Street Tree Management Plan

Prepared for:
The City of North Miami, Florida
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North Miami Florida 33161

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Executive Summary

The North Miami street tree inventory was conducted by Davey Resources Group (DRG) in three parts (2008, 2010, and 2012). DRG inventoried trees and stumps along the street right of ways (ROW) and in parks. Legacy Arborist Services (LAS) has been hired to review and analyze the inventoried tree population, as well as inventory planting sites and conduct a past (2005) and present (2015) canopy analysis.

The inventory includes 15,449 publicly managed trees along the streets of North Miami and trees located around public facilities. The inventory also includes 519 trees in publicly-owned parks. Therefore, the inventory is comprised of 15,968 trees. The predominant street tree species are black olive (30.7%), live oak (16.2%), cabbage palm (4.3%), and coconut palm (4.2%).

The distribution of ages within the tree population suggests that the majority (approximately 80%) are less than or equal to 16" diameter at breast height (DBH). Tree condition describes how well trees are managing under given site specific conditions. Over 85% of the trees are in good to fair condition.

Stocking describes how the density of trees relates to a preconceived notion of what should be there. Out of the 17,439 total sites present for street trees (includes planting sites), 89% of sites already have trees and 11% need to be planted.

Additional observations like hardscape damage or clearance issues were recorded. These items need to be addressed to increase public safety.

A considerable amount of future maintenance, both routine and high priority is needed. Attention to the high priority pruning and removal is recommended. Routine maintenance needs to be suspended until these critical maintenance tasks have been completed. If the recommended work cannot be completed as suggested in the Plan, then the current maintenance schedules and budgets need to be modified.

Table 1 - Estimated Cost of High Priority Pruning and Removals

Pruning	# Trees	Average-Per-Tree Cost	Approximate Total Cost
Priority 1 Prune	311	$1,000	$311,000
Priority 2 Prune	1353	$1,000	$1,353,000
Pruning Subtotal			**$1,664,000**
Removals			
Priority 1 Removal	141	$2,500	$352,500
Priority 2 Removal	251	$2,500	$627,500
Priority 3 Removal	429	$2,500	$1,072,500
Removals Subtotal			**$2,052,500**
Grand Total			**$3,716,500**

A total of 1,984 planting sites and stumps were identified. Approximately, 52% of the sites are for large trees and 45% are for small trees. In addition, tree replacements should be considered on every tree removal site. There are 821 potential tree replacements needed. Thus in total, North Miami has 2,805 potential planting sites for future trees.

LAS recommends limiting the future planting of black olive and live oaks because they already comprise a large portion of the tree population. Planting other large trees will assist efforts to increase the diversity of the urban canopy.

A tree planting schedule is recommended over a five or ten year planting cycle, depending on budgetary constraints. In a five year planting schedule, approximately 520 trees need to be planted each year to plant all of the identified planting sites and replace the trees that are being removed. In a ten year planting schedule, approximately 260 trees would need to be planted annually.

Prioritizing the planting locations depends on the City's priorities. For example, if the City wants to maximize shading and reduce heat island effects for residents, then prioritizing residential streets that have low canopy coverage would be recommended. If the City wants to increase aesthetic benefits from trees, then planting trees in commercial (highly visible) areas would increase beautification efforts. Future planting will result in higher canopy coverage.

The overall tree canopy cover (based on land cover percentages) is 39%, covering approximately 3.44 mi^2 or 2202 acres. One-third of the canopy cover is comprised of trees within the Oleta River State Park. The tree canopy cover in the urban areas (managed by the City and North Miami residents) is 26% or 2.25 mi^2, this excludes the trees within Oleta River State Park (managed by the State).

Over the last ten years, North Miami's urban tree canopy coverage has increased by 2%. Tree canopy coverage in Oleta River State Park has increased by 1%. The grass cover has gone down by almost 3%. Impervious surfaces (building, road, and other) decreased by 0.7%, and soil/bare ground increased by 0.2%.

With this canopy assessment the City can move forward with setting goals for the future urban tree canopy. Effective urban tree canopy goal setting requires involvement and commitment by municipal leaders and staff, local business community, neighborhood groups and citizens.

Section One – Introduction

North Miami is a dynamic city located in northern Miami-Dade County, approximately eight miles north of Downtown Miami. City officials and residents have long understood the importance of trees, as the City has been designated as a "Tree City U.S.A." since 1990. The City's Public Works Department actively manages 15,968 trees located along the city streets and publicly-owned parks, wooded buffers and drainage areas. The mission of the City is to preserve the existing natural environment and provide arboricultural improvements on public properties and rights-of-way in order to encourage amenities and screening that promotes a positive urban image, enhancement of property values, strengthening of the historic fabric, promotion of orderly growth, and overall enhanced aesthetic quality in the city.

North Miami has the following tree-related goals:

- Promote "right tree, right place"
- Educate North Miami residents on tree related issues
- Preserve natural and cultural resources
- Develop effective and responsive management
- Create partnerships with Miami-Dade County
- Develop sustainable guidelines for green infrastructure on par with gray infrastructure
- Plant quality trees in public right-of-ways and parks
- Educate policy makers and the public on the importance of adequate tree canopy
- Promote the design of urban spaces so that trees have adequate space
- Promote tree canopy in deficient areas to create a more walkable, livable community

Figure 1 - Example of a residential street well stocked with trees in North Miami. NE 129th Street and NE 2nd Avenue.

Research has shown that trees can be an instrumental part of mitigating urban environmental problems, such as: poor air quality, increased temperature from urban heat islands, and stormwater runoff. Properly maintained public trees also increase real estate values and provide neighborhood residents with improved psychological and social health. Scientific studies show that the residential neighborhoods with green surroundings tend to have less incidences of crime and the fear of crime is reduced (Kuo and Sullivan 2001).

Street trees and park trees benefit the community by increasing the community attractiveness for tourism and business. Consumer surveys have indicated that consumers prefer streetscapes with trees and consumers tend to shop longer and more often in business districts that are well-landscaped (Wolf 1999).

A street and park tree inventory is essential for actively managing the publicly owned trees. It allows the City to know how many trees are present, where they are located and their condition, size, and species. The information in this report will do the following:

- Provide a summary of the street and park tree inventory.
- Provide maintenance recommendations, general annual urban forestry work plan, and estimated budget needed to perform overall maintenance needs.
- Provide a summary of future planting sites and suggest a tree planting schedule.
- Provide a description of the current tree canopy coverage as well as illustrate the change in coverage in the past 10 years.
- Provide recommendations for creating a sustainable tree population.
- Provide list of recommended and approved street trees.
- Provide maps of the planting sites and high priority maintenance trees.

The report consists of the following sections:

Section One – Introduction

Section Two – Street and Park Trees

Section Three – Maintenance Recommendations

Section Four – Planting Program

Section Five – Tree Canopy Cover: Past & Present

Section Six – Future Recommendations

Section Two – Street & Park Trees

Methodology

The North Miami street tree inventory was conducted by Davey Resources Group (DRG) in three parts (2008, 2010, and 2012). DRG inventoried trees and stumps along the street right of ways (ROW) and in parks.

For each tree site the following data fields were collected:

- ***Address***
- ***Block Side***
- ***GPS Coordinate***
- ***Site #***
- ***Species***
- ***Tree Size (DBH)***
- ***Condition***
- ***# of Stems***
- ***Maintenance Recommendations***
- ***Observations***
- ***Clearance Issues***
- ***Hardscape Damage***
- ***Above Ground Utility Conflicts***
- ***Palm Heights***
- ***Grow Space Type***
- ***Grow Space Size***
- ***Notes***

Each tree was assigned a unique tree identification number. Tree diameters were measured at 4.5 feet above ground (commonly referred to as diameter at breast height or DBH). Maintenance recommendations are based on *ANSI A300 (Part 1)* (ANSI 2008).

The tree inventory resides in a tree inventory software program called *TreeKeeper 7.7*. It can be accessed online on the City's *TreeKeeper* login site and requires login username and password credentials. *TreeKeeper mobile* is also utilized by the City to access and update the tree inventory data in the field with mobile devices (i.e., smartphones and data enabled tablets).

Legacy Arborist Services has been hired to review and analyze the inventoried tree population.

Results

The inventoried tree population was analyzed based on the following criteria to establish base line data, review trends and assist with short and long term planning: tree numbers, species composition

and diversity, tree condition, age structure, stocking level for ROW trees, observations, and tree conflicts.

Tree Numbers

The inventory includes 15,449 publicly managed trees along the streets of North Miami and trees located around public facilities. The inventory also includes 519 trees in publicly-owned parks. Therefore, the inventory is comprised of 15,968 trees. Section Four contains additional inventory information such as planting sites and stumps.

Species Composition and Diversity

North Miami has approximately 162 different species. This is higher than the average of 53 species reported by McPherson and Rowntree (1989) in their nationwide survey of 22 cities street tree populations.

The predominant street tree species are black olive (30.7%), live oak (16.2%), cabbage palm (4.3%), and coconut palm (4.2%) (see Figure 2). Together these four species represent 55% of the street trees in North Miami. Black olives and live oaks exceed the general rule that no single species should represent more than 10% of the population. Additionally, Clark et al. 1997 recommend no genus comprise more than 20% and no single family represent more than 30%. This is commonly referred to as the 10-20-30 rule. These guidelines are recommended because of the impact that drought, disease, pests, or other stressors can have on the urban forest. An urban forest dominated by a few species is at a higher risk of damage if a nonnative fungi and insect targets one of the few species present.

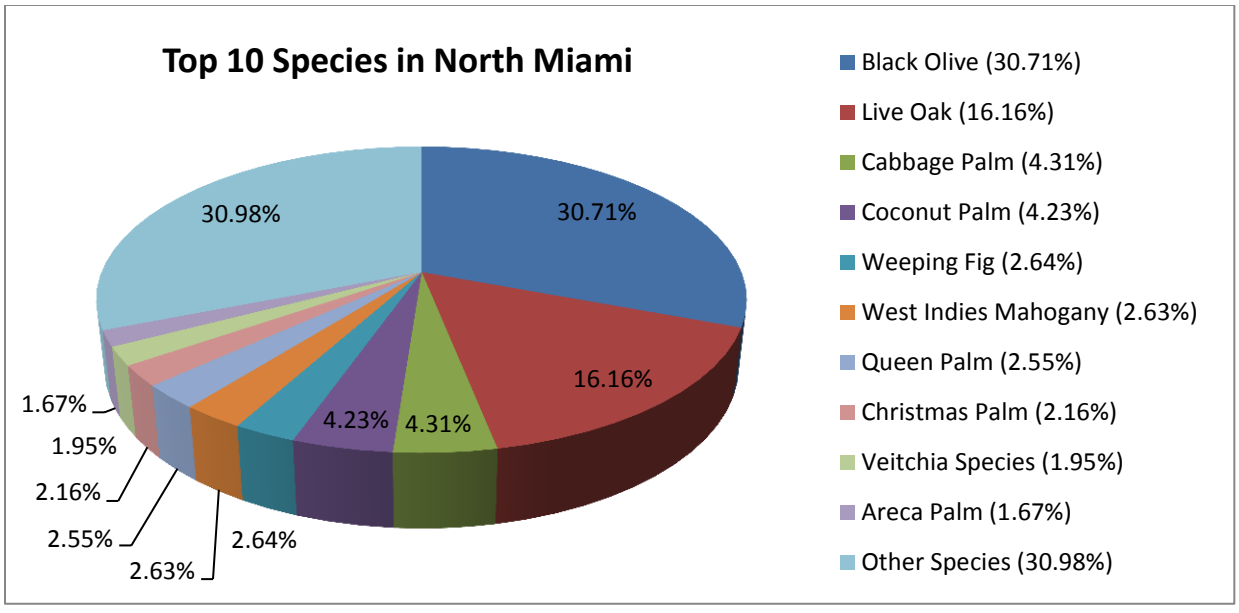


Figure 2 - North Miami species composition.

Other observations made are the high percentage of palms and hurricane-resistant trees. The dataset shows that palm trees comprise approximately 29 percent of the population. Small trees and palms have less leaf surface area, provide very little shade, and provide fewer environmental benefits than large trees. Fortunately, live oak and cabbage palm (approximately 20% of the street trees) are among the most hurricane-resistant of all trees, withstanding winds of up to 130 mph (Duryea and Kampf 2007).

Age Structure

The distribution of ages within the tree population suggests that the majority (approximately 80%) are less than or equal to 16" DBH. Figure 3 is a detailed illustration of the DBH classes and the percentage of trees that possess that diameter.

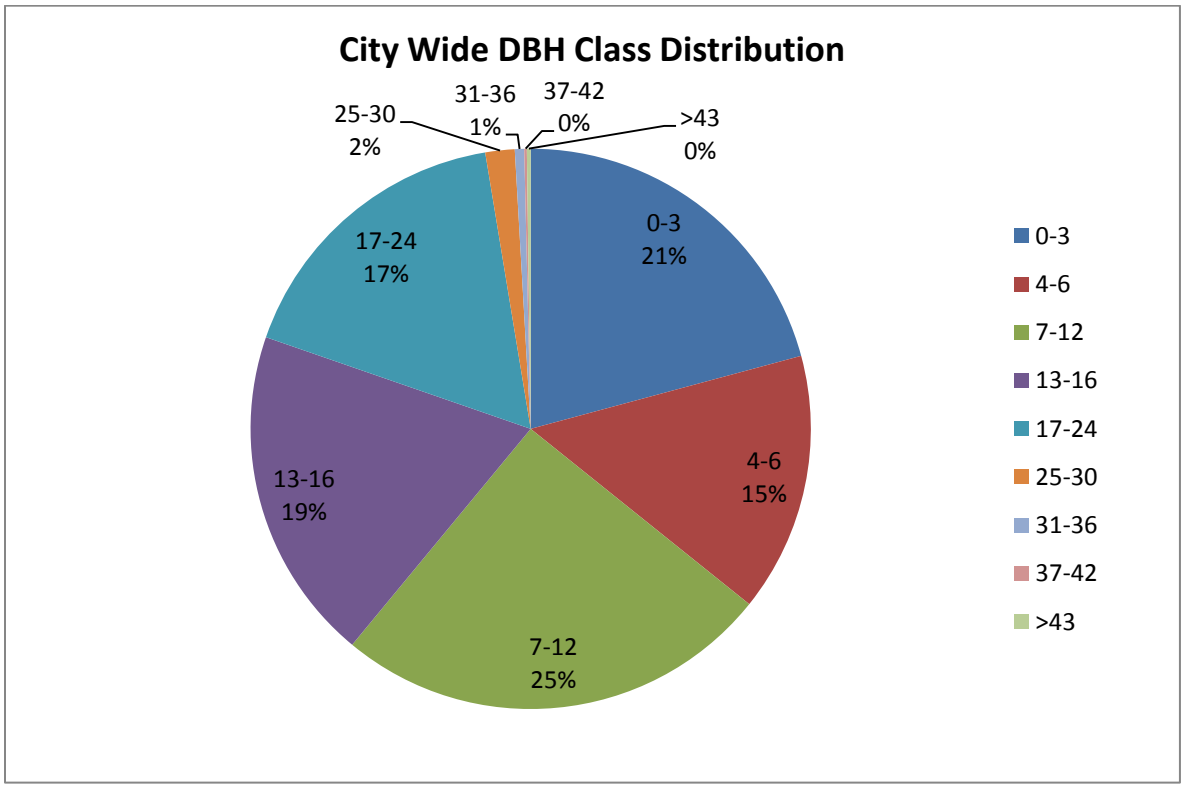


Figure 3 - North Miami DBH distribution. Please note that trees greater than 18" are specimen trees.

Age structure is an important component to review as it provides understanding as to the relative age of the population and insight into the maintenance practices and needs.

An ideal tree population would have an abundance of newly planted young trees (< 8"), with established (9-17"), maturing, (18-24") and mature trees (>24") present in lower numbers. Note: trees over 18" are also considered specimen trees. N.A. Richards in 1983 proposed an ideal diameter distribution for street trees be the largest portion of trees (40% of total) should be with diameter less than 8 inches, while large diameters (greater than 24 inches) should only comprise

10% of the population, see red line for an illustration. Figure 4 displays the current distribution of ages for the City's tree population. The 0-8" and 9-17" are higher than recommended and the percent of 18-24" and >24" is less than recommended. In future years more trees will be in the higher DBH classes as the younger age class trees mature. So the overage in younger age classes should make up for the deficient in larger (older) trees over time.

