Strategic Tree Canopy Plan

SEPTEMBER 2026

The City of

Martinsville, Virginia

Plan by the Green Infrastructure Center Inc. for the City of Martinsville

Martinsville
A CITY WITHOUT LIMITS

Green Infrastructure Center

The Green Infrastructure Center Inc. completed this report, tree canopy analysis, and strategic planning process with grant funding provided by the U.S. Department of Agriculture (USDA) Forest Service and Department of Forestry. The mention of trade names, commercial products, services, or organizations does not imply endorsement by the U.S. Forest Service, Department of Forestry, or the City of Martinsville, Virginia.

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This plan is the result of the dedication and collaboration of the City of Martinsville Tree Board, Public Works and Community Development Departments, City Manager's Office, and City Council.

Prepared by the Green Infrastructure Center Inc.
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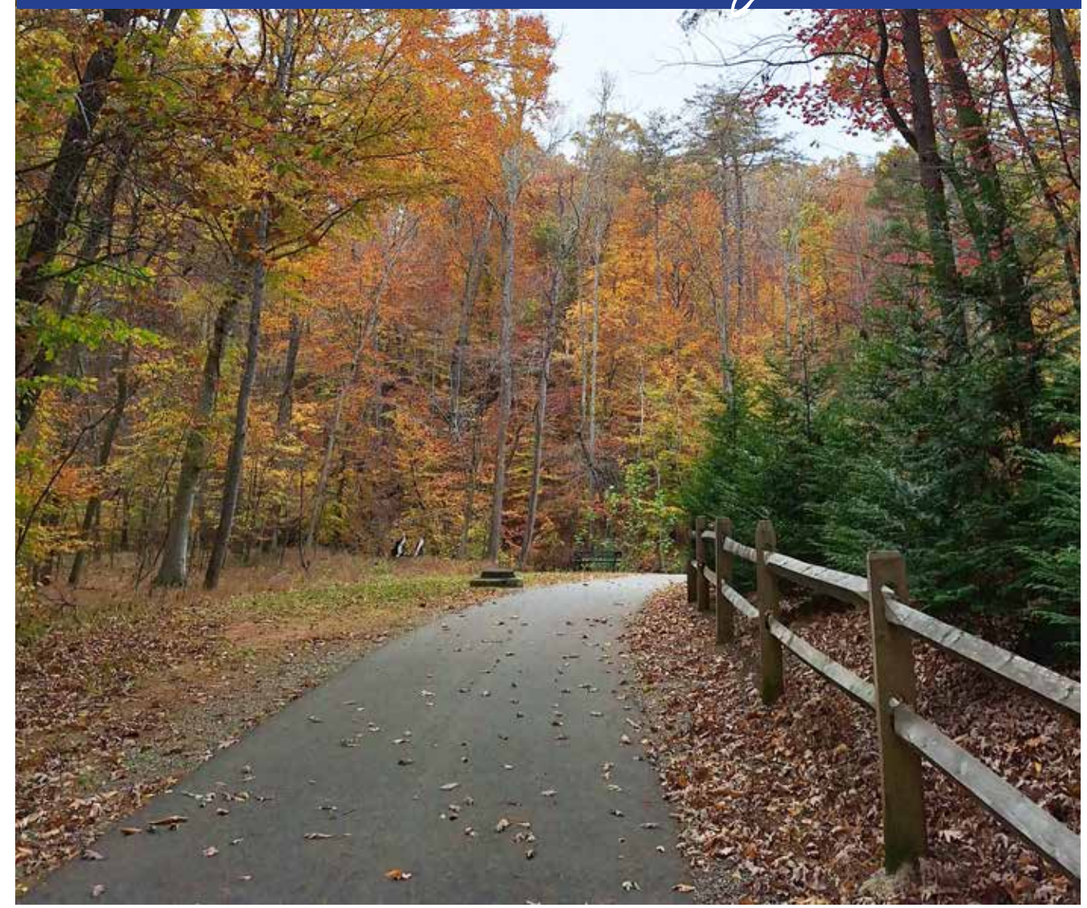

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Table of Contents

Executive Summary **4**
How Trees Benefit the City 4
Tree Canopy and Potential Planting Area 5

Introduction **6**

Tree Benefits **7**
Trees Are Green Infrastructure 7
Reducing Stormwater Runoff and Filtering Pollutants 8
Buffering Storm Damage with Green Infrastructure – Trees! 9
Improving Air Quality, Public Health, and Economic Values 10

Tree Canopy Analysis Methods **14**
Determining Plantable Acreage 14

Tree Canopy Analysis Maps and Findings **16**
Maps 17
City Land Cover 17
Tree Canopy and Potential Planting Areas 18
Public and Private Land 19
Existing Tree Canopy Coverage Along Streets 20
Potential Tree Canopy Coverage Along Streets 21
Tree Canopy Coverage by Park 22
Tree Canopy Coverage by School 24
Tree Canopy Coverage by Neighborhood 26

Tree Canopy Analysis Maps and Findings *(continued)*
Calculating Environmental Benefits 28
Stormwater Uptake 28
Tree Canopy Coverage by Watershed 29
Best Tree Canopy to Save for Stormwater Infiltration 30
Best Tree Planting Locations for Stormwater Infiltration 31
Air Quality 32
Urban Heat and Equity 33
Surface Temperature 34
Heat and Income Priority Tree Planting Locations 35

Planning and Engagement Process **36**
Advisory Committee 36
Community Partners 36
Public Engagement 37
Summary of Community Findings 37

Canopy Goal and Implementation Strategies **38**

Conclusion **42**

Appendixes **43**
Appendix A: Funding Opportunities 43
Appendix B: References 44
Appendix C: Community Feedback 46

Executive Summary

The urban forest is a critical asset for healthy, resilient, and sustainable cities. Trees provide benefits that directly support public health by cleaning the air, filtering and reducing stormwater runoff, reducing urban temperatures, and fostering greater economic development. However, these benefits are at risk because tree canopy cover is declining across many U.S. localities. This Strategic Tree Canopy Plan provides data and strategies for maintaining and restoring tree canopy in Martinsville.

This plan is the culmination of an 18-month planning process that included workshops and strategic planning sessions led by the Green Infrastructure Center Inc. (GIC) with City staff, City of Martinsville Tree Board, and community partners. The public was engaged in this process through outreach events, a Tree Celebration event, and conversations with community partners. The extent of urban forest cover was determined by analyzing aerial imagery to map the city's land cover. Open space was evaluated to determine the Potential Planting Area, where future trees might be planted, along with assessments of the environmental and social benefits the city's trees provide. Strategies for retaining, protecting, and restoring tree canopy coverage were created.

City Goal

The City of Martinsville currently has 55% tree canopy coverage city-wide. The City's goal is to increase tree canopy cover to 56%, a 1% increase, over the next 20 years. Tree plantings will be needed to not only increase tree canopy in new spaces, but also to replace trees removed due to pests, storms, development, invasive vines, or old age. The City will accomplish this goal by:

1. Expanding City capacity to manage Martinsville's urban forest.
2. Planting trees to increase tree canopy and to reduce the urban heat islands in areas of need.
3. Increasing public awareness of the importance and proper care of trees.
4. Reducing the presence of invasive species throughout the city.

As this is a new tree planting campaign, the first few years of planting are expected to be fewer. As the City's capacity and the urban forestry program expand, the number of trees planted each year can increase. To achieve Martinsville's goal, the tree planting campaign will be developed with support from local partner groups and the community.

How Trees Benefit the City

Tree canopy provides benefits such as cleaner air, urban cooling, stormwater capture, wildlife habitat, and natural beauty. This plan quantifies and identifies strategies to increase these benefits.

Air Quality

Trees sequester carbon and clean the air of particulate matter and ground-level ozone. Each year, Martinsville's trees remove:

- 4,047 metric tons of carbon
- 146,288 lbs. of ground-level ozone (O_3)
- 32,137 lbs. of airborne particulate matter

Urban Cooling

Excessive pavement and lack of shade create urban heat islands. Martinsville's trees counter urban heating by shading hot areas. Tree canopy cover lowers surface temperatures and cools the city.

Stormwater Uptake

Trees capture rainfall and filter pollutants. During a ten-year/24-hour rainfall event (5.22 inches) the City's trees:

- Soak up 36.9 million gallons of water
- Reduce runoff pollution loads for nitrogen by 30%, phosphorus by 35%, and sediment by 16%

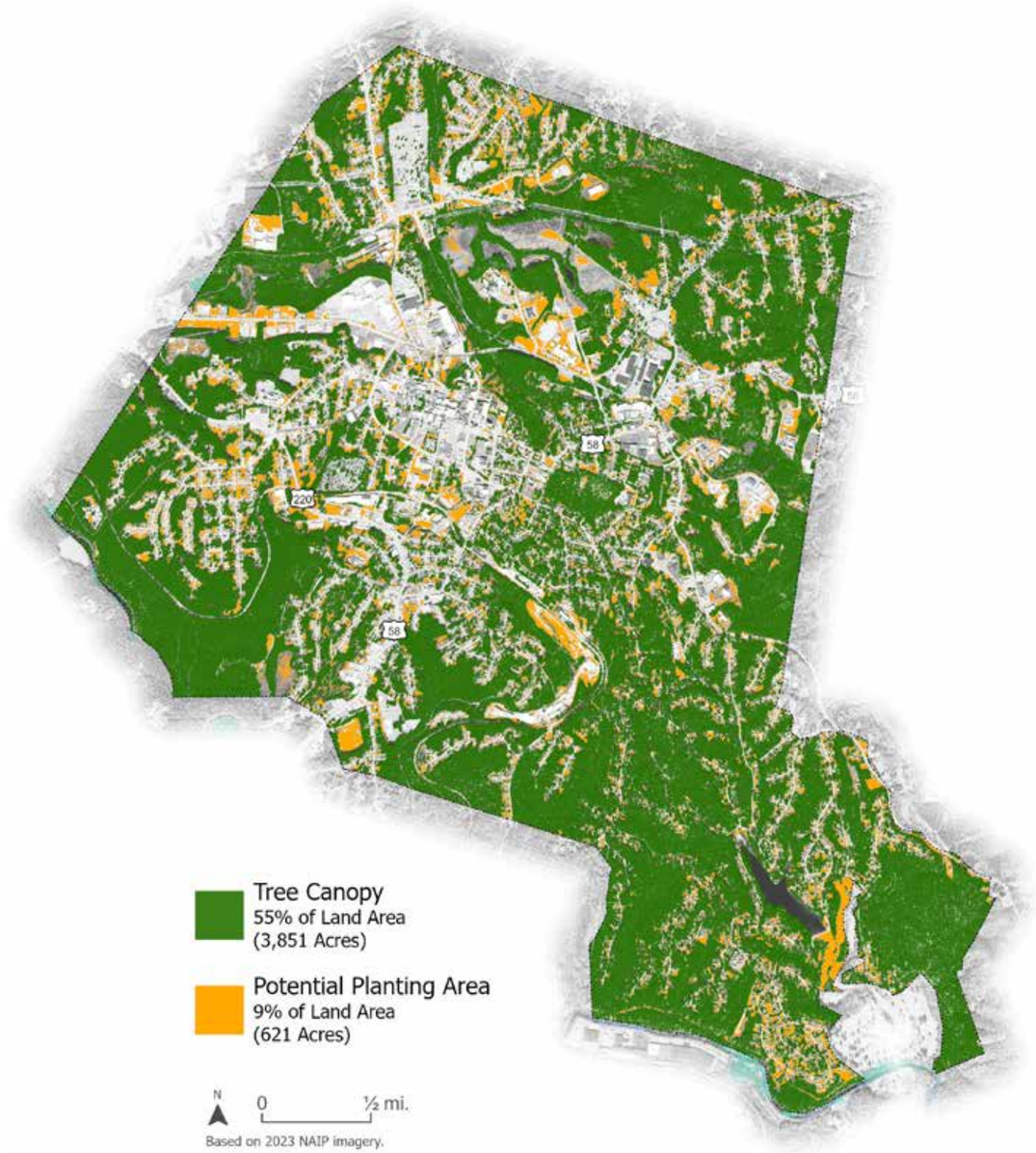
Canopy Goals

Martinsville's goal is to increase tree canopy coverage by one percent, from 55% to 56%, over the next 20 years. This goal requires each year to:

- Replacing trees lost.
- Planting ten trees on public property.
- Planting 164 trees on private property.

Tree Canopy and Potential Planting Area

The City of Martinsville now has baseline data to identify opportunities to plant new trees for shade, energy savings, increased stormwater uptake, and improved air and water quality.



Introduction

Before the founding of the City of Martinsville, the area was home to the Native American communities, including the Tutelo and Saura (also known as Cheraw) tribes, who lived on and stewarded the land. In 1773, Revolutionary War veteran General Joseph Martin established a settlement in the area. The community was later named Martinsville in his honor when it was incorporated in 1791 (Isom 2021).

As with most localities in Virginia, Martinsville's early economy revolved around the tobacco industry. As manufacturing technology advanced, Martinsville became well known for its furniture industry. The surrounding forests and water resources in the area allowed furniture manufacturing to prosper, with 75% of all furniture manufactured in Virginia being from Henry County and Martinsville (Blanton et al. 1998, 20). These natural resources helped drive industrial growth, create job opportunities, and contribute to population growth. With its forests and natural resources ingrained in its history, Martinsville has become an important location when learning about the nation's early history.

Today, Martinsville continues to benefit from a wealth of natural assets, including parks, forests, the Dick & Willie Passage Rail Trail, and streams. These resources provide social, economic, and ecological benefits to residents while contributing to the City's character and sense of place. By protecting and restoring its natural assets and embracing its local history, Martinsville can build on this strong foundation and support a healthy, resilient, and vibrant community for future generations.

This *Strategic Tree Canopy Plan* supports Martinsville Momentum, the City's Comprehensive Plan, by encouraging economic growth while conserving its natural assets and increasing climate resiliency through the preservation and expansion of the City's tree canopy. This plan calls for the conservation of existing trees and the planting of new trees to address urban heat islands, stormwater runoff, and air quality, which aligns with the following Comprehensive Plan objectives.

