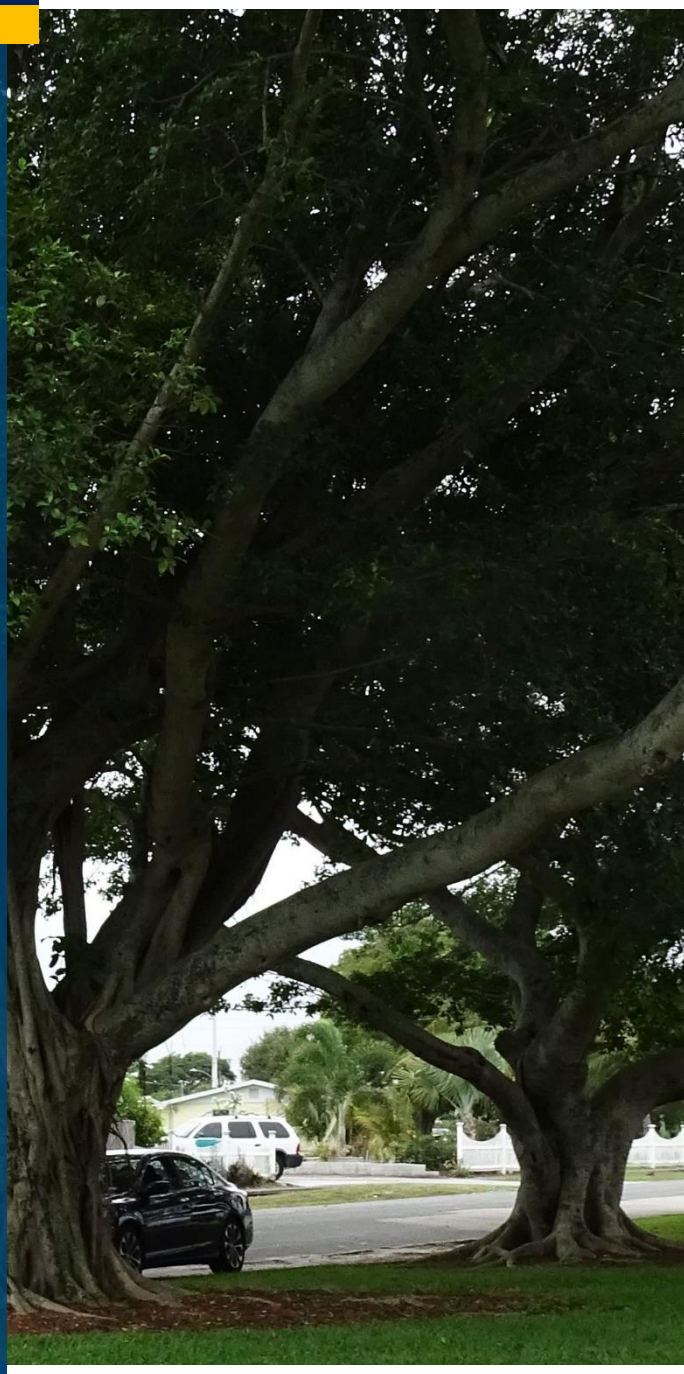
PUBLIC TREE INVENTORY

SUMMARY REPORT



BOYNTON BEACH, FLORIDA

JUNE | 2022

CITY OF BOYNTON BEACH

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2022 PUBLIC TREE INVENTORY

SUMMARY REPORT

BOYNTON BEACH, FLORIDA

ACKNOWLEDGMENTS

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Cover photograph and all other photographs and images unless otherwise noted are from the City of Boynton Beach, Florida

Disclaimer:

Inventory data provided by PlanIT Geo, Inc. "PlanIT Geo" are based on visual recording of observations and measurements at the time of the inspections. All information and data fields populated as a part of this tree inventory are for the purpose of assisting municipalities or private entities in maintenance needs, removal, and replacement of their managed trees. Recommendations provided by PlanIT Geo may be accepted or disregarded by the city and/or client or the city and/or client may seek additional advice. Visual records do not include testing or analysis of any tree component. In no event shall PlanIT Geo be held liable for any special, direct, indirect, consequential, or incidental damages caused by tree failures whatsoever and PlanIT Geo is not responsible for any hidden or otherwise non-observable hazards discovered or identified.

All risk assessments performed by PlanIT Geo's Certified Arborists (where applicable) assume a one-year timeframe for the assessed tree part for failure. All immediate concerns are passed on to the client indirectly through the live webmap (TreePlotter: Inventory), or directly through communication from PlanIT Geo's Certified Arborists or project managers. It is recommended that each risk assessed tree (where applicable) be reinspected within the one-year timeframe to update the likelihood of failure matrices. Storms or other Acts of God change the structural stability of trees and all trees surveyed prior to the event will need to be re-evaluated. Also, the dynamics of inventoried trees may result in data that varies from the current condition or characteristics observed in the field due to deterioration and/or growth of living specimens in a natural environment. All previous data populated by PlanIT Geo staff can be considered out of date upon revisiting and re-evaluating the initially inventoried trees. PlanIT Geo provides no warranty regarding the function, health, or use of the community forest for any purpose.

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Data Summary Sheet

Tree Inventory

Boynton Beach, Florida | May 2022
Tree Inventory Performed by PlanIT Geo™

The City of Boynton Beach actively manages the public urban forest in parks, along streets, in the rights-of-way, and on other City-owned properties. This tree and palm inventory provides the City with information to promote a healthy, diverse urban forest that can provide many benefits to residents as well as the ecosystem. Trees in urban environments not only contribute ecosystem services to the City, but also provide residents with invaluable green space and health benefits. Proximity to green space has been linked to better mental health, social connection, and physical wellbeing.

INVENTORY RESULTS AT-A-GLANCE

11,309 Trees and Palms

57% Palms
43% Trees

173 Unique Species

19% Sabal Palm
10% Live Oak

CITY TREE INVENTORY RECOMMENDATIONS

- Provide guidance to property owners on removal of hazardous trees.
- Monitor trees in poor/dying/dead condition.
- Maintain or establish a cyclical, routine tree monitoring and maintenance schedule.
- Educate the community about the urban forest, the associated benefits, and how to properly care for their trees.

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Learn more about this project and read the full report at GoGreenBoynton.com

TREE INVENTORY ANALYSIS HIGHLIGHTS

The City of Boynton Beach's inventory was analyzed to understand the condition of the public trees and palms, calculate the ecosystem benefits provided, and develop a plan to care for and invest in this City asset. Trees are one of the few infrastructure investments that, if properly maintained, will grow in value over time.

Species Diversity

Top 5 Tree Species		
Tree Species	#	%
Live oak	1,155	10%
Slash pine	345	3%
Gumbo limbo	307	3%
West Indian mahogany	208	2%
Jatropha	181	2%

Top 5 Palm Species		
Palm Species	#	%
Sabal palm	2,099	19%
Coconut palm	861	8%
Florida royal palm	637	6%
Christmas palm	565	5%
Foxtail palm	553	5%

Size Distribution

Tree Size Class	%
0 - 6 inch	22%
6 - 12 inch	42%
12 - 24 inch	33%
24+ inch	3%

Ecosystem Benefits

Trees provide an average of $88 per tree per year in ecosystem benefits, whereas palms provide $46 per palm per year.

Importance Values

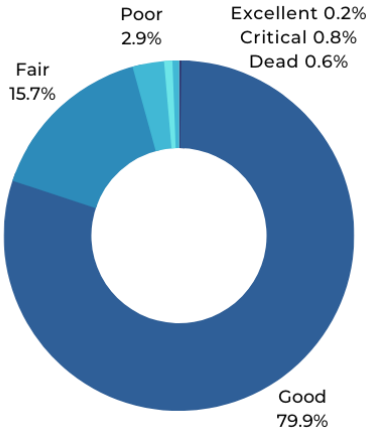
Relative Performance Index (RPI) is a calculation comparing the condition of a species with the average condition of the City's entire tree population. In Boynton Beach, these species are performing better than the overall population:

- Baldcypress (RPI 1.31)
- Gumbo limbo (RPI 1.24)
- Silver buttonwood (RPI 1.11)
- Jatropha (RPI 1.08)
- Live oak (RPI 1.05)

Inventory Conditions

Eighty percent of Boynton Beach's trees and palms are in good condition. Only 4% are in poor, critical, or dead condition. In total, the 2022 inventory identified 250 trees and palms to be removed over the 7-year maintenance schedule.

In planning for the maintenance of Boynton Beach's trees and palms, less than 1% (0.21%) are Priority 1, meaning they require immediate attention due to their condition. This indicates that the City is actively managing the public tree population and addressing many critical and hazardous issues as they arise.



Maintenance of Trees and Palms	
Priority	#
Priority 1 Prune	8
Priority 1 Removal	16
Priority 2 Prune	160
Priority 2 Removal	234
Priority 3 Routine Prune	9,803
Priority 4 Train Prune	1,088
Total Trees and Palms	11,309

Learn more about this project and read the full report at GoGreenBoynton.com

INTRODUCTION

Boynton Beach's Urban Forest

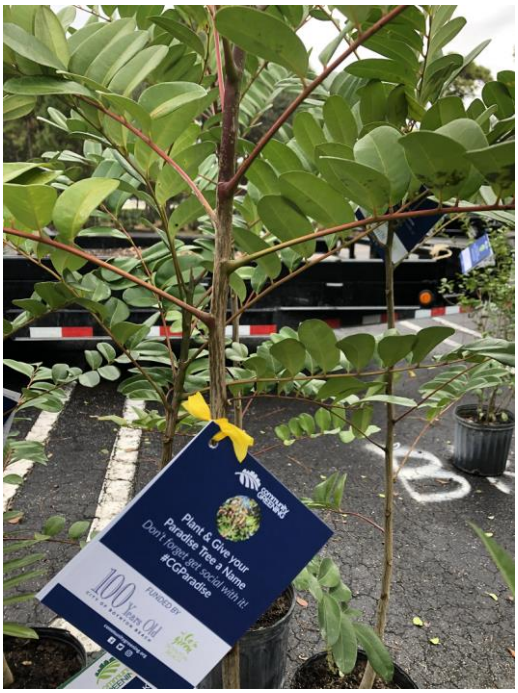
The residents of the City of Boynton Beach ("the City", "Boynton Beach") care about the place where they live, work, and recreate. The City recognizes the important role of the urban forest— exemplified by achieving the status as a Tree City USA city for 38 years. Among the many things that make the City special is its physical environment—the urban forest—consisting of tree-lined streets, abundant parks, natural areas, trees in parking lots and framing buildings, flowering trees, trees with swings in backyards, and trees edging streams and ponds cooling the waters for aquatic life. One of the most important responsibilities is to protect these resources and ensure that Boynton Beach will always be a beautiful, healthy, and livable city, long into the future.

The City has a vibrant urban forest that continues to be created, modified, and removed primarily by people, and sustaining it will require ongoing human intervention. The goal of this intervention is a sustainable urban forest— an urban forest that optimizes the benefits of trees while meeting established safety and economic goals. Achieving this requires robust management, diverse funding, adequate staffing, effective policies, and maintenance actions consistent with best practices.

The City of Boynton actively manages the public urban forest consisting of trees in parks, along streets in the rights-of-way, and on other City-owned properties. This effort is supported by the City's 2020 Climate Action Plan (CAP) which aims to grow "a greener Boynton Beach by enhancing the tree canopy and native plant and wildlife communities." The CAP identifies Urban Forestry (Strategy C-1.5) as a priority to reduce community-wide greenhouse gas emissions, while achieving co-benefits of public health, economic development, ecosystem protection, and climate resilience. The 2022 Tree Inventory and Report support CAP goals by providing data for the City's public trees and the guidance for maintaining trees for sustainability and maximizing the associated benefits they provide.

The City completed its first Urban Tree Canopy Assessment in July 2020, documenting a citywide canopy coverage of 16.1 percent, with 7.4 percent of additional plantable land area. The assessment also found that tree canopy is lower in low-income neighborhoods and communities of color. Following the study recommendations, on September 1, 2020, the City Commission unanimously adopted a citywide goal of planting 3,000 trees per year to increase the tree canopy to 20 percent by 2035 (Resolution R20-091). The City and its partners are actively collaborating to work towards this goal, with the understanding that the private

sector will also contribute. The City's commitment is demonstrated in the Inventory of Trees from Community Greening section.



The City was awarded the 2020 Managing Community Forests grant by the Florida Forest Service, a division of the Florida Department of Agriculture and Consumer Services (FDACS). This grant program will help the City develop a realistic strategy to achieve its tree canopy goal and ensure that the City's investments yield the expected results. This Tree Inventory Summary Report focuses on the public tree inventory data that was collected in 2022 to support the City's goal of increasing equitable tree canopy cover. Note, additional street trees remain to be inventoried due to the limited budget. The location for these trees is described in Remaining Streets for a Comprehensive Inventory section.

Benefits of the City's Urban Forest

The urban forest offers many benefits, some of which are directly identifiable and quantifiable, and others that are experienced. Recognition of the role urban forests play in improving human health and well-being in addition to being critical climate change mitigators continues to increase. An analysis of the 2022 inventory determined the ecosystem services and benefits of the 11,309 public trees inventoried (streets and parks) totaled $722,249 annually. Most notably, the inventoried public tree population prevents over 11.5 million gallons of stormwater runoff by intercepting rainfall, reduces the amount of energy used by over 671 thousand kilowatts, and sequesters over one million pounds of carbon annually. In addition, the canopy and biomass of the City's trees capture over four tons of air pollutants annually and these trees add over a half million dollars in property values. Taking into account the structural value, it is estimated that the total public tree population is valued at nearly $34 million. The City's legacy of trees continues to grow and caring for this asset is an important part of maintaining a sustainable and vibrant city.

2022 Public Tree Inventory Project

The tree inventory project completed in 2022 consisted of trees and palms in City parks, on public properties, and along streets in the public rights-of-way. Based on the available budget and objectives of the project, a total of 11,309 data points were collected across these landscapes. Though a comprehensive inventory of all trees on all City properties remains, newly planted trees through the Community Greening organization were also added to the inventory software for a more comprehensive look at the public tree population—a total of 12,343 data points. These 1,034 additional trees added to the inventory software do not include the same detailed attributes as the 2022 inventory and are not included in all summaries within this Report. Note, trees in parks were assigned a city park name whereas trees on public properties other than parks did not have a location reference name included. Therefore, street tree datasets and summaries within the Report include trees and palms on public properties not including parks. The following section details the inventory methodology and variations in the data collected and reported.

Tree Inventory Methodology

In 2022, the City of Boynton Beach released a request for proposals (RFP) for a qualified firm to complete a tree inventory on City-owned properties. The purpose of the inventory is to identify the health, condition, and maintenance needs of existing trees located in City-owned parks, rights-of-way, and other City properties.

The inventory, completed by PlanIT Geo's Certified Arborists accredited by the International Society of Arboriculture (ISA), was conducted in March and April of 2022. The Certified Arborists, also referred to as Tree Inventory Specialists, utilized the web-based GIS inventory software known as TreePlotter INVENTORY. The inventory team, in coordination with the City, identified the parks to inventory and established guidelines and criteria for identifying trees within public rights-of-way. Reference layers such as City parcels, parks, roads, boundary, Community Redevelopment Agency (CRA) properties, and City facilities were added to the TreePlotter software to support the Tree Inventory Specialists in determining ownership of the tree before inventorying it. The team also finalized the fields and values to be collected based on the City's RFP and the needs of the urban forestry program.

Image Description 1. Tree Inventory Specialists collecting tree inventory data on TreePlotter

Tree Inventory Specialists were assigned to street corridors, parks, and City properties and accounts within TreePlotter were set up for the crew. In addition, the City staff were given accounts to manage the inventory in real-time and for managing the data once the project was completed. All public trees (including palms) were inventoried using the map-based software and assigned the appropriate field and value based on the assessment of the Specialists and the placement of the point on the map. The following table provides a summary of the fields and values collected during the inventory:

Table 1. Summary of the fields and values collected for the public tree inventory

Tree Tab	Location Tab	Management Tab
Primary ID	Growing Space Type	Tree Work (recommended)
Status (Alive or Dead)	Park Name (if applicable)	Maintenance Priority (1-4)
Common Name	Address	Maintenance Comments
Scientific Name	Longitude	Overhead Conductors
Number of Stems	Latitude	Clearance Conflicts
DBH* & DBH Range	Location on Site	User Name
Condition (Excellent to Dead)		Date Added
Observations		Last Modified User
Comments		Last Modified (date)
Photos		

** DBH = Diameter at Breast Height measured 4.5-feet from grade*

For a complete description and definition of inventory fields and values see Appendix B.

Information Collected

Tree Information

Based on the inventory database and the location of trees, the Specialists assessed each tree and assigned the status (alive or dead), common name, number of stems, condition (excellent, good, fair, poor, critical, or dead), and noted any observations (e.g., cavity decay, dieback, girdling roots, hardscape damage, pests, disease, mechanical damage, poor structure, and/or included bark). The diameter of the tree at breast height (DBH, measured 4.5-feet above grade) was then measured using a Biltmore stick to record an accurate measurement to the nearest inch. Each tree data point included a photo of the tree taken at the time of the inventory by the Specialists.

Location Information

The Specialists then completed the location fields by indicating the tree's growing space (alley, cutout, front yard, median, other-maintained, other-unmaintained, planting strip), the park name (if applicable), and the location on site (front, left, park, near, right).

Management Information

Once the tree characteristics and location attributes were logged, the management needs were recorded by first assigning a tree work value (amend mulch, crown cleaning, disease, insects, monitor, clearance prune, restoration prune, structural prune, utility prune, removal, remove invasive species, remove hardware, remove girdling root, remove hanger, or "other" which is then addressed in the maintenance comments). After reviewing all necessary and recommended maintenance needs, a priority for maintenance was assigned (Priority 1 Prune, Priority 1 Removal, Priority 2 Prune, Priority 2 Removal, Priority 3 Routine Prune, or Priority 4 Train Prune).

As part of the overall site and tree assessment, any overhead conductors were noted in the software (no lines, present / no conflict, or present and conflicting), and any clearance conflicts were recorded (building, light, other, pedestrian, sign or signal, underground utilities, vehicle).

Other Data

Lastly, TreePlotter auto-populated a number of fields and values based on the inputs and the location of the data point. These included scientific name, DBH range, address, latitude and longitude coordinates, user name, date added, last modified user, and last modified (date).

Considerations

To complete the comprehensive, accurate, and efficient inventory of public trees, trained and experienced Certified Arborists were utilized. These Specialists have extensive knowledge of tree identification, physiology, responses to stressors, growth habits, maintenance needs, pest and disease concerns, and other factors to make informed assessments of the trees and the sites they are growing within. It is recommended the inventory be maintained by qualified individuals and industry standards and best practices are applied to data management as well as the management, planting, and removal of public trees.

It is recommended the TreePlotter software be accessed via laptop, PC, smartphone, or tablet with a Wi-Fi, cellular, or hotspot connection on Google Chrome (compatible with all major browsers). If using TreePlotter in the field, consider an external battery, a screen protector that does not hinder touchscreens or visibility, a stylus, and personal protective equipment. It is important to adhere to all traffic safety precautions while in the field.

For guidance on how to manage the inventory data going forward, see Appendix F.

Notes on the Framework of the Tree Inventory Summary Report

Trees Versus Palms

This Report is based on the inventory completed in 2022 which includes trees and palms. Generally, urban foresters and the industry agree that the main contributors to a community's urban forest are trees. While palms provide many aesthetic and wildlife values, overall, they provide less benefits and services as it relates to the environment, the economy, and society. Also, palms are managed and maintained differently than trees and cost more to maintain.

