Reforesting the Forest City:

The Cleveland Tree Canopy Goal

Cleveland, Ohio
April 2018

Presented by:

CLEVELAND
TREE COALITION

Cleveland Tree Coalition is a collaboration among more than 40 businesses, organizations, and branches of local government that have come together to implement the Cleveland Tree Plan

Executive Summary

A 2013 evaluation of Cleveland's urban forest showed that our tree *canopy cover*—the footprint that tree trunks, branches, and leaves make on the surface area of the city—averages just 19% of land area across the city. This amount of tree cover is significantly lower than both historic values and the amount of tree cover that would be expected of a city in our geographic region. The assessment also showed that Cleveland's tree cover varies widely among neighborhoods across the city. Neighborhoods and residents do not benefit equally from the benefits provided by urban trees, from lower energy costs to cleaner air and water.

Cleveland Tree Coalition is a partnership of organizations, businesses, and branches of local government that strives to create a healthy, vibrant, sustainable, and equitable urban forest by working collaboratively to implement the 2015 Cleveland Tree Plan. In this document, Cleveland Tree Coalition proposes a Cleveland Tree Canopy Goal, as called for by Action #7, *Establish a canopy goal and plan for canopy updates,* of the Cleveland Tree Plan. The Cleveland Tree Canopy Goal envisions a greener Cleveland. It unites public and private tree initiatives and provides a benchmark against which to measure our collective efforts.

With the Cleveland Tree Canopy Goal, we propose growing Cleveland's urban tree canopy cover from 19% to 30% by 2040. To kickstart tree planting and conservation efforts for this goal, we further propose a collective effort to reverse estimated trend of tree loss by planting 50,000 trees by 2020. At 30% tree canopy cover, trees would provide a wealth of benefits to people who live, work, and play in Cleveland—a value of $44 million *per year*.

As envisioned by the Cleveland Tree Plan, the Cleveland Tree Canopy Goal sets bold, yet achievable, near-term and long-term targets for the city's urban forest.

Background

In 1796, Moses Cleaveland encountered a lush, verdant forest on his expedition to the Western Reserve. Large sycamore, elm, and maple trees greeted Cleaveland's team of surveyors as they arrived at the mouth of the Cuyahoga River. Cleaveland's survey team laid out the new capital city of the region, including a 10-acre Public Square, to the east of the crooked Cuyahoga. As the city grew in population and more land was developed, more trees were cut down.

As early as 1820, Cleveland village council president Leonard Case, Sr. saw the need to reforest the city and encouraged the planting of shade trees. His son, William, carried on his father's reforestation efforts as secretary of the Cleveland Horticultural Society and Cleveland's mayor from 1850 to 1852. These initiatives by William Case are credited with spawning the Cleveland nickname, "Forest City".

Despite these early reforestation efforts, the city lost trees as it grew in population and developed into an important industrial center. The city launched a new effort to save trees in 1897 with the establishment of the Cleveland Department of Forestry & Nurseries. In the late 1930s, with Works Projects Administration aid, the city's Bureau of Horticulture planted more than 13,000

trees in city parks. By the 1940s, Cleveland had 220,000 trees lining city streets, which provided numerous ecological, environmental, and economic benefits to local residents. City growth continued into the 1950s, and then as city population and resources contracted in subsequent decades, the number of trees dwindled.

Today, the City of Cleveland has fewer than 120,000 street trees and continues to lose vital tree canopy due to old age, lack of proper maintenance, pests, disease, and development. We are again challenged to reforest our Forest City.

The Cleveland Tree Plan

In 2013, the City of Cleveland, Cleveland Neighborhood Progress, Holden Forests and Gardens, LAND Studio, and Western Reserve Land Conservancy worked collaboratively with Davey Resource Group to complete an assessment of Cleveland's urban forest. The assessment examined existing tree *canopy cover*—the footprint that tree trunks, branches, and leaves make on the surface area of the city—, in addition to tree management approaches and the people and organizations who were actively involved in tree-related efforts. Based on 25 indicators of a sustainable urban forest, Cleveland ranked low-to-moderate on nearly every indicator. Notably, Cleveland was found to have just 19% average tree canopy cover across the city, significantly lower than both historic values and the tree cover that would be expected of a city in its geographic region.

