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URBAN FOREST MANAGEMENT REPORT

FOR THE

OMNI CRA OF MIAMI, FLORIDA

June 28, 2019

This project provided by:

The John Scott Dailey Florida Institute of Government at FAU, and their Technical Services Provider:

Earth Advisors, Inc.

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Urban Forest Management Report

- Omni CRA, Miami FL -

Date: June 28, 2019

Acknowledgements

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This Urban Forest Management Report was developed to provide information to the Omni CRA to maintain a healthy and sustainable urban forest that is properly managed and cared for, while benefiting the district and its citizens with: Improving economic and environmental well-being, increasing public safety, prioritizing maintenance, and expanding urban forest canopy through informed tree planting decisions.

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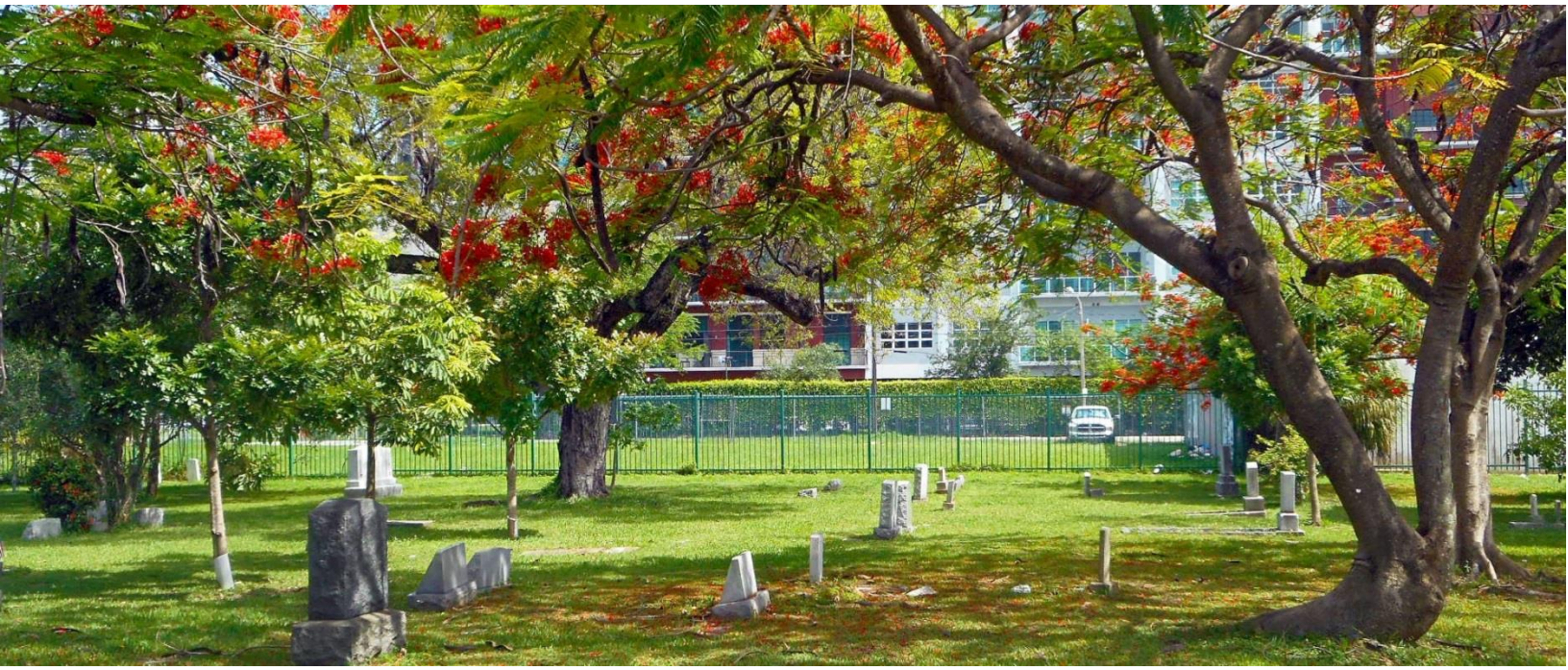
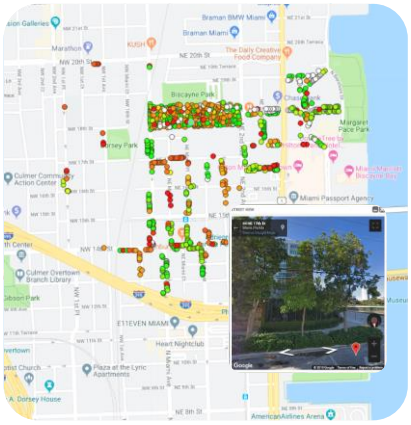
"Urban trees and forests are considered integral to the sustainability of cities as a whole. Yet, sustainable urban forests are not born, they are made. They do not arise at random, but result from a community-wide commitment to their creation and management."

| Clark et al.: Urban Forest Sustainability



Omni CRA District Tree Inventory Summary



The Omni Community Redevelopment Agency (CRA) District includes:

- ✓ A total of 1,403 locations that include trees, palms, and planting spaces
- ✓ 936 trees and 467 planting spaces inventoried
- ✓ An annual tree benefits value of $36,887, with an average of $63 per tree (584 of 936 trees are large enough to produce benefits)
- ✓ Average tree size is 11.8 inches in diameter

Diversity

There are a total of 65 unique Genera, the highest being: 104 (11%) Oaks (*Quercus*), 80 (9%) Royal palms (*Roystonea*), 72 (8%) Mahoganys (*Swietenia*), 57 (6%) Verawoods (*Bulnesia*), and 38 (4%) Fan palms (*Washingtonia*).

There are 78 species across the community, comprised primarily of 104 (11%) Live Oak (*Quercus virginiana*), 80 (9%) Florida Royal Palm (*Roystonea regia*), 72 (8%) Florida Mahogany (*Swietenia mahagoni*), 61 (7%) Coconut Palm (*Cocos nucifera*), and 57 (6%) Verawood (*Bulnesia arborea*). The diversity is high for this small tree population. Having no Genera over 20%, and only 1 species over 10% (Live Oak at 11%), is an excellent existing diversity, which improves the resilience of the urban forest against diseases and storm damages.

Tree Size Distribution

The size distribution of the District's trees consists of 27% young trees less than 6 inches in diameter at breast height (DBH), 18% adolescent trees (6-12-inch DBH), 18% maturing trees (12-24-inch DBH), and 11% mature trees (>24-inch DBH). The majority of the individuals are younger trees, so the future growth expectations for these trees provides a basis for expecting increased community values and tree benefits from these trees.

Condition

Each tree inventoried was given a health condition rating between 0-100, with 0 representing dead trees and 100 representing perfect health. The distribution of trees by health condition consists of 35 (4%) in "Good" condition (a value of 75-100), 827 (88%) in "Fair" condition (a value of 50-75), 38 (4%) in "Poor" condition (a value of 25-50), and 36 (4%) in "Dead" or "Dying" condition (a value of 0-25). Most urban trees are in Fair to Poor condition across the country, so this urban forest is at or a little above average for health.

Maintenance

As of April 2019, the inventory determined 229 (24%) require crown cleaning, 177 (19%) structural pruning, 130 (14%) palm pruning, and 92 (10%) training pruning. A total of 7 (1%) are listed as hazard removal and 64 (7%) are recommended for removal. Each maintenance requirement was designated as a Maintenance Code 1, 2, or 3; with 1 being the highest priority maintenance practice.

Annual Ecosystem Benefits

It is estimated that the urban and community forest in public spaces, which includes trees growing along streets and in maintained parks, currently provides ecosystem benefits of (definitions in Appendix III.):

- ✓ nearly $5,500 in energy savings,
- ✓ prevents 2.5 million gallons of stormwater runoff,
- ✓ sequesters 123,300 pounds of carbon,

- ✓ improves air quality by removing 1,000 pounds of pollution and particulate matter,
- ✓ increases overall property values by over $20,300,
- ✓ and provides a total tree benefits annual value of $37,000 to the community.

INTRODUCTION

The Omni Community Redevelopment Agency ("Omni CRA", "CRA") supports projects for the redevelopment and revitalization of this community within the City of Miami. The CRA is committed to improving the quality of life for residents in the district and creating affordable housing and economic opportunities. The district includes residential neighborhoods, parks, and recreational opportunities that create an attractive area to live, work, and play. Trees are an integral component of the urban environment. Their shade and beauty contribute to the community's quality of life and soften the hard appearance of concrete structures, parking lots, and streets. Trees help stabilize soils by controlling wind and water erosion and also help reduce noise levels; cleanse pollutants from the air; produce oxygen and absorb carbon dioxide; and provide habitat for wildlife.

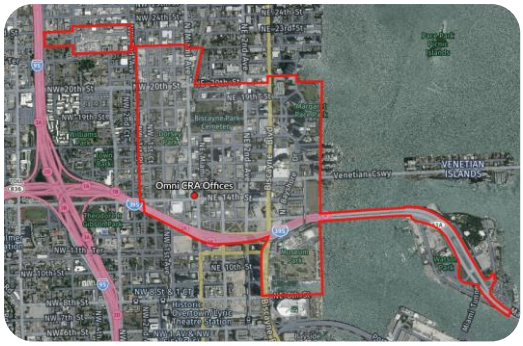
Recently, the CRA contracted with The John Scott Dailey Florida Institute of Government at FAU for Technical Services Support. This contract is for urban forestry professionals to complete a street and parks tree inventory within the boundaries of the district, and assist with decision making and implementation for an Urban Forest Management Program. In addition to the inventory, this Urban Forest Management Report ("Report") was developed to provide a thorough evaluation and summary of the inventoried trees.

While the urban forest serves as an important and integral part of the district and the city as a whole, serious challenges can negatively impact the care and management of the trees within it. The purpose of the Urban Forest Management Report is to provide a framework to effectively manage the urban forest as a sustainable asset, consistent with the values and needs of the district and the community, while maximizing its benefits.

OVERVIEW & PROJECT AREA

The Omni CRA is one of three CRA's within the City of Miami, FL (Omni, Midtown, and Southeast Overtown/Park West).

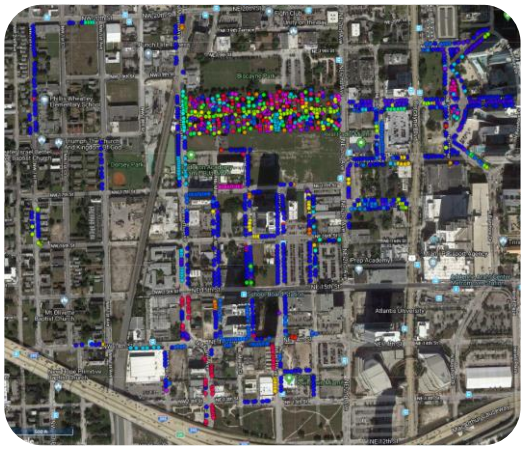
To support and enhance the trees in the city, the Omni CRA will utilize this Urban Forest Management Report for increasing environmental activism and activities. To inform this Report's recommendations, a baseline study of the existing tree structure, maintenance needs, and potential risks was conducted by completing an inventory of trees and planting spaces for streets and parks. The field work was completed in April 2019.



Omni CRA Boundary
Source: Omni CRA

This Report applies to all street and park trees within the district which are part of the inventory database. These summaries will support future tree planting and maintenance decisions which impact and benefit the district, city, and beyond. The tree inventory was conducted by ISA Certified Arborists who assessed trees and planting spaces in parks, public spaces, and within the Right-of-Ways throughout the district.

