CHICAGO URBAN FOREST MANAGEMENT PLAN

January 2023

Acknowledgements

Funding support for this publication was provided by the Urban and Community Forestry Programs of the Illinois Department of Natural Resources and the USDA Forest Service Eastern Region. This institution is an equal opportunity provider.

Project Team

City of Chicago Bureau of Forestry

Malcolm Whiteside, Deputy Commissioner
Joseph McCarthy, Senior City Forester *
John Lough, Senior City Forester
Peter Czubak, Senior City Forester

**Project Manager*

Consultant Team

Davey Resource Group, Inc.

Kerry Gray, Principal Consultant
Peter Sorensen, Senior Associate Consultant
Lee Mueller, Market Manager
Sandra Albro, Senior Associate Consultant

Table of Contents

Executive Summary

Overview

Chicago's **street trees** are a key component of the city's infrastructure **providing over $12 million each year in essential environmental and economic benefits** that directly improve the quality of life of city residents. As with other city infrastructure, like roads, bridges and utilities, street trees need proactive care and routine maintenance. However, unlike other infrastructure assets that lose value over time, **street trees actually increase in value providing their maximum benefits decades after planting**.[1] The **current asset value of Chicago's street trees is approaching $1 billion** and with proactive planting, care, and management its value will continue to grow. Recognizing this critical point, the City of Chicago's Bureau of Forestry has taken the proactive step to develop this Urban Forest Management Plan.

The purpose of the Urban Forest Management Plan is to provide strategies and actions to improve Chicago's street tree management program in an efficient, sustainable, and equitable manner. This plan was systematically developed using a variety of information obtained through staff interviews; site visit; review and analysis of sample street tree inventory data, budgets, staffing, fleet, equipment, and technology; review of plans studies and guidelines; and a program assessment.

The Urban Forest Management Plan:

- Assesses the structure and composition of Chicago's street tree population using sample street tree inventory data from 1994, 2003, 2013, and 2021 gathered by the Bureau of Forestry.
- Reviews the Bureau of Forestry's current program to assess operational opportunities and challenges.
- Provides information on peer cities to examine how their programs are managed and funded.
- Presents scenarios based on different management priorities and the resources needed to accomplish them.
- Examines plans and studies to understand how growing and caring for Chicago's street trees can help support city and regional plans and initiatives.
- Establishes strategies and action items to address programmatic opportunities and challenges identified during the planning process.

[1] McPherson, E.G., Simpson, J.R., Peper, P.J., Maco, S.E., & Xiao, Q. (2005). Municipal forest benefits and costs in five U.S. cities. *Journal of Forestry*. 103(8), 411-416.

Key Highlights

Management. The City of Chicago's Bureau of Forestry's (BoF) management of the city's street tree population is driven by 311 resident and alderman requests, high risk trees identified by staff, and emergencies (reactive program). The need to transition this reactive approach to a proactive program and **re-establish a cyclical area pruning program is a high priority** that was identified during the planning process.

The collection and disposal of woody debris and landscape material from private property by the Bureau of Forestry should be re-evaluated. This non-tree maintenance activity takes staff and resources away from the BoF's core function to maintain, manage, and plant city street trees.

Assessment. Chicago's urban forestry management program is assessed as **MODERATE** based on an evaluation using the management indicators of a sustainable urban forest. The "Indicators of a Sustainable Urban Forest" is a program assessment tool that measures a city's urban forestry program based on industry guidelines and standards.

Street Tree Inventory Data. The Bureau of Forestry has conducted sample street tree inventories in 1994, 2003, 2013, and 2021. This type of inventory collects data on a sample of street trees in random areas of the city and extrapolates the results to estimate the number, species composition, size distribution, and overall condition of the street tree population. During the analysis of the 2021 sample tree inventory data, Davey Resource Group, Inc (DRG) identified concerns and considerations in the application of the sample methodology that may impact the accuracy of the data assessment and analysis.

- While the sample inventory allows for a rapid, low cost way to gather street tree population data – due to a lack of adequate resources the BoF was not able apply the sample inventory methodology as prescribed by the researchers in the study *A Statistical Method for the Accurate and Rapid Sampling of Urban Street Tree Populations*.[2]

- Due to these resource issues, BoF has continued to use the original map of the city developed in 1994. This has led to the use of static management areas and zone segments when conducting the sample inventory that do not account for changes in land use and development patterns in the city over the last 29 years.

- If a sample inventory is conducted in the future, adequate resources should be allocated to allow BoF to review and revise its procedures to comply with the methodology documented in urban street tree rapid sampling study along with current science, technology, and best practices to ensure accurate data collection and analysis.

To proactively manage Chicago's public street trees and re-establish a cyclical pruning cycle, a comprehensive editable GIS-based inventory that collects data on the location, species, size, condition, and risk rating of each street tree is needed.

[2] Jaenson, R., Bassuk, N., Schwager, S. & Headley, D. (1992). A Statistical Method for the Accurate and Rapid Sampling of Urban Street Tree Populations. *Journal of Arboriculture*, *18*, 171-183. 10.48044/jauf.1992.035.

Street Tree Population. Analysis of sample tree inventory data for 1994, 2003, 2013, and 2021 collected by the Chicago Bureau of Forestry found:

- Chicago's estimated 2021 street tree population is 554,807, representing a 5% decrease from the 2013 sample street tree inventory (Figure 1).

- Norway maple *(Acer platanoides*), honeylocust (*Gleditsia triacanthos*), and silver maple (*Acer saccharinum*) are the dominant species of street trees. Ash (*Fraxinus spp.*) trees, which once were one of the most dominant species, have steadily declined due to infestations by the emerald ash borer *(Agrilus planipennis*).

- While Norway maple *(Acer platanoides*) remains a dominant species, its population has significantly declined from 28% of the population in 1994 to 16% of the population in 2021.This is due to increases in species diversity in new city tree plantings and since 1990, nearly eliminating the planting of Norway maples on city streets.

- Based on the sample tree inventory data, the condition of Chicago's street trees has improved from 1994 to 2021 with increases in the number of trees in excellent condition and a reduction in the number of dying/dead trees.

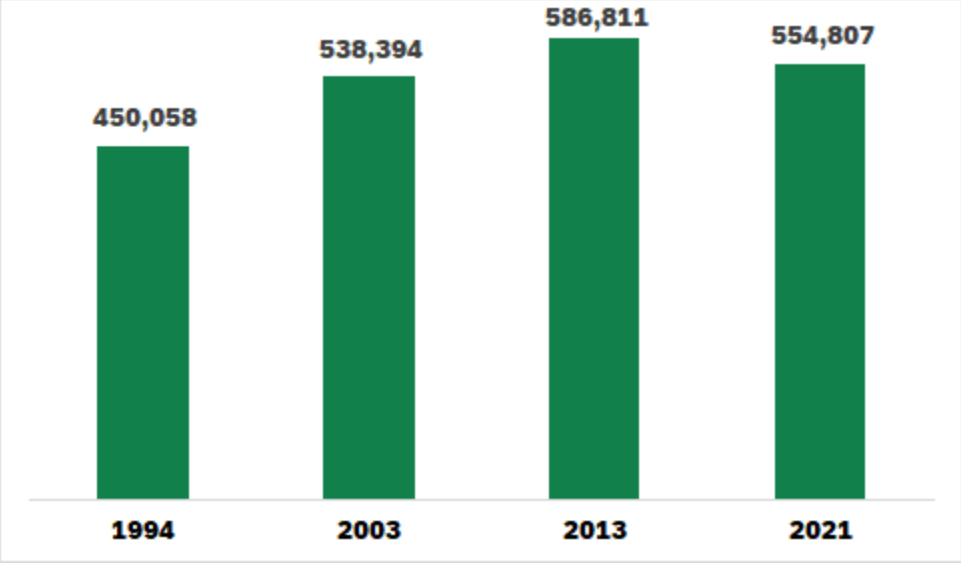


Figure 1. Estimated number of street trees in Chicago 1994-2021 based on sample street tree inventory data

Benefits. Based on estimates and extrapolations of the 2021 sample street tree inventory data– Chicago's street trees are estimated to provide **$12 million in benefits each year, or $21.85 per street tree[3], by** (Figure 2)**:**

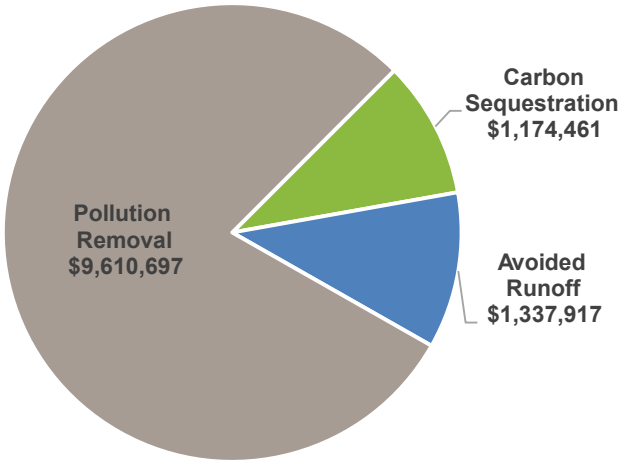


Figure 2. Benefits of Chicago's street trees

Absorbing (sequestering) over 13.7 million pounds of carbon. Annual Value: $1.2 million.

Intercepting and absorbing 149 million gallons of stormwater. Annual value: $1.3 million.

Removing 513,717 pounds of air pollution including ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, and particulate matter from the atmosphere.

The **structural (or the replacement value) of Chicago's sample street tree inventory is $915 million** (or on average $1,652 per street tree). Structural value represents the cost to replace a given tree with a one of similar size and species.[4]

Data, Technology and Resources. Improvements in data, collection and methodology, and the customization and use of technology will improve the Bureau of Forestry's operational efficiency and create a more proactive management system.

Staffing. The Bureau of Forestry has a skilled and well-trained workforce but does not have the staff capacity to meet current demands and move into a proactive management program. In addition to vacant positions there are staff on duty disability or assigned to other roles – that are unable to perform their normal position duties. Increases and reorganization of staff are needed, including tree trimmers, supervisors, and training agents to support re-establishment of the area cyclical pruning program, street tree planting, and tree inspections.

Plans, Studies, and Guidelines. Chicago has many past and current plans, studies, and guidelines to support the growth and care of the city's street trees. Guidelines and standards need to be updated and revised, including the Guide to Chicago Landscape Ordinance to meet current industry standards and best management practices. Focused efforts are needed to implement plans, make connections with other department/partner organization plans and initiatives, and ensure proper urban forestry guidelines and standards are in place and being used.

[3] USDA Forest Service iTree Tools. [Computer Software]. iTree Eco v. 6.0.25 Retrieved from https://www.itreetools.org/

[4] Nowak, D.J. (2021). Understanding i-Tree: 2021 Summary of Programs and Methods. General Technical Report NRS-200-2021. Madison, WI: USDA Forest Service Northern Research Station.

Strategies

The development of the Urban Forest Management Plan revealed the strengths of Chicago's program and shed light on areas that need improvement. The Urban Forest Management Plan's strategies are based on the key issues and themes identified during interviews, meetings, program assessment, and data analysis. Once implemented, these strategies should serve to standardize and optimize Chicago's urban forestry program, improve efficiencies, and develop a more equitable, sustainable, and resilient urban forest.

1. **Complete a comprehensive GIS-based inventory of all public street (parkway) trees.**

2. **Implement a proactive tree management program that re-establishes an area tree pruning program.**

3. **Improve data, technology, and information management.**

4. **Develop a plan to support Chicago's increase in street tree planting as part of the *Our Roots Chicago* initiative.**

5. **Review, revise, and update Chicago's ordinances, plans, policies, and guidelines to ensure they follow industry best management practices, support the long-term care and maintenance of Chicago's street trees, and are implemented.**

6. **Engage, encourage, and support active participation by City boards, residents, and neighborhood & partner organizations in tree planting & care.**

7. **Support training, education, and development of Bureau of Forestry staff.**

STRATEGY & ACTIONS

1.Complete a comprehensive GIS-based inventory of all public street (parkway) trees.

ACTION STEPS:

1.A. Determine who will conduct the inventory and collect data (i.e., in-house staff, professional consultants or a combination).

1.B. Develop tree inventory specifications, including determining data fields to collect (e.g., species, size, risk) and timeline for completion. Inventories can be completed all at one time or phased over several years depending on budget and resources.

1.C. Secure funding to complete tree inventory based on completing Tasks 1.A. and 1.B.

1.D. If hiring consultants, develop bid documents that incorporate the specifications developed in Task 1.B.; select consultant.

1.E. Develop and implement plan to regularly update the street tree inventory as maintenance and tree planting occurs by ALL city departments and re-inventory every 10 years.

1.F. Review and revise the sample tree inventory methodology, to ensure accurate data collection and analysis, if BoF plans on conducting future sample tree inventories.

2. Implement a proactive tree management program that re-establishes an area tree pruning program.

ACTION STEPS:

2.A. Implement Management Scenario B - Proactive Management and develop a 5-year area tree pruning program that details the areas to be pruned each year. Utilize tree inventory data (STRATEGY #1) as it becomes available to inform the plan.

2.A.1. Ensure equitable service delivery by pruning in multiple areas of the city each year, not just areas that request tree trimming most.

2.B. Use information from Management Scenario B and the 5-year work plan to secure funding to implement the proactive area pruning program

2.C. Fill vacancies and create positions as outlined in Management Scenario B - Proactive Management, including tree trimmers, motor truck drivers, and inspectors.

2.D. Ensure that the number and condition of equipment is adequate to support an increase in tree pruning.

2.E. Evaluate eliminating or contracting out the program to collect and dispose of woody debris and landscape material generated from private property by the BoF.

2.E. Investigate the use of carbon financing to support tree planting and maintenance.

3. Improve data, technology, and information management.

ACTION STEPS:

3.A. Customize Salesforce to meet the data entry and reporting needs of the Bureau of Forestry and incorporate tree planting into Salesforce (Bureau of Forestry and Department of Assets, Information and Services (AIS)).

3.B. Establish, document and implement a process and protocol for BoF crews and contractors to access work orders directly through Salesforce.

3.B.1. Purchase tablets for each BoF crew.

3.B.2. Identify and train a BoF crew member that will be responsible for inputting information into Salesforce when tree work has been completed. Explore options for Motor Truck Drivers to take on this role.

3.C. Develop and document standard operating procedures (SOPs) on how service requests and work orders are entered, completed, closed and reported on in Salesforce.

3.D. Create and implement a plan, in cooperation with the Department of Assets, Information and Services to transition the paper-based system for managing the BoF equipment inventory to a digital database.

3.E. Support and provide funding to conduct routine urban tree canopy assessments (every 5-10 years) to measure and track changes in canopy cover in Chicago and the region.

STRATEGY & ACTIONS
4. Develop a plan to support Chicago's increase in street tree planting as part of the *Our Roots Chicago* initiative.
ACTION STEPS:
4.A. Hire four City Forester/Community Forester positions to help manage and support the tree planting campaign (Management Scenario B).
4.B. Develop and implement a process to manage tree planting contractors, schedule inspections of newly planted trees and monitor the 2-year guarantee period.
4.B.1 Ensure that the customization of Salesforce (Action Item 3A) meets the work order and tracking needs of the tree planting program.
4.C. Utilize the 2020 tree canopy data to develop a 5-year street tree planting plan that focuses on gaps in tree canopy, equity, urban heat island reduction, climate adaptation and other city planting priorities.
4.C.1. Revise plan as street tree inventory data becomes available on vacant planting locations.
4.D. Develop a public engagement campaign and outreach materials to educate residents and youth about the benefits of trees and how they can request a tree and support the initiative.
5. Review, revise, and update Chicago's ordinances, plans, policies, and guidelines to ensure they follow industry best management practices, support the long-term care and maintenance of Chicago's street trees and are implemented.
ACTION STEPS:
5.A. Develop a City of Chicago urban forestry best management practices manual that can serve as the central resource for all tree-related information.
5.A.1. Review and revise current Bureau of Forestry guidelines and standards to ensure they follow industry standards and best management practices.
5.A.2. Develop new guidelines and standards for tree care activities which may include species selection and tree diversity; site selection and minimum soil volumes; proper tree planting; post planting care; watering; mulching; tree protection and construction; tree preservation.
5.B. Review and revise city ordinances to increase tree planting and strengthen tree preservation, protection and care.
5.C. Evaluate options to establish a wood utilization program that can utilize logs for a higher value (such as flooring and furniture) and considers the entire life cycle of the tree.
6. Engage, encourage, and support active participation by City boards, residents, and neighborhood & partner organizations in tree planting & care.
ACTION STEPS:
6.A. Support the development of Chicago's Urban Forestry Advisory Board.
6.B. Encourage active engagement by BoF staff to support the Chicago Region Trees Initiative.
6.C. Coordinate and recruit regional partner organizations, community development corporations, neighborhood groups and local leaders to serve as tree planting ambassadors to promote tree planting in low canopy neighborhoods.
6.D. Participate in school events, like Arbor Day, to promote trees and tree planting to the next generation of community leaders.
7. Support training, education, and development of Bureau of Forestry staff.
ACTION STEPS:
7.A. Fill vacant training agent positions and establish and fill a new lead training agent position.
7.B. Review and revise training curriculum to ensure it is based on the latest arboricultural science and current tree care industry standards and best management practices.
7.B.1. Use the best management practices and standards developed in STRATEGY 5 to revise training curriculum.
7.B.2 Establish an annual cycle to review and revise curriculum.
7.C. Continue to support and train tree trimmers to take the International Society of Arboriculture Certified Arborist exam.

SECTION 1: INTRODUCTION

SECTION 1: INTRODUCTION

As the third largest city in the United States, Chicago serves as a major hub of commerce and culture, as well as an important player in the environmental management of the Great Lakes basin. Chicago's street trees, a part of the city's infrastructure system, have long played an important role in supporting these functions by providing essential benefits to residents, visitors, and the environment. Research shows that healthy urban trees can improve the local environment and lessen impacts from urbanization and industry.[5] Trees improve air quality, reduce energy consumption, help manage stormwater, reduce erosion, provide critical habitat for wildlife, and promote a connection with nature. When taken together, the city's trees (collectively known as the urban forest) contribute to a healthier, more livable, and prosperous Chicago.

Chicago's Climate

Situated on the west coast of Lake Michigan, Chicago is characterized by four distinct seasons, with hot summers and cold winters. The city sits within the Chicago Lake Plain ecoregion (54b) and prior to development, the low-lying banks of Lake Michigan contained beach-dune plant communities on naturally poorly draining soils, including fens, marshes, and scrub-oak forests.[6]

Chicago straddles two USDA plant hardiness zones (5b in the north and 6a in the south) and is predicted to shift toward complete 6a designation by 2040.[7] With climate change, the city's plant hardiness zones are predicted to continue to warm, reaching 6b under low-emissions scenarios and 7a under high emissions scenarios by 2100.[8]

Brief History of Urban Forestry in Chicago

Chicago has a long history of caring for and growing its tree canopy. Beginning in the early 20th century, following decades of development and the 1871 Great Chicago Fire, the city embarked on efforts to reverse trends in tree canopy loss.[9] In 1904, residents formed a Tree Planting Society to plant street trees; and in 1909, the Chicago Women's Club formed the Chicago Tree Committee, which created an ordinance that granted city control of trees on public streets. This was followed by ongoing efforts to encourage widespread planting and maintenance of trees on privately owned land.

[5] Center for Urban Forest Research. (2017). Retrieved from https://www.fs.fed.us/psw/topics/urban_forestry/
[6] Fahey, R. T., Bowles, M. L., & McBride, J. L. (2012). Origins of the Chicago urban forest: composition and structure in relation to pre-settlement vegetation and modern land use. *Arboriculture & Urban Forestry*, *38*(5), 181-193.
[7] USDA Office of Sustainability and Climate (2021). Climate Change Pressures in the 21st Century. Retrieved from https://storymaps.arcgis.com/stories/9ee0cc0a070c409cbde0e3a1d87a487c
[8] Matthews, S. N., Iverson, L. R., Peters, M. P., & Prasad, A. M. (2018). Assessing potential climate change pressures across the conterminous United States: mapping plant hardiness zones, heat zones, growing degree days and cumulative drought severity throughout this century. RMAP-NRS-9. Newtown Square, PA: USDA Forest Service Northern Research Station. 31 p., 9, 1-31.
[9] Prost, J. H. (1911). City Forestry in Chicago. *American City*, *4*, 277-281.

In the 1970s, the City dramatically expanded urban forestry capacity to address tree losses due to Dutch elm disease (*Ophiostoma novo-ulmi*), which killed an estimated 225,000 native elms (*Ulmus spp.)* over the prior decade.[10] At the height of its response to Dutch elm disease, the Bureau of Forestry was removing 55,000 trees, trimming 40,000 trees, and planting 30,000 trees each year. More recently, Asian longhorned beetle (*Anoplophora glabripennis*) and emerald ash borer (*Agrilus planipennis* Fairmaire,) have threatened the City's maple (*Acer)*, ash (*Fraxinus)*, and other hardwood trees.

In 1989, as climate change was becoming more widely recognized as a growing threat, the city embarked on the Chicago Climate Project to quantify trees and their benefits, which was followed by an announcement by Mayor Daley in 1990 to plant 500,000 trees.[11,4] During this time, the Bureau of Forestry undertook a street tree census, which counted each live street tree, it was repeated in 2003. These live tree censuses were complemented by four sample street tree inventories in 1994, 2003, 2013, and 2021 that estimate the total number and kinds of trees based on samples in more than 30 districts, divided over North, Central, and South regions of the city. **Over time, the number of trees along city streets has ranged between 450,000 to nearly 600,000**, with numerous additional trees in parks and on private lands.

In 2010, the Morton Arboretum conducted the Chicago Region Tree Census using i-Tree Eco field plots and a LiDAR-based urban tree canopy assessment. The 2010 report estimated Chicago's tree canopy cover at 18.9% with approximately 3.6 million trees within city limits – on public and private property.[12] The Morton Arboretum's Chicago Region Tree Initiative updated the Chicago Region Tree Census in 2020 and found a slight increase in the number of trees in the city of Chicago (3.98 million trees).[13] A companion LiDAR-based urban tree canopy assessment using 2017 imagery found Chicago's tree canopy increased to 20%.[14] However, two recent measurements of tree

Measuring Tree Canopy Cover

Tree canopy is the amount of leaves, branches, and stems of trees and other woody plants that cover the ground when viewed from above. Understanding the amount of tree canopy in Chicago can help to prioritize tree planting and care where it is needed most, and measure trends in canopy growth and loss that can be used to inform policy and management decisions.

Methods for measuring canopy cover.

Urban Tree Canopy Assessment (UTC). This assessment uses /high-resolution aerial imagery/LiDAR to map the amount and extent of tree canopy cover on both public and private property. A UTC provides the most accurate measure of tree canopy cover and is considered the gold standard.

i-Tree Canopy. i-Tree Canopy is part of the USDA Forest Service's suite of tools that measure and quantify the benefits of trees. This tool uses random sample points (at least 1,000) to generate an estimated canopy percent. iTree Canopy provides a quick and inexpensive way to track canopy over time. However, different set of points can yield slightly different results.

[10] Krohe Jr. J. (1990). Green Streets. *Chicago Reader*, *19*(14). Retrieved on November 2, 2022, from https://chicagoreader.com/news-politics/green-streets-2/.

[11] McPherson, E. G., Nowak, D.J., & Rowntree, R.A. (1994). Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: USDA Forest Service, Northeastern Forest Experiment Station.

[12] Nowak, D.J., Hoehn, R.E., Bodine, A.R., Crane, D.E., Dwyer, J.F., Bonnewell, V., & Watson, G. (2013). Urban Trees and Forests of the Chicago Region. USDA Forest Service Northern Research Station. Resource Bulletin NRS-84.

[13] Morton Arboretum Chicago Region Tree Initiative. (2020). Chicago Region Tree Census Report. Retrieved from https://mortonarb.org/app/uploads/2021/05/2020-Chicago-Region-Tree-Census-Report__FIN.pdf.

[14] Morton Arboretum (Chicago Region Tree Initiative). (2022). Chicago Urban Forestry Summary (2017 LiDAR data). Retrieved from https://chicagorti.org/app/uploads/2022/09/ChicagoSummary.pdf.

canopy using i-Tree Canopy, the 2020 Tree Census (16%) and Chicago Bureau of Forestry (17%) found Chicago's tree canopy is below 20% (see *Measuring Tree Canopy* sidebar).

Street trees are important to Chicago's overall tree canopy. A 1994 study found that Chicago's residential street trees made up 27.9% of the city's total tree population and accounted for 43.7% of the leaf surface area (canopy). While in comparison, residential street trees made up 10.2% of the total tree population and 19.7% of the leaf surface area for all of Cook County.[11] The amount and distribution of leaf surface area is the driving force behind an urban forest's ability to produce benefits to the community.[15] While Chicago's street trees are estimated to make up 13.8% of the city's total urban forest today, they contribute significantly to its overall benefits – accounting for 27% of the annual benefits the city's urban forest provides (Table 1).

Table 1. Chicago's urban forest benefits - total and street trees

	Chicago Total Urban Forest*	Chicago Street Trees**	Street Trees % of Total
Estimated Number of Trees	3,997,000	554,000	13.8%
Structural (Replacement) Value	$2,050,000,000	$915,454,634	45%
Lifetime Carbon Storage (Tons)	876,500	415,483	47%
Carbon Sequestration (Tons/Year)	21,000	6,886	33%
Avoided Stormwater Runoff (Gallons/Year)	486,233,766	149,718,722	31%
Pollution Removal (Tons/Year)	800	257	32%
Total Annual Benefits ($/Year)	$44,560,000	$12,123,075	27%
*Morton Arboretum 2020 Chicago Region Tree Census			
**Chicago Bureau of Forestry 2021 Random Sample Tree Inventory and i-Tree Eco			

[15] Clark, J., Matheny, N., Cross, G., Wake, V. (1997). A Model of Urban Forest Sustainability. *Journal of Arboriculture 23*(1).

Creating a Plan for Chicago's Street Trees

To work towards a sustainably managed and cared for street tree population that supports city initiatives, the Bureau of Forestry commissioned the development of this Urban Forest Management Plan. The Plan was developed based on information and data from sources, including:

- Interviews with Chicago Bureau of Forestry and Department of Streets and Sanitation staff.
- A site visit and tour that highlighted the Bureau of Forestry's operations.
- Analysis of data from Chicago's current and historic sample tree inventories.
- Review and analysis of budgets, staff, fleet, equipment, technology, and procedures for prioritizing work.
- Assessment of Chicago's program using the "Management Indicators of a Sustainable Urban Forest".[15,16,17]
- Review of plans, studies, guidelines, and information from other Chicago departments and partner organizations.

The Urban Forest Management Plan:

- Assesses the structure, composition, and benefits of Chicago's street tree population using historic and current sample inventory data from 1994, 2003, 2013, and 2021 gathered by the Bureau of Forestry.
- Reviews the Bureau of Forestry's current program to assess operational opportunities and challenges.
- Identifies peer cities to examine how their programs are managed and funded.
- Presents scenarios based on different management priorities and the resources needed to accomplish them.
- Examines current City plans and studies to understand how growing and caring for the city's street trees can help support other City plans and initiatives.
- Establishes strategies and action items to address programmatic opportunities and challenges identified during the planning process.

The Plan is designed to support Chicago's development of a sustainable, equitable, and well-managed street tree population and improve operational efficiencies. The next section, **Section 2, describes the state of Chicago's urban forest** by presenting information and data about Chicago's street tree population. **Section 3 examines management and planning** by reviewing and assessing the Bureau of Forestry operations, examining peer city benchmarking, presenting management scenarios, and exploring plans and studies. **Section 4 presents strategies and action steps** for Chicago to plan, grow and care for its street trees and maximize their benefits.

[16] Kenney, W. A., van Wassenaer, P.J.E., & Satel, A.L. (2011). Criteria and Indicators for Sustainable Urban Forest Planning and Management. *Arboriculture & Urban Forestry, 37*(3), 108 – 117.

[17] Leff, Michael. (2016). The Sustainable Urban Forest - A Step-by-Step Approach. Davey Institute. Retrieved from https://www.itreetools.org/documents/485/Sustainable_Urban_Forest_Guide_14Nov2016_pw6WcW0.pdf

Street Tree Inventories

A comprehensive, up-to-date GIS-based **public tree inventory is the foundation of a municipal urban forestry program** – providing crucial information on the composition, condition, risk, and maintenance needs of public trees. **An inventory conducted by urban forestry professionals**, serves as the basis for managing risk, prioritizing tree care activities, delivering urban forestry services cost effectively, and developing plans and policies that maximize tree benefits and minimize risks. Using tree inventory data to identify work priorities helps to identify the resources needed, including funding, staff, and equipment to sustainably manage and care for the urban forest.

Many large cities across the United States have completed, or are in the process of completing, inventories of their public street and/or park trees.

- **Baltimore, MD.** 128,600 public trees (2017-2018)
- **Detroit, MI**. 190,000 public trees (2011-2014)
- **Kansas City, MO**. 135,500 public trees (2014)
- **Los Angeles, CA**. 700,000 trees and planting sites *estimated* (in progress)
- **Oakland, CA**.100,000+ trees and planting sites *(*2020)
- **Phoenix, AZ**. 105,000 trees and planting sites (2014)

While not an exhaustive list, these cities show that completing public tree inventories in large cities is possible and provides useful information to support forestry operations.

How long does it take? The timeframe cities complete their inventories varies. Some cities choose to phase their tree inventory and spread the cost out over several fiscal years (e.g., Baltimore and Detroit); while others complete it all at one time using capital budgets or other funding sources (e.g., Los Angeles and Oakland).

How much does it cost? Costs to complete a public tree inventory vary depending on several factors, including the number of trees and the information being collected. The average inventory cost in the United States is around $4.00 per tree for standard information such as tree location, species, size, condition, and maintenance needs**. For Chicago, the estimated cost to conduct a comprehensive tree inventory is $2.3 million** (for 575,000 street trees).

Are there alternatives? Machine learning, ground-based LiDAR, and satellite imagery are rapidly improving and starting to be applied to tree data collection with increasing frequency. Currently, a **machine-learning approach using satellite imagery** can return tree locations (but not size or species) for roughly $0.25 per tree. **For Chicago, the cost for a machine-learning inventory is estimated at $143,750** (for 575,000 street trees).

Alternatively, **ground-based LiDAR data** can do the same plus return additional information such as tree species, crown metrics, and 3-D depictions of tree structure for around $4.00 per tree. **For Chicago, the cost for a ground-based LIDAR inventory is estimated at $2.3 million** (575,000 street trees). - similar to comprehensive tree inventory. **Neither approach can currently provide information on tree risk, condition, or maintenance needs.**

SECTION 2:

THE STATE OF CHICAGO'S URBAN FOREST

SECTION 2: THE STATE OF CHICAGO'S URBAN FOREST

Street Tree Resource Assessment

A street tree population is more thoroughly understood by examining its composition and structure. Consideration of species diversity, age distribution, condition, stocking level, and overall number of trees provide a foundation for planning and strategic management. Inferences based on this data can help Chicago understand its street tree population today, how it has changed over time, and serves as the basis for planning and projecting the future potential of the resource.

This section analyzes the 2021 Random Sample Street Tree Inventory data and provides comparisons with previous sample street tree inventories collected by the Bureau of Forestry. Due to the resources needed, **Chicago does not yet have a full, complete GIS-based inventory of its street tree population** (*see Street Tree Inventories sidebar*).

Data & Methodology

To understand Chicago's street tree population and look at historical trends, Davey Resource Group, Inc. (DRG) analyzed the following data sets that were collected and provided by the Bureau of Forestry:

- 1990 100% Street Tree Census
- 1994 Random Sample Street Tree Inventory
- 2003 100% Street Tree Census
- 2003 Random Sample Street Tree Inventory
- 2013 Random Sample Street Tree Inventory
- 2020 Street Tree Estimate
- 2021 Random Sample Street Tree Inventory

The 1990 and 2003 **100% Street Tree Census** data is based on field surveys that **counted each live street tree** in the city of Chicago to get a total number of street trees. The street tree census only counted the number of trees and did not gather information on species, condition, location, or other street tree data. The Street Tree Census was conducted to determine the number of trees City-wide, by street grid, and by Ward to conduct a routine street tree pruning cycle.

The 1994, 2003, 2013, and 2021 **Random Sample Street Tree Inventory** data sets are based on field evaluations of **select street trees, vacant planting sites, and potential planting sites in randomly selected areas** of the city. In the random sample inventories, **estimates of the total number and characteristics of all street trees are extrapolated from a stratified sample inventory** using methodology that the Bureau of Forestry adapted from Jaenson and colleagues.[2] This methodology was established in 1994 and has been used continuously, without adjustment in the subsequent analyses of the sample street tree inventories in 2003, 2013 and 2021. The random sample method has been used because it provides a quick and inexpensive tool to assess city street trees when budget and resources do not allow for completion of a comprehensive street tree inventory.

The data collected during each sample inventory varied slightly. Therefore, the analysis and comparisons of the random sample inventory data differ based on the information that is available in

each dataset. Some analyses may not include a certain year because the data to conduct the analysis was not available for that year.

There are **limitations to the sample inventory due to how BoF applied the methodology.** Of note,

- Chicago has been using the same allotment of total blocks and possible blocks since it began conducting sample inventories in 1994. This relies on the assumption that the blocks that did not have trees or were unlikely to have trees in the early 1990s are the same as today or vice versa. This assumption could have a considerable impact on the results dependent on development patterns over the last ~30 years.

- The pre-sample develops an average number of trees per block without regard for block size length. The methodology in Jaenson, et al., calls for a calculation of average tree per mile or tree per feet using measurements of average block size. Using trees per block assumes that City blocks are relatively uniform in size – this may be the case for Chicago, but it should be confirmed.

- Information is not available about the density of vacant and potential tree sites per zone and region from the 2003 census (which evaluated live trees only); this would affect the accuracy of estimates about unoccupied sites, stocking level, and total potential tree canopy at full stocking.

If Chicago chooses to continue to conduct random sample street tree inventories **adequate resources should be allocated for BoF to review and revise the procedures to comply with the methodology documented in Jaenson, et al.,** along with current science, technology, and best practices to ensure accurate data collection and analysis.

2021 Random Sample Street Tree Inventory

The Chicago Bureau of Forestry conducted a random sample inventory of street trees within the city limits in the summer of 2021. The sample inventory evaluated street trees, vacant planting sites, and potential planting sites in randomly selected areas within the management scope of the Bureau of Forestry, including street parkways and boulevards. The sample inventory was stratified among three regions (North, Central, South) with 12-13 zones per region (37 zones total; Table 2). Existing trees within each sample segment were evaluated for species, condition, and size (diameter at breast height, DBH).

Table 2. Sampled sites by regions evaluated during the 2021 Random Sample Street Tree Inventory - Percentages represent the proportion of sites by type relative to the total sample

Region	Trees		Vacant Planting Sites		Potential Planting Sites		Total Samples Sites
	#	%	#	%	#	%	
North	2,426	71.6%	933	27.5%	28	0.8%	3,387
Central	2,514	72.2%	812	23.3%	156	4.5%	3,482
South	2,093	46.5%	2,356	52.3%	54	1.2%	4,503
City	**7,033**	**61.9%**	**4,100**	**36.1%**	**238**	**2.1%**	**11,371**

Street Tree Population Estimates (1994 – 2021)

The 2021 inventory sampled 11,371 occupied, vacant, and potential tree sites. Based on this sample, **the total number of street trees in 2021 is estimated to be 554,807** (Figure 3). This total represents an estimated **5% decrease in the city street tree population over an eight-year period since the last sample inventory in 2013**, including an 8% loss of street trees in the South region (Table 3).