With this information about Cleveland's urban canopy in hand, the group created the *Cleveland Tree Plan*, which was approved by the Cleveland Planning Commission in 2016. The Plan includes three overarching goals:

- Goal #1: Recognize trees as critical community infrastructure
- Goal #2: Reverse the trend of tree canopy loss
- Goal #3: Assume full stewardship for the tree infrastructure

Accompanying these goals, the group formulated nine action steps for near-term tree efforts. *Action #1, Establish a unified voice and formalize partnerships* led to the formation of the Cleveland Tree Coalition, a partnership of organizations, businesses, and branches of local government that strives to create a healthy, vibrant, sustainable, and equitable urban forest by working collaboratively to implement the Cleveland Tree Plan. While the Coalition is currently an informal collaboration, its 40+ member organizations are examining ways to formalize the partnership in the future to build needed capacity for implementation.

Cleveland Tree Canopy Goal

Action #7 as defined by Cleveland Tree Plan, *Establish a canopy goal and plan for canopy updates*, is the focus of this document. A defined canopy goal sets a vision for a greener Cleveland; it unites public and private tree initiatives and provides a benchmark against which to measure our collective efforts.

As envisioned by the Cleveland Tree Plan, the Cleveland Tree Canopy Goal should:

- align with industry standard;
- be realistic;
- align with goals set by other cities;
- yield measurable, beneficial outcomes; and
- be customizable to meet the needs and realities of its neighborhoods.

Additionally, the Cleveland Tree Canopy Goal is meant to inspire an honest look at how we value trees in our city and whether our current tree planting and maintenance activities adequately reflect these values. It will kickstart necessary conversations about practical details, such as funding planting and maintenance, that will help us determine how we will implement the lasting tree initiative that is envisioned by the Cleveland Tree Plan.

Cleveland Tree Canopy Goal, Part 1: Reverse the trend of canopy loss by 2020

50,000 Trees by 2020: Historical trends suggest that Cleveland is losing 6,400 trees (1% of existing tree canopy cover) each year due to old age, disease, development, neglect, storms, and other causes. Old age and emerald ash borer alone will account for an eventual loss of at least 3% and 5% of existing canopy cover in the next few years, respectively. With the existing rate of decline, Cleveland may see canopy shrink from 19% to 14% by 2040 if no action is taken. To stop the existing rate of canopy loss in Cleveland and reverse this trend to annual growth, Cleveland needs to plant or preserve approximately 12,800 trees per year (6,400 trees lost annually x 2).

To kickstart efforts to reverse canopy loss, the first part of the Cleveland Tree Canopy Goal is to plant 50,000 trees by 2020. Announced on Arbor Day, 2017, Mayor Frank Jackson has committed the City of Cleveland to plant 5,000 trees by 2020, approximately proportional to the percentage of Cleveland land area that is held by city government.

Cleveland Tree Canopy Goal, Part 2: Grow urban tree canopy to 30% by 2040

30% Canopy by 2040: To improve the livability, sustainability, and health of the city as it keeps pace with future growth and the impacts of climate change, the second component of the Cleveland Tree Canopy Goal is to grow the urban tree canopy from 19% to 30% by the year 2040. Cleveland's 19% average canopy cover currently provides $28 million in annual benefits due to the ability of trees to provide *ecological services* such as cleaning the air, absorbing stormwater, increasing property values, and providing shade and windbreaks. In the absence of trees, the costs to replace these ecological services would be borne by Clevelanders. Investing in growing our tree canopy has a good rate of return—at 30% urban tree canopy, Cleveland will reap a total of $44 million in annual benefits provided by trees. Appendix A illustrates what Cleveland neighborhoods look like today at current and targeted canopy levels.

