FORT HAYES
STREET TREE INVENTORY
SUMMARY REPORT

THE CITY OF
COLUMBUS
RECREATION AND PARKS

SPRING 2023

TREE INVENTORY EXECUTIVE SUMMARY

FORT HAYES COMMUNITY

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 Fort Hayes 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

Fort Hayes is a former military base that is now used by the Columbus Metropolitan School District as the Fort Hayes Metropolication Education Center and bus depot. It is surrounded by Interstates 71 and 670. The estimated population of Fort Hayes is 2 residents. The neighborhood has 0.6 miles of city-maintained vehicle roads. Fort Hayes has an area of 0.29 square miles, which is 0.13% of the area of Columbus. Current canopy cover within Fort Hayes is estimated to be 7%.

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)

31

Sites Inventoried

26 Trees

4 Planting Sites

1 Stump

OVERALL CONDITION OF FORT HAYES' INVENTORIED TREES: GOOD

50%	46%	4%
Good	Fair	Dead

THE CITY OF COLUMBUS RECREATION AND PARKS

Contact Info

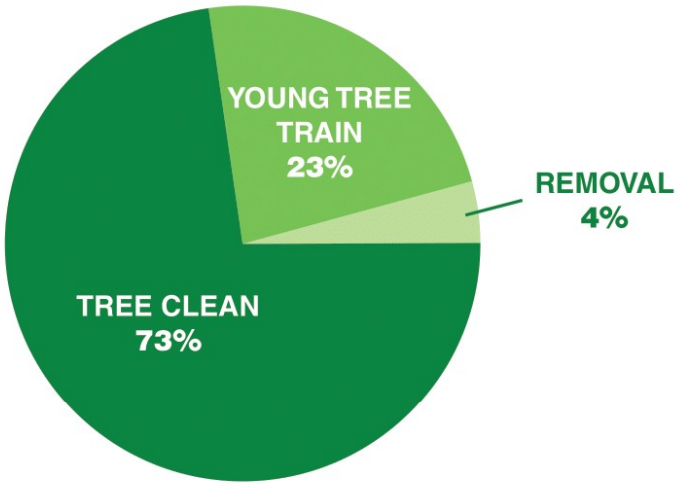
City of Columbus
Recreation & Parks Dept.
1111 East Broad Street
Columbus, Ohio 43205

DAVEY Resource Group

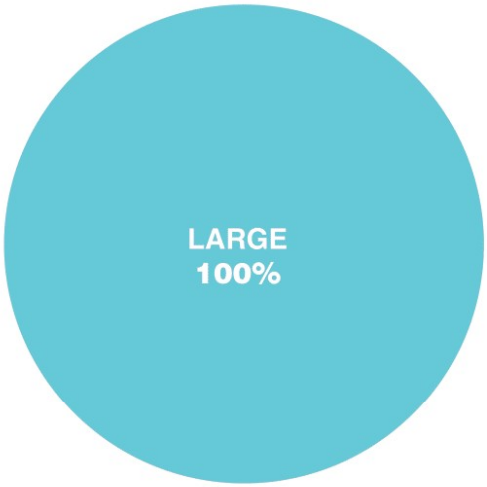
Inventory Details

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

TREES BY MAINTENANCE RECOMMENDATION



PLANTING SITES BY TREE SIZE



$41,849

Estimated value of Fort Hayes' inventoried street trees.

0.2 metric tons

Annual CO_2 captured

22 pounds

Annual air pollutants removed

3,669 gallons

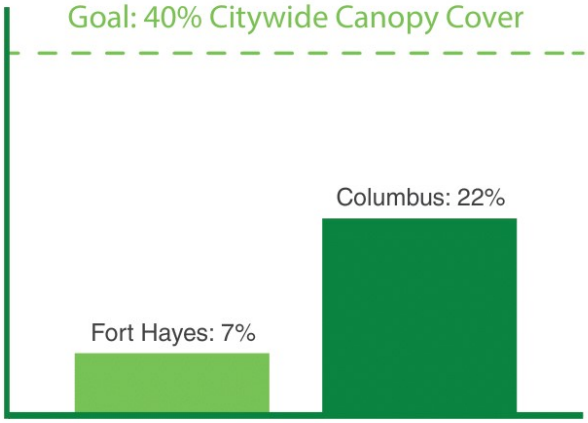
Annual stormwater runoff intercepted

CREATING EQUITABLE CANOPY COVER

Implementation of the following action steps will significantly increase canopy cover over time, provide greater value and more benefits to Fort Hayes' 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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SECTION 1: STRUCTURE, COMPOSITION, AND MAINTENANCE

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

31 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 Fort Hayes community (Figure 1 and Map 1).

