DAVEY Resource Group

November 2022

STANDARD INVENTORY ANALYSIS AND MANAGEMENT PLAN

Village of Franklin Park, Illinois

Prepared for:

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ACKNOWLEDGMENTS

This project supports the Village of Franklin Park's vision to promote and enhance community well-being through public tree conservation and improved forestry management practices. This *Standard Inventory Analysis and Management Plan* offers expertise in preserving and expanding urban canopy so the environmental, economic, and social benefits it provides continue for generations.

Franklin Park is thankful for the grant funding it received from the Chicago Region Trees Initiative (CRTI) and The Morton Arboretum in cooperation with U.S. Forest Service and the Illinois Department of Natural Resources (IDNR) through its Urban and Community Forestry (U&CF) Grant Program. The Illinois U&CF Grant Program is designed to encourage communities to create and support sustainable urban forestry programs throughout the United States.

Franklin Park also recognizes the support of its Mayor and Board of Trustees:

- Barrett F. Pedersen, Mayor
- Irene Avitia, Trustee
- Gil Hagerstrom, Trustee
- John Johnson, Trustee
- Bill Ruhl, Trustee
- Karen Special, Trustee
- Any Ybarra, Trustee

Additional staff involved and integral to the success of this project include:

- Andrew Smolen, Sustainability, Forestry, Parkways and Facilities Director

Five-Year Tree Resource Maintenance Schedule

EXECUTIVE SUMMARY

The Village of Franklin Park *Standard Inventory Analysis and Management Plan*, written by Davey Resource Group, Inc. "DRG", focuses on quantifying the benefits provided by the inventoried tree resource and addressing its maintenance needs. DRG completed a tree inventory for Franklin Park in June 2022 and analyzed the inventory data to understand the structure of the village's inventoried tree resource. DRG also estimated the economic values of the various environmental benefits provided by this public tree resource by analyzing inventory data with i-Tree Eco and recommended a prioritized management program for future tree care.

The functions of Franklin Park's inventoried tree population provide benefits with an estimated total value of $71,690 annually. The village's annual tree maintenance budget is $250,000, making Franklin Park's return on investment almost 29% annually. The functions of Franklin Park's inventoried tree population throughout its trees' lifetimes are worth an estimated $12,580,715. Supporting and funding proactive maintenance of the public tree resource is a sound long-term investment that will reduce tree management costs over time.

High priority tree removal and pruning is costly, accounting for the larger budget in Year 1 of the five-year schedule, as shown in Figure 1. After high priority work has been completed, budgets are expected to decrease and stabilize as tree management transitions from reactive to proactive maintenance. This also reduces the number of new elevated risk trees over time by preventing deteriorating conditions of trees with initial minor defects.

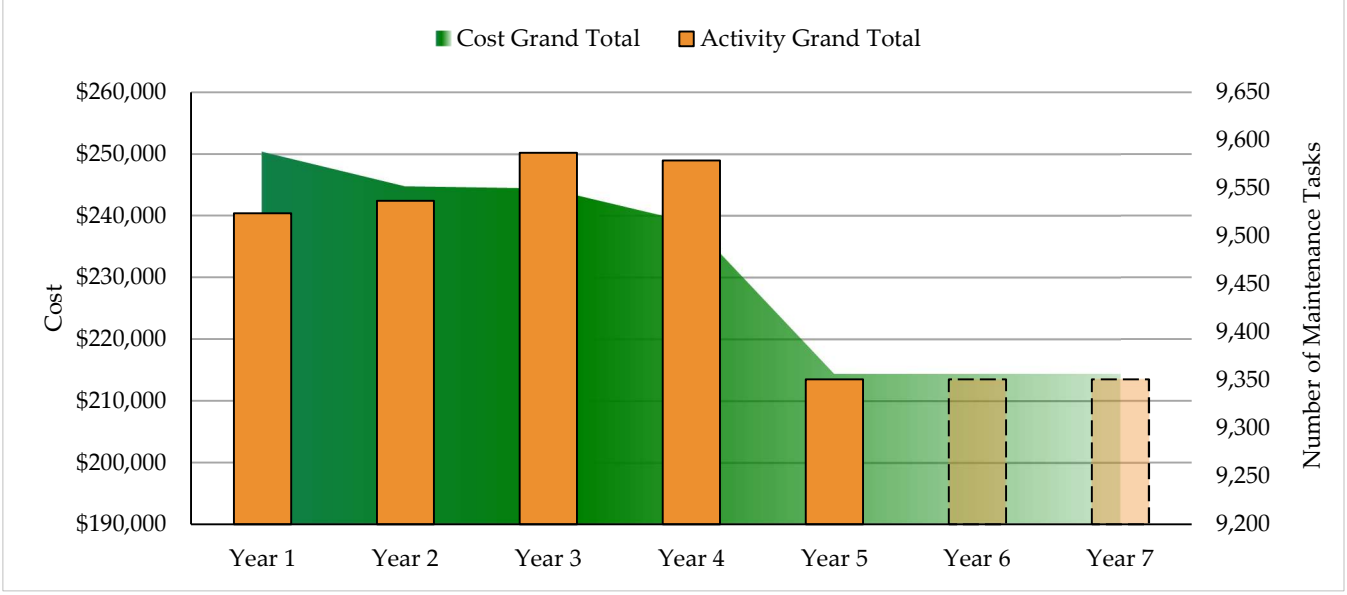


Figure 1. Five-year management program budget vs. labor over time with projection into future.

Recommended Maintenance Types

Tree Removal

Trees designated for removal have defects that cannot be cost-effectively or practically corrected. Most of the trees in this category have a large percentage of dead crown.

Total = 174 trees
High Priority = 2 trees
Moderate Priority = 37 trees
Low Priority = 135 trees
Stumps = 50

Priority Pruning

Priority pruning removes defects such as Dead and Dying Parts or Broken and/or Hanging Branches. Pruning the defected branch(es) can lower risk associated with the tree while promoting healthy growth.

Total = 50 trees
High Priority = 3 trees
Moderate Priority = 47 trees

Routine Pruning Cycle

Over time, routine pruning of Low and Moderate Risk trees can minimize reactive maintenance, limit instances of elevated risk, and provide the basis for a robust risk management program.

Total = 4,485 trees
Number in cycle each year = at least 897 trees

Young Tree Training Cycle

Younger trees can have branch structures that lead to potential problems as the tree ages, requiring training to ensure healthy growth. Training is completed from the ground with a pole pruner or pruning shear.

Total = 1,510 trees
Number in cycle each year = at least 503 trees

Tree Planting

Planting new trees in areas that have poor canopy continuity is important, as is planting trees where there is sparse canopy, to ensure that tree benefits are distributed evenly across the city.

Replacements after removals = 174 trees
Replacements after stump removals = 50 trees
Total new plantings = 224 trees

Routine Tree Inspection

Routine inspections are essential to uncovering potential problems with trees and should be performed by a qualified arborist who is trained in the art and science of planting, caring for, and maintaining individual trees.

Number in drive-by assessment cycle each year = near 6,281 trees
Number in walk-by assessment cycle each year = near 1,256 trees

INTRODUCTION

The Village of Franklin Park is home to 18,467 residents (U.S. Census Bureau 2020, retrieved from: https://www.census.gov/quickfacts/franklinparkvillageillinois) benefitting from public trees in their community. The village's urban forestry program manages all trees, stumps, and planting sites along the street rights-of-way (ROW) and throughout public properties. For 12 years, Franklin Park's staff in the Public Works Department have shown continued commitment to developing a thriving public tree resource.

Urban forestry program budgets are funded by village funds, grant funding, and property tax revenue. Franklin Park has a tree committee, a tree ordinance, spends more than $2 per capita on tree maintenance, celebrates Arbor Day, and has been a Tree City USA community for ten years.

Past urban forestry projects have demonstrated Franklin Park's dedicated commitment to sustaining the public tree resource with higher levels of tree care, earning the village one Tree City USA Growth Award. Franklin Park has one ISA Certified Arborist with a plan to certify more staff and will soon be able to set goals and perform proactive maintenance using this *Standard Inventory Analysis and Management Plan*. The village's urban forestry program is well on its way to creating a sustainable and resilient public tree resource, and it is important to stay on track by consistently renewing program funding and routinely updating the tree inventory.

RECOMMENDED APPROACH TO TREE MANAGEMENT

An effective approach to tree resource management follows a proactive and systematic program that sets clear and realistic goals, prescribes future action, and periodically measures progress. A robust urban forestry program establishes tree maintenance priorities and utilizes modern tools, such as a tree inventory accompanied by TreeKeeper® or other asset management software.

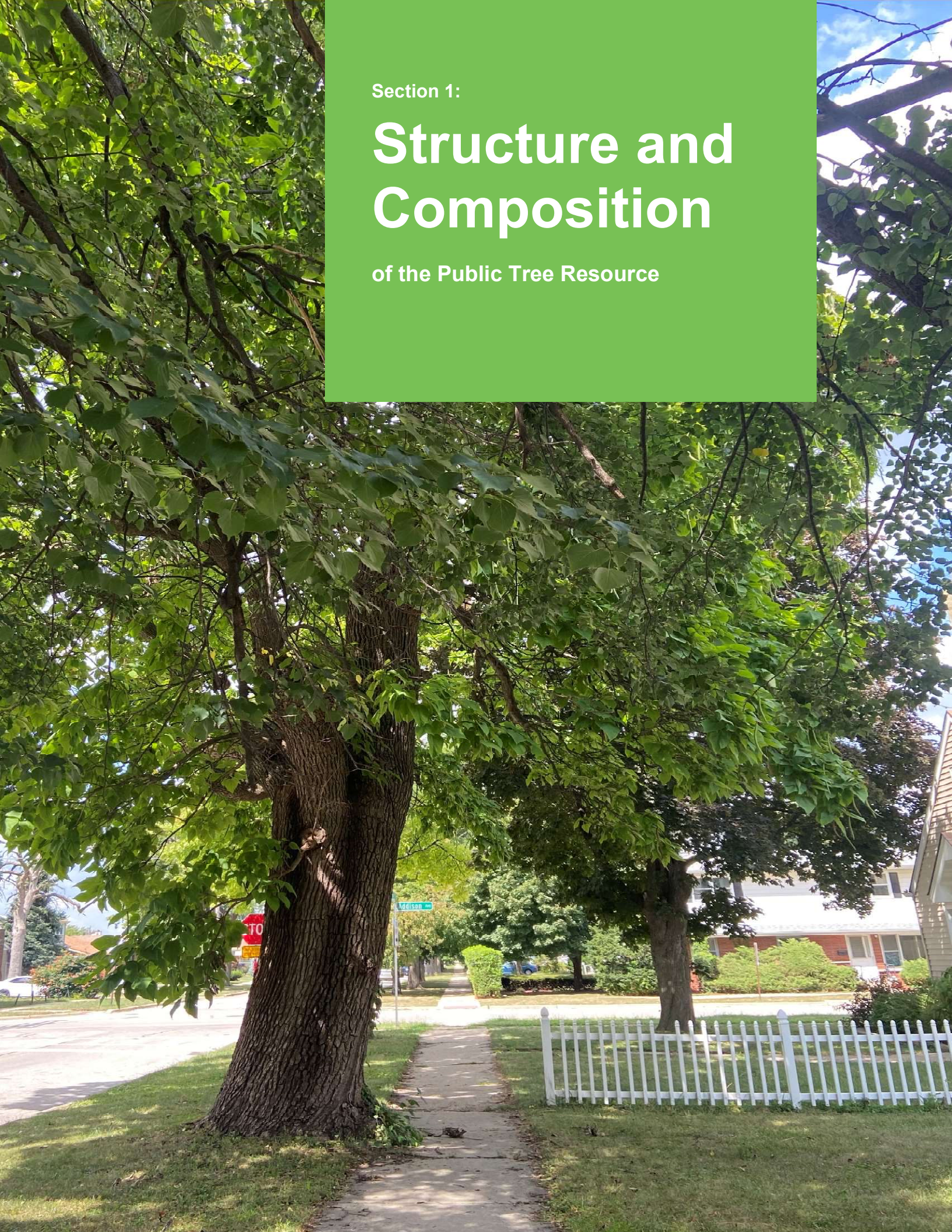
In June 2022, Franklin Park worked with DRG to inventory its public trees and develop this management plan. Consisting of three sections, this plan considers the diversity, distribution, and condition of the inventoried tree population and provides a prioritized system for managing the village's public tree resource.

- *Section 1: Structure and Composition of the Public Tree Resource* summarizes the inventory data with trends representing the current state of the tree resource.
- *Section 2: Functions and Benefits of the Public Tree Resource* summarizes the estimated value of benefits provided to the community by public trees' various functions.
- *Section 3: Recommended Management of the Public Tree Resource* details a prioritized management program and provides an estimated budget for recommended maintenance activities over a five-year period.

Section 1:

Structure and Composition

of the Public Tree Resource



SECTION 1: STRUCTURE AND COMPOSITION OF THE PUBLIC TREE RESOURCE

In June 2022, DRG arborists collected site data on trees and stumps along the street ROW and on city owned properties for a tree inventory contracted by the Public Works of the Village of Franklin Park. A total of 6,331 sites were inventoried. Figure 2 breaks down the total sites inventoried by type. See Appendix A for details about DRG's methodology for collecting site data.

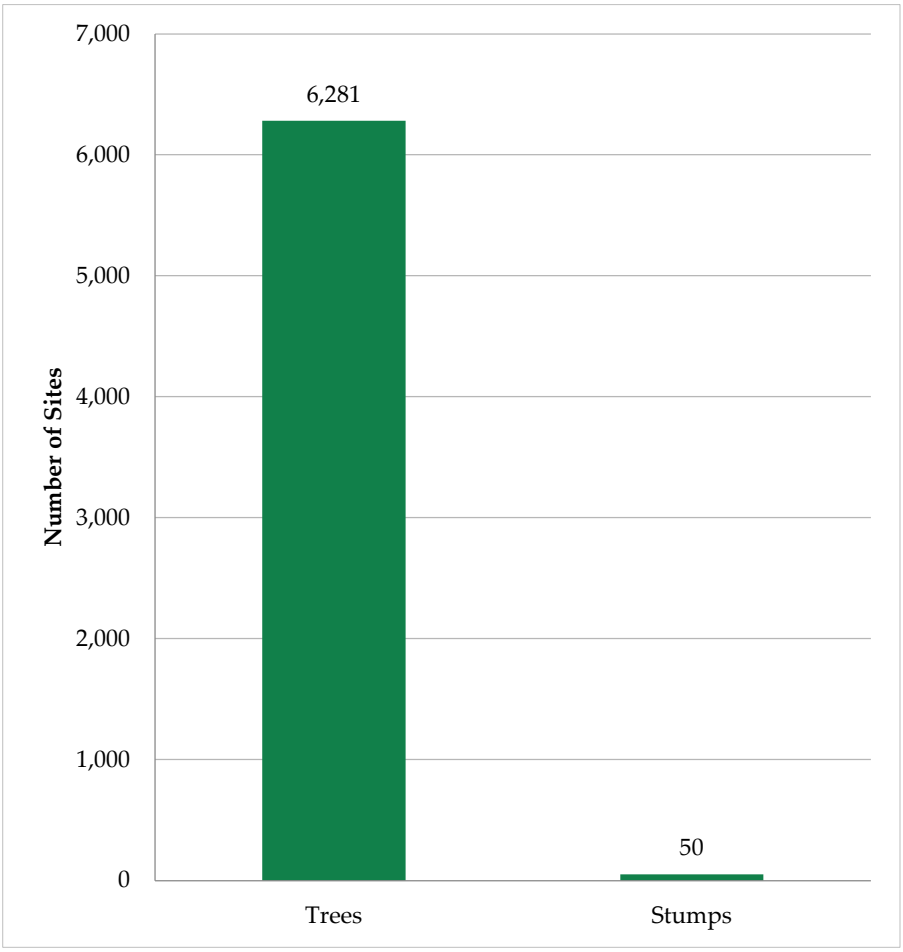


Figure 2. Number of inventoried sites by location and type.

The Village of Franklin Park designated 7 city-owned properties for DRG to collect site data for the tree inventory. These properties include: Village Hall, Village Square, Police Department, Utilities Department, City Arboretum, detention pond on Nevada Avenue and 25th Avenue, and the Jack B. Williams Reservoir Structure.

SPECIES, GENUS, AND FAMILY DISTRIBUTION

The 10-20-30 rule is a common standard for tree population distribution, in which a single species should compose no more than 10% of the tree population, a single genus no more than 20%, and a single family no more than 30% (Santamour 1990).

Figure 3 shows Franklin Park's distribution of the most abundant tree species inventoried compared to the 10% threshold. Norway maple (*Acer platanoides*) is the most abundant species at 16% of the total population. Thornless honeylocust (*Gleditsia triacanthos inermis*) and silver maple (*Acer saccharinum*) are 13% and 11%, respectively, of the total population. All three of these species are above the 10% threshold. It is recommended that Franklin Park refrains from planting these three species until the population levels even out.

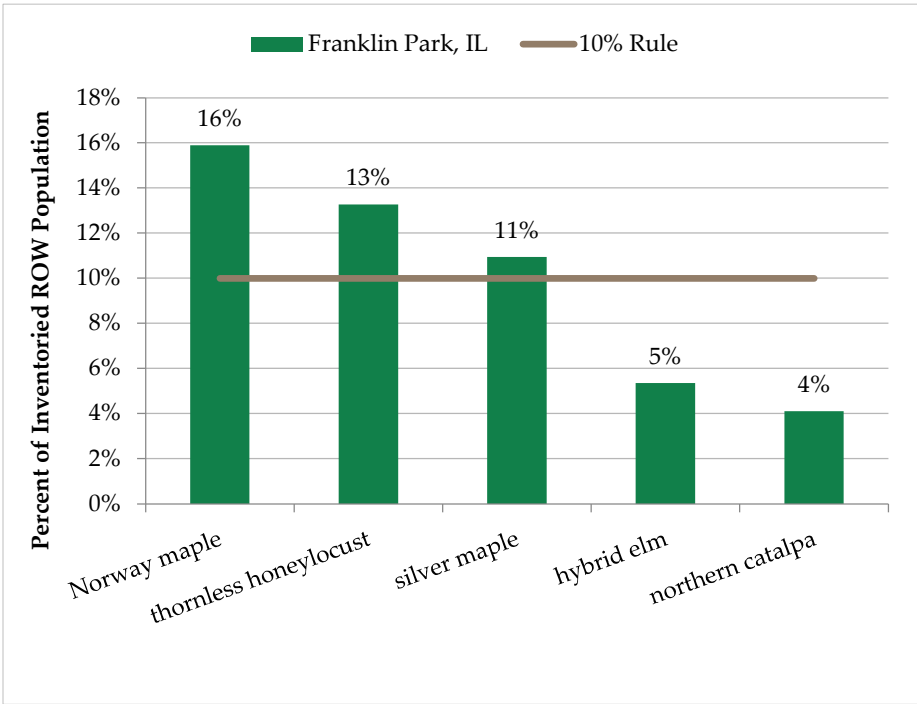


Figure 3. Species distribution of inventoried trees.

However, Figure 4 shows Franklin Park's distribution of the most abundant tree genera inventoried, and maple (*Acer*) is significantly higher than the 20% threshold. This means that Norway maple is concerning after all, because maple compose 36% of the inventoried population. For this reason, the Village of Franklin Park should not plant Norway or any other maple species until this distribution becomes more ideal.

RESILIENCE THROUGH DIVERSITY

The Dutch elm disease epidemic of the 1930s provides a key historical lesson on the importance of diversity (Karnosky 1979). The disease killed millions of American elm trees, leaving behind enormous gaps in the urban canopy of many Midwestern and Northeastern communities. In the aftermath, ash trees became popular replacements and were heavily planted along city streets. History repeated itself in 2002 with the introduction of the emerald ash borer into America. This invasive beetle devastated ash tree populations across the Midwest. Other invasive pests spreading across the country threaten urban forests, so it's vital that we learn from history and plant a wider variety of tree genera to develop a resilient public tree resource.