The map to right shows the location of all 1,403 data points inventoried for this project. This is a print of a map screen from the Tree Plotter App used in this project.



Tree Inventory Methodology

The tree and planting space inventory, facilitated by Omni CRA and completed by Earth Advisors, Inc. (EAI) and PlanIT Geo's (PG) Certified Arborists, began and was completed in April 2019. The CRA provided the consultants with the project area, priorities, desired data, and values to be collected as part of the inventory.

The tree inventory crew ("arborists") utilized EAI's Tree Plotter App, an inventory management software developed by PG, to complete the inventory. Each tree was inspected and assessed in the field with the following data collected and inputted to Tree Plotter:

- Common Name, Latin Name, and Genus
- Diameter at Breast Height (DBH, 4.5')
- Height (5' increments)
- Health (0-100 rating)
- Maintenance Needs
- Number of Trunks
- Observations
- Utilities Present
- Address, Land Use, and Lat/Long
- Tree # and ID
- Date Assessed
- User Name

Though Tree Plotter has built-in functionality to reduce error, after the inventory was completed, the arborists and project managers completed a quality assurance and quality checks (QA/QC) process to correct any misplaced tree points, erroneous data, or other inconsistencies.

The inventory data can be made available via a subscription in the Tree Plotter software application (https://pg-cloud.com/EarthAdvisors, login required). The data management, filters, and stats/charts/graphs functionality in Tree Plotter were used to complete the inventory data analysis and summaries to inform this Urban Forest Management Report.

Purpose of the Report

This Urban Forest Management Report provides a baseline summary of the trees within parks, public spaces, and rights-of-way throughout the Omni CRA district. This Report is intended to:

- Describe the current status of the urban forest resources,
- Identify priorities for managing trees and data to inform future tree plantings,
- Provide maintenance recommendations for the short-term and information for long-term tree management and sustainability decisions; and,
- Provide meaningful data summaries to propel urban forest enhancement throughout the district.

BENEFITS OF THE OMNI CRA DISTRICT'S TREES

Throughout Miami, and specifically in the Omni CRA district, trees along streets, in parks, cemeteries, yards, and throughout natural areas, constitute a valuable urban and community forest. This resource is critical for the city's green infrastructure. Trees contribute to environmental quality, public health, water conservation, property values, and aesthetic appeal. Urban forests provide "triple bottom line" benefits: *social, economic,* and *environmental.*

Total annual tree benefits of Omni CRA street and park trees are estimated at $36,887

Living trees provide services which can be assigned financial values. The main values calculator used in the United States is the USFS peer-reviewed i-Tree research. Financial values are calculated for: Stormwater retention, increased property values, energy conservation, improved air quality, and carbon dioxide reduction.

The total annual benefits of the district's inventoried trees (936 trees, 584 with benefits values) are estimated at $36,887. Increases in property values are estimated at over $20,337, without regional adjustments to the research. Additional values important to demonstrate are aesthetics, human well-being, tourism interest, sense of community, reduced crime, etc.

Stormwater retention represents 22% of the monetary value ($8,010), followed by energy conservation and air quality improvement/savings. If the large numbers of small trees currently growing are maintained properly and new trees are planted to replace all removals, these benefits are likely to sustain and will increase.

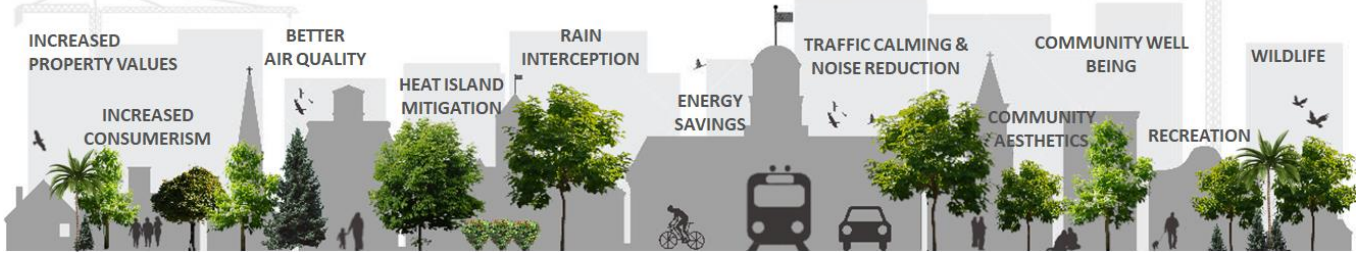
The table below summarizes the benefits of the top 5 species (40% of the inventory) inventoried. As seen in the table, large canopy trees such as the Live Oak have the second highest overall annual value with $5,002. The palms—while abundant—do not count for the benefits calculated. This is because of their small canopy size that is not large enough to count; reducing overall contributions to the ecosystem benefits described above. Definitions and resources for the ecosystem benefits are available in Appendix III.

Table 1. Summary of ecosystem benefits for the top tree species

Common Name	Count	Stormwater Savings	Property Value	Energy Savings	Air Quality Benefit	Carbon Benefit	Total Value
Live oak	104	$776	$3,612	$364	$172	$78	$5,002
Florida royal palm	80	--	--	--	--	--	$0
Mahogany tree	72	$1,588	$3,819	$847	$378	$193	$6,825
Coconut Palm	61	--	--	--	--	--	$0
Verawood tree	57	$82	$1,150	$90	$37	$12	$1,371
TOTAL	**374**	**$2,446**	**$8,581**	**$1,301**	**$587**	**$283**	**$13,198**

Table 2. Summary of ecosystem benefits of all trees inventoried (584 of 936 trees)

Total Benefit	Stormwater		Property Value	Energy		Air Quality		Carbon		
Units:	*$ Saved*	*Gallons Prevented*	*Value Added*	*Savings*	*kWh Saved*	*Benefits*	*Pollutants Removed (lb)*	*Benefits*	*C Sequestered (lb)*	*C Avoided (lb)*
$36,887	$8,010	2.5 mil	$20,337	$5,474	41,517	$2,392	1,067	$651	123,339	83,058



Tree Assessment Results & Summary

Using the inventory data in Microsoft Excel, Access, ArcGIS, and the Tree Plotter app, analyses were conducted to determine the state, characteristics, and trends of the Omni CRA district's urban forest. The information is provided to guide future maintenance and management; better planning for the health and longevity of the urban forest in Omni CRA.

This analysis and summary consists of 1,403 data points- 936 trees and 467 planting spaces.

When reviewing these summaries, recognize that park trees tend to have a better growing environment leading to larger canopies and sizes over time, which can skew the data when included with street trees.

The following section provides the results and recommendations based on the tree characteristics. It is organized by *Structure* and *Management Needs*.

This data and analysis provide the content for this Urban Forest Management Report's recommendations and strategies.

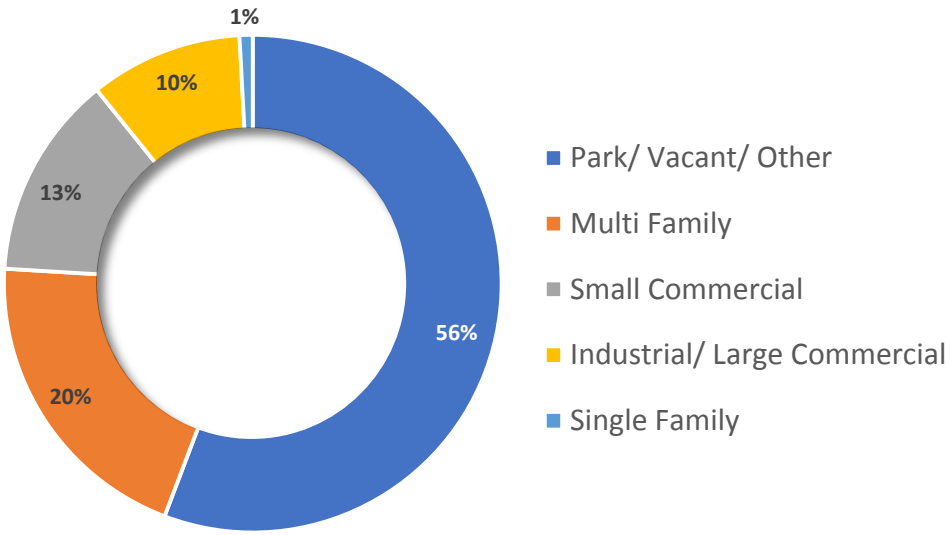
The Structure of the District's Trees

Urban forest structure describes the tree population in terms of its species composition, number of trees, age classes, and tree distribution. These summaries assist urban forest managers in proper tree management and planting to ensure long lasting canopy and benefits distributed equally across the district and city.

Trees by Land Use

Before summarizing trees by structure and maintenance needs, it is important to understand the distribution of trees in relation to land use. The land use affects the type of maintenance needed or previously conducted; the adjacent landowners and their views, perspectives, and willingness to assist; and the resources available for a tree in a particular land use. The following chart describes the distribution of trees across land uses.

Figure 1. Distribution of trees by land use



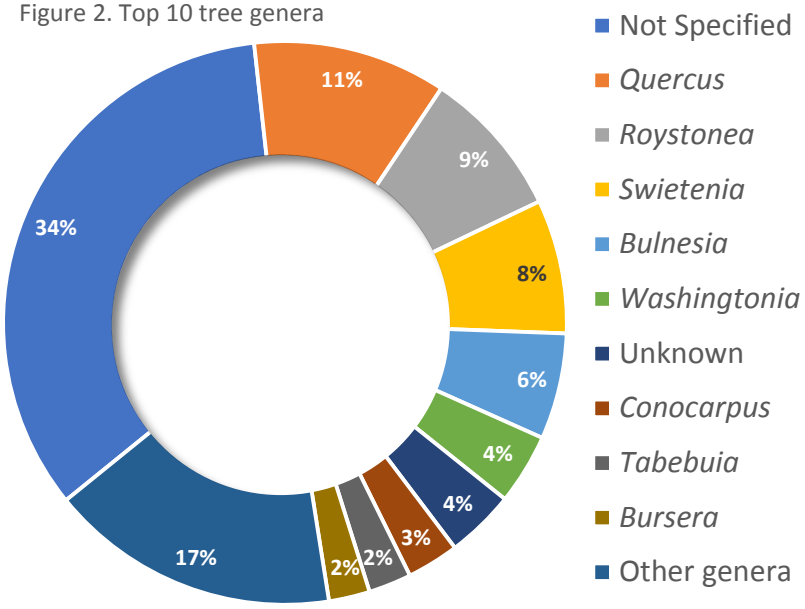
Tree Diversity and Composition

Species composition data are essential since the types of trees present in a community greatly affect the amount of benefits produced, tree maintenance activities, and budgets.