Of the 31 total inventoried sites:

***84%* = Existing street trees**

***13%* = Potential planting sites**

***3%* = Existing stumps**

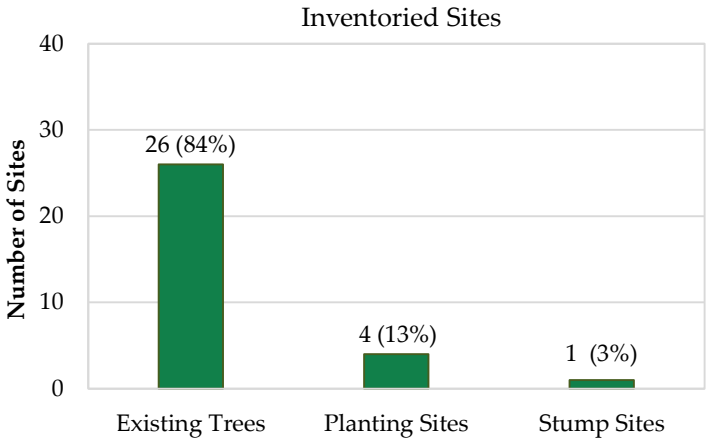
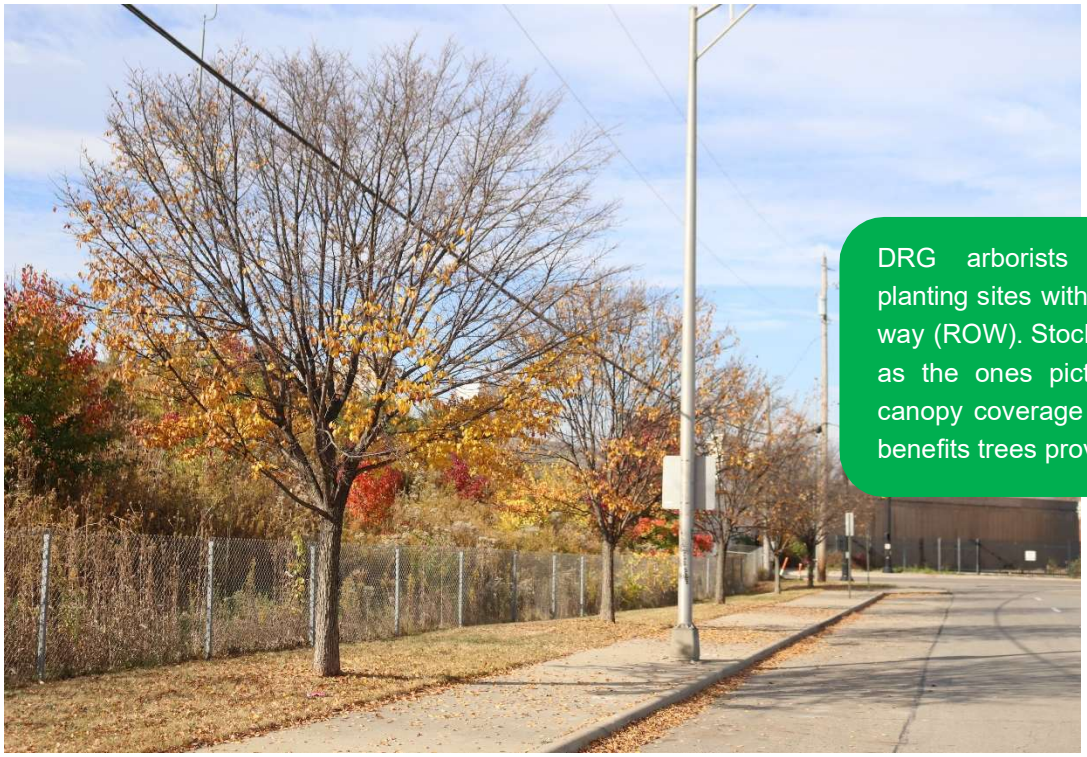


Figure 1. Quantity of inventoried sites by site type.

Explore planting options with community partners for canopy growth

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 the Fort Hayes community right-of-way is currently 84%. This is due to the land use of the community as a school campus and bus depot. In order to grow canopy in Fort Hayes, CRPD should explore creating new planting spaces in parking lots, or planting on campus greens in partnership with Columbus City Schools.