Ash trees in an urban forest killed by emerald ash borer.

USDA Forest Service (2017)

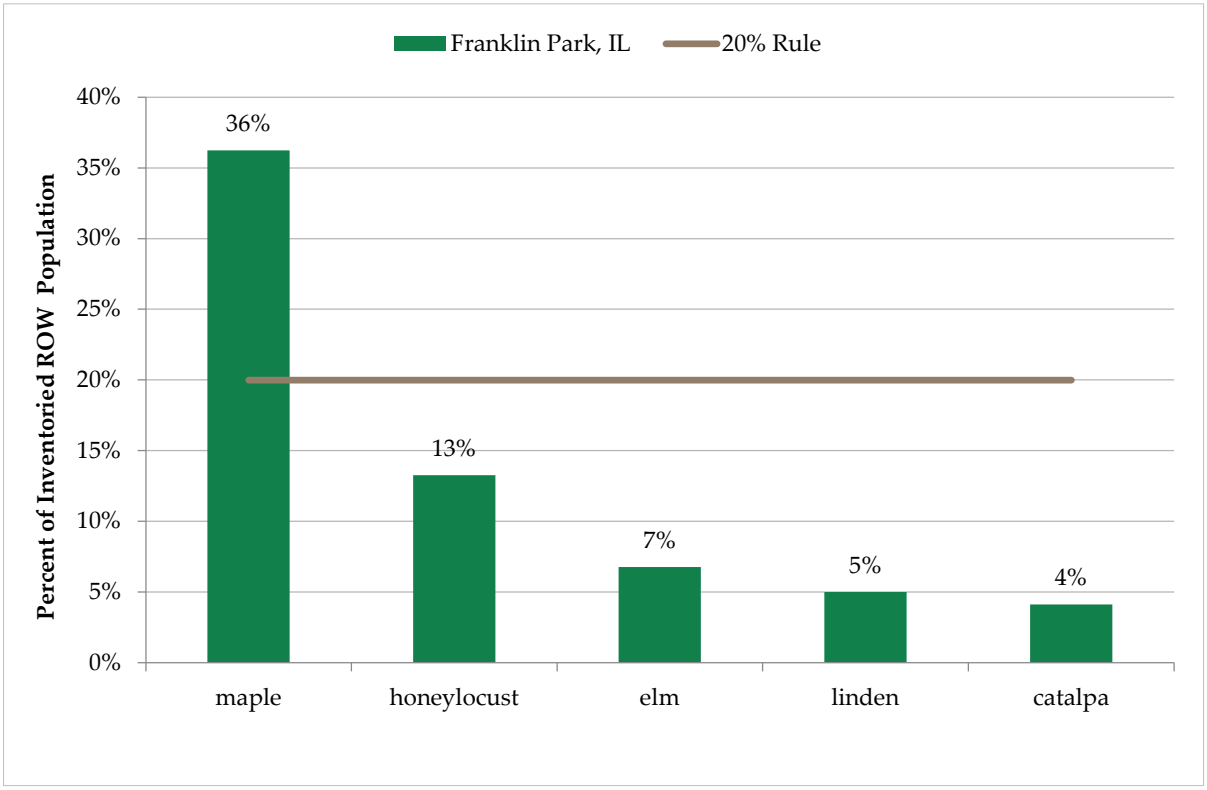


Figure 4. Genus distribution of inventoried trees.

This illustrates how species distribution alone does not completely represent tree population diversity. Genus distribution is an important consideration because some pests, such as emerald ash borer (EAB, *Agrilus planipennis*), target a single genus as its host. Some pests also target a single family as its host, such as the bacterium *Erwinia amylovora*, commonly known as fireblight. Fireblight only affects plants in the rose family (*Rosaceae*), such as serviceberry, hawthorn, apple/crabapple, hawthorn, cherry/plum, and pear.

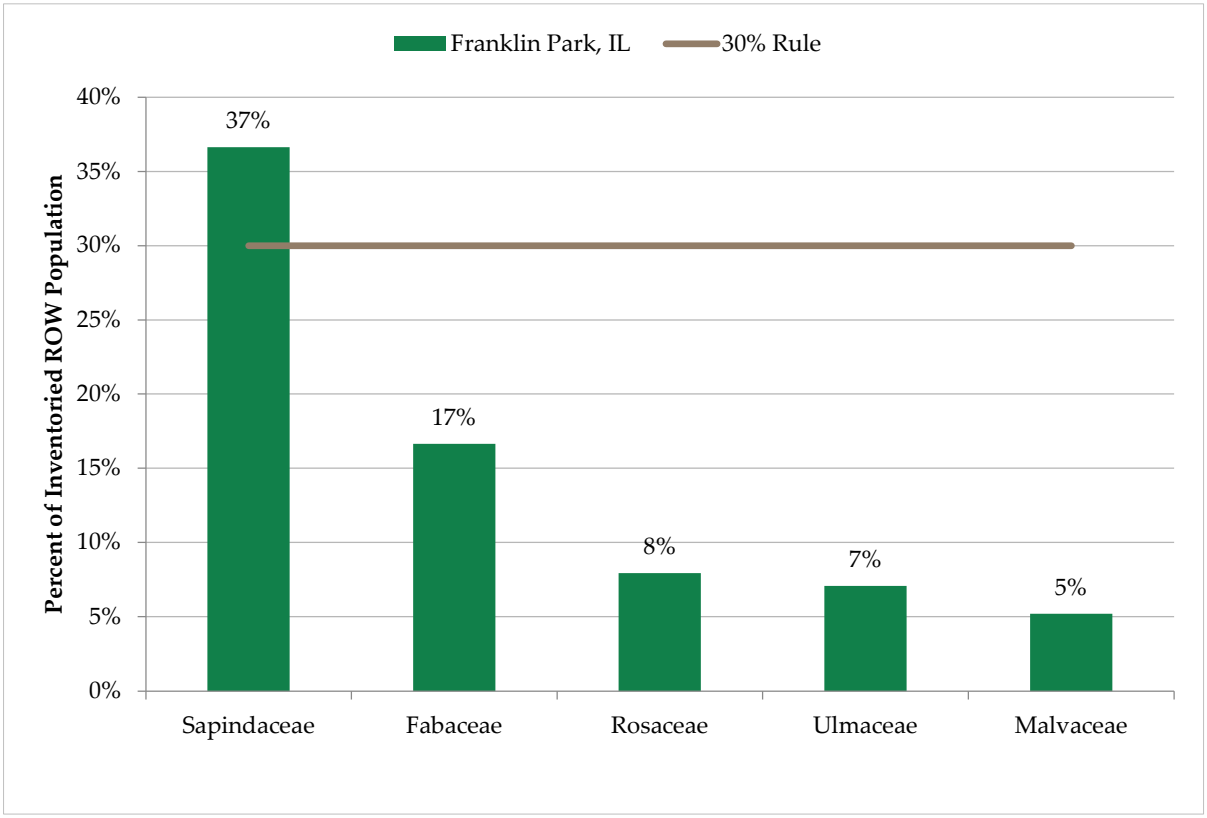


Figure 5. Family distribution of inventoried trees.

Figure 5 shows Franklin Park's distribution of the most abundant tree families inventoried compared to the 30% threshold. While Fabaceae (17%) is fairly far from the threshold, Sapindaceae (37%) is the only family composing a greater proportion of the inventoried population, which is exceeding the threshold. All other families are far below the recommended limit.

PEST SUSCEPTIBILITY

Early diagnosis of disease and infestation is essential to ensuring the health and continuity of Franklin Park's public tree resource. See Appendix B for some information about the pests listed below and websites where additional information can be found.

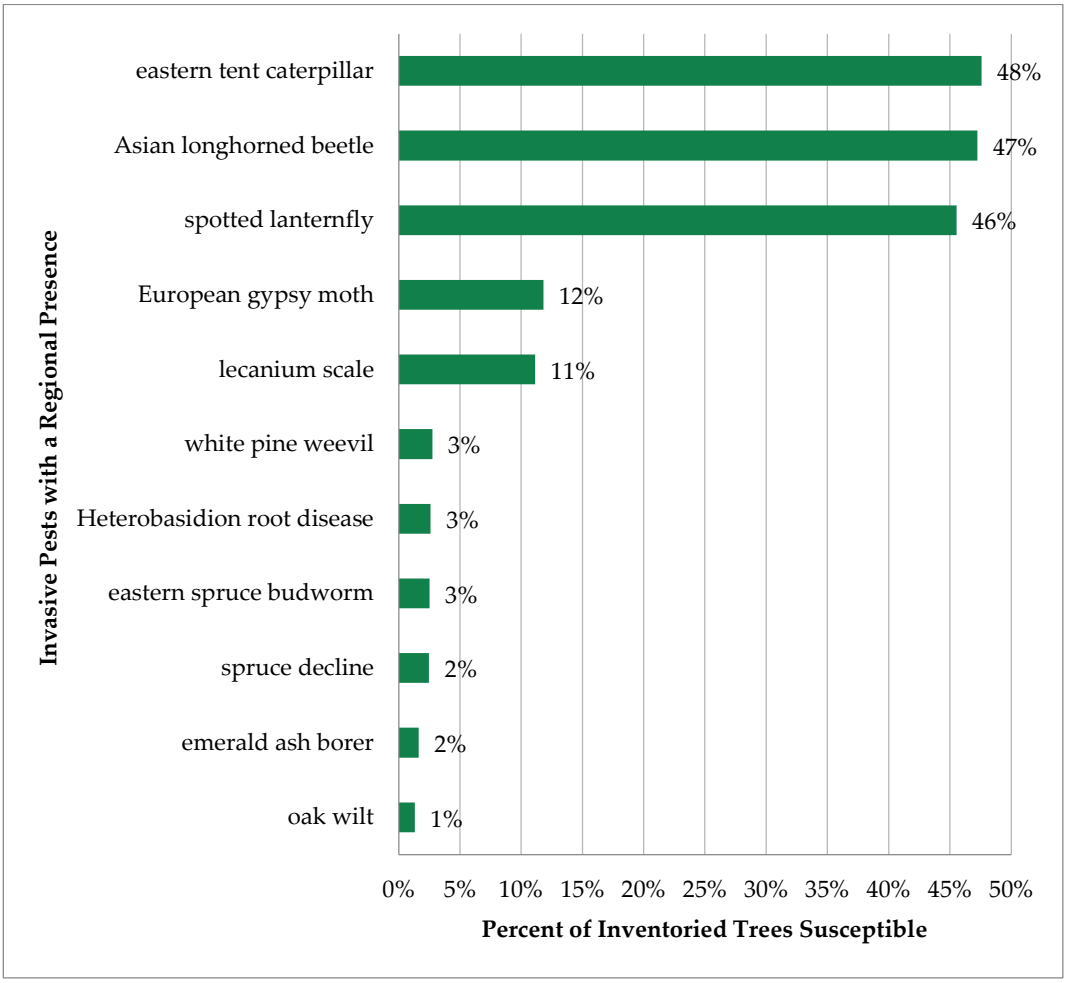


Figure 6. Tree resource susceptibility to invasive pests that have a regional presence.

Figure 6 shows the percent of inventoried trees susceptible to some of the known pests in and around Illinois. It is important to remember that this figure only represents data collected during the inventory. Many more trees throughout Franklin Park, especially those on private property, may be susceptible to hosting these invasive pests. Eastern tent caterpillar (ETC, *Malacosoma americanum*), Asian longhorned beetle (ALB, *Anoplophora glabripennis*), and spotted lanternfly (SLF, *Lycorma delicatula*) are known threats to a large percentage of the inventoried tree resource, 48%, 47%, and 46%, respectively.

Pest Susceptibility Recommendations

The overabundance of maple in Franklin Park's tree resource is a management concern because it creates unnecessary risk in the event of an invasive pest outbreak. This abundance is not only more tree resource to lose but is also more habitat for the pests it is susceptible to, such as ETC, ALB, or SLF, making it easier for them to breed and spread. While other genera besides maple (*Acer*) are susceptible to these pests, they are a much smaller proportion of the inventoried tree population. Increasing species diversity is a critical goal that will help Franklin Park's tree resource be resilient in the event of future pest invasions.

While it might be important for Franklin Park to limit planting species at the family level to prevent anyone family from approaching the 30% threshold, efforts to improve diversity at the genus and species level are a better use of short-term resources until more research is done on family diversity as a mechanism for promoting system resilience. For this reason, Franklin Park should use its resources to inspect trees in the *Acer* genus for signs of infestation on a routine basis, so affected trees can be quarantined to contain the pest before an outbreak starts.

CONDITION

Several factors affecting condition were considered for each tree, including root characteristics, branch structure, trunk, canopy, foliage condition, and the presence of pests. The condition of each inventoried tree was rated by an ISA Certified Arborist as Good, Fair, Poor, or Dead. The general health of the inventoried tree population was characterized by the most prevalent condition assigned during the inventory.

Figure 7 shows most of the inventoried trees were recorded in Good or Fair condition, 40% and 56%, respectively. Based on this data, the general health of the inventoried tree population is rated as Fair. Franklin Park has a low percentage of Dead trees and trees in Poor condition, so the general health of the village's tree resource is approaching Good.

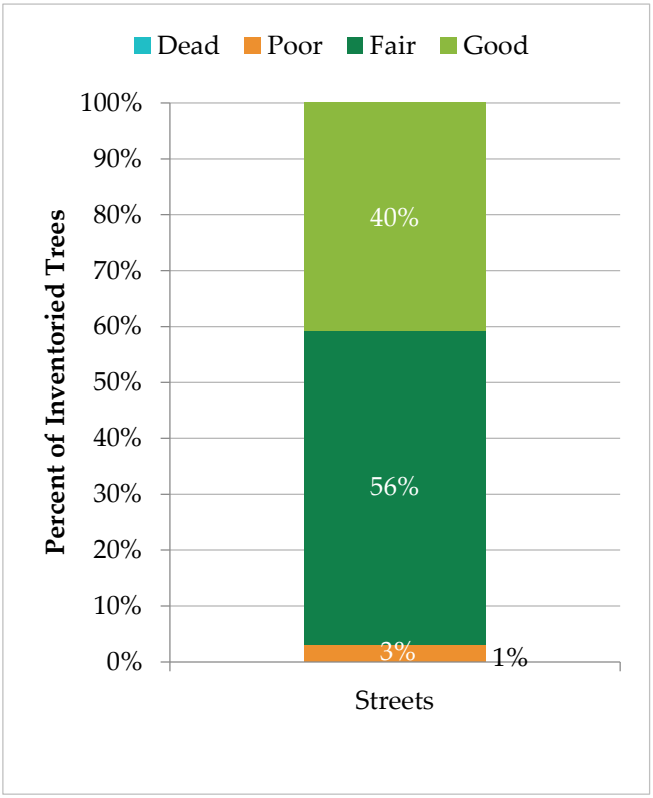


Figure 7. Condition of inventoried trees.

Condition Recommendations

- Dead trees and irreparable trees in Poor condition should be removed as soon as possible, because the health of these trees is unlikely to recover even with increased care and present a risk.
- Younger trees rated in Fair or Poor condition may benefit from structural pruning to improve their health over time. Pruning should follow *ANSI A300 (Part 1)* guidelines.
- Poor condition ratings among mature trees were generally due to visible signs of decline and stress, including decay, dead limbs, sparse branching, or poor structure. These trees will likely require corrective pruning and intensive plant health care to improve their vigor and should be monitored for worsening conditions.
- Trees in Fair condition may benefit from pruning to remove dead or defective limbs and may return to Good condition with time and care.

RELATIVE AGE DISTRIBUTION

Analysis of a tree population's relative age distribution is performed by assigning age classes to the size classes of inventoried trees, offering insight into the maintenance needs of Franklin Park's tree resource. The inventoried trees are grouped into the following relative age classes:

- Young trees (0–8 inches diameter at breast height (DBH))
- Established trees (9–17 inches DBH)
- Maturing trees (18–24 inches DBH)
- Mature trees (greater than 24 inches DBH)

These size classes were chosen so that the inventoried tree resource can be compared to the ideal relative age distribution, which holds that the largest proportion of the inventoried tree population (approximately 40%) should be young trees, while the smallest proportion (approximately 10%) should be mature trees (Richards 1983). Since tree species have different lifespans and mature at different diameters, actual tree age cannot be determined from diameter size class alone, yet size classifications can be extrapolated into relative age classes.

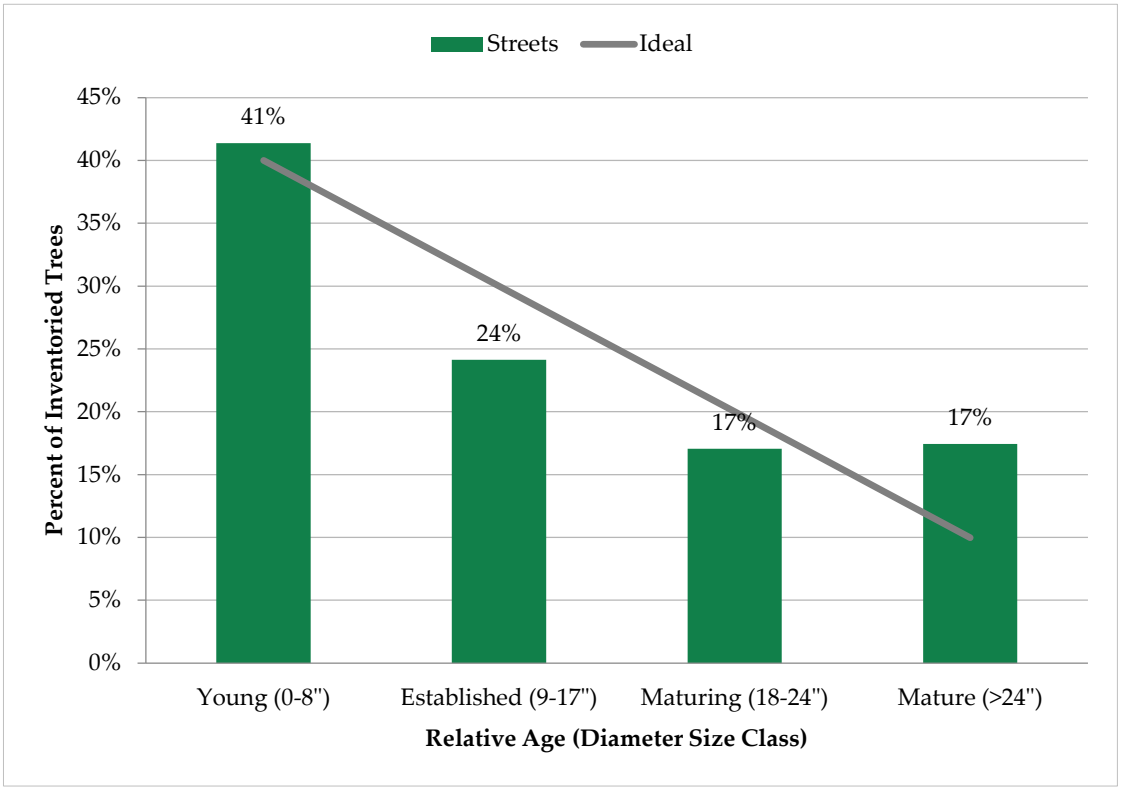


Figure 8. Relative age distribution of inventoried trees.

Figure 8 compares Franklin Park's relative age distribution of the inventoried tree population to the ideal. Franklin Park's inventoried tree resource is trending towards the ideal; however, both young and mature trees exceed the ideal by 1% and 7%, while established and maturing trees fall short by 6% and 3%.

