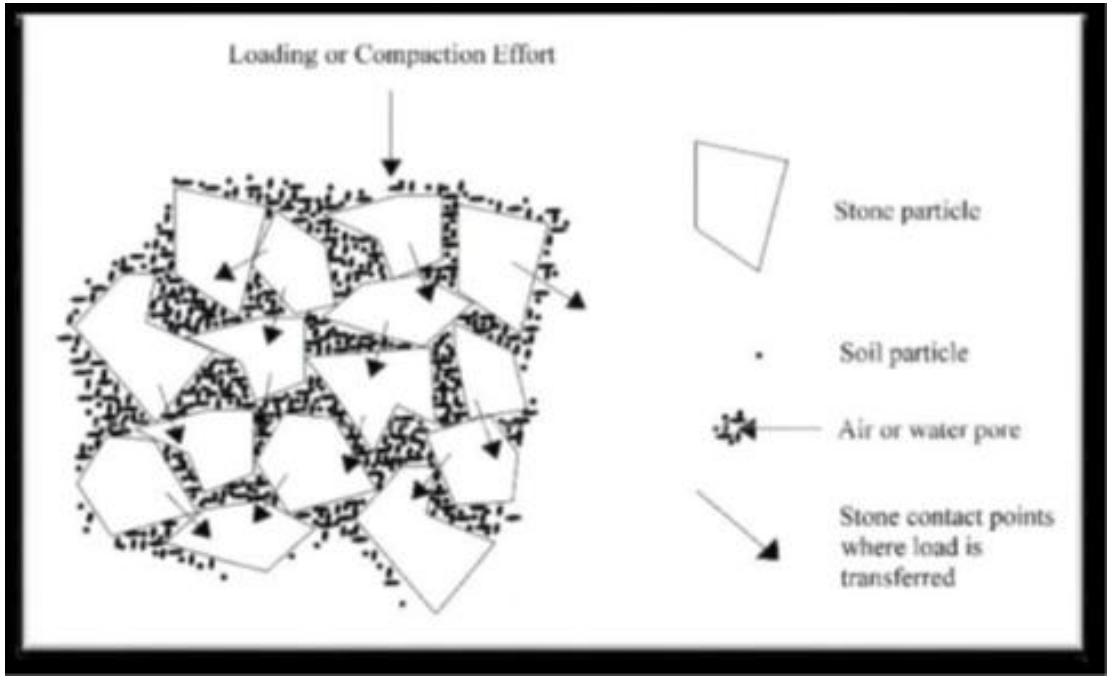
Trees and Medians

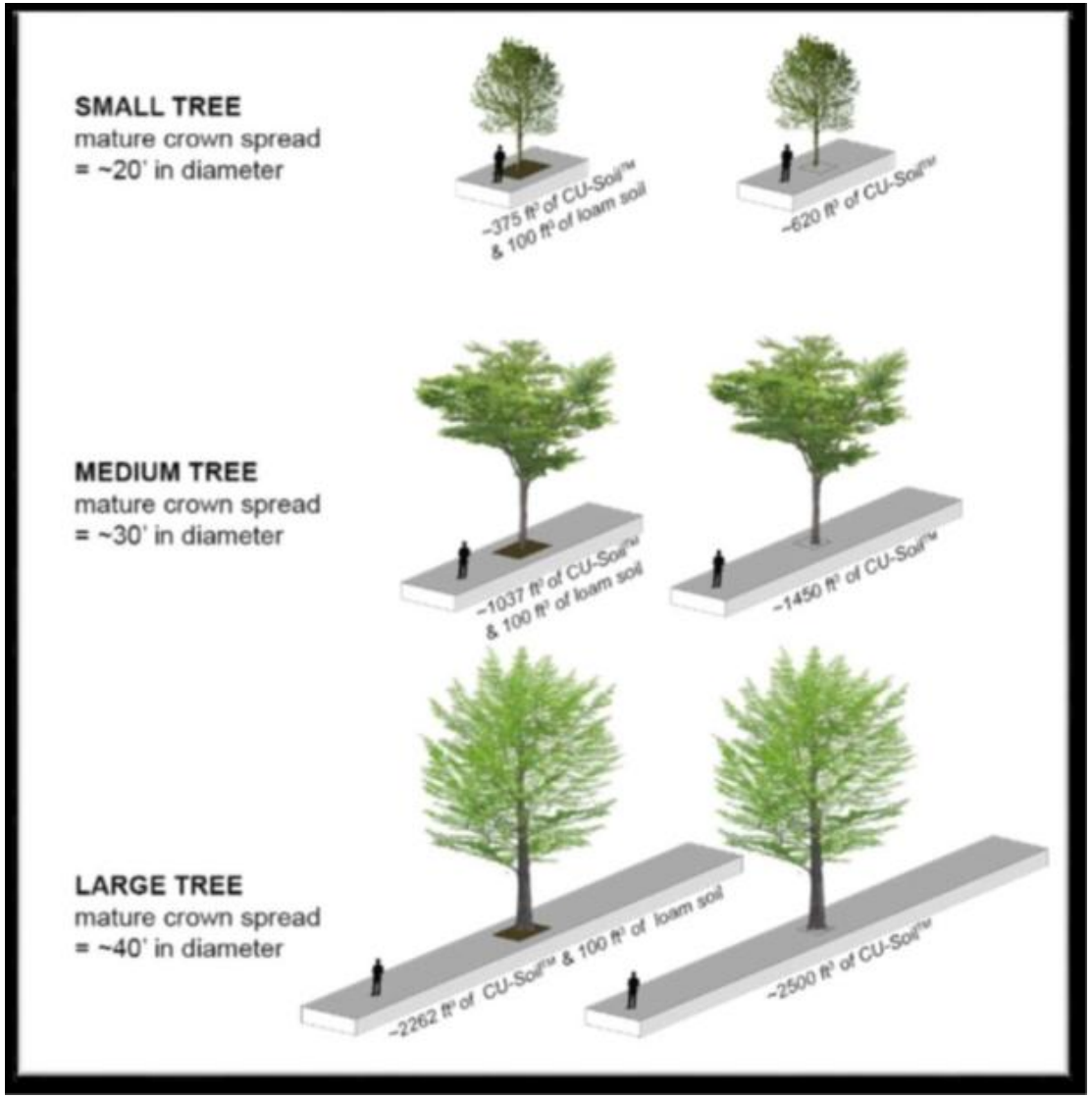
Sufficient Sized Planting Spaces

Tree Size	Rooting Space	Planting Strip Width	Space Between Trees
Canopy	300 ft^2	8-10 ft	30-35 ft
Mid-Stpry	150 ft^2	6-8 ft	20-25 ft
Small	40 ft^2	>4 ft	>10 ft

