UNIVERSITY DISTRICT COMMUNITY STREET TREE INVENTORY SUMMARY REPORT

THE CITY OF COLUMBUS RECREATION AND PARKS

SPRING 2023

TREE INVENTORY EXECUTIVE SUMMARY

UNIVERSITY DISTRICT

PROJECT OVERVIEW

In 2022, the City of Columbus Recreation and Parks Department commissioned an update to the city's existing street tree inventory in the University District neighborhood. This project directly supports the implementation of the recently completed Columbus Urban Forestry Master Plan, which establishes a vision and future goals for Columbus' urban forest.

COMMUNITY OVERVIEW

University District has an estimated population of 51,697 residents and contains 92 miles of city-maintained streets. The community encompasses 2.9 square miles of land area and accounts for 1.3% of the City of Columbus' total area. Current canopy cover within University District is estimated to be 21%.

VISION FOR THE URBAN FOREST

To prioritize, preserve, and grow the tree canopy in Columbus equitably across neighborhoods, to improve health and quality of life for all residents.

COLUMBUS' URBAN FOREST GOALS

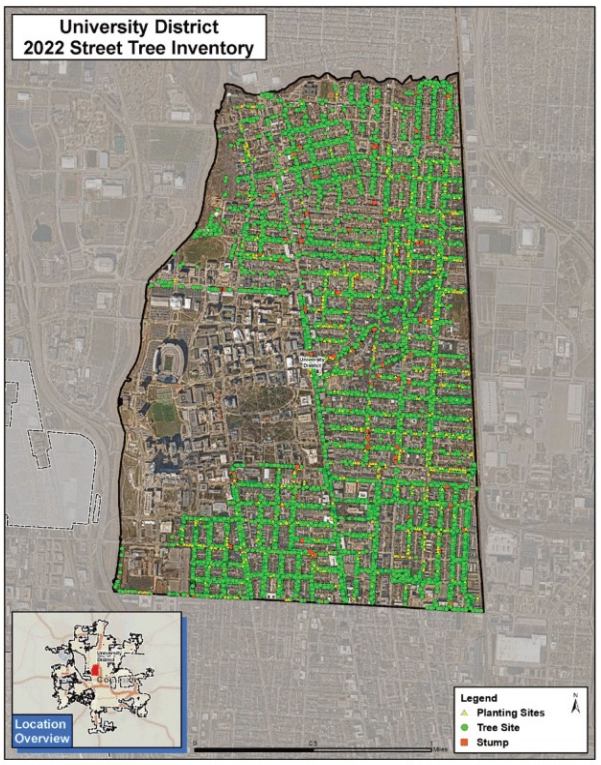
- **GOAL 1.** 40% CITYWIDE CANOPY COVER (BY 2050)
- **GOAL 2.** STOP NET CANOPY LOSS (BY 2030)
- **GOAL 3.** EQUITABLE INVESTMENT (BY 2030)

5,740 Sites Inventoried

4,563 Trees

1,020 Planting Sites

157 Stumps



OVERALL CONDITION OF UNIVERSITY DISTRICT'S INVENTORIED TREES: FAIR

Good	Fair	Poor	Dead
39%	57%	3%	1%

THE CITY OF COLUMBUS RECREATION AND PARKS

Contact Info

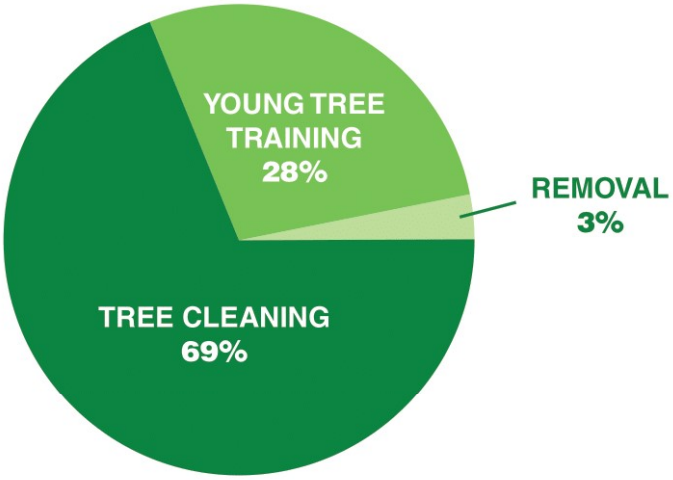
City of Columbus
Recreation & Parks Dept.
1111 East Broad Street
Columbus, Ohio 43205

DAVEY Resource Group

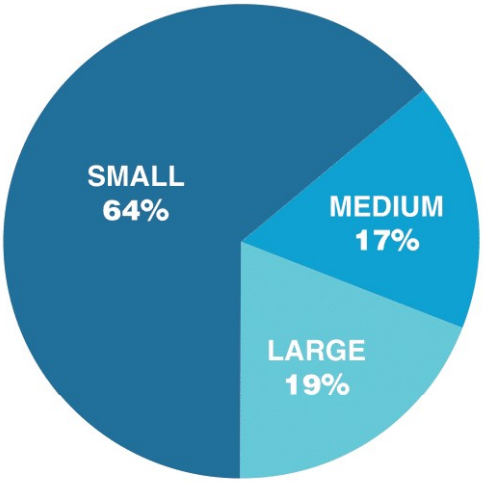
Inventory Details

DRG's team of ISA Certified Arborists completed the tree inventory in 2022.