Inventory of Trees from Community Greening

Community Greening (CG) is an urban forestry non-profit committed to improving the environment by planting trees and transforming urban green spaces. The organization has been actively planting trees in Boynton Beach since 2019 with funding from the City's sustainability program and grants from private foundations. CG has its own tree inventory software subscription where new trees planted are plotted and tracked. CG plants trees as part of projects relating to dedications, greenspace, memorials, orchards, parks, residential areas, schools, and streetscapes. In addition, the organization has a give-away program where free trees are given out and planted wherever the purchaser desires. The trees planted by CG on public property in Boynton Beach are summarized in this Report in a separate section from the main Tree Inventory. Give-away trees are not included in the Report because they are typically planted on private property and not always within the Boynton Beach City limits. The map shows the 1,034 trees from CG that are incorporated into the Report. A summary of the trees planted through CG is provided in the Community Greening Summary section.

Trees in Boynton Beach Planted through Community Greening

Figure 1. Map of trees in Boynton Beach planted through Community Greening events

Boynton Beach has experienced tree loss over the past decade. To stem that loss and to create a greener, more livable city, the City adopted a tree canopy goal on through Resolution No. R20-09. This resolution aims to increase citywide tree canopy cover from 16.1 percent to 20 percent by 2035 which would require 45,000 trees or 3,000 trees per year over 15 years. Over the past 3 years, the City and partners have been planting trees to work towards this goal. The table below summarizes the coordinated effort of the City and Community Greening from 2019 through 2022:

Table 2. Three-year summary of City and Community Greening tree plantings

Fiscal Year	Trees Planted	Trees Given Away	Total Trees	Budget
19/20	313	400	713	$54,000*
20/21	590	297	887	$76,000**
21/22	399	400	799	$70,000**
TOTALS	**1,302+**	**1,097**	**2,399**	**$200,000**

* Grant from Community Foundation of Palm Beach & Martin Counties

** Funding from the City of Boynton Beach and Boynton Beach CRA (Community Redevelopment Agency)

+ The 1,302 trees vary from the 1,034 trees analyzed as part of this Report due to inclusion of residential plantings

Variations of the Tree Inventory Dataset

The 2022 inventory collected data for trees and palms within City-owned properties consisting of parks, facilities, and street rights-of-way. The approach to management of trees and palms varies depending on the type of City-owned property. For instance, street trees should likely be pruned on a shorter routine cycle for clearance and hazards compared to park trees. As such, summaries for street trees include trees on City-owned properties that are not parks. The following map details the datasets. These datasets were provided for the City to incorporate into a comprehensive urban forest management plan in the future.

Types of Datasets

Dataset

- Street Trees
- Park Trees
- City Property Trees
- Community Greening Trees

Figure 2. Map displaying the types of tree locations

CHARACTERISTICS OF THE CITY-OWNED TREES

To grow a healthy and diverse urban forest, the public tree population must be well understood and managed. An inventory of 11,309 City-owned trees or palms was completed in 2022 by Certified Arborists accredited by the International Society of Arboriculture (ISA). These trees and palms were in maintained areas of parks, on city properties, and within the rights-of-way along streets. A portion of the City-owned tree population remains to be inventoried (see Remaining Streets for a Comprehensive Inventory section). Of the 11,309 data points, a total of 4,842 are trees or 43 percent of the population. The trees and palms inventoried were examined and assessed to determine the species, size, health, structural integrity, quality of the growing space, and maintenance needs, among other key characteristics for management.

The key to maintaining a sustainable and healthy urban forest is species and age diversity, proper maintenance, risk management, and community support, which is addressed in the Report's recommendations.

Table 3. Data point summaries for the 2022 inventory

Summary Statistic	Count
Total Data Points	11,309 (+1,034 Community Greening trees)
Total Number of Trees	4,842
Total Number of Palms	6,467
Total Number of Live Trees and Palms	11,242
Number of City Parks with Trees	24

A Note on the Data Collected and Analyzed

Note, the data collected and analyzed in the following summaries are derived from the 2022 Public Tree Inventory and analyses completed in May 2022. Public trees and palms are dynamic assets that grow and change. The condition, observations, defects, maintenance needs, and other factors are constantly changing due to the nature of the living organisms, the growing environment, and the maintenance history. The summaries and associated recommendations are based on the inventory data at the time of analysis.

For summary purposes, the following sections refer to both trees and palms as trees in most cases though separate analyses, summaries, and maps are provided within the Report and as separate documents.

Public Trees: Extent and Location

The location of public trees along with the frequency and abundance may impact the maintenance needs, resources required, and associated benefits and services. The inventory collected data on trees within the public rights-of-way of streets and medians, within maintained areas of public parks, and on public City-owned properties. The following section summarizes the location and frequency of trees inventoried in 2022.

Street, Park, and Other City Property Trees

Table 4. Summary of the extent of public trees and palms along streets, on public properties, and in parks

Street or Public Property Trees and Palms		
Street or Public Property Points	Total Street or Public Property Trees	Total Street or Public Property Palms
6,695 street points 1,399 property points 8,094 total points	3,142 street or property trees	4,952 street or property palms
Park Trees and Palms		
Park Points	Total Park Trees	Total Park Palms
3,215 total park points	1,700 park trees	1,515 park palms
TOTALS		
Total Points	**Total Trees**	**Total Palms**
11,309	**4,842**	**6,467**
Trees Added From Community Greening Projects		
Total Points	Total Trees	Total Palms
1,034	1,034	0

Location of Trees/Palms Inventoried

Figure 3. Visualization and count of the types of public trees inventoried

Note: A portion of the City's neighborhoods remain to be inventoried and these locations were shared with the City by the Tree Inventory Specialists. Additional details are provided in the following section.

Remaining Streets for a Comprehensive Inventory

Due to the available budget, certain areas of the City were not included in the 2022 inventory. As part of the project, maps displaying the remaining locations were provided. It is estimated a total of 3,000 to 5,000 trees remain. The areas to inventory are summarized below.

Table 5. Summary of remaining streets and areas to inventory

A) E of I-95, N of Woolbright Rd, W of the RR, and S of the Canal

B) E of Seacrest Blvd, N of Seacrest Scrub Natural Area, W of the RR, and S of SE 23rd Ave

C) E of US-1, N of Boynton Beach Blvd, and S of Intracoastal Park

D) E of US-1, N of Woolbright Rd, and S of Kepner Dr

E) Neighborhood of Leisureville (E of Congress Ave, N of SW 23rd Ave, W of SW 8th St, S of W Boynton Beach Blvd

F) E of I-95, N of the Canal, W of US-1, and S of E Gateway Blvd

G) NW portion of the City (N of Miner Rd, S of Hypoluxo Rd

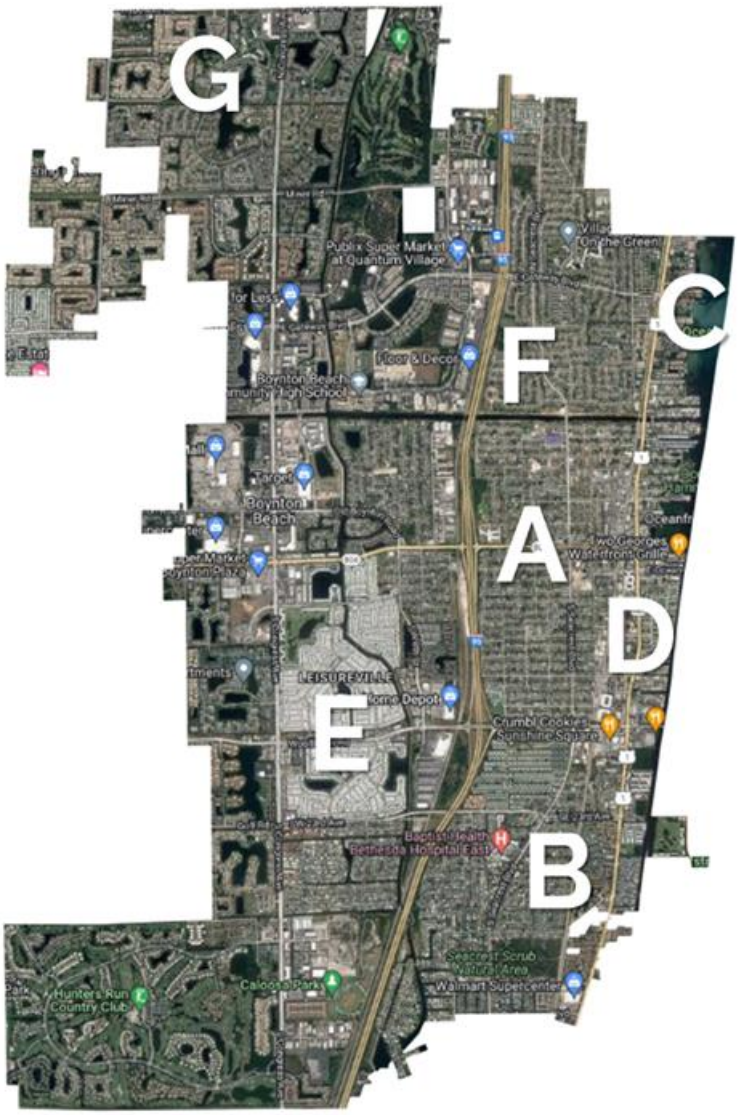


Figure 4. Map displaying the general location of remaining streets to inventory (refer to table for description)

Tree Status

Each tree was assigned a status of either alive or dead. Trees recorded as dead were primarily assigned a removal task, summarized in the maintenance section (Table 6).

Status	Streets and Public Properties		Parks	
Alive	8,043	99%	3,199	99.5%
Dead	51	1%	16	0.5%
TOTAL	**8,094**	**100%**	**3,215**	**100%**

Table 6. Status of the trees inventoried

Distribution of Park Trees

A total of 3,215 trees were inventoried in 24 City parks. The number and distribution of trees varies by park and is described below. After the inventory was completed, a total of 1,034 street and park trees from Community Greening were added to the database. These trees are not included in the summary below but are detailed in the Community Greening Summary section.

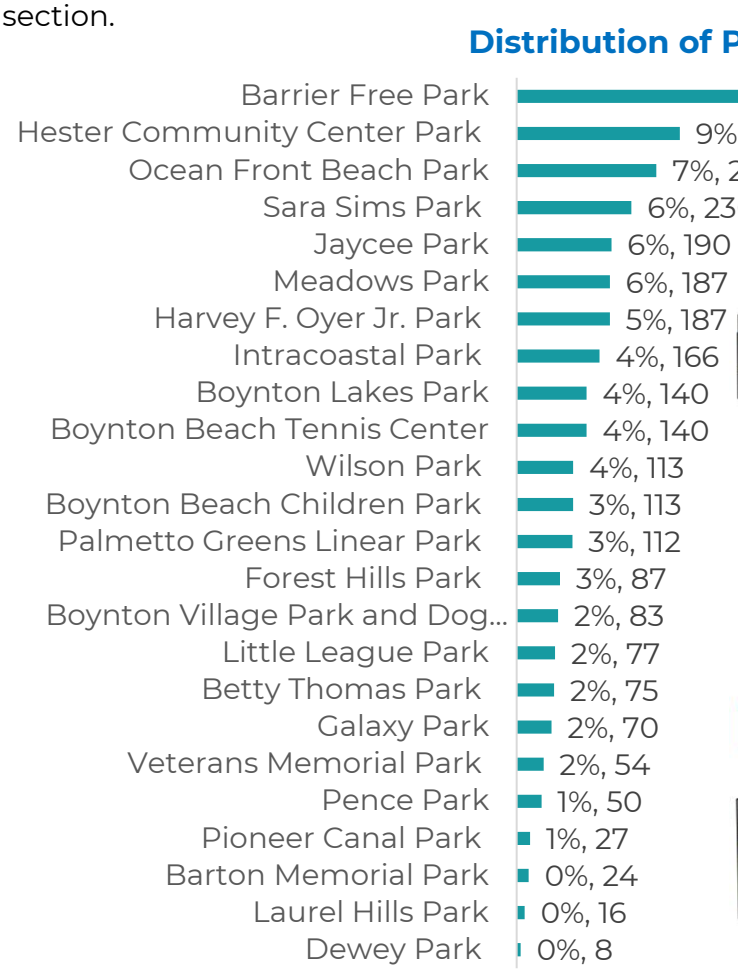


Figure 6. Count and distribution of trees by City park

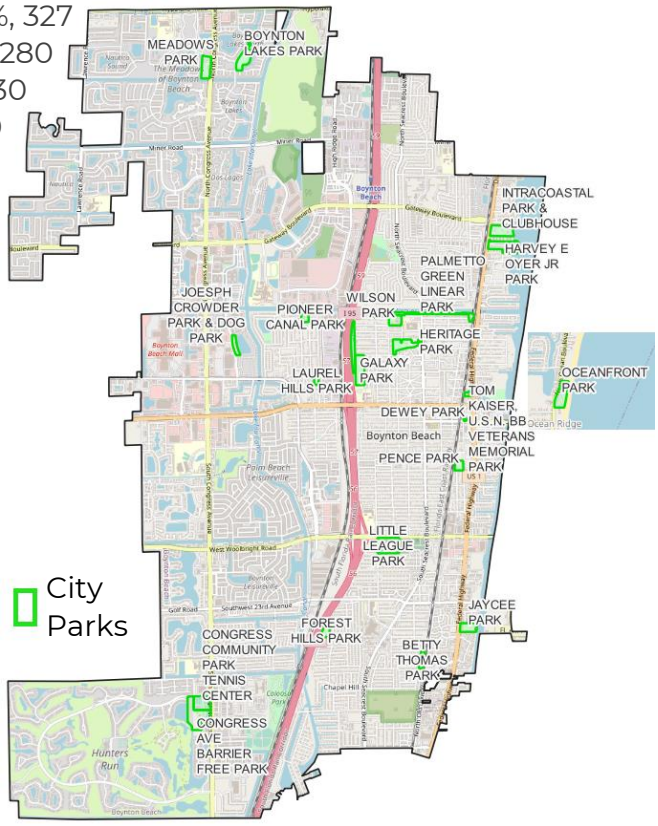


Figure 5. Map displaying City parks inventoried

The 24 parks inventoried comprise approximately 150 acres in the City and the average size is 6 acres. Of the 3,215 trees in these parks, Barrier Free Park has the largest population with 459 trees (10 percent) followed by Hester Community Center Park with 327 trees (9 percent). On average, these parks contain 134 trees. Additional analyses of trees within parks are provided in Appendix C.

Distribution of Street Trees

The planting site width for tree roots and basal flare within the growing space can impact tree growth, health, and maintenance costs over time. Adequate space and soil volume should be considered for each site based on tree species requirements and root biology. Frequency of maintenance is also a consideration for tree selection when a tree needs to be replaced. An analysis of growing space can assist tree managers in making future tree species selections for sites with similar characteristics.

The growing space types were collected for each inventoried public tree. An analysis of the growing space of existing public trees informs future planting sites and the tree species appropriate for replanting. The chart to the right shows the percentage of each growing space classification. Of the inventoried street trees, a total of 2,898 trees (36 percent) are growing in areas classified as "Other (Maintained)" and 2,147 trees (27 percent) in front yards*.

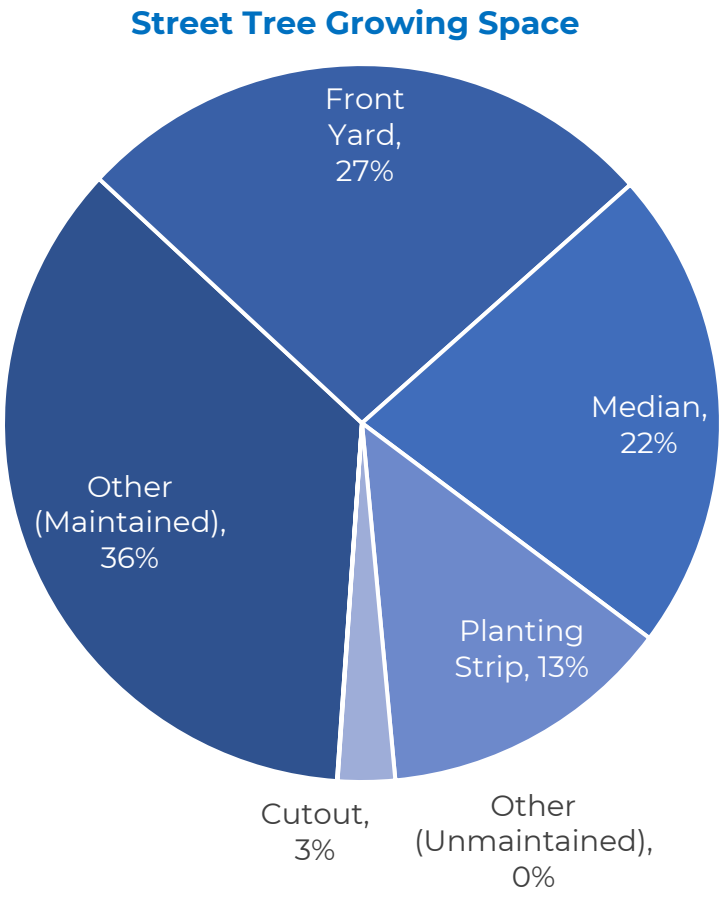
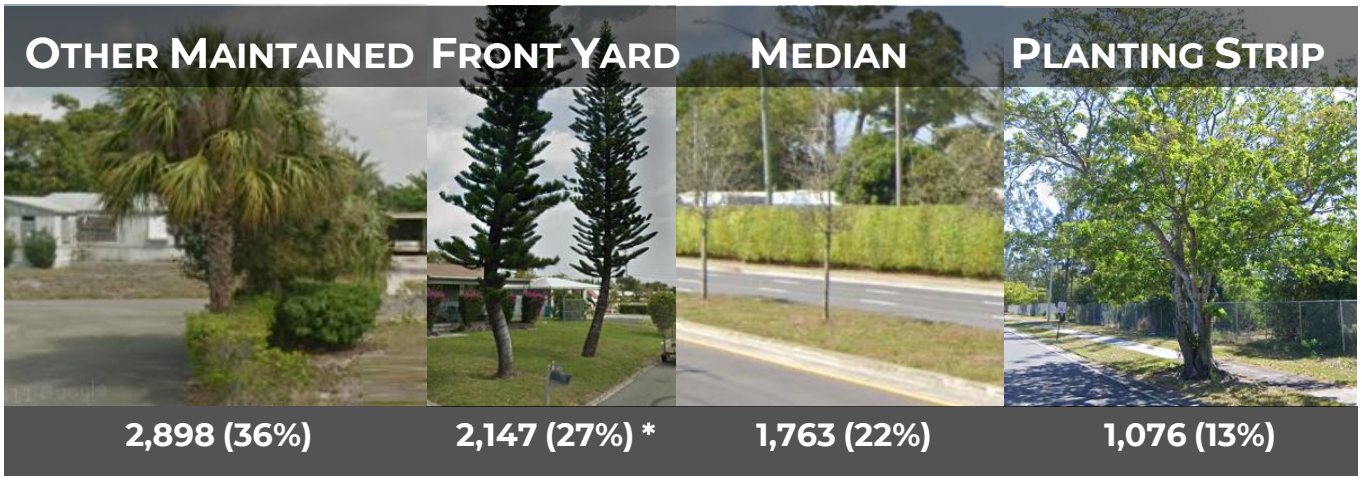


Figure 7. Type of growing space of existing public street trees



* Front Yard is a term used to describe the location of a tree within a public right-of-way that does not have a planting strip. It does not mean it is a private tree.

Figure 8. Visualization and distribution of public street trees within growing space types

Public Trees: Species Diversity

Species composition data are essential since the types of trees and palms present throughout the City dictate the amount and type of benefits produced, maintenance activities required, and budget considerations.

The 11,309 inventoried trees and palms consist of 173 different species and cultivar classifications and 136 unique genera. Of the 173 species, 141 are tree species and 32 are palm species. Sabal palms comprise the highest amount with 19 percent (2,099 trees) of the total tree population, followed by live oaks at 10 percent (1,155 trees) and coconut palms with 8 percent (861 trees). The top ten most prevalent species comprise 65 percent of the total inventoried public tree population. The remaining 35 percent is made up of other species that are primarily mahogany, palms, jatropha, crapemyrtle, buttonwood, baldcypress, Geiger tree, or frangipani— each with at least 100 trees or more.