DRG arborists identified vacant potential planting sites within Fort Hayes' street rights-of-way (ROW). Stocking the ROW with trees (such as the ones 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 Fort Hayes 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 Balanced

A total of 5 unique tree species were catalogued in the right-of-way. Although three species exceeded the 10% threshold, the population of right-of-way trees is small and thus challenges species recommendations at this scale. Future tree planting should take citywide species diversity recommendations under consideration.

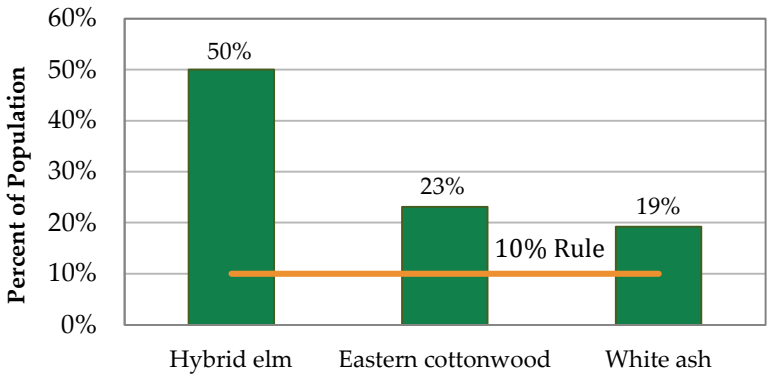


Figure 2. Species distribution of inventoried trees.

Genus Distribution is Skewed

Fort Hayes has 15 unique tree genera, or groups of tree species that are closely related (Figure 3).

The genus *Ulmus*, which is composed of elm trees, accounts for 50% of the entire inventoried population—above the suggested threshold of 20%.

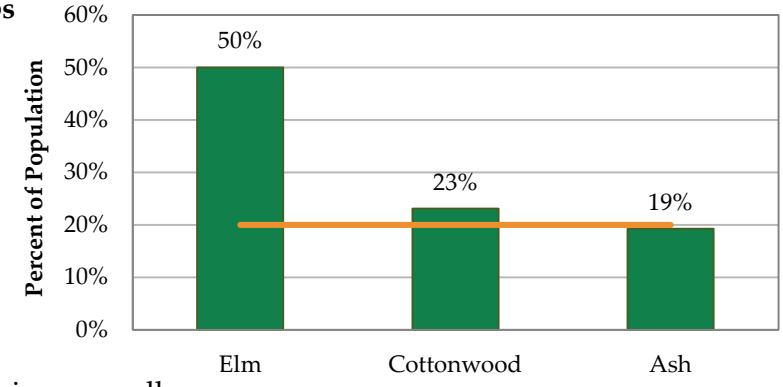


Figure 3. Genus distribution of inventoried trees

A Small Population Skews Diversity Recommendations

Because the population of inventoried trees is so small, species and genus diversity statistics are highly impacted by each individual tree. As more trees are planted and the population grows, metrics will show a more realistic representation of the neighborhood.

Future tree plantings in the Fort Hayes neighborhood should focus on planting the largest tree appropriate for each planting space. Using citywide diversity data will provide a better guideline for species selection than neighborhood-level data until the tree population grows.

Urban forest resiliency should be a top priority to planting selection; this means selecting hardy trees that add diversity. Forests that are not diverse are susceptible to pest and disease, such as the insect and fungal pests that target maples pictured to the right.

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

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

OVERALL TREE CONDITION IS GOOD

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, **Fort Hayes' public trees are in good condition** (Figure 4).

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.

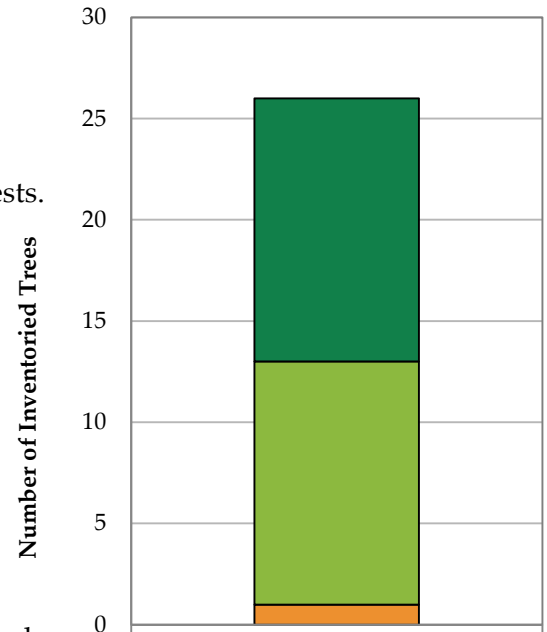


Figure 4. Condition of inventoried trees.

