

MIAMI BEACH URBAN FORESTRY MASTER PLAN

City Commission
September 16, 2020



Calvin, Giordano & Associates, Inc.
EXCEPTIONAL SOLUTIONS™

MIAMI BEACH
RISING
ABOVE



PROJECT TEAM

URBAN FORESTRY
MASTER PLAN

MIAMIBEACH

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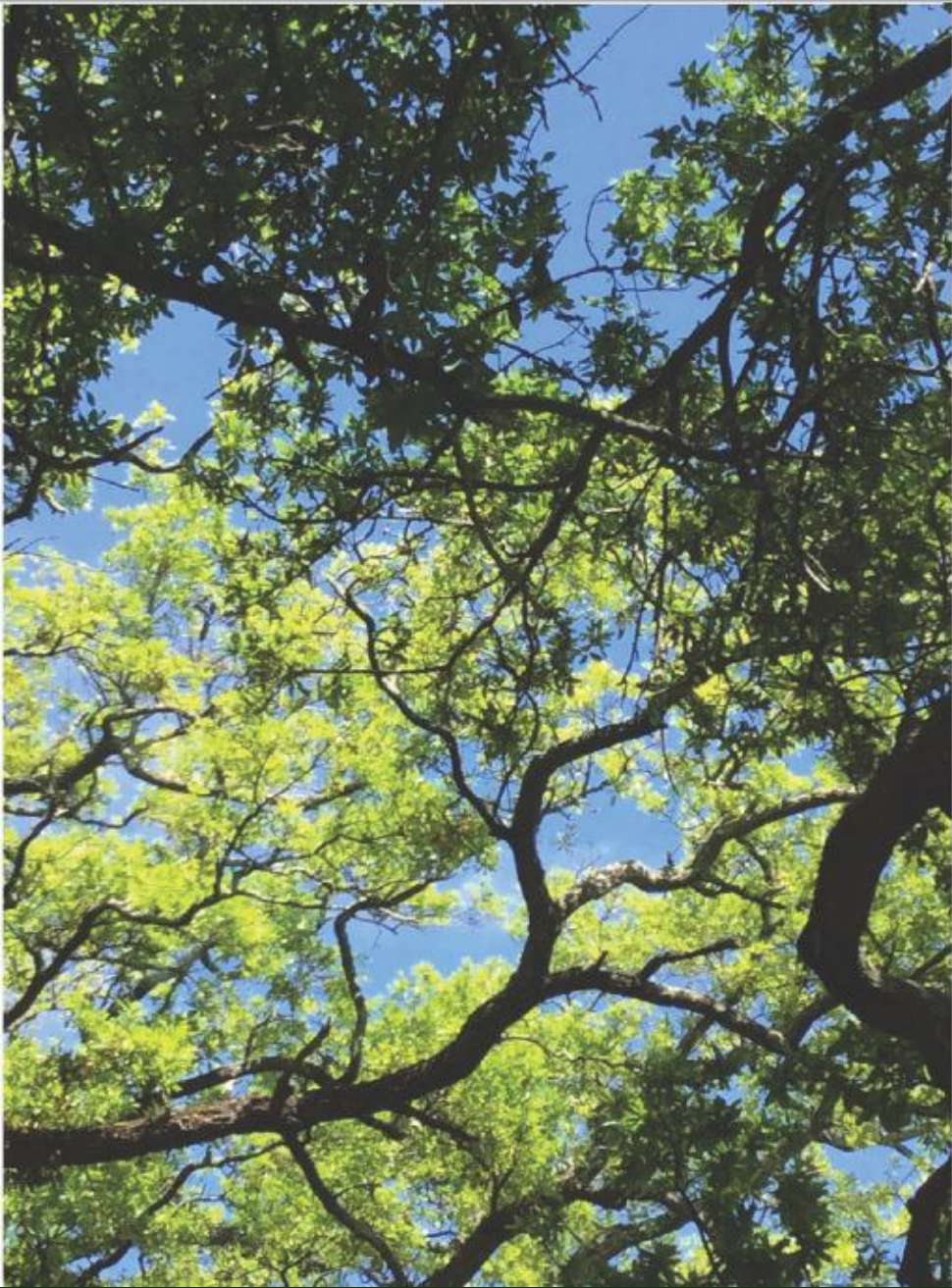
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OBJECTIVES & SCOPE

- Analyze the **existing conditions** of Miami Beach's urban forest
- Review **operational processes** within the city to understand how they affect the management of the urban forest
- Establish **goals and targets** for Miami Beach's urban forest
- Develop **recommendations & actions** for implementation
 - Day-to-day: Operations and contracting
 - Design: Implementation 'Toolkit'

URBAN FOREST MASTER PLAN

BENEFITS?