TREES BY MAINTENANCE RECOMMENDATION



PLANTING SITES BY TREE SIZE



$10.2 million

Estimated value of University District's inventoried street trees.

35 metric tons

Annual CO_2 captured

1.25 metric tons

Annual air pollutants removed

776,381 gallons

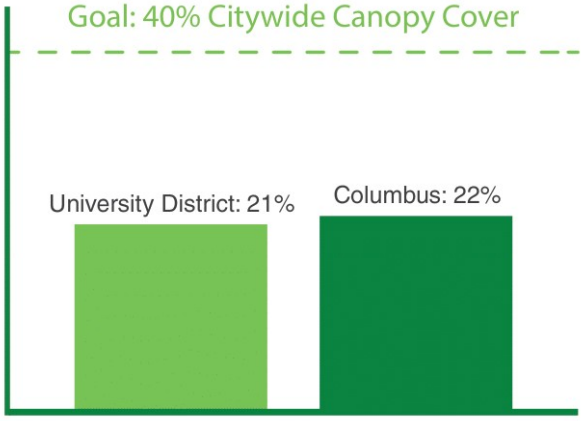
Annual stormwater runoff intercepted

CREATING EQUITABLE CANOPY COVER

Implementation of the following action steps will significantly increase canopy cover over time, provide greater value and more benefits to University District's residents, and help the city realize its vision and achieve its goals for the urban forest.

THE WAY FORWARD: ACTION STEPS

1. Preserve and maintain existing canopy.
2. Prioritize planting of large- and medium-size planting sites.
3. Develop neighborhood tree planting initiatives and community outreach focused on planting trees on private property.
4. Explore retrofitting existing street infrastructure and updating design standards to expand and improve available tree growing spaces.



Current levels of community and citywide canopy coverage compared to the city's 2050 canopy goal.

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DAVEY Resource Group

Notice of Disclaimer: Inventory data provided by Davey Resource Group, Inc. "DRG" are based on visual recording at the time of inspection. Visual records do not include individual testing or analysis, nor do they include aerial or subterranean inspection. DRG is not responsible for the discovery or identification of hidden or otherwise non-observable hazards. Records may not remain accurate after inspection due to the variable deterioration of inventoried material. DRG provides no warranty with respect to the fitness of the urban forest for any use or purpose whatsoever. Clients may choose to accept or disregard DRG's recommendations or to seek additional advice. Important: know and understand that visual inspection is confined to the designated subject tree(s) and that the inspections for this project are performed in the interest of facts of the tree(s) without prejudice to or for any other service or any interested party.

SECTION 1: STRUCTURE, COMPOSITION, AND MAINTENANCE

The City of Columbus Recreation and Parks Department (CRPD) designated the street rights-of-way (ROW) within the University District community as an area of interest for an on-going update to the city's existing GIS-based public tree inventory. The University District community street tree inventory supports the *Columbus Urban Forestry Master Plan* (CUFMP).

5,740 SITES INVENTORIED

In 2022, DRG arborists performed field data collection and catalogued new data on potential viable planting sites, existing trees, and tree stumps located within the ROW of the University District community (Figure 1 and Map 1).

Of the 5,740 total inventoried sites:

***79%* = Existing street trees**

***18%* = Potential planting sites**

***3%* = Existing stumps**

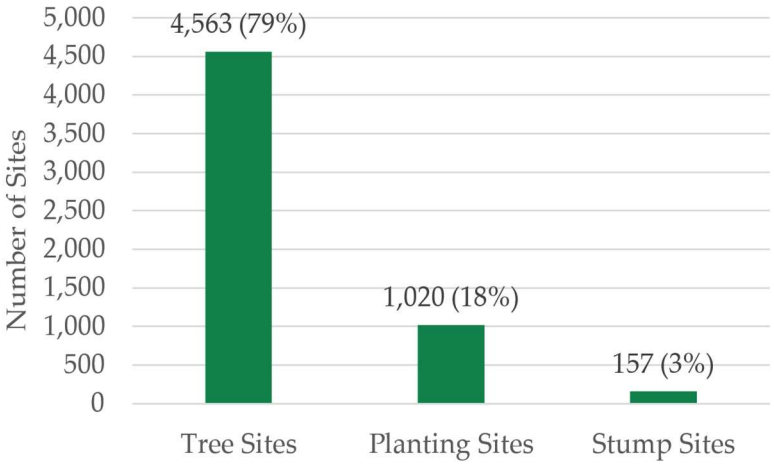


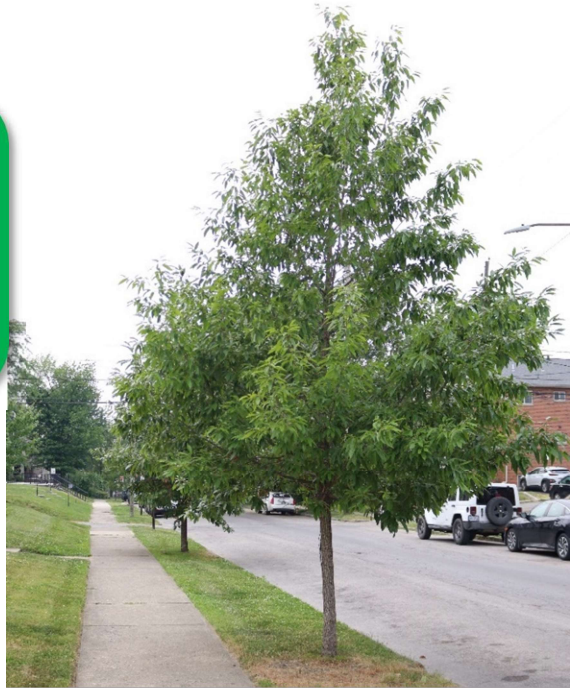
Figure 1. Quantity of inventoried sites by site type.

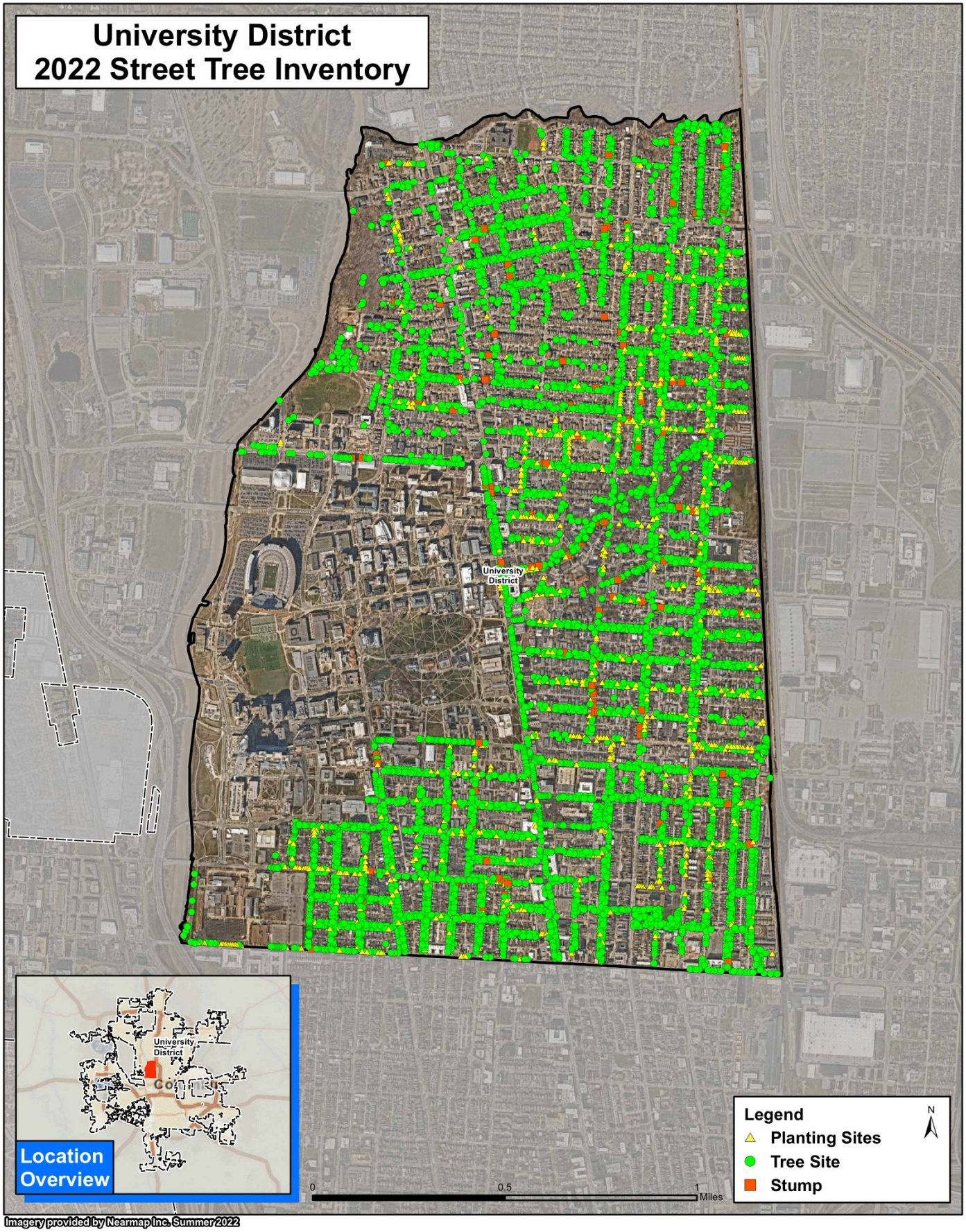
A well-stocked right-of-way holds promise for the urban forest

Stocking level is a forestry term used to report the ratio of existing street trees to the total number of suitable tree locations within the street ROW, which includes trees, stumps, and vacant planting locations.

The stocking level of University District right-of-way is currently 79%. Maintaining trees in the right-of-way as they establish and mature is the best way to grow urban tree canopy. A high stocking rate means less pressure to plant trees so CRPD can focus on proactive and strategic maintenance.