Routine inspection helps keep trees healthy, like the trees pictured here at the Fort Hayes Metropolitan Education Center campus.

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 Fort Hayes' 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 outline 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"	13	0–4"	0	13
Established	9–17"	8	5–8"	0	8
Maturing	18–24"	3	9–12"	0	3
Mature	> 24"	2	>12"	0	2

The relative age distribution of Fort Hayes' 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).

A Small Tree Population Skews Age Distribution

While the age and size distribution of trees in Fort Hayes is close to the correct proportion for a healthy urban forest, a population of only 26 trees is too small to draw conclusions from. 50% of trees are young, 31% are established, 12% maturing, and 8% are mature. No small-form trees were inventoried in Fort Hayes.

Large, mature trees provide the most benefits for the students who rely on the Fort Hayes neighborhood. As CRPD plants in Fort Hayes, the largest tree appropriate for the space should be selected.

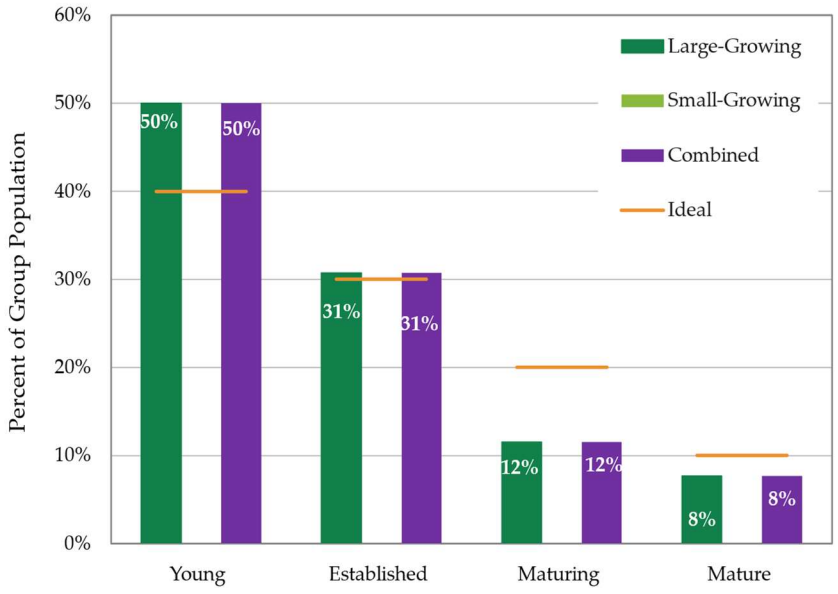


Figure 5. Relative tree age by diameter size class

[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 26 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 = 19 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 = 1 Trees

Within Fort Hayes, only 1 trees are designated for removal. City Forestry only removes trees that are hazardous: either dead, dying, or dangerous to public safety.

Young Tree Training = 6 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.

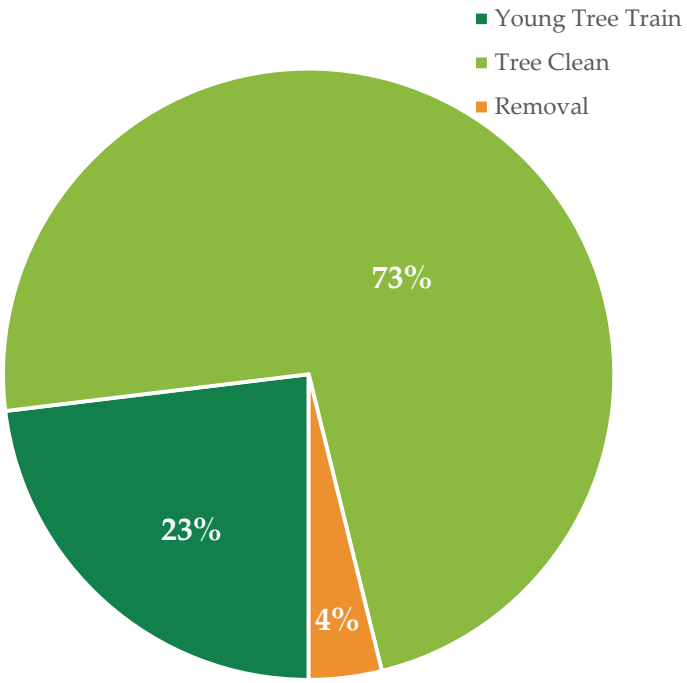


Figure 6. Primary maintenance recommendations for 26 trees in the Fort Hayes neighborhood, by type.