Table 7. Most common public tree genera

Genera	%	Genera	%
Sabal (sabal palm)	19%	*Wodyetia* (foxtail palm)	5%
Quercus (oak)	11%	*Washingtonia* (Mexican fan palm)	4%
Cocos (coconut palm)	8%	*Syagrus* (Queen palm)	3%
Roystonea (royal palm)	6%	*Pinus* (pine)	3%
Adonidia (Christmas palm)	5%	*Bursera* (Gumbo limbo)	3%

Figure 9. Most common public tree species (top 3)

Sabal palm

Live oak

Coconut palm

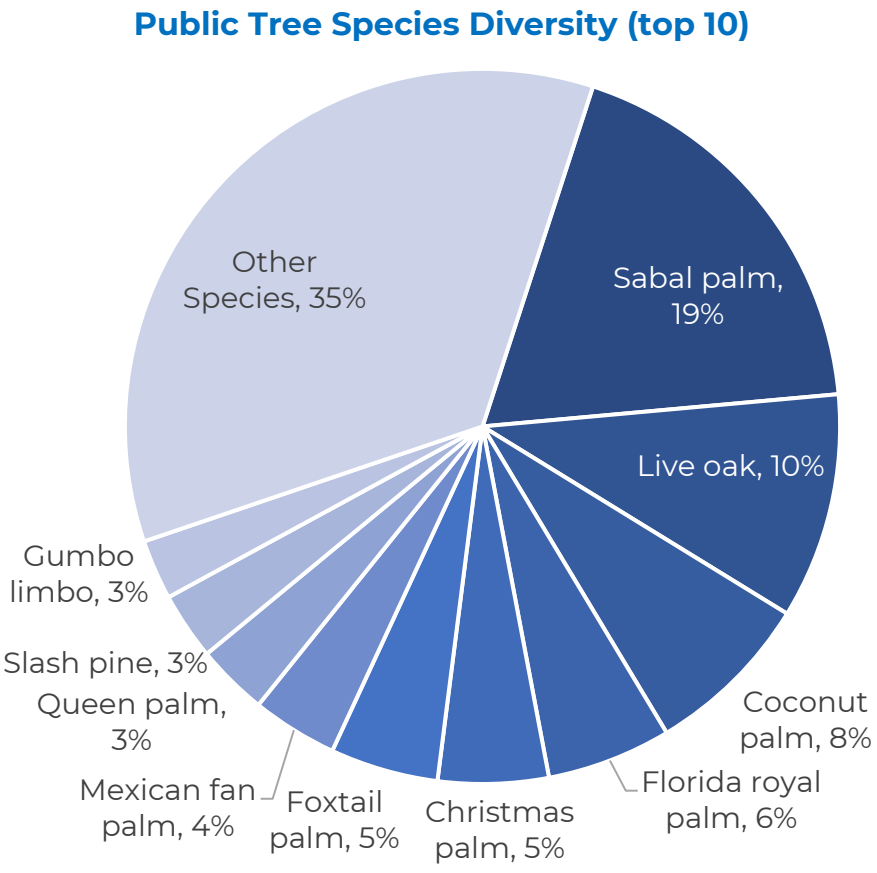


Figure 10. Public tree species diversity (top 10)

A Closer Look at Diversity

Common Name of Top 5 Trees	Count	% Whole	% Trees
Live oak	1,155	10%	24%
Slash pine	345	3%	7%
Gumbo limbo	307	3%	6%
West Indian mahogany	208	2%	4%
Jatropha	181	2%	4%
Top 5 Tree Subtotal	**2,196**	**19%**	**45%**
Other Trees	**2,646**	**23%**	**55%**
Total Trees	**4,842**	**43%**	**100%**

Common Name of Top 5 Palms	Count	% Whole	% Palms
Sabal palm	2,099	19%	32%
Coconut palm	861	8%	13%
Florida royal palm	637	6%	10%
Christmas palm	565	5%	9%
Foxtail palm	553	5%	9%
Top 5 Palm Subtotal	**4,715**	**42%**	**73%**
Other Palms	**1,752**	**15%**	**27%**
Total Palms	**6,467**	**57%**	**100%**

The maintenance and management approach and needs for trees and palms differ and thus, should be evaluated separately. The table above provides a summary of the most common trees and palms. For trees, live oaks comprise the majority with 1,155 trees making up 10 percent of the entire inventory population and 24 percent of trees specifically. For palms, sabal palms make up the majority with 2,099 specimens resulting in 19 percent of the total inventory population and 32 percent of all palms.

Figure 11. Distribution of trees and palms in the City's inventory

Public Trees: Size and Age Distribution

The distribution of tree ages influences the structure of the urban forest as well as the present and future costs. An unevenly aged urban forest offers continued flow of ecological benefits and a more uniform workflow allowing managers to more accurately allocate annual maintenance schedules and budgets.

To optimize the value and benefits of Boynton Beach's trees, the urban forest, i.e., the public tree population, should have a high percentage of large canopy trees which provide greater ecosystem benefits. On the other hand, there must be a suitable number of younger, smaller trees in the urban forest to account for and eventually replace large and mature trees in decline. Having a healthy percentage of young trees in the urban forest will ensure a sustainable tree population as well as age distribution in future years. To compare Boynton Beach's urban forest structure to industry-recommended standards, the "ideal distribution" is used (Richards, 1983 and 1993). The diameter at breast height (4.5-feet) is used to measure relative age.

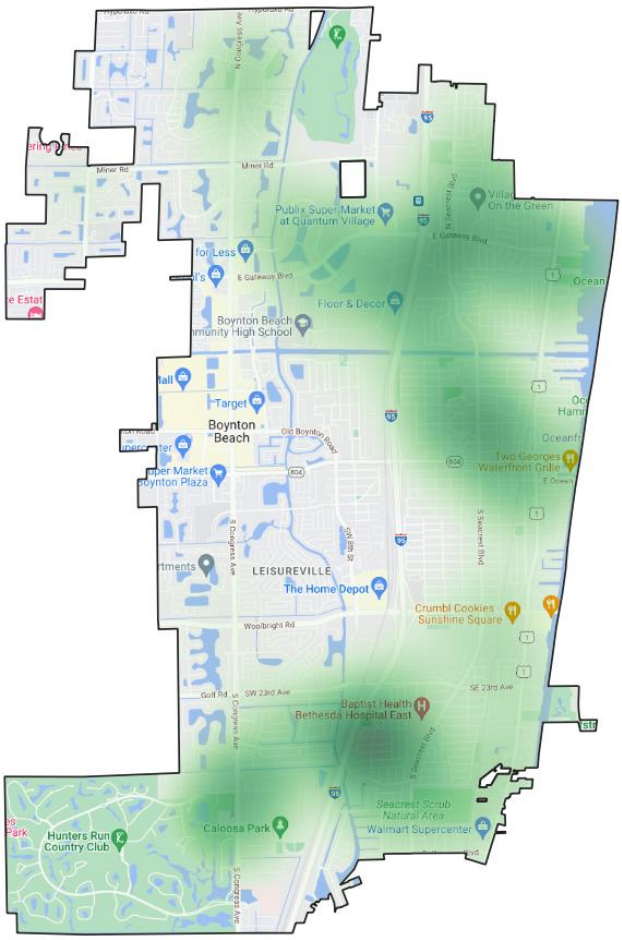
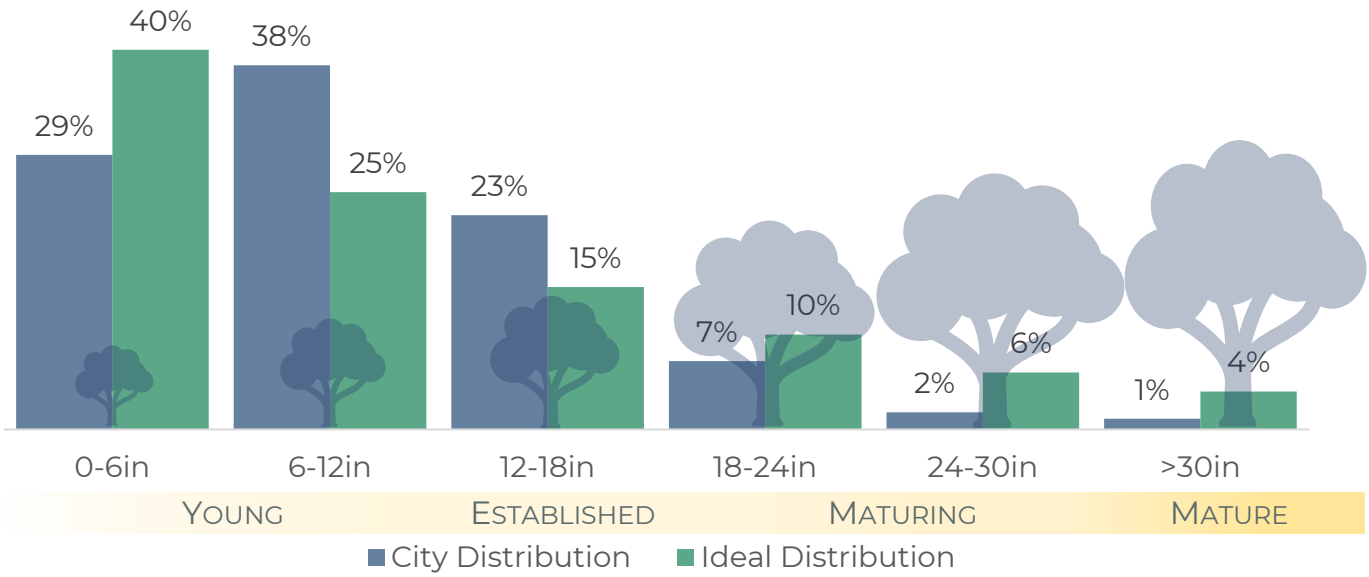


Figure 12. Heat map showing areas with the largest diameter ranges

Public Tree Size and Relative Age Classes with Community Greening Trees



Note: Only 40 percent (418 trees) of the 1,034 Community Greening trees have a diameter value though all 1,034 trees were added to the figure above.

Figure 13. Comparison of the size distribution of Boynton Beach's public trees to an ideal distribution

Overall, the age distribution of Boynton Beach's public tree population is smaller and younger than the ideal age distribution. The average diameter of trees is 11 inches and the largest diameter measured is 176 inches. As the figure above (Figure 13) shows, 67 percent of the public tree population (7,273 trees) is composed of trees with a DBH (or "diameter at breast height," measured at 4.5 feet above grade) ranging from 1 to 12 inches. This indicates that the majority of trees are young or small-statured. Also, trees planted through Community Greening projects within Boynton Beach contribute to the structure of the public tree population. These newly planted trees increase the City's distribution of trees in the 0-6-inch diameter class. The datasets provided by Community Greening did not include a measurement of diameter for all 1,034 trees added to Boynton Beach's inventory software. 40 percent (418 trees) do have a diameter value and it is assumed the other 60 percent are under six inches in diameter. Therefore, the figure above shows the distribution of tree size classes with the 1,034 Community Greening trees included.

Trees in the smaller diameter class are crucial for a healthy urban forest. Using Figure 13 above, the inventory found there are more trees in the 12-18-inch size class than the ideal distribution— 23 percent compared to the ideal 15 percent. Another concern is the trees greater than 18 inches in diameter all fall below the ideal distribution. Development often shapes the tree diversity in a city and the City should work with developers to ensure that the species they are planting allow for larger species where possible and the existing trees are preserved to grow into larger canopied trees to provide substantial benefits and services.

If the size classes ranging from 18 inches to over 30 inches were above the ideal distribution it would likely represent a declining public tree population, or a significant number of large trees expected to need removal over the life of this Report. For Boynton Beach, this is not the case and given the 0-6-inch size class are 11 percent below the ideal 40 percent (based on Figure 14 with Community Greening's trees), amplified tree plantings should and are being considered and addressed. City trees in larger DBH ranges can offer greater ecological benefits if they are properly maintained and remain healthy, but trees of this size should be monitored frequently to determine maintenance needs, potential risks, and signs of decline.

It should be noted, when analyzing only trees (no palms), the distribution is similar to Figure 13. The only variation is an increase proportion of trees in the 0-6-inch class with 43 percent compared to 22 percent and a decrease proportion of trees in the 12-18-inch class with 18 percent (compared to 25 percent) which is likely due to the number of palms in the 12-18-inch class (27 percent).

An ideal age distribution in the tree population allows managers to allocate and project annual maintenance costs uniformly. This ensures continuity in overall tree canopy coverage and associated benefits which are often dependent on the growing space of individual trees. It is recommended to monitor and manage large trees throughout the City and weigh the risks and benefits that are associated with large, mature trees.

Public Trees: Condition

Tree characteristics and environmental factors affect the management needs for urban trees. An analysis of the condition and maintenance requirements assists managers in planning Boynton Beach's public trees and the Citywide urban forest. Tree condition indicates how well trees are managed and how well they perform, given site-specific conditions. Tree maintenance needs are assigned for public safety reasons and for the health and longevity of the trees themselves. Understanding the maintenance needs assists tree managers in establishing daily work plans and maintaining public safety. These needs are examined in the Tree Work and Maintenance Priority sections of this study. The public tree inventory data were analyzed to identify potential trends in tree condition and management needs. Information on the condition of trees plays an important role in planning, budgeting, and use of resources. Each inventoried tree's health was evaluated by ISA Certified Arborists based on the condition of the wood and the foliage as well as the structure.

Figure 14 summarizes the 11,309 trees that were assigned a condition rating and shows an example of the canopy health for each respective classification. The data show that every four of five trees inventoried are classified as being in "Good" condition, comprising 80 percent or 9,031 trees, followed by those in "Fair" condition comprising 16 percent (1,771 trees). 483 (4 percent) trees are noted as being in "Poor", "Critical", or "Dead" condition. The dead trees or trees noted for removal should be addressed and planned for immediately. Trees classified as "Poor" or "Critical" may have a chance at recovery depending on the factor(s) affecting the rating. These trees should be examined to determine the mitigation necessary, if any.

Condition of Public Trees

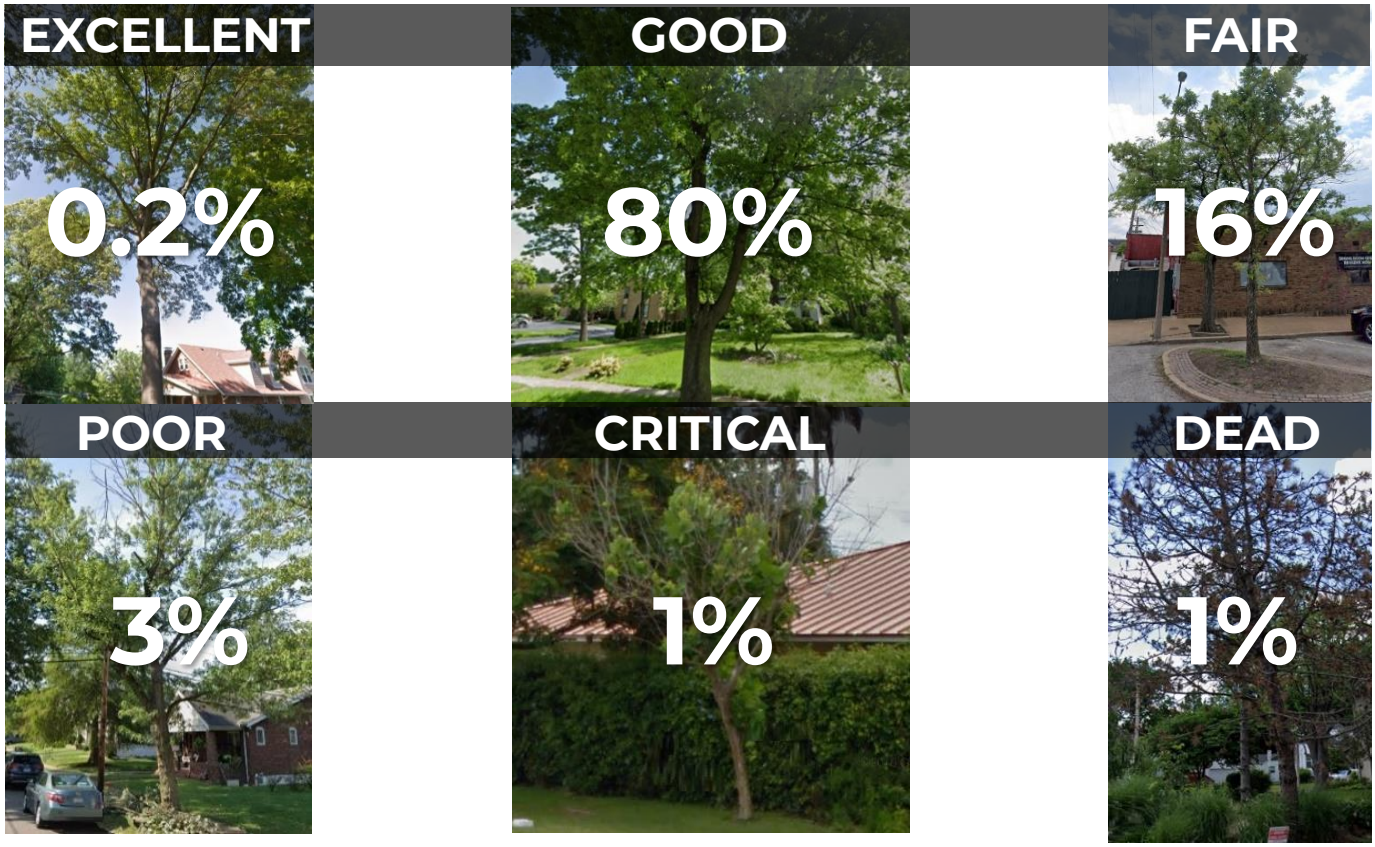
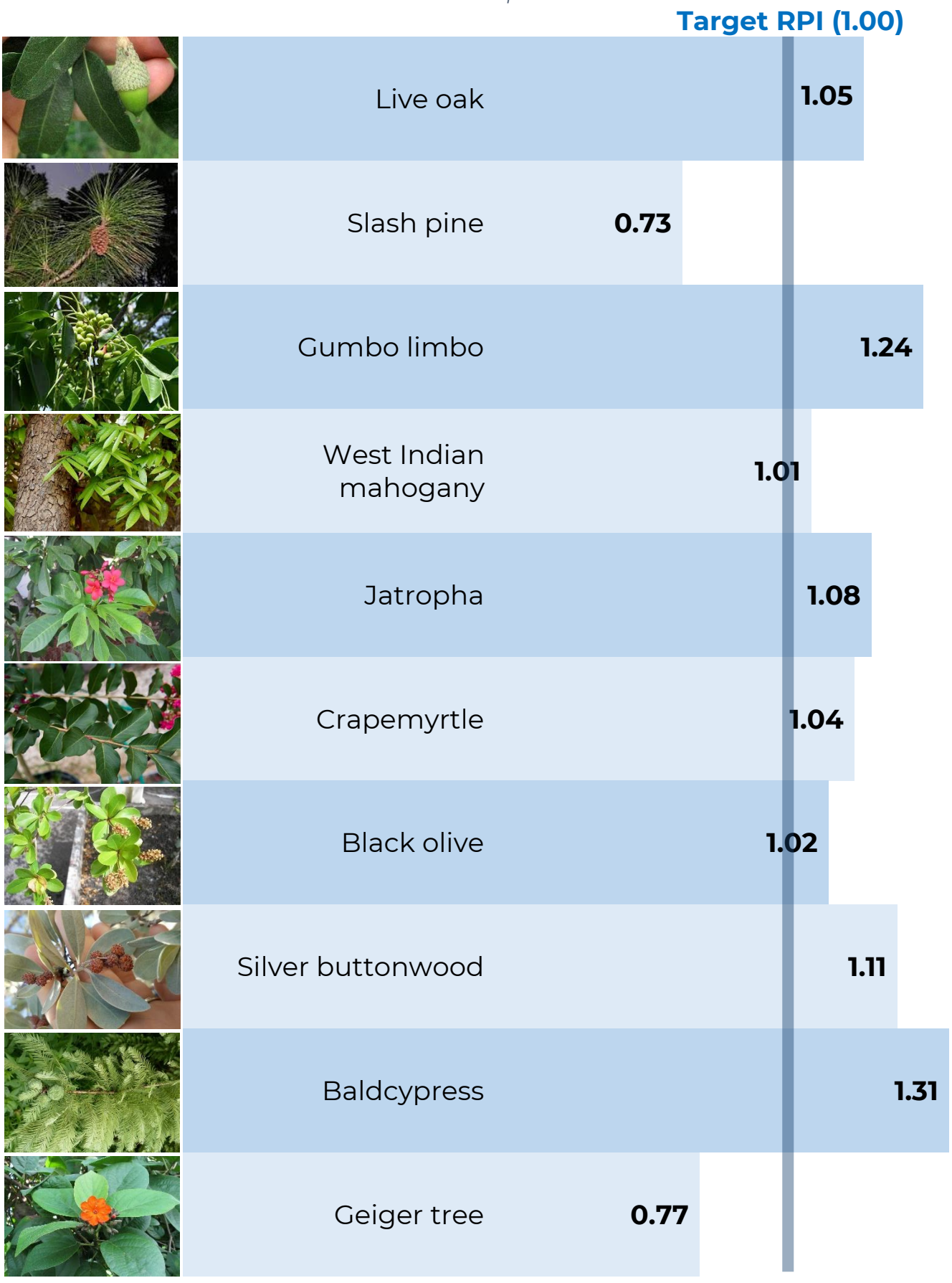


Figure 14. Summary of public tree condition classes

Relative Performance Index of Most Common Public Tree Species

Table 8. Relative Performance Index of the most common public trees



In addition to understanding the overall condition of the public tree population to inform management strategies, an analysis of performance was also conducted for the ten most prevalent tree (no palm) species using the Relative Performance Index approach. Relative Performance Index (RPI) is a comparison of a species' condition rating of "Good" and the tree population's "Good" rating. Using the percent of Good trees for a given species divided by the tree population percentage of Good trees gives a value of equal to 1, less than 1, or greater than 1. A value equal to 1 means the particular species is as healthy as the overall tree population. A value less than 1 means the species is not as healthy as the overall tree population. A value greater than 1 means the species is healthier than the overall tree population. RPI answers the question of how well a species is performing in terms of health compared to the entire inventoried population.