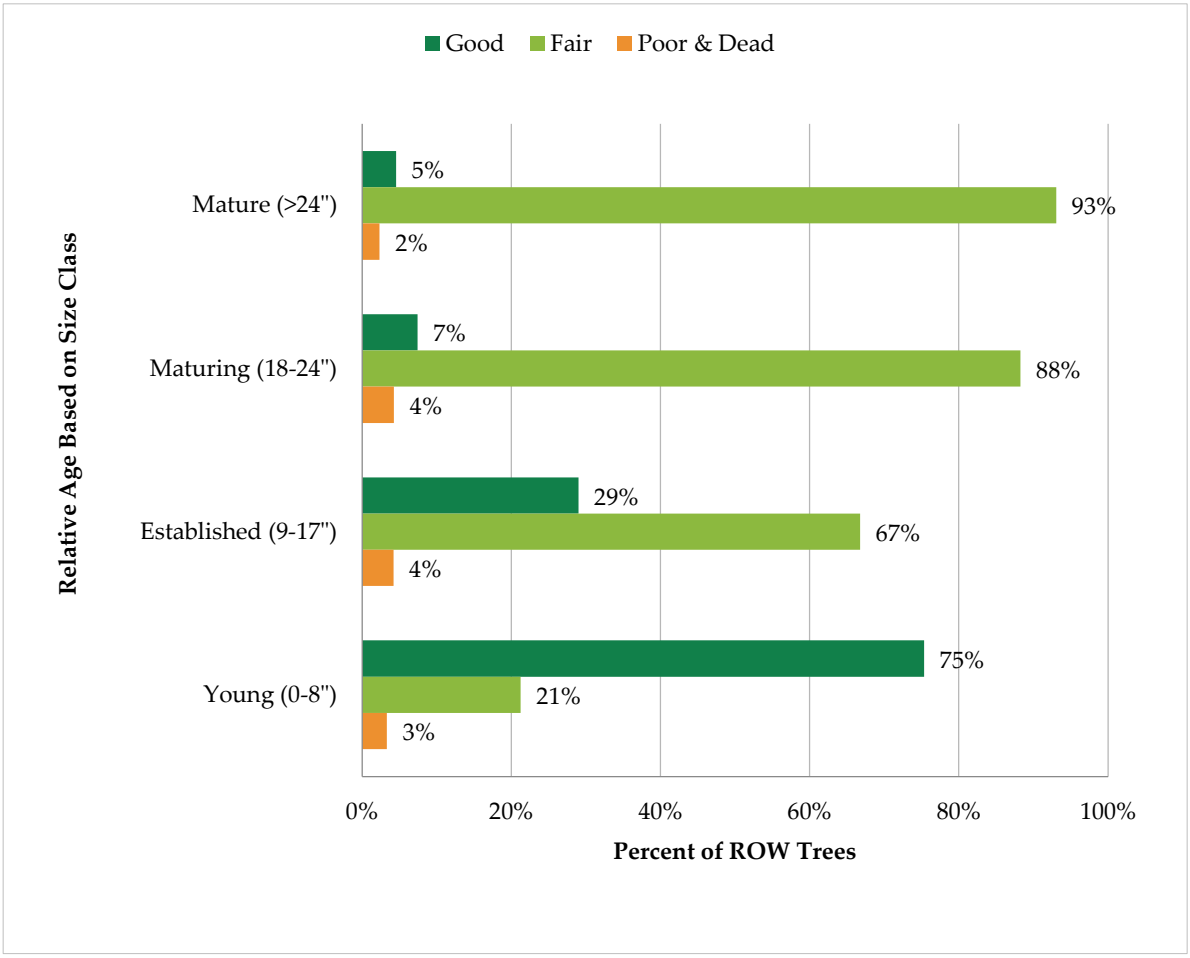


Figure 9. Condition of inventoried trees by relative age class.

Figure 9 cross analyzes the condition of the inventoried tree resource with its relative age distribution, providing insight into the inventoried population's stability. 98% of mature trees and 95% of maturing trees are rated in Fair condition or better, which matters because these larger trees would have a more damaging impact in the event of failure. 96% of both established trees and young trees are rated in Fair condition or better, so it is important to provide the maintenance they need to remain healthy as they age and grow, to reduce the proportion of mature and maturing trees in Poor condition or worse.

Relative Age Recommendations

While Franklin Park has an excess of young trees and a shortage of established trees, the village has a low percentage of trees in Poor condition, indicating that young trees have the potential of reaching maturity if they are well maintained. DRG recommends that Franklin Park implement a robust maintenance program, to conserve the condition of young trees as they age so they replace removed trees and fill canopy gaps in maturity. The village should also focus on tree preservation and proactive care, to protect mature and maturing trees from unnecessary removal and to prevent them from succumbing to treatable defects. Prioritizing proactive maintenance above tree planting will shift the relative age distribution towards the ideal over time.

DEFECT OBSERVATIONS

For each tree inventoried, DRG assessed conditions indicating the presence of structural defects and recorded the most significant condition. Table 1 shows the defects observed during data collection.

Table 1. Tree defect categories recorded during the inventory

Defect	Street Trees	Percent of Street Trees
Broken and/or Hanging Branches	14	0%
Cracks	10	0%
Dead and Dying Parts	3,585	57%
Decay/cavity	51	1%
None	46	1%
Trunk Condition	35	1%
Root Problems	32	1%
Tree Architecture	2,367	38%
Branch Attachment	141	2%
Total	**6,281**	**100%**

The two most frequently recorded defect categories were Dead and Dying Parts and Tree Architecture at 57% and 38% of inventoried trees, respectively (Table 1). Of the 3,585 trees with Dead & Dying Parts, 135 were recommended for removal.

Defect Observation Recommendations

When considering the defect recorded for each tree, there are two important qualifiers to keep in mind. First, the categories are broadly inclusive. For example, the "Dead and Dying Parts" category can include trees with just one or two smaller diameter dead limbs as well as trees found with large-diameter dead limbs or entire sections of dead canopy. Therefore, inferences on overall tree condition or risk rating cannot be derived solely from the presence or absence of a defect recorded during the inventory. Second, an inventoried tree may have multiple defects; the 2022 Franklin Park inventory recorded only the most significant defect observed for each tree. These two qualifiers are important to keep in mind when considering urban forest management planning and the prioritization of maintenance or monitoring activities.

INFRASTRUCTURE CONFLICTS

In an urban setting, space is limited both above and below ground. Trees in this environment may conflict with infrastructure, such as buildings, sidewalks, utility wires, and pipes, which could pose risks to public safety. Existing or possible conflicts between trees and infrastructure recorded during the inventory include:

- *Overhead Utilities*—The presence of overhead utility lines above a tree or stump was noted; it is important to consider these data when planning pruning activities and selecting tree species for planting.

Table 2. Tree conflicts with overhead infrastructure recorded during the inventory

Overhead Utilities	Street Trees	Percent of Street Trees
Present and Conflicting	812	13%
Present and Not Conflicting	946	15%
Not Present	4,573	72%
Total	**6,331**	**100%**

Table 2 shows 13% of street trees had overhead utilities present and were conflicting with them. There were 15% of street trees with utilities directly above, but they were not directly conflicting with them. Finally, 72% of the street trees had no overhead utilities present.

Infrastructure Recommendations

When planting around infrastructure, it is important to give the tree enough growing room above and below ground. The useful life of a public tree ends when the cost of maintenance exceeds the value contributed by the tree. This can be due to increased maintenance required by a tree in decline, or it can be due to the costs of repairing damage caused by the tree's presence in a restricted site. To prolong the useful life of street trees, the following guidelines are recommended.

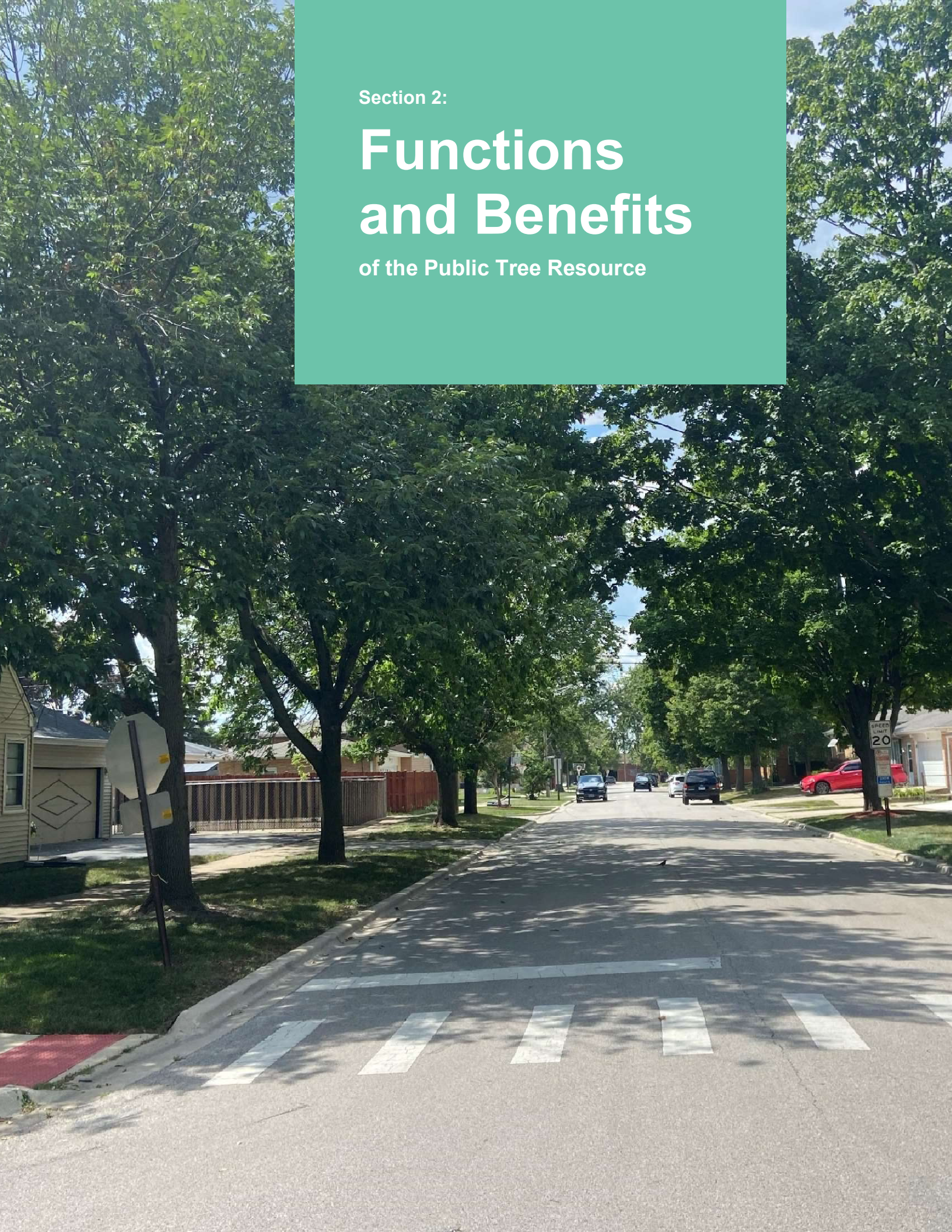
Planting only small-growing trees within 20 feet of overhead utilities, medium-size trees within 20–40 feet, and large-growing trees outside 40 feet will help improve future tree conditions, minimize future utility line conflicts, and reduce the costs of maintaining trees under utility lines.

When planting trees among hardscape features: give small-growing trees 4–5 feet, medium-growing trees 6–7 feet, and large-growing trees 8 feet or more between hardscape features. In most cases, this will allow for the spread of a tree's trunk taper, root collar, and immediate larger-diameter structural roots.

Section 2:

Functions and Benefits

of the Public Tree Resource



SECTION 2: FUNCTIONS AND BENEFITS OF THE PUBLIC TREE RESOURCE

Trees occupy a vital role in the urban environment by providing of a wide array of economic, environmental, and social benefits far exceeding the investments in planting, maintaining, and removing them. Trees reduce air pollution, improve public health outcomes, reduce stormwater runoff, sequester and store carbon, reduce energy use, and increase property value. Using advanced analytics, such as i-Tree Eco and other models in the i-Tree software suite, understanding the importance of trees to a community continues to expand by providing tools to estimate monetary values of the various benefits provided by a public tree resource.

Environmental Benefits

- Trees decrease energy consumption and moderate local climates by providing shade and acting as windbreaks.
- Trees act as mini reservoirs, helping to slow and reduce the amount of stormwater runoff that reaches storm drains, rivers, and lakes. One hundred mature tree crowns intercept roughly 100,000 gallons of rainfall per year (U.S. Forest Service 2003a).
- Trees help reduce noise levels, cleanse atmospheric pollutants, produce oxygen, and absorb carbon dioxide.
- Trees can reduce street-level air pollution by up to 60% (Coder 1996). Lovasi (2008) suggested that children who live on tree-lined streets have lower rates of asthma.
- Trees stabilize soil and provide a habitat for wildlife.

Economic Benefits

- Trees in a yard or neighborhood increase residential property values by an average of 7%.
- Commercial property rental rates are 7% higher when trees are on the property (Wolf 2007).
- Trees moderate temperatures in the summer and winter, saving on heating and cooling expenses (North Carolina State University 2012, Heisler 1986).
- On average, consumers will pay about 11% more for goods in landscaped areas, with this figure being as high as 50% for convenience goods (Wolf 1998b, Wolf 1999, and Wolf 2003).
- Consumers also feel that the quality of products is better in business districts surrounded by trees than those considered barren (Wolf 1998b).
- The quality of landscaping along the routes leading to business districts had a positive influence on consumers' perceptions of the area (Wolf 2000).

Social Benefits

- Tree-lined streets are safer; traffic speeds and the amount of stress drivers feel are reduced, which likely reduces road rage/aggressive driving (Wolf 1998a, Kuo and Sullivan 2001a).
- Chicago apartment buildings with medium amounts of greenery had 42% fewer crimes than those without any trees (Kuo and Sullivan 2001b).
- Chicago apartment buildings with high levels of greenery had 52% fewer crimes than those without any trees (Kuo and Sullivan 2001a).
- Employees who see trees from their desks experience 23% less sick time and report greater job satisfaction than those who do not (Wolf 1998a).
- Hospital patients recovering from surgery who had a view of a grove of trees through their windows required fewer pain relievers, experienced fewer complications, and left the hospital sooner than similar patients who had a view of a brick wall (Ulrich 1984, 1986).

I-TREE ECO ANALYSIS

i-Tree Eco utilizes tree inventory data along with local air pollution and meteorological data to quantify the functional benefits of a community's tree resource. By framing trees and their benefits in a way that everyone can understand, dollars saved per year, i-Tree Eco helps a community to understand trees as both a natural resource and an economic investment. Knowledge of the composition, functions, and monetary value of trees helps to inform planning and management decisions, assists in understanding the impact of those decisions on human health and environmental quality, and aids communities in advocating for the necessary funding to manage their vested interest in the public tree resource appropriately.

ANNUAL RETURN ON INVESTMENT FROM THE PUBLIC TREE RESOURCE

The i-Tree Eco analysis of the Village of Franklin Park's inventoried trees quantified the functional benefits of three critical ecosystem services that they provide: air pollution removal, carbon sequestration, and avoided surface runoff. The village's annual tree maintenance budget is $250,000, making Franklin Park's return on investment almost 29% annually.

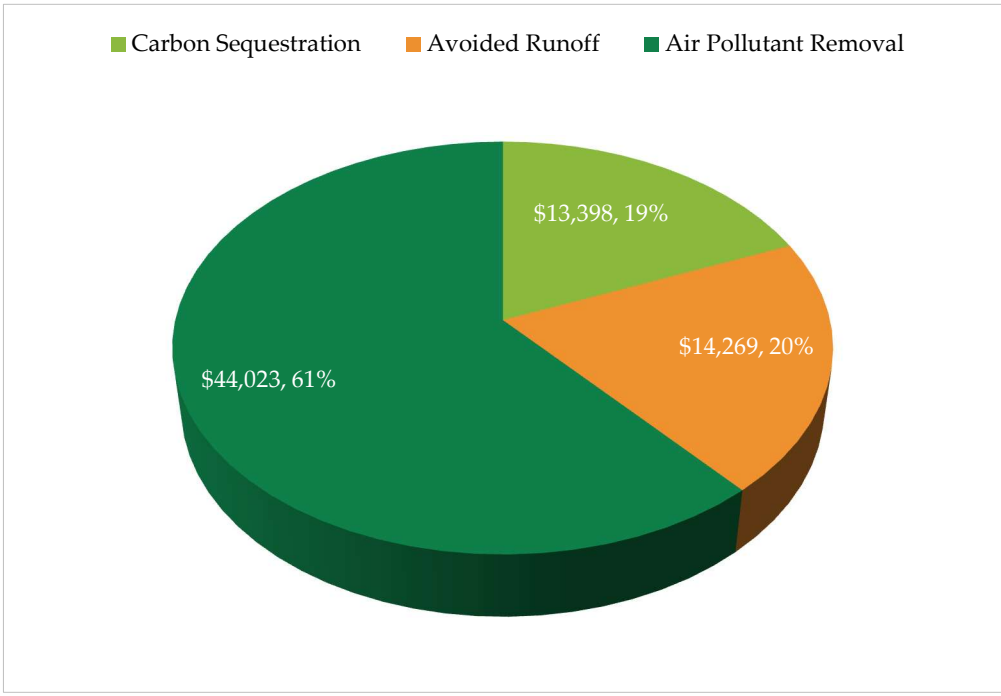


Figure 10. Estimated value of the benefits provided by inventoried trees.

Urban environments have unique challenges that make the estimated $71,690 of functional benefits provided by Franklin Park's inventoried tree population an essential asset to the village (Figure 10). Compared to rural landscapes, urban landscapes are characterized by high emissions in a relatively small area, valuing the 5,900 lbs. of airborne pollutants removed by Franklin Park's tree resource at an estimated $44,023. Avoiding stormwater runoff reduces the risk of flooding and combined sewer overflow, both of which impact people, property, and the environment, valuing the 1,596,791 gals. of runoff avoided with Franklin Park's tree resource at an estimated $14,269. Carbon dioxide ($CO_2$) also impacts people, property, and the environment as the primary greenhouse gas driving climate change, valuing the 79 tons sequestered by Franklin Park's tree resource at an estimated $13,398.

REPLACEMENT VALUE

Replacement value is an estimate of the local cost of replacing an existing tree with a similar tree. It can help provide an estimate of the overall value of a tree population or individual tree. Collectively, Franklin Park's inventoried tree population has an estimated replacement value of $12,580,715, which averages out to around $2,003 in replacement value per tree (Table 3).

The population of silver maple (*Acer saccharinum*) has the highest replacement value ($3,158,967), due at least in part to the size of the population. On a per tree basis, silver maple (*Acer saccharinum*) and sugar maple (*A. saccharum*) had the greatest replacement values; $4,598 and $3,590 per tree, respectively.

SEQUESTERING AND STORING CARBON

Trees are carbon sinks, which are the opposite of carbon sources. While carbon is emitted from cars and smokestacks, carbon is absorbed into trees during photosynthesis and stored in their tissue as they grow. The i-Tree Eco model estimates both the carbon sequestered each year and total carbon stored. Franklin Park's inventoried trees have stored 4,549 tons of carbon, which is all the carbon each tree has amassed throughout their lifetimes and is valued at $775,754. Silver maple (*Acer saccharinum*) and thornless honeylocust (*Gleditsia triacanthos inermis*) store the most carbon: 1,268 tons per tree and 1,096 tons per tree, respectively. Norway maple (*Acer platanoides*) and silver maple (*Acer saccharinum*) sequester the most carbon: 19.9 tons per tree per year and 16.5 tons per tree per year, respectively.

Table 3. Summary of benefits provided by inventoried trees ranked by species importance value.

