

# STORM WATER RETENTION ASSESSMENT AND TREES

**EXECUTIVE SUMMARY**

August 2022



**SAVANNAH TREE  
FOUNDATION**  
*Our Trees - Our Future*





# STORM WATER RETENTION ASSESSMENT AND TREES

## ABSTRACT

In 2022, Savannah Tree Foundation collaborated with Savannah College of Art and Design (SCAD) to enhance Savannah’s urban tree canopy equity. Over the course of two quarters, graduate student researchers from a variety of backgrounds worked to address the greatest areas of opportunity and compare tree density, temperature readings and potential impacts thereof in four of Savannah’s neighborhoods: specifically, Ardsley Park, Hudson Hill, West Savannah and Woodville.

Through countless hours of on-ground tree surveying, temperature monitoring and studying secondary research, the goal is to collect data to help Savannah Tree Foundation communicate with the public, develop new initiatives and successfully obtain grants through unbiased research.

**Image:**

**Savannah Tree Foundation works with Tybee Arbor Day to prepare the soil and plant new trees.**

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PLANT x ENGAGE x PROTECT



## About Savannah Tree Foundation

Founded in 1982, Savannah Tree Foundation protects and grows Chatham County's urban forest through tree planting, community engagement, and advocacy.

Trees are one of Chatham County's most treasured natural resources. Beyond their beauty and cultural significance, the impacts of trees are far-reaching and compounding, spanning from economic benefits to health improvements to climate change resilience. Trees are woven into almost every aspect of our lives.

**Savannah Tree Foundation has coordinated the planting of over 5,000 trees in Chatham County.**

While it is easy to take our live oaks and magnolias for granted, our trees are facing an increasing number of natural and man-made threats. Sprawling construction, increased severe weather, encroaching salt water levels, and a lack of funding for proper maintenance all contribute to tree loss in our region. If we are to continue enjoying the beauty and benefits of our trees, we must protect the trees we have and plant the trees of tomorrow. Properly cared for, our urban forest will create a safer and healthier community. Our trees will shape our future. For more information, visit [savannahtree.org](http://savannahtree.org).

**Image (Left): Savannah Tree Foundation founders Susie Williams, Linda Beam and Page Hungerpiller, 1978.**

### MISSION

Savannah Tree Foundation protects and preserves Chatham County's urban forest through tree planting, community engagement, and advocacy.



### VISION

To inspire and educate our community to create and sustain a healthy urban forest today, tomorrow, and forever.



# Introduction

TREES AND FORESTS IMPROVE  
STREAM QUALITY AND WATERSHED HEALTH  
PRIMARILY BY DECREASING  
THE AMOUNT OF STORMWATER RUNOFF  
AND POLLUTANTS THAT REACHES OUR  
LOCAL WATERS.

## **STORM WATER RETENTION AND TREES**

This paper explores the link between pollution of our waterways and the presence of trees in urban areas. Trees naturally act as a conduit for absorbing elements in our atmosphere like air and water and synthesizing that into usable components for life. When trees are scarce, the absence of those usable components has major negative effects on our health and quality of life. The risk to individuals is great in areas with a low or non-existing tree cover. We highlight the key insights around the benefits of an abundant urban forest and the disadvantages of limited tree coverage in contrast to the two Savannah neighborhoods that were are focus for this study.



# Key Insights



## CONTROL RUNOFF FROM STORMS

**Cities are particularly susceptible to climate-related threats such as storms and flooding.**

Urban trees can help control runoff from these by catching rain in their canopies and increasing the infiltration rate of deposited precipitation. Reducing stormwater flow reduces stress on urban sewer systems by limiting the risk of hazardous combined sewer overflows. Furthermore, well-maintained urban forests help buffer high winds, control erosion, and reduce drought.

(USDA)

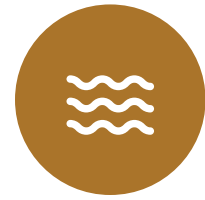


## URBAN FOREST PLANNING

**Investing in the future of urban forests will improve neighborhoods and save lives.**

Every dollar spent on planting and caring for a community tree yields benefits that are two to five times that investment—benefits that include cleaner air, lower energy costs, improved water quality and storm water control and increased property values.

(US Forest Service)



## IMPACTS ON HUMANS AND THE ENVIRONMENT

**Negative impacts from stormwater include flooding, erosion, impaired fish and aquatic life, contamination of drinking water and more.**

Stormwater from urban areas is one type of ‘nonpoint source’ pollution - pollution that comes from many different sources. The stormwater picks up all the pollutants along its pathway and is often referred to as “Polluted Runoff.”

