Ecological vulnerability of urban green infrastructure to **Hurricanes Irma and Maria in Puerto Rico**

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EXECUTIVE SUMMARY

Rapid assessments of the change in ecosystem services derived from coarse woody vegetation were performed for three municipalities (San Juan, Ponce, Mayagüez) in the island of Puerto Rico following Hurricanes Irma and Maria. The assessments used two approaches (fine-scale and landscape-level) using computer models within the suite of i-Tree tools (i-Tree Canopy and i-Tree Eco) developed by the US Forest Service. The fine-scale approach evaluated services using ground forest measurements in selected San Juan localities and the landscape approach evaluated services in San Juan, Ponce and Mayagüez using photo interpretation of remotely-sensed imagery. Here we present a highlight of the findings of these analyses followed by general recommendations based on results and past experience with urban forest monitoring by the research group. While we are confident in the methodologies used, there are inherent assumptions in the field and modeling approaches. Therefore, the results presented here must be interpreted as estimates with a range of uncertainty rather than absolute values.

Post-hurricane changes in tree area cover and associated changes in air quality and carbon services in San Juan, Ponce and Mayagüez and their estimated change from pre-hurricane conditions (i-Tree Canopy):

Current Tree cover (%):

- San Juan (25.7) down by 24.8%
- Ponce (67.6) down by 6.2%
- Mayagüez (61.1) down by 4.2%

Current Pollution removal (t/yr):

- San Juan (320.3) down by 29.9%; current monetary value $1.101M (down 30.6%)
- Ponce (170.3) down by 29.2%; current monetary value $846,061 (down by 30.5%)
- Mayagüez (93.5) down by 29.5%; current monetary value $466,796 (down by 30.5%)

Current Carbon storage (kt):

- San Juan (1,073.2) down by 25.2%; current monetary value $41.672M (down by 25.6%)
- Ponce (627.0) down by 25.2%; current monetary value $24,345,199 (down by 25.6%
- Mayagüez (337.49) down by 25.1%; current monetary value $13,104,246 (down by 25.6%)

Current Carbon sequestration (kt/yr):

- San Juan (70.64) down by 25.3%; current monetary value $2.750M (down by 25.3%)
- Ponce (41.2) down by 25.3%; current monetary value $1.6M (down by 25.3%)
- Mayagüez (22.1) down by 25.3%; current monetary value $860,482 (down by 25.3%)

*t = 1000 kg, kt = 1M kg

Post-hurricane vegetation characteristics and services values of the Santurce Peninsula and their estimated change from pre-hurricane conditions (i-Tree Eco):

- *Number of trees*: 90,320 (representing a 26.3% stem reduction)
- *Tree cover:* 13.1% (representing a 38.8% tree cover loss)
- *Percentage of trees less than 6"* (15.2 cm) diameter: 35.6% (representing a 11.9% loss)
- *Pollution removal*: 5.865 tonnes* per year with a 45.3% service reduction per year and a monetary loss of $42.6 thousand per year
- *Carbon storage:* 17.89 thousand tonnes* representing a 23.7% service loss from pre-hurricane values and a monetary loss of $790,000
- *Carbon sequestration:* 1.395 thousand tonnes* per year equivalent to a 12.8% service loss per year and a monetary loss of $29,000 per year
- *Oxygen production:* 3.376 thousand tonnes* per year equivalent to a 12.3% service loss per year
- *Avoided runoff*: 73.11 thousand cubic meters per year which represent a 48.5% service loss per year and a loss of monetary value of $162 thousand per year
- *Structural values* (the cost to replace available trees) were $13.3 million with a cost of replacement of trees estimated to have been lost at $4.8 million

  *Tonne: 1000 kilograms

Post-hurricane vegetation characteristics and service values via complete inventory of 69 residential yards within the Río Piedras watershed and their estimated change from pre-hurricane conditions:

- *Number of trees*: 368 (representing a 27% vegetation reduction)
- *Pollution removal*: 10,298.20 g per year with a 34% service reduction per year and a monetary loss of $400.56 per year
- *Carbon storage:* 25,679.64 kg representing a 15% service loss from pre-hurricane values and a monetary loss of $625
- *Carbon sequestration:* 887.4 kg per year equivalent to a 48% service loss per year and a monetary loss of $118 per year
- *Oxygen production:* 2,366.5 kg per year equivalent to a 48% service loss per year
- *Avoided runoff*: 67.10 m^2 per year which represent a 40.3% service loss per year and a loss of monetary value of $106.91 per year
- *Structural values:* $85,559 would be the cost to replace the 134 trees lost due to hurricanes impact, representing a total loss of 67%

The results generated demonstrate the utility of multiple approaches for evaluating urban forest resources and highlight the importance of on-the-ground measurements for providing detailed data at the scale of individual sites

Recommendations

1. ***Improve the application of i-Tree tools to geographic areas outside the contiguous 48 US states to inform natural disaster planning and response to mitigate the effects of future natural disasters.*** This is extremely important for insular areas that are particularly vulnerable to extreme events and can become model sites for learning how i-Tree can facilitate climate-smart urban forest planning. For Puerto Rico, this would require expanding the i-Tree database for inputs within tools like i-Tree Canopy, i-Tree Storm, i-Tree Design, i-Tree Landscape (https://www.itreetools.org). Puerto Rico is not currently included in the dropdown menu for i-Tree Canopy which forces the use of the best available estimate from the US mainland (southern Florida). Tools such as i-Tree Storm, Design and Landscape are particularly useful for individual and community stakeholders, yet are currently unavailable to residents of Puerto Rico and other US territories. These tools would have been useful to develop better disaster preparedness and response plans related to urban forest management.

2. ***Support and expand urban forest monitoring through i-Tree Eco*** in San Juan and begin similar efforts in Ponce, Mayagüez and other municipalities (especially coastal) as part of municipal and state urban planning to achieve climate smart goals. In light of what has occurred after the hurricane events in Puerto Rico, urban forest planning should also be viewed within the context as a planning strategy for emergency preparedness, mitigation of extreme events and post-hurricane recovery efforts.

3. ***Begin immediate efforts to increase urban canopy cover*** to replace services lost. Urban forest management should be guided by information on the spatial differences in tree loss and condition, structural and species composition changes, area location (i.e., proximity to water bodies and stormwater infrastructure), site topography and soil conditions of management sites. This requires more fine-scale urban vegetation data collection and modeling at watershed and city scales. At least for San Juan, modelling and reforestation efforts should consider variation in social, historical and institutional factors which has been linked to urban forest variation in that city.

CHAPTER 1. INTRODUCTION

A. Background

In September of 2017, the island of Puerto Rico was impacted by two major hurricanes within the span of two weeks. Hurricane Irma, a category 5 hurricane, passed 50 mi north of San Juan producing tropical-storm-force winds and heavy rains for the island causing a near-total loss of electricity and water supply for several days. Twelve days later, the island was hit by Hurricane Maria, a category 4 hurricane that entered Puerto Rico through the eastern town of Yabucoa with maximum sustained winds of 155 mph (National Weather Service 2018). The eyewall of Maria crossed the island following a west-northwestward trajectory (NOAA Local Report 2017) with hurricane-force winds that covered the entire island. The phenomenon disrupted all major utility services causing what has been termed the second worst blackout in world history (Houser and Marsters 2018). Hurricane Maria brought rainfall that produced major to catastrophic flash floods in many parts of the island, and widespread landslide occurrences which in some areas were recorded to be as high as 25 landslides/m^2 (Bessette-Kirton 2018). The effect of this phenomenon on the loss of natural assets and what that may mean in terms of ecosystem services lost is of major concern. A post-hurricane rapid assessment of island-wide green infrastructure using spectral mixture analysis (SMA) suggested 23-31 million trees may have been severely damaged or killed in Puerto Rico (Feng et al. 2018). Estimates are needed describing how these damages translate into ecosystem services losses. Also needed are finer scale and on-the-ground measurements that provide information about the spatial variability of tree cover loss and the effect on changes in ecosystem services, to guide recovery efforts. Evaluating these services and their monetary benefits can facilitate urban forest recovery management and long term urban planning to achieve community resilience through disaster preparedness, mitigation and response.

B. Purpose

We estimated changes in the production of ecosystem services using a three-pronged approach (**Figure 1**). First, we assessed landscape-scale changes in three major cities in Puerto Rico (San Juan, Ponce and Mayagüez) using the i-Tree Canopy tool (www.itreetools.org). This tool, developed by the US Forest Service, uses photo-interpretation to classify the land cover and estimates the production of a subset of ecosystem services (e.g., total carbon stored, net carbon sequestered, air pollution reduction) for a given area, based on its estimated percent tree cover (Nowak and Greenfield 2012, US Forest Service 2011). For this approach we performed photo-interpretation of Google Earth images before and after the combined events of Hurricanes Irma and María in 12 areas of San Juan and 11 areas of Ponce and Mayagüez (**Figure 1a**). Second, we used a fine- scale approach applied to different areas in the Santurce Peninsula of San Juan using the i-Tree Eco platform, also developed by the US Forest Service (Nowak et al. 2014, Hirabayashi 2018, US Forest Service 2018). We made use of past graduate and undergraduate student projects in the Santurce Peninsula (60 plots covering multiple land uses) that collected georeferenced urban tree data prior to hurricanes Irma and Maria between 2016 and 2017 and re-censused these plots to evaluate changes in species richness, structure

and ecosystem services. Third we expanded the fine scale approach making use of past student projects that collected pre-hurricane vegetation data of urban residential yards in the Río Piedras Watershed and re-censused these to evaluate changes in species richness, structure and ecosystem services. Thus, the overall objective was to provide a rapid assessment of landscape-level changes in tree cover and ecosystem services in three cities and a fine-scale-level assessment of changes in tree diversity, structure and services in Santurce and Río Piedras residential yards. For each approach, we present the specific methodologies employed and their respective results followed by a discussion of results, limitations of these methodologies and general recommendations. The work is a joint effort by graduate and undergraduate students of the University of Puerto Rico at Río Piedras (Department of Environmental Sciences) with administrative support from Ciudadanos del Karso, GIS imagery support from International Institute of Tropical Forestry (IITF-FS), analyses contributions by Federal Emergency Management Agency (FEMA) Environmental Planning & Historic Preservation (EHP) Cadre at DR-4336/4339 - Puerto Rico (Hurricanes Irma/Maria) and funding from the Department of the Interior and the Federal Emergency Management Agency to IITF-FS (Catalog of Federal Domestic Assistance number 10.678 Forest Stewardship).

Figure 1. Visualization of the Multiple Methodological Approach to Ecosystem Services

CHAPTER 2. METHODS

A. Changes in ecosystem services in three municipalities using i-Tree Canopy

Municipal boundary layers for Puerto Rico were obtained from the Spatial Analysis Laboratory of the USDA Forest Service International Institute of Tropical Forestry. The boundaries of San Juan, Mayagüez, and Ponce were clipped out, and within each municipality 12 circular sampling areas (1 km radius) were generated (**Figure 2**). In San Juan, 9 of the sampling areas correspond to locations previously established by the San Juan Urban Long-Term Research Area project (e.g. Melendez-Ackerman et al. 2017), and three additional circles were added to provide coverage in the northwestern and northeastern portions of the municipality. In Mayagüez and Ponce, the sampling areas were distributed using an algorithm that divided the municipal area into equal area proportions. High spatial resolution (2 x 2 m) raster land cover data (year 2010) for Puerto Rico was obtained from the NOAA C-CAP FTP Tool (https://coast.noaa.gov/ccapftp/#/). These data were used to calculate metrics of land cover classes within the sampling circles and extrapolate results to the municipal level. All geoprocessing and data analysis was conducted in ArcGIS 10.3.1, and QGIS. For San Juan, Ponce and Mayagüez sampling areas represented 25.9%, 11.1% and 24.1% of the total area of each municipality, respectively. Coordinates (WGS84) for the center of each area by municipality are listed in **Appendix 1.**

Each sampling area was uploaded as a shapefile into the web-based program i-Tree Canopy (www.itreetools.org) which uses photo-interpretation to estimate tree cover and ecosystem services. At each area we classified a total of 500 hundred points into six different cover classes (**Table 1**). Photo-interpretation with i-Tree Canopy in April 2018 allowed for land cover classification using cloud free images (Google Earth) from November 2017 (two months after Hurricane Maria) which were the most recent images at the time of classification.

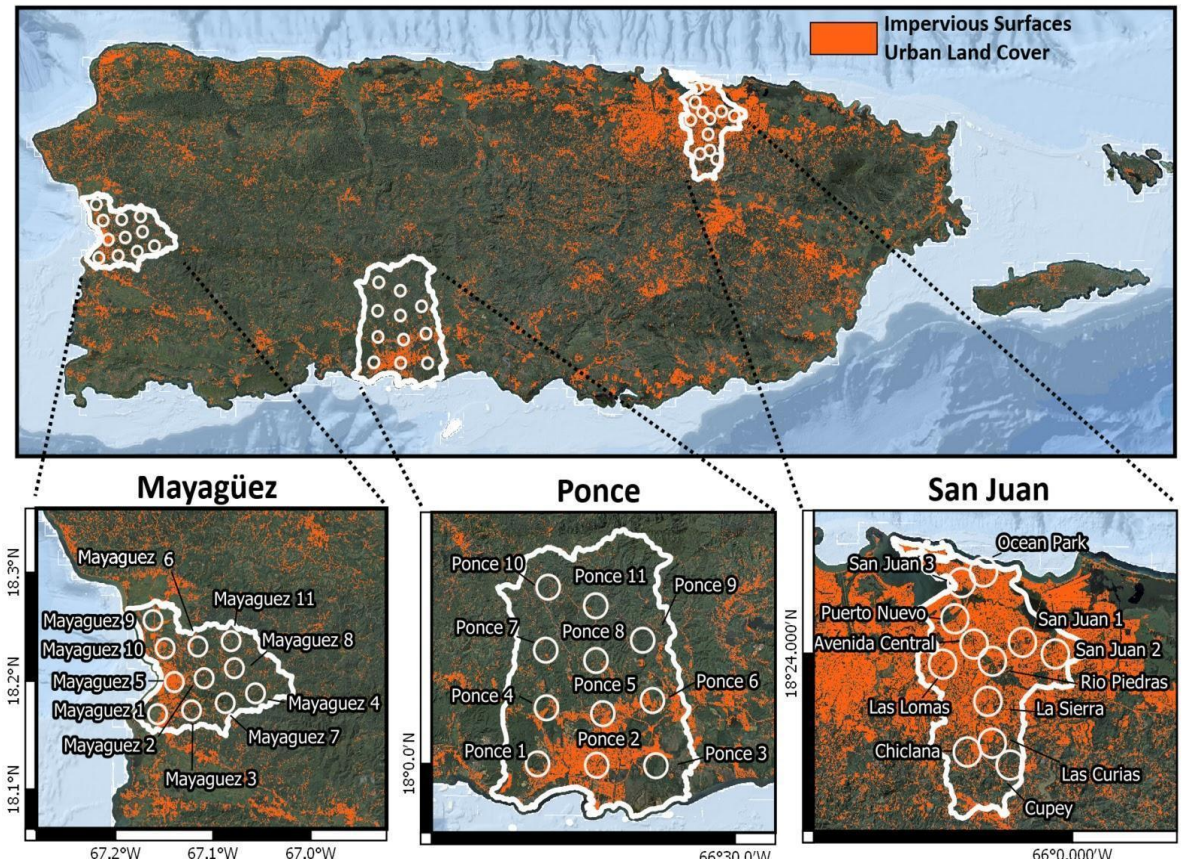
Table 1. Land Cover Classification using i-Tree Canopy (itreetools.org).

Item	Classification	Definition
1	Woody vegetation	Course woody vegetation = trees and shrubs
2	Other Vegetation	Grasses, herbs and other vegetation
3	Bare soil	Bare soil – no vegetation
4	Water	Standing water, flowing water, pools, etc.
5	Impervious	Roofs, buildings, tar, cement, streets, parking, etc.
6	Other	Includes other categories not included above

Within i-Tree Canopy, each circular area was classified as “urban”, “rural” or “all” (mixture of urban and rural) (**Appendix 1**) as the relationship between services and tree cover differs between urban and rural areas particularly for air purifications services (Nowak 2013). Multipliers for pollution removals and carbon storage and sequestration based on estimates for the state of Florida (Nowak et al. 2013, Nowak et al. 2014) in the absence of multipliers that are specific for Puerto Rico. For these analyses the class “woody vegetation” was set as the “tree cover” class for the estimation of ecosystem services related to carbon storage, carbon

sequestration and air pollution removals. i-Tree Canopy generates a graph of land cover percentages and tables with overall tree function and monetary value (**Appendix 2**). The focus of this report is the evaluation of tree cover and its associated services.

Figure 2. Maps of three municipalities of Puerto Rico (San Juan, Ponce and Mayagüez) showing the sampling areas for photo interpretation.



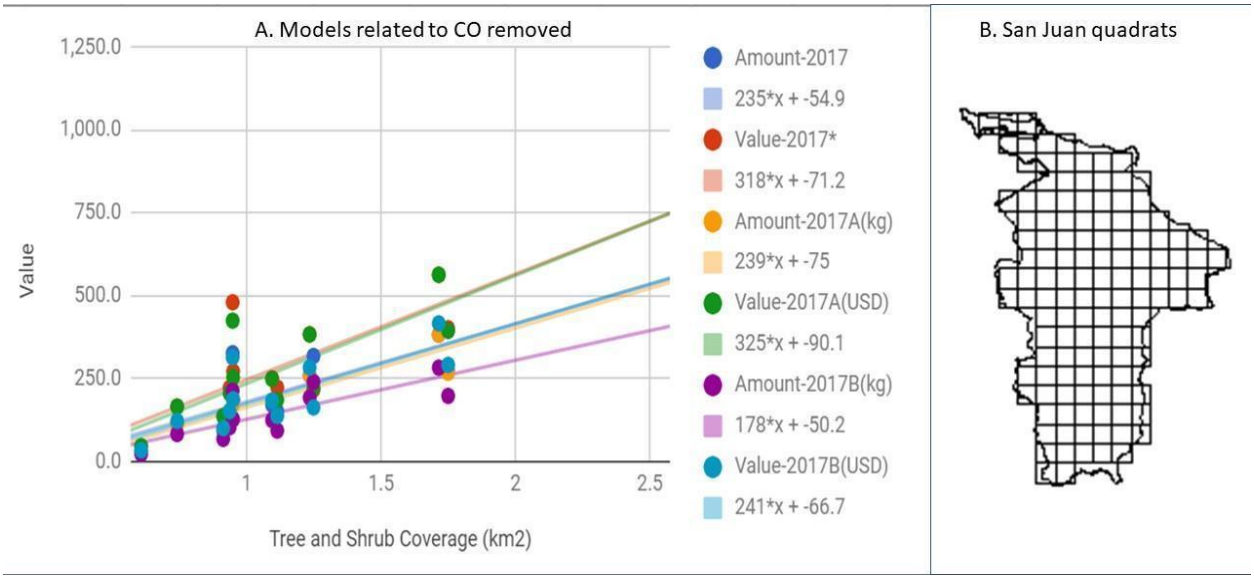
Following the post-hurricane classification, randomly generated points classified within i-Tree Canopy were then uploaded into Google Earth Pro and using the temporal “slider” option, images were set back to a pre-hurricane date for photo interpretation. Pre-hurricane classification was done using cloud free Google Earth images dated from January to May 2017 (**Figure 3**), always using the best image available. Pre-hurricane ecosystem services estimates and their monetary values were derived by modifying post-hurricane values generated by i-Tree Canopy based on tree cover estimates from the pre-hurricane classification. However, i-Tree Canopy models (which rely on tree cover data from photo-interpretation) cannot capture the full-extent of hurricane related changes in tree condition and mortality. Therefore a second estimation of post-hurricane changes in ecosystem services was generated by using data from pre-and post-hurricane tree inventories in the Santurce Peninsula and i-Tree Eco models. Specifically, we used the observed proportion of lost trees (0.26) as a multiplier to modify estimates of ecosystem function and monetary value generated by the i-Tree Canopy reports (**Appendix 2**) for photo-interpreted areas that were classified as “urban” within i-Tree Canopy for all three municipalities. i-Tree Canopy generates services regarding the removal of air pollutants (CO, NO, O_3, $PM_{2.5}$, SO_2, PM_{10}), C storage and C sequestration, as explained below

at the end of the methods. The percent areas evaluated with i-Tree Canopy for each municipality were 26.0% for San Juan (total area = 127.3 km^2), 11.1% for Ponce (total area = (301.1 km^2) and 25.1% for Mayagüez (total area = 143.1 km^2).

Figure 3. Demonstrative images of i-Tree Canopy photo-interpretation methodology showing the distribution of classification points within circular sampling areas (top panes) and close-ups of Google Earth images and sampling points (bottom panes).

Extrapolation to obtain city wide estimates of ecosystem services - For the three municipalities a graph was created to evaluate each service parameter (function and monetary value) for the three tree cover scenarios (pre-hurricane, post-hurricane, modified urban post-hurricane). This was accomplished by regressing each parameter as a function of coverage of trees and shrubs from the circles (2017 pre-hurricane, 2017 post-hurricane, 2017 post-hurricane modified, **Figure 3a**). The colored lines represent the modeled service value for each parameter. The points on the graph are only "urban" circles where air quality services have considerably more value. Urban in each case is defined as the percent coverage of impervious. This percentage is specific for each service (CO, NO_2, PM, etc.). For most services this was 25%, but not for all. For O_3 it was set to 30% and for NO_2 it was set to 40%. Applying unequal definitions of “urban” for each service resulted in a better fit of the equation. Using this equation, the service values were calculated per municipality using the land cover maps and dividing each municipality into quadrants of 1 km x 1 km (**Figure 4**) and extracting the coverage for each quadrant. Then using the specific urban thresholds for each service, each quadrant was classified into urban and non-urban. For the urban quadrants, the coverage of trees and shrubs was added and used in the equation (this is "x" in the equations, **Figure 4**) to obtain the predicted ecosystem service values for each quadrant, which were then summed to extrapolate tree function and services at the municipal scale.

Figure 4. Methodological representation method used to extrapolate function and services at the municipal scale. A) Linear models relating value and function with land cover. B) Quadrats used to determine tree and shrub cover based on a land cover map (NOAA 2010). Amount and values represent extrapolations for ecosystem function and monetary value, respectively. Dates make reference to the estimates for the Pre-hurricane period (2017), Post-hurricane period in November 2017 (2017A), and modified estimates based on a 26% tree reduction (2017B) as observed by on-the-ground measurements in San Juan (see Section D in this chapter). Data for 2017 are for the pre-hurricane state.



Classification validation - Pre-hurricane land cover classifications without i-Tree Canopy were checked against the post-hurricane classifications with i-Tree Canopy. All changes in classifications were verified through independent photo interpretations. Only one out of 29 sites had more than 10% classification errors and was completely redone and rechecked. All others had less than a 3% classifications error which were corrected and verified. Generated excel data matrices used in extrapolation analyses were checked thoroughly by three different people for consistency of formulae.

B. Fine-scale evaluation of ecosystem services changes in Santurce using i-Tree Eco

We evaluated 60 plots (0.04 ha) in the Santurce Peninsula (**Figure 5**) that were inventoried using the standardized i-Tree Eco methodology (Nowak et al. 2014). At each plot, data were collected regarding tree species, measurements of structural tree characteristics (e.g., diameter at breast height, tree height, canopy density, canopy cover, and crown size), land use classification, land cover and tree management problems (utility conflicts, sidewalk conflicts). These plots were inventoried between 2016 and 2017 and were revisited in April 2018 to evaluate the current state of trees and estimate changes in species diversity and the production of ecosystem services (total carbon stored, net carbon sequestered, air pollution removal and avoided runoff). In contrast to i-Tree Canopy, i-Tree Eco estimates ecosystem function by integrating species-specific growth rate data, light exposure, crown condition and percent tree cover. These allow for more accurate estimates of ecosystem services than i-Tree Canopy in

addition to providing additional ecosystem services not provided by the photo interpretation tool (stormwater runoff reduction, pollution removal, oxygen production, and structural value). To estimate services, the i-Tree Eco tool considers the tree condition which is calculated by the program based on % dieback and classifies trees as excellent, good, fair, poor, critical, dying and dead (i-Tree Eco v 6.0 Users' Manual, www.itreetools.org).

Figure 5. Distribution of 60 i-Tree Eco plots used in pre-and post-hurricane inventories in the Santurce Peninsula.

C. Fine-scale evaluation of ecosystem services changes in San Juan residential yards using i-Tree Eco

We also re-visited 69 residential plots (2.01 ha) where we have conducted complete i-Tree Eco inventories following standard methodology (Nowak et al. 2014). These plots were inventoried between 2016 and 2017 and were revisited in October 2018 immediately after Hurricane Irma. For residential yards we conducted a rapid assessment to record the types of damage experienced by yard trees (crown damage), the amount of missing canopy, state of recovery (re-foliation), among other variables, during the month of October. A total of 89 houses were re-visited for post-hurricane assessment of which 69 yards were surveyed. Yard sizes were calculated using Google Earth Pro v. 7.3. In contrast with the Santurce survey, the application of i-Tree Eco in residential areas used the inventory methodology which generates an annotated report focused on the function and benefits of individual tree species. Two reports were generated for i-Tree Eco, one pre-hurricanes and one post-hurricanes, to estimate the loss of ecosystem functions and monetary values.

D. List and definitions of ecosystem services reported

Here we provide a list of definitions and ecosystem services reported for this project by the different i-Tree tools. For each service, we identify the tool utilized. More details about these services and in-depth results can be derived from **Appendix 2** (i-Tree Canopy Raw Reports with Summary Tables) and **Appendix 3** (Post-Hurricane Assessment i-Tree ECO Santurce report and Metadata).

Summary of reported services provided by both i-Tree Tools (Canopy and Eco) and glossary of terms used in fine scale and landscape-level analyses (Source: USDA Forest Service 2018):

Avoided runoff – A measure of the stormwater runoff that is avoided because of rainfall interception by trees, which partially intercept precipitation on their leaves and other surfaces. Avoided runoff value is estimated by comparing the hourly precipitation processes and total annual surface runoff volume modeled for the study area as it occurs with trees present and as it would occur if there were no trees.

The models take into account the seasonal variation in leaf area for evergreen vs. deciduous trees, and calculate precipitation interception on an hourly basis from local weather records. The monetary value if stormwater runoff is estimated based on the economic damages associated with runoff and costs of stormwater control. Benefit price: $ (USD)/m^3: 2.361 (Eco default value: 2.361 for 2004). <u>This service is not provided by i-Tree Canopy.</u>

Carbon sequestration – A measure of the carbon (in the form of carbon dioxide) that is removed from the atmosphere by trees. CO_2 sequestration is determined from allometric equations based on tree species, diameter, and crown light exposure (Nowak et al. 2008). The monetary value associated to carbon sequestration is estimated based on the economic damages associated with increases in carbon or carbon dioxide emissions. The monetary value used for CO_2 carbon was carbon $ (USD)/tonne: 143.00 (Eco default value: 143.00 for 2015)

Carbon storage – A measure of the carbon that is stored within trees. This is the amount of carbon that is bound up in both the above-ground and below-ground parts of woody vegetation. The monetary value associated to carbon storage is estimated based on the economic damages associated with increases in carbon or carbon dioxide emissions. Benefit price: carbon $ (USD)/tonne: 143.00 (Eco default value: 143.00 for 2015)

Oxygen production – A measure of the oxygen produced by trees during photosynthesis, taking into account the amount consumed during plant respiration. This net oxygen production is calculated from carbon sequestration estimates. To estimate the net carbon sequestration rate, the amount of carbon sequestered as a result of tree growth is reduced by the amount lost resulting from tree mortality. Thus, net carbon sequestration and net annual oxygen production of the urban forest account for decomposition (Nowak et al. 2007). For complete inventory projects (i.e. residential trees), oxygen production is estimated from gross carbon sequestration and does not account for decomposition.

Pollution removal – A measure of the air pollution that is removed from the atmosphere by trees. Pollution removal is calculated for nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), and particulate matter less than 2.5 microns ($PM_{2.5}$). Trees remove gaseous air pollution primarily by uptake via leaf stomata, though some gases are removed by the plant surface. Trees also remove pollution by intercepting airborne particles. Some particles can be absorbed into the tree, though most particles that are intercepted are retained on the plant surface. The monetary value is associated with tree effects on atmospheric pollution. This value is estimated based on the economic damages associated with increases in pollution emissions and/or the impact of air pollution on human health.

Energy cooling savings – Estimate effects of trees on building energy use for cooling purposes based on the tree location and distance in relation to the building and measured for trees taller than 6.1 meters located no farther than 18.3 meters based on procedures described in the literature (McPherson and Simpson 1999). Cost estimates are based on U.S. Continental average costs ($280.00 per MWH)

Structural value – The compensatory value calculated based on the local cost of having to replace a tree with a similar tree. Structural values are based on valuation procedures of the Council of Tree and Landscape Appraisers (CTLA 1992) which uses tree species, diameter, condition, and location information (Nowak et al 2002a; 2002b)

Other definitions:

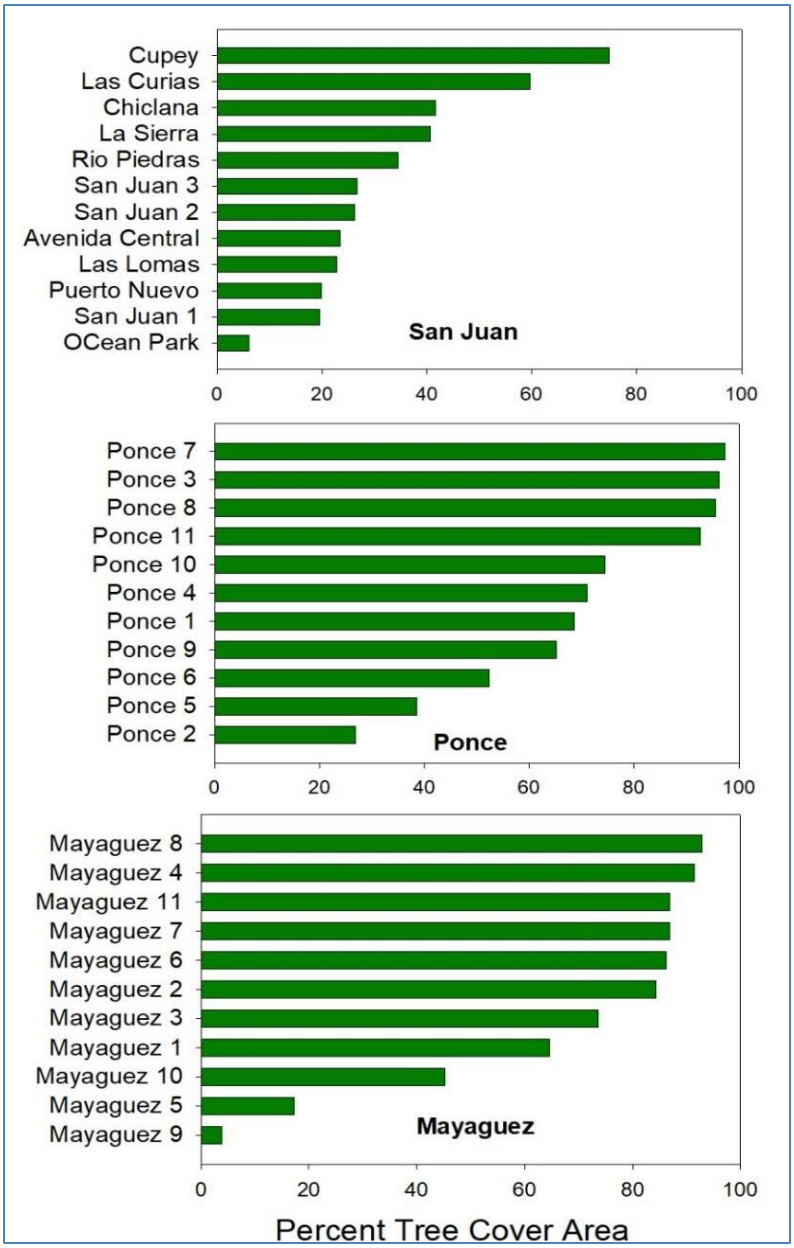
Structural Value – A compensatory value which is based on the cost of having to replace a tree with a similar tree.

Condition – Related to the tree crown health (e.g., poor condition, good, dead/dying). This variable is assessed in the field by identifying a tree's crown condition or dieback (1 - % dieback).

CHAPTER 3. RESULTS

A. Percent tree cover area / ecosystem services in three municipalities (i-Tree Canopy)

Changes in Tree Cover - For the purpose of this report, changes in land cover focus on the evaluation of changes in tree cover. Raw Data for land cover changes can be obtained from **Appendix 2** (Raw Post-hurricane i-Tree Canopy Reports). Most sampling areas in the municipality of San Juan (1 out of 12) were classified as urban based on their qualitative impervious cover for the purposes of i-Tree Canopy, while only three sampling sites were classified as areas of high urban development in both the Ponce and Mayagüez municipalities (**Table 2**). Most areas in the Mayagüez and Ponce municipalities have high tree cover and are less variable (Mayagüez average: 66.6 ± 9.4 (SE); Ponce 70.8 ± 7.3) than areas in San Juan (average 32.9 ± 5.5).



San Juan experienced a proportionally higher change in tree cover area relative to Ponce and Mayagüez (**Figure 6**). The percentage loss of tree cover area was three times higher for San Juan relative to Ponce and six times higher relative to Mayagüez (**Table 2**). Nevertheless, the total amount of tree cover area lost was larger in Ponce, the municipality with the most total area, followed by San Juan and Mayagüez (**Table 3**).

Figure 6. Percent Tree Cover in November 2017 in selected areas of three municipalities in PR.

Table 2. Changes in percent tree cover (i.e., coarse woody vegetation) before and after Hurricanes Irma and Maria by municipality. Estimates used the number of photo-interpreted points that were classified as "Coarse Woody Vegetation" divided by the total number of points classified per municipality (pre- and post-hurricane columns). For each site, percent cover for different land cover categories and their standard errors can be accessed in Appendix 2

San Juan	Pre-Hurricane	Post Hurricane*	i-Tree Canopy Classification	Area Sampled km^2
San Juan 1	122	73	Urban	3.14
San Juan 2	132	97	Urban	3.14
San Juan 3	144	98	Urban	2.84
Avenida Central	115	87	Urban	3.14
Chiclana	240	154	Urban	3.14
Cupey	373	373	Rural	3.14
Las Curias	298	221	Urban	3.14
Las Lomas	114	84	Urban	3.14
Ocean Park	30	22	Urban	1.97
Puerto Nuevo	128	73	Urban	3.14
Río Piedras	175	127	Urban	3.14
La Sierra	204	150	Urban	3.14
Total Classified	**2,075**	**1,559**	**Total Area Sampled = 36.21 km^2**	
% Tree Cover	**34.58**	**25.99**	**% Tree Cover Area Lost = 24.85**	
Ponce	**Pre-Hurricane**	**Post Hurricane***	**i-Tree Canopy Classification**	**Area Sampled km^2**
Ponce 1	343	254	Urban	3.14
Ponce 2	144	99	Urban	3.14
Ponce 3	480	481	Rural	3.14
Ponce 4	356	355	Rural	3.14
Ponce 5	197	142	Urban	3.14
Ponce 6	278	262	All	3.14
Ponce 7	482	487	Rural	3.14
Ponce 8	478	478	Rural	3.14
Ponce 9	326	326	Rural	3.14
Ponce 10	434	372	Rural	3.14
Ponce 11	478	463	Rural	3.14
Total Classified	**3,996**	**3,719**	**Total Area Sampled= 34.54 km^2**	
% Tree Cover	**72.65**	**67.62**	**% Tree Cover Area Lost = 6.86**	
Mayagüez	**Pre-Hurricane**	**Post Hurricane***	**i-Tree Canopy Classification**	**Area Sampled km^2**
Mayaguez 1	333	323	All	3.14
Mayaguez 2	423	422	Rural	3.14
Mayaguez 3	368	368	All	3.14
Mayaguez 4	464	457	Rural	3.14
Mayaguez 5	89	64	Urban	3.14
Mayaguez 6	438	431	Rural	3.14
Mayaguez 7	436	434	Rural	3.14
Mayaguez 8	461	464	Rural	3.14
Mayaguez 9	27	14	Urban	3.14
Mayaguez 10	259	167	Urban	3.14
Mayaguez 11	436	434	Rural	3.14
Total Classified	**3,734**	**3,578**	**Total Area Sampled = 34.54 km^2**	
% Tree Cover	**67.89**	**65.05**	**% Tree Cover Area Lost = 4.18**	

Table 3. Hurricane-related tree cover change within three municipalities in Puerto Rico				
Municipality	**Pre-Hurricane Tree Cover Area (km^2)**	**Post Hurricane* Tree Cover Area (km^2)**	**Total Area Lost (km^2)**	**Total Municipal Area (km^2)**
San Juan	44.0	33.0	10.94	127.3
Ponce	218.8	204.0	15.16	301.1
Mayagüez	97.2	93.1	4.06	143.1

B. Changes in ecosystem services at the municipal scale

Table 3 lists the estimated changes in tree cover area following hurricane events. Below is a summary of the current state and changes for percent tree cover and ecosystem services by municipality. Overall, San Juan experienced proportionally more reduction in carbon-based and air purification services relative to Ponce and Mayagüez, with Mayagüez having the smallest lost in tree cover and ecosystem services. Below is a summary list of ecosystem services trends by municipality followed by a table that includes corrected (derived from i-Tree and uncorrected (subtracting 26% of i-Tree Canopy values) functional and monetary values of trees.

Current Tree cover (%):

- San Juan (25.7) down by 24.8%
- Ponce (67.6) down by 6.2%
- Mayagüez (61.1) down by 4.2%

Pollution removal (t/yr):

- San Juan (320.3) down by 29.9%; current monetary value $1.101M (down 30.6%)
- Ponce (170.3) down by 29.2%; current monetary value $846,061 (down by 30.5%)
- Mayagüez (93.5) down by 29.5%; current monetary value $466,796 (down by 30.5%)

Carbon storage (kt):

- San Juan (1,073.2) down by 25.2%; current monetary value $41.672M (down by 25.6%)
- Ponce (627.0) down by 25.2%; current monetary value $24,345,199 (down by 25.6%
- Mayagüez (337.49) down by 25.1%; current monetary value $13,104,246 (down by 25.6%)

Carbon sequestration (kt/yr):

- San Juan 70.64) down by 25.3%; current monetary value $2.750M (down by 25.3%)
- Ponce (41.2) down by 25.3%; current monetary value $1.6M (down by 25.3%)
- Mayagüez (22.1) down by 25.3%; current monetary value $860,482 (down by 25.3%)

*t = 1000 kg, kt = 1M kg

C. Changes in vegetation and ecosystem services in areas with multiple land uses in the Santurce Peninsula (i-Tree Eco).

The 60 plots evaluated had 281 tree stems before Hurricanes Irma and Maria in 2017 but had only 160 in April of 2018 (a loss of 26.6%) (**Appendix 3**). Likewise, the initial species richness (i.e., species count) was 48 and changed to 40 seven months after the hurricane (a 16.7% loss). Species like *Tabebuia heterophyla, Swetenia mahogany and Bursera simarouba* had a higher proportion of remaining stems seven months after the hurricane event (**Appendix 3**). The initial percent tree cover for these plots was 21.4% but went down to 13.1% (a 38.8% loss) seven months after the hurricane events. The average percent tree dieback after the hurricanes is similar across time periods (pre-hurricane: 12.4 ± 1.3 (SE) vs post-hurricane 11.9 ± 1.3. However, the average percent of crown missing experienced a 20.8% reduction (pre-hurricane: 12.4 ± 1.6 vs post-hurricane 32.1 ± 2.2). Out of the 160 trees that still remain, 35.6% have been classified as being in fair, poor, critical or dying condition (**Figure 7**). The proportion of lost/persistent trees was not homogeneous across species (**Appendix 3**); most loss species were non-native ornamentals. However, a species-specific analysis of this process is beyond the scope of this report.

Evaluation of vegetation data from 60 plots collected in 2017 (pre-hurricane) and March-April 2018 (post-hurricane) using the i-Tree Eco model showed marked reductions in tree density, % tree cover and functional and monetary values of ecosystem services. For simplicity we list the estimates for each vegetation/service characteristics derived from the i-Tree Eco models that were run with post-hurricane data (**Appendix 4**) and the corresponding percent reduction based on i-Tree Eco models run with pre-hurricane data.

Post-hurricane vegetation characteristics and services values of the Santurce Peninsula and their estimated change from pre-hurricane conditions (i-Tree Eco):

- Number of trees: 90,320 (representing a 26.3% stem reduction)
- Tree cover: 13.1% (representing a 38.8% tree cover loss)
- Percentage of trees less than 6" (15.2 cm) diameter: 35.6% (representing an 11.9% loss)
- Pollution removal: 5.865 tonnes*/year with a 45.3% service reduction per year and a monetary loss of $42.6 thousand per year.
- Carbon storage: 17.89 thousand tonnes representing a 23.7% service loss from pre-hurricane values and a monetary loss of $790,000.
- Carbon sequestration: 1.395 thousand tonnes*/year equivalent to a 12.8% service loss per year and a monetary loss of $29,000/year.
- Oxygen production: 3.376 thousand tonnes*/year equivalent to a 12.3% service loss per year.
- Avoided runoff: 73.11 thousand cubic meters/year which represent a 48.5 service loss per year and a loss of monetary value of $162 thousand per year
- Structural values (the cost to replace available trees) were $13.3 million with a cost of replacement of trees that were lost at $4.8 million. *Tonne: 1000 kilograms

Figure 7. Distribution of tree condition categories as defined by i-Tree Eco based on percent dieback estimates (condition = 1 - % dieback). The condition classes are Excellent (<1% crown dieback), Good (1-10% dieback), Fair (11-25% dieback), Poor (26-50% dieback), Critical (51-75% dieback), Dying (76-99% dieback), and Dead (100% dieback) (US Forest Service 2018).

Tables 4a and **4b** are summary tables that facilitate pre-and post-hurricane comparisons and breakdown ecosystem services for the six air quality criteria defined by the US Environmental Protection Agency (EPA). Results indicate an average reduction of 45% in air purification services and a similar avoided runoff capacity (**Table 4**). Models estimate that for April 2018 there were 90,320 trees out of the 122,700 estimated before hurricane Maria (estimate down by 26.6%) in the Santurce Peninsula (area = 22.53 km^2). The current estimates for number of trees would have a total value of $422,271 which represents a 35.7% loss of tree value. The biggest reduction in services provided were seen for air pollution removal services and runoff reduction (**Table 4**). Models suggest a compensatory value of $4.8M to replace lost trees of a similar state as the ones lost.

Table 4. Absolute and percent changes in function and monetary values of trees before and after the 2017 hurricane season in the Santurce Peninsula.

A. Absolute and percent changes in tree function				
Service	**2017**	**2018**	**Net Loss**	**% Loss**
CO (kg/yr)	2,238.40	1,369.50	868.8	38.8
O_3 (kg/yr)	5,428.90	3,015.10	2,413.80	44.5
$PM_{2.5}$ (kg/yr)	2,027.60	947.2	1,080.40	53.3
NO_2 (kg/yr)	985.9	511.5	474.4	48.1
SO_2 (kg/yr)	39.8	22.1	17.7	44.4
C sequestration (1000 t/yr)	1.6	1.4	0.2	12.8
C storage (1000 t)	23.4	17.9	5.6	23.7
Avoided runoff (1000 m^3/yr)	141.9	73.1	68.8	48.5
Pollution removal (t/yr)	10.7	5.9	4.9	45.3
Oxygen production (1000 t /yr)	3.8	3.4	0.5	12.3
B. Absolute and percent change in total tree monetary value				
Service	**2017**	**2018**	**Net Loss**	**% Loss**
CO ($/yr)	3,623.40	2,216.90	1,406.40	38.8
O_3 ($/yr)	61,873.70	34,363.10	27,510.60	44.5
$PM_{2.5}$ ($/yr)	15,428.90	7,207.80	8,221.10	53.3
NO_2 ($/yr)	11,236.20	5,829.20	5,407.10	48.1
SO_2 ($/yr)	111.10	61.30	49.80	44.9
Cseq ($/yr)	229,000.00	200,000.00	29,000.00	12.7
Cstor ($M/yr)	3.40	2.60	0.80	23.6
Avoided runoff ($/yr)	334,990.00	172,590.00	162,400.00	48.5
Pollution removed ($/yr)	92,273.00	49,679.00	42,594.00	46.2
Total Santurce ($)	**656,266.60**	**422,270.80**	**233,995.70**	**35.7**
Structural value ($)	**18,100,000**	**13,300,000**	**4,800,000**	**26.50%**

* Tonne = 1000 kilograms

** Total area sampled is 0.024069 Km^2, Total Area in Santurce 22.53km^2

***M = millions

D. Changes in vegetation and ecosystem services in residential yards of the Río Piedras Watershed (i-Tree Eco).

After hurricane Maria, 69 residential yards lost 7.3% of the species (from 96 to 89 total species) and 26.7% of the stems (from 502 to 368 stems) (**Appendix 4**). The vast majority of standing trees (70.4%) were found to be in poor, critical, dying or dead conditions (**Figure 8**). Yards experienced considerable losses in all ecosystem services measured but avoided runoff and pollution removal services were the most affected (**Table 5a**). Results indicate that services related to energy savings from tree shade were also reduced (**Table 5b**).

Post-hurricane vegetation characteristics and service values via complete inventory of 69 residential yards within the Río Piedras watershed and their estimated change from pre-hurricane conditions:

- *Number of trees*: 368 (representing a 27% vegetation reduction)
- *Pollution removal*: 10,298.20 g per year with a 34% service reduction per year and a monetary loss of $400.56 per year
- *Carbon storage:* 25,679.64 kg representing a 15% service loss from pre-hurricane values and a monetary loss of $625
- *Carbon sequestration:* 887.4 kg per year equivalent to a 48% service loss per year and a monetary loss of $118 per year
- *Oxygen production:* 2,366.5 kg per year equivalent to a 48% service loss per year
- *Avoided runoff*: 67.10 m^2 per year which represent a 40.3% service loss per year and a loss of monetary value of $106.91 per year
- *Structural values:* $85,559 would be the cost to replace the 134 trees lost due to hurricane impact, representing a total loss of 67%

Figure 8. Distribution of tree condition categories in 69 residential yards as defined by i-Tree Eco based on percent dieback estimates (condition = 1- (% dieback). Excellent (<1% crown dieback), Good (1-10% dieback), Fair (11-25% dieback), Poor (26-50% dieback), Critical (51-75% dieback), Dying (76-99% dieback), and Dead (100% dieback) (US Forest Service 2018).