- Reduce and filter **stormwater**
- Improve air quality & sequester carbon
- Wildlife habitat
- Moderate local **climate**
- Increase **property values** & reduce energy costs
- Community character and aesthetics
- Improve **human health**

Without a Plan and with limited public resources, Miami Beach could **lose** more trees than it is replacing; **preservation is important!**





STATE OF THE URBAN FOREST

MIAMI BEACH

STATE OF THE URBAN FOREST

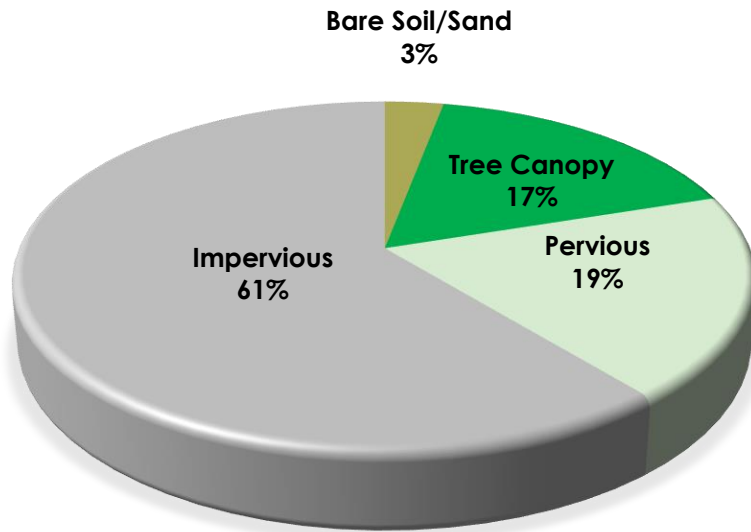
LAND COVER AND TREE CANOPY

MIAMI BEACH LAND COVER:

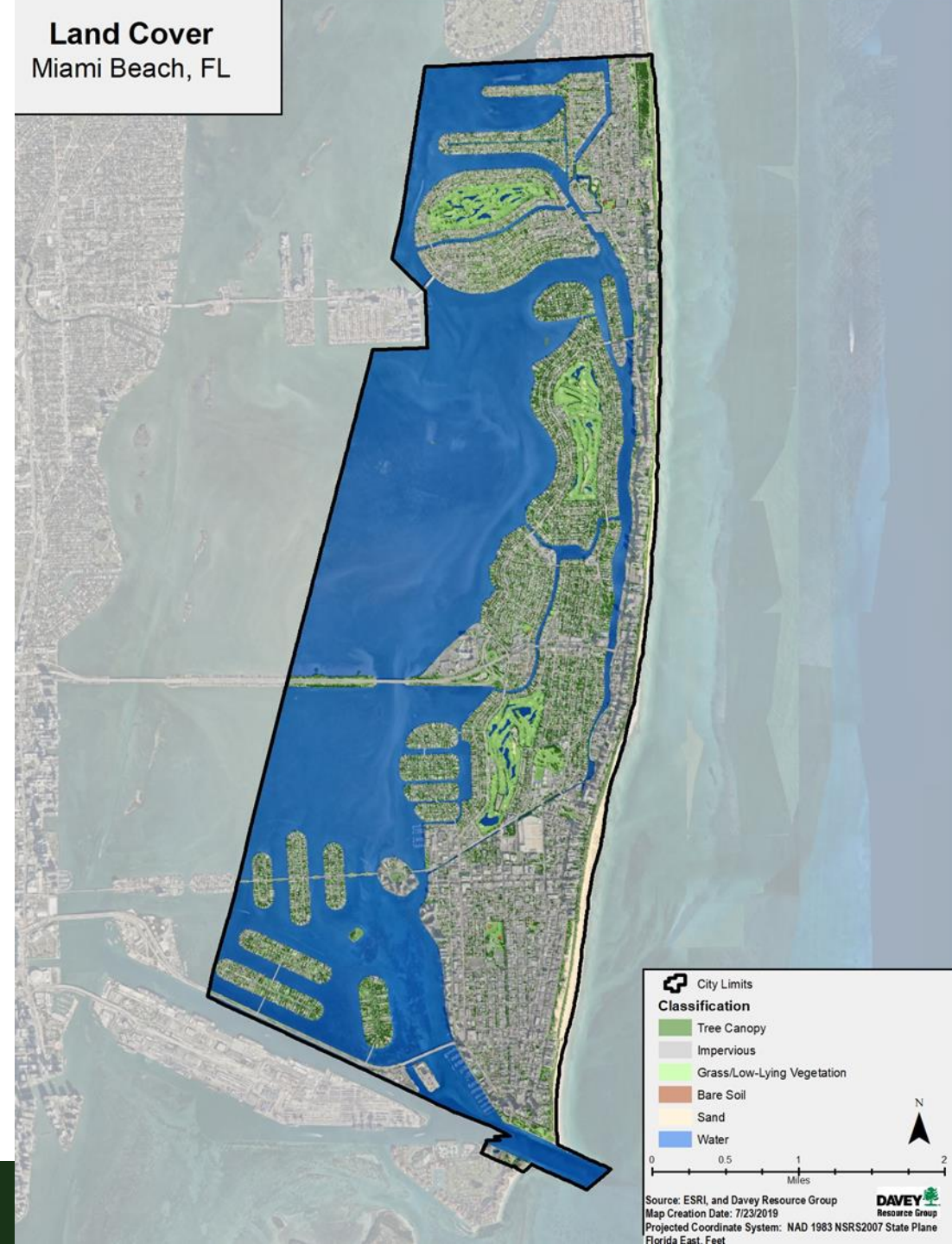
Impervious Surfaces: 61%

Tree Canopy Cover: 17%

- 78% of tree canopy cover on private residential property



Land Cover
Miami Beach, FL



STATE OF THE URBAN FOREST

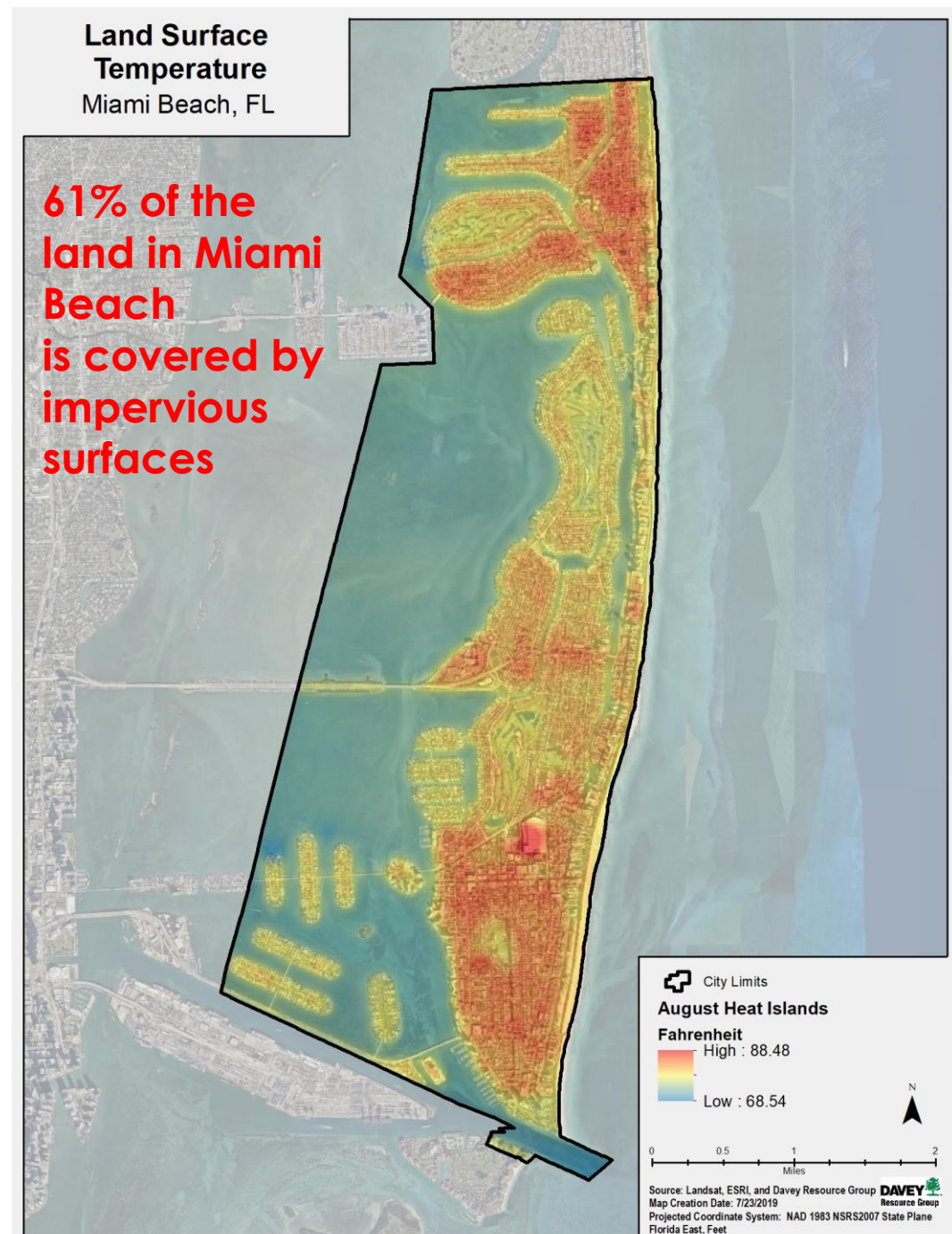
LAND COVER AND URBAN TREE CANOPY

CHALLENGE: URBAN HEAT ISLAND

Occurs when roads, buildings, and sidewalks (impervious surfaces) trap and retain heat causing the air temperature to be hotter than nearby areas that are less built up. Leading to:

- Health Impacts (heat-related illnesses)
- Increased energy consumption
- Elevated air pollution and greenhouse gases

Trees reduce the urban heat island effect by shading impervious surfaces & reducing the amount of heat absorbed.



STATE OF THE URBAN FOREST

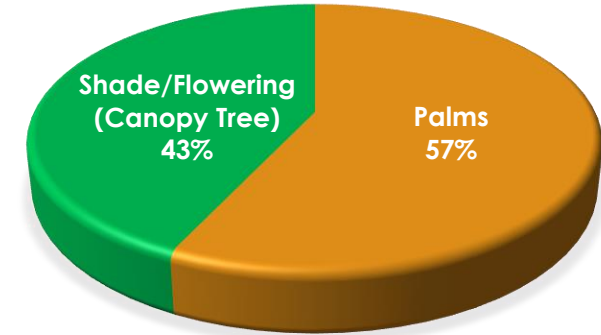
PUBLIC TREE AND PALM POPULATION

CHALLENGE: SPECIES DIVERSITY

Palms have shifted from an accent plant to a major component of Miami Beach's urban forest

48,600 Palms and Trees growing along Miami Beach streets and parks

- **Palms: 57% of population**
 - 90 different species
- **Shade/Flowering Trees: 43% of population**
 - 212 different species



Benefits*	Shade Tree Live Oak (<i>Quercus virginiana</i>)	Palm Cabbage/Sabal Palm (<i>Sabal palmetto</i>)
Carbon Dioxide (CO2) Sequestered (Absorbed)	510 pounds/year	2.71 pounds/year
Rainfall Intercepted	725 gallons/year	81 gallons/year
Ozone removed from the air	20 ounces/year	< 2 ounces/year
Energy Savings (A/C)	60 kWh	26 kWh
Carbon dioxide stored lifetime to date	3,214 pounds over lifetime	26 pounds over lifetime
Annual Value of Benefits	\$31.00	\$6.48

*Based on an analysis of a 16" diameter *Quercus virginiana* and *Sabal palmetto* utilizing the USDA Forest Service's i-Tree MyTree benefits tool – www.itreetools.org.

