



LANDSCAPE PERFORMANCE SERIES

1100 Block of Lincoln Road Mall¹ Methodology for Landscape Performance Benefits



Figure 1 & 2. Before and after images of *1100 Block of Lincoln Road Mall*. Courtesy of Raymond Jungles Inc.

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This document is a supplemental worksheet that elaborates on the environmental, social, and economic performance benefits of the *1100 Block Streetscape of Lincoln Road Mall* that were identified through case study research conducted between March and August of 2014. The research was part of the 2014 Case Study Investigation (CSI) Program funded by the Landscape Architecture Foundation (LAF). The complete findings of the research are published as a brief in the *Case Study Briefs* database of LAF's *Landscape Performance Series*. This worksheet lists all performance benefits identified and specifies the methods employed in their determination and/or calculation.

Environmental

Performance Benefit 1

Sequesters approximately 8,900 lbs of CO₂ annually through 71 trees, 61 of which are newly planted.

Methodology

To determine the CO₂ captured by the trees on the streetscape, the research fellow utilized the tree value calculator provided by the website www.treebenefits.com. The tree value calculator is based upon the iTree Streets software program developed by the USDA Forest Service for approximating street tree benefits (<http://www.itreetools.org>). The tree value calculator required the research fellow to identify the trunk diameter-at-breast-height (DBH) sizes of the tree species on site.

¹ This document can be cited as: Özer, E. (2014). *Methodology for Landscape Performance Benefits: 1100 Block Streetscape of Lincoln Road Mall*. Landscape Performance Series Case Study Briefs Database, Landscape Architecture Foundation. Retrieved from https://lafoundation.org/?page_id=728&template_id=31&preview=true

² The research assistants assisted the research fellow during two days of on-site people counts, one day of user surveys, and one day of tree caliper measurements. The research fellow performed all other data gathering, data analyses, documentation of findings, and writing.

Since some of the plant materials on the landscape architect's planting plan were replaced after the completion of the project, the research fellow crosschecked the plants on the planting plan with the plants on site. At the time of her investigation, June 2014, the site included 6 live oaks, 6 bald cypresses, 6 sabal palms, 7 pond apples, 15 coconut palms, 23 thatch palms, 3 bridalveils, 1 Guiana chestnut, and 4 red mangroves. The research team members were able to measure the DBH of most trees on site (table 1) with the exclusion of 3 bald cypresses, 3 pond apples, and 4 red mangroves that were inaccessible or were difficult to measure. For those trees, the research fellow used the DBH information provided in the landscape architect's original planting list, or estimated the size based on tree heights.

Tree	DBH (inches) 4.5 ft from ground
live oak #1	18
live oak #2	19.5
live oak #3	12
live oak #4	11
live oak #5	12.5
live oak #6	11.5
Average	14.1

Tree	DBH (inches) 4.5 ft from ground
bald cypress #1	16
bald cypress #2	25
bald cypress #3	12
bald cypress #4*	24
bald cypress #5*	24
bald cypress #6*	24
Average	20.8

Tree	DBH (inches) 4.5 ft from ground
sabal palm #1	10
sabal palm #2	9
sabal palm #3	9
sabal palm #4	9
sabal palm #5	11.5
sabal palm #6	11
Average	9.9

Tree	DBH (inches) 4.5 ft from ground
pond apple #1	2.5
pond apple #2	2.5
pond apple #3	3
pond apple #4	2.5
pond apple #5*	4
pond apple #6*	4
pond apple #7*	4
Average	3.2

Tree	DBH (inches) 4.5 ft from ground
coconut palm #1	9
coconut palm #2	10
coconut palm #3	9
coconut palm #4	8.5
coconut palm #5	8.5
coconut palm #6	7
coconut palm #7	7
coconut palm #8	11
coconut palm #9	11
coconut palm #10	11
coconut palm #11	12
coconut palm #12	9
coconut palm #13	10
coconut palm #14	9.5
coconut palm #15	12
Average	9.6

Tree	DBH (inches) 4.5 ft from ground
thatch palm #1	4
thatch palm #2	3
thatch palm #3	4
thatch palm #4	2.5
thatch palm #5	3.5
thatch palm #6	3.5
thatch palm #7	3
thatch palm #8	4
thatch palm #9	4
thatch palm #10	4
thatch palm #11	5
thatch palm #12	5
thatch palm #13	4.5
thatch palm #14	4
thatch palm #15	5
thatch palm #16	5.5
thatch palm #17	3.5
thatch palm #18	3.5
thatch palm #19	4
thatch palm #20	3.5
thatch palm #21	4.5
thatch palm #22	4
thatch palm #23	4.5
Average	4.0

Tree	DBH (inches) 4.5 ft from ground
bridalveil #1	3.5
bridalveil #2	4
bridalveil #3	3.5
Average	3.7

Tree	DBH (inches) 4.5 ft from ground
Guiana chestnut	19
Average	19.0

Table 1. Trunk diameters-at-breast-height (DBH) for the trees used in the landscape design (* denotes the trees for which DBH measurements were not possible to measure on site).



Figure 3. Site measurements for DBH values.

The research fellow entered the measurements into the tree value calculator (<http://www.treebenefits.com/calculator/>) to calculate the annual carbon sequestration amounts shown in table 2.

Scientific name	Common name	Average DBH (inches) 4.5 ft from ground	Average CO2 sequestered by one tree (lbs)	Quantity of trees	Total CO2 sequestered (lbs)
<i>Quercus virginiana</i>	live oak	14.1	518	6	3108
<i>Taxodium distichum</i>	bald cypress	20.8	396	6	2376
<i>Pachira aquatica</i>	Guiana chestnut	19	606	1	606
<i>Sabal palmetto</i>	sabal palm	9.9	56	6	336
<i>Cocos nucifera</i>	coconut palm	9.6	85	15	1275
<i>Coccothrinax argentata</i>	silver thatch palm	4	31	7	217
<i>Thrinax radiata</i>	green thatch palm	4	31	16	496
<i>Caesalpinia granadillo</i>	bridalveil	3.7	51	3	153
<i>Rhizophora mangle</i>	red American mangrove	2.5	35	4	140
<i>Annona glabra</i>	pond apple	3.2	27	7	189
Total				71	8896

Table 2. Trees' potential for carbon sequestration.

Limitations of methodology

- The online calculator does not assess non-tree vegetation such as shrubs, groundcovers, and aquatic plants that cover an area of 7,637 sq ft on the site.
- The online calculator does not list all tree species that were used in the project. Therefore, the calculations include some values calculated using generic species of similar kind.

Performance Benefit 2

Reduces air temperatures on the streetscape by an average of 1.4°F when compared to the adjacent 1200 block, which closely resembles the state of the 1100 block prior to the redevelopment.

Methodology

This benefit was calculated through direct measurement of on-site air temperatures taken hourly over an 8 hour period on two separate days.

The research fellow was interested in measuring the impact of the design on air temperatures. However, pre-development data was not available at the time of this research. During review of the pre-development aerials of the site, it was identified that the pre-development conditions of the 1100 block closely resemble the current conditions of the adjacent 1200 block (figures 6 and 7). Therefore, the fellow decided to use the 1200 block as a base condition for a comparison study.



Figure 6. An aerial showing 1100 block's streetscape in 2008, prior to its redevelopment. Source: Google Earth.



Figure 7. Prior to the new design, the 1100 block's streetscape had included several royal palm trees planted along the sidewalks on both sides of the traffic lanes and on the central median.

Courtesy of Raymond Jungles, Inc.

The temperature measurement equipment included 4 Acu-Rite Wireless #00782 indoor/outdoor thermometers. Each of the thermometers hung suspended 2 feet above the ground in an apparatus constructed using 2 plastic milk crates, a metal hook, and a 1-inch-thick pine wood board insulating the thermometer from direct sunlight (figure 10).