Most Common Trees Inventoried		Count	Percent of Total	Benefits Provided by Street Trees				
				CO_2 Stored	CO_2 Sequestered	Avoided Runoff	Air Pollution Removed	Replacement Value
Common Name	Botanical Name		%	tons	tons/year	gal/year	lbs/year	Dollars
Norway maple	*Acer platanoides*	998	15.9%	888.7	19.9	323,529	1,200	$2,582,788
thornless honeylocust	*Gleditsia triacanthos v. inermis*	833	13.3%	1,095.6	15.7	204,655	760	$2,803,161
silver maple	*Acer saccharinum*	687	10.9%	1,268.5	16.5	477,026	1,760	$3,158,967
elm species	*Ulmus*	336	5.4%	41.9	1.9	19,785	80	$99,479
northern catalpa	*Catalpa speciosa*	258	4.1%	227.3	3.1	111,409	420	$860,314
red maple	*Acer rubrum*	254	4.0%	65.5	2.4	35,080	120	$198,501
littleleaf linden	*Tilia cordata*	211	3.4%	89.0	1.9	54,901	200	$384,371
apple species	*Malus*	159	2.5%	18.0	0.6	5,829	20	$55,504
northern hackberry	*Celtis occidentalis*	148	2.4%	2.7	0.1	9,613	40	$60,387
Callery pear	*Pyrus calleryana*	137	2.2%	19.7	0.8	10,730	40	$60,242
Freeman maple	*Acer × freemanii*	127	2.0%	46.3	1.7	18,464	60	$71,593
sugar maple	*Acer saccharum*	114	1.8%	124.8	1.5	45,526	160	$409,328
blue spruce	*Picea pungens*	111	1.8%	28.3	0.5	19,262	80	$126,413
ginkgo	*Ginkgo biloba*	105	1.7%	6.3	0.1	7,615	20	$58,130
swamp white oak	*Quercus bicolor*	98	1.6%	11.7	0.5	7,170	20	$38,795
All Other Trees Inventoried		1,704	27.1%	614	11.5	246,198	820	$1,612,740
Total		**6,280**	**100%**	**4,549**	**78.6**	**1,596,791**	**5,900**	**$12,580,715**

CONTROLLING STORMWATER

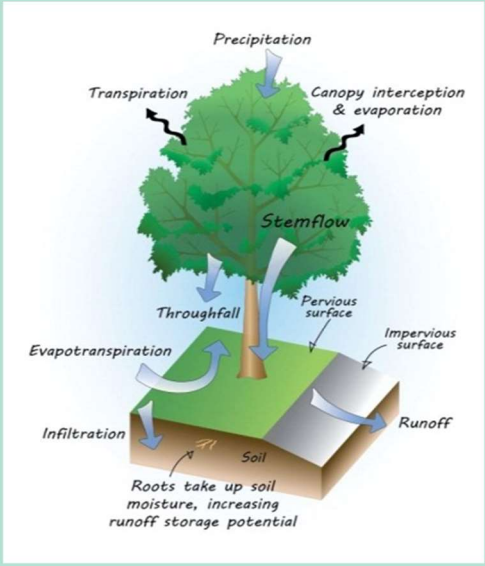
Trees intercept rainfall with their leaves and branches, helping lower stormwater management costs by avoiding runoff. The inventoried trees in the Village of Franklin Park avoid 1,596,791 gals. of runoff annually. Avoided runoff accounts for 20% of the annual functional benefits provided by Franklin Park's public tree resource.

Of all species inventoried, silver maple (*Acer saccharinum*) contributed the most annual stormwater benefits. The silver maple population (11% of inventoried trees) avoided 477,026 gals. of runoff per year. The most abundant species in the inventoried tree population, Norway maple ((*Acer platanoides*) (16%)), only avoided approximately 323,529 gals. of runoff per year. On a per-tree basis, large trees with leafy canopies provided the most functional benefits. Callery pear (*Pyrus calleryana*) and sugar maple (*Acer saccharum)* comprised 2.2% and 1.8% of the inventoried tree resource, respectively. Sugar maple avoided 45,256 gals. of runoff per year, more than four times as much as Callery pear did, despite having a similar population size. This illustrates how large-statured trees with wide canopies provide significantly greater benefits.

IMPROVING AIR QUALITY

The inventoried tree population annually removes 5,900 lbs. of air pollutants, including sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and particulate matter ($PM_{2.5}$). The i-Tree Eco model estimated the value of this benefit at $44,023, which is 61% of the value of all annual benefits. As shown in Figure 11, a small reduction of $PM_{2.5}$ is more valuable than any of the other pollutants removed. The trees that provided the highest annual air quality benefits were silver maple and Norway maple, which removed 1,760 lbs. of pollutants per tree per year and 1,200 lbs. of pollutants per tree per year, respectively.

CANOPY FUNCTIONS



Trees provide many functions and benefits all at once simply by existing, such as:

- Catching rainfall in their crown so it drips to the ground with less of an impact or flows down their trunk.
- Helping stormwater soak into the ground by slowing down runoff.
- Creating more pore space in the soil with their roots, helping stormwater to move through the ground.
- Cooling the surrounding landscape by casting shade with their canopy and releasing water from their leaves.
- Catching airborne pollutants on their leaves and absorbing them with their roots when they wash off in the rain.
- Transforming some pollutants into less harmful substances and preventing other pollutants from forming.

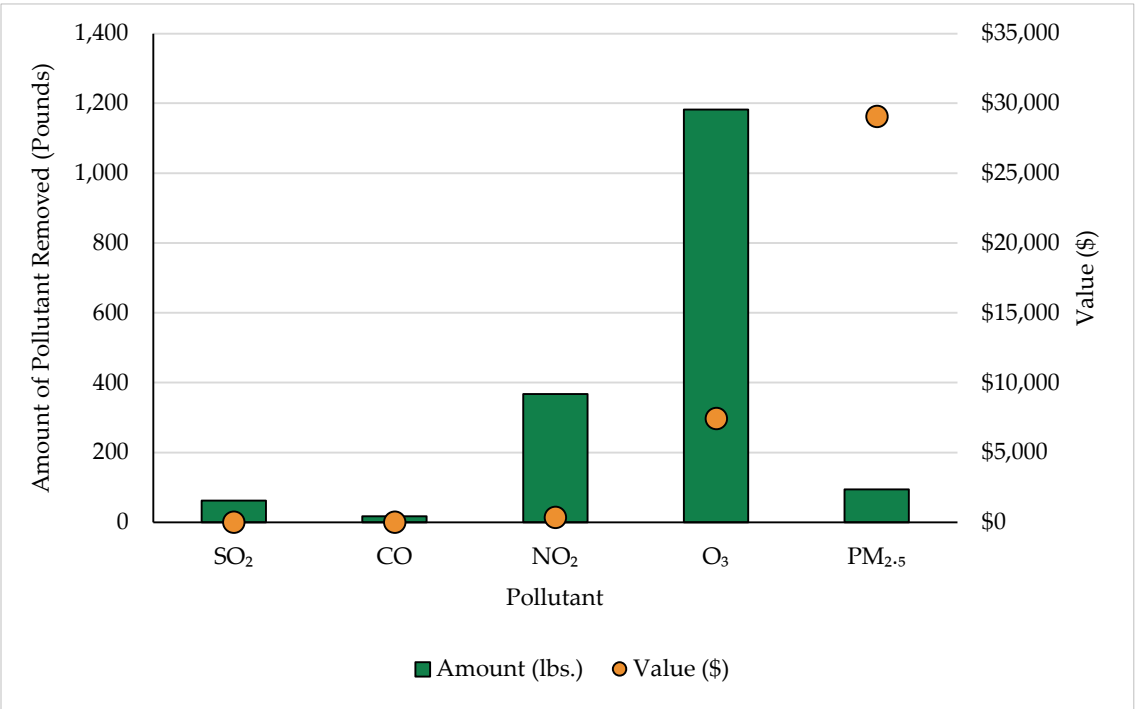


Figure 11. Estimated value of removing airborne pollution by weight and type.

In Franklin Park, only ten species account for over half of the public tree resource and half of the functional benefits it provides. If any of these species were lost to invasive pests, disease, or other threats, its loss would have significant costs. It is critical to promote species diversity with future plantings to minimize susceptibility to potential threats, and to plant large-statured broadleaf tree species wherever possible to maximize potential environmental and economic benefits. See Appendix C for a tree species list recommended by DRG.

Section 3:

Recommended Management

of the Public Tree Resource

SECTION 3: RECOMMENDED MANAGEMENT OF THE PUBLIC TREE RESOURCE

During the inventory, both a risk rating and a recommended maintenance activity were assigned to each tree. DRG recommends prioritizing and completing each tree's recommended maintenance activity based on the assigned risk rating. This five-year tree management program takes a multi-faceted and proactive approach to tree resource management.

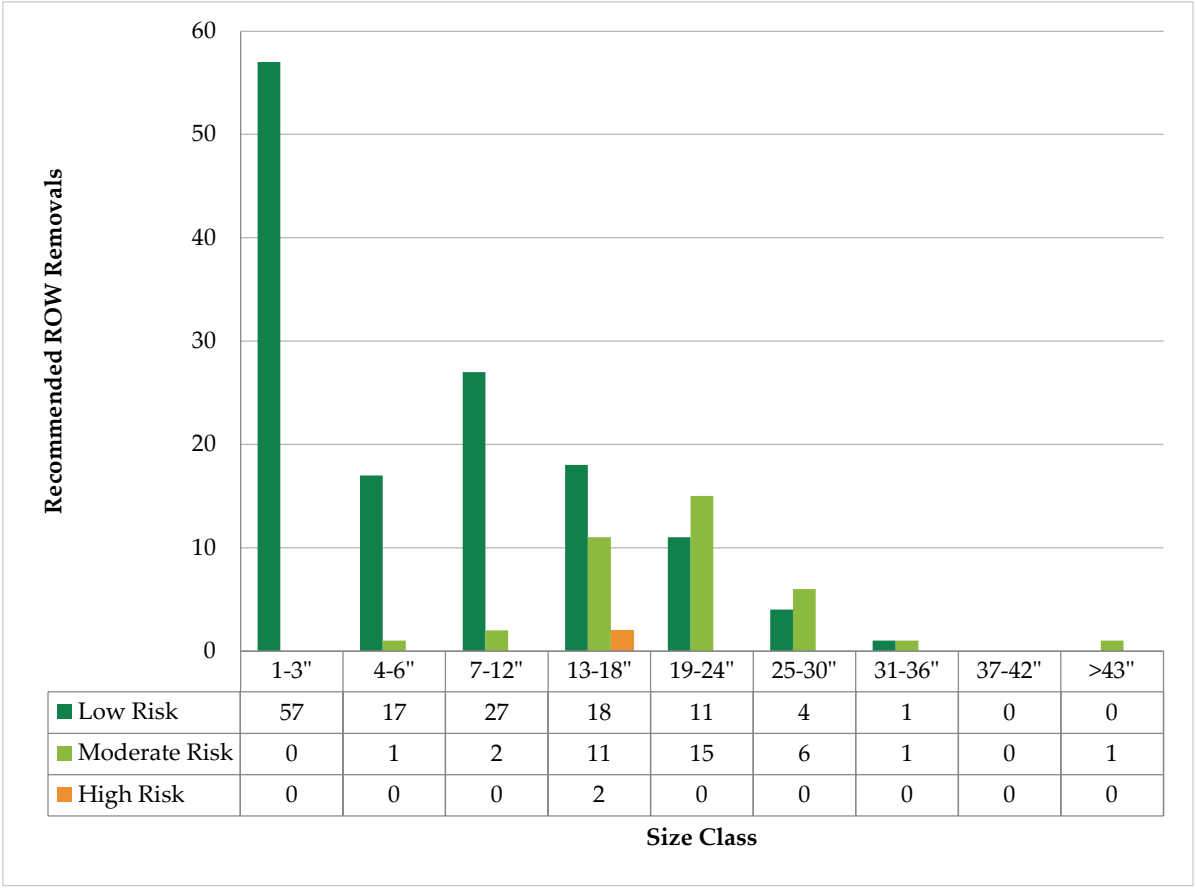
RISK MANAGEMENT AND RECOMMENDED MAINTENANCE

Although tree removal is usually considered a last resort, and may sometimes create a reaction from the community, there are circumstances in which removal is necessary. Trees fail from natural causes, such as diseases, insects, and weather conditions, and from physical injury due to vehicles, vandalism, and root disturbances. DRG recommends that trees be removed when corrective pruning will not adequately mitigate risk or when correcting problems would be cost-prohibitive. DRG recommends that tree maintenance activities are prioritized and completed based on the risk rating that was assigned to each tree during the inventory. The following section describes recommended maintenance for each risk rating category.

Trees that cause obstructions or interfere with power lines or other infrastructure should be removed when their defects cannot be corrected through pruning or other maintenance practices. Diseased and nuisance trees also warrant removal. Even though large short-term expenditures may be required, it is important to secure the funding needed to complete priority tree removals. Expedient removal reduces risk and promotes public safety. Figures 12 and 13 present tree removals and tree pruning by risk rating and diameter size class. The following sections briefly summarize the recommended removals identified during the inventory.

HIGH PRIORITY RECOMMENDED MAINTENANCE

Removing or pruning High Risk trees is strongly recommended to be prioritized and completed as soon as possible. In general, maintenance activities should be completed first for the largest diameter trees (>25″) that pose the greatest risk. Once addressed, recommended tree maintenance activities should be completed for smaller diameter trees (<25″) that pose the greatest risk. Addressing High Risk trees in a timely and proactive manner often requires significant resources to be secured and allocated. However, peforming this work expediently will mitigate risk, improve public safety, and reduce long-term costs.



	1-3"	4-6"	7-12"	13-18"	19-24"	25-30"	31-36"	37-42"	>43"
Low Risk	57	17	27	18	11	4	1	0	0
Moderate Risk	0	1	2	11	15	6	1	0	1
High Risk	0	0	0	2	0	0	0	0	0

Figure 12. Recommended removals by size class and risk rating.

High Priority Removal Recommendations

DRG identified 2 High Risk trees recommended for removal. These High Risk trees both fell in the 13–18 inches DBH diameter class. DRG recommends that trees be removed when pruning will not correct their defects, eliminate the risks that their defects cause, or when corrective pruning would be cost-prohibitive. These trees should be removed immediately based on their risk rating and size class.

High Priority Pruning Recommendations

High Risk trees should be pruned immediately based on assigned risk rating, which generally requires removing defects such as dead and dying parts, broken and/or hanging branches, and missing or decayed wood that may be present in tree crowns, even when most of the tree is sound. In these cases, when pruning the defected branch(es) can correct the problem, risk associated with the tree is reduced while promoting healthy growth.

The inventory identified 3 High Risk trees. The diameter size classes for trees with recommended high-priority pruning ranged between 25–36 inches DBH. This maintenance should be performed immediately based on assigned risk rating and may be performed concurrently with other High Risk removals.

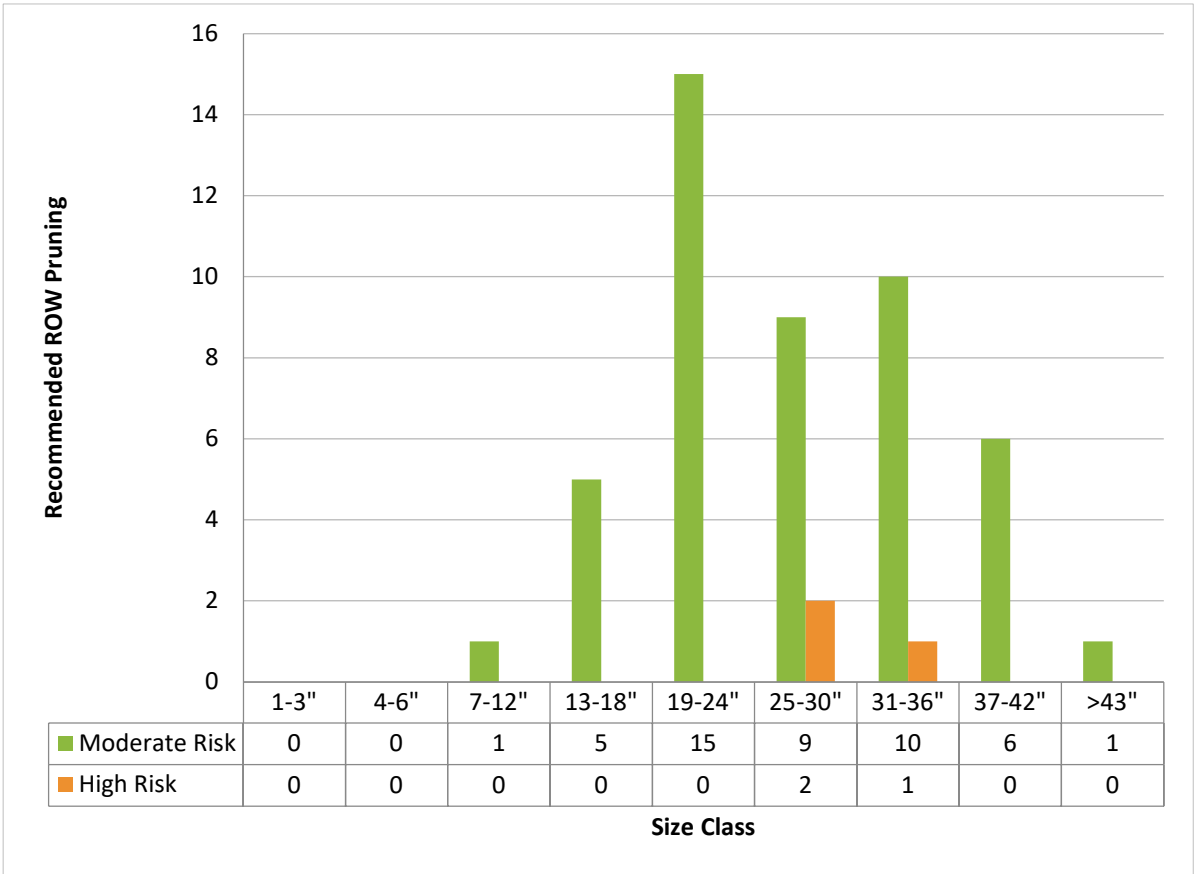


Figure 13. Recommended pruning by size class and risk rating.

MODERATE AND LOW PRIORITY RECOMMENDED MAINTENANCE

Pruning or removing Moderate and Low Risk trees are generally the next priorities for maintenance activities. For efficiency, Moderate and Low Risk removals may also be addressed when removing adjacent higher risk trees. Most trees recommended for pruning with these risk levels can be maintained during proactive, routine pruning cycles. DRG recommends implementing proactive maintenance programs incrementally over time as the backlog of risk is reduced.

Moderate Risk Removal Recommendations

DRG identified 37 Moderate Risk trees recommended for removal. Most Moderate Risk trees recommended for removal were smaller than 31 inches DBH. If corrective pruning cannot correct a tree's defects and/or adequately mitigate risk, then the tree should be removed. A total of 2 Moderate Risk trees larger than 31 inches DBH were recommended for removal. These trees should be removed as soon as possible after all High Risk removals and pruning have been completed.

Moderate Risk Pruning Recommendations

Moderate Risk pruning should be performed after all High Risk recommended maintenance is complete and may be performed concurrently with other Moderate Risk removals. The inventory identified 47 Moderate Risk trees recommended for pruning.

Low Priority Removal Recommendations

DRG identified 134 Low Risk trees recommended for removal. Low Risk removals pose little threat; these trees are generally small, dead, invasive, or poorly formed trees that need to be removed. Eliminating these trees will reduce breeding site locations for insects and diseases and will increase the aesthetic value of the area. Healthy trees growing in poor locations or undesirable species are also included in this category. If pruning cannot correct a tree's defects and/or adequately mitigate risk, then the tree should be removed. All Low Risk trees should be removed when convenient after all higher risk pruning and removals have been completed and may be performed concurrently with routine pruning.