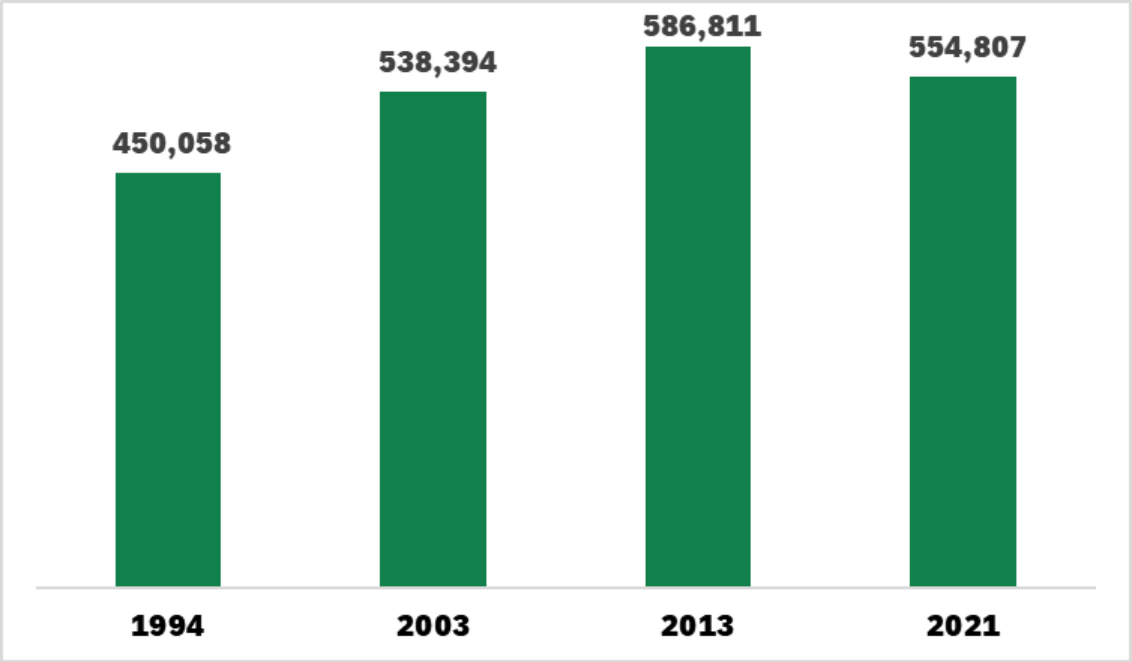


Figure 3. Estimated total number of street trees in Chicago across four sample inventory years

Table 3. Total number of estimated street trees from the four sample inventories and percent change from previous inventory

Region	1994	2003	Change (%)	2013	Change (%)	2021	Change (%)
North	139,114	173,940	+25%	170,657	-2%	162,311	-5%
Central	158,080	196,694	+24%	228,139	+16%	218,972	-4%
South	152,864	167,760	+10%	188,015	+12%	173,718	-8%
City Total	**450,058**	**538,394**	**+20%**	**586,811**	**+9%**	**554,807**	**-5%**

Tree Species Diversity

Tree species and genus diversity offers a critical measure of a tree population's resiliency to attacks from pests and disease and helps urban forestry managers identify and remedy potential areas of overexposure. When assessing tree population diversity, a common urban forestry industry guideline is that no more than 10% of an urban tree population should be composed of a single species (e.g., sugar maple) and no greater than 20% should be composed of a single genus (e.g., maple).[18]

The Chicago Bureau of Forestry must balance concerns about vulnerability to pests and disease against the challenge of finding species that are adapted to a highly urbanized environment that include small growing spaces, degraded soils, foot traffic, road salt, and other factors that dramatically limit the types of trees that can survive and grow in the city. Following the 2003 sample inventory BOF observed a decline in Norway maple (*Acer platanoides)* from 1994 (28%) to 2003 (21%). To commit to increasing species diversity BOF established a goal that no species should make up more than 15% of the city's street tree population.

The 2021 sample inventory found that three species commonly found in Chicago **exceed the Bureau's 15% goal of species diversity in at least one region: Norway maple *(Acer platanoides),* honeylocust (*Gleditsia triacanthos*), and silver maple (*Acer saccharinum*)** (Figure 4). Of these, only Norway maple averages more than 15% across the entire city street tree population (16%; Figure 4). Since 1994, sample inventories have estimated a reduction in the number of trees belonging to dominant species over time (Figure 5). The complete list of species identified in the 2021 sample inventory can be found in Appendix C.

With the 2021 sample inventory showing a decline in Norway maple to 16%, BoF is considering using the industry biodiversity guideline that no more than 10% of the street tree population is composed of a single species.

[18] Santamour, F. (1990). Trees for urban planting: Diversity, uniformity, and common sense. Proceedings of the 7th Conference of Metropolitan Tree Improvement Alliance.

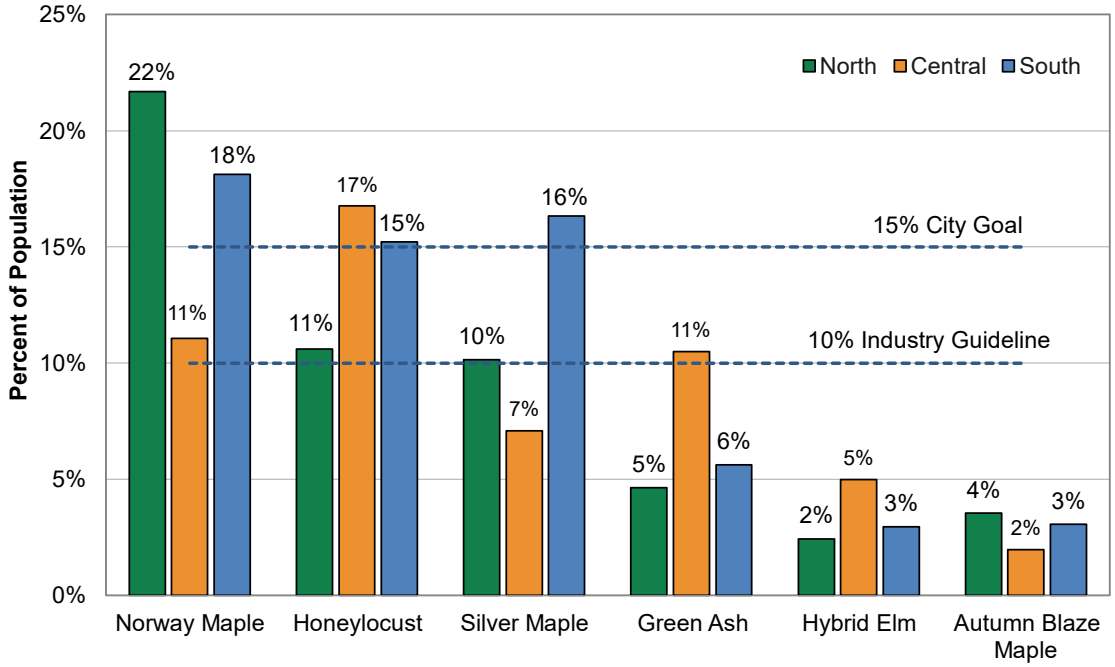


Figure 4. Dominant tree species by region as a percentage of total street tree population (2021 sample tree inventory)

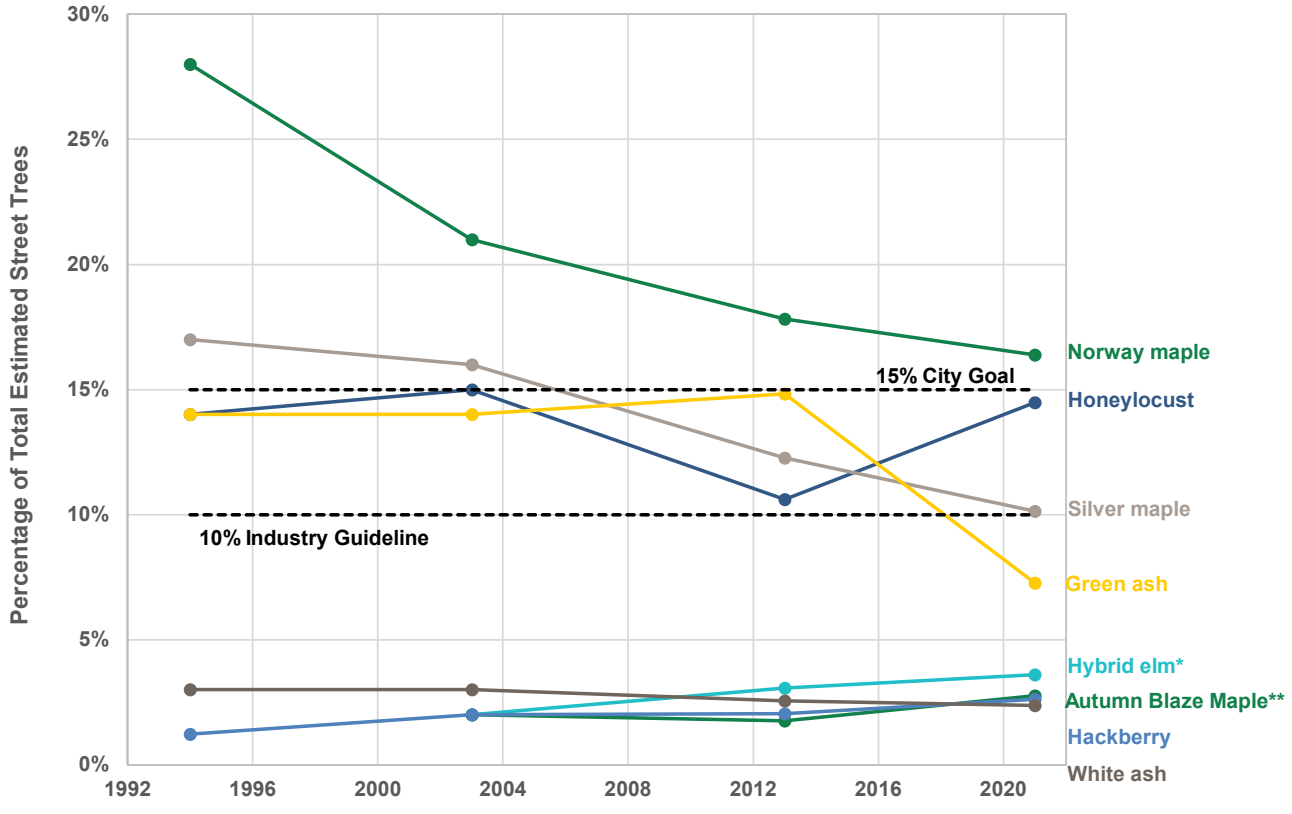


Figure 5. Change in predominant species from 1994 to 2021 as a percentage of the total estimated street tree populations.

Tree Condition

In the 2021 sample inventory, the condition of each inventoried street tree was evaluated and rated as Excellent, Good, Fair, Poor, or Dead. Trees rated as Good or Excellent comprised a majority (75%) of street trees within each of the three regions (Figure 6, Figure 7). Based on the sample trees, the health of Chicago's street trees is estimated to be Good.

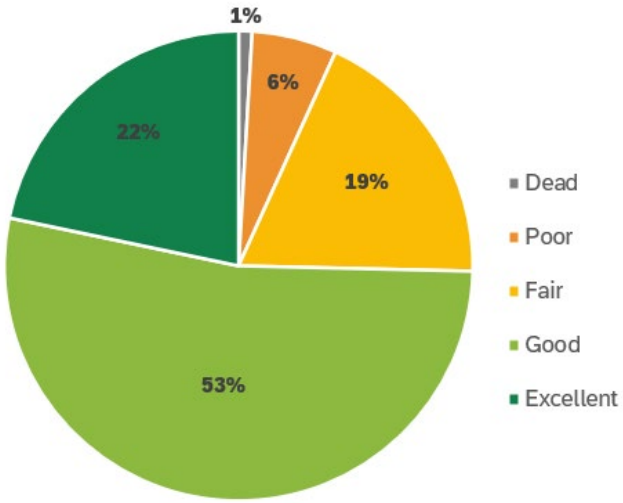
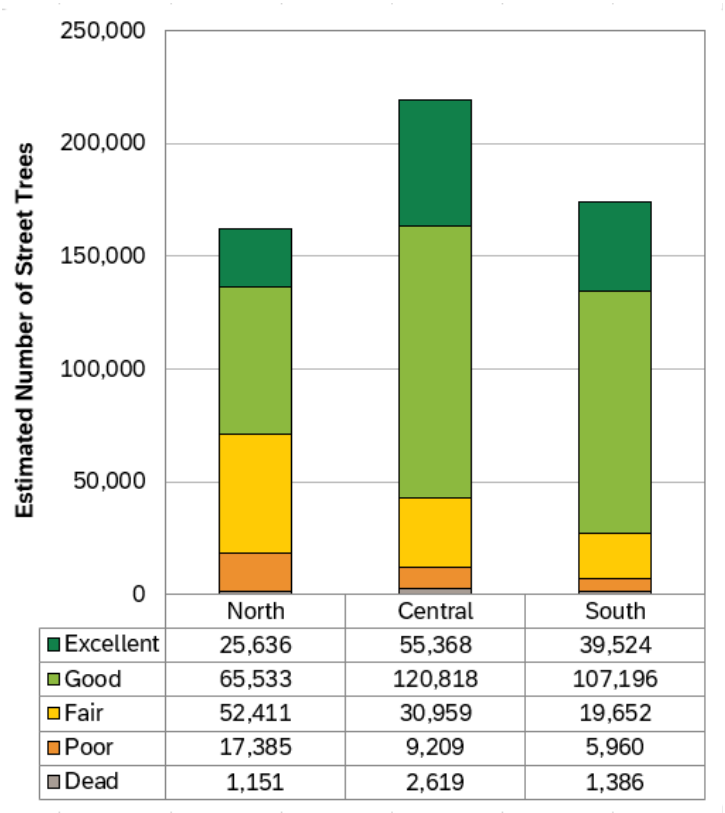


Figure 6. Condition of street trees (2021 sample inventory)



	North	Central	South
Excellent	25,636	55,368	39,524
Good	65,533	120,818	107,196
Fair	52,411	30,959	19,652
Poor	17,385	9,209	5,960
Dead	1,151	2,619	1,386

Figure 7. Condition of street trees by region (2021 sample inventory)

Across three sample inventories for which condition data was collected (1994, 2003, and 2021), the portion of street trees that are rated Excellent grew from 9% to 22%, while Dead trees decreased from 3% to 1% (Table 4 and Figure 8). In 1994 when a cyclic pruning program was in place, 87% of the street trees were assessed in Excellent or Good condition. However, by 2003 trees in Excellent or Good condition declined to 73% and in 2021 75% of street trees were assessed in those condition classes. Without a comprehensive street tree inventory that assesses the condition of each individual street, actual changes in tree condition and the reason(s) for them cannot be determined. However, some reasons that trees in Excellent condition increased between sample inventories, include, actual improvement in tree condition, method for assessing conditions changed and/or changes in tree size/age influenced tree condition.

Table 4. The percentage of street trees by condition class in the 1994, 2003 and 2021 sample inventories

Condition	1994	2003	2021
Excellent	9%	10%	22%
Good	78%	63%	53%
Fair	9%	20%	19%
Poor	1%	4%	6%
Dying/Dead	3%	3%	1%

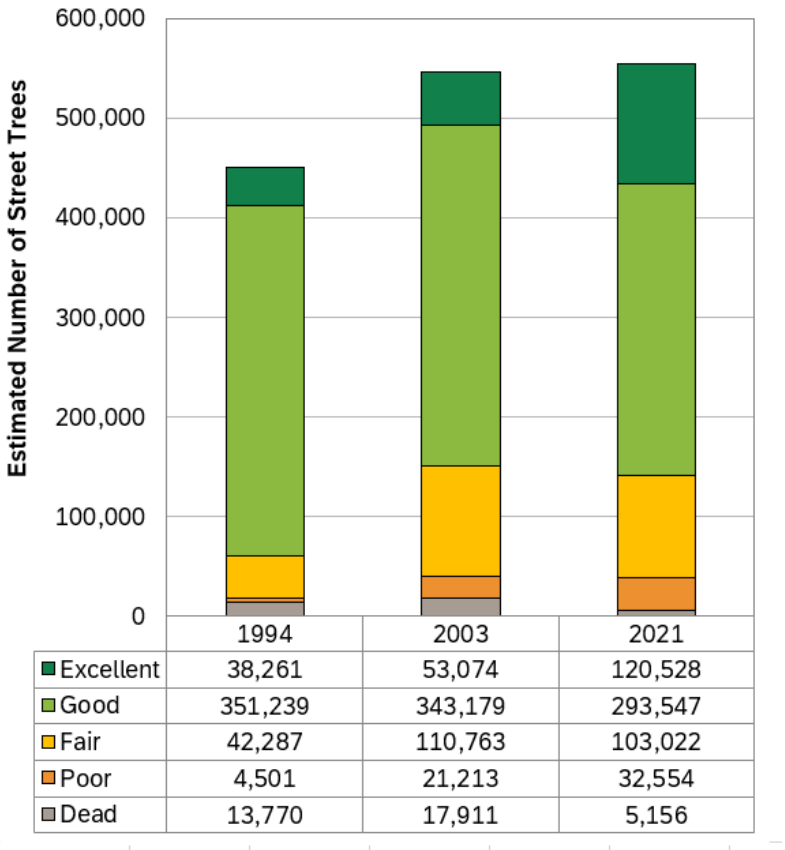


Figure 8. Tree condition of city street trees across three sample inventories (1993, 2003 and 2021)

Tree Size (Age Distribution)

Understanding the relative age of Chicago's street tree population can help the Bureau of Forestry align future management strategies with current policy goals. To determine the relative tree age of Chicago's current street tree population, data from the 2021 sample inventory was used to assign an age grouping (young, established, maturing, and mature) based on tree diameter (DBH). The relative age distribution of Chicago's inventoried tree population was then compared to an ideal distribution for an expanding urban forest, which suggests the tree population composition be approximately 40% young trees, 30% establishing, 20% maturing, and 10% mature trees (Figure 9, Figure 10). This ideal distribution accounts for the mortality of young trees and ensures that there is a sufficient number of trees to increase the population and grow into the larger size classes where the benefits they provide will be greatest.

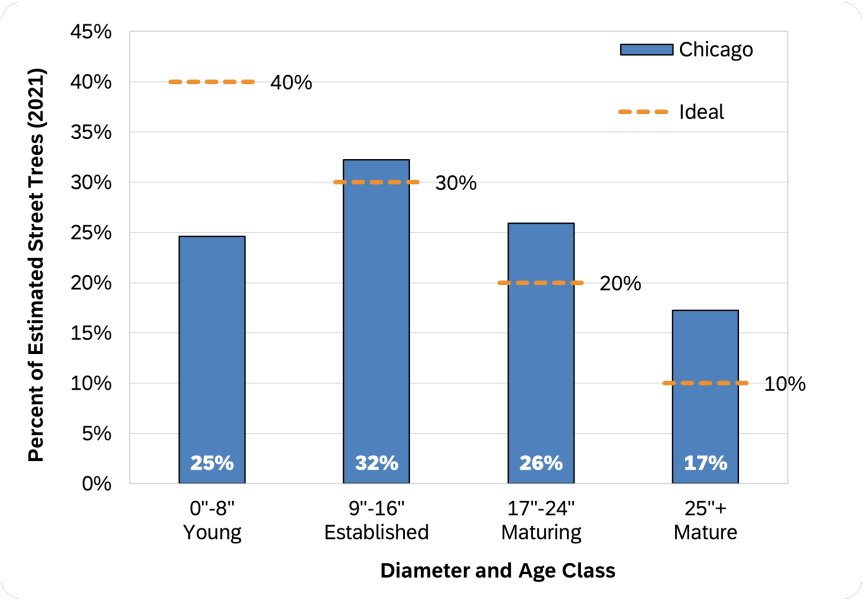


Figure 9. Relative age distribution by size class compared to the ideal distribution of an expanding urban forest (2021 sample inventory)

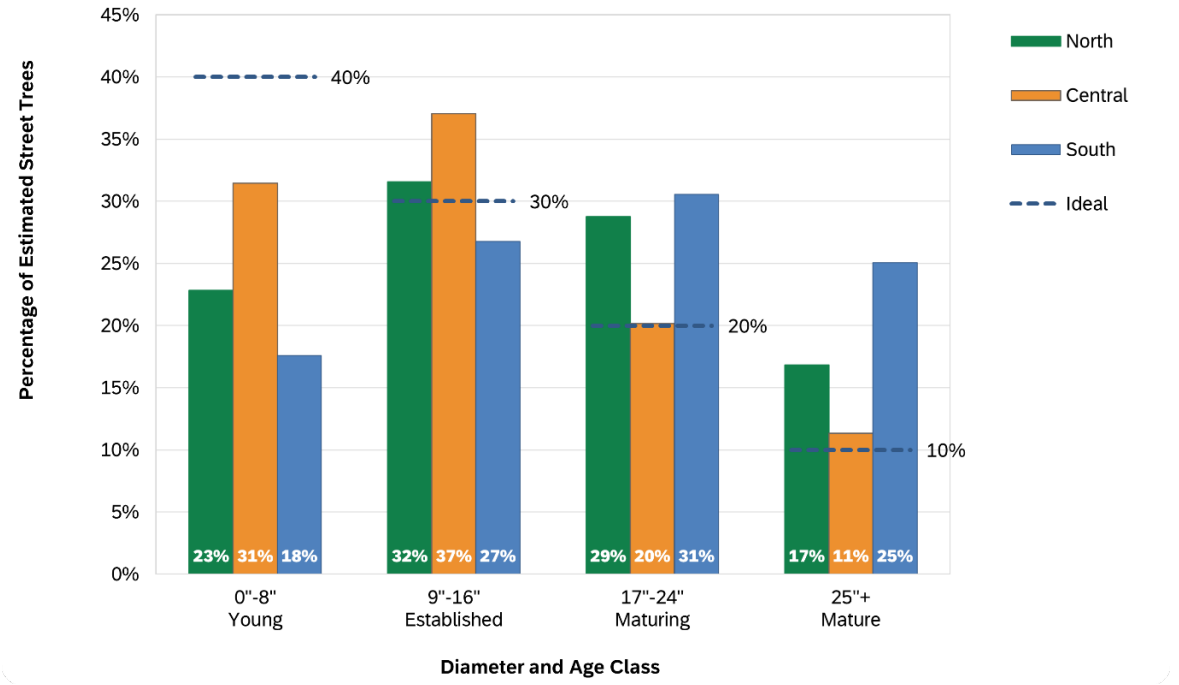


Figure 10. Relative size and age class distribution by region compared to the ideal distribution of a expanding urban forest (2021 sample inventory)

Young Trees. An estimated **25% of Chicago's current street tree population is young** (≤8 inches in diameter, DBH), compared to a suggested industry guideline of 40% of the tree population (Figure 7). As the City implements its goal of planting 75,000 trees over the next 5 years, the number of young trees will increase. Tree planting should be prioritized in the South region where there are fewer young trees (18%) and larger numbers of mature (31%) and maturing (25%) trees to ensure that street tree canopy will continue to be provided as mature trees are removed (Figure 8). To ensure the maximum number of trees are planted and reduce the number of tree planting refusals by residents, BoF should continue to transition their tree planting program from a request-based, opt-in program to one that targets specific neighborhoods and works with local leaders, residents, and regional partners to plant street trees. A post-planting care program should be created to ensure successful establishment through young tree training, watering, and routine tree health inspections.

Established, Maturing, and Mature Trees. The 2021 sample inventory shows that street trees in larger size classes are overrepresented across the city compared to an ideal distribution. This is especially pronounced **in the South, where trees larger than 17 inches DBH comprise 56% of the region's street tree population** (Figure 8). A population that skews older will have a higher degree of maintenance needs to reduce the burden of costly responses to storms and emergencies.

Trends in Size and Age Class Distribution. Data from the 2003, 2013 and 2021 sample tree inventories was analyzed to measure changes in size and age over time. Size data is not available for the 1994 data set. The diameter classes in the 2003 and 2013 datasets did not align exactly with diameter classes presented in the previous analyses for the 2021 data. To adjust for this, the size classes analyzed for the young, established, maturing, and mature are modified slightly to fit into the diameter classes assigned in the 2003 and 2013 data collection**.**

From 2003 to 2021 there was a **43% decrease in young trees and 8% decrease in establishing trees**, while there was a **20% increase in maturing trees and a 120% increase in mature trees** (Figure 11). While trees are moving up from established and maturing trees size classes, which shows a commitment to tree care, there has not been sufficient planting to replace all the trees that have been removed, leading to Chicago's street tree population being well below the ideal percentage of 40% of trees in the young size class category.

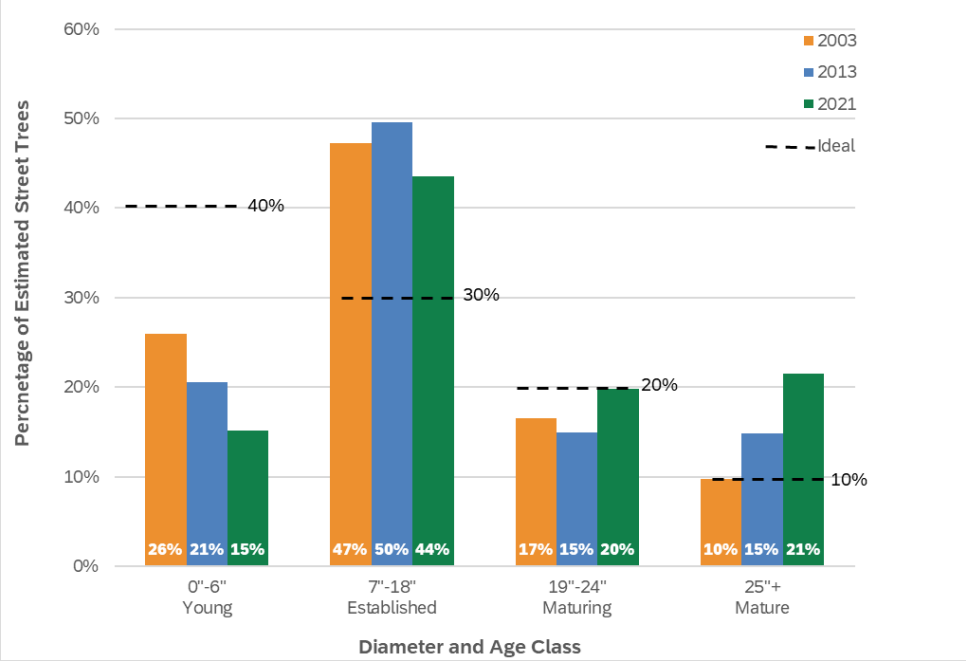


Figure 11. Relative size and age class distribution from 2003 - 2021
Note. The diameter classes have been adjusted compared to Figures 9 and 10 based on the size class data available for the 2013 sample inventory.

Tree Planting Opportunities

The analysis of the 2021 sample inventory evaluated vacant planting sites, potential planting sites (defined as sidewalks at least 9-feet wide that could accommodate planting pits), and stocking level, which is calculated as the percentage of available planting sites that are currently occupied by trees. As mentioned in *Data and Analysis,* there are **limitations to the sample inventory methodology** that affect the accuracy of estimates about unoccupied sites, stocking level, and total potential tree canopy at full stocking. **The information provided in this section should be field vetted for accuracy, and updated statistics should be shared.**

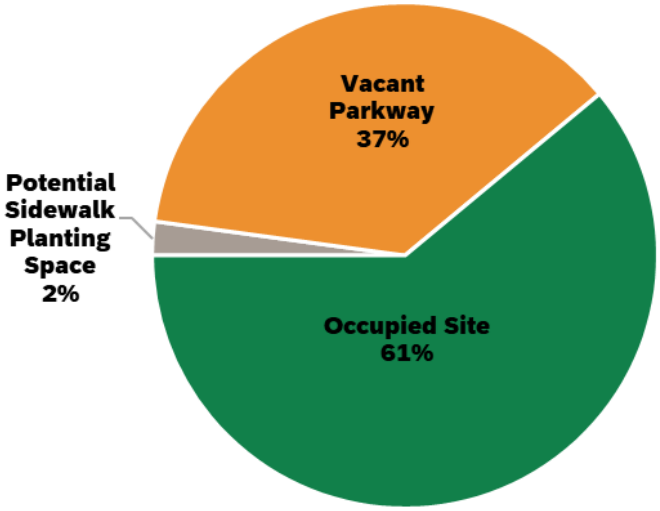
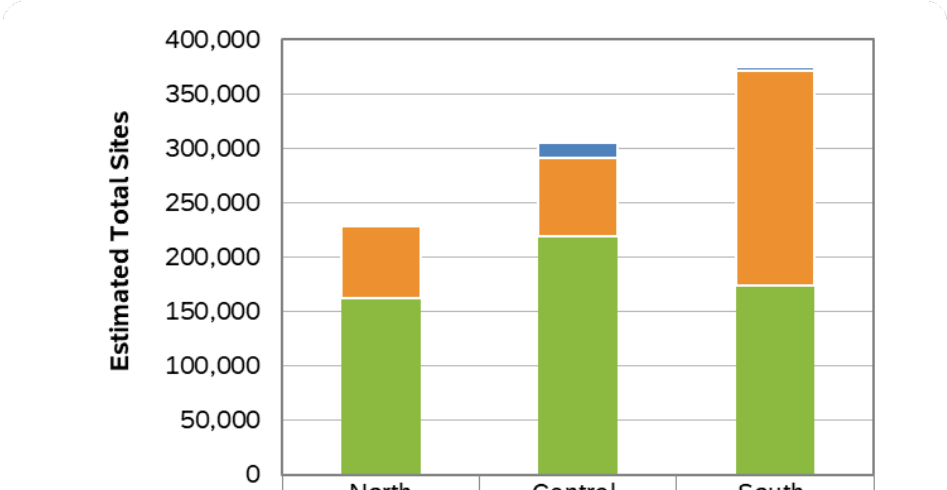


Figure 12. Estimated number of occupied, vacant and potential planting sites along Chicago's streets (2021 sample inventory)

Sites. Across the city, 61% of available sites are occupied by a tree in the 2021 sample inventory (Figure 12). In the city's North and Central regions, occupied sites comprised most available sites, followed by vacant planting sites (Figure 13). In the **South region, there are an estimated 197,000 vacant planting sites**.



	North	Central	South
Potential Sidewalk Planting Space	1,666	13,756	4,231
Vacant Parkway	65,376	71,906	197,277
Occupied Site	162,311	218,973	173,523

Figure 13. Estimated number of occupied, vacant and potential planting sites by region (2021 sample inventory)

Street Tree Planting 2012-2022. Over the last decade, Chicago's street tree planting has not been keeping pace with the number of street tree removals. Based on data provided by BoF, since 2012 there

has been a net loss in street trees of 59,069 (Table 5). With the start of the *Our Roots Chicago* initiative, 2022 marks the first year in over a decade where street tree planting exceeded street tree removals.

Table 5. Street tree removals and street tree planting 2012 - 2022

Year	Street Trees Planted	Stret Trees Planted	TOTAL TREES PLANTED	Street Tree Removals	Street Tree Removals	TOTAL TREES REMOVED	Net Gain/ Loss
	BoF	Others*		BoF	Others*		
2012	1,052	3,184	4,236	6,834	776	7,610	-3,374
2013	376	3,709	4,085	9,730	882	10,612	-6,527
2014	3,572	4,508	8,080	15,286	1,079	16,365	-8,285
2015	5,414	3,716	9,130	17,428	1,110	18,538	-9,408
2016	2,660	2,224	4,884	9,756	942	10,698	-5,814
2017	2,889	3,125	6,014	16,346	304	16,650	-10,636
2018	3,522	2,772	6,294	7,505	1,032	8,537	-2,243
2019	4,207	3,689	7,896	17,785	1,191	18,976	-11,080
2020	3,360	3,107	6,467	13,413	637	14,050	-7,583
2021	5,095	4,823	9,918	10,653	521	11,174	-1,256
2022	12,825	6,715	19,540	11,452	951	12,403	**7,137**
Total	**44,972**	**41,572**	**86,544**	**136,188**	**9,425**	**145,613**	**-59,069**

*Chicago Dept. of Transportation (CDOT); CDOT GreenStreets; Permitted tree planting and removals

Stocking Level. Stocking level is the measure of how many trees are currently planted versus the total number of planting sites (occupied and vacant). **The North and Central regions have the highest stocking level, at 71% and 72% respectively, while the South region's stocking level at 46%** is well below North and Central regions (Figure 14). Exploring stocking level over time shows fluctuations between the regions, with the highest stocking levels in 2003 in the North and South regions and in the Central region in 2013 (Figure 15). **Overall, Chicago's stocking level has decreased 15.2% from 1994 to 2021.**

In an ideal situation Chicago would have 100% stocking, where all available planting sites are planted. While it may not be practical or possible to plant in every available site due to factors including utilities, buildings, sidewalks, roads, and residents who are resistant to tree planting, **Chicago should strive to achieve the maximum stocking level it can support.**

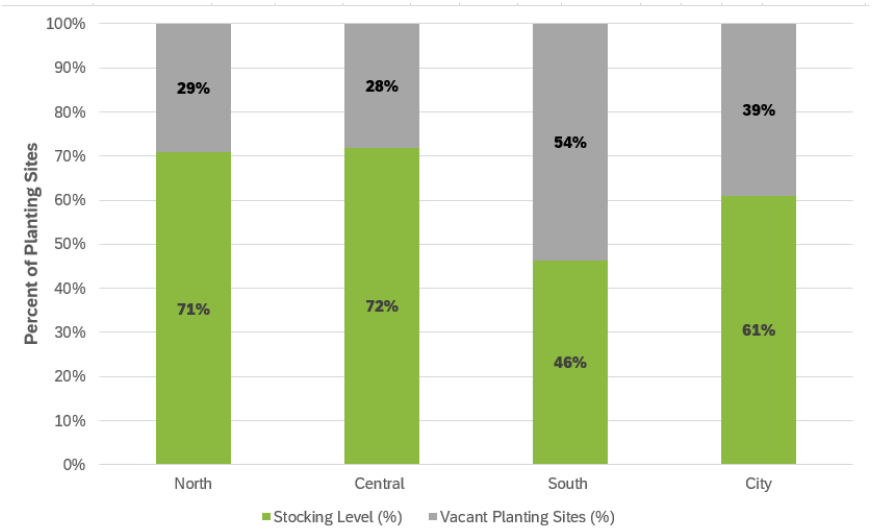


Figure 15. Stocking level and vacant planting sites by region and city-wide average (2021 sample inventory)

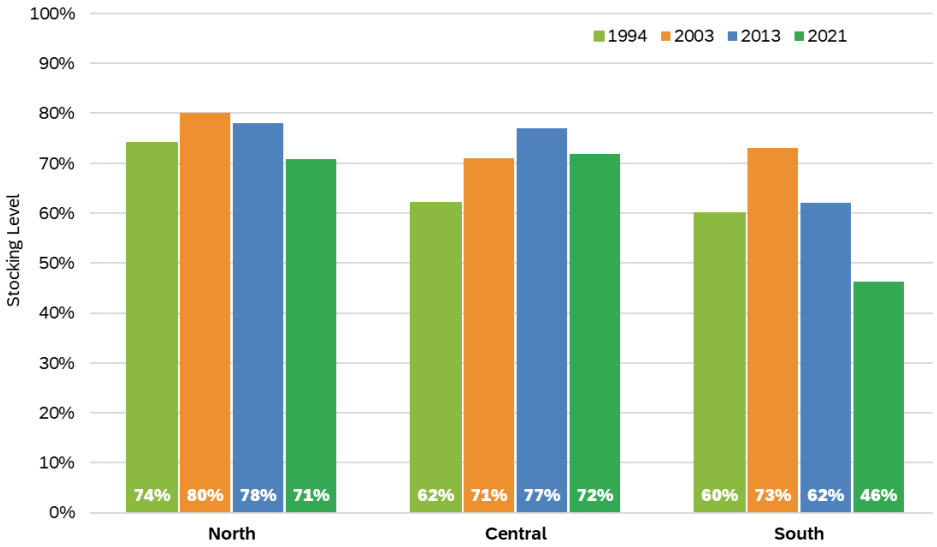


Figure 14. Stocking levels by regions 1994 - 2021

Street Tree Benefits

Chicago's street trees provide many essential benefits and services to city residents and visitors, including:

- Removing ozone from the air, helping to reduce atmospheric warming, and improving air quality and the public health effects of air pollution.
- Storing carbon and reducing the amount returning to the atmosphere as a greenhouse gas.
- Shading and cooling streets/buildings mitigating the urban heat island effect and reducing the use of air conditioning.
- Intercepting and absorbing stormwater helping to reduce flooding and the amount entering the city's stormwater system.
- Improving water quality by filtering and removing pollutants.
- Providing homes, food, and shelter for wildlife.
- Beautifying the community.
- Increasing real estate values by 7-10%.[19]
- Positively impacting the overall health of urban residents and lessening the impacts of urbanization.[20,21]

To quantify and measure the value of the environmental benefits that Chicago's street trees provide, an assessment was conducted using i-Tree Eco, a component of the USDA Forest Service's i-Tree suite of tools (https://www.itreetools.org). The analysis was performed using the 2021 random sample street tree inventory data and was extrapolated to quantify the benefits of the estimated 554,807 street trees. Chicago's street trees provide an estimated **$12 million in benefits each year or $21.85 per street tree** (Figure 16) by providing the following environmental benefits to the community.

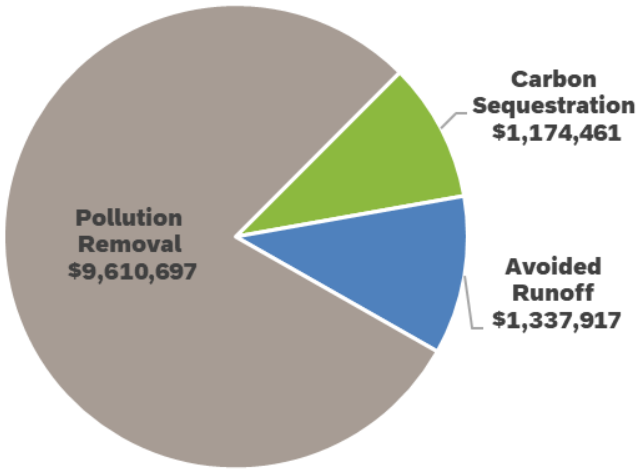


Figure 16. Annual benefits of Chicago's estimated 554,807 street trees

[19] Dwyer, J., McPherson, E. G., Schroeder, H.W., & Rowntree, R. (1992). Assessing the Benefits and Costs of the Urban Forest. *Journal of Arboriculture, 18*(5), 1-12.
[20] Ulmer, J.A., Wolf, K.L., Backman, D.R., Tretheway, R.L., Blain, C.J., O'Neil-Dunne, J.P.M., Frank, L.D. (2016) Multiple health benefits of urban tree canopy: The mounting evidence for a green prescription. *Health and Place, 42*, 54-62.
[21] CUFR. Center for Urban Forest Research, USDA Forest Service Pacific Southwest Research Station.

