

The City of
Tifton, Georgia

Strategic Tree Canopy Plan

AUGUST 2024



TIFTON
Georgia
The Friendly City

Prepared by the Green Infrastructure Center Inc.



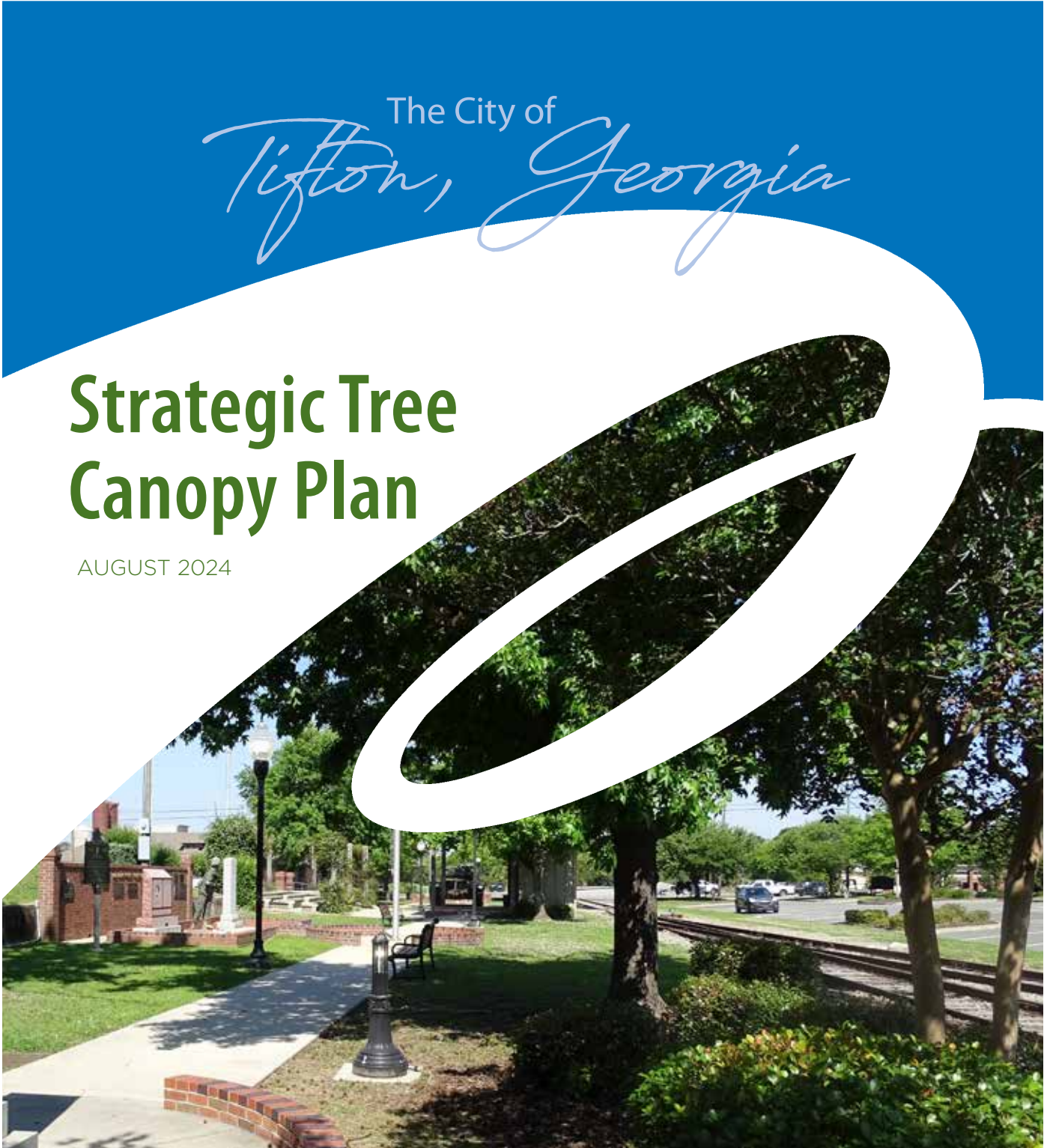
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Prepared by the Green Infrastructure Center Inc.
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Executive Summary



This plan and the accompanying assessments were completed by the Green Infrastructure Center, Inc. (GIC) through a grant from the Georgia Forestry Commission (GFC). This plan describes the findings of the tree canopy assessment, ecosystem services analysis, and codes and ordinances assessment for Tifton, Georgia. Building upon these data the city, GFC, GIC, and stakeholders participated in goal-setting sessions and developed strategies for meeting the goal to maintain tree canopy at 39% over the next 10 years. Data and strategies were presented to the public at an open house where they voted on proposed strategies and added additional comments.

Tifton Canopy Goal: Maintain tree canopy at 39% over the next 10 years.

Top Five Strategies to Achieve This Goal

- 1. Require more trees in the development code for parking lot designs.
- 2. Apply for funds to bury electrical lines and install tree wells to increase resiliency.
- 3. Require tree replacement when protected trees are removed during development.
- 4. Identify overly paved sites and remove impervious surfaces to allow for more space for planting trees.
- 5. Plant more trees at various sites throughout the community.



The Georgia Forestry Commission provided support for Tifton to study its tree canopy, set a goal and identify strategies for managing its urban forest.



Some of the best areas for planting trees are on residential private property.

Tifton, Georgia Fast Facts

- County: Tift County
- Population: 17,253 people*
- Total City Area: 12.6 sq. miles
- Land Area: 12.4 sq. miles
- Lakes/ponds: 117 acres
- Swamp & Marsh: 804 acres
- Streams: 30.6 miles
- Tree canopy: 3,049 acres
- Impervious surfaces: 2,476 acres



*(U.S. Census 2023 estimate)

In summary, Tifton can use the results of this report to:

- Support the city's "Trees Across Georgia" (TAG) grant in its work to increase tree canopy in disadvantaged neighborhoods.
- Use the data to identify potential planting spots for new trees in rights-of-way and in public spaces.
- Mitigate stormwater runoff in neighborhoods through tree planting and other green infrastructure.
- Document the many environmental and social benefits provided by city trees.
- Support greater resiliency of the urban forest in the face of storms, pests and other natural disasters.
- Determine the strategic locations for retaining or planting trees to realize environmental and social equity benefits.
- Inform management of the city's urban forest and support investments in tree care and planting.
- Prioritize policy and code updates to support more tree plantings, tree preservation and impervious surface reductions.



Summary Outcomes



Canopy

Tifton has a 39% tree canopy coverage. Tifton has room to add more tree cover and could achieve a maximum tree canopy of 51%. Any increase in tree canopy Tifton achieves expands the benefits to the city such as stormwater capture, cleaner air, urban cooling, wildlife habitat and natural beauty.



Air Quality

Each year, the tree canopy of Tifton removes 3,963 metric tons of carbon, 69,975 lbs. of ground-level ozone (O₃) and 22,348 lbs. of airborne particulate matter that can cause respiratory distress.



Heat Island

Excessive pavement and lack of shade lead to increased temperatures known as urban heat islands. Tifton’s existing tree canopy provides urban cooling through shade and evapotranspiration. The higher the tree canopy cover, the lower the surface temperatures and the cooler the city.



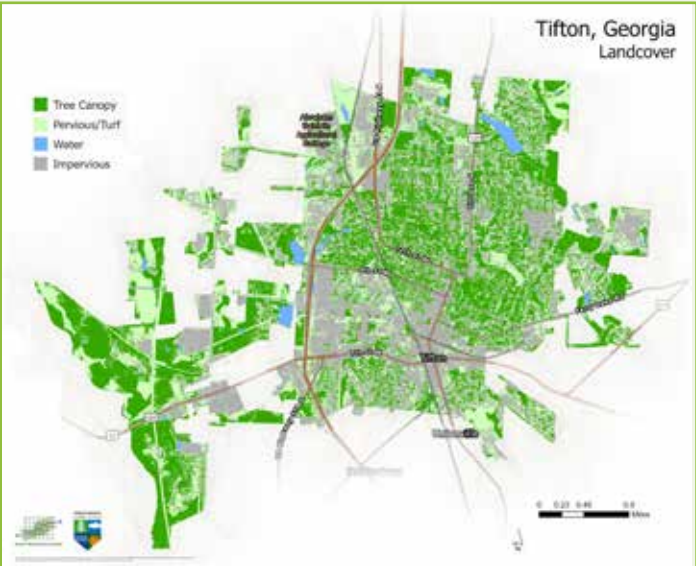
Stormwater Uptake

During a one-year/ 24-hour rainfall event (3.38 inches), the city’s trees soak up 18.3 million gallons of water! This means less flooding of streets. Annually the city’s trees reduce runoff pollution loads for nitrogen by 21%, phosphorus by 30%, and sediment by 19%, thereby reducing water pollution in local waterways.



Canopy Trends and Goals

Tifton has proposed a citywide goal of maintaining 39% canopy over the next ten years. This requires planting more than 6,957 trees in total or 696 trees annually across the city to achieve a no net loss goal, assuming the city loses on average 400 trees per year due to storms, pests, old age or new development.



The City of Tifton now has baseline data on its tree canopy and potential planting areas to identify opportunities to plant new trees. More trees equate to better air quality, shade and energy savings, more stormwater uptake as well as improved water quality.

Introduction

Tifton, Georgia is a charming historic and agricultural community about 3 hours south of Atlanta and the “Gateway to South Georgia”. The city is 8.2 square-miles, the County Seat of Tift County, and is the seventy-third largest municipality in Georgia, with an estimated 2023 population of 17,253 persons. The city was founded in 1872 and incorporated in 1890, and grew quickly due to its central location in the state along major transportation routes. The city is home to several major educational institutions, a regional medical center, and it is the center of commerce for the region. The city is 45.9% non-Hispanic Whites, 33.4% Black/African Americans, 2.2% Asian, and 14.5% Hispanic or Latino residents.¹

According to the Advisory Council on Historic Preservation, the city is known as the “Plant Center of the World” with Tift County being one of the most diverse agricultural counties in the state. Regional agriculture includes vegetable crops, row crops, forages, ornamental horticulture, livestock, forestry, fruits, tree nuts, and more. The city’s tree canopy adds to this narrative with natural amenities such as Fulwood Park that contribute to its high-quality lifestyle.

Why Map the Urban Canopy?

Trees are declining throughout the United States. The causes of this decline include land conversion for development, storm damage, pests and disease, and lack of tree replacement as older trees die. Many communities in Georgia are looking for ways to protect or expand their tree canopy and community forests. Data describing Tifton’s trees will allow the city to track trends, assess losses, and set goals to retain or restore canopy. Through this planning process the city now has baseline data to monitor canopy protection progress, measure environmental benefits of city trees and prioritize strategic tree planting locations.

Trees are the city’s ‘green infrastructure.’ Just as we manage our grey infrastructure (roads, sidewalks, bridges and pipes), we also need to manage our ‘green infrastructure’ (trees and other vegetation). Tifton’s green infrastructure provides many values that support a vibrant, safe and healthful community. Trees add to the city’s historic character, and they enhance its livability by filtering storm water and reducing runoff, cleaning the air, providing oxygen, shading, and natural beauty and enhanced property values. As the city continues to grow and adapt to climate change and more frequent and severe storm events, it should also manage and sustain the urban forest. This will help the city meet its many goals set forth in other community plans.

¹ <https://www.census.gov/quickfacts/fact/table/tiftoncitygeorgia>



Gray vs Green.

The image at left shows an example of a city’s gray infrastructure including buildings and roads. Classified high-resolution satellite imagery (at right) adds city green infrastructure data layer (trees and other vegetation). The green infrastructure provides cleaner air, water, energy savings and natural beauty.



One of the town’s beautiful trees

The Canopy Assessment

This plan describes the state of the city’s urban forest based on current canopy coverage, an analysis of the canopy’s environmental benefits and a review of the relevant codes and ordinances. With these data the city and community devised strategies to sustain and expand the urban forest. Products created include:

- Analysis of the current extent of the community forest through high-resolution tree canopy mapping.
- Possible Planting Area analysis to determine where additional trees could be planted.
- Calculation of the environmental benefits and pollution removal by city trees.
- Analysis of the city’s codes, ordinances and practices for their ability to conserve or protect the urban forest.
- A public open house concerning where the city should prioritize tree planting efforts and the top strategies for increasing tree canopy.
- Tree canopy community outreach and educational materials.

The city can utilize the tree canopy to maximize environmental and social benefits including:

- Community health and vibrancy,
- Aesthetic values and natural beauty,
- Decreased heat island impacts and reduced heating and cooling costs,
- Abundant bird and wildlife habitat,
- Expanded walkability and multimodal transit support; and,
- Revenue from tourism and retail sales.



Planting trees and adding new canopy can reduce the amount of nonpoint source pollution entering local waterways such as the Little and New Rivers.

How the Community Forest Benefits Tifton, GA

Reducing Stormwater Runoff and Filtering Pollutants

Trees provide natural flood protection and stormwater filtration at a fraction of the cost of engineered systems. As forested land is converted to impervious surfaces, runoff increases. Excess stormwater runoff can cause increased flooding, temperature spikes in receiving waters, and increased pollution of surface and ground waters.

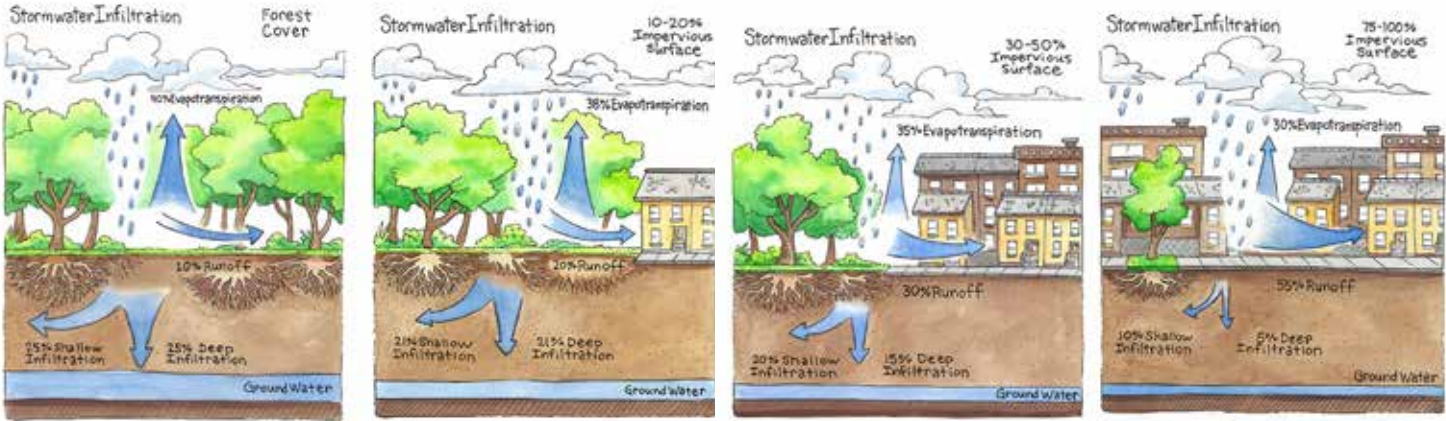
Trees reduce nitrogen, phosphorus, and sediment runoff by cleaning rainfall and stormwater of these pollutants. Increased loads of nutrients can reduce oxygen in surface water causing harm to fish and other aquatic life. The presence of trees means less pollutants reach drainage ditches, creeks, and rivers.