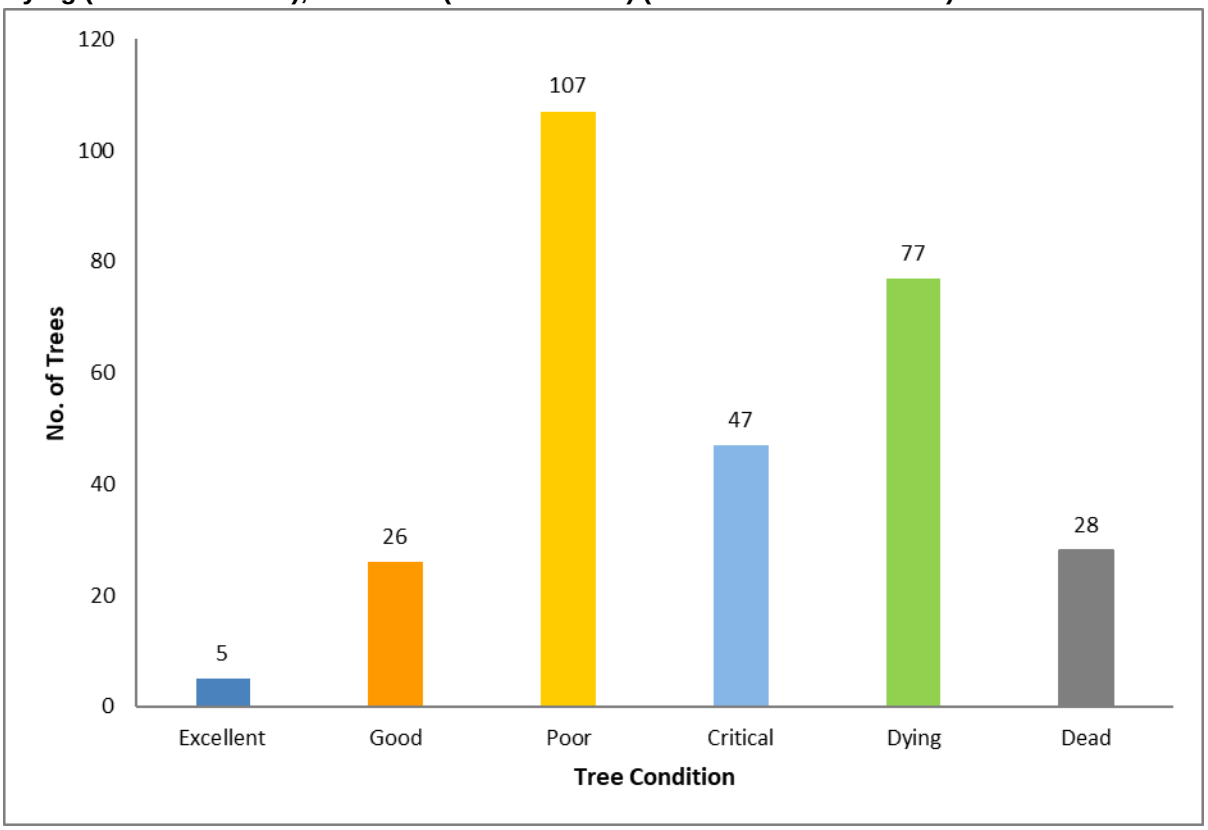


Table 5. Changes in total ecosystem function and monetary value provided by residential yards trees in San Juan (See Appendix 5 for species-specific details).				
A. Absolute and percent change in total tree function				
Service	**2017**	**2018**	**Net Loss**	**% Loss**
CO (g/yr)	2,835.80	2,203.90	631.90	22.28
O_3 (g/yr)	8,235.30	5,451.00	2,784.30	33.81
$PM_{2.5}$ (g/yr)	1,790.20	876.80	913.40	51.02
NO_2 (g/yr)	1,269.00	752.80	516.20	40.68
SO_2 (g/yr)	1,498.00	1,014.60	483.40	32.27
Gross Cseq (kg/year)	1,695.70	887.40	808.30	47.67
Cstor (kg)	30,119.10	25,679.67	4,439.43	14.74
Avoided runoff (m^2/yr)	112.40	67.10	45.30	40.30
Pollution removed (g/yr)	15,628.40	10,298.20	5,330.20	34.11
Cooling energy savings (Kwh/yr)	6,242.77	4,639.35	1603.42	25.68
Carbon avoided (kg/yr)	1,456.40	1,278.67	177.73	12.20
Oxygen produced (kg/yr)	4,521.90	2,366.50	2,155.40	47.67
B. Absolute and percent change in total tree monetary value				
Service	**2017**	**2018**	**Net Loss**	**% Loss**
CO ($/yr)	4.56	3.55	1.01	22.15
O_3 ($/yr)	95.10	62.95	32.15	33.81
$PM_{2.5}$ ($/yr)	717.69	351.52	366.17	51.02
NO_2 ($/yr)	2.19	1.30	0.89	40.64
SO_2 ($/yr)	0.94	0.60	0.34	36.17
Gross Cseq ($/yr)	248.52	130.10	118.42	47.65
Cstor ($)	4,417.25	3,766.23	651.02	14.74
Avoided runoff ($/yr)	265.24	158.33	106.91	40.31
Pollution removed ($/yr)	820.42	419.86	400.56	48.82
Cooling energy saving ($/yr)	1,748.00	1,299.06	448.94	25.68
Carbon avoided ($/yr)	213.70	187.54	26.16	12.24
Total ($/yr)	**3,196.91**	**2,307.49**	**889.42**	**27.82**
Structural value ($)	**126,972.87**	**41,413.47**	**85,559.40**	**67.38**

CHAPTER 4. DISCUSSION

A. Meaning of inventory and services results

Urban areas of San Juan, Ponce and Mayagüez all had tree covers that were comparable to other US cities (Nowak and Greenfield 2012). However, they all lost a considerable amount of tree cover and as a consequence they also lost considerable capacity to generate ecosystem services that can make these cities more resilient and less vulnerable to extreme climatic

events. Moreover, tree condition data from inventories in Santurce and San Juan yards suggest that a large proportion of trees have inadequate condition and may need further evaluation and replacement.

Prior urban forest assessments for the San Juan Metropolitan area in 2011 had reported that an estimated 20.3% of all trees in developed land showed at least one damage type that could lead to lowered crown health (disease, mechanical, etc.; Brandeis et al. 2014). Our i-Tree results indicate that this percentage is much higher in Santurce and in residential areas within the Río Piedras Watershed and that is much lower in residential yards. Moreover, in residential areas none of the trees inventoried that remained after the hurricane were in good (or excellent) condition. These results are of concern as residential areas in the San Juan Metropolitan area

contain more than 24% of its urban tree cover (Brandeis et al. 2014, Ramos-González 2014) which has city-wide forest vulnerability implications.

Given our estimated percent tree cover in San Juan (25.6%), the hurricane might have set back the tree cover in that city close to what was reported for the San Juan Metropolitan area using images from 1999 (Brandeis 2014). This reduction may have important implications in terms of increased vulnerability for the residents of San Juan, within the context of the city's capacity for disaster prevention, and given expected increases of extreme climatic events world-wide (extreme heat events, Mills et al. 2014) and observed climatic trajectories for the Caribbean (Henerah et al. 2016). According to i-Tree Eco model estimates, the loss of tree cover in Santurce, a coastal sector in San Juan with frequent pluvial flooding, has potentially reduced by half the capacity to avoid runoff. Other coastal communities like Ocean Park and Puerto Nuevo (both prone to frequent flooding), have low levels of tree cover (as measured through i-Tree Canopy) relative to other areas in San Juan, and may be even more vulnerable than Santurce. The severe reduction in air pollution removal services (almost half of its capacity reduced) also places residents of Puerto Rico at risk of chronic respiratory diseases. Indeed, Puerto Rico has the highest lifetime asthma rates in all the US and territories combined (10.6 cases per 100 people, Puerto Rico Department of Health 2016). Both landscape-scale and site-scale analysis approaches (i-Tree Canopy and i-Tree Eco) illustrate that tree cover is not equally distributed across the municipalities and that tree losses were more frequently detected within urban sectors in all three municipalities evaluated. Hurricane-driven tree cover also appeared to change according to geographic location (San Juan > Ponce > Mayagüez) which could be related to the cities' distances from the eye of hurricane Maria.

The inventories in residential yards in the Río Piedras watershed corroborate the potential contribution of private spaces to the provision of urban ecosystem services to the city, as advocated by other studies (Vila-Ruiz et al. 2014, Meléndez-Ackerman et al. 2014). Given the extent of tree cover within residential land uses in the San Juan Metropolitan area, our results on the amount of services provided by residential yards highlight that these yard spaces can provide important services to the reduction of extreme climate risks, pollution removal and even food security. Tree species related to food provision appeared in higher proportions in the residential yard inventory than in the Santurce inventory, which included a mixture of land uses. This is consistent with the observation that food trees are more common in residential areas of the San Juan Metropolitan area than in other land uses (Brandeis et. al 2014).

i-Tree Canopy vs i-Tree Eco - Both landscape and site-scale approaches used here for the evaluation of urban ecosystem services (i-Tree Canopy and i-Tree Eco) indicated the potential for spatial variation in tree cover but the combined analyses point to the need for ground forest inventories to capture data that can better inform management and reforestation decisions at a finer scale. The evaluations of changes in ecosystem services for Ponce and Mayagüez were limited relative to San Juan because they did not have the i-Tree Eco (or similar) inventories. i-tree Eco analyses generated the list of species that did not resist the impact of the hurricane and those that did as well as those that are in good condition or in need to be replaced. i-Tree Eco also provided an estimate on the number of trees that were lost with their associated

monetary values. This is not possible for i-Tree Canopy which focuses on tree cover and is limited in its consideration of fine-scale spatial differences in the provision of services, even though it accounts for urban versus rural land covers in its calculations of ecosystem service functions and values (Nowak 2013).

There are advantages and limitations to both i-Tree Canopy and i-Tree-Eco in the evaluation of ecosystem services, which is why they should be employed complementary to each other, particularly in Puerto Rico. i-Tree Canopy is a tool that is easy to use, providing communities with opportunities for rapid assessments of tree cover and in theory with rapid assessments for ecosystem services and to establish tree cover goals. However, the photo interpretation technique using i-Tree Canopy cannot capture tree losses due to hurricane-driven management (removal of hazardous trees), nor does it capture post-hurricane driven mortality due to condition change in the months to follow. i-Tree Canopy uses Google Earth images which at the time of photo interpretation in this project were images taken two months after the Maria event. To correct for this we reduced tree function and monetary values generated by i-Tree Canopy by 26%. We are confident that this modification was actually needed (at least for San Juan) given the consistent tree losses in both Santurce and the yard inventories and the observed results for tree canopy loss which for Santurce was 38%. Indeed, a large portion of the trees inventoried in San Juan, which happened to be in highly developed sectors, did not have healthy crowns which may suggest that this city's forest resources and their benefits to residents are highly vulnerable to future events. Unfortunately, i-Tree-Eco inventories for Ponce and Mayagüez were unavailable which is problematic as climatic, geographic and potential vegetation differences between municipalities may also influence hurricane-driven vegetation damage and recovery.

One advantage of i-Tree Eco over i-Tree Canopy is that it considers additional services that are also important to city planning (avoided runoff, energy savings, etc.). However, application of this technique is considerably more time consuming and does not allow for large-scale rapid assessments. There are other i-Tree tools that, like Canopy, rely on photo-interpretation and may be more accessible to users (i-Tree Storm, i-Tree Landscape/Vue, i-Tree Design). However, they are not yet accessible to the residents of Puerto Rico. Even with i-Tree Canopy there might be methodological limitations when it comes to the calculations of the tree ecosystem services. i-Tree Canopy provides equation multipliers based on tree data for the contiguous United States and not for PR, which may lead to underestimation of tree growth rates and add another level of uncertainty in the calculation of monetary values. For this work we selected the best available reference city (Florida) for the i-Tree Canopy work to minimize this limitation.

B. Recommendations

Provide an opportunity to improve the application of i-Tree tools outside the contiguous 48 US states to inform natural disaster planning and response to mitigate the effects of future natural disasters. This is extremely important for insular areas that are particularly vulnerable to extreme events and can become model sites for learning how i-Tree can facilitate

climate-smart urban forest planning. For Puerto Rico, this would require expanding the i-Tree database for inputs within tools like i-Tree Canopy, i-Tree Storm, i-Tree Design, i-Tree Landscape (www.itreetools.org). Puerto Rico is not currently included in the dropdown menu for i-Tree Canopy, which forces the use of the best available estimate. i-Tree Storm, Design and Landscape are particularly useful for individual and community stakeholders, yet they are currently unavailable to residents of Puerto Rico and other US territories. These tools would have been useful to develop better disaster preparedness and response plans related to urban forest management.

Support and expand urban forest monitoring through i-Tree Eco in San Juan and begin similar efforts in Ponce, Mayagüez and other municipalities (especially coastal) as part of municipal and state urban planning to achieve climate smart goals. In light of what has occurred after the hurricane events in Puerto Rico, urban forest planning should also be viewed as a planning strategy for emergency preparedness, mitigation of extreme events and post-hurricane recovery efforts.

Begin immediate efforts to increase urban canopy cover to replace services lost. However, urban forest management should be guided by information on the spatial differences in tree loss and condition, structural and species composition changes, area location (i.e., proximity to water bodies and stormwater infrastructure), site topography and soil conditions of management sites. This requires more fine scale urban vegetation data collection and modeling. We know from past studies that urban vegetation resources in San Juan can also be influenced by social, institutional and historical factors which should also be consider in urban forest (Meléndez-Ackerman et al. 2014, Meléndez-Ackerman et al. 2016, Torres et al. 2016) when developing and implementing forest recovery strategies and future urban planning for this city.

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APPENDICES

Appendix 1. Coordinates for the center of each area by municipality

Municipality	Longitude (x)	Latitude (y)	Area (km^2)	Classification	Date POST	Date PRE
San Juan 1	-66.035	18.4071	3.14	urban	11/2017	Jul-17
San Juan 2	-66.012	18.3998	3.14	urban	11/2017	Jul-17
San Juan 3	-66.0776	18.4446	2.84	urban	11/2017	Jul-17
Avenida Central	-66.0688	18.406	3.14	urban	11/2017	May-17
Chiclana	-66.0735	18.3382	3.14	urban	11/2017	Apr-17
Cupey	-66.0435	18.33	3.14	rural	11/2017	Jul-17
La Sierra	-66.0591	18.37	3.14	urban	11/2017	May-17
Las Curias	-66.0561	18.3437	3.14	urban	11/2017	May-17
Las Lomas	-66.0907	18.3934	3.14	urban	11/2017	Jul-17
Ocean Park	-66.0622	18.4513	1.97	urban	11/2017	Jul-17
Puerto Nuevo	-66.0822	18.4219	3.14	urban	11/2017	Jul-17
Río Piedras	-66.056	18.3952	3.14	urban	11/2017	Jul-17
Ponce 1	-66.6612	17.9999	3.14	urban	11/2017	Apr-17
Ponce 2	-66.6129	17.9989	3.14	urban	11/2017	Feb-17
Ponce 3	-66.5646	17.9986	3.14	rural	11/2017	Feb-17
Ponce 4	-66.6539	18.0412	3.14	rural	11/2017	Feb-17
Ponce 5	-66.6079	18.0369	3.14	urban	11/2017	Feb-17
Ponce 6	-66.5674	18.0466	3.14	all	11/2017	Feb-17
Ponce 7	-66.6545	18.0836	3.14	rural	11/2017	Feb-17
Ponce 8	-66.6135	18.076	3.14	rural	11/2017	Feb-17
Ponce 9	-66.5754	18.0909	3.14	rural	11/2017	Jan-17
Ponce 10	-66.6525	18.1299	3.14	rural	11/2017	Jan-17
Ponce 11	-66.6137	18.1162	3.14	rural	11/2017	Feb-17
Mayaguez 1	-67.1569	18.1695	3.14	all	11/2017	Jun-17
Mayaguez 2	-67.1092	18.2026	3.14	rural	11/2017	Feb-17
Mayaguez 3	-67.1221	18.1729	3.14	all	11/2017	Feb-17
Mayaguez 4	-67.0566	18.1887	3.14	rural	11/2017	Feb-17
Mayaguez 5	-67.1398	18.1991	3.14	urban	11/2017	Feb-17
Mayaguez 6	-67.1156	18.2319	3.14	rural	11/2017	Feb-17
Mayaguez 7	-67.0876	18.1797	3.14	rural	11/2017	Feb-17
Mayaguez 8	-67.0782	18.2119	3.14	rural	11/2017	Feb-17
Mayaguez 9	-67.1616	18.2562	3.14	urban	11/2017	Jun-17
Mayaguez 10	-67.1492	18.2302	3.14	urban	11/2017	Feb-17
Mayaguez 11	-67.0816	18.2369	3.14	rural	11/2017	Feb-17

*** In green:** Plots from previous studies by San Juan ULTRA (Urban Long-Term Research Area) of the San Juan Urban Field Station (IITF-FS).

** Classification = general land cover setting for photo interpretation in i-Tree Canopy.

Appendix 2. Summary Tables of Land cover classifications derived from i-Tree Canopy and Raw i-Tree Canopy Reports.

2A - 2017 Pre-Hurricane Frequency of Land Cover Classes by Municipality and Sampling Area Values extracted from i-Tree Canopy reports.

Municipality / Plot ID	Coarse woody vegetation	Other vegetation	Bare soil	Water	Impervious	Other
San Juan						
San Juan 1	98	52	18	3	327	2
San Juan 2	131	57	11	0	300	1
San Juan 3	133	44	14	22	287	0
Avenida Central	117	53	2	1	326	1
Chiclana	208	80	31	1	177	3
Cupey	374	51	3	71	1	0
Las Curias	298	72	1	16	112	1
Las Lomas	114	28	4	0	353	1
Ocean Park	30	5	2	3	209	1
Puerto Nuevo	99	83	31	54	225	8
Río Piedras	172	89	10	1	228	0
La Sierra	203	57	1	1	238	0
Total	**1977**	**671**	**128**	**173**	**2783**	**18**
Ponce						
Ponce 1	343	30	57	0	70	0
Ponce 2	134	52	5	6	301	2
Ponce 3	481	8	2	0	7	2
Ponce 4	355	42	15	0	88	0
Ponce 5	193	74	48	7	178	0
Ponce 6	262	79	21	33	105	0
Ponce 7	487	4	2	0	7	0
Ponce 8	478	11	3	8	0	0
Ponce 9	326	11	0	160	3	0
Ponce 10	372	106	10	0	12	0
Ponce 11	463	18	4	5	10	0
Total	**3894**	**435**	**167**	**219**	**781**	**4**
Mayagüez						
Mayaguez 1	323	52	12	0	113	0
Mayaguez 2	422	22	10	5	41	0
Mayaguez 3	368	44	20	0	68	0
Mayaguez 4	457	9	8	0	26	0
Mayaguez 5	86	63	12	5	333	1
Mayaguez 6	431	30	6	1	32	0
Mayaguez 7	434	39	6	0	21	0
Mayaguez 8	464	7	9	0	20	0
Mayaguez 9	**19**	414	18	10	39	0
Mayaguez 10	226	116	22	0	134	2
Mayaguez 11	434	36	4	0	26	0
Total	**3664**	**832**	**127**	**21**	**853**	**3**

*** In green:** Long-term urban sites of San Juan ULTRA (Urban Long-Term Research Area) of the San Juan Urban Field Station (IITF-FS).

2B - 2017 Pre-Hurricane Frequency of Land Cover Classes by Municipality and Sampling Area. Points represent modified i-Tree Canopy values assuming a 26% tree loss in urban areas.

Municipality / Plot ID	Coarse woody vegetation	Other vegetation	Bare soil	Water	Impervious	Other
San Juan						
San Juan 1	122	48	5	2	321	2
San Juan 2	132	57	10	0	301	0
San Juan 3	144	39	8	22	287	0
Avenida Central	115	55	1	1	327	1
Chiclana	240	79	9	1	171	3
Cupey	373	51	4	71	1	0
Las Curias	298	72	1	15	113	1
Las Lomas	114	28	4	0	353	1
Ocean Park	30	6	2	3	208	1
Puerto Nuevo	128	83	8	52	223	6
Rio Piedras	175	87	11	1	226	0
La Sierra	204	55	1	1	239	0
Total	**2075**	**660**	**64**	**169**	**2770**	**15**
Ponce						
Ponce 1	343	30	57	0	70	0
Ponce 2	144	52	4	6	292	2
Ponce 3	480	9	2	0	7	2
Ponce 4	356	40	16	0	88	0
Ponce 5	197	71	50	3	179	0
Ponce 6	278	82	10	33	97	0
Ponce 7	482	3	2	0	13	0
Ponce 8	478	11	3	8	0	0
Ponce 9	326	11	0	160	3	0
Ponce 10	434	51	4	0	11	0
Ponce 11	478	8	3	3	8	0
Total	**3996**	**368**	**151**	**213**	**768**	**4**
Mayagüez						
Mayaguez 1	333	51	3	0	113	0
Mayaguez 2	423	21	10	5	41	0
Mayaguez 3	368	44	20	0	68	0
Mayaguez 4	464	9	5	0	22	0
Mayaguez 5	89	63	12	5	330	1
Mayaguez 6	438	27	3	1	30	0
Mayaguez 7	436	38	5	0	21	0
Mayaguez 8	461	10	8	0	21	0
Mayaguez 9	27	418	6	10	39	0
Mayaguez 10	259	81	21	0	137	2
Mayaguez 11	436	34	4	0	26	0
Total	**3734**	**796**	**97**	**21**	**848**	**3**

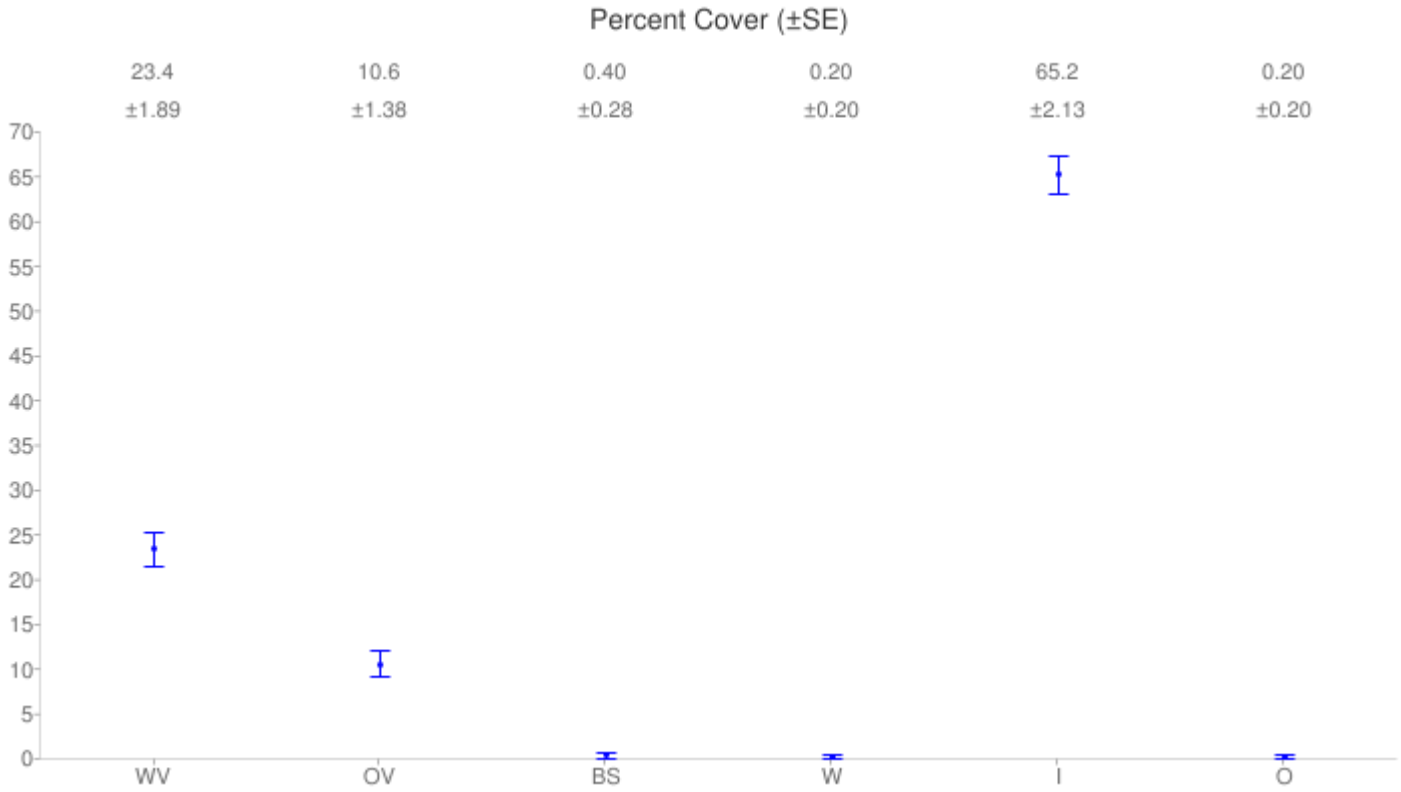
*** In green:** Long-term urban sites of San Juan ULTRA (Urban Long-Term Research Area) of the San Juan Urban Field Station (IITF-FS).

iTree Canopy Post Maria Results: Ave Central

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/25/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree, shrub	WV	117	23.4 ±1.89
Other vegetation	Grass, herb and other vegetation	OV	53	10.6 ±1.38
Bare Soil	Exposed Soil	BS	2	0.40 ±0.28
Water	Standing water, flowing water, pools, etc	W	1	0.20 ±0.20
Impervious	Rooff, building, tar, cement, streets, parkings, etc	I	326	65.2 ±2.13
Other		O	1	0.20 ±0.20

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$136.68	±11.06	92.98 kg	±7.52
NO2	Nitrogen Dioxide removed annually	$247.41	±20.02	513.69 kg	±41.56
O3	Ozone removed annually	$11,363.05	±919.43	3.97 t	±0.32
PM2.5	Particulate Matter less than 2.5 microns removed annually	$23,788.65	±1,924.82	202.71 kg	±16.40
SO2	Sulfur Dioxide removed annually	$37.26	±3.01	252.52 kg	±20.43
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$7,781.90	±629.66	1.13 t	±0.09
CO2seq	Carbon Dioxide sequestered annually in trees	$32,005.31	±2,589.66	820.65 t	±66.40
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$806,953.56	±65,293.51	20.69 kt	±1.67

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.127 @ $1,469.94 | NO2 0.700 @ $481.64 | O3 5.404 @ $2,863.63 | PM2.5 0.276 @ $117,351.49 | SO2 0.344 @ $147.54 | PM10 1.534 @ $6,909.77 | CO2seq 1,117.578 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

The concept and prototype of this program were developed by David J. Nowak, Jeffery T. Walton and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Ellingsworth, Mike Binkley, and Scott Maco (The Davey Tree Expert Company).

Limitations of i-Tree Canopy

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A Cooperative Initiative Between:

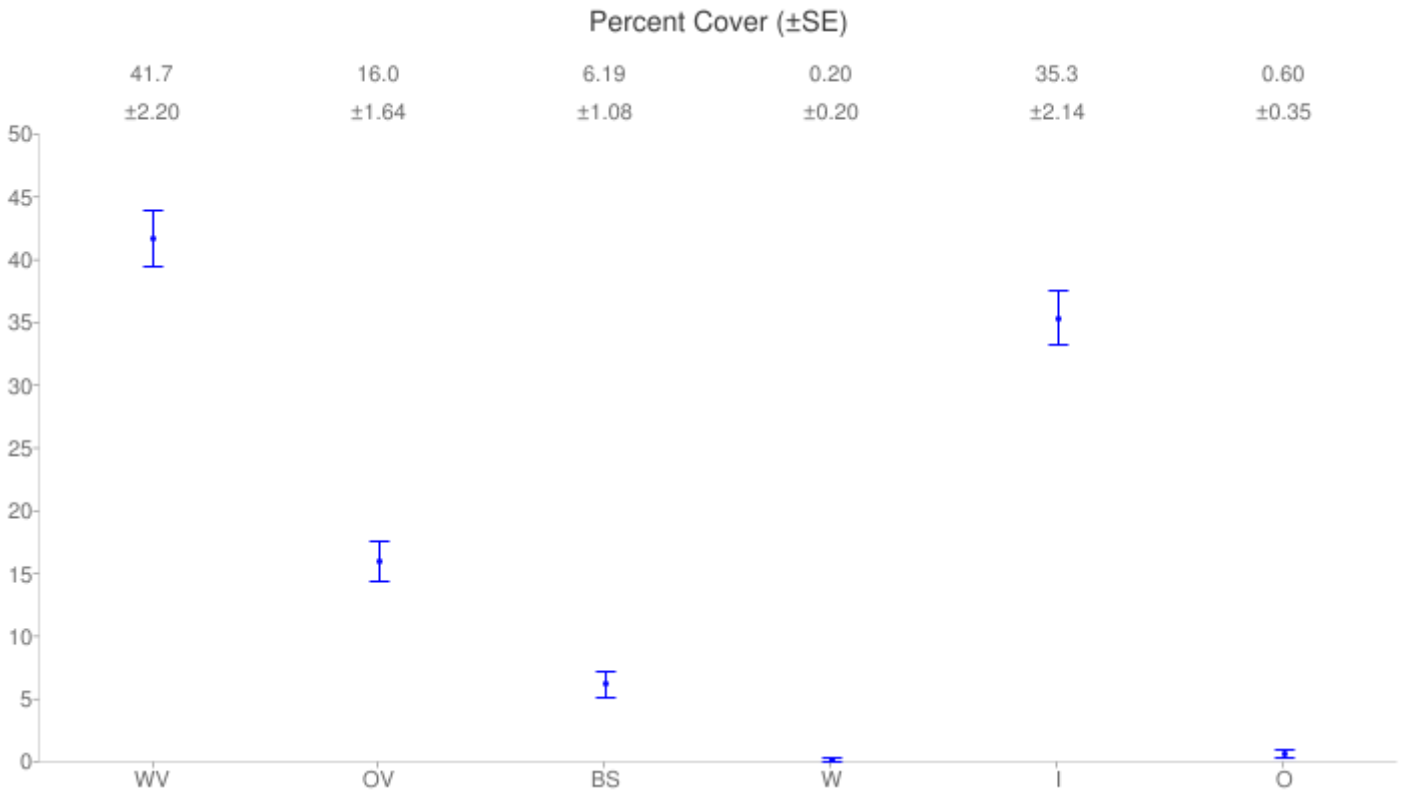
www.itreetools.org

iTree Canopy Post Maria Results: Chiclana

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 5/05/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree, non-shrub	WV	209	41.7 ±2.20
Other Vegetation	grass, herb., etc	OV	80	16.0 ±1.64
Bare soil		BS	31	6.19 ±1.08
Water	Any standing water, including pools, channels, etc.	W	1	0.20 ±0.20
Impervious	Buikding, streets, parkings, etc	I	177	35.3 ±2.14
Other		O	3	0.60 ±0.35

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$393.96	±20.80	268.01 kg	±14.15
NO2	Nitrogen Dioxide removed annually	$335.35	±17.71	849.80 kg	±44.88
O3	Ozone removed annually	$28,112.41	±1,484.56	9.01 t	±0.48
PM2.5	Particulate Matter less than 2.5 microns removed annually	$51,242.62	±2,706.02	390.68 kg	±20.63
SO2	Sulfur Dioxide removed annually	$34.77	±1.84	270.02 kg	±14.26
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$18,795.87	±992.57	2.72 t	±0.14
CO2seq	Carbon Dioxide sequestered annually in trees	$88,859.11	±4,692.47	2.28 kt	±0.12
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$1,438,582.23	±75,968.60	36.89 kt	±1.95

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

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A Cooperative Initiative Between:

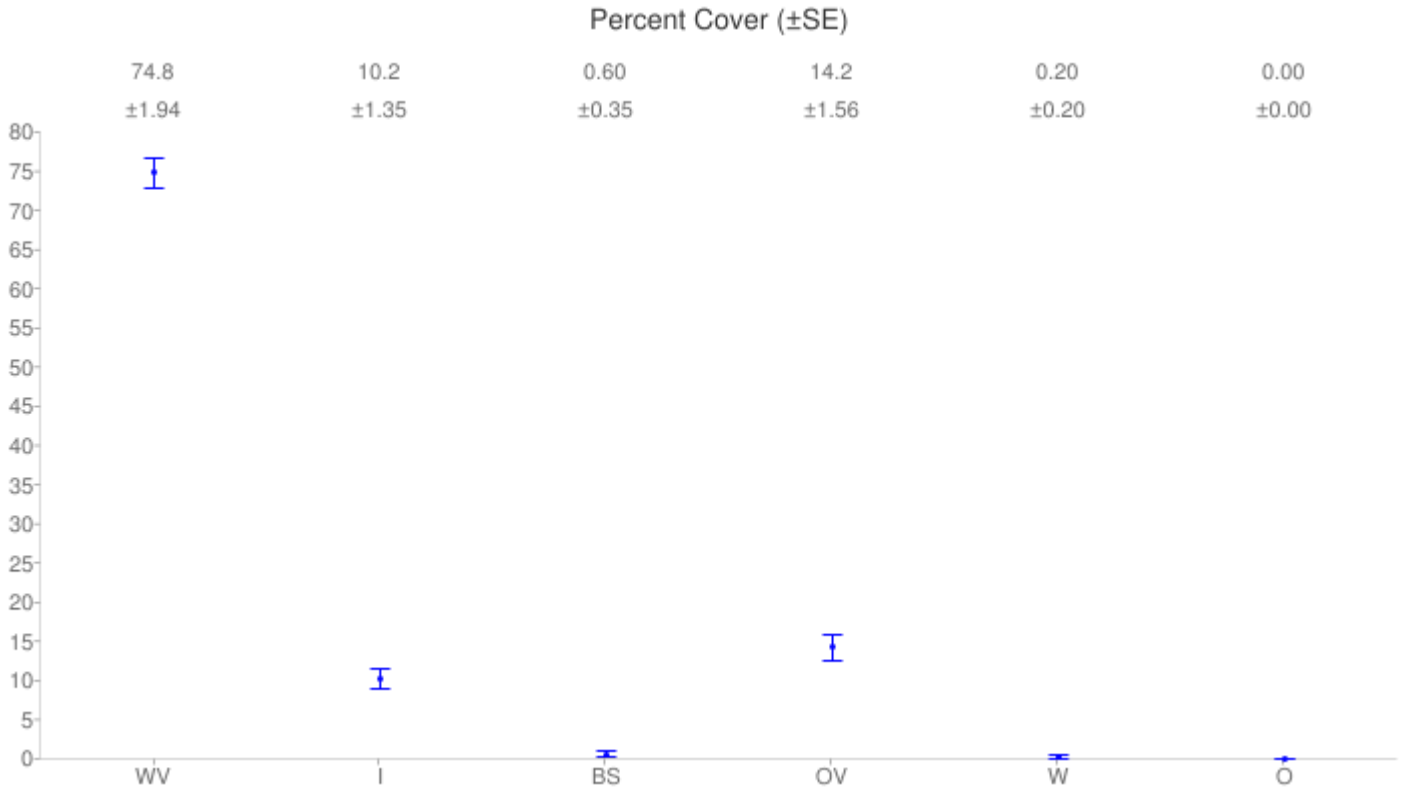
www.itreetools.org

iTree Canopy Post Maria Results: Cupey

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/24/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree & shrub	WV	374	74.8 ±1.94
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	51	10.2 ±1.35
Bare Soil		BS	3	0.60 ±0.35
Other Vegetation	Grass, Herbs, Etc.	OV	71	14.2 ±1.56
Water	Flowing water, Stanging water, pools, etc.	W	1	0.20 ±0.20
Other		O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$11.28	±0.29	421.34 kg	±10.94
NO2	Nitrogen Dioxide removed annually	$14.35	±0.37	1.60 t	±0.04
O3	Ozone removed annually	$1,145.75	±29.74	15.55 t	±0.40
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,150.22	±55.81	802.54 kg	±20.83
SO2	Sulfur Dioxide removed annually	$1.85	±0.05	483.72 kg	±12.56
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$660.00	±17.13	5.25 t	±0.14
CO2seq	Carbon Dioxide sequestered annually in trees	$151,137.40	±3,923.16	3.88 kt	±0.10
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,446,835.08	±63,513.96	62.74 kt	±1.63

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

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A Cooperative Initiative Between:

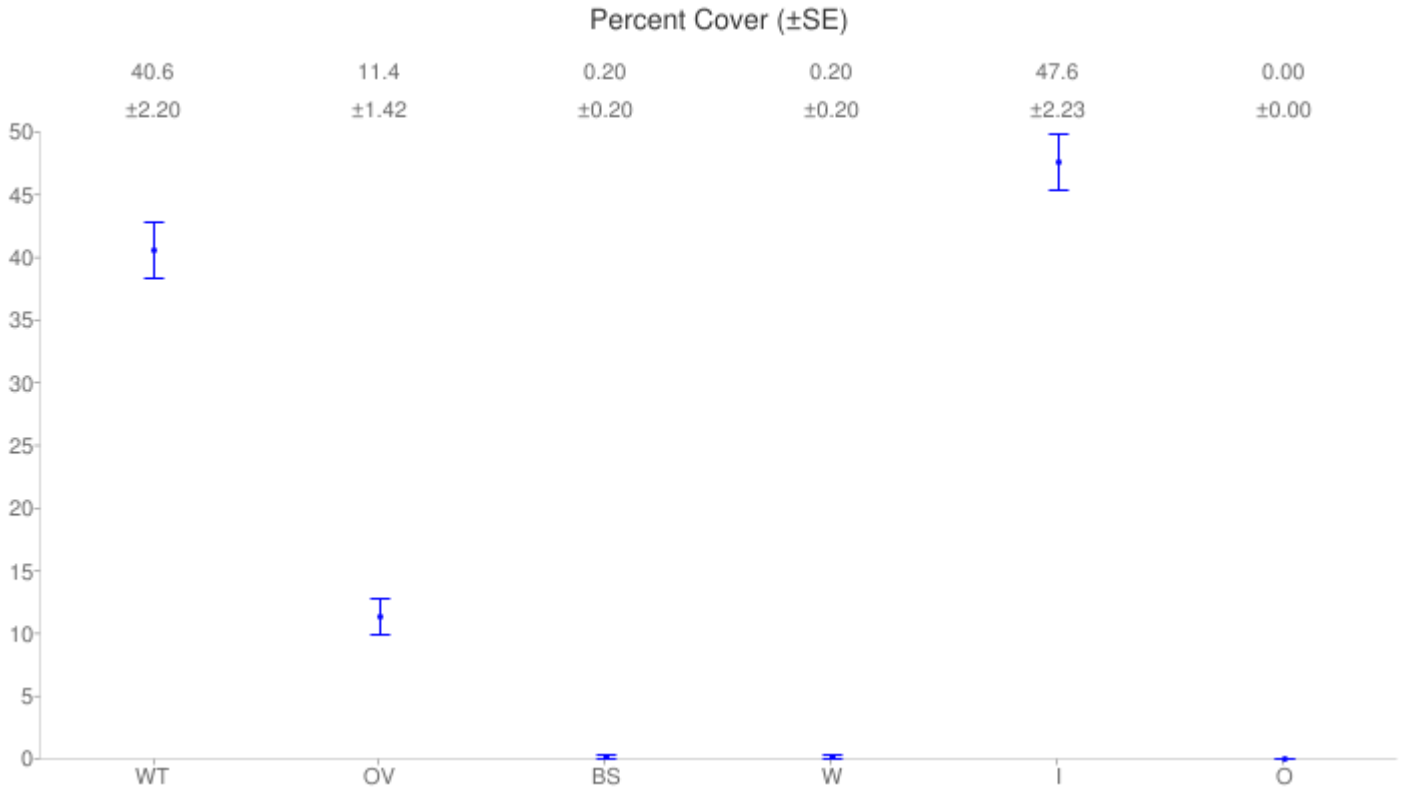
www.itreetools.org

iTree Canopy Post Maria Report: La Sierra

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/26/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Tree	Woody vegetation (tree & shrub)	WT	203	40.6 ±2.20
Other vegetation	Other vegetation (grass, herb and other vegetation)	OV	57	11.4 ±1.42
Bare soil	Bare soil	BS	1	0.20 ±0.20
Water	Water (standing water, flowing water, pools, etc.)	W	1	0.20 ±0.20
Impervious	Impervious (roofs, buildings, tar, cement, streets, parkings, etc.)	I	238	47.6 ±2.23
Other	not included in another class	O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$383.48	±20.74	260.88 kg	±14.11
NO2	Nitrogen Dioxide removed annually	$326.42	±17.66	827.18 kg	±44.75
O3	Ozone removed annually	$27,364.29	±1,480.23	8.77 t	±0.47
PM2.5	Particulate Matter less than 2.5 microns removed annually	$49,878.97	±2,698.13	380.28 kg	±20.57
SO2	Sulfur Dioxide removed annually	$33.85	±1.83	262.83 kg	±14.22
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$18,295.68	±989.68	2.65 t	±0.14
CO2seq	Carbon Dioxide sequestered annually in trees	$86,494.41	±4,678.79	2.22 kt	±0.12
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$1,400,299.03	±75,747.10	35.91 kt	±1.94

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
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A Cooperative Initiative Between:

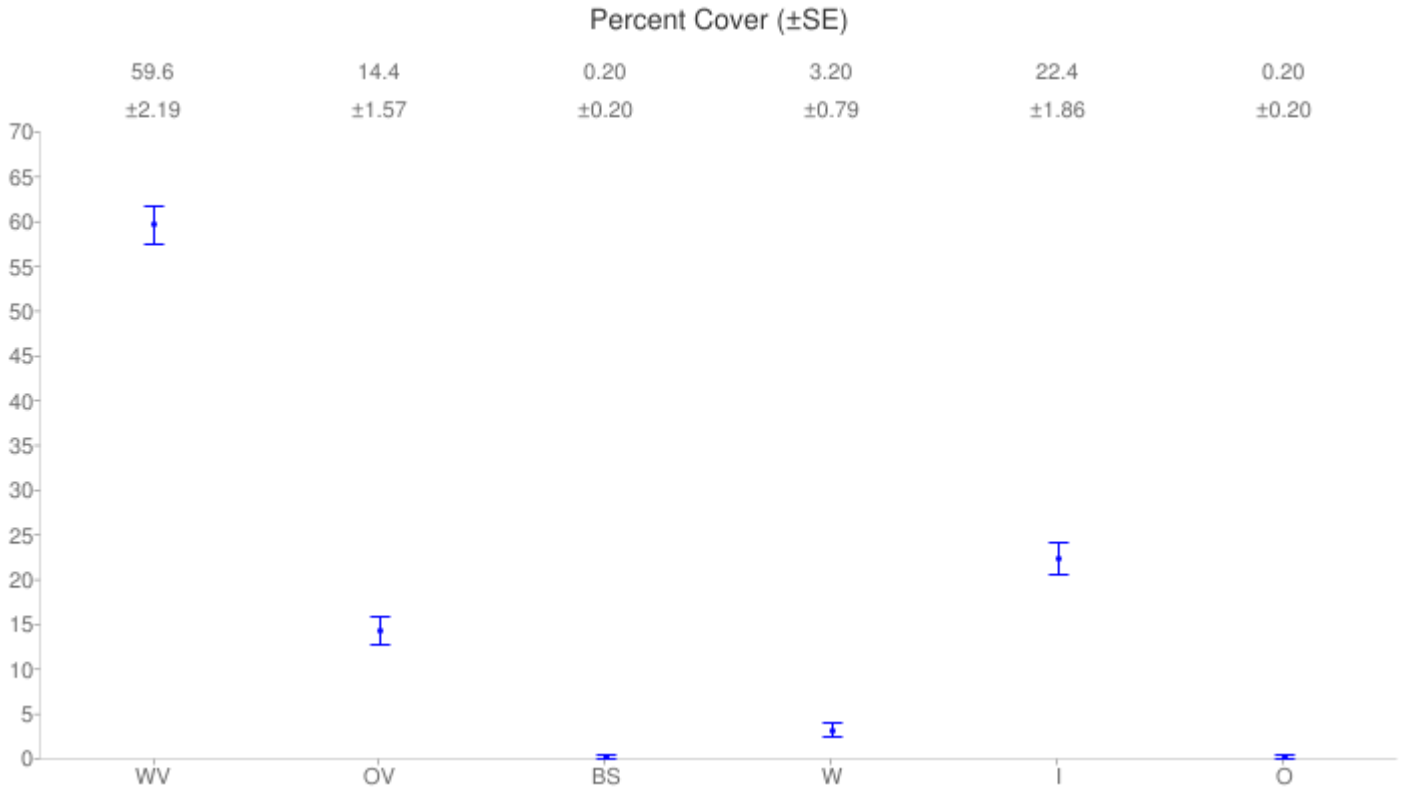
www.itreetools.org

iTree Canopy Post Maria Report: Las Curias

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree, shrub	WV	298	59.6 ±2.19
Other vegetation	Grass, herb and other vegetation	OV	72	14.4 ±1.57
Bare Soil	Exposed Soil	BS	1	0.20 ±0.20
Water	Standing water, flowing water, pools, etc	W	16	3.20 ±0.79
Impervious	Rooff, building, tar, cement, streets, parkings, etc	I	112	22.4 ±1.86
Other	other	O	1	0.20 ±0.20

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$563.00	±20.73	383.01 kg	±14.10
NO2	Nitrogen Dioxide removed annually	$479.24	±17.65	1.21 t	±0.04
O3	Ozone removed annually	$40,174.98	±1,479.24	12.88 t	±0.47
PM2.5	Particulate Matter less than 2.5 microns removed annually	$73,229.99	±2,696.32	558.31 kg	±20.56
SO2	Sulfur Dioxide removed annually	$49.69	±1.83	385.88 kg	±14.21
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$26,860.87	±989.01	3.89 t	±0.14
CO2seq	Carbon Dioxide sequestered annually in trees	$126,987.10	±4,675.65	3.26 kt	±0.12
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,055,854.32	±75,696.34	52.71 kt	±1.94

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
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A Cooperative Initiative Between:

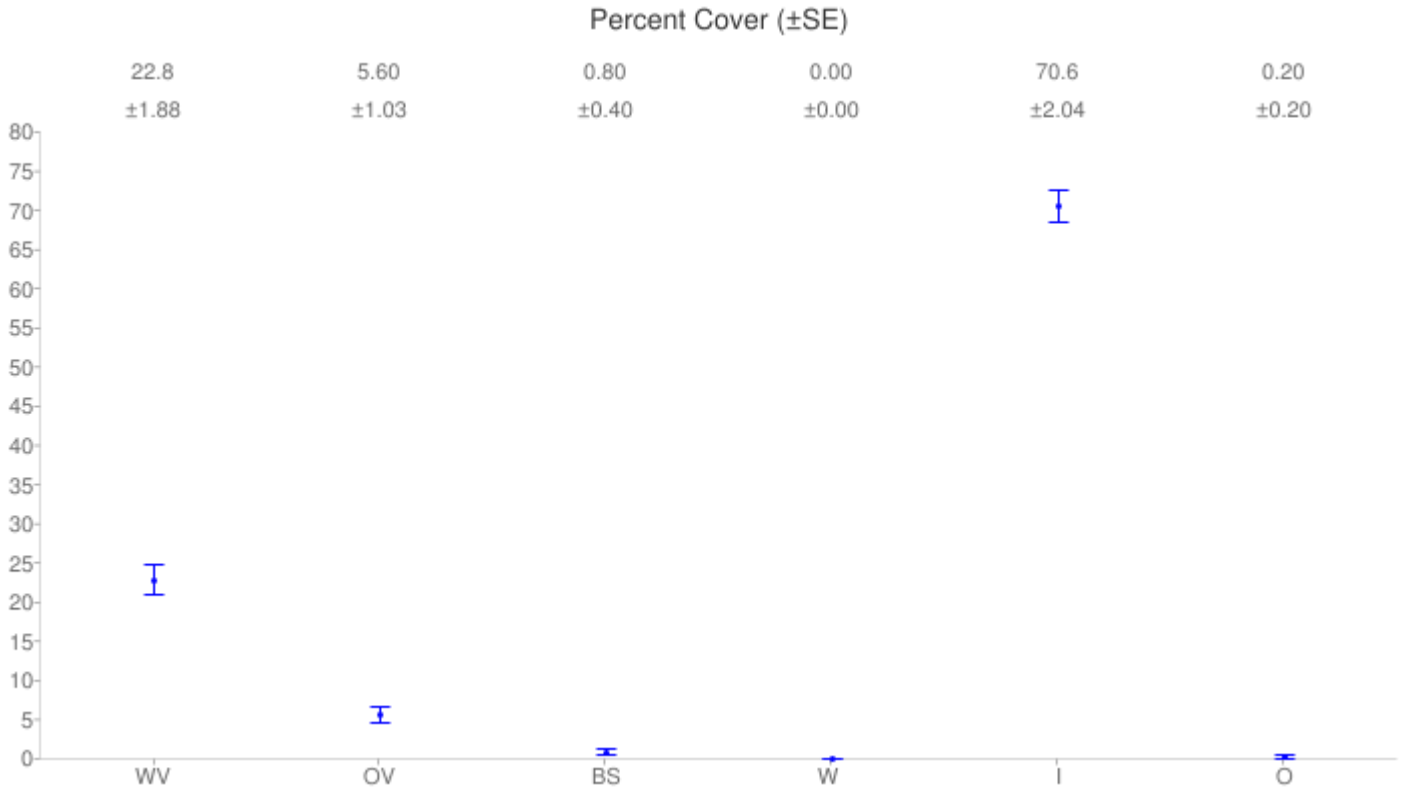
www.itreetools.org

iTree Canopy Post Maria Results: Las Lomas

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 5/01/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree & Shrub	WV	114	22.8 ±1.88
Other Vegetation	Grass, Herb and Other Vegetation	OV	28	5.60 ±1.03
Bare Soil	Bare Soil	BS	4	0.80 ±0.40
Water	Standing Water, Flowing Water & Pools	W	0	0.00 ±0.00
Impervious	Roofs, Buildings, Tar, Cement, Streets & Parkings	I	353	70.6 ±2.04
Other	Other	O	1	0.20 ±0.20

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	165.90 USD	±11.78	112.87 kg	±8.01
NO2	Nitrogen Dioxide removed annually	300.31 USD	±21.32	623.51 kg	±44.27
O3	Ozone removed annually	13,792.48 USD	±979.39	4.82 t	±0.34
PM2.5	Particulate Matter less than 2.5 microns removed annually	28,874.67 USD	±2,050.36	246.05 kg	±17.47
SO2	Sulfur Dioxide removed annually	45.22 USD	±3.21	306.51 kg	±21.76
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	9,445.68 USD	±670.73	1.37 t	±0.10
CO2seq	Carbon Dioxide sequestered annually in trees	38,848.06 USD	±2,758.56	996.10 t	±70.73
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	979,480.56 USD	±69,551.77	25.11 kt	±1.78

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and USD/t/yr: CO 0.127 @ 1,469.94 USD | NO2 0.700 @ 481.64 USD | O3 5.404 @ 2,863.63 USD | PM2.5 0.276 @ 117,351.49 USD | SO2 0.344 @ 147.54 USD | PM10 1.534 @ 6,909.77 USD | CO2seq 1,117.578 @ 39.00 USD | CO2stor is a total biomass amount of 28,177.630 @ 39.00 USD*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

The concept and prototype of this program were developed by David J. Nowak, Jeffery T. Walton and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Ellingsworth, Mike Binkley, and Scott Maco (The Davey Tree Expert Company).