For the public tree (no palm) population, baldcypress, gumbo limbo, silver buttonwood, and jatropha are performing better than the overall public tree population. Live oak, crapemyrtle, black olive, and West Indian mahogany are performing similar to the overall public tree population but Geiger trees and slash pines are underperforming and are in the poorest condition of the top ten most prevalent tree species. These metrics are useful in identifying concentrations of maintenance demand and determining the appropriate tree species to plant in the future. For reference, when evaluating only palms in an RPI study, coconut palms and Montgomery palms are performing better than the overall palm population (greater than 1.00 RPI); sabal, Florida royal, Christmas, Foxtail, Mexican fan, areca, and dwarf date palms are performing similar to the overall palm population (at or near an RPI value of 1.00); and only queen palms have a relatively low RPI with 0.87.

Public Trees: Observations and Defects

Tree observations (or defects) were recorded during the 2022 inventory to further describe a tree's health, structure, or location when more detail was needed. A total of 12 unique observation options were included in the inventory, 4,565 trees (40 percent) had one or more defects, and a total of 6,451 observations were recorded.

The table (Table 9) to the right provides a summary of the observations for Boynton Beach's public trees. Of the 6,451 observations recorded, crown dieback was the most frequent observation recorded (13 percent or 1,523 trees) during the 2022 tree inventory. 11 percent or 1,290 trees were noted as having mechanical damage, and 10 percent or 1,081 trees were observed to have poor structure.

Public Tree Observations

Observation	Count	% of Trees
Crown Dieback	1,523	13%
Mechanical Damage	1,290	11%
Poor Structure	1,081	10%
Cavity Decay	960	8%
Nutrient Deficiency	647	6%
Poor Root System	566	5%
Included Bark	263	2%
Pests/disease	54	0.5%
Girdling Roots	38	0.3%
Hardscape Damage	23	0.2%
Canker	6	0.1%
Grate/Guard	0	0.0%
TOTAL	**6,451**	**57%**

Table 9. Observations and defects recorded for Boynton Beach's public trees

Of the total observations made, 99 percent are preventable or mendable meaning the defects or concerns observed are primarily human-caused. For example, poor structure can be prevented or limited with proper young tree pruning, implementing best practices and standards would prevent or reduce the number of improperly pruned trees, and poor root systems can be prevented by choosing quality tree nursery stock, proper planting, and amending soils. Trees with hardscape damage observations could have been prevented by choosing the appropriate species for the site and ensuring adequate root space. Lastly, adequate mulch rings, growing space, grates, and awareness would reduce the count of mechanical damage observations. The data also shows the impacts of deferred maintenance. About 25 percent of the observations recorded could be addressed or prevented with proactive pruning (crown dieback, poor structure, and included bark observations).

Potentially Human-Caused Defects*

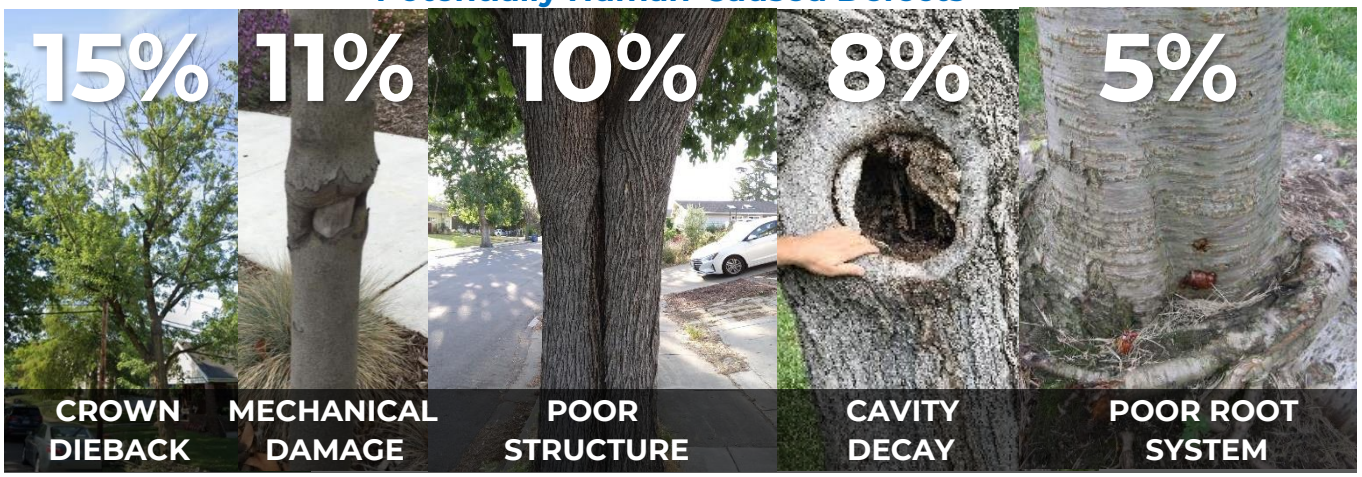


Figure 15. Examples of the potentially human-caused defects seen in the public tree observations

** Note: Images are not all from Boynton Beach's 2022 inventory*

Public Trees: Tree Work Informing Maintenance

Prior to establishing a maintenance priority, the Certified Arborists recorded the necessary and recommended tree work for each tree inventoried. A total of 18 tree work categories were available for multiple selection. From the 2022 inventory, a total of 5,507 trees (49 percent) were noted as needing tree work and a total of 6,452 tree work selections were made.

Necessary and Recommended Tree Work

Tree Work	Count	% Whole
Crown Cleaning	4,214	37%
Prune-Structural	430	4%
Prune-Clearance	427	4%
Monitor	409	4%
Prune-Utility	336	3%
Removal	243	2%
Remove Hardware	165	1%
Remove - Invasive Species	116	1%
Prune-Restoration	39	0.3%
Raise	32	0.3%
Disease	19	0.2%
Reduce	14	0.1%
Insects	3	0.03%
Other (Describe Below)	3	0.03%
Remove-Hanger	2	0.02%
Amend Mulch	0	0.00%
Remove-Girdling Root	0	0.00%
Thin	0	0.00%
TOTAL	**6,452**	**57%**

Table 10. Necessary and recommended tree work to inform maintenance priorities

Most of the tree work recommendations made relate to tree pruning (90 percent). Of the 5,507 assigned a tree work task, the vast majority (4,214 trees) require crown cleaning (37 percent of the population). All other tree work tasks represent less than 5 percent of the total inventoried population.

The tree work tasks including crown cleaning, prune-structural, prune-clearance, prune-utility, remove hardware, remove-invasive species, prune-restoration, raise, reduce, remove-hanger, amend mulch, and thin can all likely be addressed with a programmed pruning cycle. This proactive approach aims to address all public trees within a 5- to 7-year cycle as recommended by industry standards and best practices. Studies show this is the optimal range for program efficiency, tree health, and public safety. Pruning more frequently does not have a large impact on tree health and public safety though pruning less frequently begins to impact the tree health, public safety, and program efficiency due to the compounded effects of deferred maintenance.

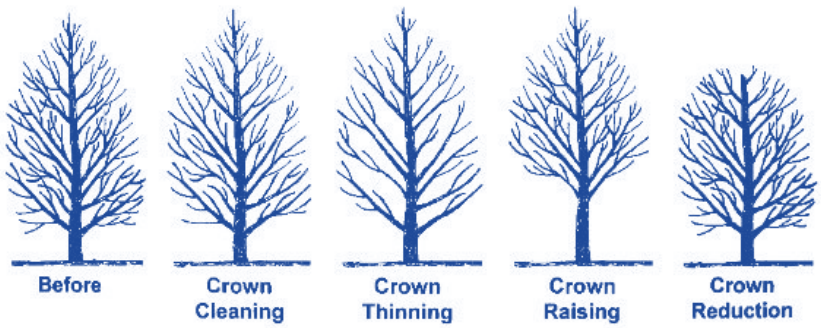


Figure 16. General demonstration of the common types of pruning (tree work)

Public Trees: Maintenance Priority

The inventory required an assessment of the maintenance needs, if any, for each tree. A total of 10 unique maintenance needs or priorities were included as options in the inventory.

Table 11 provides a summary of the priority maintenance and removal recommendations for all of the inventoried trees. 97 percent of the public tree population requires routine pruning with 1,088 (10 percent) small trees and 9,803 (87 percent) large trees. Only 2 percent (250 trees) are recommended for removal and 6 percent (16 trees) of the 250 trees were given a Priority 1 rating for removal.

Public Tree Maintenance Needs

Maintenance Need	COUNT	%
Priority 1 Prune	8	0.1%
Priority 1 Removal	16	0.1%
Priority 2 Prune	160	1%
Priority 2 Removal	234	2%
Priority 3 Routine Prune	9,803	87%
Priority 4 Train Prune	1,088	10%
TOTAL	**11,309**	**100%**

Table 11. Public tree maintenance needs

Young tree training pruning is performed for trees generally less than 6 inches DBH to improve tree form or structure. The recommended length of young tree pruning cycles is three years since young trees tend to grow at faster rates (on average) than more mature trees. The young tree cycle differs from a routine pruning cycle in that these trees generally can be pruned from the ground with a pole pruner or pruning shear. The objective is to increase structural integrity by pruning for one dominant leader in most cases for most tree species. Young tree training pruning is species-specific, since many trees may naturally have more than one leader. In addition to training pruning, young trees may also require additional maintenance such as added or amended mulch, watering, added or removed stakes and ties, and/or clearance of debris and litter. These needs can potentially be addressed during young tree training pruning. 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, crossing/interfering limbs, or dead/diseased/damaged limbs. If these problems are not corrected, they may worsen as the tree grows, increasing risk and creating potential liability.

For an overview of palm maintenance and pruning, see Appendix E.

Public Tree Maintenance Details

Figure 17. Most common public tree maintenance needs

A Closer Look at Tree Maintenance

As stated in earlier sections, the maintenance and management of trees and palms varies. Also, tree maintenance needs and approaches vary among species and age. And further, evergreens, conifers, and deciduous trees require unique approaches. As with trees, maintenance of palms is not uniform throughout the range of species. Some palms are self-pruners while others require manual pruning. The table below provides a second-tier approach to maintenance by summarizing the maintenance priorities of trees and palms separately.

Comparison of Tree and Palm Maintenance Priorities

	Trees		Palms	
Maintenance Priority	Count	% Trees	Count	% Palms
Priority 1 Prune	8	0.2%	0	0%
Priority 1 Removal	9	0.2%	7	0.1%
Priority 2 Prune	152	3%	8	0.1%
Priority 2 Removal	206	4%	28	0.4%
Priority 3 Routine Prune	3,689	76%	6,114	95%
Priority 4 Train Prune	778	16%	310	5%
TOTALS	**4,842**	**100%**	**6,467**	**100%**

Table 12. Summary of the maintenance priorities by trees and palms

As shown above, in both trees and palms, the primary maintenance priority is Priority 3 Routine Prune with 76 percent and 95 percent, respectively. A larger proportion of trees require Priority 4 Train Prune with 778 trees (16 percent) compared to 310 palms (5 percent).

For a recommended overall maintenance schedule and estimated costs see the Recommendations section.

Public Tree Stocking Level

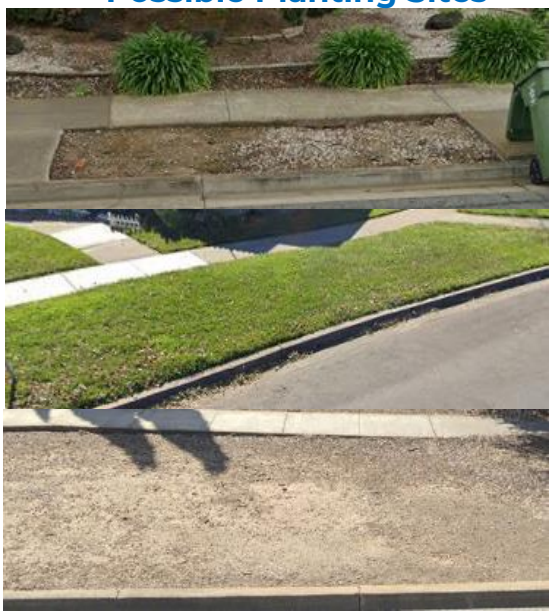
There are numerous opportunities to plant more trees on public property in the City of Boynton Beach. Historically, the locations of new tree plantings on City-owned rights-of-way in the City have been based on constituent requests, the replacement of dead or dying trees (where feasible), and project-specific plantings (e.g., streetscape improvement projects). Boynton Beach's public tree inventory did not include the collection of possible planting sites in the public rights-of-way though the City and partners may use the TreePlotter software or similar to collect this data going forward. These possible planting sites would first be gathered and then further evaluated to determine if they are feasible and preferrable sites for new trees. This dataset can provide initial information on how the City can grow its urban forest over time— informed by the 2022 inventory. As a proxy or supporting approach, the City may use the possible planting area data from the 2020 Urban Tree Canopy Assessment to identify possible planting sites that support the Citywide tree canopy goal.

By completing an inventory of public planting sites, the City will be able to calculate and monitor the stocking level. "Stocking" is a traditional forestry term used to measure the density and distribution of trees. In this case it determines how many public sites currently have a tree or stump present and how many are readily available for new trees. Note that this value can consider impervious surfaces that could become planting locations as well as potential planting locations in maintained and unmaintained areas of parks or other civic spaces. Also, trees recommended for removal (250 trees based on the 2022 inventory) may become future planting sites and are part of the stocking level equation.

An important benchmark in maintaining a sustainable urban forest is to keep it at least 90 percent stocked, such that no more than 10 percent of the existing planting sites remain vacant. The City should make every effort to budget for tree planting in the future to maintain the urban forest at least 90 percent stocked and to continue increasing its canopy. Before committing to enhanced tree planting, the responsibility and resources for post-planting care and long-term maintenance need to be identified.

In summary, stocking levels can be calculated with an inventory of possible planting spaces and include living trees, dead trees, and stumps for an overall evaluation of opportunities.

Possible Planting Sites



Small: ~1-5 feet in width

Medium: ~6-10 feet in width

Large: ~ >10 feet in width

Figure 18. Examples of the types of possible public planting sites that can be inventoried

Community Greening Summary

As discussed in earlier sections, the trees planted in Boynton Beach through Community Greening projects were also added to the inventory software. This Report primarily summarizes the trees inventoried in 2022 since many of the attributes for the inventory summary are not included in the Community Greening tree dataset. Of the many attributes included in the inventory, the Community Greening dataset only contains "common name" as an applicable attribute to summarize in this Report.

A total of 1,034 trees (no palms) from Community Greening were added to the inventory software. These trees were planted through projects for greenspace, memorials, dedications, orchards, parks, and streets. The added dataset does not include trees planted as part of the give-away program or trees planted as part of school, residential, or railroad projects.

Composition of Community Greening's Trees in Boynton Beach

Common Name	Count	% Within CG Trees	% Whole Inventory (12,343)
Slash pine	286	28%	2%
Simpson's stopper	97	9%	1%
Live oak	95	9%	1%
Gumbo limbo	70	7%	1%
Silver buttonwood	56	5%	0.5%
Green buttonwood	53	5%	0.4%
Baldcypress	43	4%	0.3%
Red maple	32	3%	0.3%
Red bay	28	3%	0.2%
Paradise tree	25	2%	0.2%
Subtotal	**785**	**76%**	**6%**
Other Species	249	24%	2%
TOTAL	**1,034**	**100%**	**8%**

Table 13. Summary of the most common (top 10) tree species from Community Greening

Most Community Greening plantings added to the inventory database consist of slash pine with 286 planted representing 28 percent of all Community Greening trees added. Simpson's stopper is the second most common tree with 97 total or 9 percent. The top 10 most common CG trees planted in Boynton Beach comprise 76 percent of the total CG plantings. The 1,034 CG trees added to the inventory database contribute to 8 percent of the total inventory (1,034 trees of the 12,343 total data points).

Benefits of the Urban Forest

The quality of life of the members in any community depends on the urban forest, as trees make a vital and affordable contribution to the sense of community, pedestrian-friendly neighborhoods, energy savings, and air quality. Boynton Beach's Public Works Department and the Sustainability Office are critical to meeting the City's commitment to climate change mitigation and adaptation, carbon sequestration, stormwater reduction, wildlife habitat enhancement, and water conservation. Trees are one of the few infrastructure investments that, if properly maintained, will grow in value over time.