- **Carbon. Absorbing (sequestering) over 13.7 million pounds of carbon** and reducing the amount returning to the atmosphere as a greenhouse gas. Annual Value: $1.2 million.

- **Stormwater. Intercepting, and absorbing 149 million gallons of stormwater**, reducing the amount entering the city's storm sewer system. Annual value: $1.3 million.

- **Air Pollution. Removing 513,717 pounds of air pollution** including ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide. and particulate matter from the atmosphere, helping to reduce atmospheric warming and improving air quality and public health effects from air pollution. Annual Value: $9.6 million.

- The **structural (or the replacement value) of Chicago's sample street tree inventory is $915 million** (or on average $1,652 per street tree). Structural value represents the cost to replace a given tree with a one of similar size and species. While this is not typically practical - for example, it is not possible to replace a 20-inch diameter oak tree with another 20-inch tree instantly – the structural value provides an estimate of the overall value of Chicago's street tree population. Structural value increases over time as more trees are planted and existing trees mature.

Benefits by Region. The benefits of the city's *estimated number of street trees* by region, North, Central, and South are calculated using i-Tree Eco. While the estimated number of trees in the South region is less than the Central region (blue bar) **the street trees in the South region provide the greatest benefits at $4.93 million** annually followed by the Central and North regions (Figure 17). In the South region 56% of the trees are estimated to be in the mature and maturing size classes (17" and greater DBH) while only 31% are within those size classes in the Central region (Figure 10). Larger trees—those in the maturing and mature size classes—provide the greatest benefits to the city. **It is important for Chicago to provide proactive care and maintenance for its young and establishing trees so they can grow into the maturing and mature size classes.** Planting new trees, especially in the South region, will ensure that benefits are not lost as mature trees die.

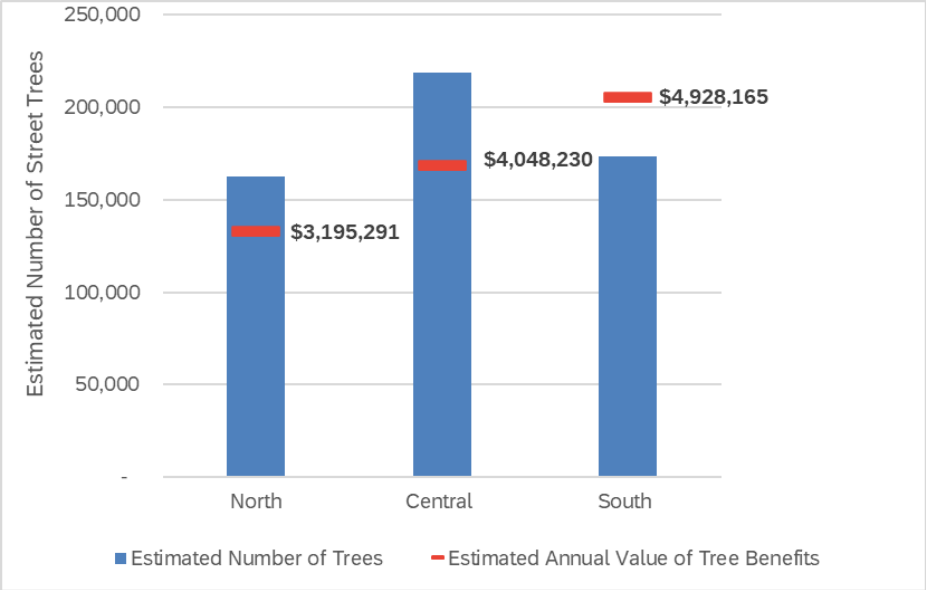


Figure 17. Estimated annual benefits by region compared to estimated number of street trees

Tree Canopy Cover (Public & Private Property)

The amount, location and distribution of Chicago's tree canopy is a driving force behind its ability to produce benefits to the community; **as tree canopy increases, so do tree benefits.** Tree canopy is measured as the layer of leaves, branches and stems of trees and other woody plants that cover the ground on **public and private property** when viewed from above.

Since 1994 Chicago has used a variety of tools and methodologies to measure the amount of tree canopy that covers the city. An urban tree canopy assessment by the Chicago Region Tree Initiative using 2017 LiDAR imagery found 20% tree canopy cover. More recent i-Tree Canopy analyses (minimum 1,000 plots) conducted by the Chicago Region Tree Initiative (2020) and the Chicago Bureau of Forestry (2021) estimates Chicago's tree canopy to be between 16% to 17.8%. While the methodologies may differ, the results show tree canopy cover in Chicago in the high teens to 20% since 2017 (Figure 18, Table 6).

Today, based on The Morton Arboretum's recent (2022) release of its analysis of 2017 LiDAR data and aerial imagery, **Chicago's tree canopy cover is estimated to be 20% with some neighborhoods having canopy cover as low as 8%.** While tree canopy slightly increased from 2010, more recent i-Tree Canopy analysis has observed a downward trend of 17.8% (2020 imagery) and 17% (2021 imagery) (both conducted by BoF Foresters) and the Morton Arboretum's 2020 Tree Census estimate of 16%. Using LiDAR together with high-resolution aerial imagery is considered the gold standard for determining tree canopy. i-Tree Canopy is considered an important tool for providing a quick and low cost analysis of tree canopy with a standard error of 1.2% (based on a minimum of 1,000 points).

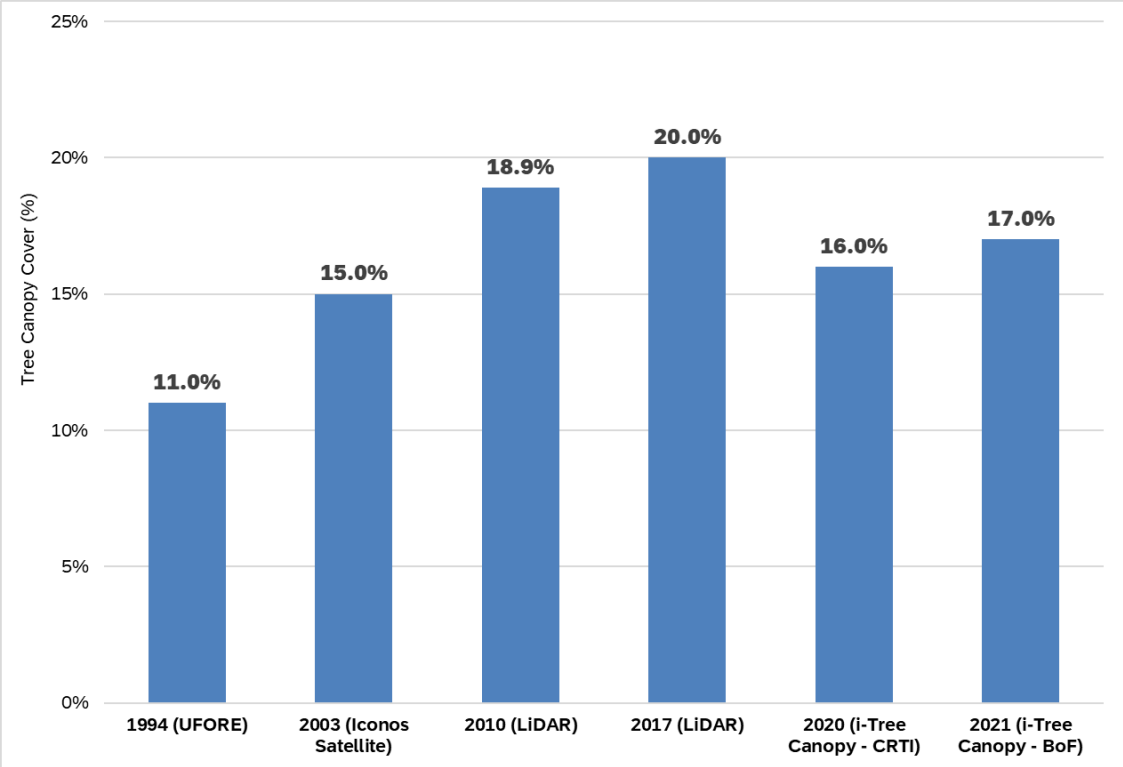


Figure 18. Chicago tree canopy cover 1994-2021

Table 6. Tree canopy cover by year and data source

Year	Tree Canopy Cover (average %)	Data Source
1994	11%	Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project (McPherson, et al., 1994. US Forest Service).[11] Field sampling of trees to estimate leaf surface area.
2003	15%	City of Chicago Planning and Development analysis of 2003 Iconos Satellite imagery.
2010	18.9%	Urban Trees and Forests of the Chicago Region (Nowak, et al. 2013. US Forest Service)[12] Chicago Tree Census. i-Tree Eco, field surveys and assessment of LiDAR.
2017	20%	Morton Arboretum Chicago Region Trees Initiative. 2022. Chicago Urban Forestry Summary – 2017 LiDAR tree canopy assessment.[14]
2020	16%	Chicago Region Tree Census Report – The Morton Arboretum.[13] i-Tree Eco – field surveys (used methodology and plots from 2010 assessment) and iTree Canopy.
2021	17%	Chicago Bureau of Forestry. 2021 i-Tree Canopy assessment [not published].

2017 Urban Tree Canopy Assessment. Utilizing the LiDAR urban tree canopy data from the Chicago Region Tree Initiative's Chicago Tree Census, Table 7 to Table 11 present tree canopy cover data by Chicago Community Area from 2010-2017.

Across the 77 Community Areas between 2010 and 2017 tree canopy cover:

- Increased in 42 areas (54%)
- Remained the same in 16 areas (21%)
- Decreased in 19 areas (25%)

Table 7. Tree canopy cover by Region and Community Area

Chicago Community Areas		Canopy Cover	
By Region		2010	2017
Far Southeast Side	Avalon Park	21%	22%
	Burnside	22%	24%
	Calumet Heights	19%	20%
	Chatham	20%	20%
	East Side	15%	15%
	Hegewisch	18%	18%
	Pullman	16%	19%
	Riverdale	20%	23%
	Roseland	21%	22%
	South Chicago	18%	19%
	South Deering	11%	14%
	West Pullman	27%	26%
	Average Tree Canopy Cover	**19%**	**20%**
Far Southwest Side	Ashburn	16%	15%
	Auburn Gresham	19%	19%
	Beverly	44%	41%
	Morgan Park	29%	28%
	Mount Greenwood	19%	18%
	Washington Heights	22%	21%
	Average Tree Canopy Cover	**25%**	**24%**
South Side	Armour Sq	8%	13%
	Bridgeport	10%	13%
	Douglas	20%	22%
	Fuller Park	11%	12%
	Grand Boulevard	15%	17%
	Greater Grand Crosssing	19%	21%
	Hyde Park	26%	27%
	Kenwood	25%	28%
	Oakland	17%	18%
	South Shore	22%	23%
	Washington Park	18%	22%
	Woodlawn	15%	22%
	Average Tree Canopy Cover	**17%**	**20%**
Southwest Side	Archer Heights	8%	8%
	Brighton Park	12%	12%
	Chicago Lawn	19%	19%
	Clearing	9%	9%
	Englewood	23%	25%
	Gage Park	14%	15%
	Garfield Ridge	13%	12%
	McKinley Park	14%	15%
	New City	15%	16%
	West Elsdon	14%	13%
	West Englewood	26%	26%
	West Lawn	11%	11%
	Average Tree Canopy Cover	**15%**	**15%**

Chicago Community Areas		Canopy Cover	
By Region		2010	2017
Central	Loop	10%	17%
	Near North Side	9%	17%
	Near South Side	8%	15%
	Average Tree Canopy Cover	**9%**	**16%**
West Side	Austin	20%	19%
	East Garfield Park	17%	18%
	Humboldt Park	16%	17%
	Lower West Side	7%	11%
	Near West Side	10%	15%
	North Lawndale	16%	18%
	South Lawndale	14%	15%
	West Garfield Park	18%	18%
	West Town	14%	20%
	Average Tree Canopy Cover	**15%**	**17%**
North Side	Avondale	14%	16%
	Lakeview	20%	24%
	Lincoln Park	21%	26%
	Logan Square	18%	20%
	North Center	22%	24%
	Average Tree Canopy Cover	**18%**	**21%**
Northwest Side	Belmont Cragin	15%	15%
	Dunning	21%	19%
	Hermosa	17%	17%
	Irving Park	25%	25%
	Montclare	20%	19%
	Portage Park	21%	19%
	Average Tree Canopy Cover	**20%**	**19%**
Far Northside	Albany Park	24%	24%
	Edgewater	20%	26%
	Edison Park	28%	23%
	Forest Glen	49%	44%
	Jefferson Park	23%	22%
	Lincoln Square	28%	28%
	North Park	35%	33%
	Norwood Park	26%	22%
	O'Hare	15%	14%
	Rogers Park	20%	27%
	Uptown	20%	24%
	West Ridge	27%	26%
	Average Tree Canopy Cover	**26%**	**26%**
	City-Wide Average Tree Canopy Cover	**19%**	**20%**

Table 8. Lowest tree canopy cover by Community Area

Lowest Canopy Cover				
Rank	Community Area	Tree Canopy		Gain/Loss
		2010	2017	
1	Archer Heights	8%	8%	0%
2	Clearing	9%	9%	0%
3	Lower West Side	7%	11%	4%
4	West Lawn	11%	11%	0%
5	Brighton Park*	12%	12%	0%
6	Fuller park	11%	12%	1%
7	Garfield Ridge	13%	12%	-1%
8	Armour Square*	8%	13%	5%
9	Bridgeport	10%	13%	3%
10	West Elsdon	14%	13%	-1%
Our Roots Chicago 2022 Priority Area				

Table 9. Highest tree canopy cover by Community Area

Highest Canopy Cover				
Rank	Community Area	Tree Canopy		Gain/Loss
		2010	2017	
1	Forest Glen	49%	44%	-5%
2	Beverly	44%	41%	-3%
3	North Park	35%	33%	-2%
4(tie)	Kenwood	25%	28%	3%
4(tie)	Lincoln Square	28%	28%	0%
4(tie)	Morgan Park	29%	28%	-1%
5(tie)	Hyde park	26%	27%	1%
5(tie)	Rogers Park	20%	27%	7%
6(tie)	Edgewater	20%	26%	6%
6(tie)	Lincoln Park	21%	26%	5%
6(tie)	West Englewood	26%	26%	0%
6(tie)	West Pullman	27%	26%	-1%
6(tie)	West Ridge	27%	26%	-1%

Table 10. Top tree canopy cover losses 2010-2017 by Community Area

Top Canopy Cover Losses				
Rank	Community Area	Tree Canopy		Gain/Loss
		2010	2017	
1	Edison Park	28%	23%	-5%
2	Forest Glen	49%	44%	-5%
3	Norwood Park	26%	22%	-4%
4	Beverly	44%	41%	-3%
5	Dunning	21%	19%	-2%
6	Portage Park	21%	19%	-2%
7	North Park	35%	33%	-2%
8	Ashburn	16%	15%	-1%
9	Austin *	20%	19%	-1%
10	Garfield Ridge	13%	12%	-1%
11	Jefferson Park	23%	22%	-1%
12	Montclare	20%	19%	-1%
13	Mount Greenwood	19%	18%	-1%
14	Washington Heights	22%	21%	-1%
15	West Elsdon	14%	13%	-1%
16	West Pullman	27%	26%	-1%
17	West Ridge	27%	26%	-1%
18	O'Hare	15%	14%	-1%
19	Morgan Park	29%	28%	-1%
**Our Roots Chicago* 2022 Priority Area				

Table 11. Top tree canopy cover gains 2010-2017 by Community Area

Top Canopy Cover Gains				
Rank	Community Area	Tree Canopy		Gain/Loss
		2010	2017	
1	Near North Side	9%	17%	8%
2	Loop	10%	17%	7%
3	Rogers Park	20%	27%	7%
4	Woodlawn	15%	22%	7%
5	Near South Side	8%	15%	7%
6	Edgewater	20%	26%	6%
7	West Town	14%	20%	6%
8	Lincoln Park	21%	26%	5%
9	Armour Square*	8%	13%	5%
10	Near West Side*	10%	15%	5%
**Our Roots Chicago* 2022 Priority Area				

Our Roots Chicago. The City of Chicago is working to increase public tree planting through the *Our Roots Chicago* initiative which aims to plant 75,000 street trees over the next five years, beginning in 2022. The initiative's goal is to plant 15,000 street trees per year, focusing on areas of the city that have been historically underserved. The City of Chicago Department of Public Health utilized a mapping tool developed in partnership with the University of Chicago and the Morton Arboretum to select 10 Community Areas for *the Our Roots Chicago* priority tree planting in 2022 (Table 12). The 10 Community Areas were chosen based on census tracts within the areas that had low canopy

cover and other metrics associated with health outcomes, including air quality, surface temperature, and traffic volume. To measure success of the street tree planting program, the BoF could measure changes in street tree stocking level at the census tract and/or Community Area level - pre and post planting.

Table 12. *Our Roots Chicago* 2022 Priority Tree Planting Areas

Our Roots Chicago Priority Areas 2022_			
Community Area	**Tree Canopy**		**Gain/Loss**
	2010	**2017**	
Austin	20%	19%	-1%
Armour Square	8%	13%	**5%**
Brighton Park	12%	12%	0%
East Garfield Park	17%	18%	1%
Greater Grand Crossing	19%	21%	2%
McKinley Park	14%	15%	1%
North Lawndale	16%	18%	2%
South Lawndale	14%	15%	1%
Near West Side	10%	15%	**5%**
New City	15%	16%	1%

A Tiered Approach for Street Tree Planting in Los Angeles

The City of Los Angeles, like Chicago, has a focus on **equitably increasing canopy cover** across the city. And like Chicago, many neighborhoods with low tree canopy cover also have more paved surfaces and fewer vacant planting sites. This can present challenges in achieving equitable canopy cover because it is more difficult to find open planting sites in these neighborhoods. To help prioritize tree planting and identify resource, policy, and infrastructure needs, the City of Los Angeles has developed a tiered approach to street tree planting that assesses the level of difficulty for planting at a site.

Tier 1: No site modifications needed. Site is available and ready to plant.
Tier 2: Minor modifications to the site are needed, for example removing concrete to create a planting pit.
Tier 3: Major modifications to the site are needed, like road redesign or reconstruction to accommodate tree planting.

This model may be a useful for the City of Chicago to consider implementing to help prioritize tree planting and identify the resources needed to make significant changes in street tree canopy in low canopy and high need neighborhoods. Information on the tiered approach can be found in the *Los Angeles Urban Forest Equity Streets Guidebook*.

(https://laurbanresearchcenter.org/wp-content/uploads/2021/05/LA-Urban-Forest_Streets-Guidebook_FINAL_REVISED.pdf).

A map of street tree planting in U.S. census tract 2306 – represented by green and red dots is shown in Figure 19. As the figure illustrates, while street tree planting opportunities exist – the area in the public right-of-way is small compared to the space available for tree planting on private property. Communities across the country recognize that simply planting more street trees in existing spaces will not be enough to increase tree canopy. In the most restrictive areas for street tree planting, expanding tree canopy on private property may be the only option. In addition to new tree planting, the preservation of existing mature trees is essential for maintaining and expanding tree canopy cover in Chicago.

While the City of Chicago is doing what it can to increase tree canopy on public property by planting street trees – the majority of tree canopy growth will need to come from planting on private property. The City should continue to work with its partners including The Chicago Region Tree Initiative, The Morton Arboretum, Openlands, the Chicago Department of Public Health, Illinois Department of Natural Resources, and USDA Forest Service to encourage and incentivize tree planting on private property.

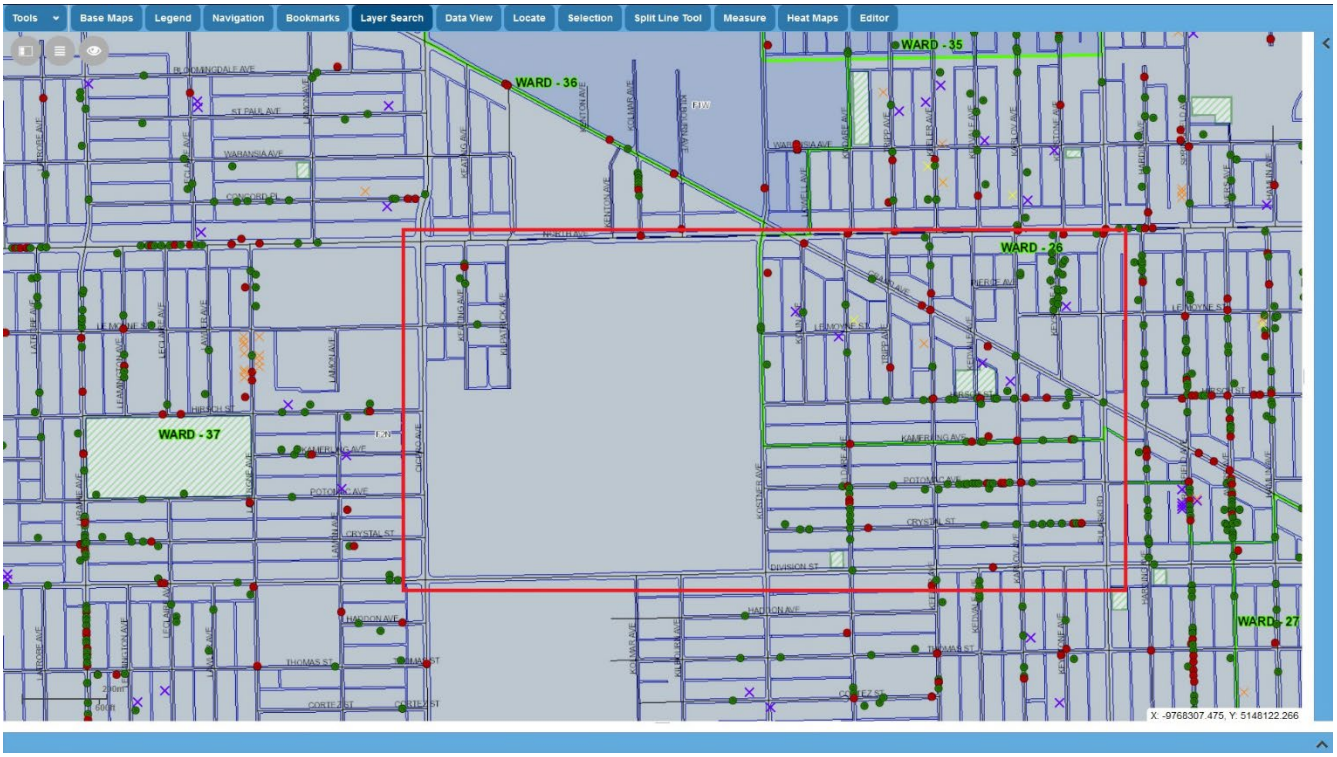


Figure 19. Street tree planting in Census Tract 2306 represented by the green and red dots. The greatest planting opportunities are on private property.

How does Chicago's Tree Canopy Compare? Chicago's tree canopy cover at 20% is lower than other large cities in North America – whose tree canopy ranges from 20% to 32% (Figure 20). Note: this information is provided for general comparison purposes only. The methodologies used to calculate tree canopy cover may differ between communities referenced and/or the information may be outdated.

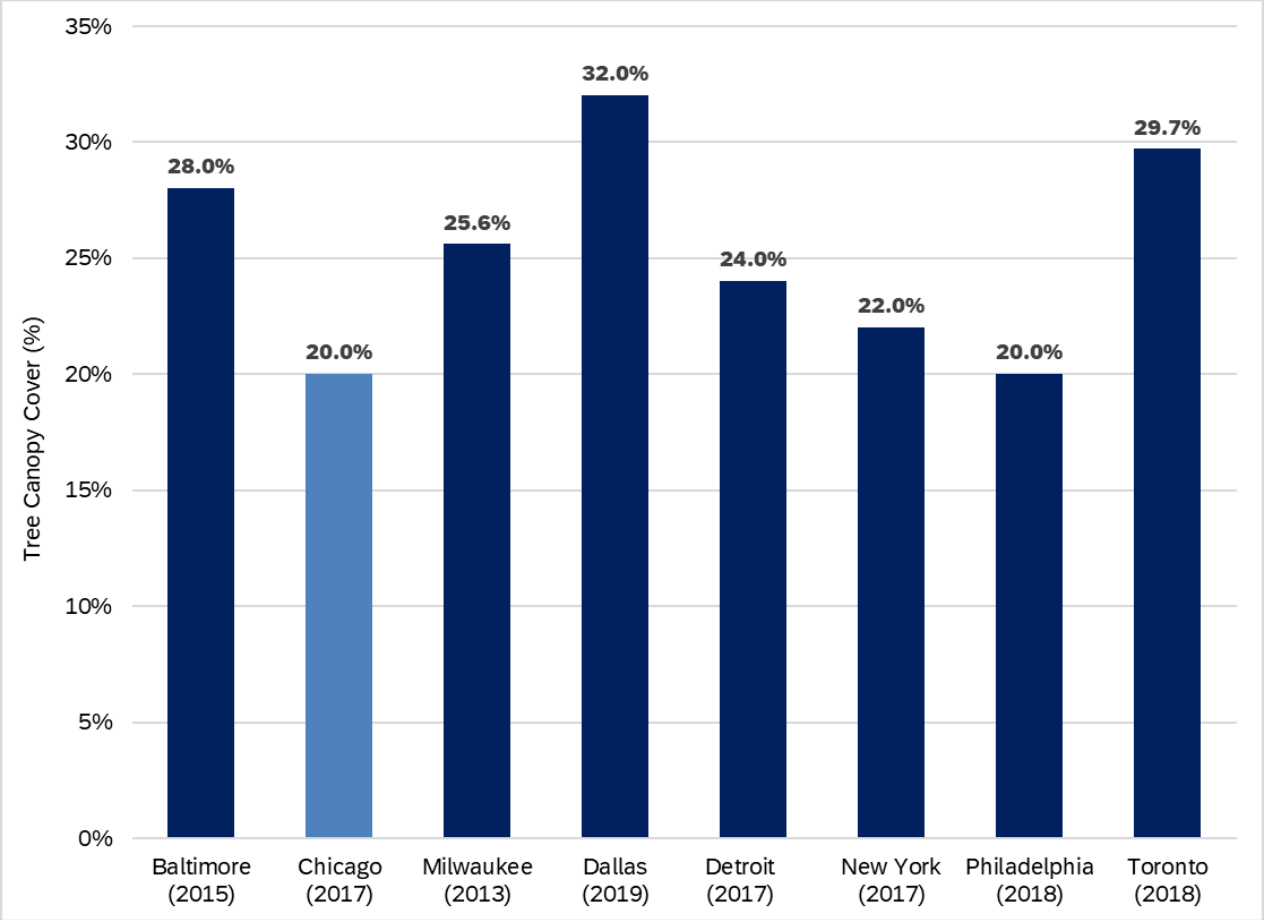


Figure 20. Tree canopy cover for Chicago and other North American cities

This section presented information that highlights the current state and historical trends of Chicago's street tree resource and urban forest. The next section examines planning and management of Chicago's public street trees.

SECTION 3:

MANAGEMENT & PLANNING

SECTION 3: MANAGEMENT & PLANNING

The City of Chicago is responsible for maintaining an estimated 554,800 street trees growing along the city's 3,780 miles of public streets. As described in Section 2, these trees are a tremendous asset valued at nearly $1 billion. They provide over $12 million in annual environmental and economic services as well as social and health benefits to Chicago's residents and visitors. **The magnitude of these benefits, together with the millions of people in the city that receive them, highlights the importance of the work that the Department of Streets and Sanitation Bureau of Forestry (BoF) does each day**. BoF is legally responsible for managing and maintaining the city's street trees and providing prompt, efficient, and safe delivery of tree care services to residents. To do this, they set goals and plan work while balancing the ever-changing needs and conditions of the urban forest and the requests of residents and leadership.

This Management and Planning section provides an overview and assessment of BoF's current management and operations, explores how other cities manage their public trees, presents management scenarios, and identifies connections between other city plans and initiatives.

Overview of Bureau of Forestry Operations

Management

The Bureau of Forestry's management of Chicago's street tree population can best be described as reactive. Tree maintenance activities are driven by 311 resident and alderman requests, high risk trees identified by staff, and emergencies. If a resident has not requested tree maintenance on a street tree in front of their home, there is a very high likelihood that the tree has not had any maintenance since the late 1990s. A reactive urban forestry program leads to inefficient and inequitable service delivery, low customer satisfaction due to delays in addressing tree concerns, and negatively impacts the overall condition, value, and sustainability of Chicago's trees.

In the 1990s BoF began a 5-year area pruning cycle (grid-trimming), however its timing was significantly impacted when 311 was introduced and the State of Illinois woody debris law (Public Act 85-1430) was adopted in 1990 banning landscape waste from landfills. The introduction of 311, shifted BoF away from their 5-year area pruning cycle and proactive tree management program to a reactive program prioritizing and conducting tree maintenance based on resident service requests. The woody debris law further impacted the pruning cycle when the collection of private yard waste became a task of BoF - the initial 5-year pruning cycle took over 10 years to complete.

BoF Yards. BoF operates five yards where tree crews are dispatched from each day. The management scenarios described later in this section and the strategies in Section 4 outline how BoF can begin transitioning back to a proactive program and more effectively use the five yards to improve efficiencies.

Data, Technology, and Information Management

Tree Inventory. As described in Section 2, BoF has conducted a series of random sample tree inventories from 1994 to 2021. While these sample inventories estimate the number of street trees, they do not provide crucial information for individual street trees, like location, species, size, conditions, risk rating, and maintenance need. This information is essential for operating a proactive program, prioritizing tree care activities based on risk, and delivering services, equitably, efficiently, and cost effectively. Tree inventory data establishes work priorities, manages work activities, and helps to identify and justify resources needed (funding, staff, and equipment) to sustainably manage and care for Chicago's street trees. **A comprehensive GIS-based public tree inventory, that is routinely updated, is the foundation of a municipal urban forestry program and is identified as a high priority need for Chicago's urban forestry program.**

Urban Tree Canopy Assessment. An urban tree canopy assessment provides information on the amount of tree canopy cover in the city on both public and private property. With the work done by The Morton Arboretum in 2010 and 2022, Chicago has current and historical tree canopy data that should be used to monitor trends and prioritize tree planting and care. Tree canopy assessments should continue to be completed every 5–10 years.

Asset Management. BoF uses three different systems to manage work orders, 311 service requests, and permits:

- Salesforce: tree maintenance work orders and 311 requests.
- Cityworks: tree planting requests and inspections.
- Permits database: tree permits for the removal, maintenance, and planting of public trees.

These systems do not interface with each other, which makes it challenging to share information both within BoF and with other City departments, which impacts coordination.

BoF has concerns with using Salesforce because its current configuration does not meet the Bureau's needs. This is one reason provided for why tree planting operations were managed through Cityworks. BoF has begun to work with the Department of Assets, Information and Services to discontinue the use of Cityworks and customize Salesforce to meet its data entry and reporting needs.

Technology & Workflow. There is a technology gap in the BoF that can be improved to provide greater efficiency and service delivery. Tree maintenance requests and work orders are entered into Salesforce; however, tree crews do not access the work orders directly through Salesforce. They are instead provided with paper work orders that are turned in at the end of each day with notes on the work completed. This information is then manually entered into Salesforce by dispatchers and supervisors and work orders/311 requests are closed.

There are concerns and opportunities for improvement in the current process:

- Paper work orders can get lost or not turned back in which could lead to work not being completed or having work order/service requests remain open even though the work has been completed.

- Delays in entering completed work orders and closing 311 requests can lead to inaccurate reporting on service times and the perception by residents and leadership that BoF is not addressing work in a timely manner.

- There are inefficiencies in printing work orders and having multiple people responsible for different steps of the work order process. Salesforce offers mobile solutions that would allow BoF tree crews to access work orders and service requests on a tablet or computer directly in the field, which would:
    - Allow tree crews to add information on work completed at the time it was done and avoid lags in updating Salesforce.
    - Improve efficiencies by visually showing the location of work on a map allowing crews to optimally route assignments to maximize production and minimize drive time.
    - Provide supervisors the opportunity to add new work orders to the crews list of daily work if an emergency or priority comes up avoiding communication issues that may arise.

- Documented standard operating procedures (SOPs) are not in place for how information is entered, and how reports are generated in Salesforce. This leads to issues when running reports on work orders and service requests. For example, running a report on the number of work orders completed in a year can have varying results depending on how information was entered and how it is queried.

Service Requests. 311 service requests are organized into four categories – tree trim, tree removal, tree debris clean-up, and tree planting. Table 13 displays service requests **received**, **completed, and closed** in each fiscal year. The analysis does not include service requests that were not completed in the year received. **The most requested tree maintenance activity was tree trimming, which further highlights the need for re-establishing an area tree pruning program**. Understanding the types of forestry activities that are most requested can help secure and prioritize budget resources.

A non-tree maintenance task that BoF is responsible for is **the collection and disposal of woody debris** and landscape material generated **from private property**. This activity, which on average was the most requested forestry service from 2019–2021 (Table 13), **takes BoF staff and resources away from the Bureau's core functions and duties of maintaining and planting public street trees**. It is recommended that Chicago re-evaluate providing this service to residents. If the city chooses to continue providing this service, the collection and disposal should be contracted out or moved to a different Bureau or Department like Sanitation as they are providing other waste management services to residents.

Table 13. Service requests received and completed by type 2019-2021

Forestry Service Request Types	2019	2020	2021	Average Request	Percent of Requests
Tree Trim	22,227	21,467	26,036	23,243	34%
Tree Removal	16,963	13,413	10,653	13,676	20%
Tree Debris Clean-Up	17,063	31,659	22,579	23,767	35%
Tree Planting*	8,000	8,000	8,000	8,000	12%
Total	**64,253**	**74,539**	**67,268**	**68,687**	**100%**

*Tree planting requests are tracked through Cityworks and not Salesforce like the trimming, removal, and debris clean-up.

Staffing

The Deputy Commissioner of Chicago's Bureau of Forestry (BoF) and a team of staff are responsible for managing the street tree resource including:

- Tree pruning
- Tree removal
- Tree planting
- Tree inspections in response to resident and alderman requests
- Site plan and construction plan review for private and public projects
- Interdepartmental coordination
- Tree data management
- Customer service support

BoF crews perform 90% of the city street tree maintenance activities and contractors perform 10%, primarily tree planting and stump removal. In fiscal year 2022, BoF had 223 budgeted positions, including tree trimmers, motor truck drivers, training agents, and administration and operational support staff. There are 162 staff in positions with 35 staff assigned to other roles, 23 on leave/disability, and 3 vacancies (Table 14). In 2023, the BoF added 2 community forester positions to support Chicago's goal of planting 75,000 street trees by 2027 – these positions are not accounted for in Table 5.

BoF does not have the capacity and resources to meet current demand and move into a more proactive management program. Bloomberg Associates found that the average number of days from when a 311 service request is received to when it closed ranged from 206 days for tree removals, 217 days for tree pruning, and 493 days for tree planting.[22] As noted above, since completed work orders are manually entered into Salesforce/Cityworks, a delay in entering will influence the length of time from request to closure.

City tree planting operations are currently overseen by one senior city forester. Historically, City contractors planted 7,000 street trees each year with a two-year guarantee period. There are many steps involved in tree planting and follow-up warranty inspections that are not possible for one staff person to complete – BoF is significantly understaffed in tree planting. In New York

[22] Bloomberg Associates. (2022). Delivering Tree Equity in Chicago: Findings and Recommendations from a Review of the Bureau of Forestry. [not published]

City, for example, there are 37 budgeted foresters that oversee tree planting. They are responsible for managing one to two contracts per season of between 500-1000 trees. With the new street tree planting initiative, *Our Roots Chicago,* tree planting will increase to 15,000 street trees per year. BoF is budgeted to add two new community foresters in fiscal year 2023 to help manage tree planting; however, this is still understaffed based on the demands of tree planting and warranty inspections.

The Plans and Permits Section of the Bureau of Forestry is staffed by senior city foresters who issue permits to private contractors for work on City trees and review plans to ensure City trees are adequately protected. Over the past five years an average of 2,200 permits have been issued per year. These plans and permits have led to an average of 4,200 new trees being planted and 850 trees removed each year by contractors working on major private developments, City Capital projects, and for private owners.

The management scenarios presented later in this section detail the staff needed to proactively manage the resource and increase street tree planting while also addressing 311 and alderman requests.

Credentials & Training. BoF has **over 53 staff who hold the accreditation of International Society of Arboriculture (ISA) Certified Arborist**. While there are not nationally published statistics on the number of ISA certifications in each municipality, Chicago appears to exceed municipal averages for the number of certified arborists on staff based on conversations with other communities. These staff are an asset to a professional urban forestry program and training to maintain the certification should continue to be supported.

Chicago has a progressive training program for its tree trimmers that includes in-house BoF training agents. The program allows BoF to train staff with varying skill levels, from beginner to advanced, in arboricultural practices and how maintenance operations are done specifically in Chicago. To improve the training program BoF should add a lead training agent position to oversee the training program and review and revise its training curriculum to ensure it is based on current tree care industry best management practices and training practices are consistent across the BoF.