(DC Dept of Energy & Environment)



## STREAM IMPAIRMENT

**Stormwater runoff is the number one cause of stream impairment in urban areas.**

Where rain falls on paved surfaces, a much greater amount of runoff is generated compared to runoff from the same storm falling over a forested area. These large volumes of water are swiftly carried to our local streams, lakes, wetlands and rivers and can cause flooding and erosion, and wash away important habitat for critters that live in the stream.



## STORMWATER RUNOFF

**Polluted runoff is one of the greatest threats to clean water in the U.S. (EPA)**

Stormwater runoff also picks up and carries with it many different pollutants that are found on paved surfaces such as sediment, nitrogen, phosphorus, bacteria, oil and grease, trash, pesticides and metals. These pollutants come from a variety of sources, including pet waste, lawn fertilization, cars, construction sites, illegal dumping and spills, and pesticide application. Researchers have found that as the amount of paved surfaces (a.k.a. Impervious cover) in the watershed increases, stream health declines accordingly.

(Center for Watershed Protection)



## REDUCTION OF POLLUTANTS

**Trees and forests improve stream quality and overall watershed health.**

Trees and forests reduce stormwater runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evapotranspiration. In addition, tree roots and leaf litter create soil conditions that promote the infiltration of rainwater into the soil. This helps to replenish our groundwater supply and maintain streamflow during dry periods.

(Center for Watershed Protection)



# Who Does This Impact?

This research is based on four neighborhoods located in Savannah, Georgia. Here is an overview of the history of the neighborhoods included: Ardsley Park, Hudson Hill, West Savannah and Woodville.

The area that became Hudson Hill, West Savannah and Woodville originally belonged to the Yamacraw. In 1757, the lands were handed over to the crown who then distributed them to colonists. It then became the Royal Valley Plantation.

People settled in the area during the early 20th century, and residential development happened in the late nineteenth century.

Work was the magnet that brought families into West Savannah, Hudson Hill and Woodville, primarily through the railroad. However, this began to decrease by the 1970s, and crumbled in the 1990s.

The Ardsley Park neighborhood is the result of two planned subdivisions that were laid out in 1909 and 1910. This was a time of great growth and prosperity in Savannah and substantial houses of the neighborhood reflect this affluence.

The developers of Ardsley Park, Savannah-natives Harry Hays Lattimore and William Lattimore, laid out the neighborhood according to a strict grid with one-acre landscaped parks placed in regular intervals and offset along the north-south corridor of Abercorn Street.

**Sources: *Low Land and the High Road: Life and community in Hudson Hill, West Savannah, and Woodville Neighborhoods*, Public Library of Savannah's historical records and Historic Savannah Foundation.**

## ARDSLEY PARK

### Residents

3,338

### Average Income

\$81,224

### Demographics

84% White

12.4% Asian & other

2.9% Black

## WEST SAVANNAH

### Residents

3,653

### Average Income

\$22,578

### Demographics

54.6% Black

28% White

16.5% Asian & other

## HUDSON HILL

### Residents

2,320

### Average Income

\$22,578

### Demographics

78.4% Black

12% Asian & other

9.5% White

## WOODVILLE

### Residents

460

### Average Income

\$39,333

### Demographics

52.9% Black

26.6% Asian & other

21.5% White

Source: [point2homes.com](https://www.point2homes.com) and [city-data.com](https://www.city-data.com)

# History of Savannah's Urban Forest

1800s

## 1ST FOREST

The forest was composed of trees such as Longleaf pine, Sugarberrys, Chinaberries, American Sycamore Trees. The 1893 hurricane was a main destructive force, but other factors such as logging contributed as well.

1900s

## 2ND FOREST

Live Oaks were commissioned to replant after the 1893 hurricane. However they were all planted 10-15 years after each other, and will die out at around the same time, around 2040. Other trees planted included Sugarberry, Chinaberry, Sycamore, though there are some that remain, they have mostly died out because of blights, stressors and age.

CURRENT

## 3RD FOREST

In Chatham county, 21,499 acres have been lost in the last 22 years. The equivalent of 3 football fields per day. Mostly this is caused by development, storms and hurricanes, and also the increased stress of climate change like drought; improper care, or lack of education.