The average annual precipitation in Tifton is 47 inches (119 cm), some of which runs off carrying surface pollutants. Large, paved areas contribute significant volumes of this runoff. During a one-inch rainfall event, a one-acre paved area such as a mall parking lot, will release 27,000 gallons of runoff compared to an acre of forest, where only 750 gallons of water runoff. While stormwater ponds and other best management practices are designed to mimic rainfall release by detaining and filtering runoff, they do not fully replicate pre-development hydrology. In addition, older parts of the city may lack stormwater management practices that are required for new developments, so not all runoff is captured or treated before it flows to open waterways.



Excess impervious areas cause hot temperatures and runoff. This parking lot can be retrofitted to add more trees.

Water Infiltration Rates with Development



Stormwater runoff increases as land is developed. Data Source: U.S. EPA

Since trees filter stormwater and reduce overall flows, planting or conserving trees is a natural way to mitigate stormwater. Each tree plays an important role in stormwater management. Based on the GIC’s review of multiple studies of canopy rainfall interception, a typical tree crown can intercept between 760 gallons to 4000 gallons of water per tree per year, depending on the species and age. During a 1-year/24-hour rainfall event (3.38 inches) in Tifton, the trees take up 18.3 million gallons of runoff, or about 28 Olympic swimming pools of water. In a larger rainfall event similar to the Tift County floods in 2009 (up to 9 inches of rain in 24 hours) the trees take up 36.6 million gallons.

As tree cover is lost and impervious areas expand, excessive stormwater runoff results in pollutants such as oil, metals, lawn chemicals (e.g., fertilizer and herbicides), pet waste, trash, and other contaminants flowing into surface waters. Trees help capture and filter that urban runoff. According to GIC’s stormwater model, the trees in Tifton capture and prevent the following nonpoint source pollution annually:

- 24,366 lbs. nitrogen,
- 1,993 lbs. of phosphorus and
- 1,204 tons of sediment.

Nitrogen and phosphorus are plant nutrients that can cause harmful algal blooms while sediment can clog fish gills, smother aquatic life, and necessitate additional dredging of canals and waterways. Algal blooms can reduce oxygen levels further harming fish and other aquatic life.



Tree islands and planting strips in developments should be pervious and adequately sized for healthy tree growth. The city can establish soil surface and soil volume standards based on the proposed size of the tree for the tree island.



Trees help mitigate stormwater runoff and can reduce nuisance flooding on properties.

Buffering Storms and Flooding

Another benefit of conserving trees and forests is buffering against storms and losses from flooding. According to the U.S. Environmental Protection Agency (EPA), excessive stormwater runoff accounts for more than half of the pollution in the nation's surface waters and causes increased flooding and property damages, as well as public safety hazards. The EPA recommends a number of ways to use trees to manage stormwater in the book *Stormwater to Street Trees*.

Retaining trees and forests also provides a wind break and helps to evaporate and reduce standing water. In addition, utilizing trees as 'green infrastructure' can provide a basis for reimbursement from FEMA if trees are damaged during storms. To qualify, trees must be inventoried and specifically utilized for stormwater management, erosion, and sediment control, buffers, or other green infrastructure functions.

Tifton participates in the National Flood Insurance Program's Community Rating System (CRS). The CRS is a voluntary incentive system that allows local

governments to earn flood insurance premium discounts for policyholders in the community. Local governments receive points for actions or policies that reduce flooding and flood damage; these points earn premium discounts as high as 45%. Tifton is currently in Class 8 which results in 10% discounts on premiums for residents.

Additionally, communities can earn credit for adopted management plans that protect the critical natural functions of floodplains and native species, while implementing habitat restoration projects. CRS requirements include an inventory of all species in the plan's geographic purview, action items for protecting one or more of the identified species of interest, restoring natural floodplain functions, and the review and update of the plan every 10 years. If a green infrastructure plan is created using the canopy data, this can earn additional points in the CRS to further reduce flood insurance premiums. Multiple objectives can be achieved by combining canopy data with the planning efforts to identify green infrastructure networks.

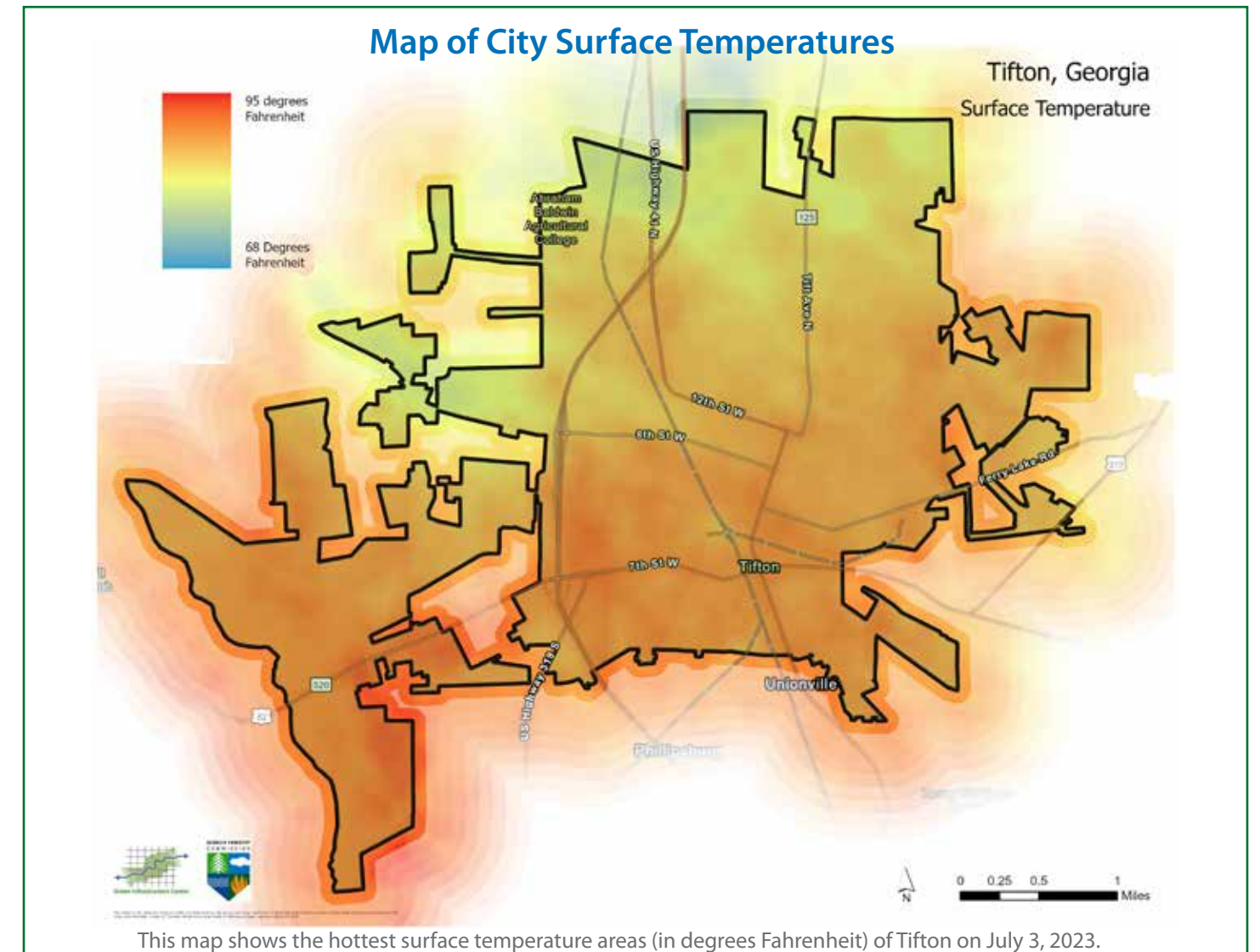
Air Quality and Surface Temperature Trees Cool the City

As summer temperatures in Georgia climb, the importance of shade cast by trees increases. Excessive heat can lead to heat stress which especially affects infants and children up to four years of age, those 65+ years of age and older, those with underlying medical issues, and those on some medications (Centers for Disease Control 2020).

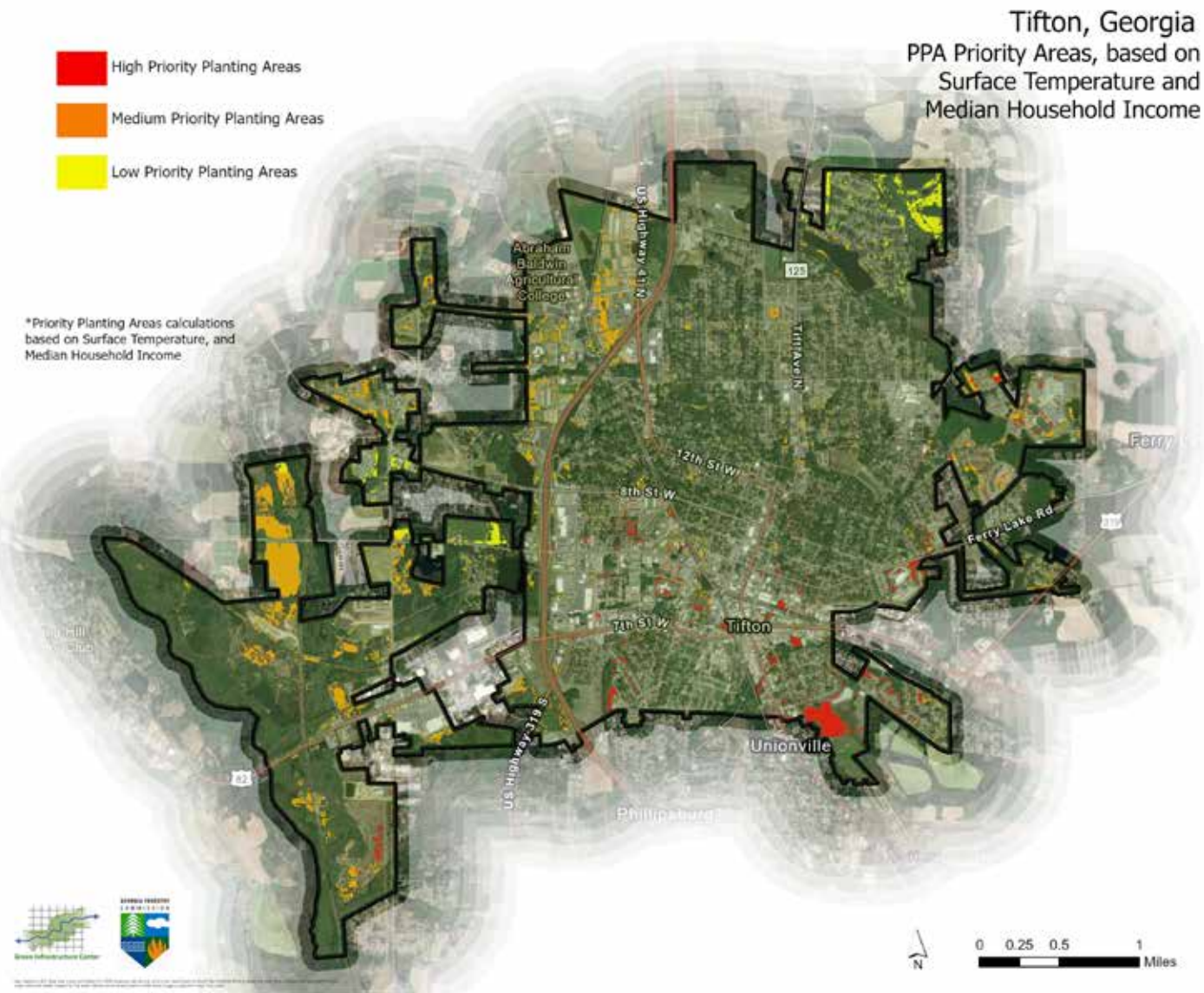
Tree cover shades streets, sidewalks, parking lots, and homes, making urban locations cooler, and more pleasant for walking or biking. Multiple studies have found significant cooling (2-7 degrees Fahrenheit) and energy savings from having shade trees in cities (McPherson et al 1997, Hashed et al 2001). Shaded pavement also has a longer lifespan, so maintenance costs associated with roadways and sidewalks are less (McPherson and Muchnick, 2005). In addition to casting shade, trees also contribute to cooler cities through

evapotranspiration- as tree leaves release water vapor it cools the surrounding air, and by reflecting more sun and absorbing less heat than impervious surfaces.

Using the tree canopy data, surface temperature data and U.S. Census data at the Block Group level, analyses can be done to identify inequities in the distribution of tree canopy and discover opportunities to address those inequities through strategic tree planting efforts. The following map illustrates one way to prioritize tree planting efforts in the city through an urban heat island and tree equity lens. Using the Potential Planting Areas (PPA) data, surface temperature and the U.S. Census's Median Household Incomes (MHHI) data at the Block Group level, GIC was able to prioritize areas of the city for tree planting that lack canopy, are the hottest and have low-income populations that are vulnerable to heat (see map on page 14). The city can use this data to do further analysis and inform how they implement tree planting efforts in the city that are equitable and help to restore canopy in neighborhoods where trees are lacking.



Map of City Potential Tree Planting Priority Areas



This map shows one way to prioritize tree planting efforts in the city through a tree equity lens by focusing tree planting in the hottest and lowest income neighborhoods of the city.

Trees Clean the Air and Sequester Carbon

In addition to cooling surfaces, trees play a critical role in maintaining air quality. Trees absorb volatile organic compounds and other pollutants from the air thereby reducing asthma rates. Trees release oxygen as well as clean the air of particulate matter and ground level ozone (O3), which can harm human health. Trees sequester sulfur dioxide and carbon dioxide, and as these greenhouse gasses are trapped by trees, limit the severity of climate change. Trees store carbon and prevent its release, also mitigating climate change impacts. Even at the neighborhood level, trees reduce pollutants and well-treed neighborhoods suffer fewer respiratory illnesses, such as asthma. (Rao et al, 2014). Each year, the tree canopy of Tifton removes 3,963 metric tons of carbon, 69,975 lbs. of ground-level ozone (O3) and 22,348 lbs. of airborne particulate matter that can cause respiratory distress.