Table 14. Bureau of Forestry staffing (as of March 2022)

Staffing	2022 Budget	Notes
Tree Trimmers (Pruning)	87	Night crew tree trimmers are within the pruning and removal trimmers
Tree Trimmers (Removal)	22	
Tree Trimmers (Floating)	8	In budget under "Disposal Non-Parkway Debris"
Total Budgeted TRIMMERS	117	
Current Trimmers Assigned to Other Roles	17	Other roles assigned: Inspectors (7), Stump/utility coordinator (1), Acting Supervisor (2), Shop (5), Acting Dispatchers (2)
Current Trimmers Leave of Absence/Disability	17	
Tree Trimmer Vacancies	0	
Current Number of Tree Trimmers	**83**	
Motor Truck Drivers (Pruning)	65	
Motor Truck Drivers (Removal)	7	In budget under "Disposal Non-Parkway Debris"
Motor Truck Drivers (Floating)	2	
Motor Truck Drivers (Night Crew)	8	Operation Support budget line item -
Total Budgeted MOTOR TRUCK DRIVERS	**82**	
Current Drivers Assigned to Other Roles	18	
Current Drivers Leave of Absence/Disability	5	
Motor Truck Driver Vacancies	0	
Current Number of Motor Truck Drivers	**59**	
Training Agent (LEAD)	0	
Training Agents	4	
Total Budgeted TRAINING AGENTS	**4**	
Current Training Agents Assigned to Other Roles	0	
Current Training Agents Leave of Absence/Disability	1	
Training Agent Vacancies	0	
Current Number of Training Agents	**3**	
Senior City Forester (Tree Planting)	1	
Total Budgeted TREE PLANTING STAFF*	**1**	
Current Tree Planting Staff Assigned to Other Roles	0	
Current Tree Planting Staff Leave of Absence/Disability	0	
Tree Planting Vacancies	0	
*In FY2023 two city forester (community foresters) are budgeted for tree planting		
Current Number of Tree Planting Staff	**1**	
Deputy Commissioner	1	
Executive Secretary	1	
Data Entry Operator	1	
Assistant Superintendent	1	
General Superintendent	1	
Senior City Forester	3	
Dispatcher - Arborist	5	
Forestry Supervisor	6	
Current Administration Staff Assigned to Other Roles	0	
Current Administration Staff Leave of Absence/Disability	0	
Administration Staff Vacancies	3	Dispatch Arborist (2); Forestry Supervisor (1)
Total Budgeted ADMINISTRATION AND OPERATIONAL SUPPORT	**19**	
Current Number of Administration and Operational Support Staff	**16**	
TOTAL	**223**	
TOTAL BUDGETED BoF STAFF	**223**	
TOTAL STAFF ASSIGNED TO OTHER ROLES	**35**	
TOTAL STAFF ON LEAVE OF ABSENCE/DISABILITY	**23**	
TOTAL VACANCIES	**3**	
TOTAL CURRENT STAFF	**162**	

Equipment.

BoF has small and large power equipment, bucket trucks, chippers, stump grinders, and other equipment to perform tree pruning, tree removal, stump grinding, and inspections. Table 15 lists the forestry equipment as of December 2021. **BoF staff felt limited in their ability to perform their duties due to equipment age, condition, and reliability -** equipment is frequently out of service or in for repairs, especially chippers.

Table 15. Bureau of Forestry equipment inventory (as of December 2021)

Operations Equipment*	BoF Equipment Inventory* (12/27/2021)	Equipment Down/Out of Service	Equipment Retired (Junked)	Average Age (Years)	Available Equipment
Chainsaws	N/A	N/A	N/A	N/A	**N/A**
Tower	49	13	0	16	**36**
Chipper w/ chipper box	47	29	3	15	**15**
Clam	29	13	0	13	**16**
Semi	28	4	1	15	**23**
Pick-Up Trucks	41	0	0	0	**41**
Computer/Tablet	0	0	0	0	**0**

* Includes equipment both owned and rented by the City of Chicago

Budget & Funding

BoF is funded through the General Fund. Their budget has fluctuated over the last three fiscal years from 2020 – 2022, with a reduction in funding from 2020 to 2021 and an increase in funding from 2021 to 2022 (Figure 21). **Overall, from 2020 to 2022, BoF's budget increased 14%.** Budget increases were related to personnel (tree trimmers, Figure 22), contracted services, commodities, materials, and equipment. Street tree planting done in support of the Chicago Recovery Act's (*Our Roots Chicago)* goal of 75,000 trees over the next five years is not included in the FY22 budget shown in Figure 21 and will be funded through general obligation bonds ($5 million per year for five years).

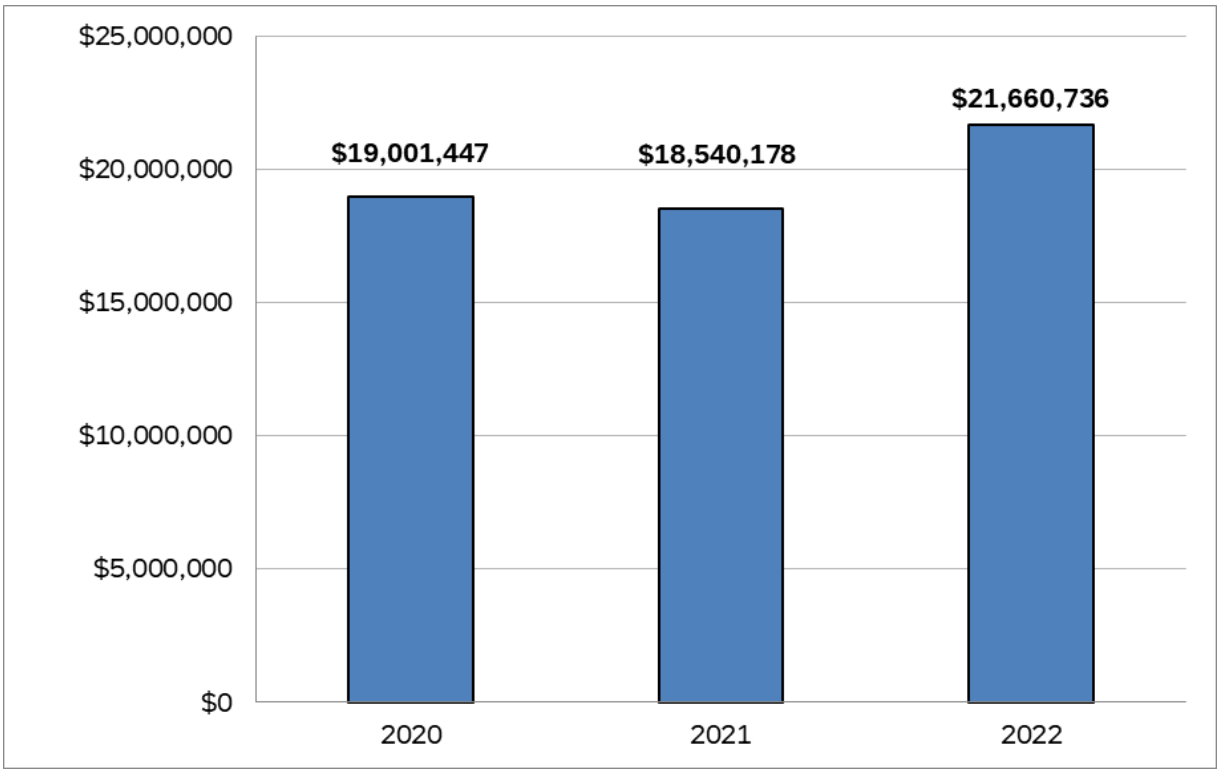


Figure 21. Bureau of Forestry budget fiscal year 2020 - 2022

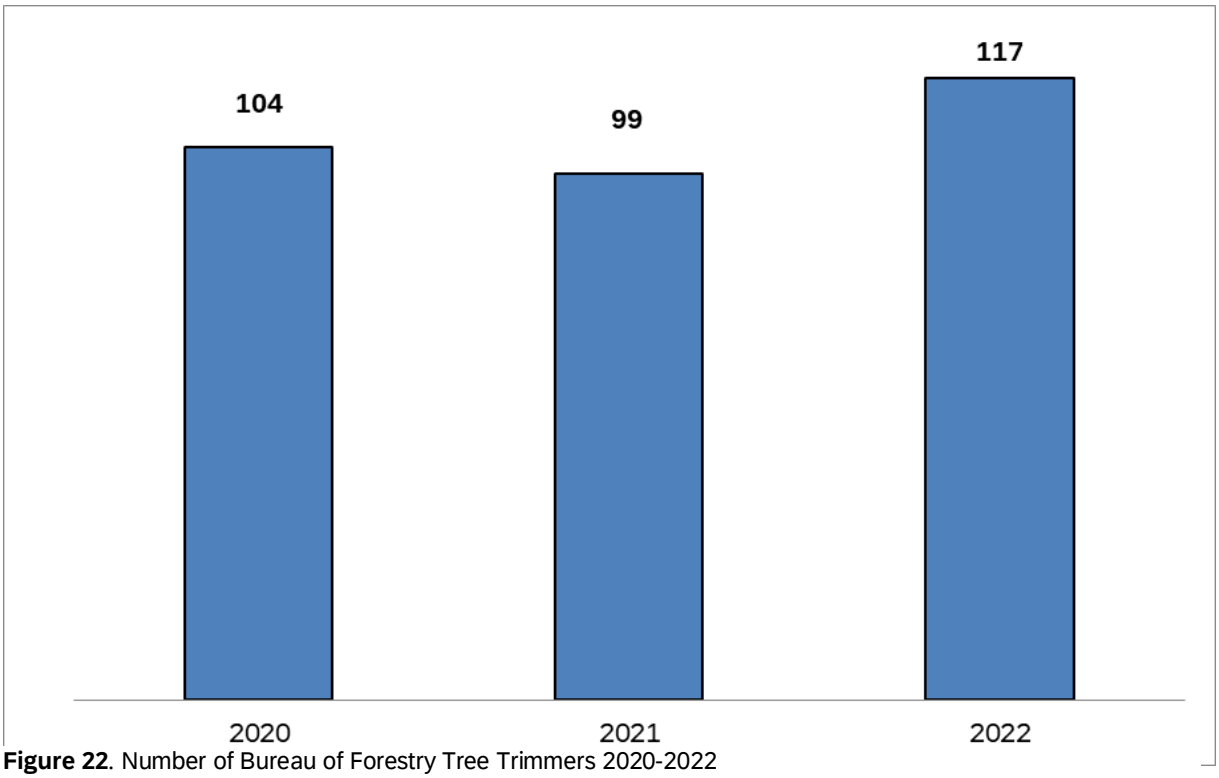


Figure 22. Number of Bureau of Forestry Tree Trimmers 2020-2022

BoF Studies, Policies, Guidelines, and Standards

The following studies, policies, guidelines, and standards related to the management of Chicago's public trees were reviewed as part of this planning effort.

- City of Chicago – Monitor Group Report – Chicago's Grid Trimming Program (2009)
- City of Chicago – Office of Inspector General – Advisory Concerning the Inefficient Tree Trimming Operations at the Bureau of Forestry (2019)
- City of Chicago – Department of Streets and Sanitation – OIG Advisory Response (2019)
- City of Chicago – Office of the Inspector General – Tree Guarantee Audit (2010)
- Bloomberg Associates - Delivering Tree Equity in Chicago: Findings and Recommendations from a Review of the Bureau of Forestry (2022)
- Chicago Urban Forest Agenda (2009)
- Adding Green to Urban Design (2008)
- BoF Guidelines and Standards:
  - BoF Diversity Plan 2021 (DRAFT)
  - BoF Tree Protection Detailed Specifications (2020)
  - City of Chicago Pruning standards (2011)
  - BoF Tree Removal and Replacement protocols (2021)
  - Planter Guidelines (2022)
- Ordinances
  - Guide to the Chicago Landscape Ordinance (2000)

The review identified opportunities and areas for improvement used in the development of the strategies in this plan.

The Monitor Group Report (2009)
Office of Inspector General Advisory (2019)
Department of Streets and Sanitation Advisory Response (2019)

In 2009, **The Monitor Group** conducted a study on the efficiency and effectiveness of the BoF's tree trimming program. The study compared BoF's current reactive (service request driven) tree pruning program with re-establishing a grid (area) tree pruning program. It measured efficiency and actual work completed by BoF crews assigned to conduct either reactive pruning (service requests) or pruning all trees in a designated area (area/grid trimming). The Monitor Group study found that **implementing a grid (area) tree trimming program increases the number of trees trimmed by city crews by 2.5 times and reduces the per tree trimming costs by 60%.**

In 2019, the Chicago **Office of Inspector General (OIG)** released an *Advisory Concerning the Inefficient Tree Trimming Operations at the Bureau of Forestry*. The Advisory found that BoF had not implemented the recommendations of The Monitor Groups Report to re-establish

a grid-trimming program and had continued to conduct tree pruning based on service requests (reactive). According to the OIG this has led not only to inefficiencies but also inequity in service delivery, with street trees in some wards receiving more pruning than others. The OIG Advisory supports the Monitor's Groups recommendations to reinitiate a proactive pruning cycle (grid trimming) to be more efficient, proactive. and equitable in the management of the city's street tree population.

The Department of Streets and Sanitation provided a response to the OIG Advisory. The response acknowledged that BoF continued pruning trees reactively but that it continued to be done due to capacity issues (inadequate staffing and resources) involved in implementing a grid trimming program. The response outlined the staffing and resources needed for BoF to implement an area trimming program, including conducting a comprehensive street tree inventory.

The information presented in these reports and documents supports the need to invest in the proactive management and care of Chicago's street trees.

Office of the Inspector General (OIG) – Tree Guarantee Audit

The OIG conducted an audit of BoF's process for monitoring and overseeing tree guarantees. BoF uses contractors for street tree planting and each tree has a two-year guarantee. The audit looked at 27,678 trees planted or under warranty from 2006-2010. The report found that processes were not in place to consistently monitor trees planted and trees that were within the warranty period. The audit discovered differences between the number of trees the contractor reported as planted versus the city; the number of trees replaced as part of the guarantee was significantly lower (0.5%) than the anticipated mortality rate, conservatively estimated at 5%; and programs to track the location of planted trees and monitor the guarantee period were not properly used during the time period examined.

As discussed in Staffing, BoF tree planting operations are significantly understaffed and issues with monitoring and tracking will continue to persist without additional staff and resources.

Delivering Tree Equity in Chicago – Bloomberg Associates (2022) – Appendix E

During the development of this Urban Forest Management Plan, Bloomberg Associates, a philanthropic consulting firm, was undertaking a study on tree equity in Chicago. DRG and Bloomberg Associates worked together to share information and avoid duplication of activities. The Bloomberg Associates report, *Delivering Tree Equity in Chicago: Findings and Recommendations from a Review of the Bureau of Forestry* identified 5 key findings:

1. BoF predominantly focuses on 311 requests.
2. BoF is oriented towards maintenance.
3. BoF is challenged to meet current demands for service.
4. BoF is not proactively engaged with the public or community partners.
5. City policies and practices outside of BoF are not oriented towards maintaining or expanding tree canopy.

The Bloomberg report provides Recommended Actions that support DRG's findings and align with the strategies outlined in Section 4, including:

- Implement an area based routine pruning (trimming) program.
- Use data to target tree planting in areas of greatest need.
- Increase staffing and resources to support proactive care and tree planting.
- Improve the use of technology and Salesforce.
- Grow and maintain partnerships with regional groups.
- Update the Landscape Ordinance.

Chicago Urban Forest Agenda (2009)

The *Urban Forest Agenda* was released in 2009 by the City of Chicago Department of Environment. **The issues and challenges discussed in Urban Forest Agenda are similar to those facing Chicago today**. The plan identified four central goals (1) "maintain and conserve trees"; (2) "expand our urban forests"; (3) "integrate green infrastructure"; and (4) "foster stewardship," and established recommendation and action strategies around these goals. The strategies in this plan strongly align with and echo the recommendations in the 2009 *Urban Forest Agenda*.

Impacts of Construction & Development on Street Trees

Approximately 4,500 plans are submitted annually for review through the Office of Underground Coordination, Architects, Engineers, and private property owners. Plans are reviewed to ensure trees are preserved whenever possible and impacts are minimized. Utilizing the Bureau of Forestry's Tree Removal and Replacement Protocol, trees that cannot be preserved are assessed an asset value and locations for replacement trees are identified within the project limits. In cases where a replacement tree is not possible, the applicant will be assessed the appraised value of the tree(s) to be removed. If only partial replacement is possible, the applicant will be assessed the difference of the value of the installed replacement tree(s) and the appraised value of tree(s) lost. Over the past ten (10) years, the Bureau of Forestry has collected an average of $540,000 each year.

It should be noted that trees impacted by City of Chicago capital improvement projects are not charged the asset value for tree removals. In most cases, the Bureau of Forestry is reimbursed for the cost of tree removal or tree trimming but not the asset value of a tree removed. The 2022 Bloomberg Associates report, *Delivering Tree Equity in Chicago,* estimated that in 2020 the **asset value of street trees lost due to City capital improvement projects that were not replaced was over $19 million**. To maximize the preservation and protection of Chicago's street trees, the design and construction methods of all City capital improvement projects need to consider the asset value of street trees and modify plans and implement practices that preserve and protect them.

Guidelines and Standards

BoF has developed a number of guidelines and standards related to tree maintenance, preservation and tree planting, including:

- BoF Diversity Plan 2021 (DRAFT)
- BoF Tree Protection Detailed Specifications (2020)
- City of Chicago Pruning standards (2011)
- BoF Tree Removal and Replacement protocols (2021)
- Planter Guidelines (2022)
- Guide to Chicago Landscape Ordinance (2020)
- Tree Space and Soil Volume Standards 2013 (DRAFT)

These standards and guidelines, however, are not located in one central location which makes finding them a challenge and limits the effectiveness of their implementation. A tree specifications manual that includes all street tree–related requirements, standards, specifications, and guidelines should be developed to provide a one-stop resource for all BoF related information. The current standards should be reviewed to ensure they are in alignment with industry standards and the International Society of Arboriculture best management practices.

Ordinances

A cursory review of the following Chicago ordinances was conducted to identify gaps and areas for improvement (Table 16):

- Chapter 10-32 Trees, Plants and Shrubs
- Chapter 17-11 Landscape and Screening
- Other relevant sections identified through a search of the term “trees” in Chicago’s code

The review identified several areas that should be reviewed and revised to strengthen city tree codes, including:

- Clearly establishing who is responsible for public street tree (parkway) maintenance.
- Require adherence to ANSI A300 standards and best management practices for public trees.
- Require International Society of Arboriculture Certified Arborist to perform public tree work conducted by outside contractors.
- Revise the formula for determining monetary value of removed/damaged public trees.
- A comprehensive review and revision of Chapter 17 (landscape ordinance) to include stronger tree preservation and protection measures, inclusion of green infrastructure and other elements that align with city priorities around equity and improving the quality of life of Chicago residents.

  As in other areas of the BoF operations, there are not sufficient staff in place to enforce the city’s tree ordinances, which limits the effectiveness of city ordinances.

Table 16. Chicago Ordinance Review

Ordinance Topic	Addressed (X)	Chapter & Section
Credentials		
Requires certified arborist for paid private tree work		
Requires Certified Arborist for public tree work		
Requires licensing of private tree care firms		
Defines official authority for public tree management	X	Chapter10; 10-32-030
Public Tree Management and Protection		
Establishes/Authorizes city forester to regulate public trees	X	Chapter 2-100, Article VIII - Bureau of Forestry
Establishes/Authorizes City position (e.g. Mayor, City Administrator, DPW Director) to regulate public trees	X	Chapter 2-100; Article VII; Chapter10; 10-32-030
Establishes a tree board	X	Chapter 10; 10-32-245 (Urban Forestry Advisory Board)
Requires annual community tree work plans		
Identifies formula for determining monetary tree value	X	Chapter 10; 10-32-200; 10-32-210
Establishes responsibility for public tree maintenance (e.g. City, adjacent property owner)	X	Chapter 2-100, Article VIII; Chapter 10; 10-32-030 (Authority of deputy commissioner); 10-32-050 (new development/construction excludes 1-3 family res units)
Requires regular public tree maintenance		
Requires particular types of maintenance (e.g., pruning)	X	Chapter 10; 10-32-050
Requires adherence to ANSI A300 standards and best management practices		
Establishes permit system for work on public trees	X	Chapter 10: 10-32-060; 10-32-070; 10-32-080; 10-32-090; 10-32-100
Establishes provisions for penalties for non-compliance	X	Chapter 10; 10-32-150; 10-32-190
Restricts tree removal on public property	X	Chapter 10; 10-32-060

Table 16 *(continued)*. Chicago Ordinance Review

Ordinance Topic	Addressed (X)	Chapter & Section
Public Tree Management and Protection (continued)		
Protection of public trees during construction	X	Chapter 10; 10-32-120; 10-32-130
Permit or approval required for tree removal, pruning or excavating near public trees	X	Chapter 10: 10-32-060; 10-32-070; 10-32-080; 10-32-090; 10-32-100
Prohibits damage to public trees (e.g. attaching ropes, signs, wires, chemicals, storing materials, excavation)	X	Chapter 8-4-120 Damage to Public Property; Chapter 10; 10-32-110; 10-32-140; 10-32-170
Restricts burning of solid wood waste		
Establishes a wood utilization program		
Establishes an insect/disease control strategy	*Partially*	Chapter 7; 7-28-130 - Specific to the removal of trees with Dutch elm disease on public and private property
Defines tree maintenance requirements on public property		
Prohibits tree topping		
Regulates abatement of hazardous or public nuisance trees	X	Chapter 10; 10-32-040 - Trees, shrubs or other plant materials, - Public nuisance
Regulates removal of dead or diseased trees	X	Chapter 10; 10-32-040 - Trees, shrubs or other plant materials, - Public nuisance
Tree Planting		
Regulates tree species which may or may not be planted on **public** property (approved tree list)	X	Chapter 10; 10-32-030 - Authority of the Deputy Commissioner
Requires tree planting around reconstructed parking lots	X	Title 17-11 Landscaping and Screening (Zoning Ordinance)
Requires replacement of removed publicly owned trees	X	Chapter 10; 10-32-200; 10-32-210
Requires tree plantings around new parking lots	X	Title 17-11 Landscaping and Screening (Zoning Ordinance)
Requires street tree planting	X	Chapter 10; 10-32-220 (Planting Standards required in accordance with Title 17, Section 17-11-0100 (Zoning Code)
Requires tree plantings around new developments	X	Title 17-11 Landscaping and Screening (Zoning Ordinance)
Soil volume standards for tree planting	X	Chapter 10; 10-32-220 (5)
Regulates tree species which may or may not be planted on **private** property (approved tree list)		

Plans and Studies

To **support Chicago's trees and urban forest, collaboration, and engagement across City departments and with local and regional partners are essential**. A review of the following City of Chicago and partner plans, studies, reports, and initiatives was conducted:

- City of Chicago – We Will Chicago – Comprehensive Plan (2022 - DRAFT)
- City of Chicago – Climate Action Plan (2022)
- City of Chicago – Adding Green to Urban Design (2009)
- Chicago Parks District - Strategic Plan (2012 & 2016 Update)
- Morton Arboretum - Chicago Region Tree Census (2020)
- Chicago Region Trees Initiative

The review identifies ways to connect Chicago's urban forest to past and current planning efforts and find opportunities for the urban forest management plan to help advance city-wide and regional initiatives while supporting the care and growth of Chicago's public trees. A summary of the plans and connections to Chicago's trees and the urban forest management plan are detailed below.

We Will Chicago (DRAFT 2022)

Goal #5 of *We Will Chicago,* the city's first comprehensive plan is to "Mitigate and eliminate sources of carbon emission in alignment with national global climate goals." Planting and maintaining street trees can increase carbon storage and sequestration – reducing the amount that is returned to the atmosphere as a greenhouse gas. Development of an urban wood utilization program (a program that creates lumber from the wood waste of city trees) also provides an opportunity for continued carbon storage from city street trees long after they have been removed. Implementing strategies outlined in this plan can help meet the *We Will Chicago* goal.

To further the equity goals of *We Will Chicago* and support another City initiative, **the Chicago Recovery Plan**, street tree planting should be prioritized in underserved neighborhoods, as part of the City's $46 million *Our Roots Chicago* tree equity strategy.

Chicago Climate Action Plan (2022)

The city's recently adopted Climate Action Plan (CAP) organizes actions and strategies around five pillars. Each pillar includes nature-based solutions that can be used in their implementation. Implementation of strategies of the urban forest management plan can help in achieving the pillars, action items, and strategies in the CAP. Below lists the pillars in bold and specific urban forest management plan strategies that can support the plan.

- **Increase Household Savings.** Revise Chicago's Zoning and Landscape Ordinances to require placement of trees for energy conservation.

- **Reduce Waste and Create Jobs.** Explore development of an urban wood utilization program.

- **Enable Personal Mobility and Improve Air Quality.** Conduct strategic street tree planting to improve air quality and mobility choices for the community. Work with City Transportation, Planning, and other departments to coordinate tree planting in

neighborhoods that have low canopy cover and fewer mobility choices to improve equitable access to both.

- **Enable Chicago's Clean Energy Future.** Ensure the Bureau of Forestry is involved in City department conversations during the planning stages of any community solar or renewable energy projects will be key to protection and preservation of Chicago's public trees.

- **Strengthen Communities and Protect Health.** Collect, update, and share public tree data that can be used to develop data driven metrics that support the CAP and urban forest management goals. Data includes comprehensive inventory of all public street trees and urban tree canopy assessments.

Chicago - Adding Green to Urban Design (2009)

The Adding Green to Urban Design manual is over 10 years old, however, the actions and critical steps identified continue to be important for Chicago to pursue in its efforts to create a sustainable city and improve the quality of life of its residents. The development of the Urban Forest Management Plan is helping to achieve some of the critical steps of Action 7 ("Develop and Implement a Growth and Management Plan for all components of Chicago's urban forest").

In response to the release of the Plan, the Bureau of Forestry developed a Chronology of Actions (Appendix D) to be taken by the Bureau, Department of Planning and Development of Transportation. To address Plan Action 2.1 the Base Study for Site Design Recommendations was released in 2009 which assessed the environmental performance of existing landscape requirements and guidelines. In 2011, the Bureau of Forestry completed the first draft of the Tree Space and Soil Volume Standards which addresses Plan Action 6.1.

Many of the Bureau of Forestry related Action Items are focused on revising/updating the Landscape Ordinance and accompanying Guide to the Landscape Ordinance. The Chicago Landscape Ordinance is prescriptive in nature and there has been discussion within City departments about moving towards a more performance based approach. There are different approaches that a performance-based code can take, for example, the Bureau of Forestry would be interested in instituting soil volume requirements tied to canopy cover projections for tree planting on new projects. While this performance based approach may require fewer trees than a prescribed approach - it allows for greater flexibility in design based on site conditions while ensuring trees grow and thrive on the site. Other performance based approaches may allow for adjusting tree requirements based on adding other site elements that improve environmental conditions such as, adding elements that improve stormwater management like permeable pavement.

Chicago Parks District – Strategic Plan (2012 and 2016 Update)

The *Chicago Parks District Strategic Plan* (2012) outlines the Parks District's vision, mission, and values. It establishes a set of key goals and benchmarks around the Park District's four core values: (1) children; (2) affordable, high-quality programs and events; (3) investment in maintaining and growing the park system; (4) improve the park system for users and staff. The 2016 Update added strategic direction related to youth, teens, greenspace, community development, water, and organizational efficiency. It also identified a strategic statement to

improve access to residents and ensure that all Chicago residents live within a 10-minute walk of open space or park.

In implementing the urban forest management plan the Bureau of Forestry should include in its tree planting plan strategic street tree planting to create shady corridors to access parks.

The Morton Arboretum & Chicago Region Trees Initiative

The Morton Arboretum's 2010 and 2020 Tree Census reports – described in Section 2 have provided essential data and information not only on the City of Chicago's urban forest but also the regions. The Chicago Bureau of Forestry should:

- Continue to develop and build partnerships with The Morton Arboretum and other local and regional organizations to increase the canopy cover in Chicago and help stop the loss.
- Support regular updates of Tree Census and tree canopy data.
- Strengthen relationships and become an active member in the Chicago Region Trees Initiative.

Assessing Chicago's Urban Forest Management Program

The information gathered and analyzed during the review of Chicago's management, planning and operations was used to assess the program using the "Indicators of a Sustainable Urban Forest"**.** The Indicators of a Sustainable Urban Forest is an assessment tool that helps to look beyond tree data and analysis to also understand how the urban forest is managed and the network of stakeholders that influence and impact it.[15,16]15 For each component, a list of Indicators and metrics are used to assess a city's current performance level related to that component.

To better understand the Bureau of Forestry's management approach only the Management component of the Indicators were assessed. The assessment helped to identify areas where Chicago's urban forestry program is performing well and areas for improvement and were used in developing the plan's strategies. **Overall, Chicago is assessed as Moderate in the Management Indicators** (Table 17). The full assessment of the management component can be found in Appendix A.

Table 17. Summary of Chicago's assessment of the Management Indicators of a Sustainable Urban Forest

Management Indicators of a Sustainable Urban Forest	*City of Chicago Assessed Performance Level*		
	Low	Moderate	High
Tree Inventory			
Sample inventory completed in 1994, 2003, 2013 and 2021. Methodology needs to be reviewed and revised. A comprehensive street tree inventory has not been conducted.		■	
Canopy Assessment			
LiDAR canopy assessment completed in 2022 by The Morton Arboretum (2017 imagery). i-Tree Canopy assessment in 2020 completed as part of The Morton Arboretum Tree Census.			■
Management Plan			
2022 Urban Forest Management Plan development is underway. This Indicator should be re-assessed after adoption to measure implementation progress.		■	
Risk Management Program			
A sample inventory was completed in 2021 but it did not collect data on risk.	■		
Maintenance of Publicly-Owned Trees (ROWs)			
Program is driven by 311 service requests from residents and Alderman.	■		
Maintenance of Publicly-Owned Natural Areas			
Indicator was not assessed.			
Planting Program			
Chicago is working on a plan to plant 75,000 trees over the next five years in support of the *Our Roots Chicago* initiative.		■	■
Tree Protection Policy			
Public tree protection in Chapter 10 of Chicago city code. Limited resources/staffing for enforcement and opportunities to strengthen requirements should be evaluated.		■	
City Staffing and Equipment			
Accredited and professional staff. Staffing levels and positions are not adequate to meet resource needs and operate a proactive program.		■	
Funding			
BoF does not have adequate funding to operate a proactive program.		■	
Disaster Preparedness & Response			
Chicago's Office of Emergency Management has a robust program that includes damage assessment and debris clean-up.			■
Communication			
Communication avenues are in place, however, better processes for communication and coordination internally and externally are needed.		■	
TOTALS	**2**	**6**	**3**
	18%	**55%**	**27%**

Benchmarking

Benchmarking can be a helpful tool for a city to understand how its urban forestry program, activities, resources, and budget align with other cities. It can provide valuable information on the ways different municipal programs operate and highlight innovative programs and best management practices that can help improve Chicago's urban forestry program. However, caution should be taken when trying to make direct comparisons as differences in governance, departmental structure, and management responsibilities can influence program operations.

Three cities, Baltimore, MD, Philadelphia, PA, and Toronto, Canada, were chosen by the Bureau of Forestry for benchmarking because they have robust urban forestry management programs and/or are similar in size to Chicago. A high-level summary of each benchmarked city and display of different metrics are detailed below (Table 18; Figure 23 to Figure 26**).** The complete benchmark results can be found in Appendix B.

Notable highlights, include:

- **Baltimore, Philadelphia, and Toronto maintain comprehensive inventories of all public street trees,** which includes details on the species, size, and location of each publicly managed street trees. Chicago has conducted sample street tree inventories - most recently completed in 2021.

- **The departments that manage public trees are responsible for both street and park trees in Baltimore, Philadelphia, and Toronto**. While in Chicago:
    - The Bureau of Forestry is responsible for maintaining trees in the public right-of-way and tree planting on residential streets.
    - The Chicago Department of Transportation is responsible for tree planting on arterial streets.
    - The Chicago Park District is responsible for tree planting and maintenance in public parks.

- The City of Toronto has the largest street tree population (635,318) and receives 9,200 tree emergencies reported each year. While Chicago has the second largest street tree population (554,800) of the benchmarked cities and receives 22,000 tree emergencies reported each year. **The number of tree emergencies reported in Chicago is more than double the number reported in Toronto and Chicago has less street trees**.

- **In all three cities – the majority of tree maintenance and planting (75-86%) is performed by contractors.** In contrast, the majority of tree maintenance in Chicago is performed by in-house Bureau of Forestry crews (90%) and 10% (tree planting) is contracted.

- **The collection of landscape and woody material that is generated from private property is not the responsibility of the departments that manage trees in Baltimore, Philadelphia, and Toronto**. In Chicago, the Bureau of Forestry is responsible for collecting and disposing of woody plant and landscape material from private property.

Baltimore, MD. Baltimore is the smallest of three cities benchmarked. At just over 80 square miles, the city is responsible for managing 93,000 street trees and 37,000 park trees. There are approximately 47 street trees per street mile in the city. Baltimore's Recreation and Parks department oversees the management of the street and park tree population with an annual budget of $5.2 million – which is 0.13% of the city's total budget.

City staff responsible for managing and maintaining the public street and park trees include a chief of forestry, tree trimmers/arborists, supervisors, and inspectors. **Tree care and maintenance** operations, including emergency work, pruning, removal, stump grinding, planting, watering, and tree pit creation are **conducted primarily by contractors** (75%). The city's four tree crews perform 25% of the needed tree care and maintenance activities, including emergency work, pruning, removal, and stump grinding. Recreation and Parks is not responsible for collecting landscape or woody material generated from private property**.** Based on the number of street trees and trimmer/arborists (16) - each City tree trimmer/arborist is responsible for managing 5,813 street trees.

Baltimore maintains a complete inventory of all city street trees that is regularly updated**. Tree maintenance activities are primarily request driven with some proactive tree pruning** occurring each year. The city receives 5,900 tree care requests each year with an average response time to inspect and complete the work of 5 months.

Baltimore operates a unique in-house program, Camp Small, to manage and utilize its wood waste. All city trees go to Camp Small, where City staff separate material between lumber logs and mulch logs/branches/brush. Lumber logs are sorted by species and graded by staff. Raw logs are available for sale to the public or can be utilized for city projects. Some logs are processed into lumber at Camp Small with a portable ban saw and kiln dried on site. The lumber is then available for public sale or city projects.

Philadelphia, PA. Philadelphia's Parks and Recreation department is responsible for managing the city's nearly 113,000 street trees and 38,000 park trees. The city has approximately 44 street trees per street mile. Parks and Recreation's annual budget to maintain and plant street and park trees is $4.5 million – which represents 0.08% of the city's total budget.

The City manages and maintains its public street trees with a team that includes a community forestry manager, a director of urban forestry, tree trimmers/arborists, supervisors, and inspectors. **85% of tree care and maintenance is performed by contractors** including, all street tree pruning, removal, and plantings. The city's 10 in-house tree crews perform park tree pruning, removal, a small amount of tree planting, and emergency work. Parks and Recreation is not responsible for collecting landscape or woody material generated from private property**.** Based on the number of street trees and trimmer/arborists (32), each City tree trimmer/arborist is responsible for managing 3,528 street trees.

Philadelphia has a complete inventory of street and park trees (excluding forested parks). The city receives approximately 4,000 tree maintenance requests, and maintenance and **management activities are driven by these requests (reactive program).** The average response time to inspect and complete work is 5-10 business days.

In 2020, Philadelphia embarked on a project to develop a comprehensive, strategic plan for Philadelphia's public street and park trees. The *Philly Tree Plan* included a robust public engagement strategy that included engaging with neighborhood ambassadors, conducting tours, hosting stakeholder workshops and virtual open houses, soliciting community photos, and a community survey. The plan gathered feedback from a diversity of stakeholders and received thousands of comments during the planning process.

Toronto, Canada. Toronto is the largest city that was benchmarked, at just over 243 square miles. The City's Parks, Forestry and Recreation division is responsible for managing over 635,000 street trees and over 4.5 million park trees that includes those growing in parks, ravines, and natural areas. There are 189 street trees per street mile in Toronto. The Parks, Recreation and Forestry division manages its street and park tree population with an annual budget of $70.2 million – which is 0.47% of Toronto's total budget.

Like Baltimore and Philadelphia, **Toronto contracts out the majority (86%) of tree maintenance** work including: tree pruning, removal, and stump grinding. The City's 16-20 in-house tree crews focus on tree pruning, stump grinding, watering, mulching, and fertilizing. The City is not responsible for collecting landscape and woody material generated from private property. Based on the number of street trees and trimmer/arborists (82) - each City tree trimmer/arborist is responsible for managing 7,748 street trees.

Toronto has a complete street tree inventory that is updated regularly. **Tree maintenance is performed both proactively and reactively.** The City receives 44,000 tree-related service requests each year for trees along the streets and in parks, natural areas, and ravines. The average response time to conduct the service request inspection is 8 weeks. Street and park tree planting is conducted proactively.