Martinsville Comprehensive Plan: Natural + Historic Resources Action Plan

Objective 3.1 NHR-2: "Amend the Zoning and Subdivision Ordinances to integrate green infrastructure principles and stronger protections for the City's existing tree canopy."

Objective 3.2 NHR-8: "Expand tree planting initiatives and explore other programs to reduce urban heat island areas throughout the City."

FAST FACTS

Martinsville

Population: 13,834 people*

40.5 % non-Hispanic Whites
45.1 % Black/African Americans
10 % Hispanic or Latino residents
1.1 % Asian

Total City Area: 11.01 sq. miles
Land Area: 10.95 sq. miles
Lakes & Ponds: 35 acres
Wetlands & Marshes: 7 acres
Streams: 24.8 miles
Tree Canopy: 3,851 acres
Potential Planting Area: 621 acres
Impervious Surfaces: 1,262 acres

(U.S. Census 2024 estimate)

The Martinsville-Henry County Heritage Center and Museum served as Henry County's courthouse for over 100 years before becoming a museum and cultural landmark for the city.

Tree Benefits

Trees benefit communities ecologically, economically, and socially. Some of the many benefits include:

- Cleaner air and water
- Enhanced natural beauty
- Bird and wildlife habitat
- Reduced city heat
- Reduced levels of crime
- Reduced traffic accidents
- Increased sales revenues in commercial areas
- Lower vacancy rates
- Lower energy costs
- Improved mental health and focus
- Improved metabolic function
- Increased access to outdoor fitness opportunities.

Trees Are Green Infrastructure

Trees and other vegetation serve as the City's "green infrastructure." Just as localities manage grey infrastructure (roads, sidewalks, bridges, and pipes), they should also manage vegetation as infrastructure. Trees support a vibrant, safe, and healthy community while adding to its historic character. They enhance sustainability by filtering stormwater and reducing runoff, cooling streets, cleaning the air, capturing carbon emissions, and reducing energy costs.

Large canopy trees provide greater benefits than smaller trees. The USDA Forest Service found that in 2025 dollars, a large tree is worth $7,411 in annual benefits while a small tree is worth just $450 (Center for Urban Forest Research and Southern Center for Urban Forestry Research & Information 2006).

Gray vs. Green

The image on the left shows the City of Martinsville's gray infrastructure, including buildings and roads. Classified high-resolution satellite imagery (*on the right*) adds the City's green infrastructure (trees and other vegetation). This green infrastructure provides cleaner air and water, energy savings, and natural beauty.

Reducing Stormwater Runoff and Filtering Pollutants

Trees protect communities from problems associated with stormwater runoff. As forested land is converted to impervious surfaces, such as roads, buildings and parking lots, urban stormwater runoff increases. Excess stormwater runoff can cause temperature spikes in receiving waters, increased pollution of surface and ground waters, and greater potential for flooding.

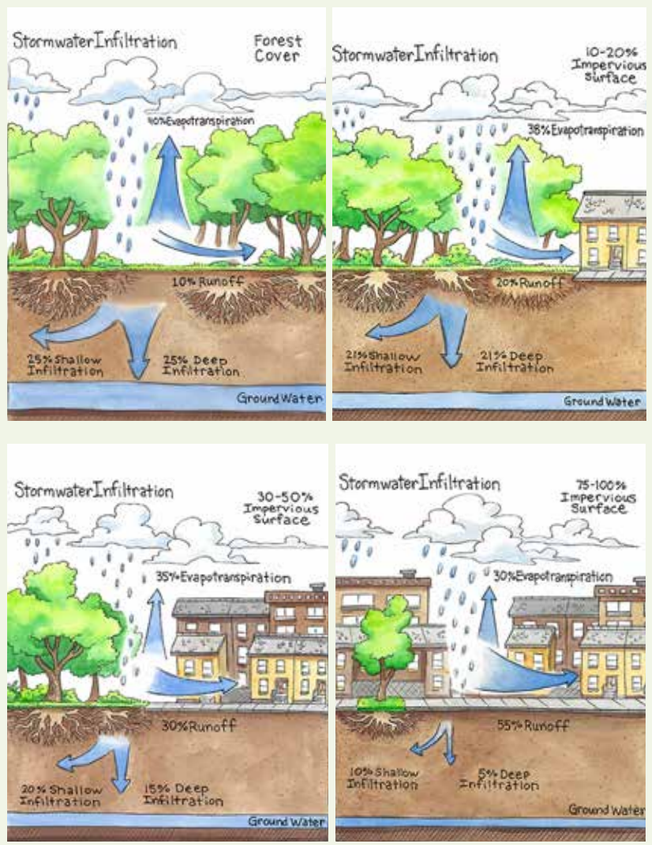
Trees reduce nitrogen, phosphorus, and sediment in stormwater by filtering runoff of these pollutants. Increased loads of nutrients in stormwater runoff reduce oxygen in surface water, causing harm to fish and other aquatic life. Nitrogen and phosphorus can cause harmful algal blooms, while sediment can clog fish gills, smother aquatic life, and necessitate additional dredging of canals and waterways. As tree cover is lost and impervious areas expand, the excessive urban runoff of these harmful pollutants greatly increases. The presence of trees means fewer pollutants enter the city's many watersheds, including the Smith River, Dan River, Roanoke River, and eventually the Albemarle Sound.

The average annual precipitation in Martinsville is 48.70 inches (National Weather Service 2026). Much of this runoff flows into a separated stormwater system transporting surface pollutants from the land to local waterways. Large paved areas contribute significant volumes to this runoff. While stormwater ponds and other best management practices (BMPs) are designed to mimic natural land cover rainfall release by detaining and filtering runoff, they do not fully replicate pre-development hydrology. In addition, older parts of the city may lack updated stormwater management practices required for new developments, so not all runoff is captured or treated before it flows into open waterways.

Since trees filter stormwater and reduce overall flows, planting or conserving trees is a natural, cost-effective way to mitigate stormwater. Each tree plays an important role in stormwater management. Based on the GIC's review of canopy rainfall interception studies, a typical street tree's crown can intercept between 760 and 4,000 gallons of water per year, depending on the tree's species and age.

Trees filter and clean stormwater runoff before it enters surface waters, ensuring healthy rivers and creeks for recreation and habitat.

Stormwater Infiltration Rates with Development



Runoff increases as land is developed.

Graphic adapted by GIC. Data Source: U.S. EPA Watershed Academy 2025.

Excess impervious areas cause hotter temperatures and increased runoff. This parking lot could be retrofitted to add more trees, bioswales, and pervious surfaces that allow water to seep into the ground.

By keeping trees along rivers, we can reduce pollutants that drain into Martinsville's waterways and continue enjoying outdoor activities.

Large trees, like in front of the Martinsville Fire Department, provide valuable stormwater management benefits by intercepting rainfall and reducing runoff.

Buffering Storm Damage with Green Infrastructure – Trees!

Another benefit of conserving trees and forests is buffering against storms and reducing losses from flooding. According to the U.S. Environmental Protection Agency (EPA), excessive stormwater causes increased flooding, property damage, and public safety hazards. The EPA recommends ways to use trees to manage stormwater in its book *Stormwater to Street Trees*. https://www.epa.gov/sites/default/files/2015-11/documents/stormwater2streettrees.pdf

Retaining trees and forests along streams prevents erosion and provides key habitat for fish, birds, animals, and people too. A community can categorize their trees as "green infrastructure" to help justify spending money on city trees because they function as natural infrastructure by reducing standing water, preventing erosion, serving as windbreaks, and shading areas to reduce excessive temperatures.

In some cases, FEMA has reimbursed communities for lost tree cover when those trees were part of identified infrastructure, such as when a stream restoration project was damaged by a hurricane and the community had already identified the planted trees as infrastructure. To qualify, trees must be inventoried, have records of maintenance, and be specifically utilized for stormwater management, buffers, or other "green infrastructure" functions. Trees should also be recognized as infrastructure in policy documents such as the Comprehensive Plan, the Capital Improvement Plan (CIP), and even the City's tree ordinances.

Riparian buffers prevent streambank erosion, provide habitat, and reduce the risk of flooding.

Improving Air Quality, Public Health, and Economic Values

Trees Clean the Air

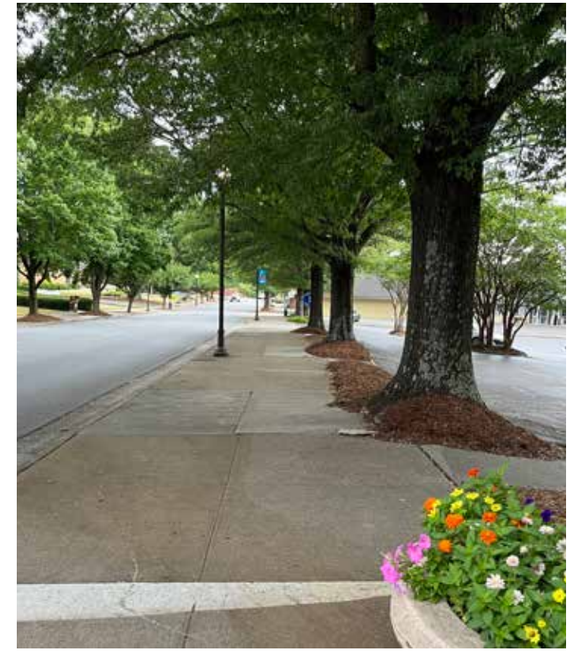
Higher tree canopy cover is correlated with better air quality. Trees reduce ground-level ozone (O_3) while filtering out fine particulate matter, which can damage lungs and lead to respiratory distress and conditions such as asthma. In fact, well-treed neighborhoods have lower rates of respiratory illness (Rao et al. 2014). Trees capture such greenhouse gases as sulfur dioxide and carbon dioxide. These gases contribute to a warming planet and are associated with health problems from excessive heat. Trees also sequester carbon by storing it as wood, preventing its release into the atmosphere and mitigating the impact of climate change.

Trees Cool the City

Tree shade provides important refuge for children and the elderly during hot summers. Excessive heat can lead to heat stress, especially affecting infants and children up to four years of age, and people 65 years of age and older, or people with obesity or other health issues (Centers for Disease Control and Prevention 2024). Individual trees can transpire hundreds of liters of water per day, creating a cooling effect equivalent to the energy needed to power two average household central air-conditioning units (Ellison et al. 2017). Tree canopy shades streets, sidewalks, parking lots, and homes, making urban locations cooler and more pleasant for outdoor activities, such as hiking, gardening and playing in city parks.

The trees at the J. Frank Wilson Park help keep the playground cool and comfortable.

Trees reduce summer temperatures through evapotranspiration and casting shade.



Well-treed sidewalks encourage people to walk and shop.

People shop longer and spend more in commercial shopping districts with trees.

Trees Improve Walkability

Trees result in people walking more and walking farther. The cooler temperatures, aesthetics, and traffic calming effect increase a community's walkability. When trees are not present on a street, people perceive distances to be longer, hotter, and less pleasant, making pedestrians less inclined to walk than if streets are well-treed (Tilt, Unfried, and Roca 2007).

Trees Improve Cognitive Function

Exposure to green spaces such as parks or treed landscapes for just 20 minutes a day can significantly improve cognitive function, emphasizing the need for green spaces around schools to allow children to learn to their best ability. Children with Attention Deficit Hyperactivity Disorder (ADHD) benefit from exposure to greenspace. Children who regularly play in green spaces have milder symptoms of ADHD (Faber Taylor and Kuo 2011).

Trees Lower Energy Costs

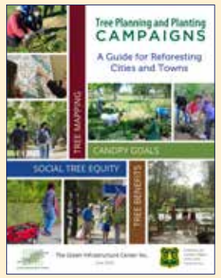
Multiple studies have found significant cooling (2-7°F) and energy savings from shade trees in cities (McPherson et al. 1997, Akbari et al. 2001).

- Proper tree placement can reduce summer air conditioning costs by up to 35% (Arbor Day Foundation 2025).
- Pavement shaded by trees has a longer lifespan than pavement in full sun, reducing maintenance costs associated with roadways and sidewalks (McPherson and Muchnick 2005).

Trees planted on the east, south, and west sides of a house help cool the house in the summer. This means less time running air conditioners and more money saved!

Preventing "Green Gentrification"

Increased property value can lead to a positive investment in the community, but also bring concerns about affordability. When it comes to community planting projects in lower-income neighborhoods, such as beautifying a neighborhood with numerous shade trees, adding street medians with more trees, planting trees in front yards, and having more parks and other open spaces nearby, may raise property values and make houses less affordable when landlords raise rents or property taxes increase. Gentrification is a legitimate concern and warrants a comprehensive approach that minimizes the negative consequences of green gentrification through policies that encourage residents to stay in their homes while enjoying the many benefits of trees and green space, such as cleaner air, cooler summers, less flooding, lower energy costs, and general social well-being. To learn more about how to prevent "green gentrification", see the GIC's *Tree Campaign Guide* https://gicinc.org/books/tree-planning-and-planting-campaigns/



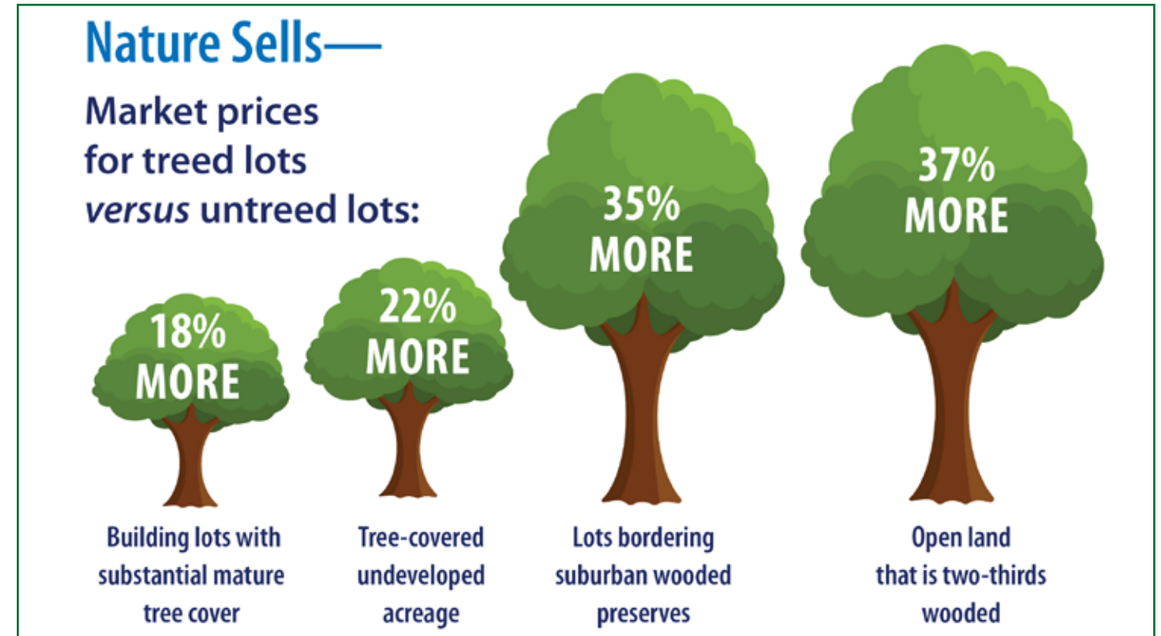
Instead of holding back on greening projects, cities should address the sources of affordability problems. One example would be an agreement with landlords not to raise rents within five years of a planting project; another would be to engage the community housing and development staff in providing more affordable housing. The City of Greenville, South Carolina for example, spent a decade and millions of dollars purchasing land around a future park development, Unity Park, that was to be built on city-owned land in historically black neighborhoods that experienced discrimination and disinvestment. The city created a housing fund to build a thousand affordable housing units around the new park, allowing low-income residents to remain in the adjacent neighborhoods and reduce displacement. The desire for more affordable housing in the area surrounding the park was an idea driven by local residents and community activists during the planning of the park.