DRG arborists identified vacant potential planting sites within University District's street rights-of-way (ROW). Stocking the ROW with new tree plantings such as the trees pictured here will help improve canopy coverage and increase the quantity of benefits trees provide to the community.





Map 1. Approximate locations of sites inventoried during the 2022 University District community street tree inventory.

IMPROVE TREE POPULATION DIVERSITY

Urban forest resiliency is positively correlated with tree population diversity; greater diversity helps reduce exposure to harmful pests and disease which can target individual tree species, groups of species, or even entire tree genera.

Species and genus diversity distributions offer a critical measure of a tree population's resiliency to such attacks and help managers to identify and remedy potential areas of overexposure.

When assessing tree population diversity, it is widely accepted that **no more than 10% of an urban tree population should be composed of a single species and no greater than 20% from a single genus**.

Species Distribution is Well-Aligned

A total of 145 unique tree species were catalogued. Of the five most abundant tree species recorded during the inventory, no species exceeded the recommended 10% threshold (Figure 2). Sugar maple, *Acer saccharum*, is the most abundant species found within the community's street ROW, accounting for 7% of all inventoried trees. Freeman maple, Japanese lilac-tree, hedge maple, and Callery pear each represent 5% of trees inventoried.

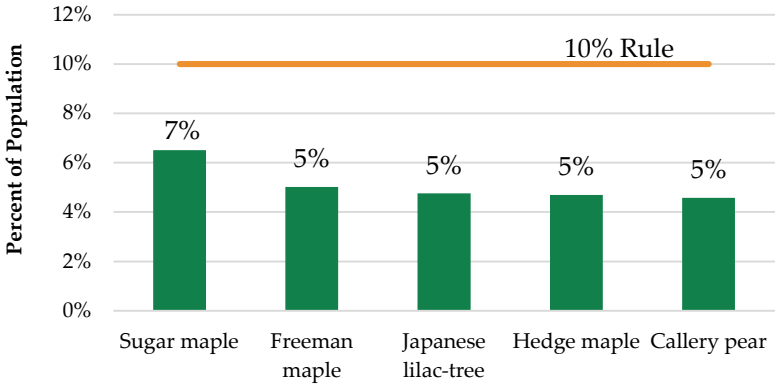


Figure 2. Species distribution of inventoried trees.

Genus Distribution is Skewed

University District has 64 unique tree genera, or groups of tree species, that are closely related (Figure 3).

The genus *Acer*, which is composed of maple trees, accounts for 33% of the entire inventoried population—well above the suggested threshold of 20%.

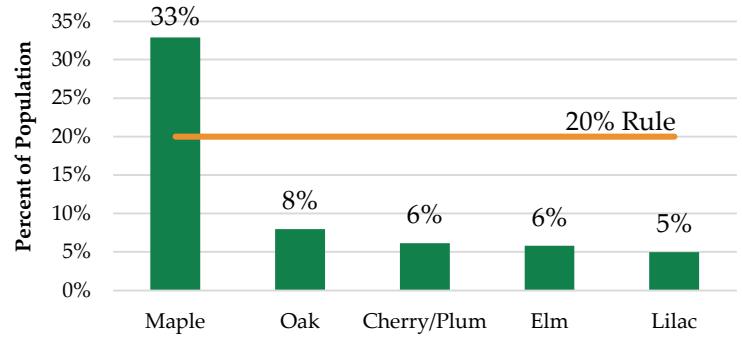


Figure 3. Genus distribution of inventoried trees.

Maples are Overrepresented

Future planting initiatives should limit the installation of additional maples in University District until representation of the genus *Acer* falls within the recommended 20% threshold.

Maple trees are susceptible to a variety of harmful pests and disease, including the fungal pathogen Verticillium wilt (*Verticillium* spp.) and the invasive Asian longhorned beetle (ALB, *Anoplophora glabripennis*). Improved genus diversity will reduce the potential for tree loss and help ensure long-term urban forest health and viability.

Above: Asian Longhorned Beetle. Photo: Jeff Tessner, DRG.

Left: Sugar maple with Verticillium wilt. Photo: Jerry Weiland, USDA-ARS.

OVERALL TREE CONDITION IS FAIR

The condition of each inventoried tree was evaluated and rated as good, fair, poor, or dead. Several factors affecting condition were considered for each tree, including root characteristics, branch structure, trunk, canopy, foliage condition, and the presence of pests.

The general health of the inventoried tree population is characterized by the median average condition rating. Overall, **University District's street trees are in fair condition** (Figure 4)**.**