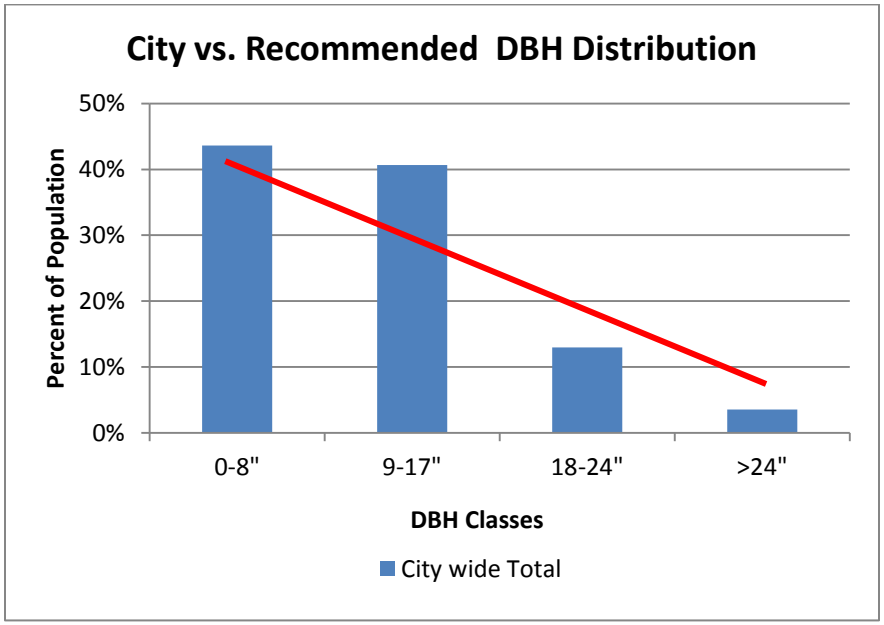


Figure 4 - Illustrates the DBH distribution in relation to Richard's recommended distribution (red line).

A close look at Figure 5 reveals a weak distribution of black olive (3%) and West Indies mahogany (13%) in the younger age classes (≤ 8 inches). Meanwhile, live oak and weeping fig have 43% and 86% of its population with a diameter ≤ 8 inches.

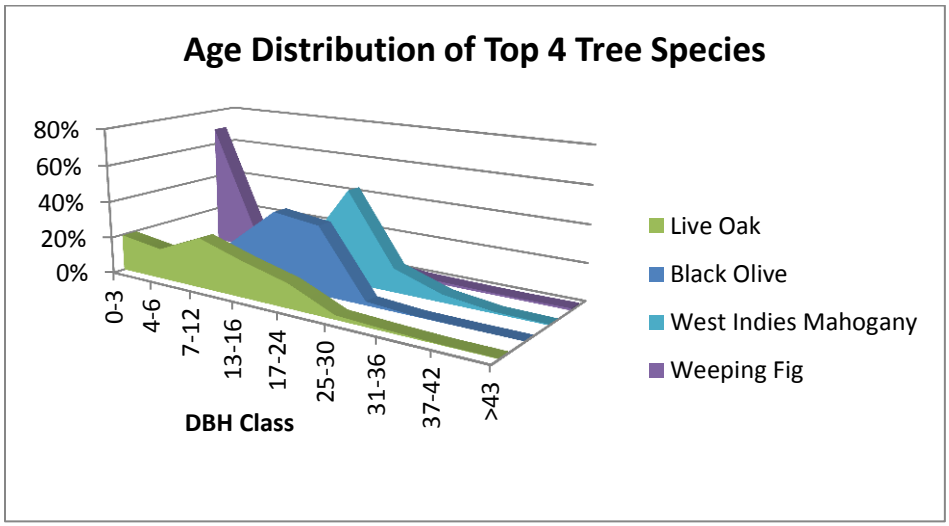


Figure 5 - Relative age distribution of North Miami's 4 most abundant street tree species (excluding palms).

Tree Condition

Tree condition describes how well trees are managing under given site specific conditions. The condition of the individual trees is assessed based on methods defined by the International Society of Arboriculture (ISA). Several factors were considered for each tree, including root characteristics; branch structure; trunk, canopy, and foliage condition; and the presence of pests. The condition of each inventoried tree was rated Excellent, Very Good, Good, Fair, Poor, Critical, or Dead. Over 85% of the trees are in good to fair condition (see Figure 6).

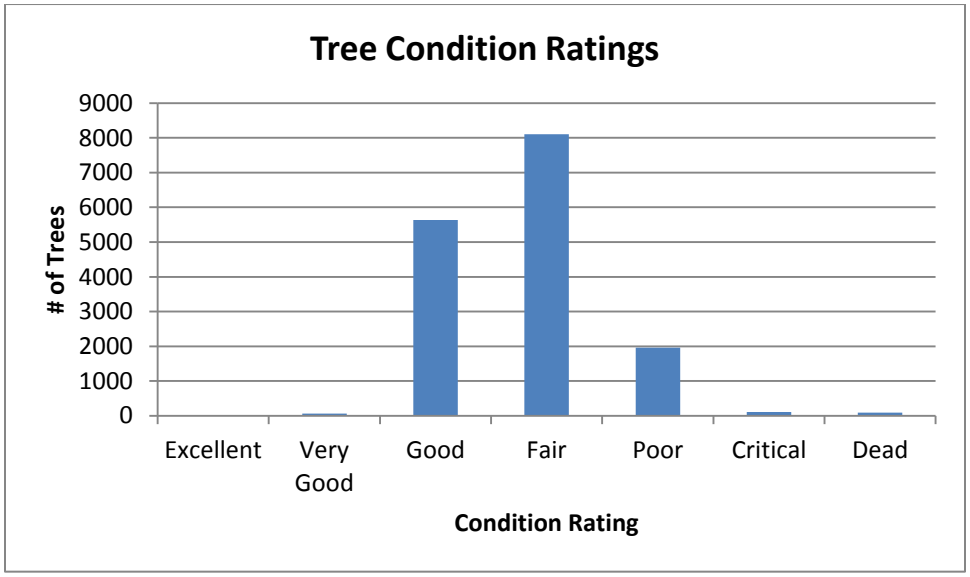


Figure 6 - Overview of North Miami's street and park tree conditions.

Street Tree Stocking

Stocking describes how the density of trees relates to a preconceived notion of what should be there. Typically, it is expressed as a ratio of planted trees to potential planting spaces. Please note that this is a measure of the street trees (located in the ROW) to contain trees, so park trees and public property trees are excluded from this measurement.

Currently, there are 15,449 street trees and 1,771 potential planting spaces/stump sites for a total of 17,220 total sites. Of the inventoried planting/stump sites, 1,029 were for large trees; 672 were for small trees; and 70 were old stump sites. The current stocking level is almost 90%.

In summary, out of the 17,220 total sites present for trees, 90% of sites already have trees and 10% need to be planted.

Other Observations

DRG recorded observations on tree health, structure, or location during the tree inventory when additional detail was warranted. Table 2 provides a summary of the observations made and how many times they were observed.

Table 2 - Observations made during the street and park tree inventory.

Observations	# Trees	Percentage (%)
Cavity or Decay	764	4.31
Grate or Guard	1	0.01
Improperly Installed	117	0.66
Improperly Mulched	6	0.03
Improperly Pruned	364	2.05
Mechanical Damage	1081	6.09
Memorial Tree	1	0.01
None	11381	64.16
Nutrient Deficiency	82	0.46
Other or Unassigned	74	0.42
Pest Problem	94	0.53
Poor Location	266	1.5
Poor Root System	608	3.43
Poor Structure	1258	7.09
Remove Hardware	428	2.41
Serious Decline	145	0.82
Signs of Stress	1069	6.03

Approximately, 1,258 trees were observed with poor structure. Mechanical damage was observed in 1,081 trees as well as signs of stress that were observed in 1,069 trees. Cavity or decay (764 trees) and poor root systems (608 trees) were observed as well.

Tree Conflicts

Hardscape damage is when trees adversely impact hardscape (curbs, sidewalks, etc.) causing the hardscape to lift. There were 1,108 instances of hardscape damage observed.

Additionally, 2,623 clearance issues were observed when trees blocked the visibility of traffic signs, signals, streetlights, or other safety devices, see Figure 7. Over 51% of the clearance issues were pedestrian related and 36% were vehicle related. When the bottom of a tree's canopy over the road was less than 14 feet or rubbing from vehicles it was noted as vehicle clearance.

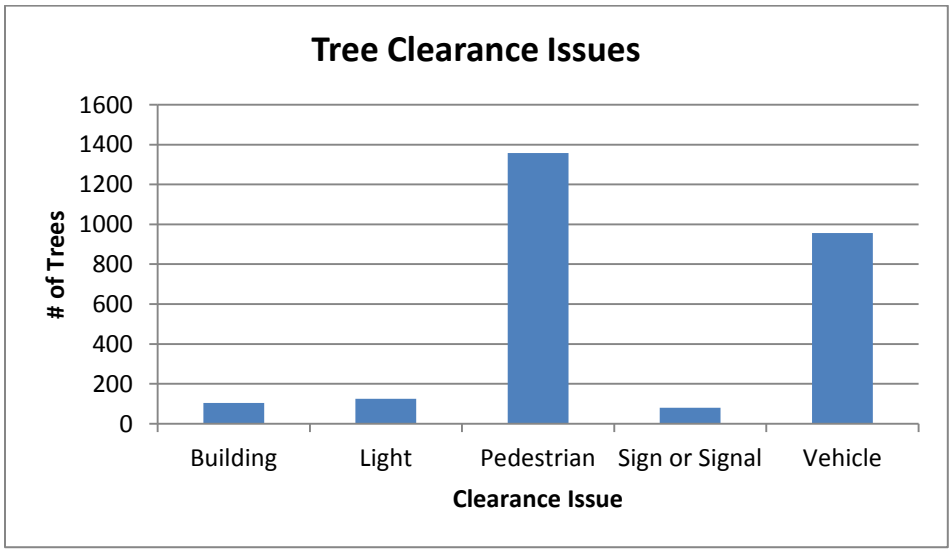


Figure 7 - Overview of clearance issues observed during the street and park tree inventory.

Discussion

Species diversity is critical for maintaining a healthy urban forest. A diverse population is able to tolerate and overcome threats from invasive pests and diseases, because it is not limited to only a few species. Diversity also influences tree maintenance needs, costs, tree planting goals and long-term success of the urban forest. The City has good overall species diversity based solely on the number of species present; however the composition of the population is not balanced. Black olive and live oaks far exceeded the recommended 10% maximum for a single species in a population, comprising 30% and 16% respectively of the inventoried tree population. Black olives and live oaks do not currently have an aggressive pest or pathogen, but having almost 50% of the City's ROW and park tree population based on two species can be problematic if a pest is introduced in the future. The plantings of these two species should be continued, but in reduced numbers. See Section Four for a recommended tree species list for planting.

The age structure for the City's tree population is very close to the Richards' recommendation. The established (9-17") class is 40% of the population, approximately 10% higher than recommended. The mature and maturing trees are slightly lower than the recommended proportion. This indicates that future maintenance may increase as the higher portion of 9-17" trees mature. It also illustrates necessity for keeping the population of young trees high and the importance of the annual planting programs for maintaining the canopy continuity.

Tree condition is primarily Good to Fair (85%). However, the trees that are in critical condition and the dead trees should be removed. They will not improve at this point even if care is increased. However, younger trees that are rated in Fair or Poor condition may benefit from improvements in structure that may improve their health over time. Guidelines have been developed by ISA and the *ANSI A300 (Part 1)* (ANSI 2008) to ensure that tree maintenance practices improve the general health of the urban forest.

Street tree stocking is helpful for developing a sustainable tree planting program. A stocking level of 75-80% would be an excellent goal, but the City's current stocking level of 90% already exceeds this goal. The national average is 60%. It is important to note that there may be additional planting spaces in publically owned properties or in parks that are not factored into this *street tree* stocking level.

Trees noted with poor structure and cavity/decay need to be inspected regularly and corrective actions should be taken when warranted. If their condition worsens removal may be required. Inspecting the types of mechanical damage observed can also be beneficial to develop solutions to alleviate the problems.

Figure 8 - Along NW 7th Avenue large trees are located beneath the utilities. This is not recommended as the trees will continually need to be pruned. Additionally, these black olives possessed considerable damage to their trunks from nearby parking lot. Large trees, such as these black olives, need more root space than this 4 foot tree lawn. Large trees prefer a 7 foot tree lawn with more than 300 square feet of growing space and will cause hardscape damage when the planting space is not adequate.

A plan to address hardscape damages should be made to reduce safety risks to the public. An additional survey of the damaged sites can allow for prioritization and for size measurements so cost estimates can be obtained. To limit hardscape damage caused by trees, trees should be planted only in growing spaces where there is adequate space for root growth. It is important to give the tree enough growing room above ground. Typically, small growing trees require 4-5 feet from hardscape, medium trees 6-7 feet, and large trees 8 feet or more between hardscape features. This will allow the tree's trunk, root collar, and structural roots adequate space for growth.

Clearance information in the inventory can be used when planning pruning activities. Tree canopy should not interfere with traffic, block visibility of signs or lights. Pruning can alleviate these issues by raising the tree crowns. This should be done in accordance with *ANSI A300 (Part 1)* (ANSI 2008). Clearance height recommendations for signs and lights are 5-8 feet, 8-10 feet over sidewalk, and 15-17 feet over streets.

Section Three – Maintenance Recommendations

Methodology

The tree inventory contains several maintenance attributes:

1. Pruning
    1.1. Priority 1 Prune
    1.2. Priority 2 Prune
    1.3. Large Tree Routine Prune
    1.4. Small Tree Routine Prune
    1.5. Restoration Prune
    1.6. Training Prune
2. Removals
    2.1. Priority 1 Removal
    2.2. Priority 2 Removals
    2.3. Priority 3 Removals
    2.4. Stump Removals
3. Planting Program (see Section Four for more information)

Results

Outlined below are the pruning and removal recommendations, as well as the number of trees that require each maintenance type.

In total, 15,129 trees need pruning. Over 54% are Large Tree Routine Prunes and 11% of the trees that need pruning are of high priority (Priority 1 and 2).

In total 821 trees and 70 stumps are recommended for removal. Only 17% of the removals are Priority 1 and approximately 52% are Priority 3 removals.

The Pruning and Removals tables and maps below will outline more detailed information on the high priority maintenance tasks.

Table 3 - Overall pruning and removals needed.

Pruning	# Trees
Priority 1 Prune	311
Priority 2 Prune	1353
Large Tree Routine Prune	8193
Small Tree Routine Prune	2540
Restoration Prune	478
Training Prune	2254
Removals	
Priority 1 Removal	141
Priority 2 Removal	251
Priority 3 Removal	429
Stump Removal	70

Pruning

	Diameter Size Class					
	1-3"	4-6"	7-12"	13-16"	17-24"	>25"
Priority 1 Prune	0	0	59	72	123	57
Priority 2 Prune	0	7	197	434	592	123
Large Tree Routine Prune	485	780	2894	2162	1690	182

The inventory identified 311 Priority 1 Prunes with almost 40% of the pruning needed in trees between 17-24". For the 1,353 Priority 2 Prunes almost 76% are needed in trees between 13-24".

Removals

	Diameter Size Class					
	1-3"	4-6"	7-12"	13-16"	17-24"	>25"
Priority 1 Removal	0	4	32	46	41	18
Priority 2 Removal	0	12	92	73	67	7
Priority 3 Removal	254	101	49	16	8	1

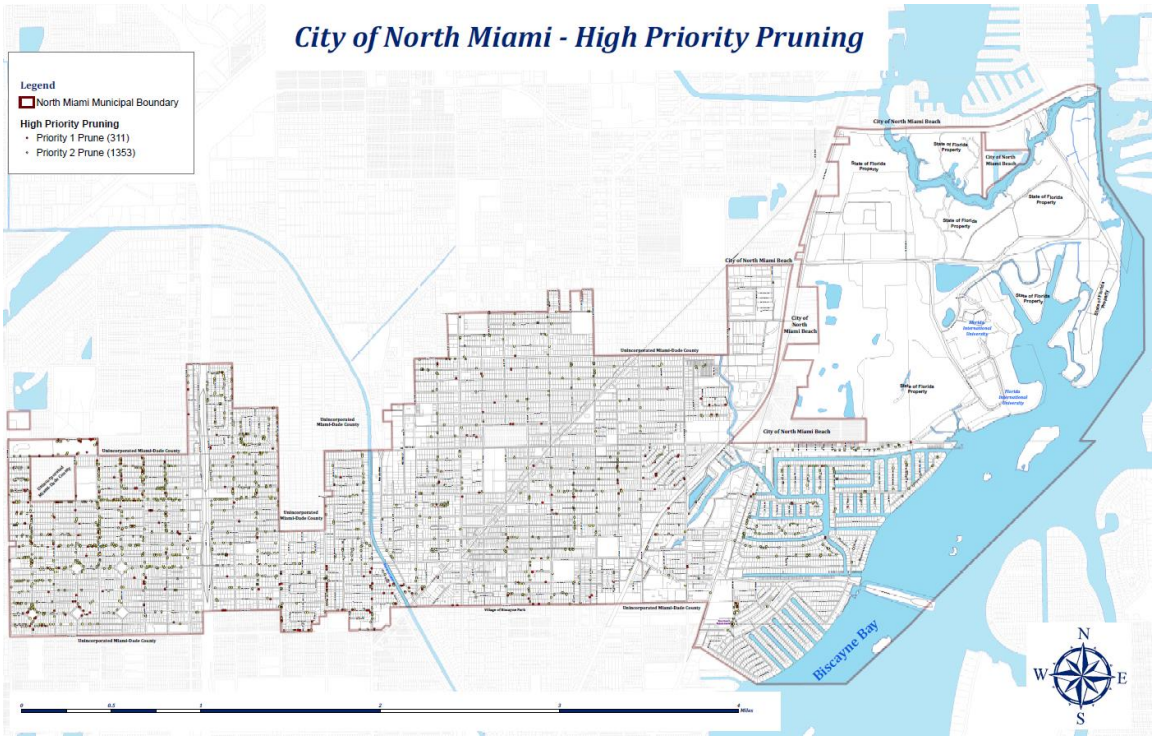


Figure 9 - Map identifies the location of trees that have high priority pruning maintenance needs.