Palms **substantially underperform** in all environmental benefits when compared to trees

STATE OF THE URBAN FOREST

UNIQUE CHALLENGES THE URBAN FOREST MASTER PLAN ADDRESSES

- **Species diversity**
 - Encouraging shade trees and shifting palms back to an accent plant
- **Tree species selection**
 - Selecting species resilient to sea level rise, flooding & increasing salinity, limited growing space, and increasing temperatures
- **Street tree maintenance and preservation**
 - Maximize the benefits Miami Beach's trees provide
- **Limited space for trees in the public right-of-way (ROW)**



57% of the public tree population is made up of palms

Tree Canopy

Current Tree Canopy Cover: 17%

Possible Tree Canopy Cover: 26%
(if **all possible** planting areas were planted)

Possible Planting Area = an area with grass or bare soil where a tree could potentially be planted.

26% canopy cover is **not** a realistic target

~50% of possible planting areas are suitable for tree planting.

Areas may be unsuitable for trees due to a variety of factors, including:

- Lack of Space
- Utilities: underground or overhead
- Inappropriate location
- Poor soil or drainage
- No access to water

22% canopy cover target is a **5% increase from today** and takes into consideration that only about 50% of sites will be suitable for tree planting.

To achieve 22% canopy cover by 2040 will require planting ~1,300 trees per year (or 25,900 total trees) on private and public property.



DESIGN TOOLKIT

MIAMI BEACH

IMPLEMENTATION

SHAPING THE VEGETATION PALETTE IN MIAMI BEACH

- **Species Diversity**
 - Palms – moving back to an accent plant

- **Tree Species Selection**

- Re-prioritize species to those that are more resilient to sea level rise, flooding & increasing salinity, limited growing space, and increasing temperatures

- **Highlights the characteristics of various species**

- Can also be used by homeowners to make better species selection when planting trees on their private properties.



Chrysophyllum cainito
Star Apple
Tropical fruit tree, slow-growing evergreen tree.
Height Range: 25' - 80'
Spread: 30'
Tree Type: Fruit Tree
Growth Rate: Moderate
Growth Habit: Round to oval canopy
Drought tolerance: Moderate
Fertilization Requirements: Three times per year
Blooming Season: Summer / Fall



Coccoloba pubescens
Green Seagrape
Can be used as an ornamental tree. Excellent for seaside locations.
Height Range: 15'
Spread: 10' - 20'
Tree Type: Fruit Tree
Growth Rate: Slow
Growth Habit: Vase-like
Drought tolerance: High
Fertilization Requirements: Moist, well-drained fertile soils
Blooming Season: Spring / Summer / Fall



Coccoloba uvifera
Sea Grape
Salt tolerant. Good seaside plant. Broad spreading.
Height Range: 25' - 35'
Spread: 20' - 30'
Tree Type: Native
Growth Rate: Moderate
Growth Habit: Vase-like
Drought tolerance: High
Fertilization Requirements: Low



Conocarpus erectus
Green Buttonwood
Evergreen tree that prefers full sun. Salt and wind tolerant. Good for residences, parks and common areas.
Height Range: 35' - 45'
Spread: 20' - 30'
Tree Type: Native
Growth Rate: Moderate
Growth Habit: Vase-like, Spreading
Drought tolerance: High
Fertilization Requirements: Low
Blooming Season: Spring / Fall



Delonix regia
Royal Poinciana
Fast growing tree. Produces showy reddish, orange flowers in summer. Long seed pods can be a nuisance. Subject to wind damage. Needs space to develop root system to reduce likelihood of toppling.
Height Range: 35' - 45'
Spread: 40' - 60'
Tree Type: Flowering
Growth Rate: Fast
Growth Habit: Vase-like, Spreading
Blooming Season: Summer