Limitations of i-Tree Canopy

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A Cooperative Initiative Between:

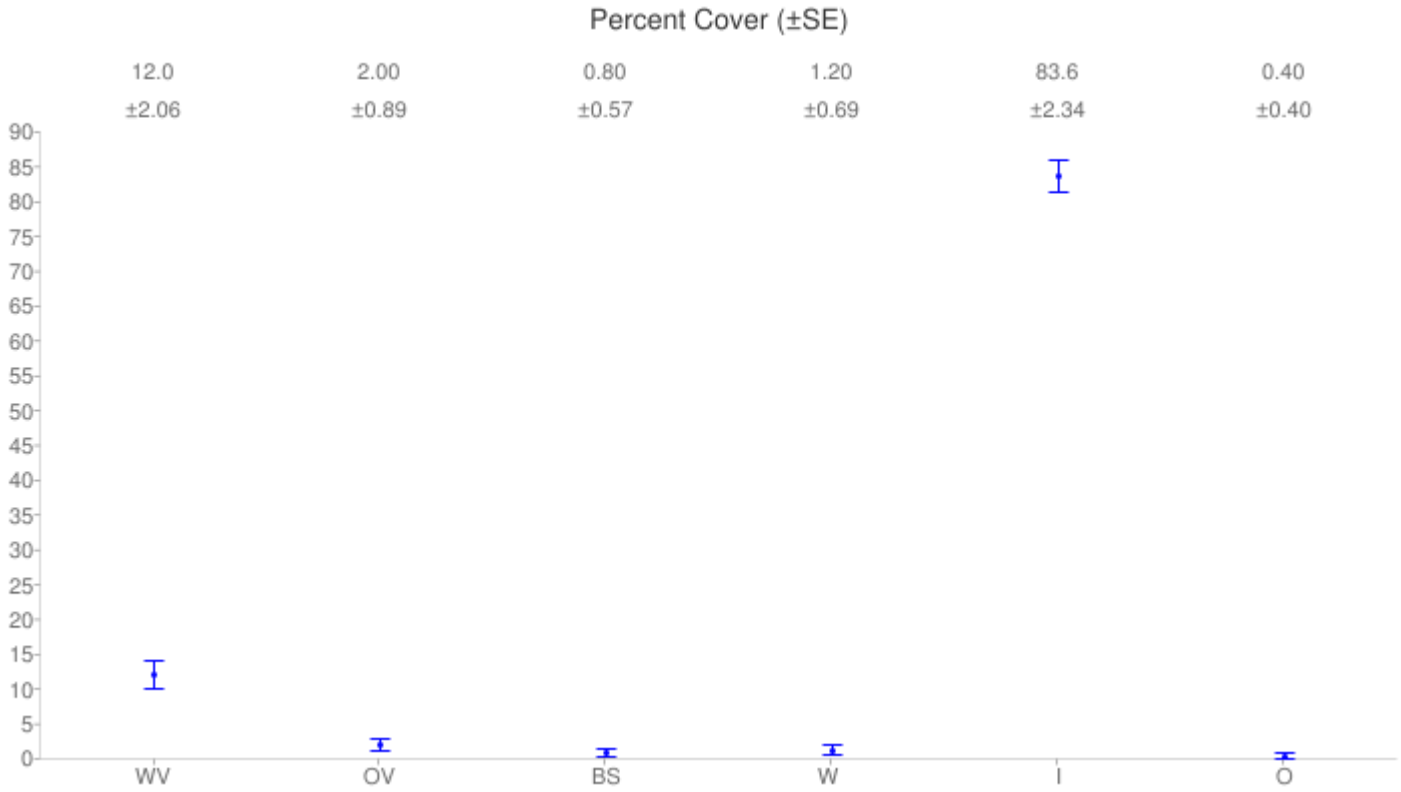
www.itreetools.org

iTree Canopy Post Maria Report: Ocean Park

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody vegetation	Tree & Shrub	WV	30	12.0 ±2.06
Other Vegetation	Grass, Herb and Other Vegetation	OV	5	2.00 ±0.89
Bare Soil	Bare Soil	BS	2	0.80 ±0.57
Water	Standing Water, Flowing Water & Pools	W	3	1.20 ±0.69
Impervious	Roofs, Buildings, Tar, Cement, Streets & Parkings	I	209	83.6 ±2.34
Other	Other	O	1	0.40 ±0.40

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	46.51 USD	±7.29	31.64 kg	±4.96
NO2	Nitrogen Dioxide removed annually	84.20 USD	±13.20	174.81 kg	±27.40
O3	Ozone removed annually	3,866.93 USD	±606.15	1.35 t	±0.21
PM2.5	Particulate Matter less than 2.5 microns removed annually	8,095.44 USD	±1,268.98	68.98 kg	±10.81
SO2	Sulfur Dioxide removed annually	12.68 USD	±1.99	85.93 kg	±13.47
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	2,648.24 USD	±415.12	383.26 kg	±60.08
CO2seq	Carbon Dioxide sequestered annually in trees	10,891.63 USD	±1,707.29	279.27 t	±43.78
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	274,611.94 USD	±43,046.18	7.04 kt	±1.10

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and USD/t/yr: CO 0.127 @ 1,469.94 USD | NO2 0.700 @ 481.64 USD | O3 5.404 @ 2,863.63 USD | PM2.5 0.276 @ 117,351.49 USD | SO2 0.344 @ 147.54 USD | PM10 1.534 @ 6,909.77 USD | CO2seq 1,117.578 @ 39.00 USD | CO2stor is a total biomass amount of 28,177.630 @ 39.00 USD*
Note: Currency is in USD
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About i-Tree Canopy

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A Cooperative Initiative Between:

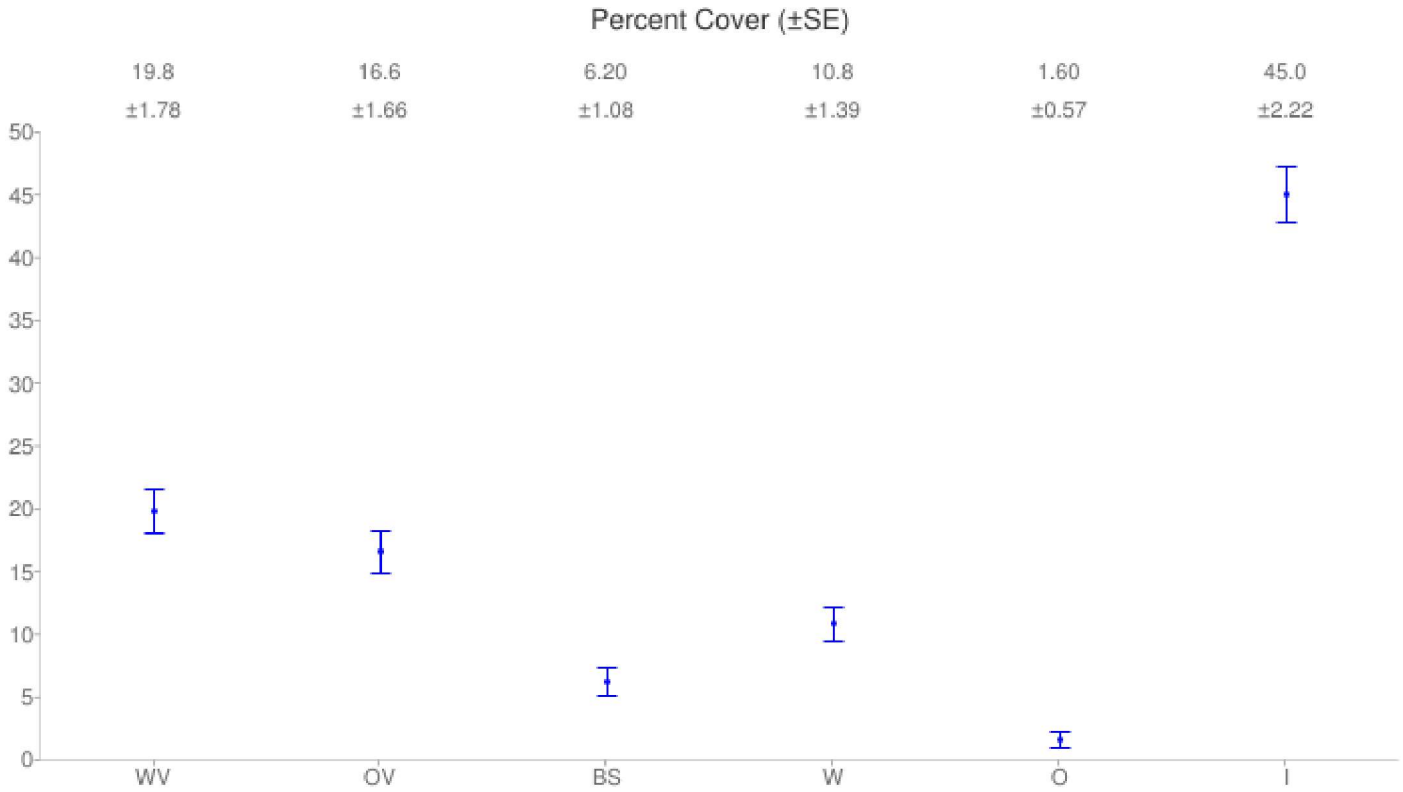
www.itreetools.org

iTree Canopy Post Maria Report: Puerto Nuevo

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/26/18



Cover Class	Description	Abbr.	Points	% Cover
Woody vegetation	Tree, shrub	WV	99	19.8 ±1.78
Other Vegetation	grass, herb and other vegetation	OV	83	16.6 ±1.66
Bare Soil	Bare soil	BS	31	6.20 ±1.08
Water	Standing water, flowing water, pools, etc	W	54	10.8 ±1.39
Other	Other	O	8	1.60 ±0.57
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	225	45.0 ±2.22

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	424.97 USD	±21.01	289.11 kg	±14.29
NO2	Nitrogen Dioxide removed annually	361.75 USD	±17.89	916.69 kg	±45.32
O3	Ozone removed annually	30,325.40 USD	±1,499.33	9.72 t	±0.48
PM2.5	Particulate Matter less than 2.5 microns removed annually	55,276.42 USD	±2,732.94	421.43 kg	±20.84
SO2	Sulfur Dioxide removed annually	37.51 USD	±1.85	291.27 kg	±14.40
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	20,275.47 USD	±1,002.45	2.93 t	±0.15
CO2seq	Carbon Dioxide sequestered annually in trees	95,854.05 USD	±4,739.15	2.46 kt	±0.12
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	1,551,826.73 USD	±76,724.37	39.79 kt	±1.97

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and USD/t/yr: CO 0.205 @ 1,469.94 USD | NO2 0.649 @ 394.62 USD | O3 6.886 @ 3,118.59 USD | PM2.5 0.298 @ 131,163.73 USD | SO2 0.206 @ 128.78 USD | PM10 2.078 @ 6,909.77 USD | CO2seq 1,740.491 @ 39.00 USD | CO2stor is a total biomass amount of 28,177.630 @ 39.00 USD*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

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A Cooperative Initiative Between:

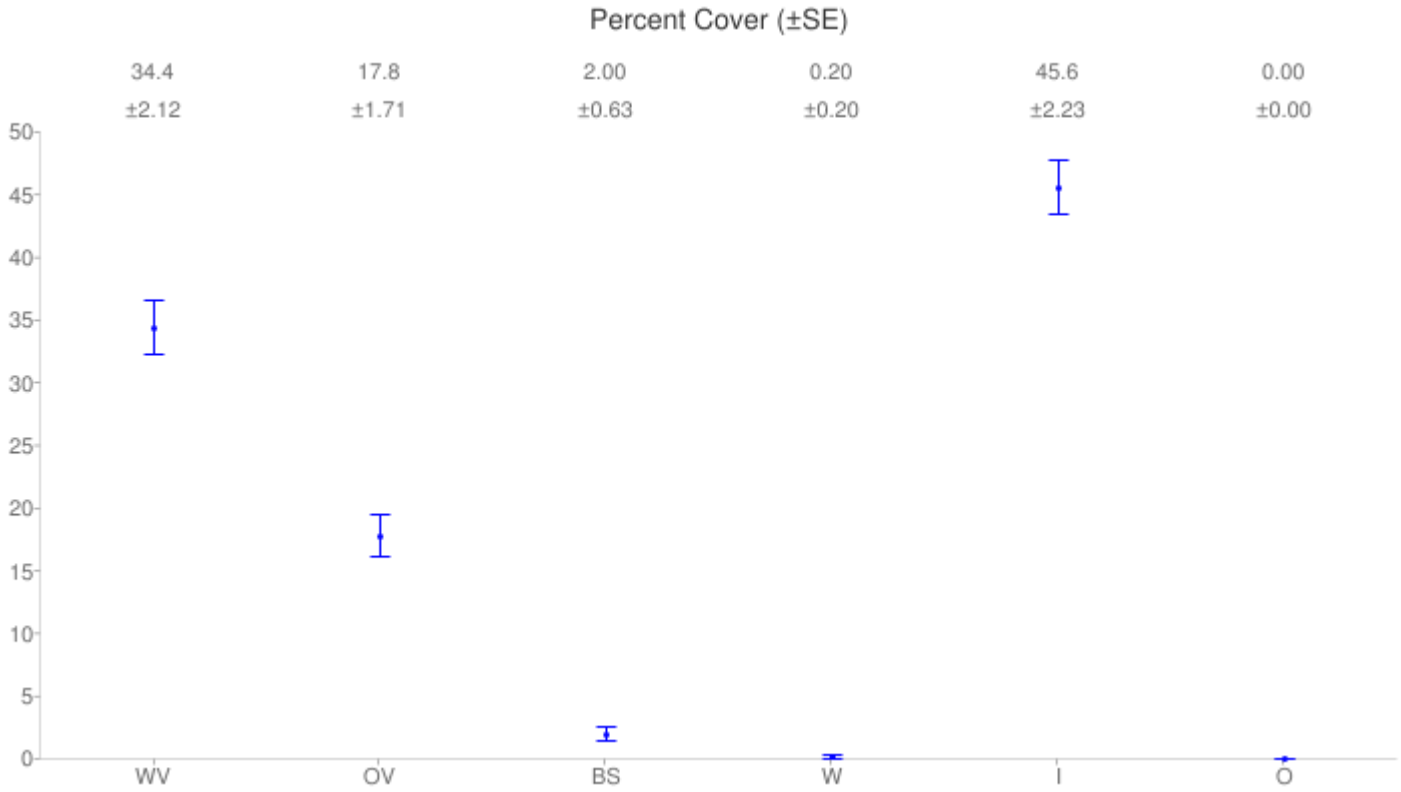
www.itreetools.org

iTree Canopy Post Maria Results: Rio Piedras

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/25/18



Cover Class	Description	Abbr.	Points	% Cover
Woody vegetation	Tree and Shrub	WV	172	34.4 ±2.12
Other Vegetation	grass, herb and other vegetation	OV	89	17.8 ±1.71
Bare soil	Exposed Soil	BS	10	2.00 ±0.63
Water	standing water, flowing water, pools, etc.	W	1	0.20 ±0.20
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	228	45.6 ±2.23
Other		O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$324.88	±20.06	221.02 kg	±13.65
NO2	Nitrogen Dioxide removed annually	$276.55	±17.08	700.79 kg	±43.28
O3	Ozone removed annually	$23,183.11	±1,431.72	7.43 t	±0.46
PM2.5	Particulate Matter less than 2.5 microns removed annually	$42,257.62	±2,609.71	322.17 kg	±19.90
SO2	Sulfur Dioxide removed annually	$28.68	±1.77	222.67 kg	±13.75
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$15,500.16	±957.25	2.24 t	±0.14
CO2seq	Carbon Dioxide sequestered annually in trees	$73,278.34	±4,525.47	1.88 kt	±0.12
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$1,186,337.81	±73,264.92	30.42 kt	±1.88

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

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Limitations of i-Tree Canopy

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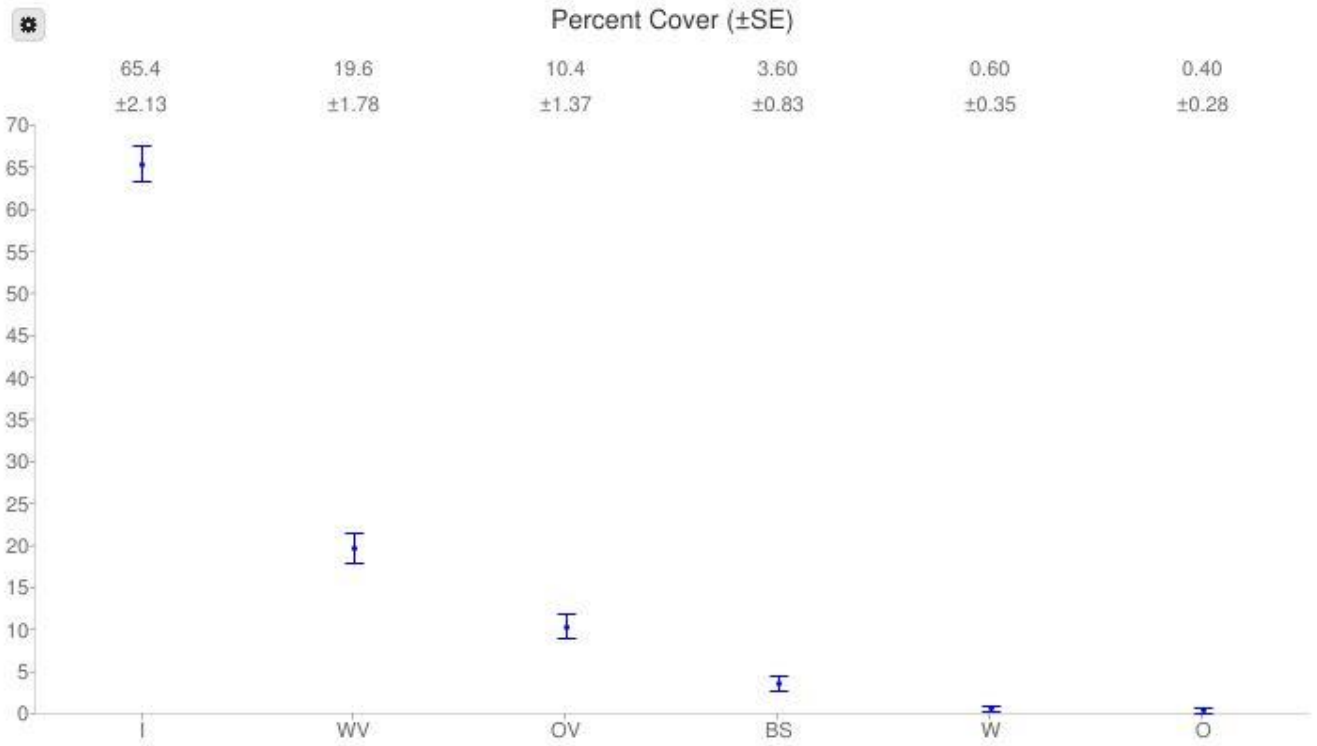
A Cooperative Initiative Between:

www.itreetools.org

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/16/18



Cover Class	Description	Abbr.	Points	% Cover
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	327	65.4 ±2.13
Woody vegetation	trees and Shrubs	WV	98	19.6 ±1.78
Other Vegetation	herbs, grass, etc.	OV	52	10.4 ±1.37
Bare soil	Exposed soil	BS	18	3.60 ±0.83
Water	standing water, flowing water, pools, etc.	W	3	0.60 ±0.35
Other		O	2	0.40 ±0.28

Tree Benefit Estimates

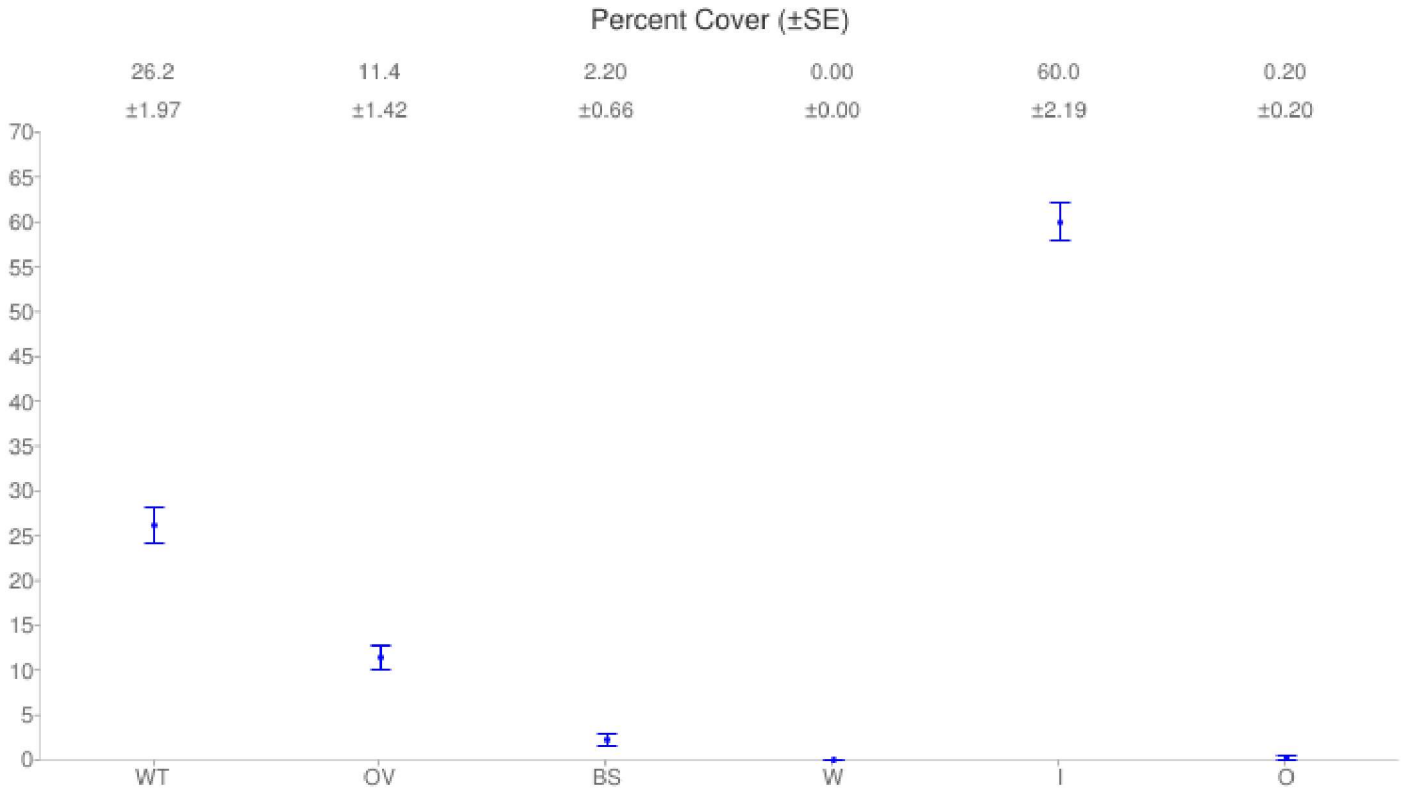
Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$186.28	±16.87	126.73 kg	±11.48
NO2	Nitrogen Dioxide removed annually	$158.57	±14.36	401.82 kg	±36.40
O3	Ozone removed annually	$13,292.90	±1,204.02	4.26 t	±0.39
PM2.5	Particulate Matter less than 2.5 microns removed annually	$24,229.97	±2,194.66	184.73 kg	±16.73
SO2	Sulfur Dioxide removed annually	$16.44	±1.49	127.68 kg	±11.56
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$8,887.59	±805.01	1.29 t	±0.12
CO2seq	Carbon Dioxide sequestered annually in trees	$42,016.85	±3,805.73	1.08 kt	±0.10
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$680,230.70	±61,612.84	17.44 kt	±1.58

iTree Canopy Post Maria Results: San Juan Random 2

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/24/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Tree	Tree, shrub	WT	131	26.2 ±1.97
Other Vegetation	grass, herb and other vegetation	OV	57	11.4 ±1.42
Bare Soil	bare soil	BS	11	2.20 ±0.66
Water	Standing water, flowing water, pools, etc.	W	0	0.00 ±0.00
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	300	60.0 ±2.19
Other	not in included in other class	O	1	0.20 ±0.20

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	249.01 USD	±18.69	169.40 kg	±12.71
NO2	Nitrogen Dioxide removed annually	211.96 USD	±15.91	537.13 kg	±40.32
O3	Ozone removed annually	17,769.11 USD	±1,333.70	5.70 t	±0.43
PM2.5	Particulate Matter less than 2.5 microns removed annually	32,389.10 USD	±2,431.04	246.94 kg	±18.53
SO2	Sulfur Dioxide removed annually	21.98 USD	±1.65	170.67 kg	±12.81
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	11,880.37 USD	±891.71	1.72 t	±0.13
CO2seq	Carbon Dioxide sequestered annually in trees	56,165.48 USD	±4,215.63	1.44 kt	±0.11
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	909,289.61 USD	±68,248.76	23.32 kt	±1.75

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and USD/t/yr: CO 0.205 @ 1,469.94 USD | NO2 0.649 @ 394.62 USD | O3 6.886 @ 3,118.59 USD | PM2.5 0.298 @ 131,163.73 USD | SO2 0.206 @ 128.78 USD | PM10 2.078 @ 6,909.77 USD | CO2seq 1,740.491 @ 39.00 USD | CO2stor is a total biomass amount of 28,177.630 @ 39.00 USD*
Note: Currency is in USD
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A Cooperative Initiative Between:

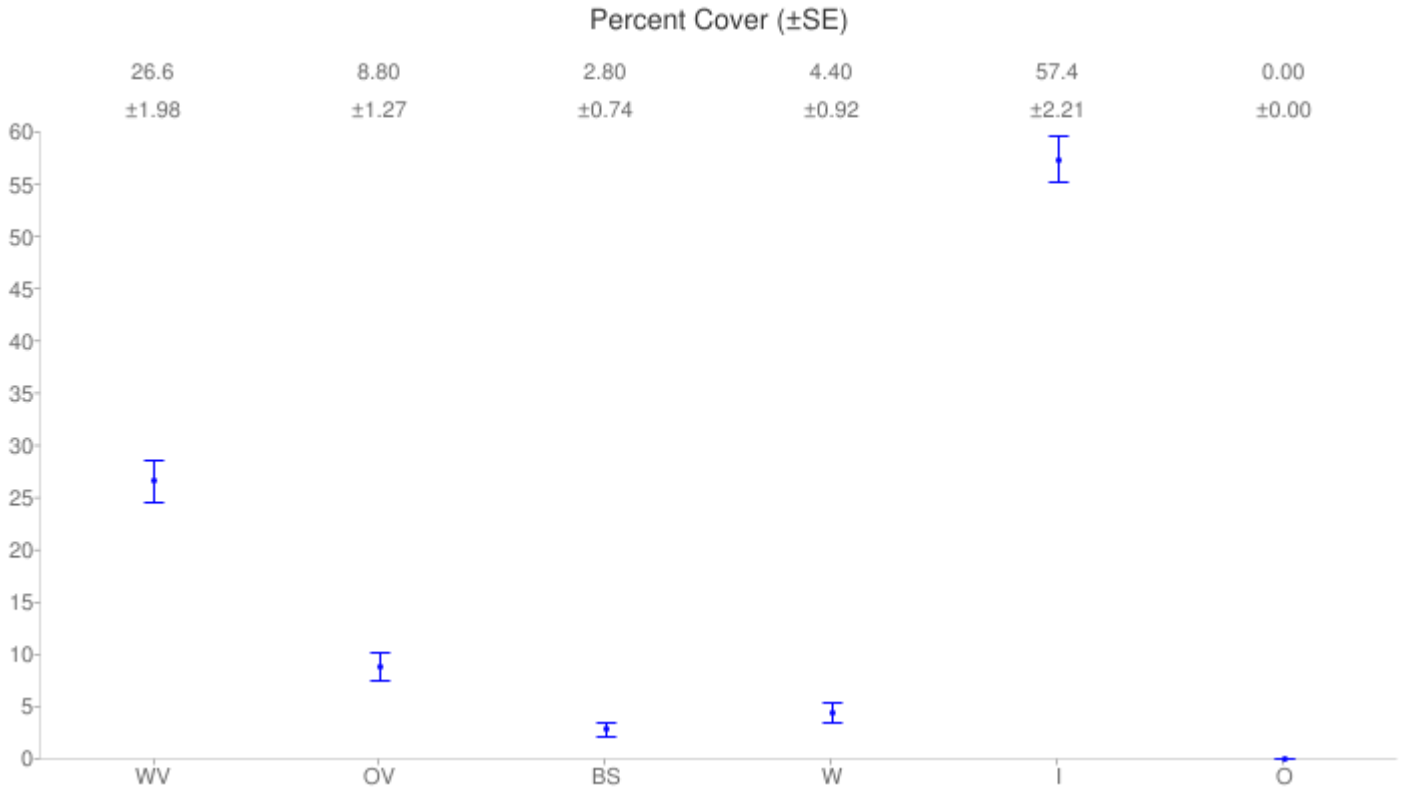
www.itreetools.org

iTree Canopy Post Maria Results: San Juan Random 3

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 5/05/18



Cover Class	Description	Abbr.	Points	% Cover
Woody vegetation	Tree and shrub	WV	133	26.6 ±1.98
Other Vegetation	herbs, grass, etc.	OV	44	8.80 ±1.27
Bare Soil	soild exposed, non-impermeable	BS	14	2.80 ±0.74
Water	standing water, flowing water, pools, etc	W	22	4.40 ±0.92
Impervious	roofs, building, tar, cement, streets, parking, etc.	I	287	57.4 ±2.21
Other	other categories not included.	O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$206.07	±15.31	140.19 kg	±10.41
NO2	Nitrogen Dioxide removed annually	$175.41	±13.03	444.50 kg	±33.02
O3	Ozone removed annually	$14,704.56	±1,092.38	4.72 t	±0.35
PM2.5	Particulate Matter less than 2.5 microns removed annually	$26,803.12	±1,991.17	204.35 kg	±15.18
SO2	Sulfur Dioxide removed annually	$18.19	±1.35	141.24 kg	±10.49
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$9,831.42	±730.36	1.42 t	±0.11
CO2seq	Carbon Dioxide sequestered annually in trees	$46,478.91	±3,452.85	1.19 kt	±0.09
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$752,469.05	±55,899.88	19.29 kt	±1.43

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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A Cooperative Initiative Between:

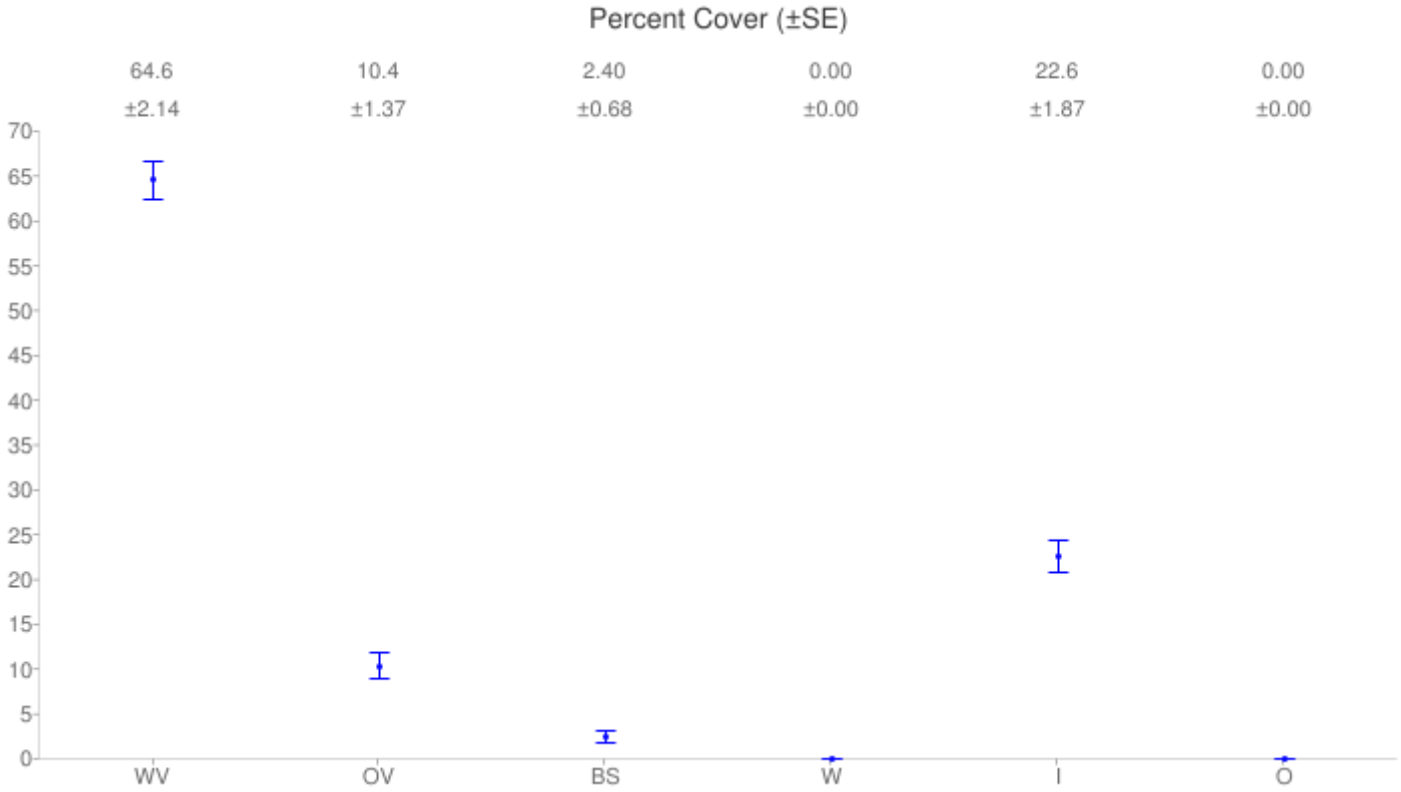
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez 1

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/30/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree and shrub	WV	323	64.6 ±2.14
Other Vegetation	Grass, herb and other vegetation	OV	52	10.4 ±1.37
Bare Soil		BS	12	2.40 ±0.68
Water	standing water, flowing water, pools, etc.	W	0	0.00 ±0.00
Impervious	roofs, building, tar, cement, parkings, etc	I	113	22.6 ±1.87
Other		O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$69.98	±2.32	389.22 kg	±12.89
NO2	Nitrogen Dioxide removed annually	$63.49	±2.10	1.45 t	±0.05
O3	Ozone removed annually	$5,275.46	±174.65	14.23 t	±0.47
PM2.5	Particulate Matter less than 2.5 microns removed annually	$9,666.99	±320.03	722.92 kg	±23.93
SO2	Sulfur Dioxide removed annually	$6.88	±0.23	441.04 kg	±14.60
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$3,439.58	±113.87	4.75 t	±0.16
CO2seq	Carbon Dioxide sequestered annually in trees	$138,496.16	±4,584.99	3.55 kt	±0.12
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,242,180.01	±74,228.53	57.49 kt	±1.90

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.191 @ $179.80 | NO2 0.711 @ $43.74 | O3 6.973 @ $370.79 | PM2.5 0.354 @ $13,372.15 | SO2 0.216 @ $15.60 | PM10 2.328 @ $724.01 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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A Cooperative Initiative Between:

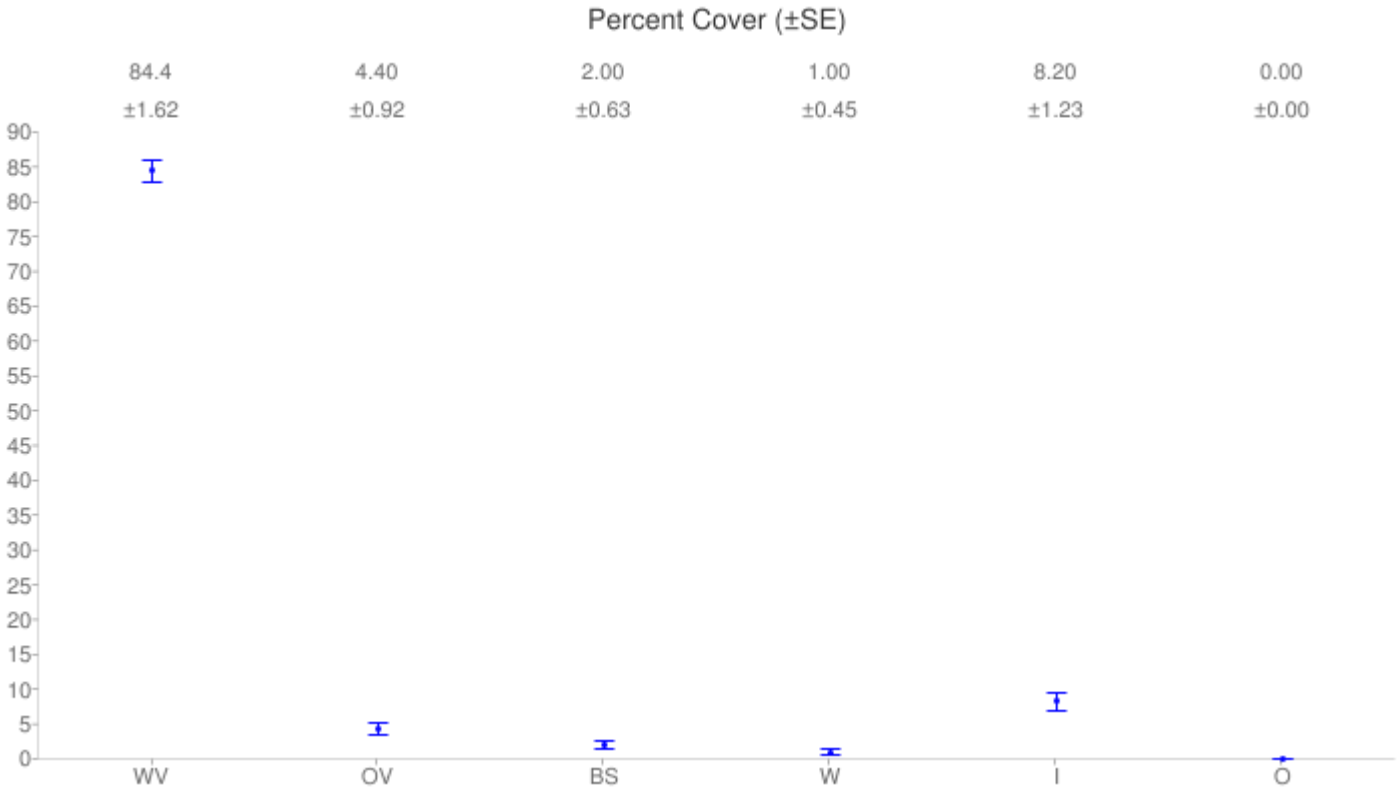
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez 2

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Trees and shrubs	WV	422	84.4 ±1.62
Other Vegetarion	herbs, grass, etc.	OV	22	4.40 ±0.92
Bare Soil	Exposed soil	BS	10	2.00 ±0.63
Water	body of water, stream, pool, etc.	W	5	1.00 ±0.45
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	41	8.20 ±1.23
Other	Other type of classification	O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$13.50	±0.26	504.34 kg	±9.70
NO2	Nitrogen Dioxide removed annually	$17.18	±0.33	1.91 t	±0.04
O3	Ozone removed annually	$1,371.46	±26.37	18.61 t	±0.36
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,573.81	±49.49	960.64 kg	±18.47
SO2	Sulfur Dioxide removed annually	$2.21	±0.04	579.01 kg	±11.13
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$790.02	±15.19	6.28 t	±0.12
CO2seq	Carbon Dioxide sequestered annually in trees	$180,911.09	±3,478.33	4.64 kt	±0.09
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,928,855.38	±56,312.40	75.10 kt	±1.44

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

The concept and prototype of this program were developed by David J. Nowak, Jeffery T. Walton and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Ellingsworth, Mike Binkley, and Scott Maco (The Davey Tree Expert Company).

Limitations of i-Tree Canopy

The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points are classified, the standard error will be too high to have any real certainty of the estimate.

A Cooperative Initiative Between:

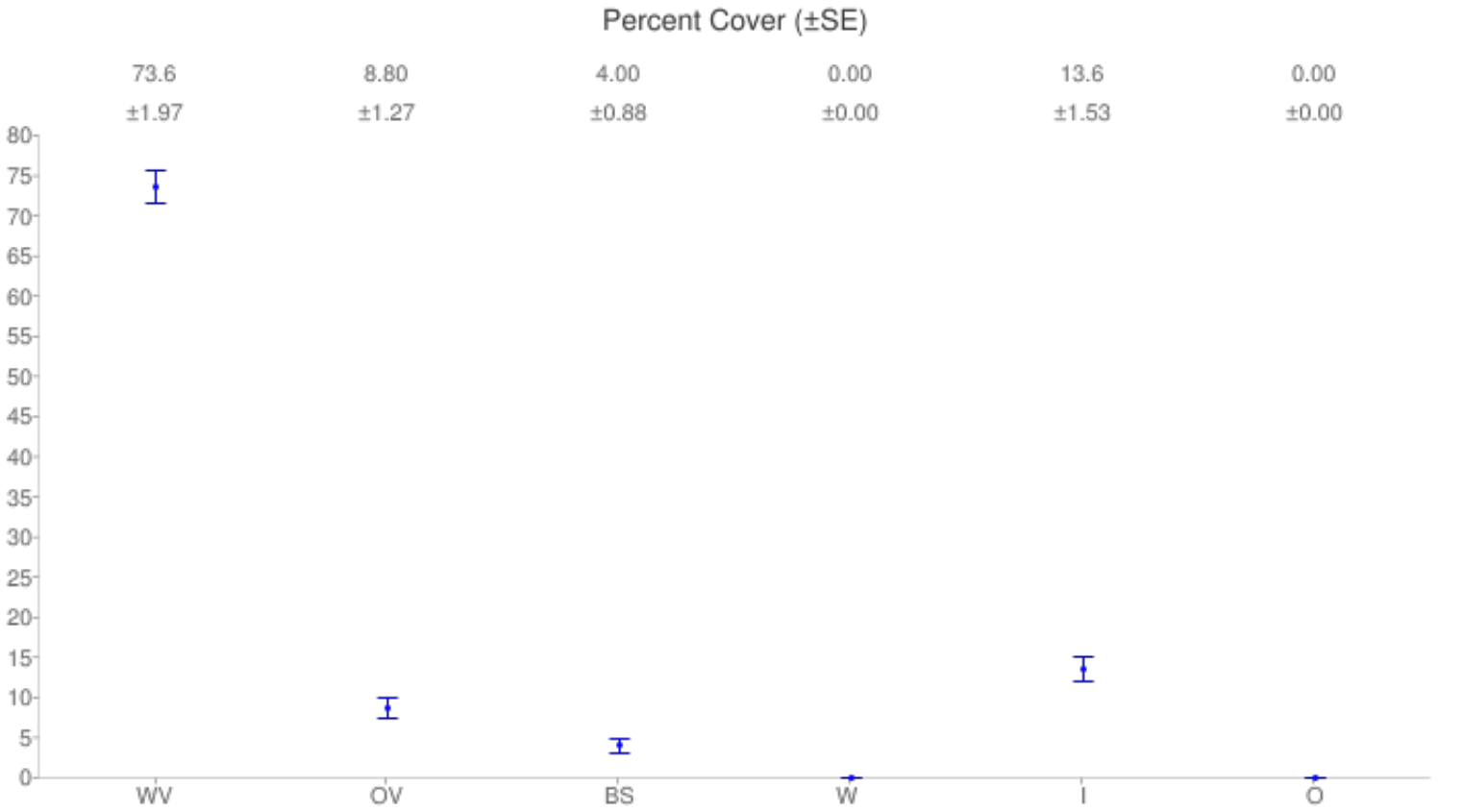
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez3

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 5/05/18



Cover Class	Description	Abbr.	Points	% Cover
Woody vegetation	Tree & Shrub	WV	368	73.6 ±1.97
Other Vegetation	Grass, Herb and Other Vegetation	OV	44	8.80 ±1.27
Bare Soil	Bare Soil	BS	20	4.00 ±0.88
Water	Standing Water, Flowing Water & Pools	W	0	0.00 ±0.00
Impervious	Roofs, Buildings, Tar, Cement, Streets & Parkings	I	68	13.6 ±1.53
Other	Other	O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$79.73	±2.14	443.44 kg	±11.88
NO2	Nitrogen Dioxide removed annually	$72.34	±1.94	1.65 t	±0.04
O3	Ozone removed annually	$6,010.31	±160.98	16.21 t	±0.43
PM2.5	Particulate Matter less than 2.5 microns removed annually	$11,013.56	±294.99	823.62 kg	±22.06
SO2	Sulfur Dioxide removed annually	$7.84	±0.21	502.48 kg	±13.46
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$3,918.70	±104.96	5.41 t	±0.14
CO2seq	Carbon Dioxide sequestered annually in trees	$157,788.21	±4,226.22	4.05 kt	±0.11
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,554,508.10	±68,420.36	65.50 kt	±1.75

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.191 @ $179.80 | NO2 0.711 @ $43.74 | O3 6.973 @ $370.79 | PM2.5 0.354 @ $13,372.15 | SO2 0.216 @ $15.60 | PM10 2.328 @ $724.01 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

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Limitations of i-Tree Canopy

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A Cooperative Initiative Between:

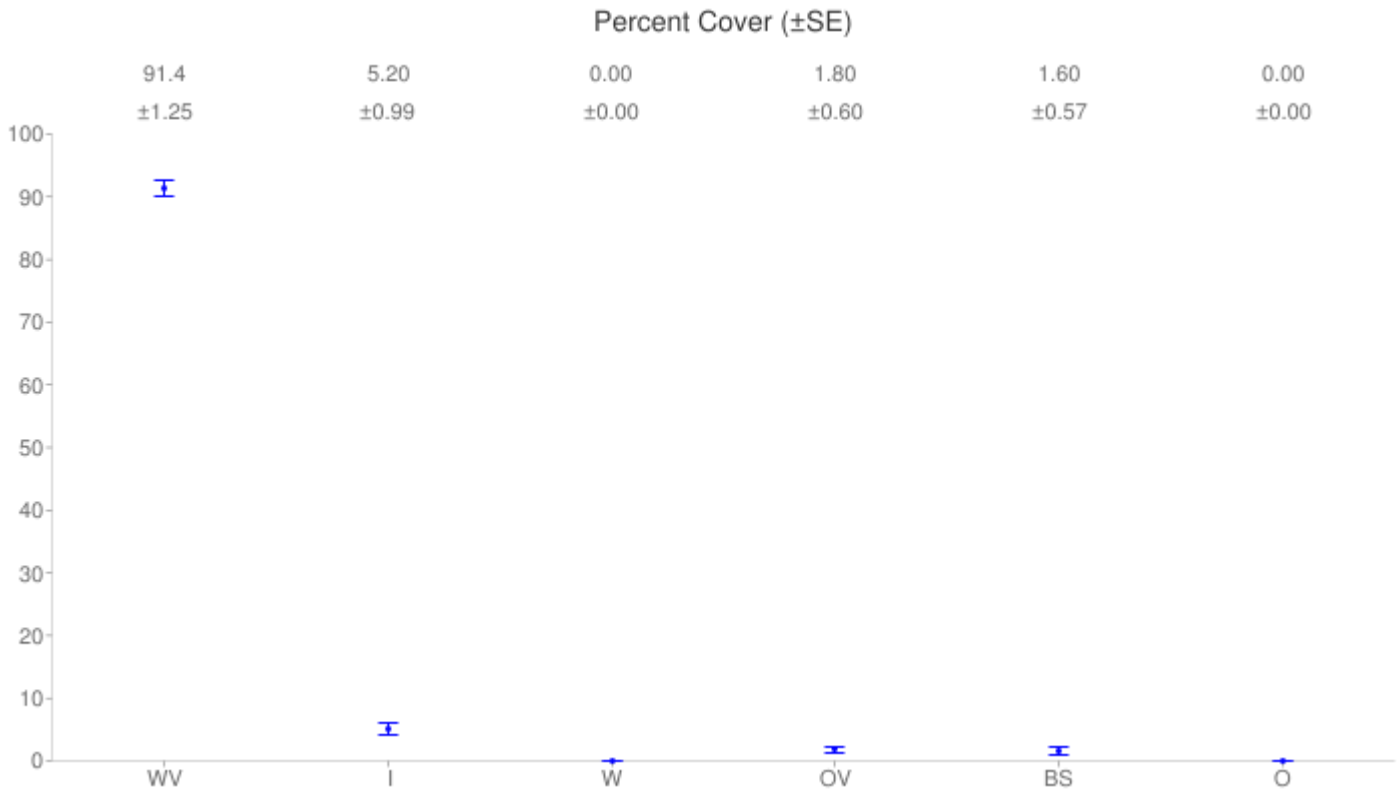
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez 4