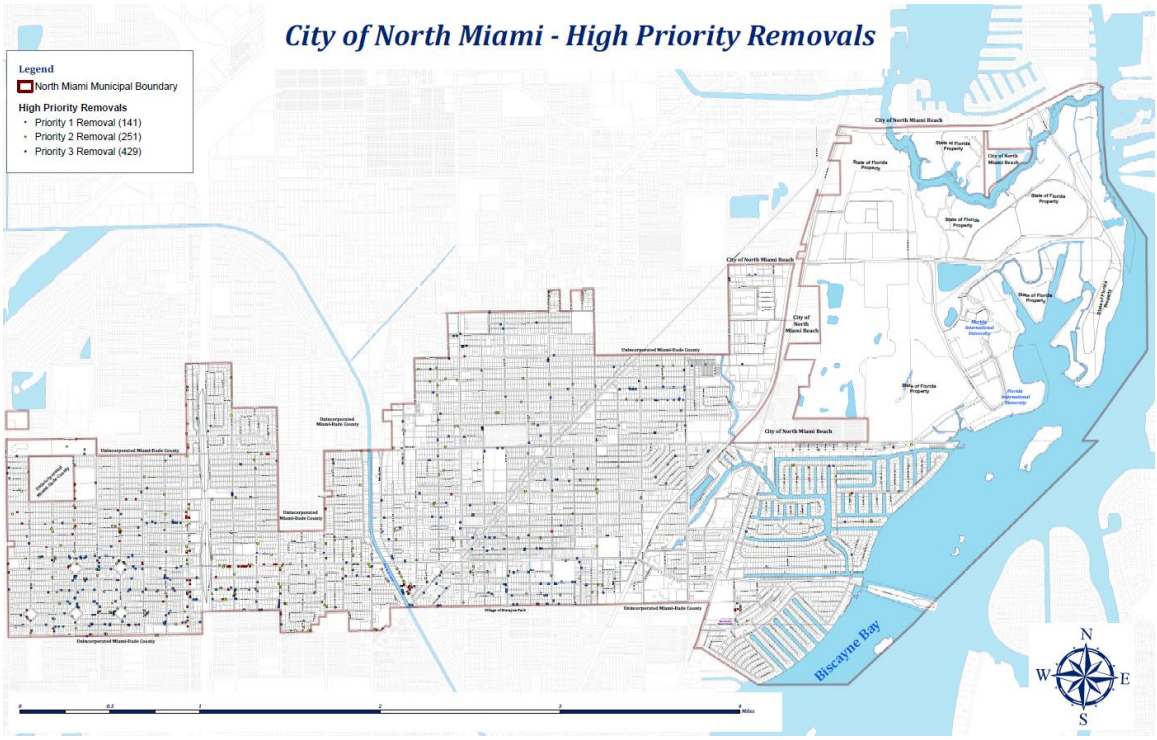


Figure 10 - Map identifies the location of trees that are high priority removals.

The inventory identified 141 Priority 1 Removals with almost 85% of the removals needed in trees between 7-24". For the 251 Priority 2 Removals almost 92% are needed in trees between 7-24".

Discussion

When it comes to tree management programs there are usually two types – reactionary versus proactive. For many communities monetary resources are limited causing tree management to be reactive. Management is reacting to problems when they have already occurred rather than being proactive. Proactive management works to prevent the problem from occurring. Research has shown that the proactive management programs that have a routine pruning cycle will improve the overall health of the tree population (Miller and Sylvester 1981). The main advantage of this proactive approach is that it reduces risks to the public and liability for the City. Other advantages are predictable workloads, reduced long-term tree maintenance costs, predictable budgets, and increase benefits from the trees due to improved structural health.

Tree care is always an ongoing process, but work must be prioritized to reduce safety risks for the public. LAS recommends completing high priority work first (for example, Priority 1 is higher in priority than Priority 3). All the high priority prunes and removals should be completed before the annual routine pruning and tree planting is continued. Initially these activities will account for a large volume of work (and budget monies). However, once the immediate needs are satisfied, lower priority routine tree maintenance and improvement can be scheduled over a five to seven-year period. For example, planning can take place to replace the trees that were removed. Also, it is important to continue to monitor the tree population to identify additional high priority trees that may not have been present when the inventory was completed.

Table 4 is an outline of basic and additional services that make up a municipal urban forestry maintenance program. You can choose not to implement some of these immediately or ever. While some functions have specific time value, others can occur all year or periodically. Each line item would be developed into an annual work plan item developed around the calendar year; your budget year may differ so budget-planning events should be adjusted accordingly.

Table 4 - General annual maintenance tasks.

ACTIVITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1. PLANNING												
a. Rank work to be done	.	.	.	.	.	.	.	.	■	■	.	.
b. Organize Activities	.	.	.	.	.	.	.	.	.	.	■	.
c. Budget Preparation	.	.	.	.	.	.	.	.	.	.	■	■
2. TREE PLANTING												
a. Survey potential sites	■	.	.	.	.	.	.	.	.	.	.	.
b. Decide locations, species	■	.	.	.	.	.	.	.	.	.	.	.
c. Order trees	.	.	■	.	.	.	.	.	.	.	.	.
d. Inspect/tag trees in nursery	.	.	.	■	.	.	.	.	.	.	.	.
e. Receive/inspect/plant trees	.	.	.	.	■	■	.	.	.	.	.	.
f. Water trees periodically	.	■	■	■	■	■	■	.	.	.	.	.
3. TREE PRUNING												
a. Survey trees/decide which to prune	.	.	.	.	.	.	.	.	.	.	■	■
b. Send out Bid Requests	.	.	.	.	.	.	.	.	.	.	■	■
c. Supervise pruning/trim disposal	■	■	■	.	.	.	.	.	.	.	.	.
4. TREE REMOVAL												
a. Survey trees/decide which to remove	.	.	.	.	.	■	■	.	.	.	.	.
b. Notify adjacent property owners	.	.	.	.	.	.	■	.	.	.	.	.
c. Send out Bid Requests	.	.	.	.	.	.	■	■	.	.	.	.
d. Supervise contract/wood disposal	.	.	.	.	.	.	.	.	■	■	.	.
e. Grind stumps	.	.	.	.	.	.	.	.	■	■	.	.
5. PUBLIC RELATIONS												
a. Report to City officials	■	.	.	■	.	.	■	.	.	■	.	.
b. News releases	■	.	.	■	.	.	■	.	.	■	.	.
c. Submit grant applications	Periodically, As Needed											
d. Develop interpretive programs	.	.	.	.	.	.	■	■	■	.	.	.
e. Hold Arbor Day ceremony	.	.	.	■	.	.	.	.	.	.	.	.
f. Research & review grants available	.	.	■	.	.	.	.	.	.	.	■	.
6. OTHER TASKS												
a. Water trees during drought	Periodically, As Needed											
b. Fertilize trees	.	.	.	■	.	.	.	■	.	.	.	.
c. Control insects/disease	Periodically, As Needed											
d. Clean up storm damage	Periodically, As Needed											
e. Training/Professional development	.	.	.	.	.	■	.	.	■	.	.	.
f. Training/Safety education of workers	.	.	.	.	.	.	.	■	■	.	.	.

Below in Table 5 is an estimated budget to perform the maintenance tasks to date. Please note that this should be broken up into multiple years as outlined above (typically a 5-7 year period), prioritizing high priority prunes and removals for immediate attention. Some of the maintenance items in the inventory may have been completed since the inventory date, but not updated in the database. Database updates are essential for maintaining an accurate tree inventory.

Table 5 - Overall budget needs for all maintenance tasks needed, based on the tree inventory.

Pruning	# Trees	Average-Per-Tree Cost	Approximate Total Cost
Priority 1 Prune	311	$1,000	$311,000
Priority 2 Prune	1353	$1,000	$1,353,000
Large Tree Routine Prune	8193	$500	$4,096,500
Small Tree Routine Prune	2540	$300	$762,000
Restoration Prune	478	$500	$239,000
Training Prune	2254	$200	$450,800
Pruning Subtotal			**$7,212,300**
Removals			
Priority 1 Removal	141	$2,500	$352,500
Priority 2 Removal	251	$2,500	$627,500
Priority 3 Removal	429	$2,500	$1,072,500
Stump Removal	70	$300	$21,000
Removals Subtotal			**$2,073,500**
Grand Total			**$9,285,800**

The average annual budget for tree maintenance is $400,000. This allocation will need to be adjusted to provide adequate funding for the City to perform the current tree maintenance tasks. With the current budget of $400,000 it would take over 20 years to address all of the maintenance needs and over 9 years to address all of the high priority pruning and removals. It is essential for the City to address the high priority maintenance tasks as soon as possible.

Maps of the high priority prunes and removals can be found in the Appendix.

Section Four – Planting Program

Methodology

LAS was hired to conduct a planting site inventory. LAS utilized TreeKeeper mobile to directly input planting sites into the existing street tree inventory database. The planting site assessment was conducted along all of the streets maintained by the City (excluding streets maintained by the State). This will be referred to as the City-wide Planting Inventory, see Figure 11. Additionally, LAS inventoried the planting sites in the downtown corridors (see Figure 12) and along NW 7th Avenue from NW 119th Street to NW 143rd Street. This will be referred to as the Downtown Corridor Planting Inventory.

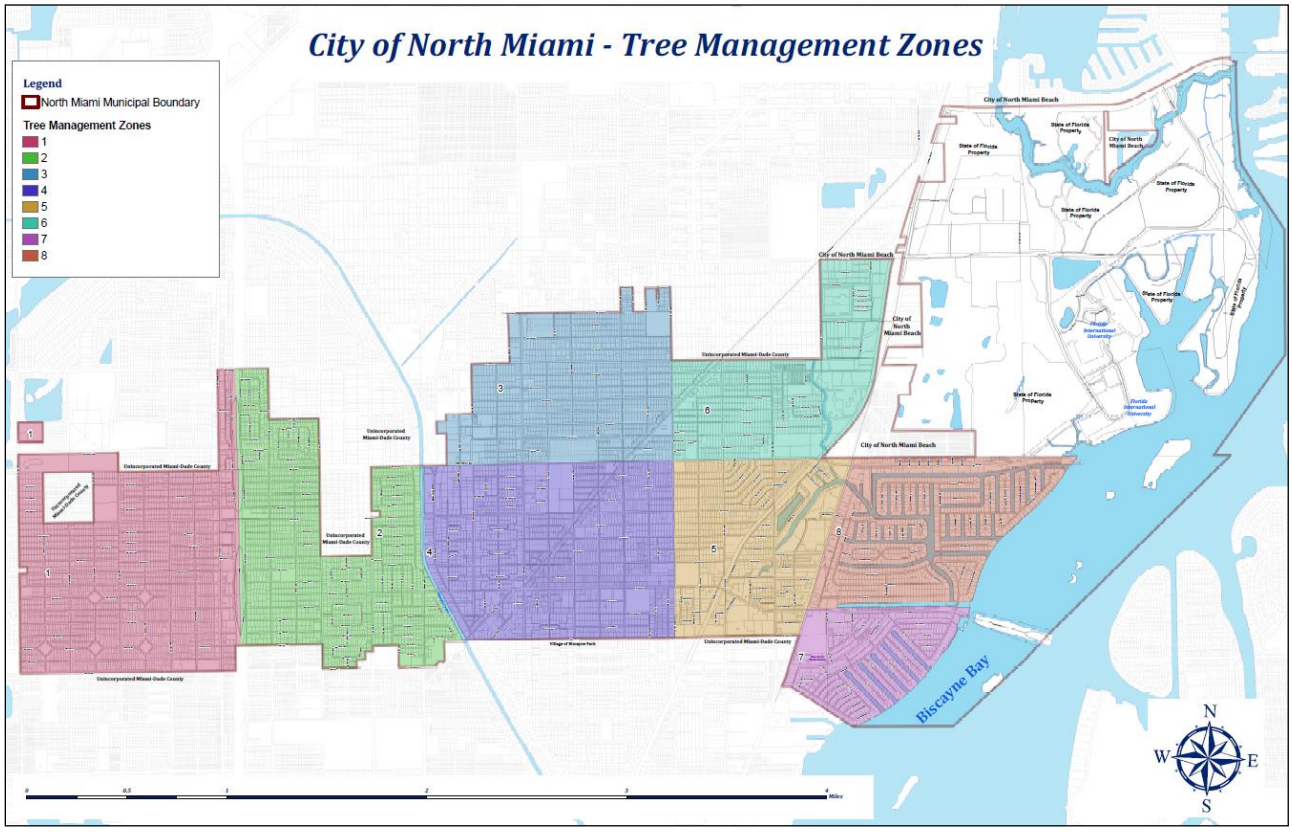


Figure 11 - Potential planting sites were identified on all of the streets maintained by the City (see colored areas). Planting sites were not identified on streets maintained by the State or in the northeast portion of the City (Oleta River State Park).

The following specifications were used to identify potential planting sites within the City-wide Planting Inventory:

- at least 3 feet from the edge of the street pavement and sidewalk or property line; the swale must be at least 6 feet wide or more (which is typical)
- a minimum of 10 feet from driveways and property line of adjacent property
- at least 10 feet from any utility poles
- a minimum of 15 feet from street lights
- a minimum of 30 feet apart
- a minimum of 30 feet from existing trees in the swale and on private property
- large tree will not be located under utilities
- other sites will be located under overhead utilities

Downtown Corridor Planting Sites:

Figure 12 – Potential planting sites were identified along major thoroughfares in the downtown area (highlighted in yellow): NE 125th Street, W. Dixie Hwy, NE 6th Avenue. (The other corridor that was done that is not part of the downtown corridor is the NW 7th Avenue corridor because it is a priority thoroughfare in the City).

The planting sites in the downtown corridor are unique due to their highly developed and commercial nature. The three planting site types for these corridors were identified based on the following specifications:

- *existing tree lawns or well pits* must be at least 2 feet from the edge of the street pavement and sidewalk or property line
- *proposed planting sites* (sites require a cutout of the sidewalk) and prefer placement near adjacent grassy areas when possible
- *potential easement agreements* (a privately owned vacant planting strip between sidewalk and parking lot)

Results

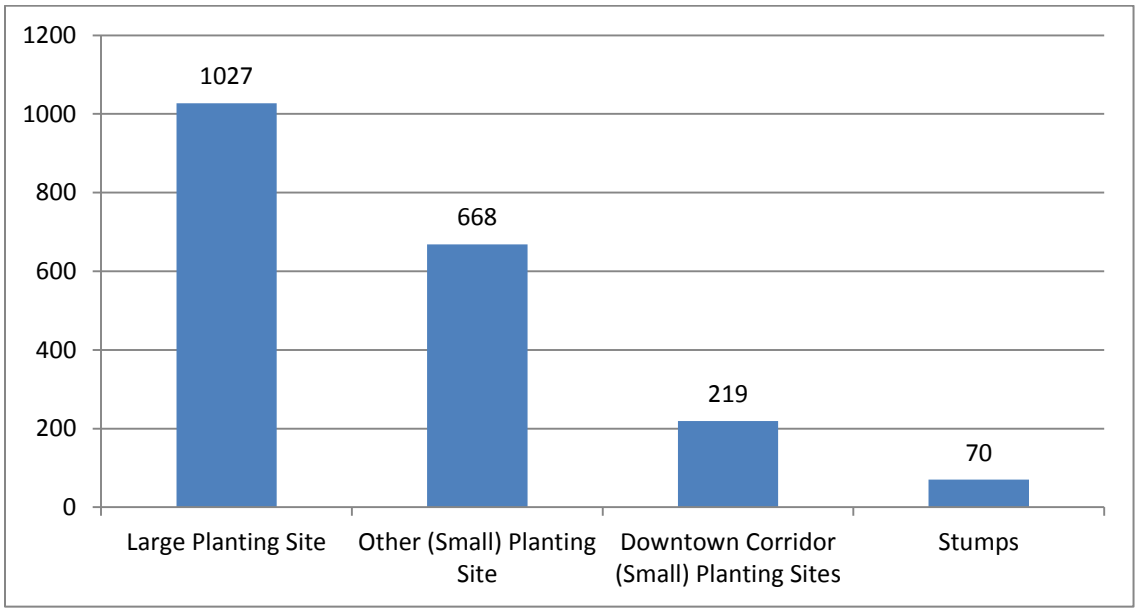


Figure 13 - Overview of planting site types found during the planting site inventory.

A total of 1,984 planting sites and stumps were identified. Approximately, 52% of the sites are for large trees and 45% are for small trees. In the Downtown Corridor 219 planting sites were identified. Most of these sites are suitable only for small trees (less than 15 to 20 ft in height) due to the limited size of the planting spaces (see page 28 for examples of small trees that are recommended). DRG inventoried the stump sites during the initial tree inventory data collection. These sites can be considered as potential planting sites, unless the sites do not meet the planting specifications outlined above.

In addition, tree replacements should be considered on every tree removal site. Table 6 outlines the current planting sites as well as the potential future planting sites. There are 821 potential future plantings sites. In total, North Miami has 2,805 planting sites for future trees.