Achieving an urban canopy cover of 30% by 2040 will require a dual commitment to planting trees and refocusing efforts on tree preservation. Thirty percent canopy cover can be

achieved by planting the initial commitment of 50,000 trees by 2020, followed by 24,000 trees per year through 2030. This goal allows for trees to grow into 30% canopy cover by 2040.

In terms of quantity, approximately 5,475 acres or 361,350 trees would need to be planted by 2030 to reach a 30% canopy goal over the following ten years. This is roughly one tree for every Cleveland resident. How this compares to existing planting efforts is an area for further study; known efforts among Cleveland Tree Coalition members from 2015–present have averaged 2,500 trees per year, while planting efforts by residents and non-member businesses and organizations remain uncounted. Planting 50,000 trees by 2020, then 24,000 trees per year until 2030, is a bold yet achievable goal, but it can only be met with community-wide commitment.

Additionally, growing the urban tree canopy to 30% will require greater efforts to maintain existing trees, preserve existing trees from unnecessary cutting, and create a strong maintenance plan that can support 30% tree canopy cover.

Evaluating the Cleveland Tree Canopy Goal

The Cleveland Tree Plan envisioned five factors by which we could establish and evaluate a canopy goal that is reasonable for Cleveland. Let's revisit those criteria in light of the new Cleveland Tree Canopy Goal.

- **The Cleveland Tree Canopy Goal is in line with industry standard.** American Forests and other industry professionals recommend that cities create customized canopy goals based on their unique qualities, taking into account such factors as development patterns, land use, ordinances, and climate. For cities like Cleveland that are located in temperate forest biomes, 40% canopy cover is an acceptable target goal. Our goal of 30% canopy cover will take us over halfway of the distance from current cover to 40% by 2030.

Planting Trees Reaps Annual Benefits

- Planting one tree and growing it for ten years is conservatively estimated at producing a tree with an average canopy width of 29 feet.
- Over ten years of growth, this one tree will yield $44 in annual benefits.
- Planting 24,000 trees/year and growing them out for ten years will yield over $1,000,000 in annual benefits.

- **The Cleveland Tree Canopy Goal is realistic.** According to the 2013 county-wide urban tree canopy assessment, tree canopy covers 19% of Cleveland. The assessment also determined that a maximum of 71% tree canopy cover is theoretically possible in Cleveland if every available space for trees were to be planted. This means that Cleveland has achieved 27% *relative canopy*, calculated as current canopy (19%) divided by total possible canopy (71%) . Relative canopy is useful to setting realistic goals among very different areas. A goal of 30% canopy cover would utilize less than half of the space in Cleveland that is currently available to trees.

- **The Cleveland Tree Canopy Goal is in line with goals set by other cities.** Comparing Cleveland's canopy cover to other cities can be a helpful exercise, with the caveat that every city is unique. Among cities of similar size, geographic location, and/or land use history as Cleveland, our canopy goal compares favorably:

Cleveland Tree Canopy Goal compared to goals from other cities

City	Canopy Cover	Canopy Goal
Cleveland	19% (2013)	30% canopy cover by 2040
Pittsburgh	40% (2012)	60% urban tree canopy by 2032
Baltimore	20% (2006)	40% canopy cover by 2036
Columbus	22% (2015)	27% canopy cover by 2020
Cincinnati	26% (2013)	Plant 2 million trees by 2020
Toledo	N/A	Plant 282,313 trees by 2020 (1 per person)
Detroit	18–22% (2004)	28% canopy cover (no date specified)