Benefits Overview

Benefits and Services Provided by Boynton Beach's Urban Forest

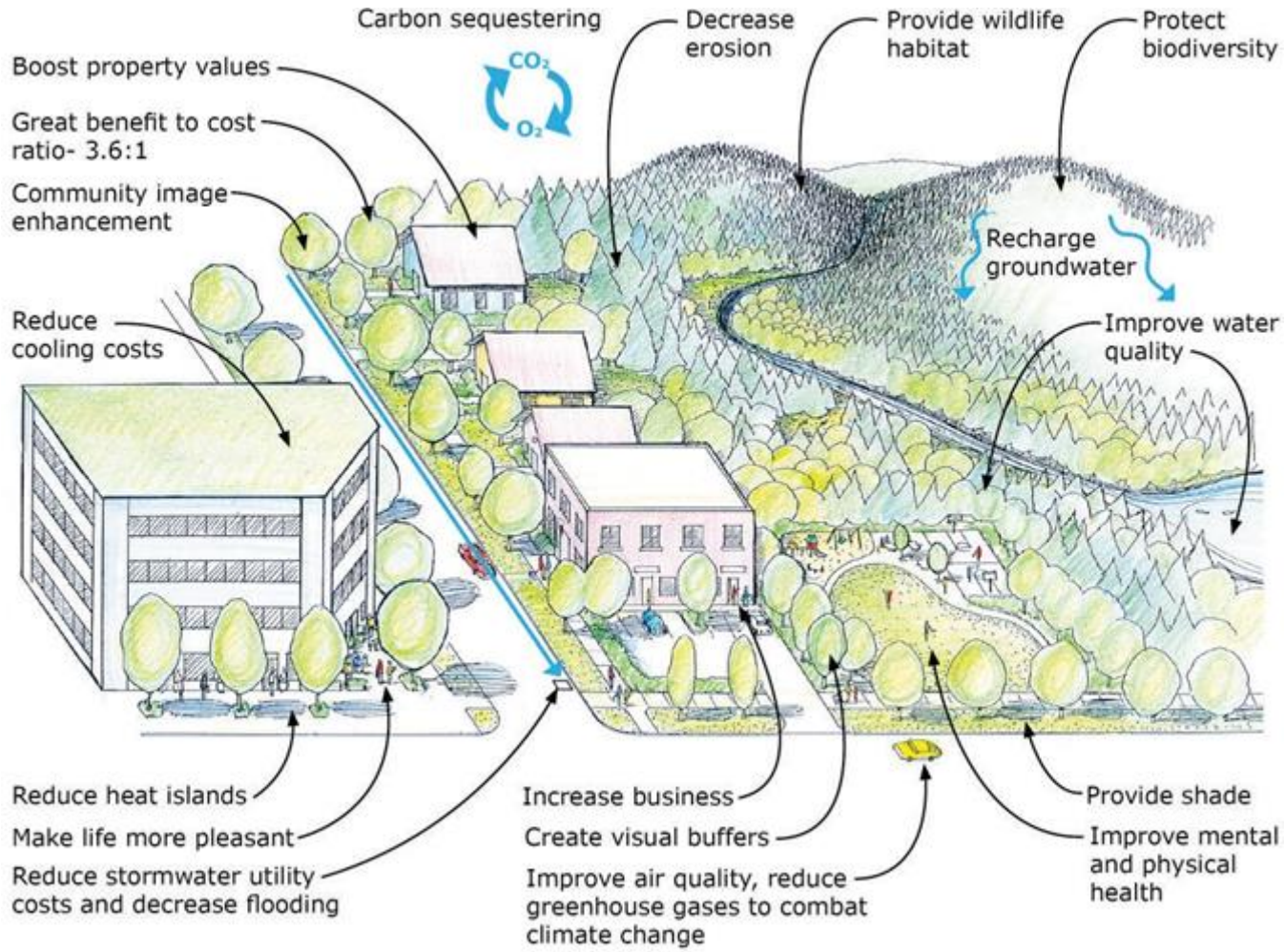


Figure 19. Overview of the ecosystem benefits and services provided by trees in communities

Note: The following data was derived from the Alliance for Community Trees.

Reduce Stress and Improve the Quality of Life

Neighborhoods with generous canopies of trees are good for public health. Greater contact with natural environments correlates with lower levels of stress, improving performance. Students' concentration levels go up when they are able to look out onto a green landscape. Studies show that children with attention deficit disorder function better after activities in green settings. A green environment impacts worker productivity. Workers without views of nature from their desks claimed 23 percent more sick days than workers with views of nature. Residents of areas with the highest levels of greenery were 3 times as likely to be physically active and 40 percent less likely to be overweight than residents living in the least green settings.

Clean the Air and Breathe Easier

Shade trees reduce pollution and return oxygen to the atmosphere. In addition to carbon dioxide, trees' leaves or needles absorb pollutants, such as ozone, nitrogen dioxide, sulfur dioxide, and some particulate matter.

Save Energy and Lower Energy Costs for Buildings

As natural screens, trees can insulate homes and businesses from extreme temperatures, keep properties cool, and reduce air conditioning utility bills. A 20 percent canopy of deciduous trees over a house results in annual cooling savings of 8 to 18 percent and annual heating savings of 2 to 8 percent. By planting shade trees on sunny exposures, residents and businesses can save up to 50 percent on hot-day energy bills.

Positively Influence Climate to Ensure Sustainability

Trees absorb carbon dioxide and store carbon in wood, which helps to reduce greenhouse gases. Carbon emissions from vehicles, industries, and power plants are a primary contributor to increased air temperatures in metropolitan areas. Trees in the United States store 700 million tons of carbon valued at $14 billion with an annual carbon sequestration rate of 22.8 million tons per year valued at $460 million annually.

Reduce the Need for Street Maintenance

Shaded streets last longer and require far less pavement maintenance, reducing long- term costs. Canopy diminishes pavement fatigue, cracking, rutting, and other damage. A study from University of California at Davis found that 20 percent shade cover on a street improves pavement condition by 11 percent, which is a 60 percent savings for resurfacing over 30 years.

Raise Property Values

Trees are sound investments, for businesses and residents alike, and their value increases as they grow. Sustainable landscapes can increase property values up to 37 percent. The value of trees appreciates over time, because the benefits grow as they do. For businesses, trees have added value, including higher revenues. Shoppers seek out leafy promenades that frame storefronts. Research shows that shoppers spend more—between 9 and 12 percent more—on products in tree-lined business districts.

Conserve Water and Soil

A tree's fibrous roots, extending into the soil, are premier pollution filtration and soil erosion prevention systems. Intensely urbanized areas are covered with a large number of impermeable surfaces. In contrast to an impervious hardscape, a healthy urban forest can reduce annual stormwater runoff up to 7 percent. Highly efficient trees also utilize or absorb toxic substances such as lead, zinc, copper, and biological contaminants. One study estimated that eliminating the need for additional local stormwater filtration systems would result in savings exceeding $2 billion.

Cooler Pavement Diminishes Urban Heat Islands

Broad canopy trees lower temperatures by shading buildings, asphalt, and concrete. They deflect radiation from the sun and release moisture into the air. The urban heat island effect is the resulting higher temperature of areas dominated by buildings, roads, and sidewalks. Cities are often 5° to 10°F hotter than undeveloped areas, because hot pavement and buildings have replaced cool vegetated land. In addition, high temperatures increase the volatility of automobile oil and oil within the asphalt itself, releasing the fumes into the atmosphere. Shade trees can reduce asphalt temperatures by as much as 36°F, which diminishes the fumes and improves air quality.

Protect Wildlife and Restore Ecosystems

Planting and protecting trees can provide habitat for hundreds of birds and small animals. Urbanization and the destruction of valuable ecosystems have led to the decline of many of species. Adding trees, particularly native trees, provides valuable habitat for wildlife.

Build Safe Communities and Decrease Crime

Police and crime prevention experts agree that trees and landscaping cut the incidence of theft, vandalism, and violence by enhancing city neighborhoods. Thriving trees on well-maintained streets indicate pride of ownership. Public housing residents with nearby trees and natural landscapes reported 25 percent fewer acts of domestic aggression and violence. Apartment buildings with high levels of greenery had 52 percent fewer crimes than those without any trees. Buildings with medium amounts of greenery had 42 percent fewer crimes.

Calm Traffic and Make Neighborhoods Safer and Quieter

People drive more slowly and carefully through tree-lined streets, because trees create the illusion of narrower streets. One study found a 46 percent decrease in crash rates across urban arterial and highway sites after landscape improvements were installed. The presence of trees in a suburban landscape reduced the cruising speed of drivers by an average of 3 miles per hour. Faster drivers and slower drivers both drove at decreased speeds in the presence of trees. Trees reduce noise pollution, buffering as much as half of urban noise. By absorbing sounds, a belt of trees 100 feet wide and 50 feet tall can reduce highway noise by 6 to 10 decibels. Buffers composed of trees and shrubs can reduce 50 percent of noise.

Benefit Analysis of Boynton Beach's Public Trees

To identify the dollar value provided and returned to the community, the City's tree inventory data were assigned values based on the i-Tree software built within the TreePlotter software. These applications analyze an inventoried tree population's structure to estimate the costs and benefits of that tree population. The assessment creates annual benefit reports that demonstrate the value the City's trees provide.

These quantified benefits and the reports generated are described below.

Image Description 2. The i-Tree Tools software was developed by the U.S. Department of Agriculture, Forest Service (USDA FS) with the help of several industry partners.

Learn more at www.itreetools.org.

- **Aesthetic/Other Benefits**: Shows the tangible and intangible benefits of trees reflected by increases in property values (in dollars).
- **Stormwater**: Presents reductions in annual stormwater runoff due to rainfall interception by trees measured in gallons.
- **Carbon Stored**: Tallies all of the carbon dioxide (CO2) stored in the urban forest over the life of its trees as a result of sequestration. Carbon stored is measured in pounds.
- **Energy**: Presents the contribution of the urban forest towards conserving energy in terms of reduced natural gas use in the winter (measured in therms [thm]) and reduced electricity use for air conditioning in the summer (in Megawatt-hours ([MWh]).
- **Carbon Sequestered**: Presents annual reductions in atmospheric CO2 due to sequestration by trees and reduced emissions from power plants due to reductions in energy use. This is measured pounds and has been translated to tons for this report. The model accounts for CO2 released as trees die and decompose and CO2 released during the care and maintenance of trees.
- **Air Quality**: Quantifies the air pollutants (ozone [O3], nitrogen dioxide [NO2], sulfur dioxide [SO2], particulate matter less than 10 micrometers in diameter [PM10]) deposited on tree surfaces, and reduced emissions from power plants (NO2, PM10, volatile organic compounds [VOCs], SO2) due to reduced electricity use in pounds. The potential negative effects of trees on air quality due to biogenic volatile organic compounds (BVOC) emissions is also reported.

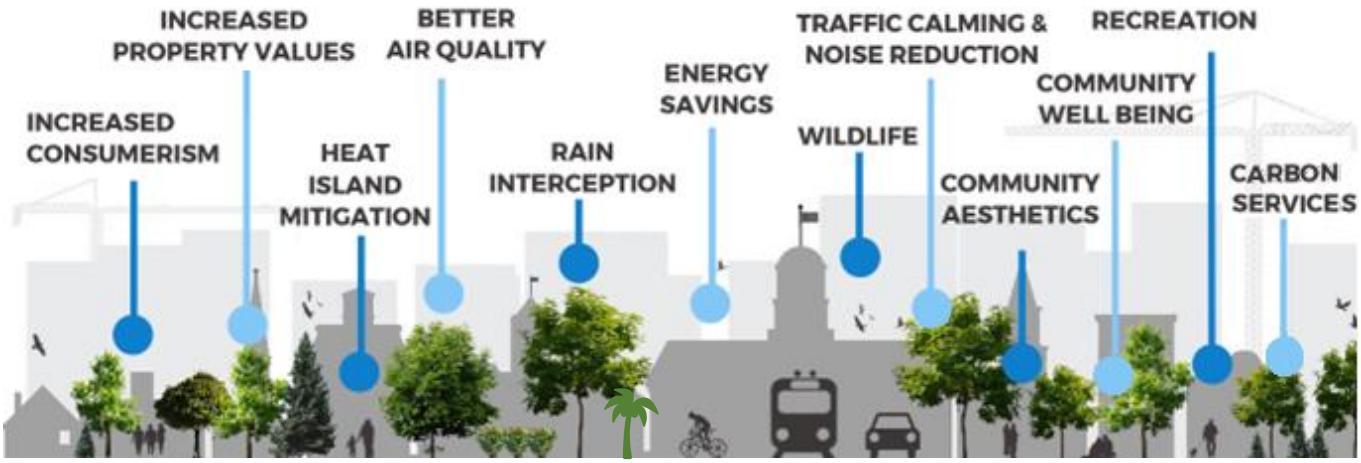


Figure 20. Illustration of the benefits provided by Boynton Beach's urban forest

Ecosystem Services and Benefits of the Inventoried Public Trees

Based on the 2022 inventory, the annual benefits and services provided by trees were determined. It was found the overall public tree (and palm) population of 11,309 trees provides annual benefits in the amount of $722,249 (an additional $22,400 when including Community Greening trees). Notably, the trees reduce the kilowatt (kWh) usage by 671 thousand, capture over four tons of air pollutants, provide an added $512,847 to property values, sequester over one million pounds of carbon, and prevent over 11.5 million gallons of stormwater.

Annual Benefits and Services of the Inventoried Trees and Palms (2022)

Overall	Energy Savings	Air Quality	Property Value	Carbon Services	Stormwater
$722,249	$53,367	$18,239	$512,847	$10,317	$90,475
Annually	671,000 kWh	8,335 lbs	Added value	1.0M lbs C seq.	11.5M gallons

Table 14. Annual ecosystem benefits and services of the inventoried population (trees and palms)

Annual Benefits and Services of the Inventoried Palms (2022)

Overall	Energy Savings	Air Quality	Property Value	Carbon Services	Stormwater
$297,447	$12,735	$8,015	$218,744	$4,143	$40,449
Annually	164,000 kWh	3,058 lbs	Added value	313k lbs C seq.	4.7M gallons
Palms Contribution to the Total Annual Benefits and Services (Palms = 57% of inventory)					
41%	24% 24%	44% 37%	43%	40% 31%	45% 41%

Table 15. Annual ecosystem benefits and services of the inventoried palms

Trees and palms provide varying levels of benefits and services. As shown in Figure 22 below, palms tend to cost more to maintain and provide less benefits on average. A study of benefits and services of the inventoried palms was completed, and it was found that though 57 percent of the inventory population is made up of palms, these palms only provide 41 percent ($297,447) of the total annual value. Similarly, palms only provide about 40 percent of the air quality, property value, carbon services, and stormwater benefits and services. Most notably, palms only provide 24 percent of the energy savings and benefits. On average, palms bring a value of approximately $46 per palm per year whereas, trees provide approximately $88 per tree per year.

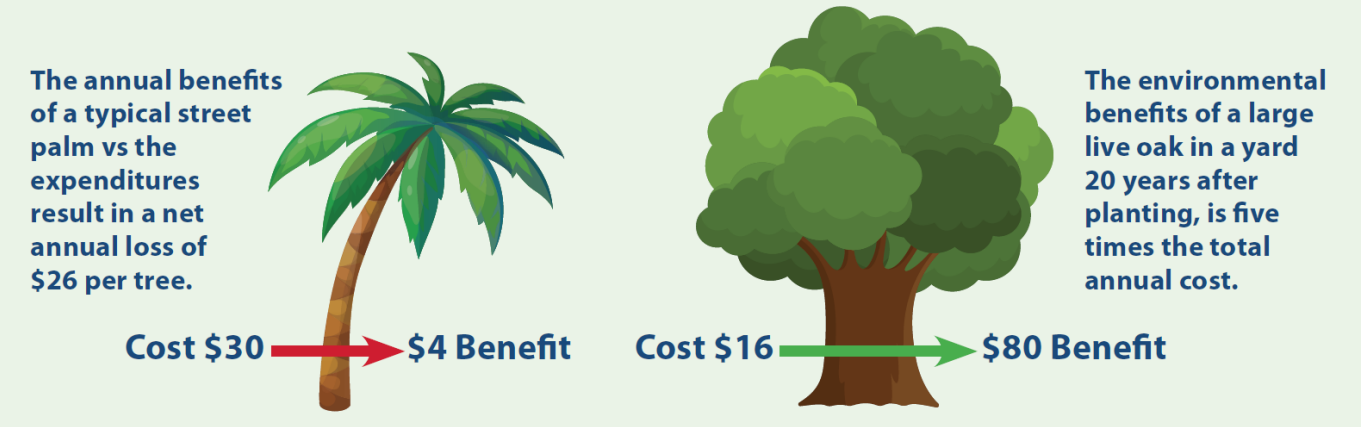


Figure 21. A cost and benefit comparison of palms and trees (Source: USFS Central Florida Community Tree Guide)

RECOMMENDATIONS

The public trees are a defining and valued characteristic of Boynton Beach making the City a desirable place to live, work and recreate. It is a resource that has a history and legacy of care and management; however, certain trees require immediate removal or maintenance. The City should strive to achieve a routine monitoring and maintenance schedule of all trees and continue to plant trees, especially after removal, to enhance the beauty of the City and the benefits that trees provide. While maintaining the City's trees will take work and additional resources, doing so will support Boynton Beach's goals for sustainability and increased urban forest canopy cover. Implementing recommendations in this Report will also help ensure Boynton Beach's public trees will continue to be valued by its constituents.

TREE MAINTENANCE RECOMMENDATIONS

The first steps in proactively managing Boynton Beach's public trees are to:

1) Evaluate, mitigate, and routinely assess risk trees
2) Continually and frequently monitor all public trees
3) Properly track information in the City's TreePlotter™ application

A schedule and budget of recommended maintenance activities and their associated costs has been provided in the following section. Using these recommendations as a guide, the City should have qualified staff evaluate the recommended removals and amend/correct issues, if possible, or remove the tree if not possible (based on priority, budget, potential targets, location, and other factors). The urban forestry program should also budget and prepare for natural tree mortality, hence the need for continued monitoring.

Once risk trees are mitigated, the City should consider:

A) Enhancing programs for continuous, effective, and equitable public education and engagement;
B) Establishing maintenance and removal cost-share programs with the adjacent property owners;
C) Strengthening the framework for contracted maintenance and associated specifications;
D) Evaluating the feasibility of an in-house arborist crew to proactively manage the public tree resource.

A routine pruning cycle delineated by a grid system or city planning boundary should be considered where all public trees are pruned within a timespan of five to seven years. Routine pruning consists of clearance pruning (from signs, sidewalks, roads, buildings), cleaning (removing of dead/dying/diseased/decayed branches), structural (removal of weakly attached limbs with included bark and removal of co-dominant stems), and aesthetics (shaped based on natural growth habits). A recommended training pruning program has also been provided. View the following pages for the summary of tree maintenance recommendations and the recommended tree management schedule and estimated budget.

Summary of Tree Maintenance Recommendations

- Address high risk and priority removals and pruning needs.
- Evaluate, monitor, and address lower priority removals and pruning needs.
- Monitor trees less than fair in condition.
- Conduct, support, and educate on routine tree maintenance.
- Plant trees after removal.
- Ensure industry standards and best practices are followed during the planting and care of trees.
- Educate the public, partners, and staff on the inventory population, the urban forest, the program, and benefits.
- Continue to track maintenance, plantings, and removals in the TreePlotter application.
- Establish or expand programs that engage the public in public tree stewardship such as watering and pruning, and strengthen partnerships.
- Complete the inventory in remaining areas of the City and routinely reinventory trees on a 5-10-year cycle.