Trees provide shade and make shopping districts more walkable.

Trees Pay Us Back

As Martinsville considers the cost of planting and caring for more trees, it's important to note that "every dollar invested in planting a tree results in an average return on investment of $2.25" (Endreny 2018). In fact, even a newly planted tree will immediately begin to provide benefits. So, while the City will need to expend more funds to increase and maintain its canopy coverage, those trees will more than pay their way. Trees help rejuvenate business districts, increase tourism revenue, and make the City more attractive to new businesses. For example, people were seen to shop longer and spend more in treed commercial shopping districts, which benefits the city through increased sales revenues (Wolf 2007).

Homes sell faster in new developments that include green space or natural areas and for higher profits than those that take the common approach of building over an entire area without conserving natural space (Benedict and McMahon 2006). Individual trees and forested open spaces make lots more valuable. Trees on developed lots add about 18% to property assessments and real estate value. (Wolf 2007). [See the Nature Sells graphic.]



Planting trees should not be seen in isolation, but as part of a wider cycle of urban renewal and growth, in which trees lower energy costs, spur development and raise incomes, business sales and that 'feel-good factor', which can, in turn, lead to a desire for more trees, parks and outdoor leisure facilities. Trees help turn a downward spiral into an upward spiral, as part of a city's renewed sense of pride and prosperity.

> **Trees help rejuvenate business districts, increase tourism revenue, and make the city more attractive to new businesses. Trees add to a city's sense of pride and prosperity.**

Tree Canopy Analysis Methods

The tree canopy analysis was performed to map current tree canopy, quantify the ecosystem services these trees provide, map potential planting areas, and estimate potential future canopy based on plantable areas. This new tree canopy data can be used to analyze urban cooling, walkability, and street tree plantings; or to inform area plans, urban forestry planning, and the City's Comprehensive Plan updates.

Satellite imagery from the National Agricultural Imagery Program (NAIP) distributed by the USDA Farm Service Agency was classified to determine the types and extent of different land covers in Martinsville. The land cover map was created at 1-meter resolution using NAIP imagery from October 12, 2023. An ArcGIS Pro extension named Feature Analyst was used to classify the image using a supervised classification approach. In addition, various vector data were used where possible (e.g. sidewalks, driveways, and other impervious surfaces). The tree canopy was mapped at 95% accuracy, with an overall land cover accuracy of 85%.

Determining Plantable Acreage

Potential Planting Areas

In urban areas, a realistic goal for expanding urban canopy depends on an accurate assessment of the total plantable open area. A Potential Planting Area (PPA) map estimates areas where it may be feasible to plant trees. The PPA is estimated by selecting land cover types that have space available for planting trees and accounts for the overlap of canopy (canopy that is intermingled or a large canopy tree that partially covers an understory tree).

Of the nine land cover types mapped, only pervious and bare earth were considered for the PPA. However, some paved areas could be removed or reduced, soils conditioned, and then used to plant new trees. For example, a parking lot could be redesigned in order to accommodate more tree canopy to absorb and clean stormwater runoff and provide shade for cars.

Eligible planting areas are also limited by their proximity to features that interfere with a tree's natural growth (such as buildings) or where a tree might affect the feature, such as power lines, street signs, or road junctions. The GIC buffers potential planting areas to exclude trees from these features. City staff and

NAIP Aerial Image

Potential Planting Area (PPA)

There are many places where new trees can be planted in the City such as on private residential property, along streets in pits, and near bus stops.

the GIC reviewed the draft PPA map and removed playing fields, cemeteries, and other land uses where trees would not be appropriate. The resulting PPA represents the maximum potential places trees can be planted and grow to full size.

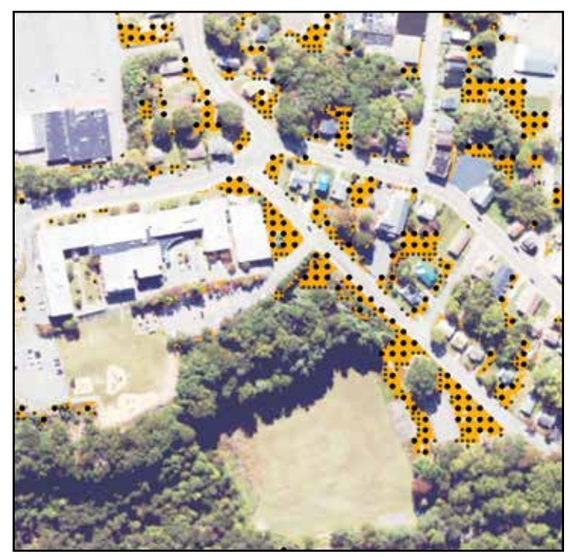
Based on an analysis of existing pervious surfaces, 9% of the city's land area, or 621 acres, could be planted with additional trees. The GIC recommends that no more than half the available PPA, 4% or 310 acres, is realistic to plant, since many other uses, such as vegetable gardens or swimming pools, require full sun.

Potential Planting Spots

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 mature size. For this analysis, expected canopy spreads of 20ft. and 40ft. diameter for individual mature trees were used, with priority given to 40 ft. diameter trees, since larger trees provide more benefits.

Potential Canopy Area

The Potential Canopy Area (PCA) is created from the PPS. Once the PPS are selected, the buffer around each point is created to represent the mature canopy spread. For this analysis, that buffer radius is either 10ft. or 20ft., which represents a 20ft. or 40ft. diameter canopy. These individual tree canopies are then merged to form a Potential Canopy Area.



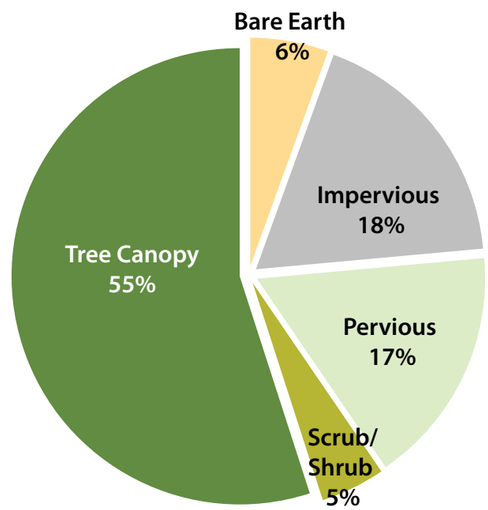
Potential Planting Spots (PPS)

Potential Canopy Area (PCA)

Canopy Analysis Maps and Findings

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

Martinsville Land Cover



The *Tree Canopy Analysis* has been used to plan the City's target tree canopy goal and will act as a benchmark to gauge the future status of the City's tree canopy. An ArcGIS geodatabase with digital shape files produced during the study has been provided to the City.

In addition, the City received tree canopy statistics for the following areas:

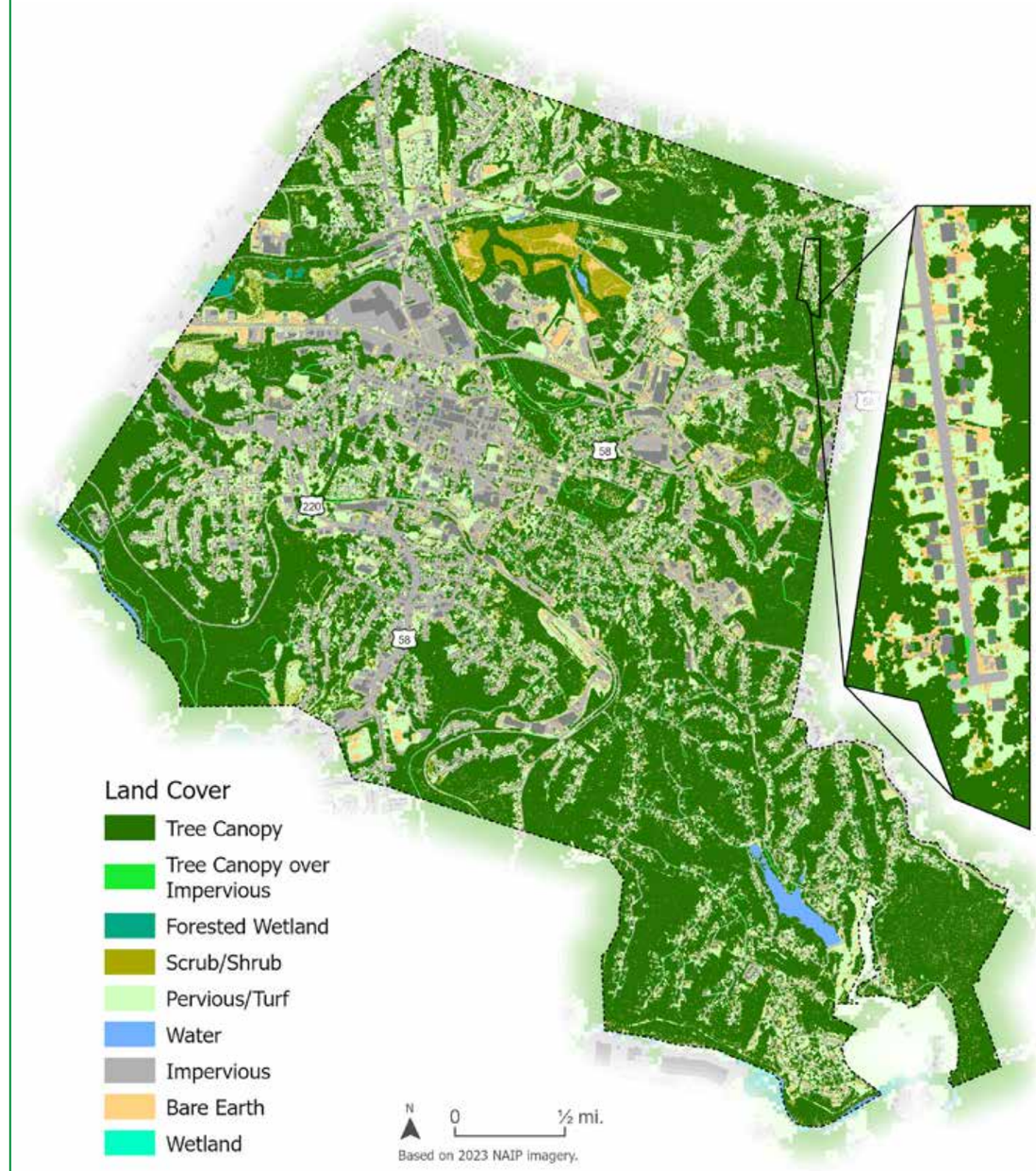
- Streets
- Parks
- Schools
- Parcels
- Neighborhoods

The *Tree Canopy Analysis* can inform tree planting decisions to meet many goals, such as walkability, greenhouse gas emission reduction, energy savings, urban heat reduction, and economic revitalization.

The following pages contain Martinsville's *Tree Canopy Analysis* Maps.