On June 22, the research fellow sampled air temperatures at two locations on the 1100 block and two locations on the 1200 block (figure 8). On July 9, temperatures were measured at 2 additional locations on each block (figure 9). In order to develop a more accurate evaluation of the effect of design conditions on temperatures, the research fellow measured air temperatures at the same time at parallel locations on the 1100 and 1200 blocks under approximate conditions. For example, #1 (in figure 8) samples air temperatures over the 1200 block's concrete sidewalk while #2 samples air temperatures over a stone paved surface of the 1100 block. Similarly, #7 (in figure 9) samples air temperatures near an outdoor seating space of a café (Huahua's) on the 1200 block, while #8 samples air temperatures near an outdoor seating space of another café (Nespresso) on the 1100 block.

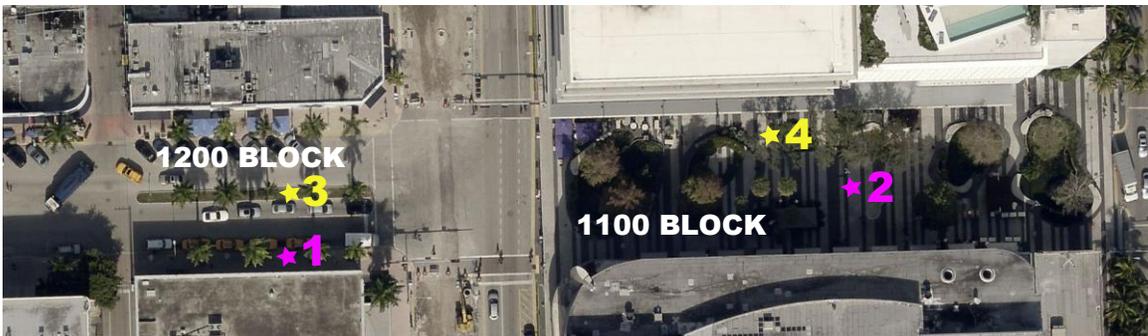


Figure 8. The locations sampled on June 22 are marked on the above aerial:

- 1**- Air temperatures above concrete sidewalk (1200 block)
- 2**- Air temperatures above natural stone paving (1100 block)
- 3**- Air temperatures above turf median near a royal palm (1200 block)
- 4**- Air temperatures above natural stone paving located near a planter with live oaks and groundcover (1100 block)



Figure 9. The locations sampled on July 9 are marked on the above aerial:

- 5**- Air temperatures above concrete sidewalk under an entry overhang (1200 block)
- 6**- Air temperatures above natural stone paving under a bald cypress (1100 block)
- 7**- Air temperatures above concrete sidewalk near a royal palm next to outdoor café seating (1200 block)
- 8**- Air temperatures above natural stone paving near a live oak next to outdoor café seating (1100 block)

Temperature data were recorded hourly throughout each observation day from 9am to 6pm. The recorded data is listed in table 7 and table 8.

Weather in Miami Beach on June 22 was mostly sunny with a mean temperature of 82 degrees. On July 9 the weather was sunny in the morning and rainy in the afternoon with a mean temperature of 83 degrees.



Figure 10. Temperature measurement apparatus.

		Temperatures read (°F) Sunday, 6/22/2014		
Time of day	Weather condition	1200 block (★1) above concrete sidewalk	1100 block (★2) above natural stone paving	Difference in temperature (°F)
9:00 AM	Sunny	85.3	84.7	0.6
10:00 AM	Sunny	88.7	87.7	1
11:00 AM	Partly cloudy	95	94.6	0.4
12:00 PM	Partly cloudy	94.6	94.2	0.4
1:00 PM	Partly cloudy-Rain	92.3	91.5	0.8
2:00 PM	Sunny	92.8	91.2	1.6
3:00 PM	Partly cloudy-Rain	95.9	94.8	1.1
4:00 PM	Thunderstorm	95.9	95.5	0.4
5:00 PM	Thunderstorm	92.1	90.1	2
Averages		92.5	91.6	0.9

		Temperatures read (°F) Sunday, 6/22/2014		
Time of day	Weather condition	1200 block (★3) above turf median, near a royal palm	1100 block (★4) above natural stone paving, near a live oak	Difference in temperature (°F)
9:00 AM	Sunny	84.5	84	0.5
10:00 AM	Sunny	84.8	84.7	0.1
11:00 AM	Partly cloudy	85.3	85.6	-0.3
12:00 PM	Partly cloudy	87.8	87.4	0.4
1:00 PM	Partly cloudy-Rain	88	84.6	3.4
2:00 PM	Sunny	87.1	86	1.1
3:00 PM	Partly cloudy-Rain	85.8	85.8	0
4:00 PM	Thunderstorm	86.9	88.3	-1.4
5:00 PM	Thunderstorm	85.1	84.4	0.7
Averages		86.1	85.6	0.5

Table 7. Temperatures measured between 9am and 5pm on June 22, 2014.

		Temperatures read (°F) Wednesday, 7/09/2014		
Time of day	Weather condition	1200 block (★5) above concrete sidewalk under an entry overhang	1100 block (★6) above natural stone paving under a bald cypress	Difference in temperature (°F)
9:00 AM	Mostly sunny	85.8	85.3	0.5
10:00 AM	Partly sunny	86.9	85.5	1.4
11:00 AM	Mostly sunny	90	88.7	1.3
12:00 PM	Mostly cloudy	91.8	89.6	2.2
1:00 PM	Mostly cloudy	90.3	85.5	4.8
2:00 PM	Mostly cloudy-Rain	79.2	76.6	2.6
3:00 PM	Rain-Thunderstorm	77.2	75.2	2
4:00 PM	Mostly cloudy-Rain	73.8	73.4	0.4
5:00 PM	Mostly cloudy-Rain	74.8	74.5	0.3
Averages		83.3	81.6	1.7

		Temperatures read (°F) Wednesday, 7/09/2014		
Time of day	Weather condition	1200 block (★7) above concrete sidewalk near a royal palm next to outdoor café seating	1100 block (★8) above natural stone paving near a live oak next to outdoor café seating	Difference in temperature (°F)
9:00 AM	Mostly sunny	85.5	83.3	2.2
10:00 AM	Partly sunny	86.5	83.3	3.2
11:00 AM	Mostly sunny	90	86.1	3.9
12:00 PM	Mostly cloudy	92.3	88.7	3.6
1:00 PM	Mostly cloudy	90.1	85.8	4.3
2:00 PM	Mostly cloudy-Rain	79	77.1	1.9
3:00 PM	Rain-Thunderstorm	75.9	75.3	0.6
4:00 PM	Mostly cloudy-Rain	74.1	73.2	0.9
5:00 PM	Mostly cloudy-Rain	74.8	73.7	1.1
Averages		83.1	80.7	2.4

Table 8. Temperatures measured between 9am and 5pm on July 9, 2014.

Calculation:

$(0.9+0.5+1.7+2.4)/4=1.4$ °F average reduced air temperatures on-site.

Limitations of methodology

- Although in its current state the 1200 block closely resembles the 1100 block's pre-development conditions, it should be noted that the planter in the middle of the 1100 block had 2 rows of palms while the median on the 1200 block has only 1 row of palms.

Social

Performance Benefit 3

Attracts 4,598 people on a typical weekday and 8,572 people on a typical weekend day during the summer.

Methodology

Visitor counts were taken during two separate site visits on June 22 and July 9, between 9:00 am and 5:00 pm. The 1100 Block Streetscape has three possible entry points (figure 11). One person observed each entry point and counted the visitors entering the site (figure 12).