Recommended Tree Management Schedule

Recommended Tree Management Schedule and Estimated Costs

Estimated Costs for Each Activity			Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7			
Activity	DBH Class	Cost/Tree	#	Cost	#	Cost	#	Cost	#	#	#	Cost	#	Cost	#	Cost	7-Year Cost	Total Trees
Priority 1 Removals (addressed in first 3 years) Includes Stump Removal	0-3"	$200		$0		$0		$0									$0	0
	3-6"	$400		$0		$0		$0									$0	0
	6-12"	$775	2	$1,550	2	$1,550	1	$775									$3,875	5
	12-18"	$1,450	3	$4,350	3	$4,350	1	$1,450									$10,150	7
	18-24"	$2,200	2	$4,400	2	$4,400		$0									$8,800	4
	24-30"	$3,500		$0		$0		$0									$0	0
	>30"	$5,900		$0		$0		$0									$0	0
Activity Total(s)			**7**	**$10,300**	**7**	**$10,300**	**2**	**$2,225**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$22,825**	**16**
Priority 1 Prune (addressed in first 3 years)	0-3"	$75		$0		$0		$0									$0	
	3-6"	$90		$0		$0		$0									$0	
	6-12"	$250		$0		$0		$0									$0	
	12-18"	$350	1	$350	1	$350	1	$350									$1,050	3
	18-24"	$550	1	$550	1	$550		$0									$1,100	2
	24-30"	$850	1	$850	1	$850	1	$850									$2,550	3
	>30"	$1,150		$0		$0		$0									$0	
Activity Total(s)			**3**	**$1,750**	**3**	**$1,750**	**2**	**$1,200**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$4,700**	**8**
Priority 2 Removals (addressed in Years 1-7) Includes Stump Removal	0-3"	$200	2	$486	2	$486	2	$486	2	$486	2	$486	2	$486	2	$486	$3,400	17
	3-6"	$400	11	$4,571	11	$4,571	11	$4,571	11	$4,571	11	$4,571	11	$4,571	11	$4,571	$32,000	80
	6-12"	$775	11	$8,193	11	$8,193	11	$8,193	11	$8,193	11	$8,193	11	$8,193	11	$8,193	$57,350	74
	12-18"	$1,450	6	$8,493	6	$8,493	6	$8,493	6	$8,493	6	$8,493	6	$8,493	6	$8,493	$59,450	41
	18-24"	$2,200	2	$3,457	2	$3,457	2	$3,457	2	$3,457	2	$3,457	2	$3,457	2	$3,457	$24,200	11
	24-30"	$3,500	1	$2,500	1	$2,500	1	$2,500	1	$2,500	1	$2,500	1	$2,500	1	$2,500	$17,500	5
	>30"	$5,900	1	$5,057	1	$5,057	1	$5,057	1	$5,057	1	$5,057	1	$5,057	1	$5,057	$35,400	6
Activity Total(s)			**33**	**$32,757**	**33**	**$32,757**	**33**	**$32,757**	**33**	**$32,757**	**33**	**$32,757**	**33**	**$32,757**	**33**	**$32,757**	**$229,300**	**234**
Priority 2 Prune (addressed in Years 1-7)	0-3"	$75		$0		$0		$0		$0		$0		$0		$0	$0	
	3-6"	$90	1	$51	1	$51	1	$51	1	$51	1	$51	1	$51	1	$51	$360	4
	6-12"	$250	2	$464	2	$464	2	$464	2	$464	2	$464	2	$464	2	$464	$3,250	13
	12-18"	$350	5	$1,850	5	$1,850	5	$1,850	5	$1,850	5	$1,850	5	$1,850	5	$1,850	$12,950	37
	18-24"	$550	7	$4,086	7	$4,086	7	$4,086	7	$4,086	7	$4,086	7	$4,086	7	$4,086	$28,600	52
	24-30"	$850	4	$3,764	4	$3,764	4	$3,764	4	$3,764	4	$3,764	4	$3,764	4	$3,764	$26,350	31
	>30"	$1,150	3	$3,779	3	$3,779	3	$3,779	3	$3,779	3	$3,779	3	$3,779	3	$3,779	$26,450	23
Activity Total(s)			**23**	**$13,994**	**23**	**$13,994**	**23**	**$13,994**	**23**	**$13,994**	**23**	**$13,994**	**23**	**$13,994**	**23**	**$13,994**	**$97,960**	**160**
Priority 3 Routine Prune (addressed in Years 1-7)	0-3"	$50	18	$907	18	$907	18	$907	18	$907	18	$907	18	$907	18	$907	$6,350	127
	3-6"	$75	191	$14,314	191	$14,314	191	$14,314	191	$14,314	191	$14,314	191	$14,314	191	$14,314	$100,200	1,336
	6-12"	$250	649	$162,214	649	$162,214	649	$162,214	649	$162,214	649	$162,214	649	$162,214	649	$162,214	$1,135,500	4,542
	12-18"	$300	384	$115,200	384	$115,200	384	$115,200	384	$115,200	384	$115,200	384	$115,200	384	$115,200	$806,400	2,688
	18-24"	$450	117	$52,521	117	$52,521	117	$52,521	117	$52,521	117	$52,521	117	$52,521	117	$52,521	$367,650	817
	24-30"	$550	26	$14,379	26	$14,379	26	$14,379	26	$14,379	26	$14,379	26	$14,379	26	$14,379	$100,650	183
	>30"	$800	16	$12,571	16	$12,571	16	$12,571	16	$12,571	16	$12,571	16	$12,571	16	$12,571	$88,000	110
Activity Total(s)			**1,400**	**$372,107**	**1,400**	**$372,107**	**1,400**	**$372,107**	**1,400**	**$372,107**	**1,400**	**$372,107**	**1,400**	**$372,107**	**1,400**	**$372,107**	**$2,604,750**	**9,803**
Priority 4 Train Prune (addressed in Years 1-7)	0-3"	$50	43	$2,157	43	$2,157	43	$2,157	43	$2,157	43	$2,157	43	$2,157	43	$2,157	$15,100	302
	3-6"	$75	96	$7,179	96	$7,179	96	$7,179	96	$7,179	96	$7,179	96	$7,179	96	$7,179	$50,250	670
	6-12"	$250	15	$3,679	15	$3,679	15	$3,679	15	$3,679	15	$3,679	15	$3,679	15	$3,679	$25,750	103
	12-18"	$300	2	$471	2	$471	2	$471	2	$471	2	$471	2	$471	2	$471	$3,300	11
	18-24"	$450	0	$129	0	$129	0	$129	0	$129	0	$129	0	$129	0	$129	$900	2
	24-30"	$550	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	$0	
	>30"	$800	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	$0	
Activity Total(s)			**155**	**$13,614**	**155**	**$13,614**	**155**	**$13,614**	**155**	**$13,614**	**155**	**$13,614**	**155**	**$13,614**	**155**	**$13,614**	**$95,300**	**1,088**
Maintenance and Removal Totals			**1,622**	**$444,523**	**1,622**	**$444,523**	**1,616**	**$435,898**	**1,612**	**$432,473**	**1,612**	**$432,473**	**1,612**	**$432,473**	**1,612**	**$432,473**	**$3,054,835**	**11,309**

Tree Inventory Software Links to Maintenance and Removal Priorities

Maintenance Priority	URLs for Trees & Palms	# of Trees
Priority 1 Removal	https://pg-cloud.com/BoyntonBeachFL/?scenario=All-P1-Remove	16
Priority 1 Prune	https://pg-cloud.com/BoyntonBeachFL/?scenario=All-P1-Prune	8
Priority 2 Removal	https://pg-cloud.com/BoyntonBeachFL/?scenario=All-P2-Remove	234
Priority 2 Prune	https://pg-cloud.com/BoyntonBeachFL/?scenario=All-P2-Prune	160
Priority 3 Routine Prune	https://pg-cloud.com/BoyntonBeachFL/?scenario=All-P3-Routine	9,803
Priority 4 Train Prune	https://pg-cloud.com/BoyntonBeachFL/?scenario=All-P4-Train	1,088

Table 16. Recommended schedule and budget for public tree management based on the 2022 inventory

Worksheet Summary Tables

Management Activity Costs	Duration	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Activity Totals
Priority 1 Removals & Stump Removal	Years 1-3	$10,300	$10,300	$2,225					$22,825
Priority 1 Prune	Years 1-3	$1,750	$1,750	$1,200					$4,700
Priority 2 Removals & Stump Removal	Years 1-7	$32,757	$32,757	$32,757	$32,757	$32,757	$32,757	$32,757	$229,300
Priority 2 Prune	Years 1-7	$13,994	$13,994	$13,994	$13,994	$13,994	$13,994	$13,994	$97,960
Priority 3 Routine Prune	Years 1-7	$372,107	$372,107	$372,107	$372,107	$372,107	$372,107	$372,107	$2,604,750
Priority 4 Train Prune	Years 1-7	$13,614	$13,614	$13,614	$13,614	$13,614	$13,614	$13,614	$95,300
Annual Totals	**7 Years**	**$444,523**	**$444,523**	**$435,898**	**$432,473**	**$432,473**	**$432,473**	**$432,473**	**$3,054,835**

Management Activity Counts	Duration	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Activity Totals
Priority 1 Removals & Stump Removal	Years 1-3	7	7	2					16
Priority 1 Prune	Years 1-3	3	3	2					8
Priority 2 Removals & Stump Removal	Years 1-7	33	33	33	33	33	33	33	234
Priority 2 Prune	Years 1-7	23	23	23	23	23	23	23	160
Priority 3 Routine Prune	Years 1-7	1,400	1,400	1,400	1,400	1,400	1,400	1,400	9,803
Priority 4 Train Prune	Years 1-7	155	155	155	155	155	155	155	1,088
Annual Totals	**7 Years**	**1,622**	**1,622**	**1,616**	**1,612**	**1,612**	**1,612**	**1,612**	**11,309**

Table 17. Summary of the costs (above) and tree counts (below) by management activity, year, and totals

Tree Planting Recommendations

- It is recommended the City maintain its commitment to the tree canopy goal by effectively planting more trees than removed and ensuring existing canopy is preserved through ordinances, policies, education, and enforcement.

- When planning for new trees, attention must be given to ensure a proper tree species, location, and timing (based on the inventory data) are selected to help create a diverse urban forest in terms of species composition and age structure. Additional considerations should be made for underserved neighborhoods in the City.

- Newly planted trees must be properly cared for (mulching, watering, training pruned, monitored).

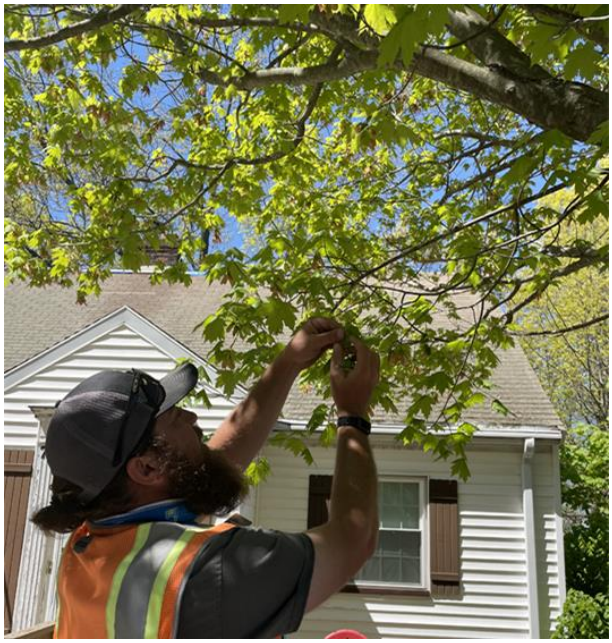
- For enhanced ecosystem benefits, it is recommended that more trees be planted than replaced. The information in this Report will help the City plan and budget for future maintenance needs.

- Future costs can be potentially reduced by conducting young tree training—establishing the lowest permanent branch, proper scaffolding of branches, healthy branches and limbs, and a central stem without competing co-dominant and/or poorly attached stems.

- When selecting species for new and/or replacement plantings, the landscape architecture, design, and building architecture of the City street can be incorporated to achieve a cohesive feeling.

Program Recommendations

- Maintain safety and diversity as priorities for a healthy urban forest.
- Existing trees should be properly maintained, and new tree plantings should prioritize species diversity.
- The City can use its TreePlotter™ application to keep track of maintenance activities and plantings.
- City staff can also participate in trainings and workshops to further enhance their knowledge. The City should have ISA Certified Arborists on staff and/or contracted by the City for any tree care operations.
- ANSI A300 pruning standards and ISA Best Management Practices should be adhered to. Ensure partners and contractors adhere to these standards.
- Care should be taken to ensure that trees are properly protected during construction / infrastructure installation or replacement.
- Routine pruning, inspections, and risk assessments should follow a cyclical pattern and be tracked in annual reports.
- Trees in less than good condition or with pertinent observations should receive routine monitoring to reevaluate their status, and all trees regardless of condition should be monitored for pests and diseases.
- Develop an urban forest management plan that provides a long-term vision and strategies to grow a sustainable and equitable urban forest.



Outreach and Education Recommendations

- Enhance education programs since the responsibility to maintain public street trees is primarily placed on the adjacent property owner.

- The City should target outreach and education to all neighborhoods in Boynton Beach that aim to create tree stewards and a shared commitment to the urban forest.

- Existing and new partners and programs can increase capacity, outreach, and impacts.

- New or expanding programs relating to planting, young tree care, pest and disease monitoring, and others will help grow a sustainable urban forest.

- The City should also explore expanding or creating a heritage tree program for significant trees in the City as well as a recognition program to distinguish high levels of tree stewardship from individuals, youth, organizations, business, corporations, and others.

- The City should continue to achieve Tree City USA status and receive Growth Awards and Sterling Tree City USA recognition upon receiving 10 Growth Awards from the Arbor Day Foundation.

- The City should utilize the tree inventory data to educate the public on the maintenance needs, goals for sustainability, tree equity, and associated benefits of trees.

SUMMARY

Boynton Beach's public trees are a valuable asset that, if properly planned and cared for, will continue to add to the health and well-being of the visitors, workers, students, and residents for years to come. Everyone benefits from the proper care and enhancement of the City's trees. This Report serves as a road map outlining meaningful, high-priority actions that the City should take to strive towards the vision of a healthy, thriving and equitable urban forest. This means addressing maintenance needs, continually monitoring the urban forest, planting more trees than removed, responding to the challenges of climate change and other environmental factors, and engaging the community. This Report functions as a management tool for city tree managers and also provides transparency to the public regarding the actions the City may take to support environmental health, public safety, and tree equity on behalf of all who enjoy Boynton Beach. The City should begin to implement recommendations in this Report as soon as possible and integrate the findings into a comprehensive urban forest management plan to ensure an equitable, healthy, thriving, and sustainable urban forest.

APPENDICES

Appendix A. References and Resources

References

FL Department of Transportation (FDOT), Office of Maintenance, "A Guide for Tree, Palm Maintenance for Urban Roadsides and Landscape Areas". 2015 edition.

Broschat, T., Pruning Palms. University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) Extension. ENH1182. April 2011, rev. May 2014.

Peper, Paula J.; McPherson, E. Gregory; Simpson, James R.; Albers, Shannon N.; Xiao, Qingfu. 2010. Central Florida community tree guide: benefits, costs, and strategic planting. Gen. Tech. Rep. PSW-GTR-230. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 118 p.

Resources

Glossary of Inventory Terms:
https://docs.google.com/document/d/1oW9dwoqT1dmSTJc_8rstACvnoWVNEuUWEebVkAZqCVE/edit

Blair, S., D.C. McLean, D.R. Hilbert, A.K. Koeser, E.F. Gilman, and B. Kempf. 2019. A Guide for Tree and Palm Maintenance Along Florida Roadsides. University of Florida IFAS/Extension, Wimauma, Florida 103pp.

Appendix B. Tree Inventory Data Fields and Values

Location Tab

TERM	DEFINITION
Full Address	The number and street tied to an address test
Growing Space	The area the tree is in
Alley	A narrow passageway between or behind buildings.
Front Yard	Land between house and street
Planting Strip	Area between sidewalk and street
Cutout	Planting square in sidewalk
Median	Strip of grass separating oncoming lanes
Other (Maintained)	Open area such as park or play fields
Other (Unmaintained)	Typically areas next to roads and forests
Location On Site	Simple location of tree on site
Front	Front of parcel
Left	Left of parcel
Right	Right of Parcel
Rear	Rear of parcel
Park	Park
Park Name	Name of park where tree is located
Latitude	Latitude coordinate for tree's location
Longitude	Longitude coordinate for tree's location

Tree Information Tab

TERM	DEFINITION
Primary ID	Automatic number assigned to tree by number of plots. Note: each plot, even deleted ones, will have a number
Status	Status of the tree
Alive	Tree is alive
Dead	Tree is no longer living
Removed	Tree has been removed
Stump	Bottom area of a tree left after being cutdown
Proposed Planting Site - Large	Planting site typically 11 or more feet of rootspace with no overhead conflicts
Proposed Planting Site - Medium	Planting site typically 6-10 feet of rootspace with no overhead conflicts
Proposed Planting Site - Small	Planting site typically 1-5 feet of rootspace or under powerlines
Common Name	English name or name tree is typically called
Scientific Name	The formal Latin name of a biological taxon according to an internationally accepted standard
DBH	Diameter at breast height. Typically 4.5 feet
Number of Stems	Amount of stems forming below 1 foot
Condition	Overall condition of the tree
Excellent	Trees in this category show no structural or biotic defects. They represent a tree that is 100% healthy
Good	Trees in this category show minor structural or biotic defects and represent a tree that is below 100% but above 80% healthy
Fair	Trees in this category show structural or biotic defects and represent a tree that is below 80% but above 50% healthy
Poor	Trees in this category show significant structural or biotic defects and represent a tree that is below 50% healthy often with serious decline
Critical	Trees in this category show significant structural or biotic defects and represent a tree that is below 25% healthy often with serious decline

TERM	DEFINITION (continued)
Dead	Trees in this category are dead and have no live growth on them
Observations	Observations about the tree's condition
Canker	Localized diseased area on stems, roots, and branches. Often shrunken and discolored.
Cavity Decay	Open or closed hollow within a tree stem, usually associated with decay
Crown Dieback	Condition in which the branches in the tree crown die from the tips toward the center.
Frost Cracks	Vertical split in the wood of a tree, generally near the base of the bole, caused by internal stresses and low temperatures.
Girdling Roots	Root that encircles all or part of the trunk of a tree or other roots and constricts the vascular tissue and inhibits secondary growth and the movement of water and photosynthates.
Grate/Guard	Grating installed at the same level with the pavement around a tree or guard installed around the tree's trunk
Mechanical Damage	Tree or tree parts show signs of damage caused by mechanical equipment or vehicles
Nutrient Deficiency	Condition in which the supply or availability of an essential element results in cessation of critical plant processes, resulting in visible, physical symptoms such as chlorotic leaves or necrotic margins
Pest/Disease	Organism (including, but not limited to, weeds, insects, or fungi) that is damaging, noxious, or a nuisance.
Poor Root System	Tree exhibits exposed roots or is growing in confined spaces causing roots to possibly girdle or not provide enough anchorage for the tree.
Poor Structure	Tree exhibits poor structure for the species.
Tree Comments	Comments or notes about tree or surroundings can be added here.
Photos	Pictures associated with tree

Management Information Tab

TERM	DEFINITION
Tree Work	
Amend Mulch	Turn or replenish mulch
Crown Cleaning	Prune to remove dead, dying, diseased, and broken branches from the tree crown
Disease	Condition that impairs the performance of one or more vital functions of the tree. Usually associated with infectious agents
Insects	Tree shows signs of damage caused by insects,
Monitor	Monitor tree's condition
Other (Describe Below)	Check here and describe in notes below
Prune-Clearance	Prune to remove branches to provide clearance from structures, vehicles, and other objects
Prune-Structural	Prune to establish a strong arrangement or system of scaffold branches
Raise	Prune to remove lower limbs from a tree crown to provide clearance
Reduce	Prune to reduce the height and/or spread of a tree crown
Remove	Remove tree
Remove Hardware	Remove hardware from a tree.
Remove-Foreign Object	Remove foreign object located in the tree
Remove-Girdling Root	Remove girdling roots that may be present
Remove-Hanger	Remove hanging branch from tree
Restoration	Prune to improve the structure, form, and appearance of trees that have been improperly trimmed, vandalized, or damaged.
Sidewalk Damage	Tree has caused sidewalk damage that needs to be repaired
Thin	Prune to remove live branches to reduce crown density.
Utility	Pruning needed around or near utility facilities
Maintenance Comments	Specific comments made for maintenance or to be added after maintenance has been completed

TERM	DEFINITION
Maintenance Priority	Prioritization of assigned maintenance for management plan purposes
Clearance Conflicts	If clearance conflicts exist, indicate that by checking the options
Building	Tree or tree part is coming in to contact with a building.
Light	Tree or tree part is coming in to contact with or obstructing a street light.
Other	Tree or tree part is coming in to contact with other objects.
Pedestrian	Tree or tree part could potentially come in contact with pedestrians in the vicinity of the tree.
Sign or Signal	Tree or tree part is obstructing a sign or signal light
Underground Utilities	Underground utilities are present in the tree's root zone
Vehicle	Tree or tree part is at risk of coming in to contact with vehicles in the vicinity of the tree.
Overhead Conductors	Utility/powerline conflicts
No Lines	No utility lines in the vicinity of the tree
Present / No Conflict	Utility lines are present near the tree but there is no conflict
Present and Conflicting	Utility lines are present near the tree and could cause, or are causing, a conflict
User	User that added the feature
Date Added	Date feature was added
Last Modified User	User that made the last modification
Last Modified	Date of last modification

Work History Tab

*by default, the list of activities will reflect the Tree Work field in Management Information tab

TERM	DEFINITION
Date	Date work was performed
Activity	Type of activity that was performed
User	User that performed the work
Notes	Notes about work performed

Tree Inventory Management

Appendix C. Park Tree Summaries

The following summaries are based on the 2022 Tree Inventory and do not include the 1,034 trees planted through Community Greening projects.