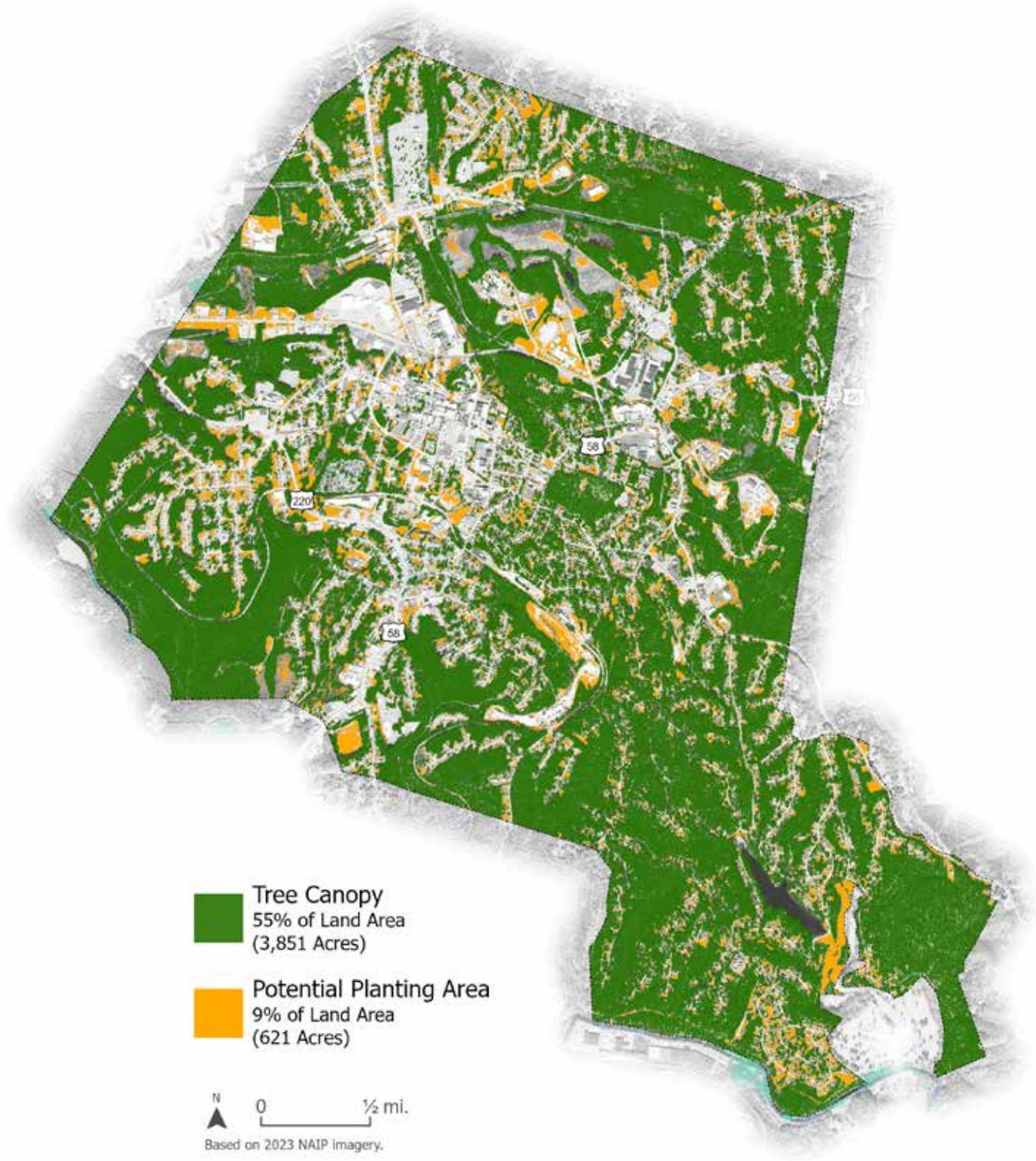
City Land Cover

GIC classified 9 land cover types for the City of Martinsville from 2023 NAIP aerial imagery.



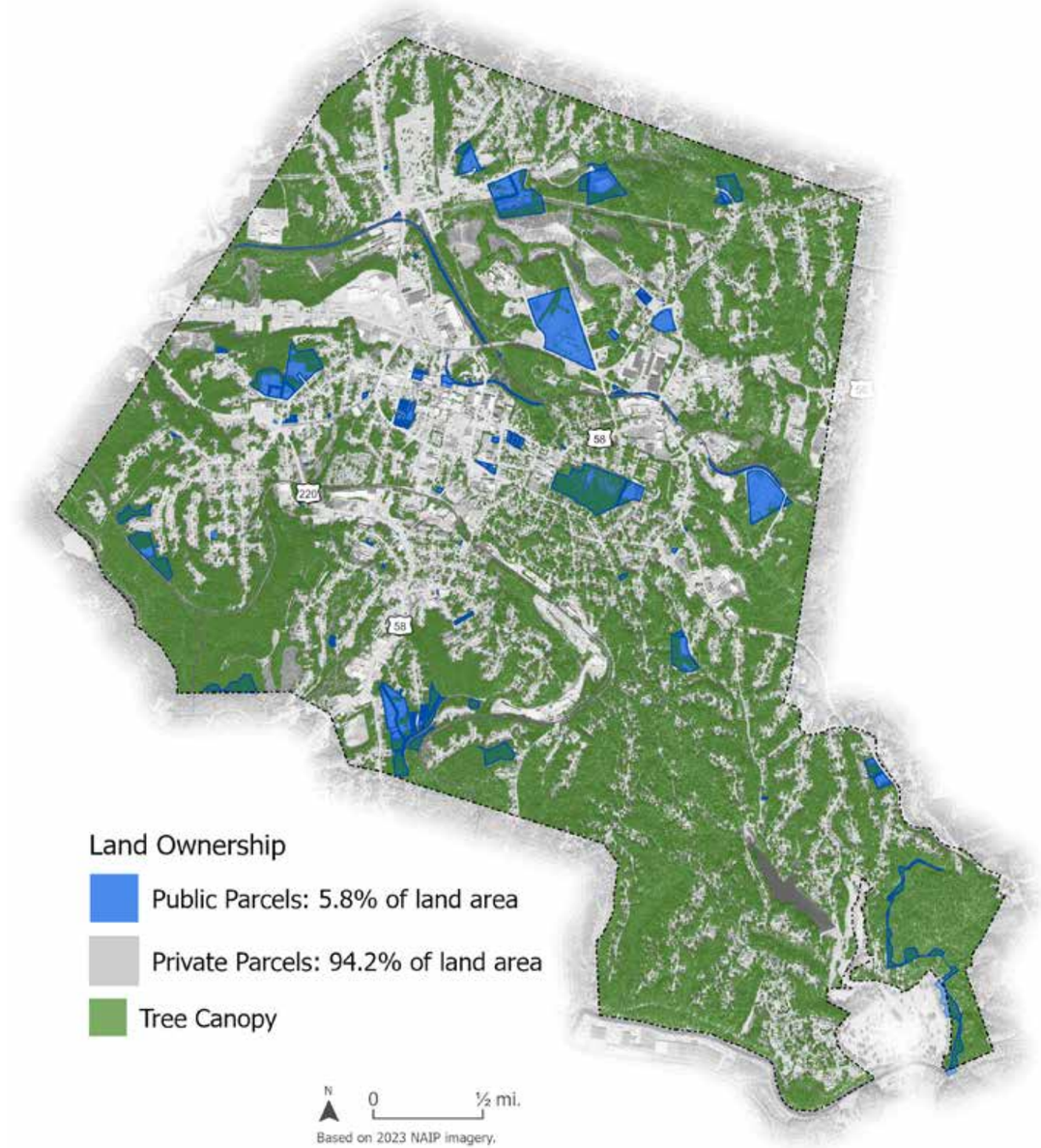
City Tree Canopy and Potential Planting Areas

Existing tree canopy (green) and potential planting area (orange) were determined based on land cover data and input from the City. Potential planting areas (PPA) depict areas where it may be possible to plant trees. All sites would need to be confirmed in the field prior to planting. The map shows PPA on both private and public lands.



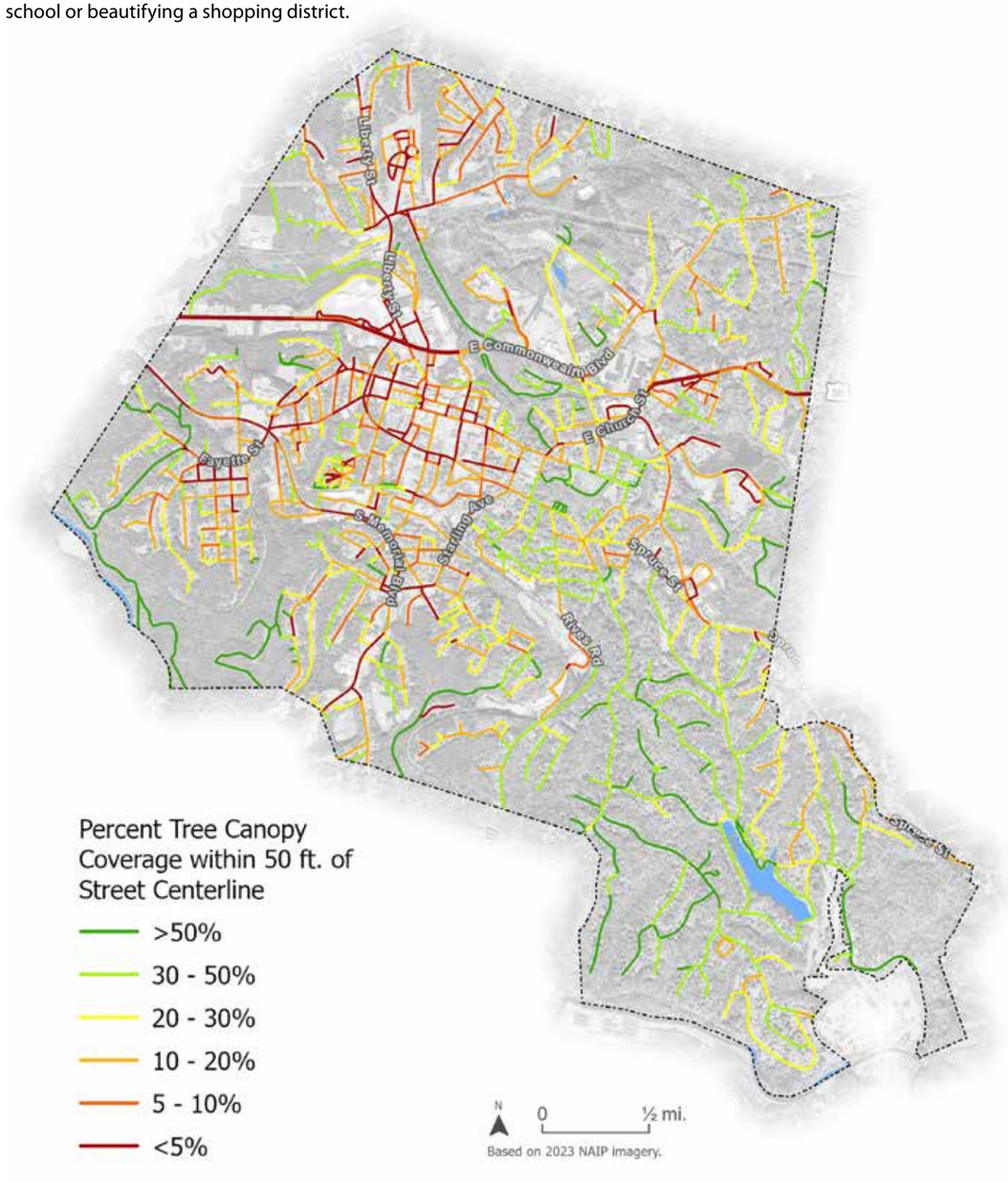
Public and Private Land

In Martinsville, publicly owned land makes up 6%, while privately owned land makes up 94%, of the total land in the city. This map shows a breakdown of public and private land in Martinsville. To meet Martinsville's tree canopy goal of increasing canopy coverage to 56%, conserving existing trees while planting additional trees must occur on both public and private land.



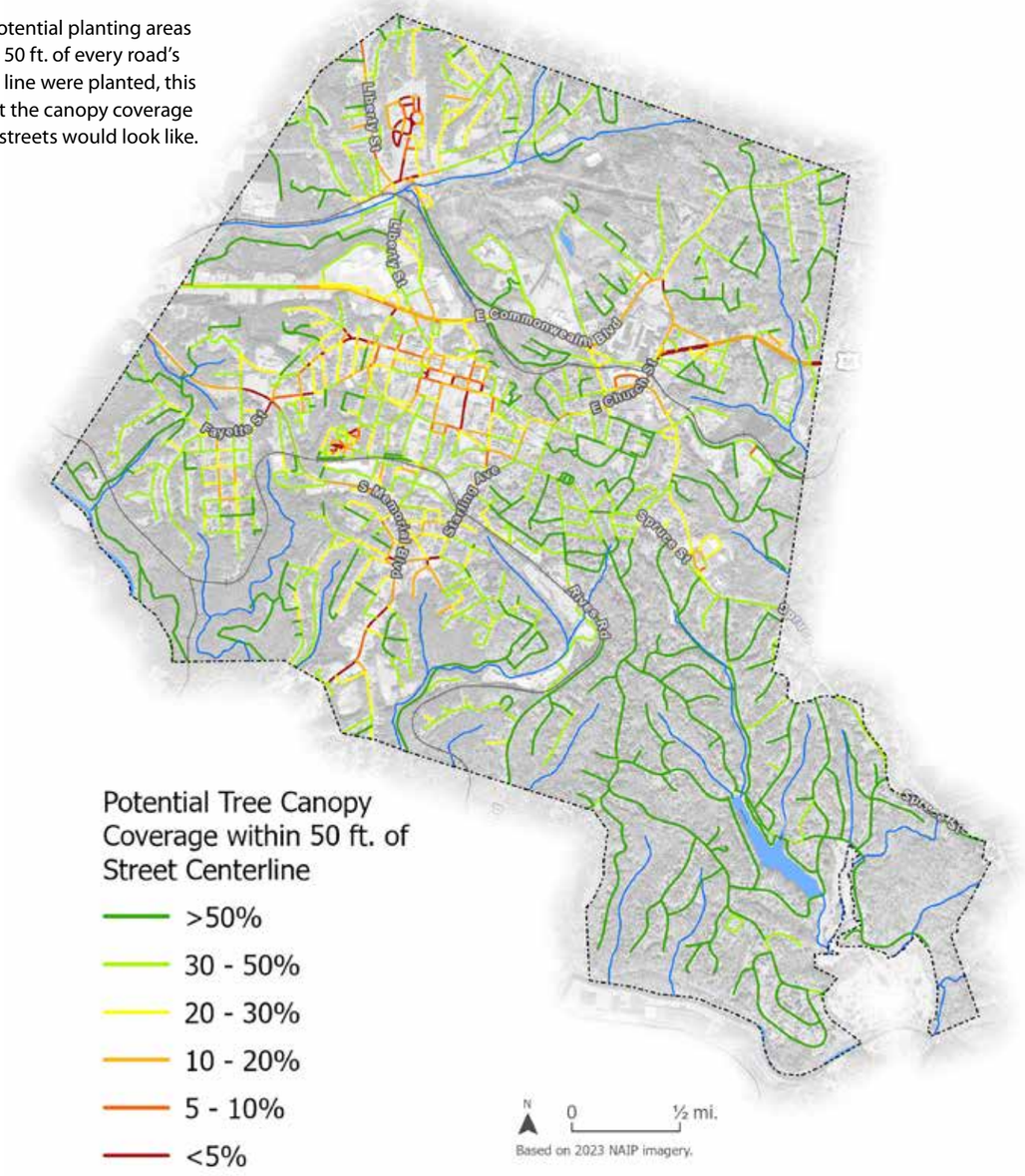
Existing Tree Canopy Coverage Along Streets

Streets that have the most canopy (dark green) and those that have the least canopy (red). Streets that lack good tree coverage can be targeted as appropriate for planting to facilitate specific City goals, such as safe routes to school or beautifying a shopping district.