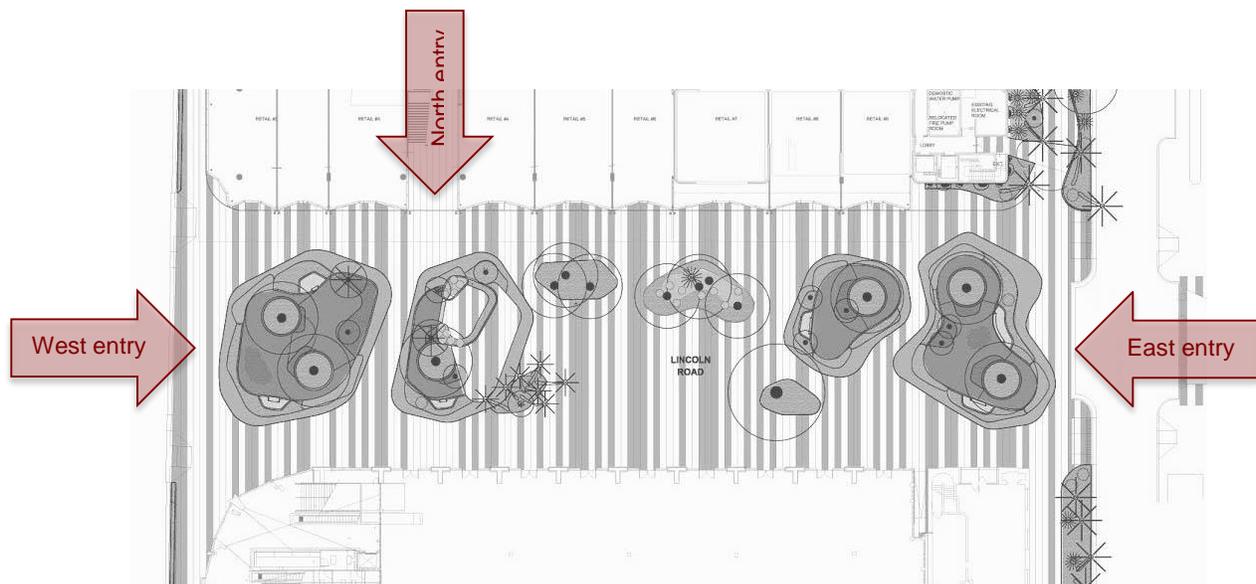


Figure 11. Visitors can enter the 1100 block from Alton Road on the west, from Lenox Avenue on the east, and from an entry at the 1111 parking structure.

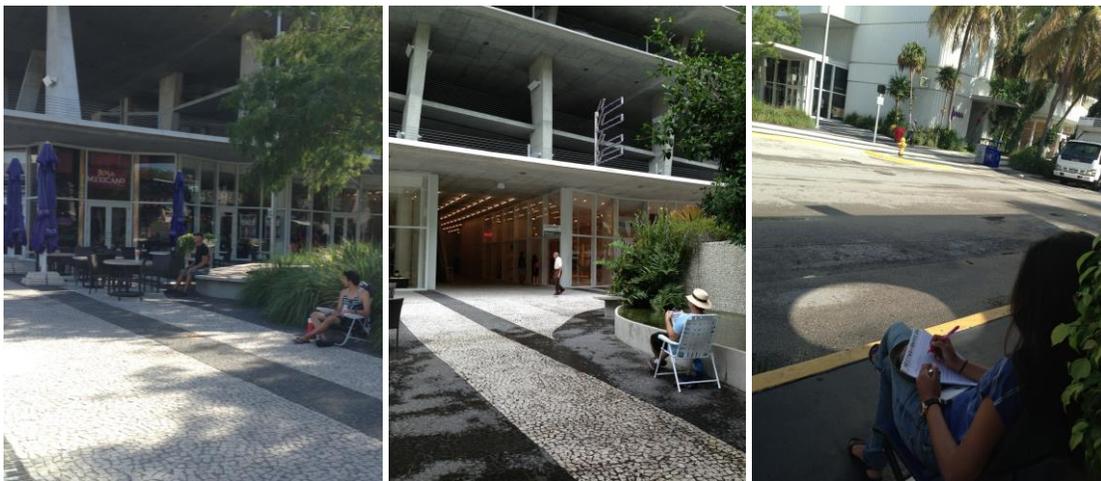


Figure 12. One person observed each point of entry to record the number of visitors.

Total counts - Wednesday, July 9, 2014			Total counts - Sunday, June 22, 2014		
Entered site	Totals	%	Entered site	Totals	%
By walking	4317	93.89	By walking	7942	92.65
On/with bike	204	4.44	On/with bike	375	4.37
On/with skateboard	11	0.24	On/with skateboard	35	0.41
On/with roller skates/scooter	13	0.28	On/with roller skates/scooter	15	0.17
By jogging	31	0.67	By jogging	88	1.03
With dog	22	0.48	With dog	117	1.36
	4598	100.00		8572	100.00

Table 9. Overall visitor counts of the 1100 block during a summer weekday and weekend day.

Time / Weather	Entered site	West entry	East entry	North entry	Hourly totals
9:00 AM - 10:00 AM					
Sunny Actual temp: 83° Feels like: 89° 72% Humidity	By walking	122	65	2	189
	On/with bike	18	12	0	30
	On/with skateboard	0	2	0	2
	On/with roller skates/scooter	0	0	0	0
	By jogging	5	14	1	20
	With dog	6	11	0	17
	Hourly totals	151	104	3	258
10:00 AM - 11:00 AM					
Sunny Actual temp: 84° Feels like: 91° 72% Humidity	By walking	244	57	5	306
	On/with bike	38	38	0	76
	On/with skateboard	0	0	0	0
	On/with roller skates/scooter	0	3	0	3
	By jogging	10	10	2	22
	With dog	6	6	0	12
	Hourly totals	298	114	7	419
11:00 AM - 12:00 PM					
Partly cloudy Actual temp: 87° Feels like: 94° 63% Humidity	By walking	298	275	31	604
	On/with bike	21	23	1	45
	On/with skateboard	2	1	0	3
	On/with roller skates/scooter	0	0	0	0
	By jogging	8	25	2	35
	With dog	6	13	2	21
	Hourly totals	335	337	36	708
12:00 PM - 1:00 PM					
Partly cloudy Actual temp: 89° Feels like: 97° 54% Humidity	By walking	388	475	103	966
	On/with bike	26	24	2	52
	On/with skateboard	0	5	2	7
	On/with roller skates/scooter	0	0	0	0
	By jogging	0	7	0	7
	With dog	6	6	2	14
	Hourly totals	420	517	109	1046
1:00PM - 2:00PM					
Partly cloudy - Rain Actual temp: 88° Feels like: 92° 53% Humidity	By walking	417	488	111	1016
	On/with bike	17	13	1	31
	On/with skateboard	0	0	1	1
	On/with roller skates/scooter	0	0	0	0
	By jogging	0	2	0	2
	With dog	6	6	3	15
	Hourly totals	440	509	116	1065
2:00 PM - 3:00 PM					
Sunny Actual temp: 88° Feels like: 96° 61% Humidity	By walking	569	837	123	1529
	On/with bike	23	16	2	41
	On/with skateboard	2	6	0	8
	On/with roller skates/scooter	0	0	2	2
	By jogging	0	0	0	0
	With dog	3	6	2	11
	Hourly totals	597	865	129	1591
3:00 PM - 4:00 PM					
Partly Cloudy - Rain Actual temp: 87° Feels like: 95° 65% Humidity	By walking	530	740	175	1445
	On/with bike	30	19	4	53
	On/with skateboard	2	0	3	5
	On/with roller skates/scooter	1	0	0	1
	By jogging	0	2	0	2
	With dog	4	3	4	11
	Hourly totals	567	764	186	1517
4:00 PM - 5:00 PM					
Thunderstorm Actual temp: 77° Feels like: 77° 76% Humidity	By walking	757	935	195	1887
	On/with bike	22	19	6	47
	On/with skateboard	5	2	2	9
	On/with roller skates/scooter	6	3	0	9
	By jogging	0	0	0	0
	With dog	6	8	2	16
	Hourly totals	796	967	205	1968
9:00 AM - 5:00 PM totals		3604	4177	791	8572

Table 10. Hourly visitor counts and weather conditions on June 22, 2014.