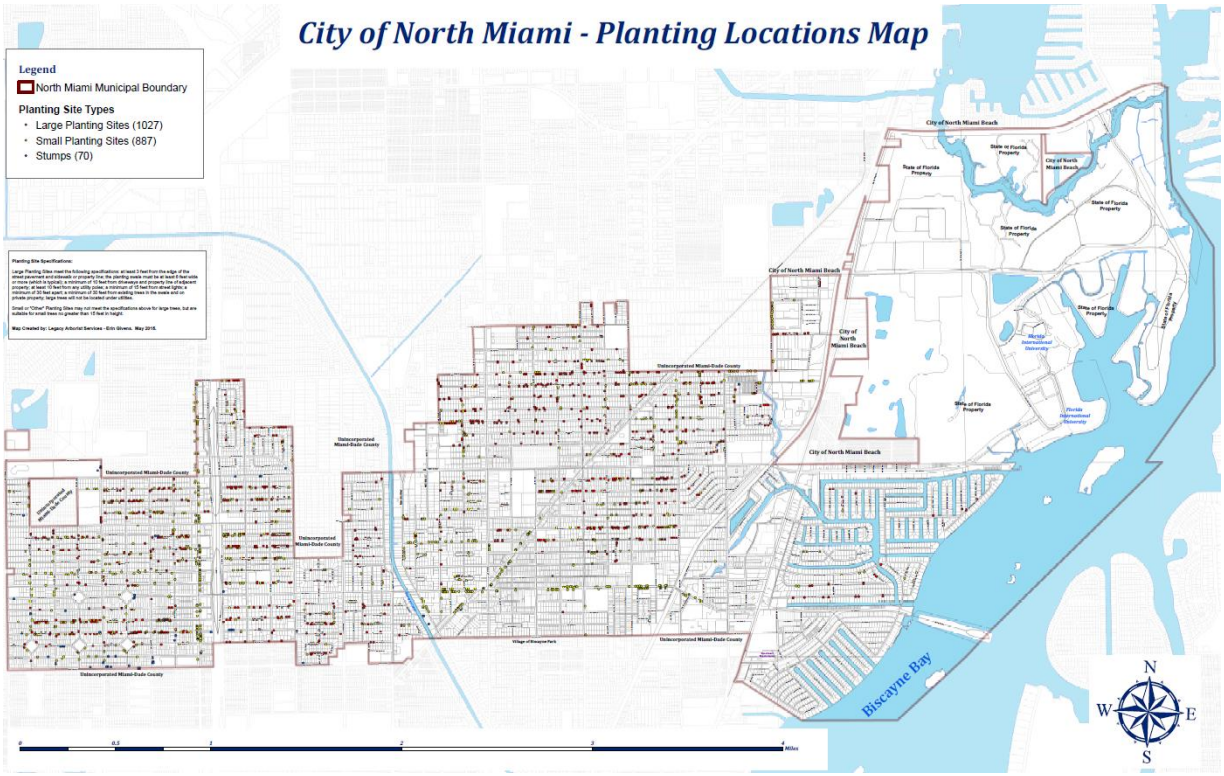


Figure 14 - Large and small potential planting sites were identified. Stumps from the DRG street tree inventory were also identified as potential planting sites.

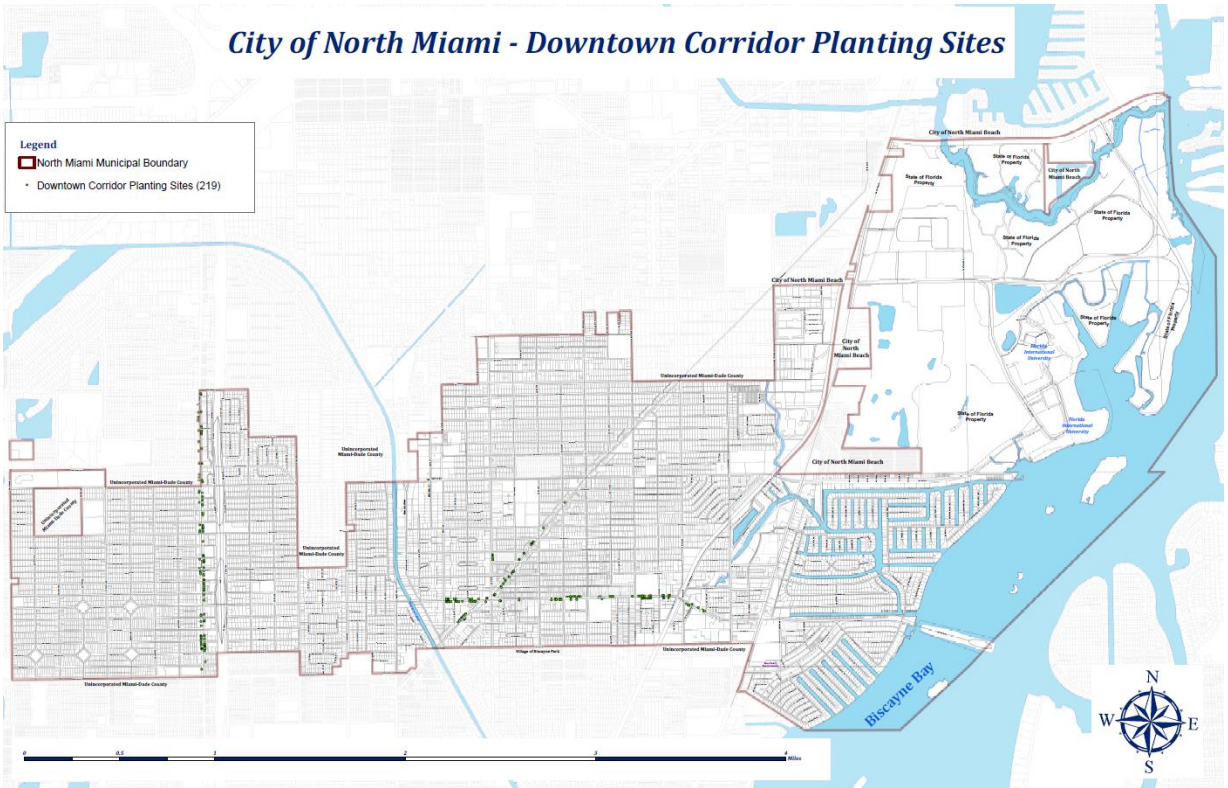


Figure 15 - Potential planting sites along the major thoroughfares in the downtown area and along NW 7th Avenue.

Table 6- Overview of current and potential future planting sites.

Current Vacant Sites	# Sites
Large Planting Site	1027
Other (Small) Planting Site	668
Downtown Corridor (Small) Planting Sites	219
Stumps	70
Total Current Vacant Sites	**1984**

Future Vacant Sites	# Sites
Priority 1 Removal	141
Priority 2 Removal	251
Priority 3 Removal	429
Total Future Vacant Sites	**821**

Discussion

The goal of a tree planting program is to create healthy trees that reach the limits of their natural lifespan. This is challenging due to the difficult urban conditions that urban trees must tolerate, such as poor soil conditions and limited irrigation. However, there are several ways we can improve the likelihood of success with planting: selecting the right tree for the right place, utilizing proper planting techniques, and providing the tree with follow up tree maintenance.

The following tables assist efforts to put the right tree in the right place. Before determining which tree is appropriate it is important to understand what size tree can be planted in the planting area present. Providing trees adequate space is one of the challenges in urban environments. The following table illustrates the planting area requirements for small, medium and large trees.

Table 7 - Planting area requirements of small, medium and large trees

Total planting area (lawn, island, or soil strip)	Distance between sidewalk and curbing	Minimum distance from pavement or wall	Maximum tree size at maturity
50-150 square feet	3 to 4 feet	2 feet	Small (less than 30 feet tall)
150-300 square fee	4 to 7 feet	4 feet	Medium (less than 50 feet tall)
More than 300 square feet	More than 7 feet	More than 6 feet	Large (taller than 50 feet tall)

Recommended Trees to Plant in North Miami

Table 8 – Preferred list of trees for North Miami

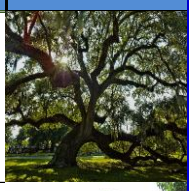
Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs / Comments	Example Image
Live Oak	Quercus virginiana	40' - 50'	Large	Native	Moderate	N/A	Wind Tolerant	
Mahogany	Swietenia mahagoni	35' - 60'	Large	Native	Fast	N/A	Low wind tolerance; needs space to develop adequate root system to reduce the likelihood of toppling; brittle in Central and North Dade.	
Gumbo Limbo	Bursera simaruba	40' - 50'	Large	Native	Fast	N/A	Does not have showy flowers, but it is affectionately called the tourist tree because of its shiny red and peeling bark. Wind tolerant.	
Satinleaf	Chrysophyllum oliviforme	20' - 30'	Small	Native	Slow	N/A	Wet and/or shady areas wind tolerant.	
Crape Myrtle	Lagerstromeia indica	15' - 20'	Small	Flowering	Moderate	Summer (May-September)	Lavender or white flowers. Can be planted adjacent to power lines	
Pigeon Plum	Coccoloba diversifolia	25' - 30'	Small	Native	Moderate	Spring	Moderate-growing with a dense, columnar canopy producing small white flowers in the spring. Attractive bark. Native. Fruits ripen in late summer/fall and attract birds. Female plant bears fruit; weevils if near sea grape.	
Geiger Tree	Cordia sebestena	20' - 25'	Small	Flowering Native	Moderate	Year-round	Moderate-growing with a dense rounded evergreen canopy. Flowers appear through-out the year with small edible white pear-shaped fruit. Salt and wind tolerant.	
Florida Privet	Forestiera segregata	10' - 15'	Small	Native	Moderate	N/A	Drought tolerant; OK under power lines	

Table 8 (continued) - Preferred list of trees for North Miami

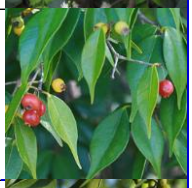
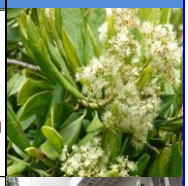
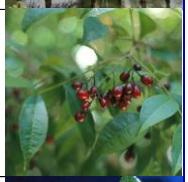
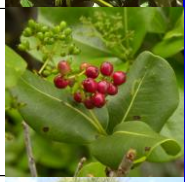
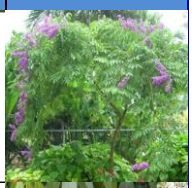
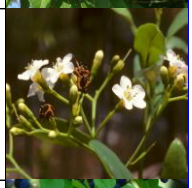
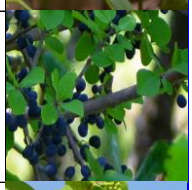
Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs / Comments	Example Image
Desert Senna	Senna polyphylla	10' - 15'	Small	Flowering	Slow	Fall	Slow growing evergreen tree with a spreading, cascading crown with tiny leaves. Pro-duces yellow flowers throughout Fall to Spring. Larval plant for Sulfur butterfly. Can be planted under power lines, but planting as a standard can result in a snapped main stem.	
Red Stopper	Eugenia rhombea	15' - 20'	Small	Native	Moderate	N/A	Can be planted adjacent to power lines.	
Redberry Stopper	Eugenia confusa	15' - 20'	Small	Native	Moderate	N/A	Can be planted adjacent to power lines.	
White Stopper	Eugenia axillaries	15' - 25'	Small	Native	Moderate	N/A	Salt tolerant. Can be planted adjacent to power lines.	
Simpson Stopper	Myricanthes fragrans	20' - 30'	Small	Native	Slow	N/A	Hardy native; can be planted adjacent to power lines	
Spanish Stopper	Eugenia foetida	15' - 20'	Small	Native	Moderate	N/A	Small native evergreen tree. Moderate columnar growth; small leaves in tight formation; wildly fragrant flowers; good salt-tolerance. Can be planted adjacent to power lines.	

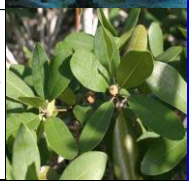
Table 9 - Additional list of trees for North Miami

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs / Comments	Example Image
Allspice	Pimenta Diocica	10' - 15 '	Medium	Shade	Slow	N/A	Leaves are leathery, aromatic and quite attractive. Has whitish gray bark peels in thin sheets. The leaves and fruit smell like a combination of cloves, black pepper, nutmeg, and cinnamon, hence the common name. Small white flowers. Wind tolerant.	
Bahama Lysiloma	Lysiloma sabicu	20' - 30'	Medium	Shade	Slow	N/A	Slow growing shade tree with small leaves and red-dish new growth. Can be invasive, so do not plant next to a natural area.	
Bald Cypress	Taxodium distichum	30' - 60'	Large	Native	Moderate	N/A	Thrives in wet sites. Native deciduous tree. Loses all its leaves in winter. Wind tolerant.	
Bitterbush	Picramnia pentandra	12' - 18'	Small	Native	Moderate	N/A	Can be planted adjacent to power lines.	
Black Ironwood	Krugiodendron ferreum	20' - 30'	Small	Native	Slow	N/A	Wind Tolerant	
Black torch	Erithalis fruticosa	10' - 20'	Small	Native	Fast	N/A	Can be planted adjacent to power lines.	
Blolly	Guapira discolor	25' - 35'	Medium	Native	Moderate	N/A	Hardy shade tree. Needs minimal care. Very salt tolerant.	
Brown Ebony	Caesalpinia punctata	20' - 30'	Medium	Flowering	Moderate	Summer	Beautiful, wide spreading tree up to about 15 m tall (50 ft) and 23 m spread (75 ft); yellowish to tan-colored trunk, dividing into several large branches low on stem; flowers small and light yellow. Ornamental specimen tree.	
Colville's Glory	Colvillea racemosa	40' - 50'	Large	Flowering	Moderate	Fall (November)	Clusters of vivid scarlet and orange flowers. Like a late season flamboyant.	

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs / Comments	Example Image
Copperpod	Peltophorum pterocarpum	40' - 50'	Large	Flowering	Fast	Spring Summer	Fast-growing evergreen tree. Produces fragrant, showy yellow flowers in the spring and summer. Seedpods turn to an attractive wine-brown color. Subject to wind damage. Needs space to develop adequate root system to reduce the likelihood of windthrow.	
Dahoon Holly	Ilex cassine	20' - 40'	Large	Native	Moderate	N/A	Wet areas; wind tolerant	
Green Buttonwood	Conocarpus erectus	30' - 50'	Large	Native	Moderate	N/A	Salt and Wind Tolerant	
Guinea plum	Drypetes laterifolia	20' - 30'	Small	Native	Slow	N/A		
Inkwood	Exothea paniculata	25' - 35'	Medium	Native	Moderate	Summer	Slender dense crown with glossy leaves and tiny fragrant blooms in spring and early summer. Produces red berries that ripen to deep purple.	
Jacaranda	Jacaranda mimosifolia	40' - 50'	Large	Flowering	Fast	Fall and Winter (if cool enough)	Needs space to develop adequate root system to reduce the likelihood of toppling. Does not flower well in South Florida.	
Jamaica Rain	Brya ebenus	15' - 30'	Small	Flowering	Slow	Spring and Summer	Blooms spring, summer and in times of high humidity. Tolerates heat and salt but may drop leaves when dry Excellent street tree selection.	
Japanese Fern	Filicium decipiens	20' - 30'	Medium	Shade	Moderate	N/A	Broad canopy.	
Krug's Holly	Ilex krugiana	25' - 30'	Small	Native	Moderate	N/A	Attractive red berries in winter	

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs / Comments	Example Image
Lancepod	Lonchocarpus violaceous	30' - 35'	Medium	Flowering	Fast	Late Summer Fall	Evergreen with a fast-growing, dense canopy. Produces fragrant, lavender, showy flowers during the late summer / fall. Produces long, slender, seed pods. Plant at least 30 feet from power lines and 16-22 feet from your house. Full sun.	
Lancewood	Nectandra coriacea	25' - 35'	Medium	Native	Moderate	N/A	Aromatic leaves and small clustering white flowers. Attract bees. Wind tolerant.	
Lignum Vitae	Guaiacum sanctum	10' - 30'	Small	Flowering Native	Very Slow	Year-round	Purple blooms several times per year. Slow-growing but long-lived, it is adaptable to dry rocky areas in full sun to light shade Can be planted adjacent to Power Lines. Rare, expensive, but worth it in small spaces.	
Limber Capper	Capparis flexuosa	25' - 20'	Small	Flowering Native	Moderate	Late Summer Spring	Pink and white flowers. Can be planted in partial sun adjacent to power lines	
Madagascar Olive	Noronhia emarginatga	20' - 30'	Small	Shade	Moderate	N/A	Salt tolerant. Can be planted adjacent to power lines.	
Mast Tree	Polyalthia longifolia	10' - 25'	Small	Shade	Slow	N/A	Narrow canopy tree with attractive foliage. Good for screening.	
Mexican Cassia	Caisalpinia mexicana	20' - 25'	Small	Flowering	Moderate	Summer (May-September)	Fragrant, golden flowers. Needs full sun. Can be planted adjacent to power lines.	
Myrsine	Myrsine guianensis	15' - 25'	Small	Native	Slow	N/A	Can be planted adjacent to power lines.	
Paradise Tree	Simarouba glauca	35' - 50'	Large	Native	Moderate	N/A	Attractive reddish color on new foliage. Fast growing native. Female plant bears black berries that attract birds.	