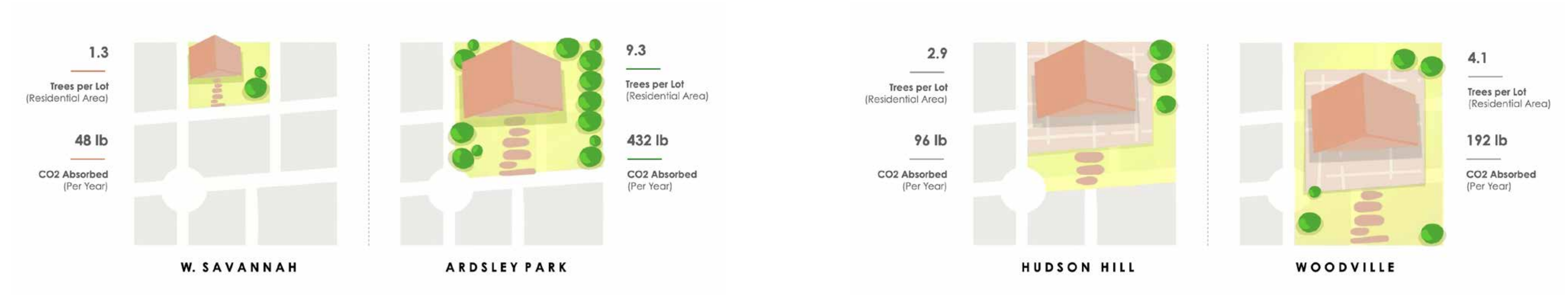
FUTURE

## 4TH FOREST

Savannah will boast a resilient, multi-species, varied in age, healthy forest in perpetuity.



# CO<sub>2</sub> Comparison by Lot



The above graphics depict our four focus neighborhoods, with the average lot sizes, house sizes and tree coverage by neighborhood. While the percentage of impervious land may seem similar across neighborhoods, the above graphics illustrate the contrast between lot size and tree coverage.