- **The Cleveland Tree Canopy Goal will yield measurable beneficial outcomes.** Using a suite of computer software that calculates the benefits that are provided by trees based on attributes like size, location, and species, it is possible to translate numbers of trees into beneficial outcomes—for example, reduction in heat stress, or stormwater intercepted—and their corresponding real-world value. (This software suite, called i-Tree, is freely available to the public: http://www.itreetools.org/). By performing these calculations on our existing canopy cover and the Cleveland Tree Canopy Goal, the value of these benefits would grow from $28 million to $44 million annually with an increase to 30% canopy cover.
- **The Cleveland Tree Canopy Goal can be customized to meet the needs and realities of its neighborhoods.** Existing canopy coverage varies widely among Cleveland neighborhoods, from 4% canopy cover downtown to ≥ 30% in neighborhoods like Euclid-Green, Kamm's, and Edgewater. Similarly, neighborhoods differ in how much space is available to plant trees. Whatever their current situation, however, neighborhoods can help achieve goals for human health, economic development, and environmental quality by increasing their tree canopy. Each neighborhood in Cleveland will be invited to come up with customized plans for increasing tree canopy that speak to the realities, needs, and desires of their community. At the same time, benefits from trees extend beyond the boundaries of neighborhoods to affect the well-being of the entire region.

In addition to the above requirements that were outlined in the Cleveland Tree Plan, Cleveland Tree Canopy Goal can also supports overarching citywide initiatives, such as:

- **Cleveland Climate Action Plan.** Adopted in 2013, the goal of the Cleveland Climate Action Plan is a reduction of greenhouse gas emissions of 80% below 2010 levels by 2050. Increased urban tree canopy directly relates to focus area *Land Use and Clean Water, Action 27: Develop and implement an urban tree plan to grow the canopy.* According to the Cleveland Climate Action Plan, increased urban tree canopy can reduce 2030 carbon emissions by 110,000 metric tons of CO_2 equivalent ($MTCO_2$ Eq.) due primarily to reductions in heating and cooling costs and absorption of stormwater. The Plan is being updated in 2018 and will continue to include actions on trees.
- **Neighborhood-Level Plans.** By establishing a citywide tree canopy goal, it becomes easier to establish and implement neighborhood-specific tree goals. As a first step, trees are being heavily incorporated into Cleveland Neighborhood Progress' Climate Resilience and Urban Opportunity Initiative, which focuses on the neighborhoods of Central-Kinsman, Detroit Shoreway, Glenville, and Slavic Village. This initiative will help chart a course for the development of customized tree plans that can address the needs and desires of each Cleveland neighborhood.
- **Regional Water and Green Space Plans.** Trees can be incorporated into green stormwater infrastructure to slow and reduce the amount of stormwater runoff that reaches our sewer system, supporting regional efforts to reduce discharges of combined sewer overflow into Lake Erie and its tributaries (see Northeast Ohio Regional Sewer District's Project Clean Lake). Trees are also an important part of local efforts to improve our parks and other urban green space (see Cleveland Metroparks 2020: The Emerald Necklace Centennial Plan).

Measuring Success

Canopy Assessments

To ensure that our efforts at planting and preserving trees are on track for 30% by 2040, we will need to reassess urban tree canopy approximately every 5–10 years. To complete this analysis, implementing the Cleveland Tree Canopy Goal will require a commitment of resources to periodically reassess urban tree canopy cover to monitor net changes and evaluate urban forestry program and policy success.

The Cleveland Tree Coalition aims to track partner-led tree planting initiatives, share information with the community via a website, help advocate and secure funding for future urban tree canopy assessments, and produce periodic progress reports.

Why Tree Canopy? The Benefits of Trees

A growing body of research documents the critical role that a robust urban forest provides to cities and their people. Trees contribute to health and economic wellbeing, and they help us meet the many environmental and ecological challenges that impact our daily lives. Based on the value of benefits that are provided by trees today, we can estimate the value that we will reap from our urban forest at 30% canopy cover by 2040.