Toronto has a robust tree protection and preservation program that applies to trees on public and private property. The program has dedicated staff for plan review (53), compliance and enforcement (13), and policy and administration. Toronto prioritizes tree preservation and protection – involving Forestry in the design phase of City construction and development projects.

Table 18. Budgets of benchmarked cities

	Chicago	Baltimore	Philadelphia	Toronto
Annual tree care & management budget (including planting)	$ 21,660,736	$ 5,200,000	$ 4,500,000	$ 70,242,000
Number of trees managed with budget	554,800	130,000	150,767	5,174,721

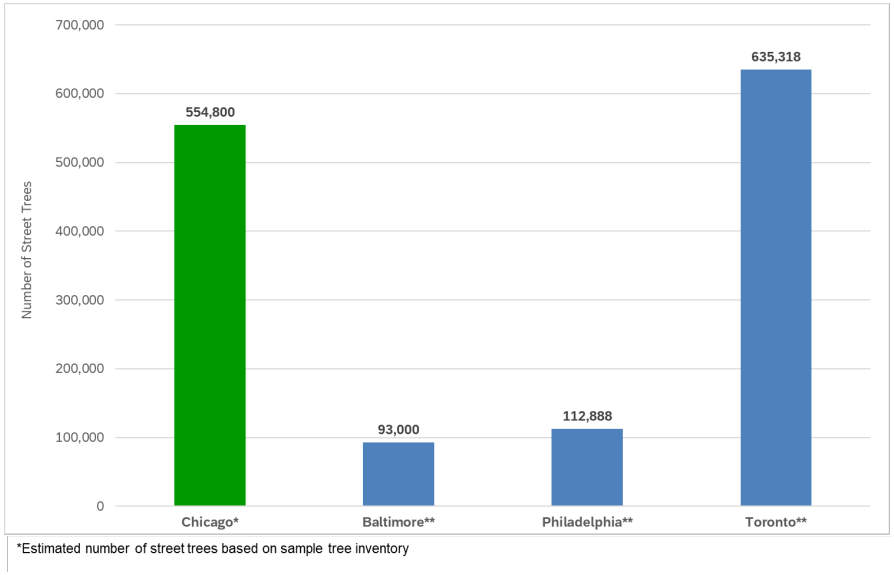


Figure 23. Number of street trees in each benchmarked city

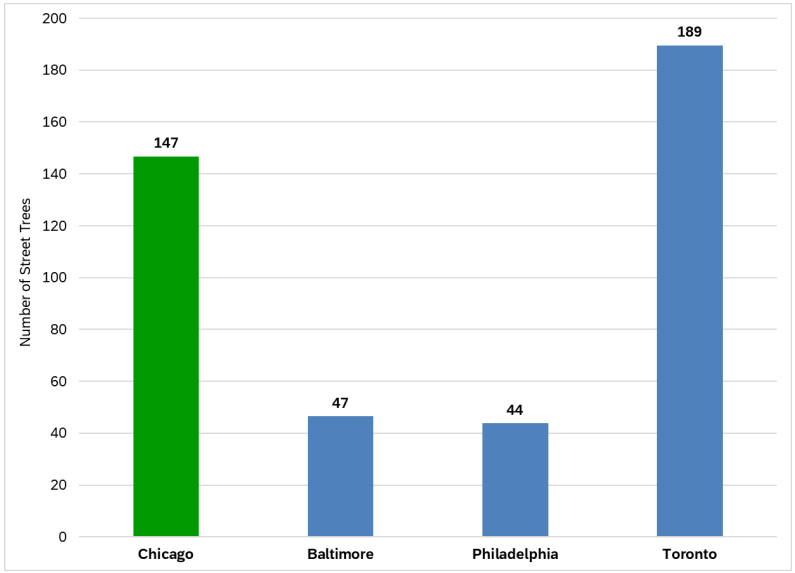


Figure 24. Number of street trees per street mile in each benchmarked city

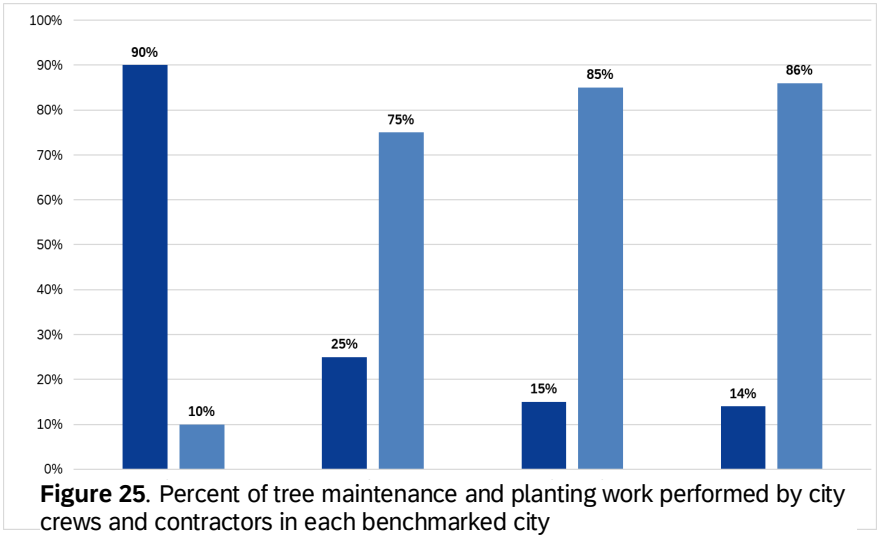


Figure 25. Percent of tree maintenance and planting work performed by city crews and contractors in each benchmarked city

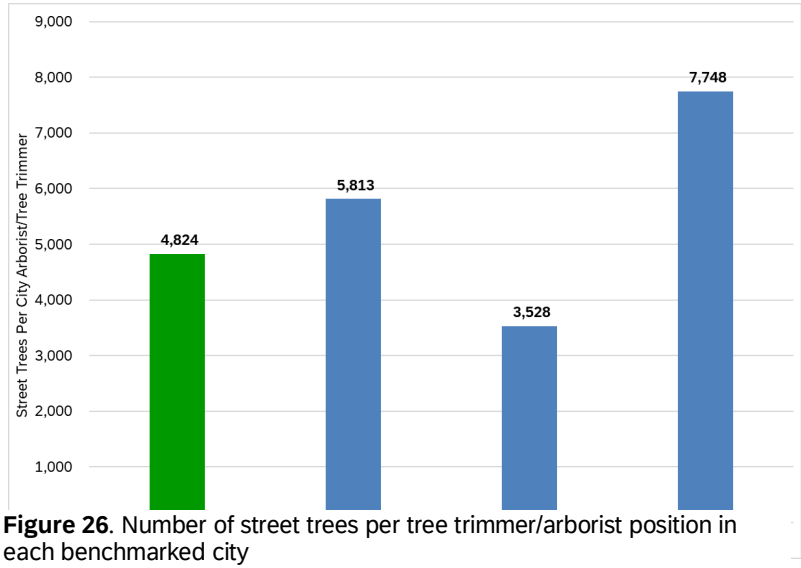


Figure 26. Number of street trees per tree trimmer/arborist position in each benchmarked city

Proactive Tree Management

The Monitor Group's 2009 report on improving BoF's trimming program found that re-establishing a "grid trimming" (area pruning) cycle would provide Chicago the following operational benefits:

"**Coverage** - ability to trim 2.5 times more trees"
"**Efficiency** - per tree costs reduced by 60%"
"**Prevention** - reduced storm damage"
"Service - City able to serve additional 46,000 addresses each year."

The Report found that grid (area) trimming was more efficient and cost effective for Chicago leading to increased crew productivity, reduced travel, and travel costs (fuel savings, less vehicle wear and tear) compared to addressing 311 tree pruning requests.

Trees pruned on a regular basis develop proper structure and form leading to[1]:

- Lower per tree pruning costs compared to reactive pruning done in response to storm damage, sight clearance, or immediate hazards.
- Early identification and correction of insect/disease problems.
- Reduction in storm related tree damage.
- Lower future maintenance costs.
- Reduction of tree-related service requests and improved customer service.
- Development of a healthy and sustainable urban forest.

Richards, S., Stutz, B., & K. Yoskowitz. (2004). Interagency Study of Tree Management Practice (OLO Report 2004-9. Montgomery County, Maryland. Office of Legislative Oversight. Retrieved from http://www6.montgomerycountymd.gov/content/council/olo/reports/pdf/trees.pdfT

Management Scenarios

An important goal and priority identified by the Bureau of Forestry is the re-establishment of its area cyclical routine pruning cycle. To transition to this cycle the BoF will first need a comprehensive inventory to gain an accurate assessment of the number, condition, maintenance needs, and risk priorities of its street tree population. The data from this inventory will establish cyclic pruning priorities, manage work activities, and identify and justify needed resources. The BoF is currently seeking grant funding to conduct a comprehensive inventory.

There are different ways to transition to a more proactive urban forestry program with an area cyclical pruning cycle. For BoF to gain a better understanding of the different levels of proactive management and resources needed to implement them, two management scenarios were developed.

Scenario A is a hybrid management approach that combines reactive and proactive tree care activities. In Scenario A:

(a) BoF crews are assigned to tasks seasonally with crews removing trees for six months of the year and pruning trees for the other 6 months (Table 19).

(b) Tree removal activities would focus on ensuring that BoF maintains the current level of service of removing approximately 13,475 street trees per year.

(c) A 10-year routine area pruning (trimming) cycle would be established - - where each street tree would be pruned once every 10 years (55,000 trees pruned per year).

(d) Woody debris removal would continue to be performed by the BoF. Woody debris removal is the collection of vegetation and woody debris that originates from private property. This is an add-on service that the BoF has been performing for many years, but it is not one of the core services of the BoF to maintain, plant, and care for public street trees. In Scenario A this service is estimated to cost the BoF an average of $3.3 million per year.

Table 19. Proposed tree crews by management scenario

Tree Crews by Activity and Season	Scenario A	Scenario B
Tree Removal (Winter)	30	15
Tree Removal (Summer)	5	15
Tree Pruning (Winter)	0	20
Tree Pruning (Summer)	20	20
Floating Crews (Winter)	0	5
Floating Crews (Summer)	5	5
Total Number of Crews	**30**	**40**

Scenario B is a fully proactive management approach (IDEAL). In Scenario B:

(a) BoF would have crews dedicated to year round (12 months) to tree pruning and crews focused year round (12 months) on tree removals (Table 19).

(b) A 5-year area pruning (trimming) cycle would be established - where each street tree is pruned once every 5 years (110,000 trees pruned per year).

(c) Tree removals would maintain BOF's current tree removal level of service of 13,475 street trees per year.

(d) The collection of private woody debris removal **is not** performed by the BoF; and BoF focuses on its core services of maintaining, planting, and caring for public street trees. The costs for this service are put toward establishing the 5-year pruning cycle.

Scenario B is the ideal scenario and would lead to lower annual costs and a shorter pruning cycle length of 5 years versus 10 years for Scenario A**.** Scenario B would:

- Provide greater customer service, as residents would not have to wait as long for their trees to be pruned and allow BoF to provide a general schedule of when tree work would be performed (which they are currently unable to provide).
- Achieve operational efficiencies and the benefits of routine tree pruning (see *Proactive Management sidebar*) at a quicker rate than the 10-year cycle.
- Ensure equitable service delivery, ensuring that all city trees are maintained and not relying solely on resident requests to direct maintenance activities.
- Improve the overall health, condition, safety, and resilience of Chicago's street trees.
- Cost $1.18 million less than Scenario A while achieving these results (Table 20).

Table 20. Management scenario budgets and FY22 BoF budget

Budget		
FY22 Budget*	$	21,660,736
Scenario A (Year 1)**	$	26,541,044
Scenario B (Year 1)**	$	25,398,160
* Does not include contract tree planting costs ($5 million)		
**Scenario budgets do not include contractor costs for tree planting ($5 million per year), stump removal and other contracted tree care activities; and equipment needed for administration and operational support.		

Based on management activities conducted by BoF in 2022, it would take 23.8 years to prune all the City's street trees, while in Scenario A it would take 10 years, and in Scenario B 5 years (Table 21).

Table 21. Tree pruning under management scenarios and current management (2022)

Tree Pruning	Scenario A	Scenario B	Current Management (2022)
Street Trees (estimate)	554,000	554,000	554,000
Months Pruning	6	12	6
Work Days of Pruning*	110	220	110
Pruning Crews (Winter)	0	20	0
Pruning Crews (Summer)	20	20	Up to 33
Pruning Crews per Yard (Winter -5 yards)	4	4	Varies
Pruning Crews Per Yard (Summer - 5 yards)	0	4	0
Number of Trees Pruned Per Day/Crew	25	25	25
Number of Trees Pruned Per Year Per Crew	2,750	5,500	704**
Total Number of Trees Pruned Per Year	**55,000**	**110,000**	**23,243**
Tree Pruning Cycle (Years)	**10.1**	**5.0**	**23.8**
* REALISTIC CONDITIONS: Actual work days accounting for crew vacation, sick, holiday time, other missed work days, and reassignment to other tasks (i.e. snow removal, storms, debris pick-up)			
**Based on pruning an average of 23,243 trees based on service requests received			

Under both Scenarios, the number of trees removed per year would stay at the same level as 2022 tree removals (Table 22).

Table 22. Tree removals under management scenarios and current management (2022)

Tree Removals	Scenario A	Scenario B	Current Management (2022)
Street Trees (estimate)	554,000	554,000	554,000
Months of Tree Removals	6	12	6
Work Days Tree Removals*	110	220	110
Removal Crews (Winter)	30	15	Up to 33
Removal Crews (Summer)	5	15	-
Removal Crews per Yard (Winter - 5 yards)	6	3	Varies
Removal Crews per Yard (Summer - 5 Yards)	1	3	Varies
Trees Removed Per Day/Crew	3.5	3.5	3.5
Trees Removed Per Year Per Removal Crew	385	770	414
Trees Removed Per Year by 5 Floating Crews	1,925	1,925	-
Total Number of Trees Removed Per Year	**13,475**	**13,475**	**13,676**
days, and reassignment to other tasks (i.e. snow removal, storms, debris pick-up)			

Management Scenario Discussion. In 2023, the BoF is planning to begin implementing a routine area pruning cycle that most closely resembles Scenario A. However, BoF may be limited in its ability to conduct all of the annual maintenance activities in Scenario A due to:

- **Staffing.** BoF does not have enough staff to perform all the work that needs to be done. In addition to vacant positions there are staff on duty disability or assigned to other tasks.

- **Tree Inventory.** As the City moves towards conducting a comprehensive tree inventory, there will be trees identified during the inventory that will require immediate attention to improve safety and reduce risk and liability. This may move staff away from conducting routine tree pruning.

- **311 and Other Service Requests.** To move towards proactive management requires BoF to move away from focusing exclusively on addressing resident, alderman, and interdepartmental service requests. This will require management, leadership, and political support to share the message that BoF is moving towards more proactive and systematic tree maintenance and only addressing requests that pose an immediate risk to the community.

- **Data and Technology Issues.** As discussed earlier in this Section – BoF's work order system currently relies on providing paper-based work orders to the crews. To improve operational efficiencies, and to maximize the use and ensure that a comprehensive street tree inventory remains updated will require a commitment by management and leadership to update BoF's asset management system and support technology usage by crews.

For BoF to successfully move towards a proactive management program will require development of a communications and outreach plan. The plan should focus on communication strategies that target the following audiences:

- City management and leadership
- Elected officials
- Public

Messaging should focus on why the BoF is moving back to proactive management and the benefits it will provide to the community and Chicago's street trees.

A Third Scenario?

A goal of the Bureau of Forestry is to return to a 5-year area pruning cycle – like the one that was in place in the 1990s. Scenario A offers a 10 year pruning cycle, while Scenario B presents a 5 year pruning cycle.

As the Bureau is moving towards implementing Scenario A – **what would it take to implement a 5-year area pruning cycle under Scenario A**?

To prune 110,000 street trees per year to achieve a 5-year pruning cycle under Scenario A – would require adding 10 tree trimming crews that would include:

- 20 Tree Trimmers
- 10 Motor Truck Drivers
- 10 Chainsaws
- 10 Tower Trucks
- 10 Chippers with Trucks
- 10 Computer Tablets
- Average of $3.8 million each year to the budget

Management Scenario Details. The details for each management scenario and current BoF maintenance activities are provided in tables that follow (**Table 23** to **Table 29**). The management scenarios are based on the following:

- **Actual work days.** Realistic conditions are used to estimate the actual number of work days that crews would be fully operational to conduct work activities. The number of actual work days, 220, accounts for crew vacation, sick, and holiday time; other missed work days; and reassignment to other tasks (i.e., snow removal, storms, debris pick-up).

- **Cost Increases.** The budget estimates for each scenario includes a 2% annual cost increase.

- **Crews.** Scenario A proposes different crew structures based on the season (winter and summer), while Scenario B proposes year-round crews dedicated to specific activities. Both scenarios include floating crews - one in each of the BoF's five yards. Floating crews would perform tree removal, trimming, storm clean-up, special projects, and other duties as assigned (Table 18).

- **Yards.** BoF operates five yards located in the bureau's five management areas. To ensure tree work is performed equitable across the city, the management scenarios propose an equal number of crews in each of the five yards. It should be noted that the management areas may not have the same number of trees and the number of crews assigned to each of the five yards may need to be adjusted based on the needs of the resource. Conducting an inventory of all public street trees, including location, can help ensure that staffing in each management area matches the resource's needs.

- **Training Agents.** To support Chicago's training program an increase in the number of training agents and the creation of a lead training agent is an identified staff need. Both scenarios include four training agents and a lead training agent, who would be responsible for overseeing the training program and ensuring it is based on current tree care industry standards and best management practices.

- **Tree Planting.** Based on the city's goal to double street tree planting to 15,000 trees per year and the current understaffing of the street tree planting programs both management scenarios propose increases in staff to oversee tree planting and administration (Table 24). In both scenarios the number of trees that each city forester is responsible for managing will increase exponentially as they are responsible for managing new tree plantings, as well as the two-year guarantee period for each tree planted. To avoid repeating issues as outlined in the 2010 Inspector General tree guarantee report – BoF should consider maximizing the number of staff that is assigned to tree planting for the next 7 years.

Table 23. Proposed staff dedicated to tree planting administration for each management scenario

Tree Planting	Scenario A	Scenario B
Senior City Forester	1	1
City Forester- Community Forester	2	4
Number of trees managed per city forester per year (Year 1)*	7,500	3,750
*This number will increase exponentially each year as city foresters are responsible for new tree planting plus monitoring the 2-year guarantee period of each tree planted		

Table 24. Staffing under different management scenarios and current BoF operations

Staffing	Scenario A	Scenario B	2022 Staff (Budgeted)	2022 Staff (Actual)*
Tree Trimmers	102	107	117	83
Motor Truck Drivers	92	77	82	59
Training Agents	5	5	4	3
Tree Planting Oversight & Administration	3	5	1	1
Administration and Operational Support	19	19	19	16
Total	**221**	**213**	**223**	**162**
*Includes staff assigned to other roles, on leave of absence/disability and vacancies				

Table 25. Equipment under different management scenarios and current BoF operations

Equipment	Scenario A*	Scenario B*	2021 (Inventory)**	2021 (In-Service)**
Chainsaws	102	97	Not provided	Not provided
Tower	30	40	49	36
Chipper w/ chipper box	25	25	47	15
Clam	30	20	29	16
Semi	30	15	28	23
Pick-up Truck	13	20	41	41
Computer/Tablet	39	61	0	0
*Does not include equipment needs for Administration and Operational Support staff				
**December 2021 BoF equipment inventory				

Table 26. Scenario A: Summary of Operational Needs

SCENARIO A: HYBRID MANAGEMENT - 10-YEAR AREA PRUNING CYCLE, TREE REMOVALS, TREE PLANTING AND WOODY DEBRIS REMOVAL

Based on 6 months dedicated tree pruning and tree removal

Operations Staff	Number of Staff Needed
Tree Trimmers (Pruning - Summer)*	40
Tree Trimmers (Removal- Winter)*	90
Tree Trimmers (Removal - Summer)*	15
Tree Trimmers (Floating - Summer)*	10
Tree Trimmers (Night Crew)	2
Tree Trimmers (Woody Debris Removal - Summer)*	20
Tree Trimmers (Inspectors)	10
Total TRIMMERS**	**102**
Motor Truck Drivers (Pruning- Summer)*	20
Motor Truck Drivers (Removal- Winter)*	90
Motor Truck Drivers (Removal-Summer)*	15
Motor Truck Drivers (Floating - Summer)*	10
Motor Truck Drivers (Woody Debris Removal - Summer)*	20
Motor Truck Drivers (Night Crew)	2
Total MOTOR TRUCK DRIVERS**	**92**
Senior City Forester (Tree Planting)	1
City Foresters (Tree Planting)	2
Total TREE PLANTING ADMINISTRATION	**3**
Training Agent (LEAD)	1
Training Agents	4
Total TRAINING AGENTS	**5**

*Tree Trimmers and Motor Truck Drivers will be assigned to Pruning, Removal, Floating or Woody Debris Removal Crews depending on the time of year.

**To avoid double counting staff needed - totals for Tree Trimmers and Motor Truck Drivers are calculated by adding all the staff needed and then subtracting the staff needed for summer work (i.e., tree pruning, removals, floating, woody debris removal).

Administrative & Operational Support Staff	
Deputy Commissioner	1
Executive Secretary	1
Data Entry Operator	1
Assistant Superintendent	1
General Superintendent	1
Senior City Forester	3
Dispatcher - Arborist	5
Forestry Supervisor	6

Staff Summary by Activity	Number of Crews	Number of Staff Needed
Tree Pruning (Summer)	20	60
Tree Removal (Winter)	30	180
Tree Removal (Summer)	5	30
Floating Tree Crews (Summer)	5	20
Woody Debris Removal (Summer)	20	40
Night Crew	1	4
Inspectors (Tree Trimmer)		10
Training Agents		5
Tree Planting Administration		3
Administrative & Operational Support		19
Unassigned TreeTrimmers (Summer)***		5
Unassigned Motor Truck Drivers (Summer)***		25
Total**		**221**

***In this scenario there are 5 Tree Trimmers and 25 Motor Truck Driver in the summer that are are not assigned to crews and are available to cover vacation, sick time and storm response

Resource Management Needs
Comprehensive street tree inventory (GIS-based)
Asset Management Software (used across all BoF units)
Field Computer/Tablets (see equipment)

Equipment*	
Chainsaws	102
Tower	30
Chipper w/ chipper box	25
Clam	30
Semi	30
Pick-up Truck	13
Computer/Tablet	39

*Does not include equipment needs for Administration and Operational Support staff

Table 27. Scenario A: Budget

SCENARIO A: HYBRID MANAGEMENT - 10-YEAR AREA PRUNING CYCLE, TREE REMOVALS, TREE PLANTING AND WOODY DEBRIS REMOVAL Based on 6 months dedicated tree pruning and tree removal crews	YEAR 1	YEAR 2**	YEAR 3**	YEAR 4**	YEAR 5**
Tree Pruning - 10 Year Area Trim Cycle (20 crews - Summer)					
ANNUAL Pruning Costs	$ 3,654,300	$ 3,727,386	$ 3,801,934	$ 3,877,972	$ 3,955,532
ANNUAL Number of Trees Pruned	55,000	55,000	55,000	55,000	55,000
Tree Removal (30 Winter Crews; 5 Summer Crews)					
ANNUAL Removal Cost	$ 12,155,585	$ 12,398,697	$ 12,646,671	$ 12,899,604	$ 13,157,596
ANNUAL Number of Trees Removed	25,025	13,475	13,475	13,475	13,475
Floating Crew (5 crews - Summer)					
ANNUAL Floating Crew Costs	$ 1,330,095	$ 1,356,697	$ 1,383,831	$ 1,411,507	$ 1,439,738
Tree Planting Oversight and Administration (1 Senior City Forester + 2 City Community Foresters)					
ANNUAL Tree Planting Oversight & Administration Costs	$ 303,546	$ 309,617	$ 315,809	$ 322,125	$ 328,568
Number of Trees Planted Per Year (Goal)	15,000	15,000	15,000	15,000	15,000
Number of Trees Managed Per City Community Forester (2) per Year	7,500	7,500	7,500	7,500	7,500
Night Crew (1 crew) - Year Round					
ANNUAL Night Crew Costs	$ 467,558	$ 476,909	$ 486,447	$ 496,176	$ 506,100
Woody Debris Removal Clam Crews (20) (Summer)					
ANNUAL Woody Debris Removal Costs	$ 3,171,064	$ 3,234,485	$ 3,299,175	$ 3,365,158	$ 3,432,462
Unassigned Staff (Summer)* **					
ANNUAL Unassigned Staff Costs (Summer)	$ 1,234,740	$ 1,259,435	$ 1,284,623	$ 1,310,316	$ 1,336,522
Tree Inspectors (10) (Year)					
ANNUAL Tree Inspector Costs	$ 1,115,556	$ 1,137,867	$ 1,160,624	$ 1,183,837	$ 1,207,514
Training Agents (5) (Year)					
ANNUAL Training Agents Costs	$ 580,720	$ 592,335	$ 604,182	$ 616,265	$ 628,590
TOTAL ANNUAL OPERATIONS COSTS	**$ 24,013,164**	**$ 24,493,428**	**$ 24,983,296**	**$ 25,482,962**	**$ 25,992,621**
Administration and Operational Support Personnel ****					
TOTAL Annual Administration Costs	$ 2,527,880	$ 2,578,438	$ 2,630,006	$ 2,682,606	$ 2,736,259
TOTAL: ANNUAL Operations Staff & Equipment AND Administration & Operational Support Personnel	**$ 26,541,044**	**$ 27,071,865**	**$ 27,613,303**	**$ 28,165,569**	**$ 28,728,880**

( ) = Number of Staff/Crews

* REALISTIC CONDITIONS: Based on running 6 month pruning, 6 month removal, and year round floating and night crews - 220 work days per year (accounting for crew vacation, sick, holiday time, other missed work days, and reassignment to other tasks (i.e. snow removal, storms, debris pick-up)

**After Year 1 includes 2% annual cost increase

***There are 5 Tree Trimmers and 25 Motor Truck Driver in the summer that are are not assigned to crews and are available to cover vacation, sick time and storm response

****Does not include equipment costs for Administration and Operational Support staff

Table 28. Scenario B: Summary of Operational Needs

SUMMARY OPERATIONAL NEEDS

SCENARIO B: PROACTIVE MANAGEMENT: 5 YEAR AREA PRUNING CYCLE, TREE REMOVAL CREWS & TREE PLANTING

Non-Parkway Woody Debris Removal is not performed by BoF in this scenario.

Based on 12 months dedicated tree pruning and tree removal

Operations Staff	Dedicated Staff for Proactive Management & Removals*
Tree Trimmers (Pruning)	40
Tree Trimmers (Removal)	45
Tree Trimmers (Floating)	10
Tree Trimmers (Night Crew)	2
Tree Trimmers (Inspectors)	10
Total TRIMMERS	**107**
Motor Truck Drivers (Pruning)	20
Motor Truck Drivers (Removal)	45
Motor Truck Drivers (Floating)	10
Motor Truck Drivers (Night Crew)	2
Total MOTOR TRUCK DRIVERS	**77**
Senior City Forester (Tree Planting)	1
City Foresters (Tree Planting)	4
Total TREE PLANTING ADMINISTRATION	**5**
Training Agent (LEAD)	1
Training Agents	4
Total TRAINING AGENTS	**5**

*Does not include staff for reactive work including storm response, non-parkway woody debris removal, etc.

Administrative & Operational Support Staff	
Deputy Commissioner	1
Executive Secretary	1
Data Entry Operator	1
Assistant Superintendent	1
General Superintendent	1
Senior City Forester	3
Dispatcher - Arborist	5
Forestry Supervisor	6

Staff Summary by Activity	Number of Crews	Number of Staff
Tree Pruning	20	60
Tree Removal	15	90
Floating Tree Crews	5	20
Night Crew	1	4
Inspectors		10
Training Agents		5
Tree Planting Administration		5
Administrative & Operational Support		19
TOTAL	**41**	**213**

Resource Management Needs
Comprehensive street tree inventory
Asset Management Software (used across all BoF units)
Field Computer/Tablets (see equipment)

Equipment*	
Chainsaws	97
Tower	40
Chipper w/ chipper box	25
Clam	20
Semi	15
Pick-up Truck	20
Computer/Tablet	61

*Does not include equipment needs for Administration and Operational Support staff

Table 29. Scenario B: Budget

SCENARIO B: PROACTIVE MANAGEMENT - 5 YEAR AREA PRUNING CYCLE*, TREE PLANTING & ADDITIONAL TREE REMOVAL CREWS Based on 12 months dedicated tree pruning and tree removal crews | Non-Parkway Woody Debris Removal is not performed by BoF in this scenario.					
	YEAR 1	YEAR 2**	YEAR 3**	YEAR 4**	YEAR 5**
Tree Pruning - 5 Year Area Trim Cycle (20 crews year round)					
ANNUAL Pruning Costs	$ 7,308,600	$ 7,454,772	$ 7,603,867	$ 7,755,945	$ 7,911,064
ANNUAL Number of Trees Pruned	110,000	110,000	110,000	110,000	110,000
Tree Removal (15 crews year round)					
ANNUAL Tree Removal Costs	$ 10,142,730	$ 10,345,585	$ 10,552,496	$ 10,763,546	$ 10,978,817
ANNUAL Number of Trees Removed	11,550	11,550	11,550	11,550	11,550
Floating Crew (5 crews - year round / tree removal & projects)					
ANNUAL Floating Crew Costs	$ 2,660,190	$ 2,713,394	$ 2,767,662	$ 2,823,015	$ 2,879,475
ANNUAL Number of Trees Removed	1,925	1,925	1,925	1,925	1,925
Tree Planting Oversight and Administration (1 Senior City Forester + 4 City Community Foresters)					
ANNUAL Tree Planting Oversight & Administration Costs	$ 478,446	$ 488,015	$ 497,775	$ 507,731	$ 517,885
Number of Trees Planted Per Year (Goal)	15,000	15,000	15,000	15,000	15,000
Number of Trees Managed Per City Community Forester (4) per Year	3,750	3,750	3,750	3,750	3,750
Night Crew (1 crew - year round)					
ANNUAL Night Crew Costs	$ 584,038	$ 595,719	$ 607,633	$ 619,786	$ 632,182
Woody Debris Removal					
Not conducted by BoF in this Scenario	$ -	$ -	$ -	$ -	$ -
Unassigned Staff (Summer)					
All staff assigned to a crew in this scenario	$ -	$ -	$ -	$ -	$ -
Tree Inspectors (10)					
ANNUAL Tree Inspector Costs	$ 1,115,556	$ 1,137,867	$ 1,160,624	$ 1,183,837	$ 1,207,514
Training Agents (5)					
ANNUAL Training Agents Cost	$ 580,720	$ 592,335	$ 604,182	$ 616,265	$ 628,590
TOTAL ANNUAL OPERATIONS COSTS	**$ 22,870,280**	**$ 23,327,686**	**$ 23,794,240**	**$ 24,270,125**	**$ 24,755,527**
Administration and Operational Support Personnel * **					
TOTAL ANNUAL Administration Costs	$ 2,527,880	$ 2,578,438	$ 2,630,006	$ 2,682,606	$ 2,736,259
TOTAL: ANNUAL Operations Staff & Equipment AND Administration & Operational Support Personnel	**$ 25,398,160**	**$ 25,906,124**	**$ 26,424,246**	**$ 26,952,731**	**$ 27,491,786**
( ) = Number of Staff/Crews					
* REALISTIC CONDITIONS: Based on running full-time, year round pruning, removal, floating and night crews - 220 work days per year (accounting for crew vacation, sick, holiday time, other missed work days, and reassignment to other tasks (i.e. snow removal, storms, debris pick-up)					
**After Year 1 includes 2% annual cost increase					
***Does not include equipment costs for Administration and Operational Support staff					

SECTION 4: STRATEGIES & ACTIONS

SECTION 4: STRATEGIES & ACTIONS

The plan's strategies are based on the key issues and themes identified during interviews, meetings, program assessment and data analysis. Each of the seven strategies below is followed by a brief description, actions, resources, and implementation timeline.

1. **Complete a comprehensive GIS-based inventory of all public street (parkway) trees.**

2. **Implement a proactive tree management program that re-establishes an area tree pruning program.**

3. **Improve data, technology, and information management.**

4. **Develop a plan to support Chicago's increase in street tree planting as part of the *Our Roots Chicago* initiative.**

5. **Review, revise, and update Chicago's ordinances, plans, policies, and guidelines to ensure they follow industry best management practices, support the long-term care and maintenance of Chicago's street trees, and are implemented.**

6. **Engage, encourage, and support active participation by City boards, residents, and neighborhood & partner organizations in tree planting & care.**

7. **Support training, education, and development of Bureau of Forestry staff.**

	STRATEGY & ACTIONS	RESOURCES	TIMELINE
1	**Complete a comprehensive GIS-based inventory of all public street (parkway) trees.**	**Estimated Cost.** Vary depending on who, how, and the timeframe for inventory data collection. Costs for field data collection may range in price from $4-$8 per tree. New technologies in machine learning can help reduce initial costs	**Immediate (0-2 years)**
	DESCRIPTION: A comprehensive inventory provides crucial information on the location, size, species, condition and risk of each of the city's street trees. This information is essential for determining budgets and resources need to operate a proactive program, prioritizing tree care activities based on risk and delivering services, equitably, efficiently and cost effectively. The City's current system of conducting random sample tree inventories does not provide the information necessary to operate a proactive program.		
	ACTION STEPS:		
	1.A. Determine who will conduct the inventory and collect data (i.e., in-house staff, professional consultants or a combination).		
	1.B. Develop tree inventory specifications, including determining data fields to collect (e.g., species, size, risk) and timeline for completion. Inventories can be completed all at one time or phased over several years depending on budget and resources.	**Staff.** A designated staff person from BoF responsible for overseeing tree inventory data collection	
	1.C. Secure funding to complete tree inventory based on completing Tasks 1.A. and 1.B.		
	1.D. If hiring consultants, develop bid documents that incorporate the specifications developed in Task 1.B.; select consultant.		
	1.E. Develop and implement plan to regularly update the street tree inventory as maintenance and tree planting occurs by ALL city departments and re-inventory every 10 years.		
	1.F. Review and revise the sample tree inventory methodology, to ensure accurate data collection and analysis, if BoF plans on conducting future sample tree inventories.		

	STRATEGY & ACTIONS	RESOURCES	TIMELINE
2	**Implement a proactive tree management program that re-establishes an area tree pruning program.**	**Estimated Cost.** Management Scenario B estimates the costs to implement a proactive management program at $25.3 million in year 1, Costs should be reviewed and revised based on the results of the street tree inventory.	**Short-term (0-5 years)**
	DESCRIPTION: As with any city infrastructure, like roads, bridges, and utilities, public trees need proactive care and routine maintenance. Chicago's current street tree management program can best be described as reactive where tree maintenance activities are driven by 311 resident and alderman service requests. The need to re-establish an area tree pruning program, which was discontinued in 1999 when 311 service requests became the primary mechanism for directing tree work, has also been recommended by The Monitor Group Report, Chicago's Office of Inspector General Report, and the Bloomberg Associates report.		
	ACTION STEPS:		
	2.A. Implement Management Scenario B - Proactive Management and develop a 5-year area tree pruning program that details the areas to be pruned each year. Utilize tree inventory data (STRATEGY #1) as it becomes available to inform the plan.	**Staff.** Management Scenario B estimated the number of BoF staff needed to implement the program to be 213, including tree trimmers, motor truck drivers, training agents, inspectors, and administrative and operational support staff	
	2.A.1. Ensure equitable service delivery by pruning in multiple areas of the city each year, not just areas that request tree trimming most.		
	2.B. Use information from Management Scenario B and the 5-year work plan to secure funding to implement the proactive area pruning program		
	2.C. Fill vacancies and create positions as outlined in Management Scenario B - Proactive Management, including tree trimmers, motor truck drivers, and inspectors.		
	2.D. Ensure that the number and condition of equipment is adequate to support an increase in tree pruning.		
	2.E. Evaluate eliminating or contracting out the program to collect and dispose of woody debris and landscape material generated from private property by the BoF.		
	2.E. Investigate the use of carbon financing to support tree planting and maintenance.		

	STRATEGY & ACTIONS	RESOURCES	TIMELINE
3	**Improve data, technology, and information management.**	**Estimated Cost.** BoF and AIS to determine costs for customizing Salesforce. The estimated costs to purchase 40 tablets for the 40 crews as outlined in Management Scenario B is $20,000. Annual AIS support fees and wireless charges to be determined. **Staff:** A staff person from BoF should be assigned to take on the role of managing the implementation of this STRATEGY in coordination with AIS and leadership in the Department of Streets and Sanitation.	**Immediate (0-2 years)**
	DESCRIPTION: The Bureau of Forestry uses a variety of systems to manage work orders, 311 service requests and permits. These systems do not interface with each other, and in some cases, are only accessible by a few staff. This coupled with the a lack of technology usage by BoF tree crews (i.e., receiving printed work orders instead of accessing work orders directly through Salesforce) has lead to inefficiencies and errors in service delivery.		
	ACTION STEPS:		
	3.A. Customize Salesforce to meet the data entry and reporting needs of the Bureau of Forestry and incorporate tree planting into Salesforce (Bureau of Forestry and Department of Assets, Information and Services (AIS)).		
	3.B. Establish, document and implement a process and protocol for BoF crews and contractors to access work orders directly through Salesforce.		
	3.B.1. Purchase tablets for each BoF crew.		
	3.B.2. Identify and train a BoF crew member that will be responsible for inputting information into Salesforce when tree work has been completed. Explore options for Motor Truck Drivers to take on this role.		
	3.C. Develop and document standard operating procedures (SOPs) on how service requests and work orders are entered, completed, closed and reported on in Salesforce.		
	3.D. Create and implement a plan, in cooperation with the Department of Assets, Information and Services to transition the paper-based system for managing the BoF equipment inventory to a digital database.		
	3.E. Support and provide funding to conduct routine urban tree canopy assessments (every 5-10 years) to measure and track changes in canopy cover in Chicago and the region.		