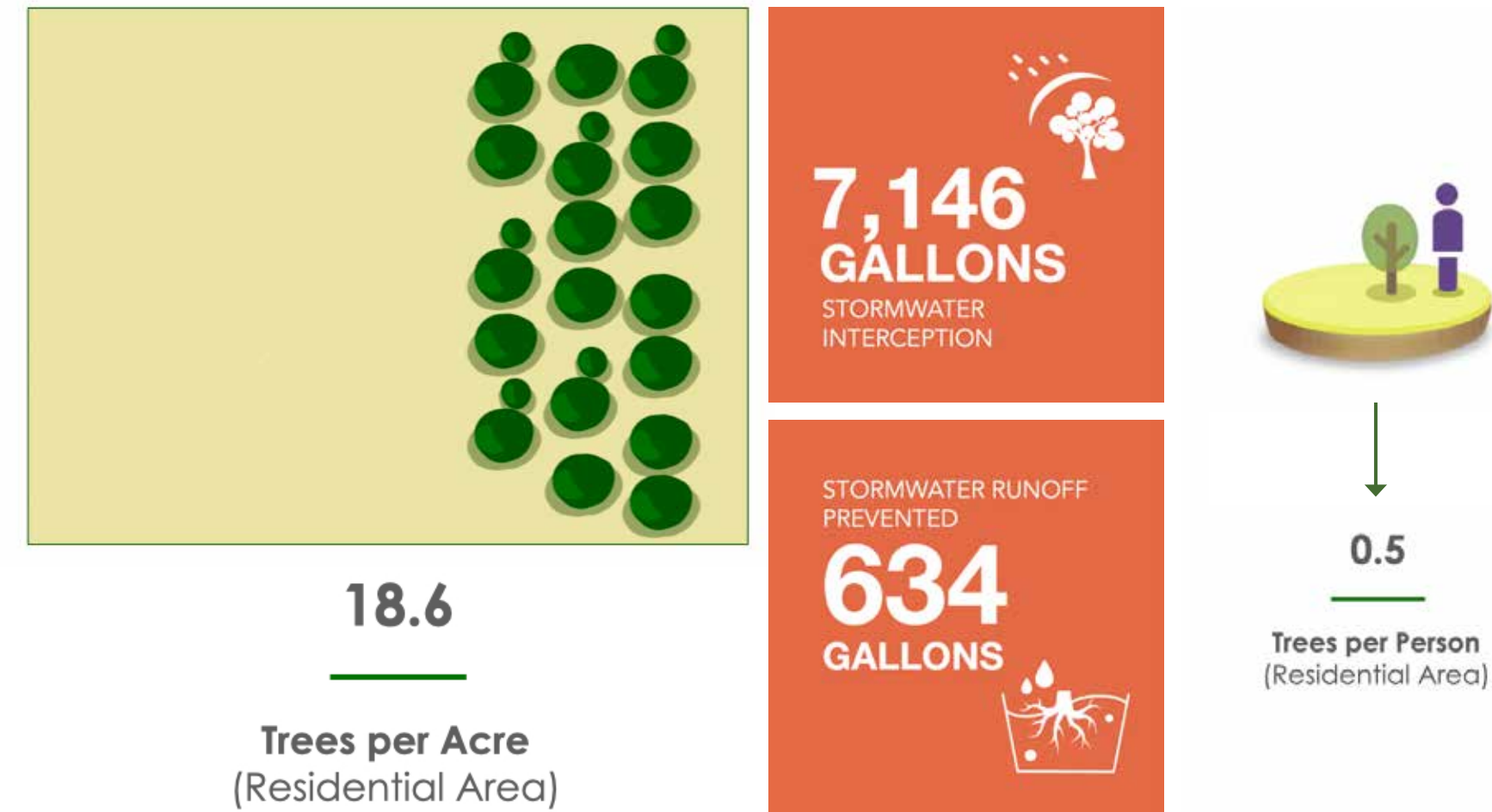


# Trees Per Acre and Tree Benefits Over 10 Years\*

## ARDSLEY PARK



## WEST SAVANNAH



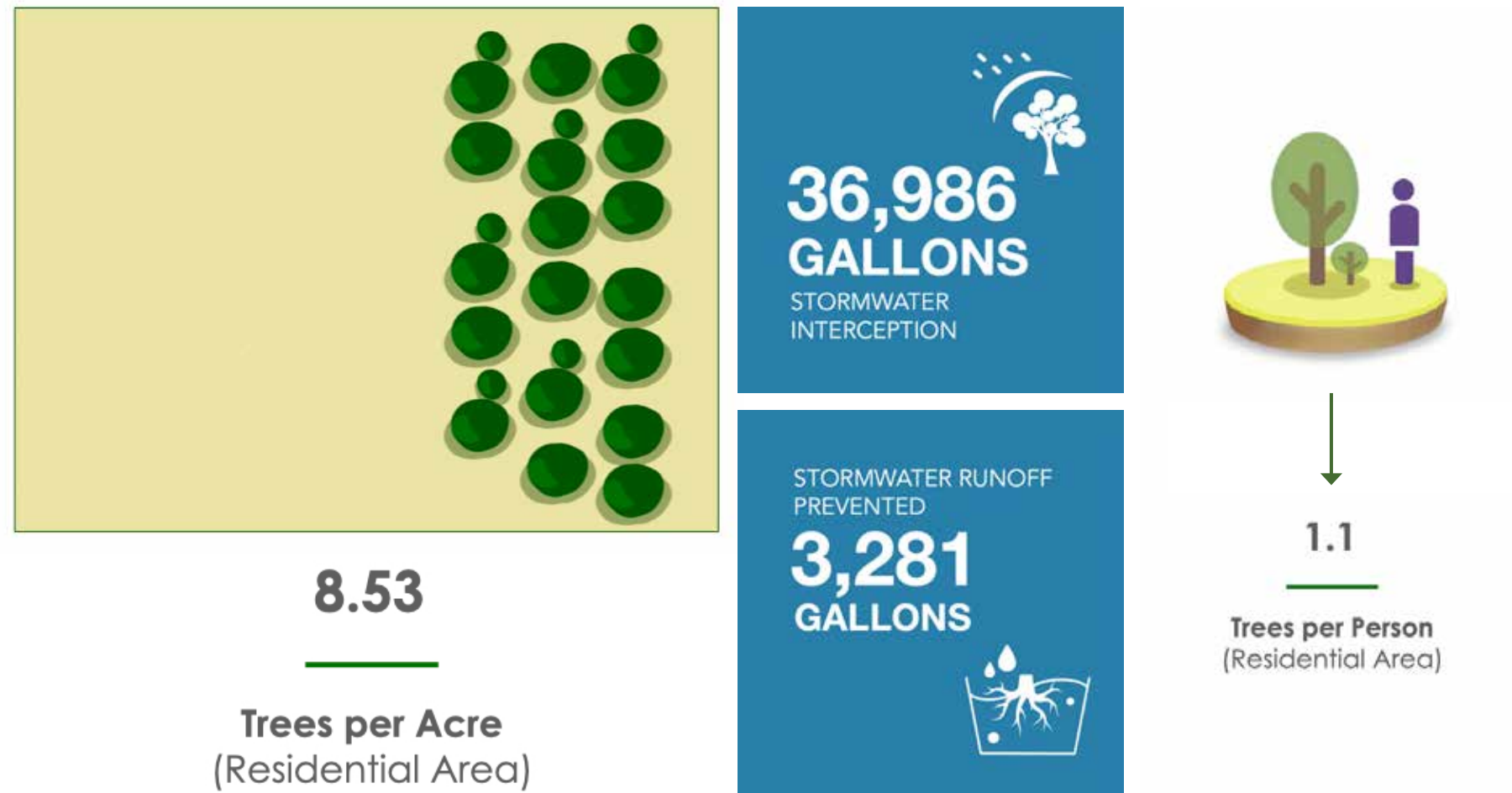
\*Average Tree Density across the neighborhoods is extrapolated from the average number of healthy trees per acre of residential land. Fact comparisons based on potential benefits from trees per average lot across the neighborhoods. Figures are extrapolated from itree canopy. Average benefit per lot is calculated over 10 years.