Table 3. Summary of the top 10 tree genera

Genus	Count	Percent
Not Specified	319	34%
Quercus	104	11%
Roystonea	80	9%
Swietenia	72	8%
Bulnesia	57	6%
Washingtonia	38	4%
Unknown	37	4%
Conocarpus	28	3%
Tabebuia	23	2%
Bursera	22	2%
Other genera	156	17%
TOTAL	**936**	**100%**

Figure 2. Top 10 tree genera

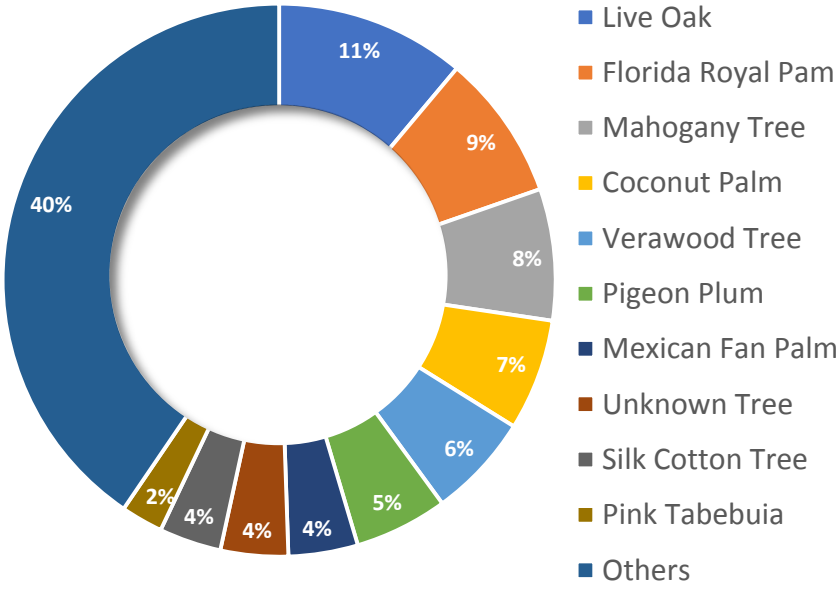


The tree inventory database of 936 trees contains a total of 65 unique genera with the top five comprised of *Quercus* (11%), *Roystonea* (9%), *Swietenia* (8%), and *Bulnesia* (6%). Within the tree inventory dataset there exists 319 trees (34%) without the genus specified. Including these unspecified trees, the top five genera account for 83% (780) of the total trees in the database.

Table 4. Top 10 tree species

Common Name	Count	Percent
Live Oak	104	11%
Florida Royal Pam	80	9%
Mahogany Tree	72	8%
Coconut Palm	61	7%
Verawood Tree	57	6%
Pigeon Plum	51	5%
Mexican Fan Palm	38	4%
Unknown Tree	37	4%
Silk Cotton Tree	34	4%
Pink Tabebuia	23	2%
Other species	379	40%
TOTAL	**936**	**100%**

Figure 3. Top 10 tree species



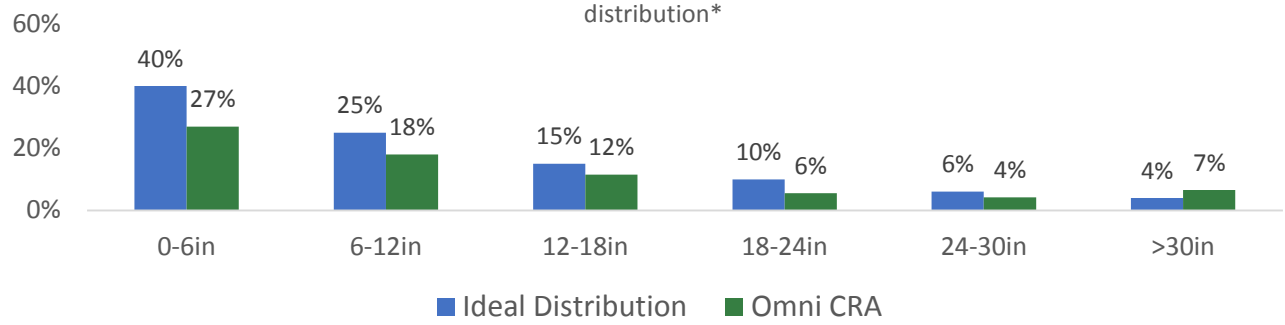
The 65 genera are comprised of 78 unique species classifications. The top ten species comprise 60% of the population, the highest belonging to Live Oak amounting to 11% of the total population followed by Florida Royal Palm (9%), Mahogany (8%), Coconut Palm (7%), and Verawood (6%).

It is generally recommended that no more than 30% of the trees in a city, neighborhood, or district be of the same family, no more than 20% of the same genus, and no more than 10% of the same species. Following this 30/20/10 rule will help to ensure that pests and diseases are isolated and controllable, minimizing impacts on the total value of the urban forest. Also, this diversity improves resiliency for storm damages.

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 uneven-age urban forest offers continued flow of benefits and a more uniform workflow allowing managers to more accurately allocate annual maintenance funds.

Figure 4. Comparison of the Omni CRA district's tree diameter class distribution to the ideal distribution*



*Based on McPherson's Ideal Distribution https://www.fs.fed.us/psw/publications/mcpherson/psw_2011_mcpherson(soares)002.pdf

To optimize the value and benefit of trees, the community forest should have a high percentage of large canopy trees which provide more ecosystem benefits. At the same time, there must be a sufficient number of younger, smaller trees in the tree population to account for the loss of trees over time and thereby maintain a sustainable community forest. In traditional forest management, this is following uneven-aged stand management methods for the total tree population.

Figure 4 shows the distribution of size classes (DBH or diameter at breast height, 4.5') for the inventoried trees that were assigned a value. Most palms were not given a DBH and are primarily represented as "NA" in Figure 4. According to the figure, the 3-6-inch DBH range comprises the majority of the tree inventory database with 176 trees or 19% and the 24-30-inch DBH range makes up the smallest portion with 39 trees or 4%.

According to Figure 4, the aggregated data does not reflect the ideal urban forest uneven-age distribution. The distribution of individual tree ages within a tree population influences present and future costs as well as the flow of benefits. Ideally, the district would have a greater portion of trees under 6 inches DBH with distribution decreasing as the diameter class increases. An ideal age/size distribution in the tree population allows managers to allocate annual maintenance costs uniformly over many years and assures continuity in overall tree canopy coverage and associated benefits which are often dependent on the growing space of individual trees (e.g. open grown versus restricted growing areas). It is recommended to increase tree plantings throughout the district, considering the growth habits and the mature form and size of the species selected.

Additional summaries regarding the structure of the trees in the district are provided below.

Figure 5. Distribution of tree heights

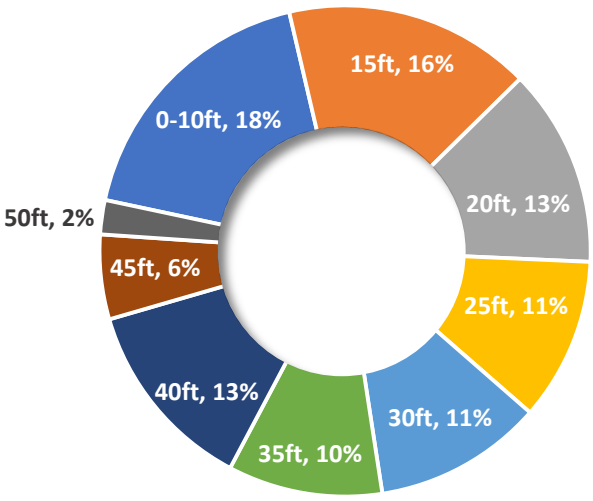
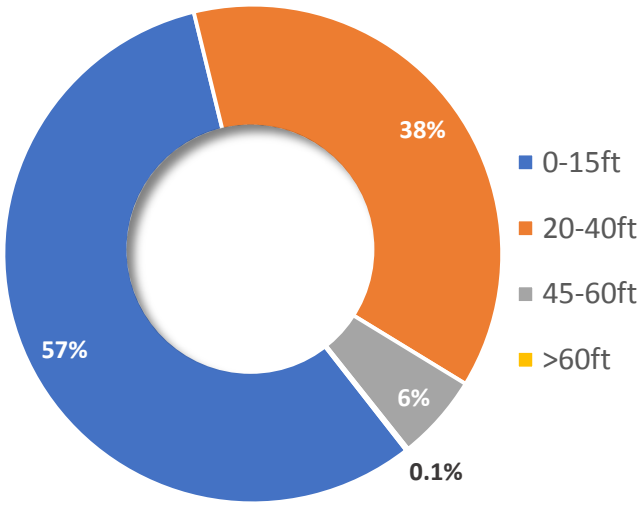


Figure 6. Distribution of trees by canopy spread (ft)



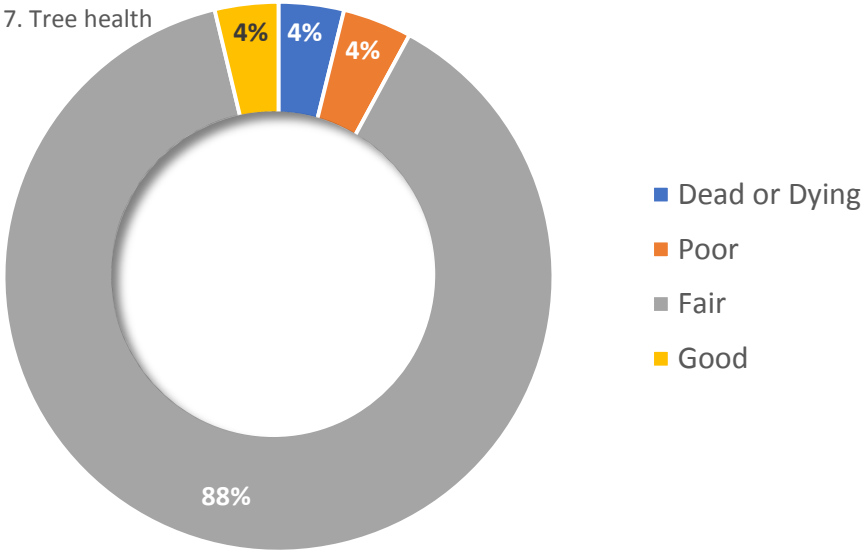
The Management Needs of Omni CRA District Trees

Tree characteristics and outside forces affect the management needs for urban trees. An analysis of the condition and maintenance requirements assists managers in planning the urban forest. Tree condition indicates how well trees are managed and how well they perform given site-specific conditions. Tree maintenance needs are inventoried for public safety reasons and for the health and longevity of the trees. Understanding the maintenance needs assists tree managers in establishing daily work plans and has also complemented the development of the Urban Forest Management Plan.

Urban Forest Condition

The inventory data was analyzed to identify potential trends in tree management needs and condition. Local information on the condition of street and park trees plays an important role in community planning, municipal budgeting, and use of resources. Each inventoried tree was rated for the condition of the wood and the foliage on a scale of 0-100 with 0 attributed to dead or dying trees and 100 attributed to excellent/healthy trees.