Social Values

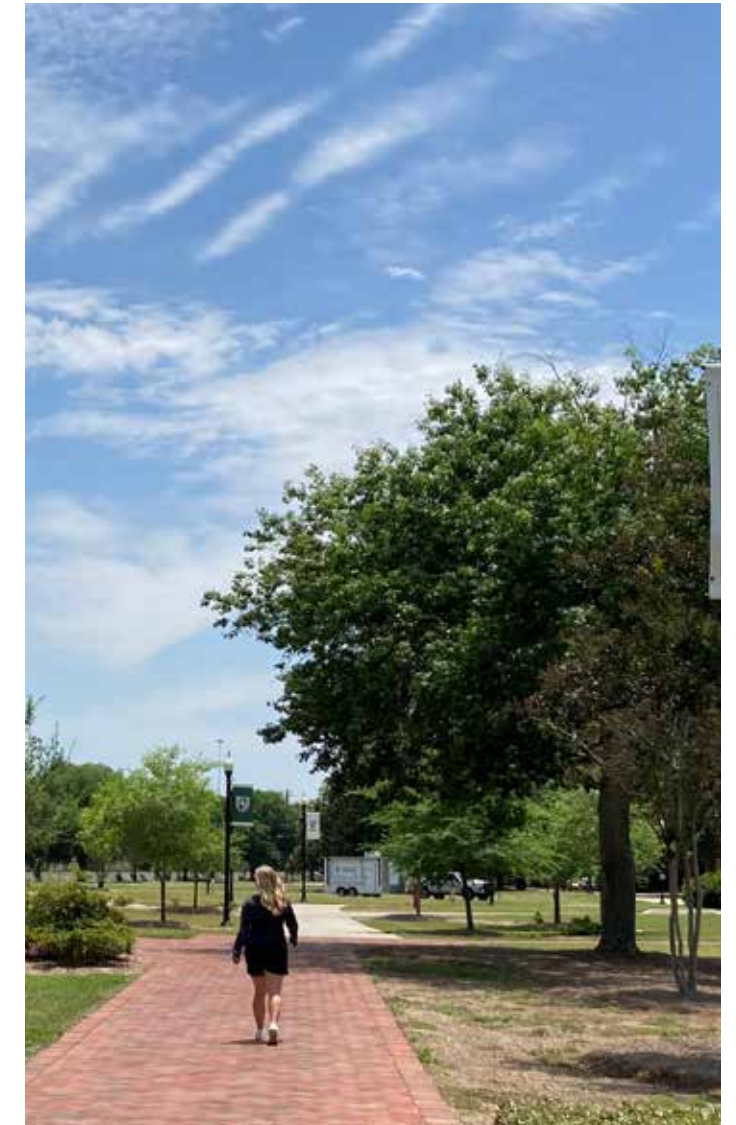
Trees Improve Cognitive Function

Children who suffer from Attention Deficit Hyperactivity Disorder (ADHD) benefit from living near forests and other natural areas. One study showed that children who moved closer to green areas have the highest level of improved cognitive function after the move, regardless of level of affluence (Wells 2000). Thus, communities with greener landscapes benefit children and reduce ADHD symptoms. Exposure to green spaces for 20 minutes a day can also improve cognitive function so providing more natural areas on or near school grounds as well as greening routes to school can better prepare children to learn.



The trees provide cooling shade during hot summer months.

Exposure to green spaces for 20 minutes a day can improve cognitive function.



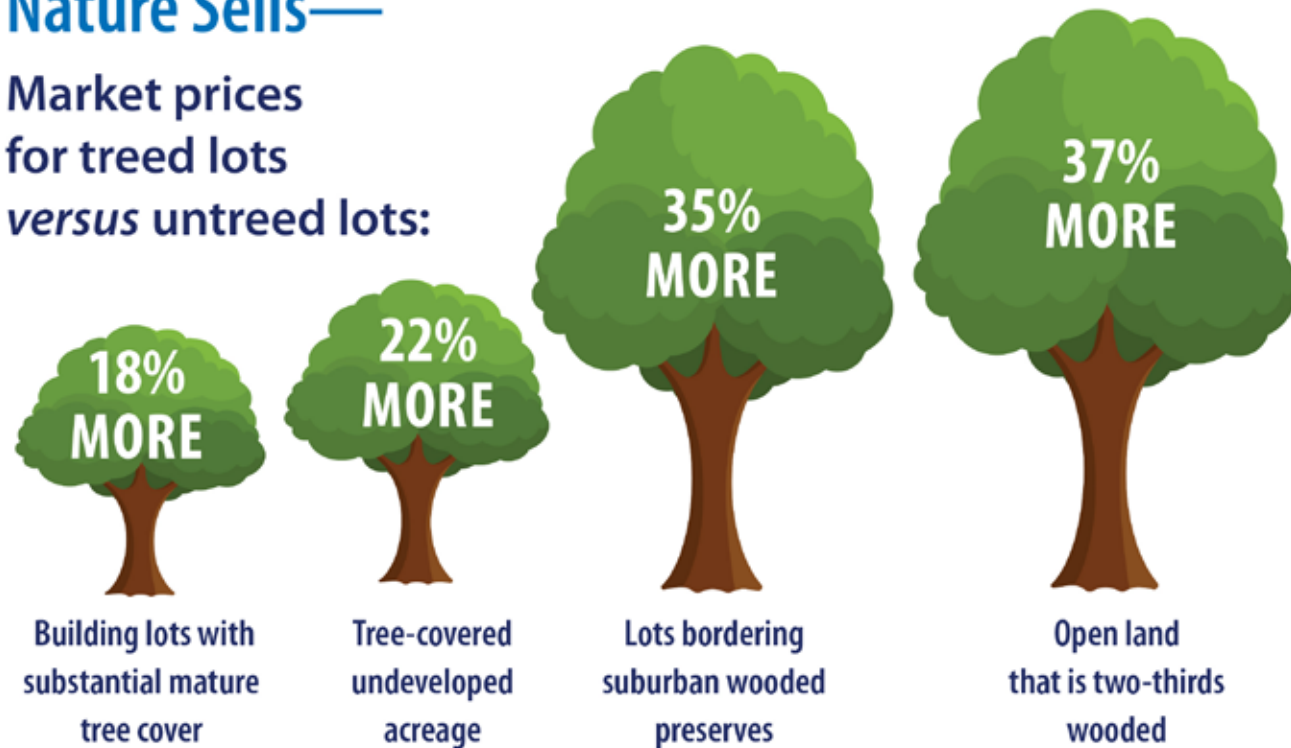
Well treed areas encourage people to walk and bike.

Trees Improve Walkability

The presence of trees encourages people to walk more and walk farther. According to research, when trees are not present, distances are perceived to be longer and destinations farther away, making people less inclined to walk than if streets are well treed (Tilt, Unfried and Roca 2007).

Nature Sells—

Market prices
for treed lots
versus untreed lots:



Source: Kathleen Wolf, 2007, *City Trees and Property Values*.

Home buyers are willing to pay more for homes located near a park or other natural area.

Trees Increase Property Values and Sales

Developments that include green space or natural areas in their plans sell homes faster and for higher profits than those that take the more traditional approach of building over an entire area without providing for community green space (Benedict and McMahon 2006).

A study by the National Association of Realtors found that 57% of voters surveyed were more likely to purchase a home near green space and 50% were more willing to pay 10% more for a home located near a park or other protected area.



Urban Tree Loss – Reversing the Trend

Tifton now has baseline data to monitor canopy increases from plantings, measure the stormwater and water quality benefits of its community forest, and can prioritize restoration of canopy where it is most needed. Currently the city's canopy coverage is 39%, and the data identifies areas to plant to maintain this canopy coverage into the future.

To maintain the canopy, the city needs to actively plant trees to replace those lost to natural mortality (old age), storms, development, pests, and neglect or poor care. As older trees die, or preferably before they die, younger trees need to be planted to replace the older canopy. While the city has been planting trees, more trees need to be planted by both the public and private sectors in greater numbers to achieve the goal of sustaining canopy coverage at 39%. The data from this plan can inform the city's tree planting, shared with the public to encourage them to plant trees, and used to secure grants and donations to help fund the effort.



Why Are Urban Trees Declining?

Tree loss is not a problem that is unique to Tifton. Trees are declining throughout the United States. Cities are also losing older, established trees from the cumulative impacts of land development, storms, diseases, old age and other factors (Nowak and Greenfield 2012).

It is not just development and storms that contribute to tree loss, millions of trees are also lost as they reach the end of their life cycle through natural causes. Choosing the wrong tree for a site or climate, planting it incorrectly, or caring for it poorly can all lead to tree canopy loss. For every 100 street trees planted, only 50 will survive 13-20 years largely due to poor planting conditions and care (Roman et al 2014). Even in older developed areas with a well-established tree canopy, redevelopment projects may remove trees. It is important to realize that an older, well-treed neighborhood of today may not have good coverage in the future unless young trees – the next generation – are planted.



Newly Planted Tree

Current and Potential Tree Canopy

To determine the current tree canopy, model scenarios for future tree coverage, and quantify their ecosystem services, a detailed land cover analysis and an estimation of potential future planting areas were developed (see Appendix A for details). In addition to community forest planning, the new land cover data can be used for other purposes such as analyzing urban cooling, walkability, street tree plantings, or informing area plans such as the city's comprehensive plan.

Method

Satellite imagery from the National Agricultural Imagery Program (NAIP) distributed by the USDA Farm Service Agency was classified based on infrared bands to determine the types and extent of different land covers in Tifton. Canopy maps were created by a third-party vendor from previously modeled land cover data based NAIP imagery from 2019 and 2021. The final classification for land cover consists of three classes (types of land cover), tree canopy, pervious (lawn/turf) and impervious surfaces.



NAIP Image 2021



Potential Planting Area (PPA) with exclusions in red hatching

Potential Planting Areas (PPA)

In urban areas, realistic goals for expanding tree canopy depend on an accurate assessment of plantable open space. A Potential Planting Area (PPA) map estimates areas that may be feasible to plant trees. The PPA is created by selecting the land cover features that have space available for planting trees and accounts for the overlap of canopy (e.g., canopy that is intermingled or a large canopy tree that partially covers an understory tree). Of the three land cover classes, only pervious/turf were considered for PPA. However, some paved areas could be removed or reduced, soils conditioned, and then used to plant new canopy.

Eligible planting areas are limited based on their proximity to features that might either interfere with a tree's natural growth (such as buildings) or places a tree might affect the feature itself, such as power lines, sidewalks or roads. Playing fields, cemeteries and other known land uses that would not be appropriate for tree cover, such as golf courses and airports were also avoided in calculating plantable areas. The resulting PPA represent the maximum potential places trees can be planted and grow to full size. The GIC recommends planting no more than half the available PPA, since many uses such as tomato gardens or sunbathing by the pool require full sun.



Potential Planting Spots (PPS)

Potential Planting Spots (PPS)

Potential Planting Spots (PPS) are created from the PPA. A GIS modeling process is applied to select spots where a tree can be planted depending on the desired size. For this analysis, expected sizes of 20 ft. and 40 ft. diameter for individual mature tree canopy were used with priority given to 40 ft. diameter trees because larger trees have more benefits.



Potential Canopy Area (PCA)

Potential Canopy Area (PCA)

The Potential Canopy Area (PCA) is created from the PPS. Once possible planting spots are selected, a buffer around each point that represents a tree's mature canopy is created. For this analysis, that buffer radius is either 10 ft. or 20 ft., which represents a 20 ft. or 40 ft. diameter canopy. These individual tree canopies are then dissolved together to form the potential overall canopy area. For Tifton 12% more canopy could be added to the city.



Maps and Findings

The tree canopy map should be used to plan for tree conservation and as a benchmark to gauge future progress in tree preservation and planting. An ArcGIS geodatabase with all GIS shape files produced during the study was provided to the city.

Tree Canopy Goal for the City of Tifton

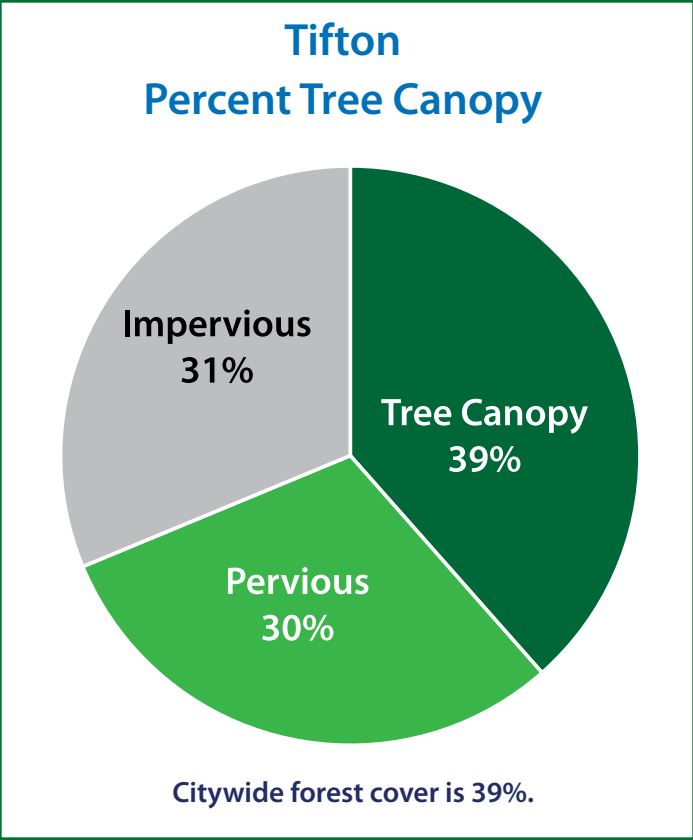
Using tree canopy and land cover data, this plan’s consultants mapped the maximum potential tree canopy for planting 100% of the available planting areas which equates to a potential canopy cover of 51%. However, a more realistic goal for the maximum potential tree canopy is to plant only 50% of the PPA, resulting in a maximum desired goal of 45% tree canopy.

Using this information and other tools, such as GIC’s Canopy Budget Calculator Tool which estimates the financial cost of increasing canopy to a certain percentage, the city decided to set a no net loss goal to maintain its current canopy at 39% over the next 10 years. To maintain the canopy, assuming 400 trees are lost per year, will require planting an additional 6,957 trees; approximately 3,665 large shade trees and 3,291 small trees at a rate of 696 trees planted annually.