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/24/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree & shrub	WV	457	91.4 ±1.25
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	26	5.20 ±0.99
Water	standing water, flowing water, pools, etc.	W	0	0.00 ±0.00
Other Vegetation	grass, herb, etc.	OV	9	1.80 ±0.60
Bare soil		BS	8	1.60 ±0.57
Other	Not specified above	O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$14.62	±0.20	546.21 kg	±7.49
NO2	Nitrogen Dioxide removed annually	$18.60	±0.26	2.07 t	±0.03
O3	Ozone removed annually	$1,485.33	±20.38	20.16 t	±0.28
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,787.50	±38.24	1.04 t	±0.01
SO2	Sulfur Dioxide removed annually	$2.39	±0.03	627.08 kg	±8.60
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$855.61	±11.74	6.80 t	±0.09
CO2seq	Carbon Dioxide sequestered annually in trees	$195,931.19	±2,687.79	5.02 kt	±0.07
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,172,022.88	±43,513.84	81.33 kt	±1.12

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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About i-Tree Canopy

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Limitations of i-Tree Canopy

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A Cooperative Initiative Between:

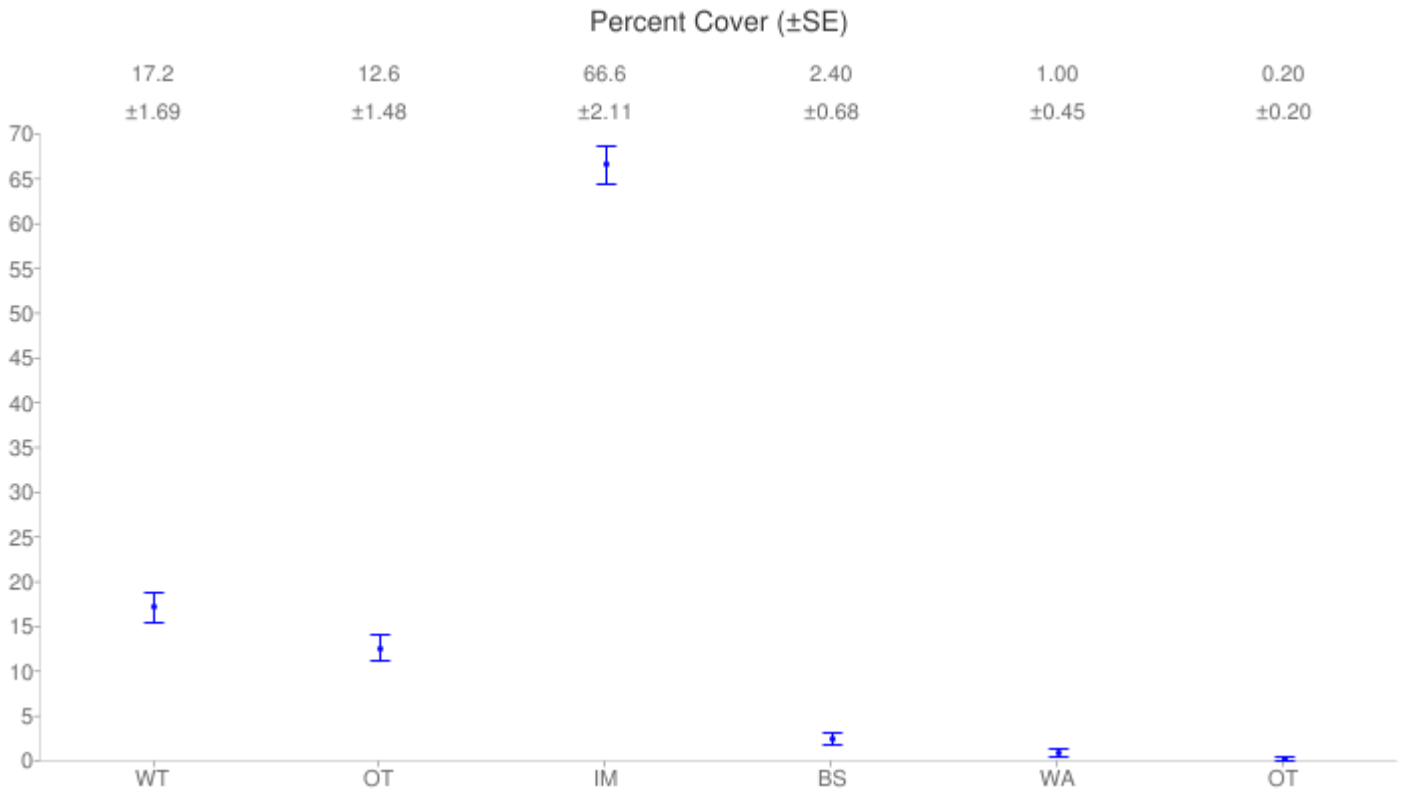
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez5

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Tree	Tree, shrub	WT	86	17.2 ±1.69
Other Vegetation	grass, herb and other veg	OT	63	12.6 ±1.48
Impervious	roofs, building, tar, cement, streets, parking	IM	333	66.6 ±2.11
Bare Soil		BS	12	2.40 ±0.68
Water	standing water, flowing water, pools, etc	WA	5	1.00 ±0.45
Other	Other	OT	1	0.20 ±0.20

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$163.49	±16.04	111.22 kg	±10.91
NO2	Nitrogen Dioxide removed annually	$139.17	±13.66	352.66 kg	±34.60
O3	Ozone removed annually	$11,666.40	±1,144.73	3.74 t	±0.37
PM2.5	Particulate Matter less than 2.5 microns removed annually	$21,265.23	±2,086.58	162.13 kg	±15.91
SO2	Sulfur Dioxide removed annually	$14.43	±1.42	112.05 kg	±11.00
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$7,800.12	±765.36	1.13 t	±0.11
CO2seq	Carbon Dioxide sequestered annually in trees	$36,875.73	±3,618.32	945.53 t	±92.78
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$596,998.66	±58,578.64	15.31 kt	±1.50

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
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About i-Tree Canopy

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A Cooperative Initiative Between:

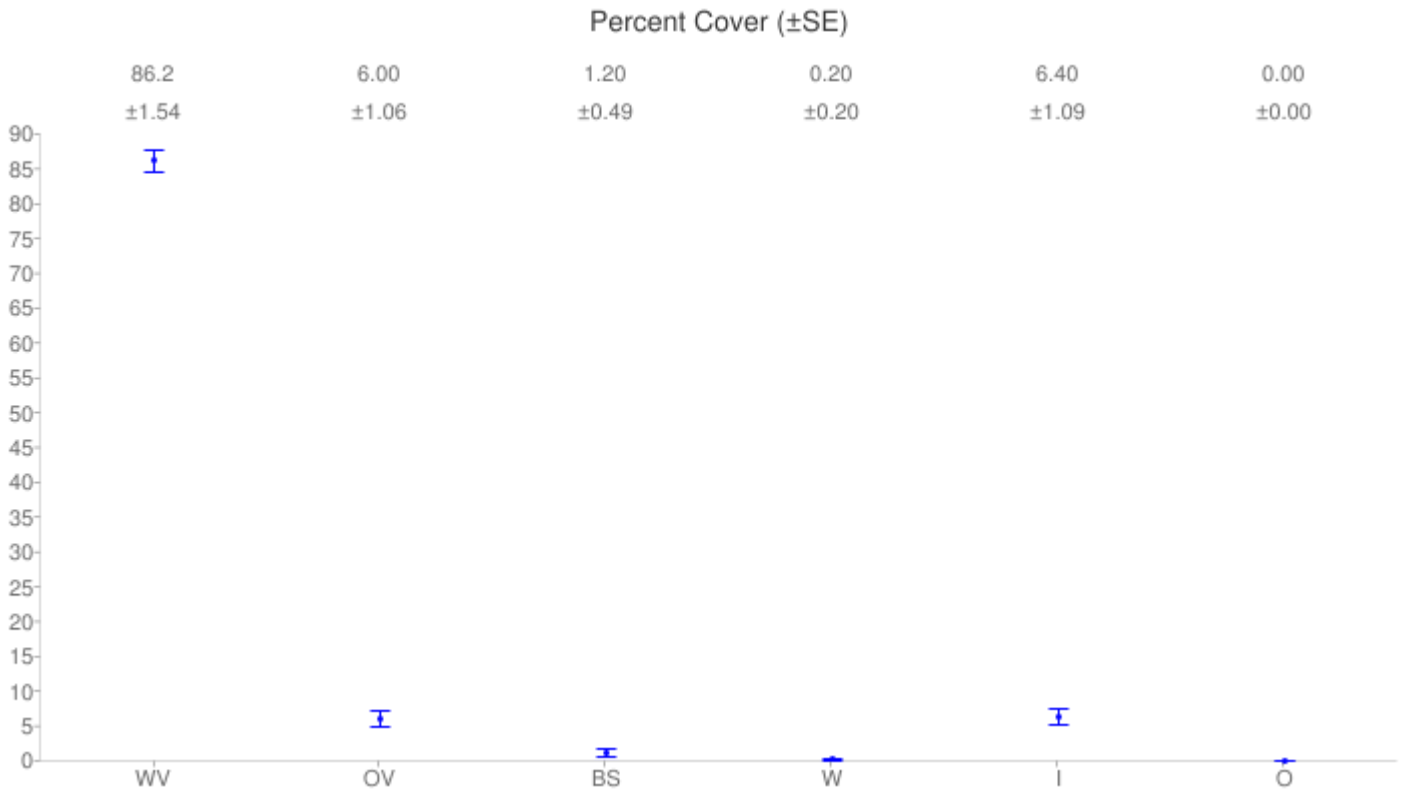
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez6

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree, shrub	WV	431	86.2 ±1.54
Other Vegetation	grass, herb and other veg	OV	30	6.00 ±1.06
Bare soil		BS	6	1.20 ±0.49
Water		W	1	0.20 ±0.20
Impervious	Building, street, parking , etc.	I	32	6.40 ±1.09
Other		O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$13.79	±0.25	515.10 kg	±9.22
NO2	Nitrogen Dioxide removed annually	$17.54	±0.31	1.96 t	±0.03
O3	Ozone removed annually	$1,400.74	±25.06	19.01 t	±0.34
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,628.75	±47.04	981.15 kg	±17.56
SO2	Sulfur Dioxide removed annually	$2.26	±0.04	591.37 kg	±10.58
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$806.88	±14.44	6.41 t	±0.11
CO2seq	Carbon Dioxide sequestered annually in trees	$184,772.56	±3,306.27	4.74 kt	±0.08
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,991,370.60	±53,526.78	76.70 kt	±1.37

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
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About i-Tree Canopy

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A Cooperative Initiative Between:

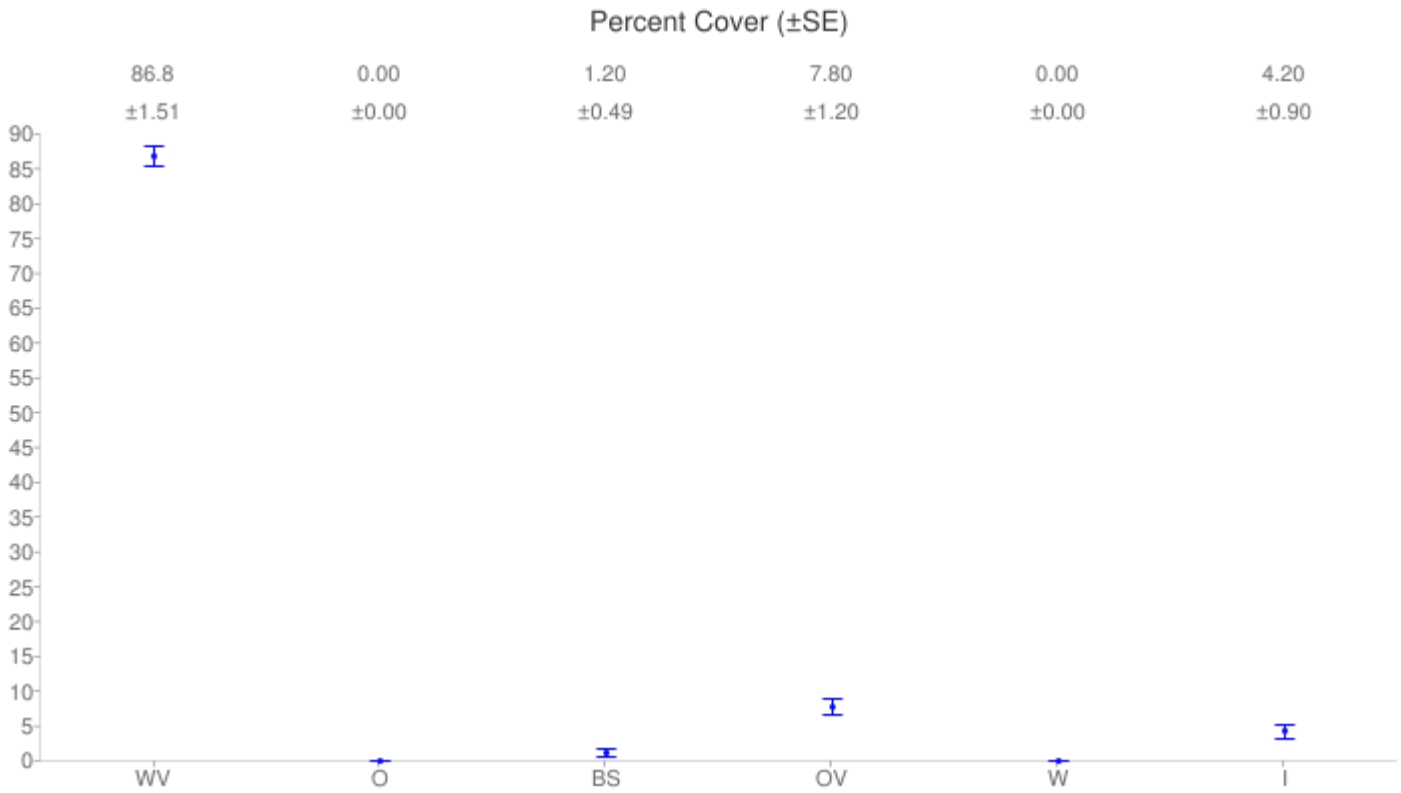
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez7

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 5/01/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	tree and shrub	WV	434	86.8 ±1.51
Other	All other surfaces.	O	0	0.00 ±0.00
Bare Soil		BS	6	1.20 ±0.49
Other Vegetation	grass, herb and other vegetation	OV	39	7.80 ±1.20
Water	river, pool, channel, etc.	W	0	0.00 ±0.00
Impervious	building, tar, cement, parking, street, etc.	I	21	4.20 ±0.90

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$13.89	±0.24	518.84 kg	±9.05
NO2	Nitrogen Dioxide removed annually	$17.67	±0.31	1.97 t	±0.03
O3	Ozone removed annually	$1,410.91	±24.61	19.15 t	±0.33
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,647.84	±46.18	988.27 kg	±17.24
SO2	Sulfur Dioxide removed annually	$2.27	±0.04	595.66 kg	±10.39
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$812.74	±14.17	6.46 t	±0.11
CO2seq	Carbon Dioxide sequestered annually in trees	$186,114.47	±3,245.80	4.77 kt	±0.08
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,013,095.36	±52,547.85	77.26 kt	±1.35

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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A Cooperative Initiative Between:

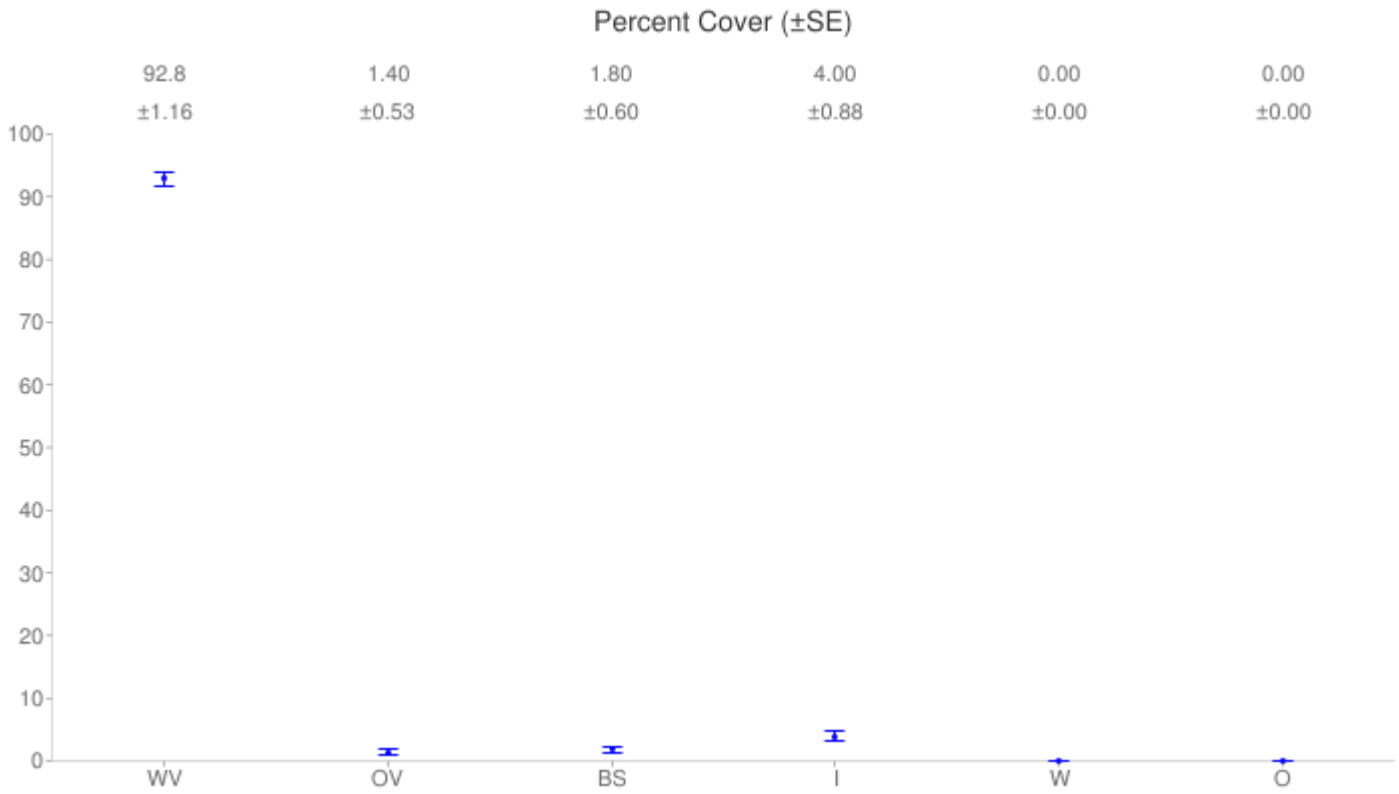
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez8

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/25/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree, shrub	WV	464	92.8 ±1.16
Other vegetation	Grass, herb and other vegetation	OV	7	1.40 ±0.53
Bare Soil	Exposed Soil	BS	9	1.80 ±0.60
Impervious	Rooff, building, tar, cement, streets, parkings, etc	I	20	4.00 ±0.88
Water	Standing water, flowing water, pools, etc	W	0	0.00 ±0.00
Other		O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$14.84	±0.18	554.61 kg	±6.91
NO2	Nitrogen Dioxide removed annually	$18.89	±0.24	2.11 t	±0.03
O3	Ozone removed annually	$1,508.16	±18.79	20.47 t	±0.25
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,830.34	±35.26	1.06 t	±0.01
SO2	Sulfur Dioxide removed annually	$2.43	±0.03	636.72 kg	±7.93
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$868.76	±10.82	6.90 t	±0.09
CO2seq	Carbon Dioxide sequestered annually in trees	$198,942.81	±2,478.20	5.10 kt	±0.06
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,220,779.43	±40,120.68	82.58 kt	±1.03

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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A Cooperative Initiative Between:

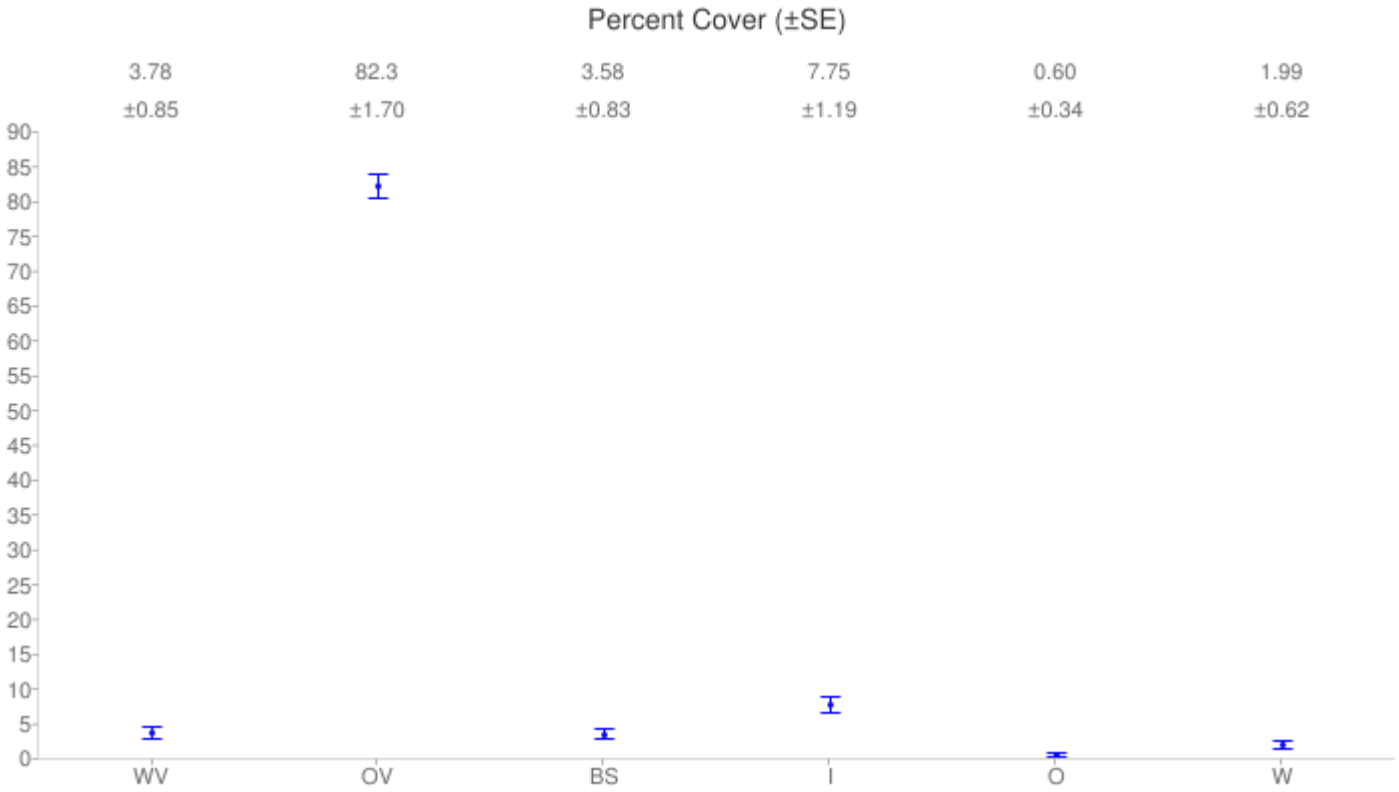
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez9

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree and Shrub	WV	19	3.78 ±0.85
Other Vegetation	grass, herb and other vegetation	OV	414	82.3 ±1.70
Bare Soil	Exposed Soil	BS	18	3.58 ±0.83
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	39	7.75 ±1.19
Other		O	3	0.60 ±0.34
Water		W	10	1.99 ±0.62

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$35.90	±8.08	24.42 kg	±5.50
NO2	Nitrogen Dioxide removed annually	$30.56	±6.88	77.44 kg	±17.43
O3	Ozone removed annually	$2,561.72	±576.49	821.44 kg	±184.86
PM2.5	Particulate Matter less than 2.5 microns removed annually	$4,669.45	±1,050.82	35.60 kg	±8.01
SO2	Sulfur Dioxide removed annually	$3.17	±0.71	24.61 kg	±5.54
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$1,712.76	±385.44	247.87 kg	±55.78
CO2seq	Carbon Dioxide sequestered annually in trees	$8,097.22	±1,822.21	207.62 t	±46.72
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$131,089.73	±29,500.58	3.36 kt	±0.76

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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A Cooperative Initiative Between:

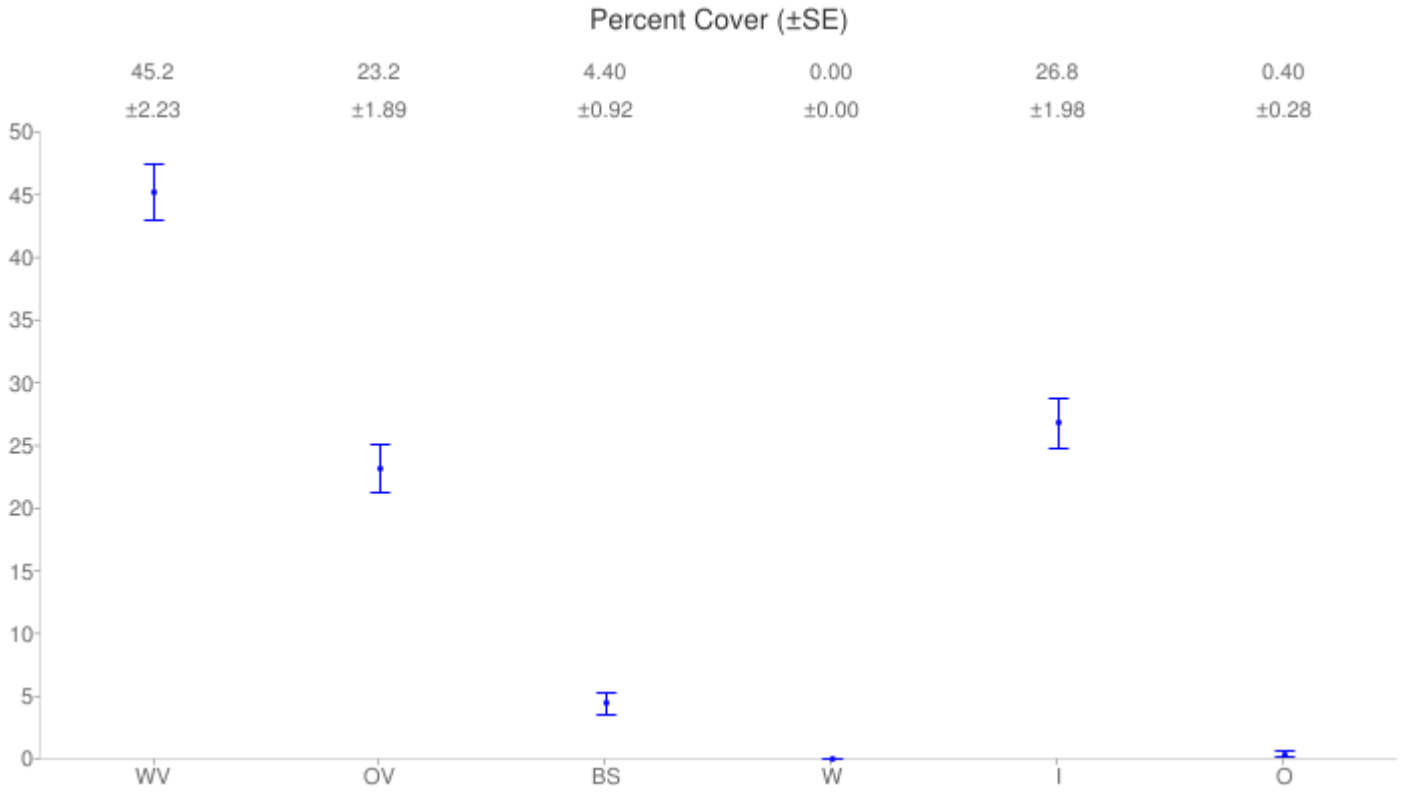
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez10

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody vegetation	Tree and Shrub	WV	226	45.2 ±2.23
Other Vegetation	grass, herb and other vegetation	OV	116	23.2 ±1.89
Bare Soil		BS	22	4.40 ±0.92
Water	Standing water, flowing water, pools, etc.	W	0	0.00 ±0.00
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	134	26.8 ±1.98
Other		O	2	0.40 ±0.28

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	950.53 USD	±0.00	646.65 kg	±0.00
NO2	Nitrogen Dioxide removed annually	809.11 USD	±0.00	2.05 t	±0.00
O3	Ozone removed annually	67,828.36 USD	±0.00	21.75 t	±0.00
PM2.5	Particulate Matter less than 2.5 microns removed annually	123,635.90 USD	±0.00	942.61 kg	±0.00
SO2	Sulfur Dioxide removed annually	83.90 USD	±0.00	651.49 kg	±0.00
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	45,349.84 USD	±0.00	6.56 t	±0.00
CO2seq	Carbon Dioxide sequestered annually in trees	214,395.28 USD	±0.00	5.50 kt	±0.00
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	3,470,946.87 USD	±0.00	89.00 kt	±0.00

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and USD/t/yr: CO 0.205 @ 1,469.94 USD | NO2 0.649 @ 394.62 USD | O3 6.886 @ 3,118.59 USD | PM2.5 0.298 @ 131,163.73 USD | SO2 0.206 @ 128.78 USD | PM10 2.078 @ 6,909.77 USD | CO2seq 1,740.491 @ 39.00 USD | CO2stor is a total biomass amount of 28,177.630 @ 39.00 USD*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

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Limitations of i-Tree Canopy

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A Cooperative Initiative Between:

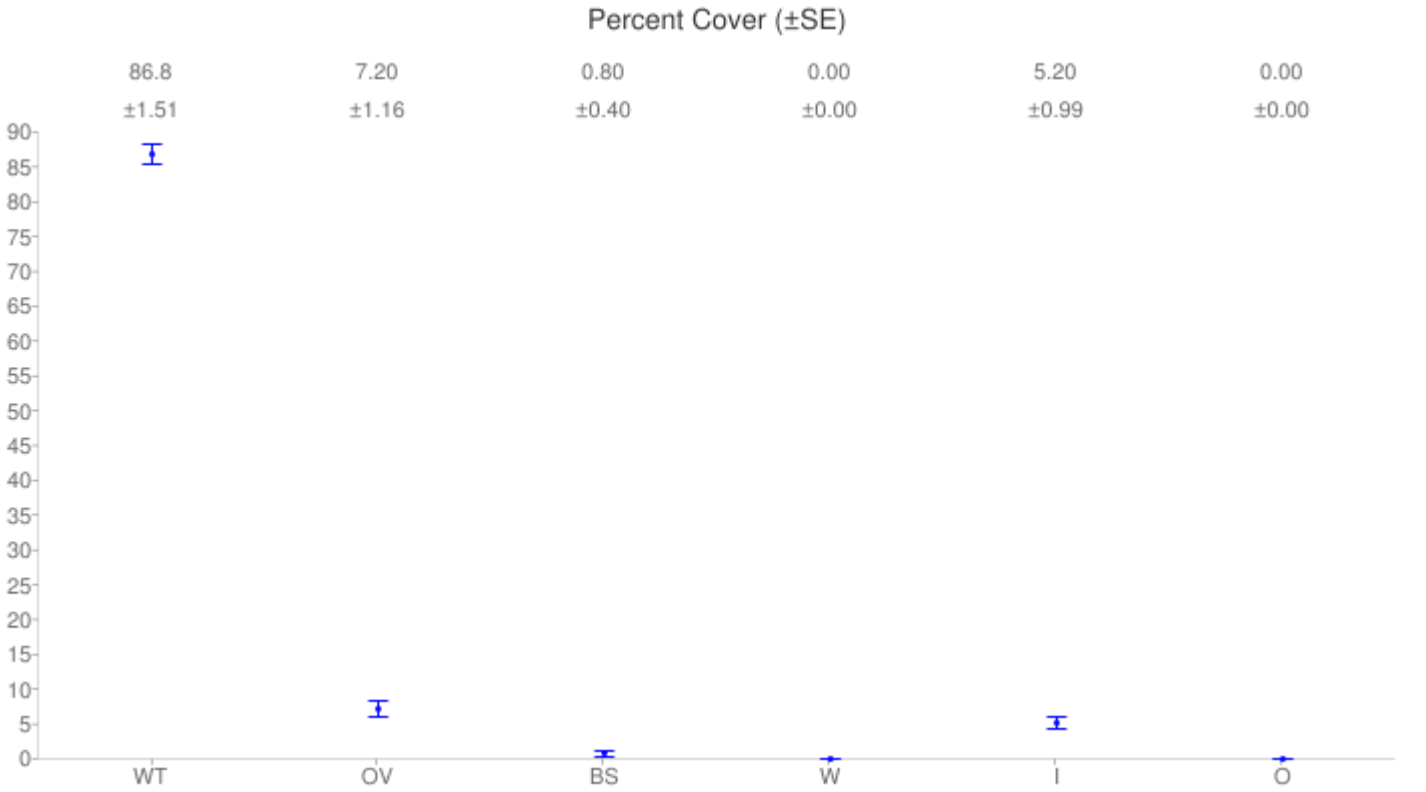
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez11

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/30/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Tree	Woody vegetation (tree & shrubs)	WT	434	86.8 ±1.51
Other vegetation (grass, herb and other vegetation)	Other vegetation (grass, herb and other vegetation)	OV	36	7.20 ±1.16
Bare soil	Bare soil	BS	4	0.80 ±0.40
Water	Water (standing water, flowing water, pools, etc.)	W	0	0.00 ±0.00

Cover Class	Description	Abbr.	Points	% Cover
Impervious	Impervious (roofs, buildings, tar, cement, streets, parkings, etc.)	I	26	5.20 ±0.99
Other	Other vegetation (grass, herb and other vegetation)	O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$13.89	±0.24	518.77 kg	±9.05
NO2	Nitrogen Dioxide removed annually	$17.67	±0.31	1.97 t	±0.03
O3	Ozone removed annually	$1,410.71	±24.60	19.14 t	±0.33
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,647.46	±46.17	988.13 kg	±17.23
SO2	Sulfur Dioxide removed annually	$2.27	±0.04	595.58 kg	±10.39
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$812.62	±14.17	6.46 t	±0.11
CO2seq	Carbon Dioxide sequestered annually in trees	$186,087.87	±3,245.34	4.77 kt	±0.08
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,012,664.75	±52,540.34	77.25 kt	±1.35

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

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A Cooperative Initiative Between:

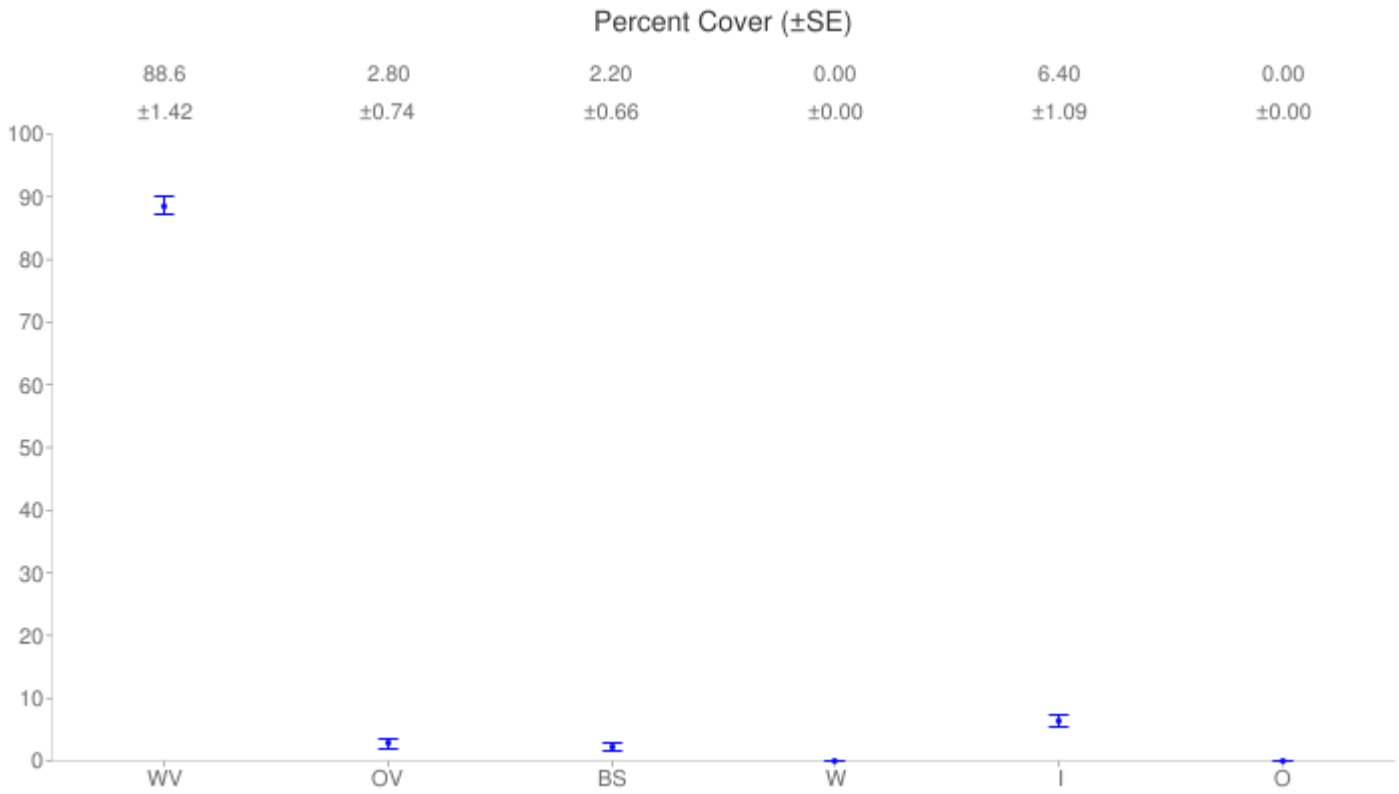
www.itreetools.org

iTree Canopy Results: Post Maria - Mayaguez12

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/26/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree and shrub	WV	443	88.6 ±1.42
Other Vegetation	grass, herb., etc	OV	14	2.80 ±0.74
Bare soil		BS	11	2.20 ±0.66
Water	rivers, pools, channels, etc	W	0	0.00 ±0.00
Impervoius	Buikding, streets, parkings, etc	I	32	6.40 ±1.09
Other		O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$14.18	±0.23	529.60 kg	±8.50
NO2	Nitrogen Dioxide removed annually	$18.04	±0.29	2.01 t	±0.03
O3	Ozone removed annually	$1,440.15	±23.10	19.54 t	±0.31
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,702.72	±43.36	1.01 t	±0.02
SO2	Sulfur Dioxide removed annually	$2.32	±0.04	608.01 kg	±9.75
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$829.59	±13.31	6.59 t	±0.11
CO2seq	Carbon Dioxide sequestered annually in trees	$189,972.02	±3,047.48	4.87 kt	±0.08
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,075,547.15	±49,337.02	78.86 kt	±1.27

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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A Cooperative Initiative Between:

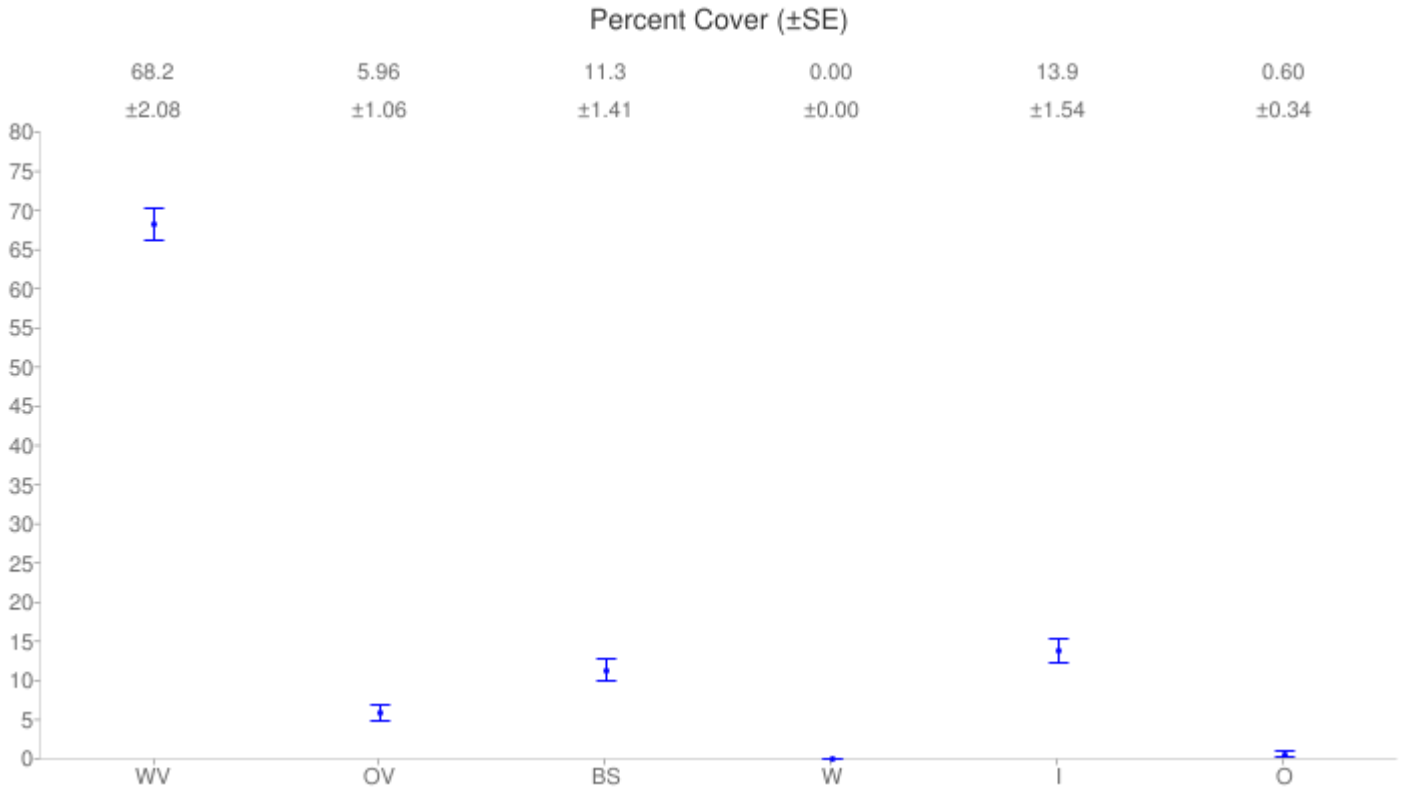
www.itreetools.org

iTree Canopy Post Maria: Ponce 1

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody vegetation	Tree and shrub	WV	343	68.2 ±2.08
Other vegetation	Grass, herbs & other vegetation	OV	30	5.96 ±1.06
Bare soil		BS	57	11.3 ±1.41
Water	standing water, flowing water, pools, ect.	W	0	0.00 ±0.00
Impervious	roofs buildings, TAR, cement, streets, parkings	I	70	13.9 ±1.54
Other		O	3	0.60 ±0.34

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$648.17	±19.74	440.95 kg	±13.43
NO2	Nitrogen Dioxide removed annually	$551.73	±16.80	1.40 t	±0.04
O3	Ozone removed annually	$46,252.14	±1,408.51	14.83 t	±0.45
PM2.5	Particulate Matter less than 2.5 microns removed annually	$84,307.30	±2,567.40	642.76 kg	±19.57
SO2	Sulfur Dioxide removed annually	$57.21	±1.74	444.25 kg	±13.53
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$30,924.05	±941.73	4.48 t	±0.14
CO2seq	Carbon Dioxide sequestered annually in trees	$146,196.10	±4,452.10	3.75 kt	±0.11
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,366,837.90	±72,077.12	60.69 kt	±1.85

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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A Cooperative Initiative Between:

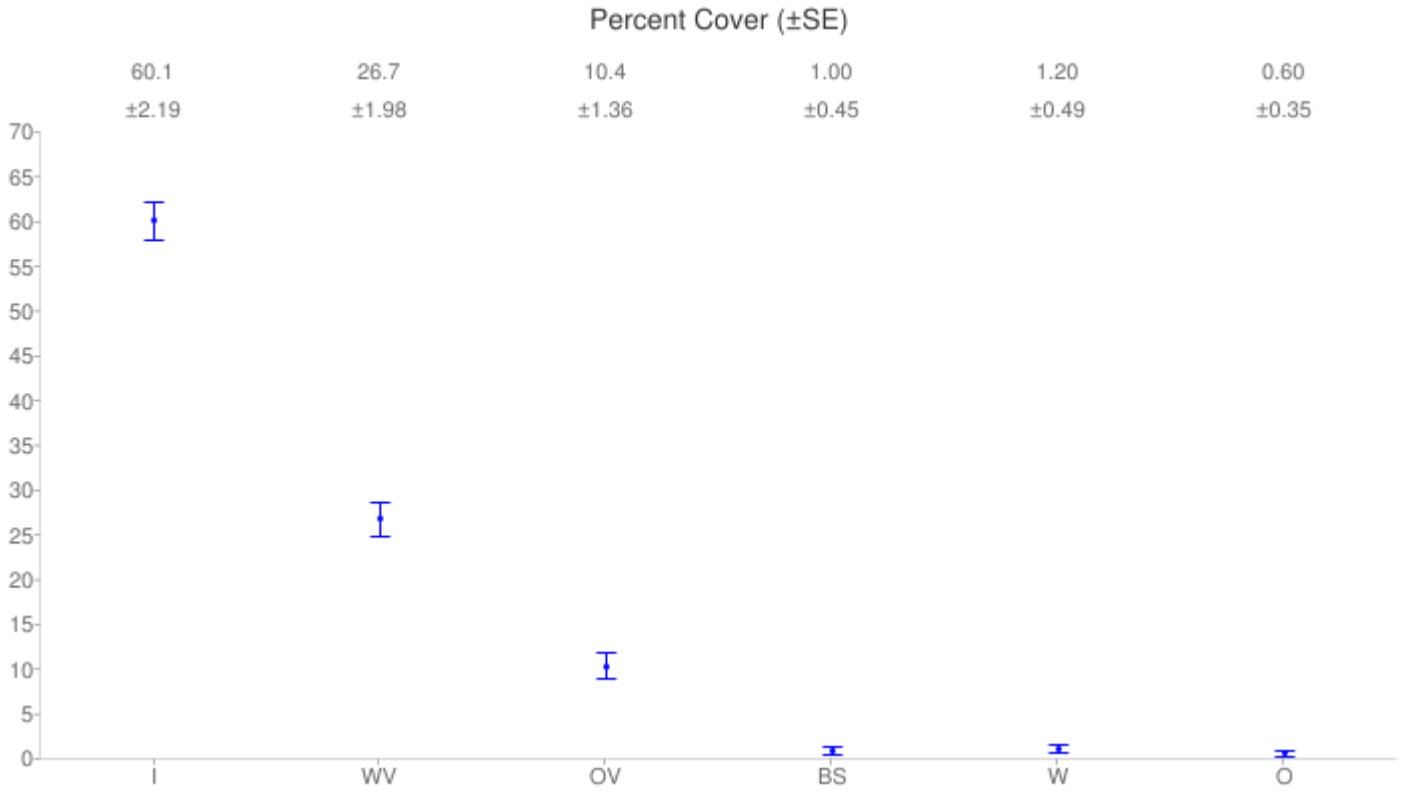
www.itreetools.org

iTree Canopy Post Maria: Ponce 2

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Impervious	Buildings, roads, sidewalks, etc.	I	301	60.1 ±2.19
Woody Vegetation	Trees and shrubs	WV	134	26.7 ±1.98
Other Vegetation	grass, herbs, etc.	OV	52	10.4 ±1.36
Bare soil	soil exposed	BS	5	1.00 ±0.45
Water	body of water such as streams, rivers, pools, etc.	W	6	1.20 ±0.49
Other	other not listed above.	O	3	0.60 ±0.35