Time / Weather	Entered site	West entry	East entry	North entry	Hourly totals
9:00 AM - 10:00 AM					
	By walking	178	57	14	249
Mostly Sunny	On/with bike	18	19	0	37
Actual temp: 83°	On/with skateboard	0	1	0	1
Feels like: 105°	On/with roller skates/scooter	0	3	0	3
82% Humidity	By jogging	4	4	0	8
	With dog	0	2	0	2
	Hourly totals	200	86	14	300
10:00 AM - 11:00 AM					
	By walking	186	130	40	356
Partly Sunny	On/with bike	19	23	0	42
Actual temp: 86°	On/with skateboard	0	0	0	0
Feels like: 110°	On/with roller skates/scooter	0	2	0	2
71% Humidity	By jogging	2	2	0	4
	With dog	1	1	0	2
	Hourly totals	208	158	40	406
11:00 AM - 12:00 PM					
	By walking	263	252	75	590
Mostly Sunny	On/with bike	14	22	0	36
Actual temp: 86°	On/with skateboard	2	2	0	4
Feels like: 109°	On/with roller skates/scooter	0	0	0	0
71% Humidity	By jogging	8	1	0	9
	With dog	2	5	0	7
	Hourly totals	289	282	75	646
12:00 PM - 1:00 PM					
	By walking	270	388	161	819
Mostly Cloudy	On/with bike	18	20	0	38
Actual temp: 88°	On/with skateboard	3	0	0	3
Feels like: 103°	On/with roller skates/scooter	0	0	0	0
60% Humidity	By jogging	1	4	0	5
	With dog	3	1	0	4
	Hourly totals	295	413	161	869
1:00PM - 2:00PM					
	By walking	449	342	86	877
Mostly Cloudy	On/with bike	15	6	0	21
Actual temp: 89°	On/with skateboard	0	0	0	0
Feels like: 107°	On/with roller skates/scooter	2	0	0	2
60% Humidity	By jogging	3	1	0	4
	With dog	2	1	1	4
	Hourly totals	471	350	87	908
2:00 PM - 3:00 PM					
	By walking	161	221	94	476
Mostly Cloudy / Rain	On/with bike	4	5	0	9
Actual temp: 91°	On/with skateboard	1	0	0	1
Feels like: 102°	On/with roller skates/scooter	0	2	1	3
56% Humidity	By jogging	0	0	0	0
	With dog	1	2	0	3
	Hourly totals	167	230	95	492
3:00 PM - 4:00 PM					
	By walking	162	193	94	449
Rain / Thunderstorm	On/with bike	3	7	0	10
Actual temp: 81°	On/with skateboard	0	1	0	1
Feels like: 82°	On/with roller skates/scooter	1	0	0	1
71% Humidity	By jogging	0	1	0	1
	With dog	0	0	0	0
	Hourly totals	166	202	94	462
4:00 PM - 5:00 PM					
	By walking	208	207	86	501
Mostly Cloudy / Rain	On/with bike	8	2	1	11
Actual temp: 76°	On/with skateboard	1	0	0	1
Feels like: 86°	On/with roller skates/scooter	0	1	1	2
87% Humidity	By jogging	0	0	0	0
	With dog	0	0	0	0
	Hourly totals	217	210	88	515
	9:00 AM - 5:00 PM totals	2013	1931	654	4598

Table 11. Hourly visitor counts and weather conditions on July 9, 2014.

Limitations of methodology

- The research team members were only able to count the entry numbers, not the duration of stay. Therefore they couldn't determine the number of visitors actually visiting the site for extended periods rather than merely passing through.
- Visitor counts were limited to a single day on a weekday and a single day on a weekend. Increasing the number of days counted could yield daily variations and reveal visitor averages.
- The CSI program runs through the summer months, which is actually the low season for Miami Beach tourism. Visitor counts could have been significantly higher if the study was conducted during the high tourism season. The *2013 Visitor Industry Overview* report of the Greater Miami Convention & Visitors Bureau (<http://www.miamiandbeaches.com/visitor-resources>) indicates that 2013 June arrivals to Miami International Airport were 1,704,807, while 2013 December arrivals were 1,915,827 (%12.4 higher).

Performance Benefits 4, 5, and 6

Makes shopping, dining, and lingering experiences more comfortable compared to the other blocks of Lincoln Road Mall for 91% of the 71 survey respondents visiting the streetscape.

Provides a safe and secure environment for 96% of survey respondents visiting the streetscape. Main reasons cited were the open design and fact that it is well-lit at night.

Improves perception of the City of Miami Beach for 63% of the survey respondents.

Methodology

To measure the social performance benefits of the 1100 Block Streetscape, the research fellow developed a voluntary, on-site survey. The surveys were conducted on site on July 19, 20, and 22. A total of 71 adults participated in the survey.



Figure 11. Research fellow and the research assistant conducting user surveys on-site.
Survey findings:

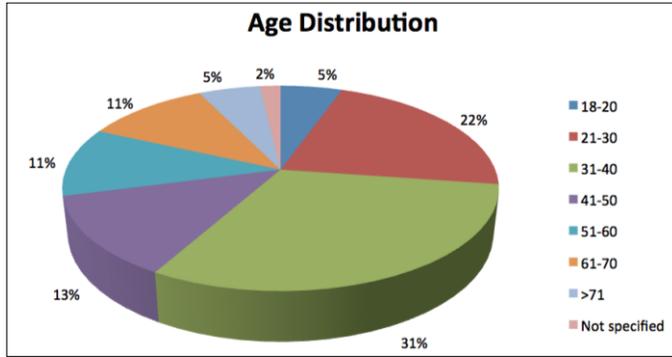


Table 12. 31% of the survey participants were between 31-40 years old, while 22% were 21-30, 13% were 41-50, and 11% were 61-70.

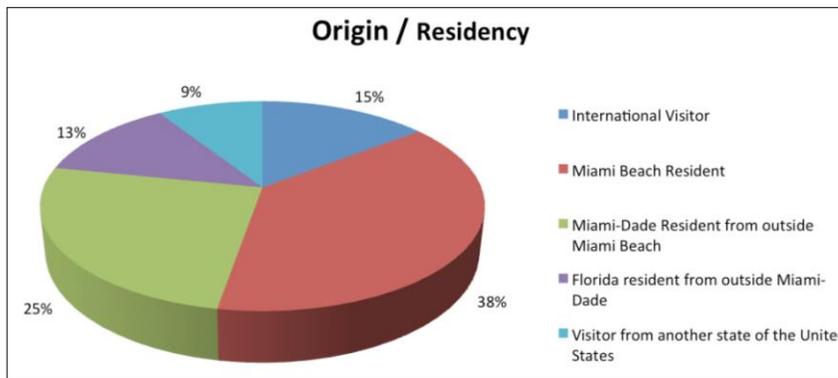


Table 13. 38% of the survey participants identified themselves as Miami Beach residents, while 25% self identified as Miami-Dade county residents from outside Miami Beach, 15% identified as international visitors, 13% identified as Florida residents from outside Miami-Dade county, and 9% identified as out-of-state visitors.

Out-of-state visitors surveyed included individuals from New York, Massachusetts, Maine, Tennessee, Connecticut, and California. International visitors surveyed included individuals from Denmark, Italy, France, Canada, Argentina, Colombia, and Peru.

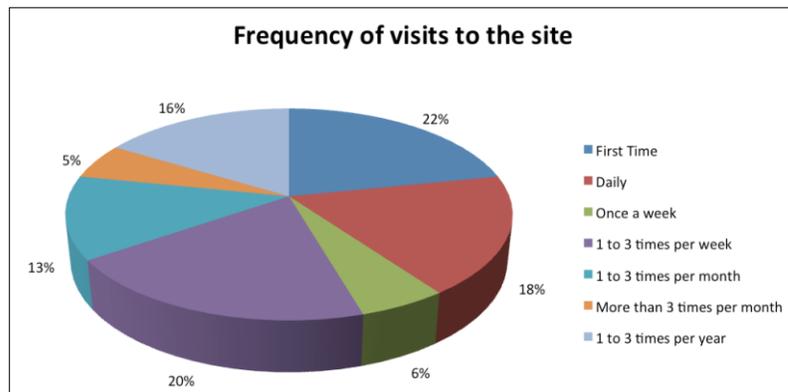


Table 14. 22% of the survey participants were visiting the 1100 block of the Lincoln Road for the first time, while 18% visited daily, 20% visited one to three times a week, and 16% visited one to three times a year.