Low Priority Pruning Recommendations

There were 4,485 Low Risk trees recommended for pruning. Low Risk trees with the assigned maintenance of either "Prune", "Discretionary Prune", or "None" should be included in a proactive Routine Pruning cycle after all the higher risk trees are addressed.

ROUTINE INSPECTIONS

Inspections are essential to uncovering potential problems with trees. They should be performed by a qualified arborist who is trained in the art and science of planting, caring for, and maintaining individual trees. Arborists are knowledgeable about the needs of trees and are trained and equipped to provide proper care. Ideally, the arborist will be ISA Certified and also hold the ISA Tree Risk Assessment Qualification credential.

Routine Inspection Recommendations

All trees along the street ROW should be regularly inspected and attended to as needed. When trees require additional or new work, they should be added to the maintenance schedule. The budget should also be updated to reflect the additional work. Utilize computer management software such as TreeKeeper® to make updates, edits, and keep a log of work records. In addition to locating trees with unidentified defects, inspections also present an opportunity to look for signs and symptoms of pests and diseases. Franklin Park has a large population of trees that are susceptible to pests and diseases, including ash, maple, and oak.

DRG recommends that Franklin Park perform routine inspections of inventoried trees by windshield survey (inspections performed from a vehicle) in line with *ANSI A300 (Part 9)* annually and after all severe weather events, to identify defects with heightened risk, signs of pest activity, and symptoms of disease. When trees need additional maintenance, they should be added to the work schedule immediately. Use asset management software such as TreeKeeper® to update inventory data and schedule work records.

ROUTINE PRUNING CYCLE

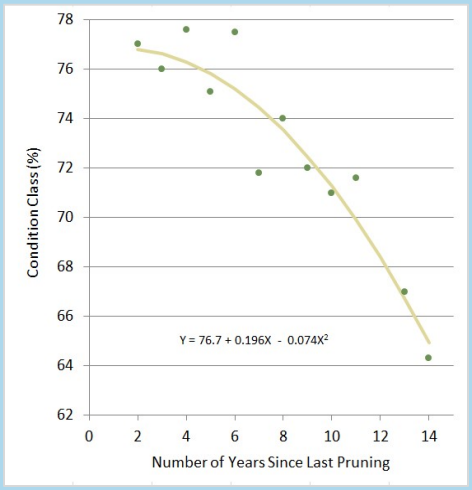
The Routine Pruning cycle includes all Low Risk trees that received a "Prune", "Discretionary Prune", or "None" maintenance recommendation. These trees pose some risk but have a smaller defect size and/or a lower probability of impacting a target. Over time, routine pruning can minimize reactive maintenance, limit instances of elevated risk, and provide the basis for a robust risk management program.

Based on Miller and Sylvester's research, DRG recommends five-year Routine Pruning cycles to maintain the condition of the inventoried tree resource. However, not all municipalities are able to remain proactive with a five-year cycle based on budgetary constraints, the size of the public tree resource, or both. In these cases, extending the length of the Routine Pruning cycle is an option; however, it is in the municipality's best interest to not approach or exceed a 10-year pruning cycle. The reason is that this is around when tree condition deteriorates significantly without regular pruning, because their once-minor defects have worsened, reducing tree health and potentially increasing risk (Miller and Sylvester 1981).

Routine Pruning Cycle Recommendations

Franklin Park's inventory has 4,485 trees that should be routinely pruned, and DRG recommends that the village establish a five-year Routine Pruning cycle with approximately 897 trees pruned each year. If this is not feasible for Franklin Park, a six-year Routine Pruning cycle with approximately 747 trees pruned each year, or a seven-year Routine Pruning cycle with approximately 640 trees pruned each year, is acceptable considering the inventoried tree population's size. DRG recommends that the Routine Pruning cycle begins in Year One of the proposed five-year program, after all High Risk Recommended Maintenance is complete.

PROACTIVE PRUNING



Relationship between tree condition and years since previous pruning. (adapted from Miller and Sylvester 1981)

Miller and Sylvester studied the pruning frequency of 40,000 street trees in Milwaukee, Wisconsin. Trees that had not been pruned for more than 10 years had an average condition rating 10% lower than trees that had been pruned in the previous several years. Their research suggests that a five-year pruning cycle is optimal for urban trees.

Routine pruning cycles help detect and correct most defects before they reach higher risk levels. DRG recommends that pruning cycles begin after all Extreme and High Risk tree maintenance has been completed.

DRG recommends two pruning cycles: a Young Tree Training cycle and a Routine Pruning cycle. Newly planted trees will enter the Young Tree Training cycle once they become established and will move into the Routine Pruning cycle when they reach maturity. A tree should be removed and eliminated from the Routine Pruning cycle when it outlives its usefulness.

Approximately 71% of the inventoried tree population would benefit from routine pruning. Figure 14 shows a variety of size classes recommended for pruning, with the majority between 7–30 inches DBH.

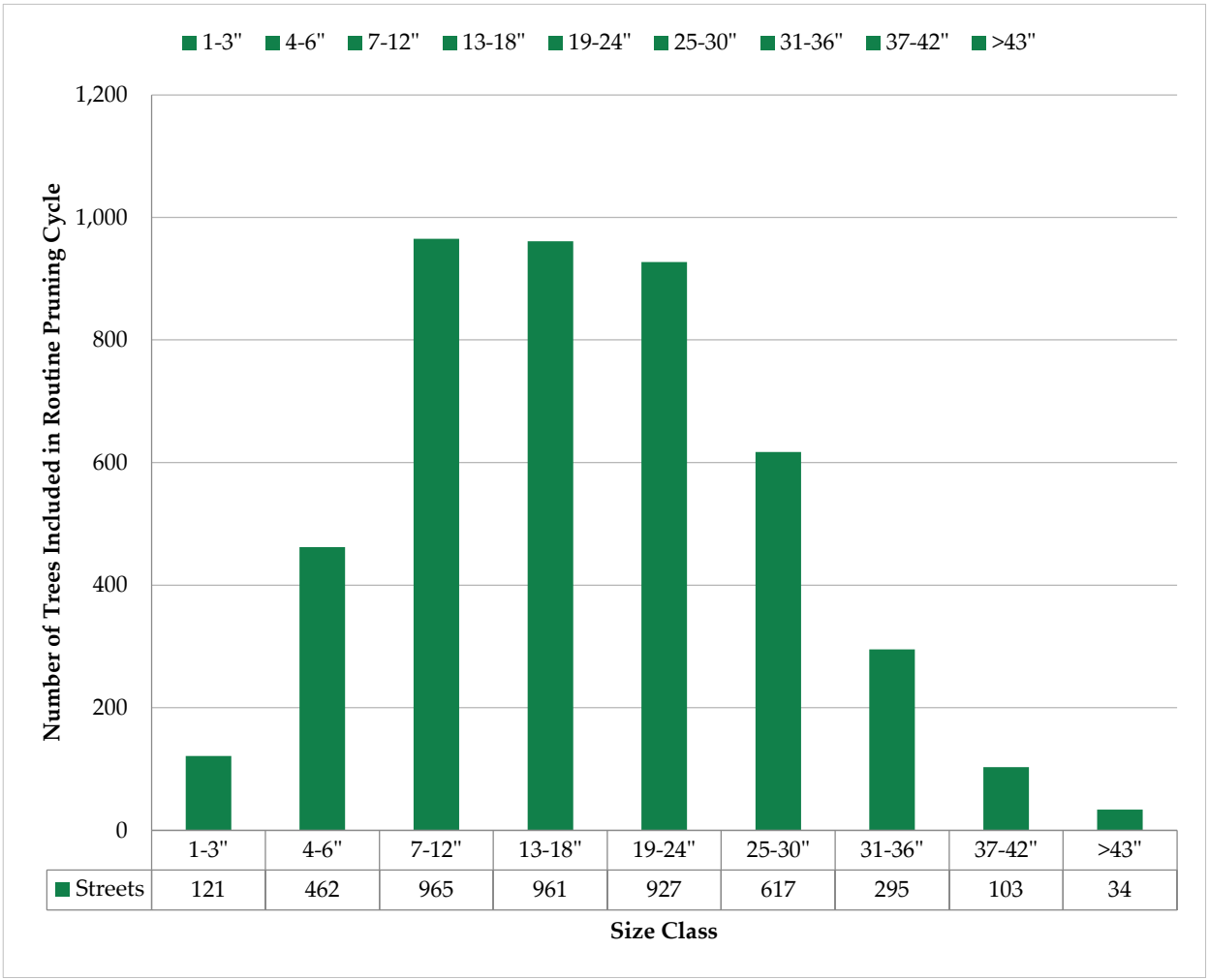


Figure 14. Routine pruning cycle by size class.

YOUNG TREE TRAINING CYCLE

Trees included in the Young Tree Training cycle are generally less than 6 inches DBH. These younger trees sometimes have branch structures that can lead to potential problems as the tree ages. Potential structural problems include codominant leaders, multiple limbs attaching at the same point on the trunk, or crossing/interfering limbs. If these problems are not corrected, they may worsen as the tree grows, increasing its risk rating and creating potential liability.

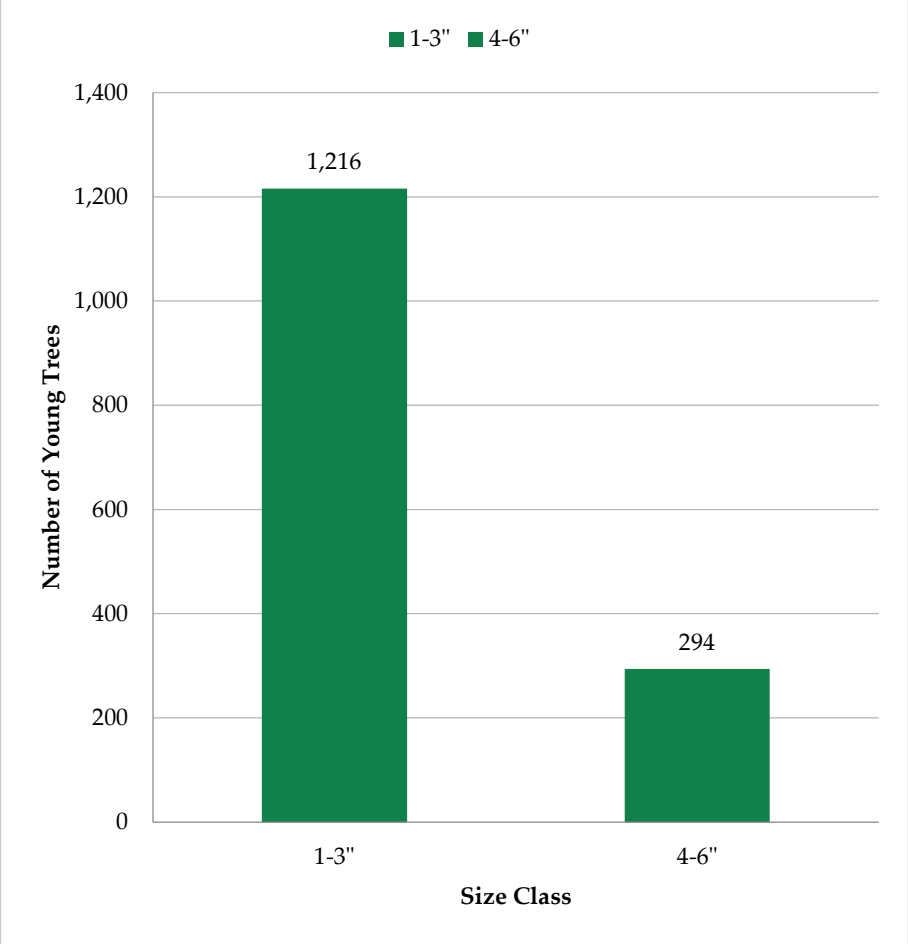


Figure 15. Three-year Young Tree Training cycle by size class.

The recommended length of a Young Tree Training cycle is three years because young trees tend to grow at faster rates than mature trees. The Young Tree Training cycle differs from the Routine Pruning cycle in that Young Tree Training cycle generally only includes trees that can be pruned from the ground with a pole pruner or pruning shear.

Young Tree Training Cycle Recommendations

DRG recommends that Franklin Park implement a three-year Young Tree Training cycle beginning after the completion of all High Risk Recommended Maintenance activities. During the inventory, 1,510 trees less than or equal to 6 inches DBH were inventoried and recommended for young tree training. Since Franklin Park has so many young trees, the Young Tree Training cycle is vital for the future condition of the inventoried tree population. DRG recommends that an average of 503 trees be trained with structural pruning each year over three years, beginning in Year One of the management program.

When new trees are planted, they should enter the Young Tree Training cycle after establishment, typically within 2–3 years after planting. In future years, the number of trees in the Young Tree Training cycle will be based on tree planting efforts and growth rates of young trees. The village should strive to structurally prune approximately one-third of its young trees each year.

TREE PLANTING AND STUMP REMOVAL

Planting new trees in areas where there is sparse canopy already is the most important. It is also important to plant more trees in areas with poor canopy continuity or gaps in existing canopy. While Franklin Park as a whole receives value from the ecosystem services provided by the public tree resource, those benefits usually are not distributed evenly across the village.

The Right Tree in the Right Place is a mantra for tree planting used by the Arbor Day Foundation and many utility companies nationwide. Trees come in many different shapes and sizes, and often change dramatically over their lifetimes. Before selecting a tree for planting, make sure it is the right tree—know how tall, wide, and deep it will be at maturity. Equally important to selecting the right tree is choosing the right spot to plant it. Blocking an unsightly view or creating some shade may be a priority, but it is important to consider how a tree may impact existing utility lines and hardscape as it grows taller, wider, and deeper. If the tree at maturity will reach overhead lines, or conflict with sidewalks and curbs, it is best to choose another tree or a different location.

Tree Planting and Stump Removal Recommendations

Creating larger growing sites for trees in the municipal ROW can be the single most beneficial management practice to improve the survival rate of planted and developing trees. Increasing planting space can also reduce the amount of tree-related infrastructure conflicts, as the trees will be planted further from curbs and sidewalks. Depending on the site, there are several methods available to create and/or increase the growing space for newly planted trees:

- Install or enlarge tree wells/pits in existing sidewalks of sufficient width. Ideally, the minimum growing space of a small-sized tree is 32 square feet. Where Franklin Park has sidewalks of a sufficient width and length, the city could install tree pits with enough space remaining for the sidewalk to still comply with Americans with Disabilities Act (ADA) standards.
- Planting trees 4 feet behind a curb without a sidewalk, or 4 feet behind an existing sidewalk, can be a low-cost alternative to more construction intensive methods. This can result in less damage to the sidewalk and give tree roots room to grow into the open soil.

- Re-routing the sidewalk around an area to create designated large tree sites is a relatively cost-effective method to increase growing spaces. This method can also be applied to existing large tree sites, where tree roots have already come in conflict with the sidewalk.
- A landscape bump-out/curb extension is a vegetative area that protrudes into the parking lane of a street, to provide a growing space for plants or trees. These spaces can be used quite effectively by municipalities to beautify a streetscape, provide greater storm water retention, along with the added benefit of slowing car speeds at the bump-out location.

The inventory identified 50 stumps recommended for removal, with a wide range of sizes from 1" to >43" in diameter. Stump removals should occur when convenient and be included in regular planting plans if the site would be feasible for planting after the stump is removed. For this reason, it is most convenient to remove all stumps in areas with scheduled tree planting work, so all feasible sites in an area are stocked at once.

A list of suggested tree species is provided in Appendix C. These tree species are specifically selected for the climate of Franklin Park. This list is not exhaustive but can be used as a guideline for species that meet community objectives and to enhance any existing list of approved species.

MAINTENANCE SCHEDULE AND BUDGET

Utilizing 2022 Village of Franklin Park tree inventory data, an annual maintenance schedule was developed detailing the recommended tasks to complete each year. DRG made budget projections using industry knowledge and public bid tabulations. A complete table of estimated costs for Franklin Park's five-year tree management program follows.

This schedule provides a framework for completing the recommended inventoried tree maintenance over the next five years. Following this schedule can shift tree maintenance activities from being reactive to a more proactive tree care program.

To implement the maintenance schedule, Franklin Park's tree maintenance budget should be no less than:

- $250,355 for the first year of implementation.
- $244,730 for the second year.
- $244,365 for the third year.
- $238,865 for the fourth year.
- $214,355 for the final year of the maintenance schedule.

Annual budget funds are needed to ensure that High Risk trees are expediently managed and that the vital Young Tree Training and Routine Pruning cycles can begin as soon as possible. If routing efficiencies and/or contract specifications allow more tree work to be completed in a given year, or if this maintenance schedule requires adjustment to meet budgetary or other needs, then it should be modified accordingly. Unforeseen situations such as severe weather events may arise and change the maintenance needs of trees. If maintenance needs change, then budgets, staffing, and equipment should be adjusted to meet the new demand.