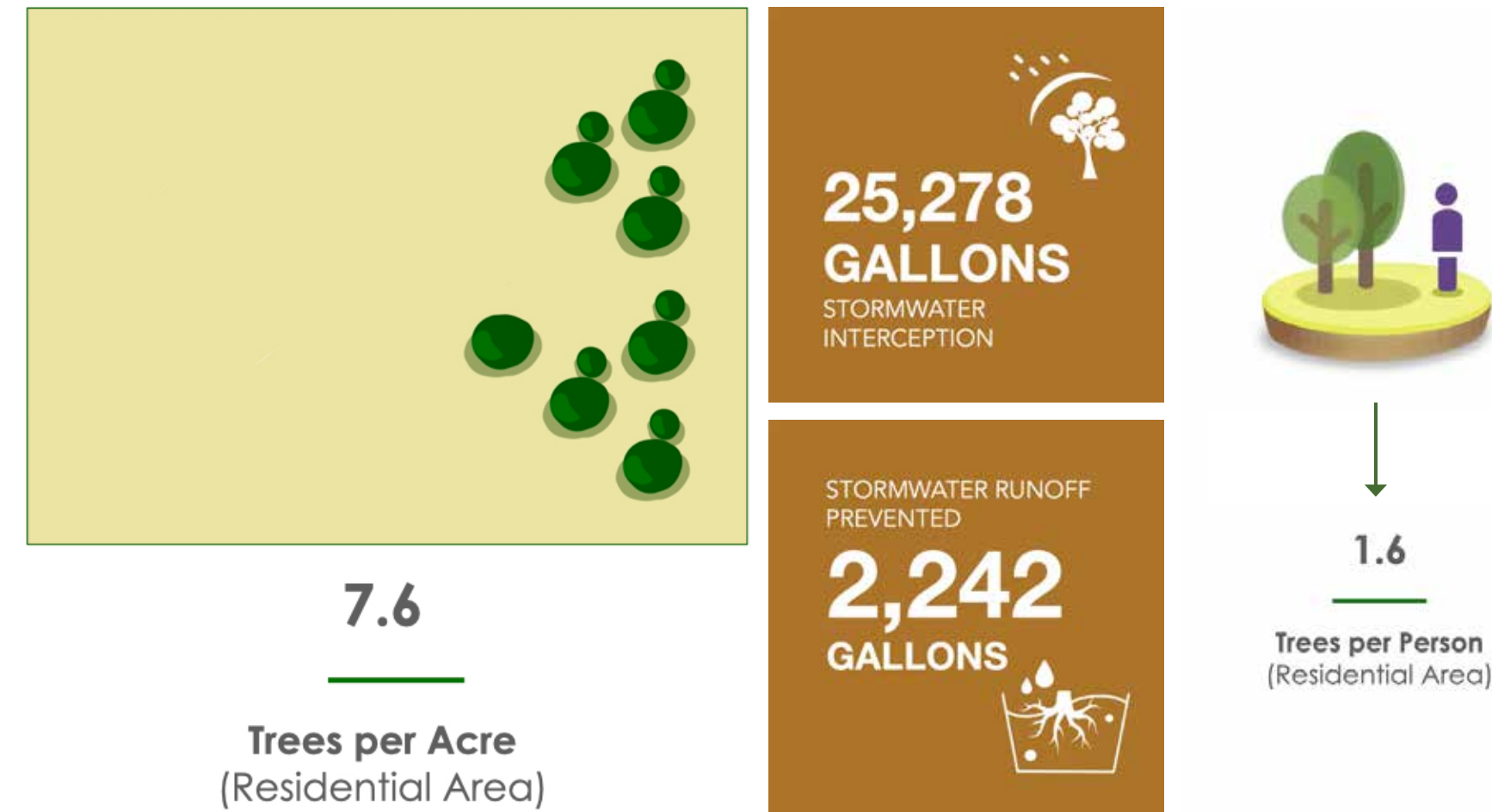


# Trees Per Acre and Tree Benefits Over 10 Years\*

## HUDSON HILL



## WOODVILLE



\*Average Tree Density across the neighborhoods is extrapolated from the average number of healthy trees per acre of residential land. Fact comparisons based on potential benefits from trees per average lot across the neighborhoods. Figures are extrapolated from itree canopy. Average benefit per lot is calculated over 10 years.



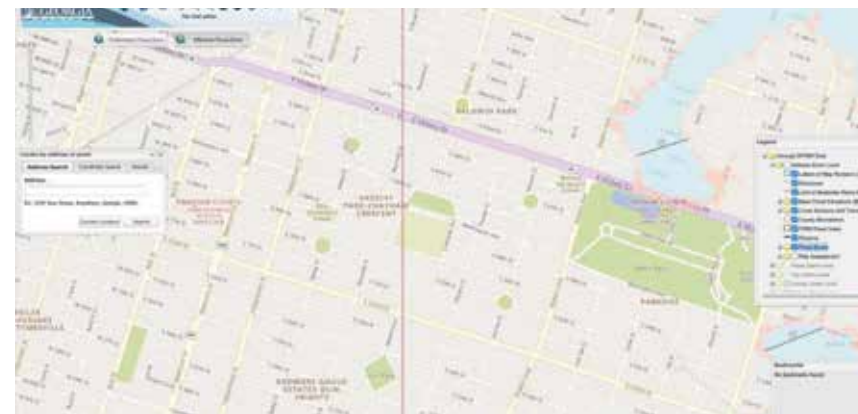
# Chatham County Flood Map Data

## ARDSLEY PARK

FLOOD RISK: **LOW**



No risk of base flooding

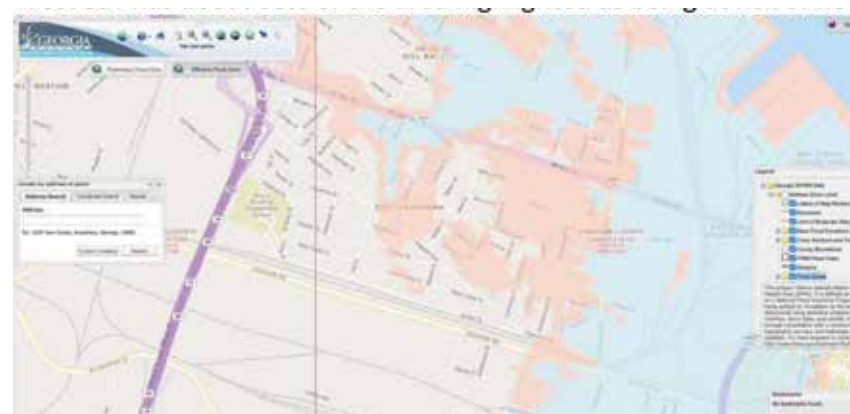


## WEST SAVANNAH

FLOOD RISK: **MODERATE**



60% of the area at risk of base flooding



### Map Key

Zone	Flood Risk	Flood Insurance
Floodway	High	Required
A	High	Required
AE	High	Required
VE	High	Required
X_500	Moderate	Available
X	Low	Available
Unincorporated Chatham County Border between Municipalities		
Flooded Structure Before Hurricanes		
Flooded Structure After Hurricanes		
LIMWA		
Chatham County Canals		

DFIRMS Date: August 16, 2018

## Negative Impacts of Stormwater on Humans and the Environment

**Flooding** - Damage to public and private property

**Eroded Streambanks** - Sediment clogs waterways, fills lakes, reservoirs, kills fish and aquatic animals

**Widened Stream Channels** - Loss of valuable property

**Aesthetics** - Dirty water, trash and debris, foul odors

**Fish and Aquatic Life** - Impaired and destroyed

**Impaired Recreational Uses** - Swimming, fishing, boating

**Threatens Public Health** - Contamination of drinking water, fish/shellfish

**Threatens Public Safety** - Drownings occur in flood waters

**Economic Impacts** - Impairments to fisheries, shellfish, tourism, recreation related businesses

**Increased Cost of Water and Wastewater Treatment** - Stormwater pollution increases raw water treatment costs and reduces the assimilative capacity of water bodies.