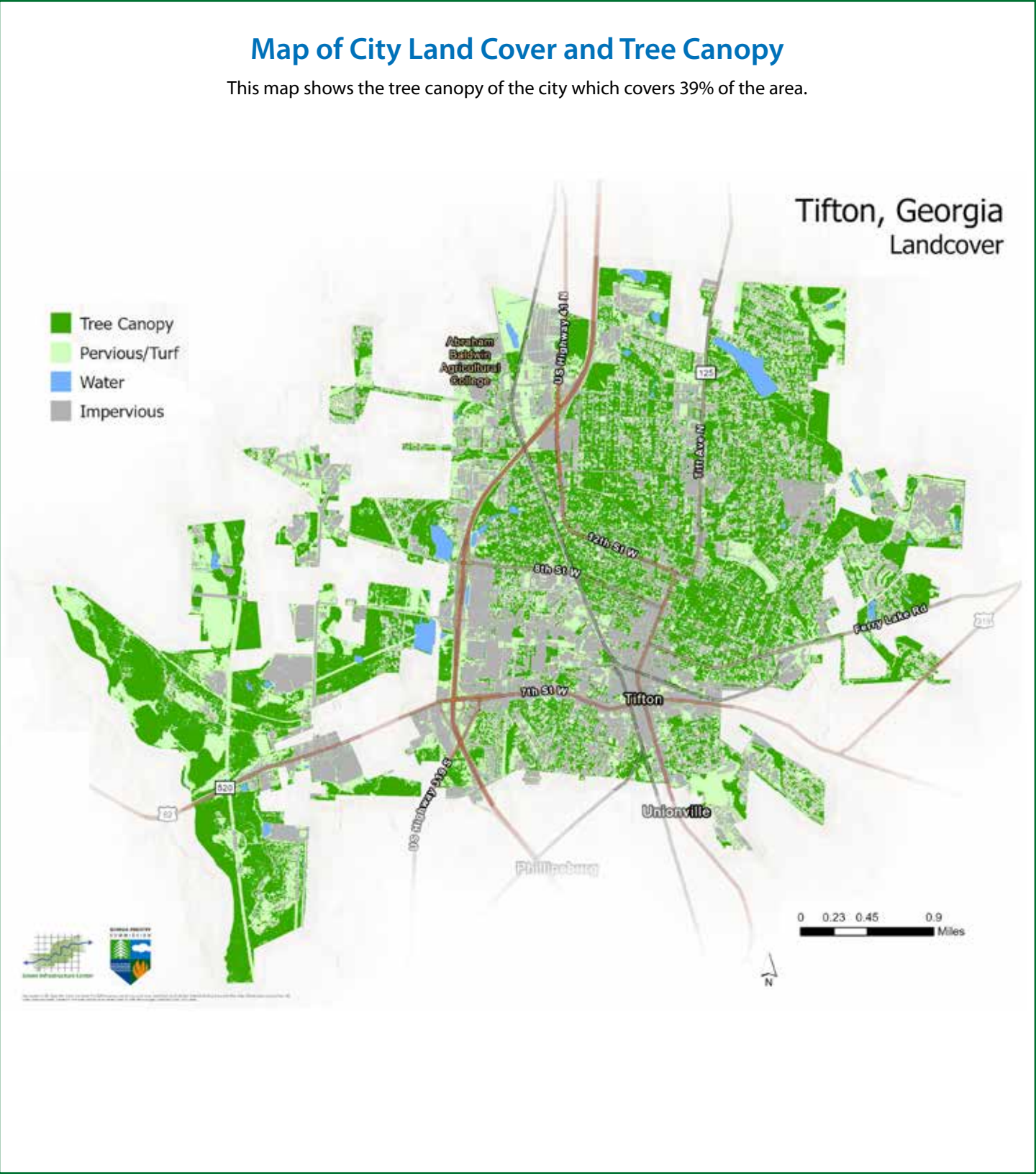
The city also requested statistics for canopy by the following geographies:

- Streets
- Fulwood Park
- Downtown Development Authority District
- Schools

The canopy data and the possible planting area map can inform tree planting decisions to meet many goals such as walkability, stormwater mitigation, energy savings or economic revitalization. Knowing the distribution of canopy for different types of properties allows the city to craft more specific strategies for achieving their canopy goal of “no net loss” and ensuring that canopy is distributed equitably across the landscape. The following maps can be used to prioritize where to start planting and for public awareness of such planting needs.



One mature tree can absorb thousands of gallons of water per year.



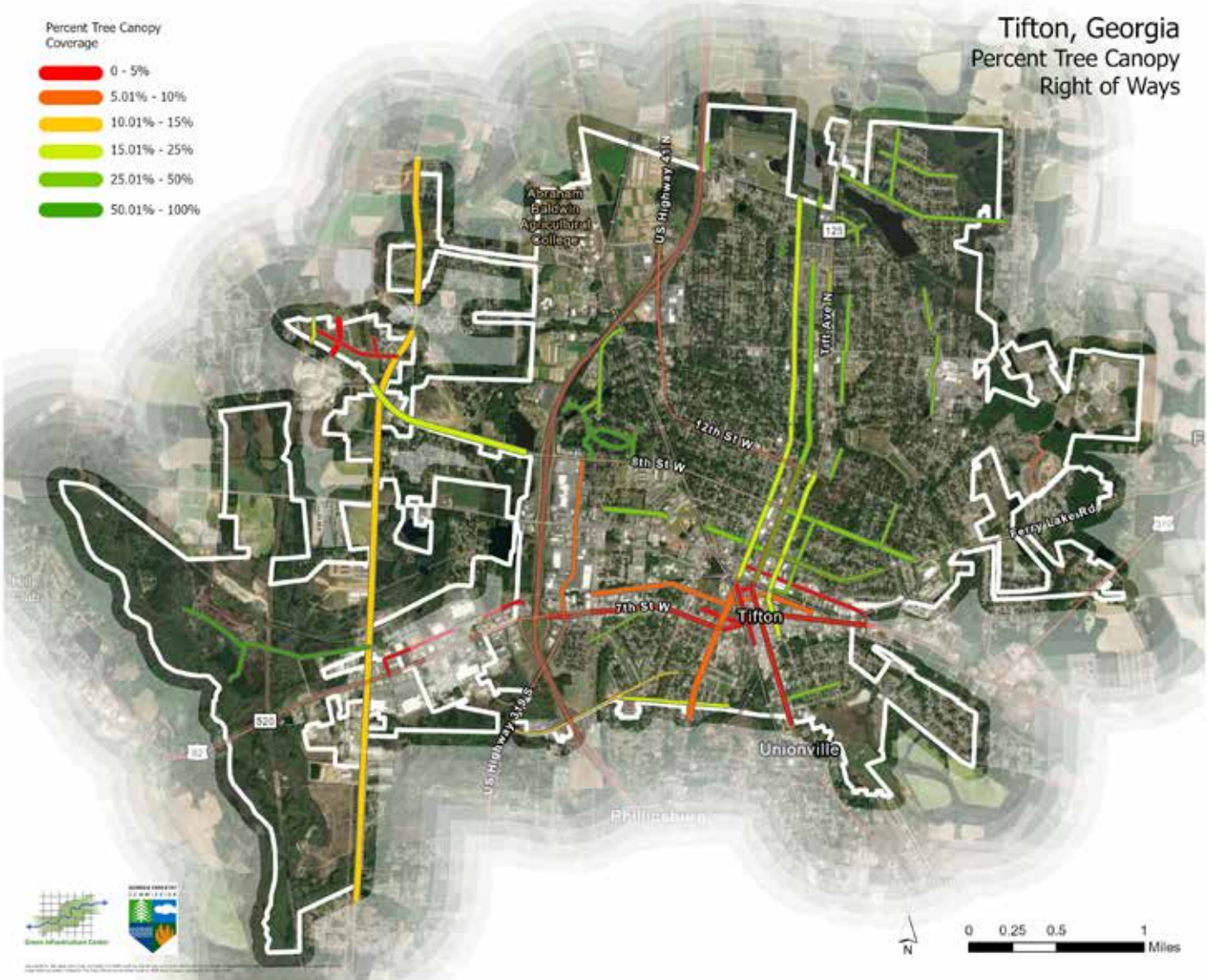
Map of Possible Planting Areas

Potential Planting Areas (PPA) shown in orange depicts areas where it may be possible to plant trees. All sites need to be confirmed in the field and may be on private or public lands.



Map of Street Tree Coverage

Percent Street Trees is calculated using the tree canopy and road centerlines, which are buffered outward from each road segment's centerline based on that street's rights-of-way (ROW) (often 50 feet or more). The percent value represented is the percentage of tree cover within that ROW buffer which is variable depending the street segment within the city.



This map shows which streets have the most canopy (dark green) and which have the least (red). Streets lacking good coverage can be prioritized for tree plantings to facilitate uses, such as Safe Routes to School or beautifying a shopping district.

Map of Fulwood Park

Fulwood Park has high existing tree canopy cover at 86%, but lacks the next generation of trees. This well-treed park has planting spots available for another 29 large trees and 49 small trees. It is important to plant and establish those trees now to replace aging trees and maintain the tree canopy into the future.

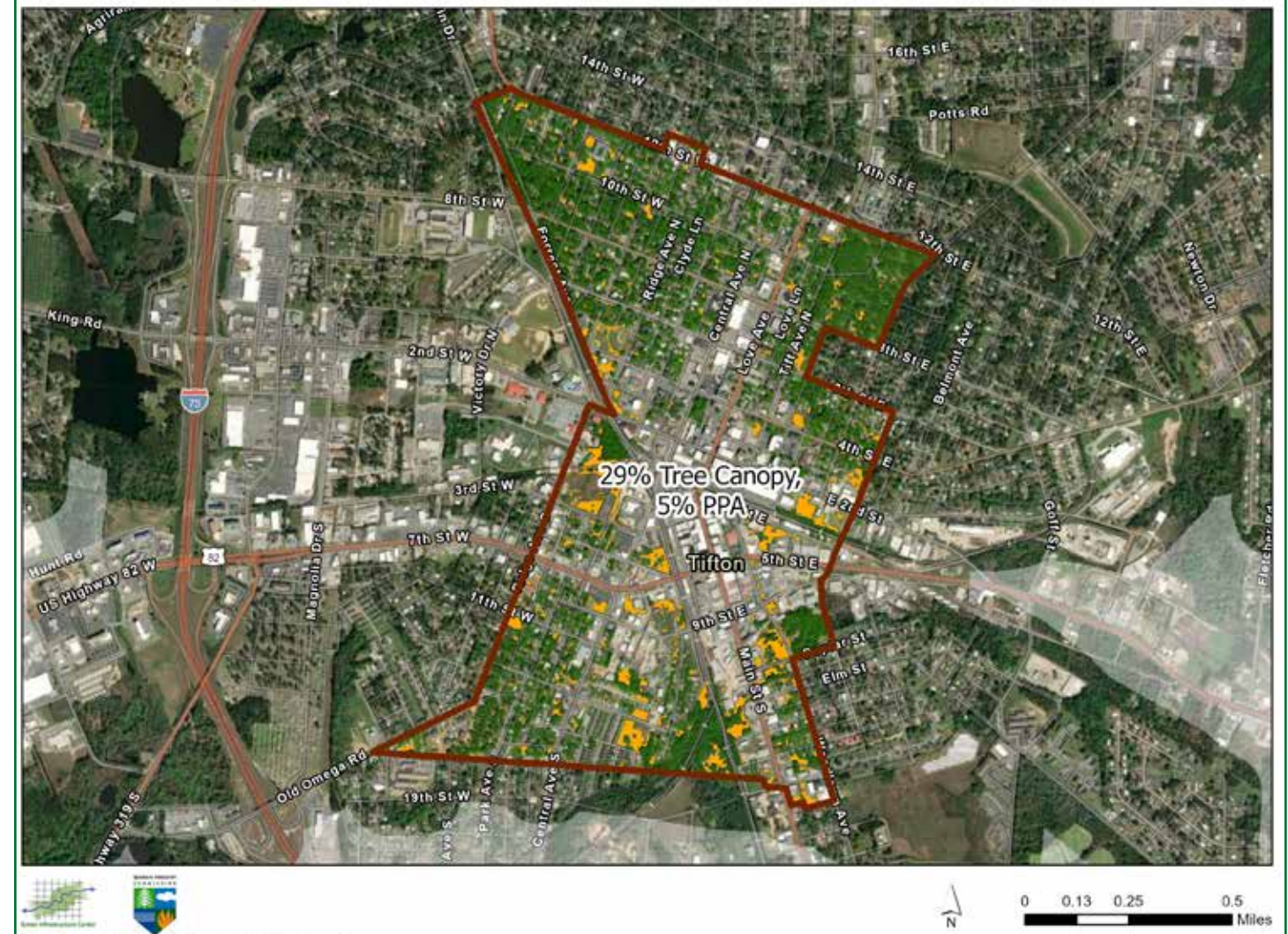
Tifton, Georgia
Percent Tree Canopy
Fulwood Park



Map of Downtown Development Authority Coverage

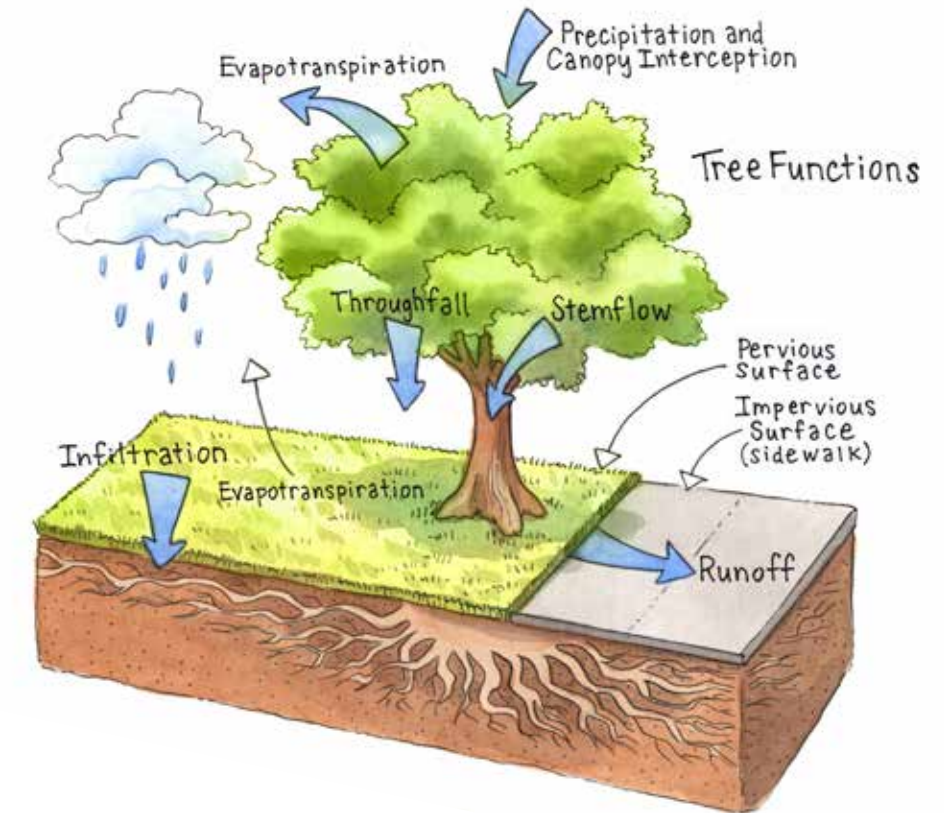
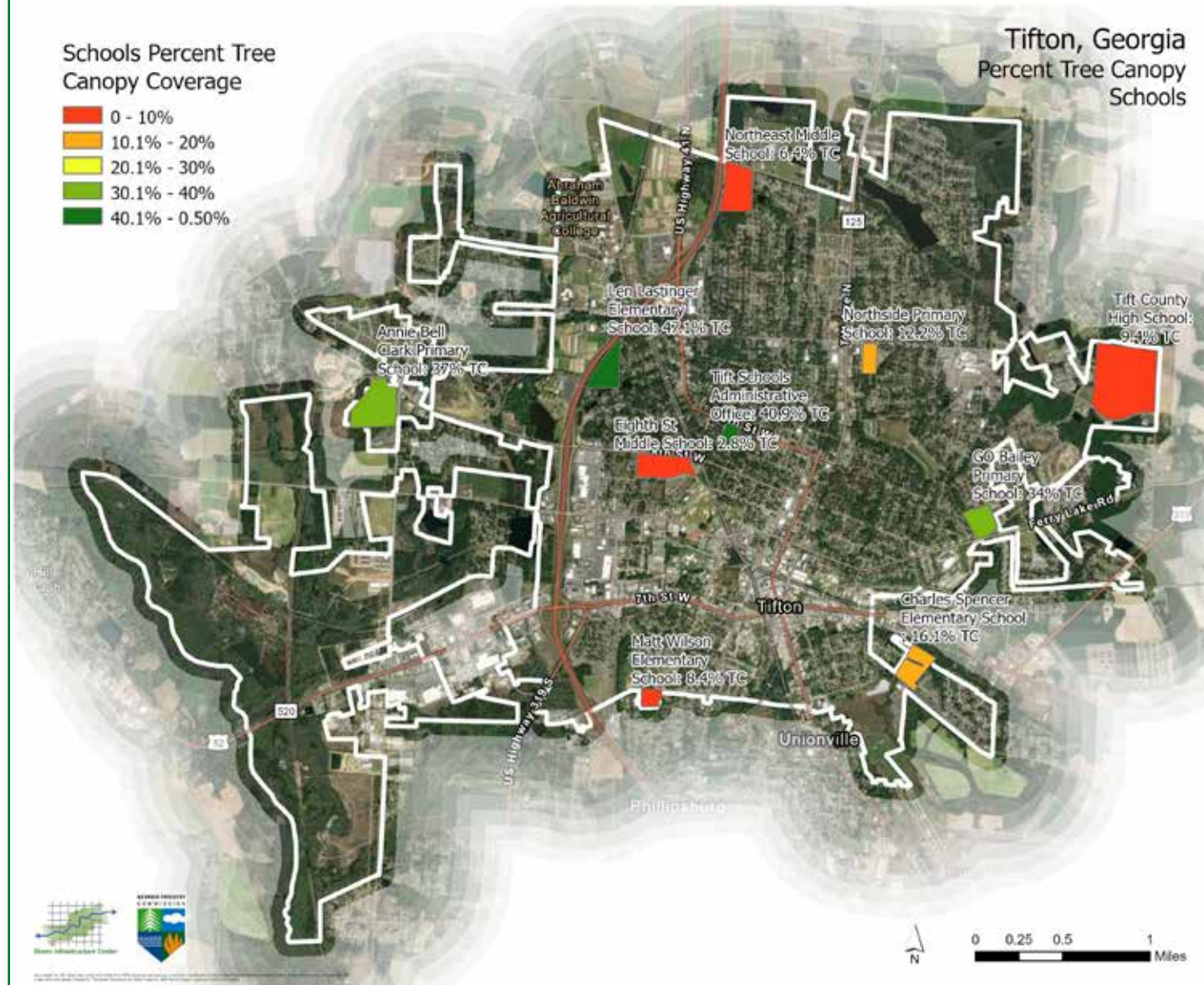
This map shows tree canopy by the Downtown Development Authority (DDA) a special district that supports the beautification and management of the downtown district. Shopping districts with greater tree canopy see shoppers spend more money and time in those districts.

