Trees$_2$O H_2O: Utilizing Trees for Stormwater Management in Charleston South Carolina

Green Infrastructure Center

SOUTH CAROLINA FORESTRY COMMISSION

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Presentation Topics:

Project Description

Overview of Green Infrastructure

Trees as Green Infrastructure and their role in stormwater management

Pilot Trees and Stormwater Project

Trees$_2$O H$_2$O

USDA Forest Service has funded 7 states to develop pilot projects to demonstrate how cities can best utilize trees for stormwater management.

Urban flooding

A partnership between the SC Forestry Commission, Green Infrastructure Center and the City of Charleston.

The project began in fall 2016 and will conclude by end of 2017.

Green Infrastructure Center

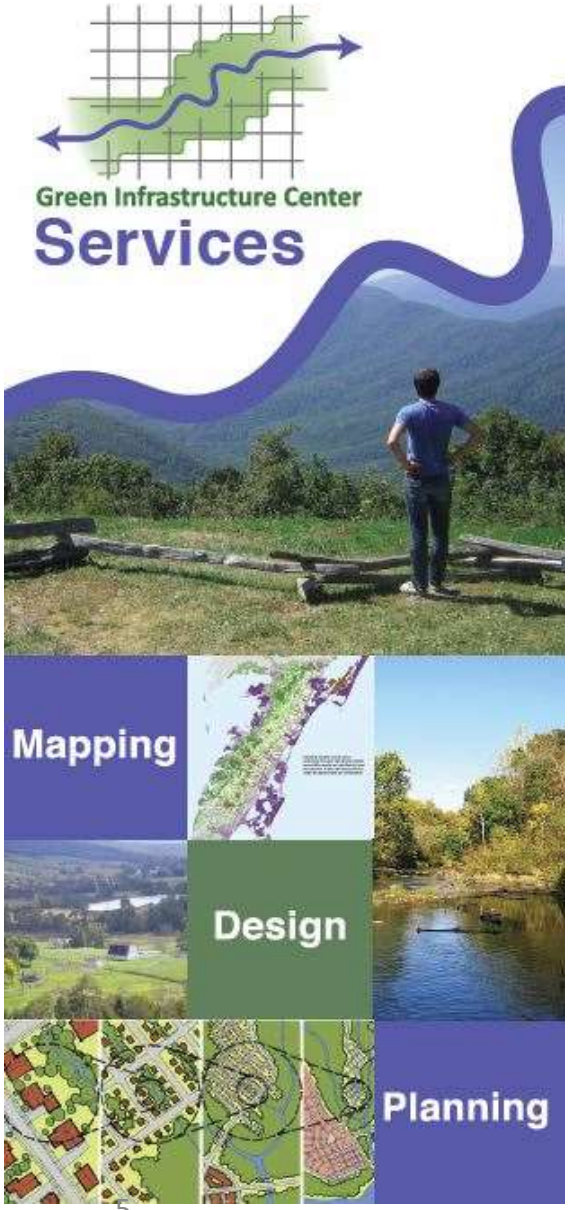
7 southern states:

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

Project Description and Goals

Stormwater runoff can lead to urban flooding. Trees help absorb stormwater but they are often not utilized as a key tool to clean and absorb runoff.

The Trees$_2$O H_2O project is helping Charleston map, evaluate, protect and restore its urban forest for improved stormwater management and clean water!



The Green Infrastructure Center (GIC) is creating the calculations and maps for the project.

The GIC helps communities evaluate their green assets and manage them to maximize ecological, economic and cultural returns. The GIC helps cities:

Building habitat models

Teach workshops

Research new methods

Work with communities to re-green cities

Why are trees green infrastructure?

A city map (left) shows a neighborhood's **gray infrastructure** including buildings and roads. Classified high-resolution satellite imagery (right) adds a green infrastructure data layer (trees and other vegetation). This is the **green infrastructure** that cools the city, cleans the air, soaks up water and adds beauty!