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs / Comments	Example Image
Pink Trumpet Tree	Tabebuia heterophylla	20' - 30'	Small	Flowering	Moderate	Spring - Summer	It has a showy display of pink or white, bell-shaped blooms appearing throughout the spring and summer.	
Podocarpus	Podocarpus sp	30' - 50'	Large	Shade	Moderate	N/A	Evergreen conifer. Red "berries" attract birds. Wind tolerant.	
Queen's Crepe Myrtle	Lagerstroemia speciosa	30' - 45'	Large	Flowering	Moderate	Summer	Moderate-growing with leaves that turn red before falling in the winter. It has large showy pink or purplish flowers during the summer. Drops leaves when during cold spells.	
Rough Strong Bark	Bourreria ovata	15' - 20'	Small	Native	Moderate	N/A	Can be planted adjacent to power lines.	
Saffron Plum	Bumelia celastrinum	20' - 25'	Small	Native	Slow	N/A	Can be planted adjacent to power lines.	
Sea Grape	Coccoloba uvifera	15' - 35'	Large	Native	Moderate	N/A	Salt tolerant/ needs to have multiple trunks for stability	
Shortleaf Fig	Ficus citrifolia	40' - 50'	Large	Native	Fast	N/A	Large, fast growing native. Fruit attractive to birds.	
Silver Buttonwood	Conocarpus erectus	10' - 25'	Small	Native	Moderate	N/A	Small native evergreen tree. Moderate growing. Salt Tolerant. Can be planted adjacent to power lines.	
Soapberry	Sapindus saponaria	20' - 30'	Small	Native	Moderate	N/A	Seeds are poisonous.	

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs / Comments	Example Image
Spicewood	Callyprtranthes pallens	10' - 15'	Small	Native	Moderate	N/A	Can be planted adjacent to power lines.	
Sugarberry	Celtis laevigata	40' - 60'	Large	Native	Moderate	N/A	Rated only to zone 10	
Torchwood	Amyris elemifera	10' - 15'	Small	Native	Slow	N/A	Salt tolerant. Can be planted adjacent to power lines.	
Vera Wood	Bulneisa arborea	20' - 30'	Large	Flowering	Moderate	Summer	Large flowering tree (yellow). Tall, slow growing with bright yellow flowers and shiny deep-green compound leaves. This tree is adapted to dry conditions and has very hard wood and flowers throughout the year. Needs space to develop adequate root system to reduce the likelihood of toppling.	
Wax Myrtle	Myrica cerifera	15' - 25'	Small	Native	Moderate	N/A	Salt tolerant. Can be planted adjacent to power lines. Susceptible to lac scale	
West Indian Cherry	Prunus myrtifolia	30' - 40'	Large	Native	Fast	November - January	Profuse clusters of tiny fragrant white flowers with yellow centers. Fruit attractive to birds. Leaves aromatic.	
White Cordia	Cordia boissieri	15' - 20'	Small	Flowering	Moderate	Year-round	Salt tolerant. Can be planted adjacent to power lines.	
White Mangrove	Laguncularia racemiosa	15' - 20'	Large	Native	Moderate	N/A	Salt tolerant. Can be planted adjacent to power lines.	
Wild Dilly	Manikara bahamensis	15' - 20'	Small	Native	Slow	N/A	Salt tolerant. Can be planted adjacent to power lines.	

Common Name	Scientific Name	Height Range	Tree Size	Tree Type	Growth Rate	Blooming Season	Special Needs / Comments	Example Image
Wild Tamarind	Lysiloma latisiliqua	40' - 50'	Large	Native	Fast	N/A	Salt tolerant. Can be planted adjacent to power lines.	
Willow Bustic	Dipholis salicifolium	20' - 30'	Medium	Native	Moderate	N/A	Salt tolerant. Can be planted adjacent to power lines.	
Winged Sumac	Rhus copallina	15' - 20'	Small	Native	Fast	N/A	Salt tolerant. Can be planted adjacent to power lines.	
Ylang-Ylang (dwarf)	Canaga fruiticosa	10' - 15'	Small	Flowering Shade	Slow	Spring & Summer	Slow growing. This plant is attractive to bees, butterflies and/or birds. Flowers are fragrant. Suitable for growing in containers.	

For the small planting spaces yaupon holly (*Ilex vomitoria*) and Dahoon holly (*Ilex cassine*) make fine urban trees with their columnar form, leaves with no points, drought-tolerance, and ability to thrive in cramped spaces. Other trees suitable for small to medium spaces include: bottlebrush (*Callistemon spp.*), silver buttonwood (*Conocarpus erectus,* var. *sericeus*), Geiger tree (*Cordia sebestena*), wax myrtle (*Myrica cerifera*), Oleander Standard (*Nerium oleander*), and frangipani (*Plumeria rubra*).

Crape myrtle (*Lagerstroemia indica*), sometimes called the "Lilac of the South," is very versatile in its use. They are available as small trees, shrubs, and ground covers. For street tree use, choose specimens having a single trunk (known as a "standard"). While the summer flowering, fall leaf color, and decorative bark are unsurpassed for beauty in the landscape, crape myrtle are attacked by two pests: powdery mildew and crape myrtle aphids.

Crape myrtles require more care than other tree species, so be prepared to regularly inspect for insect and disease problems and prune to achieve small tree form. Initial irrigation is necessary but in general they do not like "wet feet." Light fertilizer application for the first few years is all that is needed. The following crape myrtle cultivars, based on their demonstrated resistance to pest problems, should be used for street tree planting: Miami (dark pink), Natchez (white), Sioux (dark pink), Tuscarora (coral pink), and Zuni (medium lavender).

Large shade trees that are suitable for the large planting sites (with no utilities overhead) include: live oak (*Quercus virginiana*), gumbo-limbo (*Bursera simaruba*), Florida mahogany (*Swietenia mahogoni*), black olive (*Bucida buceras*), wild tamarind (*Lysiloma latisiliqua*), golden trumpet-tree, pongam (*Pongamia pinnata*), pigeon-plum (*Coccoloba diversifolia*), South Florida slash pine (*Pinus elliottii var. densa*), and bald cypress (*Taxodium distichum*).

It is important to remember that black olive and live oaks have far exceeded the recommended 10% maximum for a single species in a population, comprising 30% and 16% respectively of the inventoried tree population. LAS recommends limiting the planting of these two species. Increasing the planting numbers of other large trees will assist efforts to increase the diversity of the urban canopy.

Table 10 - Palms that are susceptible to lethal yellowing (LY).

Palm species that LY phytoplasma has been detected in symptomatic palms.		
Adonidia merrillii **Manila Palm**	*Dictyosperma album* **Hurricane Palm**	*Phoenix reclinata* **Senegal Date Palm**
Aiphanes lindeniana **Cuaro**	*Dypsis cabadae* **Cabada Palm**	*Phoenix rupicola* **Cliff Date Palm**
Allagoptera arenaria **Seashore Palm**	*Dypsis decaryi* **Triangle Palm**	*Phoenix sylvestris* **Wild Date Palm**
Arenga engleri **Formosa Palm**	*Gaussia attenuata* **Llume Palm**	*Pritchardia affinis* **Kona Fan Palm**
Borassus flabellifer **Palmyra or Toddy Palm**	*Howea belmoreana* **Sentry Palm**	*Pritchardia pacifica* **Fiji Fan Palm**
Caryota mitis **Fishtail Palm**	*Howea forsteriana* **Kentia Palm**	*Pritchardia remota* **Loulu**
Caryota rumphiana **Fishtail Palm**	*Hyophorbe verschaffeltii* **Spindle Palm**	*Pritchardia thurstonii* **Thurston Palm**
Chelyocarpus chuco **Caranai**	*Latania lontaroides* **Red Latan Palm**	*Ravenea hildebrantii* **Inazi**
Cocos nucifera **Coconut Palm**	*Livistona chinensis* **Chinese Fan Palm**	*Syagrus schizophylla* **Arikury Palm**
Copernicia alba **Caranday Palm**	*Livistona rotundifolia* **Footstool Palm**	*Trachycarpus fortunei* **Windmill Palm**
Corypha taliera **Tali**	*Nannorrhops ritchiana* **Mazari Palm**	*Veitchia arecina* **Montgomery Palm**
Crysophila warsecewiczii **Rootspine Palm**	*Phoenix canariensis* **Canary Island Date Palm**	
Cyphophoenix nucele **Lifou Palm**	*Phoenix dactylifera* **Date Palm**	

Tropical palms of various species make up nearly 29% of the street trees in North Miami. Care should be taken to avoid palm species (and screw-pine *Pandanus utilis*) subject to lethal yellowing disease. Lethal yellowing (LY) is an incurable disease of palms caused by a mycoplasma-like organism (MLO) vectored by a planthopper bug, *Myndus crudus*. This organism has been recorded

in Miami-Dade county as of 1996. Table 10 is a short list of palms known to be susceptible to lethal yellowing.

Many palm species are not susceptible to LY. To date it has not been reported on most palm species native to Florida or regions of the Caribbean Basin. These include cabbage palm (*Sabal palmetto*), royal palm (*Roystonea regia*), Paurotis palm (*Acoelorraphe wrightii*), and thatch palms (*Thrinax* species). Other non-susceptible palms include Bismarck palm (*Bismarckia nobilis*), silver palm (*Ptychosperma elegans*), Washington palm (*Washingtonia robusta*), and foxtail palm (*Wodyetia bifurcate*).

Trees to Avoid

Trees to avoid planting in City rights-of-way regardless of width include: Melaleuca (*Melaleuca quinquenervia*), Australian-pine (*Casuarina spp.*) and Brazilian pepper (*Schinus terebithifolius*). These are all trees that are invasive and may quickly become a pest in the landscape. Do not plant them anywhere. Wherever they occurr, no matter their condition, LAS recommends removal for these three species since the Florida Exotic Pest Plant Council classifies them as "Category I" invasive exotic plants. These three species alone have invaded millions of acres in South Florida.

Many plants on the EPPC list thrive in South Florida. The following trees should be removed whenever possible: earleaf acacia (*Acacia auriculiformis*), woman's tongue (*Albizia lebbeck*), and sapodilla (*Manilkara zapota*).

Trees and Downtown Corridor

Figure 16 - Along the Downtown Corridor small trees (less than 15-20 ft. in height) are recommended due to limited planting space sizes.

In the Downtown Corridor many of the existing planting spaces are small and only suitable for small trees, see small tree recommendations located in Tables 8 and 9. Future redevelopment of this area would need to incorporate planting spaces of sufficient size to accommodate the tree sizes desired and to provide increased shade.

Innovative solutions such as converting on-street parking spaces to tree and landscape planters as shown in Figure 17 illustrate how current parking spaces can be used to create larger planting areas in the Downtown Corridor.

Figure 17 – Typical example of planting space conversions for the Downtown. (Source: Downtown Concept Plan)

This is similar in design to parklets which are sidewalk extension that provide more space and amenities for people using the street. Usually parklets are installed on parking lanes and use several parking lanes. They provide an opportunity for increased planting spaces and greenery.

Figure 18 - Example of 4 foot wide tree lawn typical along NW 7th Avenue (part of the Planting Inventory). Note: use of small palms or trees for this type of planting space.

For the tree lawns that are 4 feet wide and between edge of pavement and sidewalk on NW 7th Avenue (see Figure 18), small palm trees are recommended.

Small palm trees include: Christmas palm (*Adonidia merrillii*), seashore palm (*Allagoptera arenaria*), miniature fishtail palm (*Chamaedorea metallica*), bamboo palm (*Chamaedorea erumpens*), Silver palm (*Coccothrinax spp.*), bottle palm (*Hyophorbe lagenicaulis*), solitaire palm (*Ptychosperma elegans*), and thatch palms (*Thrinax spp.*).

Trees and Overhead Utilities

The following graphic shows minimum setbacks recommended for tree plantings near over overhead utility wires in the urban environment.

Figure 19 - Planting guide for plantings near utilities.

Budget Planning and Tree Planting

Annual budget needs should always be considered when planning to plant trees. The cost of installing any tree on public property is never a one-time expense. All planted trees in the urban environment should have appropriately scheduled maintenance to promote good health for the tree and safety to the public.

Adequate care of trees after planting helps insure tree survival and good health as it develops. Proper irrigation during tree establishment is imperative for long-term good health. For most trees, this establishment period extends through at least one growing season and into the second so plan to irrigate trees during the first year after planting.

Proper use of organic mulch around trees can reduce moisture stress of newly established trees and help keep mowing and trimming equipment away from the trunk. Mulch should totally cover the root zone of newly planted trees plus a bit beyond at a depth of two to four inches (usually 5-6 feet in diameter). Keep mulch back from the trunk of the tree, however. Mounding mulch directly against the stem can form a haven for slugs, borers, and rotting fungi.

After the trees are established they will require routine tree care including: routine pruning, watering, plant health care and integrated pest management.

Tree Schedule

A tree planting schedule is recommended over a five or ten year planting cycle, depending on budgetary constraints. As outlined in the Maintenance section it is important to address high priority pruning and removals before allocating the City's tree maintenance resources for planting projects. However, if the City has internal funds allocated exclusively for plantings (i.e. tree funds)

or can apply for external funding via grants or partner with community stakeholder, then annual plantings can still be achieved while addressing the high priority maintenance tasks.

Depending on the City's budget a five to ten year timeline can be implemented. In a five year planting schedule, approximately 520 trees need to be planted each year to plant all of the identified planting sites and replace the trees that are being removed. In a ten year planting schedule, approximately 260 trees would need to be planted annually.

Figure 20 - Example of a residential street in North Miami that needs additional street trees in the ROW.

Prioritizing the planting locations depends on the City's priorities. For example, if the City wants to maximize shading and reduce heat island effects for residents, then prioritizing residential streets that have low canopy coverage would be recommended. If the City wants to increase aesthetic benefits from trees, then planting trees in commercial (highly visible) areas would increase beautification efforts.

Section 5 – Tree Canopy Cover: Past & Present

Tree canopy is defined as the layer of leaves, branches, and stems of public and private trees that cover the ground when viewed from above. Tree canopy provides many benefits to communities by lowering city temperatures, reducing air pollution, improving water quality, saving energy, enhancing property value, providing wildlife habitat, as well as providing social and aesthetic benefits. Establishing a tree canopy goal is crucial for communities seeking to improve their green infrastructure and environmental quality. The first step towards setting a canopy goal is conducting a tree canopy assessment to estimate the amount of tree canopy present in a city as well as the amount of tree canopy that could potentially be established.

LAS was hired to conduct the tree canopy assessment for North Miami in 2015. The canopy assessment was performed with *i-Tree Canopy*. *i-Tree* is a state-of-the-art, peer reviewed software suite from the US Forest Service that provides urban and community forestry analysis and benefits assessment tools. The application within this software suite, called *i-Tree Canopy* offers a quick and easy way to produce statistically valid estimates of cover types (e.g. tree cover) using aerial images. *i-Tree Canopy* can be used to not only estimate tree canopy cover, but to also set canopy goals and monitor canopy changes over time.

The City's objective was to determine the current (2015) and past (2005) tree canopy coverage. This past and present analysis provides the City with an opportunity to examine the trend of the canopy coverage over the past ten years and serves as baseline data for establishing tree canopy goals for the next decade.

Methodology

To assess the current 2015 canopy coverage, LAS used *i-Tree Canopy*, to analyze 1701 random sample points within the City boundary. The software randomly distributes points onto *Google Maps* 2015 aerial imagery and the LAS interpreter classifies which cover class each point falls upon. To assess the past canopy coverage the points were exported into *Google Earth* and the January 2005 aerial imagery was utilized to reclassify each point's cover class.

LAS defined nine potential cover class types:

- Tree – City
- Tree – State Park
- Grass/Herbaceous/Shrubs
- Impervious – Building
- Impervious – Road
- Impervious – Other
- Soil/Bare Ground
- Water – Freshwater
- Water – Saltwater

The city boundary for North Miami is unique in that it encompasses Oleta River State Park and a portion of Biscayne Bay.

Tree Cover Types

Tree canopy coverage was divided into two types: trees within Oleta River State Park and trees in the remainder of the city boundaries. This separation allows the City to determine the overall tree canopy coverage in North Miami and the proportion of canopy coverage provided by Oleta River State Park. For management purposes it also allows the City to determine the percent tree canopy coverage managed by City staff and North Miami's residents versus the tree canopy coverage that is in Oleta River State Park and managed by the State's Natural Resource Department.

Grass/Herbaceous/Shrubs
The grass cover class comprises all understory (non-tree) vegetation within the City boundary, including herbaceous plants and shrubs.

Impervious Cover Types
Impervious cover types were divided into three types: building, road, and other. The impervious other cover type includes driveways, sidewalks, parking lots, pools, patios and railroads.

Soil/Bare Ground
The soil/bare ground cover type describes areas that are devoid of vegetation.

Water Cover Types
The two water cover types were separated as freshwater and saltwater. Water bodies within the land area such as ponds, creeks, and Oleta River were considered freshwater. Biscayne Bay and canals along the coast line were considered saltwater.