Table 18. Park tree genera diversity (top 10)

Genera	Count	%
Sabal	1,054	33%
Quercus	607	19%
Pinus	240	7%
Bursera	128	4%
Conocarpus	108	3%
Wodyetia	83	3%
Cocos	72	2%
Roystonea	66	2%
Taxodium	64	2%
Coccoloba	60	2%
Subtotal	**2,482**	**77%**
Other Genera	**733**	**23%**
TOTAL	**3,215**	**100%**

Table 19. Park tree species diversity (top 10)

Common Name	Count	%
Sabal palm	1,054	33%
Live oak	544	17%
Slash pine	239	7%
Gumbo limbo	128	4%
Foxtail palm	83	3%
Coconut palm	72	2%
Florida royal palm	66	2%
Baldcypress	64	2%
West Indian mahogany	60	2%
Montgomery palm	58	2%
Subtotal	**2,368**	**74%**
Other Species	**847**	**26%**
TOTAL	**3,215**	**100%**

Table 20. Park tree condition

Condition	Count	%
Excellent 100%	11	0.3%
Good 80%	2,331	73%
Fair 60%	711	22%
Poor 40%	118	4%
Critical 20%	28	1%
Dead 0%	16	0.5%
TOTAL	**3,215**	**100%**

Table 21. Park tree diameter classes

DBH Range	Count	%
0-3in	104	3%
3-6in	456	14%
6-12in	1,367	43%
12-18in	886	28%
18-24in	261	8%
24-30in	96	3%
>30in	45	1%
TOTAL	**3,215**	**100%**

Table 22. Tree work recommended for park trees

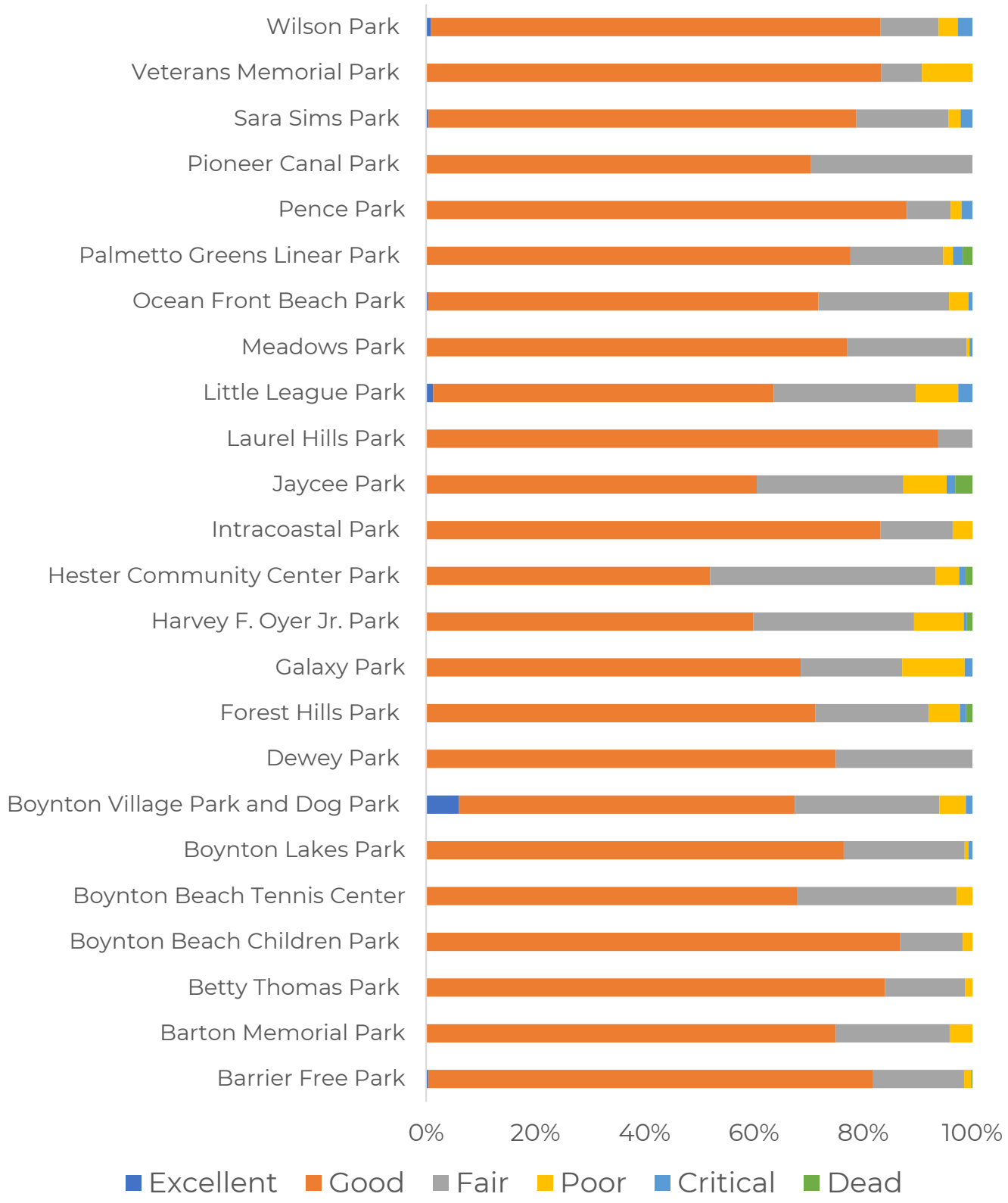
Tree Work	Count	% Park Trees
Crown Cleaning	1,147	36%
Prune-Structural	154	5%
Prune-Clearance	147	5%
Monitor	146	5%
Removal	52	2%
Remove Hardware	42	1%
Prune-Utility	40	1%
Raise	25	1%
Prune-Restoration	17	1%
Remove - Invasive Species	15	0.5%
Disease	12	0.4%
Insects	3	0.1%
Other (Describe Below)	3	0.1%
Reduce	2	0.1%
Remove-Hanger	1	0.03%
Amend Mulch	0	0%
Remove-Girdling Root	0	0%
Thin	0	0%
TOTAL	**1,806**	**56%**

Table 23. Park tree maintenance priority

Maintenance Priority	Count	%
Priority 1 Prune	4	0.1%
Priority 1 Removal	4	0.1%
Priority 2 Prune	89	3%
Priority 2 Removal	52	2%
Priority 3 Routine Prune	2,865	89%
Priority 4 Train Prune	201	6%
TOTAL	**3,215**	**100%**

Summary of Tree Condition by Park

Figure 22. Summary of tree condition by park



Appendix D. Risk Tree Management Guidance

Overview

Risk management is a well-established concept in the management of public spaces. Acceptable levels of risk have been recognized or defined for most basic infrastructure elements such as sidewalks, curbs, streets, playgrounds, and utilities. In many communities, these elements are assessed and managed according to acceptable levels of risk that are specified within written policies or enacted through management practices. Although not all pot-holes can be immediately filled in, not all heaving sidewalks immediately repaired, not all burned-out street light bulbs immediately replaced, a successful risk management program provides a community with a systematic approach to implement corrective actions within a reasonable timeframe.

An urban community consists of both the gray infrastructure (buildings, streets, utilities) and the green infrastructure— the urban forest. Although gray infrastructure has long been assessed and monitored for acceptable levels of risks, green infrastructure has for the most part not received the same subjective evaluations. The urban forest is an integral part of a community's infrastructure, and trees often dominate the landscape or at least are the most visible part of it. Urban trees contribute to increased quality of life for many communities and their residents. Most people prefer to live, recreate, and work in communities of healthy and well-maintained urban forests. Considerable research documents that people not only prefer to recreate in well-maintained parks with trees, but are willing to pay extra for the privilege. Safety, or at least the perception of safety, is critical if urban forests are to be managed and enjoyed.

Management of Tree Risk

Community managers have the responsibility to create and maintain a safe and useful urban forest for their constituents. Urban foresters need the training, expertise, and data to recognize varying levels of risk, and to manage the forest at an acceptable level of risk. Tree risk management involves the process of inspecting and assessing trees for their potential to injure people or damage property. Traditionally the term "hazard" (or hazardous) had been used in the context of evaluating trees for their failure potential. To many people, "hazard" suggests trees are at immediate risk for failure. In this report, the term "risk" trees is used to define trees with structural defects that may cause the tree or tree part to fail, where such a failure may cause property damage or personal injury. Trees will vary, ranging from low to high risk for failure and may require attention immediately or in the near future. The threshold of risk acceptable to liable parties is dependent upon their policies and objectives. To make objective, science-based decisions on the safety of trees and the urban forest, individual trees and site conditions need to be evaluated for the level of risk that they do or do not present.

Liability and Risk

Community leaders and decision-makers must consider the perceived public liability for tree damage and injury claims. In the extreme, trees are excluded from public rights-of-way to minimize public exposure. In the risk management field this is called risk avoidance. In these cases, the public benefits that trees provide, which usually outweigh the perceived costs, are not delivered to the community. Attempts to attain zero risk often become costly over time, due to premature tree removals, more frequent tree replacements, and loss of benefits that mature trees provide. Instead, the City should actively monitor, prioritize, and mitigate risk as funding permits.

Street Tree Management in Boynton Beach

Maintenance of street trees is primarily the adjacent property owner's responsibility though a permit must be approved by the City's Engineering Division prior to any work within the public right-of-way. Tree pruning must adhere to City standards in order to protect the health and vitality of public trees.

The City's Public Works Department oversees street trees by addressing hazards and installing new trees. The Sustainability Office is directly involved with the management of the Citywide urban forest and other sustainability related programs. Other departments such as Development and Recreation & Parks are involved with trees in the City, as well as the City's golf course management program. The following assessment aims to provide the City with the guidance to effectively identify priority risks and recommend mitigation within the confines of available resources and funding.

Purpose of Tree Risk Management

The purpose of a tree risk assessment is to inspect and assess in detail the structure and quality of the tree, tree parts, surrounding targets, and environmental conditions. An assessment provides the persons or entity responsible for tree care with options for mitigating or reducing risk associated with each tree assessed. By evaluating and ranking the risk potential, tree managers can prioritize mitigation efforts within the limits of available funding and resources.

Trees may appear to be permanent fixtures of our environment though at some point, trees will eventually decline in health, deteriorate in structure, collapse, and decompose. Trees may decline and eventually die from myriad causes including disease, insect attack, drought, uprooting, and catastrophic stem failure in high winds, or from combinations of factors working together. Others may die from old age and go through a natural cycle of senescence before failure. Some trees die and later collapse as their stems and branches decay, and some begin to break up while they are still green. While any large tree poses a risk of failure in high winds, in situations where people and trees must live together in close proximity it is important to identify where a tree has become an unacceptable risk.

Many different kinds of professionals are interested in managing tree risk in communities. For the City of Boynton Beach, the Sustainability Office implements long-term planning and management of the street tree population and City commissions and boards support these activities. Tree managers in Boynton Beach need reliable information concerning the identification and management of hazard or "risk" trees. In addition, public trees need to be routinely pruned to minimize risk, maintain public safety, improve tree health, strengthen the structure of trees, and provide a continual flow of ecosystem benefits and services.

Procedures for Tree Risk Management

The City should use tree inventory data, inventory software, service requests, and staff observations to continue to prioritize trees for risk assessment and potential mitigation. Risk assessors should use the ISA Level 2 Basic Risk Assessment protocols along with the American National Standards Institute's (ANSI) A300 Standards.

Both empirical data and subjective data should be gathered for each tree. The industry protocols require the assessor to evaluate the tree for conditions and factors that may qualify as a potential risk. The evaluation considers the tree's crown and branches, trunk(s), and roots. If a potential risk is identified in either or all of the tree's components, the site information is

collected, and the risk assessment commences. Potential targets such as people or vehicles are noted along with site factors and tree health issues. The tree component causing the potential risk is then examined and documented. For the crown or branches, issues such as deadwood are recorded along with the deadwood size and the level of load bearing on the branch or branches. The likelihood of failure and impact are recorded, and the likelihood of failure and impact is autopopulated based on the ISA tree risk assessment matrix (see tables below). In addition, the level of consequence is autopopulated as is the risk rating for the specific tree component (e.g., crown and branches). If other tree components such as the trunk or roots pose a potential risk, a similar process is completed. Once all components are assessed, an overall risk rating is autopopulated indicating the risk level as extreme, high, moderate, or low risk.

Table 24. The ISA tree risk assessment matrix to establish a risk rating

Likelihood of Failure	Likelihood of Impact			
	Very Low	Low	Medium	High
Imminent	Unlikely	Somewhat Likely	Likely	Very Likely
Probable	Unlikely	Unlikely	Somewhat Likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat Likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Likelihood of Failure	Consequences of Failure			
	Negligible	Minor	Significant	Severe
Very Likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat Likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Definitions

Risk Tree: Formerly referred to as a hazard tree, a risk tree has structural defects in the roots, stem, or branches that may cause the tree or tree part to fail, where such failure may cause property damage or personal injury.

Tree Defects: Tree defects are often organized into two categories— 1) injury or disease that seriously weakens the stems, roots, or branches of trees, predisposing them to fail or, 2) structural problems arising from poor tree architecture, including poorly attached stems and branches that lead to weak unions, shallow rooting habits, inherently brittle wood, and other physiological conditions.

Low Risk: The low risk category applies when consequences are “negligible” and likelihood is “unlikely”; or when consequences are “minor” and likelihood is “somewhat likely” (refer to Table 24 for terminology). Some trees with this level of risk may benefit from mitigation or maintenance measures, but immediate action is not usually required. Tree risk assessors may recommend retaining and monitoring these trees, as well as mitigation that does not include removal of the tree.

Moderate Risk: Moderate risk situations are those for which consequences are “minor” and likelihood is “very likely” or “likely”; or when likelihood is “somewhat likely” and consequences

are “significant” or “severe” (refer to the ISA tree risk assessment matrix table in the overview provided at the beginning of this report). The tree risk assessor may recommend mitigation and/or retaining and monitoring. The decision for mitigation and timing of treatment depends upon the risk tolerance of the tree owner or manager.

High Risk: High risk situations are those for which consequences are “significant” and likelihood is “very likely” or “likely,” or when consequences are “severe” and likelihood is “likely”. This combination of likelihood and consequences indicates that the tree risk assessor should recommend mitigation measures be taken as soon as is practical. The decision for mitigation and timing of treatment depends upon the risk tolerance of the tree owner or risk manager. In populations of trees, the priority of high risk trees is second only to extreme risk trees.

Extreme Risk: The extreme risk category applies in situations in which failure is “imminent” and there is a high likelihood of impacting the target, and the consequences of the failure are “severe” (refer to Table 24). The tree risk assessor should recommend that mitigation measures be taken as soon as possible. In some cases, this may mean immediate restriction of access to the target zone area to avoid injury to people.

Programmed Pruning: Designed to create structurally sound trunk and branch architecture, this “preventative maintenance” will sustain a tree’s benefits to the longest extent possible until the tree naturally reaches a point of senescence— or process of deterioration with age. Programmed pruning is typically implemented citywide or in prioritized maintenance corridors on a rotation of five to seven years depending on the tree species, density of trees, frequency of pedestrians and vehicles, available budget, and other factors. This means that each tree in the programmed pruning cycle is pruned for clearance, risk, health, and/or structure at least once within the programmed cycle (e.g., five to seven years). The goal with mature trees is to develop and maintain a sound structure to minimize risks such as branch failure. This task is easier provided a good structure was established earlier in the tree’s life. When properly executed, a variety of benefits are derived from pruning. Benefits include reduced risk of branch and stem breakage, better clearance for vehicles and pedestrians, improved health and appearance, and enhanced view.

Tree risk management and programmed pruning should be a prominently positioned component of Boynton Beach’s Urban Forestry Program. Tree risk management and programmed pruning plans should complement the City’s overall street and park tree management program goals, align with the Urban Forest Master Plan, and should be fully integrated with the tree planting, plant health care, and emergency response programs.

Programmed Pruning for Tree Preservation and Reduced Risk

In addition to more frequent tree assessments, proper tree planting, and structural pruning of young trees, the routine maintenance of street trees reduces the overall risk, improves the health of trees, and reduces long-term costs.

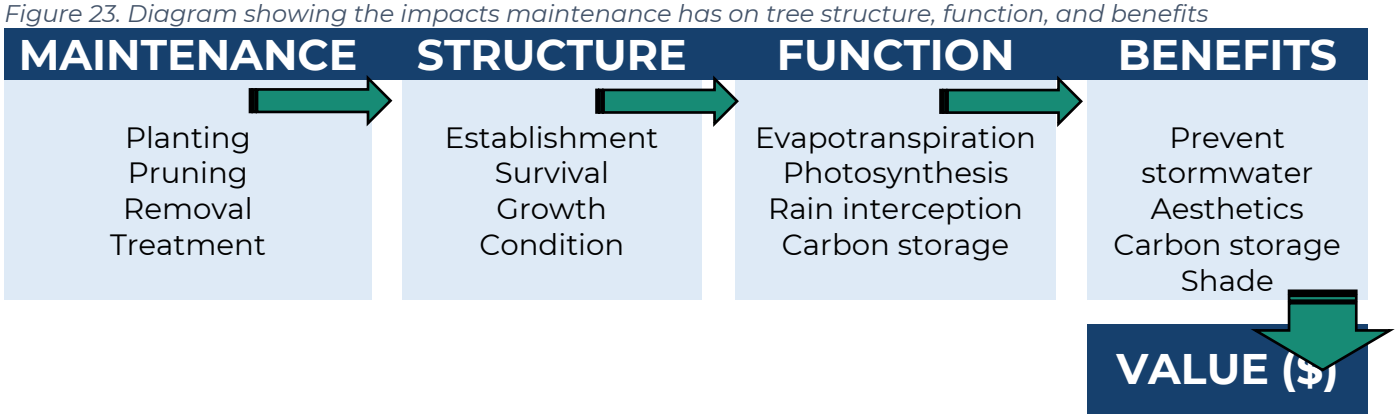
Routine maintenance, often referred to as grid pruning or programmed pruning, is the most cost effective near- and long-term pruning management strategy for city tree maintenance since every tree within a given grid, priority area, or zone is pruned each pruning cycle. When each tree is inspected and pruned on a regular cycle, both short- and long-term maintenance costs are reduced due to efficiencies in mobilization, scheduling, and service tracking; both preventative and reactive maintenance are performed in one operation and the need for future priority pruning is minimized. Conversely, street trees that are not pruned on a regular

cycle, or their maintenance is deferred, results in the opposite effect— as the interval between pruning increases the tree health declines and the maintenance costs increase.

The level of care or maintenance performed on a planted tree is linked to tree establishment, survival, growth, condition, and longevity. Survival, growth, and condition are closely connected to one another and to the structure of a tree (size, leaf area) and of the urban forest (canopy cover, diversity, age distribution). As a result, tree structure impacts the functions provided by the urban forest and ultimately the level of benefits generated by the tree. Thus, less than optimal maintenance may lead to decreased benefits produced by the urban forest. The benefits lost are the "costs" of not maintaining trees.