Trees Improve Public Health and Safety

Trees improve public health by improving air quality and reducing urban heat island effects. In Cleveland, it has been estimated that our current tree canopy accounts for 1,200 fewer incidents of adverse health effects—like respiratory issues and hospital visits—each year, valued at just under $6.9 million. **Increasing the tree canopy to 30% by 2040 will result in 1,900 fewer adverse health incidents per year, valued at $10.9 million annually.** Specific public health outcomes include:

- *Trees reduce exposure to ultraviolet rays* that have been linked to skin cancer by about 50%.
- *Trees provide oxygen and filter the air.* In one year, an acre of mature trees can provide enough oxygen for 18 people. Higher tree canopy cover reduces rates of respiratory illness, including asthma.
- *Trees have calming effects that reduce stress*, which has wide-reaching effects on human health and behavior. Higher urban tree canopy has been linked lower rates of heart disease. Tree canopy has also been linked to reductions in violent crime; some studies have shown a 12% decrease in crime with a 10% increase in tree canopy.
- *Trees block unpleasant sights and sounds.* Trees can mask concrete walls, parking lots, and other unsightly views. They muffle sound from nearby streets and freeways and create an eye-soothing canopy of green. A 100-ft wide, 45-ft high, densely planted tree buffer can reduce highway noise by 50%. Trees also absorb dust and wind and reduce sun glare.

Trees Provide Economic Value

- *Trees conserve energy.* Three trees placed strategically around a single-family home can cut summer air conditioning needs by up to 50%. By reducing the energy demand for cooling our houses, we reduce carbon dioxide and other pollution emissions from power plants.
- *Trees in Cleveland save residents and businesses $3.5 million in energy costs each year* by reducing annual energy usage by 32 million kilowatt-hours. Increasing the urban tree canopy to 30% will save residents and businesses $5.5 million in energy costs each year.
- *Trees increase property values.* The beauty of a well-planted property, street, and neighborhood can raise property values by an average of 7%.

- Cleveland's urban forest canopy adds an estimated $4.5 million in value to residential and commercial properties. **In 2040, 30% urban tree canopy will increase Cleveland property values by $7.1 million.**

- *Trees increase business traffic in commercial districts.* Studies show that the more trees and landscaping a business district has, the more business will flow in. A tree-lined street will also slow traffic enough to allow the drivers to look at the store fronts instead of speeding by.
  - In Cleveland, commercial land use has an average canopy of just 9%, with a potential for 29% tree canopy cover that would make business districts more appealing to customers.

Trees Help Meet Environmental Challenges

- *Trees clean the air.* Trees can remove up to 60% of street-level air pollution, including carbon dioxide, ozone, nitrogen dioxide, sulfuric dioxide, and small particulate matter by absorbing them or trapping them on their leaves and bark.
  - Cleveland's urban forest removes just under 830,000 lbs. of air pollutants every year, a service valued at $1.8 million. **By 2040, our urban forest at 30% canopy cover will absorb 1.3 million lbs of pollutants, valued at $2.8 million per year.**

- *Trees help combat climate change.* Trees absorb CO_2, removing and storing the carbon while releasing the oxygen back into the air. In one year, an acre of mature trees absorbs the amount of CO_2 produced when you drive your car 26,000 miles.
  - The amount of carbon dioxide absorbed (or "sequestered") by trees annually has been calculated at just under 42,000 tons of carbon in Cleveland, valued at $800,000. **In 2040, our urban forest at 30% canopy cover will absorb 66,300 tons of carbon dioxide annually, valued at $1.26 million per year.**
  - The amount of carbon stored in woody tissue of living trees over their lifetime, calculated at almost 1.3 million tons, is valued at just over $25 million. **In 2040, our urban forest at 30% canopy cover will store 2.1 million tons of carbon annually, valued at $39.5 million per year.**

- *Trees cool the streets and the city.* Trees cool the city by 20°F to 45°F by shading our homes and streets, by breaking up urban "heat islands", and by evaporating water through their leaves.

- *Trees help prevent water pollution:* Trees act as mini water reservoirs by slowing and reducing the amount of rainwater that enters storm drains, which is especially important in highly developed urban areas like Cleveland. Trees also trap contaminants (oils, solvents, pesticides, and fertilizers) that mix with rainwater as it flows across parking lots or lawns, keeping pollutants out of waterways.