Diospyros digyna
Black Sapote
Tree with novel edible fruits.
Height Range: 60' - 80'
Spread: 30'
Tree Type: Fruit Tree
Growth Rate: Slow
Growth Habit: Elliptic-Oblong
Drought tolerance: Moderate
Fertilization Requirements: Low
Blooming Season: Fall / Winter



Diospyros virginiana
Common Persimmon
Irregularly-shaped native tree, for possible naturalizing in yards or parks.
Height Range: 40' - 60'
Spread: 30' - 35'
Tree Type: Native
Growth Rate: Moderate
Growth Habit: Oval, Pyramidal
Drought tolerance: Low
Fertilization Requirements: Low
Blooming Season: Spring / Summer



Elaeocarpus decipiens
Japanese Blueberry
Evergreen tree that prefers full to partial sun.
Height Range: 30' - 40'
Spread: 30' - 40'
Tree Type: Shade
Growth Rate: Slow
Growth Habit: Pyramidal
Drought tolerance: Low
Fertilization Requirements: Low
Blooming Season: Spring



Erythrina crista-galli
Cockspur Coral Tree
Widely planted as a street or garden tree. The flowers produce a high fragrance.
Height Range: 15' - 25'
Spread: 15' - 25'
Tree Type: Flowering
Growth Rate: Fast
Growth Habit: Umbrella-Shaped
Drought tolerance: High
Blooming Season: Summer



Exothea paniculata
Inkwood Tree
Tree with dense foliage maintained close to the ground.
Height Range: 35' - 35'
Spread: 35'
Tree Type: Native
Growth Rate: Slow
Growth Habit: Oblong to lanceolate
Drought tolerance: Moderate
Fertilization Requirements: 6 months
Blooming Season: Winter / Summer / Spring



Ficus aurea
Strangler Fig
The native strangler fig is vine-like while young, later straggling its bare with heavy roots and eventually becoming a self-supporting tree.
Height Range: 50' - 60'
Spread: 50' - 70'
Tree Type: Native
Growth Rate: Fast
Growth Habit: Irregular
Drought tolerance: High
Blooming Season: Spring / Summer



Ficus citrifolia
Short-Leaf Fig
Naturally found in tropical hammocks throughout south Florida and requires full sun for optimal growth.
Height Range: 30' - 40' (70')
Spread: 50'
Tree Type: Native
Growth Rate: Moderate to fast
Growth Habit: Oval, Rounded with Sowers inside
Drought tolerance: High
Blooming Season: Winter / Spring / Fall



Thrinax parviflora
Broom Thatch Palm
Surface of each leaf is covered with a waxy down, providing a silvery appearance.
Size: 8' - 20' HT
Spread: 10' - 12'
Growth Rate: Slow
Type: Evergreen
Drought Tolerance: Moderate
Light Requirements: Full sun to partial shade
Maintenance Need: Low
Fruit: Fan Leaf



Dypsis decaryi
Triangle Palm
Three-planned arrangement of leaves give great use for accent planting.
Size: 25' - 35' HT
Spread: 15'
Growth Rate: Slow
Type: Specimen
Type: Evergreen
Drought Tolerance: Moderate
Light Requirements: Full sun to partial shade
Maintenance Need: Low
Fruits: Grow in three rows forming triangle



Phoenix canariensis
Canary Island Date Palm
Single Trunk; spiny petiole.
Size: 30' - 40' HT
Spread: 20' - 25'
Growth Rate: Slow
Type: Specimen
Drought Tolerance: High
Light Requirements: Full sun to partial shade
Maintenance Need: Moderate
Fruits: Feather Leaf



Phoenix dactylifera 'Medjool'
Medjool Date Palm
Single Trunk; spiny petiole.
Size: 20' - 40' HT
Spread: 10' - 15'
Growth Rate: Slow
Type: Specimen
Drought Tolerance: High
Light Requirements: Full sun to partial shade
Maintenance Need: Moderate
Fruits: Feather Leaf



Phoenix sylvestris
Sylvester Date Palm
Single Trunk; spiny petiole.
Size: 30' - 40' HT
Spread: 20' - 25'
Growth Rate: Slow
Type: Specimen
Drought Tolerance: High
Light Requirements: Full sun to partial shade
Maintenance Need: Moderate
Fruits: Feather Leaf