The percentage of each cover class (p) was calculated as the number of sample points (x) hitting the cover attribute divided by the total number of interpretable sample points (n) within the area of analysis (p= x/n). The standard error of the estimate (SE) was calculated SE = $\sqrt{}$ p x (1-p) / n. This method has been used to assess canopy cover in many cities (e.g., Nowak et al., 1996). The *i-Tree Canopy Technical Notes* is included in the Appendix for a more detailed explanation of the calculations performed.

All of the cover class percentages for the City of North Miami were calculated to illustrate both land and water cover percentages. Afterwards, the tree canopy coverages were calculated based on the land cover percentages only. The "land" cover percentages exclude water from the dataset so the cover estimates can be based on city land area (where potential trees canopy could theoretically exist), not on city total area.

Results

Currently in 2015, the City of North Miami has 51% tree canopy and grass, 32% impervious, 3% soil/bare ground, and 14% water, see Figure 21 below.

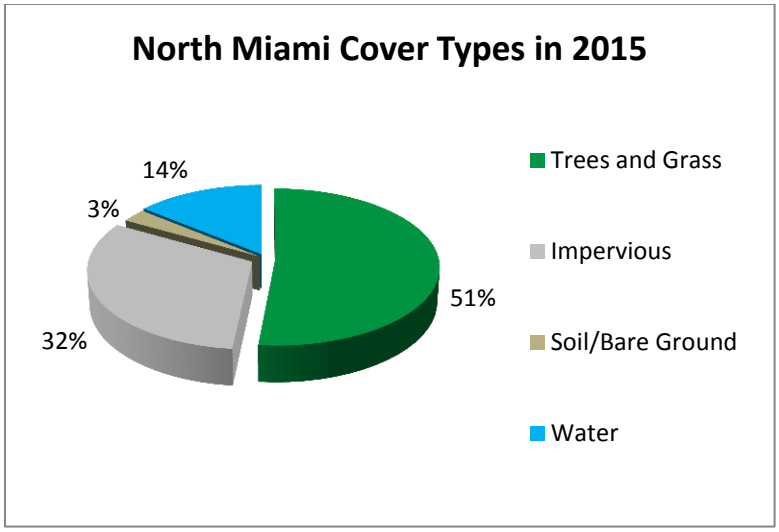


Figure 21 - Cover types for North Miami (including water).

The overall tree canopy cover (based on land cover percentages) is 39%, covering approximately 3.44 mi^2 or 2202 acres. One-third of the canopy cover is comprised of trees within the Oleta River State Park.

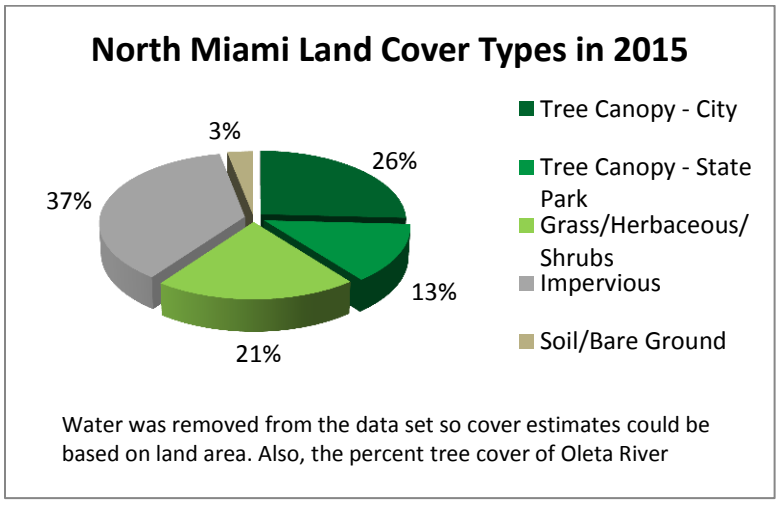


Figure 22 - Land cover types for North Miami (excluding water).

The tree canopy cover in the urban areas (managed by the City and North Miami residents) is 26% or 2.25 mi^2, this excludes the trees within Oleta River State Park (managed by the State), see Figure 22.

Over the last ten years, North Miami's urban tree canopy coverage has increased by 2%. Tree canopy coverage in Oleta River State Park has increased by 1%. The grass cover has gone down by almost 3%. Impervious surfaces (building, road, and other) decreased by 0.7%, and soil/bare ground increased by 0.2%.

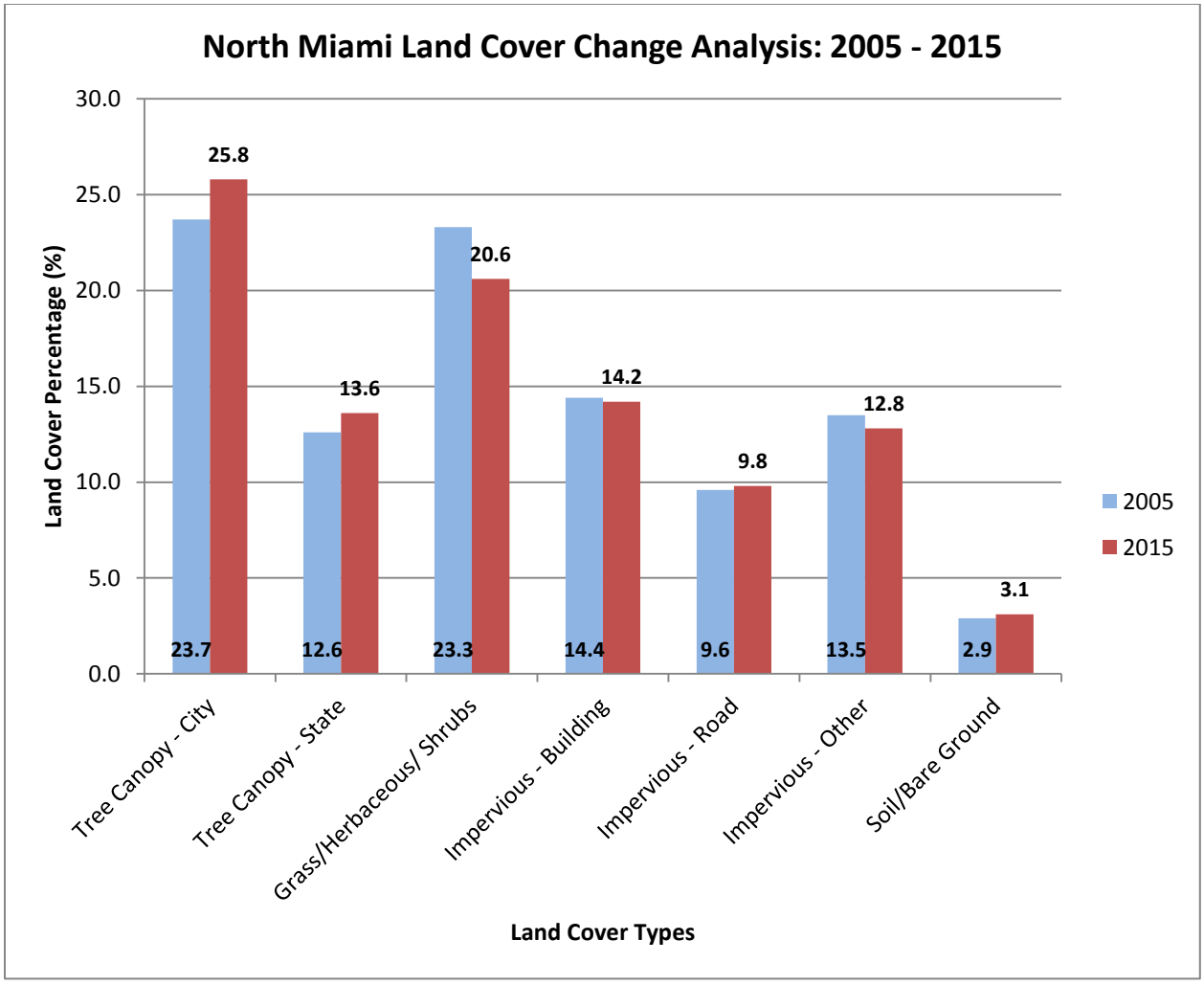


Figure 23 - North Miami's tree canopy coverage managed by the City and North Miami residents has increased by 2%.

Figure 23 illustrates the changes over the past ten years. Table 11 provides the land cover percentages for 2005 and 2015.

Table 11- Average percentage of land cover changes from 2005 to 2015, including Standard Error percentages.

	Average Percentages				Standard Error Percentages	
Land Cover Class Type	**2005**	**2015**	**Change**		**2005**	**2015**
Tree Canopy - City	23.7	25.8	2.1		1.11	1.14
Tree Canopy - State	12.6	13.6	1.0		0.87	0.9
Grass/Herbaceous/ Shrubs	23.3	20.6	-2.7		1.1	1.06
Impervious - Building	14.4	14.2	-0.2		0.92	0.91
Impervious - Road	9.6	9.8	0.2		0.77	0.78
Impervious - Other	13.5	12.8	-0.7		0.89	0.87
Soil/Bare Ground	2.9	3.1	0.2		0.44	0.46

Discussion

Tree cover is constantly changing due to natural and anthropogenic forces. Natural causes for increases in tree canopy can be due to regeneration or tree growth while decreases can be due to tree mortality from insects or diseases or old age. Anthropogenic factors that influence tree cover include tree planting and tree mortality or removal from direct or indirect human actions such as development and air pollution.

Some of the tree canopy coverage in the urban areas changed to other cover types, such as grass or impervious other. This symbolizes tree loss due to mortality or removals. However, a higher percentage of the grass cover converted to tree canopy by means of natural regeneration, tree growth and/or tree plantings. Thus, resulting in a net increase of tree canopy coverage in urban areas of 2%.

The tree canopy coverage in Oleta River State Park increased by 1%. This was due to the conversion of grass to tree canopy by means of natural regeneration and/or tree growth.

Impervious cover did not change much, but a portion of the decrease was due to buildings being cleared for other land uses or the new building construction has not taken place yet in 2015. Additionally, the increasing tree canopy cover decreased the impervious other cover type due to the growing tree canopy covering the sidewalks, driveways, etc.

In review of the land cover percentages in 2015, the tree canopy could potentially cover an additional 24% of the City's land area (grass and soil/bare ground cover types). However, it is important to note that these areas encompass both public and private land. Additionally, not all of this area can be planted in trees as new planting sites have specific size and location specifications, see Section Four.

American Forest, a recognized leader in conservation and urban forestry has established an average canopy goal of 40 percent for metropolitan areas.

With this canopy assessment the City can move forward with setting goals for the future urban tree canopy. Effective urban tree canopy goal setting requires involvement and commitment by municipal leaders and staff, local business community, neighborhood groups and citizens. The following three steps are recommended:

1. **Assess Possible Urban Tree Canopy**

    - Identify opportunities on public and private land.

2. **Adopt Goals Based on Assessments**

    - If possible, institutionalize goals in appropriate ordinances, policies, or community master plans.

3. **Develop Implementation Plan**

    - Identify strategies to meet goals based on available resources, political climate and stakeholder needs. Produce timeline and identify parties responsible for each strategy.

Below is a checklist for implementing urban tree canopy goals:

❖ **Plant New Trees**

- Identify and prioritize planting sites community-wide
- Assess species diversity needs.
- Identify how trees will be maintained.

❖ **Protect & Maintain Existing Trees**

- Maintain tree protection ordinance and conservation easements.
- Ensure proper pruning in utility corridors.

❖ **Minimize & Restore Urban Tree Canopy Lost to Age, Mortality & Land Conversion**

- Specify strategies within a Comprehensive Land Use Plan
- Adopt subdivision, zoning, and landscape ordinances.

❖ **Promote Public Education & Awareness**

- Promote tree benefits (e.g., community website, newsletter, water bill insert)
- Promote proper tree planting (e.g., Arbor Day, workshops)
- Develop or participate in tree planting campaign

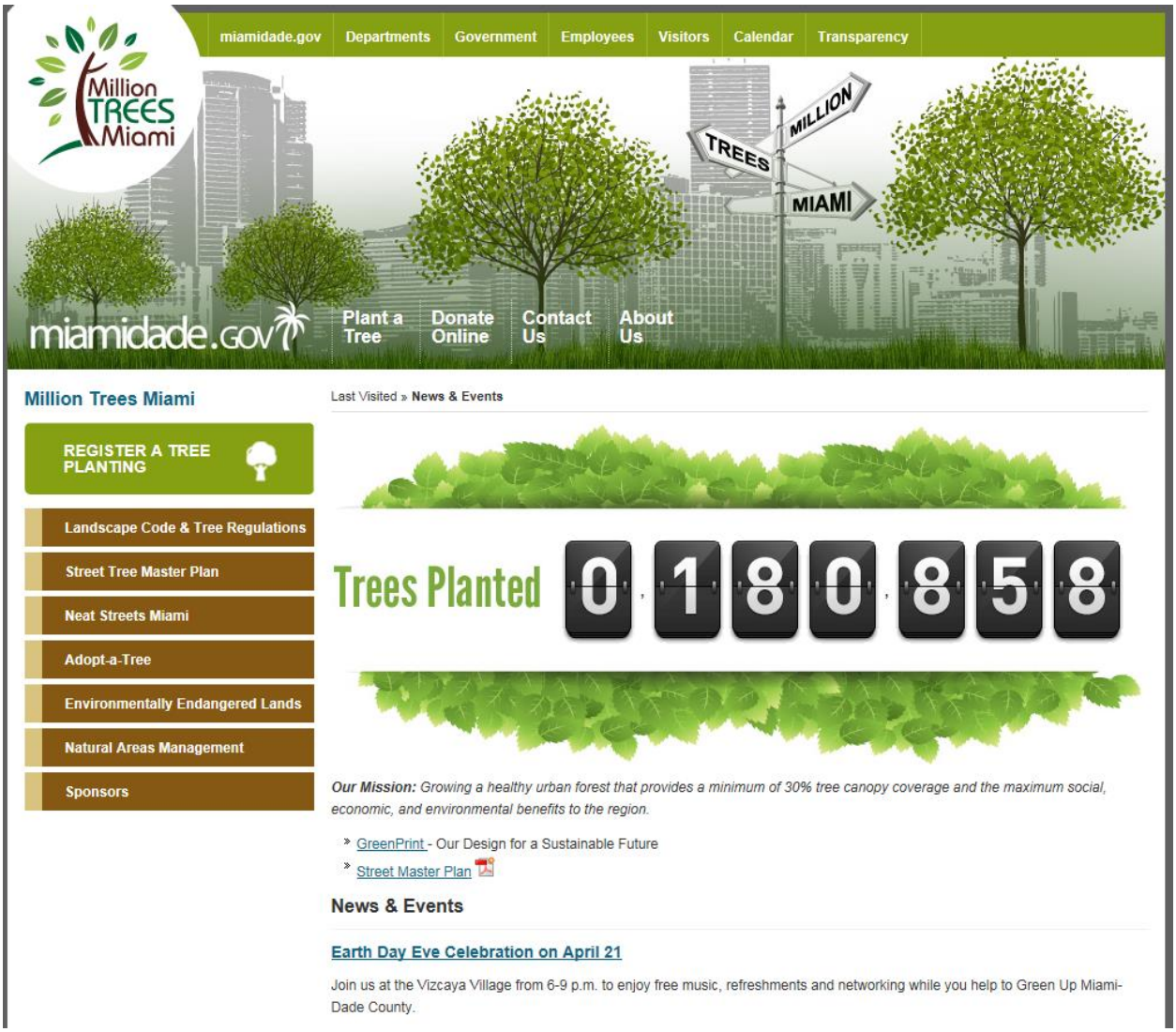


Figure 24 - Example of Miami-Dade's tree planting campaign and community website.

Section 6 – Additional Future Recommendations

LAS recommends that the inventory and the Plan be regularly updated so that the North Miami can sustain its program and accurately project future program and budget needs:

- Update the tree maintenance schedule and acquire the funds needed to promote public safety. Schedule work placing high priority tasks above routine maintenance.

- Perform routine inspections or "Windshield surveys" of public trees to evaluate changing conditions. Update the tree maintenance schedule and the budget as needed so that identified tree work may be performed efficiently.

- Conduct inspections of trees after all severe weather events. Utilize *TreeKeeper mobile* to record changes in tree condition and maintenance needs in the inventory database.

- Add new tree work to the schedule when work is identified through inspections or a citizen call process.

- If the recommended work cannot be completed as suggested in the Plan, modify maintenance schedules and budgets accordingly.

- Re-inventory the street ROW and parks in five to seven years, updating all data fields.

- Revise the Urban Tree Canopy Master Plan after five or seven years when the re-inventory has been completed.

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City of North Miami - Tree Management Zones

Legend

North Miami Municipal Boundary

Tree Management Zones

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

City of North Miami Beach

State of Florida Property

City of North Miami Beach

State of Florida Property

State of Florida Property

State of Florida Property

State of Florida Property

State of Florida Property

City of North Miami Beach

City of North Miami Beach

Florida International University

Florida International University

State of Florida Property

Unincorporated Miami-Dade County

Unincorporated Miami-Dade County

Unincorporated Miami-Dade County

Unincorporated Miami-Dade County

Unincorporated Miami-Dade County

Unincorporated Miami-Dade County

Unincorporated Miami-Dade County

Village of Biscayne Park

Unincorporated Miami-Dade County

City of North Miami Beach

Biscayne Bay

NE 135TH ST

NE 6TH AVE

0 0.5 1 2 3 4 Miles

N W E S

City of North Miami - Planting Locations Map

Legend

North Miami Municipal Boundary

Planting Site Types

- Large Planting Sites (1027)
- Small Planting Sites (887)
- Stumps (70)

Planting Site Specifications:

Large Planting Sites meet the following specifications: at least 3 feet from the edge of the street pavement and sidewalk or property line; the planting swale must be at least 6 feet wide or more (which is typical); a minimum of 10 feet from driveways and property line of adjacent property; at least 10 feet from any utility poles; a minimum of 15 feet from street lights; a minimum of 30 feet apart; a minimum of 30 feet from existing trees in the swale and on private property; large trees will not be located under utilities.