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$254.23	±18.80	172.95 kg	±12.79
NO2	Nitrogen Dioxide removed annually	$216.41	±16.00	548.39 kg	±40.55
O3	Ozone removed annually	$18,141.59	±1,341.33	5.82 t	±0.43
PM2.5	Particulate Matter less than 2.5 microns removed annually	$33,068.05	±2,444.95	252.11 kg	±18.64
SO2	Sulfur Dioxide removed annually	$22.44	±1.66	174.25 kg	±12.88
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$12,129.41	±896.81	1.76 t	±0.13
CO2seq	Carbon Dioxide sequestered annually in trees	$57,342.84	±4,239.76	1.47 kt	±0.11
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$928,350.39	±68,639.43	23.80 kt	±1.76

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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A Cooperative Initiative Between:

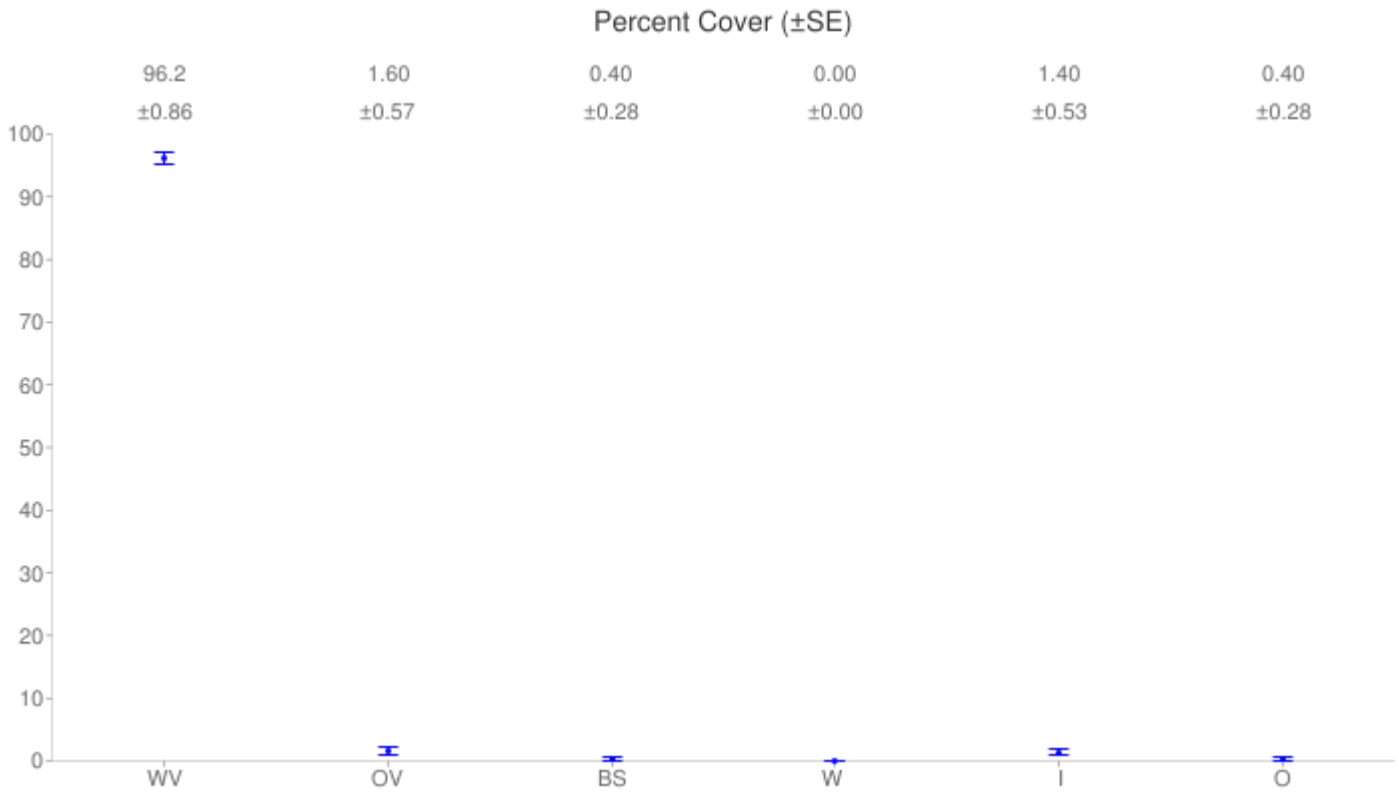
www.itreetools.org

iTree Canopy Post Maria: Ponce 3

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/26/18



Cover Class	Description	Abbr.	Points	% Cover
Woody vegetation	Tree & Shrub	WV	481	96.2 ±0.86
Other Vegetation	Grass, Herb and Other Vegetation	OV	8	1.60 ±0.57
Bare Soil	Bare Soil	BS	2	0.40 ±0.28
Water	Standing Water, Flowing Water & Pools	W	0	0.00 ±0.00
Impervious	Roofs, Buildings, Tar, Cement, Streets & Parkings	I	7	1.40 ±0.53
Other	Other	O	2	0.40 ±0.28

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$8.14	±0.07	304.10 kg	±2.70
NO2	Nitrogen Dioxide removed annually	$12.09	±0.11	1.66 t	±0.01
O3	Ozone removed annually	$871.81	±7.75	16.69 t	±0.15
PM2.5	Particulate Matter less than 2.5 microns removed annually	$1,754.54	±15.59	809.26 kg	±7.19
SO2	Sulfur Dioxide removed annually	$3.07	±0.03	1.06 t	±0.01
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$707.35	±6.29	5.62 t	±0.05
CO2seq	Carbon Dioxide sequestered annually in trees	$132,432.34	±1,177.10	3.40 kt	±0.03
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,339,031.80	±29,678.35	85.62 kt	±0.76

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.100 @ $26.77 | NO2 0.545 @ $7.29 | O3 5.492 @ $52.25 | PM2.5 0.266 @ $2,168.07 | SO2 0.347 @ $2.90 | PM10 1.850 @ $125.82 | CO2seq 1,117.578 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
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A Cooperative Initiative Between:

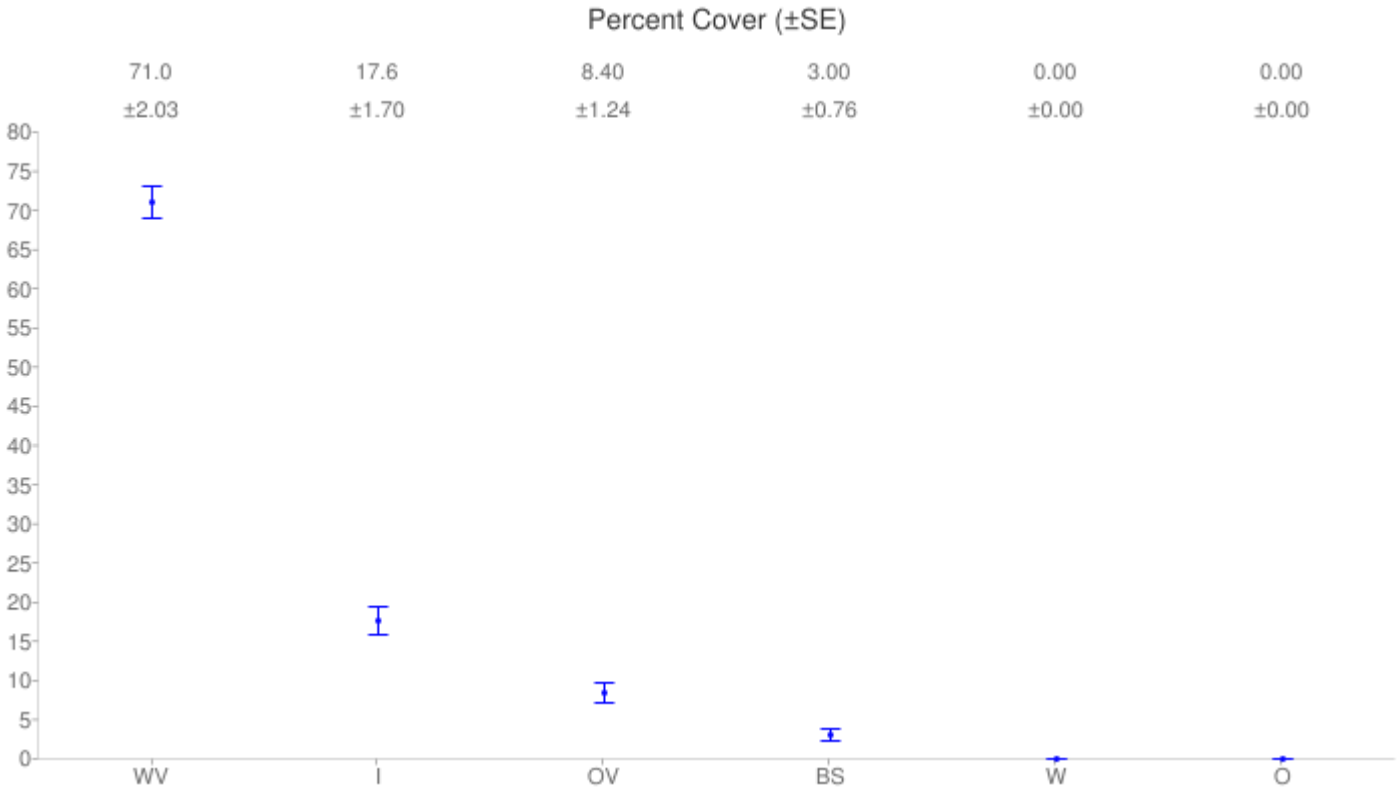
www.itreetools.org

iTree Canopy Post Maria: Ponce 4

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/24/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree, and Shrubs	WV	355	71.0 ±2.03
Impervious	roofs, buildings, tar, cement, streets, parkings...	I	88	17.6 ±1.70
Other Vegetation	grass, herb, ...	OV	42	8.40 ±1.24
Bare Soil		BS	15	3.00 ±0.76
Water	standing water, flowing water, pools...	W	0	0.00 ±0.00
Other	not specified above	O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$11.36	±0.32	424.34 kg	±12.13
NO2	Nitrogen Dioxide removed annually	$14.45	±0.41	1.61 t	±0.05
O3	Ozone removed annually	$1,153.93	±32.98	15.66 t	±0.45
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,165.57	±61.90	808.27 kg	±23.10
SO2	Sulfur Dioxide removed annually	$1.86	±0.05	487.17 kg	±13.92
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$664.71	±19.00	5.28 t	±0.15
CO2seq	Carbon Dioxide sequestered annually in trees	$152,216.27	±4,350.57	3.90 kt	±0.11
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,464,301.37	±70,433.40	63.19 kt	±1.81

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A Cooperative Initiative Between:

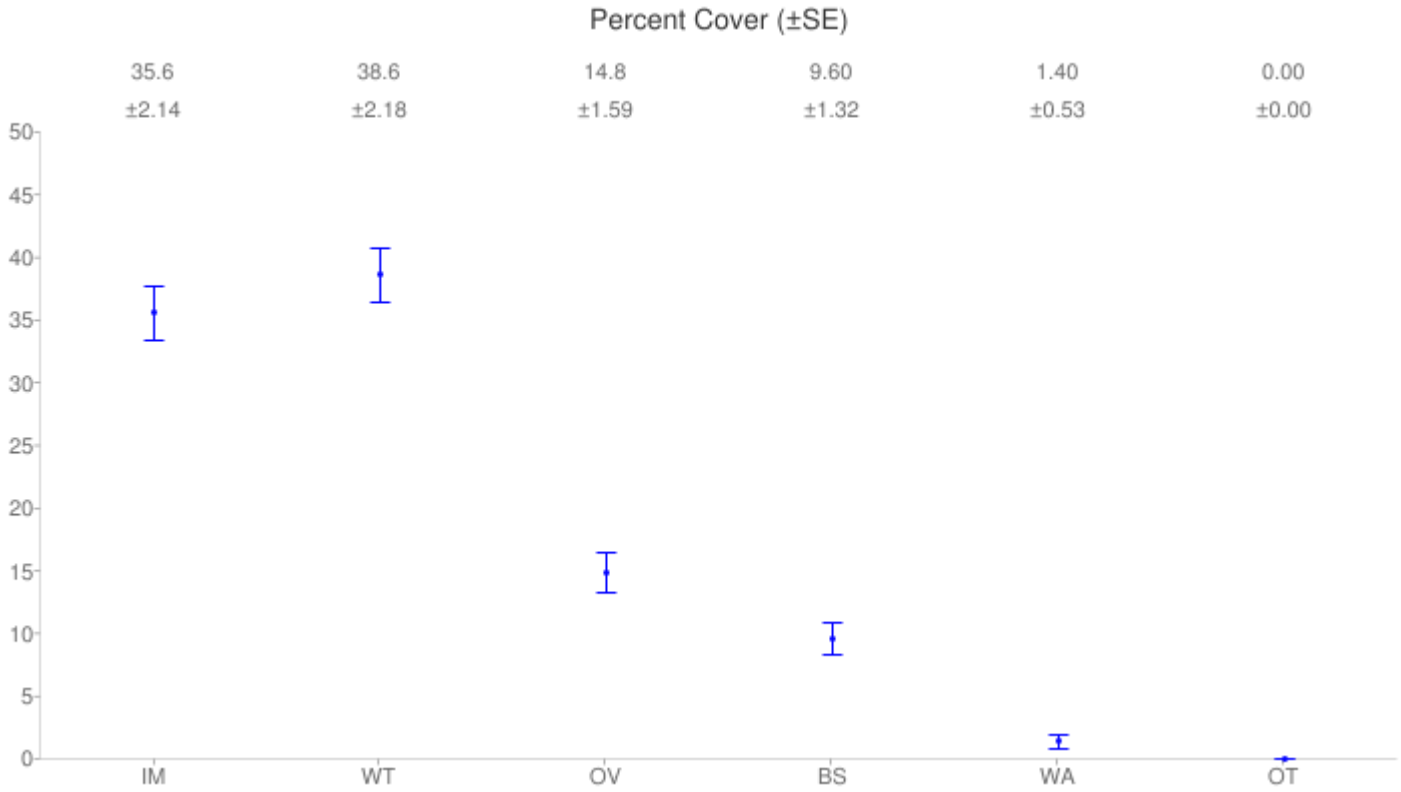
www.itreetools.org

iTree Canopy Post Maria: Ponce 5

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Impervious	roofs, building, tar, cement, streets, parking	IM	178	35.6 ±2.14
Woody Vegetation	tree and shrubs	WT	193	38.6 ±2.18
Other Vegetation	grass, herb and other veg	OV	74	14.8 ±1.59
Bare Soil		BS	48	9.60 ±1.32
Water	standing water, flowing water, pools, etc	WA	7	1.40 ±0.53
Other		OT	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$366.90	±20.69	249.60 kg	±14.08
NO2	Nitrogen Dioxide removed annually	$312.32	±17.62	791.43 kg	±44.64
O3	Ozone removed annually	$26,181.63	±1,476.73	8.40 t	±0.47
PM2.5	Particulate Matter less than 2.5 microns removed annually	$47,723.25	±2,691.76	363.84 kg	±20.52
SO2	Sulfur Dioxide removed annually	$32.38	±1.83	251.47 kg	±14.18
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$17,504.96	±987.34	2.53 t	±0.14
CO2seq	Carbon Dioxide sequestered annually in trees	$82,756.22	±4,667.74	2.12 kt	±0.12
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$1,339,779.73	±75,568.17	34.35 kt	±1.94

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A Cooperative Initiative Between:

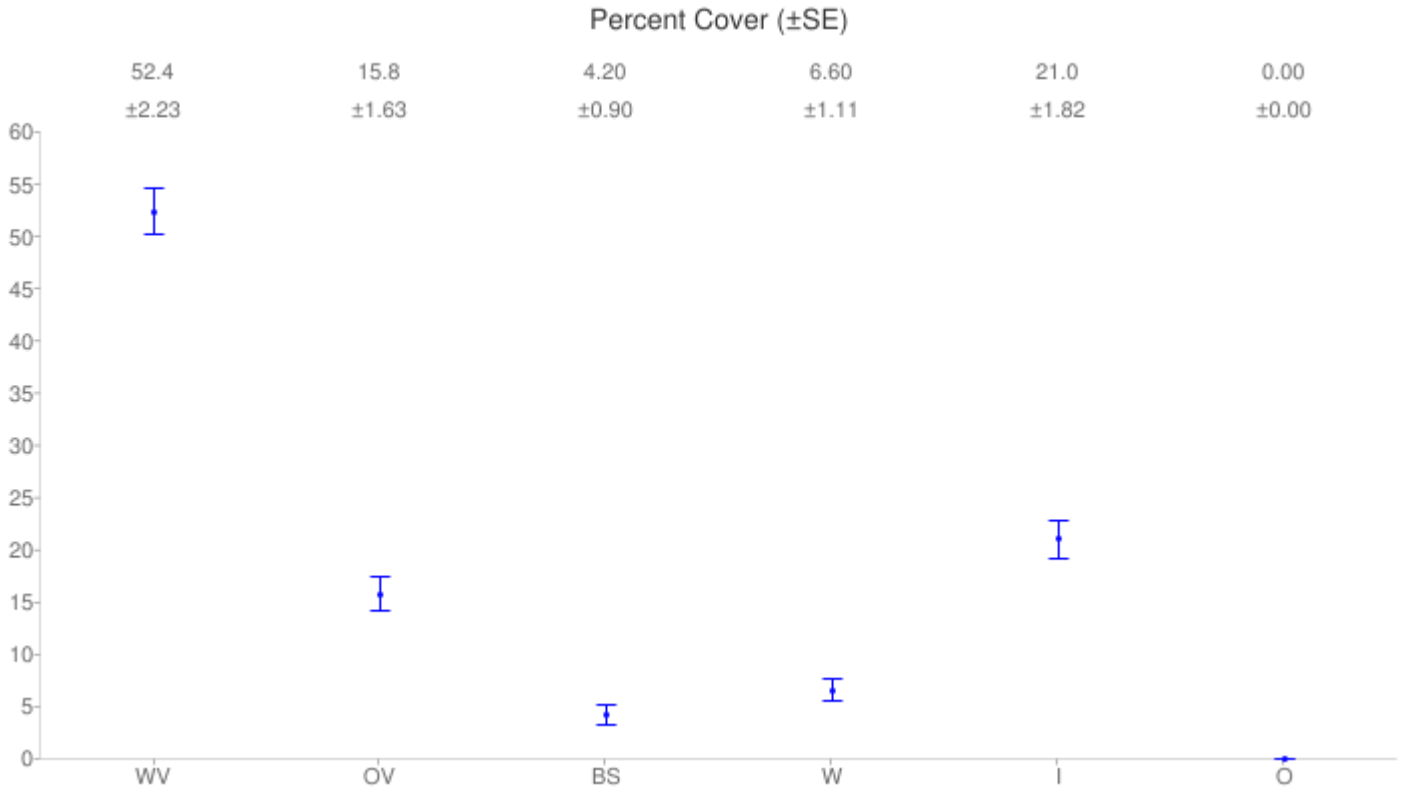
www.itreetools.org

iTree Canopy Post Maria: Ponce 6

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree, shrub	WV	262	52.4 ±2.23
Other Vegetation	grass, herb and other veg	OV	79	15.8 ±1.63
Bare soil		BS	21	4.20 ±0.90
Water	standing water, flowing water, pools, etc.	W	33	6.60 ±1.11
Impervious	roofs, buildings, tar, cement, streets, parking lots	I	105	21.0 ±1.82
Other		O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$79.51	±2.14	442.23 kg	±11.91
NO2	Nitrogen Dioxide removed annually	$72.14	±1.94	1.65 t	±0.04
O3	Ozone removed annually	$5,993.88	±161.37	16.17 t	±0.44
PM2.5	Particulate Matter less than 2.5 microns removed annually	$10,983.45	±295.70	821.37 kg	±22.11
SO2	Sulfur Dioxide removed annually	$7.82	±0.21	501.11 kg	±13.49
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$3,907.99	±105.21	5.40 t	±0.15
CO2seq	Carbon Dioxide sequestered annually in trees	$157,356.83	±4,236.37	4.03 kt	±0.11
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,547,524.31	±68,584.52	65.32 kt	±1.76

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.191 @ $179.80 | NO2 0.711 @ $43.74 | O3 6.973 @ $370.79 | PM2.5 0.354 @ $13,372.15 | SO2 0.216 @ $15.60 | PM10 2.328 @ $724.01 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

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A Cooperative Initiative Between:

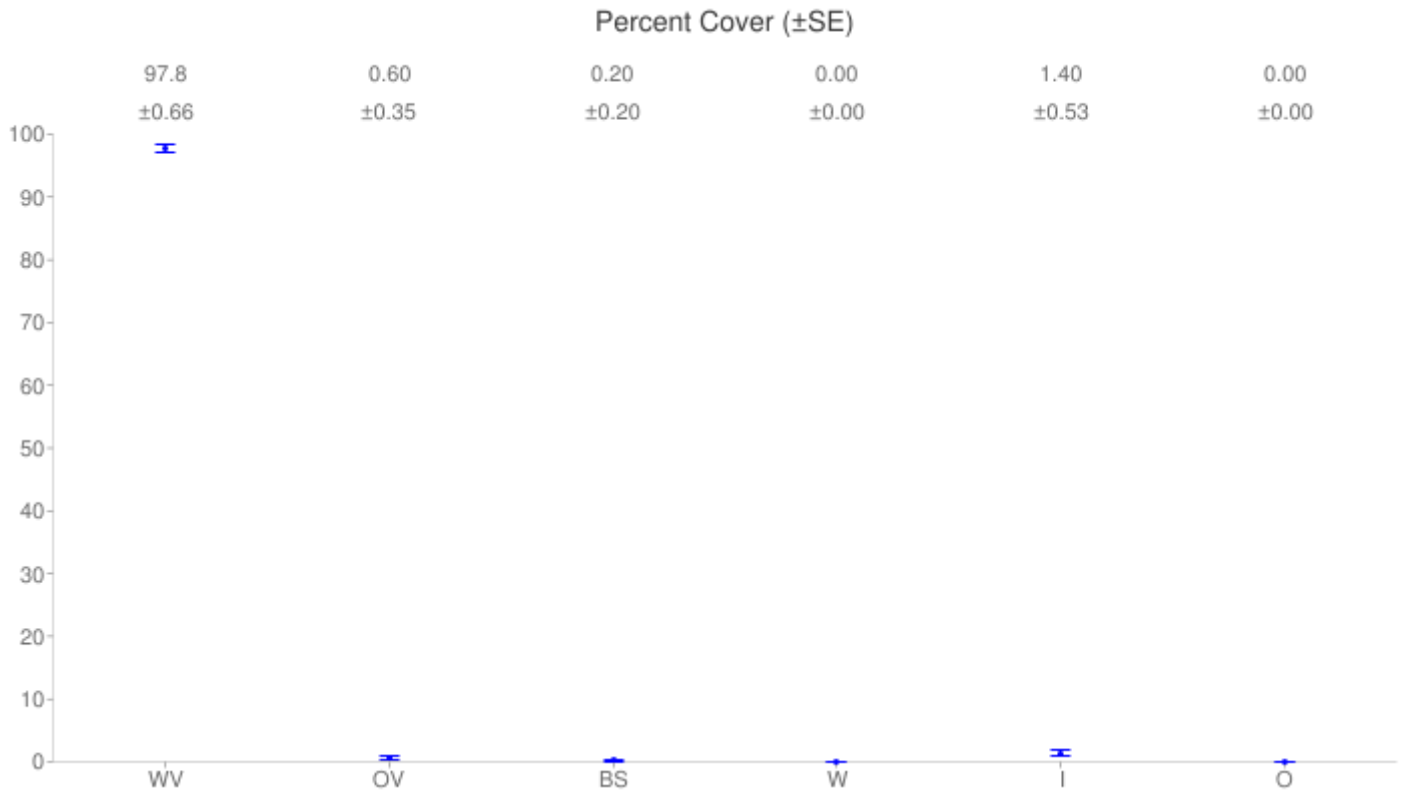
www.itreetools.org

iTree Canopy Post Maria: Ponce 7

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/30/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree and shrub	WV	489	97.8 ±0.66
Other Vegetation	grass, herb and other vegetation	OV	3	0.60 ±0.35
Bare Soil		BS	1	0.20 ±0.20
Water	river, pool, channel, etc.	W	0	0.00 ±0.00
Impervious	Building, tar, cement, parking, street, etc.	I	7	1.40 ±0.53
Other	All other surfaces	O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$15.65	±0.10	584.51 kg	±3.92
NO2	Nitrogen Dioxide removed annually	$19.91	±0.13	2.22 t	±0.01
O3	Ozone removed annually	$1,589.47	±10.66	21.57 t	±0.14
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,982.93	±20.01	1.11 t	±0.01
SO2	Sulfur Dioxide removed annually	$2.56	±0.02	671.05 kg	±4.50
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$915.60	±6.14	7.28 t	±0.05
CO2seq	Carbon Dioxide sequestered annually in trees	$209,668.03	±1,406.34	5.38 kt	±0.04
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,394,415.04	±22,767.84	87.04 kt	±0.58

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

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A Cooperative Initiative Between:

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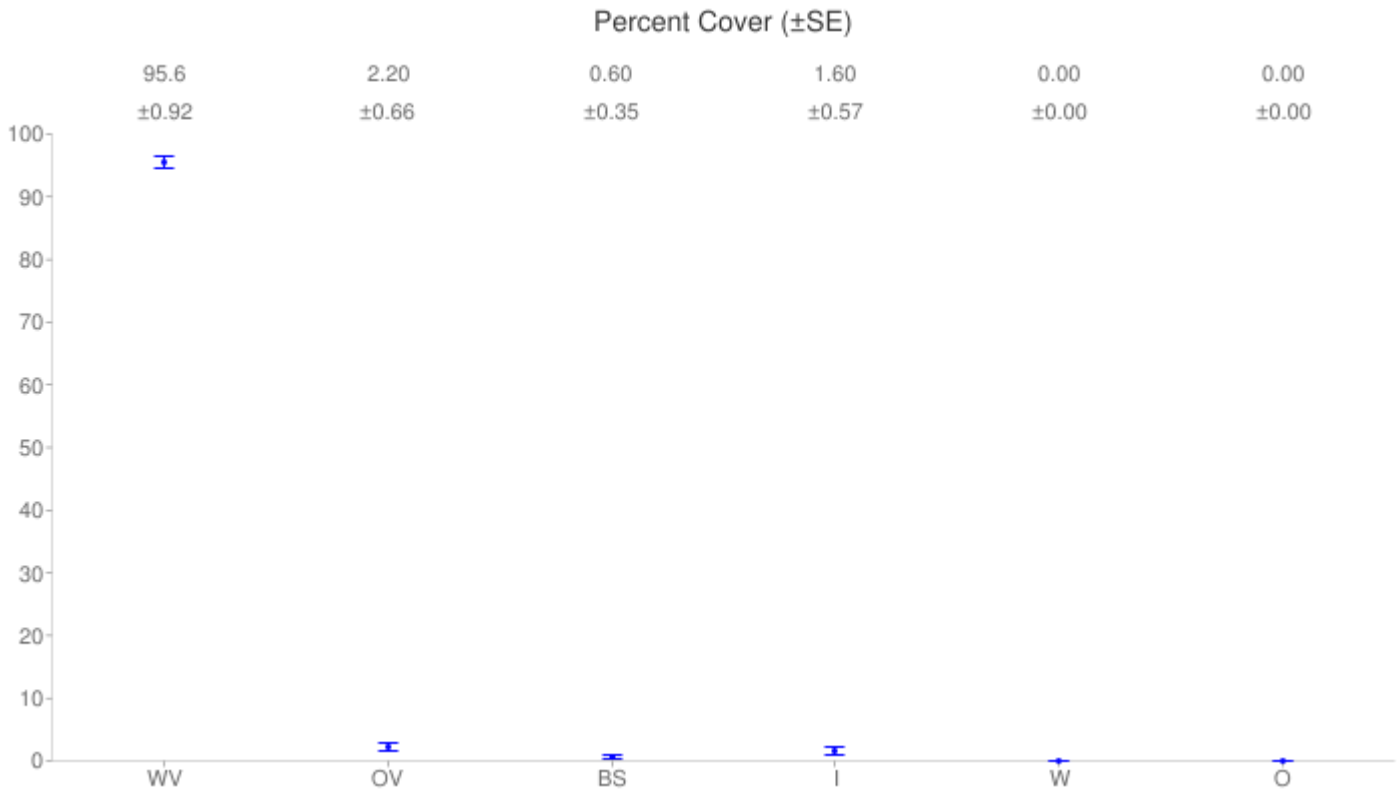
iTree Canopy Post Maria: Ponce 8

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree, shrub	WV	478	95.6 ±0.92
Other vegetation	Grass, herb and other vegetation	OV	11	2.20 ±0.66
Bare Soil	Exposed Soil	BS	3	0.60 ±0.35
Impervious	Rooff, building, tar, cement, streets, parkings, etc	I	8	1.60 ±0.57
Water	Standing water, flowing water, pools, etc	W	0	0.00 ±0.00
Other	other	O	0	0.00 ±0.00

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$15.29	±0.15	571.38 kg	±5.48
NO2	Nitrogen Dioxide removed annually	$19.46	±0.19	2.17 t	±0.02
O3	Ozone removed annually	$1,553.78	±14.91	21.08 t	±0.20
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,915.96	±27.98	1.09 t	±0.01
SO2	Sulfur Dioxide removed annually	$2.50	±0.02	655.98 kg	±6.29
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$895.04	±8.59	7.11 t	±0.07
CO2seq	Carbon Dioxide sequestered annually in trees	$204,960.46	±1,966.45	5.26 kt	±0.05
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,318,201.95	±31,835.76	85.08 kt	±0.82

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.189 @ $26.77 | NO2 0.718 @ $8.97 | O3 6.983 @ $73.69 | PM2.5 0.360 @ $2,679.25 | SO2 0.217 @ $3.82 | PM10 2.356 @ $125.82 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
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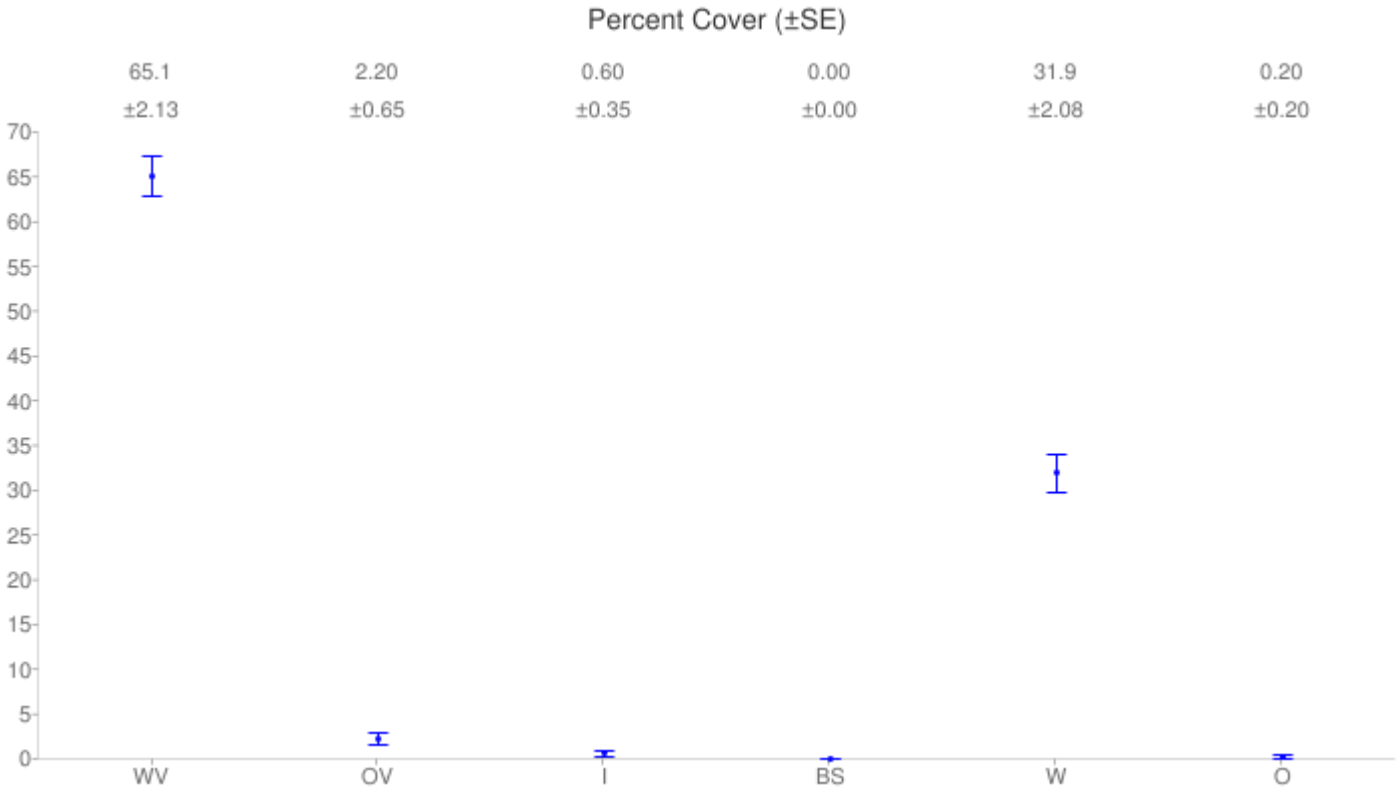
iTree Canopy Post Maria: Ponce 9

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody Vegetation	Tree and Shrub	WV	326	65.1 ±2.13
Other Vegetation	grass, herb and other vegetation	OV	11	2.20 ±0.65
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	3	0.60 ±0.35
Bare Soil	Exposed Soil	BS	0	0.00 ±0.00
Water		W	160	31.9 ±2.08
Other		O	1	0.20 ±0.20

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$618.45	±20.24	420.73 kg	±13.77
NO2	Nitrogen Dioxide removed annually	$526.44	±17.23	1.33 t	±0.04
O3	Ozone removed annually	$44,131.74	±1,444.58	14.15 t	±0.46
PM2.5	Particulate Matter less than 2.5 microns removed annually	$80,442.28	±2,633.15	613.30 kg	±20.08
SO2	Sulfur Dioxide removed annually	$54.59	±1.79	423.88 kg	±13.88
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$29,506.35	±965.84	4.27 t	±0.14
CO2seq	Carbon Dioxide sequestered annually in trees	$139,493.83	±4,566.11	3.58 kt	±0.12
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$2,258,331.71	±73,922.92	57.91 kt	±1.90

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and $/t/yr: CO 0.205 @ $1,469.94 | NO2 0.649 @ $394.62 | O3 6.886 @ $3,118.59 | PM2.5 0.298 @ $131,163.73 | SO2 0.206 @ $128.78 | PM10 2.078 @ $6,909.77 | CO2seq 1,740.491 @ $39.00 | CO2stor is a total biomass amount of 28,177.630 @ $39.00*
Note: Currency is in USD
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A Cooperative Initiative Between:

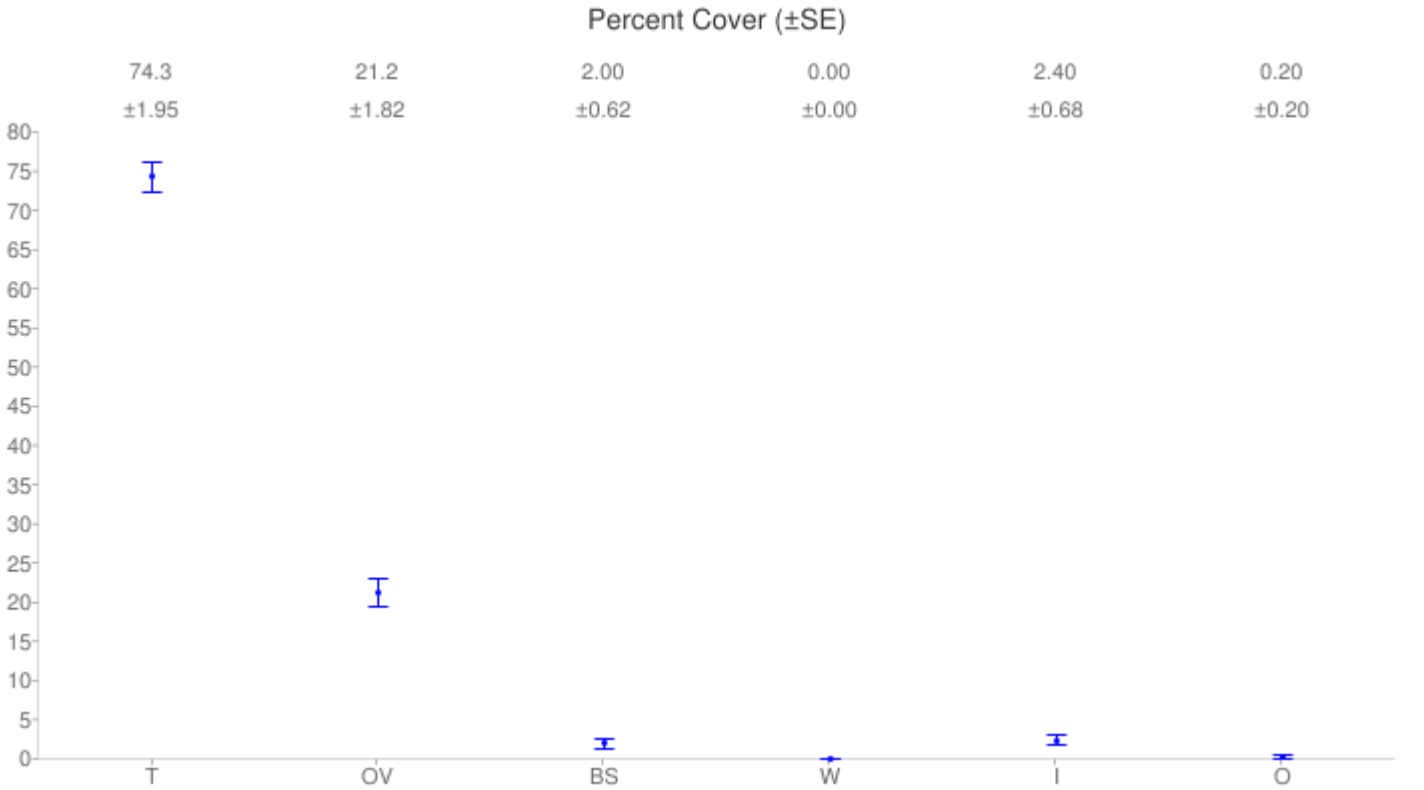
www.itreetools.org

iTree Canopy Post Maria: Ponce 10

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 4/29/18



Cover Class	Description	Abbr.	Points	% Cover
Woody vegetation	Tree and Shrub	T	372	74.3 ±1.95
Other Vegetation	grass, herb and other vegetation	OV	106	21.2 ±1.82
Bare soil		BS	10	2.00 ±0.62
Water	Standing water, flowing water, pools, etc.	W	0	0.00 ±0.00
Impervious	roofs, buildings, tar, cement, streets, parkings, etc.	I	12	2.40 ±0.68
Other		O	1	0.20 ±0.20

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	16.00 USD	±0.00	597.63 kg	±0.00
NO2	Nitrogen Dioxide removed annually	20.35 USD	±0.00	2.27 t	±0.00
O3	Ozone removed annually	1,625.15 USD	±0.00	22.05 t	±0.00
PM2.5	Particulate Matter less than 2.5 microns removed annually	3,049.90 USD	±0.00	1.14 t	±0.00
SO2	Sulfur Dioxide removed annually	2.62 USD	±0.00	686.11 kg	±0.00
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	936.15 USD	±0.00	7.44 t	±0.00
CO2seq	Carbon Dioxide sequestered annually in trees	214,374.93 USD	±0.00	5.50 kt	±0.00
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	3,470,617.35 USD	±0.00	88.99 kt	±0.00

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and USD/t/yr: CO 0.189 @ 26.77 USD | NO2 0.718 @ 8.97 USD | O3 6.983 @ 73.69 USD | PM2.5 0.360 @ 2,679.25 USD | SO2 0.217 @ 3.82 USD | PM10 2.356 @ 125.82 USD | CO2seq 1,740.491 @ 39.00 USD | CO2stor is a total biomass amount of 28,177.630 @ 39.00 USD*
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A Cooperative Initiative Between:

www.itreetools.org

iTree Canopy Post Maria: Ponce 11

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

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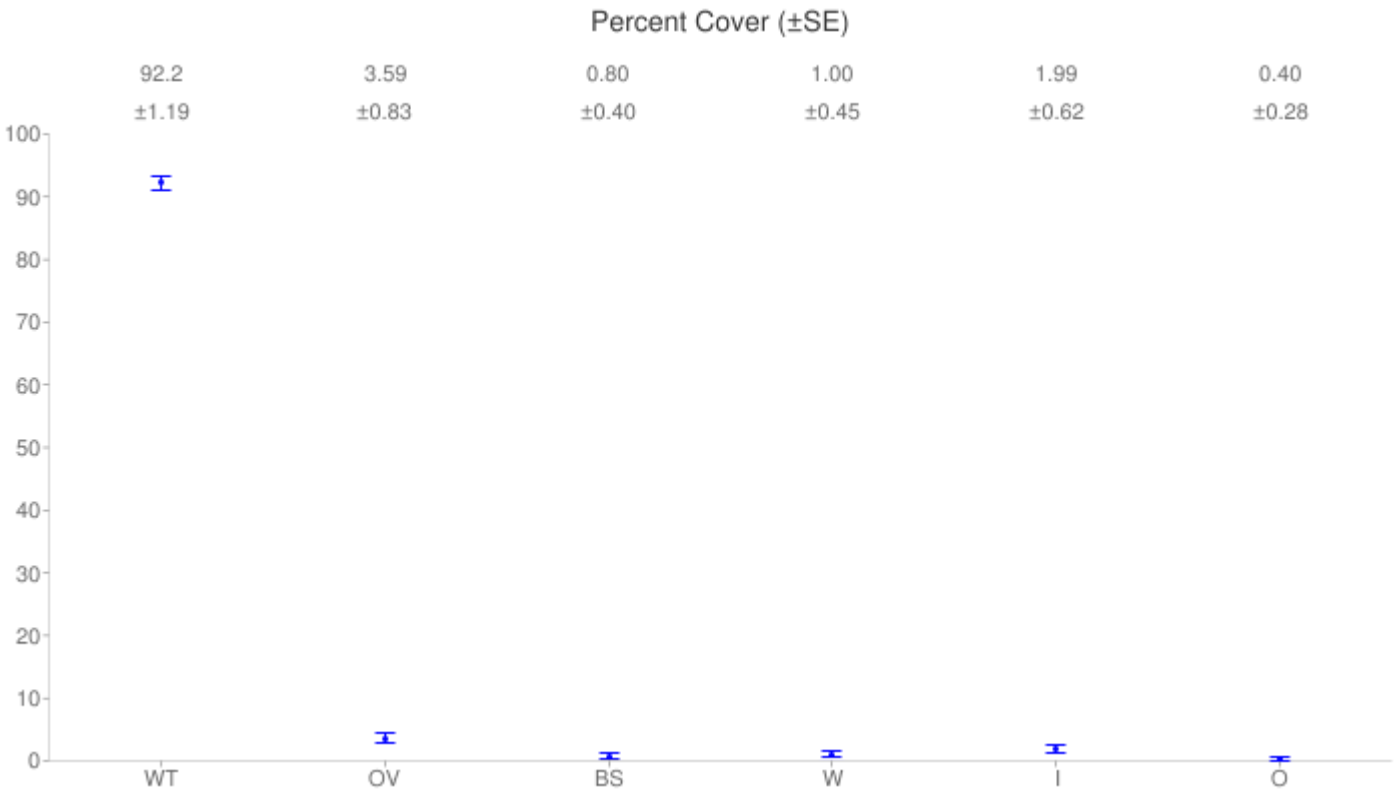

Cover Class	Description	Abbr.	Points	% Cover
Woody Tree	Woody vegetation (tree & shrubs)	WT	463	92.2 ±1.19
Other vegetation (grass, herb and other veg)	Other vegetation (grass, herb and other vegetation)	OV	18	3.59 ±0.83
Bare soil	Bare soil	BS	4	0.80 ±0.40
Water	Water (standing water, flowing water, pools, etc.)	W	5	1.00 ±0.45
Impervious	Impervious (roofs, buildings, tar, cement, streets, parkings, etc.)	I	10	1.99 ±0.62
Other	not included in another class	O	2	0.40 ±0.28

Tree Benefit Estimates

Abbr.	Benefit Description	Value (USD)	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$14.75	±0.19	551.24 kg	±7.14
NO2	Nitrogen Dioxide removed annually	$18.77	±0.24	2.09 t	±0.03
O3	Ozone removed annually	$1,499.01	±19.42	20.34 t	±0.26
PM2.5	Particulate Matter less than 2.5 microns removed annually	$2,813.17	±36.44	1.05 t	±0.01
SO2	Sulfur Dioxide removed annually	$2.42	±0.03	632.86 kg	±8.20
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$863.49	±11.19	6.86 t	±0.09
CO2seq	Carbon Dioxide sequestered annually in trees	$197,735.79	±2,561.39	5.07 kt	±0.07
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$3,201,238.34	±41,467.51	82.08 kt	±1.06

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Appendix 3. Post-hurricane changes in species abundance in Santurce AND i-Tree Eco Metadata.*

A. Post-hurricane changes in species abundance in Santurce*

Differences in the number of individuals per species			
Species	**Pre-hurricane # individuals**	**Post-Hurricane # individuals**	**%Loss**
Albizia procera	11	7	36.4
Annona muricata	1	0	100.0
Buchenavia capitata	4	4	0.0
Bucida buceras	11	9	18.2
Bursera simaruba	15	14	6.7
Callistemon sp.	2	2	0.0
Carica sp.	1	0	100.0
Calophyllum antillanum	7	6	14.3
Dypsis lutescens	11	10	9.1
Citrus aurantium	1	1	0.0
Coccoloba diversifolia	2	1	50.0
Cocos nucifera	4	4	0.0
Cordia sebestena	1	1	0.0
Delonix regia	4	2	50.0
Dracaena sp.	2	2	0.0
Eucalyptus deglupta	3	2	33.3
Eucalyptus robusta	0	1	NEW
Ficus benjamina	4	2	50.0
Ficus elastica	1	1	0.0
Ficus lyrata	1	1	0.0
Gliricidia sepium	1	0	100.0
Handroanthus chrysotrichus	4	2	50.0
Lagerstroemia indica	2	2	0.0
Lagerstroemia speciosa	2	2	0.0
Lantana sp	0	1	New
Mangifera indica	7	0	100.0
Melicoccus bijugatus	2	2	0.0
Moringa sp.	1	0	100.0
Ochna sp.	1	1	0.0
Phoenix roebelenii	2	2	0.0
Pithecellobium dulce	1	1	0.0
Pimenta racemosa	1	1	0.0
Polyscias scutellaria	1	1	0.0

Differences in the number of individuals per species			
Species	**Pre-hurricane # individuals**	**Post-Hurricane # individuals**	**%Loss**
Pritchardia pacifica	3	3	0.0
Psidium guajava	1	0	100.0
Ravenala madagascariensis	3	0	100.0
Roystonea borinquena	3	3	0.0
Roystonea regia	1	1	0.0
Schefflera arboricola	3	3	0.0
Spathodea campanulata	1	0	100.0
Swietenia mahogani	27	20	25.9
Swietenia macrophylla	3	3	0.0
Tabebuia heptaphylla	6	5	16.7
Tabebuia heterophylla	28	20	28.6
Terminalia catappa	3	2	33.3
Veitchia merrillii	13	9	30.8
Washingtonia sp	11	5	54.6
Wodyetia bifurcata	1	1	0.0
Total Stems	**218**	**160**	**26.6**
***Inventory generated with the iTree-Eco methodology**			

Metadata Report For: Santurce Pre-Maria

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: Santurce SE POst Maria, Series: Santurce Post Maria, Year: 2018
Generated: 5/5/2018

i-Tree Eco v6.0.8
Project created: 5/5/2018
Project location: D:\itree\Santurce_PreMaria_complete_05_05_18_1445.ieco
Model HAS been run

Project Type: Plot-based

- Project: Santurce SE POst Maria
- Series: Santurce Post Maria
- Year: 2018
- 60/60 plots completed
- 218 trees

Project Info

- Area: 1,352.01 hectares
- Location: San Juan, San Juan, Puerto Rico, United States of America
- Population: 381,931
- Study area is treated as Urban: Yes
- Units: Metric

Pollution Details:

- Year: 2013

Weather Station Details:

- Year: 2013
- USAF: 785260
- WBAN: 99999
- Name: SAN JUAN INTL ARPT

* see avoided runoff report for annual precipitation total used for analysis

Benefit Prices:

- Electricity $ (USD)/kWh: 0.28 (Eco default value: 0.28 for 2012)
- Fuels $ (USD)/Therm: 1.92 (Eco default value: 1.92 for 2012)
- Carbon $ (USD)/tonne: 143.00 (Eco default value: 143.00 for 2015)
- Avoided Runoff $ (USD)/m^3: 2.361 (Eco default value: 2.361 for 2004)

Models:

- Forecast v6.0.8
- UFORE-D v1.1.0

Processing History:

Metadata Report For: Santurce Pre-Maria

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: Santurce SE POst Maria, Series: Santurce Post Maria, Year: 2018
Generated: 5/5/2018

Date/Time	File Name	Retrieved
May 5, 2018 4:08 PM	_001_72_127_76770_Santurce_PreMaria_complete_05_05_18_1445.ieco.2018_5_5_58104.zip	YES

Report Availability

Formatted Reports
Written Report
Composition and Structure
Structure Summary
By Species
By Strata and Species
Population Summary
By Species
By Strata
By Strata per Unit Area
Public and Private by Strata
Street Trees by Strata (Unavailable: "Street tree/non-street tree" not checked)
Species Distribution
By DBH Class (chart)
By DBH Class (vertical table)
By DBH Class (horizontal table)
By DBH Class and Strata (vertical table)
By DBH Class and Strata (horizontal table)
Importance Values
By Species
Diversity Indices
By Strata
Species Range
Native Status by Strata
Condition
By Species
By Strata and Species
Leaf Area
By Strata
By Strata per Unit Area
Leaf Area and Biomass
Of Shrubs by Strata (Unavailable: "Shrub details", not checked)
Of Trees and Shrubs by Strata
Ground Cover Composition
By Strata
Land Use Composition
By Strata
Relative Performance Index
By Species
Maintenance (Unavailable: "Maintenance recommended", "Maintenance task", "Sidewalk conflict", "Utility conflict" not checked)
Recommended (Unavailable: "Maintenance recommended" not checked)
Task (Unavailable: "Maintenance task" not checked)
Sidewalk Conflicts (Unavailable: "Sidewalk conflict" not checked)

- Utility Conflicts (Unavailable: "Utility conflict" not checked)
- Other (Unavailable: "Custom Field One name:", "Custom Field Two name:", "Custom Field Three name:" not checked)
- Field One (Unavailable: "Custom Field One name:" not checked)
- Field Two (Unavailable: "Custom Field Two name:" not checked)
- Field Three (Unavailable: "Custom Field Three name:" not checked)
- Benefits and Costs
- Benefits Summary
- By Species
- By Strata and Species
- Carbon Storage of Trees
- By Species
- By Strata
- By Strata per Unit Area
- Annual Carbon Sequestration of Trees
- By Species
- By Strata
- By Strata per Unit Area
- Annual Net Carbon Sequestration of Trees
- By Species
- By Strata
- By Strata Per Unit Area
- Energy Effects (Unavailable: "Energy (building interactions)" not checked)
- Of Trees (Unavailable: "Energy (building interactions)" not checked)
- Avoided Runoff of Trees
- By Species
- By Strata
- Oxygen Production of Trees
- By Strata
- By Strata per Unit Area
- Pollution Removal by Trees and Shrubs
- Monthly Removal
- Monthly Removal (chart display)
- VOC Emissions of Trees
- By Species
- By Strata
- UV Effects of Trees
- By Strata
- Wildlife Suitability
- By Plot
- By Strata
- Management Costs
- By Expenditure
- Net Annual Benefits
- Net Annual Benefits for All Trees
- Foodscape Benefits of Trees
- By Species
- Measured Tree Details
- Composition and Structure
- Individual Tree Data

- By Species
- By Strata
- Benefits and Costs
  - Individual Tree Benefits Summary
  - Carbon Storage
  - Carbon Sequestration
  - Energy Effects (Unavailable: "Energy (building interactions)" not checked)
  - Avoided Runoff
  - Pollution Removal
  - Oxygen Production
  - VOC Emissions
- Air Quality Health Impacts and Values (Unavailable for this project type or location)
- Pest Analysis
  - Susceptibility to Pests
    - By Strata
  - Primary Pest (Unavailable: "Pests (IPED)" not checked)
    - Impacts by Strata (Unavailable: "Pests (IPED)" not checked)
    - Impacted Tree Details (Unavailable: "Pests (IPED)" not checked)
  - Signs and Symptoms (Unavailable: "Pests (IPED)" not checked)
    - Totals by Species (Unavailable: "Pests (IPED)" not checked)
    - Summaries by Species (Unavailable: "Pests (IPED)" not checked)
    - Details by Species (Unavailable: "Pests (IPED)" not checked)
    - Totals by Strata (Unavailable: "Pests (IPED)" not checked)
    - Summaries by Strata (Unavailable: "Pests (IPED)" not checked)
    - Details by Strata (Unavailable: "Pests (IPED)" not checked)
    - Impacted Tree Finder (Unavailable: "Pests (IPED)" not checked)
  - Pest Review (Unavailable: "Pests (IPED)" not checked)
    - Of Assessed Trees (Unavailable: "Pests (IPED)" not checked)
- Charts
  - Pollution and Weather
    - Raw and Source Data
      - Air Pollutant Concentration
      - Photosynthetically Active Radiation
      - Rain
      - Temperature
      - UV Index
    - Air Quality Improvement
      - By Trees
      - By Shrubs (Unavailable: "Shrub details", not checked)
    - Air Pollutant Flux (Dry Deposition)
      - Per Unit Tree Cover
      - Per Unit Shrub Cover (Unavailable: "Shrub details", not checked)
    - Transpiration
      - By Trees
      - By Shrubs (Unavailable: "Shrub details", not checked)
    - Evaporation
      - By Trees
      - By Shrubs (Unavailable: "Shrub details", not checked)
    - Water Intercepted

	By Trees
	By Shrubs (Unavailable: "Shrub details", not checked)
Avoided Runoff	
	By Trees
	By Shrubs (Unavailable: "Shrub details", not checked)
Potential Evapotranspiration	
	By Trees
	By Shrubs (Unavailable: "Shrub details", not checked)
UV Index Reduction by Trees	
	Effects in Tree Shade
	Effects Overall
Forecast Reports	
Composition and Structure	
Population Summary	
	Number of Trees
	Number of Trees by Strata
	Percent Tree Cover
	Percent Tree Cover by Strata
	Tree Cover Area
	Tree Cover Area by Strata
	Average DBH Growth
	Average DBH Growth by Strata
	Yearly DBH Distributions
	Basal Area
	Basal Area by Strata
Leaf Area and Biomass	
	Leaf Area
	Leaf Area by Strata
	Leaf Area Index
	Leaf Area Index by Strata
	Leaf Biomass
	Leaf Biomass by Strata
	Leaf Biomass per Unit Area
	Leaf Biomass by Strata per Unit Area
	Tree Biomass
	Tree Biomass by Strata
Benefits	
Carbon Storage and Sequestration	
	Carbon Storage
	Carbon Storage By Strata
	Carbon Sequestration
	Carbon Sequestration By Strata
Pollutant Removal by Trees	
	Value for All Pollutants
	CO
	NO2
	O3
	SO2
	PM2.5

Metadata Report For: Santurce Post-Maria

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: Santurce SE POst Maria, Series: Santurce Post Maria, Year: 2018
Generated: 4/29/2018

i-Tree Eco v6.0.8
Project created: 4/28/2018
Project location: C:\Users\Elvia\Downloads\Santurce_Post Maria_01_015.ieco
Model has NOT been run

Project Type: Plot-based

- Project: Santurce SE POst Maria
- Series: Santurce Post Maria
- Year: 2018
- 0/60 plots completed
- 31 trees

Project Info

- Area: 3,340.88 acres
- Location: San Juan, San Juan, Puerto Rico, United States of America
- Population: 381,931
- Study area is treated as Urban: Yes
- Units: Metric

Pollution Details:

- Year: 2013

Weather Station Details:

- Year: 2013
- USAF: 785260
- WBAN: 99999
- Name: SAN JUAN INTL ARPT

* see avoided runoff report for annual precipitation total used for analysis

Benefit Prices:

- Electricity $ (USD)/kWh: 0.28 (Eco default value: 0.28 for 2012)
- Fuels $ (USD)/Therm: 1.92 (Eco default value: 1.92 for 2012)
- Carbon $ (USD)/ton: 129.73 (Eco default value: 129.73 for 2015)
- Avoided Runoff $ (USD)/gallon: 0.0089 (Eco default value: 0.0089 for 2004)

Models:

- Forecast v6.0.8
- UFORE-D v1.1.0

Report Availability

Formatted Reports
Written Report
Composition and Structure

- Structure Summary
  - By Species
  - By Strata and Species
- Population Summary
  - By Species
  - By Strata
  - By Strata per Unit Area
  - Public and Private by Strata
  - Street Trees by Strata (Unavailable: "Street tree/non-street tree" not checked)
- Species Distribution
  - By DBH Class (chart)
  - By DBH Class (vertical table)
  - By DBH Class (horizontal table)
  - By DBH Class and Strata (vertical table)
  - By DBH Class and Strata (horizontal table)
- Importance Values
  - By Species
- Diversity Indices
  - By Strata
- Species Range
  - Native Status by Strata
- Condition
  - By Species
  - By Strata and Species
- Leaf Area
  - By Strata
  - By Strata per Unit Area
- Leaf Area and Biomass
  - Of Shrubs by Strata (Unavailable: "Shrub details", not checked)
  - Of Trees and Shrubs by Strata
- Ground Cover Composition
  - By Strata
- Land Use Composition
  - By Strata
- Relative Performance Index
  - By Species
- Maintenance (Unavailable: "Maintenance recommended", "Maintenance task", "Sidewalk conflict", "Utility conflict" not checked)
  - Recommended (Unavailable: "Maintenance recommended" not checked)
  - Task (Unavailable: "Maintenance task" not checked)
  - Sidewalk Conflicts (Unavailable: "Sidewalk conflict" not checked)
  - Utility Conflicts (Unavailable: "Utility conflict" not checked)
- Other (Unavailable: "Custom Field One name:", "Custom Field Two name:", "Custom Field Three name:" not checked)
  - Field One (Unavailable: "Custom Field One name:" not checked)
  - Field Two (Unavailable: "Custom Field Two name:" not checked)
  - Field Three (Unavailable: "Custom Field Three name:" not checked)

Benefits and Costs

- Benefits Summary
  - By Species

- By Strata and Species
- Carbon Storage of Trees
  - By Species
  - By Strata
  - By Strata per Unit Area
- Annual Carbon Sequestration of Trees
  - By Species
  - By Strata
  - By Strata per Unit Area
- Annual Net Carbon Sequestration of Trees
  - By Species
  - By Strata
  - By Strata Per Unit Area
- Energy Effects (Unavailable: "Energy (building interactions)" not checked)
  - Of Trees (Unavailable: "Energy (building interactions)" not checked)
- Avoided Runoff of Trees
  - By Species
  - By Strata
- Oxygen Production of Trees
  - By Strata
  - By Strata per Unit Area
- Pollution Removal by Trees and Shrubs
  - Monthly Removal
  - Monthly Removal (chart display)
- VOC Emissions of Trees
  - By Species
  - By Strata
- UV Effects of Trees
  - By Strata
- Wildlife Suitability
  - By Plot
  - By Strata
- Management Costs
  - By Expenditure
- Net Annual Benefits
  - Net Annual Benefits for All Trees
- Foodscape Benefits of Trees
  - By Species

Measured Tree Details

- Composition and Structure
  - Individual Tree Data
  - By Species
  - By Strata
- Benefits and Costs
  - Individual Tree Benefits Summary
  - Carbon Storage
  - Carbon Sequestration
  - Energy Effects (Unavailable: "Energy (building interactions)" not checked)
  - Avoided Runoff

- Pollution Removal
- Oxygen Production
- VOC Emissions
- Air Quality Health Impacts and Values (Unavailable for this project type or location)
- Pest Analysis
  - Susceptibility to Pests
    - By Strata
  - Primary Pest (Unavailable: "Pests (IPED)" not checked)
    - Impacts by Strata (Unavailable: "Pests (IPED)" not checked)
    - Impacted Tree Details (Unavailable: "Pests (IPED)" not checked)
  - Signs and Symptoms (Unavailable: "Pests (IPED)" not checked)
    - Totals by Species (Unavailable: "Pests (IPED)" not checked)
    - Summaries by Species (Unavailable: "Pests (IPED)" not checked)
    - Details by Species (Unavailable: "Pests (IPED)" not checked)
    - Totals by Strata (Unavailable: "Pests (IPED)" not checked)
    - Summaries by Strata (Unavailable: "Pests (IPED)" not checked)
    - Details by Strata (Unavailable: "Pests (IPED)" not checked)
    - Impacted Tree Finder (Unavailable: "Pests (IPED)" not checked)
  - Pest Review (Unavailable: "Pests (IPED)" not checked)
    - Of Assessed Trees (Unavailable: "Pests (IPED)" not checked)

Charts

- Pollution and Weather
  - Raw and Source Data
    - Air Pollutant Concentration
    - Photosynthetically Active Radiation
    - Rain
    - Temperature
    - UV Index
  - Air Quality Improvement
    - By Trees
    - By Shrubs (Unavailable: "Shrub details", not checked)
  - Air Pollutant Flux (Dry Deposition)
    - Per Unit Tree Cover
    - Per Unit Shrub Cover (Unavailable: "Shrub details", not checked)
  - Transpiration
    - By Trees
    - By Shrubs (Unavailable: "Shrub details", not checked)
  - Evaporation
    - By Trees
    - By Shrubs (Unavailable: "Shrub details", not checked)
  - Water Intercepted
    - By Trees
    - By Shrubs (Unavailable: "Shrub details", not checked)
  - Avoided Runoff
    - By Trees
    - By Shrubs (Unavailable: "Shrub details", not checked)
  - Potential Evapotranspiration
    - By Trees
    - By Shrubs (Unavailable: "Shrub details", not checked)

UV Index Reduction by Trees
Effects in Tree Shade
Effects Overall
Forecast Reports
Composition and Structure
Population Summary
Number of Trees
Number of Trees by Strata
Percent Tree Cover
Percent Tree Cover by Strata
Tree Cover Area
Tree Cover Area by Strata
Average DBH Growth
Average DBH Growth by Strata
Yearly DBH Distributions
Basal Area
Basal Area by Strata
Leaf Area and Biomass
Leaf Area
Leaf Area by Strata
Leaf Area Index
Leaf Area Index by Strata
Leaf Biomass
Leaf Biomass by Strata
Leaf Biomass per Unit Area
Leaf Biomass by Strata per Unit Area
Tree Biomass
Tree Biomass by Strata
Benefits
Carbon Storage and Sequestration
Carbon Storage
Carbon Storage By Strata
Carbon Sequestration
Carbon Sequestration By Strata
Pollutant Removal by Trees
Value for All Pollutants
CO
NO2
O3
SO2
PM2.5

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

						Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
1	1	Mangifera indica	78.4	0.00	1,852.7	271.71	117.8	17.27	2.1	4.84	34.5	5.05	285.2	14.97	36.28	78.42
1	2	Cocos nucifera	28.2	460.64	19.2	2.82	0.2	0.03	1.5	3.56	12.6	1.85	209.9	11.02	12.95	29.41
1	3	Pterocarpus indicus	65.0	0.00	1,127.3	165.33	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.00	0.00
1	4	Mangifera indica	15.0	0.00	35.1	5.15	1.1	0.16	0.1	0.32	13.1	1.92	19.0	1.00	13.60	17.00
1	5	Mangifera indica	13.6	0.00	27.8	4.08	1.2	0.17	0.1	0.23	11.8	1.73	13.5	0.71	12.26	15.10
1	6	Pterocarpus indicus	47.1	0.00	557.2	81.72	28.3	4.16	0.3	0.74	48.4	7.10	43.5	2.28	49.08	63.36
4	1	Musa x paradisiaca	14.9	179.44	2.3	0.34	0.0	0.01	0.2	0.40	0.6	0.09	23.5	1.23	0.69	2.42
4	2	Musa x paradisiaca	6.7	197.99	0.9	0.14	0.0	0.00	0.1	0.20	0.0	0.00	11.7	0.61	0.00	0.81
4	3	Musa x paradisiaca	12.7	221.78	2.3	0.34	0.1	0.01	0.2	0.39	0.8	0.11	23.1	1.22	0.86	2.59
4	4	Musa x paradisiaca	5.5	117.56	0.8	0.12	0.0	0.00	0.1	0.17	0.0	0.00	10.2	0.54	0.00	0.71
4	5	Musa x paradisiaca	8.8	117.56	1.2	0.18	0.0	0.00	0.1	0.21	0.0	0.00	12.4	0.65	0.00	0.86
4	6	Musa x paradisiaca	6.3	223.42	6.8	1.00	0.1	0.02	0.1	0.18	8.7	1.28	10.8	0.57	9.20	11.25
4	7	Persea americana	19.5	0.00	71.8	10.53	15.6	2.29	1.8	4.16	10.2	1.50	244.8	12.85	10.81	31.61
5	1	Artocarpus altilis	80.7	0.00	2,044.9	299.90	70.0	10.27	3.2	7.51	105.9	15.54	442.4	23.23	111.60	168.14
6	1	Musa x paradisiaca	4.0	419.48	1.3	0.19	0.1	0.01	0.1	0.12	2.3	0.33	7.1	0.37	2.78	3.61
6	2	Musa x paradisiaca	12.0	523.80	3.1	0.46	0.2	0.03	0.2	0.37	5.5	0.81	21.8	1.14	6.74	9.08
6	3	Musa x paradisiaca	13.0	565.53	3.1	0.46	0.1	0.01	0.2	0.36	5.5	0.81	20.9	1.10	6.74	9.01
6	4	Musa x paradisiaca	10.5	565.53	3.1	0.45	0.1	0.01	0.2	0.36	5.5	0.81	20.9	1.10	6.74	9.01
6	5	Musa x paradisiaca	10.0	523.80	3.1	0.46	0.1	0.01	0.2	0.37	5.5	0.81	21.8	1.14	6.74	9.07
6	6	Musa x paradisiaca	5.0	267.98	0.4	0.07	0.0	0.00	0.0	0.09	0.0	0.00	5.2	0.28	0.00	0.37
6	7	Musa x paradisiaca	7.0	482.07	3.2	0.47	0.1	0.01	0.2	0.39	5.5	0.81	22.7	1.19	6.74	9.14
6	8	Musa x paradisiaca	8.0	502.94	3.1	0.46	0.1	0.01	0.2	0.38	5.5	0.81	22.3	1.17	6.74	9.10
6	9	Musa x paradisiaca	9.0	461.21	3.2	0.47	0.1	0.01	0.2	0.39	5.5	0.81	23.2	1.22	6.74	9.17
6	10	Musa x paradisiaca	12.0	451.12	3.2	0.47	0.1	0.01	0.1	0.34	6.3	0.93	20.1	1.05	7.72	10.06
6	11	Musa x paradisiaca	17.0	451.12	3.3	0.48	0.1	0.01	0.1	0.34	6.3	0.93	20.1	1.05	7.72	10.06
6	12	Musa x paradisiaca	13.0	451.12	3.3	0.48	0.1	0.01	0.1	0.34	6.3	0.93	20.1	1.05	7.72	10.06
6	13	Musa x paradisiaca	11.0	451.12	3.2	0.47	0.1	0.01	0.1	0.34	6.3	0.93	20.1	1.05	7.72	10.06
8	1	Brunfelsia pauciflora	6.2	0.00	3.9	0.57	1.6	0.24	0.0	0.08	0.0	0.00	4.6	0.24	0.00	0.56
10	1	Adonidia merrilli	11.6	715.11	2.5	0.37	0.2	0.03	0.1	0.33	5.7	0.83	19.4	1.02	6.94	9.16
10	2	Pithecellobium dulce	9.3	0.00	10.5	1.54	3.7	0.54	0.1	0.21	0.2	0.03	12.1	0.64	0.35	1.77
10	3	Adonidia merrilli	39.0	1,198.52	2.4	0.36	0.2	0.03	0.1	0.17	7.3	1.07	9.9	0.52	8.96	10.75
13	1	Hibiscus rosa-sinensis	4.8	0.00	2.5	0.37	0.9	0.13	0.1	0.20	0.1	0.02	11.8	0.62	0.13	1.10

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
13	2	Hibiscus rosa-sinensis	4.5	0.00	2.3	0.34	0.9	0.13	0.1	0.23	0.1	0.02	13.5	0.71	0.13	1.22
13	3	Hibiscus rosa-sinensis	5.3	0.00	3.2	0.47	1.0	0.14	0.1	0.22	0.1	0.01	13.0	0.68	0.07	1.13
13	4	Hibiscus rosa-sinensis	6.6	0.00	5.1	0.75	1.4	0.20	0.1	0.27	0.1	0.01	15.7	0.82	0.07	1.38
13	5	Hibiscus rosa-sinensis	9.2	0.00	10.7	1.57	3.0	0.44	0.1	0.23	0.1	0.01	13.4	0.70	0.06	1.44
13	6	Hibiscus rosa-sinensis	6.9	0.00	5.2	0.76	1.5	0.22	0.0	0.08	0.1	0.01	4.8	0.25	0.07	0.63
13	7	Hibiscus rosa-sinensis	4.3	0.00	2.1	0.30	0.8	0.12	0.1	0.21	0.3	0.04	12.5	0.66	0.32	1.35
13	8	Dracaena fragrans	4.2	290.11	0.8	0.12	0.0	0.00	0.1	0.17	0.0	0.00	10.1	0.53	0.00	0.70
13	9	Hibiscus rosa-sinensis	6.3	0.00	4.1	0.61	1.4	0.20	0.0	0.04	0.2	0.04	2.3	0.12	0.29	0.68
13	10	Hibiscus rosa-sinensis	6.6	0.00	5.1	0.75	1.3	0.19	0.1	0.21	0.3	0.04	12.5	0.66	0.32	1.42
13	11	Hibiscus rosa-sinensis	4.3	0.00	1.8	0.27	0.8	0.12	0.0	0.07	0.3	0.04	4.0	0.21	0.30	0.74
13	12	Hibiscus rosa-sinensis	6.3	0.00	4.2	0.62	1.1	0.17	0.0	0.08	0.2	0.03	4.7	0.25	0.28	0.81
13	13	Hibiscus rosa-sinensis	4.6	0.00	2.1	0.30	0.9	0.13	0.0	0.05			2.7	0.14		0.32
13	14	Hibiscus rosa-sinensis	6.6	0.00	5.6	0.82	1.4	0.21	0.2	0.47			27.4	1.44		2.11
13	15	Hibiscus rosa-sinensis	7.0	0.00	6.1	0.89	1.5	0.22	0.2	0.39			23.0	1.21		1.82
13	16	Hibiscus rosa-sinensis	3.6	0.00	1.3	0.20	0.6	0.09	0.1	0.12			7.2	0.38		0.60
13	17	Dypsis lutescens	41.1	217.59	13.7	2.01	0.2	0.03	1.2	2.81			165.6	8.69		11.54
13	18	Codiaeum variegatum	9.9	0.00	12.1	1.77	2.4	0.35	0.0	0.06			3.5	0.18		0.59
13	19	Hibiscus rosa-sinensis	3.7	0.00	1.4	0.21	0.7	0.10	0.1	0.12			7.1	0.37		0.59
13	20	Hibiscus rosa-sinensis	7.9	0.00	7.9	1.16	1.8	0.26	0.2	0.43			25.1	1.32		2.00
13	21	Codiaeum variegatum	5.4	0.00	3.1	0.46	1.0	0.15	0.1	0.17	0.0	0.00	9.8	0.52	0.00	0.83
13	22	Hibiscus rosa-sinensis	4.2	0.00	1.8	0.26	0.8	0.11	0.0	0.11	0.1	0.02	6.4	0.34	0.13	0.70
13	23	Hibiscus rosa-sinensis	4.3	0.00	1.9	0.28	0.8	0.12	0.1	0.12	0.1	0.02	7.1	0.37	0.12	0.74
13	24	Hibiscus rosa-sinensis	4.8	0.00	2.3	0.34	0.9	0.14	0.0	0.05	0.1	0.02	2.8	0.15	0.12	0.47
13	25	Codiaeum variegatum	5.1	0.00	2.5	0.37	0.9	0.13	0.0	0.07	0.0	0.00	4.0	0.21	0.00	0.41
13	26	Hibiscus rosa-sinensis	4.8	0.00	2.3	0.34	1.0	0.14	0.0	0.11	0.1	0.02	6.6	0.34	0.11	0.72
13	27	Hibiscus rosa-sinensis	5.8	0.00	3.7	0.54	1.2	0.18	0.1	0.16	0.1	0.02	9.4	0.50	0.13	0.98
13	28	Hibiscus rosa-sinensis	4.2	0.00	1.9	0.27	0.8	0.12	0.1	0.16	0.1	0.02	9.2	0.48	0.13	0.90
13	29	Hibiscus rosa-sinensis	5.3	0.00	3.0	0.44	1.1	0.16	0.0	0.10	0.1	0.02	5.8	0.31	0.12	0.70
13	30	Hibiscus rosa-sinensis	4.4	0.00	2.0	0.29	0.8	0.12	0.0	0.09	0.1	0.02	5.4	0.28	0.11	0.62
13	31	Hibiscus rosa-sinensis	4.9	0.00	2.5	0.36	1.0	0.15	0.0	0.08	0.1	0.02	4.8	0.25	0.12	0.62
13	32	Hibiscus rosa-sinensis	5.0	0.00	2.6	0.38	1.0	0.14	0.1	0.13	0.1	0.02	7.7	0.40	0.12	0.81
13	33	Dracaena	8.2	331.69	1.3	0.19	0.0	0.00	0.1	0.20	0.1	0.01	11.8	0.62	0.07	0.90

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
14	1	Citrus aurantifolia	4.1	0.00	1.8	0.26	2.0	0.29	0.0	0.09			5.3	0.28		0.65
14	2	Coccoloba pubescens	4.1	0.00	1.7	0.25	2.0	0.29	0.1	0.12	1.1	0.17	7.0	0.37	1.38	2.32
14	5	Dypsis lutescens	9.0	290.11	4.7	0.68	0.1	0.01	0.4	0.83	2.3	0.34	49.1	2.58	2.81	6.56
14	6	Cestrum diurnum	16.4	0.00	44.2	6.49	5.2	0.76	0.5	1.24	-5.4	-0.79	73.1	3.84	-4.51	0.54
15	1	Tecoma stans	8.3	0.00	7.9	1.16	1.8	0.27	0.1	0.19	0.0	0.01	11.2	0.59	0.05	1.10
16	1	Musa acuminata	6.5	312.25	0.9	0.14	0.0	0.00	0.1	0.19	0.0	0.00	11.5	0.60	0.00	0.80
16	2	Musa acuminata	6.0	334.38	0.6	0.09	0.0	0.00	0.0	0.10	0.0	0.00	5.9	0.31	0.00	0.41
16	3	Musa acuminata	6.2	422.93	0.2	0.03	0.0	0.00	0.0	0.04	0.0	0.00	2.2	0.11	0.00	0.15
16	4	Musa acuminata	14.0	754.96	2.0	0.29	0.1	0.01	0.1	0.31	-0.2	-0.03	18.4	0.97	0.11	1.37
16	5	Musa acuminata	8.0	533.60	1.0	0.15	0.0	0.00	0.1	0.18	0.0	0.00	10.8	0.57	0.00	0.75
16	6	Cajanus	3.9	0.00	1.3	0.19	0.5	0.07	0.0	0.02	0.0	0.00	1.2	0.07	0.00	0.15
17	1	Mangifera indica	72.2	0.00	1,540.3	225.89	2.1	0.30	2.0	4.83	13.8	2.03	284.4	14.93	18.03	40.12
24	1	Cocos nucifera	34.1	2,215.89	108.5	15.91	2.3	0.34	2.9	6.92	205.2	30.10	407.5	21.39	225.12	283.86
24	2	Musa x paradisiaca	12.0	148.50	2.0	0.29	0.1	0.01	0.0	0.08	1.4	0.21	4.5	0.23	1.49	2.01
24	3	Ficus carica	26.1	0.00	129.8	19.03	8.3	1.22	0.0	0.05	6.4	0.94	3.2	0.17	6.74	9.12
28	1	Musa x paradisiaca	7.6	577.87	0.5	0.08	0.0	0.00	0.0	0.07	0.0	0.00	4.3	0.23	0.00	0.30
28	2	Musa x paradisiaca	7.3	704.71	0.7	0.10	0.0	0.00	0.0	0.11	0.0	0.00	6.5	0.34	0.00	0.45
28	3	Musa x paradisiaca	8.1	419.48	1.3	0.19	0.0	0.00	0.1	0.21	0.0	0.00	12.4	0.65	0.01	0.88
28	4	Musa x paradisiaca	7.9	482.07	0.9	0.14	0.0	0.00	0.1	0.18	0.0	0.00	10.5	0.55	0.00	0.74
28	5	Musa x paradisiaca	11.0	441.60	1.7	0.26	0.1	0.01	0.1	0.26	3.1	0.45	15.3	0.80	3.68	5.21
29	1	Morinda citrifolia	13.2	0.00	24.4	3.58	7.4	1.08	0.1	0.22	0.0	0.00	12.8	0.67	0.00	1.97
29	2	Cajanus	4.3	0.00	1.7	0.25	1.1	0.16	0.1	0.13	0.0	0.00	7.4	0.39	0.00	0.68
29	3	Cajanus	7.9	0.00	7.1	1.04	4.9	0.72	0.2	0.40	0.2	0.03	23.8	1.25	0.20	2.61
29	4	Cajanus	6.9	0.00	5.0	0.74	2.0	0.30	0.1	0.24	0.0	0.00	14.0	0.74	0.00	1.27
29	5	Cajanus	6.8	0.00	5.0	0.74	3.9	0.57	0.2	0.43	0.7	0.10	25.2	1.32	0.76	3.18
29	6	Melicoccus bijugatus	1.9	0.00	0.3	0.04	0.3	0.04	0.0	0.02	2.4	0.36	1.0	0.05	2.92	3.38
29	7	Cestrum diurnum	4.9	0.00	2.5	0.37	0.9	0.13	0.0	0.08	2.5	0.37	4.8	0.25	2.98	3.82
29	8	Morinda citrifolia	3.9	0.00	1.5	0.22	0.6	0.09	0.0	0.08	1.4	0.20	4.7	0.25	1.66	2.28
29	9	Psidium guajava	18.6	0.00	60.3	8.84	12.8	1.87	1.0	2.26	3.9	0.58	133.3	7.00	4.69	16.40
32	1	Musa x paradisiaca	7.3	511.45	0.6	0.09	0.0	0.01	0.0	0.10			5.6	0.30		0.40
32	2	Musa x paradisiaca	6.4	502.94	0.7	0.10	0.0	0.01	0.0	0.11			6.5	0.34		0.46
32	3	Plumeria alba	8.8	0.00	9.1	1.34	2.6	0.39	0.0	0.01			0.4	0.02		0.41

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
32	4	Musa x paradisiaca	7.6	533.60	1.7	0.26	0.0	0.01	0.1	0.34			19.8	1.04		1.38
32	5	Musa x paradisiaca	6.5	489.33	1.3	0.19	0.0	0.00	0.1	0.27			15.9	0.83		1.11
32	6	Musa x paradisiaca	6.3	533.60	1.0	0.15	0.0	0.00	0.1	0.19			11.3	0.59		0.79
32	7	Musa x paradisiaca	7.0	577.87	0.8	0.12	0.0	0.00	0.1	0.17			9.9	0.52		0.69
32	8	Musa x paradisiaca	6.3	511.47	0.8	0.12	0.0	0.00	0.1	0.15			8.9	0.47		0.62
32	9	Musa x paradisiaca	8.4	540.86	1.8	0.26	0.0	0.01	0.1	0.32			18.7	0.98		1.30
32	10	Musa x paradisiaca	8.1	613.34	1.5	0.23	0.0	0.00	0.1	0.34			20.2	1.06		1.41
32	11	Averrhoa carambola	10.5	0.00	15.2	2.23	2.6	0.38	0.3	0.62			36.5	1.91		2.92
32	12	Dovyalis hebecarpa	4.6	0.00	2.8	0.41	1.0	0.14	0.2	0.48			28.5	1.50		2.13
32	13	Phyllanthus acidus	15.7	0.00	38.8	5.70	4.7	0.69	0.4	0.86	15.8	2.32	50.7	2.66	18.04	24.57
32	14	Artocarpus altilis	44.3	0.00	473.3	69.41	49.1	7.20	3.3	7.74	27.6	4.04	456.0	23.94	31.06	73.98
32	15	Averrhoa carambola	7.8	0.00	8.0	1.17	2.1	0.31	0.1	0.27	6.5	0.95	16.1	0.84	7.31	9.69
32	16	Persea americana	2.8	0.00	0.9	0.13	0.4	0.06	0.1	0.16			9.2	0.48		0.70
32	17	Mangifera indica	8.8	0.00	9.9	1.45	1.7	0.26	0.0	0.10	3.1	0.45	6.0	0.32	3.35	4.48
32	18	Citrus aurantifolia	3.8	0.00	1.2	0.18	0.0	0.00	0.0	0.00			0.0	0.00		0.00
32	19	Citrus aurantifolia	3.8	0.00	1.2	0.18	0.0	0.00	0.0	0.00			0.0	0.00		0.00
32	20	Tamarindus indica	22.2	0.00	93.7	13.74	9.0	1.31	0.5	1.12	27.7	4.06	66.2	3.47	29.93	39.91
32	21	Inga vera	24.7	0.00	117.4	17.21	9.8	1.44	0.8	1.86	12.6	1.85	109.6	5.75	14.12	25.02
32	22	Chrysophyllum cainito	8.7	0.00	8.8	1.30	1.5	0.22	0.1	0.13			7.6	0.40		0.75
32	23	Chrysophyllum cainito	8.5	0.00	8.7	1.28	2.0	0.29	0.2	0.37	3.4	0.50	21.6	1.13	3.79	6.08
32	24	Psidium guajava	3.8	0.00	1.5	0.22	0.6	0.09	0.1	0.13			7.8	0.41		0.63
32	25	Psidium guajava	24.6	0.00	113.8	16.69	8.2	1.20	0.4	0.98	1.6	0.24	57.9	3.04	1.91	7.36
32	26	Plumeria	2.8	0.00	0.6	0.09	0.5	0.07	0.0	0.11			6.6	0.34		0.52
32	27	Psidium guajava	3.1	0.00	1.0	0.14	0.5	0.07	0.0	0.11			6.5	0.34		0.53
32	28	Psidium guajava	2.6	0.00	0.5	0.07	0.4	0.05	0.0	0.00			0.1	0.01		0.06
32	29	Mammea americana	35.8	0.00	291.6	42.76	38.4	5.63	2.3	5.35	7.2	1.05	315.4	16.56	8.28	36.88
32	30	Chrysobalanus icaco	3.6	0.00	1.2	0.18	0.6	0.09	0.0	0.08			4.5	0.24		0.41
32	31	Chrysobalanus icaco	7.6	0.00	6.7	0.99	1.8	0.26	0.1	0.23			13.8	0.72		1.22
32	32	Chrysobalanus icaco	3.2	0.00	1.1	0.17	0.6	0.09	0.1	0.17			9.9	0.52		0.77
32	33	Mangifera indica	4.0	0.00	1.4	0.21	0.7	0.11	0.0	0.02			1.2	0.06		0.19
32	34	Mangifera indica	52.2	0.00	694.6	101.87	30.0	4.41	1.7	4.07	12.9	1.89	239.7	12.58	14.41	37.36
32	35	Syzygium cumini	3.2	0.00	1.0	0.15	0.5	0.07	0.1	0.12			7.1	0.37		0.57

Individual Tree Benefits Summary

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Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

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32	36	Chrysobalanus icaco	2.8	0.00	0.8	0.12	0.5	0.07	0.1	0.15			8.8	0.46		0.68
32	37	Ochna serrulata	5.7	0.00	3.2	0.47	1.6	0.23	0.1	0.12			7.3	0.38		0.74
32	38	Citrus	10.6	0.00	15.4	2.26	3.2	0.47	0.1	0.29			17.4	0.91		1.68
32	39	Citrus	4.7	0.00	2.1	0.31	0.0	0.00	0.0	0.00			0.1	0.00		0.01
32	40	Annona muricata	3.9	0.00	1.4	0.21	0.7	0.10	0.0	0.03			1.8	0.10		0.23
32	41	Mangifera indica	11.7	0.00	20.2	2.96	3.7	0.55	0.4	0.84			49.5	2.60		3.98
32	42	Syzygium malaccense	12.2	0.00	22.4	3.28	3.5	0.52	0.3	0.68	7.3	1.08	40.0	2.10	8.25	12.62
34	1	Moringa oleifera	28.8	0.00	157.7	23.12	20.0	2.94	0.6	1.42			83.9	4.41		8.77
34	2	Cestrum diurnum	3.6	0.00	1.2	0.17	1.2	0.18	0.0	0.04			2.6	0.14		0.36
34	3	Ficus benjamina	4.4	0.00	1.8	0.26	1.8	0.27	0.0	0.03			1.9	0.10		0.40
34	4	Ficus benjamina	6.1	0.00	3.8	0.56	2.7	0.40	0.0	0.04			2.5	0.13		0.57
34	5	Ficus benjamina	6.1	0.00	3.8	0.56	0.3	0.04	0.0	0.01			0.6	0.03		0.08
34	6	Ficus benjamina	4.2	0.00	1.6	0.23	0.2	0.03	0.0	0.02			1.4	0.07		0.12
34	7	Ficus benjamina	7.8	0.00	6.9	1.01	4.5	0.66	0.0	0.06			3.8	0.20		0.92
34	8	Duranta erecta	4.5	0.00	1.8	0.26	1.3	0.19	0.1	0.12			7.2	0.38		0.69
34	9	Duranta erecta	4.2	0.00	1.6	0.23	1.0	0.15	0.2	0.53			31.1	1.63		2.31
34	10	Duranta erecta	3.4	0.00	1.0	0.14	0.8	0.11	0.2	0.53			31.1	1.63		2.28
34	11	Duranta erecta	3.0	0.00	0.7	0.10	0.6	0.09	0.0	0.09			5.0	0.26		0.44
34	12	Dypsis lutescens	18.1	533.60	8.4	1.23	0.3	0.04	0.6	1.41	-4.7	-0.69	82.9	4.35	-3.94	1.17
34	13	Dypsis lutescens	17.3	622.14	8.4	1.23	0.2	0.03	0.5	1.16	-1.2	-0.18	68.1	3.58	-0.09	4.49
34	18	Ficus benjamina	11.7	0.00	18.1	2.65	3.0	0.44	0.1	0.14			8.4	0.44		1.02
34	19	Ficus benjamina	6.5	0.00	4.7	0.69	1.3	0.19	0.1	0.16			9.4	0.50		0.84
34	20	Pimenta racemosa	4.4	0.00	2.1	0.31	2.5	0.36	0.1	0.21			12.5	0.65		1.23
34	21	Ficus benjamina	6.6	0.00	4.9	0.72	1.6	0.23	0.1	0.18			10.6	0.56		0.96
34	22	Ficus benjamina	4.3	0.00	1.9	0.27	0.9	0.13	0.0	0.10			5.7	0.30		0.53
34	23	Ficus benjamina	8.4	0.00	8.1	1.20	2.1	0.31	0.0	0.04			2.5	0.13		0.49
34	24	Psidium guajava	7.2	0.00	6.1	0.90	1.9	0.28	0.1	0.21			12.5	0.65		1.15
34	25	Ficus benjamina	2.6	0.00	0.7	0.10	0.4	0.06	0.0	0.11			6.4	0.34		0.51
34	26	Ficus benjamina	2.9	0.00	0.7	0.10	0.5	0.07	0.0	0.01			0.7	0.04		0.12
34	27	Ficus benjamina	6.0	0.00	3.8	0.56	1.4	0.20	0.0	0.09			5.2	0.27		0.56
34	28	Salvia	4.8	0.00	2.6	0.38	1.1	0.17	0.0	0.07			4.2	0.22		0.46
34	29	Ficus benjamina	4.6	0.00	2.1	0.31	1.0	0.15	0.0	0.06			3.3	0.17		0.38

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
34	30	Ficus benjamina	3.6	0.00	1.1	0.17	0.7	0.11	0.0	0.04			2.2	0.11		0.26
34	31	Musa x paradisiaca	6.3	400.79	0.8	0.11	0.0	0.00	0.1	0.16			9.2	0.48		0.64
34	32	Ficus benjamina	4.4	0.00	1.9	0.28	0.8	0.12	0.0	0.08			4.5	0.24		0.43
34	33	Ficus benjamina	6.2	0.00	4.0	0.59	1.2	0.18	0.0	0.06			3.3	0.17		0.40
34	34	Ficus benjamina	3.1	0.00	0.9	0.13	0.5	0.07	0.0	0.09			5.4	0.28		0.45
34	35	Carica papaya	12.7	0.00	21.9	3.21	3.3	0.48	0.1	0.13			7.9	0.41		1.02
34	36	Ficus benjamina	6.5	0.00	4.7	0.69	1.3	0.19	0.1	0.12			7.1	0.37		0.68
34	37	Ficus benjamina	5.9	0.00	3.7	0.55	1.1	0.17	0.1	0.12			7.1	0.37		0.66
34	39	Annona muricata	7.6	0.00	7.8	1.14	4.3	0.63	0.2	0.55			32.6	1.71		2.90
34	40	Ficus benjamina	8.2	0.00	8.0	1.17	2.0	0.29	0.1	0.22			13.0	0.68		1.19
34	42	Ficus benjamina	5.3	0.00	2.9	0.43	1.1	0.16	0.0	0.09			5.4	0.28		0.54
34	43	Musa x paradisiaca	8.4	237.18	1.2	0.17	0.0	0.00	0.1	0.19			11.4	0.60		0.80
34	44	Ficus benjamina	14.7	0.00	31.5	4.62	4.3	0.64	0.1	0.22			13.2	0.69		1.55
34	45	Ficus benjamina	3.8	0.00	1.4	0.20	0.7	0.11	0.0	0.09			5.1	0.27		0.46
34	46	Ficus benjamina	7.7	0.00	6.8	1.00	1.8	0.26	0.1	0.15			8.9	0.47		0.88
36	1	Dracaena fragrans	5.7	460.68	0.5	0.07	0.0	0.00	0.0	0.09	0.0	0.00	5.4	0.28	0.00	0.38
36	2	Ficus benjamina	11.4	0.00	17.1	2.51	4.3	0.63	0.1	0.30	0.0	0.00	17.9	0.94	0.00	1.87
36	3	Ficus benjamina	4.5	0.00	2.2	0.32	1.0	0.14	0.1	0.20	0.0	0.00	11.5	0.60	0.00	0.94
36	4	Plumeria rubra	9.1	0.00	9.7	1.42	2.4	0.36	0.1	0.23	0.0	0.00	13.6	0.71	0.00	1.30
38	1	Annona muricata	10.7	0.00	14.7	2.15	6.0	0.88	0.0	0.08	0.0	0.00	4.7	0.25	0.00	1.20
38	2	Hibiscus rosa-sinensis	3.4	0.00	1.2	0.17	0.8	0.12	0.0	0.10	0.0	0.00	6.1	0.32	0.00	0.55
38	4	Carica papaya	7.1	0.00	5.7	0.83	1.6	0.24	0.0	0.06	1.9	0.27	3.7	0.19	2.26	3.03
38	5	Pimenta racemosa	22.1	0.00	88.8	13.03	18.5	2.71	0.5	1.09	28.5	4.18	64.3	3.37	32.97	44.33
41	12	Dypsis lutescens	15.8	259.97	5.2	0.77	0.1	0.01	0.4	0.99			58.1	3.05		4.05
41	22	Callistemon citrinus	31.8	0.00	197.1	28.91	0.0	0.00	0.0	0.00			0.0	0.00		0.00
41	25	Dypsis lutescens	4.5	688.55	2.1	0.31	0.1	0.01	0.1	0.29			16.8	0.88		1.18
41	26	Dypsis lutescens	3.8	732.82	1.3	0.19	0.1	0.01	0.0	0.12			6.8	0.36		0.48
41	27	Dypsis lutescens	4.1	634.49	0.8	0.12	0.0	0.00	0.1	0.14			8.1	0.43		0.57
41	28	Dypsis lutescens	3.8	577.87	0.8	0.12	0.0	0.00	0.1	0.12			7.3	0.38		0.51
43	1	Cordyline fruticosa	4.4	252.58	0.7	0.11	0.1	0.01	0.1	0.13			7.4	0.39		0.52
43	2	Araucaria heterophylla	10.8	0.00	11.1	1.62	1.9	0.28	0.3	0.72			42.4	2.23		3.22
43	3	Annona reticulata	13.4	0.00	25.6	3.75	4.7	0.68	0.1	0.31			18.4	0.96		1.96

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
43	4	Codiaeum variegatum	5.1	0.00	2.7	0.40	1.3	0.19	0.1	0.13			7.8	0.41		0.73
43	5	Hibiscus rosa-sinensis	8.4	0.00	8.3	1.22	2.6	0.38	0.0	0.11			6.7	0.35		0.85
43	6	Codiaeum variegatum	4.0	0.00	1.5	0.22	1.0	0.14	0.0	0.04			2.4	0.13		0.31
43	7	Hibiscus rosa-sinensis	5.7	0.00	3.4	0.50	1.2	0.18	0.0	0.11			6.5	0.34		0.63
43	8	Ochna serrulata	10.8	0.00	15.0	2.19	6.9	1.01	0.1	0.23			13.3	0.70		1.94
43	9	Callistemon citrinus	49.7	0.00	588.6	86.32	25.6	3.76	0.1	0.18			10.7	0.56		4.50
43	10	Cajanus	5.3	0.00	2.7	0.39	1.4	0.21	0.1	0.29			17.3	0.91		1.41
43	11	Musa x paradisiaca	10.0	459.92	1.8	0.26	0.0	0.01	0.1	0.29			17.1	0.90		1.19
48	1	Musa acuminata	14.3	336.03	2.5	0.36	0.1	0.01	0.2	0.45	0.8	0.11	26.7	1.40	0.92	2.91
48	2	Musa acuminata	10.7	470.64	1.0	0.14	0.0	0.00	0.1	0.19	0.0	0.00	11.5	0.60	0.00	0.80
48	3	Musa acuminata	10.0	294.30	1.0	0.15	0.0	0.00	0.1	0.21	0.0	0.00	12.5	0.66	0.00	0.87
48	4	Musa acuminata	8.8	290.11	1.1	0.16	0.0	0.00	0.1	0.23	0.0	0.00	13.3	0.70	0.00	0.93
51	1	Dracaena	4.0	533.60	1.2	0.18	0.1	0.01	0.1	0.16			9.4	0.49		0.66
51	2	Dypsis lutescens	7.5	378.66	9.5	1.39	0.3	0.04	0.6	1.53			90.0	4.73		6.30
51	4	Murraya paniculata	3.0	0.00	1.1	0.16	0.7	0.10	0.1	0.20			11.6	0.61		0.91
51	5	Malpighia emarginata	6.3	0.00	4.8	0.70	2.9	0.43	0.1	0.28	2.2	0.32	16.7	0.88	2.88	4.79
53	1	Psidium guajava	5.1	0.00	2.9	0.42	1.1	0.17	0.1	0.21			12.4	0.65		1.03
53	2	Dracaena marginata	23.8	489.33	3.0	0.43	0.1	0.01	0.2	0.49			29.1	1.53		2.03
53	3	Citrus sinensis	22.9	0.00	99.5	14.59	18.1	2.66	0.9	2.03	5.9	0.87	119.6	6.28	7.21	19.04
53	4	Citrus limon	11.6	0.00	19.7	2.88	7.5	1.10	0.3	0.62			36.6	1.92		3.64
54	1	Averrhoa carambola	20.9	0.00	77.5	11.36	9.8	1.44	0.6	1.35	7.3	1.07	79.7	4.18	7.69	15.74
54	2	Roystonea regia	28.3	1,173.08	14.2	2.09	0.5	0.08	0.8	1.88	8.0	1.18	110.6	5.81	8.39	17.33
54	3	Roystonea regia	2.5	486.12	0.7	0.10	0.0	0.00	0.1	0.14			8.0	0.42		0.56
54	4	Psidium guajava	9.8	0.00	12.5	1.84	4.1	0.60	0.0	0.06			3.3	0.17		0.83
54	5	Thespesia grandiflora	31.1	0.00	204.0	29.92	16.3	2.39	1.5	3.46	4.4	0.65	203.9	10.71	5.14	22.36
54	6	Codiaeum variegatum	2.3	0.00	0.4	0.05	0.4	0.06	0.0	0.00			0.1	0.00		0.07
54	7	Graptophyllum pictum	2.4	0.00	0.4	0.06	0.3	0.04	0.0	0.02			1.1	0.06		0.12
54	8	Hibiscus rosa-sinensis	2.8	0.00	0.7	0.10	0.5	0.07	0.0	0.04			2.4	0.13		0.24
54	10	Graptophyllum pictum	4.1	0.00	2.0	0.29	0.8	0.11	0.1	0.23			13.5	0.71		1.05
54	11	Syzygium jambos	27.3	0.00	150.6	22.08	12.9	1.89	1.2	2.78	-1.6	-0.24	164.0	8.61	1.03	14.08
54	12	Codiaeum variegatum	4.2	0.00	1.8	0.26	0.9	0.13	0.1	0.14			8.0	0.42		0.69
54	13	Calophyllum antillanum	4.6	0.00	2.0	0.29	1.0	0.15	0.0	0.02			1.5	0.08		0.25