Tifton, Georgia
Percent Tree Canopy
Downtown Development Authority



Map of School Coverage

Every school was analyzed for tree canopy cover. The data show that some school properties lack sufficient canopy and have the potential for more trees. After excluding athletic fields, Tifton schools have room for 2,552 more trees to be planted.



Ecosystem Services Modeling

Methods to Calculate Tree Benefits

Stormwater Uptake Modeling

The best land cover for taking up stormwater is the urban forest. The GIC evaluated stormwater runoff and uptake by the city's tree canopy using the GIC's Trees Stormwater Calculator (TSW) Tool. The TSW tool estimates the capture of precipitation by tree canopies and the resulting reductions in runoff yield. It considers the interaction of land cover and soil hydrologic conditions. It can also be used to run 'what-if' scenarios, specifically losses of tree canopy from development or storms and increases in tree canopy from tree planting programs.

Trees intercept, take up and slow the rate of stormwater runoff. Canopy interception varies from 100 percent at the beginning of a rainfall event to about three percent at maximum rain intensity. Trees take up more water early on during storm events and less water as storm events proceed and the ground becomes saturated (Xiao et al., 2000). Many forestry scientists, as well as civil engineers recognize that trees have important stormwater benefits (Kuehler 2017, 2016).

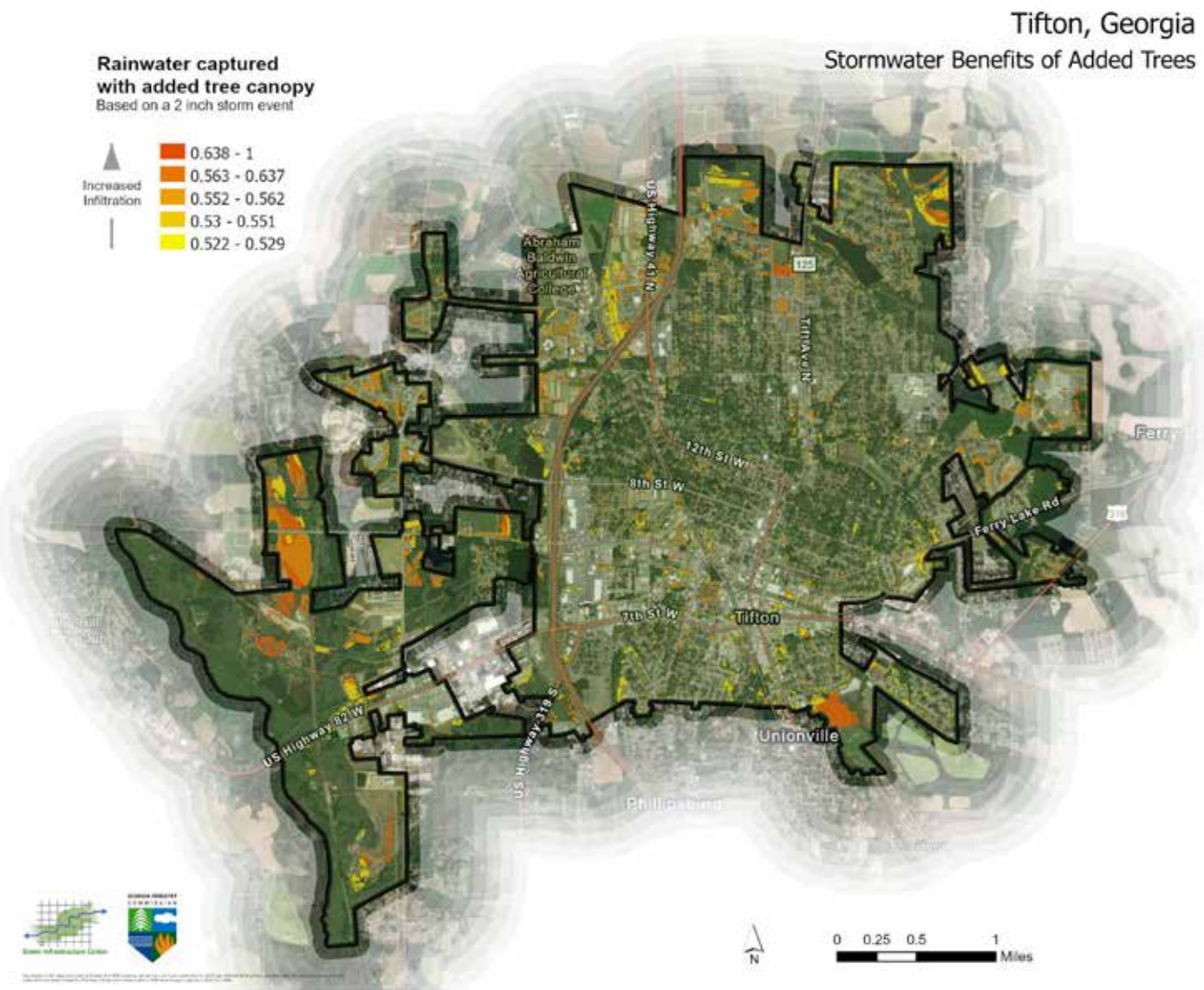
See diagram of tree water flow above.



Trees absorb and slow the rate of stormwater runoff.

Map of Stormwater Benefits of Planting Trees

This map identifies the best planting areas to plant trees to infiltrate stormwater into the soil.



Investments in canopy at the neighborhood level can improve the respiratory health of residents.



Air Quality Pollution Removal Values

Air quality pollution removal values were calculated by applying the multipliers used by the i-Tree models. I-Tree is a peer-reviewed software suite from the USDA Forest Service that provides urban and rural forestry analysis and benefit assessment tools. It provides standard pollution removal values per acre for various air pollutants. The following i-Tree model values for urban areas were used to derive the pollution removal values per acre of tree canopy.

Carbon monoxide (CO) affects how quickly greenhouse gases such as methane breakdown, which are linked to climate change and global warming. Carbon is another element that contributes to climate change mainly in the form of carbon dioxide. Trees sequester carbon from carbon dioxide in their leaves, trunk, and roots, and prevent it from being released into the atmosphere where it can contribute to climate change.

Ground level ozone O3 can cause the muscles in people's airways to constrict, trapping air in the alveoli, leading to wheezing and shortness of breath, which is particularly harmful to those with respiratory diseases or chronic conditions, such as asthma. Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2) also irritate airways in the respiratory system and aggravate respiratory conditions such as asthma.

PM10 is particulate matter measuring 10 micrometers or less in diameter and PM2.5 is particulate matter 2.5 micrometers or less in diameter (a human hair is about 100 micrometers = about 40 fine particles). PM2.5 is generally described as fine particles. Finer particles have the potential for greater harm since they may lodge deeper in the lungs. Trees can filter and clean particles from the air.

Well-treed neighborhoods suffer fewer respiratory illnesses, such as asthma (Rao et al, 2014). This means that investments in the canopy at the neighborhood scale can increase the health of residents.

Pounds of air pollution and greenhouse gases removed annually by all trees in Tifton

CO (carbon monoxide)	NO ₂ (nitrogen dioxide)	O ₃ (ozone)	PM ₁₀ * (particulate matter 10 microns)	PM _{2.5} (particulate matter 2.5 microns)	SO ₂ (sulphur dioxide)	CO ₂ seq (carbon dioxide sequestered) in lbs	CO ₂ stored ** (carbon dioxide stored in lbs)
1,963	9,640	69,975	18,330	4,018	1,274	8,736,919	264,034,424

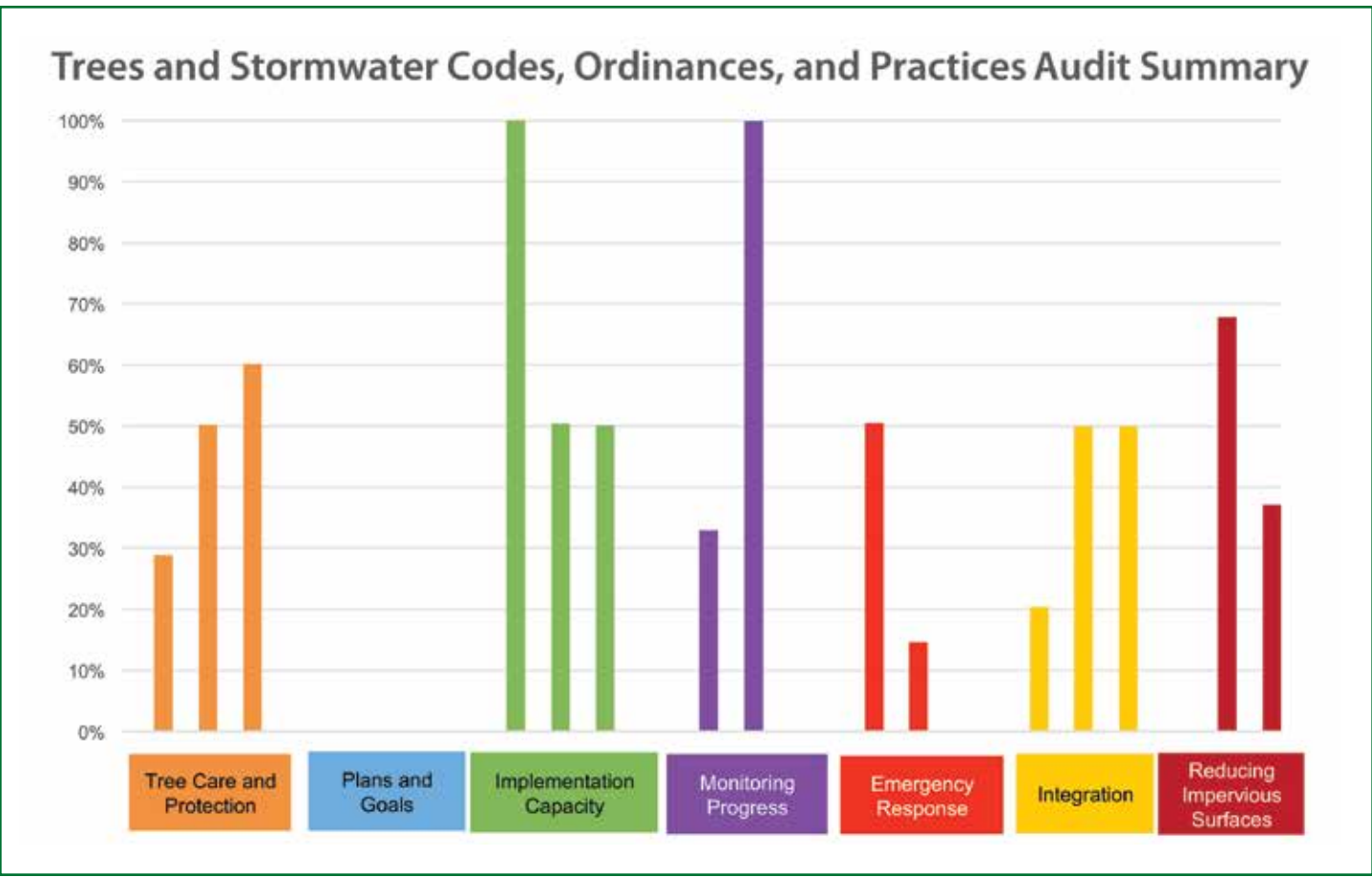
*PM = Particulate matter
**CO₂ stored is not an annual rate but a total amount of carbon stored.

Codes, Ordinances and Practice Review

This review determined which practices create more impervious surfaces (e.g., too much parking required), protect or restore pervious surfaces (e.g., conserving trees or requiring open spaces), and create a healthy urban forest (e.g., tree planting and care standards). Documents reviewed during the codes, ordinances and practices analysis for the project include relevant sections of the city’s code that influence urban forest practices, runoff or infiltration. Data were gathered through analysis of city codes and policies, as well as interviews with city staff, whose input was incorporated directly into the spreadsheet summary prepared by the GIC. The spreadsheet provided to the city lists all the codes reviewed, interviews held and relevant findings.

Points were assigned to indicate what percentage of urban forestry and planning best practices have been adopted to date by the city. The spreadsheet tool created for city codes can also serve as a tracking tool and for determining other practices or policies the city may want to adopt in the future to strengthen the urban forestry program or to reduce impervious land cover. The less city land that is paved, the more room there is to add trees.