Small or "Other" Planting Sites may not meet the specifications above for large trees, but are suitable for small trees no greater than 15 feet in height.

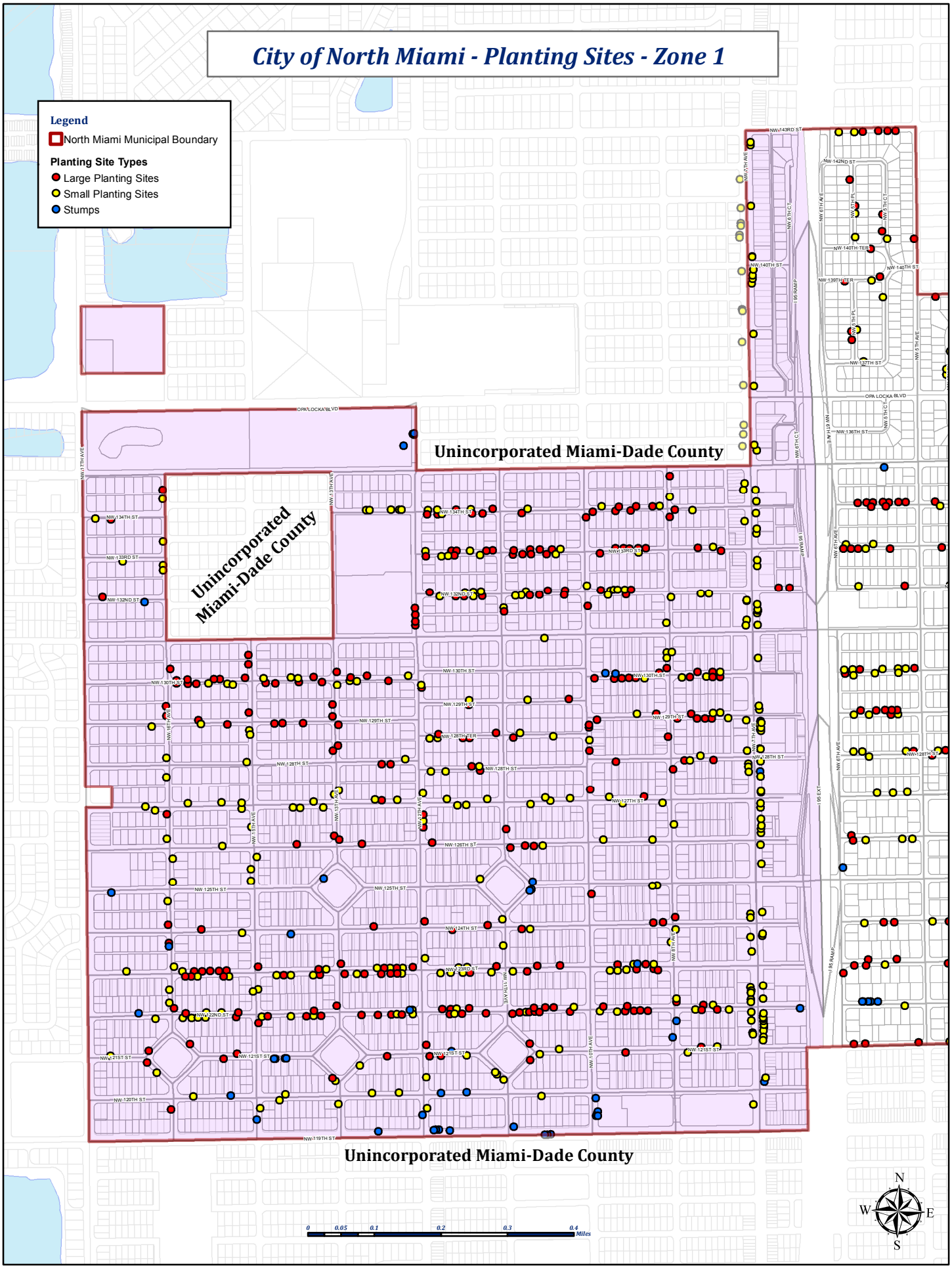
Map Created by: Legacy Arborist Services - Erin Givens. May 2015.

City of North Miami Beach
State of Florida Property
City of North Miami Beach
State of Florida Property
State of Florida Property
State of Florida Property
City of North Miami Beach
City of North Miami Beach
State of Florida Property
State of Florida Property
Florida International University
Florida International University
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Village of Biscayne Park
Unincorporated Miami-Dade County
City of North Miami Beach
Biscayne Bay
NE 135TH ST
NE 125TH ST
Memorial Park
Arch Creek Historic Preserve

0 0.5 1 2 3 4 Miles

N W E S

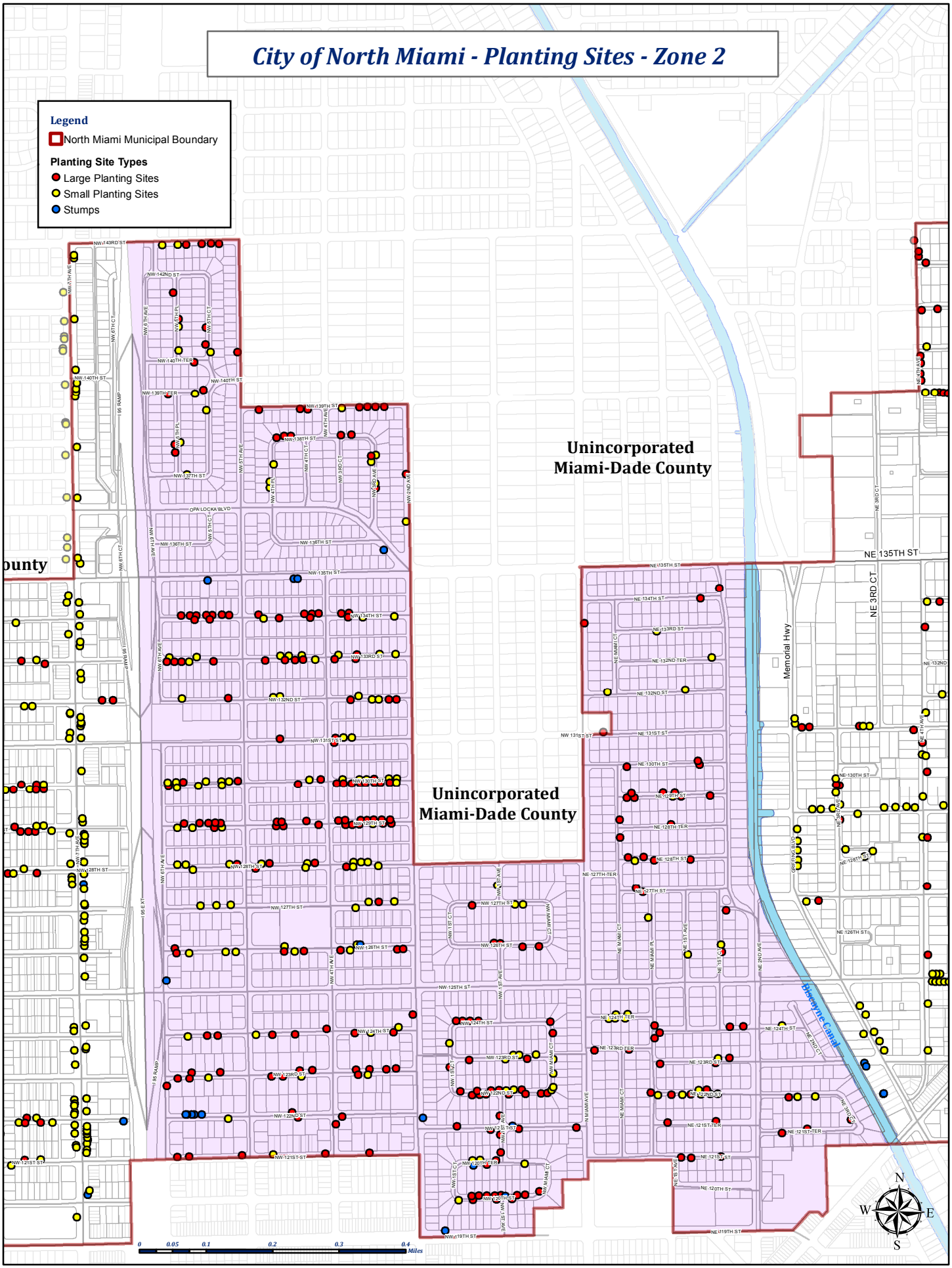
City of North Miami - Planting Sites - Zone 1



Projection: NAD State Plane East
Map Scale: 1 in = 1,000 ft

Map by: Legacy Arborist Services (E. Givens)
Map Date: May 15, 2015

City of North Miami - Planting Sites - Zone 2



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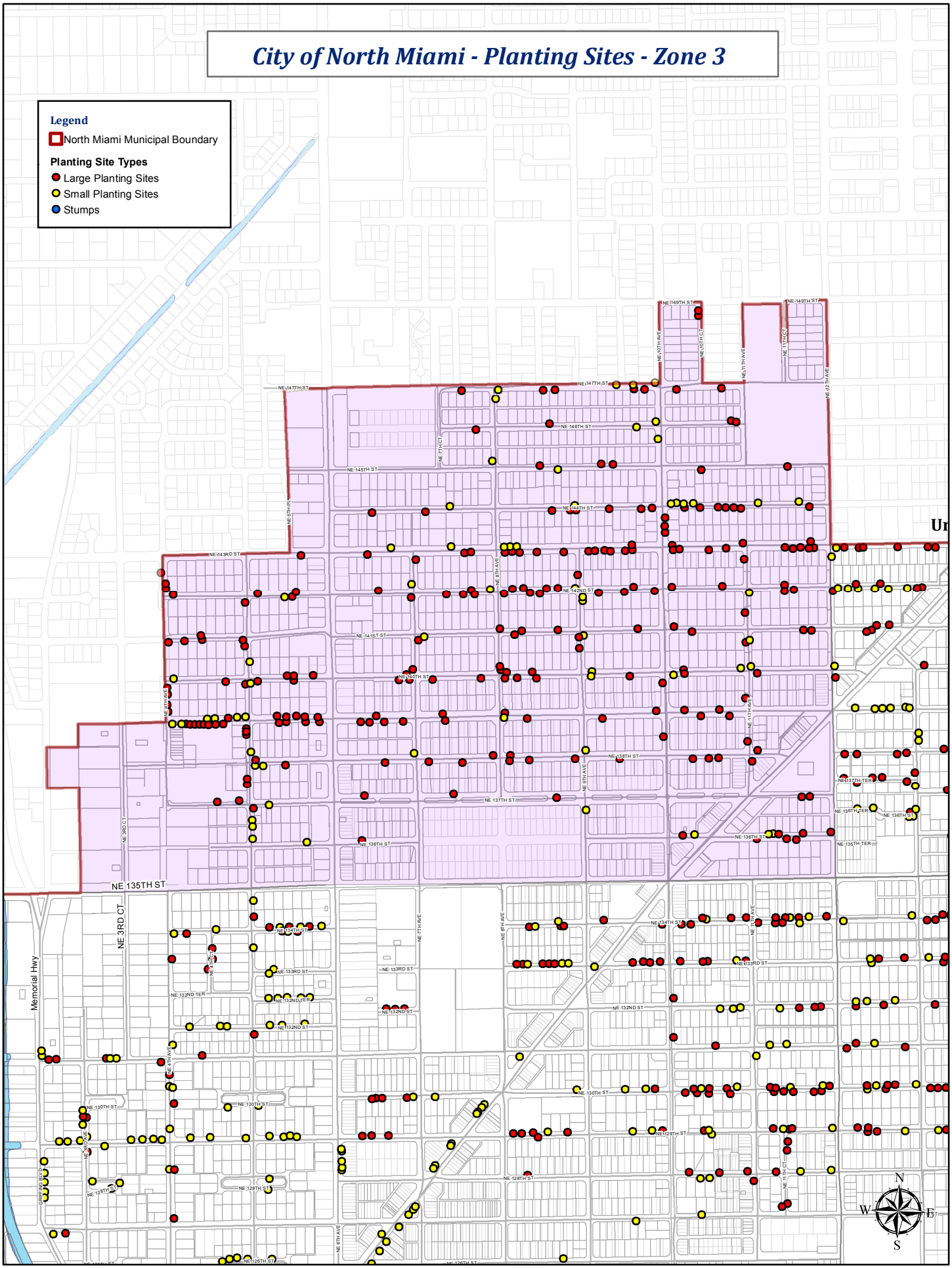
Map by: Legacy Arborist Services (E. Givens)
Map Date: May 15, 2015

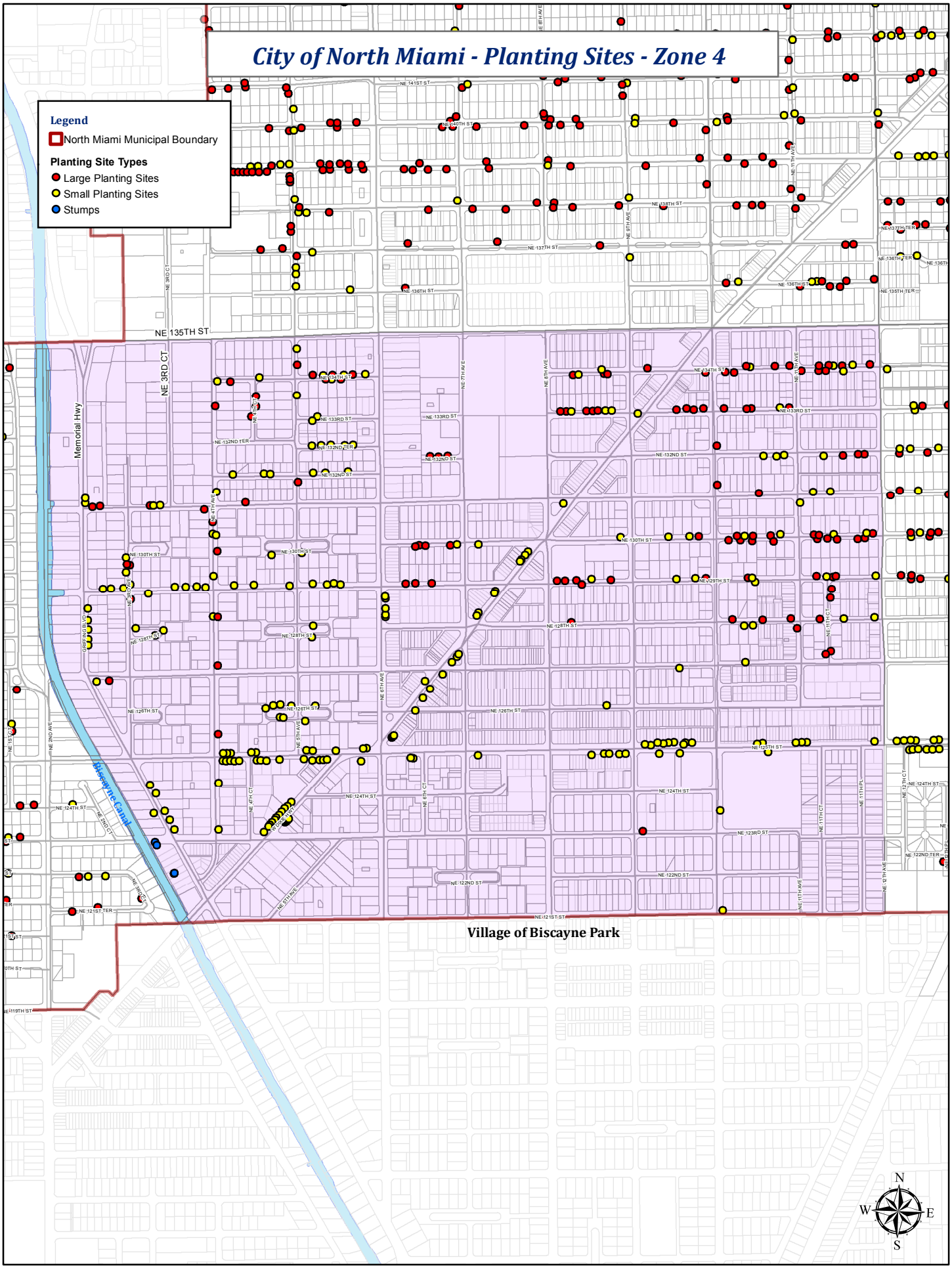
City of North Miami - Planting Sites - Zone 3