Phoenix reclinata
Wild Date Palm
Clumping multi-trunk, weedy and has spiny petiole.
Size: 25' - 50' HT
Spread: 10' - 15'
Growth Rate: Moderate
Type: Specimen
Drought Tolerance: High
Light Requirements: High
Maintenance Need: Moderate
Fruits: Feather Leaf

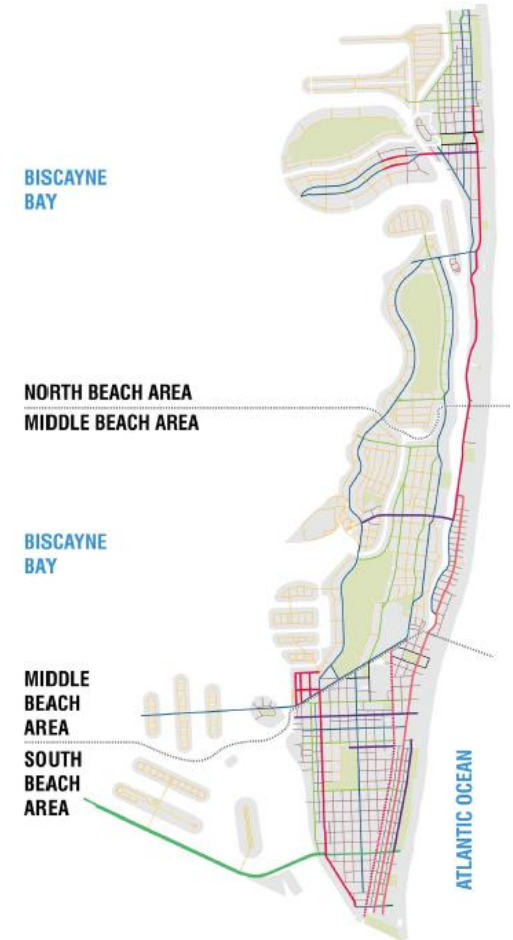
IMPLEMENTATION

PLANNING AND PRIORITIZING STREETS BY CHARACTER & USE

- **Planning for a city-wide approach**
 - Establishing a classification strategy for all streets within the City.
- **Street-by-Character**
 - Understanding that streets are not only about traffic movement, but also about experience; working in concert with abutting land uses.
- **Street tree species prioritization plan**
 - Identifying key species for specific street-types to build uniformity and wayfinding



- LEGEND
- HIGHLY VISIBLE & HIGH-PROFILE CORRIDORS
 - COMMERCIAL CORRIDORS
 - HOSPITALITY CORRIDORS
 - GATEWAYS
 - CULTURAL CORRIDORS
 - CITY-CONNECTOR CORRIDORS
 - NEIGHBORHOOD-CONNECTOR CORRIDORS
 - URBAN RESIDENTIAL CORRIDORS
 - SUB-URBAN RESIDENTIAL CORRIDORS
 - PEDESTRIAN CONNECTOR ROUTES
 - ALLEYS
 - PARK PARCELS
 - PARCELS



IMPLEMENTATION

CASE-STUDIES ON UNIQUE CONDITIONS IN MIAMI BEACH

- **Pine Tree Drive**
 - How can we adapt to natural aging of canopy and changes in the climate without losing our history?
- **La Gorce Island**
 - How can we adapt neighborhoods in low-lying areas to meet the challenges of increased salinity in groundwater and still maintain an identity?
- **Meridian Avenue**
 - How can we keep the environmental benefits of large, established canopies when approaching the rising of streets?