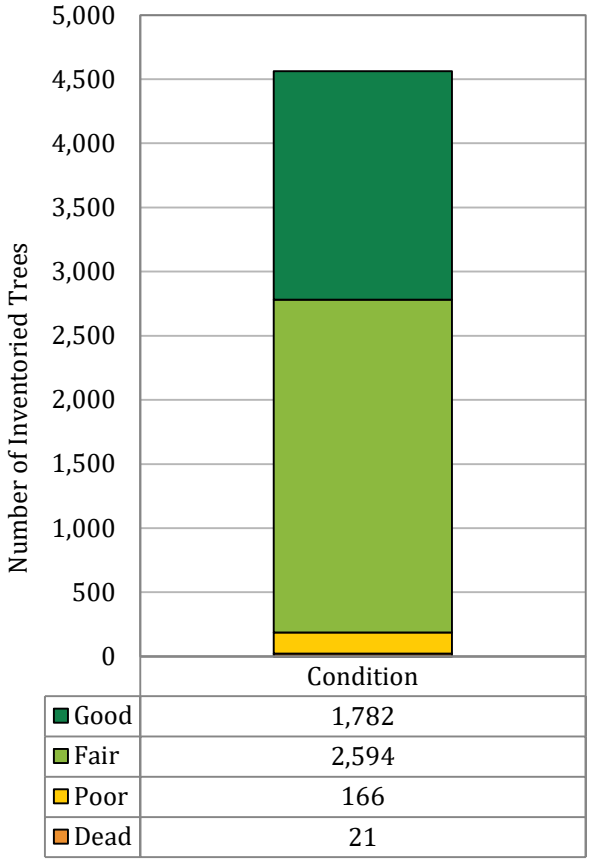
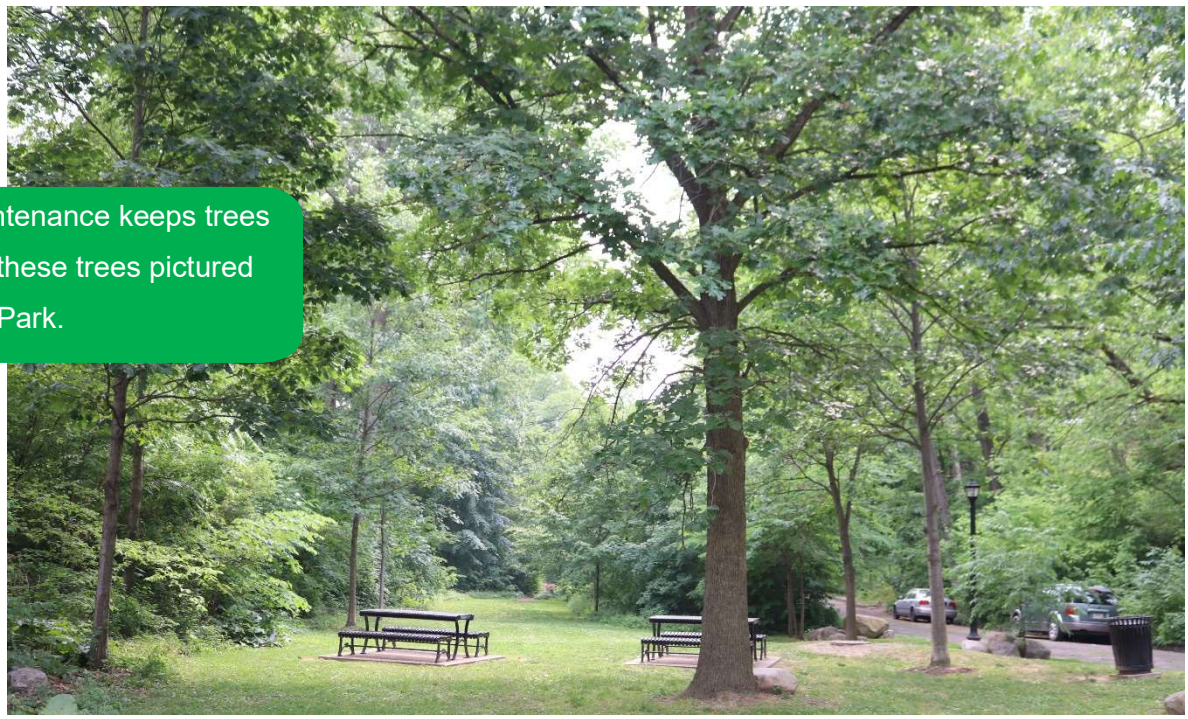


Figure 4. Condition of inventoried trees.

Routine Inspections are Key

Proactive monitoring helps identify, prevent, and mitigate concerns. Routine tree inspections are necessary to monitor for changes in tree condition, the presence of pests and/or disease, or the worsening of existing defects – particularly among trees rated in poor condition.

Poor condition ratings are generally due to visible signs of decline and stress, such as decay, dead limbs, or discolored foliage. If retained, these trees will likely require corrective pruning and intensive plant health care to improve their vigor. Dead trees and trees with defects that cannot be remedied should be removed as soon as possible.



Routine maintenance keeps trees healthy, like these trees pictured here at Iuka Park.

TREE DIAMETER-AGE DISTRIBUTION

Understanding the relative age of a tree population can help planners align future management strategies with current policy goals. To determine relative tree age, DRG first categorized University District's inventoried tree population by small- and large-growing trees and then assigned each tree to an age grouping based on the tree diameter measured at breast height (DBH) as outlined in Table 1.[1]

Table 1. Tree age by growing size at maturity and diameter at breast height (DBH).

Relative Tree Age	Large-Growing		Small-Growing		Combined
	DBH	Quantity	DBH	Quantity	Quantity
Young	0–8"	1,430	0–4"	561	1,991
Established	9–17"	1,053	5–8"	398	1,451
Maturing	18–24"	374	9–12"	179	553
Mature	> 24"	421	>12"	102	523

The relative age distribution of University District's inventoried tree population was then compared to an ideal distribution for an expanding urban forest, which suggests the tree population composition be equivalent to 40% young trees, 30% establishing, 20% maturing, and 10% mature trees (Figure 5).