	STRATEGY & ACTIONS	RESOURCES	TIMELINE
4	**Develop a plan to support Chicago's increase in street tree planting as part of the *Our Roots Chicago* initiative.**	**Estimated Cost.** $5 million per year for tree planting funded through general obligation bonds. The 2 additional City forester - community foresters (to bring the total number of community foresters to 4) are estimated to add $122,640 each year to the budget (not including benefits).	**Immediate (0-2 years)**
	DESCRIPTION: In 2022, the Chicago Recovery Plan committed $46 million over 5 years to the *Our Roots Chicago* initiative to prioritize street tree planting in underserved neighborhoods. The initiative will plant 75,000 trees over 5 years, or 15,000 street trees per year. This initiative more than doubles the number of street trees the Bureau of Forestry plants each year.		
	ACTION STEPS:		
	4.A. Hire four City Forester/Community Forester positions to help manage and support the tree planting campaign (Management Scenario B).		
	4.B. Develop and implement a process to manage tree planting contractors, schedule inspections of newly planted trees and monitor the 2-year guarantee period.		
	4.B.1 Ensure that the customization of Salesforce (Action Item 3A) meets the work order and tracking needs of the tree planting program.		
	4.C. Utilize the 2020 tree canopy data to develop a 5-year street tree planting plan that focuses on gaps in tree canopy, equity, urban heat island reduction, climate adaptation and other city planting priorities.		
	4.C.1. Revise plan as street tree inventory data becomes available on vacant planting locations.	**Staff.** Senior City Forester and 4 City Forester - Community Forester	
	4.D. Develop a public engagement campaign and outreach materials to educate residents and youth about the benefits of trees and how they can request a tree and support the initiative.		

	STRATEGY & ACTIONS	RESOURCES	TIMELINE
5	**Review, revise, and update Chicago's ordinances, plans, policies, and guidelines to ensure they follow industry best management practices, support the long-term care and maintenance of Chicago's street trees and are implemented.**	**Estimated Cost**. Implementation of this STRATEGY varies depending on whether the work is completed in-house or by consultants. Estimated costs can range from $10,000 - $100,000.	**Short-term (0-5 years)**
	DESCRIPTION: A number of plans, studies, ordinances and guidelines have been developed by City of Chicago departments and the Bureau of Forestry that provide a solid foundation for managing a sustainable urban forest. Periodic reviews should be conducted to measure progress in implementation and ensure guidelines, plans and policies align with current industry standards and best management practices.		
	ACTION STEPS:		
	5.A. Develop a City of Chicago urban forestry best management practices manual that can serve as the central resource for all tree-related information.		
	5.A.1. Review and revise current Bureau of Forestry guidelines and standards to ensure they follow industry standards and best management practices.	**Staff.** Senior City Forester assigned to oversee implementation of this STRATEGY. Student interns can also be hired to assist with this activity.	
	5.A.2. Develop new guidelines and standards for tree care activities which may include species selection and tree diversity; site selection and minimum soil volumes; proper tree planting; post planting care; watering; mulching; tree protection and construction; tree preservation.		
	5.B. Review and revise city ordinances to increase tree planting and strengthen tree preservation, protection and care.		
	5.C. Evaluate options to establish a wood utilization program that can utilize logs for a higher value (such as flooring and furniture) and considers the entire life cycle of the tree.		

	STRATEGY & ACTIONS	RESOURCES	TIMELINE
6	**Engage, encourage, and support active participation by City boards, residents, and neighborhood & partner organizations in tree planting & care.**	**Estimated Cost.** Implementation of this STRATEGY varies depending on how engagement activities are structured. To ensure equitable engagement - city's across the U.S. are providing stipends and other incentives to residents to help spread the word about community activities.	**Short-term (0-5 years)**
	DESCRIPTION: An important component in building a resilient, growing, and well-maintained urban forest is engaging the community and partners in its management. Chicago is fortunate to have many organizations that support the growth and care of the city and region's urban forest, including The Morton Arboretum, The Chicago Region Trees Initiative and Openlands. These organizations are an asset that can provide capacity and support as BoF begins work on increasing tree planting and care in disadvantaged neighborhoods with low canopy cover.		
	ACTION STEPS:		
	6.A. Support the development of Chicago's Urban Forestry Advisory Board		
	6.B. Encourage active engagement by BoF staff to support the Chicago Region Trees Initiative		
	6.C. Coordinate and recruit regional partner organizations, community development corporations, neighborhood groups and local leaders to serve as tree planting ambassadors to promote tree planting in low canopy neighborhoods.	**Staff.** A BoF staff person (new city forester - community forester) should be assigned to oversee this task.	
	6.D. Participate in school events, like Arbor Day, to promote trees and tree planting to the next generation of community leaders.		

	STRATEGY & ACTIONS	RESOURCES	TIMELINE
7	**Support training, education, and development of Bureau of Forestry staff.**	**Estimated Cost.** New lead training agent - annual salary estimated at $100,000 not including benefits. Cost to revise training curriculum to be determined.	**Short-term (0-5 years)**
	DESCRIPTION: The Bureau of Forestry has a progressive in-house program to train tree trimmers on basic and advanced arboricultural practices. The program allows BoF to target training to the specific needs of its work force.		
	ACTION STEPS:		
	7.A. Fill vacant training agent positions and establish and fill a new lead training agent position.		
	7.B. Review and revise training curriculum to ensure it is based on the latest arboricultural science and current tree care industry standards and best management practices.	**Staff.** Four training agents and Lead Training Agent	
	7.B.1. Use the best management practices and standards developed in STRATEGY 5 to revise training curriculum.		
	7.B.2 Establish an annual cycle to review and revise curriculum.		
	7.C. Continue to support and train tree trimmers to take the International Society of Arboriculture Certified Arborist exam.		

Appendix A: Management Indicators of a Sustainable Urban Forest – Full Assessment for Chicago

MANAGEMENT APPROACH

Indicators of a Sustainable Urban Forest	Overall Objective or Industry Standard	Performance Levels - City of Chicago			Notes
		Low	Moderate	High	
Tree Inventory	Comprehensive, GIS-based, current inventory of all intensively-managed public trees to guide management, with mechanisms in place to keep data current and available for use. Data allows for analysis of age distribution, condition, risk, diversity, and suitability.	No inventory or out-of-date inventory of publicly-owned trees.	Partial or sample-based inventory of publicly-owned trees, inconsistently updated.	Complete, GIS-based inventory of publicly-owned trees, updated on a regular, systematic basis.	Sample inventory completed in 1994 2003, 2013 and 2021. Methodology needs to be reviewed and revised.
Canopy Assessment	Accurate, high-resolution, and recent assessment of existing and potential city-wide tree canopy cover that is regularly updated and available for use across various departments, agencies, and/or disciplines.	No tree canopy assessment.	Sample-based canopy cover assessment, or dated (over 10 years old) high resolution canopy assessment.	High-resolution tree canopy assessment using aerial photographs or satellite imagery.	2022 urban tree canopy assessment using 2017 LiDAR and aerial imagery (The Morton Arboretum). i-Tree Canopy assessment in 2020 (The Morton Arboretum).
Management Plan	Existence and buy-in of a comprehensive urban forest management plan to achieve city-wide goals. Re-evaluation is conducted every 5 to 10 years.	No urban forest management plan exists.	A plan for the publicly-owned forest resource exists but is limited in scope, acceptance, and implementation.	A comprehensive plan for the publicly owned forest resource exists and is accepted and implemented.	2022 Urban Forest Management Plan development is underway. This Indicator should be re-assessed after adoption to measure implementation.
Risk Management Program	All publicly-owned trees are managed for maximum public safety by way of maintaining a city-wide inventory, conducting proactive annual inspections, and eliminating hazards within a set timeframe based on risk level. Risk management program is outlined in the management plan.	Request-based, reactive system. The condition of publicly-owned trees is unknown.	There is some degree of risk abatement thanks to knowledge of condition of publicly-owned trees, though generally still managed as a request-based reactive system.	There is a complete tree inventory with risk assessment data and a risk abatement program in effect. Hazards are eliminated within a set time period depending on the level of risk.	A sample inventory was completed in 2021 but it did not collect data on risk.
Maintenance Program of Publicly-Owned Trees ***(trees managed intensively)***	All intensively-managed, publicly-owned trees are well maintained for optimal health and condition in order to extend longevity and maximize benefits. A reasonable cyclical pruning program is in place, generally targeting 5 to 7 year cycles. The maintenance program is outlined in the management plan.	Request-based, reactive system. No systematic pruning program is in place for publicly-owned trees.	All publicly-owned trees are systematically maintained, but pruning cycle is inadequate.	All publicly-owned trees are proactively and systematically maintained and adequately pruned on a cyclical basis.	Program is driven by 311 requests from residents and Alderman.
Maintenance Program of Publicly-Owned Natural Areas ***(trees managed extensively)***	The ecological structure and function of all publicly-owned natural areas are protected and enhanced while accommodating public use where appropriate.	No natural areas management plans are in effect.	Only reactive management efforts to facilitate public use (risk abatement).	Management plans are in place for each publicly-owned natural area focused on managing ecological structure and function and facilitating public use.	*This Indicator has not been assessed*

MANAGEMENT APPROACH

Indicators of a Sustainable Urban Forest	Overall Objective or Industry Standard	Performance Levels - City of Chicago			Notes
		Low	Moderate	High	
Planting Program	Comprehensive and effective tree planting and establishment program is driven by canopy cover goals, equity considerations, and other priorities according to the plan. Tree planting and establishment is outlined in the management plan.	Tree establishment is ad hoc.	Tree establishment is consistently funded and occurs on an annual basis.	Tree establishment is directed by needs derived from a tree inventory and other community plans and is sufficient in meeting canopy cover objectives.	Chicago is working on a plan to plant 75,000 trees over the next five years.
Tree Protection Policy	Comprehensive and regular updated tree protection ordinance with enforcement ability is based on community goals. The benefits derived from trees on public and private property are ensured by the enforcement of existing policies.	No tree protection policy.	Policies are in place to protect trees, but the policies are not well-enforced or ineffective.	Protections policies ensure the safety of trees on public and private land. The policies are enforced and supported by significant deterrents and shared ownership of city goals.	Public tree protection in Chapter 10 of Chicago city code. Limited resources/staffing for enforcement and opportunities to strengthen requirements should be evaluated.
City Staffing and Equipment	Adequate staff and access to the equipment and vehicles to implement the management plan. A high level urban forester or planning professional, strong operations staff, and solid certified arborist technicians.	Insufficient staffing levels, insufficiently-trained staff, and/or inadequate equipment and vehicle availability.	Certified arborists and professional urban foresters on staff have some professional development, but are lacking adequate staff levels or adequate equipment.	Multi-disciplinary team within the urban forestry unit, including an urban forestry professional, operations manager, and arborist technicians. Vehicles and equipment are sufficient to complete required work.	Accredited and professional staff. Staffing levels and positions are not adequate to meet resource needs and operate a proactive program.
Funding	Appropriate funding in place to fully implement both proactive and reactive needs based on a comprehensive urban forest management plan.	Funding comes from the public sector only, and covers only reactive work.	Funding levels (public and private) generally cover mostly reactive work. Low levels of risk management and planting in place.	Dynamic, active funding from engaged private partners and adequate public funding are used to proactively manage and expand the urban forest.	BoF does not have adequate funding to operate a proactive program.
Disaster Preparedness & Response	A disaster management plan is in place related to the city's urban forest. The plan includes staff roles, contracts, response priorities, debris management and a crisis communication plan. Staff are regularly trained and/or updated.	No disaster response plan is in place.	A disaster plan is in place, but pieces are missing and/or staff are not regularly trained or updated.	A robust disaster management plan is in place, regularly updated and staff is fully trained on roles and processes.	Chicago's Office of Emergency Management has a robust program that includes damage assessment and debris clean-up.
Communication	Effective avenues of two-way communication exist between the city departments and between city and its citizens. Messaging is consistent and coordinated, when feasible.	No avenues are in place. City departments and public determine on an ad-hoc basis the best messages and avenues to communicate.	Avenues are in place, but used sporadically and without coordination or only on a one-way basis.	Avenues are in place for two way communication, are well-used with targeted, coordinated messages.	Communication avenues are in place, however, better processes for communication and coordination internally and externally are needed.

APPENDIX B: BENCHMARKING

URBAN FORESTRY PROGRAM BENCHMARKING				
	Chicago	**Baltimore**	**Philadelphia**	**Toronto**
Completed by:	Joe McCarthy, Senior City Forester	Daniel Coy, Chief of Forestry/ Erik Dihle (City Forester, Retired)	Erica Smith- Fichman, Community Forestry Manager); Lori Hayes, Director of Urban Forestry	Kim Statham, Acting Director Urban Forestry; Connie Pinto, Program Standards and Development Officer
Completion Date:	May 2022	June 2022	June 2022	June 2022
GENERAL				
Department/Agency responsible for Urban Forestry	Department of Streets and Sanitation, Bureau of Forestry (Primary); Chicago Park District (Parks); CDOT streets (secondary)	Recreation and Parks	Philadelphia Parks & Recreation (primary); Philadelphia City Planning Commission (primary; development review), Pennsylvania Horticultural Society (secondary; street trees; park trees); Fairmount Park Conservancy (secondary; park trees); DCNR Bureau of Forestry, PennDOT (secondary)	Parks, Forestry & Recreation Division
City population (2020 Census)	2,710,000	576,498	1,603,797	2,794,356
City size (Land area; Square Miles)	228	80.94	134.28	243.32
# of street miles	3,780	2,000	2575	3,353
URBAN FOREST RESOURCE				
# of street trees	554,800	93,000	112,888	635,318
Street trees per mile	147	47	44	189
# of park trees	150,000	37,000	37,879	4539403
Public Trees Per Capita	0.26	0.23	0.09	2
Existing tree canopy (Average %)	20%	28%	20%	29.7%

URBAN FORESTRY PROGRAM BENCHMARKING				
	Chicago	**Baltimore**	**Philadelphia**	**Toronto**
FUNDING & STAFFING				
Annual tree care & management budget (including planting) (FY22)	$ 21,660,736.00	$ 5,200,000.00	$ 4,500,000.00	$70,242,000
Source(s) of tree care & management budget	General fund (GEO bond (will fund tree planting) as part of Chicago Recovery Act	General Fund (Other: CIP & Mitigation Funds)	General Funds (also private foundations and state grants)	Tax-supported Operating Budget
Per Tree Spending	$ 39.04	$ 40.00	$ 29.85	$13.57 (all street and park trees); $110.56 (street trees only).
Annual City Budget	$ 10,622,924,000	$ 4,110,000,000	$ 5,600,000,000	$ 14,990,000,000
Tree care & management budget as % of total municipal budget	0.25%	0.13%	0.08%	0.47%
# of staff that perform tree care work (full time equivalent - FTE)	199	35	45	82
# of tree trimmers/arborists	115	16	32	82
Ratio of City Tree Trimmers/Arborists to Street Trees	4,824	5,813	3,528	7,748
# of staff dedicated to inspections? If none, are inspections part of duties of other staff. (Inspections in response to request for Trimming, Removal and Planting)	11	8	8	16
# of supervisors that oversee tree crews	7	3	6	8
# of staff dedicated to arboriculture/training	4	0	0	1
# of staff in management roles	3	4	8	2
# of degreed Forester, Landscape Architect, etc.	4	5	3	Certified staff but not tracked
# of city tree crews	33	4	3	16-20
# of staff per tree crew	2 trimmers, 1 driver (only drives)	3	10	2 - 5
# of tree crews each tree supervisor oversees	5	1 to 4	2	5 - 9
% of tree care activities performed by City crews	90%	25%	15%	14%
Tree care activities conducted by City Crews	Prune, Remove, Emergency	Emergency, prune, removal, stump grinding	Park tree pruning, removal and minimal planting, emergency tree work	Tree pruning, removal, stumping/fill and seed, tree watering, mulching and fertilizing
% of tree care activities performed by Contractors	10%	75%	85%	86%
Tree care activities conducted by Contractors	Planting, Stump removal	Emergency, prune, removal, stump grinding, planting, watering, tree pit creation	All street tree pruning, removal and planting	Tree pruning, removal, stumping/fill and seed
International Society of Arboriculture Certified Arborist (#)	53	7	8	Not tracked
International Society of Arboriculture Certified Tree Worker (#)	0	0	0	Not tracked

URBAN FORESTRY PROGRAM BENCHMARKING				
	Chicago	**Baltimore**	**Philadelphia**	**Toronto**
TOOLS, EQUIPMENT & METHODS OF WORK				
% of work performed by climbing	0	0	10	Not tracked
% of work performed by tower/bucket truck	100	75	90	Not tracked
Number of tower/bucket trucks	45	4	6	30
Number of chipper and chipper trucks	35	4	0	54 chippers 28 chipper trucks
Type and number of other equipment used	25 clam loader, 15 semis	2 stump grinders	3 dump trucks, 3 cranes, 6 pickup trucks, variety of chain saws (36), climbing and rigging gear, 3 stump grinders, 3 skid steers	15 - knuckle booms 4 - stick cranes 11 - stumpers various other equipment
Overall condition/age of equipment (good, fair, poor)	fair	fair	fair	Ranges from poor, fair to good based on age
Is Equipment/Vehicle Maintenance handled in-house or contracted?	In house	In house and contracted	Equipment maintenance is contracted out. Most vehicle maintenance is done in house with City mechanics with the exception of yearly boom inspections and recertifications or if a vehicle has property damage due to an accident.	In house and contracted
Equipment needs	Towers, Clams	inspection vehicles	Too much to summarize here	N/A

URBAN FORESTRY PROGRAM BENCHMARKING				
	Chicago	**Baltimore**	**Philadelphia**	**Toronto**
MAINTENANCE & MANAGEMENT				
Up-to-date public tree inventory (Yes/No). If yes, year inventory was conducted.	Yes, 2021	Yes, 2018	Yes - 2021	Yes, street tree inventory is updated on a regular basis.
Type of public tree inventory	Sample-based	Complete street tree inventory	Complete inventory of street trees and park trees (does not include forested parks)	Complete street tree inventory
Asset management software used to manage work orders and work requests	Salesforce, Cityworks	Salesforce, Cityworks, ESRI	Cityworks	Maximo
Does this software meet the City's needs	Yes, still working out all our needs	Yes	To be determined - just started using.	Not yet operational
Management Type: Programmed Cyclic vs. Request Driven	Request Driven	Request driven. Some proactive	Request driven	Both, proactive and reactive street tree planting; proactive park tree planting. Urban Forest Renewal program plants 120,000 trees and shrubs on public and private land annually
Regular tree risk management program in place	No – perform an annual dead tree survey but that is the extend of tree risk management.	No	No	Hazard tree program and forest health care program
Annual Tree Removals (# of trees)	13,321	1277	220	16,100
Most common reasons for tree removals	Dead, diseased, storm damage	Decline	Public safety	No longer viable (e.g., dead, dying, hazardous, etc.)
Annual Tree Pruning (# of trees)	23,243	1122	1,500	68,600
Most common reasons for tree pruning	Clear roof, bldg, lightpoles	Clearance, then deadwood removal	Public safety	General tree health, hazard mitigation, public safety
Perform cyclical tree pruning (Yes/No)	No	Partial/Yes	No	Yes
Current Pruning Cycle Length (Years), if applicable	24	None	N/A	10
Desired Pruning Cycle Length (Years)	6	10 years	Undetermined	7

URBAN FORESTRY PROGRAM BENCHMARKING				
	Chicago	**Baltimore**	**Philadelphia**	**Toronto**
MAINTENANCE & MANAGEMENT (continued)				
Average # Tree Emergencies Reported Yearly:	22,000	5100	745	9200
Annual Tree Planting (# of trees)	7,400 avg. (2019-2021); increasing planting to 15,000 street trees per year for 5 years beginning in 2022	7,000 (5.8% of pop.)	800	122,800
Tree Planting conducted based on resident requests, annual tree planting plan or other reason (specify).	Request Driven	The majority of tree planting done with partner NGOs. Locations for these plantings are determined by two major factors. First, our strategic planting map which is generated through analyzing environmental, economic, and census data to identify areas of greatest need. Second, the specific goals of NGOs and their grants, with the City filling in the gaps between NGO areas of focus. Second to this type of planting are our community partner plantings where neighborhood and other community groups get volunteers to plant and care for trees supplied by the City. The third most frequent way we get trees planted is through online requests from adjacent property owners, some of which get planted by us and some they do the planting. Some people also get planting permits and plant their own street trees.	Resident requests, park Friends groups (some have park plans), capital projects	22 Planting requests 120,000 annual planting target
Does Municipality issue Permits to private companies for public tree work?	Yes	Private tree protection/mitigation regulations in progress	Yes	Yes
Average number of permits per year for: Pruning, Removal, Planting	285 Removals, 860 pruning, 680 plants (permits issued, not # trees) (20 yr avg)	0	Unknown	37,7491 maintenance/pruning 6,262 removals 22 planting requests

URBAN FORESTRY PROGRAM BENCHMARKING				
	Chicago	**Baltimore**	**Philadelphia**	**Toronto**
REQUESTS				
Number of resident tree care requests received each year	30,000 trim/removal; 8,000 planting	5,900	4,000	44,033
Resident Request Response Time	Tree trim 8 – 12 months, Tree removal 8 months, tree planting 9 months, stump removal 45 days	5 months	5-10 business days	8 weeks
WOOD DEBRIS DISPOSAL				
How is wood debris disposed? (i.e., Landfill, Burning, Composted, Wood Utilization (processed wood chips, urban lumber, firewood etc). Is this work done In-house or Contracted?	90% processed (chipper or tub grinder). Chips sent to Water reclamation district to produce Biosolids. Other chips supplied landscapers, picked up by residents for landscape use and spread on vacant lots. 10% logs picked up by private vendors (informal, no contracts) for uses such as pallets.	Camp Small/ in-house	In house chipping and composting	Used in commercial tree settings and any remaining wood is sold to contractors
Does municipality pick up woody landscape debris left at curbside? If YES, is there a charge to owner or is this a regular service provided, at no charge?	Yes, regular service if generated by homeowner. Try to avoid obvious fly by night service leaving logs, whole tree etc by contacting owner.	No	No	No
TREE PROTECTION & PRESERVATION				
Does your municipality have public tree preservation or tree protection by (a) policy; (b) ordinance; (c) both; (d) other (please explain).	Tree protection ordinance (10-32-120 Protection of trees during building) operations and policy (Removal and Replacement)	Partial; update coming 2022	B	Two tree protection bylaws: *Municipal Code Chapter 813, Trees* - both public and private trees *Municipal Code Chapter 658, Ravine and Natural Feature Protection* - trees of any size within ravine and natural feature designated area Strategic forest management plan and many policies and guidelines
Is there staff dedicated to plan review, modification and enforcement of tree protection and preservation ordinances/policies?	Yes	Yes	Philadelphia Parks & Recreation (PPR) street tree inspectors also do plan review for street trees only. Philadelphia City Planning Commission (PCPC) staff do review for on-site tree requirements. There are no staff for inspection and enforcement.	Yes
If yes to question above, how many staff dedicated to review? enforcement?	1 full-time plan review; 1 part-time code enforcement	1	1 - street tree review only	Plan review - 53; Compliance and enforcement - 13; Policy Administration -30
Is the protection and preservation of street trees prioritized during City capital construction projects? (a) Yes, Forestry is involved early from the design phase; (b) Sometimes, depends on which department is coordinating the work; (c) No, trees are not considered in the design or construction; (d) Other (please explain).	B	Yes. Somewhere between a & b, mostly a	B	(a) Yes, Forestry is involved early from the design phase

APPENDIX C: 2021 Street Tree Species Composition

	Common Name	Central	South	North	Total	% of Total		Common Name	Central	South	North	Total	% of Total
1	Norway Maple	24,229	31,459	35,265	90,953	16.4%	56	Hawthorn	-	84	966	1,050	0.2%
2	Honeylocust	36,732	26,406	17,230	80,368	14.5%	57	Eastern White Pine	279	262	443	984	0.2%
3	Soft Maple	15,513	28,342	16,468	60,324	10.9%	58	European Black Alder	569	195	218	981	0.2%
4	Green Ash	22,998	9,762	7,529	40,289	7.3%	59	Blacklocust	531	444	-	975	0.2%
5	Hybrid Elm	10,936	5,123	3,953	20,012	3.6%	60	Paper Birch	369	238	363	969	0.2%
6	Autumn Blaze Maple	4,325	5,302	5,749	15,376	2.8%	61	American Hophornbeam	78	683	127	888	0.2%
7	Basswood	4,605	4,865	5,131	14,601	2.6%	62	Turkish Hazelnut	614	70	201	885	0.2%
8	Hackberry	5,913	5,089	3,520	14,522	2.6%	63	Walnut	339	-	546	885	0.2%
9	Littleleaf Linden	7,730	3,744	1,702	13,176	2.4%	64	Bald cypress	873	-	-	873	0.2%
10	White Ash	4,997	3,280	4,890	13,167	2.4%	65	Eastern Red Cedar	304	-	531	835	0.2%
11	Pear	6,367	2,936	3,435	12,738	2.3%	66	Quaking Aspen	78	303	409	790	0.1%
12	Red Maple	5,614	2,652	3,567	11,833	2.1%	67	Juniper Spp	453	172	74	698	0.1%
13	Kentucky Coffeetree	6,283	2,520	2,266	11,069	2.0%	68	Boxelder	311	155	211	678	0.1%
14	Crimson King Norway Maple	2,375	2,377	4,418	9,170	1.7%	69	Dawn Redwood	257	84	283	623	0.1%
15	Swamp White Oak	3,253	2,248	2,854	8,355	1.5%	70	Austrian Pine	135	229	219	583	0.1%
16	Siberian Elm	2,982	3,619	1,055	7,656	1.4%	71	Chinese Elm	-	81	483	564	0.1%
17	London Plane Tree	3,168	2,899	1,287	7,354	1.3%	72	Catalpa	-	561	-	561	0.1%
18	American Elm	3,826	1,766	1,347	6,939	1.3%	73	Amur Chokecherry	175	313	72	559	0.1%
19	Male Maiden Hairtree	4,224	1,114	419	5,757	1.0%	74	Black Gum	220	-	316	536	0.1%
20	Sugar Maple	1,742	1,581	2,322	5,645	1.0%	75	Dogwood Spp	145	248	74	467	0.1%
21	Canadian Red Chokecherry	1,823	1,404	1,512	4,739	0.9%	76	White Oak	86	-	339	425	0.1%
22	Arborvitae	2,301	1,150	1,258	4,709	0.8%	77	Canadian Hemlock	-	341	72	413	0.1%
23	Northern Catalpa	1,027	2,506	1,170	4,703	0.8%	78	European Mountain Ash	178	74	160	411	0.1%
24	Rose of Sharon	1,445	1,522	1,291	4,258	0.8%	79	Chicagoland Hackberry	328	-	53	381	0.1%
25	Crabapple	2,276	807	1,123	4,206	0.8%	80	Cottonless Cottonwood	149	-	231	381	0.1%
26	Fastigate English Oak	2,591	568	733	3,892	0.7%	81	White Poplar	-	171	203	374	0.1%
27	Colorado Spruce	280	-	3,394	3,674	0.7%	82	Silver Linden	170	195	-	365	0.1%
28	Mulberry	1,508	326	1,200	3,034	0.5%	83	Scotch Pine	110	-	213	323	0.1%
29	Baldcypress	1,369	514	892	2,774	0.5%	84	European Larch	241	-	67	308	0.1%
30	Tree of Heaven	1,813	330	397	2,540	0.5%	85	Blue Ash	-	-	293	293	0.1%
31	Burr Oak	963	651	926	2,540	0.5%	86	Ash	86	-	191	277	0.0%
32	Catalpa	2,478	-		2,478	0.4%	87	Amur Maple	97	84	67	248	0.0%
33	Spruce Spp	1,563	-	869	2,431	0.4%	88	Tartarian Maple	-	244	-	244	0.0%
34	Red Oak	956	218	1,256	2,430	0.4%	89	Marmo Maple	78	153	-	231	0.0%
35	Sycamore	553	421	1,401	2,375	0.4%	90	Japanese Zelkova	163	-	60	223	0.0%
36	Norway Spruce	-	1,646	594	2,240	0.4%	91	Black Oak	156	-	64	219	0.0%
37	Japanese Tree Lilac	823	239	1,033	2,094	0.4%	92	Autumn Fantasy Maple	98	74	-	172	0.0%
38	Cherry	443	-	1,647	2,091	0.4%	93	Mountain Ash	86	82	-	168	0.0%
39	Miyabei Maple	879	1,070	81	2,031	0.4%	94	Planetree	-	163	-	163	0.0%
40	River Birch	663	253	985	1,901	0.3%	95	Cherry	-	151	-	151	0.0%
41	Japanese Maple	1,263	-	574	1,837	0.3%	96	Aristrocrat Pear	-	148	-	148	0.0%
42	Princeton Sentry Ginko	169	672	884	1,726	0.3%	97	European Hornbeam	92	-	56	147	0.0%
43	Eastern Redbud	681	245	766	1,691	0.3%	98	Beech	86	-	59	145	0.0%
44	Chinkapin Oak	471	653	508	1,631	0.3%	99	Hoptree	67	-	72	139	0.0%
45	Horsechestnut	351	665	509	1,525	0.3%	100	Red Pine	-	-	120	120	0.0%
46	Shingle Oak	528	621	355	1,504	0.3%	101	Katsuratree	86	-	-	86	0.0%
47	English Oak	207	428	865	1,500	0.3%	102	Thornless Cockspur	86	-	-	86	0.0%
48	Ohio Buckeye	596	611	237	1,444	0.3%	103	Russian olive	85	-	-	85	0.0%
49	Serviceberry	293	692	441	1,426	0.3%	104	Willow spp	85	-	-	85	0.0%
50	Sweetgum	481	330	525	1,336	0.2%	105	Douglas Fir	-	82	-	82	0.0%
51	American Hornbeam	820	163	326	1,309	0.2%	106	Chinese Juniper	-	81	-	81	0.0%
52	Tulip Tree	258	432	559	1,249	0.2%	107	Japanese Pagoda Tree	78	-	-	78	0.0%
53	Hedge Maple	411	-	785	1,196	0.2%	108	Hessei European Ash	-	70	-	70	0.0%
54	Pin Oak	183	857	153	1,194	0.2%	109	American Larch	-	-	53	53	0.0%
55	Magnolia	280	332	554	1,166	0.2%	110	Horsechestnut	-	-	-	-	0.0%

APPENDIX D: BoF's Chronology of Adding Green to Urban Design Actions

Developed by the Bureau of Forestry

Chronology of Adding Green to Urban Design (2008) Actions to be taken by the Bureau of Forestry, Department of Planning and Development and Department of Transportation.

Critical Step Action 2.2

Action 2.2 Modify/Update Landscape Ordinance to Improve Environmental Performance: **Move from Prescriptive to Performance Based Ordinance.**

Concurrent Actions needed to inform Action 2.2

Action 2.1 Assess the success (compliance) and performance of the existing landscape ordinance. *

(DPD lead, BOF/Zoning co-leads)

a) Field assessment/survey of Landscape Ordinance sites for compliance and performance.

Compliance: Required trees present or not (% present) Set back, islands installed per plan

Performance: How trees are doing. Storm water captured by setback, island etc.

b) **Action 11.5** Conduct In-depth Review of Guidelines and Standards to identify levels of enforcement, existing conflicts, and possible obstacles (A large part of this was done in the GUD review process).

Action 5.4 Update BOF Manual of Tree Planting Standards (1990)**

a. **Action 6.1** Develop soil volume requirements/standards for tree planting. Leads back to Action 2.2 Update Ordinance and Guide.
(BOF has developed the Tree Space and Soil Volume Standards (2013 draft)

b. **Action 8.2** Develop a Sustainable Street Design Standard. Matrix based on land use street types and ROW width. Identify minimum sidewalk width and associated parkway landscape treatment.

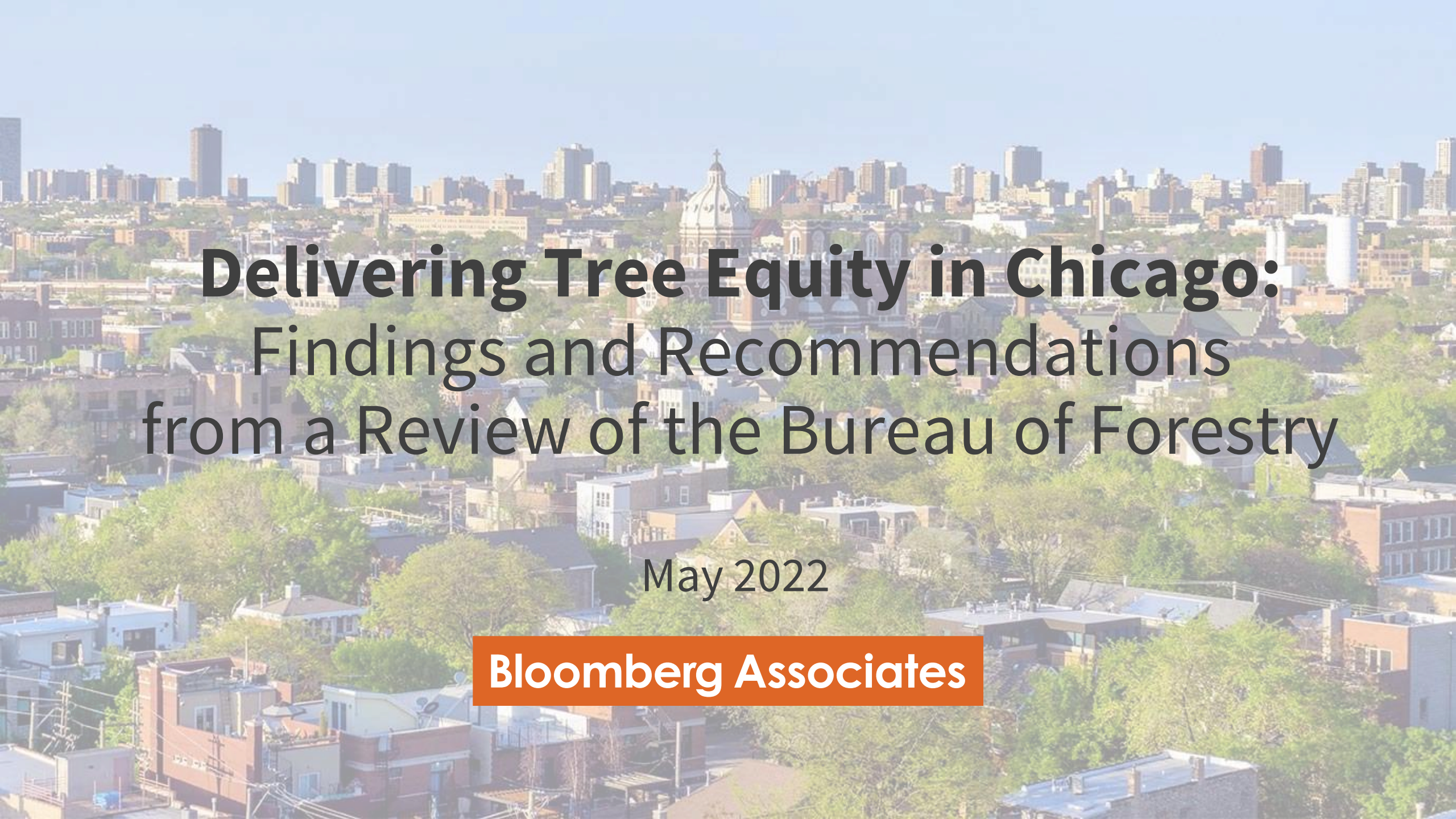
Work with CDOT to harmonize BOF Manual with CDOT Street and Site Plan Design Guidelines Standards to minimize/reduce conflicts. Once completed informs Action 8.2.

c. **Action 8.3** Modify the (Guide to) landscape ordinance to replace current parkway requirement (standards) with landscape provisions defined in Sustainable Street Design Standard Matrix **Action 8.2.**

*Base Study for Site Design Recommendations by BauerLatoza Studio MWH 2009 which assessed the environmental performance of existing landscape requirements and guidelines.

** This manual was a precursor to the original Guide to Landscape Ordinance. Each successive version of the guide was simplified as the target audience was the public and lost detail and rationale for standards over time.