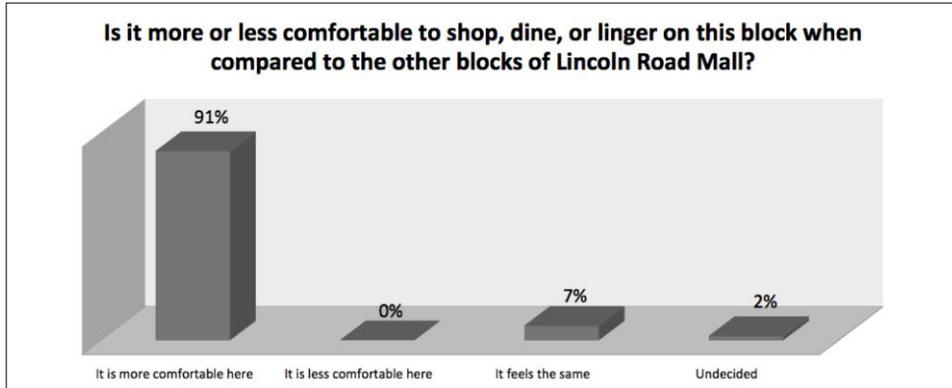


Table 15. 91% of the survey participants felt that shopping, dining, and lingering is more comfortable on the 1100 block of the Lincoln Road Mall.

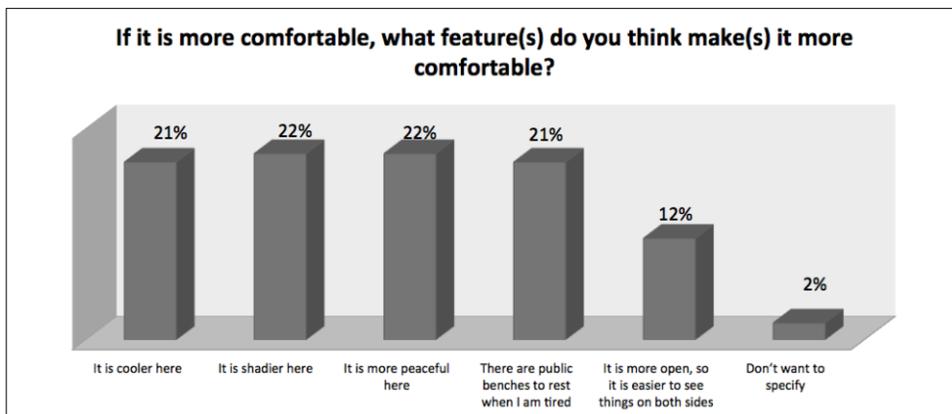


Table 16. According to the survey participants who thought that the 1100 block was more comfortable for shopping, dining, and lingering than other parts of Lincoln Road Mall, the reason they felt this way was evenly divided between 4 options provided which included: 1) it is cooler, 2) it is shadier, 3) it is more peaceful, and 4) it has public benches to rest. Additionally, several participants noted that they felt that the 1100 block was “Designed better”. Other significant comments included: “My children like to play with the ponds here. I shop more comfortable when my husband and children are having fun outside”, “Smooth circulation”, and “It has a character, the rest is just cafes and shops”.

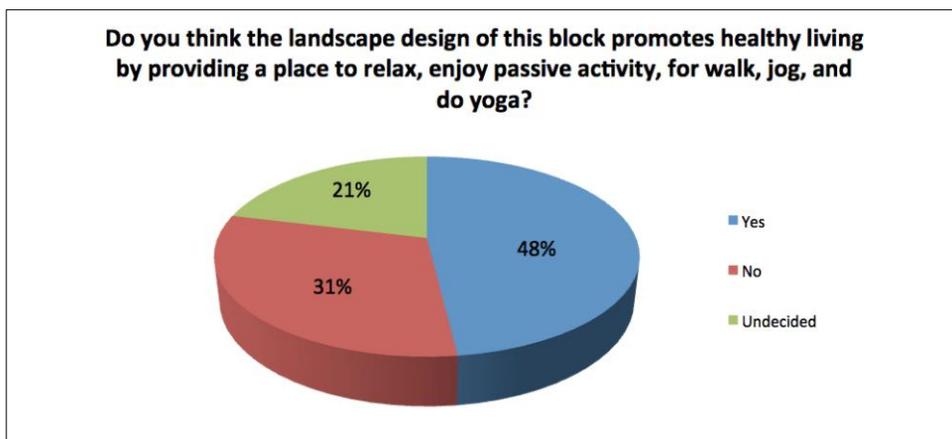


Table 17. 48% of survey participants think the landscape design of the 1100 streetscape promotes healthy living by providing a place to relax, enjoy passive activity, walk, jog, and do yoga.

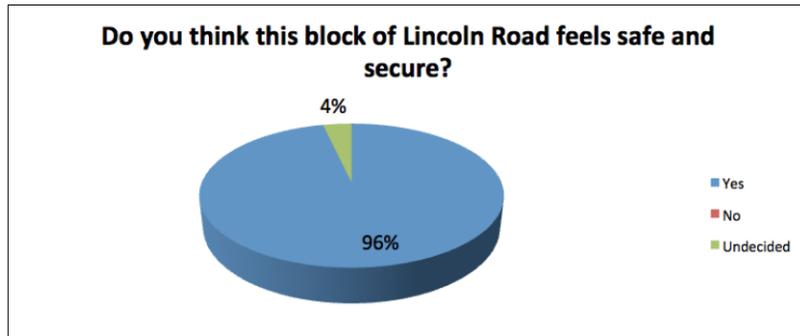


Table 18. 96% of the survey participants felt safe and secure in the 1100 block.

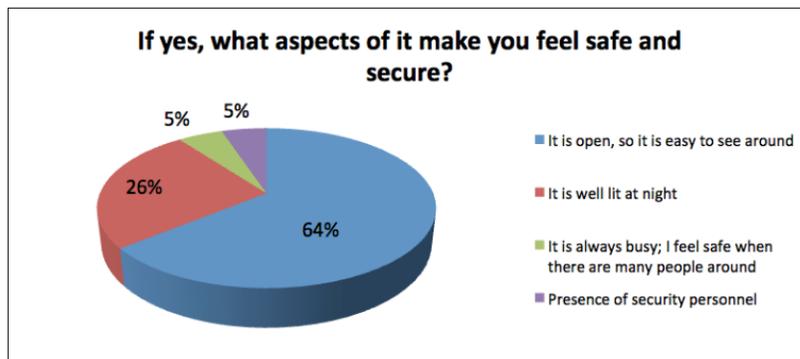


Table 19. 64% of the survey participants felt safe and secure in 1100 block primarily because of its open design, which allows visitors to easily see around. 26% of the participants thought the streetscape is well lit at night.

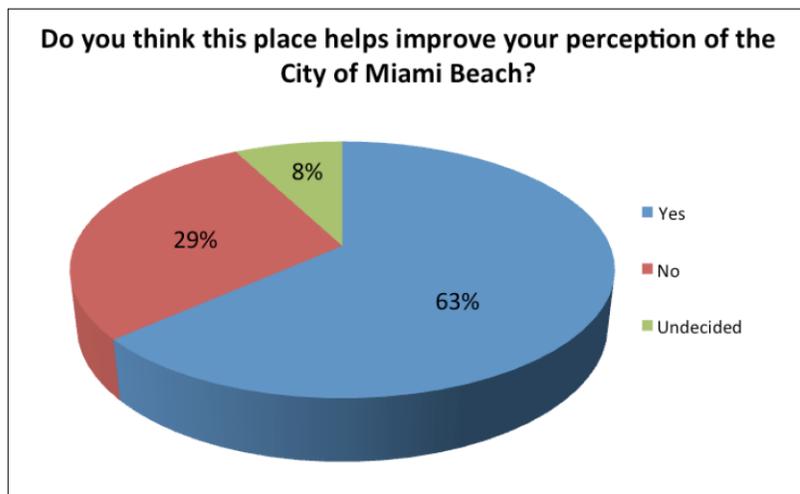


Table 20. 63% of the survey participants felt that the 1100 block's streetscape helps to improve their perception of the city.