Trees: the original –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)

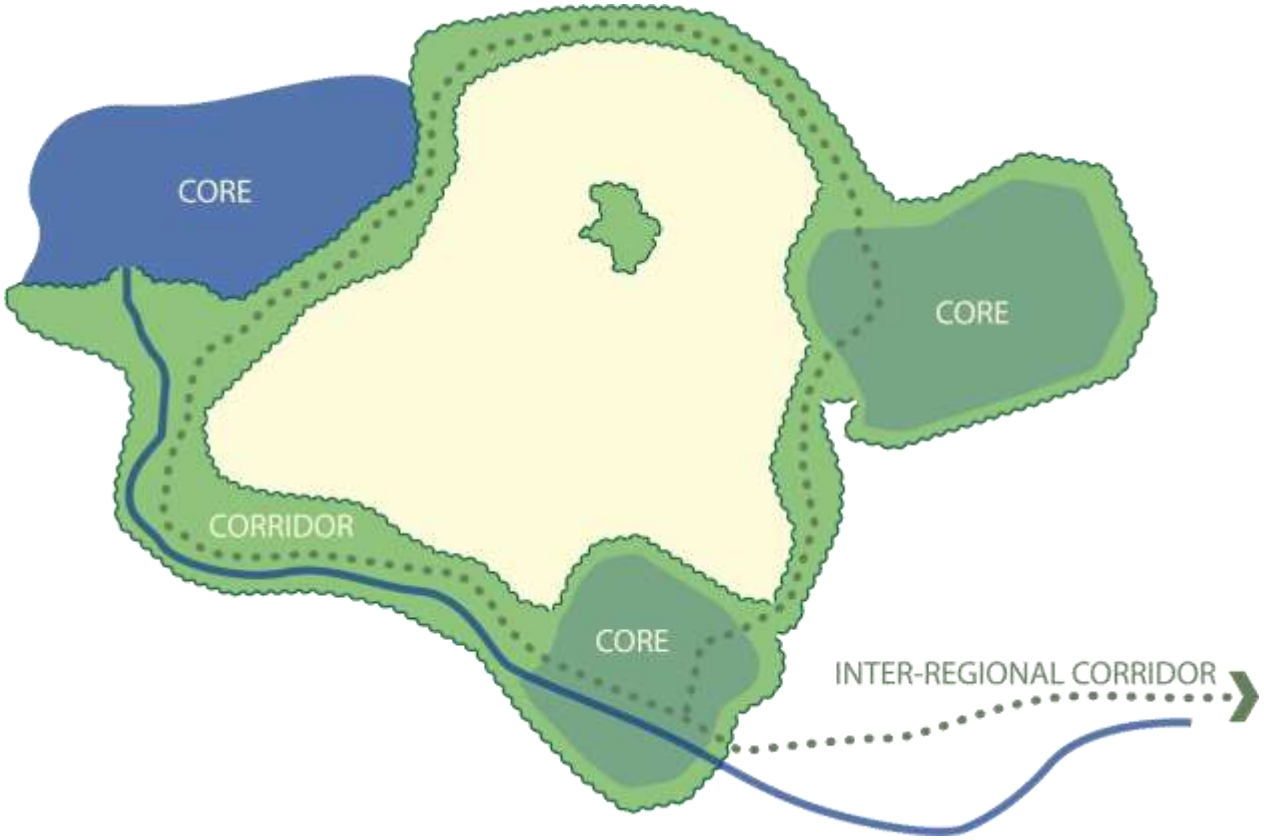
Charleston City Arborist Danny Burbage leads tour of amazing Charleston Trees

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!

Even in cities, habitat patches should be protected and connected!



Trees and Stormwater

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

Project is linking urban tree canopy to stormwater mitigation (MS4) permits that localities have to meet. It also will suggest incentives to expand canopy.

Land conserved for stormwater retention and flood prevention “show an eight-to-one dollar savings ratio versus man-made flood-control structures.” (McDonald 2015)

At Urban Scale – Canopy is Key

Studies have shown that urban canopy can reduce a city's stormwater runoff by anywhere from two to seven percent
(Fazio 2010)

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 Charleston

This Project Will Review City Codes and Policies:

This will answer two main questions:

Do city policies add excessive impervious area?

For example does the city mandate excessive parking area?

Does it provide incentives to reduce impervious area?

Can the city manage and expand the urban forest?

For example, are tree care and management well funded and implemented?

Does the city have a strategy for planting trees in areas most in need?