**Excess stormwater** - Causes flooding and damage that is difficult and costly to clean up.

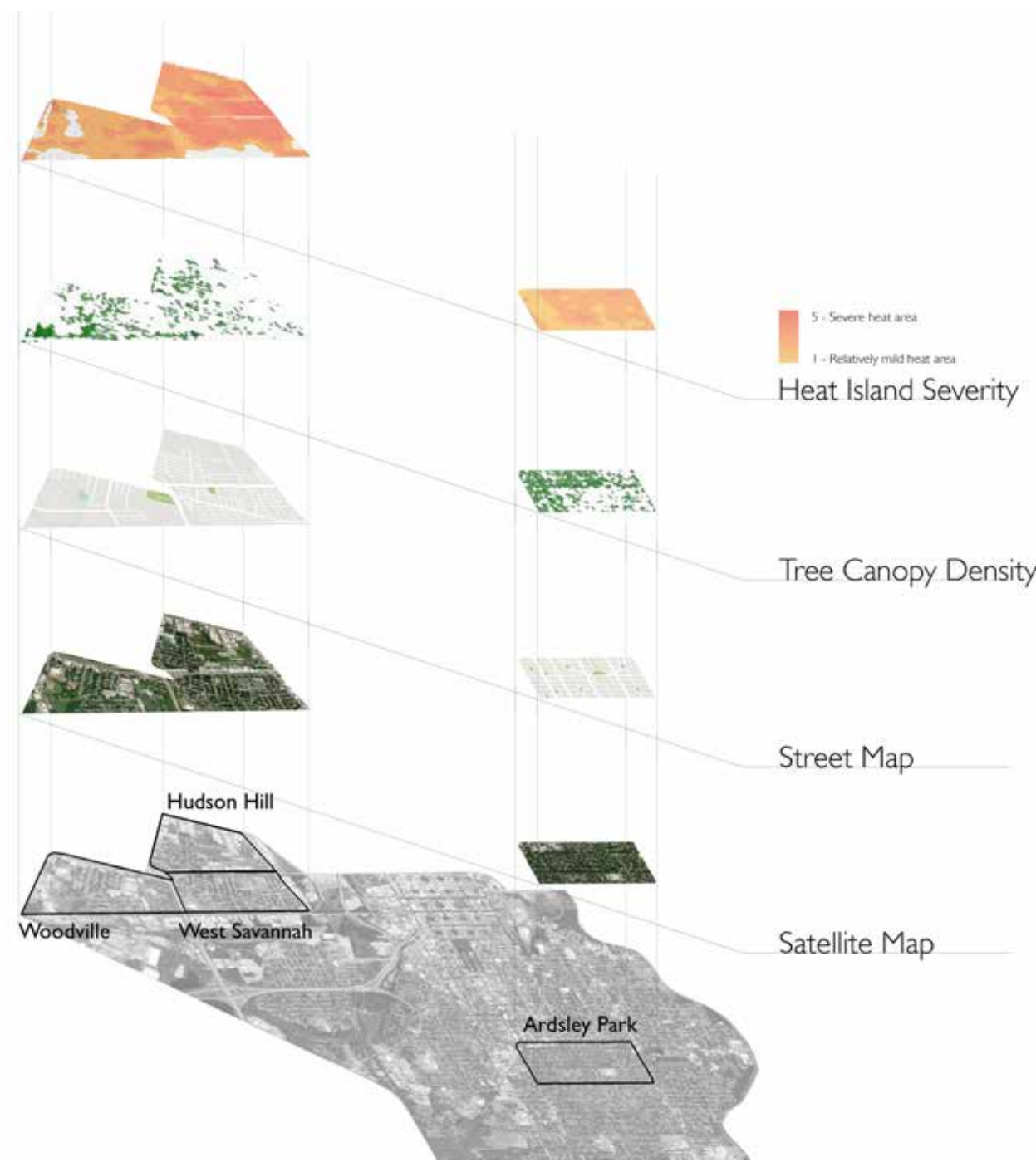


# Heat Stack Map

The map depicts the location of all 4 neighborhoods, Ardsley Park, West Savannah, Hudson Hill and Woodville, in relation to each other. The layers of maps including satellite map, street map, tree canopy density, heat island severity and flood hazard level. Comparing to Ardsley Park, the other 3 neighborhoods, with less tree canopy density, have higher heat island level and face more risk of flood hazard.