- *Cleveland's urban forest intercepts an impressive 1.8 billion gallons of rainwater and snow melt every year*, a service valued at just under $11 million. **By 2040 at 30% tree canopy cover, Cleveland trees will capture 2.8 million gallons of stormwater, saving us $17.4 million in utilities costs.**

Trees Have Ecological Value

- *Trees help prevent soil erosion:* Trees, especially tree roots, help stabilize hillsides and stream banks. They also aerate the soil, which allows the ground to absorb more stormwater runoff.
- *Trees provide a canopy and habitat for wildlife:* Urban wildlife habitat serves as refuge for songbirds and pollinators impacted by urbanization and is an important part of wildlife conservation.
    - In Cleveland, large areas of uninterrupted forest cover only 7% of land area. Remaining tree canopy is composed of patchy forested areas that are less valuable as habitat for plants and wildlife. Connecting small forest patches with one another and with large forested areas provides corridors for migration and movement of wildlife that are enjoyable to humans.
    - Trees shade water and keep water temperatures cool. Fallen leaves in the water are a food source for fish, insects, and invertebrates. Trees also keep soil in place, which prevents high silt loads in streams that can smother aquatic life, and reduce pollutants that flow into streams, rivers, and lakes.

The estimated value of benefits provided by Cleveland's urban forest

Tree-related Benefit	Benefit Value ($)	
	at 19% tree cover	at 30% tree cover
Stormwater runoff	$10,800,000	$16,900,000
Energy savings	3,500,000	5,500,000
Adverse health effects	6,900,000	10,800,000
Air quality improvement	1,800,000	2,800,000
Carbon sequestered	800,000	1,300,000
Property value increase	4,500,000	7,000,000
Total Annual Benefits	**$28,200,000**	**$44,200,000**

Next Steps

Achieving the Cleveland Tree Canopy Goal of 30% tree canopy cover by 2040 will require a significant cultural shift in how we value and care for our urban forest. With a majority of land area being owned by private landowners, we need significant involvement from everyone, including residents, businesses, and organizations that own land where trees can be planted.

Visit www.ClevelandTrees.org for more information about the Cleveland Tree Coalition and its members. Together, we are building resources to help Clevelanders

- learn more about tree planting, care, and maintenance;
- make a plan to plant and care for trees on your property;
- log your tree planting efforts; and
- support community tree initiatives.

Further Reading

Cleveland Tree Coalition. 2018. Cleveland Tree Coalition [web site]. www.clevelandtrees.org

Cleveland Tree Coalition. 2018. Cleveland Tree Coalition [Facebook page]. www.facebook.com/cletrees

Cuyahoga County Planning Commission. 2014. Urban Tree Canopy Assessment [web site]. www.countyplanning.us/projects/urban-tree-canopy-assessment

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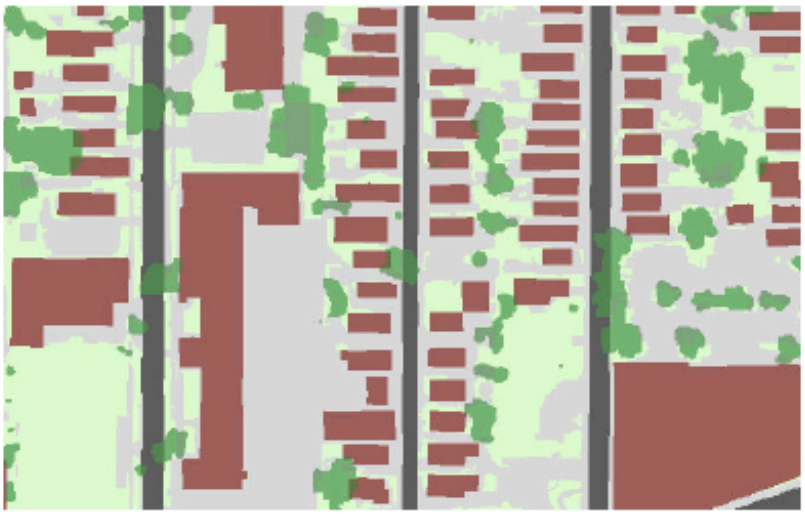
Sustainable Cleveland. 2018. Climate Action [web site]. www.sustainablecleveland.org/climate-action