Categories the city scored best in were “Implementation Capacity,” “Monitoring Progress,” and “Reducing Impervious Surfaces” while “Tree Care and Protection”, “Plans and Goals”, “Emergency Response”, and “Integration” all had room for improvement. Best practices the city follows under “Implementation Capacity” include having a certified arborist on staff who supports the day-to-day operations of the urban forest and an active Tree Board that supports tree planting, grant writing, pest monitoring and other urban forest management. The city requires a public tree removal permit for all public trees (“Monitoring Progress”) to limit any unnecessary tree removals.



Summary scores for city codes and policies within each category. The city scored best in ‘Implementation Capacity’, ‘Monitoring Progress’ and ‘Reducing Impervious Surfaces’ but had room for improvement in ‘Tree Care and Protection’, ‘Plans and Goals’, ‘Emergency Response’ and ‘Integration’

Managing an urban forest is divided into public property and private property. Your measures don't recognize that distinction. A municipality has to concentrate on public trees first.								
MONITORING PROGRESS Knowing the urban canopy coverage is the first step in determining whether the canopy is providing the maximum possible ecosystem services. Keeping track of that urban canopy over time is imperative for tracking urban tree canopy goals and seeing trends in the status of the urban tree canopy.								
	Feature	Present?	Municipality Comments	Reviewer Comments	Source	What to Look For	Score	Potential Score
State of the Trees								
	Is data gathered about current health and structure of publicly owned trees?	No		The workshop attendees certainly know the general age of trees, and species dynamic, but there doesn't appear to be any public dataset	City Staff Comment	Data gathering and analysis inform decision making. For example, if field surveys show a predominance of aging trees, decisions are made to replace aging trees with new plantings. Doing so minimizes risk from falling limbs and allows new canopy trees to replace older, larger canopy trees before they are lost to age or disease. Guided by data and planning, many urban forest emergencies can be avoided. Municipalities gathering data (such as tree age, tree health, tree location, maintenance performed on trees etc.) about urban trees score two points.	0	3
	How often is data collected about overall urban forest canopy? What are the methods used to collect the data?	In Progress		We've just made this deliverable, and the locality will likely use it to inform decisions	In-Person Meeting (5/19)	Use methods (such as municipality-wide urban tree mapping, detailed statistical sampling, and complete tree inventories) to facilitate urban forestry related decision making. Update urban forestry data every four years to see and track changes. Be sure to include the results of the data collection in an Urban Forest Management Plan. Municipalities performing urban tree canopy analyses and using data to inform decision making score two points.	0	2
	Are permits required to remove trees on public property?	Yes		On private lands, tree permits are required upon site design/new development only, not at any other time. For public lands/ROWs, the removal of any tree on City ROW, not classified by an immediate threat, requires the approval of the City of Tifton Tree Board.	Municipalcode 4.08.07 - FAQs - https://www.tifton.net/tifan.aspx?cid=70	Require a permits to remove significant trees (typically 18" DBH and greater) in all districts. Municipalities where permits are required to remove significant trees in all public districts score two points.	2	2
	Are permits required to remove trees on private property?	No		See above	Municipalcode 4.08.07 - FAQs - https://www.tifton.net/tifan.aspx?cid=70	Require a permits to remove significant trees (typically 18" DBH and greater) on private property. Municipalities where permits are required to remove significant trees on private property score two points.	0	2

A snapshot of the types of questions or sections of code evaluated.

Recommendations

Tree Care and Protection

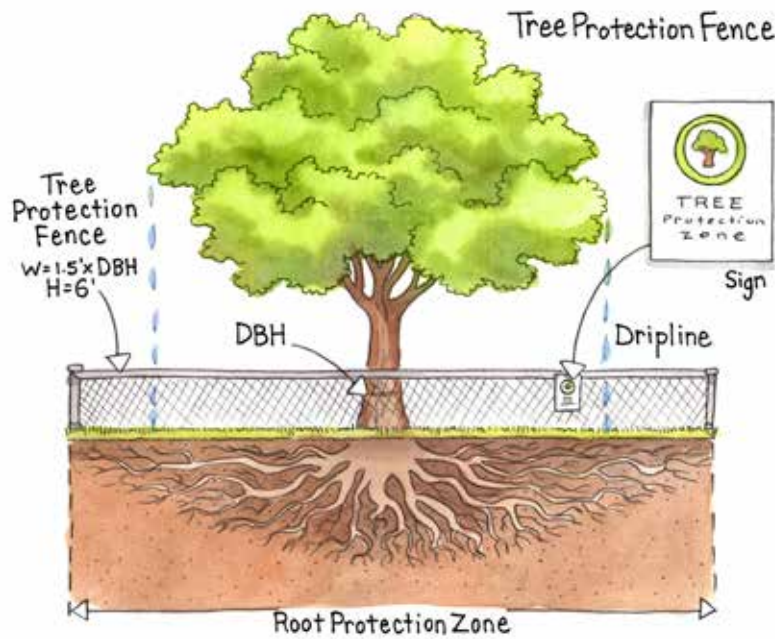
The city’s tree canopy would benefit from strengthened tree protection requirements. Currently tree protection only applies to public trees. The city should expand tree protections to include trees on private property. The urban forest is part of the greater community fabric and as such the impacts of tree loss on private property impact the entire city. The city could limit tree protection on private property to only include significant trees (16 inches DBH or greater) or another standard for tree size found on site. Updating the tree ordinance to include private trees can minimize the loss of trees during the development process. In situations where trees must be removed to accommodate the development, the city should require replacement of those trees elsewhere on site or the developer to pay a fee into a tree mitigation fund in-lieu of planting. Establishing a tree mitigation fund that allows funds to be used to plant trees on public and private property will give greater flexibility to plant trees where they are most needed. The tree replacement fee should be strong enough to discourage widespread tree removal on a site.



Requiring tree protection on private property for trees of a certain size during new or redevelopment can help reduce canopy loss in the community.

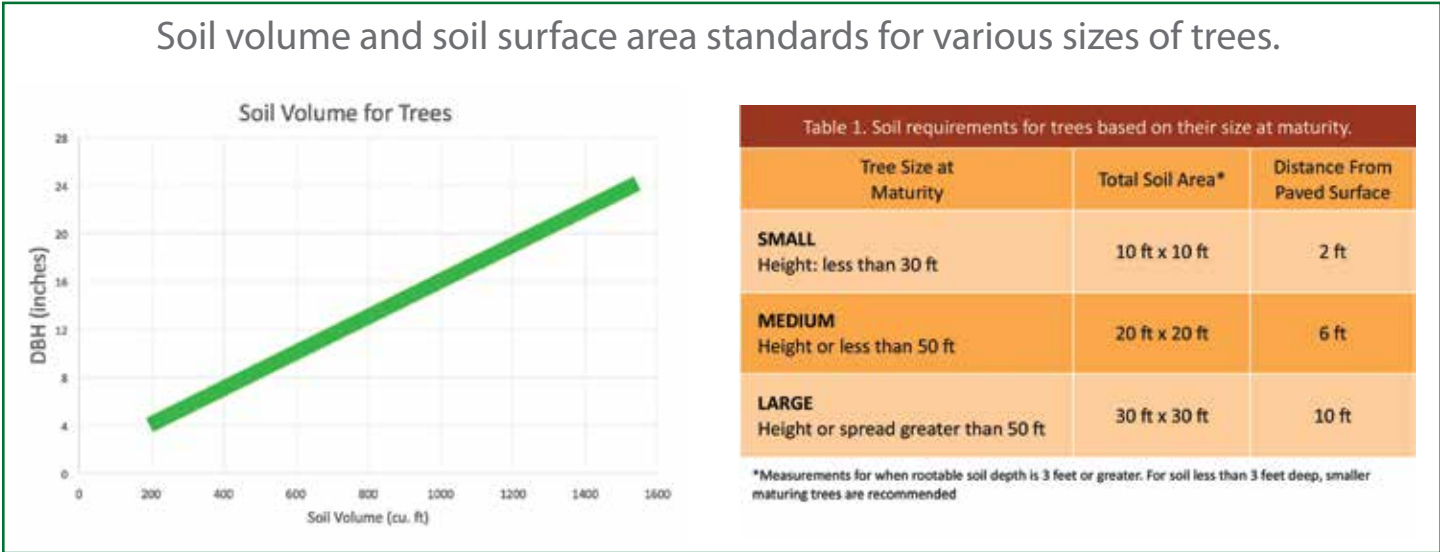
The city should consider increasing the distance of the tree protection zone where fencing is installed from the dripline to the Critical Root Zone (CRZ). Many municipalities require that tree protection fences be placed at the dripline. While protection at the dripline is an accepted practice, it does not adequately protect the roots. The Critical Root Zone (CRZ) is the zone where small roots at the radial extents of the tree root area uptake water and absorb nutrients. Protection of these roots is important for the optimal health of a tree. To protect the CRZ, the city should require placement of tree protection fencing at a distance 1.5' times the tree's diameter at breast height (DBH) from the tree. For example, a 20-inch DBH tree would need its CRZ protected out to a distance of 30-feet while a 10-inch DBH tree would need its CRZ protected out to a distance of 15-feet. Currently, the tree protection zone radius is a maximum of 20 feet from the trunk of the tree regardless of tree size, whereas this formula adequately sizes protection of the CRZ based on the size of the tree.

The ordinance should also include detailed standards for what constitutes tree protection mechanisms. The most common form of tree protection is tree fencing. It is a physical barrier that keeps people and machines out of a tree's critical root zone during construction. However, some municipalities only require plastic orange fencing and wooden stakes. This type of fencing can be removed or trampled easily and reduces protection effectiveness. Without effective barriers, even trees designated to be saved may suffer development impacts such as root compaction and trunk damage. The city should require sturdy metal chain link fencing in high-risk areas (e.g., near heavy construction equipment and active site grading) and use orange plastic fencing in lower risk areas (e.g. along the tree line at the edge of a development property).



Tree Protection Fence and Signage

The city currently does not require tree protection signage. Tree protection signage communicates how work crews should follow tree protection requirements. It also informs construction crews and citizens about the consequences of violating city code. Construction crew members may not understand that building materials may not be placed in tree protection zones and that moving the protective fencing around the tree is never permitted. The city should design a standard tree protection sign which summarizes the dos and don'ts of working near and around tree protection zones. Additional training may be helpful to ensure that developers comply with the city's tree ordinances and understand how to protect trees during construction. If the work crews are of different nationalities, consider signage that has multi-lingual instructions.



Trenching for utilities severs tree roots and destabilizes trees. The city could require boring or tunneling for utility installation instead.

Other examples of best management practices for tree protection include requiring the severing of roots of nearby trees before tree removals, requiring thick mulching (no more than 4-5") or matting to protect roots if heavy equipment is to be driven in the critical root zone, encouraging (or requiring) boring versus trenching for utilities, and irrigating protected trees during construction in periods of drought.

In urban environments, many trees do not survive to their full potential life span. Limited planting space, insufficient soil volume and lack of watering stresses trees, stunting their growth and reducing their lifespans. For every 100 street trees planted, only 50 will survive 13-20 years (Roman et al 2014). Establishing adequate tree well sizing standards is a critical factor in promoting a healthy urban forest.

To encourage proper planning, planting and design for trees on sites, the city should designate root soil volume and soil surface area standards. Tree roots need adequate soil volume and surface area to absorb water and promote gas exchange for healthy root growth. At a minimum, large canopy trees require 1000 cubic feet of soil volume to thrive. During storms, the most critical factor for the ability of a tree to withstand hurricane force winds is adequate soil volumes to allow for proper tree anchorage into the ground and reduce the risk of falling over (Duryea 2007). The following table provides recommended soil volume and soil surface area standards for healthy tree growth and resistance to wind. In areas where space is tight or where heavy uses occur above, underground tree support cells can be used to stabilize and direct tree roots towards areas with less conflicts (e.g., away from pipes).

These and other practices, implemented to provide long term care, protection and best planting practices for the urban forest, will ensure that investments in city trees will pay dividends for reducing stormwater runoff, as well as cleaner air and water, lower energy bills, higher property values and natural beauty long into the future.

Plans and Goals

The canopy data, assessments and strategic planning from this project can all inform the directions and goals of the urban forestry program going forward. The city now has clear and concrete goals and strategies for implementation and data that can be used as a baseline for future monitoring and assessments to track changes over time. These data can be integrated into other areas of planning within the city, such as in the Natural Resources chapter of the Comprehensive Plan, the Hazard Mitigation Plan, Parks Master Plans, Sustainability Plans, etc.

Emergency Response

The city proactively manages the community forest for natural disasters. The city has identified critical routes for debris clearing and response and this is coordinated between the Emergency Operations Center (EOC) and local emergency personnel. The city also has standing contracts for debris cleanup and removal services in place in case of a natural disaster. This allows the city to respond more quickly and deploy resources more effectively post-disaster.

An area for improvement includes the city integrating trees and other green infrastructure practices in their next Hazard Mitigation Plan update. The Hazard Mitigation Plan is a required plan by the Federal Emergency Management Agency (FEMA) and details mitigation measures a community is taking to minimize health and safety risk and property damage to the community from natural disasters. The actions identified in the plan are eligible for FEMA's hazard mitigation grants. Including trees and other green infrastructure practices as mitigation measures, creates funding opportunities for the city to plant more trees to mitigate stormwater, urban heat island and climate change.

The city has a designated site for staging woody debris, but further analysis can be done to estimate how much debris could be generated from various categories of storms. The Army Corp of Engineers has a formula to estimate storm debris and to approximate the necessary size of a debris management site. More information on estimating debris management sites can be found at GIC's storm planning website: <https://gicinc.org/projects/resiliency/storm-mitigation-planning/>

Another area of improvement is establishing an annual program to assess tree risk for public trees. With a tree inventory, the city can develop a risk management program for public trees and mitigate potential impacts from natural disasters such as tropical storms. The city could apply for

funding from the Georgia Forestry Commission for a tree risk assessment contract for city trees, or a subset of city trees. An annual Level-1 tree risk assessment, also known as a windshield survey, is a simple and relatively quick way to assess trees for potential risk. This type of survey can help the city track trees with potential hazards and follow-up with a more detailed assessment and mitigation through pruning or removal.



Integration

Recommendations under “Integration” include incorporating urban forestry data (canopy data, tree inventory) throughout city departments and systems. Integrating this data also allows for various city staff to use and incorporate the data into their work such as planning staff who can use the data in daily and long-range planning. For example, staff can use this data to more strategically target plantings in neighborhoods with the greatest need or most extreme heat. In addition, by making the canopy data available online, the city can provide information to the public about this important natural asset.

Other recommendations are the integration of trees more fully into the city’s stormwater management system. The city allows forested natural areas to count in stormwater management on site, but it should also allow individual trees to be credited for stormwater management. In addition, the city should consider a stormwater utility fee to help fund more tree planting efforts in the city and construct more built green infrastructure into the rights-of-way such as bioswales.