Table 4. Estimated budget for recommended five-year tree resource management program

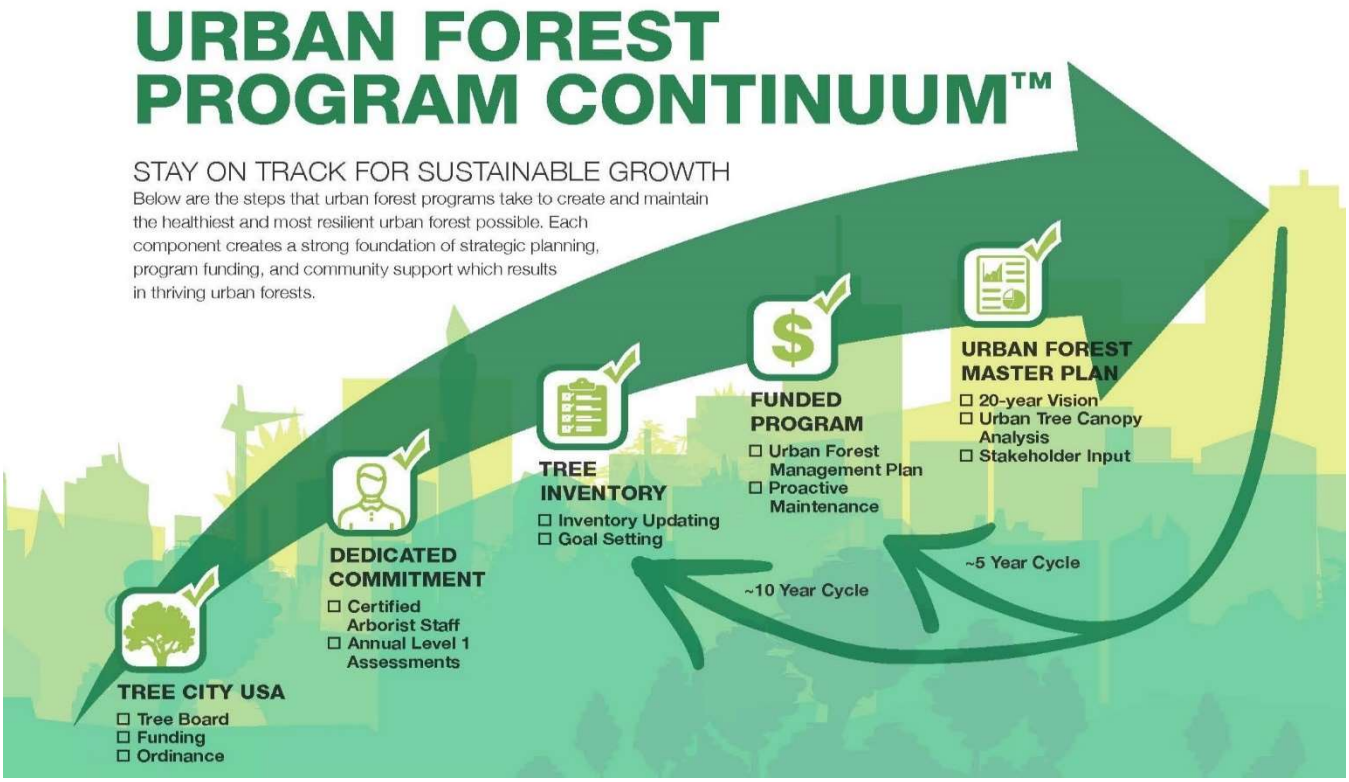
Activity Cost			Year 1		Year 2		Year 3		Year 4		Year 5		Five-Year Cost
Activity	Diameter	Cost/Tree	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	
High Priority Removals	1-3"	$25		$0		$0		$0		$0		$0	$0
	4-6"	$75		$0		$0		$0		$0		$0	$0
	7-12"	$125		$0		$0		$0		$0		$0	$0
	13-18"	$175	2	$350		$0		$0		$0		$0	$350
	19-24"	$200		$0		$0		$0		$0		$0	$0
	25-30"	$900		$0		$0		$0		$0		$0	$0
	31-36"	$1,100		$0		$0		$0		$0		$0	$0
	37-42"	$1,100		$0		$0		$0		$0		$0	$0
	>43"	$1,300		$0		$0		$0		$0		$0	$0
Activity Total(s)			**2**	**$350**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$350**
Moderate Priority Removals	1-3"	$25		$0		$0		$0		$0		$0	$0
	4-6"	$75	1	$75		$0		$0		$0		$0	$75
	7-12"	$125	2	$250		$0		$0		$0		$0	$250
	13-18"	$175	11	$1,925		$0		$0		$0		$0	$1,925
	19-24"	$200	15	$3,000		$0		$0		$0		$0	$3,000
	25-30"	$900	6	$5,400		$0		$0		$0		$0	$5,400
	31-36"	$1,100	1	$1,100		$0		$0		$0		$0	$1,100
	37-42"	$1,100		$0		$0		$0		$0		$0	$0
	>43"	$1,300	1	$1,300		$0		$0		$0		$0	$1,300
Activity Total(s)			**37**	**$13,050**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$13,050**
Low Priority Removals	1-3"	$25		$0		$0		$0	57	$1,425		$0	$1,425
	4-6"	$75		$0		$0	17	$1,275		$0		$0	$1,275
	7-12"	$125		$0	27	$3,375	27	$3,375		$0		$0	$6,750
	13-18"	$175		$0	18	$3,150		$0		$0		$0	$3,150
	19-24"	$200		$0	11	$2,200		$0		$0		$0	$2,200
	25-30"	$900		$0	4	$3,600		$0		$0		$0	$3,600
	31-36"	$1,100		$0	1	$1,100		$0		$0		$0	$1,100
	37-42"	$1,100		$0		$0		$0		$0		$0	$0
	>43"	$1,300		$0		$0		$0		$0		$0	$0
Activity Total(s)			**0**	**$0**	**61**	**$13,425**	**44**	**$4,650**	**57**	**$1,425**	**0**	**$0**	**$19,500**
Stump Removals	1-3"	$25		$0		$0	2	$50		$0		$0	$50
	4-6"	$50		$0		$0	4	$200		$0		$0	$200
	7-12"	$100		$0	16	$1,600		$0		$0		$0	$1,600
	13-18"	$150		$0	12	$1,800		$0		$0		$0	$1,800
	19-24"	$200		$0	7	$1,400		$0		$0		$0	$1,400
	25-30"	$225	3	$675		$0		$0		$0		$0	$675
	31-36"	$250	2	$500		$0		$0		$0		$0	$500
	37-42"	$400	3	$1,200		$0		$0		$0		$0	$1,200
	>43"	$500	1	$500		$0		$0		$0		$0	$500
Activity Total(s)			**9**	**$2,875**	**35**	**$4,800**	**6**	**$250**	**0**	**$0**	**0**	**$0**	**$7,925**
High Priority Pruning	1-3"	$25		$0		$0		$0		$0		$0	$0
	4-6"	$50		$0		$0		$0		$0		$0	$0
	7-12"	$75		$0		$0		$0		$0		$0	$0
	13-18"	$125		$0		$0		$0		$0		$0	$0
	19-24"	$150		$0		$0		$0		$0		$0	$0
	25-30"	$175	2	$350		$0		$0		$0		$0	$350
	31-36"	$225	1	$225		$0		$0		$0		$0	$225
	37-42"	$300		$0		$0		$0		$0		$0	$0
	>43"	$450		$0		$0		$0		$0		$0	$0
Activity Total(s)			**3**	**$575**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$575**
Moderate Priority Pruning	1-3"	$25		$0		$0		$0		$0		$0	$0
	4-6"	$50		$0		$0		$0		$0		$0	$0
	7-12"	$75	1	$75		$0		$0		$0		$0	$75
	13-18"	$125	5	$625		$0		$0		$0		$0	$625
	19-24"	$150	15	$2,250		$0		$0		$0		$0	$2,250
	25-30"	$175	9	$1,575		$0		$0		$0		$0	$1,575
	31-36"	$225	10	$2,250		$0		$0		$0		$0	$2,250
	37-42"	$300	6	$1,800		$0		$0		$0		$0	$1,800
	>43"	$450	1	$450		$0		$0		$0		$0	$450
Activity Total(s)			**47**	**$9,025**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$9,025**
Routine Inspection	Drive-by Assessment	$1	6,281	$6,281	6,281	$6,281	6,281	$6,281	6,281	$6,281	6,281	$6,281	$31,405
	Walk-by Assessment	$4	1,256	$5,024	1,256	$5,024	1,256	$5,024	1,256	$5,024	1,256	$5,024	$25,120
Activity Total(s)			**7,537**	**$11,305**	**7,537**	**$11,305**	**7,537**	**$11,305**	**7,537**	**$11,305**	**7,537**	**$11,305**	**$56,525**
Young Tree Training (3-year Cycle)	1-3"	$20	405	$8,100	405	$8,100	405	$8,100	405	$8,100	405	$8,100	$40,500
	4-6"	$30	98	$2,940	98	$2,940	98	$2,940	98	$2,940	98	$2,940	$14,700
Activity Total(s)			**503**	**$11,040**	**503**	**$11,040**	**503**	**$11,040**	**503**	**$11,040**	**503**	**$11,040**	**$55,200**
Routine Pruning (5-year Cycle)	1-3"	$25	24	$605	24	$605	24	$605	24	$605	24	$605	$3,025
	4-6"	$50	92	$4,620	92	$4,620	92	$4,620	92	$4,620	92	$4,620	$23,100
	7-12"	$75	193	$14,475	193	$14,475	193	$14,475	193	$14,475	193	$14,475	$72,375
	13-18"	$125	192	$24,025	192	$24,025	192	$24,025	192	$24,025	192	$24,025	$120,125
	19-24"	$150	185	$27,810	185	$27,810	185	$27,810	185	$27,810	185	$27,810	$139,050
	25-30"	$175	123	$21,595	123	$21,595	123	$21,595	123	$21,595	123	$21,595	$107,975
	31-36"	$225	59	$13,275	59	$13,275	59	$13,275	59	$13,275	59	$13,275	$66,375
	37-42"	$300	21	$6,180	21	$6,180	21	$6,180	21	$6,180	21	$6,180	$30,900
	>43"	$450	7	$3,060	7	$3,060	7	$3,060	7	$3,060	7	$3,060	$15,300
Activity Total(s)			**897**	**$115,645**	**897**	**$115,645**	**897**	**$115,645**	**897**	**$115,645**	**897**	**$115,645**	**$578,225**
Replacement Tree Planting and Maintenance	Purchasing	$250	25	$6,250	30	$7,500	62	$15,500	57	$14,250		$0	$43,500
	Planting & Watering	$135	25	$3,375	30	$4,050	62	$8,370	57	$7,695		$0	$23,490
	Mulching	$20	25	$500	30	$600	62	$1,240	57	$1,140		$0	$3,480
Activity Total(s)			**75**	**$10,125**	**90**	**$12,150**	**186**	**$25,110**	**171**	**$23,085**	**0**	**$0**	**$70,470**
New Tree Planting and Maintenance	Purchasing	$250	75	$18,750	75	$18,750	75	$18,750	75	$18,750	75	$18,750	$93,750
	Planting & Watering	$135	75	$10,125	75	$10,125	75	$10,125	75	$10,125	75	$10,125	$50,625
	Mulching	$20	75	$1,500	75	$1,500	75	$1,500	75	$1,500	75	$1,500	$7,500
Activity Total(s)			**225**	**$30,375**	**225**	**$30,375**	**225**	**$30,375**	**225**	**$30,375**	**225**	**$30,375**	**$151,875**
Natural Mortality (1%)	Tree Removal	$175	63	$11,025	63	$11,025	63	$11,025	63	$11,025	63	$11,025	$55,125
	Stump Removal	$150	63	$9,450	63	$9,450	63	$9,450	63	$9,450	63	$9,450	$47,250
	Replacement Tree	$405	63	$25,515	63	$25,515	63	$25,515	63	$25,515	63	$25,515	$127,575
Activity Total(s)			**189**	**$45,990**	**189**	**$45,990**	**189**	**$45,990**	**189**	**$45,990**	**189**	**$45,990**	**$229,950**
Activity Grand Total			**9,524**		**9,537**		**9,587**		**9,579**		**9,351**		**47,578**
Cost Grand Total				**$250,355**		**$244,730**		**$244,365**		**$238,865**		**$214,355**	**$1,192,670**

CONCLUSION

When properly maintained, the valuable benefits trees provide over their lifetime far exceed the time and money invested in planting, pruning, and inevitably removing them. The public trees inventoried provide $71,690 in estimated annual economic value, which is over 29% of the village's annual tree maintenance budget of $250,000. Successfully implementing the five-year program may increase Franklin Park's ROI over time, or at least maintain it over the years.

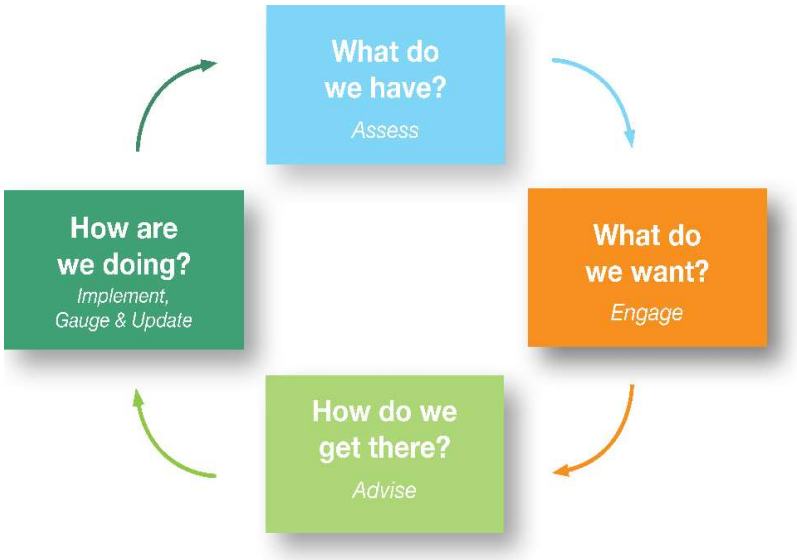
The program is ambitious and is a challenge to complete in five years but becomes easier after all high priority tree maintenance is completed. This *Standard Inventory Analysis and Management Plan* could potentially help the village advocate for an increased urban forestry budget to fund the recommended maintenance activities. Getting started is the most difficult part because of the expensive maintenance in the first year, which represents the transition from reactive maintenance to proactive maintenance. Significant investment early on can reduce tree maintenance costs over time.

As the urban forest grows, the benefits enjoyed by the Village of Franklin Park and its residents will increase as well. Inventoried trees are only a fraction of the total trees in Franklin Park when including private property, which is why it is important to also incentivize private landowners to care for their trees and to plant new ones. The village's urban forestry program is well on its way to creating a sustainable and resilient public tree resource, and can stay on track by setting goals, updating inventory data to check progress, and setting more ambitious goals once they are reached.



EVALUATING AND UPDATING THIS PLAN

This *Standard Inventory Analysis and Management Plan* provides management priorities for the next five years, and it is important to update the tree inventory using TreeKeeper® as work is completed, so the software can provide updated species distribution and benefit estimates. This empowers Franklin Park to self-assess the village's progress over time and set goals to strive toward by following the adaptive management cycle. Below are some ways of implementing the steps of this cycle:



- Prepare planting plans well enough in advance to schedule and complete stump removal in the designated area, and to select species best suited to the available sites.
- Annually comparing the number of trees planted to the number of trees removed and the number of vacant planting sites remaining, then adjusting future planting plans accordingly.
- Annually comparing the species distribution of the inventoried tree resource with the previous year after completing planting plans to monitor recommended changes in abundance.
- Schedule and assign high-priority tree work so it can be completed as soon as possible instead of reactively addressing new lower priority work requests as they are received.
- Include data collection such as measuring DBH and assessing condition into standard procedure for tree work and routine inspections, so changes over time can be monitored.

GLOSSARY

address (data field): The address number was recorded based on parcel data within the GIS data collection program and confirmed with visual observation of the actual address number posted on a building at the inventoried site. In instances where there was no posted address number on a building or sites were located by vacant lots with no GIS parcel addressing data available, the address number assigned was matched as closely as possible to opposite or adjacent addresses by the arborist(s) and the suffix field (assigned address field) was set to "X".

air pollution removal: In i-Tree Eco, air pollution removal refers to the removal of ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matter less than 2.5 microns ($PM_{2.5}$).

American National Standards Institute (ANSI): ANSI is a private, nonprofit organization that facilitates the standardization work of its members in the United States. ANSI's goals are to promote and facilitate voluntary consensus standards and conformity assessment systems, and to maintain their integrity.

***ANSI A300*:** Tree care performance parameters established by ANSI that can be used to develop specifications for tree maintenance.

arboriculture: The art, science, technology, and business of commercial, public, and utility tree care.

assigned address (data field): see **suffix**

avoided runoff: In i-Tree Eco, avoided runoff measures the amount of surface runoff avoided when trees intercept rainfall during precipitation events.

canopy: Branches and foliage that make up a tree's crown.

canopy cover: As seen from above, it is the area of land surface that is covered by tree canopy.

carbon monoxide (CO): A colorless, odorless, highly toxic gas formed as a result of the incomplete combustion of a carbon or carbon compound.

carbon sequestration: The capture and storage of carbon from the Earth's atmosphere. In i-Tree Eco, carbon sequestration is calculated as an annual functional benefit of trees.

carbon storage: Storage of carbon in plant tissue. In i-Tree Eco, carbon storage is calculated as a structural benefit over the lifetime of the tree.

clean (secondary maintenance required): The tree has dead or diseased parts greater than 2 inches in diameter which should be removed to improve tree health, appearance, and to reduce associated risk.

comments (data field): Additional comments on the state of the inventoried site. Comments may include additional defects that were significant but not the primary defect, explanations for why further inspection is needed, and other general information considered important by the inventory arborist.

commercial (land use): Land used for the buying and selling of commercial goods. This land use type includes stores, restaurants, hospitals, and other businesses which provide goods or services for a fee. Although churches do not necessarily fall under this category, they were included under the umbrella of commercial land.

community forest: see **urban forest**.

condition (data field): The general condition of each tree rated during the inventory according to categories adapted from the International Society of Arboriculture's rating system.

cycle: Planned length of time between vegetation maintenance activities.

dead (condition rating): A dead tree shows no signs of life.

defect: See **structural defect**.

defect (data field): The primary defect noted by the inventory arborist. Defects include missing or decayed wood, dead or dying parts, broken or hanging branches, weakly attached branches and codominant stems, cracks, root problem, tree architecture, other, and none.

diameter: See **tree size**.

diameter at breast height (DBH): See **tree size**.

extreme risk tree: Applies in situations where tree failure is imminent, there is a high likelihood of impacting the target, and the consequences of the failure are "severe." In some cases, this may mean immediate restriction of access to the target zone area in order to prevent injury.

failure: In terms of tree management, failure is the breakage of stem or branches, or loss of mechanical support of the tree's root system.

failure size (data field): The size of the portion of a tree for which risk was assessed during the inventory.

fair (condition rating): A fair tree has minor problems that may be corrected with time or corrective action.

front (side): The side of a parcel facing the address street.

functional benefit: In i-Tree Eco, a benefit which is due to the physiological processes carried out by trees, calculated on an annual basis.

further inspection (data field): Notes that a specific tree may require an annual inspection for several years to make certain of its maintenance needs. A healthy tree obviously impacted by recent construction serves as a prime example. This tree will need annual evaluations to assess the impact of construction on its root system. Another example would be a tree with a defect requiring additional equipment for investigation.

genus: A taxonomic category ranking below a family and above a species and generally consisting of a group of species exhibiting similar characteristics. In taxonomic nomenclature, the genus name is used, either alone or followed by a Latin adjective or epithet, to form the name of a species.

geographic information system (GIS): A technology that is used to view and analyze data from a geographic perspective. The technology is a piece of an organization's overall information system framework. GIS links location to information (such as people to addresses, buildings to parcels, or streets within a network) and layers that information to provide a better understanding of how it all interrelates.

global positioning system (GPS): GPS is a system of earth-orbiting satellites that make it possible for people with ground receivers to pinpoint their geographic location.

good (condition rating): A tree in good condition shows no major problems.

grow space size (data field): The r root space available between hardscape features as measured parallel to the street. In parks, the longest dimension of the estimated root space.

grow space type (data field): Categorization of the type of growing space in which a site is located, including median, open space, planting strip, well/pit, or wooded space.

high risk tree: The high-risk category applies when consequences are "significant" and likelihood is "very likely" or "likely," or consequences are "severe" and likelihood is "likely." In a population of trees, the priority of high-risk trees is second only to extreme-risk trees.

industrial (land use): Land used to produce goods. Factories, warehouses, and associated parking are included in this land use.

insect/disease monitoring (further inspection): A tree which requires additional inspection by an entomologist or tree disease specialist to determine whether or not there is an emergent pest or disease present.

invasive tree: A tree species that is out of its original biological community. Its introduction into an area causes or is likely to cause economic or environmental harm, or harm to human health. An invasive, exotic tree has the ability to thrive and spread aggressively outside its natural range. An invasive species that colonizes a new area may gain an ecological edge since the insects, diseases, and foraging animals that naturally keep its growth in check in its native range are not present in its new habitat.

inventory: See **tree inventory**.

inventory date (data field): Date a site was collected.

i-Tree Eco: i-Tree Eco is a street tree management and analysis tool that uses tree inventory data to quantify the dollar value of annual environmental benefits, including runoff reduction, air pollution reduction, and carbon sequestration, as well as life-long structural benefits trees provide, including carbons storage and structural value.

i-Tree Streets: i-Tree Streets is a street tree management and analysis tool that uses tree inventory data to quantify the dollar value of annual environmental and aesthetic benefits: energy conservation, air quality improvement, CO_2 reduction, stormwater control, and property value increase. While i-Tree Streets was not used for the tree benefits analysis in this management plan, it is still used as the basis for the tree benefits tab in TreeKeeper®.

i-Tree Tools: State-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools. The i-Tree Tools help communities of all sizes to strengthen their urban forest management and advocacy efforts by quantifying the structure of community trees and the environmental services that trees provide.

land use (data field): Use that the land adjacent to a site is put to, including residential, commercial, industrial, park, or public grounds.

large (grow space size): Site with a minimum dimension of at least 8 feet between hardscape features. Suitable for large sized mature trees.

level 3 assessment (further inspection): A more in-depth assessment than the level 2 assessment conducted during the inventory which requires specialized equipment or training to complete.