Figure 7. Tree health



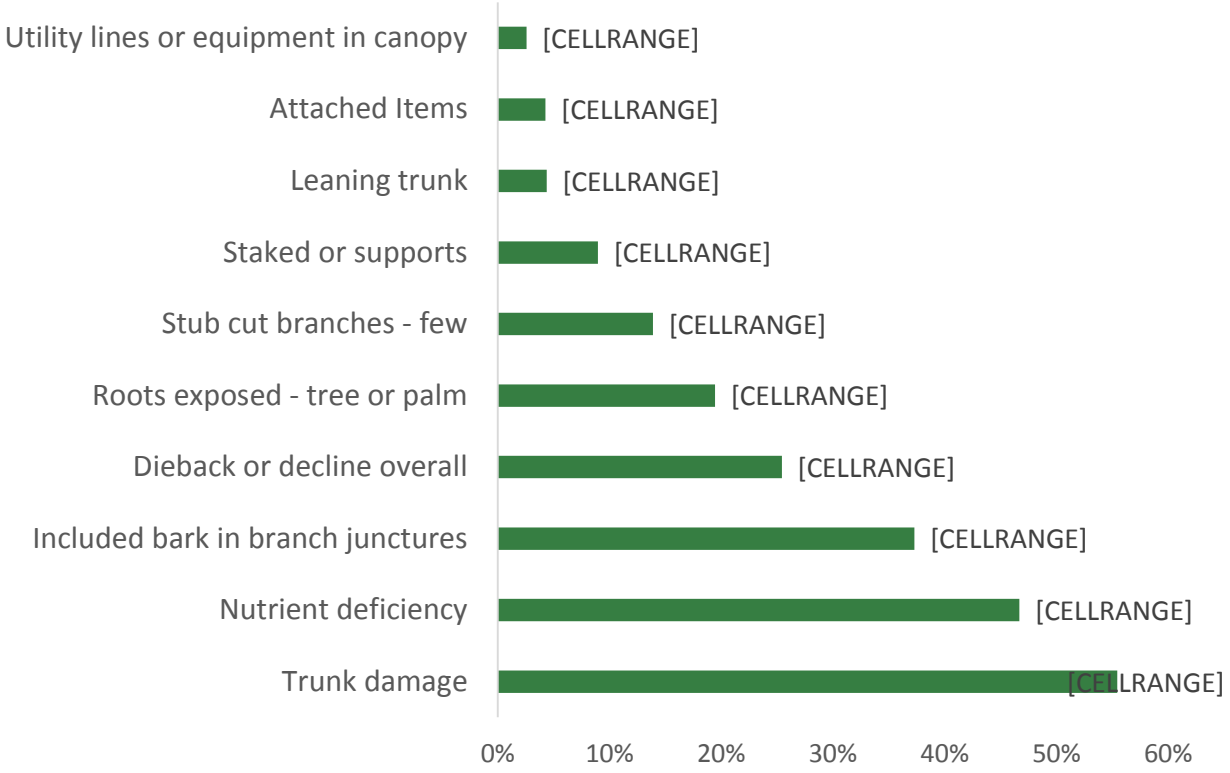
The tree health chart shows that of the 936 trees inventoried, the majority (88%) are in fair condition or a rating between 50-75%. Only 36 (4%) trees are dead or dying (a value of 0-25). Trees that are dead or dying should be removed, with priority to remove the highest risks. Trees that are in poor condition should be monitored, maintained, treated, and/or removed depending on each tree's situation.

Figure 8. Examples of trees in poor to dying health condition observed during the inventory. Summaries for maintenance or removal of these trees are provided in the Tree Removals section

TREE OBSERVATIONS

Observations were noted during the inventory to indicate common issues of the street and park trees such as mechanical damage, cavity decay, and nutrient deficiency. The chart below summarizes the top ten observations for the 936 trees inventoried (as of April 2019).

Figure 9. Summary of top ten observations



A total of 2,108 observations were recorded during the inventory. Of these observations, trunk damage had the highest count with 519 trees (55% of all trees) recorded. Other observations included nutrient deficiency with 437 (47% of all trees) observations, and dieback/decline with 238 (25% of all trees) observations. It should be noted that the majority of these observation categories are a result of anthropogenic causes or maintenance neglect. While some observations can be treated, many cannot be corrected and should instead be prevented, such as trunk damage. Others could have been prevented, such as nutrient deficiency or included bark, by conducting reasonable amounts (or levels) of fertilization, monitoring, and Training Pruning.

Figure 10. Examples of common observations (examples only)

Exposed Roots

Trunk Damage

Crown Dieback

Included Bark

Maintenance Needs Summary

The tree inventory required an assessment of the maintenance needs for each tree. The recommended maintenance, along with location, and tree size, are used to guide the management recommendations. For each tree, the priority for each maintenance need was identified by assigning the maintenance task as Maintenance Code 1, Maintenance Code 2, or Maintenance Code 3, with 1 as highest priority. Each tree could have up to three maintenance requirements that can either be addressed at the same time or separately, depending of the type of maintenance. Maintenance Code 1 should be addressed first by the tree managers and maintenance staff. The table below gives a summary of the maintenance required.

Table 5. Summary of maintenance requirements

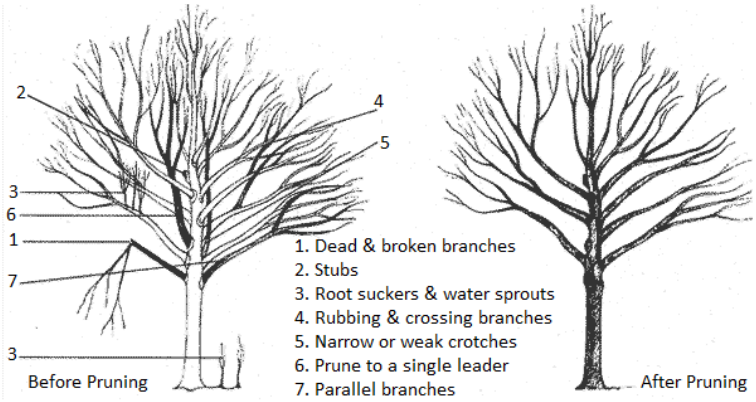
Maintenance Code	Maintenance Code 1	Maintenance Code 2	Maintenance Code 3	Total	%Whole
Structural Pruning	156	21	0	177	19%
Palm Pruning	128	2	0	130	14%
Crown Cleaning	121	104	4	229	24%
Training Pruning	81	11	0	92	10%
Newly Planted	76	0	0	76	8%
Clearance Pruning	73	0	0	73	8%
X2 Recommended Removal	46	14	4	64	7%
Fertilization- if necessary for survival	32	3	0	35	4%
Utility Pruning	27	0	0	27	3%
Crown Reduction	22	0	0	22	2%
Remove Straps/Supports	12	75	0	87	9%
Restoration Pruning	8	0	0	8	1%
X1 Hazard Removal	7	0	0	7	1%
Palm Pruning-clearance only	2	0	0	2	0%
Remove Attachment	1	2	0	3	0%
Plant new item*	0	53	0	53	6%
TOTAL	**792**	**285**	**8**	**1,085**	

*Typically for a tree that is dead or dying, not for empty planting spaces

A total of 1,085 recommended maintenance tasks were recorded during the inventory. As of April 2019, the greatest maintenance need (Maintenance Code 1) is Structural Pruning of all tree sizes (young, established, maturing, and mature trees)- for a total of 156 trees.

Considering all 3 priority levels of maintenance codes, Crown Cleaning has the highest count of 229 (24%) trees followed by Structural Pruning of 177 (19%) trees, and Palm Pruning for 130 palms (14%). These maintenance requirements can be completed by tree crews conducting routine pruning visits.

Figure 11. Illustration of maintenance activity "crown cleaning"



Tree Removals

Based on the inventory, a total of 7 trees have been identified as a high risk requiring immediate removal ("X1 Hazard Removal"). Figure 13 shows that of the 7 trees, 4 trees are in the 6-12-inch DBH range followed by the 12-18-inch DBH range with 3 trees. This is a low quantity of hazards for this population size.

Figure 12. Tree removal summaries by priority

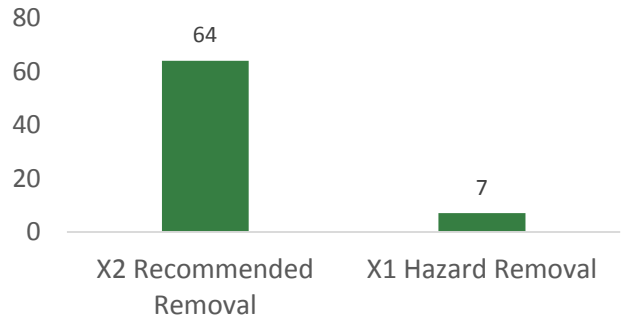
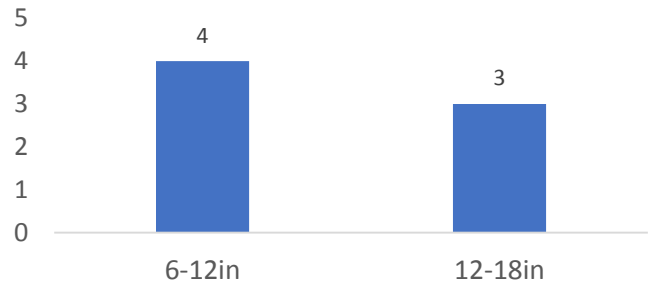


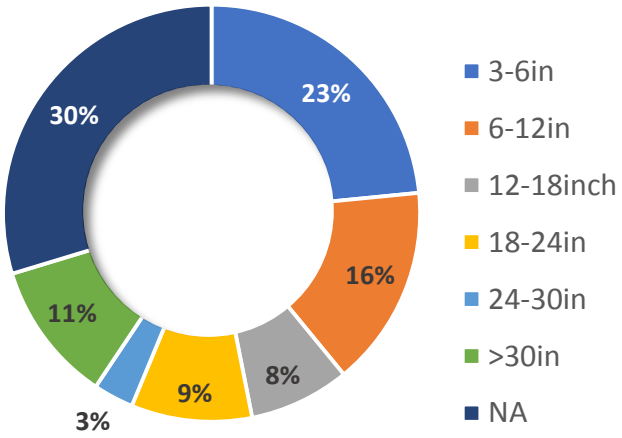
Figure 13. X1 Hazard Removals by DBH range



The inventory shows that there is a need to remove trees in order to lower risk and maintain public safety. It is recommended that these trees be prioritized by size, condition, and location and remove the largest, poorest quality trees as soon as possible, especially those that have the highest probability of failure and potential for impacting a target.

Figures 12 and 14 show that a total of 64 trees were classified as "X2 Recommended Removal". These trees should be reviewed to determine other maintenance tasks (i.e. Maintenance Code 1 and 2) recommended as alternate work before considering removal. These trees should be monitored and removed if maintenance tasks do not abate the issues causing the recommendation to remove. These trees could also be in poor condition, where removal is the preferred maintenance option, but they pose a low risk.

Figure 14. X2 Recommended Removals by DBH (64 total)



Of the 64 trees recommended for removal, 19 trees (30%) do not have a DBH value specified but 15 trees (23%) in the 3-6-inch DBH range are recommended for removal. The large trees in the >30-inch DBH range that are recommended for removal (7 trees) should be evaluated and monitored due to their size and potential to cause damage if tree failure occurs.

These results illustrate the importance of proper young tree planting and maintenance to improve tree establishment and healthy growth over their lifetime, thereby reducing the count of recommended removals.