A Peek at Work In Progress in Charleston, SC

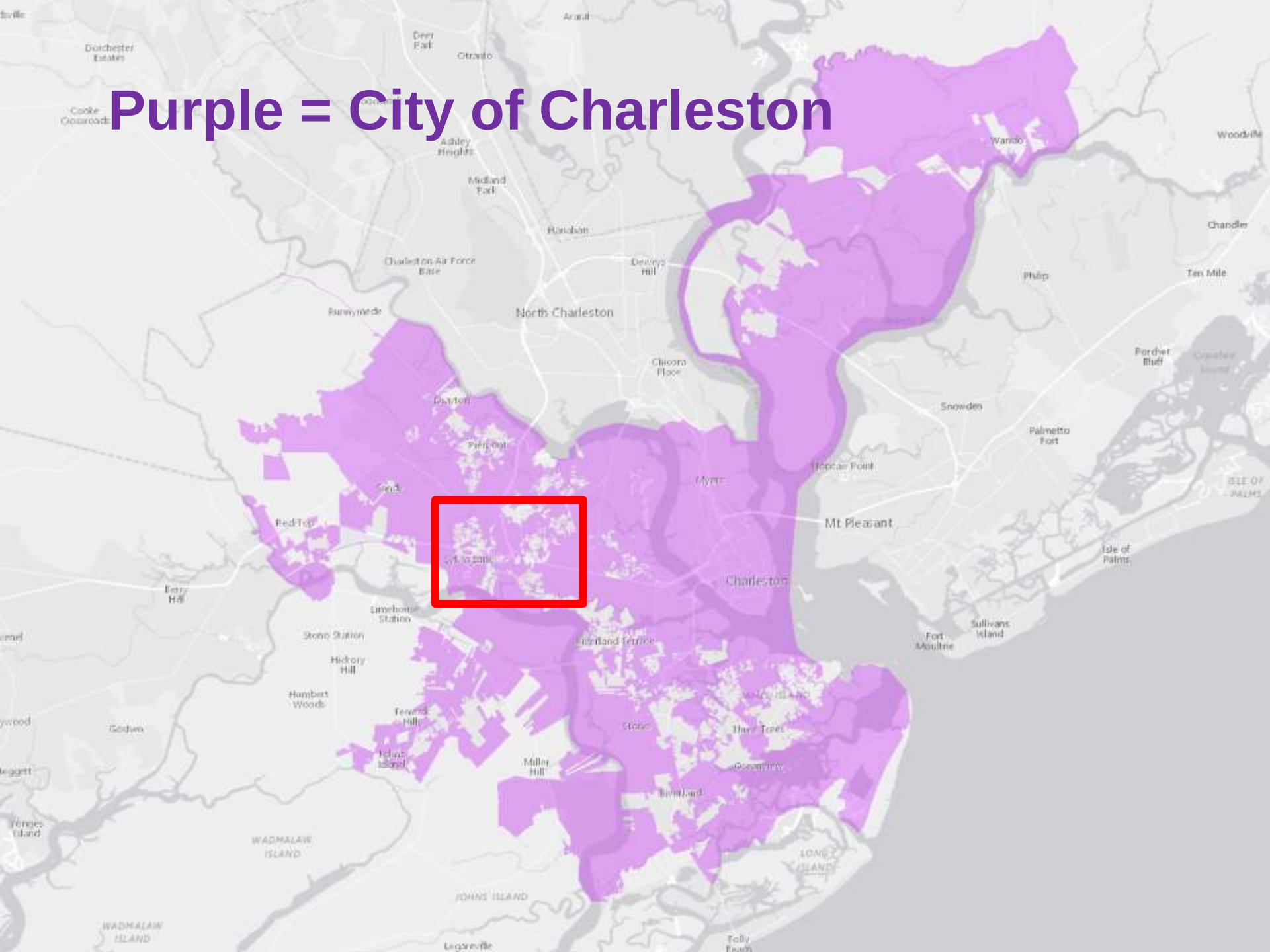
We can move from images to calculations of canopy by drainage area.