Source: arcgis.com

Funding for this project was provided by the U.S. Forest Service (USFS). RedCastle Resources, Inc. produced the dataset under contract to the USFS. Geospatial Technology and Applications Center., Savannah Area GIS, Esri, HERE, Garmin, SafeGraph, FAO, METI/ NASA, USGS, EPA, NPS



# Conclusions

In review of the data above, it is clear that the mostly non-white neighborhoods of Savannah are impacted the greatest by the lack of tree coverage. These areas are also home to lower income residents who are at greater risk of financial difficulties in the event of flooding. In order to support those communities, tree planting, proper maintenance and tree education is urgently needed.

In order to keep communities safe from storm water pollutants, help increase property values, mitigate repair costs in the event of flooding and contribute to building stronger communities, it is important to earnestly address the gaps in tree coverage between higher-and lower-income neighborhoods in Savannah.

# Methodology



1

Survey the tree canopy, temperatures and impervious surface data in the neighborhoods of Ardsley Park, West Savannah, Woodville and Hudson Hill.

2

Conduct and compile ethnographic data (surveys, interviews and conversations).

3

Compile secondary research related to the impact Urban Heat Islands (UHI), including quality of life, health, mental health, livability and other factors.

4

Visualize data in reports through infographics.

5

Share these findings with Savannah Tree Foundation and government partners, community leaders, local businesses and SCAD to build collaborative capacity for a comprehensive and equitable Savannah tree management plan.

## Terms

**Urban forest:** all trees within a densely populated area, including trees in parks, on streetways, and on private property

**Urban Heat Island:** this occurs when cities replace natural land cover with dense concentrations of pavement, buildings, and other surfaces that absorb and retain heat.

**Stormwater runoff:** When rain falls on roads, parking lots, rooftops and other paved surfaces that do not allow water to soak into the ground.

**Stream impairment:** when water is contaminated by pollutants, the water bodies are considered impaired.

**Watershed health:** a well-balanced system, capable of sustaining a variety of environments and many forms of life .

**Evapotranspiration:** the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants .



# About SCADServe

The multidisciplinary course, GOOD 560 Design for Good, directly supports the mission of SCAD SERVE, our community service design studio. Focusing on four critical areas of need — food, clothing, shelter, and environment — SCAD SERVE empowers the SCAD community to listen to the needs of its neighbors and local leaders, and create meaningful design solutions that improve quality of life.

Volunteerism, public service, and social impact are and always have been an integral part of SCAD's character. GOOD 560 Design for Good employs our students' collective brilliance through elevated, design-for-good solutions that make a difference in our hometowns of Atlanta and Savannah. For more information, visit [scad.galaxydigital.com](http://scad.galaxydigital.com).

## Images (Right):

Summer and Spring GOOD 560 class members (listed below).

Lia Alemán, Design for Sustainability M.F.A. • Sofia Alturas, Design for Sustainability M.A. Shreyas • Athreya, Design for Sustainability M.F.A. • Lindsay Brine, Service Design M.F.A. • María Carrau, Architecture M.A. • Kiera Ceyskens, Design for Sustainability M.F.A. • Ankit Charturvedi, Design for Sustainability M.F.A. • Yushan Chen, Service Design M.F.A. • Emma Covello, Design for Sustainability M.F.A. • Amber Francis, Service Design M.A. • Tanvi Gudipudi, Design for Sustainability M.F.A. • Vivek Gupta, Design for Sustainability M.A. and Jewelry M.A. • Seth Holland, Design for Sustainability M.F.A. • Olivia Loeffler, Design for Sustainability M.F.A. • Anirbaan Mukherjee, Design for Sustainability M.F.A. • Kanchi Parekh, Design Management M.A. • Morgan Rizzo, Design for Sustainability M.A. • Daniela Rodriguez, Design for Sustainability M.A. • Riley Shelton, Design for Sustainability M.F.A. • Olivia Snow, Design for Sustainability M.F.A. • Brittany Snyder, Design for Sustainability M.F.A. • Harshini Vasu, Design for Sustainability M.F.A. • Professor Scott Boylston, Graduate Coordinator, Design for Sustainability Program • Professor Saty Sharma, Design for Sustainability Program



## MISSION

To enhance Savannah Tree Foundation's efforts in ensuring tree canopy equity through gathering and synthesizing data, experiences, and community relationships.





Published in conjunction with SCADServe