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
54	14	Ardisia elliptica	4.4	0.00	2.1	0.31	1.0	0.14	0.1	0.17			10.0	0.53		0.84
54	15	Acalypha wilkesiana	3.7	0.00	1.2	0.18	1.0	0.15	0.0	0.05			2.7	0.14		0.33
54	17	Codiaeum variegatum	3.4	0.00	1.1	0.16	0.8	0.12	0.0	0.06			3.6	0.19		0.36
54	18	Ardisia elliptica	4.0	0.00	1.5	0.22	1.2	0.17	0.0	0.04			2.5	0.13		0.34
54	19	Codiaeum variegatum	5.1	0.00	2.7	0.40	1.4	0.20	0.1	0.14			8.0	0.42		0.76
54	20	Hibiscus rosa-sinensis	3.3	0.00	0.9	0.14	0.3	0.04	0.0	0.00			0.2	0.01		0.06
54	21	Hibiscus rosa-sinensis	2.7	0.00	0.6	0.09	0.2	0.03	0.0	0.00			0.2	0.01		0.05
54	22	Hibiscus rosa-sinensis	4.2	0.00	1.5	0.23	0.8	0.11	0.0	0.00			0.3	0.01		0.13
54	23	Plumeria	4.0	0.00	1.4	0.20	0.9	0.13	0.0	0.03			1.9	0.10		0.26
54	24	Psidium guajava	12.9	0.00	26.0	3.81	4.8	0.71	0.5	1.22			72.1	3.79		5.72
54	25	Caryota mitis	11.4	540.86	6.1	0.89	0.4	0.05	0.4	0.91			53.6	2.82		3.78
56	1	Azadirachta indica	13.8	0.00	26.8	3.93	5.1	0.75	0.1	0.12			7.3	0.39		1.26
56	3	Psidium guajava	13.8	0.00	29.2	4.28	8.6	1.26	0.4	0.86			50.9	2.67		4.79
56	4	Hibiscus rosa-sinensis	100.1	0.00	3,237.2	474.77	71.7	10.52	0.1	0.34			20.3	1.06		11.93
61	1	Annona muricata	2.9	0.00	0.7	0.10	0.4	0.06	0.0	0.03			1.8	0.09		0.18
61	2	Hibiscus rosa-sinensis	3.9	0.00	1.4	0.20	0.7	0.10	0.0	0.06			3.8	0.20		0.36
61	3	Hibiscus rosa-sinensis	7.0	0.00	5.2	0.77	1.5	0.21	0.0	0.11			6.5	0.34		0.66
61	4	Mangifera indica	66.5	0.00	1,266.0	185.67	86.5	12.69	2.4	5.76	48.7	7.14	339.4	17.82	57.36	100.77
61	5	Phyllanthus acidus	5.2	0.00	2.5	0.37	1.3	0.19	0.1	0.17			10.1	0.53		0.89
61	6	Punica granatum	5.0	0.00	2.4	0.36	0.9	0.13	0.0	0.10			5.7	0.30		0.52
61	7	Musa x paradisiaca	16.5	354.72	1.0	0.15	0.0	0.00	0.1	0.19			11.2	0.59		0.78
64	1	Ptychosperma macarthurii	5.1	1,009.01	1.8	0.26	0.1	0.01	0.1	0.16			9.5	0.50		0.67
64	2	Ptychosperma macarthurii	6.5	1,430.35	3.7	0.54	0.1	0.02	0.1	0.21			12.2	0.64		0.87
64	3	Ptychosperma macarthurii	4.6	1,079.23	1.9	0.28	0.1	0.01	0.1	0.19			11.3	0.59		0.79
64	4	Ptychosperma macarthurii	6.0	1,336.72	3.2	0.47	0.1	0.01	0.1	0.26			15.3	0.80		1.08
64	5	Schefflera arboricola	39.5	0.00	349.4	51.24	18.7	2.74	0.7	1.56	23.2	3.40	91.9	4.83	27.91	40.44
64	6	Ptychosperma macarthurii	6.9	1,032.42	4.9	0.72	0.1	0.02	0.2	0.40	15.8	2.32	23.9	1.25	18.94	22.94
64	7	Ptychosperma macarthurii	6.5	1,243.09	5.4	0.79	0.1	0.02	0.2	0.39	17.1	2.50	23.2	1.22	20.48	24.62
64	8	Ptychosperma macarthurii	6.5	1,383.53	6.7	0.98	0.2	0.03	0.2	0.44	19.6	2.87	25.9	1.36	23.55	28.24
64	9	Ptychosperma macarthurii	5.7	393.89	0.6	0.09	0.0	0.00	0.0	0.09			5.0	0.26		0.35
64	10	Ptychosperma macarthurii	16.9	1,003.65	12.5	1.83	0.5	0.08	0.4	0.93	23.3	3.42	54.6	2.87	28.14	35.43
64	11	Ptychosperma macarthurii	14.6	754.96	5.9	0.87	0.2	0.03	0.2	0.58	15.3	2.24	34.4	1.81	18.36	23.02

Individual Tree Benefits Summary

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Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
						Gross Carbon Sequestration		Avoided Runoff		Carbon Avoided		Pollution Removal		Energy Savings	Total Annual Benefits
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	($)	(kg/yr)	($/yr)	(m³/yr)	($/yr)	(kg/yr)	($/yr)	(g/yr)	($/yr)	($/yr)	($/yr)
64	12	Schefflera arboricola	27.4	0.00	144.0	21.12	12.7	1.86	0.3	0.75			44.3	2.33		4.94
64	13	Ptychosperma macarthurii	6.1	1,079.23	5.8	0.85	0.2	0.03	0.2	0.50	16.6	2.43	29.7	1.56	19.90	24.42
64	14	Ptychosperma macarthurii	5.9	1,478.40	6.0	0.88	0.2	0.02	0.2	0.47	18.4	2.70	27.4	1.44	22.11	26.74
64	15	Ptychosperma macarthurii	6.0	1,264.07	7.9	1.16	0.2	0.02	0.3	0.74	7.9	1.16	43.5	2.28	8.89	13.10
64	16	Ptychosperma macarthurii	5.3	1,452.95	6.3	0.92	0.2	0.03	0.1	0.33	7.9	1.16	19.6	1.03	8.89	11.44
64	17	Ptychosperma macarthurii	6.0	1,452.95	6.9	1.01	0.2	0.03	0.2	0.49	7.9	1.16	28.8	1.51	8.89	12.08
64	18	Ptychosperma macarthurii	5.9	1,191.42	6.7	0.98	0.2	0.02	0.2	0.44	6.2	0.91	25.9	1.36	6.71	9.44
64	19	Ptychosperma macarthurii	6.4	843.50	3.7	0.55	0.1	0.02	0.1	0.29			17.0	0.89		1.20
64	20	Ptychosperma macarthurii	5.6	1,452.95	6.4	0.93	0.2	0.03	0.1	0.35	7.9	1.16	20.7	1.09	8.89	11.52
66	1	Citrus aurantifolia	2.0	0.00	0.5	0.07	0.4	0.06	0.0	0.06			3.5	0.18		0.31
66	2	Citrus sinensis	17.1	0.00	49.1	7.21	6.6	0.96	0.5	1.28			75.5	3.96		6.21
66	3	Punica granatum	2.4	0.00	0.4	0.06	0.5	0.08	0.0	0.05			3.1	0.16		0.29
66	4	Musa x paradisiaca	13.9	533.60	5.2	0.77	0.1	0.02	0.4	0.86			50.9	2.67		3.55
66	5	Musa x paradisiaca	13.8	550.63	3.7	0.54	0.2	0.03	0.2	0.46			27.2	1.43		1.91
66	6	Musa x paradisiaca	15.0	785.73	3.4	0.50	0.1	0.01	0.2	0.41			24.0	1.26		1.68
66	7	Tabernaemontana divaricata	7.9	0.00	7.8	1.14	2.7	0.39	0.2	0.43			25.3	1.33		2.15
66	8	Tabernaemontana divaricata	10.7	0.00	15.7	2.30	4.0	0.58	0.3	0.64			37.8	1.98		3.21
67	1	Musa x paradisiaca	10.3	511.47	1.6	0.23	0.0	0.01	0.1	0.28			16.5	0.87		1.15
67	2	Musa x paradisiaca	7.6	611.08	0.9	0.13	0.0	0.00	0.1	0.12			7.0	0.37		0.49
67	3	Musa x paradisiaca	9.5	564.27	2.0	0.30	0.0	0.01	0.1	0.34			20.2	1.06		1.41
67	4	Musa x paradisiaca	11.0	533.60	2.3	0.33	0.1	0.01	0.2	0.39			23.0	1.21		1.61
67	5	Musa x paradisiaca	9.9	681.31	1.8	0.26	0.1	0.01	0.1	0.24			14.3	0.75		1.00
67	6	Musa x paradisiaca	5.4	634.49	0.6	0.08	0.0	0.00	0.0	0.08			4.8	0.25		0.34
69	1	Schinus terebinthifolius	5.7	0.00	3.2	0.46	1.1	0.16	0.0	0.03			1.5	0.08		0.27
69	2	Citrus aurantifolia	5.7	0.00	3.5	0.51	1.2	0.18	0.0	0.05			3.2	0.17		0.40
69	3	Adonidia merrilli	16.3	791.44	5.7	0.84	0.3	0.04	0.3	0.81			47.5	2.49		3.34
69	4	Adonidia merrilli	17.1	767.69	6.1	0.89	0.3	0.04	0.4	0.89			52.3	2.75		3.68
69	5	Mussaenda frondosa	8.7	0.00	9.3	1.37	1.8	0.26	0.1	0.21			12.3	0.64		1.11
69	6	Ficus lyrata	19.8	0.00	70.2	10.30	17.3	2.54	1.0	2.26	15.3	2.24	133.2	6.99	17.49	31.52
70	1	Dypsis lutescens	16.8	223.71	5.0	0.73	0.1	0.02	0.5	1.08			63.8	3.35		4.45
70	2	Annona muricata	7.9	0.00	7.7	1.12	5.0	0.73	0.1	0.25			14.8	0.78		1.76
70	8	Musa acuminata	11.2	520.90	0.6	0.09	0.0	0.00	0.0	0.08			5.0	0.26		0.35

Individual Tree Benefits Summary

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							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
70	9	Musa acuminata	10.4	611.08	0.5	0.08	0.0	0.00	0.0	0.08			4.5	0.24		0.32
70	11	Musa acuminata	10.5	517.45	0.7	0.10	0.0	0.01	0.0	0.07			3.9	0.21		0.28
70	12	Clerodendrum quadriloculare	3.1	0.00	0.8	0.12	0.0	0.00	0.0	0.01			0.5	0.03		0.04
70	13	Malpighia emarginata	7.0	0.00	5.8	0.85	1.6	0.24	0.1	0.23			13.8	0.72		1.20
70	14	Adonidia merrilli	17.4	1,173.08	5.3	0.78	0.3	0.05	0.3	0.59			34.8	1.83		2.46
70	15	Annona muricata	6.5	0.00	4.9	0.72	1.8	0.26	0.1	0.19			11.1	0.58		1.03
71	1	Phoenix dactylifera	11.5	704.71	1.7	0.25	0.1	0.02	0.1	0.25			14.7	0.77		1.04
71	2	Adonidia merrilli	13.5	1,149.46	4.9	0.72	0.2	0.02	0.1	0.23			13.7	0.72		0.97
71	3	Bougainvillea glabra	11.4	0.00	17.2	2.53	2.0	0.30	0.0	0.11			6.5	0.34		0.75
71	4	Bougainvillea glabra	8.3	0.00	8.6	1.27	2.2	0.33	0.1	0.31			18.5	0.97		1.61
71	5	Persea americana	9.0	0.00	11.2	1.64	5.0	0.73	0.2	0.53	16.3	2.39	31.5	1.65	18.52	23.83
71	6	Musa x paradisiaca	8.1	511.47	1.0	0.15	0.0	0.00	0.1	0.20			11.9	0.62		0.83
71	7	Musa x paradisiaca	11.1	704.71	2.5	0.37	0.1	0.01	0.2	0.43			25.5	1.34		1.78
71	8	Musa x paradisiaca	11.6	600.01	2.0	0.29	0.1	0.01	0.1	0.33			19.4	1.02		1.36
71	9	Psidium guajava	7.4	0.00	7.0	1.03	3.6	0.53	0.2	0.41			23.9	1.25		2.18
71	10	Citrus aurantifolia	8.1	0.00	9.3	1.36	2.5	0.37	0.2	0.58			33.9	1.78		2.72
71	12	Musa x paradisiaca	12.4	386.65	1.0	0.14	0.1	0.01	0.0	0.09			5.4	0.29		0.39
71	13	Flacourtia indica	4.8	0.00	2.1	0.31	0.7	0.10	0.0	0.02			1.0	0.05		0.17
71	14	Persea americana	11.2	0.00	17.7	2.60	3.8	0.55	0.2	0.39			22.7	1.19		2.13
71	15	Dypsis lutescens	2.8	461.21	0.8	0.12	0.0	0.00	0.1	0.13			7.4	0.39		0.52
71	16	Dypsis lutescens	3.9	489.33	1.5	0.21	0.0	0.01	0.1	0.19			11.1	0.58		0.78
71	17	Dypsis lutescens	3.2	577.87	0.9	0.14	0.0	0.00	0.1	0.15			8.9	0.47		0.62
71	18	Mangifera indica	86.2	0.00	2,308.4	338.55	123.0	18.04	2.0	4.61	47.5	6.97	271.3	14.24	53.54	97.40
71	19	Dypsis lutescens	6.9	511.47	1.0	0.15	0.0	0.00	0.1	0.16			9.7	0.51		0.68
71	20	Dracaena marginata	4.3	423.82	0.8	0.11	0.0	0.00	0.1	0.13			7.4	0.39		0.52
71	21	Pimenta racemosa	3.9	0.00	1.5	0.23	0.8	0.12	0.1	0.14			8.3	0.44		0.70
71	22	Dracaena marginata	4.4	422.93	0.9	0.13	0.0	0.00	0.1	0.15			9.0	0.47		0.63
71	23	Dracaena marginata	5.5	447.23	1.0	0.15	0.0	0.00	0.1	0.20			12.0	0.63		0.84
71	24	Dracaena marginata	3.1	540.86	0.4	0.06	0.0	0.01	0.0	0.06			3.8	0.20		0.27
73	1	Roystonea borinquena	26.9	915.38	21.4	3.14	0.3	0.04	1.1	2.61	6.7	0.99	153.6	8.07	6.92	18.62
73	2	Roystonea borinquena	22.0	1,172.86	17.1	2.51	0.3	0.04	0.6	1.52	6.9	1.01	89.5	4.70	7.11	14.38
73	3	Roystonea borinquena	24.0	985.60	24.4	3.58	0.3	0.04	1.4	3.36	6.8	1.00	198.0	10.40	7.01	21.81

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

						Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
73	4	Caesalpinia ferrea	48.4	0.00	585.4	85.85	29.1	4.27	1.5	3.48	7.1	1.04	205.3	10.78	7.60	27.17
73	5	Caesalpinia ferrea	41.8	0.00	412.4	60.48	23.7	3.48	1.5	3.47	7.7	1.13	204.4	10.73	8.34	27.15
73	6	Roystonea borinquena	26.2	1,453.75	14.2	2.08	0.4	0.05	0.4	1.03	8.9	1.30	60.5	3.18	9.45	15.00
73	7	Roystonea borinquena	24.6	577.87	12.4	1.82	0.2	0.04	0.7	1.60	7.8	1.14	94.5	4.96	8.67	16.41
74	1	Clerodendrum quadriloculare	5.6	0.00	3.5	0.52	3.4	0.50	0.1	0.19	0.0	0.01	11.4	0.60	0.04	1.33
74	2	Musa x paradisiaca	11.5	689.67	0.7	0.11	0.0	0.00	0.0	0.11	0.0	0.00	6.4	0.33	0.00	0.45
74	3	Musa x paradisiaca	12.5	562.45	1.8	0.26	0.1	0.01	0.1	0.35	0.0	0.00	20.7	1.09	0.00	1.45
74	4	Musa x paradisiaca	10.6	358.91	1.6	0.24	0.0	0.01	0.1	0.32	0.0	0.00	18.8	0.99	0.00	1.31
74	5	Musa x paradisiaca	11.0	511.56	1.8	0.26	0.0	0.00	0.2	0.37	0.0	0.00	22.0	1.15	0.00	1.53
74	6	Musa x paradisiaca	18.7	308.02	3.8	0.56	0.1	0.01	0.3	0.75			44.4	2.33		3.10
74	7	Musa x paradisiaca	26.5	206.25	6.1	0.90	0.1	0.01	0.5	1.25			73.9	3.88		5.15
74	8	Dypsis lutescens	11.7	231.71	2.4	0.35	0.0	0.01	0.2	0.51			29.8	1.56		2.07
74	9	Citrus sinensis	6.3	0.00	4.6	0.67	3.3	0.48	0.1	0.17			9.8	0.52		1.16
74	10	Citharexylum spinosum	8.2	0.00	7.8	1.14	2.8	0.41	0.0	0.12			6.9	0.36		0.89
74	11	Schinus terebinthifolius	12.1	0.00	20.7	3.03	4.8	0.70	0.2	0.36			21.3	1.12		2.18
75	1	Codiaeum variegatum	20.0	0.00	68.4	10.04	17.3	2.54	0.5	1.12			65.9	3.46		7.12
76	1	Leea guineense	7.9	0.00	7.0	1.03	0.0	0.00	0.0	0.00			0.0	0.00		0.00
76	2	Leea guineense	4.7	0.00	2.0	0.29	0.0	0.00	0.0	0.00			0.0	0.00		0.00
76	3	Leea guineense	5.1	0.00	2.5	0.36	0.0	0.00	0.0	0.00			0.0	0.00		0.00
81	1	Allamanda blanchetii	7.9	0.00	7.8	1.14	2.2	0.32	0.1	0.33			19.5	1.03		1.68
81	2	Schefflera arboricola	10.8	0.00	16.3	2.39	7.1	1.04	0.2	0.48	-5.3	-0.78	28.5	1.50	-4.51	-2.27
81	3	Dypsis lutescens	12.2	447.23	2.9	0.42	0.1	0.02	0.2	0.51			29.8	1.56		2.09
81	4	Dypsis lutescens	14.5	1,045.87	2.6	0.39	0.1	0.02	0.1	0.33			19.4	1.02		1.36
81	5	Dypsis lutescens	8.5	486.12	7.3	1.07	0.2	0.03	0.4	0.93			54.8	2.88		3.84
82	1	Citrus limon	6.4	0.00	5.5	0.80	1.9	0.27	0.1	0.33			19.4	1.02		1.62
82	2	Roystonea regia	47.9	938.79	40.4	5.93	1.0	0.15	2.2	5.24	38.8	5.69	308.7	16.21	39.66	66.95
82	3	Schefflera	8.0	0.00	9.0	1.32	2.5	0.36	0.4	0.93			54.6	2.87		4.16
82	4	Lagerstroemia indica	9.2	0.00	10.6	1.56	0.7	0.10	0.1	0.23			13.6	0.71		1.04
82	5	Codiaeum variegatum	4.4	0.00	1.8	0.27	0.7	0.10	0.0	0.06			3.3	0.17		0.33
85	1	Citrus aurantifolia	5.0	0.00	4.6	0.67	1.4	0.21	0.3	0.69			40.9	2.15		3.05
85	2	Musa x paradisiaca	8.7	704.71	0.9	0.13	0.0	0.01	0.0	0.11			6.5	0.34		0.46
85	3	Musa x paradisiaca	7.9	564.27	0.8	0.12	0.0	0.00	0.1	0.13			7.8	0.41		0.55

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
85	4	Musa x paradisiaca	4.6	356.52	0.5	0.08	0.0	0.00	0.0	0.11			6.4	0.34		0.45
85	5	Musa x paradisiaca	11.5	511.47	2.0	0.30	0.1	0.01	0.1	0.31			18.1	0.95		1.27
85	6	Musa x paradisiaca	8.2	688.55	1.2	0.17	0.0	0.00	0.1	0.19			11.1	0.58		0.78
85	7	Musa x paradisiaca	10.5	845.16	1.7	0.24	0.1	0.01	0.1	0.21			12.3	0.64		0.86
85	8	Musa x paradisiaca	8.8	378.66	0.8	0.12	0.0	0.00	0.1	0.13			7.6	0.40		0.53
85	9	Musa x paradisiaca	4.3	634.49	0.4	0.06	0.0	0.00	0.0	0.03			2.0	0.11		0.14
85	10	Musa x paradisiaca	7.0	422.93	1.0	0.15	0.0	0.00	0.1	0.19			11.0	0.58		0.77
85	11	Clerodendrum quadriloculare	2.7	0.00	0.8	0.11	0.5	0.07	0.1	0.13			7.4	0.39		0.59
85	12	Clerodendrum quadriloculare	3.0	0.00	0.8	0.12	0.6	0.08	0.0	0.06			3.4	0.18		0.32
87	1	Ptychosperma macarthurii	11.0	1,198.52	9.8	1.43	0.3	0.04	0.3	0.75	12.4	1.82	44.3	2.32	14.21	19.15
87	2	Ptychosperma macarthurii	6.5	915.38	2.2	0.32	0.1	0.01	0.1	0.27			15.9	0.83		1.12
87	3	Ptychosperma macarthurii	13.9	918.65	14.2	2.09	0.3	0.05	0.6	1.52	12.3	1.80	89.8	4.71	14.20	22.29
87	4	Ptychosperma macarthurii	14.8	1,071.31	16.9	2.47	0.4	0.06	0.7	1.54	-3.8	-0.55	90.8	4.77	-1.53	4.28
87	5	Ptychosperma macarthurii	13.0	1,055.83	14.6	2.14	0.3	0.05	0.6	1.38	-6.0	-0.87	81.6	4.28	-3.80	1.04
87	6	Ptychosperma macarthurii	11.8	1,172.86	26.4	3.87	1.5	0.22	0.6	1.33	14.1	2.07	78.6	4.13	18.27	26.02
87	7	Ptychosperma macarthurii	11.8	1,045.87	5.8	0.86	0.3	0.05	0.3	0.71	-6.3	-0.93	42.1	2.21	-5.35	-3.31
87	8	Ptychosperma macarthurii	10.4	1,300.30	8.0	1.17	0.2	0.04	0.3	0.71	-3.8	-0.56	41.5	2.18	-2.10	0.27
87	9	Ptychosperma macarthurii	8.1	1,020.42	6.0	0.88	0.3	0.05	0.3	0.67	-1.6	-0.23	39.5	2.07	-0.25	2.31
88	1	Myrciaria floribunda	21.1	0.00	78.3	11.48	16.2	2.37	0.5	1.11			65.2	3.42		6.90
88	2	Citrus x jambhiri	16.0	0.00	40.1	5.88	3.6	0.52	0.1	0.19			11.0	0.57		1.28
88	3	Annona muricata	12.7	0.00	24.3	3.56	7.7	1.13	0.4	0.90			52.9	2.78		4.80
88	4	Roystonea borinquena	34.7	1,927.64	64.5	9.46	1.0	0.15	1.7	4.00	81.0	11.87	235.8	12.38	86.92	115.32
88	5	Roystonea borinquena	30.8	2,060.94	63.8	9.35	0.9	0.13	1.9	4.52	64.3	9.43	266.2	13.97	69.41	97.47
89	1	Livistona	26.1	435.24	7.2	1.06	0.1	0.02	0.5	1.28			75.7	3.97		5.28
89	2	Ptychosperma	5.2	1,086.99	3.2	0.47	0.2	0.04	0.1	0.16			9.3	0.49		0.68
89	5	Coccoloba uvifera	13.8	0.00	27.4	4.02	4.8	0.71	0.1	0.30			17.4	0.91		1.92
89	6	Coccoloba uvifera	8.9	0.00	9.5	1.39	2.0	0.30	0.1	0.24			14.1	0.74		1.28
89	7	Ptychosperma macarthurii	8.9	799.23	1.3	0.20	0.1	0.01	0.1	0.17			10.2	0.54		0.72
89	8	Ptychosperma macarthurii	12.7	754.96	3.5	0.51	0.3	0.04	0.2	0.39			22.9	1.20		1.63
91	1	Malpighia emarginata	27.9	0.00	154.4	22.64	23.8	3.50	0.9	2.01	12.8	1.88	118.5	6.22	15.15	28.77
91	2	Codiaeum variegatum	4.4	0.00	1.9	0.28	0.7	0.10	0.0	0.11			6.3	0.33		0.54
91	3	Annona muricata	22.3	0.00	91.3	13.39	9.7	1.43	0.5	1.11	13.8	2.03	65.2	3.42	16.59	24.58

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
91	4	Ptychosperma macarthurii	16.3	938.79	12.1	1.78	0.3	0.04	0.6	1.34	13.8	2.03	78.6	4.13	16.49	24.02
91	5	Musa x paradisiaca	6.4	732.82	1.2	0.18	0.0	0.01	0.1	0.14			8.4	0.44		0.59
91	6	Musa x paradisiaca	9.4	523.80	0.5	0.07	0.0	0.00	0.0	0.10			6.1	0.32		0.43
91	7	Musa x paradisiaca	10.9	544.66	2.0	0.30	0.0	0.00	0.2	0.47			27.6	1.45		1.92
91	8	Psidium guajava	13.9	0.00	32.7	4.79	4.8	0.71	0.9	2.06	8.7	1.28	121.2	6.36	9.16	19.57
92	1	Persea americana	14.3	0.00	35.1	5.15	5.3	0.78	1.0	2.24	10.5	1.54	132.2	6.94	12.42	23.92
92	2	Duranta	3.0	0.00	0.7	0.10	0.5	0.07	0.0	0.04			2.3	0.12		0.23
92	3	Citrus sinensis	5.8	0.00	5.0	0.73	2.8	0.41	0.2	0.52			30.5	1.60		2.53
92	4	Duranta	2.3	0.00	0.4	0.06	0.4	0.06	0.0	0.03			1.9	0.10		0.19
92	5	Duranta	2.9	0.00	0.6	0.09	0.5	0.07	0.0	0.03			2.0	0.11		0.21
92	6	Duranta	1.3	0.00	0.1	0.01	0.2	0.03	0.0	0.03			1.5	0.08		0.14
92	7	Duranta	1.6	0.00	0.2	0.02	0.2	0.04	0.0	0.02			1.1	0.06		0.12
92	8	Duranta	2.9	0.00	0.6	0.09	0.5	0.07	0.0	0.04			2.3	0.12		0.23
92	9	Duranta	2.7	0.00	0.5	0.08	0.4	0.06	0.0	0.04			2.3	0.12		0.22
92	10	Duranta	1.6	0.00	0.2	0.02	0.2	0.04	0.0	0.02			0.9	0.05		0.10
92	11	Duranta	2.6	0.00	0.5	0.07	0.4	0.06	0.0	0.04			2.2	0.11		0.21
92	12	Duranta	2.8	0.00	0.6	0.09	0.5	0.07	0.0	0.04			2.6	0.14		0.25
92	13	Psidium guajava	18.4	0.00	58.5	8.58	14.3	2.10	0.7	1.74			102.7	5.39		9.23
92	14	Duranta	3.2	0.00	0.8	0.12	0.6	0.08	0.0	0.07			4.0	0.21		0.36
92	15	Duranta	2.0	0.00	0.3	0.04	0.4	0.05	0.0	0.05			3.0	0.16		0.26
92	16	Duranta	3.2	0.00	0.8	0.12	0.6	0.09	0.0	0.04			2.6	0.14		0.28
92	17	Duranta	2.8	0.00	0.6	0.08	0.5	0.08	0.0	0.03			1.6	0.09		0.19
92	18	Duranta	3.5	0.00	1.0	0.15	0.7	0.10	0.0	0.04			2.6	0.13		0.28
92	19	Duranta	5.8	0.00	3.4	0.49	1.4	0.20	0.0	0.07			4.3	0.23		0.50
92	20	Citrus reticulata	9.3	0.00	11.5	1.68	2.8	0.42	0.1	0.33			19.3	1.01		1.76
92	21	Duranta	6.7	0.00	4.6	0.67	1.6	0.23	0.0	0.05			3.0	0.16		0.44
92	22	Duranta	2.8	0.00	0.6	0.09	0.5	0.07	0.0	0.02			1.1	0.06		0.15
92	23	Duranta	5.0	0.00	2.3	0.34	1.0	0.15	0.0	0.07			4.0	0.21		0.43
92	24	Citrus sinensis	7.7	0.00	6.7	0.98	1.3	0.19	0.0	0.06			3.3	0.17		0.41
92	25	Duranta	5.1	0.00	2.4	0.36	1.0	0.15	0.0	0.05			2.7	0.14		0.34
92	26	Duranta	2.5	0.00	0.5	0.07	0.4	0.06	0.0	0.06			3.5	0.18		0.30
92	27	Duranta	2.5	0.00	0.5	0.07	0.4	0.06	0.0	0.03			1.8	0.09		0.18

Individual Tree Benefits Summary

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Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
92	28	Duranta	1.1	0.00	0.1	0.01	0.2	0.03	0.0	0.08			4.6	0.24		0.34
92	29	Mangifera indica	22.5	0.00	93.4	13.71	9.8	1.43	0.7	1.72	13.5	1.98	101.6	5.33	14.91	25.39
92	30	Artocarpus altilis	13.0	0.00	24.8	3.64	4.4	0.64	0.2	0.54	10.7	1.56	31.7	1.66	11.84	16.25
93	2	Codiaeum variegatum	3.0	0.00	0.9	0.13	0.7	0.10	0.0	0.11			6.7	0.35		0.57
93	3	Musa acuminata	6.2	459.92	1.6	0.24	0.0	0.01	0.1	0.30			17.6	0.93		1.23
93	4	Musa acuminata	6.1	511.45	0.6	0.09	0.0	0.00	0.0	0.09			5.4	0.28		0.38
93	6	Musa acuminata	7.1	459.92	0.7	0.11	0.0	0.00	0.1	0.14			8.1	0.43		0.57
93	9	Musa acuminata	7.8	459.92	1.1	0.16	0.0	0.01	0.1	0.16			9.2	0.48		0.64
93	10	Musa acuminata	7.8	628.12	1.1	0.16	0.0	0.01	0.1	0.13			7.9	0.41		0.55
93	11	Musa acuminata	11.5	496.17	2.5	0.37	0.1	0.01	0.1	0.34			20.1	1.05		1.40
93	12	Musa acuminata	12.2	551.52	2.0	0.30	0.1	0.02	0.1	0.34			19.7	1.04		1.39
93	13	Musa acuminata	9.4	478.24	0.8	0.12	0.0	0.00	0.1	0.12			7.2	0.38		0.50
93	14	Musa acuminata	12.4	586.39	1.9	0.28	0.1	0.01	0.2	0.36			21.3	1.12		1.49
93	15	Musa acuminata	10.3	523.80	1.4	0.20	0.0	0.01	0.1	0.26			15.3	0.80		1.07
93	16	Hibiscus rosa-sinensis	4.8	0.00	2.7	0.39	2.2	0.32	0.1	0.26			15.5	0.82		1.40
93	18	Hibiscus rosa-sinensis	7.8	0.00	7.7	1.13	2.1	0.31	0.2	0.41			24.3	1.28		2.00
93	19	Citrus sinensis	9.5	0.00	11.3	1.65	5.1	0.75	0.0	0.11			6.5	0.34		1.20
95	1	Citrus aurantifolia	5.8	0.00	5.2	0.76	1.5	0.23	0.2	0.54			31.8	1.67		2.44
95	2	Cupressus sempervirens	8.5	0.00	6.1	0.90	2.7	0.40	0.1	0.19			11.0	0.58		1.16
95	3	Cupressus sempervirens	7.3	0.00	4.4	0.64	1.2	0.18	0.0	0.11			6.5	0.34		0.64
95	4	Cupressus sempervirens	7.9	0.00	5.2	0.77	1.4	0.20	0.1	0.14			8.3	0.44		0.78
95	5	Cupressus sempervirens	10.6	0.00	9.7	1.43	3.7	0.54	0.1	0.25			14.5	0.76		1.55
95	6	Euphorbia	10.3	0.00	14.1	2.07	3.4	0.50	0.4	0.94	21.6	3.17	55.1	2.89	24.38	31.87
95	8	Cajanus	4.2	0.00	1.6	0.23	0.8	0.11	0.0	0.12			6.9	0.36		0.59
95	9	Cajanus	4.9	0.00	2.2	0.33	1.2	0.18	0.2	0.36			20.9	1.10		1.63
95	10	Citrus aurantifolia	4.9	0.00	5.1	0.75	1.3	0.20	0.4	0.88			51.7	2.72		3.79
95	11	Schinus terebinthifolius	4.4	0.00	1.9	0.28	1.1	0.16	0.1	0.13			7.4	0.39		0.68
96	1	Morinda citrifolia	7.9	0.00	7.9	1.17	2.3	0.34	0.2	0.50			29.3	1.54		2.37
96	2	Breynia disticha	2.7	0.00	0.6	0.09	0.5	0.07	0.0	0.06			3.8	0.20		0.33
96	3	Citrus sinensis	21.1	0.00	78.8	11.56	6.9	1.01	0.4	0.95			56.2	2.95		4.92
96	4	Annona muricata	5.8	0.00	3.8	0.55	2.8	0.41	0.1	0.20			12.0	0.63		1.24
96	5	Musa x paradisiaca	8.0	531.04	1.4	0.21	0.0	0.01	0.1	0.23			13.5	0.71		0.94

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m^3/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
96	6	Musa x paradisiaca	3.5	312.18	0.2	0.02	0.0	0.00	0.0	0.01			0.8	0.04		0.06
96	7	Musa x paradisiaca	4.9	315.17	0.8	0.12	0.0	0.00	0.1	0.14			8.1	0.43		0.57
96	8	Musa x paradisiaca	5.7	496.56	1.1	0.17	0.0	0.00	0.1	0.16			9.3	0.49		0.65
96	9	Musa x paradisiaca	7.0	628.12	1.7	0.25	0.0	0.01	0.1	0.28			16.5	0.87		1.15
96	10	Musa x paradisiaca	6.5	511.45	0.9	0.13	0.0	0.00	0.1	0.12			7.0	0.37		0.49
99	1	Psidium guajava	39.0	0.00	327.9	48.09	15.2	2.23	0.1	0.20			11.8	0.62		3.05
99	2	Murraya paniculata	23.5	0.00	95.9	14.06	7.8	1.15	0.1	0.26			15.4	0.81		2.22
99	8	Musa acuminata	38.0	377.01	1.3	0.19	0.0	0.00	0.1	0.28			16.6	0.87		1.15
99	9	Musa acuminata	39.0	334.38	1.4	0.20	0.0	0.00	0.1	0.32			18.7	0.98		1.30
99	10	Musa acuminata	35.0	398.62	1.3	0.19	0.0	0.00	0.1	0.29			17.0	0.89		1.19
99	11	Musa acuminata	61.0	461.21	2.3	0.34	0.0	0.00	0.2	0.48			28.2	1.48		1.96
99	12	Musa acuminata	42.0	440.35	2.1	0.30	0.0	0.01	0.2	0.39			22.8	1.20		1.59
99	13	Citrus aurantifolia	37.9	0.00	305.7	44.83	13.7	2.01	0.1	0.19			10.9	0.57		2.76
99	14	Dracaena reflexa	37.1	0.00	290.6	42.62	15.9	2.33	0.1	0.12			7.1	0.37		2.83
99	15	Caesalpinia ferrea	133.0	0.00	5,284.7	775.06	57.5	8.43	3.0	7.04	20.0	2.93	414.8	21.78	23.19	63.37
99	16	Ardisia solanacea	5.7	0.00	3.3	0.48	1.1	0.17	0.0	0.04			2.3	0.12		0.33
99	17	Annona muricata	15.0	0.00	33.1	4.85	3.5	0.51	0.0	0.11			6.7	0.35		0.98
99	18	Cestrum diurnum	31.5	0.00	197.6	28.98	13.5	1.98	0.1	0.29			17.4	0.91		3.19
99	19	Averrhoa carambola	28.5	0.00	153.6	22.53	9.7	1.43	0.1	0.27			15.7	0.82		2.52
99	20	Cestrum diurnum	31.8	0.00	200.6	29.42	14.5	2.13	0.1	0.27			16.0	0.84		3.24
99	21	Theobroma cacao	50.8	0.00	629.7	92.35	24.9	3.65	0.3	0.63			36.9	1.94		6.22
99	22	Cestrum diurnum	14.0	0.00	27.5	4.03	4.0	0.59	0.0	0.08			4.5	0.24		0.91
99	23	Murraya paniculata	4.5	0.00	1.9	0.28	0.8	0.12	0.0	0.06			3.8	0.20		0.38
99	25	Polyscias guilfoylei	8.2	0.00	7.9	1.16	2.5	0.37	0.1	0.13			7.8	0.41		0.92
100	1	Musa x paradisiaca	4.8	482.07	0.1	0.02	0.0	0.00	0.0	0.01			0.6	0.03		0.05
100	2	Musa x paradisiaca	7.7	461.21	1.7	0.25	0.0	0.00	0.1	0.34			20.2	1.06		1.41
100	3	Musa x paradisiaca	6.9	440.35	1.3	0.20	0.0	0.00	0.1	0.25			15.0	0.79		1.04
100	4	Musa x paradisiaca	5.9	467.20	1.2	0.18	0.0	0.00	0.1	0.24			14.4	0.76		1.01
100	5	Musa x paradisiaca	8.3	433.09	1.8	0.26	0.0	0.01	0.1	0.34			20.0	1.05		1.40
100	6	Musa x paradisiaca	8.0	502.94	0.6	0.09	0.0	0.01	0.0	0.06			3.6	0.19		0.26
100	8	Musa x paradisiaca	8.7	615.50	1.5	0.22	0.0	0.00	0.1	0.27			15.9	0.83		1.11
100	9	Musa x paradisiaca	6.1	440.35	0.6	0.09	0.0	0.00	0.0	0.12			6.9	0.36		0.48

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 6/29/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
100	10	Musa x paradisiaca	6.1	629.00	0.7	0.11	0.0	0.00	0.0	0.09			5.2	0.27		0.37
100	11	Musa x paradisiaca	6.6	467.20	1.5	0.23	0.0	0.00	0.1	0.29			17.3	0.91		1.21
100	12	Musa x paradisiaca	8.1	452.68	1.1	0.16	0.0	0.01	0.1	0.13			7.8	0.41		0.55
100	13	Musa x paradisiaca	6.2	648.98	0.4	0.05	0.0	0.00	0.0	0.04			2.6	0.13		0.18
100	14	Musa x paradisiaca	6.6	419.48	0.2	0.03	0.0	0.00	0.0	0.02			0.9	0.05		0.07
100	15	Citrus sinensis	18.2	0.00	56.9	8.34	12.5	1.83	0.4	0.99	9.3	1.36	58.2	3.06	10.65	17.89
103	1	Citrus aurantifolia	12.6	0.00	26.1	3.83	8.1	1.18	0.5	1.25			73.5	3.86		6.29
103	2	Citrus aurantifolia	6.1	0.00	4.7	0.69	1.7	0.24	0.1	0.26			15.2	0.80		1.30
103	3	Leea guineense	4.4	0.00	1.9	0.28	1.1	0.16	0.0	0.10			5.7	0.30		0.55
103	4	Tabernaemontana divaricata	4.5	0.00	1.9	0.27	0.8	0.12	0.0	0.02			1.1	0.06		0.20
103	5	Codiaeum variegatum	5.5	0.00	3.2	0.46	1.7	0.24	0.0	0.11			6.5	0.34		0.70
103	6	Schefflera arboricola	10.6	0.00	14.2	2.09	3.9	0.57	0.0	0.09			5.0	0.26		0.92
109	1	Dypsis lutescens	5.3	282.58	2.6	0.39	0.0	0.01	0.2	0.57			33.9	1.78		2.36
109	2	Dypsis lutescens	13.3	231.69	5.7	0.83	0.1	0.01	0.5	1.17			68.8	3.61		4.79
109	3	Carica papaya	7.7	0.00	6.9	1.01	4.5	0.66	0.1	0.14			8.4	0.44		1.24
109	4	Dypsis lutescens	16.0	308.02	9.3	1.36	0.1	0.01	0.9	2.03			119.7	6.28		8.33
110	1	Ptychosperma	15.9	223.71	9.4	1.38	0.3	0.05	0.6	1.42	14.0	2.05	83.8	4.40	14.39	22.31
110	2	Malpighia emarginata	30.7	0.00	189.6	27.81	25.2	3.70	0.9	2.09			123.3	6.47		12.26
110	3	Dracaena marginata	11.1	358.91	1.2	0.18	0.0	0.01	0.1	0.21			12.6	0.66		0.88
110	4	Dracaena marginata	10.4	333.46	1.1	0.16	0.1	0.01	0.1	0.17			10.2	0.54		0.72
110	5	Dracaena marginata	6.7	435.24	0.8	0.12	0.1	0.01	0.0	0.11			6.2	0.33		0.45
110	6	Tabernaemontana divaricata	7.6	0.00	6.4	0.93	2.0	0.29	0.0	0.06			3.5	0.18		0.53
		Total		**126,973**	**30,119**	**4,417**	**1,696**	**249**	**112**	**265**	**1,457**	**214**	**15,628**	**820**	**1,649**	**3,197**

Carbon storage and gross carbon sequestration value is calculated based on the price of $0.14666 per kilogram.
Avoided runoff value is calculated by the price $2.361/m³. The user-designated weather station reported 140.2 centimeters of total annual precipitation.
Energy saving value is calculated based on the prices of $280.00 per MWH and $19.24 per MBTU. Trees less than 10ft/3m tall or further than 60ft/18m away from buildings do not provide energy benefits to nearby buildings.
Pollution removal value is calculated based on the prices of $1.61 per kilogram (CO), $11.55 per kilogram (O3), $1.72 per kilogram (NO2), $0.63 per kilogram (SO2), $400.91 per kilogram (PM2.5).
Structural value is the compensatory value calculated based on the local cost of having to replace a tree with a similar tree.
A value of zero may indicate that ancillary data (pollution, weather, energy, etc.) may not available for this location or that the reported amounts are too small to be shown.