APPENDIX E: Delivering Tree Equity in Chicago – Bloomberg Associates (2022)



Delivering Tree Equity in Chicago: Findings and Recommendations from a Review of the Bureau of Forestry

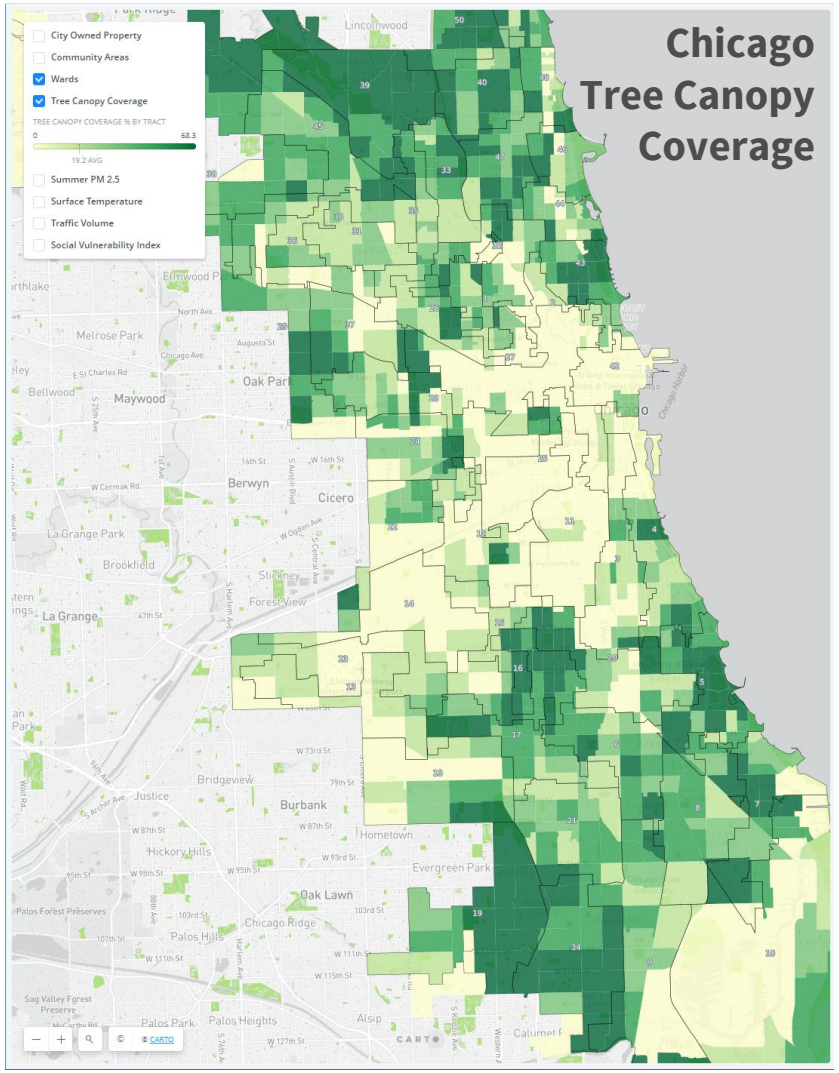
May 2022

Bloomberg Associates

Context

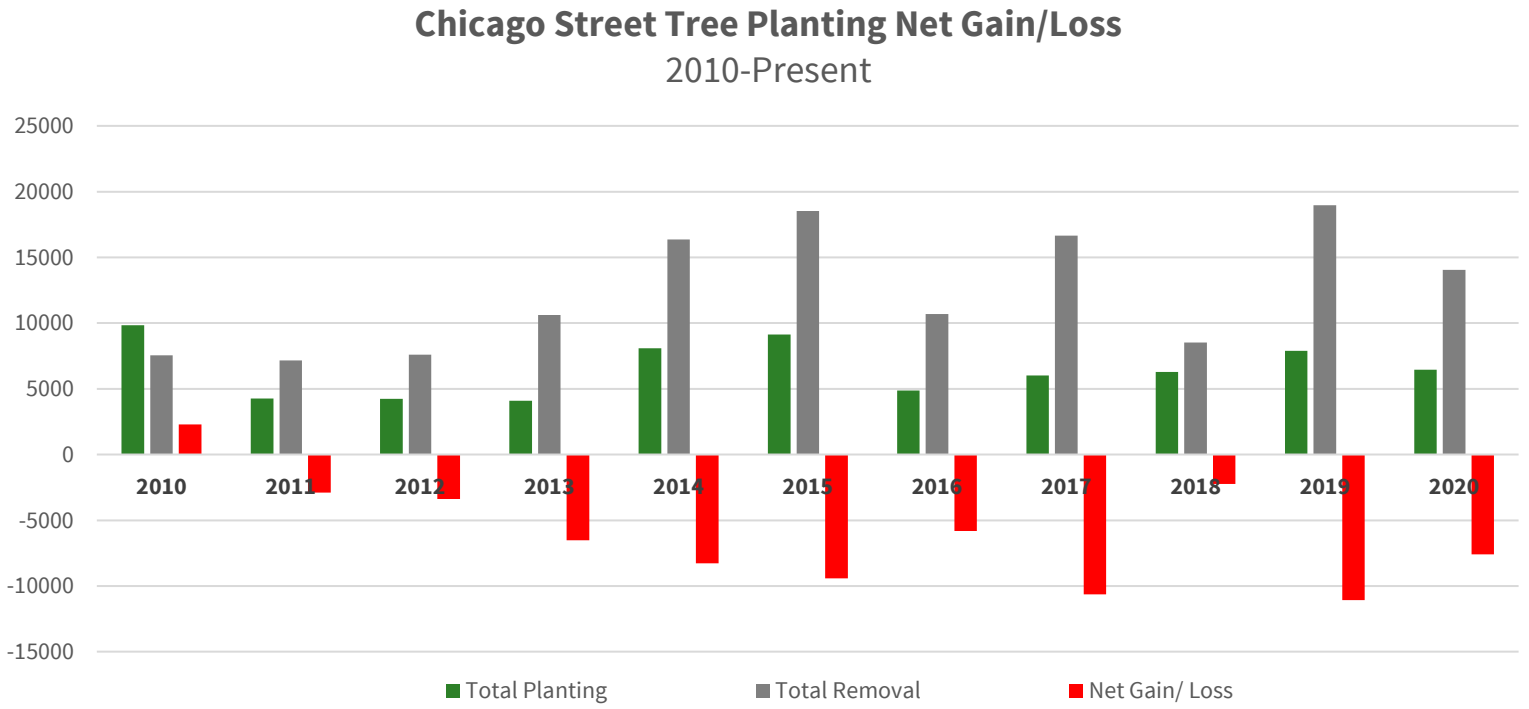
- Chicago's **tree canopy is not evenly distributed**. While the citywide tree canopy coverage is 16%, some neighborhoods have as low as 5-6% canopy coverage
- In 2021, Mayor Lightfoot announced a new tree equity strategy with $46M of funding over 5 years to **increase tree planting and maintenance** and **expand community engagement and partnerships** around trees
- **Chicago's trees provide clean air, cool neighborhoods, and reduce flood risks,** generating $2.2 billion in annual ecosystem benefits

Bloomberg Associates was asked to review the Bureau of Forestry's (BoF) resources, policies, and processes to ensure it is resourced and positioned to achieve the Mayor's tree equity goal



Chicago has lost thousands of trees annually

The current approach to urban forestry is not increasing Chicago's tree coverage. According to LiDAR data from the Chicago Regional Trees Initiative, Chicago lost 3% of its tree canopy from 2010 to 2020.



- Chicago had an **average net loss of ~7,500 trees a year for the past 5 years**
- Annual **tree removals have exceeded new plantings for the past 10 years**
- **Lack of long-term dedicated funding for tree planting** has led to wide fluctuations in annual tree planting, ranging from 4,000 to ~10,000 trees a year

Review Methodology

The Mayor's Office and Dept. of Streets and Sanitation engaged Bloomberg Associates to review the Bureau of Forestry's (BoF) resources, policies, and processes and identify what is needed for BoF and the City of Chicago to deliver on the Mayor's tree equity strategy. To do this, we:

1) **Interviewed 25+ key internal and external stakeholders***, including:
    - Bureau of Forestry: 11 staff
    - City departments: DSS, CDOT, AIS, Mayor's Office
    - External stakeholders: Park District, Seven-D, Openlands,
2) **Reviewed BoF personnel and equipment data and processes**
3) **Analyzed 311 service request data and CRTI tree canopy data**
4) **Coordinated with Davey Resource Group**, which is currently developing an *Urban Forestry Management Plan* for the City

This review **builds on BA's ongoing work since early 2021** to develop and implement a tree equity strategy, **but focuses on the BoF**

* Full list of interviews included in Appendix

Tree management is fragmented in Chicago…

Tree Maintenance

Public Right-of-Way

Reactive, based on **311 requests**

BoF staff
(in-house crews)

$15.6M
(2021; Corporate fund)

54,000 311 requests
(2021)

DSS

Public Parks

Proactive, based on staff survey

Park District staff
(in-house crews)

$3.1M
(annual avg.; personnel budget)

16,796
(2021 trims/removals)

Tree Planting

Residential Streets

Reactive, based on **311 requests**

Private contractor
(Seven-D Construction)

$2M
(2021; Chicago Works infra. bond)

5,000 trees planted
(2021)

DSS

Arterial Streets

Proactive, identified by CDOT forester

Private contractor
(Seven-D Construction)

$1M
(2021; Chicago Works infra. bond)

2,500 trees planted
(2021)

CDOT

Public Parks

Proactive, based on replacing removals

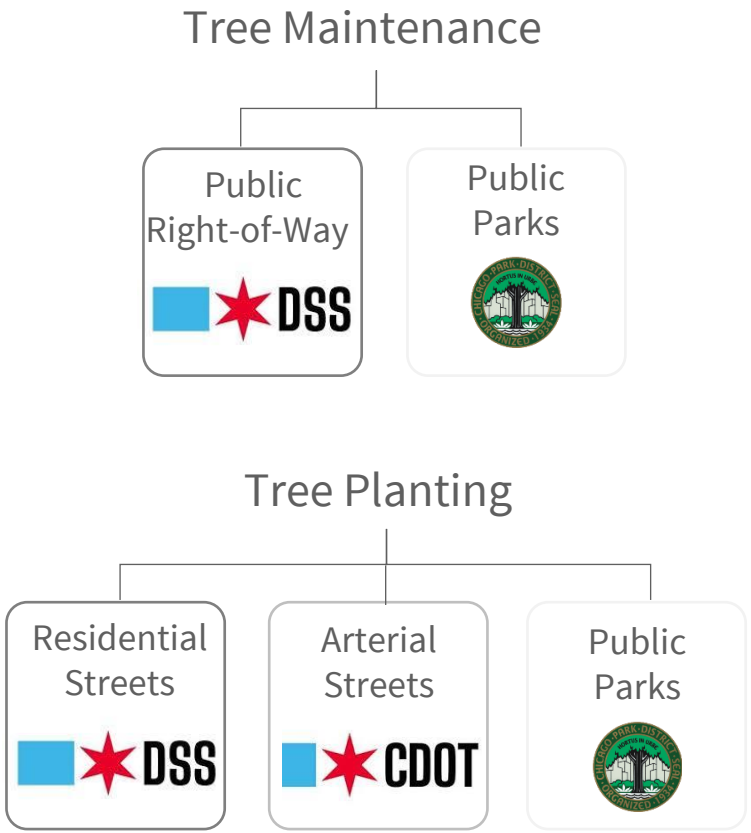
Private contractor
(Moore Landscaping)

$1.75M
(2022; value of planting contract)

3,000 trees planted
(2011-21 annual avg.)

Note: This slide focuses exclusively on trees on publicly-owned property and does NOT address tree planting or maintenance on private property

… in contrast to other large U.S. cities



In New York City and Philadelphia, all tree planting and maintenance on streets *and* parks is **managed by a single City entity**

NYC Parks

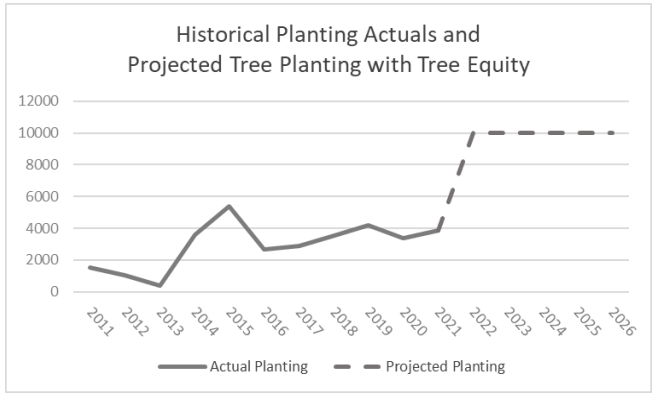
Philadelphia Parks & Recreation

In 2019, Los Angeles **created a Chief Forest Officer** position within the Department of Public Works to coordinate all tree work done by City departments and external partners

Los Angeles Public Works

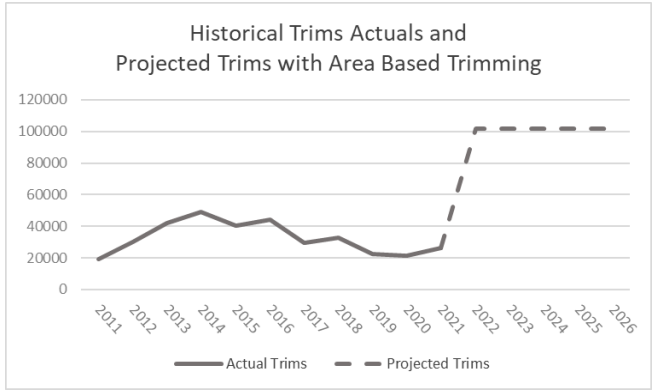
Tree equity will increase demand for BoF services

BoF is currently unable to fulfill most of the 311 service requests it receives within the year the request is submitted. Moving away from a purely request-based system will further stretch BoF resources (personnel and equipment) and processes.



239%

Projected increase in tree planting



214%

Projected increase in tree trimming

Projected increases with full implementation of **tree equity planting** (10k/year) and **area trimming** (trim all City trees on 5-6 year cycle)

Note: BoF implemented Salesforce in 2018 leading to some data inconsistencies that calendar year

Key Findings

1	BoF has predominantly focused on 311 requests	Contributes to an inequitable distribution of tree canopy
2	BoF is oriented towards maintenance	Limited capacity to expand tree canopy via new planting
3	BoF is challenged to meet current demand for services	Leads to delays in meeting current demands and long wait times for residents
4	BoF is not proactively engaged with the public or community partners	Critical to achieve tree equity and community buy-in for trees
5	City policies and practices outside of BoF not oriented to maintaining or expanding tree canopy	Results in net tree loss and over-reliance on publicly-funded tree planting

Recommended Actions

Actions In Progress

1 BoF has predominantly focused on 311 requests

1) **Track tree equity goals and metrics** in addition to 311 requests
2) **Move to "opt-out" notices** for new tree planting
3) **Implement area-based trimming** as a practice
4) **Use data to plant new trees** in priority areas

2 BoF is oriented towards maintenance

5) **Increase staff resources for tree planting,** including Foresters, dispatchers, and inspectors
6) **Add a Senior City Forester into BoF management hierarchy**
7) **Develop a City Forester hiring strategy** to address upcoming retirements

3 BoF is challenged to meet current demand for services

8) **Fill priority vacant positions**
9) **Create a standardized training curriculum** based on arboricultural best practices
10) **Add mobile technology for field inspections**
11) **Enhance asset mgmt. strategies for Forestry equipment**

4 BoF is not proactively engaged with the public or community partners

12) **Hire dedicated position to lead public outreach and partnerships**
13) **Create new public communication materials with tree equity brand**
14) **Partner with nonprofit and community groups** on planting and maintenance

5 City policies and practices outside of BoF not oriented to maintaining or expanding tree canopy

15) **Explore feasibility of creating Chief Forestry Officer position**
16) **Launch Urban Forestry Advisory Board in 2022**
17) **Institute a No-Net Loss tree policy** for City agencies
18) **Dedicate tree removal payments to a BoF Tree Fund**
19) **Update Landscape Ordinance**
20) **Explore workforce development opportunities with GreenCorps**

1) BoF predominantly focused on 311 requests

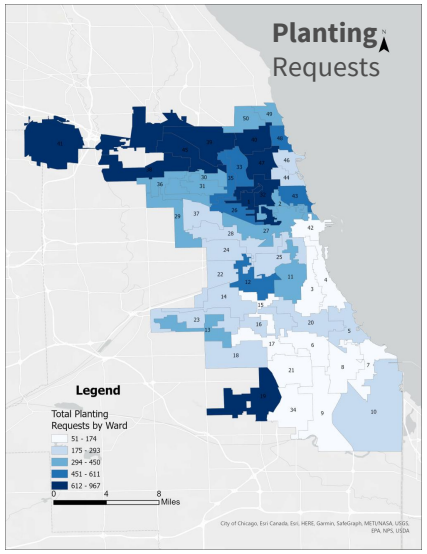
Contributes to an inequitable distribution of tree canopy

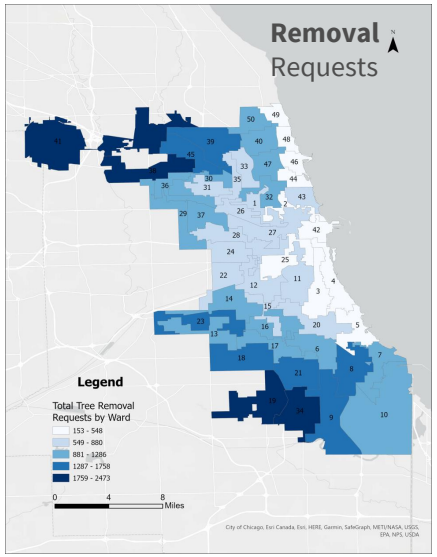
Issues

- **311 service requests are not evenly made across Chicago's neighborhoods**
  - Service requests for planting over the past 5 years have been concentrated on the north side, while tree removals have been concentrated on the south side
  - Wards 41, 19, and 38 have consistently high request volumes
  - Wards 42, 25, 3, and 4 have consistently low request volumes
- **Planting requests from residents are not sufficient to meet new annual planting goal of 15,000 trees**
  - BoF currently receives ~3,300 planting requests/year on average, far below the new goal of 10,000/year
- **Relying on service requests for tree trimming results in trees not receiving adequate and regular maintenance**

Supporting Data

Tree-related 311 requests (2018-2022)





"The City relies on residents' calls to 311 to identify trees in need of trimming, rather than using a systematically proactive, arboriculturally based approach…since **some area residents do not regularly call 311** to request tree trims, **many City trees have not been trimmed in over 10 years**."

- City of Chicago Inspector General Report, 2019

1) BoF predominantly focused on 311 requests

Contributes to an inequitable distribution of tree canopy

Issues

- **311 service requests are not evenly made across Chicago's neighborhoods**
- **Planting requests from residents are not sufficient to meet new annual planting goal of 15,000 trees**
- **Relying on service requests for tree trimming results in trees not receiving adequate and regular maintenance**

Recommended Actions + Next Steps

1) **Track tree equity goals and metrics** in addition to 311 requests
   - Work with Tree Equity Working Group to develop options for ambitious tree equity goal and associated progress metrics/milestones

2) **Move to "opt-out" notices** for new tree planting
   - Print and distribute updated tree planting door hanger w/ info on how to opt-out
   - Communicate procedural change to WG and general public

3) **Implement area-based trimming** as a practice
   - Complete hiring and training of new trimmers until BoF has sufficient crews for new system

4) **Use data to plant new trees** in priority areas
   - Explore a complete tree inventory
   - Use CRTI canopy data to identify all areas w/ low existing canopy coverage to target for future tree planting

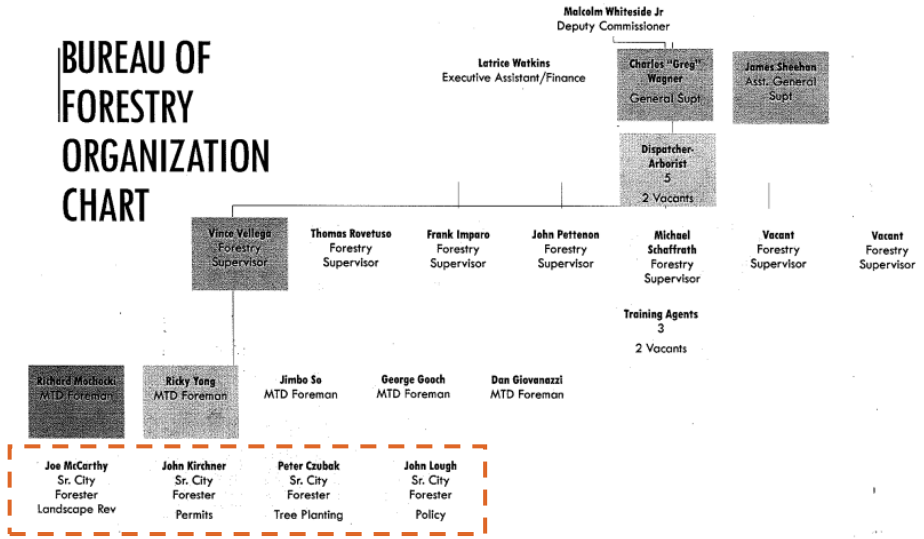
2) BoF oriented towards maintenance

Results in limited capacity to expand tree canopy via new planting

Issues

- **There is only a single City Forester fully dedicated to planting strategy and operations**
  - Lack of committed planting team has led to a significant data backlog and long wait times for residents to receive requested trees
- **Foresters isolated from organizational hierarchy and management decisions**
  - Forester's projects are not well integrated with BoF maintenance operations + limited overlap between training of staff and Foresters
- **No replacement strategy for Foresters who are getting close to retirement age**
  - Loss of decades of institutional knowledge without a replacement hiring strategy

Supporting Data



2) BoF oriented towards maintenance

Results in limited capacity to expand tree canopy via new planting

Issues

- **There is only a single Forester fully dedicated to planting strategy and operations**
- **Foresters isolated from organizational hierarchy and management decisions**
- **No replacement strategy for Foresters who are getting close to retirement age**

Recommended Actions + Next Steps

5) **Increase staff resources for tree planting,** including Foresters, dispatchers, and inspectors*
6) **Add a Senior City Forester into BoF management hierarchy**
7) **Develop a City Forester hiring strategy** to address upcoming retirements

* The forthcoming *Urban Forestry Management Plan* will include more detail on staffing recommendations and comparisons with other cities

3) BoF capacity and resources (1 of 4)

Leads delays in meeting current demand and long wait times for residents

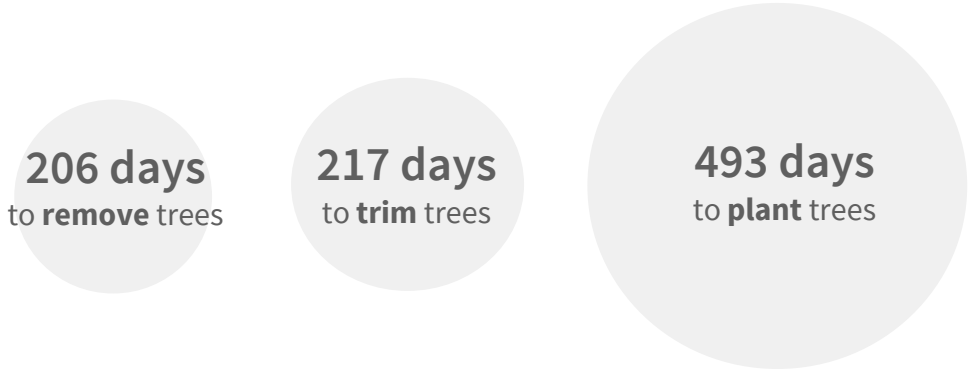
Issues

- **BoF not staffed to meet service demand, current or projected**
  - Staff are often required to "act up" into different roles when there are critical vacancies
- **Lack of standardized and arboriculture best practice-informed training** for BoF staff
  - Insufficient # of training agents to adequately supervise trainees during critical learning period
  - Lack of support and continuity for professional development opportunities for BoF staff
- **Limited staff capacity & time to thoroughly review all projects in OUC**
  - Development projects are not sufficiently reviewed to ensure there are no adverse impacts to public trees in the vicinity

Supporting Data

Average # of days to close* service requests

(2018-19, 2-year pre-pandemic avg.)



Open CHI311 service requests in 2021

Planting:	3,147
Removal:	3,268
Trim:	22,440

***** Closing out a 311 service request in Salesforce/CityWorks currently requires manual data entry, so this timing may reflect a data entry issue more than an operations issue. We cannot analyze the actual days from request to service completion based solely upon the 311 data available.

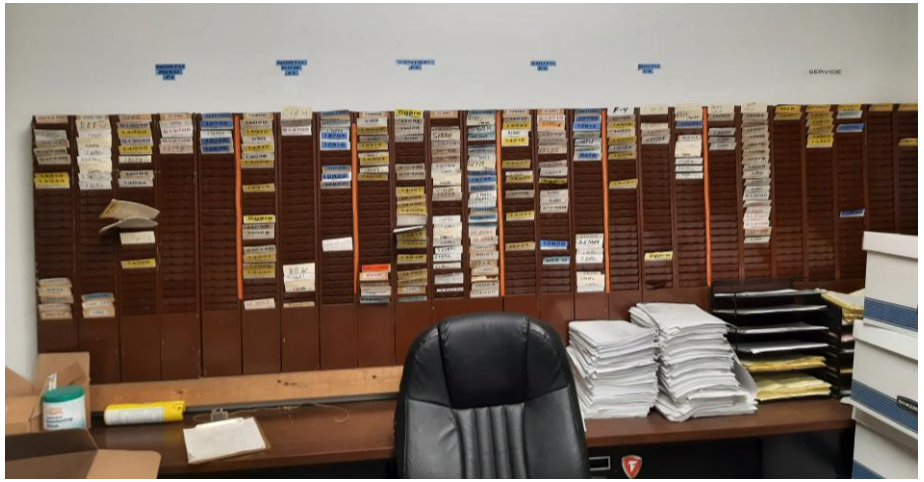
3) BoF capacity and resources (2 of 4)

Leads delays in meeting current demand and long wait times for residents

Issues

- **Forestry equipment is old and difficult to keep in working order**
  - Equipment often breaks down which disrupts and slows maintenance work
  - Forestry equipment is so old it is often hard to repair or get replacement parts and is unusable for months
- **Limited digital management of equipment**
  - Equipment inventory is managed on index cards and other analog tracking systems

Supporting Data



Equipment Type	Ideal Replacement Age	Average Age
12" Brush Chipper	8	15
Aerial Bucket Truck	10	15
Clam - Grapples	8	12
Dump Truck	9	20
Forklift	10	30
Lift Gate Truck	9	24
Stump Grinder	8	29
Tub Grinder	8	20

3) BoF capacity and resources (3 of 4)

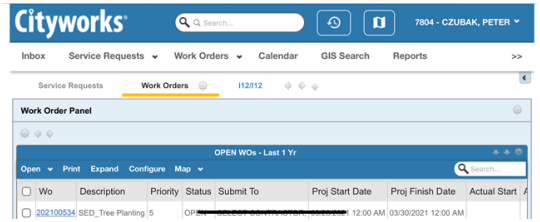
Leads delays in meeting current demand and long wait times for residents

Issues

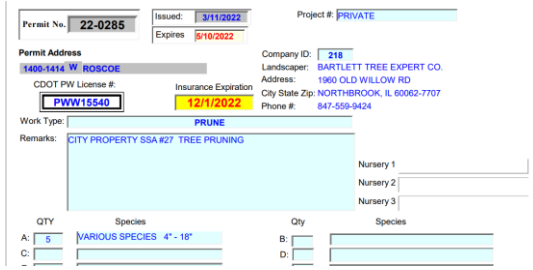
- **There is no complete inventory of public trees in Chicago with GPS coordinates**
  - Data is based on a random sample inventory conducted every 10 years + new planting data
  - Tree locations are tied to property addresses, rather than GPS coordinates – precise locations may differ from address and multiple trees may be listed under same address
- **Different data management systems are used for workstreams (planting, maintenance, permits), with limited interoperability**

Supporting Data

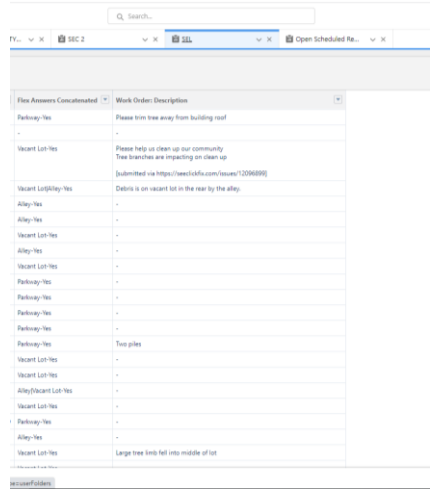
1 **Cityworks**: Planting requests and inspections



2 **Permit database**: Permits filed for work on public trees



3 **Salesforce**: Maintenance requests



3) BoF capacity and resources (4 of 4)

Leads delays in meeting current demand and long wait times for residents

Issues

- **BoF not staffed to meet service demand, current or projected**
- **Lack of standardized and arboriculture best practice-informed training for BoF staff**
- **Limited staff capacity & time to thoroughly review all projects in OUC**
- **Forestry equipment is old and difficult to keep in working order**
- **Limited digital management of equipment**
- **There is no complete inventory of public trees in Chicago with GPS coordinates**
- **Different data management systems are used for workstreams (planting, maintenance, permits), with limited interoperability**

Recommended Actions + Next Steps

8) **Fill priority vacant positions***

9) **Create a standardized training curriculum** based on arboricultural best practices

10) **Add mobile technology for field inspections**

11) **Enhance asset mgmt. strategies for Forestry equipment**

* The forthcoming *Urban Forestry Management Plan* will include more detail on staffing recommendations and comparisons with other cities

4) BoF public engagement and partnerships

Critical to achieve tree equity and community buy-in for trees

Issues

- **Many residents are unaware of the health, economic, and environmental benefits of trees**
  - Many residents are unaware they can request a tree planted or tree care services through 311
  - Anecdotal evidence that residents and local political leaders believe negative myths about trees, leading to resistance to new trees in certain neighborhoods
- **BoF not an active partner with local tree organizations (e.g. CRTI and Openlands)**
  - No BoF representation in CRTI
  - CRTI often partners with neighboring municipalities for sponsored tree planting events

Supporting Data


CHICAGO DEPARTMENT OF STREETS & SANITATION

BUREAU OF FORESTRY

Congratulations! In an effort to enhance Chicago's beauty and reduce the "Urban Heat Island Effect," a tree planting site(s) has been identified in front of your home/ business. If you would like to have a tree planted for free by the City of Chicago, please call us at (312) 742-8733 to confirm. You will need to leave us your Name, Address and Service Request Code (listed below). Thank you for your interest in improving our environment and making Chicago an even more beautiful place to live.

YOUR RESPONSE IS REQUIRED

Comments: _____

Service Request Code: _____

Inspector: _____

Date: _____

CITY OF CHICAGO, RAHM EMANUEL, MAYOR
Charles L. Williams, Commissioner
Department of Streets and Sanitation
121 N. LaSalle Street, #1107, Chicago, Illinois 60602
www.cityofchicago.org/streetsandsan

CHICAGO DEPARTMENT OF STREETS & SANITATION

OFICINA FORESTAL

¡Felicidades! Con el esfuerzo de embellecer la Ciudad de Chicago y reducir el "Efecto Isla de Calor" se identificó el área enfrente de su casa o comercio para plantar un árbol. Si usted gusta recibir un árbol gratis departe del municipio. Por favor llame para confirmar su interés al (312) 742-8733 y deje un recado con su nombre, domicilio, y él número del servicio (el número aparece abajo). Gracias por su interés en mejorar nuestro medio ambiente y hacer de Chicago un lugar bello en donde vivir.

SE REQUIERE SU RESPUESTA

Comentarios: _____

Número del Servicio: _____

Inspector: _____

Fecha: _____

CITY OF CHICAGO, RAHM EMANUEL, MAYOR
Charles L. Williams, Commissioner
Department of Streets and Sanitation
121 N. LaSalle Street, #1107, Chicago, Illinois 60602
www.cityofchicago.org/streetsandsan

BoF door hanger was still in use in 2021, showing **outdated information** (lists Mayor Rahm Emanuel and Commissioner Charles Williams)

4) BoF public engagement and partnerships

Critical to achieve tree equity and community buy-in for trees

Issues

- Many residents are unaware of the health, economic, and environmental benefits of trees
- BoF not an active partner with local tree organizations (e.g. CRTI and Openlands)

Recommended Actions + Next Steps

12) **Hire dedicated position to lead public outreach and partnerships**

13) **Create new public communication materials with Our Roots Chicago tree equity brand**

14) Work with CDPH and AIS to launch new website as tree resource hub
    - Re-design BoF door hanger
    - Disseminate new flyers to Alders, CBOs, etc.

15) **Partner with nonprofit and community groups** on planting and maintenance
    - Maintain presence at monthly Tree Equity Working Group

5) City policies & practices outside of BoF

Lead to net tree loss and over-reliance on public tree planting

These issues fall outside of BoF, but are critical to tree equity

Issues

- **Tree management is fragmented in Chicago**
- **Trees are not sufficiently protected by existing policies and practices**
  - City agencies are not required to replace or pay restitution for projects that remove trees
  - Funds paid to City for tree removals are not allocated to Forestry to replace trees lost
  - Alderman can use discretionary power to have Forestry take down healthy trees
- **Landscape Ordinance has not been revised since 1999 and lacks enforcement**
  - Development planting standards are outdated, difficult to enforce, and do not reflect current arboriculture practices
- **City labor agreements limit hiring pipelines into BoF from apprenticeships or job training programs**

Supporting Data

Department of Water Management Tree Removal Costs
(2019-2020)

	Trees	Inches	Removal Costs	Stump Cost	Total Removal Cost	Annual Stormwater Interception	Asset Value Lost*
2019	710	16527	$1,462,416.48	$48,754.65	**$1,511,171.13**	2,278,137	$15,753,128
2020	822	19643	$1,515,211.83	$57,946.85	**$1,573,158.68**	2,739,278	$19,132,281

DWM tree removals cost the BoF over $1.5M in 2020. This cost is borne by BoF, and not by DWM.

In 2020 alone, the City removed almost $20 million in asset value* without replacement.