Potential Tree Canopy Coverage Along Streets

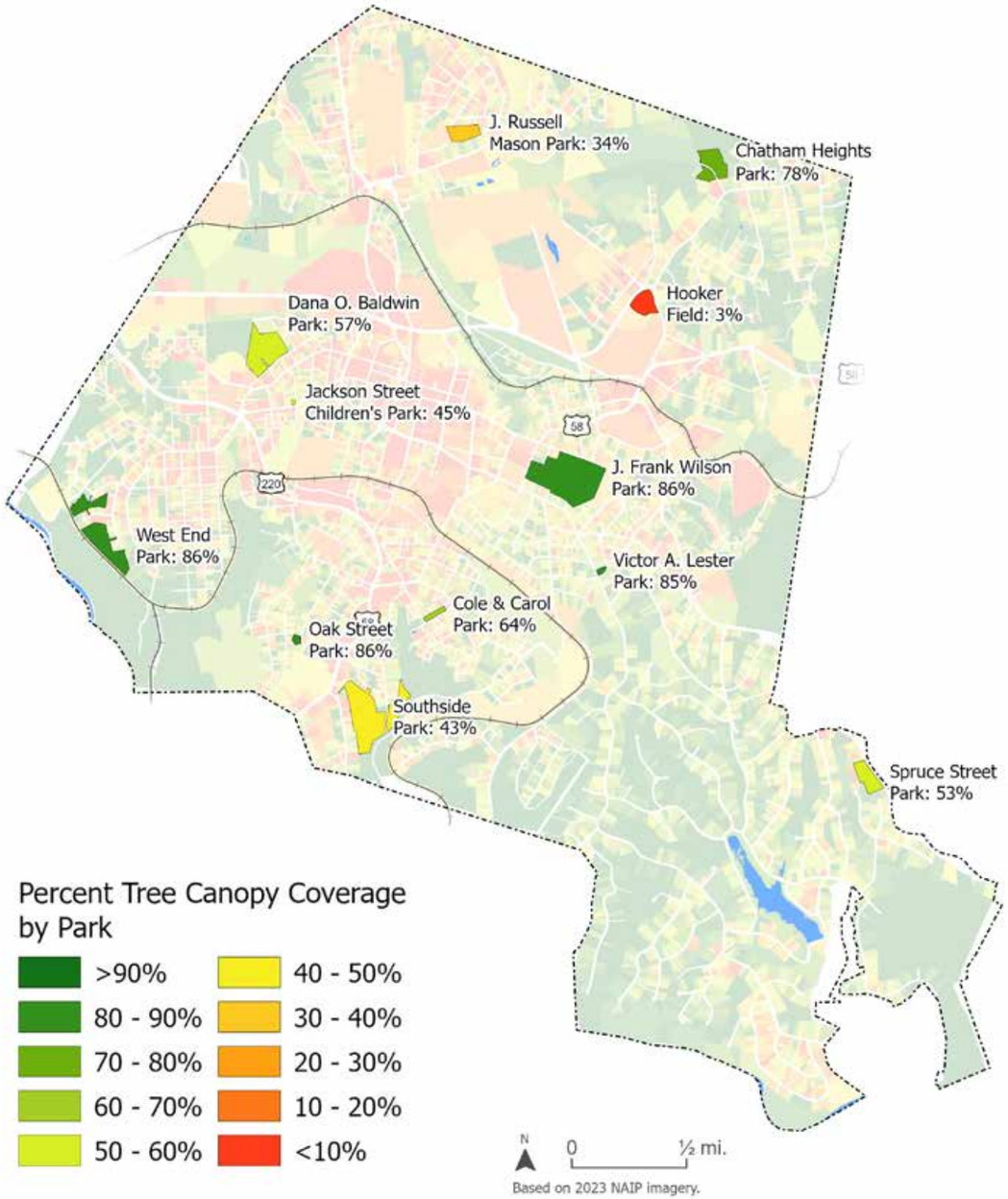
If all potential planting areas within 50 ft. of every road's center line were planted, this is what the canopy coverage along streets would look like.



Disclaimer: This map is based on Potential Planting Areas (PPA) within 50 ft. of the Right-of-Way. As such, it identifies unconstrained planting sites based on the best available GIS data, meaning that existing underground tree wells or narrow landscape strips (under 6 ft.) are not included in this analysis. As with the overall PPA map, it does not account for utilities, and all locations must be field verified.

Tree Canopy Coverage by Park

Tree canopy for each City park. Parks with trees promote physical and mental health and provide shaded areas for children to play.

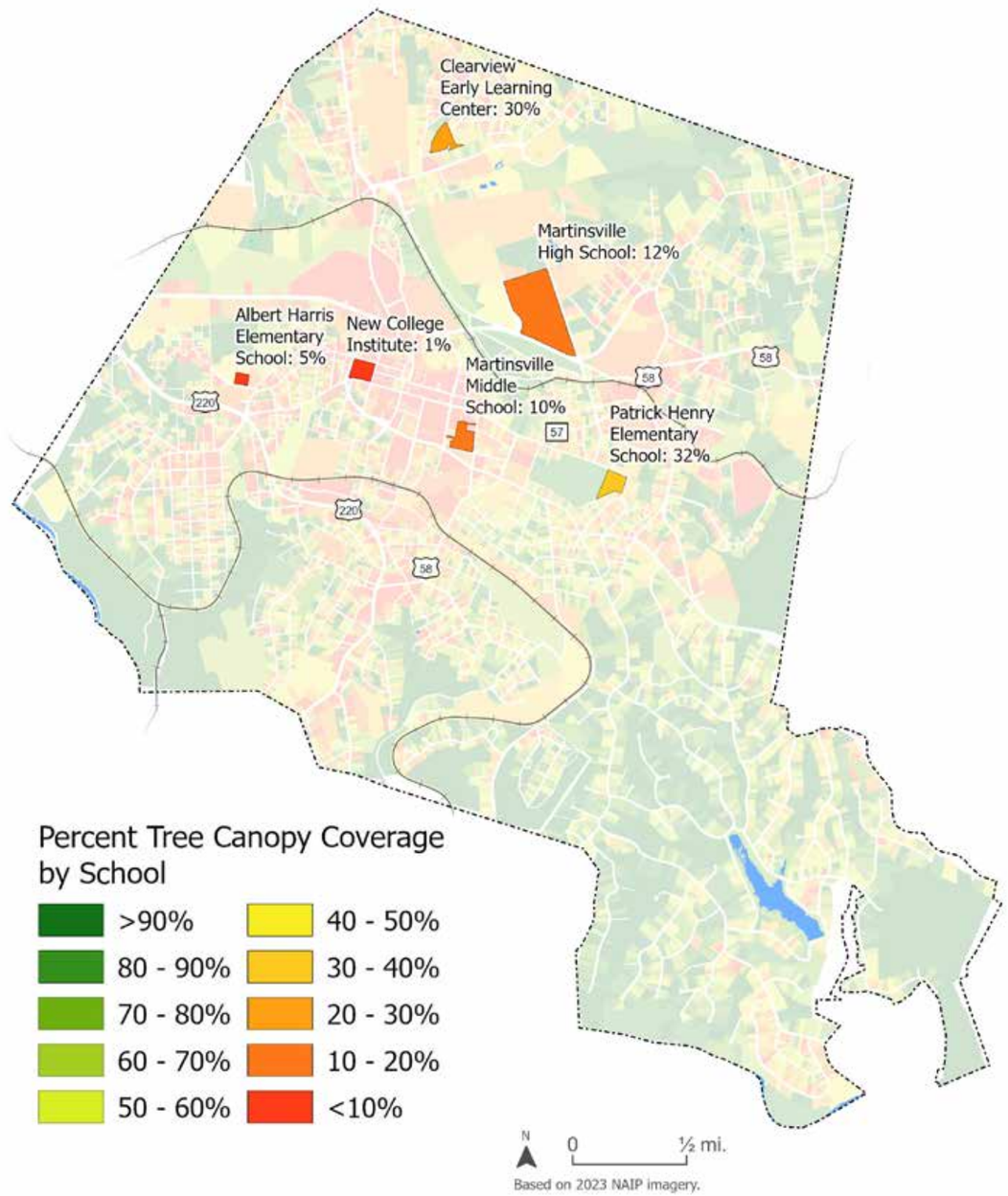


Park Name	Percent Tree Canopy (Current)	Potential Tree Canopy Coverage	PPA Acres	Small Trees That Could Be Planted	Large Trees That Could Be Planted	Total Potential Trees To Plant
Chatham Heights Park	78%	96%	1.3	52	67	119
Cole & Carol Park	64%	78%	0.1	7	7	14
Dana O. Baldwin Park	57%	64%	0.7	50	42	92
Hooker Field	3%	9%	0.3	13	14	27
J. Frank Wilson Park	86%	90%	0.9	109	45	154
J. Russell Mason Park	34%	51%	0.7	39	42	81
Jackson Street Children's Park	45%	80%	0.1	2	3	5
Oak Street Park	86%	97%	0.1	7	4	11
Southside Park	43%	48%	1.1	60	59	119
Spruce Street Park	53%	95%	2.2	72	118	190
Victor A. Lester Park	85%	95%	0.1	2	3	5
West End Park	86%	96%	1.3	66	76	142

Southside Park has room to potentially plant 119 additional trees.

Tree Canopy Coverage by School

Planting at school sites can save energy costs for cooling and boost student concentration and learning.

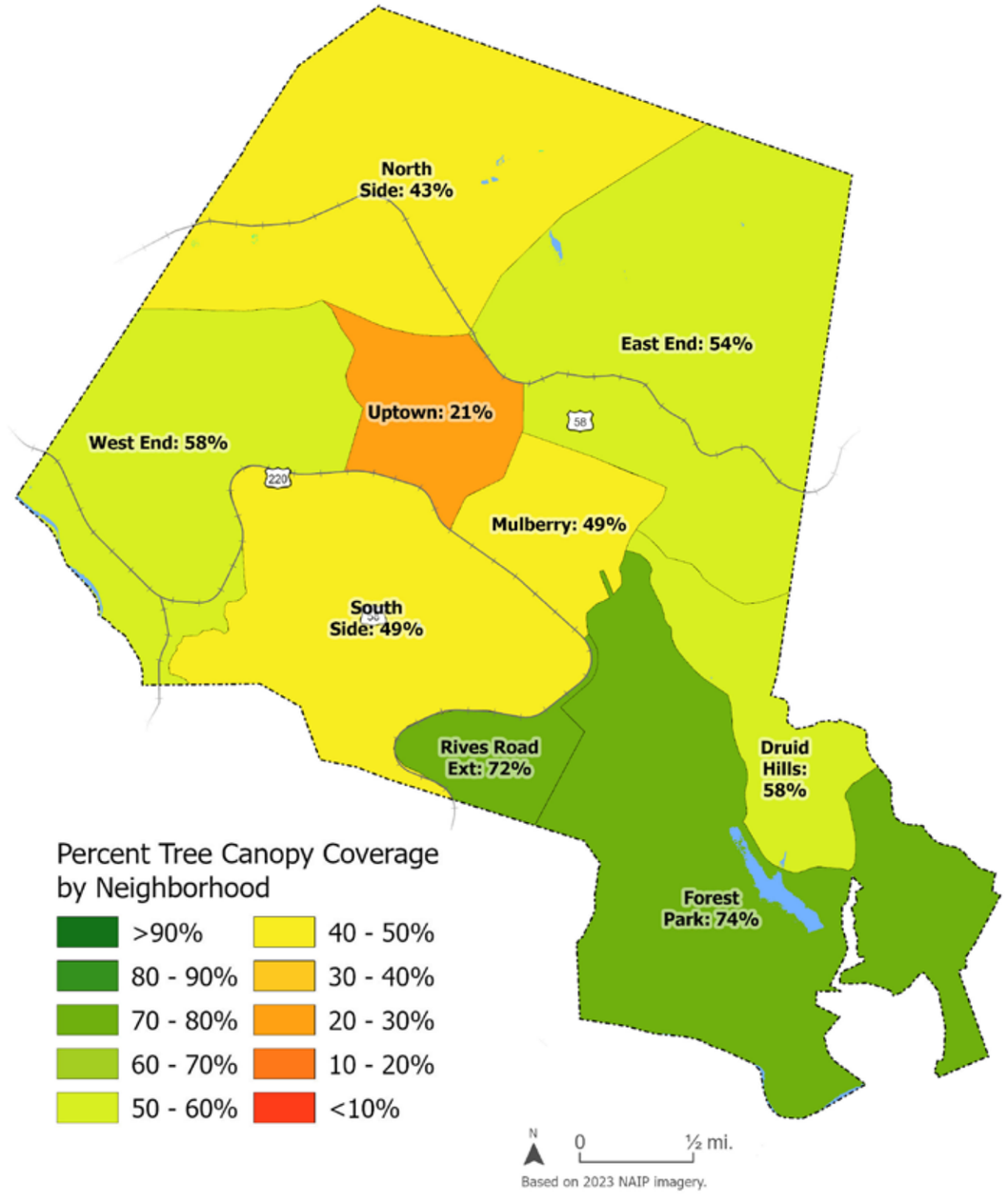


School Name	Percent Tree Canopy (Current)	Potential Tree Canopy Coverage	PPA Acres	Small Trees That Could Be Planted	Large Trees That Could Be Planted	Total Potential To Plant Trees
Albert Harris Elementary School	5%	6%	0.01	5	0	5
Clearview Early Learning Center	30%	32%	0.1	13	4	17
Martinsville High School	12%	58%	14	727	791	1,518
Martinsville Middle School	10%	14%	0.1	30	4	34
New College Institute	1%	20%	0.6	51	32	83
Patrick Henry Elementary School	32%	49%	0.8	44	38	82

Out of all the schools, Martinsville High School has the biggest opportunity to plant more trees, with room for a maximum of 1,518 trees.