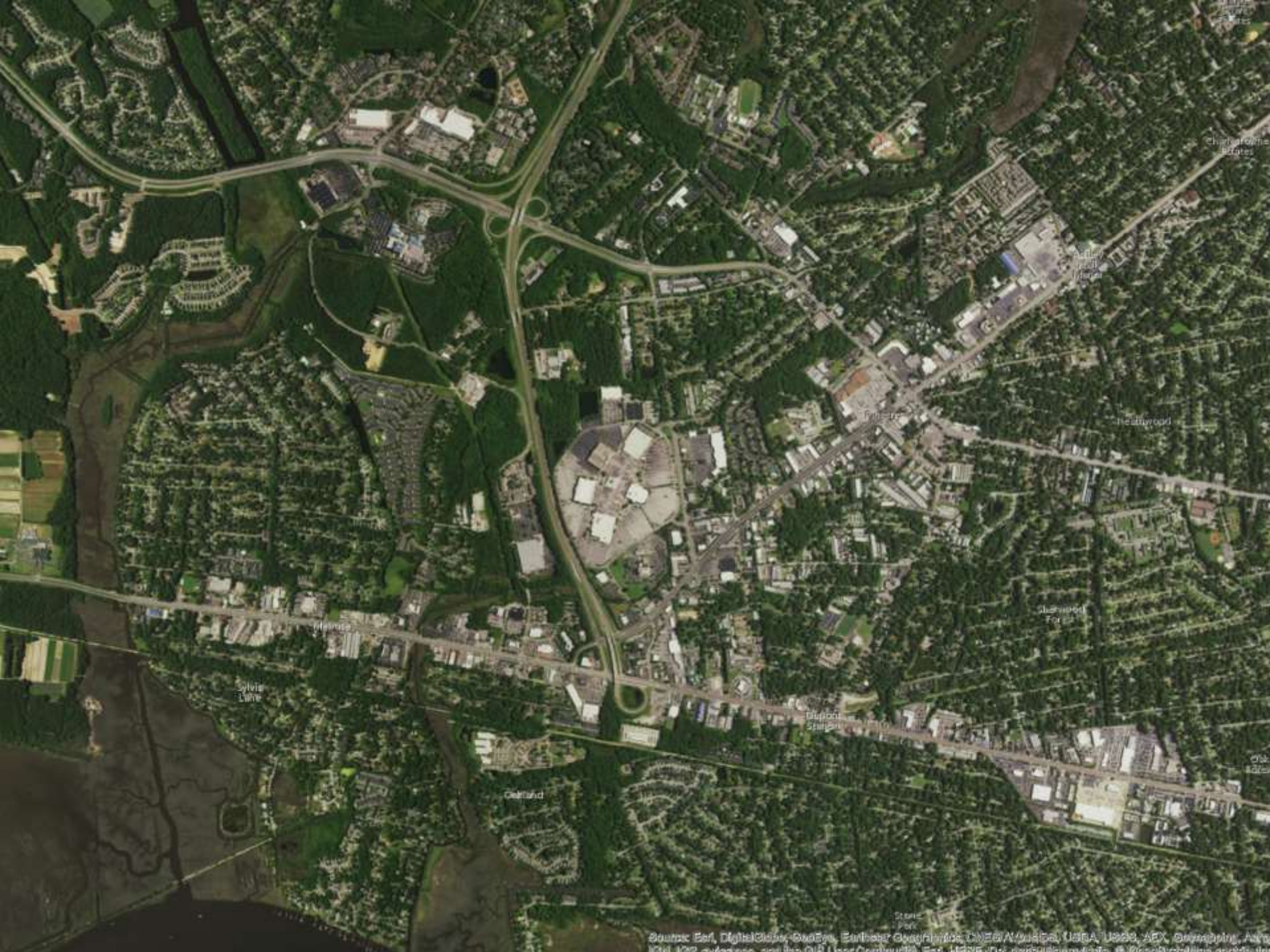
This lets us know what may soak in and what may runoff the land into storm drains and waterways

How much canopy do we have?

We use satellite imagery and software to classify land cover. We can divide up an image into discrete ‘classes’, so we can tell what type of land cover we have – is the landscape Trees? Turf? Bare earth? Roads? Buildings? Water? While this project’s primary purpose is to identify tree canopy, a useful ‘byproduct’ is learning how much impervious surfaces are in the city. This helps us know how much water can soak in and how much might run off!