USDA Forest Service, Northern Research Station. 2010. Sustaining America's urban trees and forests: a Forests on the Edge report [report NRS-62]. www.fs.fed.us/nrs/pubs/gtr/gtr_nrs62.pdf

Appendix A
Existing Canopy Cover Examples



Where we are now:

19%

Detroit-Shoreway SPA

Image credit: CSU Center for Community Planning and Development using information from the Cleveland Tree Plan, Cuyahoga County Greenprint and Google Streetview

Where we want to be:

30%
Edgewater SPA

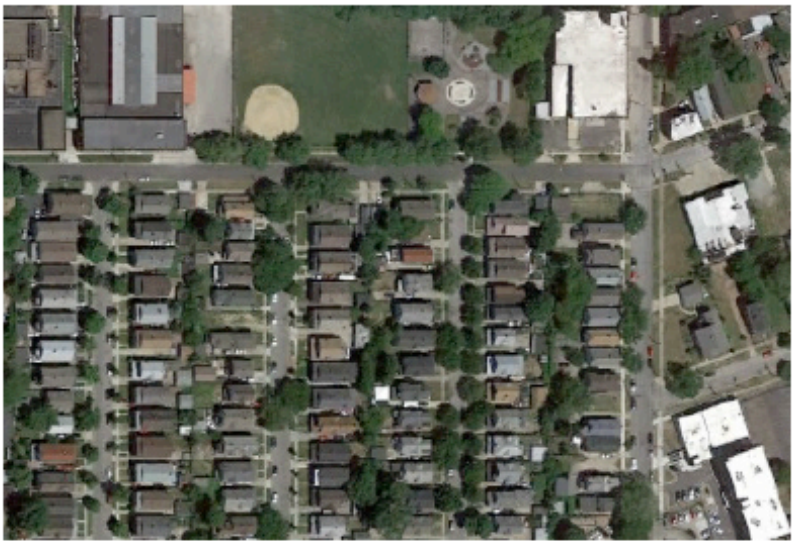
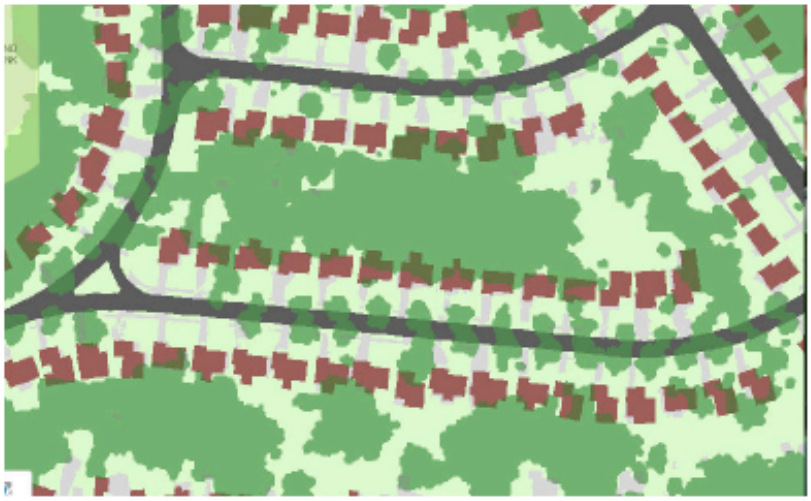


Image credit: CSU Center for Community Planning and Development using information from the Cleveland Tree Plan, Cuyahoga County Greenprint and Google Streetview



Citywide High Tree Canopy:

39%

Euclid-Green SPA

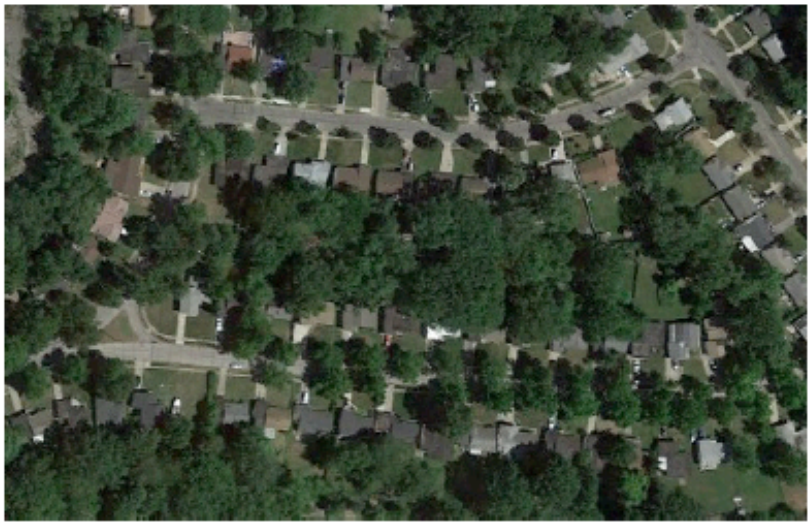
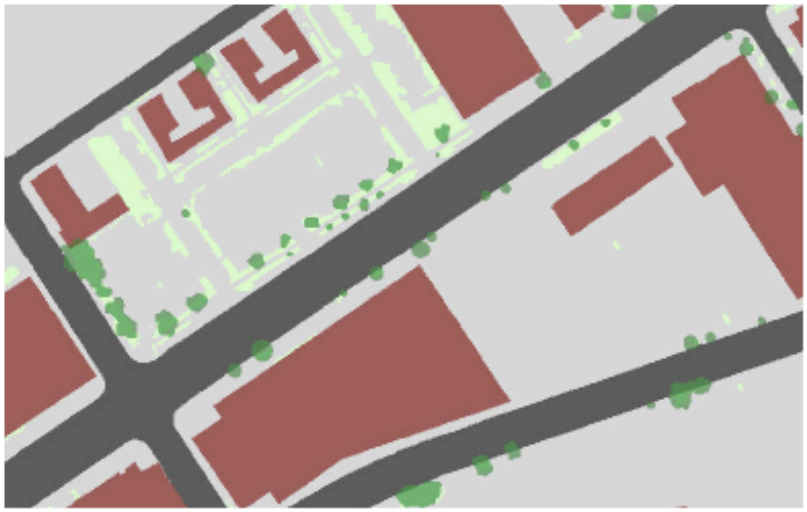


Image credit: CSU Center for Community Planning and Development using information from the Cleveland Tree Plan, Cuyahoga County Greenprint and Google Streetview



Citywide low tree canopy:

4%

Downtown SPA

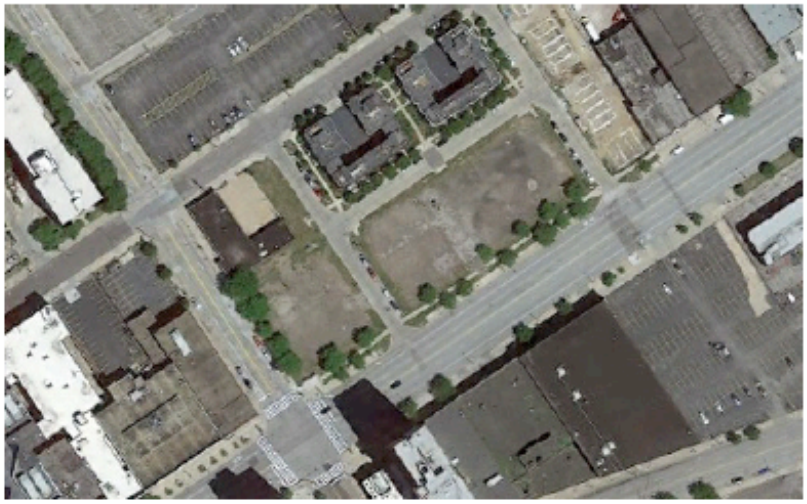


Image credit: CSU Center for Community Planning and Development using information from the Cleveland Tree Plan, Cuyahoga County Greenprint and Google Streetview