An Abundance of Young and Established Trees

Overall, 44% of University District's inventoried trees are classified as young, compared to an ideal level of 40%, and 32% of inventoried trees are in the established size class, which is slightly above the ideal threshold of 30%. Future maintenance should prioritize activities that help establish these young trees in the urban landscape through pruning to train future tree growth, watering programs, and routine tree health inspections.

Maturing and Mature Trees are Underrepresented

For both large-growing and small-growing trees, the largest size classes of trees are underrepresented in the street tree population. Only 12% of trees are in the maturing size class compared to an ideal of 20%. And 12% of trees are in the mature size class, which is just over the ideal of 10%. Maintenance and preservation of existing trees in these age groups is critical to ensure uninterrupted canopy expansion and succession of the urban forest as young trees establish.

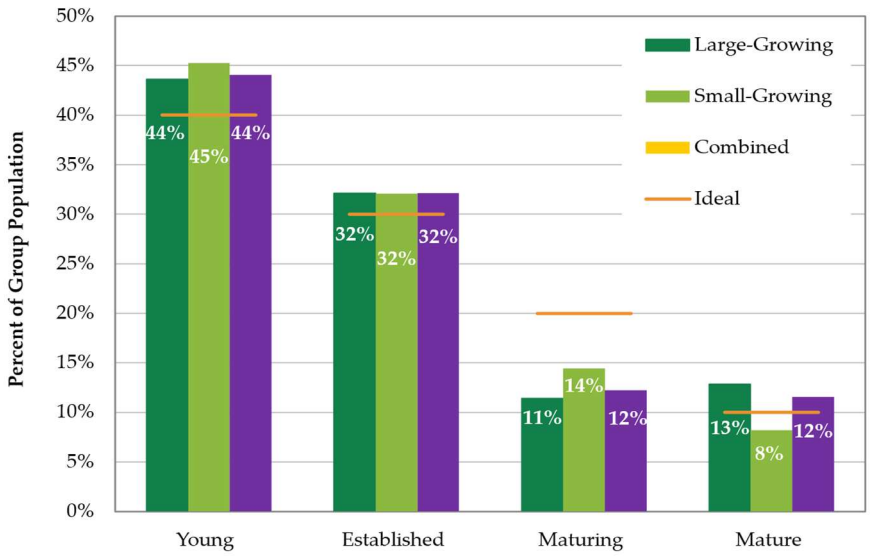


Figure 5. Distribution of relative tree age by diameter size class.

[1] Tree size is only a rough approximation of tree age; tree size alone is not a definitive or appropriate measure of tree age. In the urban environment in particular, numerous factors play a role in determining tree size, including the availability of water, soil, and sunlight, proper tree care and planting techniques, the presence of pests and pathogens, etc.

TREE MAINTENANCE RECOMMENDATIONS

During the inventory, DRG arborists assigned a primary recommended maintenance activity to each of the 4,563 inventoried trees (Figure 6).

City managers generally prioritize maintenance activities by risk. For example, a large dead tree by a busy intersection should be removed before a small dead tree at the end of a little-used secondary street.

PRIMARY MAINTENANCE CATEGORIES

Tree Cleaning = 3,157 Trees

Tree cleaning describes pruning to remove dead, dying, broken, decayed, and/or crossing limbs. Trees in this category are recommended for inclusion in a regularly scheduled, routine maintenance program. Over time, routine pruning minimizes the occurrence of reactive maintenance.

Tree Removal = 154 Trees

Within University District, 154 trees are designated for removal. City Forestry only removes trees that are hazardous: either dead, dying, or dangerous to public safety.

Young Tree Training = 1,252 Trees

Younger trees can have branch structures that lead to potential problems as the tree ages. These trees should be pruned to train future growth patterns and correct or eliminate weak, interfering, or objectionable branches to minimize future maintenance requirements.