Tree Canopy Coverage by Neighborhood

Referring to the overall tree canopy coverage in each neighborhood can help show which communities should be prioritized for equity-based planting efforts.



Neighborhood	Percent Tree Canopy (Current)	Potential Tree Canopy Coverage	PPA Acres	Small Trees That Could Be Planted	Large Trees That Could Be Planted	Total Potential To Plant Trees
Druid Hills	58%	73%	34	3,493	1,907	5,400
East End	54%	68%	122	9,802	6,727	16,529
Forest Park	74%	85%	108	8,494	6,084	14,578
Mulberry	49%	65%	27	2,797	1,510	4,307
North Side	43%	59%	128	9,407	7,110	16,517
Rives Road Ext	72%	81%	10	974	573	1,547
South Side	49%	65%	92	7,172	5154	12,326
Uptown	21%	38%	33	2,659	1,846	4,505
West End	58%	70%	69	5,759	3,827	9,586

Uptown neighborhood has the lowest tree canopy coverage (21%), but could potentially plant an additional 4,505 trees to increase tree canopy to 38%.

Calculating Environmental Benefits

Stormwater Uptake

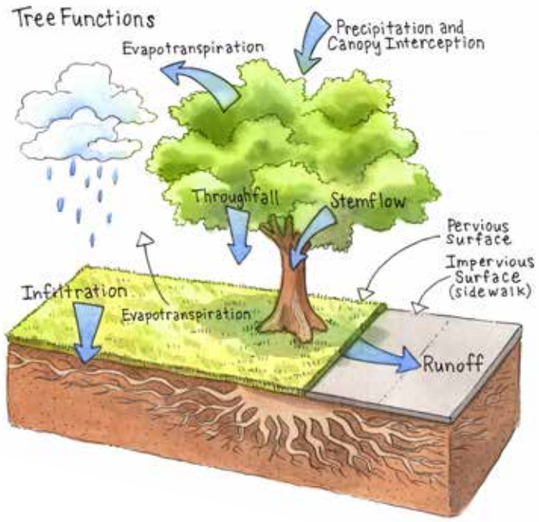
Trees and forests are the best land cover for taking up urban stormwater and are recognized as such by forestry scientists and civil engineers (Kuehler 2017, 2016). Tree canopy stormwater interception varies from 100% at the beginning of a rainfall event to about 3% at maximum rain intensity (Xiao et al. 2000).

Trees help capture and filter stormwater runoff. The Trees and Stormwater (TSW) Tool, developed by the GIC, estimates the stormwater interception, infiltration, and runoff of different land cover types. This methodology uses a modified version of the "curve number" approach, originally developed by the Natural Resources Conservation Service (NRCS), which factors in impacts of hydrologic soil groups, land cover types, hydrologic condition, and design/management practices that impact runoff. The modified TR55 curve numbers (CN) provided by GIC include a factor for canopy interception. This 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. This is because the conditions and the soils in which the tree is living affect the amount of water the tree can intercept. For more about this methodology, please visit: https://gicinc.org/projects/resiliency/trees-and-stormwater/

The GIC used its TSW Tool to model stormwater and pollution reductions by city tree canopy. The model shows that, during a 10-year/24-hour rainfall event (5.22 inches), trees take up 36.9 million gallons of runoff, or about 56 Olympic swimming pools of water. Martinsville's trees capture:

- **27,966 nitrogen lbs. annually**
- **2,296 phosphorus lbs. annually**
- **1,494 sediment tons annually**

The TSW Tool takes into account the interaction of land cover and hydrologic soil conditions within each watershed. The TSW Tool can also be used to run 'what-if' scenarios, specifically losses of tree canopy from development or storm damage, or increases in tree canopy from additional tree planting.



Lawn trees in a park soak up more stormwater than trees over pavement.

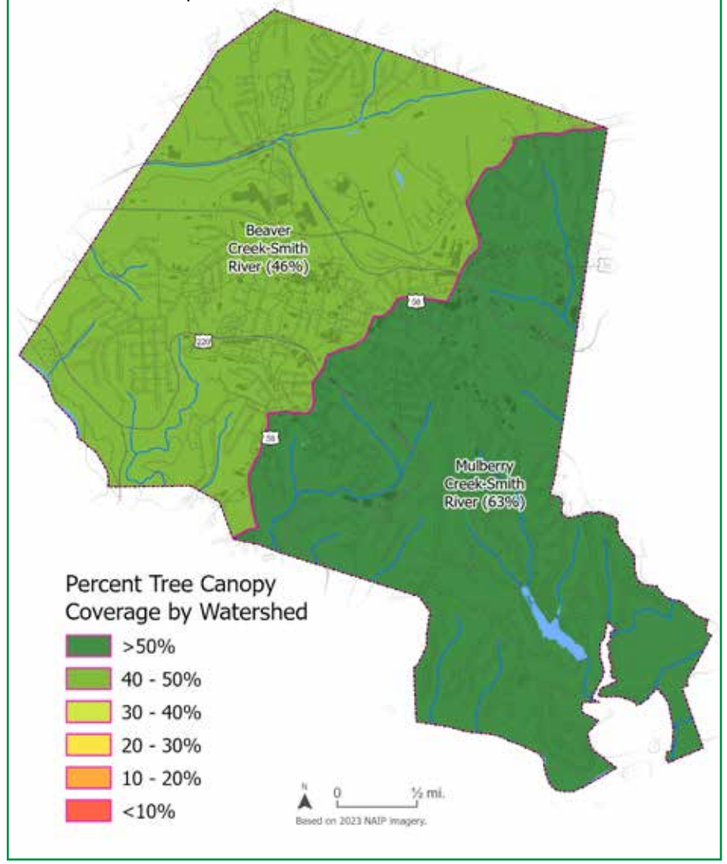
Tree Canopy Coverage by Watershed

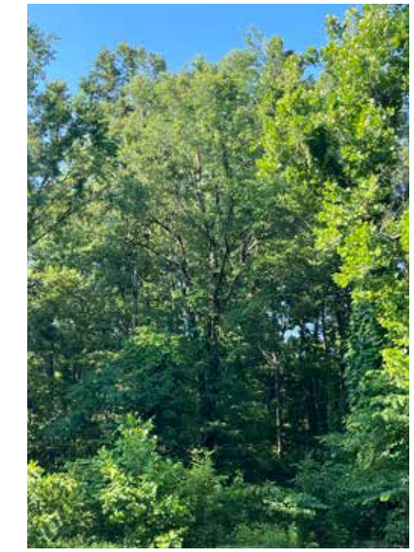
The conditions under and around a tree, such as the size of its planting box, the amount and type of open space, surface soils, drainage, and root spread affect the infiltration of water. The TSW Tool uses plantable open spaces to determine how many more trees could be planted and how much additional nitrogen, phosphorus, and sediment pollutants new trees and their surrounding soils could absorb.

Removal of mature trees and existing forest results in the greatest increase in stormwater runoff. As more land is developed, the City should maximize tree conservation and encourage new tree plantings to maintain surface water quality and groundwater recharge. The following maps use soil types and tree cover to show the areas where it is most important to retain trees for stormwater uptake and areas where tree planting will have the most benefits for stormwater uptake.

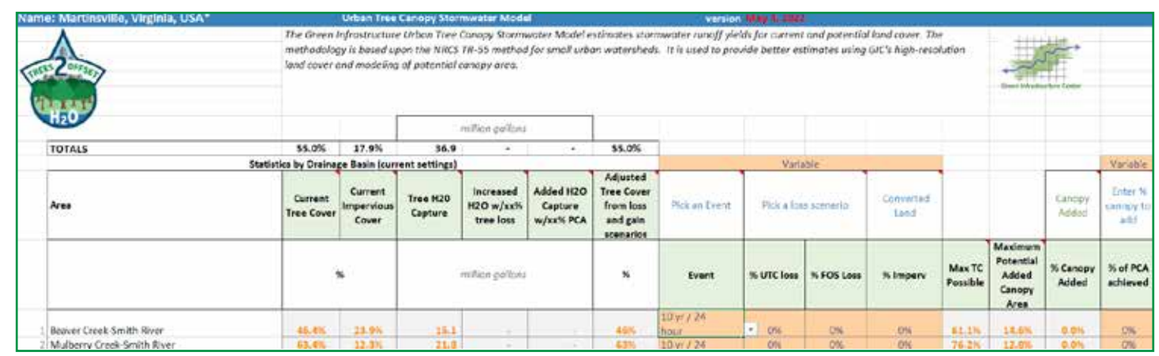
Tree Canopy Coverage by Watershed

The City can use the TSW Tool for running scenarios and setting goals at the watershed scale, for planting trees, and for evaluating consequences of tree loss, as it pertains to stormwater runoff.





Forests are the best land cover type for stormwater uptake.



Name: Martinsville, Virginia, USA* | Urban Tree Canopy Stormwater Model | version

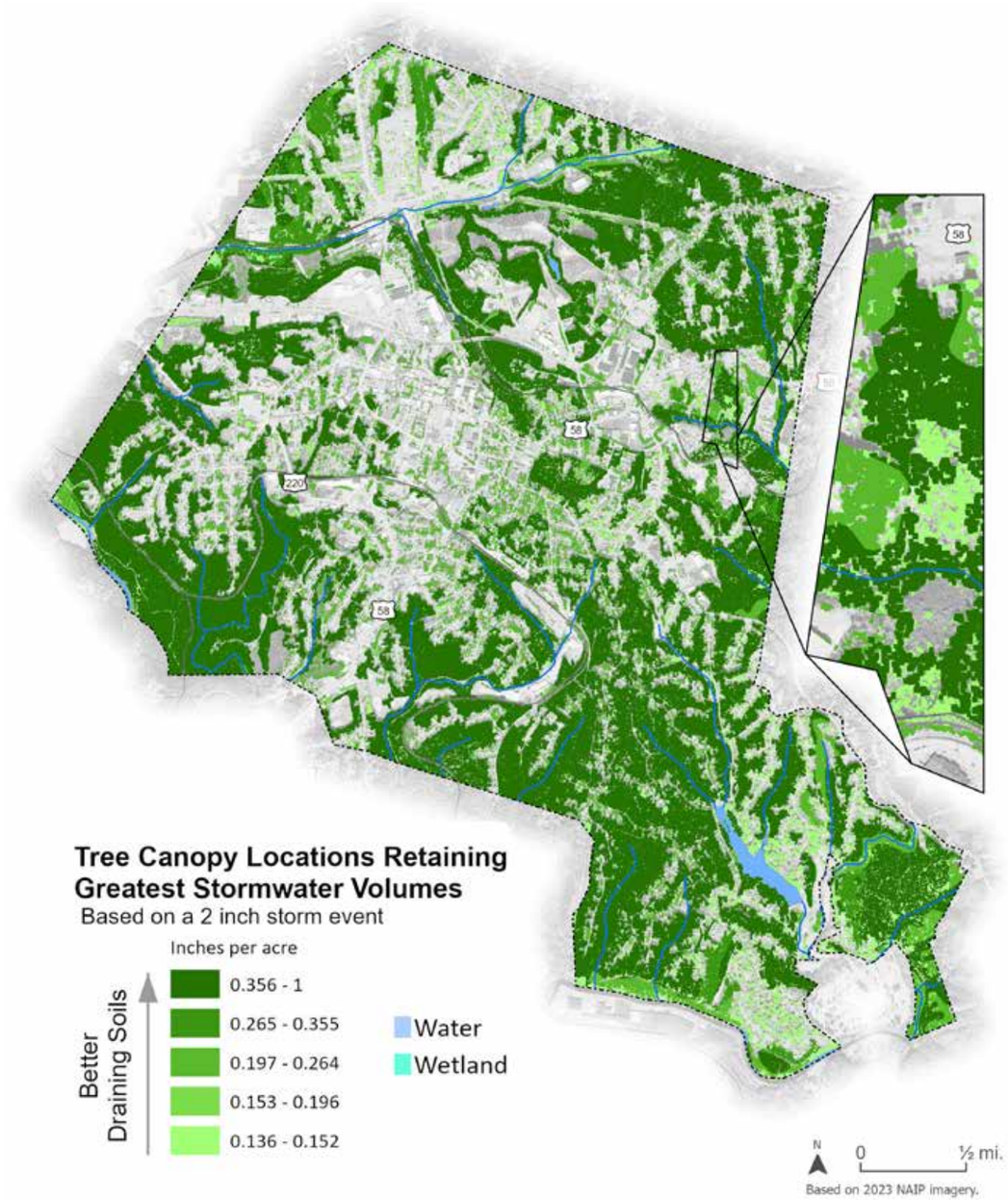
The Green Infrastructure Urban Tree Canopy Stormwater Model estimates stormwater runoff yields for current and potential land cover. The methodology is based upon the NRCS TR-55 method for small urban watersheds. It is used to provide better estimates using GIC's high-resolution land cover and modeling of potential canopy area.

	Area	Current Tree Cover	Current Impervious Cover	Tree H2O Capture	Increased H2O w/xx% tree loss	Added H2O Capture w/xx% PCA	Adjusted Tree Cover from loss and gain scenarios	Pick an Event	Pick a loss scenario			Converted Land		Canopy Added	Enter % canopy to add
				million gallons											
	TOTALS	55.0%	17.9%	36.9	-	-	55.0%								
	Statistics by Drainage Basin (current settings)							Variable							Variable
		%		million gallons			%	Event	% UTC loss	% FOS Loss	% Imperv	Max TC Possible	Maximum Potential Added Canopy Area	% Canopy Added	% of PCA achieved
1	Beaver Creek-Smith River	46.4%	23.9%	15.1	-	-	46%	10 yr / 24 hour	0%	0%	0%	61.1%	14.6%	0.0%	0%
2	Mulberry Creek-Smith River	63.4%	12.3%	21.8	-	-	63%	10 yr / 24	0%	0%	0%	76.2%	12.0%	0.0%	0%

The TSW Tool allows the City to model water uptake by the existing canopy and impacts from changes, whether positive (adding trees) or negative (removing trees).