low-risk tree: The low-risk category applies when consequences are "negligible" and likelihood is "unlikely"; or consequences are "minor" and likelihood is "somewhat likely." Some trees with this level of risk may benefit from mitigation or maintenance measures, but immediate action is not usually required.

mapping coordinates (data field): Helps to locate a tree; X and Y coordinates were generated for each tree using GPS.

median (grow space type): Strip of landscaped area which divides lanes of traffic. The center of traffic circles is included in this grow space type.

median (side): Site located between lanes of traffic, between parking spaces, or within roundabouts or cul-de-sacs.

medium (grow space size): Site with a minimum dimension of at least 6 feet and a maximum dimension below 8 feet between hardscape features. Suitable for medium sized mature trees.

moderate risk tree: The moderate-risk category applies when consequences are "minor" and likelihood is "very likely" or "likely"; or likelihood is "somewhat likely" and consequences are "significant" or "severe." In populations of trees, moderate-risk trees represent a lower priority than high- or extreme-risk trees.

monoculture: A population dominated by one single species or very few species.

multi-stem tree (data field): Indicates whether a tree has multiple trunks splitting less than 1 foot above ground level. For this inventory, multi-stem trees were measured below the trunk split or at ground level in cases where multiple stems originated from a branching point below grade.

multi-year annual (further inspection): Designates a tree which should be inspected annually or biannually to monitor a defect for improvement or degradation.

nitrogen dioxide (NO_2): Nitrogen dioxide is a compound typically created during the combustion processes and is a major contributor to smog formation and acid deposition.

none (risk rating): Equal to zero. It is used only for planting sites and stumps, or as a residual risk rating when a tree is recommended for removal.

open space (grow space type): Unrestricted, maintained growing space located behind the sidewalk, if sidewalk is present, or behind the curb of a street if sidewalk is not present. Most sites within privately owned lawns fall into this grow space type.

ordinance: See **tree ordinance**.

overhead utilities (data field): Designates the presence of any overhead utility lines including primary and secondary electrical distribution lines, telecommunication lines, service drops, streetlight supply lines, etc. within the airspace around or in a tree's crown.

ozone (O_3): A strong-smelling, pale blue, reactive toxic chemical gas with molecules of three oxygen atoms. It is a product of the photochemical process involving the Sun's energy. Ozone exists in the upper layer of the atmosphere as well as at the Earth's surface. Ozone at the Earth's surface can cause numerous adverse human health effects. It is a major component of smog.

park (land use): Open land set aside for public recreation.

park name (data field): The park or public grounds on which a site was located. If a site was within the street ROW, the park name field was set to N/A.

particulate matter ($PM_{2.5}$): A major class of air pollutants consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and mists.

planting strip (grow space type): Also known as a **tree lawn**, a strip of landscaped area located between the sidewalk and the road.

plant tree (primary maintenance required): Used only for sites which do not currently host a tree, but which could be viable planting sites. Indicates the need to plant a tree.

poor (condition rating): A tree in poor condition has major problems that are irrecoverable.

primary maintenance required (data field): The type of tree work recommended to reduce immediate risk or fulfill other goals.

prune (primary maintenance required): The tree needs priority pruning to remove dead limbs, provide clearance, remove an obstruction, or thin or restore the canopy.

pruning: The selective removal of plant parts to meet specific goals and objectives.

public grounds (land use): Public land used for purposes other than public recreation (see **park**). Includes City offices or publicly owned lots.

raise (secondary maintenance required): The tree has limbs which are obstructing pedestrian or vehicle traffic or obscuring streetlights, signs, or signals. These limbs should be raised to provide appropriate clearance and reduce associated risk.

rear (side): The side of the parcel opposite of the address street.

reduce (secondary maintenance required): The tree has limbs which are interfering with overhead utilities or nearby buildings. These limbs should be reduced to provide appropriate clearance and reduce associated risk.

remove (primary maintenance need): Data field collected during the inventory identifying the need to remove a tree. Trees designated for removal have defects that cannot be cost-effectively or practically treated. Most of the trees in this category have a large percentage of dead crown.

replacement value: In i-Tree Eco, the compensatory value calculated based on the local cost of having to replace a tree with a similar tree.

residential (land use): Privately owned land used to house people. Includes apartments, condos, and single-family homes.

residual risk (data field): The risk rating of a tree after the recommended primary maintenance has been carried out. Residual risk may be equal to but never greater than the original risk rating.

resilience: The ability of a community to absorb disturbance and reorganize while undergoing change to retain essentially the same function, structure, identity, and feedbacks as prior to the disturbance.

resistance: The ability of a community to remain unchanged when challenged by a disturbance such as pests, severe weather, or climate change.

restore (secondary maintenance required): A tree which needs special pruning to restore the crown and improve tree health, generally due to dieback or damage in the crown.

right-of-way (ROW): strips of land along each side where shoulders, curbs, gutters, sidewalks or drainage swales exist. Area in which street trees were inventoried during the inventory.

risk: Combination of the probability of an event occurring and its consequence.

risk assessment complete (data field): Indicates whether the arborist was able to complete a Level 2 qualitative risk assessment. Arborists may not be able to fully assess tree risk due to embankments, homeowner conflicts, fences, or other obstacles to getting a 360 degree view of the tree.

risk rating (data fields): Level 2 qualitative risk assessment will be performed on the ANSI A300 (Part 9) and the companion publication *Best Management Practices: Tree Risk Assessment*, published by International Society of Arboriculture (2011). Trees can have multiple failure modes with various risk ratings. One risk rating per tree will be assigned during the inventory. The failure mode having the greatest risk will serve as the overall tree risk rating. The specified time period for the risk assessment is one year.

routine prune (primary maintenance required): The tree requires no immediate pruning but should be included in a routine pruning cycle to maintain condition over time.

secondary maintenance required (data field): A further description of the work needed to reduce immediate risk when the primary maintenance need is prune.

side (data field): Each site is assigned a side value to aid in locating the site. Side values include: *front*, *side*, *median* (includes islands), and *rear* based on the site's location in relation to the assigned address.

side (side): Site is located on either side of the lot that is between the front and rear.

site: Any point for which data was recorded during the inventory, including trees, vacant sites, and stumps.

small (grow space size): Site with a minimum dimension of less than 6 feet between hardscape features. Potential suitable for small-sized mature trees.

species (data field): Fundamental category of taxonomic classification, ranking below a genus or subgenus, and consisting of related organisms capable of interbreeding.

stem: A woody structure bearing buds and foliage and giving rise to other stems.

street trees: trees growing along public street right- of-way and managed by the town

structural benefit: In i-Tree Eco, a benefit which is produced by the physical arrangement and composition of trees and tree parts and which is calculated as an aggregate over the lifetime of a tree.

structural defect: A feature, condition, or deformity of a tree or tree part that indicates weak structure and contributes to the likelihood of failure.

structural value: See **replacement value**.

stump removal (primary maintenance required): Indicates a stump that should be removed.

suffix (data field): Data field indicating whether the address was assigned by the arborist.

sulfur dioxide (SO_2): A strong-smelling, colorless gas that is formed by the combustion of fossil fuels. Sulfur oxides contribute to the problem of acid rain.

thin (secondary maintenance required): The tree has very densely spaced limbs in the crown which should be thinned to improve tree health, provide appropriate air flow within the crown, and improve tree aesthetics.

topping: Characterized by reducing tree size using internodal cuts without regard to tree health or structural integrity; this is not an acceptable pruning practice.

train (primary maintenance required): A young or small size tree that requires routine structural pruning to ensure good form as it grows.

TRAQ-risk rating (data fields): see **risk rating**

tree: A tree is defined as a perennial woody plant that may grow more than 20 feet tall. Characteristically, it has one main stem, although many species may grow as multi-stemmed forms.

tree benefit: An economic, environmental, or social improvement that benefits the community and results mainly from the presence of a tree. The benefit received has real or intrinsic value associated with it.

tree inventory: Comprehensive database containing information or records about individual trees typically collected by an arborist.

tree lawn: see **planting strip**.

tree ordinance: Tree ordinances are policy tools used by communities striving to attain a healthy, vigorous, and well-managed urban forest. Tree ordinances simply provide the authorization and standards for management activities.

tree pit: see **well/pit**.

tree size (data field): A tree's diameter measured to the nearest inch in 1-inch size classes at 4.5 feet above ground, also known as diameter at breast height (DBH) or diameter.

tree well: see **well/pit**.

urban forest: All the trees within a municipality or a community. This can include the trees along streets or rights-of-way, in parks and greenspaces, in forests, and on private property.

volunteer: A tree that was not intentionally planted, but rather grew naturally in a location and has been allowed to remain as part of the maintained landscaping.

ward (data field): The Albany Ward within which a site falls.

well/pit (grow space type): A growing space completely surrounded by hardscape, typically sidewalk, and generally constrained in area in all dimensions.

wooded space (grow space type): An unmaintained area typically located behind the curb or sidewalk and usually hosting volunteer trees.

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APPENDIX A
DATA COLLECTION AND SITE LOCATION METHODS

DATA COLLECTION METHODS

DRG collects tree inventory data using their proprietary GIS software, called Rover, loaded onto pen-based field computers. At each site, the following data fields were collected:

- Date of Inventory
- Address
- X and Y Coordinates
- Side
- Overhead Utilities
- Comments
- Species
- Multi-stem Tree
- Size*
- Defects
- Condition
- Maintenance Need
- TRAQ- Risk Rating

* measured in inches in diameter at 4.5 feet above ground or diameter at breast height (DBH]).

The knowledge, experience, and professional judgment of DRG's arborists ensure the high quality of inventory data.

SITE LOCATION METHODS

Equipment and Base Maps

Inventory arborists use FZ-G1 Panasonic Toughpad® units with internal GPS receivers. Geographic information system (GIS) map layers are loaded onto these units to help locate sites during the inventory. This table lists these base map layers, along with each layer's source and format information.

Data Source	Data Year	Projection
Shapefile Cook County, IL	2021	NAD 1983 StatePlane Illinois East, Feet
Aerial Imagery Cook County, IL	2020	NAD 1983 StatePlane Illinois East, Feet

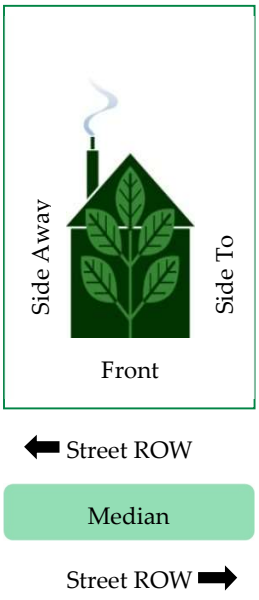
STREET ROW SITE LOCATION

Individual street ROW sites were located using a methodology that identifies sites by *address number*, *street name*, *side*, and *on street*. This methodology was used to help ensure consistent assignment of location.

Address Number and Street Name

Where there was no GIS parcel addressing data available for sites located adjacent to a vacant lot, or adjacent to an occupied lot without a posted address number, the arborist used their best judgment to assign an address number based on nearby addresses. An "X" was then added to the number in the database to indicate that it was assigned, for example, "37X Choice Avenue."

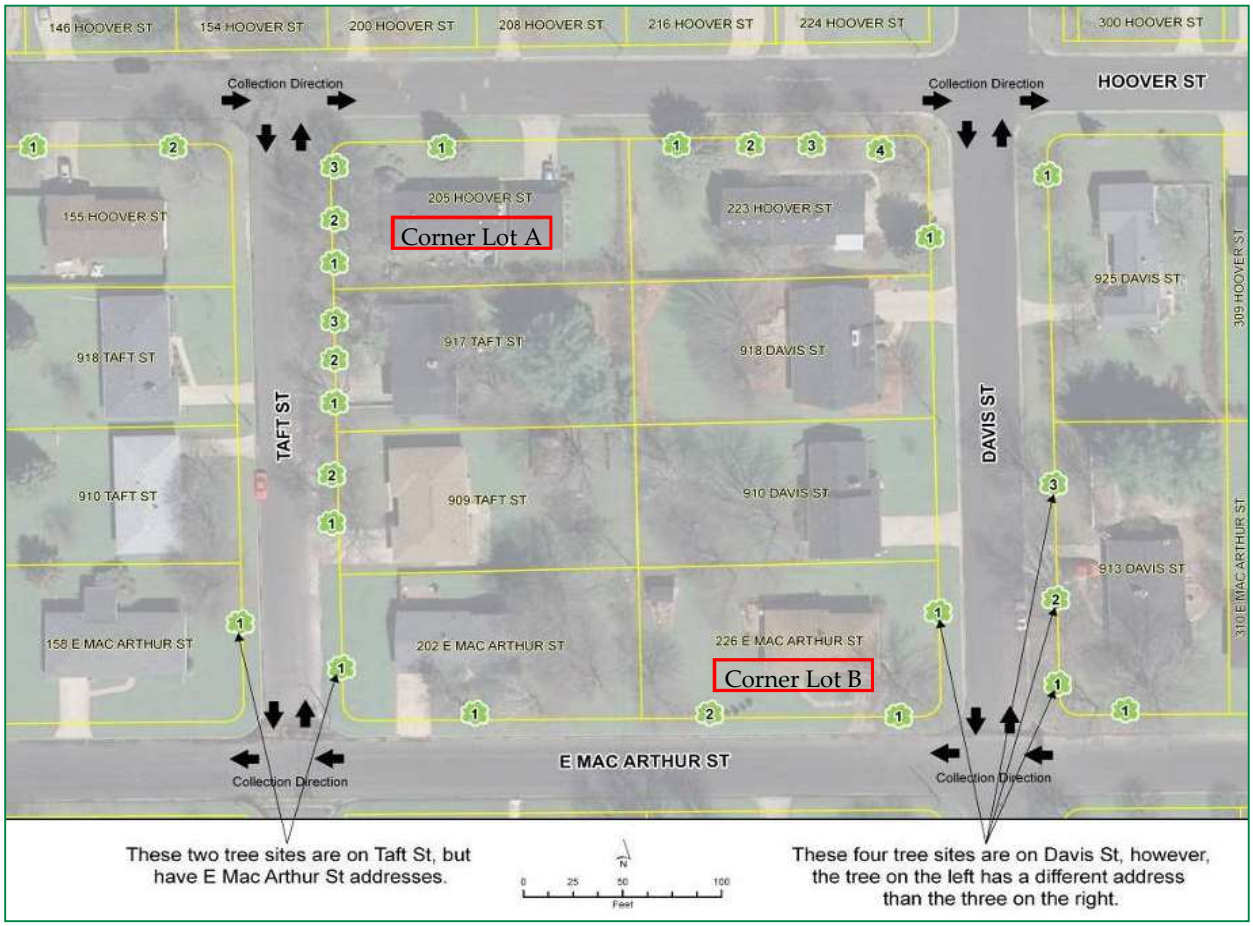
Sites in medians were assigned an address number by the arborist in Rover using parcel and streets geographical data. Each segment was numbered with an assigned address that was interpolated from addresses facing that median and addressed on that same street as the median. If there were multiple medians between cross streets, each segment was assigned its own address. The *street name* assigned to a site was determined by street centerline information.



Side Value

Each site was assigned a *side value*, including *front*, *side*, *median*, or *rear* based on the site's location in relation to the lot's street frontage. The *front* is the side facing the address street. *Side* is either side of the lot that is between the front and rear. *Median* indicates a median or island surrounded by pavement. The *rear* is the side of the lot opposite of the address street.

Site Location Example



Corner Lot A

Address/Street Name:	205 Hoover St.
Side:	Side
On Street:	Taft St.
Address/Street Name:	205 Hoover St.
Side:	Side
On Street:	Taft St.
Address/Street Name:	205 Hoover St.
Side:	Side
On Street:	Taft St.
Address/Street Name:	205 Hoover St.
Side:	Front
On Street:	Hoover St.

Corner Lot B

Address/Street Name:	226 E Mac Arthur St.
Side:	Side
On Street:	Davis St.
Address/Street Name:	226 E Mac Arthur St.
Side:	Front
On Street:	E Mac Arthur St.
Address/Street Name:	226 E Mac Arthur St.
Side:	Front
On Street:	E Mac Arthur St.

APPENDIX B
INVASIVE PESTS AND DISEASES

In today's worldwide marketplace, the volume of international trade brings increased potential for pests and diseases to invade our country. Many of these pests and diseases have seriously harmed rural and urban landscapes and have caused billions of dollars in lost revenue and millions of dollars in cleanup costs. Keeping these pests and diseases out of the country is the number one priority of the USDA's Animal and Plant Inspection Service (APHIS).

Updated pest range maps can be found at: https://www.nrs.fs.fed.us/tools/afpe/maps/ and updated pest information can be found at: https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/Pest-Tracker

Although some invasive species naturally enter the United States via wind, ocean currents, and other means, most invasive species enter the country with some help from human activities. Their introduction to the U.S. is a byproduct of cultivation, commerce, tourism, and travel. Many species enter the United States each year in baggage, cargo, contaminants of commodities, or mail.

Once they arrive, invasive pests grow and spread rapidly because controls, such as native predators, are lacking. Invasive pests disrupt the landscape by pushing out native species, reducing biological diversity, killing trees, altering wildfire intensity and frequency, and damaging crops. Some pests may even push species to extinction. The following sections include key pests and diseases that adversely affect trees in America at the time of this plan's development. This list is not comprehensive and may not include all threats.

It is critical to the management of community trees to routinely check APHIS, USDA Forest Service, and other websites for updates about invasive species and diseases in your area and in our country so that you can be prepared to combat their attack.

APHIS, Plant Health, Plant Pest Program Information
- www.aphis.usda.gov/plant_health/plant_pest_info

The University of Georgia, Center for Invasive Species and Ecosystem Health
- www.bugwood.org

USDA National Agricultural Library
- www.invasivespeciesinfo.gov/microbes

USDA Northeastern Areas Forest Service, Forest Health Protection
- www.na.fs.fed.us/fhp

SPOTTED LANTERNFLY

The spotted lanternfly (SLF, *Lycorma delicatula*) is native to China and was first detected in Pennsylvania in September 2014. SLF feeds on a wide range of fruit, ornamental, and woody trees, with tree-of-heaven being one of its preferred hosts. SLF is a hitchhiker and can be spread long distances by people who move infested material or items containing egg masses.

If allowed to spread in the United States, this pest could seriously impact the country's grape, orchard, and logging industries. Be sure to inspect for the pest. Egg masses, juveniles, and adults can be on trees and plants, as well as on bricks, stone, metal, and other smooth surfaces. Also thoroughly check vehicles, trailers, and even the clothes you are wearing to prevent accidently moving SLF.

Symptoms of SLF are plants oozing or weeping with a fermented odor, buildup of a sticky fluid called honeydew on the plant or on the ground underneath them, and sooty mold growing on plants. The following trees are susceptible to SLF: almond, apple, apricot, cherry, maple, nectarine, oak, peach, pine, plum, poplar, sycamore, walnut, and willow, as well as grape vines and hop plants.

Pinned spotted lanternfly.

Photograph courtesy of PA Dept of Agriculture

Pinned spotted lanternfly nymph with wingspan open.

Photograph courtesy of USDA APHIS

EMERALD ASH BORER

Emerald ash borer *(EAB) (Agrilus planipennis*) is responsible for the death or decline of tens of millions of ash trees in 14 states in the American Midwest and Northeast. Native to Asia, EAB has been found in China, Japan, Korea, Mongolia, eastern Russia, and Taiwan. It likely arrived in the United States hidden in wood-packing materials commonly used to ship consumer goods, auto parts, and other products. The first official United States identification of EAB was in southeastern Michigan in 2002.

Close-up of an emerald ash borer.

Photograph courtesy of USDA APHIS (2020)

Adult beetles are slender and 1/2-inch long. Males are smaller than females. Color varies but adults are usually bronze or golden green overall with metallic, emerald-green wing covers. The top of the abdomen under the wings is metallic, purplish-red and can be seen when the wings are spread.