Possible Planting Space Summary

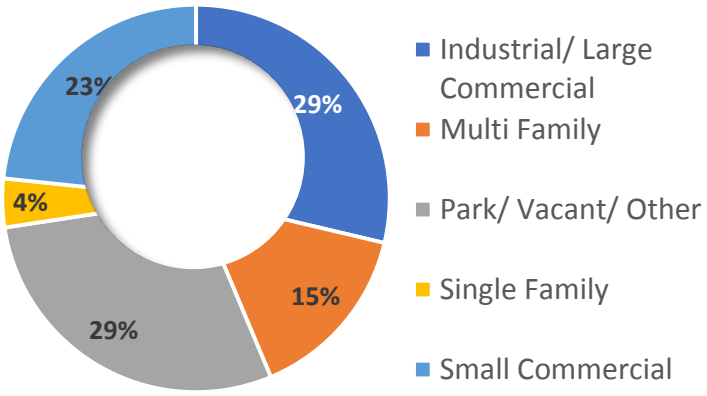
As part of the inventory, possible planting spaces were identified and mapped based on criteria and protocols established during the project kickoff. This data informs the Omni CRA staff, planners, and partners to make future tree planting decisions as it relates to species and location. Following are summaries of the planting space data collected. These summaries were used to inform the recommendations in this Report.

Land Use

Table 6. Summary of the distribution of possible planting spaces by land use

Land Use	Count	Percent
Industrial/ Large Commercial	134	29%
Multi Family	70	15%
Park/ Vacant/ Other	135	29%
Single Family	19	4%
Small Commercial	109	23%
TOTAL	**467**	**100%**

Figure 15. Summary of the distribution of possible planting spaces by land use



Planting Space Types

Table 7. Summary of the types of planting spaces

Type	Count	Percent
Swale	303	65%
Hardscape	106	23%
NA	31	7%
Island	10	2%
Pit	7	1%
5x5	6	1%
Median	3	1%
Cutout	1	0%
TOTAL	**467**	**100%**

Figure 16. Summary of planting space types

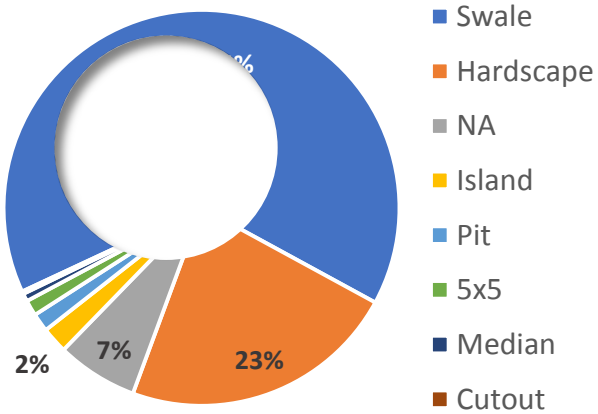
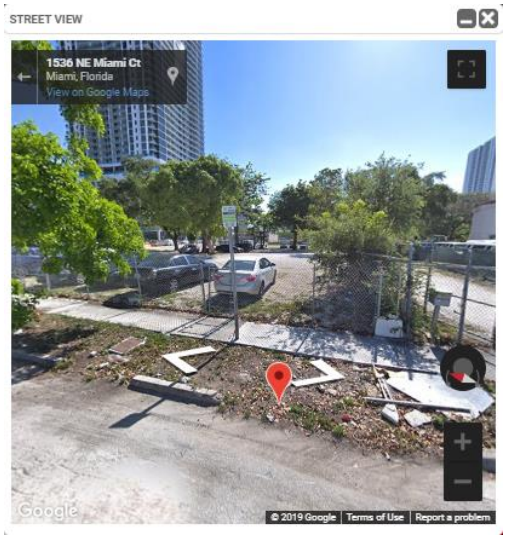
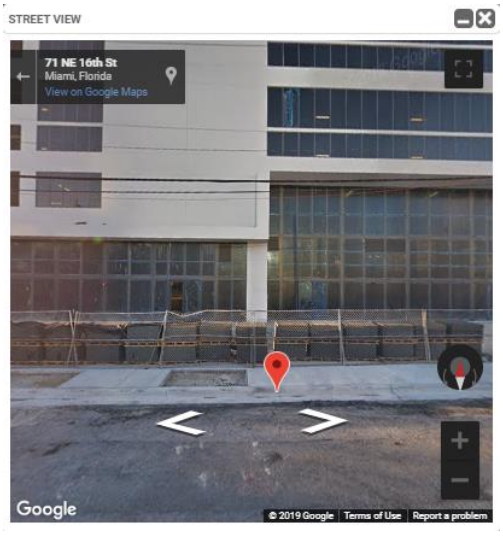


Figure 17. Examples of planting space types; swale (left) and cutout within sidewalk (right)





"When properly cared for, trees can be a valuable and growing asset worth many times their initial investment"

Image Source: Google Street View, 169 NE 14th St

Tree Maintenance & Planting Recommendations

The following tree maintenance and planting recommendations are based on the collected inventory data (available as a table in Appendix I). The inventory is comprised of trees and planting spaces that were inventoried in April 2019. Thus, maintenance requirements and available planting space may have changed during and after completion of the inventory.

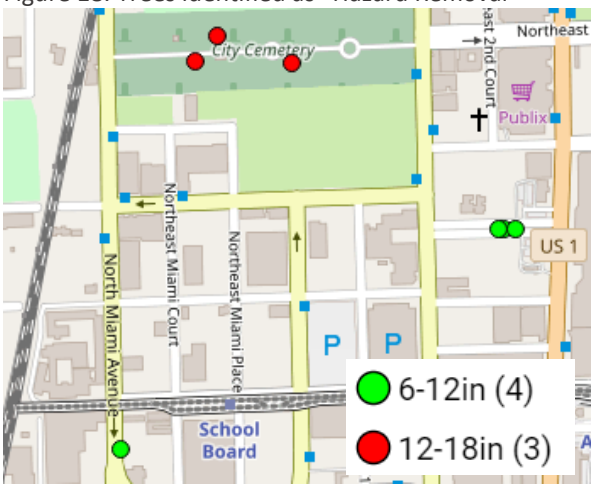
Tree Maintenance Recommendations Summary

- Immediately prioritize and address all high-risk removals (i.e. X1 hazard removals).
- Monitor and address other trees recommended for removal (i.e. X2 recommended removals).
- Perform a continuing routine pruning cycle for public trees, beginning in Year 1 on a 5-year rotation, starting with the inventoried trees.
- Perform cyclical pruning of young trees (<6" DBH), beginning in Year 1.
- Develop plans for the aftercare of newly planted trees which may include watering, mulching, staking, and pruning.
- Develop plans for invasive plants, pests, and diseases that may threaten the tree population.

High-Risk Removals & Recommended Removals

The data provided in the following section can be used by the district's tree managers to effectively prioritize hazard removals and monitor or evaluate the recommended removals.

Figure 18. Trees identified as "Hazard Removal"



https://pg-cloud.com/EarthAdvisors/?scenario=HazardRemovals

Figure 19. Trees identified as "Recommended Removal"

https://pg-cloud.com/EarthAdvisors/?scenario=RecRemovals

District-Wide Young Tree Pruning

To reduce future maintenance needs and costs and to improve tree health and vitality, young tree pruning is recommended- Training Pruning. Young tree pruning is conducted to "train" the trees by removing dead, dying, diseased, broken, interfering, conflicting, and/or weak branches; including directional pruning for future branch growth. This maintenance is to develop a strong structural architecture at an early stage when costs are much lower (smaller size tree that can be pruned from ground level).

Young tree pruning should not be needed until three years after planting dates, in order to prevent additional stress placed on the tree. The only recommended pruning within three years of establishment is the removal of broken or diseased branches. Generally, it is recommended that young tree pruning be completed for all trees that are less than six inches in diameter at least once, and then monitoring in next 2-4 years for any additional Training Pruning. Regular tree pruning is commonly planned for 3-5 year pruning cycle. The one-year cycle is designated for new trees because of the faster growth rates for most species.

Though resources may be limited, young tree pruning can be completed throughout the year and require very few tools or equipment (e.g. no bucket truck). Also, volunteers and interns can be trained for this type of work.

Tree Planting Recommendations

Omni CRA tree managers, planners, and partners should coordinate efforts to effectively plan the district's future urban forest. Using the tree and planting space inventory, tree species selection and locations can be determined to support a diverse, vibrant, and thriving urban forest that provides continual benefits to the community. The following describes the recommendations and criteria to consider for planting within the district. The spreadsheet provided as part of this project contains a table displaying the addresses of all planting spaces inventoried.

Proper Planning

- If not already available, establish planting and maintenance zones within the district that align with criteria such as existing infrastructure maintenance zones, neighborhoods, land use, and distribution of existing trees and planting space to address equity across the district.
- Within each of these zones, establish district "blocks" or "street segments" and conduct an analysis of the tree inventory data to determine species diversity, age/size diversity, ecosystem benefits, and available planting space for each created boundary.
- Identify inefficiencies or gaps within each zone to determine funding or grant sources, species selection, timing, and forecast the future canopy cover and benefits.
- Use the inventory and ecosystem benefits analyses to build support for tree plantings and funding.
- Consider planting in zones that do not meet the 30-20-10 rule and/or the ideal diameter distribution (see the Tree Diversity and Composition and Size and Age Distribution sections for more information).

Tree Selection

- For each planting site, determine the tree species by considering the following. Much of this information has been obtained in this project to use for implementing a Planting Plan:
    - Timing, existing and potential infrastructure conflicts, existing trees, mature canopy size, planned watering/irrigation, adjacent land use, neighborhood values and opinions, planned maintenance, planned infrastructure construction, repair, and/or replacement, soil conditions, soil volume, sun exposure, and city and county tree planting recommendations.
- Tree selection resources:
    - Million Trees Miami's Street Tree Master Plan: http://milliontrees.miamidade.gov/library/million-trees-master-plan.pdf
    - FUFC Right Tree Right Place publication, and FPL's Right Tree Right Place publications
    - IFAS Extension: https://sfyl.ifas.ufl.edu/miami-dade/landscapes--gardening/flowering--shade-trees-a---e/

Industry Standards

- Adhere to the ANSI Z60.1 tree nursery standards and Florida DACS *Grades & Standards for Nursery Plants* to select quality planting stock.
- Adhere to the ANSI A300 Part 6 for proper planting procedures.

Community Engagement

- Conduct outreach and engage the residents to participate in stewardship activities such as tree plantings and watering.
- Inform the community about the tree planting plans and offer opportunities for input.
- Establish or strengthen a trained volunteer stewardship network to assist with young tree pruning, watering, and general maintenance.

Tracking & Reporting

- Track the planting, maintenance, and removal of trees using the Tree Plotter app.
- Report on activities such as number of trees planted, ecosystem benefits, number of trees watered, number of volunteers, species diversity, and other meaningful information.

General Urban Forestry Recommendations

The following provides general recommendations relating to an urban forestry program. A more comprehensive list of recommendations should be developed by conducting an analysis of the district's urban forestry program and engaging stakeholders in the community. Recommendations for tree maintenance and planting are provided in the previous sections.

- Identify and involve stakeholders so that they become familiar with the inventory database and have input on how best to use information for urban forestry program development.
- Use tree inventory results and graphics on Omni CRA's website.
- The Tree Inventory Database should be maintained and kept current as trees are planted, replaced, maintained, and reassessed. It can be used to generate Work Orders, record work records, map maintenance and planting projects, and to support management actions.
- Continue to monitor and update the tree inventory making note of any pest/disease concerns and implementing the appropriate actions.
- Complete a comprehensive analysis of the programs and projects impacting the district's urban forest.
- Develop thorough recommendations based on this Report and an urban forestry program analysis.
- Develop strategies to achieve the goals and recommendations.
- Develop measurements and milestones that monitor progress towards achieving goals and allows for adaptive management.
- Develop street tree planting master plans that balance tree functions, diversity, design, and neighborhood character.
- Enhance and develop programs that encourage active participation by volunteers.
- Strengthen working relationships and partnerships with businesses, organizations, and contractors whose activities impact district trees by instituting regular dialogue and project coordination.
- Obtain the highest and best use of wood from trees removed within the district.
- Review Urban Forest Management Plan periodically and update as needed.
- Report on accomplishments.