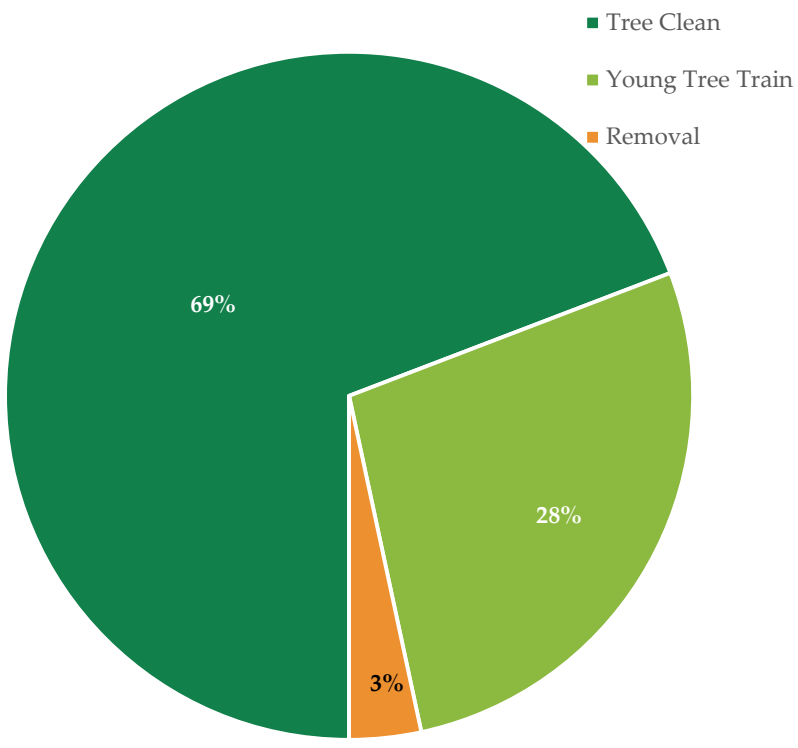


Figure 6. Primary maintenance recommendations for 4,563 trees in the University District neighborhood, by type.

SECTION 2: TREE BENEFITS

STRUCTURAL VALUE OF UNIVERSITY DISTRICT'S STREET TREES: $10.3 million

Trees are critical to public health and contribute significantly to quality of life for every community resident. In addition to improving air quality, water quality, and alleviating heat stress, trees provide significant social benefits, such as reducing mental stress, encouraging greater neighborhood-level involvement, and fulfilling spiritual and aesthetic needs. **Structural value calculates the cost it would take to replace trees, meaning that all of the street trees in University District are valued at $10.3 million.**

Because of the significant value of these benefits, cities across the country now recognize trees are critical infrastructure. In fact, they are the only type of infrastructure that increases in value over time and have been proven to pay for themselves. Urban trees in the Midwest consistently provide benefits value three times more than the cost to maintain them.[2]

Table 2. Estimated benefits provided by University District's street trees

Category	Value
Ecosystem Services	$449,759.96
Structural Value	$10,297,349.15
Combined Value	**$10,747,109.11**
Per Tree Average	**$2,355.27**

The 4,563 street trees inventoried within the University District community provide an ecosystem value of $449,760 thorugh air filtration, water quality improvements, and carbon storage--and those are just the benefits quantified by this analysis (Table 2). Trees also boost property values, reduce energy costs, lower crime rates, and help create more successful business districts.[3]

ECOSYSTEM SERVICES

Annual Carbon Captured – 76,875 pounds

As the primary greenhouse gas driving climate change, carbon dioxide (CO_2) impacts people, property, and the environment. Trees are carbon sinks—constantly absorbing CO_2 from the atmosphere and storing it within tree tissue. Over the course of their lifetime, University District's inventoried trees have captured over 2,235 metric tons of carbon. Using trees to sequester CO_2 is a key part of the *Columbus Climate Adaptation Plan*'s goal to make the city more resilient.

Annual Air Pollution Removed – 2,756 pounds

Ozone and particulates can especially aggravate existing respiratory conditions (like asthma) and create long-term chronic health problems. Trees absorb gaseous pollutants such as ozone during respiration and intercept particulate pollutants, such as $PM_{2.5}$s, from entering the atmosphere by trapping them on plant surfaces.

Annual Rainwater Intercepted – 776,381 gallons

As cities grow, land that naturally absorbs rainwater (i.e., lawns, parks, fields) tends to be replaced by hard surfaces that cause rain to run off (i.e., roads, buildings, parking lots). Rainwater flowing over these hard surfaces accumulates pollutants, and the contaminated stormwater flows into overloaded sewers, ultimately reaching the local lakes and streams. Polluted water is a major cause of human health issues and degrades the local ecology. Tree leaves intercept rainwater as it falls, which slows the rate at which stormwater enters sewer systems.

STRUCTURAL VALUE – $10.3 million

Structural value represents the cost to replace a given tree with an identical one. Structural value increases over time as more trees are planted and existing trees mature. The total value of the University District community forest will grow considerably in future years as more trees are planted, existing trees are maintained and become healthier, and the city works toward achieving the goals of the *Columbus Urban Forestry Master Plan*.

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[2] Peper, Paula J.; McPherson, E. Gregory; Simpson, James R.; Vargas, Kelaine E.; Xiao, Qingfu. 2009. Lower Midwest community tree guide: benefits, costs, and strategic planting. Gen. Tech. Rep. PSW-GTR-219. Albany, CA: U.S. Forest Service, Pacific Southwest Research Station. 115 p.

[3] See the Columbus Urban Forestry Master Plan for in-depth discussion on tree benefits and their impact on the city's residents.

SECTION 3: FUTURE CONSIDERATIONS

Every neighborhood deserves access to the benefits trees provide. With an estimated 21% canopy cover in University District, growing canopy cover in the neighborhood is crucial for achieving citywide urban tree canopy goals. Realizing the vision and achieving the goals of the *Columbus Urban Forestry Master Plan* will take planned strategic effort guided, in part, by data analysis and application.

1,020 POTENTIAL PLANTING SITES

A key objective of the tree inventory update is to catalog and analyze growing spaces along the neighborhood's street ROW. Analysis results will inform future planting initiatives and help ensure the selection of the most appropriate tree species given the available growing spaces within the neighborhood.