Planning Process and Community Engagement Steering Committee

The first step in the planning process was to develop a steering committee of city staff and Tree Board members to provide their knowledge and expertise when reviewing data, maps and tools. The steering committee participated in a series of six workshops each focused on a different area of analysis presented in this report. Using final land cover, Potential Planting Areas (PPA) data and each of the analyses, the steering committee created a list of proposed strategies and a proposed canopy goal. The proposed goal and strategies along with a summary of the results from the canopy study and codes audit were presented to the general public at an open house in January of 2024. The open house was an opportunity for the public to learn about the study and vote on the proposed goals and strategies developed by the steering committee. The voting results were reported to the steering committee which influenced the final strategies chosen. The committee also decided which strategies and actions would use dedicated implementation funds from the Georgia Forestry Commission. The city is in the process of finalizing agreements with the Georgia Forestry Commission to use the funds to proactively remove water oak trees that are in decline along city rights-of-ways and replace them with better-suited species. The city also plans to use its implementation funds to support tree care, maintenance, and establishment of several hundred trees planted in February of 2024.



Tifton city staff and tree board members attended a series of in-person and virtual workshops to review maps and data and propose goals and strategies for the city’s tree canopy.



The Tifton community attended an open house on January 24, 2024 to review maps, vote on their favorite strategies and learn more about the city’s tree canopy.

Public Open House and Input

The Green Infrastructure Center held an open house on January 24, 2024 at Tifton City Hall to share maps and findings from the canopy study with the public. GIC also presented the city’s proposed canopy goal and strategies for increasing canopy or reducing its loss. Twenty-two members of the community showed up to learn more about the tree canopy and vote on the city’s proposed strategies..

The Top Five Strategies

Voted Highest by the Public
(in order of most votes)

- Require more trees in the development code for parking lot designs. (13 votes)
- Apply for funds to bury electrical lines and install tree wells to increase resiliency. (12 votes)
- Require tree replacement when protected trees are removed during development. (11 votes)
- Identify overly paved sites and remove impervious surfaces to allow for more space for planting trees. (9 votes)
- Plant more trees at various sites around the community. (8 votes)



Informing Other Existing Planning Efforts With Tifton

Community forest planning has roots in existing planning efforts in the city. The following plans highlight previous community input for managing the community forest resource or are policies, programs or goals that align with many of the strategies and recommendations found within this document. The data from this study and many of the strategy ideas developed during this project can inform other planning efforts in the city and identify ways to accomplish many of these stated goals. The integration of canopy data and planning of the city’s green infrastructure will make other types of planning more successful by achieving multiple benefits and goals. For example, the city’s comprehensive plan identifies greenways, complete streets and connectivity as major themes, which would benefit from including trees. The city should consider adding trees and green infrastructure to its next Hazard Mitigation Plan update. Trees and green infrastructure will help make the city more resilient to future hazards and natural disasters, which are becoming more frequent and severe. Many of the city’s strategies listed in this document along with additional recommendations by GIC will increase storm readiness and open funding opportunities, such as FEMA’s Building Resilient Infrastructure and Communities (BRIC) program to pay for the necessary work.



Fulwood Park is a green gem in the heart of the city, but much of its canopy is mature with few replacement trees planted. The city wants to plant more trees to sustain the canopy cover that makes this park one of the shadiest and coolest areas of the city.

Tifton’s Comprehensive Plan, 2023—2028

Natural Resources

Goal 1: Promote energy efficiency and protect environmental and open space resources.

Policy 1.3: Provide protection for green spaces through text amendments to the Zoning Ordinance and through a strong, working Character Area Map.

Cultural Resources

Goal 2: Recognize and foster the history, connection, and value of cultural resources, including the arts, festivals, local museums and historic preservation.

Policy 2.1: Support the continued implementation of the Tift Area Greenway Plan to conserve available natural areas and abandoned railways for greenway trails and environmental protection.

Policy 2.2: Program more funding for all local parks to include improvements to facilities, maintenance of landscapes, and provision of enhanced security.

Policy 2.3: Re-landscape Fulwood Park, expand its play equipment for children and provide for its continued future maintenance.

Policy 2.7: Continue supporting programs for the protection, preservation, and appropriate use of historically significant buildings, structures, sites, and landscapes throughout Tifton.



Development Patterns - Land Use & Transportation
Goal 5: Adopt land-use patterns that occur in a manner which protect neighborhoods, community resources, and promote efficient use of infrastructure and transportation facilities.

Policy 5.6: Encourage the use of the Complete Streets concept throughout Tifton to improve safety and usability of all modes of transportation throughout the City.

Policy 5.8: Support the efforts of the Tift Area Greenway Association in the development of a greenway on the old abandoned railway corridor and other greenways in the City as appropriate.

Policy 5.9: Encourage participation in the Safe Routes to School program including conducting school safety studies and school crash reports.

Policy 5.10: Conduct a study for feasibility and development of sidewalk and bicycle connectivity between the UGA and ABAC campuses and Downtown Tifton.

Community Facilities and Services

Goal 6: Ensure the provision of infrastructure, community facilities, and public services which support efficient growth and development patterns.

Policy 6.7: Encourage the creation and improvement of parks and recreation areas that promote fitness and outdoor social gatherings, along with bike routes that connect to these areas.



Suwannee-Satilla Regional Water Plan 2017

The following goals and objectives from the city adopted Suwannee-Satilla Regional Water Plan can benefit from tree planting, urban forest management and built green infrastructure include:

- 8. Protect, maintain, and where appropriate and practicable, identify opportunities to enhance water quality and river base flows.
- 9. Protect and maintain regional water-dependent recreational opportunities.
- 10. Identify opportunities to manage stormwater to improve water quality and quantity.
- 11. Identify and implement cost-effective water management strategies.

Specifically, the plan discusses nonpoint source pollution and how best management practices from the forestry (urban) sector can contribute. Tree plantings are an excellent Best Management Practice strategy for improving water quality and reducing surface runoff by capturing and filtering pollutants before reaching local waterways.

- Data collection to confirm source of pollutants and causes; encourage storm water ordinances, septic system maintenance, and coordinated planning
- Ensure funding and support for Best Management Practices Programs by local and state programs, including urban/suburban, rural, forestry, and agricultural Best Management Practices



Strategies and Recommendations

The strategies in this plan were developed in workshops with the technical advisory committee and voted on by community members. GIC made additional recommendations. All strategies and recommendations are based on the land cover and ecosystem service modeling, analysis of the tree canopy and potential planting areas and the codes, ordinances and policy review.

Following are the top strategies and recommendations to improve tree canopy cover in Tifton listed in priority order.



Palm trees are not ideal if the goal is to cast shade over this parking lot. This parking lot island has room to plant two large shade canopy trees. Updating development standards to require adequately sized tree islands for large shade canopy trees, and requiring more trees in the overall design can help mitigate issues such as urban heat.

1

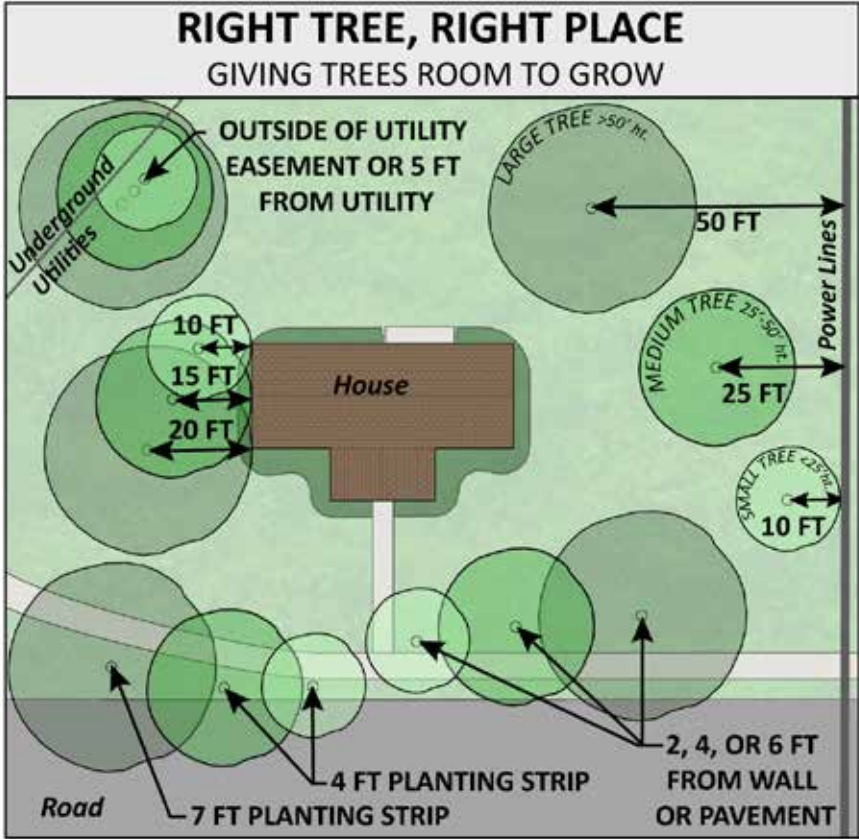
Require more trees in the development code for parking lot designs.

The development code for parking lot designs could be improved to reduce impervious surfaces created through large developments. Ways to achieve better parking lot designs is to set parking space maximums rather than minimums to discourage too much parking on site. Another design practice is to encourage pervious surfaces in areas that need to function and double as spillover parking. Increasing the amount of landscaping and the number of tree islands per number of parking spaces and requiring large canopy trees will cast more shade, cool down these surfaces, extend the life of the pavement and help capture more stormwater runoff. If tree islands are recessed with curb cutouts, they can act as mini stormwater basins, catching surface runoff and irrigating the trees.

2

Apply for funds to bury electrical lines and install tree wells to increase resiliency.

Burying overhead utility lines is expensive but may be worth the investment to protect the electric grid from exposure to storms and other natural disasters. The burying of lines is a disruptive process requiring the excavation and trenching of the streetscape. Since this installation is already tearing up the road bed, the city can couple this construction with installing tree wells with adequate soil volume for healthy tree growth. Trees capture rain and stormwater runoff with some wells acting as a storage facility for surface runoff. Burying overhead utility lines coupled with creating tree wells to store stormwater would increase community resiliency by limiting disruptions in the grid and reducing storm flooding.



3

Require tree replacement when protected trees are removed during development.

The city does not currently have requirements for replacing protected trees that are removed or die during development. By requiring tree replacement, the city can minimize overall canopy loss. In general, the replacement requirement should be high enough to discourage removal of protected trees. Many communities require an inch-to-inch replacement value. For example, a 20-inch Diameter at Breast Height (DBH) tree that is removed should be replaced with 10, 2-inch caliper replacement trees. This will allow the site to recover and even increase the canopy post-development over the next 10-20 years. If the site cannot accommodate that many trees, then the developer can pay into a tree mitigation fund which the city can use to plant trees in other areas or use to host tree giveaways to get trees planted on private property in areas of the city in need of more canopy. The city has recently drafted an updated tree protection ordinance that is being reviewed by city staff and anticipated to come before the city council later this year that would increase protections, preservation and replacement of tree canopy in the city.

Tree giveaways are one of the most popular and cost-effective ways to get trees planted on private property and educate the public.

4

Identify overly paved sites and remove impervious surfaces to allow for more space for planting trees.

In addition to amending the code to retain and promote healthy tree growth into the future, the city should pilot retrofits with green infrastructure practices. One focus area should be the Downtown Development Authority (DDA). This district has a relatively high rate of impervious surfaces and low canopy (29%) compared to the citywide average (39%). This is also a very visible area of the community with many shops, restaurants, parks and municipal buildings. Demonstration projects that mitigate stormwater impacts, help cool the district and increase the aesthetics can motivate the public to demand more of this type of infrastructure within their community. Install signage for stormwater infrastructure demonstration projects to educate residents and the general public.



5

Prioritize low-canopy neighborhoods for hosting public tree giveaways.

Prioritizing low-canopied neighborhoods for tree giveaways will jumpstart the replacement of canopy in areas that need it most. Tree giveaways are one of the most popular and cost-effective ways to get trees planted on private property and provide an opportunity to educate the public on proper tree planting, care and maintenance. The city can start by giving away a small number of trees, and expand as the community gains interest in this type of programming. The city should work with community partners such as the Tree Board, Master Gardeners or other groups to support the planning of the event and day of logistics. Tree giveaways are also a way for the city to prioritize specific species or native trees in the giveaway, influencing over time the composition of the urban forest, even on private property. Since the majority of the city's land base is in private property ownership, private residents are instrumental in the effort to maintain or increase canopy in the community. Residents who voluntarily plant trees on their properties are contributing to the greater good of the community through stormwater management, reduced urban heat island, improved air quality and public health, and wildlife habitat.



Residential properties play a key role in the stewardship of the urban forest by planting and caring for new trees.

6

Plant trees and educate students at Tift County schools and universities.

Establishing the next generation of tree stewards in the community is key for the long-term sustainability and management of Tifton's urban forest. A friendly and competitive tree planting competition between schools or among homerooms in a single school can generate enthusiasm and interest among youth in the city's community forest. Many high schools require community service hours as a part of graduation requirements and tree planting and stewardship can be an excellent way for students to give back to their community and create a legacy at their school. The city can also leverage its partnership with the University of Georgia (UGA) to engage college students and faculty in tree planting, stewardship and monitoring of the urban forest. Several UGA faculty members are also Tifton Tree Board members and can help bridge the connections between building capacity for the city's urban forest program and the natural resources and agricultural sciences students at the university.



Partnering with teachers, students and parents can increase tree plantings at schools and engage the broader community in maintaining the city's tree canopy.

7

Plant trees at Tifton public housing authority community properties.

Generally speaking, public housing authority properties lack adequate tree canopy and landscaping is mostly lawn or turf grass. These properties are often quite large with significant Potential Planting Areas (PPA) to them. The city recently secured funding under the GA ReLeaf grant funding program to plant 154 trees, some of them on public housing authority properties. Continued partnership with the housing authority, the city and community partners can increase tree canopy for residents most in need who cannot afford or have the ability to plant more trees around their homes.



Through efforts by the tree board, the city received a tree planting grant to plant trees at Tifton Housing Authority properties.

8

Plant trees around retention ponds in places where it still provides access for maintenance.

Too often trees are not planted or integrated into the design of other stormwater best management practices (BMPs). These sites, commonly detention basins or dry ponds are only planted with grass or occasionally shrubby vegetation leaving valuable real estate to plant a tree. Trees can complement these facilities if properly sited by capturing and absorbing stormwater. Trees should be placed within the facility where they do not impede access for maintenance and should not be planted on the sides of the basin or too close to the "risers", the structures that prevent overflow of the facility and need to be kept clear of debris and material for proper drainage.

Additional GIC Recommendations

■ Establish a stormwater utility fee.

The management of stormwater facilities and infrastructure needs to be sustainably funded over the long-term. Having a dedicated fee that residents and businesses pay into annually can support the necessary investments in green infrastructure. It can also incentivize residents, developers and property owners to incorporate green infrastructure best management practices into new projects, or through retrofits. Allow developers and property owners to use tree plantings to offset the amount of the fee. Ensure that a portion of utility fee revenues are used to support public tree plantings.

9

Add incentives in the development code to reduce imperviousness.