TREE MAINTENANCE AND PLANTING BEST PRACTICES

The urban forest within the Omni CRA district plays a significant role in maintaining the health and vitality of urban life. The urban forest provides a wealth of benefits to neighborhoods and residents through the reduction of energy consumption, the removal of pollutants from the air and water, reduction in stormwater flows, increased valuation of private property, increased worker productivity, reduction in stress and violent crime, as well as providing recreational opportunities and aesthetic diversity. At the same time stresses from the urban environment including air pollution, damage by vehicles, increased impervious surface, soil compaction, and maintenance neglect reduce the diversity and magnitude of these benefits and may lead to tree-related problems.

The inherently close interaction between people and trees in the district requires active and diligent management of the urban and community tree and forest resources to ensure public safety. To enhance tree canopy and associated benefits, trees need to be properly maintained and planted.

TREE MAINTENANCE BEST PRACTICES

The following provides an overview of tree maintenance best practices. It is not intended to be an extensive or comprehensive summary of best practices. All tree maintenance practices should follow the American National Standards Institute's (ANSI) A300 Standards (Parts 1-10).

Reasons for Tree Pruning

1. *Pruning for Safety*
   Involves removing branches that could fall and cause injury or property damage, trimming branches that interfere with lines of sight on streets or driveways, and removing branches that grow into utility lines. Safety pruning can be largely avoided by carefully choosing species that will not grow beyond the space available to them and have strength and form characteristics that are suited to the site.

2. *Pruning for Health*
   Involves removing diseased or insect-infested wood, thinning the crown to increase airflow and reduce some pest problems, and removing crossing and rubbing branches. Pruning can best be used to encourage trees to develop a strong structure and reduce the likelihood of damage during severe weather. Removing broken or damaged limbs encourages wound closure.

3. *Pruning for Form*
   Improves the structure of trees and removes branches that are more likely to fail. Branches that are poorly attached may be broken off by wind and accumulation of snow and ice. Branches removed by such natural forces often result in large, ragged wounds that rarely seal.

4. *Pruning for Aesthetics*
   Involves enhancing the natural form and character of trees or stimulating flower production.

To reduce the need for pruning it is best to consider a tree's natural form. It is very difficult to impose an unnatural form on a tree without a commitment to constant.

Common Types of Tree Pruning

1. *Crown Cleaning*
   Consists of the selective removal of dead, dying, diseased, and weak branches from a tree's crown. No more than 25% of the live crown should be removed in any one year, even for young trees.

2. *Crown Thinning*
   Primarily for hardwoods, thinning is the selective removal of branches to increase light penetration and air movement throughout the crown of a tree. The intent is to maintain or develop a tree's structure and form. To avoid unnecessary stress and prevent excessive production of epicormic sprouts, no more than one-quarter of the living crown should be removed at a time. If it is necessary to remove more, it should be done over successive years.

   Branches with strong U-shaped angles of attachment should be retained. Branches with narrow, V-shaped angles of attachment often form included bark and should be removed.

3. *Crown Raising*
   The practice of removing branches from the bottom of the crown of a tree to provide clearance for pedestrians, vehicles, buildings, lines of site, or to develop a clear stem for timber production. After pruning, the ratio of the living crown to total tree height should be at least two-thirds. On young trees temporary branches may be retained along the stem to encourage taper and protect trees from vandalism and sunscald.

4. *Crown Reduction*
   Most often used when a tree has grown too large for its permitted space. This method, sometimes called drop crotch pruning, is preferred to topping because it results in a more natural appearance, increases the time before pruning is needed again, and minimizes stress (see drop crotch cuts in the next section). Crown reduction pruning, a method of last resort, often results in large pruning wounds.

Figure 20. Types of tree pruning

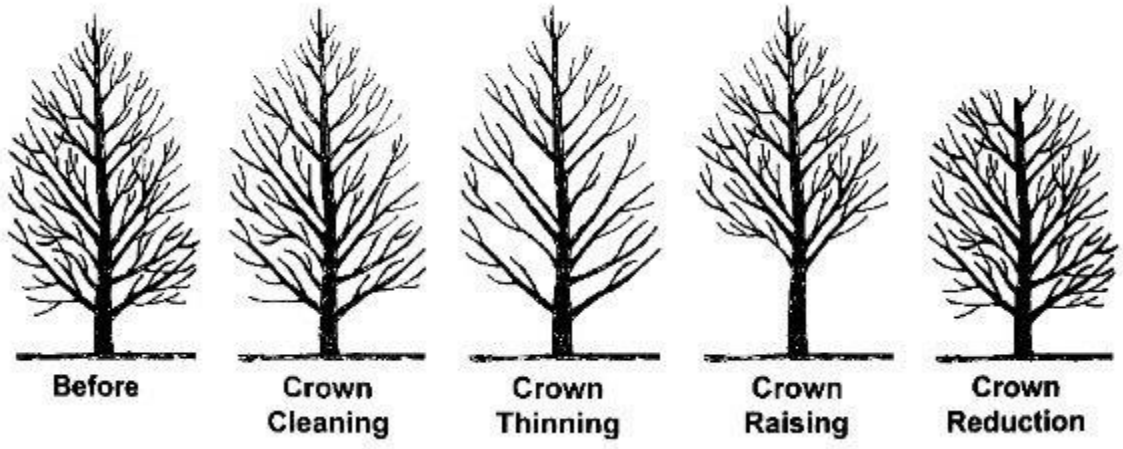


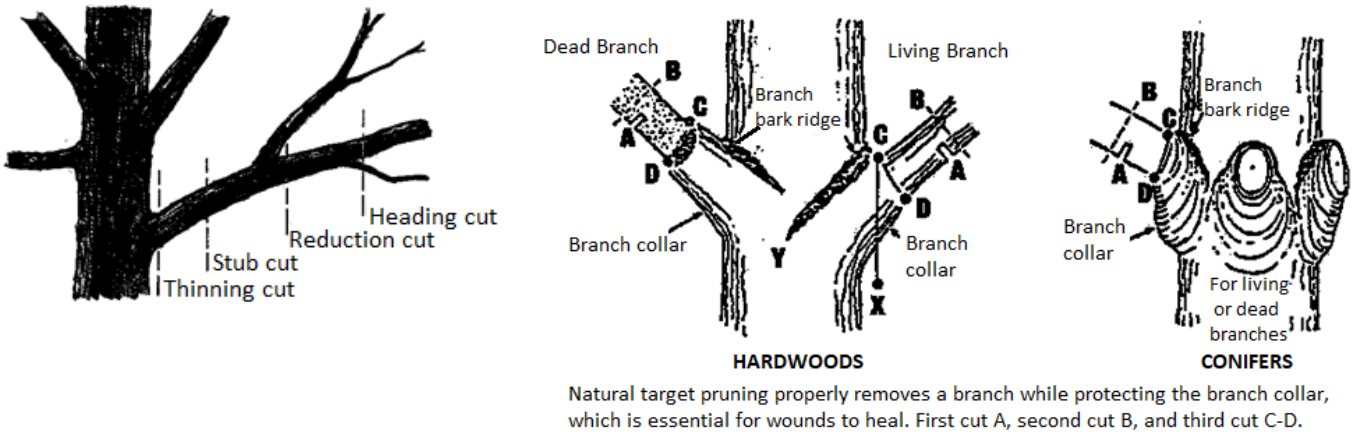
Image source: www.owentree.com

Tree Pruning Cuts

Pruning cuts should be made so that only branch tissue is removed and stem tissue is not damaged. To find the proper place to cut a branch, look for the branch collar that grows from the stem tissue at the underside of the

base of the branch. On the upper surface, there is usually a branch bark ridge that runs parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar. A proper cut begins just outside the branch bark ridge and angles down away from the stem of the tree, avoiding injury to the branch collar.

Figure 21. Types of pruning cuts and the proper branch cutting technique



Natural target pruning properly removes a branch while protecting the branch collar, which is essential for wounds to heal. First cut A, second cut B, and third cut C-D.

Image source: Pennsylvania State University Urban Forestry Extension

PALM MAINTENANCE BEST PRACTICES

Palm Pruning (Information source: http://edis.ifas.ufl.edu/ep443)

1. *Removal of Dead Leaves and Fruit Stalks*
   Pruning palms includes the removal of completely dead leaves and flower and fruit stalks. Half-dead or discolored lower leaves are a symptom of potassium or other nutrient deficiencies. Despite their unattractive appearance, these leaves should be left on the palm as they are providing K in the absence of sufficient K in the soil.

2. *Removal of Damaged Leaves*
   If stems of otherwise healthy leaves have become severely kinked or damaged due to wind or other mechanical injuries, the affected leaves can be removed. However, following a windstorm where many leaves are damaged, removed, or dead, the kinked leaves that remain on a palm should be retained as a source of photosynthates for the palm until new leaves can be produced.

3. *Hurricane Prevention*
   In the past, palms were pruned prior hurricane season. These "hurricane-cut" palms would have the 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. Observations of palms after severe hurricane seasons in Florida have shown that these "hurricane-cut" palms were more likely to have their crowns snapped off than those with fuller crowns.

4. *No Pruning*
   Not all palms require pruning. There is a large group of palms that have crownshafts. Palms with crownshafts should never need pruning if properly fertilized. Old leaves will undergo natural senescence where green leaves will quickly turn orange-brown then completely brown and fall off within days.

The palm in Figure 22 is not a properly pruned palm. It provides little shade, is unattractive, and will be weaker than a full-canopied palm like the one in Figure 23. A properly fertilized and pruned palm like the one in Figure 15 should have a round canopy with green leaves right down to the bottom. Consumers must be educated that palms are supposed to have round crowns, not feather-duster crowns.

Figure 22. Over pruned sabal palm

Figure 23. Properly pruned palm

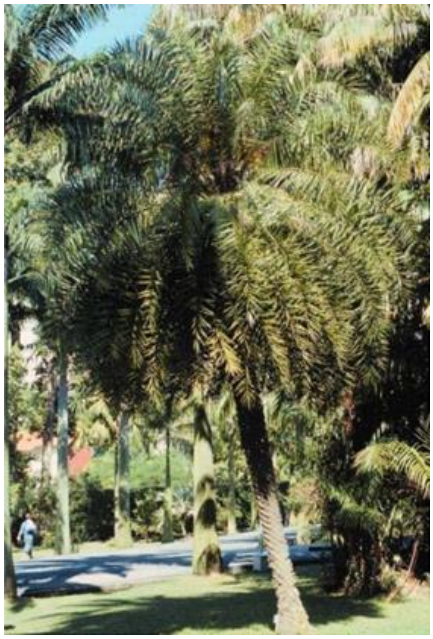


Photo source: University of Florida IFAS Extension

UTILITY TREE MAINTENANCE BEST PRACTICES

Utility Tree Pruning Overview

The CRA should work with the utility companies to ensure proper pruning practices are followed and that open communication between the company, the city, and the public are maintained. The International Society of Arboriculture provides guidelines for maintaining trees near power lines (*Best Management Practices – Utility Pruning of Trees*, G. Kempter).