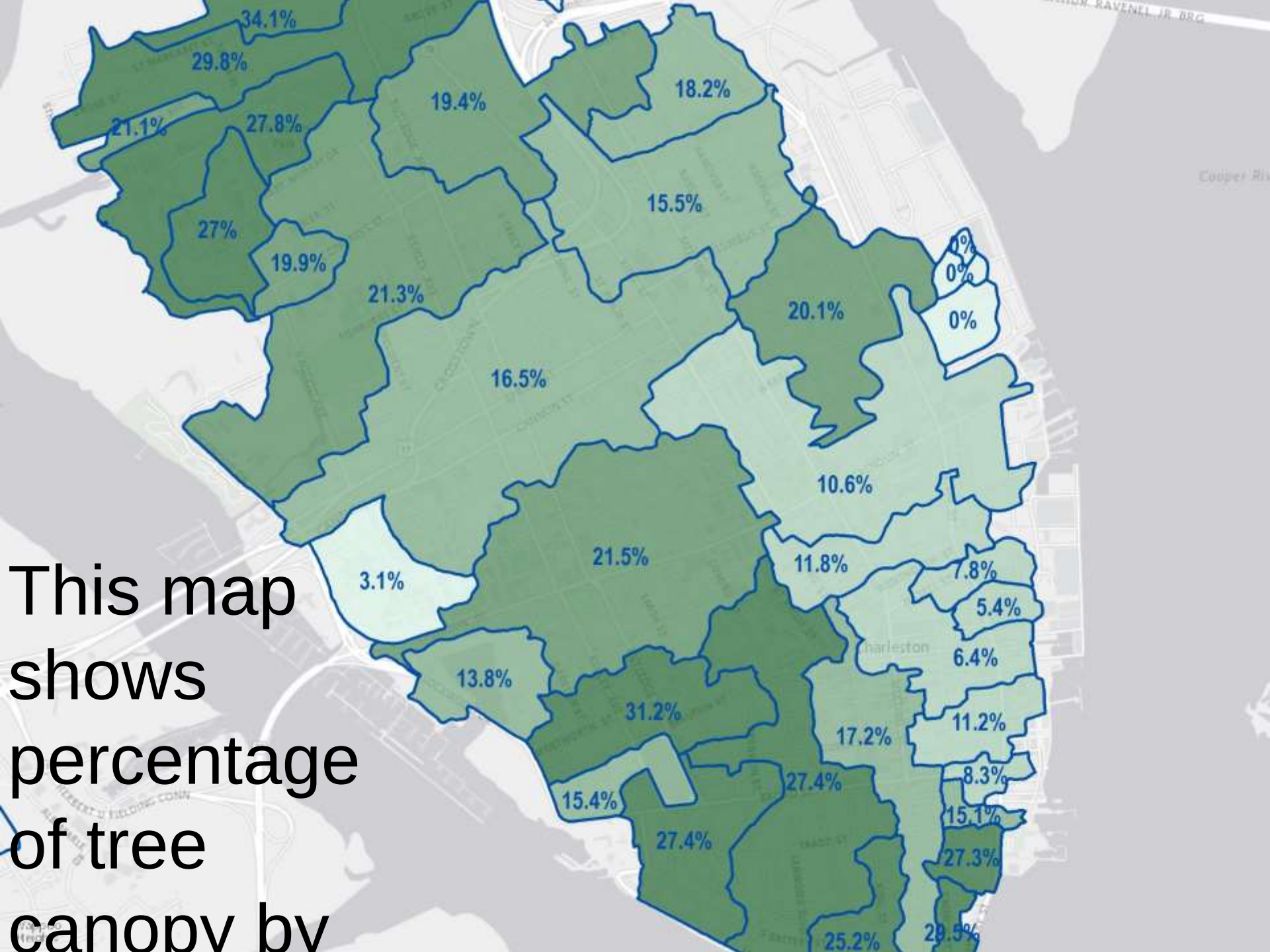
Purple = City of Charleston




Heathwood
Sylvia Lane
Oakland
Stone Park

The tree canopy classified (green) so we know how much we have and where it is.

Now adding drainage boundaries, which little watersheds have the most/least trees?



This map shows percentage of tree canopy by

Stormwater Study Project Outcomes

- ✓ Integrating trees into the city's stormwater management program
- ✓ Updated tree canopy and impervious land cover map (map and GIS digital format)
- ✓ Potential planting areas map future canopy goals
- ✓ Codes & Ordinances Audit

Project Outcomes Cont.

- ✓ Workshops with local community education and solicit input
- ✓ Model ordinance language or other program/policy documents for using trees to meet stormwater regulations
- ✓ Written step by step methodology for linking urban forest systems to urban stormwater (MS4 permit) requirements.
- ✓ Calculations for tree benefits.

Project Outcomes Cont.

- ✓ Case study of the project to share at workshops, with elected and appointed officials, and other agencies/stakeholders
- ✓ Ultimately, Charleston will have a more strategic, effective process for dealing with stormwater runoff
- ✓ Next steps, stormwater calculations and education!

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