***** Tree asset value is calculated based upon species and condition using a standard science-based methodology

5) City policies & practices outside of BoF

Lead to net tree loss and over-reliance on public tree planting

These actions fall outside of BoF, but are critical to tree equity

Issues

- Tree management is fragmented in Chicago
- Trees are not sufficiently protected by existing policies and practices
- Landscape ordinance has not been revised since 1999 and lacks enforcement
- City labor agreements limit hiring pipelines into BoF from apprenticeships or job training programs

Recommended Actions + Next Steps

15) **Explore feasibility of creating Chief Forestry Officer position**

16) **Launch Urban Forestry Advisory Board in 2022**

17) **Institute a No-Net Loss tree policy for city agencies**

18) **Allocate tree removal payments to a BoF Tree Fund**
    - Work with OBM to establish internal procedures to direct funds to BoF

19) **Update Landscape Ordinance**
    - Create working group with representatives from DPD, BoF, and CDOT (and others) to review ordinance, enforcement, and propose changes

20) **Explore workforce development opportunities with GreenCorps**

Next Steps on Priority Needs*

* Priority needs based upon supporting 2023 budget requests related to tree equity

Priority Need	Actions	Responsibility	
		Lead	Support
Complete equity-focused planting in 2022 (Spring and Fall planting seasons)	• Use data to prioritize Spring/Fall 2022 tree planting • Pilot community-driven projects in Little Village and North Lawndale • Train-the-trainers model to partner with CBOs to identify planting locations in equity areas	BoF	BA, Mayor's Office, CDPH, Tree Equity Working Group
Upgrade data & technology	• Complete tree planting process mapping w/ AIS • Identify mobile solution for tree field workflows • Develop broader BoF technology strategy to integrate different systems • Explore tree inventory options	BoF/AIS	BA, Mayor's Office
Hire new foresters	• Draft job description for community forester • Promote position(s) once posted	DSS/DHR	BA, Mayor's Office
Develop new communications materials	• Promote 'Our Roots Chicago' as tree equity program brand • Launch new website, flyers, social media assets • Finalize and print updated BoF door hangers	Mayor's Office/CDPH	BA, AIS, BoF
Update tree planting contract	• Finalize and publish new large tree planting spec w/ 4 zones and up to 4 contractors, enhanced GIS data requirements • Promote contract w/ targeted audiences	DPS	BA, Mayor's Office, BoF
Finalize move to opt-out policy	• Finalize door hanger with opt-out info • Update internal BoF procedures	BoF	BA, Mayor's Office

Appendix

Who We Spoke With

Bureau of Forestry Staff

Malcolm Whiteside, Deputy Commissioner
Greg Wagner, General Superintendent
Jimmy Sheehan, Assistant General Superintendent
Joe McCarthy, Senior City Forester
John Lough, Senior City Forester
John Kirchner, Senior City Forester
Peter Czubak, Senior City Forester
Julio Munoz II, Equipment Manager
Michael Schaffrath, Supervisor
Danny Munoz, Dispatcher
Joseph Rinella, Tree Trimmer

City Staff

John Wedel, AIS
Kevin Campbell, AIS
Jeff Brink, CDOT
Mark Maloney, CDOT
Matthew Peterson, CDOT
Sean Wiedel, CDOT
Drew Hines, CDOT
Eric Colon, DSS
Mimi Simon, DSS
Luis Zepeda, DSS

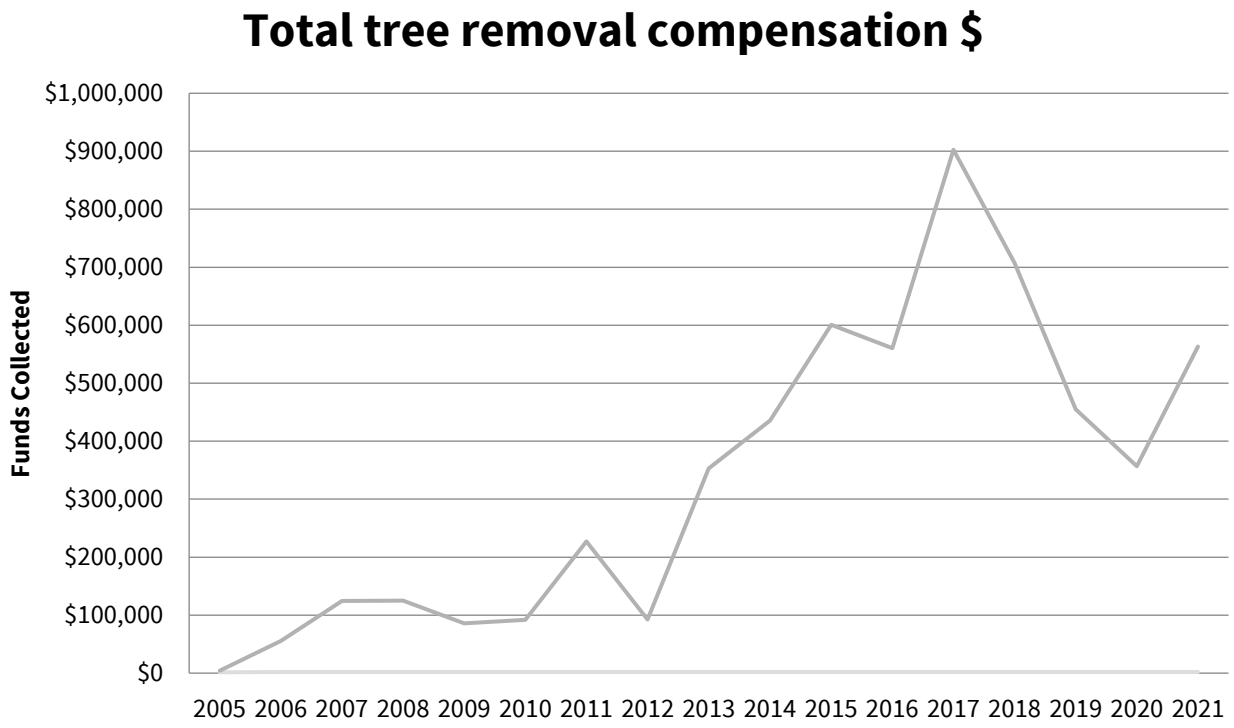
External Stakeholders

Mauro Gavilanes, Seven-D Construction
Scott Grams, Illinois Landscape Contractors Association
Michael Duggan, Openlands
Daniella Pereira, Openlands
Cathy Breitenbach, Park District
Mike Brown, Park District
Bob Benjamin, Former BoF Supervisor
Andy Johnson, WRD Environmental

Tree Removal Compensation $

Annual tree removal compensation payments
(2005-2021)

Year	Collected
2005	$4,362.00
2006	$55,663.24
2007	$124,334.67
2008	$125,223.94
2009	$86,036.00
2010	$91,821.00
2011	$226,891.75
2012	$92,682.23
2013	$353,221.00
2014	$435,823.38
2015	$600,715.06
2016	$560,450.00
2017	$902,758.00
2018	$707,321.40
2019	$455,029.00
2020	$356,809.00
2021	$563,299.00



BoF Staffing

Bureau of Forestry Staffing + Vacancies
(2022 budgeted positions)

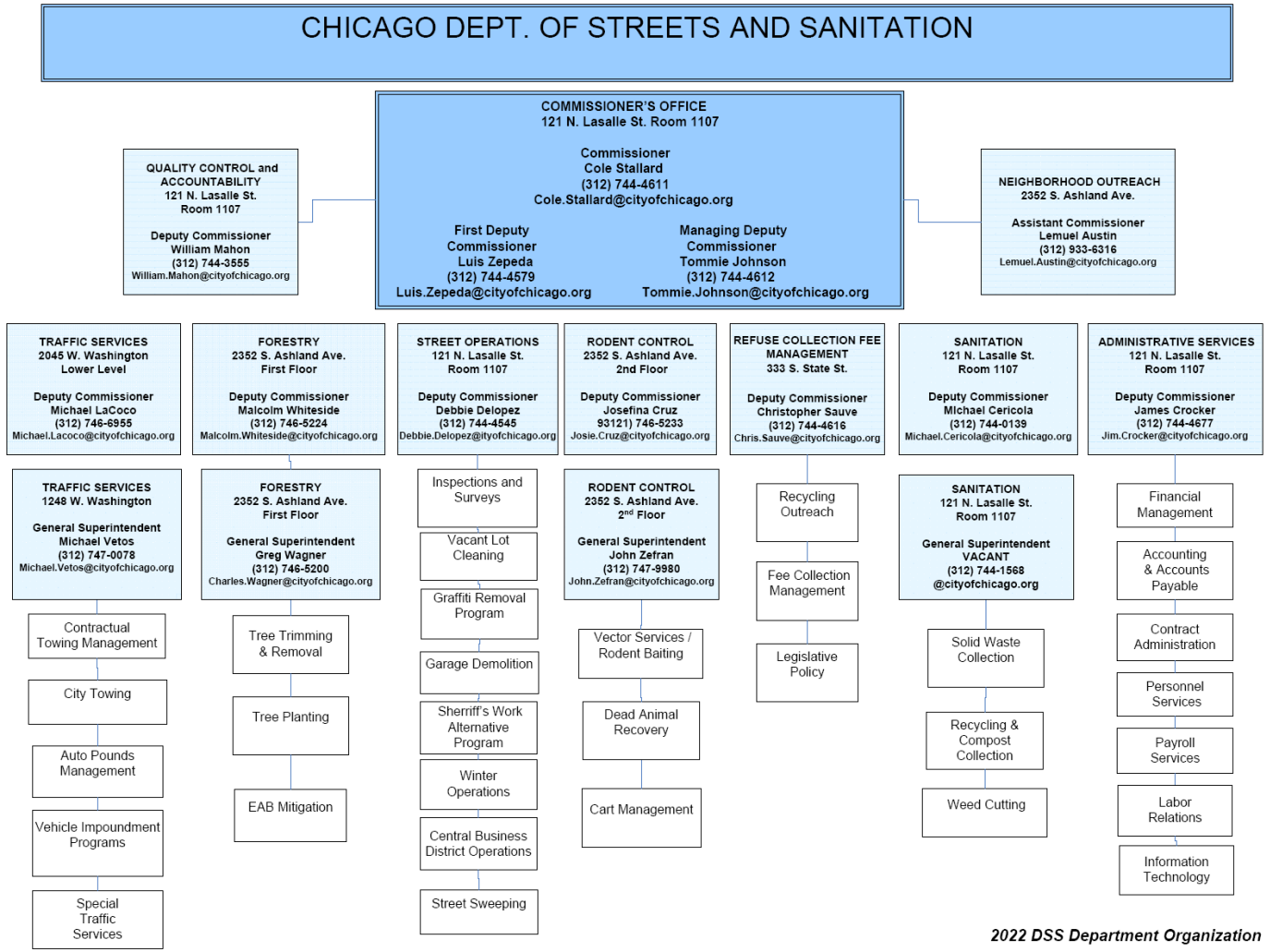
Title	2022	Vacancies (as of 4/14/22)
Assistant General Superintendent	1	-
Data Entry Operator	1	1
Deputy Commissioner	1	-
Dispatcher - Arborist	5	1
Executive Secretary I	1	-
Foreman of Motor Truck Drivers	5	-
Forestry Supervisor	6	1
General Superintendent	1	-
Motor Truck Driver	59	-
Pool Motor Truck Driver	18*	-
Senior City Forester	4	-
Staff Assistant	0	-
Training Agent I - Per Agreement	4	1
Tree Trimmer	117	6
Grand Total	**223**	**10**

Bureau of Forestry Budgeted Positions
(2011-2022)

Year	# of Budgeted Positions
2011	155
2012	159
2013	174
2014	168
2015	165
2016	218
2017	218
2018	207
2019	206
2020	209
2021	200
2022	223

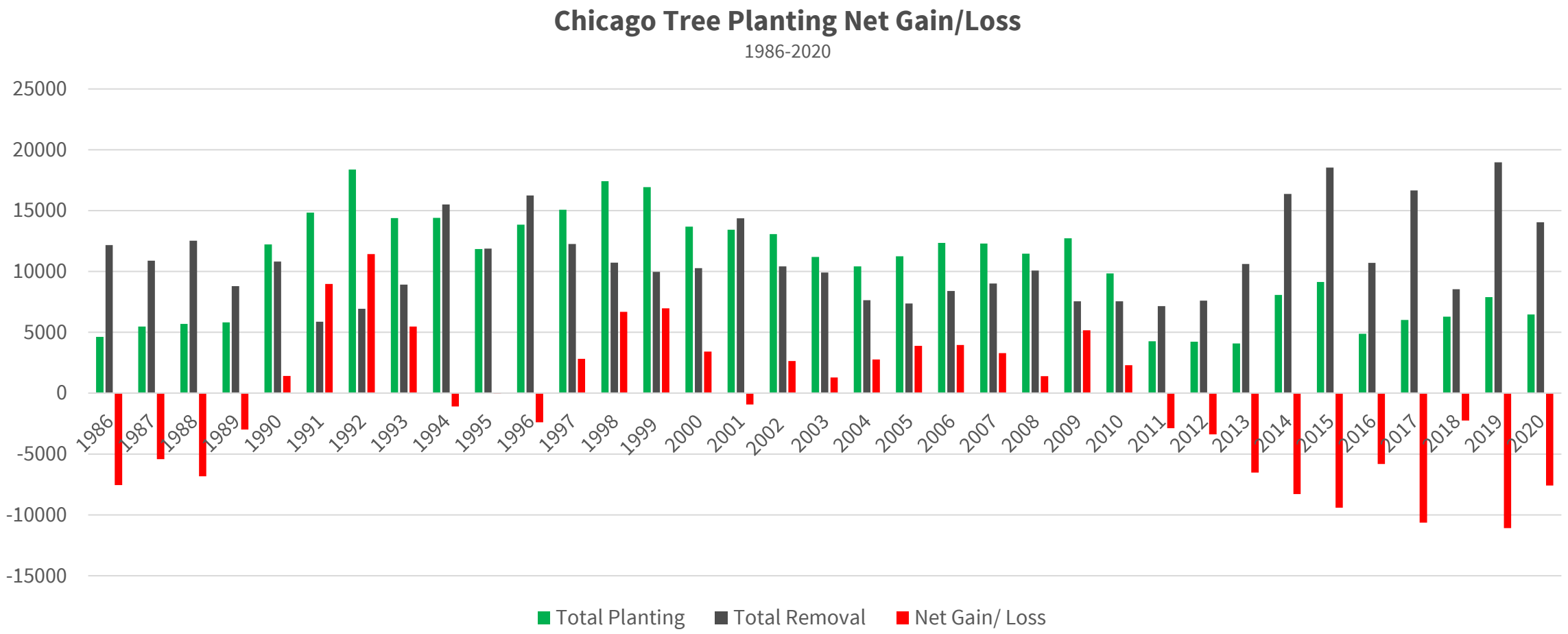
***** These positions are officially budgeted to BoF, but are currently loaned to use elsewhere within Dept. of Streets and Sanitation

Department of Streets and Sanitation Org Chart



2022 DSS Department Organization

Historical Tree Planting Figures



BoF by the Numbers

554,804

Street trees managed by BoF

220

Pieces of Forestry equipment

66%

Of Chippers down as of March 2022

67,500

Total 311 service requests (2021)

223

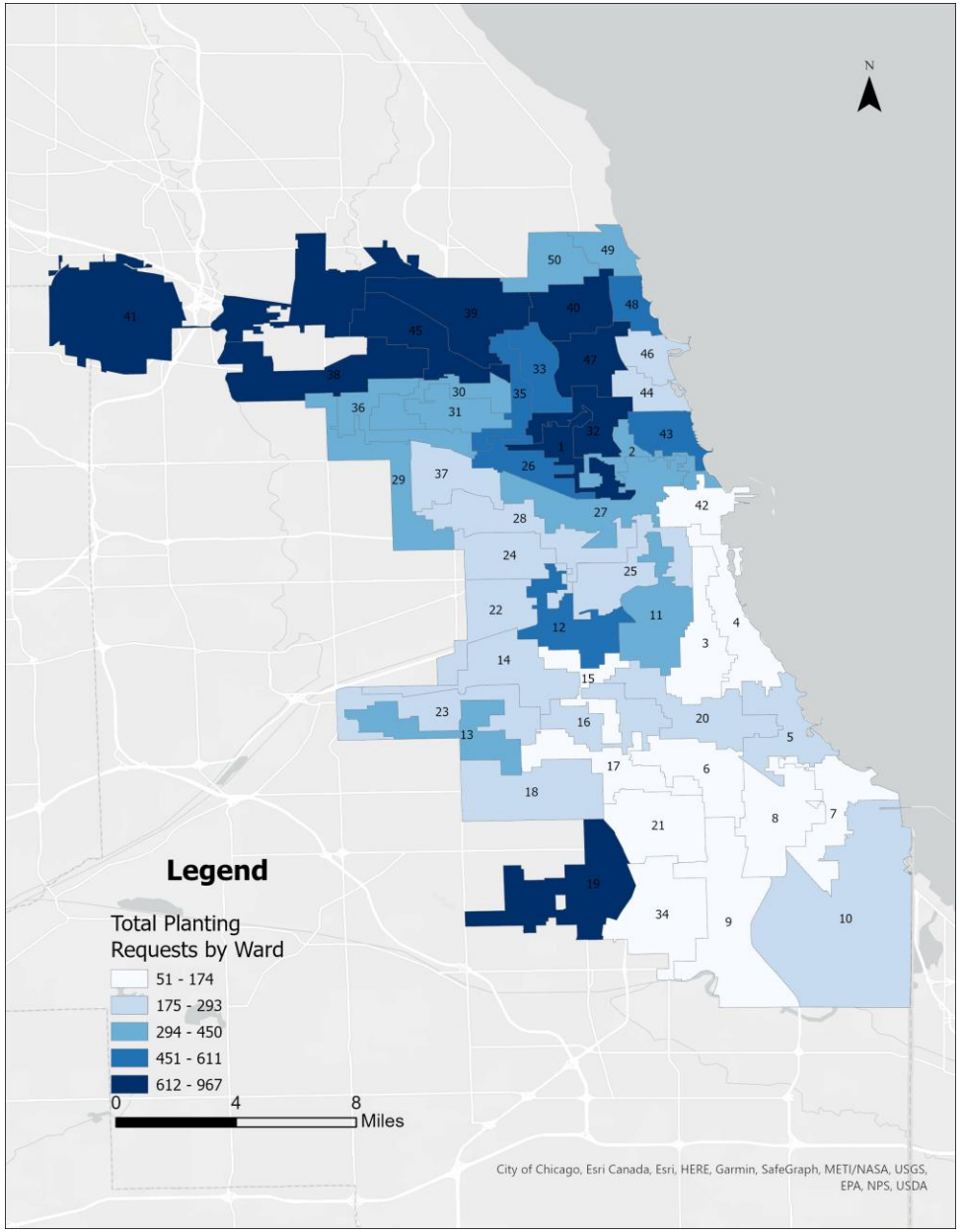
BoF current staff

~239%

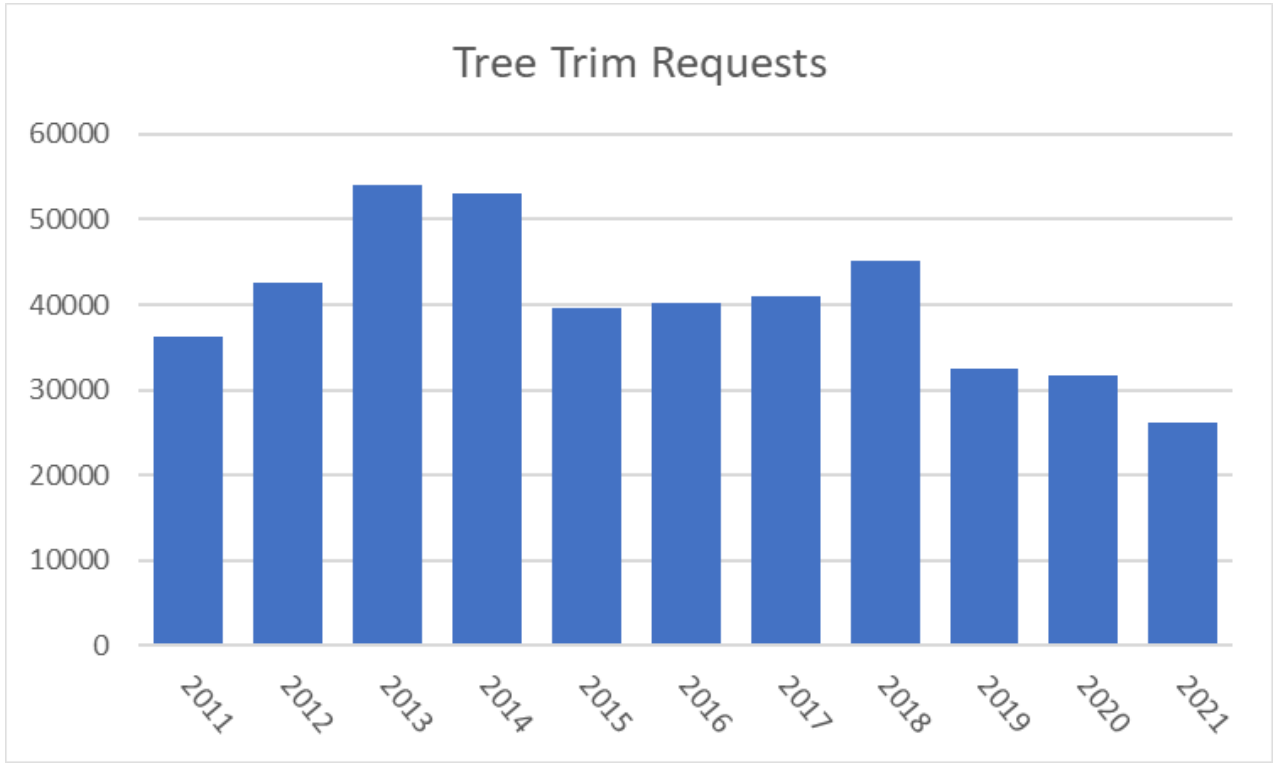
Increase in trees planted annually under new tree equity program

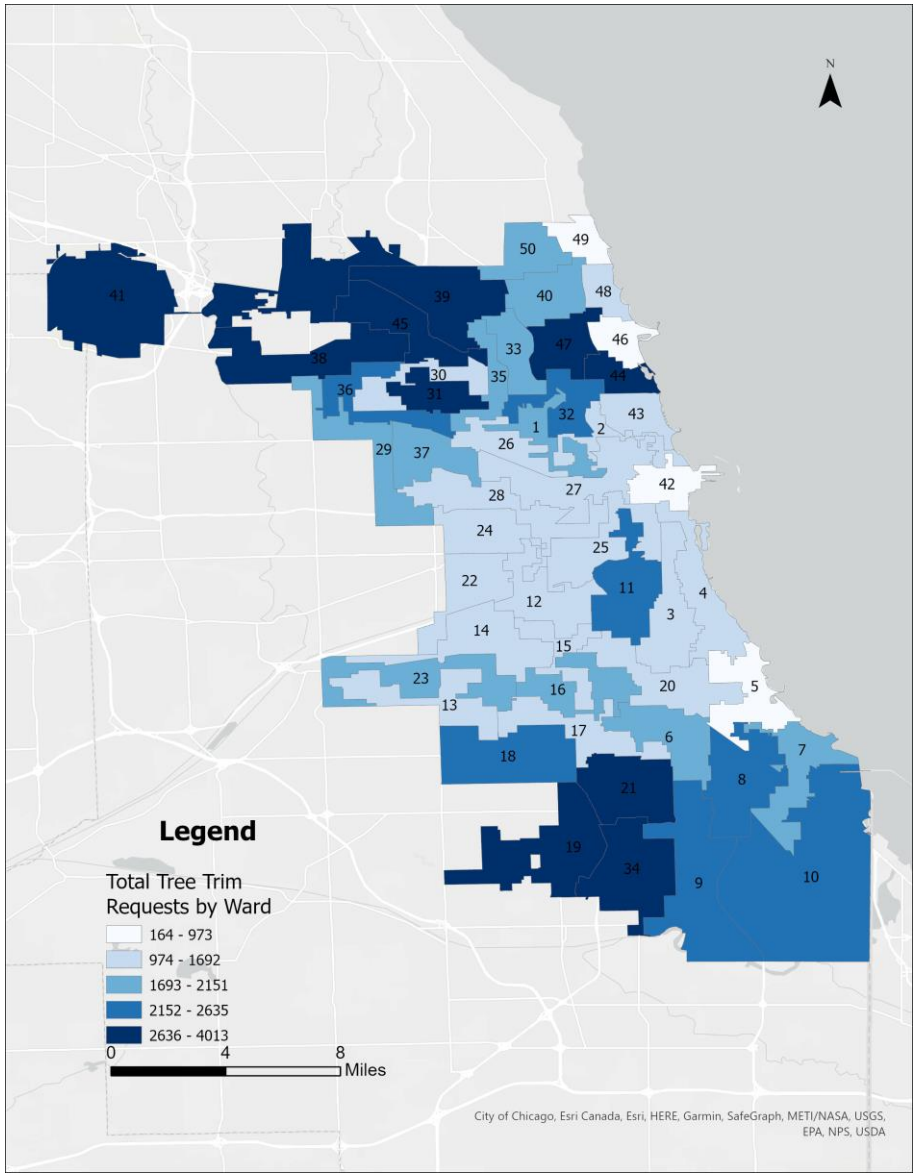
Chicago
Tree-related
311 Data

Tree Planting Requests

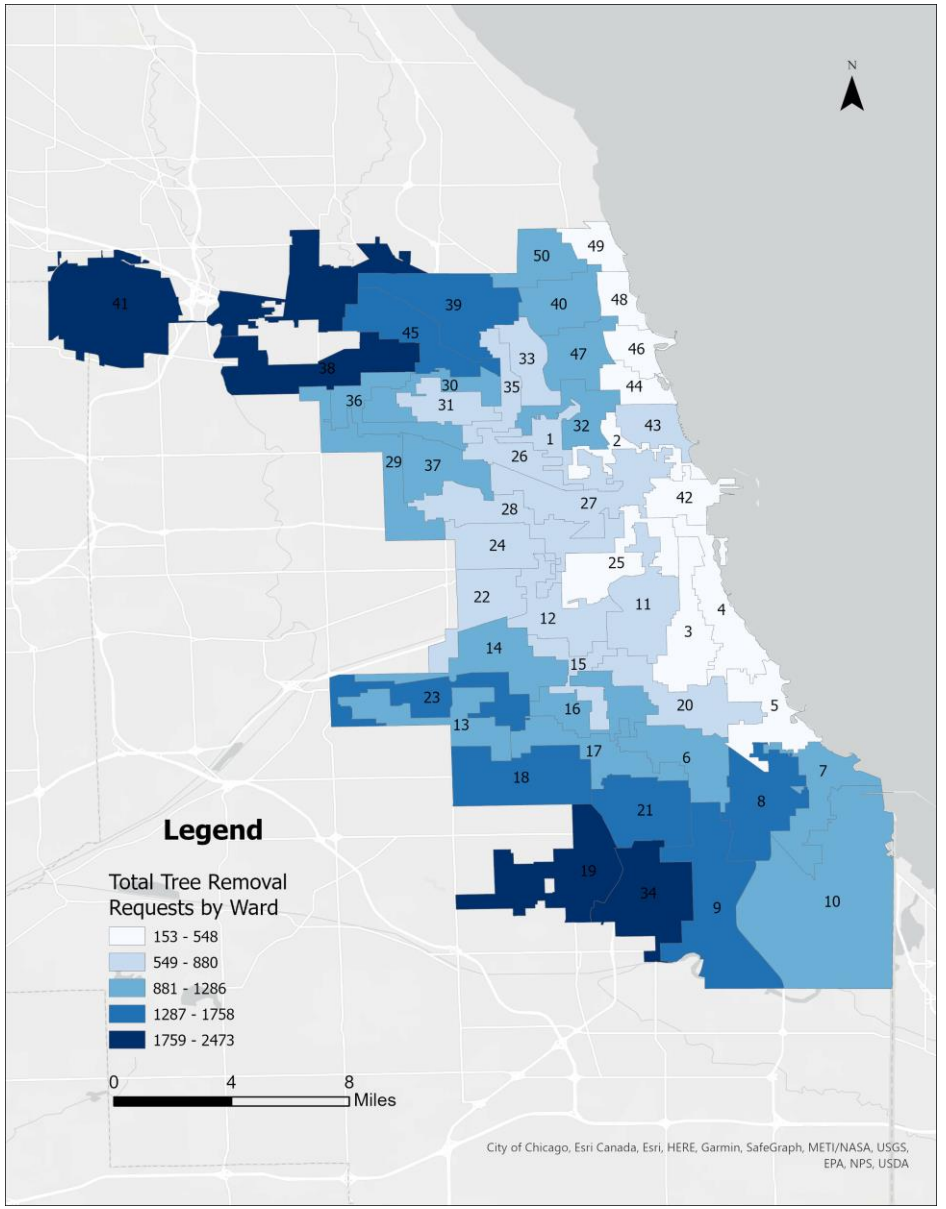


Tree Trim Requests

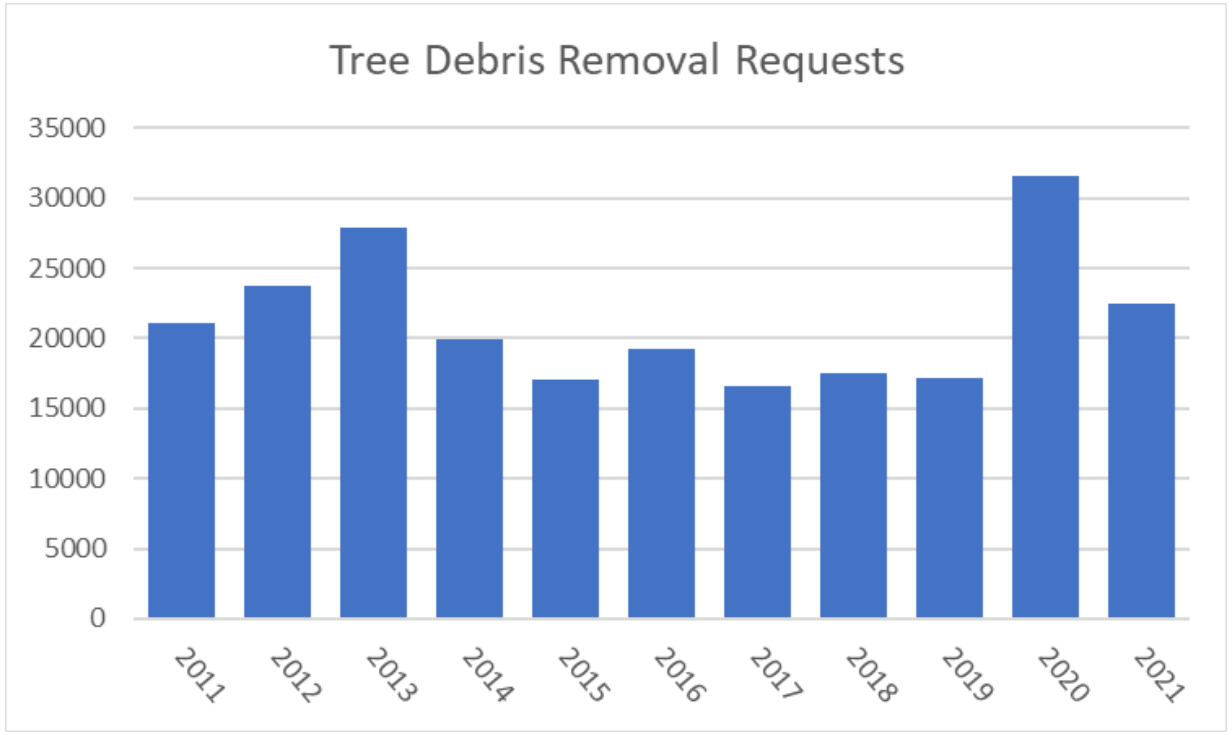


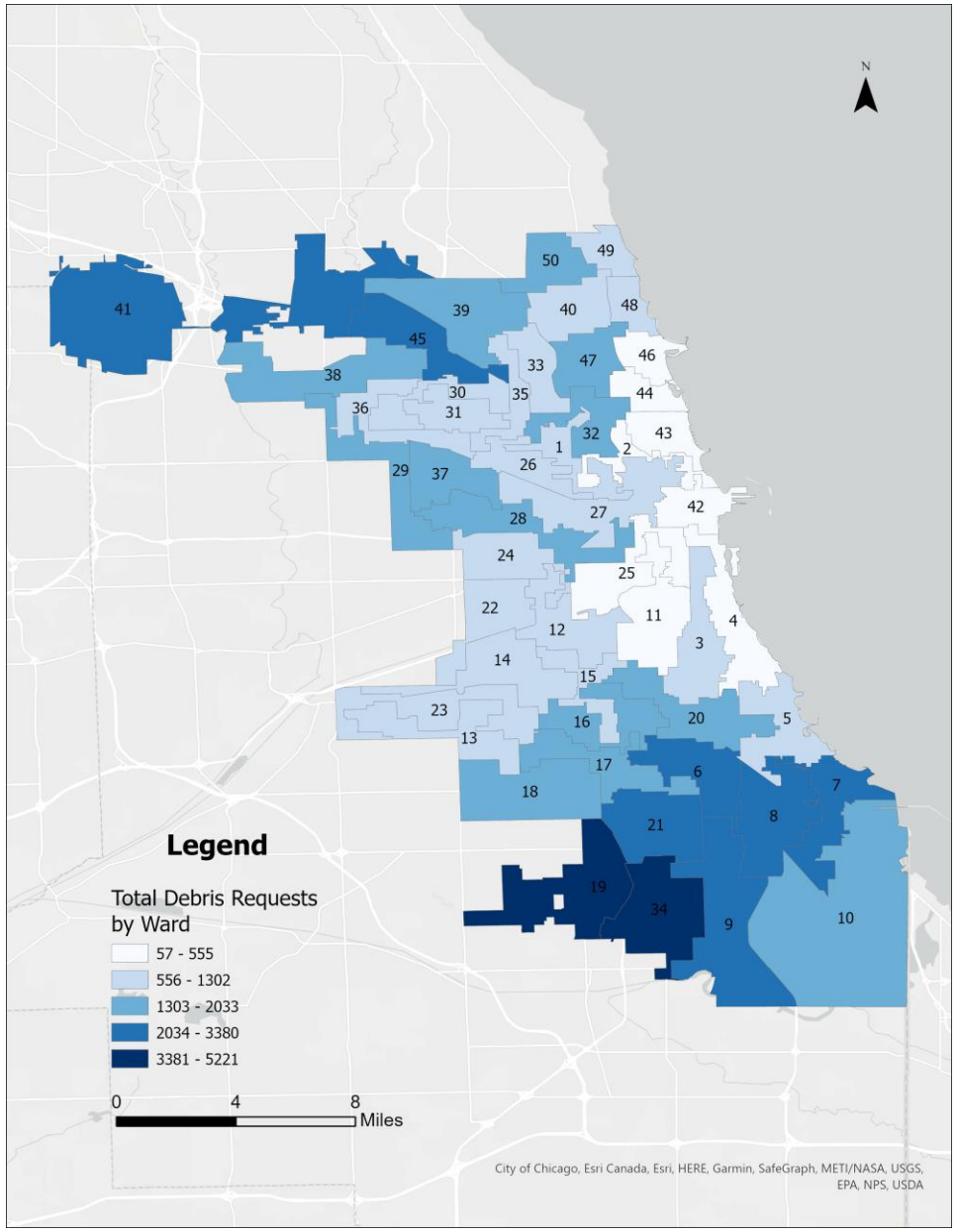


Tree Removal Requests

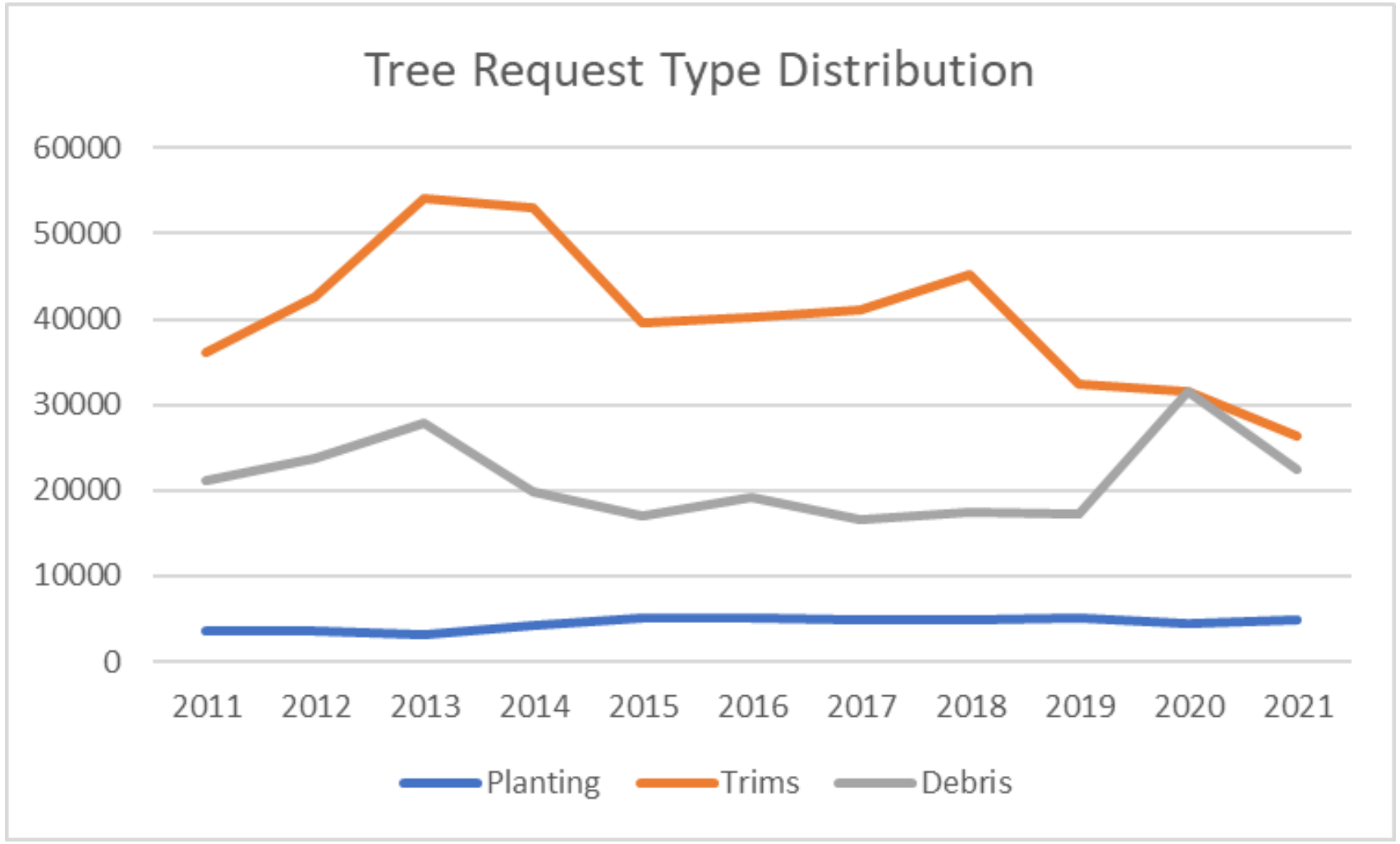


Tree Debris Removal Requests





Trends by Tree Request Type



No pre-2018 data available for tree removal requests

Summary of Open Requests Remaining 2018 – 2021

As of April 22nd, 2022

Open Requests in 2018

- Trim: 0
- Removal: 0
- Planting: 226
- Debris Removal: 0

Open Requests in 2019

- Trim: 65
- Removal: 0
- Planting: 2,296
- Debris Removal: 0

Open Requests in 2020

- Trim: 427
- Removal: 1,450
- Planting: 1,942
- Debris Removal: 0

Open Requests in 2021

- Trim: 22,440
- Removal: 3,268
- Planting: 3,147
- Debris Removal: 0

This may be more of a data systems issue than an operational capacity issue. A 311 request could be fulfilled but remain 'open' until the manual data entry step is completed to close out the request.