0 0.05 0.1 0.2 0.3 0.4 Miles

Projection: NAD State Plane East
Map Scale: 1 in = 1,000 ft

Map by: Legacy Arborist Services (E. Givens)
Map Date: May 15, 2015



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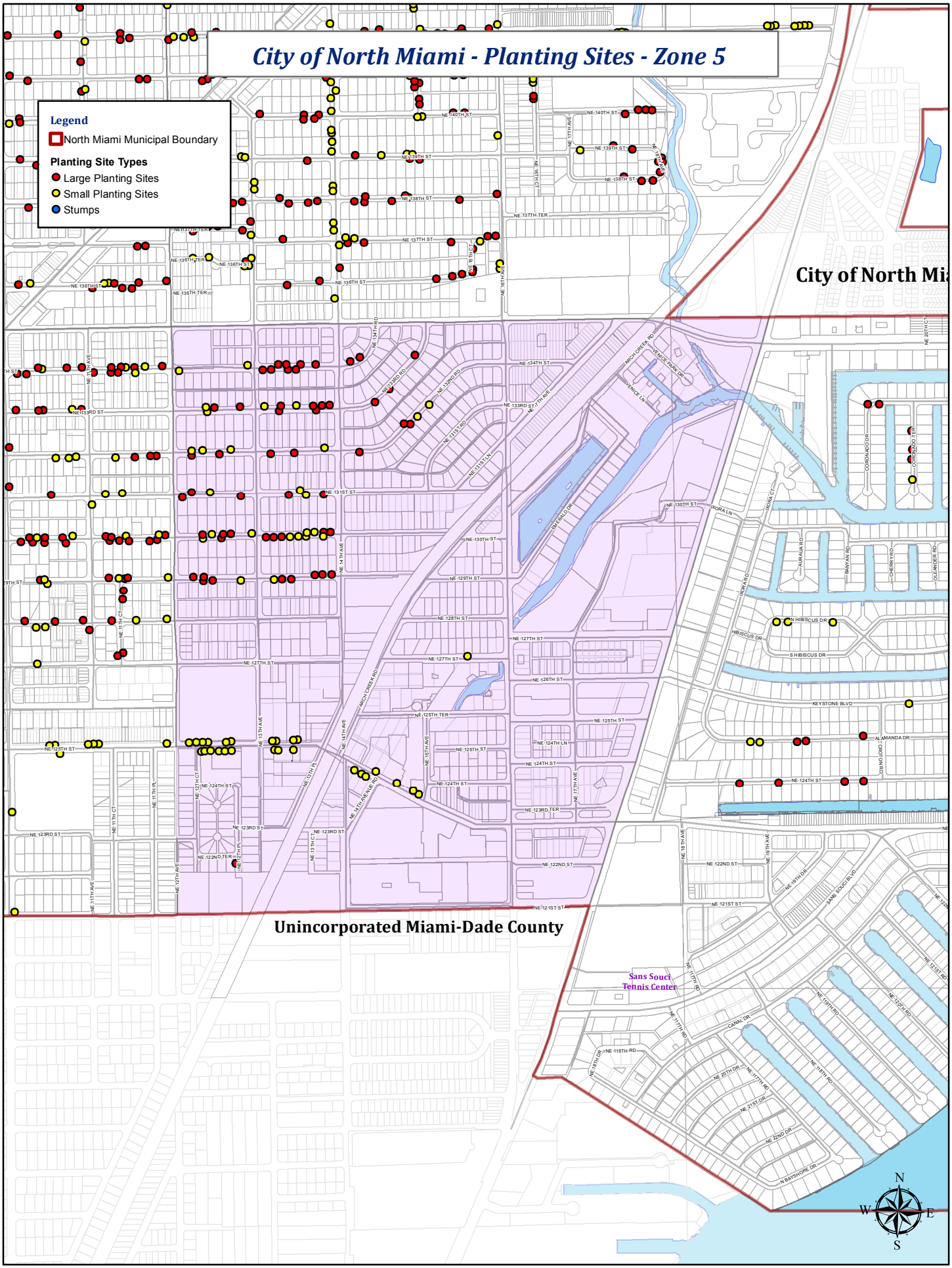
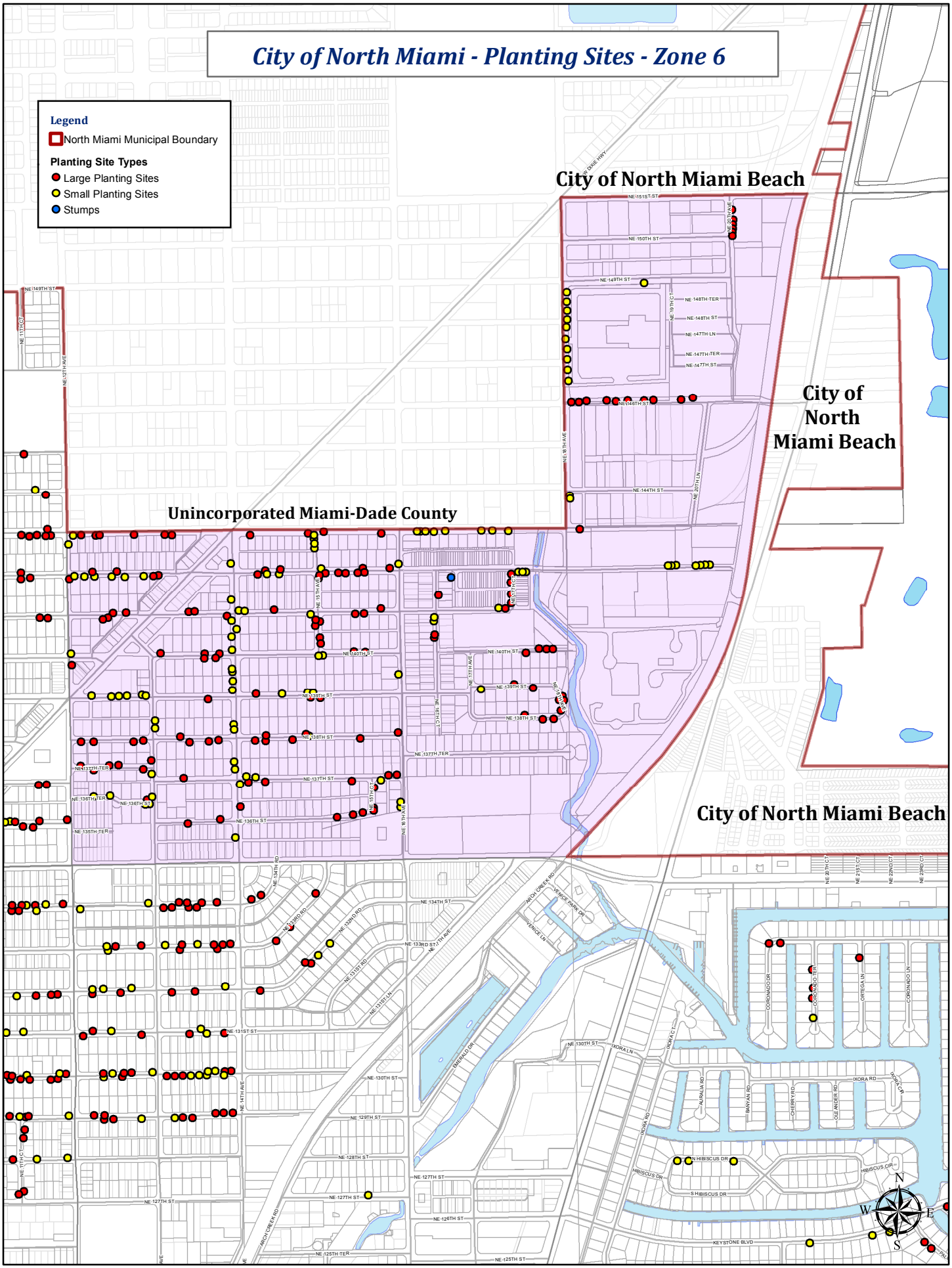
Map by: Legacy Arborist Services (E. Givens)
Map Date: May 15, 2015



0 0.05 0.1 0.2 0.3 0.4 Miles

Projection: NAD State Plane East
Map Scale: 1 in = 1,000 ft

Map by: Legacy Arborist Services (E. Givens)
Map Date: May 15, 2015



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Map by: Legacy Arborist Services (E. Givens)
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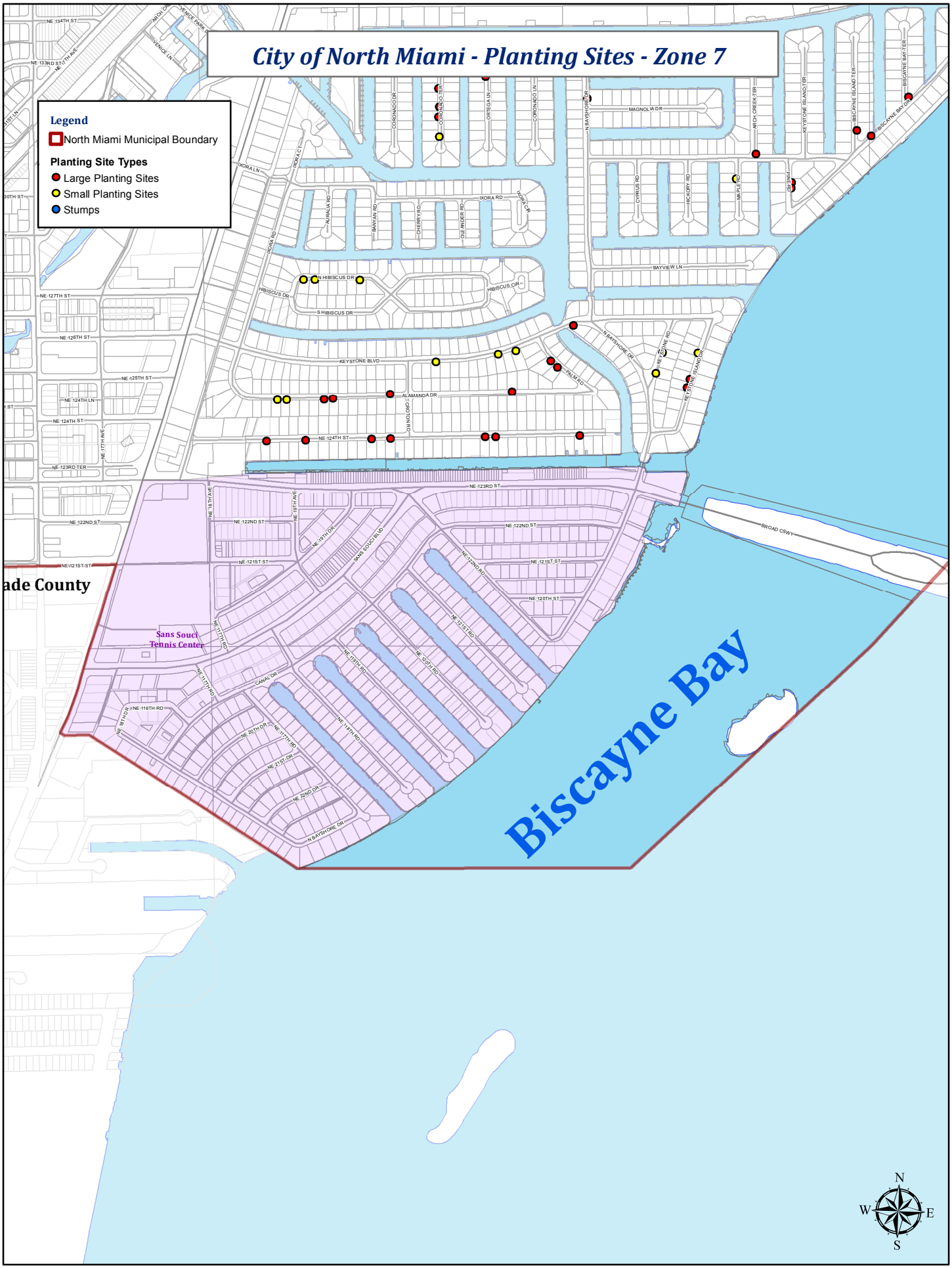

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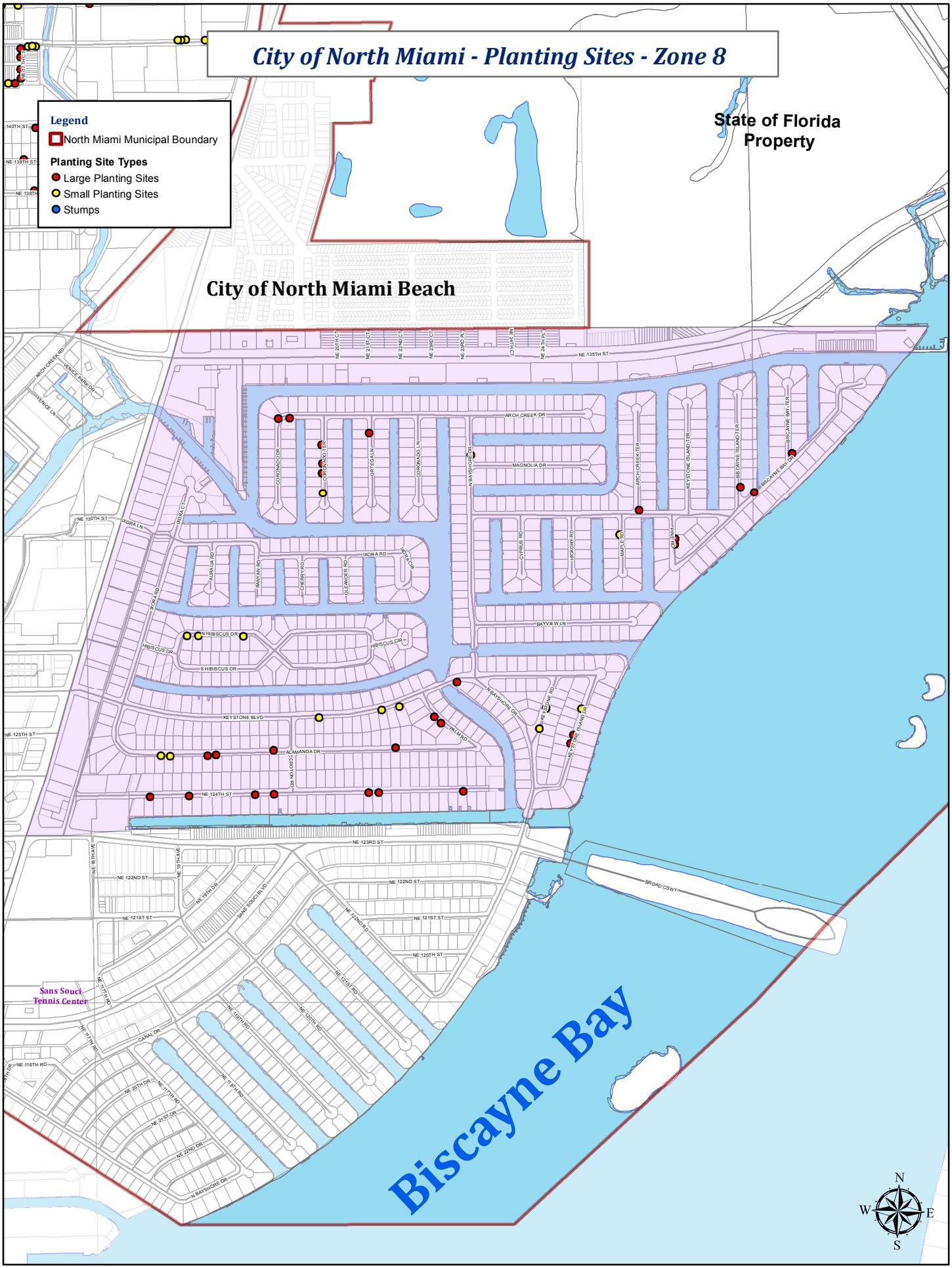
Map by: Legacy Arborist Services (E. Givens)
Map Date: May 15, 2015



Projection: NAD State Plane East
Map Scale: 1 in = 1,000 ft

Map by: Legacy Arborist Services (E. Givens)
Map Date: May 15, 2015

City of North Miami - Downtown Corridor Planting Sites

Legend

- North Miami Municipal Boundary
- Downtown Corridor Planting Sites (219)

City of North Miami Beach
State of Florida Property
City of North Miami Beach
State of Florida Property
State of Florida Property
State of Florida Property
City of North Miami Beach
City of North Miami Beach
State of Florida Property
State of Florida Property
Florida International University
Florida International University
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
State of Florida Property
City of North Miami Beach
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Village of Biscayne Park
Unincorporated Miami-Dade County
Biscayne Bay

0 0.5 1 2 3 4 Miles

N W E S

City of North Miami - High Priority Pruning

Legend

North Miami Municipal Boundary

High Priority Pruning

- Priority 1 Prune (311)
- Priority 2 Prune (1353)

City of North Miami Beach
State of Florida Property
City of North Miami Beach
State of Florida Property
State of Florida Property
State of Florida Property
City of North Miami Beach
City of North Miami Beach
State of Florida Property
State of Florida Property
Florida International University
Unincorporated Miami-Dade County
State of Florida Property
Florida International University
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
City of North Miami Beach
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Unincorporated Miami-Dade County
Village of Biscayne Park
Unincorporated Miami-Dade County
Biscayne Bay

0 0.5 1 2 3 4 Miles

N W E S

City of North Miami - High Priority Removals