SECTION 2: TREE BENEFITS

STRUCTURAL VALUE OF AIRPORT'S STREET TREES: $41,849

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 total cost it takes to replace trees, meaning that all of the street trees in Fort Hayes are estimated at $41,849.**

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 Fort Hayes' street trees

Category	Value
Ecosystem Services	$1,963.14
Structural Value	$41,849.49
Combined Value	**$43,812.63**
Per Tree Average	**$1,685.10**

The street trees inventoried within the Fort Hayes community currently provide an ecosystem value of $1,963 through air filtration, water quality improvements, and carbon storage–and those are just the benefits quantified by this analysis. Trees also boost property values, reduce energy costs, lower crime rates, and help create more successful business districts.[3]

ECOSYSTEM SERVICES

Annual Carbon Captured – 463 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, Fort Hayes' inventoried trees have captured over 9.6 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 – 22 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 – 3,669 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 runoff (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 – $41,849

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 Fort Hayes 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 7% canopy cover in Fort Hayes, retaining and 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.

4 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 4 vacant sites suitable for planting trees. 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. All 4 sites could accommodate trees species that are large or medium-sized at maturity (Figure 7). By working with Columbus Metropolitan School District, CRPD may be able to identify more planting spaces on the school campus.

0 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.

0 Medium Planting Sites

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

4 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.

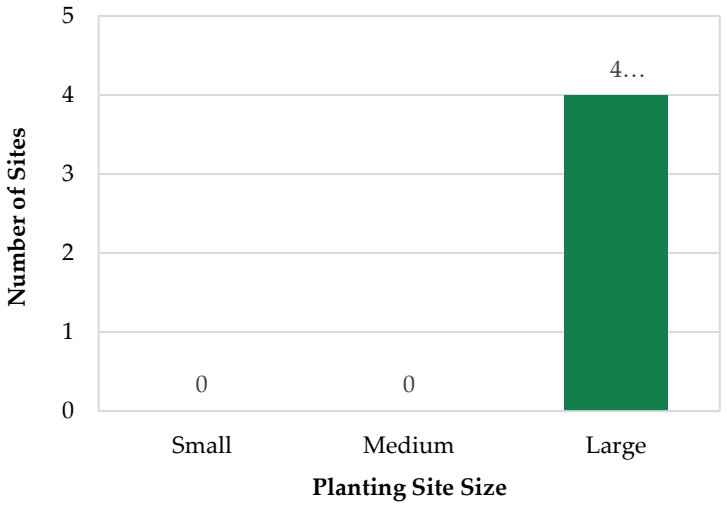


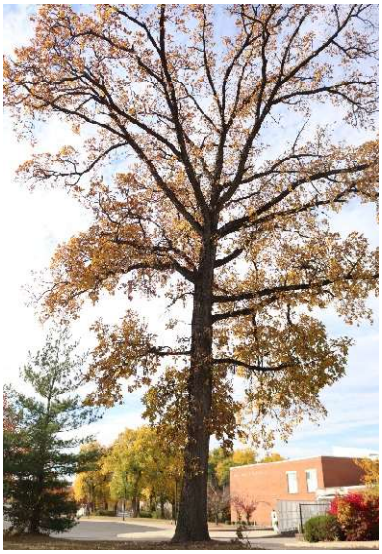
Figure 7. Vacant planting sites by size.

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.



USING LIMITED PLANTING SITES STRATEGICALLY

The tough news: Because Fort Hayes is an educational center, trees are critically important to the wellbeing and academic achievements of students. The location of the highways also compounds air pollution concerns and makes trees more necessary. Currently, tree canopy in Fort Hayes is less than 10%, which means that students do not have full access to the benefits that trees provide.

The better news: By working with the school district, CRPD can plant trees that will have an immediate impact on the lives of Columbus students. While planting spaces in the public right-of-way are limited, if trees can be planted on the school campus, CRPD will have more leeway in species and size selection.

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 Fort Hayes, tree planting is needed for the neighborhood to be in line with the city's canopy goals, and the community will benefit from equitable investment to maintain and grow that canopy. There are very few right-of-way planting spaces available, but cooperation with the school district could lead to a productive planting campaign. Given this set of facts, what can be done in Fort Hayes to maximize growth of the neighborhood forest for the benefit of its residents, visitors, 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.

Prioritize Planting of Large and Medium Sites (Short-Term)

Larger trees provide residents with greater benefits. Within Fort Hayes, 4 large sites were identified. Planting in these locations will increase the amount of street trees by 15% 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.