IMPLEMENTATION

BRIDGING EFFORTS ACROSS URBAN FORESTRY, PUBLIC WORKS, CIP & PLANNING

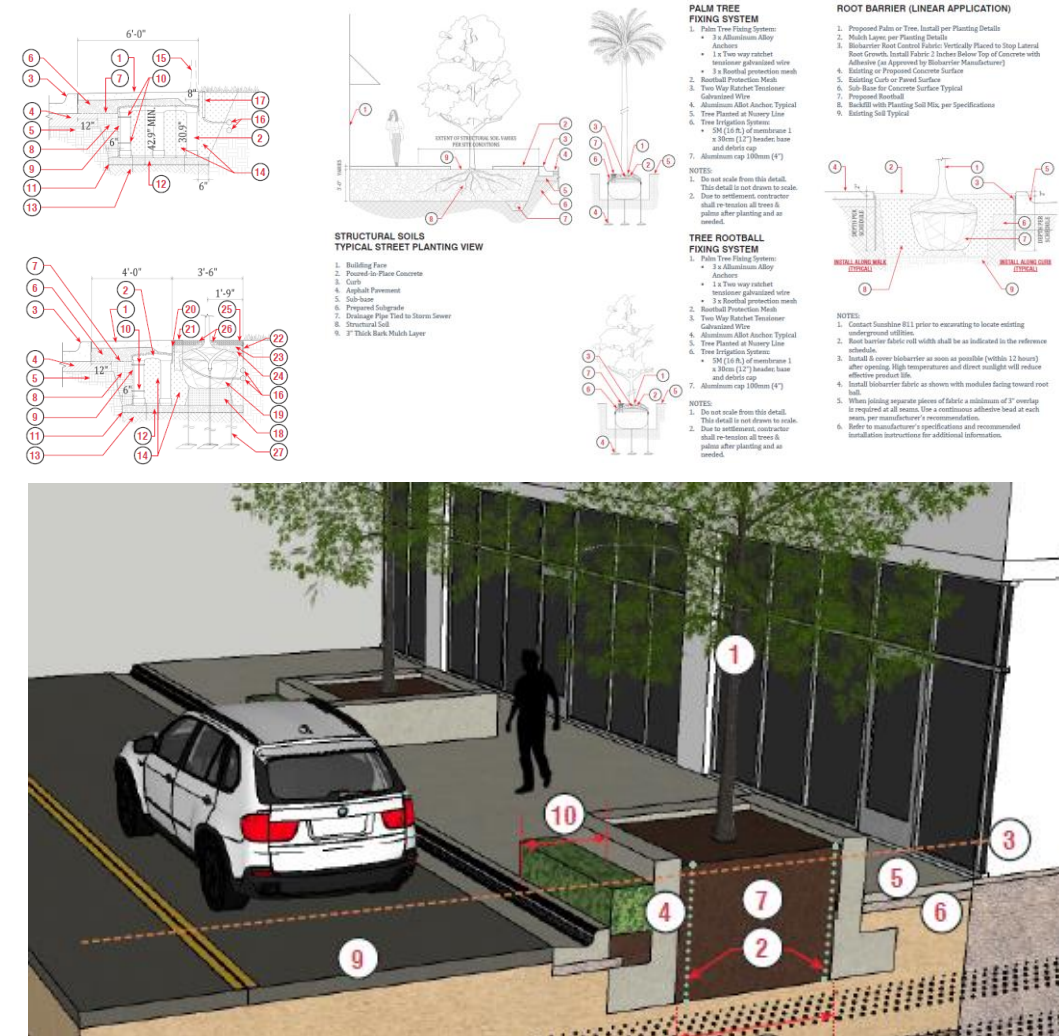
- **Establishing Tactics for Street Tree Planting**
 - Key to maintain and promote trees in Miami Beach's urban condition is to **use appropriate green infrastructure**.
 - Increases short-term implementation costs but provides a better return on investment (ROI) over the long-term.
 - **Establishes goals** in order to budget appropriately for future projects
 - **Supports design coordination across city departments** for review and implementation
 - Minimizes conflicts during plan review and construction processes



IMPLEMENTATION

BRIDGING EFFORTS ACROSS URBAN FORESTRY, PUBLIC WORKS, CIP & PLANNING

- **Standardizes components of implementation**
 - Provides standard construction details to be incorporated into the City's PW manual and standard details
- **Establishes minimum metrics for soil volumes**
 - Helps ensure new trees thrive and reach their ideal mature size.
- **Provides strategies for a phased approach to street tree planting in light of sea level rise**
 - How to plan for trees today so that they are not negatively impacted by planned adaptation improvement projects in the future?



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Thank you for your time



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