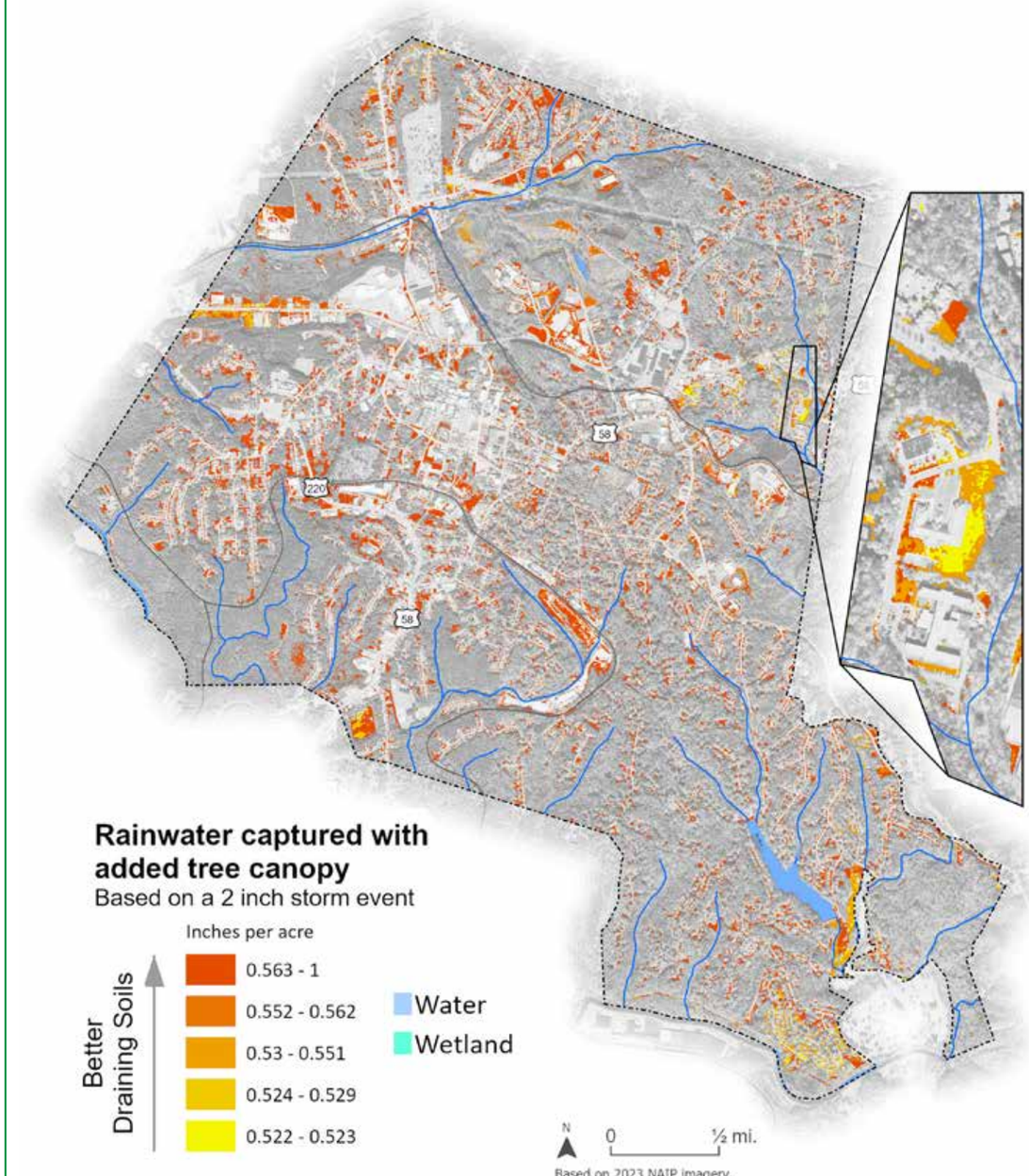
Best Tree Canopy to Save for Stormwater Infiltration

The TSW Tool was applied to map the locations where tree conservation will result in the greatest amount of stormwater capture and infiltration (dark green).



Best Tree Planting Locations for Stormwater Infiltration

The TSW Tool was applied to map locations where planting trees will result in the greatest amount of stormwater capture and infiltration (red).



Air Quality

Air pollution removal values were calculated by applying the pollution removal values for each acre of tree cover from the i-Tree Canopy model. i-Tree is a peer-reviewed software suite from the USDA Forest Service that provides urban and rural forestry assessment tools.

Trees mitigate climate change by storing carbon in their tissues and sequestering atmospheric carbon from carbon dioxide (CO_2) in new tree growth. Current trees in the City are storing 132,016 metric tons of carbon that will be released back into the atmosphere when these trees die. Trees also capture particulate matter, ground-level ozone (O_3), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) from the air, resulting in better air quality and healthier neighborhoods.

Air Quality and Carbon Sequestration Benefits Provided by the Tree Canopy (2023 data)

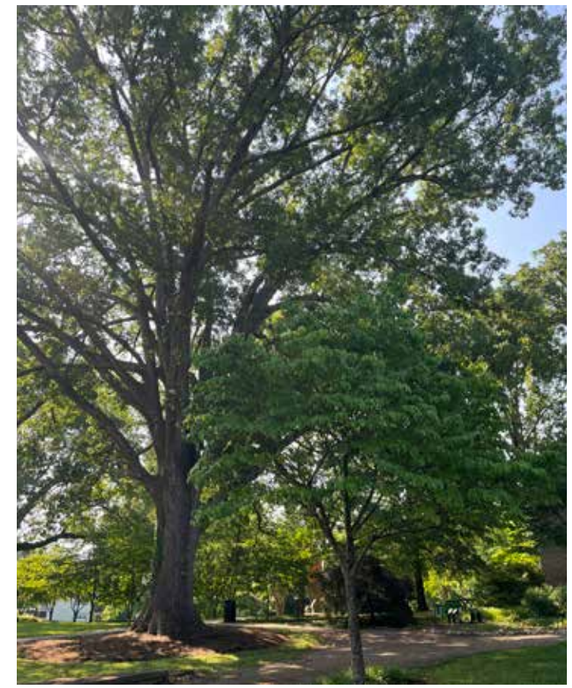
Air pollution and greenhouse gases removed annually by trees in Martinsville						
CO (carbon monoxide)	NO_2 (nitrogen dioxide)	O_3 (ozone)	PM_{10} (particulate matter 10 microns)	$PM_{2.5}$ (particulate matter 2.5 microns)	SO_2 (sulphur dioxide)	C seq (carbon sequestered)
2,045 lbs	**12,327 lbs**	**146,288 lbs**	**27,843 lbs**	**4,294 lbs**	**4,047 lbs**	**5,314 Metric Tons**

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

Well-treed neighborhoods have cleaner air and lower rates of asthma.

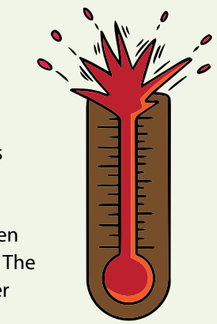
Urban Heat and Equity

Urban heat is a growing concern as extreme heat continues to increase in Virginia with the changing climate. In Martinsville, the number of days above 100˚F is projected to rise from the historic average of 3 per year to 68 per year by the year 2070. To reduce temperatures, the City can plant trees to cool the landscape. Inequities in the distribution of tree canopy and opportunities to correct them can be identified through tree canopy data, surface temperature data, and U.S. Census data that provides race and income statistics.



Trees providing shade Gravely-Lester Art Garden

How much hotter is your hometown now than when you were born?



This interactive online tool allows a user to put in their hometown and birthdate to see how their hometown has changed since then and how much hotter it may get. The tool provides the average number of days over 90°F.

https://www.nytimes.com/interactive/2018/08/30/climate/how-much-hotter-is-your-hometown.html

Extreme Heat

Average days per year with temperatures over 100˚F

Where we are now	Where we are currently headed		If bold action is taken
Historically 1971-2000	Midcentury 2036-2065	Late Century 2070-2099	Extreme heat limited to
3 days	**35** days	**68** days	**24** days

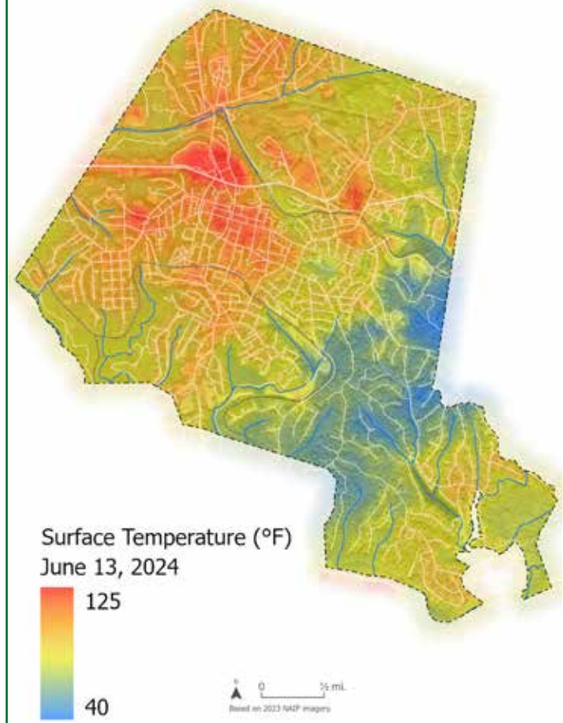
In this table "bold action" refers to reductions in greenhouse gases through energy conservation. It does not consider the effects of planting more trees. Source: Union of Concerned Scientists. *2019, Killer Heat Interactive Tool*.

What is tree equity?

Tree equity ensures all communities have access to the benefits that trees provide. Areas that have been under-resourced, having fewer trees and more heat than the rest of the city, are the focus of tree-planting efforts.

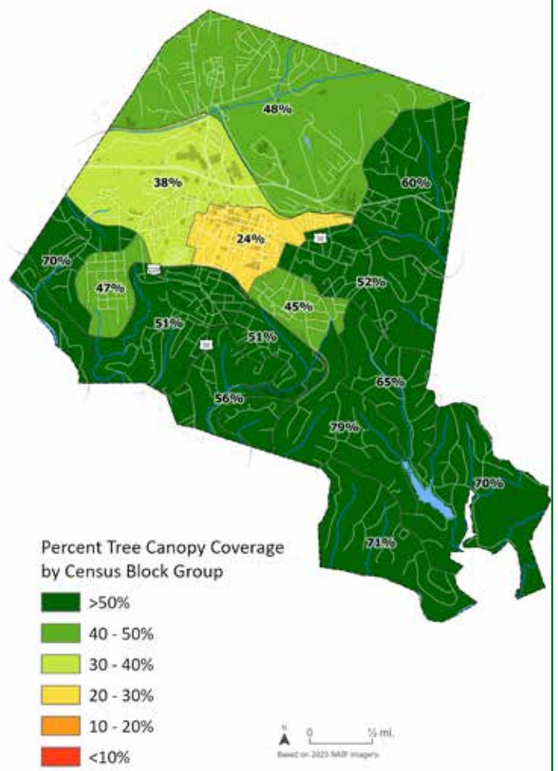
Surface Temperature

The surface temperature map captures the hottest to coolest places in the city on a typical summer day.



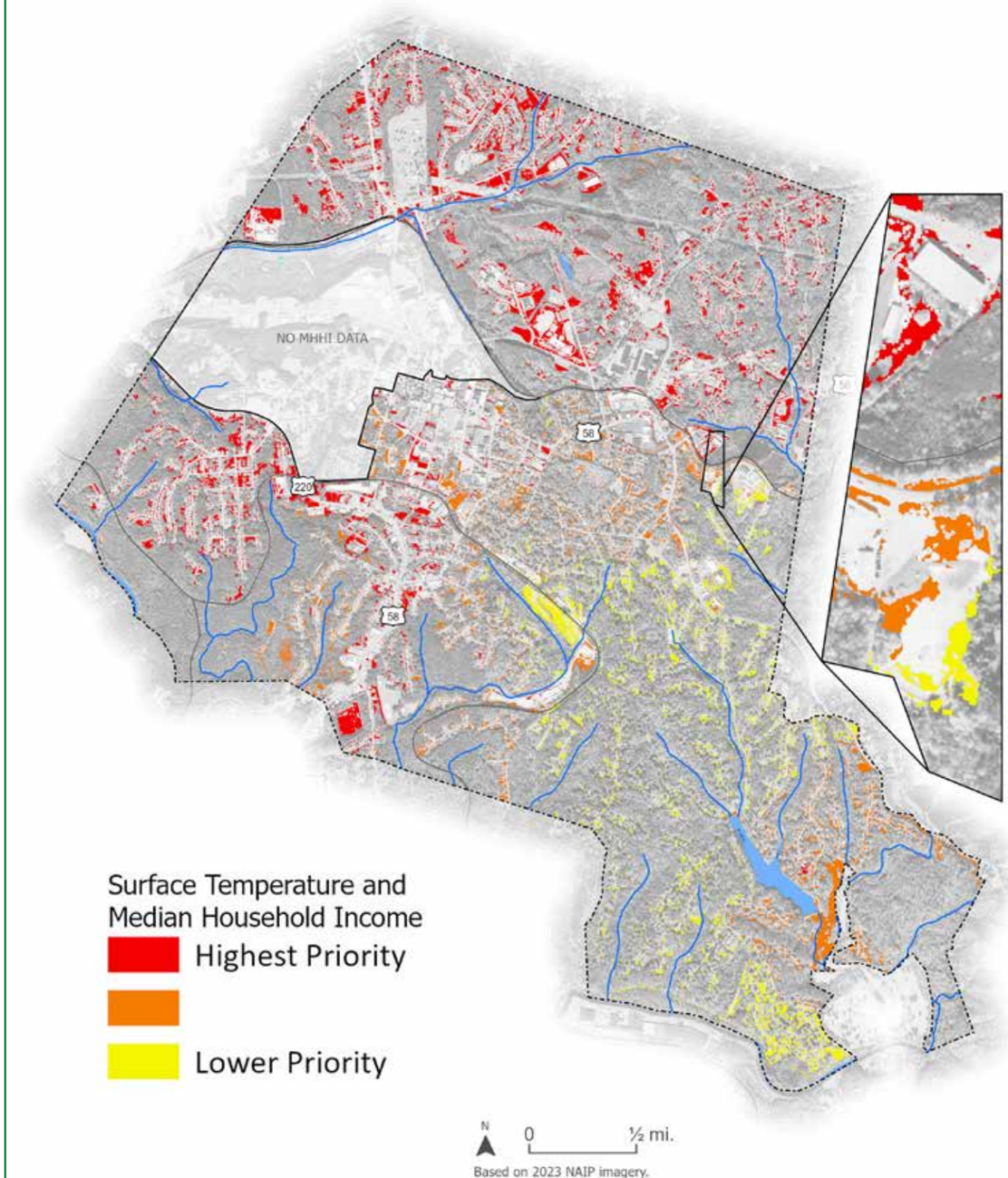
Tree Canopy Coverage by Census Block Group

Tree canopy cover percentages by Census Block Group. By combining U.S. Census and tree canopy data, the City can identify equity-based tree planting opportunities.