Economic

Performance Benefit 7

Contributed to an 85% increase in the total assessed value of properties within a half-block of the streetscape from 2010 to 2013. This led to a \$1,211,480 (80%) increase in property tax revenues. During the same period, gross property values for the entire City of Miami Beach increased by only 12%.

Methodology

Assessed property value data obtained from the Miami-Dade Property Appraiser (<http://www.miamidade.gov/PaPortal/PRC/PRCdisplay.aspx?prcYear=2012&prcFol=0232340180080>) to calculate the change in property values of buildings located within a half-block distance from the 1100 Block Streetscape.



Figure 12. The 1100 block streetscape is highlighted in green and the examined properties are highlighted in pink.

Map Ref #	Property Address	Assessed Property Values				% Change 2010 to 2013
		2010	2011	2012	2013	
1	1111 LINCOLN RD	23,588,885	38,324,061	42,912,501	47,477,888	101.27%
2	1100 LINCOLN RD	37,740,000	41,514,000	45,665,400	98,000,000	159.67%
3	1035 LINCOLN RD	6,490,000	7,139,000	7,852,900	8,638,190	33.10%
4	1031 LINCOLN RD	0	0	1,358,464	1,494,310	N/A
5	1029 LINCOLN RD	2,687,500	2,600,000	2,860,000	3,146,000	17.06%
6	1040 LINCOLN RD	3,546,998	3,901,697	4,291,866	4,721,052	33.10%
7	1036 LINCOLN RD	12,000,000	10,300,000	10,770,000	11,847,000	-1.28%
8	1634 ALTON RD	2,761,850	2,761,850	2,761,850	2,761,850	0.00%
9	1624 ALTON RD	991,365	1,090,501	965,725	956,151	-3.55%
10	1209 LINCOLN RD	3,174,000	3,320,000	3,300,000	3,630,000	14.37%
11	1656 ALTON RD	2,397,386	2,500,000	1,927,515	2,120,266	-11.56%
12	1664 ALTON RD	3,351,849	3,300,000	2,846,144	2,999,597	-10.51%
TOTALS		75,140,948	78,427,048	83,241,400	138,820,106	84.75%

Table 21. Assessed property values of buildings located within a half-block distance from the 1100 Block Streetscape.

Yellow highlighted properties (property #1 and property #4) were excluded from the calculation of the total valuation change for the following reasons:

- 1- Property #1 had a substantial renovations and a significant new addition that included a new parking garage, residences, and retail space designed by prominent architecture firm Herzog & de Meuron. Its construction was completed at the same time (January 2010) as the 1100 block's streetscape. Because these renovations and additions are likely a significant contributor the property's value increase, this property was excluded from the calculation.
- 2- Property #4 is a new building that was completed in 2010. As seen in table 21, the county appraiser specified the value in 2010 and 2011 as 0 -zero-. It was not possible to include this property into the calculation since its value prior to 2013 was 0 -zero-.

	2010	2011	2012	2013	% Change 2010 to 2013
City of Miami Beach Gross Taxable Property Values	22,104,742,947	21,978,289,928	23,072,321,980	24,656,576,889	11.54%

Table 23. The City of Miami Beach gross taxable property values in billions – 2010 through 2013.

To calculate the increase in tax revenues, we examined revenue data for the buildings shown in figure 12 by accessing the Miami-Dade Tax Collector webpage (<https://www.miamidade.county-taxes.com/public>).

Map Ref #	Property Address	Property Taxes Paid				% Change 2010 to 2013
		2010	2011	2012	2013	
1	1111 LINCOLN RD	499,703.16	761,546.30	933,185.29	1,019,596.09	104.04%
2	1100 LINCOLN RD	799,478.12	844,807.21	912,120.79	1,913,286.14	139.32%
3	1035 LINCOLN RD	137,483.13	148,477.34	178,253.02	212,691.59	54.70%
4	1031 LINCOLN RD	0	0	27,321.62	31,255.27	N/A
5	1029 LINCOLN RD	56,931.58	51,665.20	56,816.96	71,140.21	24.96%
6	1040 LINCOLN RD	0	0	0	0	N/A
7	1036 LINCOLN RD	254,206.08	204,673.69	211,644.47	275,348.88	8.32%
8	1634 ALTON RD	58,506.60	54,881.38	54,273.94	53,920.50	-7.84%
9	1624 ALTON RD	21,000.90	23,016.38	18,977.74	18,667.28	-11.11%
10	1209 LINCOLN RD	67,237.52	65,972.50	64,849.28	82,892.63	23.28%
11	1656 ALTON RD	50,785.84	49,678.08	35,878.17	41,605.32	-18.08%
12	1664 ALTON RD	71,005.01	65,575.07	55,930.42	58,562.13	-17.52%
	TOTALS	1,516,634.78	1,508,746.85	1,588,744.79	2,728,114.68	79.88%

Table 24. Amount of property taxes paid for the buildings located within a half-block distance from the 1100 Block Streetscape.

Property #1 and property #4 were excluded from the calculation of the change in tax revenues due to the same reasons listed above for the calculation of property value change. In addition, property #6 was also excluded from the calculation since this property is owned by the City of Miami Beach and its tax revenues are listed as 0 -zero-.

Limitations of methodology

- The redesign of the 1100 block's streetscape was part of a larger development that included a Herzog & de Meuron designed parking structure, new retail space, offices, and condominium residences. It is not possible to distinguish the economic impact of the landscape design by itself since these architectural improvements and additions around the streetscape likely may have significantly contributed to elevating the surrounding property values.

Cost Comparison Methodology

Treatment of the water in the water gardens is done with a bead-filter and ultraviolet treatment system instead of a traditional sand-filter and chlorination system like the ones used for water features elsewhere on the Lincoln Road Mall. The initial cost of the UV-treatment system was roughly double that of a traditional system. However, because the bead filters require less pressure to keep the water circulating, they use 12.7 kWh less energy per week than a sand filter. The bead filters also require less backwashing to clean the system, saving 1,580 gallons of wastewater per week. The lack of chemicals in the UV-treatment system allows the water gardens to function as habitat for various plant and animal species.

Cost comparison information for water treatment systems was provided by Kristen Mertz of Edgewater Exhibits during a meeting on July 11, 2014 at 2:00pm.

Calculations:

Wastewater savings: Using a standard sand filter for the 1100 Block Streetscape water gardens would require backwashing the filter twice per week. The filter would require a 400-gal/min flush for 2 minutes. One filter would have been used for all four water gardens.

$(400 \text{ gal/min} \times 2 \text{ minutes} \times 2 \text{ times per week}) = 1600 \text{ gallons of wastewater per week}$

The bead filters utilized at 1100 Block Streetscape require a 5-gal/min backwash once per week for 1 minute. One filter is needed for each water garden.

$(5 \text{ gal/min} \times 1 \text{ minute} \times 1 \text{ time per week} \times 4 \text{ water gardens}) = 20 \text{ gallons of wastewater per week}$

Energy savings: Using a standard sand filter requires greater energy. A sand filter requires a pump that can overcome 45-50 ft of head (high head) or approximately 20 hp. A bead filter requires a pump output of 5ft of head (low head) or approximately 3 hp. The pumps run continuously to keep water circulating in the water gardens.
1 hp = 746 W (approximately)

$((20 \text{ hp} - 3 \text{ hp}) \times 746 \text{ W}) / 1000 \text{ W per kW} (\times 1 \text{ hour}) = 12.7 \text{ kWh energy output savings.}$

Habitat function: The use of UV filtration in the water gardens as a method of killing bacteria, algae, and other organisms eliminates the usage of chemicals in the water that would otherwise prevent the water gardens from supporting life. Several plants installed by landscape architect are located in inundated planters in the water garden. Fish, frogs, and turtles have been observed inhabiting the ponds.