Maintaining power lines free of tree growth is based on a consistent, planned trimming cycle of the utility vegetation management company. This approach improves electric service to all the customers who get their power from that line. A sensible approach to trimming trees means having a thorough maintenance plan that improves the safety and reliability of electric service to residents. Residents and the city/district staff should not attempt to trim any vegetation growing near or on any overhead power lines.

Utility Tree Maintenance Techniques

1. *Directional Pruning*
   Removes entire branches and limbs to the main trunk of the tree and future growth is directed away from the power lines. Reduction cuts are used for removing these branches and limbs and should be pruned properly back to a lateral branch that is at least one-third the diameter of the branch being removed. This allows for good wound closure and protects apical dominance and reduces sprouts.

   Avoid topping or rounding over trees. This removes more foliage than directional pruning, increases the number of tree wounds, stresses the tree, causes unstable decay, and increases water sprouts.

2. *Right Tree Right Place*
   Selecting the right tree for the site can reduce potential safety hazards and improve the reliability of the electric service. Smaller trees near power lines do not need to be excessively pruned and do not lose their natural form.

3. *Recommended Trees*
   Trees potentially suitable for planting adjacent to power lines includes fringetree (*Chionanthus virginicus*), wax myrtle (*Morella cerifera*), crape myrtle (*Lagerstromea indica*), and Japanese privet (*Ligustrum japonicum*). Additional species should be considered and listed in a recommended species list.

Figure 24. Example of trees directionally pruned for clearance from power lines

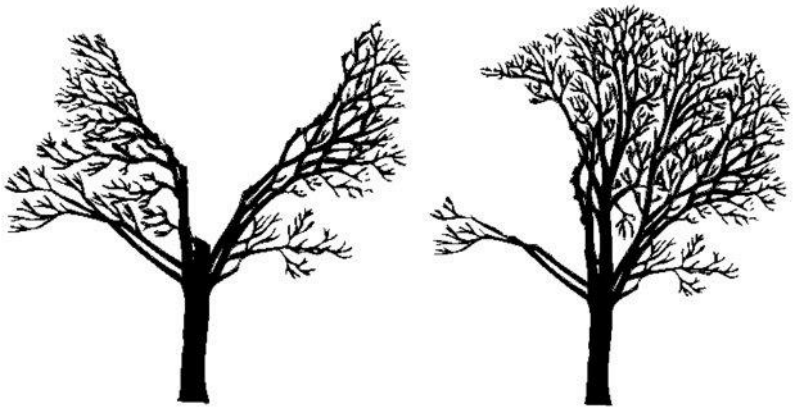


Photo source: Pennsylvania State University Urban Forestry Extension

YOUNG TREE MAINTENANCE BEST PRACTICES

Proper pruning is essential in developing a tree with a strong structure and desirable form. Trees that receive the appropriate pruning measures while they are young will require less corrective pruning as they mature.

Young Tree Maintenance Techniques

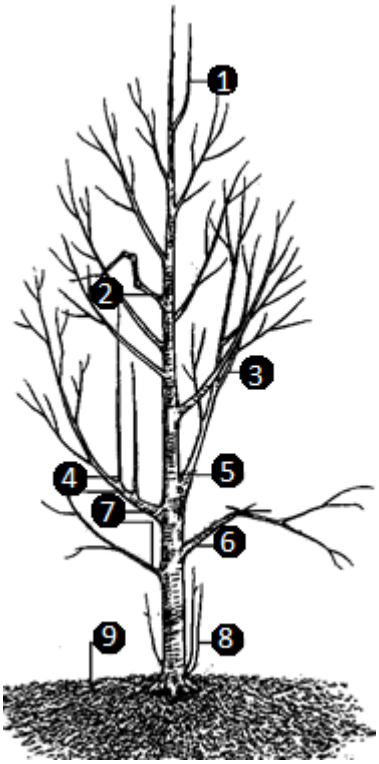
1. *Consider the Nature Form and Desired Growth*
   Accentuate the natural branching habit of a tree and correct any structural problems over time, if needed, to not stress the tree.

2. *Pruning in 1-2 Years after Planting*
   Prune as little as possible after planting to ensure there are enough temporary branches to produce food for new growth of roots, trunk, and branches. Prune only dead, broken, malformed, or diseased branches. Remove codominant leaders to maintain one dominant trunk. Prune for clearance if absolutely necessary. Keep size of branch removed to less than one inch in diameter.

3. *Pruning 2-3 Years after Planting*
   Prune any dead, broken, malformed, or diseased branches. Remove any suckers from the base of the tree. Next, determine the permanent branch structure by considering:
   - Remove, thin, or cut back any competing leaders
   - Remove crossing or rubbing branches, keeping the branch that maintains the natural form
   - Thin excessively crowded branches but do not lions-tail
   - Remove branches with narrow angles between the branch and trunk (consider species)

- Remove branches to maintain well-spaced branches along and around the trunk. Ideal mature trees will have lateral branches that are 18-24 inches apart (depending on species)
- Avoid pruning near time of bud break
- Prune flowering trees after flowering

Figure 25. Example of branches to be pruned for newly planted trees to promote good structure



1. Prune competing leader
2. Prune malformed branches
3. Remove crossing branches
4. Remove water sprouts
5. Remove branches with poor angles
6. Prune broken or damaged branches
7. Prune temporary branches over time
8. Remove suckers
9. Apply 2-3" of mulch

Photo source: Pennsylvania State University Urban Forestry Extension

Tree Planting Best Practices

The following provides an overview of best practices that should be considered and followed before during and after planting trees.

- Trees to be planted should be selected from an approved tree planting list developed to maintain and enhance species diversity that are suitable for Plant Hardiness Zone 9b and changing climates.
- Planting material will conform to the latest version of the American Standard for Nursery Stock (American National Standards Institute [ANSI] Z60.1). Trees to be planted should be of standard quality or better, and should be true to name and type of their species variety.
- Trees should not be planted in tree lawns less than 2 feet in width or in planting pits less than 5 feet long by 5 feet wide.
- Trees should not be planted within 50 feet of any major intersection, or within 20 feet of a fire hydrant, a driveway, or a pole supporting a light.
- The burlap and twine from balled-and-burlap trees should be removed from the tree and the tree pit. Wire tree baskets may remain on the root ball, but the top one-third should be clipped and removed from the planting hole.
- Mulch should be placed around trees in a minimum 3-foot circle and 3-inch depth to protect trees from lawnmower damage and competition from turf; mulch will be kept away from tree trunks.
- Newly planted trees should be irrigated weekly during droughts in the growing season for three years.

CONCLUSION

The Omni CRA district's urban forest is a defining and valued characteristic of Miami making the city a desirable place to live, work and play.

It is a resource that has a history and legacy of care and management; however, potential risks to individual trees and the urban forest exist.

The assessment and recommendations presented in this Urban Forest Management Report have been created to provide a framework to effectively, proactively, and sustainably manage it. Implementation of these recommendations will help ensure that the district's urban forest will continue to be a sustainable and valued part of Miami as a whole.

Image Source: World Red Eye,
Omni Park supported by Omni CRA

APPENDICES

Image Source: World Red Eye, Omni Park supported by Omni CRA

Appendix I. Hazard & Recommended Removals

Table 8. List of trees identified as X1 Hazard Removal or X2 Recommended Removal

Address	Common Name	DBH Range	Maintenance Code	Primary ID	Tree Id	Utilities Present
41 Northeast 17th Terrace	Royal Poinciana, Flamboyant Tree	12-18in	X1 Hazard Removal	48233	504	No
240 Northeast 17th Terrace	Royal Poinciana, Flamboyant Tree	6-12in	X1 Hazard Removal	49113	1365	No
240 Northeast 17th Terrace	Royal Poinciana, Flamboyant Tree	6-12in	X1 Hazard Removal	49114	1366	No
249 Northeast 17th Street	Royal Poinciana, Flamboyant Tree	6-12in	X1 Hazard Removal	49115	1367	No
1800 Northeast 2nd Avenue	Mahogany tree	12-18in	X1 Hazard Removal	48387	653	No
1800 Northeast 2nd Avenue	Stopper, general Eugenia species	12-18in	X1 Hazard Removal	48285	555	No
1445 N Miami Ave	Verawood tree	6-12in	X1 Hazard Removal	47930	207	No
101 Northeast 14th Street	Alexander/Solitaire palm		X2 Recommended Removal	49002	1255	No
108 Northeast 17th Street	Black Olive, Oxhorn	6-12in	X2 Recommended Removal	48811	1065	No
1101 North Miami Avenue	Royal Palm, Florida		X2 Recommended Removal	47892	171	No
111 Northwest 20th Street	Lysiloma	12-18in	X2 Recommended Removal	47732	12	Yes
1232 North Miami Avenue	Verawood tree	6-12in	X2 Recommended Removal	47875	154	Yes
1232 North Miami Avenue	Verawood tree	6-12in	X2 Recommended Removal	47874	153	Yes
1237 North Miami Avenue	Verawood tree	3-6in	X2 Recommended Removal	47868	147	Yes
1237 North Miami Avenue	Verawood tree	3-6in	X2 Recommended Removal	47873	152	Yes
1237 North Miami Avenue	Verawood tree	3-6in	X2 Recommended Removal	47871	150	Yes
1237 North Miami Avenue	Verawood tree	3-6in	X2 Recommended Removal	47870	149	Yes
1245 North Miami Avenue	Verawood tree	3-6in	X2 Recommended Removal	47869	148	Yes
1320 North Miami Avenue	Verawood tree	3-6in	X2 Recommended Removal	47882	161	No
1400 North Miami Avenue	Verawood tree	3-6in	X2 Recommended Removal	47931	208	No
1440 North Miami Avenue	Verawood tree	3-6in	X2 Recommended Removal	47937	213	Yes
1440 North Miami Avenue	Verawood tree	3-6in	X2 Recommended Removal	47936	212	Yes
1445 N Miami Ave	Verawood tree	3-6in	X2 Recommended Removal	47926	204	No
1501 Biscayne Boulevard	Royal Palm, Florida		X2 Recommended Removal	48753	1008	No
1501 Biscayne Boulevard	Royal Palm, Florida		X2 Recommended Removal	48752	1007	No
1529 Northeast Miami Court	Pongam tree	>30in	X2 Recommended Removal	48992	1245	No