Heat and Income Priority Tree Planting Locations

This map uses surface temperature data and median household income data to prioritize potential tree planting areas.



Planning and Engagement Process

The City of Martinsville and the GIC partnered in an 18-month effort to create this *Strategic Tree Canopy Plan*. A Tree Canopy Advisory Committee and subsequent Tree Board were created to review data and establish the City's tree canopy goal and strategies. From the spring of 2024 to the fall of 2025, the committee and City of Martinsville Tree Board engaged in a series of workshops to evaluate tree canopy cover, determine plantable areas, set a tree canopy goal, and evaluate policies and practices that support said goal. In the spring of 2025, the Tree Board, in partnership with the GIC, organized the Tree Celebration, an educational and interactive tree giveaway event. Throughout this engagement process, City leadership was updated on the program's progress by the Tree Board, City staff, and a presentation to the City Council by the Green Infrastructure Center.

Maps beginning on page 17 show the results of the Tree Canopy Analysis. An assessment of the ecosystem services provided by City trees included:

- **A stormwater analysis**
- **A surface temperature map**
- **An air quality analysis**

The City of Martinsville Tree Board assists the city's urban forestry efforts by planning events, providing technical assistance, and conducting community outreach.

Results of these analyses were then used to identify opportunities to maximize benefits from future tree planting and retention. In addition, GIC staff conducted a trees and stormwater ordinances audit to evaluate the impact of City policies and ordinances on trees, tree care, and tree protection. The audit, developed by GIC and used across the U.S., shows which policies contribute to a healthy tree cover and which lead to excessive imperviousness and less green space. Results of the audit were used to inform the final tree canopy cover strategies and future tree ordinance updates.

Advisory Committee

During the beginning of the planning process, a Tree Canopy Advisory Committee (TCAC) was formed. This committee consisted of representatives from Martinsville Public Works, Community Planning, and Information Technology Departments as well as the Dan River Basin Association (DRBA), Uptown Partnership, and West Piedmont Planning District Commission. Committee members participated in workshops, attended check-in meetings throughout the planning process, and assisted in reestablishing the City of Martinsville Tree Board. The current Tree Board members include city residents and representatives from DRBA and the Virginia Museum of Natural History. The City of Martinsville Tree Board and the TCAC have reviewed the maps, data, and community input to develop the *Strategic Tree Canopy Plan* goal and strategies for a more resilient Martinsville.

Community Partners

Throughout the planning process, the Tree Board members, City and GIC staff met with key community partners to discuss current initiatives and opportunities to partner for a greener, resilient city. These community partners provided support through assisting in stewardship, planting, funding, and outreach efforts. Community partner organizations included:

- **Dan River Basin Association**
- **Uptown Partnership**
- **Virginia Museum of Natural History**
- **West Piedmont Planning District Commission**

Public Engagement

Community feedback was fundamental to the creation of Strategic Tree Canopy Plan. In addition to the creation of the Tree Board, the engagement process included events with an emphasis on public education and community feedback.

In April 2025, the City of Martinsville Tree Board partnered with the Virginia Museum of Natural History and the Green Infrastructure Center to host the Tree Celebration, an educational and interactive tree giveaway event at the museum. The Tree Celebration was organized with additional support from the Dan River Basin Association and Virginia Master Naturalists. During the event, residents selected their free tree with support from the Tree Board, had free admission to the museum's exhibits, made DYI seed bombs, and learned about Martinsville's trees. Attendees were shown maps of Martinsville's tree canopy assessment and asked to give input on the city's urban forest.

Additionally, the Tree Board participated in existing public events, such as Fast Track 2025, to increase public awareness of the importance of trees in the community and gather input from local businesses and residents.

The City of Martinsville Tree Board partnered with the Virginia Museum of Natural History to give free trees to Martinsville residents. Residents learned about the benefits of Martinsville's trees and were asked to give input on where they would like to see trees planted.

Summary of Community Findings

During the 18-month planning process, the City of Martinsville Tree Board and GIC staff participated in existing outreach events and hosted a Tree Celebration event to collect community input. Over 90 votes were recorded.

The following is a summary of community input, while a full report of comments can be found in Appendix C.

Q1: Where should more trees be planted?

There were five options for this question: parks, schools, streets/sidewalks, neighborhoods, and businesses. The results: businesses (10 votes), neighborhoods (10 votes), streets/sidewalks (10 votes), schools (8 votes), and parks (7 votes).

Q2: Which benefits of trees is most important to you?

Seven benefits were listed as options. The results: cleaner air (13 votes), cooler temperatures (9 votes), cleaner water (7 votes), less flooding (7 votes), lower utility costs (4 votes), beautification (4 votes), and food production (1 vote).

Q3. Where would you like to see more trees?

Residents were asked for specific locations throughout the city where they wanted trees to be planted. Answers included natural areas, Patrick Henry Elementary School, and shopping parking lots.

Newly planted trees.

Goal and Implementation Strategies

The City of Martinsville's goal is to increase tree canopy coverage to 56% over the next 20 years.

Newly planted trees in Uptown help meet the goal of increasing tree canopy cover on public property.

Recent national data show urban and suburban tree canopy cover is trending downwards at a rate of 175,000 acres lost per year – approximately 36 million trees lost annually (Nowack and Greenfield 2012). Trees are lost due to development, disease, storms, and old age. Martinsville has the opportunity to proactively address urban canopy decline by building on the city's existing tree related efforts and implementing this plan's strategies.

The City of Martinsville's goal is to increase tree canopy coverage to 56% over the next 20 years.

Achieving this goal requires a coordinated effort by both the city and private property owners. To increase tree canopy by 1% on public property, the City will plant trees to replace those lost plus an additional ten trees each year. To increase tree canopy on private property by 1%, the City encourages plantings on private land by expanding educational outreach efforts and hosting tree giveaway events. An additional 164 trees on private property are needed annually to achieve the goal of increasing tree canopy.

However, due to an uneven distribution of tree canopy across the City, a different tree planting goal should be established for each neighborhood based on the current tree canopy cover percentage, potential planting area, and need. For example, there is the potential to increase the tree canopy in Uptown by up to 17%. If the community were to set a tree planting target of 18 trees each year, the tree canopy of Uptown could increase by 2% over the next 20 years. This would not only help reduce heat in Uptown, but also beautify and make the community more resilient. To better understand opportunities for tree planting in each neighborhood, refer to the Tree Canopy Coverage by Neighborhood map and table.

To support a successful tree planting campaign, funding is needed for community outreach, tree plantings, tree care, and administrative support. Funding can come from a variety of sources, including City budget, grants, private donations, or crowd sourcing.

More information on funding opportunities can be found in Appendix A.

As this is a new program, the first few years of planting may be fewer, and then gradually increase. As the City's capacity and the urban forestry program expand, the number of trees planted each year is expected to increase. A tree planting campaign could be developed in partnership with the Tree Board and community support to achieve the goal. Additionally, to reduce the number of tree plantings needed, the City can prioritize conserving existing trees. Methods could include tree educational outreach to homeowners and organizing invasive vine removals to support existing, healthy trees.

Many streets and private properties, such as this private yard (*left*) and businesses' landscape strip (*right*), have room to plant trees to add shade, beauty, and improve air quality.

The tree canopy goal, objectives, and action items for Martinsville's urban forest are on the following pages. These, along with other practices, will provide long-term care, protection, and best planting practices for the urban forest. This will ensure that investments in city trees pay dividends by reducing stormwater runoff, cleaning the air and water, lowering energy bills, and providing natural beauty long into the future.

Tree Celebration Tree Giveaway

Goal: Increase tree canopy to 56% over the next 20 years.

1 OBJECTIVE 1: Expand city capacity to manage Martinsville's urban forest.

- **Action 1.1:** Establish a public tree ordinance for the protection and proper care of publicly owned trees.
  – Responsible Parties: Community Development
- **Action 1.2:** Update standards for tree planting and preservation during development in the zoning and sub-division code.
  – Responsible Parties: Community Development
- **Action 1.3**: Institute a "right tree, right place" policy that reduces conflicts between future tree plantings and overhead and underground utilities.
  – Responsible Parties: Public Works and Utilities
- **Action 1.4:** Increase training on arboriculture for City staff.
  – Responsible Parties: Public Works
- **Action 1.5:** Hire or contract either a part-time or full-time consulting city arborist.
  – Responsible party: Public Works

2 OBJECTIVE 2: Plant trees to increase tree canopy and to reduce the urban heat islands in areas of need.

- **Action 2.1:** Raise funds for tree plantings by applying for grants or other sources.
  – Responsible parties: Tree Board
- **Action 2.2:** Plant large shade trees in the hottest areas of the city.
  – Responsible parties: Tree Board and Public Works
- **Action 2.3:** Host tree giveaway events in neighborhoods experiencing elevated temperatures.
  – Responsible parties: Tree Board
- **Action 2.4:** Plant trees on public school grounds to provide educational opportunities.
  – Responsible party: Tree Board
- **Action 2.5:** Plant small tree species along powerlines.
  – Responsible party: Public Works

Planting smaller species under powerlines helps avoid extreme pruning and conflicts in the future.

Giving away trees for city residents allows the city to increase tree canopy cover on private property.

3 OBJECTIVE 3: Increase public awareness of the importance and proper care of trees.

- **Action 3.1:** Create a social media presence for the Tree Board where tree-related news, information, and events can be posted.
  – Responsible party: Tree Board
- **Action 3.2:** Host an annual Arbor Day/Earth Day celebration in partnership with the Virginia Museum of Natural History.
  – Responsible party: Tree Board
- Action 3.3: Share educational materials, such as tutorial videos, on invasive species removal and proper tree care at existing public events and on the City's website.
  – Responsible parties: Tree Board and Green Infrastructure Center
- **Action 3.4:** Partner with local groups for public trainings and education on tree care.
  – Responsible parties: Tree Board

4 OBJECTIVE 4: Reduce the presence of invasive species throughout the city.

- **Action 4.1:** Create an approved species list with a preference for native trees for public and private projects.
  –Responsible party: Tree Board
- **Action 4.2:** Create a prohibited plant species list to limit the introduction of invasive species in city projects.
  –Responsible party: Tree Board
- **Action 4.3:** Partner with the Virginia Master Naturalists to host invasive species removal events for volunteers.
  –Responsible party: Tree Board
- **Action 4.4**: Support community members to register for state-sponsored tree bounty events.
  –Responsible party: Tree Board
- **Action 4.5**: As appropriate, use goats as a way to manage invasive plant species on large tracts of land.
  –Responsible party: Community Development

Training public works staff on proper tree care helps increase the health of the city's trees.

Removing kudzu from mature trees helps conserve existing tree canopy.

Conclusion

Martinsville has new data and strategies in this plan to guide the management of its urban forest. This plan is a living document that is intended to be integrated into on-going staff work plans, annual budgets, grant proposals, and partnerships with outside agencies. It is recommended that an implementation committee or Tree Board meet at least quarterly to document the plan's progress and adapt its strategies as needed. Implementing these tree strategies will ensure that current and future residents enjoy the continued benefits of trees and a healthy, resilient, and beautiful city for all.

Appendixes

Appendix A: Funding Opportunities

For tree campaigns to be successful, there must be dedicated funds. These funds can come from a variety of sources, including federal, state, local, and private resources. A few examples of these opportunities are listed below.

Virginia Department of Forestry

- Virginia Trees for Clean Water Grant Program
- Urban and Community Forestry Grant Program
- Emerald Ash Borer Cost-Share Program

For more information: https://dof.virginia.gov/urban-community-forestry/urban-forestry-community-assistance/financial-assistance-for-urban-and-community-forestry-projects

Virginia Environmental Endowment

- Various grants, updated yearly

For more information: https://www.vee.org

The Harvest Foundation

- A foundation local to Martinsville that "seeks to inspire, invest in, partner with and support community initiatives in health, education, and community vitality."

  –Grant applications are accepted on a rolling basis.

For more information: https://theharvestfoundation.org

Appendix B: References

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Appendix C: Community Feedback

The following questions were posed to the community during the Tree Celebration event in April 2025.

Q1: Where should trees be planted?

Area	Votes
Businesses	10
Neighborhoods	10
Streets/Sidewalks	10
Schools	8
Parks	7

Q2: Which benefit of trees is most important to you?

Area	Votes
Cleaner Air	13
Cooler Temperatures	9
Cleaner Water	7
Less Flooding	7
Lower Utility Costs	4
Beautification	4
Food Production	1

Q3: Where would you like to see more trees?

Comments
In more natural areas.
Patrick Henry School
Shopping Parking Lots: Walmart
Everywhere
Liberty Street
Festival Area of Smith River Sports Complex
Below the mall and around the mall shopping area. They are HOT!

Q4: Additional Comments?

Comments
Start a committee to dig up and fight kudzu!

More trees in shopping parking lots—Walmart.

Start a committee to dig up and fight kudzu!

More trees at Patrick Henry School

More trees below the mall and around the mall shopping area. They are HOT!

More trees in Festival Area of Smith River Sports Complex