The EAB-preferred host tree species are in the genus *Fraxinus* (ash).

EASTERN TENT CATERPILLAR

Eastern tent caterpillar (*Malacosoma americanum*) was first observed in the United States in 1646. In spring, caterpillars make nests in the forks and crotches of tree branches. Caterpillars do not feed within the nest; they leave the nest to feed up to 3 feet from nest, and return to rest and take shelter in wet weather. Large infestations may occur at 8- to 10-year intervals. Egg masses overwinter on twigs. Trees are rarely killed by eastern tent caterpillar, but health is compromised that year and aesthetic value is decreased.

Eastern tent caterpillar nest.

Photograph courtesy of Prairie Haven (2008)

Easter tent caterpillar have a wide range of hosts, including apple (*Malus*) and cherry (*Prunus*).

ASIAN LONGHORNED BEETLE

The Asian longhorned beetle (ALB, *Anoplophora glabripennis*) is an exotic pest that threatens a wide variety of hardwood trees in North America. The beetle was introduced in Chicago, New Jersey, and New York City, and is believed to have been introduced in the United States from wood pallets and other wood-packing material accompanying cargo shipments from Asia. ALB is a serious threat to America's hardwood tree species.

Adult Asian longhorned beetle.

Photograph courtesy of New Bedford Guide (2011)

Adults are large (3/4- to 1/2-inch long) with very long, black and white banded antennae. The body is glossy black with irregular white spots. Adults can be seen from late spring to fall depending on the climate. ALB has a long list of host species; however, the beetle prefers hardwoods, including several maple species. Examples include: box elder (*Acer negundo*); Norway maple (*A. platanoides*); red maple (*A. rubrum*); silver maple (*A. saccharinum*); sugar maple (*A. saccharum*); buckeye (*Aesculus glabra*); horsechestnut (*A. hippocastanum*); birch (*Betula*); London planetree (*Platanus* × *acerifolia*); willow (*Salix)*; and elm (*Ulmus*).

LYMANTRIA DISPAR

Lymantria dispar dispar (LDD, formerly called European gypsy moth) is native to Europe and first arrived in the United States in Massachusetts in 1869. This moth is a significant pest because its caterpillars have an appetite for more than 300 species of trees and shrubs. LDD caterpillars defoliate trees, which makes the host trees vulnerable to diseases and other pests that can eventually kill the tree.

Close-up of male (darker brown) and female (whitish color) LDD moths.

Photograph courtesy of USDA APHIS (2019)

Male LDD are brown with a darker brown pattern on their wings and have a 1/2-inch wingspan. Females are slightly larger with a 2-inch wingspan and are nearly white with dark, saw-toothed patterns on their wings. Although they have wings, the female of the species cannot fly.

LDD prefers approximately 150 primary hosts but feeds on more than 300 species of trees and shrubs. Many preferred hosts are found in these common genera: birch (*Betula* spp.); cedar (*Juniperus* spp.); larch (*Larix* spp.); poplar (*Populus* spp.); oak (*Quercus* spp.); and willow (*Salix* spp.).

THOUSAND CANKERS DISEASE

Walnut twig beetle, side view.

Photograph courtesy of USDA Forest Service (2011)

A complex disease referred to as Thousand cankers disease (TCD) was first observed in Colorado in 2008 and is now thought to have existed in Colorado as early as 2003. TCD is considered to be native to the United States and is attributed to numerous cankers developing in association with insect galleries.

TCD results from the combined activity of the *Geosmithia morbida* fungus and the walnut twig beetle (WTB, *Pityophthorus juglandis*). The WTB has expanded both its geographical and host range over the past two decades, and coupled with the *Geosmithia morbida* fungus, walnut (*Juglans*) mortality has manifested in Arizona, California, Colorado, Idaho, New Mexico, Oregon, Utah, and Washington. In July 2010, TCD was reported in Knoxville, Tennessee. The infestation is believed to be at least 10 years old and was previously attributed to drought stress. This is the first report east of the 100th meridian, raising concerns that large native populations of black walnut (*J. nigra*) in the eastern United States may suffer severe decline and mortality.

The tree species preferred as hosts for TCD are walnut.

OAK WILT

Oak wilt symptoms on red and white oak leaves.

Photograph courtesy of USDA Forest Service

Oak wilt was first identified in 1944 and is caused by the fungus *Ceratocystis fagacearum*. While considered an invasive and aggressive disease, its status as an exotic pest is debated since the fungus has not been reported in any other part of the world. This disease affects the oak genus and is most devastating to those in the red oak subgenus, such as scarlet oak (*Quercus coccinea*), shingle oak (*Q. imbricaria*), pin oak (*Q. palustris*), willow oak (*Q. phellos*), and red oak (*Q. rubra*). It also attacks trees in the white oak subgenus, although it is not as prevalent and spreads at a much slower pace in these trees.

Just as with DED, oak wilt disease is caused by a fungus that clogs the vascular system of oak and results in decline and death of the tree. The fungus is carried from tree to tree by several borers common to oak, but the disease is more commonly spread through root grafts. Oak species within the same subgenus (red or white) will form root colonies with grafted roots that allow the disease to move readily from one tree to another.

CALICIOPSIS CANKER DISEASE

Caliciopsis canker disease, caused by the fungus *Caliciopsis pinea*, is a canker-causing disease of eastern white pine (*Pinus strobus*) as well as many fir (*Abies* spp.). Common symptoms of the disease include heavy pitching from small round or elongated cankers in the mid- to upper bole of infected trees. Cankers appear between the branch whorls, distinguishing the disease from the similar symptoms caused by blister rust, which is associated with branch intersections.

Although the canker does not usually cause tree mortality alone, it has been observed to cause canopy thinning and reduce vigor, which may increase susceptibility to other pests, diseases, and environmental stressors. This disease is considered to be part of a complex of diseases and environmental factors contributing to white pine decline in the eastern United States.

Pitch streaks from pine cankers.

Photograph courtesy of NH Division of Forests and Lands 2021.

EASTERN SPRUCE BUDWORM

Eastern spruce budworm (*Choristoneura fumiferana*) is a native species of tree pest that has cyclical population booms every 30 to 40 years. Spruce budworm are generally a concern for Christmas tree farms and forest stands, but may also impact landscape trees. Common hosts of this pest include spruce (*Picea* spp.), which are moderately susceptible to the insect, and fir (*Abies* spp.), particularly balsam fir (*A. balsamea*), which are highly susceptible.

Damage to new growth caused by budworm feeding.

Photograph courtesy of University of Minnesota

Budworm larvae feed on new foliage growth, and early signs of the pest include partially eaten needles webbed onto branch tips and turned a reddish-orange color. Although most trees can withstand defoliation, repeated damage may cause tree mortality and leaves the tree susceptible to secondary pests and diseases. Since outbreaks of this pest tend to last 8–10 years, mortality is a real possibility without intervention. Spruce budworm may be controlled successfully in landscape trees with the use of pesticides.

HETEROBASIDION ROOT DISEASE

Heterobasidion root disease, formerly called annosum root rot, is considered one of the most destructive diseases of conifer in the northern parts of the world. The disease is caused by several species of fungi, most commonly *Heterobasidion irregulare*. Most conifer species can host the disease, although it's particularly damaging in red and white pine (*Pinus resinosa* and *P. strobus*) plantations.

Fungal conks start out with a popcorn-like appearance.

Photograph courtesy of Wisconsin Department of Natural Resources

The disease can enter trees through basal wounds or even through recently cut stumps, where the fungus then spread to adjacent trees of the same species through root grafts. The fungus kills the basal trunk, root crown, and roots of affected trees, making dying trees susceptible to whole tree failure. Signs and symptoms of the disease include small white fruiting bodies which look like popcorn at the root crown, browing/yellowing foliage, needles growing in tufts, undersized foliage, and reddish/purplish discolored bark. Once infected, a tree cannot be cured. Preventative measures include avoiding trunk wounds, particularly near the soil line, and treating recently cut stumps with fungicide to prevent infection.

LECANIUM SCALE

Certain scale insects within the genus *Parthenolecanium* continue to be referred to as lecanium scale as they were once included in the *Lecanium* genus. These scale insects infest a number of different host species and genera, including oak (*Quercus*), hickory (*Carya*), birch (*Betula*), apple (*Malus*), cherry/peach/plum (*Prunus*), and pear (*Pyrus*).

A heavily infested oak twig.

Photograph courtesy of Jim Baker, NC State University.

These scale insects suck sap from the leaves and twigs of host trees, causing stunted growth, poor vigor, and dieback. They also excrete large amounts of honeydew, which may attract other pest species, including sooty mold, which coats the host tree and nearby trees and objects in a soft black coating. Due to the scale covering of the insects, pesticide applications are only effective when crawlers are present.

SPRUCE DECLINE

Although many species of spruce are popular landscape trees, they are susceptible to a wide range of diseases and pests. Over the past several decades, there has been a noticeable increase in spruce decline in many parts of the Midwest. The most commonly affected tree is Colorado blue spruce (*Picea pungens*), but other species of spruce have also seen an increase in rates of decline as well.

Spruce decline is believed to be related to a complex of diseases and environmental conditions, including needlecast diseases, canker diseases, gall adelgids, and spruce spider mites, exacerbated by changing climate conditions. Poorly sited trees may be stressed and thus more susceptible to the many contributing factors to spruce decline. Management involves identifying the site or pest conditions causing decline and using pesticides to control the pests while ameliorating site conditions.

Symptoms of spruce decline tend to start on lower branches.

Photograph courtesy of Dennis Fulbright, MS

WHITE PINE WEEVIL

Considered the most destructive insect pest of eastern white pine in North America, the white pine weevil (*Pissodes strobi*) is a small, rust-colored insect with a long, snout-like beak. Although it prefers eastern white pine (*Pinus strobus*), the weevil will attack Colorado blue, Norway, and Serbian spruce (*Picea pungens, P. abies,* and *P. omorika*), Scots, red, pitch, jack, and Austrian pine (*Pinus sylvestris, P. resinosa, P. rigida, P. banksiana, P. nigra*), and occasionally Douglas-fir *(Pseudotsuga menzietsii*).

Early symptoms of white pine weevil include terminal shoots which droop in a "shepherd's crook".

Photograph courtesy of Whitney Cranshaw, Colorado State University

Trees become susceptible to the weevil when they reach around 3 feet in height and more susceptible if located in direct sunlight. White pine weevils feed and lay their eggs in the terminal shoots of the host trees, and the resulting larva feed on the cambium layer of the terminal shoot, causing the current year's growth to droop in a "shepherd's crook" and eventually die. While this does not cause mortality of the host tree, it does result in permanent disfiguration of the tree and poor structure, with crooked boles or multiple main leaders, which may lead to problems as the tree grows and ages. Pesticides may be used to kill white pine weevils in landscape trees, and if the terminal leader of a landscape tree is killed, structural pruning may be necessary to ensure the tree grows straight and with acceptable form.

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APPENDIX C
i-TREE ECO METHOLOGY

Replacement value (also called structural value) is a compensatory value calculated based on the local cost of having to replace a tree with a similar tree. In other words, it is a measurement of the value of the resource itself. The structural value of an urban forest is the sum of the structural values of all the individual trees contained within. Monetary values are assigned based on valuation procedures of the Council of Tree and Landscape Appraisers using information on species, diameter, condition, and location (McPherson 2007) and (Nowak et al. 2008).

Carbon sequestration refers to the capture and storage of carbon from the earth's atmosphere. i-Tree Eco analysis reports on the gross annual amount of carbon sequestered as well as the total amount of carbon stored over the lifetime of the tree. For this analysis, carbon storage and sequestration values are calculated at a rate of $170.55 per ton.

Air pollution removal refers to the removal of ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matter less than 2.5 microns ($PM_{2.5}$). For this analysis, the pollution removal value is calculated based on the prices of $5,720 per ton of ozone, $320 per ton of sulfur dioxide, $900 per ton of nitrogen dioxide, $1,440 per ton of carbon monoxide, and $278,920 per ton of particulate matter less than 2.5 microns.

Avoided runoff measures the amount of surface runoff avoided when trees intercept rainfall during precipitation events. Surface runoff from rainfall contributes to the contamination of streams, rivers, lakes, and wetlands by washing oils, pesticides, and other pollutants, either directly into waterways or into drainage infrastructure that ultimately empties into waterways. For this analysis, annual avoided runoff is calculated based on the estimated amount of intercepted rainfall and the local weather in Franklin Park, where annual precipitation in 2019 equaled 51.6 inches. The monetary value of avoided runoff is based on the U.S. Forest Service's Community Tree Guide Series at a rate of $0.067 per cubic foot.

APPENDIX D
SUGGESTED TREE SPECIES FOR USDA HARDINESS ZONE 5

Proper landscaping and tree planting are critical components of the atmosphere, livability, and ecological quality of a community's urban forest. The tree species listed below have been evaluated for factors such as size, disease and pest resistance, seed or fruit set, and availability. The following list is offered to assist all relevant community personnel in selecting appropriate tree species. These trees have been selected because of their aesthetic and functional characteristics and their ability to thrive in the soil and climate conditions throughout Zone 5 on the USDA Plant Hardiness Zone Map.

DECIDUOUS TREES

Large Trees: Greater than 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Acer rubrum	red maple	Red Sunset®
Acer nigrum	black maple	
Acer saccharum	sugar maple	'Legacy'
*Aesculus flava**	yellow buckeye	
Betula nigra	river birch	Heritage®
Carpinus betulus	European hornbeam	'Franz Fontaine'
*Castanea mollissima**	Chinese chestnut	
Celtis occidentalis	common hackberry	'Prairie Pride'
Cercidiphyllum japonicum	katsuratree	'Aureum'
*Diospyros virginiana**	common persimmon	
*Fagus grandifolia**	American beech	
*Fagus sylvatica**	European beech	(numerous exist)
Ginkgo biloba	ginkgo	(male trees only)
Gleditsia triacanthos inermis	thornless honeylocust	'Shademaster'
Gymnocladus dioica	Kentucky coffeetree	Prairie Titan®
*Juglans regia**	English walnut	'Hansen'
*Larix decidua**	European larch	
Liquidambar styraciflua	American sweetgum	Cherokee™
Liriodendron tulipifera	tuliptree	'Fastigiatum'
Maclura pomifera	osage-orange	'White Shield','Witchita'
*Magnolia acuminata**	cucumbertree magnolia	(numerous exist)
*Magnolia macrophylla**	bigleaf magnolia	
Metasequoia glyptostroboides	dawn redwood	'Emerald Feathers'
Nyssa sylvatica	black tupelo	
Platanus × acerifolia	London planetree	'Yarwood'
*Platanus occidentalis**	American sycamore	
Quercus alba	white oak	
Quercus bicolor	swamp white oak	
Quercus coccinea	scarlet oak	
Quercus ellipsoidalis	northern pin oak	

Large Trees: Greater than 45 Feet in Height at Maturity (continued)

Scientific Name	Common Name	Cultivar
Quercus frainetto	Hungarian oak	
Quercus imbricaria	shingle oak	
Quercus lyrata	overcup oak	
Quercus macrocarpa	bur oak	
Quercus montana	chestnut oak	
Quercus muehlenbergii	chinkapin oak	
Quercus phellos	willow oak	
Quercus robur	English oak	Heritage®
Quercus rubra	northern red oak	'Splendens'
Quercus shumardii	Shumard oak	
Quercus texana	Texas oak	
Styphnolobium japonicum	Japanese pagodatree	'Regent'
Taxodium distichum	common baldcypress	'Shawnee Brave'
Tilia americana	American linden	'Redmond'
Tilia cordata	littleleaf linden	'Greenspire'
Tilia tomentosa	silver linden	'Sterling'
Ulmus parvifolia	Chinese elm	Allée®
Zelkova serrata	Japanese zelkova	'Green Vase'

Medium Trees: 31 to 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Aesculus × carnea	red horsechestnut	
Cladrastis kentukea	American yellowwood	'Rosea'
Eucommia ulmoides	hardy rubbertree	
Koelreuteria paniculata	goldenraintree	
Ostrya virginiana	eastern hophornbeam	
Parrotia persica	Persian parrotia	'Vanessa'
Phellodendron amurense	amur corktree	'Macho'
Prunus maackii	amur chokecherry	'Amber Beauty'
Prunus sargentii	Sargent cherry	
Quercus acutissima	sawtooth oak	
Quercus cerris	European turkey oak	
Sorbus alnifolia	Korean mountainash	'Redbird'

Small Trees: 15 to 30 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Acer buergerianum	trident maple	Streetwise®
Acer campestre	hedge maple	Queen Elizabeth™
Acer cappadocicum	coliseum maple	'Aureum'
Acer ginnala	amur maple	Red Rhapsody™
Acer griseum	paperbark maple	
*Acer pensylvanicum**	striped maple	
Acer truncatum	Shantung maple	
*Aesculus pavia**	red buckeye	
Amelanchier arborea	downy serviceberry	(numerous exist)
Amelanchier laevis	Allegheny serviceberry	
Carpinus caroliniana	American hornbeam	
Cercis canadensis	eastern redbud	'Forest Pansy'
Chionanthus virginicus	white fringetree	
Cornus kousa	Kousa dogwood	(numerous exist)
*Cornus mas**	corneliancherry dogwood	'Spring Sun'
Corylus avellana	European filbert	'Contorta'
*Cotinus coggygria**	common smoketree	'Flame'
*Cotinus obovata**	American smoketree	
Crataegus phaenopyrum	Washington hawthorn	Princeton Sentry™
Crataegus viridis	green hawthorn	'Winter King'
*Franklinia alatamaha**	Franklinia	
Halesia tetraptera	Carolina silverbell	'Arnold Pink'
*Magnolia × soulangiana**	saucer magnolia	'Alexandrina'
*Magnolia stellata**	star magnolia	'Centennial'
*Magnolia tripetala**	umbrella magnolia	
*Magnolia virginiana**	sweetbay magnolia	Moonglow®
Malus spp.	flowering crabapple	(disease resistant only)
Oxydendrum arboreum	sourwood	'Mt. Charm'
Prunus subhirtella	Higan cherry	pendula
Prunus virginiana	common chokecherry	'Schubert'
Styrax japonicus	Japanese snowbell	'Emerald Pagoda'
Syringa reticulata	Japanese tree lilac	'Ivory Silk'

Note: * denotes species **not** recommended for use as street trees.

CONIFEROUS AND EVERGREEN TREES

Large Trees: Greater than 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Abies balsamea	balsam fir	
Abies concolor	white fir	'Violacea'
Chamaecyparis nootkatensis	Nootka falsecypress	'Pendula'
Cryptomeria japonica	Japanese cryptomeria	'Sekkan-sugi'
Ilex opaca	American holly	
Picea omorika	Serbian spruce	
Picea orientalis	Oriental spruce	
Pinus densiflora	Japanese red pine	
Pinus strobus	eastern white pine	
Pinus sylvestris	Scotch pine	
Psedotsuga menziesii	Douglasfir	
Thuja plicata	western arborvitae	(numerous exist)
Tsuga canadensis	eastern hemlock	

Medium Trees: 31 to 45 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Chamaecyparis thyoides	Atlantic whitecedar	(numerous exist)
Juniperus virginiana	eastern redcedar	
Pinus bungeana	lacebark pine	
Pinus flexilis	limber pine	
Thuja occidentalis	eastern arborvitae	(numerous exist)

Small Trees: 15 to 30 Feet in Height at Maturity

Scientific Name	Common Name	Cultivar
Ilex × attenuata	Foster's holly	
Pinus aristata	bristlecone pine	
Pinus mugo	mugo pine	

Dirr's Hardy Trees and Shrubs (Dirr 2013) and *Manual of Woody Landscape Plants (5th Edition)* (Dirr 1988) were consulted to compile this suggested species list. Cultivar selections are recommendations only and are based on DRG's experience. Tree availability will vary based on availability in the nursery trade.