Trees are an important part of the city's infrastructure and need to be planned for in future developments, particularly in land uses with a lot of impervious surfaces such as commercial and office zones. City staff should amend the landscape ordinance to require a greater number of trees through wider buffers and/or minimum pervious surface requirements. The city's code can be amended to incentivize retention of mature trees for meeting stormwater requirements. Large mature trees provide greater and more immediate ecosystem service benefits than newly planted trees used for mitigation. Other types of incentives include faster permitting for preserved trees or patches of forest or for meeting stricter caps on impervious surfaces.



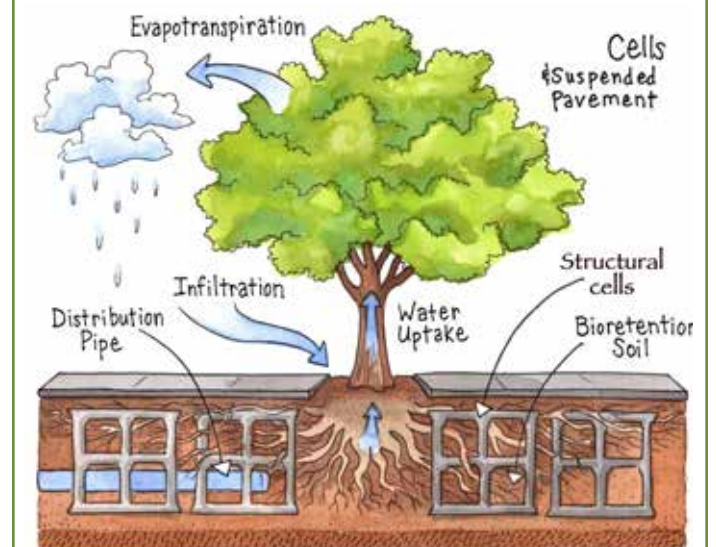
For tree plantings such as this one in the historic downtown district where the tree well is too small, the city can install structural cells that provide more soil volume for larger and healthier trees while allowing for high traffic volume.

Additional GIC Recommendations

■ Require and enforce 600, 1,000, and 1,500 cubic feet soil volume planting requirements for small, medium, and large trees respectively.

At a minimum, canopy trees require 1,000 cubic feet of soil volume to thrive, as recommended by the Environmental Protection Agency (Stormwater to Street Trees, 2013). Soil volume allows for adequate room for root growth which will help keep the tree healthier for longer, further extending the investment of green infrastructure. Greater soil volume and soil areas will also decrease a tree's risk of failure during a storm by providing adequate area for root anchoring. When planting sites are narrow or surrounded by impervious surfaces then municipalities can consider structural cells which provide the support and hard surface needs for high trafficked areas, but also provide the adequate soil volume needed for healthy tree growth. These structural cells can also function, depending on the design, as a way to capture stormwater runoff and irrigate the tree.

Structural Cells and Suspended Pavement



Structural Cells and Suspended Pavement are techniques to integrate trees in highly impervious areas.

Many communities establish a tree donation fund that residents can voluntarily contribute money for new tree plantings. These types of funds are often structured as memorial funds or honorariums that connect a gift to the memory of a loved one. This type of fund can provide additional resources for new tree plantings in the community and a great way to connect the past to the present and future as the legacy of these memorials live on in the community.



Additional GIC Recommendations for Tifton

■ Educate the public on tree removals, risks of tree hazards and the importance of proper tree placement, tree care and pruning to reduce tree loss.

The public should be made aware that proper maintenance and care of existing trees can significantly reduce risk of failure during storms. While risk can never be zero there are best practices that can reduce overall risk. Another important educational component is sharing information on “Right Tree, Right Place”. Include infographics with social media posts, tree giveaways, and planting brochures to aid in proper siting and planting of trees on private property, particularly as it relates to plantings in or near the rights-of-way (ROWs). Proper placement will result in fewer conflicts with other infrastructure such as overhead utilities and can give adequate soil volume to the tree which will make it more resilient during wind-driven storms.

■ Create a webpage on the city’s website with resources and links about trees and the community forest.

A dedicated centralized webpage about the Tifton’s tree canopy can host important educational material and links for the public to access information and resources on tree care, placement, and municipal tree programs. The city could eventually create a story map of its tree canopy data to allow residents access to see where the canopy is and lacking in the community.

■ Update the tree protection ordinance to include protecting trees on private property and require tree mitigation when significant trees must be removed to accommodate development.

Trees are part of the city’s infrastructure and impact both public and private properties alike. By increasing the protection of trees on private property, the city can conserve and minimize tree canopy loss over time. Tree mitigation fees or penalties should be strong enough to limit the wholesale clearing of trees on a site, but not so punitive to limit necessary development. A tree mitigation fund should also be flexible to allow for tree plantings on both public and private property.

Additional GIC Recommendations for Tifton *(Continued)*

■ Continue the integration of planning for trees in all planning and pre-development activities.

Holding pre-development conferences before sites are designed allows for creative solutions for tree conservation to be considered before extensive funds are spent on site planning. Explorations can also include calculating potential stormwater impacts from tree removal or planting.

■ Collect public tree inventory data and integrate it into asset management systems.

The city should collect tree inventory data on all public trees to support additional urban forest management. Tree inventories collect biometric data (species, size, location, condition, etc.) that can undergo further analysis and tell a more complete picture of the state of the city’s urban forest. For example, tree inventory data can tell the city what percentage of the trees are composed of one or more species. It can also help the city understand how mature or old is the current public tree population. A tree inventory is also foundational to a tree risk management program and will support the routine scheduling and maintenance of publicly owned trees. Once the city finishes collecting a tree inventory for all public trees the data should be integrated into the city’s asset management tracking systems where other types of public infrastructure are tracked and managed. This will allow the city to track and monitor its assets for tree locations, condition and maintenance needs as further work is conducted over time. These records are critical for securing future FEMA reimbursement to replace trees under its Public Assistance grants available after federally-declared disasters.

■ Develop an urban forest management plan for the city.

An urban forest management plan (UFMP) details the state of public trees, sets goals and outlines the process for managing the city’s tree canopy. It is used to proactively manage the city’s canopy and achieve long term benefits. A UFMP also informs budgeting for urban forest maintenance or tree planting. An urban forest management plan requires data to inform the goals, actions and benchmarks including canopy and tree inventory data. An urban forest management plan prioritizes maintenance needs for all public trees and estimates the resource needed. Then it develops a timeline for implementing the necessary maintenance. UFMPs are typically on a 5-year cycle and need updating



The city can do rapid tree risk assessments to flag trees for further evaluation that are within the public rights-of-way. Then follow-up to mitigate risk before the next storm.

as the work is completed or new challenges arise such as damage from storms. Once the city has collected its tree inventory data (at least a partial inventory) it can develop an urban forest management plan for its public trees and make sure that it is adequately funded to meet maintenance needs. A street tree planting plan can be an important component that informs an urban forest management plan.

■ Proactively conduct annual tree risk assessments on public trees in highly trafficked areas of the town.

Tree risk assessments can be used to determine and develop plans to mitigate tree risks, such as diseased limbs that may fall. This information is a great baseline dataset the city can use to develop a risk management program for city trees. In highly trafficked areas, a Level-1 assessment, also known as a windshield survey, should be done annually for all public trees. Implementing proactive tree risk assessments will reduce overall risks and potential losses. The city should develop a formalized tree risk assessment program to ensure this work is being done consistently every year

■ Conduct a land cover assessment every four to six years to compare tree canopy coverage changes over time.

Tree canopy coverage should be expanded and maintained to promote public health, walkability, water quality and groundwater recharge. Regular updates to land cover maps also track trends (losses or gains) in the canopy over time, monitoring and support adaptive management for prioritizing planting strategies. This will also be a useful measure to help the city track its progress and outcomes of its Trees Across Georgia (TAG) grant.

Conclusion

The community of Tifton has started to collect data for the management of its urban forest. These data (canopy data, codes audit) provide a variety of assessments that can inform actions and strategies moving forward. A tree inventory can support further decision-making around green infrastructure assets. Implementing these strategies and recommendations will benefit the local ecology by using native species (trees and other vegetation) to uptake and clean stormwater along with other ecosystem service benefits (air quality, urban heat island, etc.). It will also lower costs of tree cleanup after storms since proper pruning or removal of trees deemed to be at risk can be done before storms occur.

Tifton should use the canopy map and updates to track canopy change over time and prioritize increasing canopy by neighborhoods to restore lost canopy. The city can use the canopy data, analysis and recommendations and stormwater calculator tool to continue to create a safer, cleaner, cost-effective and more attractive environment for all.



Maintaining canopy at levels that promote public health, walkability, and clean water is vital for livability.



Next Steps

An urban forest management plan is another key plan the city should develop to ensure that it has detailed and actionable processes to care for and manage its trees. Grant funding is available from the Georgia Forestry Commission’s Urban and Community Forestry Program for such activities. A key aspect of urban forest management is integrating urban forestry within emergency response plans. This should be coordinated with the Georgia Emergency Management Agency and adjacent communities who share similar concerns about storm debris and removal or repurposing. Given the many benefits that trees provide, the city should plan for funding and replacement tree plantings following natural disasters. Codifying trees as green infrastructure to mitigate stormwater and erosion is a great first step to make them eligible for replacement under FEMA’s Public Assistance grants. Tree inventory data (location, species, trunk diameter, photo) the city collects will support the necessary documentation to claim a tree as eligible for reimbursement if lost or damaged by a federally-declared storm or other natural disaster. Including tree maintenance records and expenditures as part of the city’s asset management system will demonstrate the role trees play as critical green infrastructure.

Lastly, it is recommended that the city conduct a land cover assessment every four to six years to compare tree canopy change over time and track progress towards maintaining its 39% coverage goal. Maintaining canopy at levels that promote public health, walkability, and clean water is vital for livability and for meeting state water quality standards. Regular updates to land cover maps facilitate analysis and planning and allow for monitoring of canopy changes and adapting strategies if goals are not being met. These and other practices, implemented to provide long-term care, protection and best planting practices for the urban forest, will help ensure that investments in city trees will pay dividends for reducing stormwater runoff as well as clean air and water, lower energy bills, higher property values and natural beauty long into the future.



Appendixes

Appendix A: Potential Canopy Analysis Methods

This section provides technical documentation for the methodology used to create Potential Planting Spots (PPS) and Potential Canopy Area (PCA) scenarios for the city. This information can be used to gain knowledge about certain issues; for example: Where can trees be planted to increase canopy cover for specific neighborhoods or sites within the city? What can the city set as a goal to sustain or increase its tree canopy? The land cover data was provided by a third-party vendor and included three classes, tree canopy, pervious and impervious. Pervious land cover was only considered in this analysis for Potential Planting Spots (PPS).

Potential Planting Area Dataset

The Potential Planting Area dataset has three components. These three data layers are created using the landcover layer and relevant data in order to exclude unsuitable tree planting locations or where it would interfere with existing infrastructure.

- Potential Planting Area (PPA)
- Potential Planting Spots (PPS)
- Potential Canopy Area (PCA)

The Potential Planting Area (PPA) is created by selecting the landcover features that have space available for planting trees, then eliminating areas that would interfere with existing infrastructure.

Initial inclusion selected from GIS-created land cover pervious surfaces class.

Exclusion features applied:

- The pervious surfaces were buffered in 10 ft. from all impervious surfaces including buildings and roads.
- Playing fields (i.e.: baseball, soccer,

football) as well as golf courses, cemeteries, airports and other incompatible land uses were identified where visually possible. (Digitized by GIC)

- Power Line Corridors and Major Road Median exclusions were created by buffering their representative line data.
- Once this initial phase was completed, the Potential Planting Area data were reviewed by the city and manually edited to best represent city expectations of where planting was allowed (e.g., not on play fields). In addition, areas that were known to be planned for development were removed.

This additional work to exclude known areas that cannot be planted resulted in a more accurate and realistic calculation of plantable areas and the number of new trees that can be added.

Potential Planting Spots. The Potential Planting Spots (PPS) are created from the PPA. The potential planting areas (PPA) are run through a GIS model that selects spots a tree can be planted depending on the size tree's that are desired.

- Tree planting scenarios were based on a 20 ft. and 40 ft. mature tree canopy with a 30% overlap. Therefore, the planting spots are 16 ft. and 32 ft. apart respectively.

Potential Canopy Area. The Potential Canopy Area (PCA) is created from the PPS. The possible planting spots are given a buffer around each point that represents a tree's mature canopy. First, larger canopy trees are digitally added, followed by smaller trees in the remaining spaces. Planting spots were assigned a buffer of 10 or 20 ft. to result in 20 and 40 ft. tree canopy that overlaps by 30%. This reduces gaps that would be found at the corners of adjacent circles and reflects the reality that trees overhang and intermingle with adjacent trees.



NAIP Image 2021



Potential Planting Area (PPA)



Potential Planting Spots (PPS)



Potential Canopy Area (PCA)

Appendix B: Trees to Offset Stormwater Calculator

The trees and stormwater calculator (TSW) tool developed by GIC uses modified TR-55 curve numbers to calculate stormwater uptake for different land covers, since they are widely recognized and understood by stormwater engineers. A canopy interception factor is added to account for the role trees play in interception of rainfall based on location and planting condition (e.g., trees over pavement versus trees over a lawn or in a forest).

Cities usually use TR-55 curve numbers developed by the Natural Resources Conservation Service (NRCS) to generate expected runoff amounts. The modified TR55 curve numbers (CN) provided by GIC includes a factor for canopy interception. Cities can use the stormwater calculator tool for setting goals at the watershed scale for planting trees and for evaluating consequences of tree loss as it pertains to stormwater runoff. Curve numbers produced for this study can be utilized in the town's modeling and design reviews.

Tree canopy reduces the proportion of precipitation that becomes stream and surface flow, also known as water yield. A study by Hynicka and Divers (2016) modified the water yield equation of the NRCS model by adding a canopy interception term (Ci) to account for the role that canopy plays in capturing stormwater, resulting in:

$$R = \frac{(P - C_i - I_a)^2}{(P - C_i - I_a) + S}$$

Where **R** is runoff, **P** is precipitation, **I_a** is the initial abstraction (the fraction of the storm depth after which runoff begins), and **S** is the potential maximum retention after runoff begins for the subject land cover (**S = 1000/CN - 10**).

Major factors determining **CN** are:

- The hydrologic soil group (defined by surface infiltration rates and transmission rates of water through the soil profile, when thoroughly wetted)
- Land cover types



Tree over street



Trees over forest



Tree over lawn



Tree over parking lot

- Hydrologic condition – density of vegetative cover, surface texture, seasonal variations
- Treatment – design or management practices that affect runoff

This new approach allows for more detailed assessments of stormwater uptake based on the landscape conditions of the city's forests. It distinguishes whether the trees are within a forest, a lawn setting, a forested wetland or over pavement, such as streets or sidewalks because the conditions and the soils in which the tree is living affect the amount of water the tree can intercept and infiltrate.

The analysis can be used to create plans for where adding trees or better protecting them can reduce stormwater runoff impacts and improve water quality. This methodology was developed and tested in 13 communities in the south under a grant from the Southern Region of the USDA Forest Service. For more about the project, please visit: <https://gicinc.org/projects/resiliency/trees-and-stormwater/>

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