Address	Common Name	DBH Range	Maintenance Code	Primary ID	Tree Id	Utilities Present
1531 Northeast Miami Court	Montgomery palm		X2 Recommended Removal	48922	1176	No
1537 Northeast Miami Court	Pongam tree	24-30in	X2 Recommended Removal	48993	1246	No
1545 Northeast Miami Court	Pongam tree	>30in	X2 Recommended Removal	48981	1234	No
155 Northeast 15th Street	Bishopwood	18-24in	X2 Recommended Removal	48880	1134	No
1552 Northeast Miami Place	Pongam tree	>30in	X2 Recommended Removal	48980	1233	No
1637 Northwest 1st Place	Crape Myrtle	3-6in	X2 Recommended Removal	48112	384	Yes
1700 Biscayne Boulevard	Crape Myrtle	3-6in	X2 Recommended Removal	49129	1381	No
1700 Biscayne Boulevard	Pigeon Plum	3-6in	X2 Recommended Removal	49128	1380	No
1700 Biscayne Boulevard	Pigeon Plum	3-6in	X2 Recommended Removal	49127	1379	No
1730 Northwest 1st Ave	Pongam tree	6-12in	X2 Recommended Removal	47726	6	Yes
1730 Northwest 1st Avenue	Pongam tree	6-12in	X2 Recommended Removal	47725	5	Yes
1765 North Miami Avenue	Unknown Tree	12-18in	X2 Recommended Removal	48160	432	No
1768 Northeast 2nd Court	Mexican Fan palm, Washingtonia Palm		X2 Recommended Removal	49081	1333	No
1770 Northeast 4th Avenue	Alexander/Solitaire palm		X2 Recommended Removal	48775	1030	No
1790 Northeast 2nd Court	Royal Palm, Florida		X2 Recommended Removal	48792	1046	No
1794 Northeast 4th Avenue	Seaside Mahoe, Portia Tree	18-24in	X2 Recommended Removal	48568	826	No
1794 Northeast 4th Avenue	Mexican Fan palm, Washingtonia Palm		X2 Recommended Removal	48573	831	No
1800 Northeast 2nd Avenue	Mahogany tree	12-18in	X2 Recommended Removal	48388	654	No
1800 Northeast 2nd Avenue	Montgomery palm		X2 Recommended Removal	48356	623	No
1800 Northeast 2nd Avenue	Spindle Palm		X2 Recommended Removal	48312	582	No
1800 Northeast 2nd Avenue	Chinese Tallow	6-12in	X2 Recommended Removal	48252	523	No
1800 Northeast 2nd Avenue	Gumbo Limbo, Turpentine Tree	18-24in	X2 Recommended Removal	48207	478	No
1800 Northeast 2nd Avenue	Black Olive, Oxhorn	>30in	X2 Recommended Removal	48427	688	No
1800 Northeast 2nd Avenue	Montgomery palm		X2 Recommended Removal	48359	626	No
1800 Northeast 2nd Avenue	Montgomery palm		X2 Recommended Removal	48357	624	No
1800 Northeast 2nd Avenue	Montgomery palm		X2 Recommended Removal	48354	621	No
1800 Northeast 2nd Avenue	Montgomery palm		X2 Recommended Removal	48353	620	No

Address	Common Name	DBH Range	Maintenance Code	Primary ID	Tree Id	Utilities Present
1837 Northeast 4th Avenue	Mahogany tree	>30in	X2 Recommended Removal	48635	891	No
1900 North Bayshore Drive	Royal Palm, Florida		X2 Recommended Removal	48647	903	No
1900 North Bayshore Drive	Royal Palm, Florida		X2 Recommended Removal	48610	867	No
1901 North Miami Avenue	Cedar, Southern Red	12-18in	X2 Recommended Removal	48206	477	No
1901 North Miami Avenue	Silk Cotton Tree, Ceiba	6-12in	X2 Recommended Removal	48200	471	No
1901 North Miami Avenue	Unknown Tree	18-24in	X2 Recommended Removal	48065	339	No
1901 North Miami Avenue	Silk Cotton Tree, Ceiba	18-24in	X2 Recommended Removal	48073	346	No
2 Northeast 20th Street	Black Olive, Oxhorn	12-18in	X2 Recommended Removal	48001	276	No
222 Northeast 17th Terrace	Mexican Fan palm, Washingtonia Palm		X2 Recommended Removal	49035	1288	No
331 Northeast 18th Street	Tamarind	6-12in	X2 Recommended Removal	48710	965	No
331 Northeast 18th Street	Seagrape	>30in	X2 Recommended Removal	48700	955	No
41 Northeast 17th Terrace	Orange Geiger	6-12in	X2 Recommended Removal	48236	507	No
41 Northeast 17th Terrace	Unknown Tree	6-12in	X2 Recommended Removal	48221	492	No
430 Northeast 18th Street	Royal Palm, Florida		X2 Recommended Removal	48584	842	No
49 Northeast 14th Street	Oak, Live	3-6in	X2 Recommended Removal	47830	109	No
79 Northeast 17th Terrace	Seaside Mahoe, Portia Tree	24-30in	X2 Recommended Removal	48434	695	No
79 Northeast 17th Terrace	Mahogany tree	>30in	X2 Recommended Removal	48430	691	No
79 Northwest 14th Street	Mahogany tree	18-24in	X2 Recommended Removal	47747	26	No

Appendix II. Urban Forestry Resources

- Florida Urban Forestry Council: http://www.fufc.org/
- Florida Forest Service's Urban and Community Forestry: https://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/For-Communities/Urban-Forestry/Florida-Urban-and-Community-Forestry-Grant-Program
- A Guide for Tree, Palm Maintenance for Urban Roadsides and Landscape Areas (FDOT): http://www.fdot.gov/maintenance/RDW/Guide_LandscapeandTreeMaintenance.pdf
- Florida Yards and Neighborhoods Program: http://www.floridayards.org/landscape/FYN-Handbook.pdf
- International Society of Arboriculture: www.isa-arbor.com
- Sample Tree Ordinance: https://www.arborday.org/programs/treecityusa/documents/sample-tree-ordinance.pdf
- Tree ordinance guidelines: http://www.isa-arbor.com/education/resources/educ_TreeOrdinanceGuidelines.pdf
- Tree Contracting Specifications: https://www.springfieldmo.gov/DocumentCenter/View/11756
- Trees and development guidelines: http://www.a2gov.org/departments/field-operations/forestry/Pages/StreetTreesDevelopment.aspx
- Municipal urban forestry staff: https://www2.apwa.net/Documents/About/CoopAgreements/UrbanForestry/UrbanForestry-2.pdf
- Tree boards: http://www.tufc.com/pdfs/treeboard_handbook.pdf
- Urban Watershed Forestry Management: http://www.forestsforwatersheds.org/
- Funding sources: http://actrees.org/resources/tools-for-nonprofits/fundraising-tools-for-nonprofits/
- Trees as green infrastructure best management practices: http://water.epa.gov/polwaste/green/upload/stormwater2streettrees.pdf
- Valuing tree benefits: www.itreetools.org
- Information on urban tree canopy assessments (UTC): www.nrs.fs.fed.us/urban/utc/
- Sustainable Urban Forest Guide: http://www.itreetools.org/resources/content/Sustainable_Urban_Forest_Guide_14Nov2016.pdf
- Private property tree program: http://treebaltimore.org/get-a-free-tree/
- Tree inventory tools: www.planitgeo.com and www.treeplotter.com
- Urban Tree Canopy assessments: https://www.nrs.fs.fed.us/urban/utc/

Appendix III. Ecosystem Benefits Defined

Table 9. Ecosystem benefits defined

Benefits are only calculated for trees with defined species, DBH, and land use based on i-Tree research. Totals are annual amounts.

Ecosystem Benefit	Definition
Stormwater Monetary Benefit	Monetary savings due to reductions in annual stormwater runoff due to rainfall interception by tree canopy.
Runoff Prevention (Gallons)	Reductions in annual stormwater runoff due to rainfall interception by tree canopy.
Property Value Total	Monetary increases in tangible and intangible benefits of trees reflected in increases in property values.
Energy Savings	Monetary increases due to the contribution of the urban forest toward conserving energy in terms of reduced natural gas use in winter (measured in therms) and reduced electricity use for air conditioning in the summer.
Energy Saved (kWh)	Contribution of the urban forest toward conserving energy in terms of reduced natural gas use in winter (measured in therms) and reduced electricity use for air conditioning in the summer (measured in kwh).
Natural Gas Savings	Monetary increase due to the contribution of the urban forest toward conserving energy in terms of reduced natural gas use in winter.
Heat Prevention (Therms)	Contribution of the urban forest toward conserving energy in terms of reduced natural gas use in winter (measured in therms).
Air Quality Monetary Benefit	Trees improve air quality when air pollutants (O3, NO2, SO2, Particulate Matter) are deposited on tree surfaces and absorbed, and from reduced emissions from power plants (NO2, Particulate Matter, VOC's (Volatile Organic Compounds), SO2) due to reduced electricity use (see Energy Conservation definition). This is the monetary amount of this benefit.
Pollutants removed (lb)	Trees improve air quality when air pollutants (O3, NO2, SO2, Particulate Matter) are deposited on tree surfaces and absorbed, and from reduced emissions from power plants (NO2, Particulate Matter, VOC's (Volatile Organic Compounds), SO2) due to reduced electricity use (see Energy Conservation definition). This is the measured amount of this benefit in lbs.
Carbon Monetary Benefit	The dollar value associated with the amount of carbon stored or sequestered by trees based on calculations of the social cost of carbon.
Carbon Stored (lb)	All carbon dioxide stored in the urban forest over the life of the trees as a result of sequestration (in pounds). This measurement is not the same as annual carbon sequestered.
Carbon Sequestered (lb)	The amount of carbon annually removed from the atmosphere and stored in the canopy's biomass (in pounds).
Carbon Avoided (lb)	Annual reductions in atmospheric CO2 due to sequestration by trees and reduced emissions from power plants due to reduced energy use (in pounds).
Resources	www.itreetools.org http://www.treebenefits.com/calculator/

Appendix IV. Tree Planting Case Study – North Miami Avenue

The following provides the district tree managers, planners, and partners with a case study that utilizes the tree and planting space inventory data to inform future planting decisions. **This study focuses on North Miami Avenue which runs north to south within the district and contains existing trees and planting spaces.** The information should be used in addition to the content in the Tree Planting Recommendations section.

Table 10. North Miami Avenue tree summaries

Species Diversity

Common Name	Count	%Within
Verawood tree	36	39%
Mahogany tree	27	29%
Java Plum, Jambolan Plum	12	13%
Florida Royal Palm	10	11%
Live Oak	7	8%
TOTAL	**92**	**100%**

Land Use

Land Use	Count	%Within
Small Commercial	54	59%
Park/ Vacant/ Other	22	24%
Industrial/ Lg Commercial	13	14%
Multi Family	3	3%
TOTAL	**92**	**100%**

Tree Age/Size Diversity

DBH Range	Count	%Within
3-6in	37	40%
6-12in	24	26%
12-18in	8	9%
18-24in	1	1%
24-30in	3	3%
>30in	9	10%
NA	10	11%
TOTAL	92	100%

Ecosystem Benefits Summary

Annual Ecosystem Benefits	Value
Stormwater Savings	$823
Property Value	$2,949
Energy Savings	$597
Air Quality Monetary Benefit	$236
Carbon Monetary Benefit	$67
Total Monetary Benefit	**$4,669**

Figure 26. North Miami Avenue Tree & Planting Space Maps

Example: Planting space available at 1601 N Miami Ave

Map URLs

Planting Spaces: https://pg-cloud.com/EarthAdvisors/?scenario=NMiamiAvePlantingSpaces

Trees & Planting Spaces: https://pg-cloud.com/EarthAdvisors/?scenario=NMiamiAveTrees-PlantingSpaces

Based on the summaries for the trees and planting spaces on North Miami Avenue, future tree planting decisions can be made. The half mile road segment consists of only five species, one of which is a palm and four comprise the district's most prevalent species. While 40% of the trees are less than six inches in diameter, only three trees currently exist in the Multi Family land use along this roadway. Use the ecosystem benefits to support the outreach for stewardship and funding.

This Urban Forest Management Report was developed to provide information to the Omni CRA to maintain a healthy and sustainable urban forest that is properly managed and cared for, benefiting the district and its citizens with improved economic and environmental well-being, increasing public safety, cost effective maintenance, and informed tree planting decisions.

Image Source: World Red Eye,
Omni Park supported by Omni CRA