DRG arborists found a total of 1,020 vacant sites potentially suitable for planting trees.[4] Vacant planting sites were evaluated for suitability for trees and characterized by size and type. DRG considered the presence of existing utilities, overhead lines, and distances from stop signs, fire hydrants, driveways, and other existing infrastructure in the evaluation of planting sites. A majority of these sites (64%) can only accommodate trees species that are small at maturity (Figure 7).

656 Small Planting Sites

- Best suited for small-maturing trees.
- Minimum width of 3 to 5 feet.
- Located at least 20 feet from another tree.
- Includes all sites with overhead utilities, regardless of site width.

173 Medium Planting Sites

- Best suited for medium-maturing trees.
- Minimum width of 5 to 7 feet.
- Located at least 30 feet from another tree.

191 Large Planting Sites

- Best suited for large-maturing trees.
- Minimum width of greater than 7 feet.
- Located at least 40 feet from another tree.
- The highest quality potential planting site.

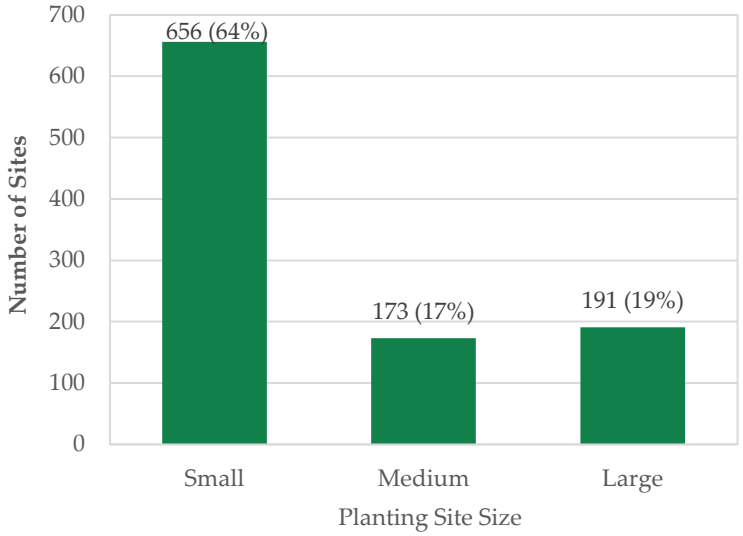

Figure 7. Vacant planting sites by size.

PLANTING CONSIDERATIONS

Site Selection: Urban environments constrain what tree species are appropriate. Existing infrastructure such as utilities and sidewalks, growing space size, and other trees all impact what tree is appropriate for a site.

Tree Selection: Tree species should be resilient to the urban environment, diverse, and the appropriate height and width for the growing space.

Blocking an unsightly view or creating shade may be a priority, but the impact of a tree on its environment – and vice versa – must be considered. Sustainable and successful planting initiatives select tree species that thrive and flourish in the chosen planting location in a way that harmonizes with the surrounding urban environment.

[5] All planting locations will require further investigation by the city and CRPD prior to any final determination of suitability for planting.

USING LIMITED PLANTING SITES STRATEGICALLY

The good news: There are many opportunities to plant more trees in University District. With 1,020 available sites, a robust planting campaign can have plenty of success.

The less good news: The majority of available sites, 64%, are only suitable for small trees (Figure 7). There is not as much room to plant larger-maturing trees that will provide more environmental benefits and canopy cover over the course of their lifetime than small trees.

THE WAY FORWARD: ACTION STEPS

Investing in equitable canopy does not just entail increasing overall tree canopy cover through planting, but also addressing the quality of the trees, caring for the existing trees, planning for trees within the different land uses and infrastructure, and reaching out to residents about the importance of trees.

In University District, we know that existing canopy cover is insufficient, and the community needs equitable investment. Though there is an abundance of available planting locations, their smaller size diminishes their potential for improving the urban forest. Given this set of facts, what can be done in University District to maximize growth of the neighborhood forest for the benefit of its residents, stakeholders, and the entire City of Columbus?

Maintain and Preserve Existing Trees (Near-Term)

It takes a long time for a young tree to become a large, stately mature shade tree. Preserving what is already there is a major component of an urban forest growth strategy. When trees fail or need to be removed, they should always be replaced in the next growing season.

Prioritize Planting, Especially Large and Medium Sites (Short-Term)

Larger trees provide residents with greater benefits. Within University District, 191 large and 173 medium planting sites were identified. Planting in these locations will increase the amount of street trees by 8% and provide a solid foundation for maintaining and improving community canopy cover.

Explore Planting Beyond the Right-of-Way (Intermediate-Term)

Where insufficient space or overhead utilities restrict available planting options, planting on private property can allow for the selection of more desirable tree species. Urban forestry stewardship on private property will require education and outreach initiatives, as well as easy and low-cost access to trees.

Expand Right-of-Way Growing Spaces (Intermediate to Long-Term)

Future policy initiatives should consider options to improve available grow space, including retrofitting existing infrastructure and implementing design standards that provide adequate grow space for trees within street rights-of-way. Examples include the addition of bump-outs, expanding the size of tree lawns during utility or development projects, and exploring the use of green infrastructure technologies (e.g., silva cells, structural soils). Ensuring canopy equity requires sufficient growing space for trees to survive and thrive in an urban setting.