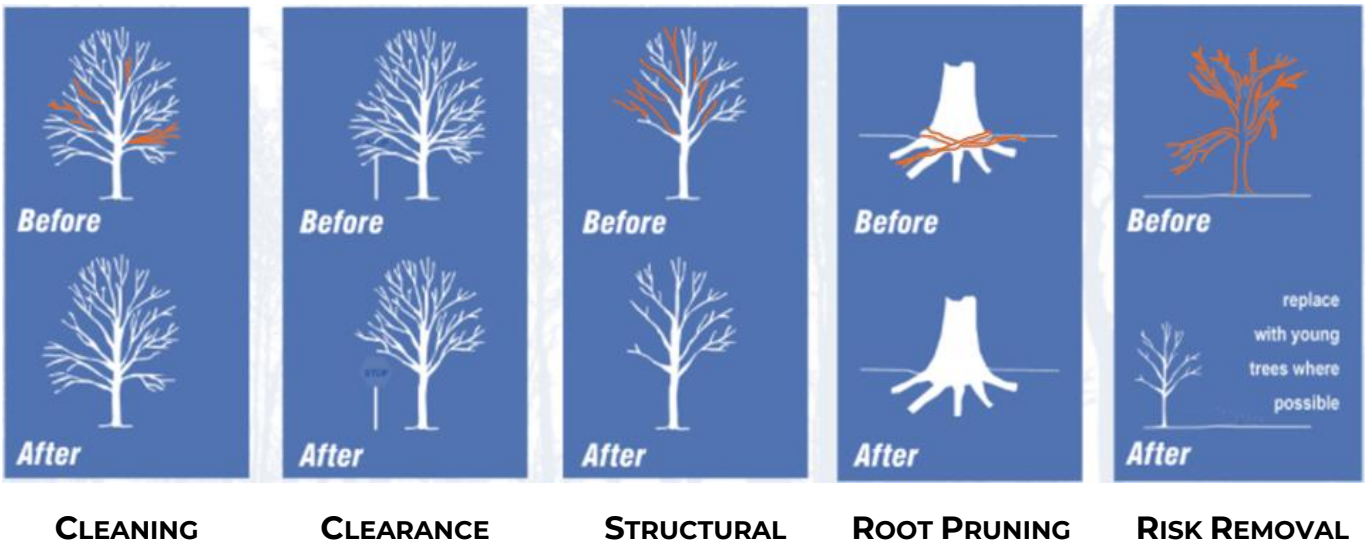
The Impacts of Programmed Pruning

Figure 23. Diagram showing the impacts maintenance has on tree structure, function, and benefits



Examples of Programmed Pruning Techniques for Preventative Maintenance

Figure 24. Examples of techniques for routine tree pruning (Source: Arbor Day Foundation)



Appendix E. Palm Maintenance Considerations

As discussed in the City's 2020 Urban Tree Canopy Assessment report, palm trees are a signature aesthetic element of Palm Beach County and its cities and towns. Technically, though, palms are more similar to grasses than they are to conifers and hardwood trees. Palms and grasses are both monocots – plants whose seeds contain only one leaf. Palms are in the *Arecaceae* botanical family of perennial flowering plants in the monocot order *Arecales*.

Palm growth forms include climbers, shrubs, stemless and tree-like plants. Those with a tree-like form are colloquially called "palm trees." Larger palm trees function like trees in providing some shade, cooling, wildlife habitat, carbon sequestration and air pollution removal. Although palms take up some stormwater, due to their shallow root structure, skinny trunks and narrow, thin canopy, they do not match the abilities of a native hardwood tree, such as a live oak, for ecosystem benefits.

Although "palm trees" are ubiquitous to Florida, they are expensive to maintain as a street "tree." In a study of Central Florida, the US Forest Service found that palm trees can be "very expensive to plant and maintain." Research shows that annual benefits and expenditures for a typical palm used as a street tree (sabal palm) were $4 and $30, respectively, resulting in a net annual loss of $26 per tree. Compare that to a large live oak in a yard 20 years after planting, for which the total value of environmental benefits alone ($80) is five times the total annual cost ($16).

One reason palm trees are so expensive to maintain compared to typical trees, is that many palms in Florida are "non-self-cleaning." These palms require that every leaf produced be manually removed. Fallen palm fronds do not biodegrade into turf and soil as do the leaves of many broadleaf tree species. Palms also require more nutrients than any cultivated plant in Florida. To grow well and develop fully, palm trees require routine treatment with expensive palm fertilizers.

Image Description 3. Example of palm trees serving as street trees in Boynton Beach

The 2022 Tree Inventory Summary Report and supporting analyses provide Citywide summaries and recommendations along with individualized reports on palms, trees, and trees / palms within parks. For example, the following palms were analyzed separately as these palms are the top ten most common palms that require frequent maintenance: sabal palm, Mexican fan palm, queen palm, Canary Island date palm, Bismarck palm, Carpentaria palm, coconut palm, Chinese fan palm, triangle palm, and true date palm. Palms requiring less frequent maintenance include: royal palm, foxtail palm, Alexander palm, Christmas palm, and Montgomery palm.

As a key aesthetic element of Palm Beach County, palm trees are a primary element in street and urban forest design. But when looking to realize the benefits of an abundant tree canopy for shade, stormwater, air quality and health, the City of Boynton Beach should consider planting more large shade trees – both to save on costs and to realize the true benefits of large, native trees. (Source: 2020 Urban Tree Canopy of Boynton Beach, FL)

Palm Maintenance

Not all palms require pruning. There is a large group of palms that have crownshafts—a region of smooth, usually green, tightly clasping leaf bases at the top of the gray trunk (Figure 25). Palms with crownshafts should never need pruning if properly fertilized. A healthy old leaf will be completely green one day, completely orange-brown the second day, and completely brown the third day, when it should fall off by itself. This is natural senescence.

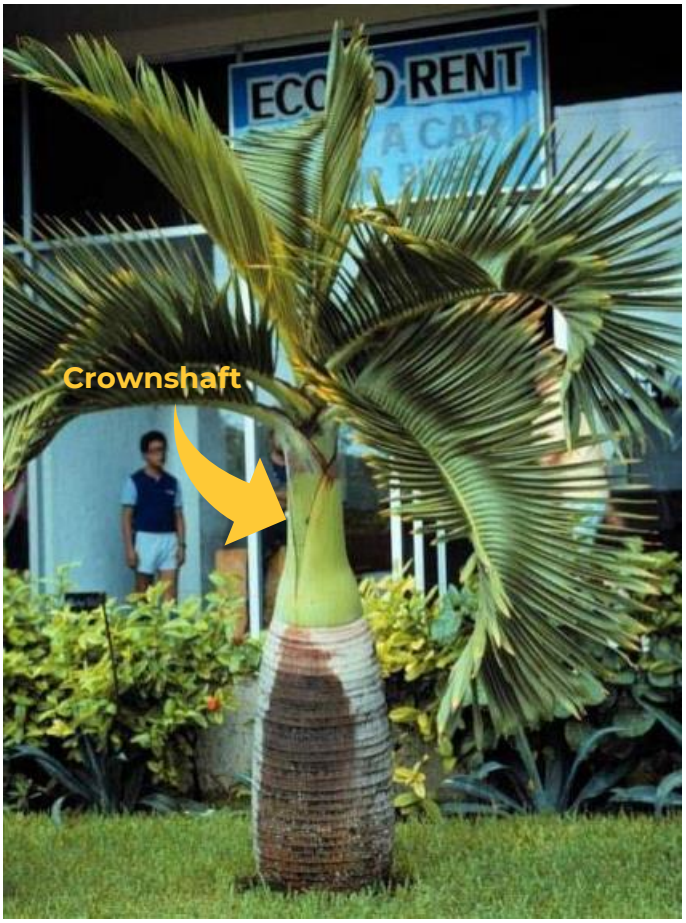


Figure 25. Location of the crownshaft on palms requiring little to no maintenance (Source: FDOT)

Pruning, or more importantly, excessive pruning, can affect palms in a number of ways. If palms are overpruned, the reduction in canopy size results in reduced photosynthetic capacity. In the short term, some studies have shown that overpruning can result in greater leaf production rates, but the resulting leaves are smaller in size. If this practice is repeated frequently, the palm may also develop a smaller trunk diameter (Broschat, 2011).

Traditionally, arborists have been asked to prune palms prior to the arrival of hurricane season. "Hurricane-cut" palms have most of their leaves cut off, leaving only a tuft of the youngest leaves intact. The intent was to reduce wind resistance in the palm, thereby protecting it from wind damage. However, observations of palms after the severe hurricane seasons of 2004 and 2005 in Florida showed that these "hurricane-cut" palms were more likely to have their crowns snapped off than those with fuller crowns. This may be because the youngest leaves left on these overpruned palms have not hardened off to the extent that older leaves have and lack the support of the older leaf bases. There is no evidence, however, that reduced trunk caliper reduces palm trunk strength (Broschat, 2011).

Timing for Palm Pruning

Palm pruning is done primarily for aesthetic purposes. From the palm's perspective, there is no one time of the year that is better than another. Pruning dead leaves prior to hurricane season may reduce the chances that these easily detached leaves will become issues in a storm. Ideally, a dead leaf would be pruned whenever it appears on a palm, but that simply is not practical unless a private palm addressed by the resident or property owner and is small enough to be easily accessible with common pruning tools. Commercially, palms are pruned on a fixed schedule (e.g., yearly, semiannually, etc.) or whenever the palm's appearance becomes unacceptable to the owner (Broschat, 2011).

Removing Living Leaves

Experienced tree pruners have observed that the time until dead leaves reappear at the bottom of the canopy can be extended if they remove a number of living leaves from the bottom of a palm canopy while they are pruning off dead leaves. This is one of the justifications used for overpruning palms. This concept has merit except that one critical factor is missing in most Florida palms. With the exception of some *Veitchia* spp., solitaire palms (*Ptychosperma elegans*), Christmas palms (*Adonidia merrillii*), and a few other species, virtually all palms in the state of Florida are deficient in potassium (K). Potassium deficiency causes premature leaf senescence; therefore, K-deficient palms are unable to support a full canopy of leaves. For example, the average 'Malayan Dwarf' coconut palm (*Cocos nucifera*) in South Florida retains about 13 leaves due to K deficiency. However, if properly fertilized and with no K deficiency, this species retains 26 or more leaves. The average Canary Island date palm retains about 65 leaves in South Florida due to K deficiency, but without K deficiency this species usually retains 130–150 leaves. Thus, most palms in Florida only have half of their normal number of leaves prior to pruning.

If one starts with a K-sufficient palm with a full 360-degree canopy of healthy leaves, then, in theory, one could prune off as many living leaves from the bottom of the canopy as would be produced by the palm during the interval between prunings without ever seeing a single deficient or dead leaf on the palm during that time. In addition, the palm would never appear overpruned. For example, suppose one wishes to prune the leaves of a coconut palm on an annual basis, and this species produces an average of 10 leaves per year. If starting with a healthy, 26-leaved, full-canopied palm and removing 10 leaves, the result would be a 16-leaf palm. During the following year, this palm would slowly add new leaves to the canopy until, at 12 months, it would again appear as it did previously. After about 13 months, the first dead leaf would appear at the bottom of the canopy, but since the palm would be repruned at 12 months, no dead leaves would ever appear on the palm. However, if one starts with a typical K-deficient South Florida coconut palm that only has 13 leaves and removes a full year's production of 10 leaves, the result would be an overpruned 3-leaf palm that, unfortunately, looks very familiar to most Floridians.

Because pruning K-deficient leaves is known to accelerate the rate of decline from K deficiency, and because those K-deficient older leaves are serving as a source of K for the palm in the absence of sufficient K in the soil, only completely dead leaves should be removed from these palms. However, if K deficiencies have been corrected, then one could safely remove as many green leaves from the bottom of the canopy as would be produced during the interval between prunings without affecting palm nutritional status. The number of leaves produced per year varies widely among palm species.

While the pruning regime discussed above is ideal for palms, it is unrealistic to expect that the City and property owners will go to the effort and expense of correcting the K deficiency in their palms. It is a slow process that can take three years or longer. Thus, ANSI pruning standards for palms (ANSI 2001) state that no leaves with tips above the horizontal plane (9:00 and 3:00 positions on a clock face) should be removed. In some counties in Florida, doing so is a civil offense and can result in a fine (Broschat, 2011).

Process for Removing Leaves

Leaves should be cut close to the trunk, but never cut into the trunk with a machete as this can result in wounds that have been shown to allow Thielaviopsis trunk rot, a lethal disease, to become established. For this reason, one should never pull off leaves that do not pull off easily. By pulling hard enough to eventually free these leaves, a small strip of trunk tissue will also tear off, again resulting in a wound that is readily colonized by *Thielaviopsis paradoxa*, the causal agent of Thielaviopsis trunk rot. Finally, never use climbing spikes for pruning palm leaves, because wounds caused by the spikes will never heal (Figure 26) and can become entry sites for diseases, such as Thielaviopsis trunk rot, or attractants for serious insect pests, such as palm weevils (Broschat, 2011).

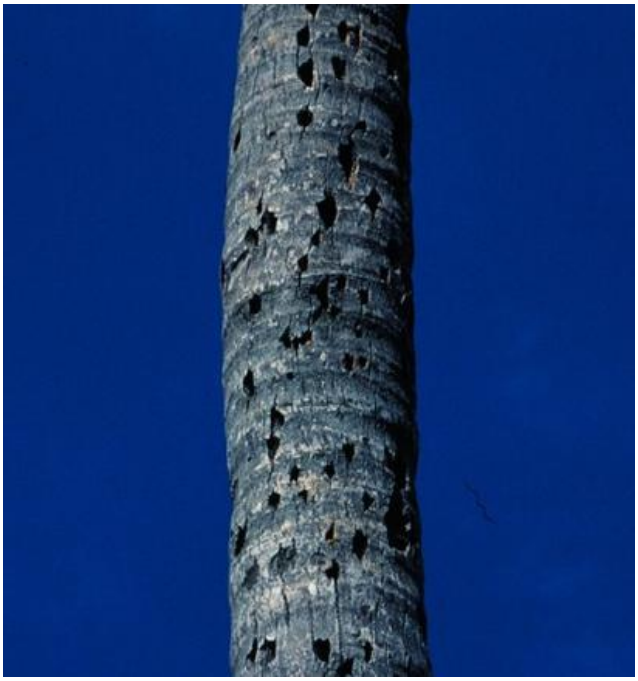


Figure 26. A palm with permanent trunk damage due to tree spikes

Though the management approach varies for trees compared to palms, they both contribute to the City of Boynton Beach's urban forest and must be properly planned and managed for these assets to continue to provide benefits to the community.

Trees and Palms Comprise Boynton Beach's Urban Forest

Image Description 4. Palms and trees contribute to Boynton Beach's urban forest

Appendix F. Guidance for Managing the Inventory

As part of the inventory and reporting project, the City staff were trained on the use of TreePlotter INVENTORY to manage data, add new trees, create reports, among other features and functionality. The following provides an overview of some of the primary functions of the software. For a 4-step summary of best practices, see Tree Inventory Management in the appendix.

Accessing the Inventory

The inventory database can be accessed on all major browsers though Google Chrome is preferred. The software has screen optimization to be accessible on laptops, PC, smartphones, and tablets. For Boynton Beach, the public tree inventory is located at www.pg-cloud.com/BoyntonBeachFL.

Creating and Managing Accounts

The "HUB" button is the source for all administrative, map, and data tools and includes all statistics and reports based on the data within the software. Within the HUB, TreePlotter's support staff can be accessed for any issues or concerns relating to the software. The Admin tab within HUB will allow administrative accounts to add or manage users. As the City becomes familiar with the software, the users and login levels can be adjusted here.

Map and Data Tools

Within the HUB button, the Map Tools tab allows permitted users to access map drawing and making tools. The Data Tools tab contains tools for editing field and value names within the database, exporting data to a Microsoft Comma Separated Values file or a shapefile, editing lookup tables such as tree species lists, creating custom map scenarios, or mass updating trees with a particular value. For any of the Data Tools, it is recommended a user review the TreePlotter resources and training tutorials or contact Support before undertaking any action that may impact the existing data.

Viewing the Stats and Reports

Summaries regarding the tree population or a filtered set of trees within the software can be found under the HUB button. Within the Stats tab, charts and graphs are available that summarize the tree population by location, management need, risk rating, tree diversity, health, size, and ecosystem benefits (where applicable). The Reports tab enables a user to create unique summaries based on a filtered set of trees (see Filtering Data below for more information).

The Data Button

Rather than accessing and updating data using the points on the map, permitted users may access the "DATA" button to view all data or a filtered set of data in a table form. Custom views can be created of the table and each column can be sorted or filtered.

Updating Existing Tree Data

To update an individual tree's data using the map points (as opposed to the DATA button described above), the tree point is found using the pan and zoom features of the map, typing in the address (described in Map Panel Tools below), or filtering values for the tree(s). A permitted user may click the desired point to view the tree popup window. This window contains buttons with various tools. The "DETAILS" button will bring up the inventory database organized into Tree, Location, Management, and History tabs. The field where the desired change is needed is located then the value is updated with a mouse, stylus, or finger

depending on the platform. By clicking the "CLOSE" button at the top of the form, the updated data is saved and a user may move on to the next tree for update. To update many trees at once with the same data, a permitted user may utilize the Mass Update feature found in the HUB though it is recommended the user be properly trained prior to use.

Adding a New Tree

To add data to the existing inventory, a permitted user may click the "ADD" button to add a tree, stump, or planting site point on the map. The user should first navigate to the desired site using the zoom, pan, or search by address tools. Once the location of the site is identified, the ADD button will enable the user to choose the type of point to add. With the ADD button activated, the location is touched using the mouse, finger, or stylus and a point will then be added. From this point, the data field window (DETAILS) will open allowing the user to add all necessary data fields and values.

Map Panel Tools

As mentioned above, a user may navigate the inventory on the map by using the zoom, pan, or search by address feature. This search by address feature is found on the left side of the map. The "+" and "-" buttons enable a user to zoom in or out, the home icon will bring the map to the original extent, the crosshairs button will zoom the map to the user's device (turn off after location is determined), the globe icon will enable the search by address feature, the funnel icon provides the powerful filter tool (described below), the map icon enables a user to change the basemap, and the "?" icon is a direct link to the TreePlotter Support page within the HUB button.

Filtering Data

One of the most useful tools in TreePlotter is the filter, also referred to as the advanced filter. This tool can be used to filter trees by any field and value within the database (depending on account). For example, perhaps a user would like to view all trees greater than 12 inches in diameter that are in poor condition. The filter will find only the trees that meet this criterion. Or perhaps a user would like to only view the Priority 1 Removal trees. Any number of filters can be applied and even saved for easier access in the future. In addition to filtering by attribute, a user may filter by map polygon. Clicking the "TREE MAP FILTER" button within the filter tool will enable a user to draw a polygon around the desired tree points for filtering. Simply close the polygon and only the trees within the polygon will appear. Perhaps a user would like to select a subset of trees along a street that may be impacted by sidewalk and curb and gutter repair. A polygon around these trees will enable custom reports and maps for the urban forestry program to utilize in design and decision planning. To undo any filters simply click the "CLEAR ALL FILTERS" or "CLEAR TREE MAP FILTER" buttons where applicable. Note, these filtering tools will update all Stats, Reports, and Legend values based on the filter by attribute or filter by map selection.

Additional Considerations

In addition to trees, work orders, inspections, service requests, among other tree-related points, data, and functionality can be accessed within the TreePlotter software. For a complete description and tutorial on TreePlotter visit www.PlanITGeo.com/TreePlotter.

BOYNTON BEACH, FL

PUBLIC TREE INVENTORY SUMMARY REPORT

JUNE 2022

CITY OF BOYNTON BEACH

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