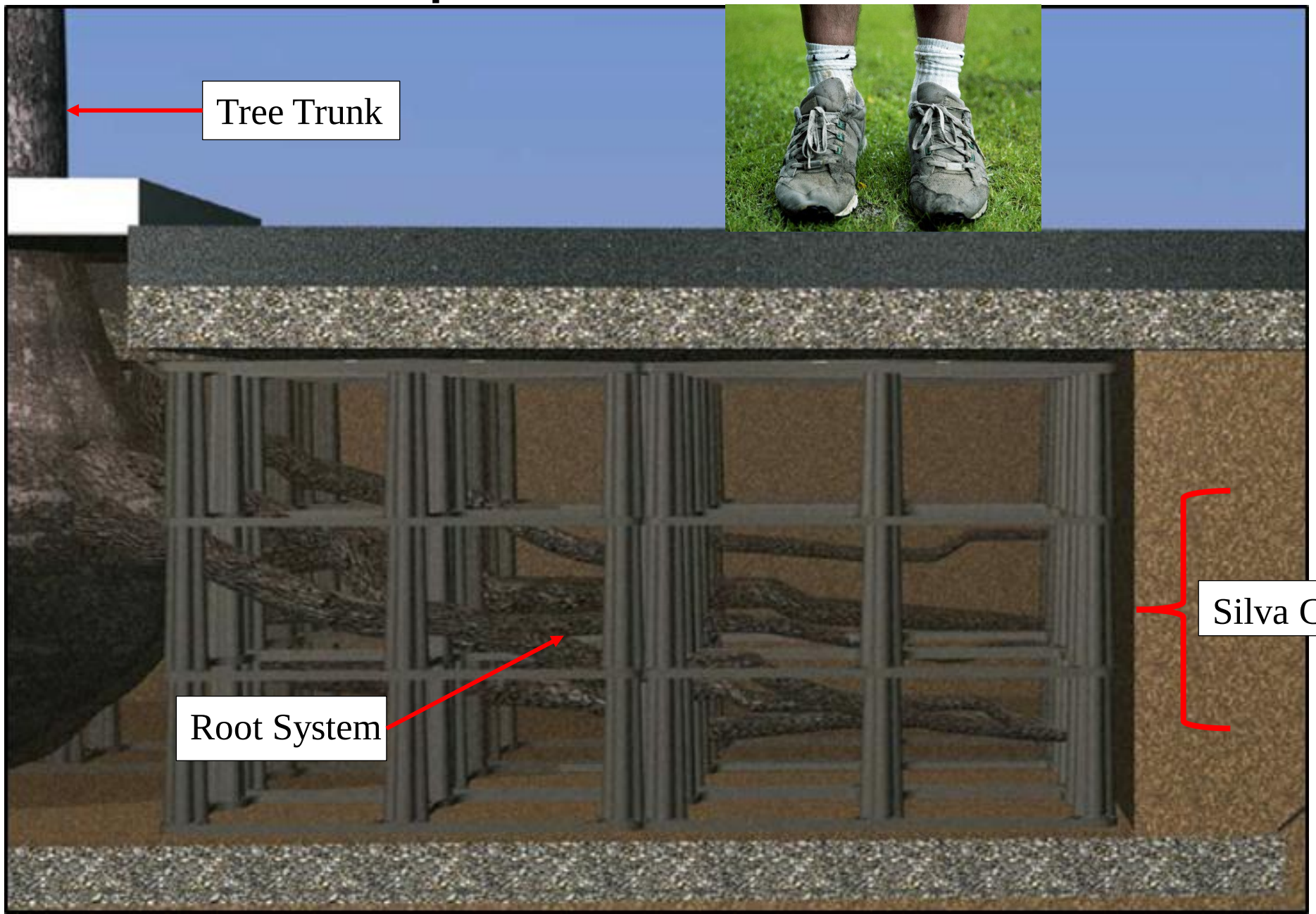
Insufficient Sized Planting Spaces

Structural Soil



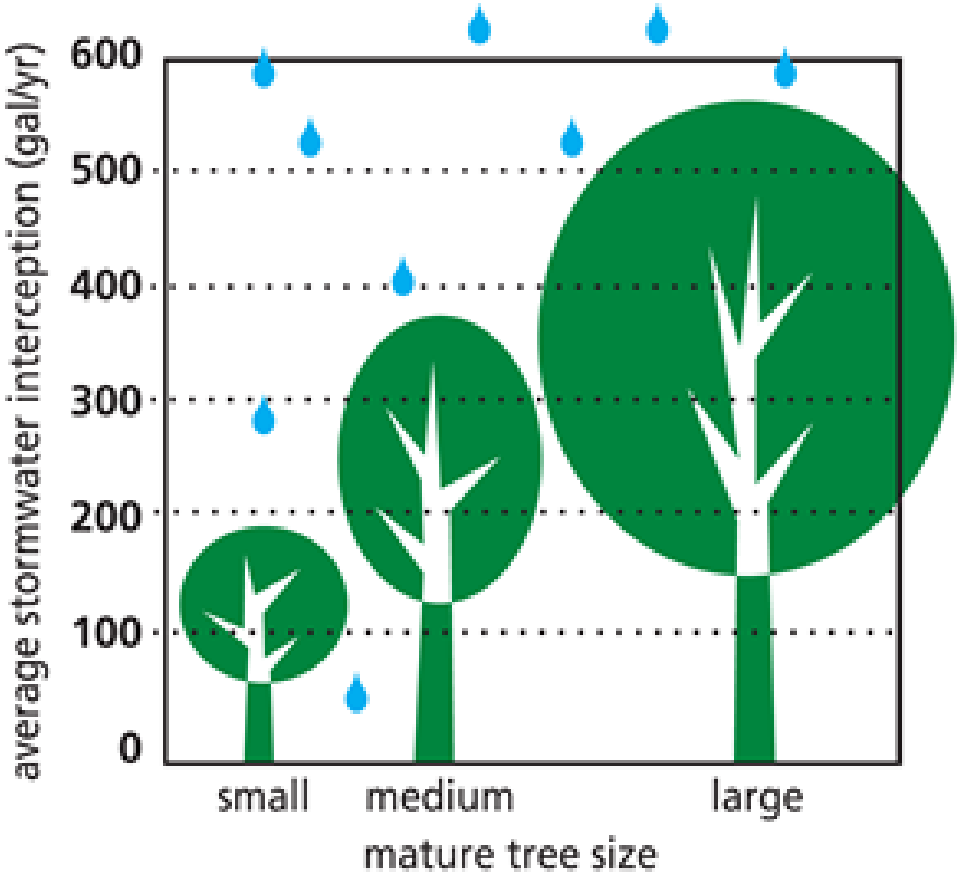


Suspended Pavement



Tree Species Selection

The larger the tree, the more stormwater it can manage.



Which Species Provides the Most Runoff Avoidance?

• Yellow Poplar	620 gal/yr
• Baldcypress	500
• Redcedar	480
• Slash Pine	400
• Shumard Oak	350
• Live Oak	300
• Magnolia	275

All Trees are 20 inch dbh

Recommended Tree Species

- Live Oak
- Nuttall Oak
- Swamp Chestnut Oak
- Shumard Oak
- Yellow Poplar
- Southern Magnolia
- Sweetbay
- Sycamore

- Baldcypress
- Tupelo Gum
- Red Maple
- Ginko
- Hickories
- Winged Elm
- Slash Pine
- Redcedar

Sources of Information

- “Trees to Offset Stormwater” by Karen Firehock, Green Infrastructure Center, http://www.gicinc.org/trees_stormwater.htm.
- Ohio/Kentucky/Indiana Regional Council of Governments http://treesandstormwater.org.
- Center for Watershed Protection https://www.cwp.org/reducing-stormwater-runoff/.
- City of Philadelphia http://www.phillywatersheds.org/what_were_doing/green_infrastructure.
- US EPA “Stormwater to Street Trees” https://www.epa.gov/sites/production/files/2015-11/documents/stormwater2streettrees.pdf.
- “Urban Forests and Stormwater Management” https://www.srs.fs.usda.gov/compass/2018/01/11/urban-forests-stormwater-management/.
- “Up By Roots” by Jim Urban, ISA Website

- Tree Risk Assessments
- Tree Appraisals
- Pre-Development Tree Evaluations
- Expert Witness Testimony
- On-site Tree Preservation
- Arborjet Tree Injections
- Natural Areas Management Planning
- Street / Park Tree Inventory
- Canopy Analysis
- Urban Forest Management Planning
- i-Tree Ecosystem Analysis
- Grant & Ordinance Preparation
- Educational Workshops
- Urban Forestry Outreach & Promotion

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