SUSTAINABLE FEATURE

68 plant species were used in the streetscape, 60% of which are native to the state of Florida. (10 of these native species are also endangered or threatened in the state.) Native trees include live oak and bald cypress, native grasses include fakahatchee grass and gamma grass, and native vines and flowers include golden creepers and swamp lilies. Species were selected to be able to withstand the harsh urban and coastal environment of Miami Beach.

This increased plant species diversity of the streetscape by 338%. The ratio of native to non-native species on the streetscape increased by 136%.

Methodology

These figures were calculated by comparing the pre-development site planting, as determined through study of the landscape architect's tree inventory plan and site photography of previous existing conditions, with the current conditions of the streetscape, as studied on-site and determined by the landscape architect's planting plan.



Figure 4. Photographs of plant species on site prior to development. Courtesy of Raymond Jungles Inc.

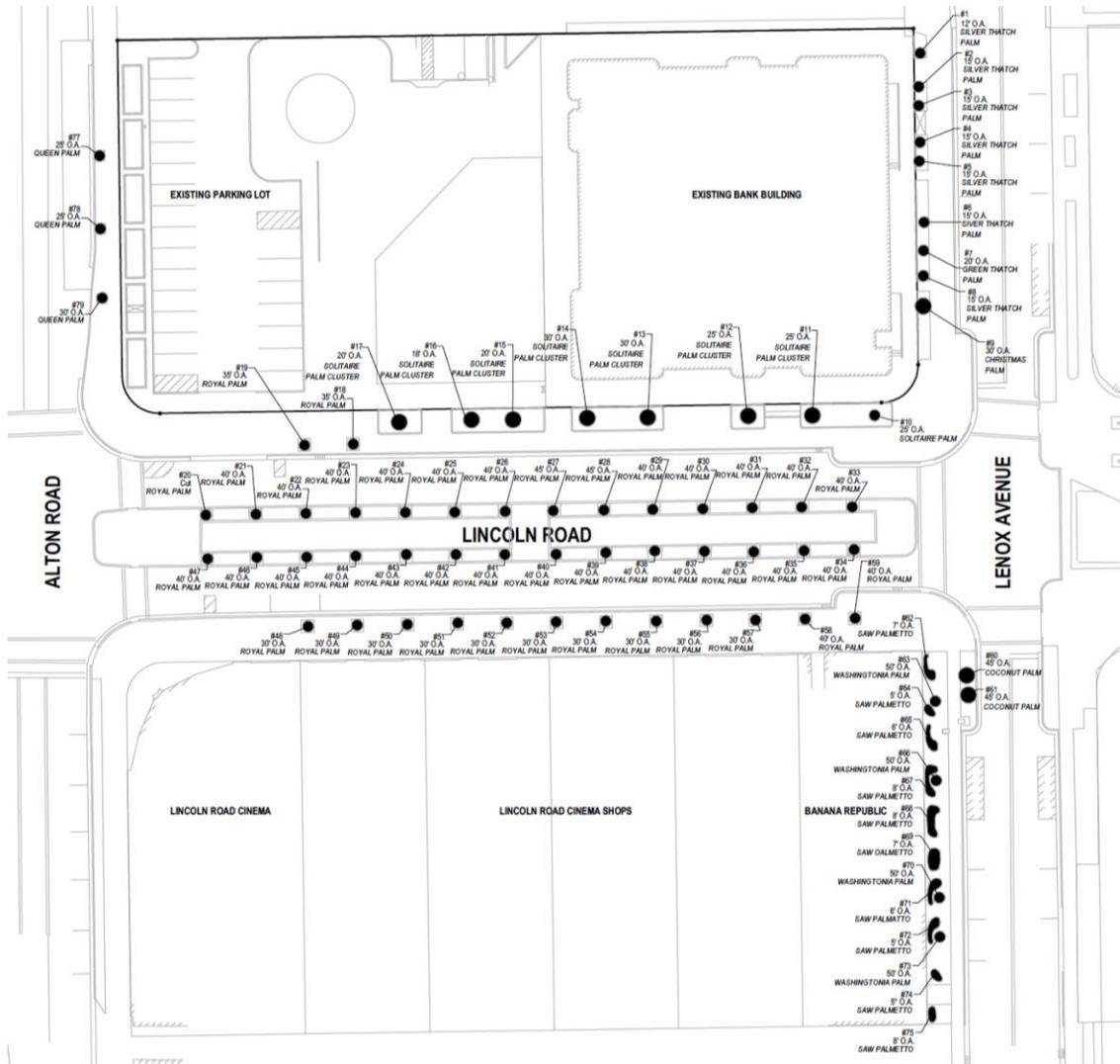


Figure 5. Tree inventory plan of pre-development conditions. Courtesy of Raymond Jungles Inc.

	Scientific name	Common name	Native status
1	<i>Arecastrum romanzoffianum</i>	queen palm	Not native to FL
2	<i>Coccothrinax argentata</i>	silver thatch palm	Native to FL (threatened in FL)
3	<i>Cocos nucifera</i>	coconut palm	Not native to FL
4	<i>Codiaeum variegatum</i>	variegated croton	Not native to FL
5	<i>Crinum augustum 'Queen Emma'</i>	queen Emma crinum	Not native to FL
6	<i>Ficus benjamina</i>	Benjamin fig	Not native to FL
7	<i>Pittosporum tobira</i>	pittosporum	Not native to FL
8	<i>Podocarpus macrophyllus</i>	Japanese yew	Not native to FL
9	<i>Ptychosperma elegans</i>	solitaire palm	Not native to FL
10	<i>Roystonea elata</i>	royal palm	Native to FL
11	<i>Serenoa repens</i>	saw palmetto	Native to FL
12	<i>Shefflera arboricola</i>	variegated dwarf shefflera	Not native to FL
13	<i>Thrinax radiata</i>	green thatch palm	Native to FL (threatened in FL)
14	<i>Veitchia merrillii</i>	christmas palm	Not native to FL
15	<i>Washingtonia robusta</i>	Mexican Washingtonia palm	Not native to FL
16	<i>Zoysia japonica</i>	zoysia grass	Not native to FL

Table 3. Plant species existing on site prior to new design, with native species indicated. The landscape architect re-used silver and green thatch palms existing on site prior to the development, which are threatened in the state of Florida.

	Scientific name	Common name	Native status
1	<i>Acrostichum danaeifolium</i>	leather fern	Native to FL
2	<i>Aechmea 'Dean'</i>	bromeliad	Not native to FL
3	<i>Aechmea 'Mexicana'</i>	bromeliad	Not native to FL
4	<i>Alcantarea odorata</i>	alcantarea	Not native to FL
5	<i>Annona glabra</i>	pond apple	Native to FL
6	<i>Arachis glabrata</i>	wild peanut	Not native to FL
7	<i>Bacopa caroliniana</i>	lemon bacopa	Native to FL
8	<i>Bacopa monnieri</i>	water hyssop	Native to FL
9	<i>Beaumontia grandiflora</i>	Herald's trumpet	Not native to FL
10	<i>Bougainvillea glabra</i>	bougainvillea	Not native to FL
11	<i>Caesalpinia granadillo</i>	bridalveil	Not native to FL
12	<i>Colocasia esculenta</i>	black taro	Not native to FL
13	<i>Canella winterana</i>	cinnamon bark	Native to FL (endangered in FL)
14	<i>Ceratozamia mexicana</i>	Mexican horncone	Not native to FL
15	<i>Clerodendrum splendens</i>	Flaming glory	Not native to FL
16	<i>Coccothrinax argentata</i>	silver thatch palm	Native to FL (threatened in FL)
17	<i>Cocos nucifera</i>	coconut palm	Not native to FL
18	<i>Colocasia sp.</i>	small leaf green colocasia	Native to FL
19	<i>Copernicia macroglossa</i>	Cuban petticoat palm	Not native to FL
20	<i>Coreopsis leavenworthii</i>	tickseed	Native to FL
21	<i>Crinum americanum</i>	swamp lily	Native to FL
22	<i>Equisetum scirpoides</i>	dwarf horsetail	Not native to FL
23	<i>Eragrostis elliottii 'Tallahassee Sunset'</i>	dwarf silver love grass	Not native to FL
24	<i>Ermodea littoralis</i>	golden creeper	Native to FL
25	<i>Ficus pumila</i>	creeping fig	Not native to FL
26	<i>Fuirena pumila</i>	dwarf umbrella-sedge	Native to FL
27	<i>Guaiacum officinale</i>	lignum vitae	Not native to FL
28	<i>Iris virginica</i>	blue flag iris	Native to FL
29	<i>Jacquemontia pentanthos</i>	skyblue clustervine	Native to FL (endangered in FL)
30	<i>Juncus effusus</i>	soft rush	Native to FL
31	<i>Juncus inflexus 'blue arrows'</i>	blue arrows rush	Not native to FL
32	<i>Mimosa strigillosa</i>	sunshine mimosa powderpuff	Native to FL
33	<i>Monstera deliciosa</i>	monstera	Not native to FL
34	<i>Muhlenbergia capillaris</i>	pink muhly grass	Native to FL
35	<i>Neomarica caerulea 'Regina'</i>	walking iris	Not native to FL
36	<i>Nephrolepis exaltata</i>	sword fern	Native to FL
37	<i>Nuphar luteum</i>	spatterdock	Native to FL
38	<i>Nymphaea mexicana</i>	yellow water lily	Native to FL
39	<i>Oncidium 'Sharry Baby'</i>	oncidium 'Sherrie Baby'	Native to FL
40	<i>Oncidium sp.</i>	oncidium orchid	Native to FL
41	<i>Pachira aquatica</i>	Guiana chestnut	Not native to FL
42	<i>Peperomia obtusifolia</i>	baby rubber plant	Native to FL (endangered in FL)
43	<i>Philodendron 'Burle Marx'</i>	philodendron 'Burle Marx'	Not native to FL
44	<i>Philodendron speciosum</i>	philodendron	Not native to FL
45	<i>Phyla nodiflora</i>	creeping Charlie	Native to FL
46	<i>Pontederia cordata</i>	blue pickerelweed	Native to FL
47	<i>Portlandia grandiflora</i>	glorias Floridas de Cuba	Not native to FL
48	<i>Quercus virginiana</i>	live oak	Native to FL
49	<i>Quisqualis indica</i>	rangoon creeper	Not native to FL
50	<i>Rhizophora mangle</i>	red American mangrove	Native to FL
51	<i>Rhynchospora latifolia</i>	white-top sedge	Native to FL
52	<i>Sabal palmetto</i>	sabal palm	Native to FL
53	<i>Scutellaria lateriflora</i>	skull cap	Native to FL
54	<i>Serenoa repens 'silver'</i>	silver saw palmetto	Native to FL
55	<i>Sporobolus virginicus</i>	seashore dropseed	Native to FL
56	<i>Stephanotis floribunda</i>	bridal wreath	Not native to FL
57	<i>Syngonium podophyllum</i>	arrowhead vine	Not native to FL
58	<i>Taxodium distichum</i>	bald cypress	Native to FL
59	<i>Thalia geniculata</i>	alligator flag	Native to FL
60	<i>Thrinax radiata</i>	green thatch palm	Native to FL (endangered in FL)
61	<i>Tillandsia balbisiana</i>	wild pine air plant	Native to FL (threatened in FL)
62	<i>Tillandsia fasciculata</i>	cardinal airplant	Native to FL (endangered in FL)
63	<i>Tillandsia recurvata</i>	ball moss	Native to FL
64	<i>Tillandsia setacea</i>	needleleaf airplant	Native to FL
65	<i>Trachelospermum jasminoides</i>	confederate jasmine	Not native to FL
66	<i>Tradescantia sp.</i>	spiderwort	Native to FL
67	<i>Tripsacum dactyloides</i>	Fakahatchee grass	Native to FL
68	<i>Tripsacum floridanum</i>	gammagrass	Native to FL (threatened in FL)
69	<i>Vanda sp.</i>	vanda	Not native to FL
70	<i>Zamia pumila</i>	coontie	Native to FL

Table 4. Plant species included in the landscape architect's design, with native species indicated.

Prior to the development there were 16 plant species on site (table 3). After the new design, the streetscape has 70 plant species (table 4).

Calculation:

$(70-16)/16=3.38 = 338\%$ increase in the number of plant species.

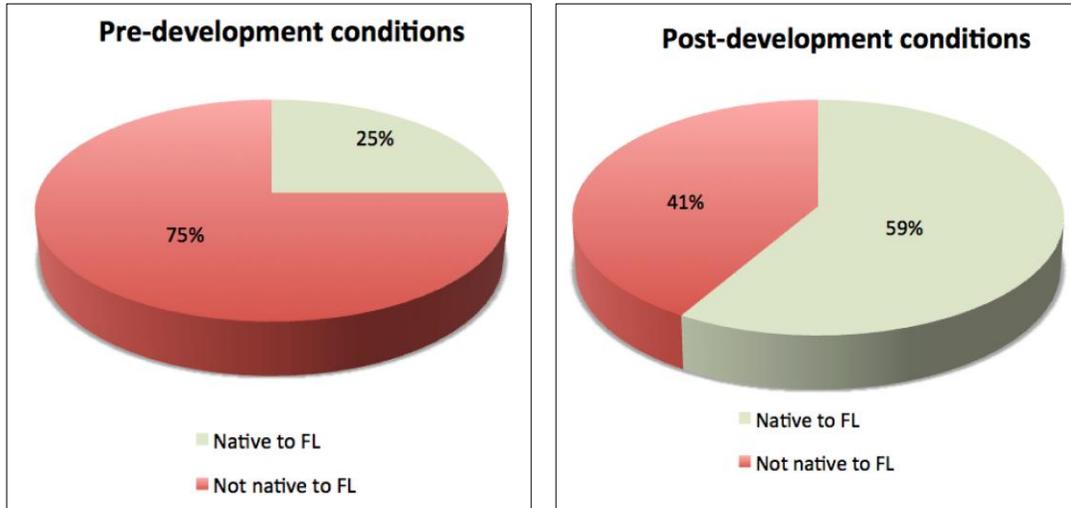


Table 5. Prior to development, 4 of the 16 (25%) plant species on site were native to the state of Florida. After the new design 41 of the 70 (59%) plant species on site are native to the state of Florida.

Calculation:

$(59-25)/25 = 1.36 = 136\%$ increase in the ratio of native/non-native species on site.

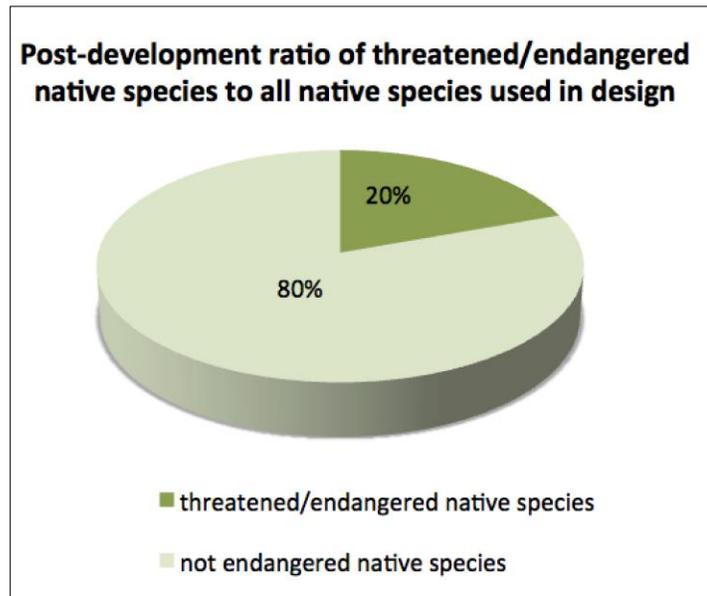


Table 6. It is important to note that 20% of the native species utilized in the design of the new streetscape are classified as threatened or endangered plant species in the state of Florida.