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

						Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
1	1	Mangifera indica	78.4	0.00	1,852.7	271.71	102.2	14.99	2.6	6.21	46.7	6.85	403.7	16.46	48.69	93.19
1	3	Pterocarpus indicus	65.0	0.00	1,127.3	165.33	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.00	0.00
1	6	Pterocarpus indicus	47.1	0.00	557.2	81.72	0.6	0.09	0.0	0.11	63.2	9.27	7.2	0.30	63.39	73.16
4	1	Musa x paradisiaca	14.9	179.44	2.3	0.34	0.0	0.01	0.2	0.51	0.6	0.09	33.2	1.35	0.69	2.65
4	2	Musa x paradisiaca	6.7	197.99	0.9	0.14	0.0	0.00	0.1	0.25	0.0	0.00	16.5	0.67	0.00	0.93
4	3	Musa x paradisiaca	12.7	221.78	2.3	0.34	0.1	0.01	0.2	0.50	0.8	0.11	32.8	1.34	0.86	2.83
4	4	Musa x paradisiaca	5.5	117.56	0.8	0.12	0.0	0.00	0.1	0.22	0.0	0.00	14.4	0.59	0.00	0.81
4	7	Persea americana	19.5	0.00	65.4	9.59	2.7	0.40	0.3	0.66	13.8	2.02	42.9	1.75	14.24	19.07
5	1	Artocarpus altilis	80.7	0.00	2,044.9	299.90	18.8	2.75	0.6	1.41	89.7	13.16	91.7	3.74	92.34	113.41
6	1	Musa x paradisiaca	4.0	86.97	1.0	0.15	0.0	0.00	0.0	0.05	1.9	0.27	3.2	0.13	2.27	2.73
6	2	Musa x paradisiaca	12.0	364.10	4.5	0.66	0.1	0.01	0.4	0.92	6.9	1.01	60.1	2.45	8.46	12.85
6	3	Musa x paradisiaca	13.0	0.00	1.7	0.25	0.0	0.00	0.0	0.00	4.5	0.66	0.0	0.00	5.51	6.17
6	4	Musa x paradisiaca	10.5	48.28	3.6	0.53	0.0	0.00	0.3	0.64	6.1	0.90	41.6	1.70	7.47	10.71
6	5	Musa x paradisiaca	10.0	44.71	2.9	0.43	0.0	0.00	0.2	0.41	5.3	0.78	26.7	1.09	6.49	8.77
6	8	Musa x paradisiaca	8.0	42.93	3.3	0.49	0.0	0.00	0.2	0.55	5.7	0.84	35.8	1.46	6.98	9.83
6	10	Musa x paradisiaca	12.0	55.40	3.0	0.44	0.0	0.00	0.2	0.38	6.1	0.89	24.6	1.00	7.44	9.72
6	11	Musa x paradisiaca	17.0	791.44	4.2	0.62	0.1	0.02	0.3	0.73	7.5	1.10	47.6	1.94	9.13	12.92
6	13	Musa x paradisiaca	11.0	791.44	3.0	0.44	0.1	0.01	0.2	0.38	6.1	0.89	24.6	1.00	7.44	9.73
8	1	Brunfelsia pauciflora	6.2	0.00	3.9	0.57	1.6	0.24	0.0	0.09	0.0	0.00	6.1	0.25	0.00	0.58
10	1	Adonidia merrilli	11.6	657.90	2.3	0.34	0.2	0.03	0.2	0.35	5.2	0.77	23.0	0.94	6.40	8.49
10	2	Pithecellobium dulce	9.3	0.00	10.5	1.54	5.7	0.84	0.1	0.21	0.1	0.02	13.5	0.55	0.24	1.85
10	3	Adonidia merrilli	39.0	143.82	1.8	0.27	0.0	0.00	0.0	0.02	4.4	0.65	1.3	0.05	5.42	6.14
13	1	Hibiscus rosa-sinensis	4.8	0.00	2.1	0.31	0.0	0.00	0.0	0.00	0.1	0.01	0.0	0.00	0.07	0.08
13	2	Hibiscus rosa-sinensis	4.5	0.00	1.8	0.27	0.0	0.00	0.0	0.00	0.1	0.01	0.0	0.00	0.07	0.08
13	3	Hibiscus rosa-sinensis	5.3	0.00	2.8	0.41	0.0	0.00	0.0	0.00	0.0	0.01	0.0	0.00	0.04	0.04
13	4	Hibiscus rosa-sinensis	6.6	0.00	4.7	0.69	0.3	0.04	0.0	0.08	0.0	0.01	5.3	0.22	0.05	0.39
13	5	Hibiscus rosa-sinensis	9.2	0.00	11.0	1.62	2.8	0.41	0.2	0.49	0.1	0.01	31.7	1.29	0.07	2.28
13	6	Hibiscus rosa-sinensis	6.9	0.00	5.2	0.76	1.0	0.15	0.0	0.11	0.1	0.01	6.9	0.28	0.07	0.61
13	7	Hibiscus rosa-sinensis	4.3	0.00	1.9	0.28	0.3	0.05	0.1	0.15	0.2	0.03	10.0	0.41	0.25	0.89
13	8	Dracaena fragrans	4.2	173.40	0.5	0.08	0.0	0.00	0.1	0.12	0.0	0.00	8.1	0.33	0.00	0.45
13	9	Hibiscus rosa-sinensis	6.3	0.00	4.1	0.60	0.8	0.11	0.0	0.03	0.2	0.03	1.9	0.08	0.24	0.48
13	10	Hibiscus rosa-sinensis	6.6	0.00	4.8	0.70	0.4	0.06	0.0	0.08	0.2	0.03	5.2	0.21	0.21	0.59

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

						Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
13	11	Hibiscus rosa-sinensis	4.3	0.00	1.8	0.26	0.5	0.07	0.0	0.04	0.2	0.03	2.6	0.10	0.23	0.47
13	12	Hibiscus rosa-sinensis	6.3	0.00	4.2	0.61	0.8	0.11	0.0	0.06	0.2	0.03	4.2	0.17	0.24	0.61
13	13	Hibiscus rosa-sinensis	4.6	0.00	2.0	0.30	0.5	0.07	0.0	0.05			3.0	0.12		0.24
13	14	Hibiscus rosa-sinensis	6.6	0.00	5.4	0.79	0.7	0.10	0.2	0.47			30.4	1.24		1.80
13	15	Hibiscus rosa-sinensis	7.0	0.00	5.8	0.86	0.9	0.13	0.1	0.35			22.5	0.92		1.39
13	16	Hibiscus rosa-sinensis	3.6	0.00	1.3	0.19	0.3	0.05	0.1	0.12			8.0	0.33		0.50
13	17	Dypsis lutescens	41.1	203.46	13.7	2.01	0.2	0.03	1.5	3.60			234.4	9.56		13.19
13	18	Codiaeum variegatum	9.9	0.00	12.1	1.78	2.2	0.33	0.0	0.09			6.1	0.25		0.67
13	19	Hibiscus rosa-sinensis	3.7	0.00	1.3	0.19	0.5	0.07	0.0	0.07			4.2	0.17		0.30
13	20	Hibiscus rosa-sinensis	7.9	0.00	7.5	1.11	0.9	0.14	0.1	0.32			20.7	0.84		1.30
13	21	Codiaeum variegatum	5.4	0.00	3.1	0.45	0.6	0.08	0.1	0.18	0.0	0.00	11.7	0.48	0.00	0.74
13	22	Hibiscus rosa-sinensis	4.2	0.00	1.7	0.25	0.4	0.06	0.0	0.09	0.1	0.01	5.8	0.24	0.11	0.50
13	23	Hibiscus rosa-sinensis	4.3	0.00	1.9	0.27	0.6	0.09	0.1	0.14	0.1	0.02	9.2	0.38	0.11	0.73
13	24	Hibiscus rosa-sinensis	4.8	0.00	2.2	0.33	0.3	0.04	0.0	0.03	0.1	0.01	1.7	0.07	0.09	0.24
13	25	Codiaeum variegatum	5.1	0.00	2.5	0.37	0.7	0.11	0.0	0.07	0.0	0.00	4.3	0.18	0.00	0.35
13	26	Hibiscus rosa-sinensis	4.8	0.00	2.4	0.35	0.6	0.08	0.1	0.16	0.1	0.02	10.1	0.41	0.11	0.78
13	27	Hibiscus rosa-sinensis	5.8	0.00	3.7	0.54	1.0	0.15	0.1	0.19	0.1	0.02	12.5	0.51	0.12	0.99
13	28	Hibiscus rosa-sinensis	4.2	0.00	1.8	0.27	0.7	0.11	0.1	0.19	0.1	0.02	12.2	0.50	0.13	0.94
13	29	Hibiscus rosa-sinensis	5.3	0.00	2.9	0.43	0.7	0.10	0.0	0.08	0.1	0.01	5.2	0.21	0.10	0.50
13	30	Hibiscus rosa-sinensis	4.4	0.00	1.8	0.26	0.0	0.00	0.0	0.00	0.1	0.01	0.0	0.00	0.07	0.08
13	32	Hibiscus rosa-sinensis	5.0	0.00	2.4	0.35	0.0	0.00	0.0	0.00	0.1	0.01	0.0	0.00	0.07	0.08
13	33	Dracaena	8.2	331.69	1.3	0.19	0.0	0.00	0.1	0.26	0.1	0.01	16.7	0.68	0.07	1.02
14	6	Cestrum diurnum	16.4	0.00	42.8	6.28	1.5	0.23	0.2	0.56	-4.0	-0.59	36.7	1.50	-3.40	-1.70
15	1	Tecoma stans	8.3	0.00	7.9	1.16	1.8	0.27	0.1	0.21	0.0	0.01	13.9	0.57	0.05	1.11
16	1	Musa acuminata	6.5	168.69	0.5	0.07	0.0	0.00	0.0	0.10	0.0	0.00	6.7	0.28	0.00	0.38
16	2	Musa acuminata	6.0	295.95	0.5	0.08	0.0	0.00	0.0	0.11	0.0	0.00	7.3	0.30	0.00	0.41
16	3	Musa acuminata	6.2	301.40	0.1	0.02	0.0	0.00	0.0	0.02	0.0	0.00	1.5	0.06	0.00	0.08
16	4	Musa acuminata	14.0	17.36	1.0	0.15	0.0	0.00	0.0	0.08	-0.2	-0.02	5.4	0.22	0.07	0.35
16	5	Musa acuminata	8.0	165.60	0.5	0.07	0.0	0.00	0.0	0.05	0.0	0.00	3.4	0.14	0.00	0.19
17	1	Mangifera indica	72.2	0.00	1,531.8	224.65	7.3	1.07	0.0	0.00	27.9	4.10	0.0	0.00	30.73	35.89
24	1	Cocos nucifera	34.1	178.29	101.9	14.94	0.2	0.03	2.8	6.71	214.1	31.40	436.1	17.78	232.21	288.13
24	3	Ficus carica	26.1	0.00	129.8	19.03	0.0	0.00	0.0	0.00	9.1	1.34	0.0	0.00	9.50	10.84

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m^3/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
28	2	Musa x paradisiaca	7.3	628.12	0.6	0.08	0.0	0.00	0.0	0.11	0.0	0.00	7.1	0.29	0.00	0.40
28	3	Musa x paradisiaca	8.1	342.75	1.2	0.18	0.0	0.00	0.1	0.25	0.0	0.00	16.4	0.67	0.01	0.94
28	4	Musa x paradisiaca	7.9	364.49	0.5	0.07	0.0	0.00	0.0	0.09	0.0	0.00	5.8	0.24	0.00	0.33
28	5	Musa x paradisiaca	11.0	349.60	1.3	0.19	0.1	0.01	0.1	0.20	2.6	0.38	12.9	0.53	3.11	4.23
29	1	Morinda citrifolia	13.2	0.00	24.4	3.58	8.4	1.23	0.1	0.28	0.0	0.00	18.1	0.74	0.00	2.25
29	2	Cajanus	4.3	0.00	1.7	0.25	1.2	0.18	0.1	0.24	0.0	0.00	15.7	0.64	0.00	1.06
29	3	Cajanus	7.9	0.00	7.1	1.04	5.1	0.75	0.3	0.72	0.2	0.03	46.9	1.91	0.24	3.65
29	4	Cajanus	6.9	0.00	5.0	0.74	2.2	0.32	0.2	0.46	0.0	0.00	29.6	1.21	0.00	1.99
29	5	Cajanus	6.8	0.00	5.0	0.74	0.0	0.00	0.0	0.00	0.3	0.05	0.0	0.00	0.41	0.46
29	6	Melicoccus bijugatus	1.9	0.00	0.3	0.04	0.2	0.03	0.0	0.01	1.7	0.24	0.3	0.01	1.98	2.28
29	7	Cestrum diurnum	4.9	0.00	2.4	0.36	1.0	0.14	0.0	0.06	2.1	0.31	3.6	0.15	2.56	3.22
29	8	Morinda citrifolia	3.9	0.00	1.5	0.22	0.6	0.09	0.0	0.07	1.3	0.19	4.6	0.19	1.54	2.07
29	9	Psidium guajava	18.6	0.00	60.3	8.84	11.9	1.75	1.2	2.90	3.9	0.58	188.7	7.69	4.69	17.62
32	1	Musa x paradisiaca	7.3	0.00	0.2	0.04	0.0	0.00	0.0	0.00			0.0	0.00		0.00
32	3	Plumeria alba	8.8	0.00	9.1	1.34	0.1	0.01	0.0	0.00			0.0	0.00		0.01
32	9	Musa x paradisiaca	8.4	335.10	0.9	0.13	0.0	0.00	0.0	0.10			6.7	0.27		0.38
32	11	Averrhoa carambola	10.5	0.00	14.3	2.10	0.3	0.05	0.1	0.15			10.0	0.41		0.61
32	12	Dovyalis hebecarpa	4.6	0.00	2.0	0.29	0.0	0.00	0.0	0.02			1.0	0.04		0.06
32	13	Phyllanthus acidus	15.7	0.00	38.8	5.70	3.9	0.57	0.4	0.94	14.9	2.19	61.1	2.49	17.05	23.23
32	14	Artocarpus altilis	44.3	0.00	473.3	69.41	1.0	0.15	0.1	0.23	14.8	2.17	14.8	0.61	16.74	19.89
32	15	Averrhoa carambola	7.8	0.00	7.5	1.10	0.0	0.01	0.0	0.01	4.4	0.64	0.8	0.03	4.91	5.60
32	16	Persea americana	2.8	0.00	0.7	0.10	0.2	0.03	0.0	0.07			4.7	0.19		0.30
32	17	Mangifera indica	8.8	0.00	9.7	1.43	0.2	0.02	0.0	0.03	2.8	0.40	2.2	0.09	2.99	3.54
32	20	Tamarindus indica	22.2	0.00	93.7	13.74	6.0	0.87	0.6	1.44	28.3	4.15	93.7	3.82	30.66	40.95
32	21	Inga vera	24.7	0.00	114.1	16.73	0.0	0.00	0.0	0.00	6.7	0.99	0.0	0.00	7.51	8.50
32	23	Chrysophyllum cainito	8.5	0.00	8.7	1.28	0.0	0.00	0.0	0.00	2.3	0.33	0.0	0.00	2.51	2.84
32	24	Psidium guajava	3.8	0.00	1.3	0.19	0.0	0.00	0.0	0.02			1.2	0.05		0.07
32	25	Psidium guajava	24.6	0.00	112.3	16.46	0.2	0.03	0.1	0.13	1.2	0.17	8.6	0.35	1.40	2.08
32	27	Psidium guajava	3.1	0.00	0.8	0.11	0.0	0.00	0.0	0.00			0.0	0.00		0.00
32	28	Psidium guajava	2.6	0.00	0.5	0.07	0.0	0.00	0.0	0.00			0.0	0.00		0.00
32	29	Mammea americana	35.8	0.00	282.3	41.41	2.7	0.39	0.1	0.14	4.1	0.60	9.2	0.38	4.72	6.23
32	31	Chrysobalanus icaco	7.6	0.00	6.3	0.93	0.0	0.00	0.0	0.00			0.0	0.00		0.00

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
32	32	Chrysobalanus icaco	3.2	0.00	0.8	0.12	0.0	0.00	0.0	0.00			0.0	0.00		0.00
32	34	Mangifera indica	52.2	0.00	687.7	100.85	0.7	0.11	0.1	0.14	7.8	1.14	9.4	0.38	8.71	10.49
32	35	Syzygium cumini	3.2	0.00	0.9	0.13	0.2	0.03	0.0	0.04			2.8	0.11		0.19
32	36	Chrysobalanus icaco	2.8	0.00	0.7	0.10	0.5	0.07	0.0	0.08			5.0	0.20		0.35
32	37	Ochna serrulata	5.7	0.00	3.2	0.47	1.5	0.22	0.1	0.12			8.0	0.33		0.66
32	38	Citrus	10.6	0.00	14.5	2.13	0.6	0.09	0.0	0.03			2.1	0.09		0.21
32	40	Annona muricata	3.9	0.00	1.4	0.21	0.0	0.00	0.0	0.04			2.6	0.10		0.15
32	41	Mangifera indica	11.7	0.00	19.6	2.87	3.0	0.44	0.3	0.64			41.9	1.71		2.79
32	42	Syzygium malaccense	12.2	0.00	21.2	3.11	0.0	0.00	0.0	0.00	4.1	0.60	0.0	0.00	4.57	5.17
34	1	Moringa oleifera	28.8	0.00	157.7	23.12	17.2	2.52	1.2	2.88			187.3	7.64		13.03
34	2	Cestrum diurnum	3.6	0.00	1.3	0.18	0.3	0.04	0.1	0.12			8.1	0.33		0.49
34	3	Ficus benjamina	4.4	0.00	1.8	0.27	0.3	0.05	0.0	0.08			5.4	0.22		0.35
34	4	Ficus benjamina	6.1	0.00	3.9	0.57	0.2	0.03	0.0	0.11			7.0	0.29		0.43
34	5	Ficus benjamina	6.1	0.00	3.9	0.57	1.5	0.22	0.0	0.09			6.0	0.24		0.56
34	6	Ficus benjamina	4.2	0.00	1.9	0.28	1.1	0.16	0.1	0.25			16.2	0.66		1.07
34	7	Ficus benjamina	7.8	0.00	6.9	1.02	3.4	0.50	0.1	0.13			8.2	0.33		0.96
34	8	Duranta erecta	4.5	0.00	1.8	0.26	1.2	0.17	0.1	0.18			11.5	0.47		0.81
34	9	Duranta erecta	4.2	0.00	1.6	0.23	0.9	0.14	0.3	0.72			46.9	1.91		2.77
34	10	Duranta erecta	3.4	0.00	1.0	0.14	0.8	0.11	0.3	0.81			52.6	2.14		3.07
34	11	Duranta erecta	3.0	0.00	0.7	0.10	0.6	0.09	0.1	0.15			10.0	0.41		0.65
34	12	Dypsis lutescens	18.4	380.27	10.0	1.47	0.2	0.03	1.0	2.32	-5.1	-0.75	151.1	6.16	-4.33	3.43
34	13	Dypsis lutescens	17.3	407.61	10.6	1.55	0.1	0.02	0.9	2.20	-0.2	-0.02	142.8	5.82	1.18	9.19
34	18	Ficus benjamina	11.7	0.00	17.8	2.62	0.2	0.03	0.0	0.04			2.3	0.09		0.16
34	19	Ficus benjamina	6.5	0.00	4.5	0.65	0.0	0.00	0.0	0.02			1.1	0.05		0.07
34	21	Ficus benjamina	6.6	0.00	4.9	0.72	1.5	0.22	0.1	0.24			15.8	0.64		1.10
34	22	Ficus benjamina	4.3	0.00	1.9	0.28	0.8	0.11	0.1	0.14			9.1	0.37		0.62
34	23	Ficus benjamina	8.4	0.00	8.2	1.20	1.7	0.25	0.0	0.08			5.3	0.22		0.55
34	24	Psidium guajava	7.2	0.00	6.3	0.92	1.2	0.17	0.2	0.38			24.8	1.01		1.57
34	25	Ficus benjamina	2.6	0.00	0.9	0.13	0.5	0.07	0.1	0.29			18.7	0.76		1.12
34	26	Ficus benjamina	2.9	0.00	0.8	0.11	0.5	0.07	0.0	0.06			3.9	0.16		0.28
34	27	Ficus benjamina	6.0	0.00	3.8	0.56	1.3	0.19	0.1	0.13			8.6	0.35		0.68
34	30	Ficus benjamina	3.6	0.00	1.1	0.17	0.4	0.06	0.0	0.03			1.9	0.08		0.17

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
34	32	Ficus benjamina	4.4	0.00	2.0	0.29	0.6	0.09	0.1	0.16			10.2	0.42		0.66
34	33	Ficus benjamina	6.2	0.00	4.1	0.61	1.2	0.18	0.1	0.14			9.1	0.37		0.69
34	34	Ficus benjamina	3.1	0.00	0.9	0.13	0.4	0.05	0.0	0.12			7.6	0.31		0.48
34	36	Ficus benjamina	6.5	0.00	4.7	0.69	1.3	0.19	0.1	0.19			12.5	0.51		0.89
34	37	Ficus benjamina	5.9	0.00	3.8	0.56	1.1	0.17	0.1	0.23			15.0	0.61		1.01
34	39	Annona muricata	7.6	0.00	7.3	1.07	2.2	0.32	0.2	0.36			23.7	0.96		1.65
34	40	Ficus benjamina	8.2	0.00	7.9	1.17	1.5	0.22	0.1	0.27			17.3	0.70		1.19
34	42	Ficus benjamina	5.3	0.00	2.8	0.41	0.4	0.05	0.0	0.06			3.9	0.16		0.27
34	44	Ficus benjamina	14.7	0.00	31.6	4.64	3.9	0.57	0.2	0.37			23.8	0.97		1.90
34	46	Ficus benjamina	7.7	0.00	6.8	0.99	1.3	0.19	0.1	0.17			10.9	0.45		0.80
36	1	Dracaena fragrans	5.7	32.25	0.2	0.03	0.0	0.00	0.0	0.04	0.0	0.00	2.4	0.10	0.00	0.14
36	2	Ficus benjamina	11.4	0.00	17.1	2.51	2.1	0.32	0.2	0.39	0.0	0.00	25.4	1.04	0.00	1.74
36	3	Ficus benjamina	4.5	0.00	2.1	0.30	0.5	0.08	0.1	0.18	0.0	0.00	11.7	0.48	0.00	0.74
36	4	Plumeria rubra	9.1	0.00	9.7	1.42	0.0	0.01	0.0	0.02	0.0	0.00	1.3	0.05	0.00	0.08
38	1	Annona muricata	10.7	0.00	14.6	2.14	0.8	0.12	0.0	0.05	0.0	0.00	3.2	0.13	0.00	0.30
38	2	Hibiscus rosa-sinensis	3.4	0.00	1.0	0.15	0.2	0.03	0.0	0.04	0.0	0.00	2.8	0.12	0.00	0.19
38	4	Carica papaya	7.1	0.00	5.6	0.82	0.2	0.03	0.0	0.04	1.6	0.23	2.7	0.11	1.95	2.36
38	5	Pimenta racemosa	22.1	0.00	87.7	12.86	6.2	0.91	0.2	0.55	25.4	3.73	35.5	1.45	28.75	35.38
41	12	Dypsis lutescens	16.0	189.33	4.9	0.72	0.1	0.01	0.5	1.17			76.1	3.10		4.28
41	25	Dypsis lutescens	4.5	451.12	1.3	0.19	0.0	0.01	0.0	0.11			7.4	0.30		0.42
41	26	Dypsis lutescens	3.8	522.24	1.0	0.14	0.0	0.01	0.0	0.04			2.6	0.11		0.15
41	27	Dypsis lutescens	4.1	531.04	0.5	0.07	0.0	0.00	0.0	0.08			5.5	0.22		0.31
41	28	Dypsis lutescens	3.8	445.03	0.4	0.06	0.0	0.00	0.0	0.03			2.3	0.09		0.13
43	1	Cordyline fruticosa	4.4	283.38	0.7	0.10	0.1	0.01	0.1	0.15			9.7	0.39		0.55
43	2	Araucaria heterophylla	10.8	0.00	11.2	1.64	1.9	0.28	0.4	0.98			63.5	2.59		3.84
43	3	Annona reticulata	13.4	0.00	25.8	3.78	4.9	0.72	0.2	0.56			36.5	1.49		2.77
43	4	Codiaeum variegatum	5.1	0.00	2.5	0.37	0.0	0.00	0.0	0.04			2.4	0.10		0.14
43	5	Hibiscus rosa-sinensis	8.4	0.00	8.3	1.22	0.7	0.11	0.1	0.16			10.3	0.42		0.68
43	7	Hibiscus rosa-sinensis	5.7	0.00	3.5	0.51	0.7	0.11	0.1	0.20			12.8	0.52		0.82
43	8	Ochna serrulata	10.8	0.00	15.0	2.19	5.7	0.83	0.1	0.29			18.8	0.77		1.89
43	9	Callistemon citrinus	49.7	0.00	588.6	86.32	27.3	4.00	0.1	0.22			14.3	0.58		4.81
48	3	Musa acuminata	10.0	43.07	0.4	0.06	0.0	0.00	0.0	0.08	0.0	0.00	5.1	0.21	0.00	0.28

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
48	4	Musa acuminata	8.8	190.07	0.9	0.13	0.0	0.00	0.1	0.24	0.0	0.00	15.6	0.63	0.00	0.88
51	1	Dracaena	4.0	441.60	0.8	0.11	0.0	0.01	0.0	0.05			3.1	0.13		0.18
51	2	Dypsis lutescens	7.5	161.04	8.0	1.18	0.1	0.02	0.6	1.48			96.3	3.93		5.43
51	4	Murraya paniculata	3.0	0.00	1.1	0.16	0.7	0.11	0.1	0.25			16.4	0.67		1.03
51	5	Malpighia emarginata	6.3	0.00	4.3	0.63	0.1	0.01	0.0	0.01	1.4	0.21	0.8	0.03	1.87	2.14
53	1	Psidium guajava	5.1	0.00	2.5	0.37	0.0	0.00	0.0	0.00			0.0	0.00		0.00
53	2	Dracaena marginata	23.8	461.21	3.7	0.54	0.1	0.01	0.4	0.87			56.6	2.31		3.19
53	3	Citrus sinensis	22.9	0.00	99.5	14.59	19.2	2.82	1.1	2.60	10.7	1.56	169.2	6.90	12.02	25.91
53	4	Citrus limon	11.6	0.00	17.6	2.58	0.1	0.02	0.0	0.02			1.2	0.05		0.09
54	1	Averrhoa carambola	20.9	0.00	76.2	11.18	5.7	0.83	0.4	0.84	8.9	1.30	54.4	2.22	9.16	14.35
54	5	Thespesia grandiflora	31.1	0.00	198.4	29.10	3.0	0.43	0.2	0.36	5.0	0.74	23.2	0.95	5.45	7.92
54	10	Graptophyllum pictum	4.1	0.00	2.3	0.34	0.1	0.02	0.2	0.54			35.1	1.43		1.99
54	11	Syzygium jambos	27.3	0.00	145.7	21.37	0.0	0.00	0.0	0.00	1.5	0.21	0.0	0.00	2.89	3.10
54	12	Codiaeum variegatum	4.2	0.00	1.7	0.24	0.2	0.03	0.0	0.10			6.5	0.27		0.39
54	13	Calophyllum antillanum	4.6	0.00	2.0	0.29	0.7	0.10	0.0	0.04			2.4	0.10		0.24
54	14	Ardisia elliptica	4.4	0.00	2.0	0.30	0.5	0.07	0.1	0.14			9.3	0.38		0.59
54	17	Codiaeum variegatum	3.4	0.00	1.0	0.15	0.3	0.04	0.0	0.05			3.0	0.12		0.21
54	18	Ardisia elliptica	4.0	0.00	1.6	0.24	0.5	0.07	0.1	0.13			8.4	0.34		0.54
54	19	Codiaeum variegatum	5.1	0.00	2.6	0.38	0.2	0.03	0.0	0.06			4.0	0.16		0.26
54	20	Hibiscus rosa-sinensis	3.3	0.00	0.9	0.14	0.1	0.01	0.0	0.01			0.3	0.01		0.03
54	21	Hibiscus rosa-sinensis	2.7	0.00	0.6	0.09	0.0	0.00	0.0	0.00			0.1	0.00		0.01
54	22	Hibiscus rosa-sinensis	4.2	0.00	1.5	0.23	0.1	0.02	0.0	0.00			0.1	0.00		0.03
54	23	Plumeria	4.0	0.00	1.4	0.20	0.9	0.13	0.1	0.13			8.7	0.36		0.62
56	1	Azadirachta indica	13.8	0.00	27.0	3.96	5.1	0.75	0.1	0.31			20.4	0.83		1.89
61	1	Annona muricata	2.9	0.00	0.7	0.10	0.4	0.07	0.0	0.04			2.7	0.11		0.22
61	2	Hibiscus rosa-sinensis	3.9	0.00	1.3	0.20	0.6	0.09	0.0	0.07			4.3	0.18		0.33
61	3	Hibiscus rosa-sinensis	7.0	0.00	5.2	0.77	1.5	0.23	0.1	0.14			9.2	0.37		0.74
61	4	Mangifera indica	66.5	0.00	1,266.0	185.67	62.7	9.19	3.1	7.39	49.3	7.24	480.5	19.59	58.09	101.50
61	5	Phyllanthus acidus	5.2	0.00	2.5	0.37	1.3	0.19	0.1	0.16			10.2	0.42		0.76
61	6	Punica granatum	5.0	0.00	2.4	0.36	0.0	0.00	0.0	0.00			0.0	0.00		0.00
61	7	Musa x paradisiaca	16.5	354.72	1.0	0.15	0.0	0.00	0.1	0.24			15.8	0.65		0.89
64	1	Ptychosperma macarthurii	5.1	405.80	1.4	0.20	0.0	0.00	0.0	0.08			5.4	0.22		0.31

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
							Gross Carbon Sequestration		Avoided Runoff		Carbon Avoided		Pollution Removal		Energy Savings	Total Annual Benefits
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	(kg/yr)	($/yr)	(m^3/yr)	($/yr)	(kg/yr)	($/yr)	(g/yr)	($/yr)	($/yr)	($/yr)
64	2	Ptychosperma macarthurii	6.5	808.46	3.3	0.49	0.1	0.01	0.1	0.15			9.5	0.39		0.55
64	3	Ptychosperma macarthurii	4.6	785.96	1.8	0.27	0.0	0.01	0.1	0.23			14.7	0.60		0.84
64	5	Schefflera arboricola	39.5	0.00	347.2	50.93	9.9	1.46	0.2	0.45	15.4	2.26	29.5	1.20	18.33	23.70
64	6	Ptychosperma macarthurii	6.9	695.76	4.1	0.60	0.1	0.01	0.1	0.25	13.4	1.96	16.2	0.66	15.83	18.72
64	7	Ptychosperma macarthurii	6.5	499.94	4.3	0.63	0.1	0.01	0.1	0.14	12.8	1.88	9.4	0.38	15.16	17.57
64	8	Ptychosperma macarthurii	6.5	631.61	5.6	0.82	0.1	0.01	0.1	0.20	15.1	2.22	12.8	0.52	17.98	20.93
64	9	Ptychosperma macarthurii	5.7	11.76	0.3	0.05	0.0	0.00	0.0	0.01			0.6	0.03		0.04
64	10	Ptychosperma macarthurii	16.9	881.26	13.1	1.92	0.5	0.07	0.6	1.38	26.2	3.85	89.7	3.66	31.35	40.30
64	11	Ptychosperma macarthurii	14.6	754.96	5.1	0.75	0.2	0.03	0.2	0.47	14.2	2.09	30.5	1.24	16.82	20.65
64	12	Schefflera arboricola	27.4	0.00	143.4	21.03	12.0	1.75	0.2	0.51			32.9	1.34		3.60
64	13	Ptychosperma macarthurii	6.1	551.35	5.8	0.85	0.1	0.01	0.3	0.65	18.0	2.65	42.1	1.72	21.37	26.39
64	14	Ptychosperma macarthurii	5.9	842.69	5.7	0.83	0.1	0.01	0.2	0.49	18.3	2.68	31.7	1.29	21.71	26.19
64	15	Ptychosperma macarthurii	6.0	464.94	7.2	1.05	0.1	0.01	0.3	0.72	8.4	1.23	46.5	1.90	9.30	13.15
64	16	Ptychosperma macarthurii	5.3	537.59	5.2	0.76	0.1	0.01	0.0	0.06	5.8	0.85	4.1	0.17	6.43	7.52
64	17	Ptychosperma macarthurii	6.0	0.00	5.0	0.73	0.0	0.00	0.0	0.00	5.2	0.76	0.0	0.00	5.74	6.50
64	18	Ptychosperma macarthurii	5.9	682.89	5.7	0.83	0.1	0.01	0.1	0.22	5.6	0.82	14.3	0.58	6.00	7.64
64	19	Ptychosperma macarthurii	6.4	358.73	3.1	0.45	0.0	0.01	0.1	0.15			9.7	0.40		0.55
64	20	Ptychosperma macarthurii	5.6	0.00	5.0	0.73	0.0	0.00	0.0	0.00	9.5	1.39	0.0	0.00	10.45	11.83
66	1	Citrus aurantifolia	2.0	0.00	0.4	0.06	0.5	0.07	0.0	0.05			3.1	0.13		0.24
66	2	Citrus sinensis	17.1	0.00	47.5	6.97	4.6	0.68	0.4	0.93			60.4	2.46		4.07
66	3	Punica granatum	2.3	0.00	0.4	0.06	0.2	0.03	0.0	0.03			2.1	0.08		0.14
66	6	Musa x paradisiaca	15.0	122.45	2.2	0.33	0.0	0.00	0.1	0.13			8.6	0.35		0.49
66	7	Tabernaemontana divaricata	7.9	0.00	7.6	1.11	2.1	0.31	0.2	0.38			24.7	1.01		1.70
66	8	Tabernaemontana divaricata	10.7	0.00	15.2	2.24	3.2	0.47	0.2	0.53			34.2	1.39		2.39
67	2	Musa x paradisiaca	7.6	411.82	0.8	0.12	0.0	0.00	0.1	0.14			9.1	0.37		0.51
67	3	Musa x paradisiaca	9.5	410.94	1.9	0.28	0.0	0.00	0.2	0.41			26.5	1.08		1.49
69	1	Schinus terebinthifolius	5.7	0.00	3.3	0.48	1.0	0.14	0.0	0.11			6.9	0.28		0.53
69	2	Citrus aurantifolia	5.7	0.00	3.5	0.51	1.2	0.17	0.0	0.07			4.5	0.18		0.42
69	3	Adonidia merrilli	16.3	648.98	5.6	0.82	0.2	0.03	0.4	0.97			63.4	2.58		3.59
69	4	Adonidia merrilli	17.1	609.41	5.7	0.83	0.2	0.03	0.4	1.01			65.6	2.67		3.71
69	5	Mussaenda frondosa	8.7	0.00	9.6	1.40	1.2	0.17	0.2	0.43			28.2	1.15		1.76
69	6	Ficus lyrata	19.8	0.00	66.7	9.78	2.8	0.41	0.1	0.33	8.8	1.29	21.3	0.87	10.24	13.14

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
70	1	Dypsis lutescens	16.8	223.71	4.6	0.67	0.1	0.02	0.5	1.24			81.0	3.30		4.56
70	2	Annona muricata	7.9	0.00	7.5	1.11	2.5	0.36	0.1	0.24			15.9	0.65		1.26
70	11	Musa acuminata	10.5	208.11	1.0	0.15	0.0	0.00	0.1	0.20			13.1	0.54		0.74
70	12	Clerodendrum quadriloculare	3.1	0.00	0.8	0.12	0.3	0.05	0.0	0.05			3.1	0.13		0.23
70	13	Malpighia emarginata	7.0	0.00	5.8	0.85	1.3	0.20	0.1	0.27			17.3	0.70		1.17
70	14	Adonidia merrilli	17.4	1,020.58	5.8	0.84	0.3	0.04	0.4	0.90			58.2	2.38		3.31
70	15	Annona muricata	6.5	0.00	4.8	0.70	1.6	0.23	0.1	0.14			9.0	0.37		0.74
71	1	Phoenix dactylifera	11.5	551.52	1.4	0.20	0.1	0.02	0.1	0.22			14.0	0.57		0.81
71	2	Adonidia merrilli	13.5	1,149.46	4.9	0.71	0.2	0.02	0.1	0.28			18.1	0.74		1.04
71	3	Bougainvillea glabra	11.4	0.00	17.2	2.52	2.2	0.33	0.0	0.08			5.5	0.22		0.64
71	4	Bougainvillea glabra	8.3	0.00	8.6	1.26	1.7	0.25	0.2	0.37			24.0	0.98		1.60
71	5	Persea americana	9.0	0.00	10.9	1.60	3.7	0.54	0.2	0.52	16.4	2.41	33.7	1.37	18.47	23.31
71	6	Musa x paradisiaca	8.1	217.52	0.9	0.14	0.0	0.00	0.1	0.22			14.3	0.58		0.80
71	7	Musa x paradisiaca	11.1	513.22	2.8	0.41	0.0	0.01	0.3	0.63			41.1	1.68		2.31
71	8	Musa x paradisiaca	11.6	324.14	1.7	0.25	0.0	0.00	0.1	0.34			22.1	0.90		1.25
71	9	Psidium guajava	7.4	0.00	6.5	0.96	1.6	0.24	0.1	0.15			9.7	0.39		0.78
71	10	Citrus aurantifolia	8.1	0.00	8.9	1.30	1.5	0.22	0.2	0.57			37.3	1.52		2.31
71	12	Musa x paradisiaca	12.4	64.44	1.0	0.14	0.0	0.00	0.1	0.12			7.7	0.31		0.43
71	13	Flacourtia indica	4.8	0.00	2.1	0.31	0.0	0.00	0.0	0.00			0.1	0.00		0.01
71	14	Persea americana	11.2	0.00	17.5	2.56	2.6	0.39	0.1	0.31			19.9	0.81		1.50
71	18	Mangifera indica	86.2	0.00	2,306.2	338.22	75.8	11.11	1.8	4.30	45.4	6.65	279.7	11.40	50.65	84.12
71	20	Dracaena marginata	4.3	262.59	0.5	0.07	0.0	0.00	0.0	0.07			4.7	0.19		0.26
71	21	Pimenta racemosa	3.9	0.00	1.4	0.21	0.4	0.06	0.0	0.09			5.7	0.23		0.38
71	22	Dracaena marginata	4.4	0.00	0.3	0.05	0.0	0.00	0.0	0.00			0.0	0.00		0.00
71	23	Dracaena marginata	5.5	228.48	0.5	0.08	0.0	0.00	0.0	0.10			6.3	0.26		0.35
71	24	Dracaena marginata	3.1	335.10	0.4	0.05	0.0	0.00	0.0	0.06			3.9	0.16		0.22
73	1	Roystonea borinquena	26.9	766.13	17.9	2.62	0.2	0.04	0.9	2.19	6.8	1.00	142.5	5.81	6.95	15.98
73	2	Roystonea borinquena	22.0	726.67	14.5	2.13	0.2	0.03	0.5	1.10	6.6	0.96	71.6	2.92	6.73	11.74
73	3	Roystonea borinquena	24.0	342.82	16.8	2.46	0.1	0.02	0.8	1.83	6.0	0.88	119.2	4.86	6.13	13.72
73	4	Caesalpinia ferrea	48.4	0.00	585.4	85.85	22.3	3.28	2.3	5.33	10.1	1.48	346.4	14.13	10.64	34.85
73	5	Caesalpinia ferrea	41.8	0.00	412.4	60.48	14.1	2.07	1.3	3.17	9.7	1.43	205.8	8.39	10.23	25.28
73	6	Roystonea borinquena	26.2	900.70	13.5	1.98	0.2	0.03	0.5	1.10	9.5	1.39	71.7	2.92	9.99	15.44

Individual Tree Benefits Summary

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Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
73	7	Roystonea borinquena	24.6	511.45	13.7	2.01	0.2	0.03	1.1	2.49	9.8	1.44	161.6	6.59	10.78	21.33
74	3	Musa x paradisiaca	12.5	0.00	0.4	0.06	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.00	0.00
74	5	Musa x paradisiaca	11.0	317.17	1.1	0.17	0.0	0.00	0.1	0.27	0.0	0.00	17.7	0.72	0.00	1.00
74	6	Musa x paradisiaca	18.7	175.57	2.7	0.40	0.0	0.01	0.3	0.60			39.0	1.59		2.20
74	7	Musa x paradisiaca	26.5	35.06	1.5	0.22	0.0	0.00	0.0	0.11			7.3	0.30		0.41
74	8	Dypsis lutescens	16.1	161.07	2.1	0.31	0.0	0.00	0.2	0.54			34.9	1.42		1.96
74	9	Citrus sinensis	6.3	0.00	4.1	0.60	0.0	0.00	0.0	0.00			0.0	0.00		0.00
74	10	Citharexylum spinosum	8.2	0.00	7.8	1.14	0.0	0.00	0.0	0.00			0.0	0.00		0.00
74	11	Schinus terebinthifolius	12.1	0.00	20.1	2.95	0.1	0.01	0.0	0.04			2.7	0.11		0.17
81	1	Allamanda blanchetii	7.9	0.00	7.4	1.08	1.5	0.22	0.1	0.15			9.8	0.40		0.77
81	2	Schefflera arboricola	10.8	0.00	15.5	2.27	0.1	0.02	0.0	0.01	-2.8	-0.41	0.8	0.03	-2.33	-2.67
81	3	Dypsis lutescens	12.2	155.56	1.3	0.20	0.0	0.00	0.1	0.14			9.3	0.38		0.52
81	4	Dypsis lutescens	14.5	177.80	1.5	0.22	0.0	0.00	0.0	0.05			3.3	0.13		0.19
81	5	Dypsis lutescens	8.5	9.72	3.7	0.55	0.0	0.00	0.0	0.02			1.6	0.06		0.09
82	1	Citrus limon	6.4	0.00	4.4	0.65	0.1	0.02	0.0	0.03			2.1	0.09		0.14
82	2	Roystonea regia	47.9	479.60	34.1	5.00	0.5	0.07	2.0	4.67	38.5	5.64	303.8	12.39	39.29	62.06
82	3	Schefflera	8.0	0.00	8.3	1.21	1.9	0.28	0.3	0.67			43.7	1.78		2.73
82	4	Lagerstroemia indica	9.2	0.00	10.6	1.56	2.7	0.40	0.4	0.97			62.9	2.56		3.93
82	5	Codiaeum variegatum	4.4	0.00	1.8	0.27	0.6	0.09	0.0	0.06			4.0	0.16		0.32
85	1	Citrus aurantifolia	5.0	0.00	2.6	0.38	0.4	0.05	0.0	0.08			5.3	0.21		0.35
85	7	Musa x paradisiaca	10.5	569.56	1.3	0.19	0.0	0.01	0.1	0.14			9.0	0.37		0.51
85	10	Musa x paradisiaca	7.0	374.31	1.2	0.18	0.0	0.00	0.1	0.30			19.8	0.81		1.12
85	11	Clerodendrum quadriloculare	2.7	0.00	0.6	0.09	0.2	0.04	0.0	0.04			2.3	0.09		0.17
85	12	Clerodendrum quadriloculare	3.0	0.00	0.7	0.11	0.2	0.03	0.0	0.02			1.2	0.05		0.10
87	2	Ptychosperma macarthurii	6.5	865.63	1.8	0.26	0.1	0.01	0.1	0.22			14.3	0.58		0.81
88	1	Myrciaria floribunda	21.1	0.00	78.0	11.44	16.2	2.37	0.5	1.25			81.1	3.31		6.92
88	2	Citrus x jambhiri	16.0	0.00	40.2	5.90	4.6	0.68	0.1	0.28			18.5	0.75		1.72
88	3	Annona muricata	12.7	0.00	23.9	3.51	5.2	0.76	0.4	0.87			56.6	2.31		3.94
88	4	Roystonea borinquena	34.7	337.83	50.1	7.34	0.2	0.03	0.2	0.44	51.1	7.50	28.5	1.16	54.69	63.82
88	5	Roystonea borinquena	30.8	402.71	47.3	6.94	0.2	0.03	0.2	0.44	37.6	5.51	28.7	1.17	40.48	47.63
89	1	Livistona	26.1	291.61	7.2	1.06	0.1	0.01	0.7	1.65			107.1	4.37		6.03
89	2	Ptychosperma	5.2	1,149.46	3.2	0.47	0.3	0.04	0.1	0.20			13.1	0.54		0.78

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
89	5	Coccoloba uvifera	13.8	0.00	27.6	4.05	3.7	0.54	0.2	0.51			33.3	1.36		2.41
89	6	Coccoloba uvifera	8.9	0.00	9.5	1.40	1.8	0.26	0.1	0.35			22.7	0.93		1.54
89	7	Ptychosperma macarthurii	8.9	753.29	1.3	0.19	0.1	0.01	0.1	0.20			13.0	0.53		0.74
89	8	Ptychosperma macarthurii	12.7	711.57	3.4	0.50	0.3	0.04	0.2	0.47			30.6	1.25		1.76
91	1	Malpighia emarginata	27.9	0.00	153.3	22.49	19.6	2.87	0.8	1.79	18.1	2.66	116.6	4.76	20.20	32.28
91	2	Codiaeum variegatum	4.4	0.00	1.8	0.27	0.8	0.12	0.0	0.06			3.9	0.16		0.34
91	3	Annona muricata	22.3	0.00	90.2	13.22	3.0	0.43	0.2	0.57	16.2	2.38	37.2	1.52	18.38	23.29
91	4	Ptychosperma macarthurii	16.3	20.41	7.7	1.13	0.0	0.00	0.1	0.27	13.8	2.02	17.4	0.71	15.52	18.52
91	6	Musa x paradisiaca	9.4	364.10	0.3	0.04	0.0	0.00	0.0	0.07			4.4	0.18		0.25
91	8	Psidium guajava	13.9	0.00	31.7	4.65	3.6	0.53	0.8	1.94	14.3	2.09	126.4	5.15	14.73	24.45
92	2	Duranta	3.0	0.00	0.7	0.10	0.0	0.00	0.0	0.00			0.3	0.01		0.02
92	3	Citrus sinensis	5.8	0.00	5.0	0.73	2.6	0.38	0.3	0.66			43.2	1.76		2.81
92	5	Duranta	2.9	0.00	0.6	0.09	0.0	0.00	0.0	0.00			0.2	0.01		0.01
92	6	Duranta	1.3	0.00	0.1	0.01	0.0	0.00	0.0	0.00			0.2	0.01		0.01
92	8	Duranta	2.9	0.00	0.6	0.09	0.0	0.00	0.0	0.00			0.1	0.00		0.01
92	9	Duranta	2.7	0.00	0.5	0.08	0.0	0.00	0.0	0.00			0.1	0.00		0.01
92	10	Duranta	1.6	0.00	0.2	0.02	0.0	0.00	0.0	0.00			0.1	0.00		0.00
92	11	Duranta	2.6	0.00	0.5	0.07	0.0	0.00	0.0	0.00			0.1	0.00		0.01
92	12	Duranta	2.8	0.00	0.6	0.09	0.0	0.00	0.0	0.01			0.4	0.02		0.03
92	13	Psidium guajava	18.4	0.00	56.9	8.34	8.6	1.27	0.5	1.07			69.4	2.83		5.17
92	14	Duranta	3.2	0.00	0.8	0.12	0.0	0.01	0.0	0.01			0.5	0.02		0.03
92	15	Duranta	2.0	0.00	0.3	0.04	0.0	0.00	0.0	0.01			0.6	0.03		0.04
92	16	Duranta	3.2	0.00	0.8	0.12	0.5	0.08	0.0	0.03			1.7	0.07		0.17
92	17	Duranta	2.8	0.00	0.6	0.08	0.0	0.00	0.0	0.00			0.3	0.01		0.02
92	18	Duranta	3.5	0.00	1.0	0.15	0.1	0.01	0.0	0.01			0.4	0.02		0.04
92	19	Duranta	5.8	0.00	3.4	0.49	1.1	0.16	0.0	0.06			4.1	0.17		0.39
92	20	Citrus reticulata	9.3	0.00	11.5	1.68	3.0	0.44	0.2	0.42			27.3	1.11		1.98
92	21	Duranta	6.7	0.00	4.6	0.67	1.3	0.19	0.0	0.04			2.7	0.11		0.34
92	23	Duranta	5.0	0.00	2.3	0.34	1.0	0.14	0.0	0.05			3.3	0.13		0.32
92	24	Citrus sinensis	7.7	0.00	6.5	0.96	1.7	0.25	0.0	0.02			1.5	0.06		0.33
92	25	Duranta	5.1	0.00	2.4	0.36	0.7	0.11	0.0	0.04			2.7	0.11		0.26
92	26	Duranta	2.5	0.00	0.5	0.07	0.4	0.06	0.0	0.07			4.3	0.18		0.30

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
92	27	Duranta	2.5	0.00	0.5	0.07	0.2	0.03	0.0	0.01			0.6	0.03		0.07
92	28	Duranta	1.1	0.00	0.1	0.01	0.1	0.01	0.0	0.02			1.3	0.05		0.09
92	29	Mangifera indica	22.5	0.00	91.8	13.46	5.8	0.85	0.4	1.01	12.1	1.78	65.7	2.68	13.18	19.49
92	30	Artocarpus altilis	13.0	0.00	24.8	3.64	0.1	0.01	0.0	0.02	8.9	1.31	1.4	0.06	9.62	11.02
93	2	Codiaeum variegatum	3.0	0.00	0.9	0.13	0.7	0.10	0.1	0.16			10.6	0.43		0.70
93	10	Musa acuminata	7.8	53.62	0.7	0.10	0.0	0.00	0.0	0.04			2.3	0.09		0.13
93	16	Hibiscus rosa-sinensis	4.8	0.00	2.7	0.40	1.4	0.21	0.2	0.36			23.6	0.96		1.54
93	18	Hibiscus rosa-sinensis	7.8	0.00	7.9	1.16	2.1	0.31	0.3	0.63			41.1	1.68		2.62
93	19	Citrus sinensis	9.5	0.00	11.4	1.67	3.4	0.51	0.1	0.20			12.9	0.53		1.23
95	1	Citrus aurantifolia	5.8	0.00	5.4	0.79	1.5	0.23	0.3	0.78			50.9	2.07		3.08
95	10	Citrus aurantifolia	4.9	0.00	4.6	0.68	1.2	0.17	0.4	0.92			59.8	2.44		3.53
95	11	Schinus terebinthifolius	4.4	0.00	1.9	0.27	1.1	0.16	0.1	0.15			9.9	0.40		0.72
96	1	Morinda citrifolia	7.9	0.00	7.9	1.17	2.3	0.34	0.3	0.64			41.5	1.69		2.67
96	2	Breynia disticha	2.7	0.00	0.5	0.08	0.0	0.00	0.0	0.00			0.0	0.00		0.00
96	3	Citrus sinensis	21.1	0.00	78.9	11.58	6.9	1.01	0.5	1.29			83.9	3.42		5.72
96	4	Annona muricata	5.8	0.00	3.6	0.52	1.8	0.27	0.1	0.13			8.1	0.33		0.72
99	1	Psidium guajava	39.0	0.00	327.6	48.05	4.0	0.59	0.0	0.07			4.8	0.20		0.86
99	2	Murraya paniculata	23.5	0.00	95.8	14.05	6.5	0.95	0.1	0.27			17.3	0.70		1.92
99	8	Musa acuminata	38.0	131.13	0.3	0.04	0.0	0.00	0.0	0.04			2.8	0.11		0.16
99	9	Musa acuminata	39.0	142.21	0.6	0.09	0.0	0.00	0.1	0.15			9.8	0.40		0.55
99	11	Musa acuminata	61.0	0.00	0.4	0.07	0.0	0.00	0.0	0.00			0.0	0.00		0.00
99	12	Musa acuminata	42.0	225.54	1.0	0.15	0.0	0.00	0.1	0.16			10.3	0.42		0.58
99	13	Citrus aurantifolia	37.9	0.00	305.6	44.81	13.7	2.01	0.1	0.18			11.9	0.48		2.67
99	14	Dracaena reflexa	37.1	0.00	290.5	42.61	15.9	2.33	0.0	0.11			7.0	0.29		2.73
99	15	Caesalpinia ferrea	133.0	0.00	5,284.7	775.06	49.1	7.20	1.0	2.42	12.1	1.77	157.5	6.42	14.31	32.13
99	17	Annona muricata	15.0	0.00	33.0	4.84	3.2	0.48	0.0	0.08			5.2	0.21		0.77
99	18	Cestrum diurnum	31.5	0.00	197.6	28.97	10.8	1.59	0.1	0.33			21.4	0.87		2.79
99	19	Averrhoa carambola	28.5	0.00	153.4	22.50	7.9	1.16	0.1	0.16			10.1	0.41		1.73
99	20	Cestrum diurnum	31.8	0.00	200.5	29.40	11.8	1.73	0.1	0.22			14.2	0.58		2.53
99	21	Theobroma cacao	50.8	0.00	629.5	92.32	19.7	2.89	0.3	0.62			40.5	1.65		5.16
99	22	Cestrum diurnum	14.0	0.00	27.5	4.03	4.0	0.59	0.0	0.08			5.5	0.22		0.90
99	23	Murraya paniculata	4.5	0.00	1.9	0.28	0.9	0.13	0.0	0.08			5.0	0.20		0.41

Individual Tree Benefits Summary

Location: San Juan, San Juan, Puerto Rico, United States of America
Project: San Juan Residential Trees, Series: Residential Trees, Year: 2017
Generated: 7/1/2018

							Annual benefits									
Plot ID	Tree ID	Species Name	DBH (cm)	Structural Value ($)	Carbon Storage (kg)	Carbon Storage ($)	Gross Carbon Sequestration (kg/yr)	Gross Carbon Sequestration ($/yr)	Avoided Runoff (m³/yr)	Avoided Runoff ($/yr)	Carbon Avoided (kg/yr)	Carbon Avoided ($/yr)	Pollution Removal (g/yr)	Pollution Removal ($/yr)	Energy Savings ($/yr)	Total Annual Benefits ($/yr)
99	25	Polyscias guilfoylei	8.2	0.00	8.0	1.17	2.4	0.35	0.1	0.19			12.4	0.50		1.05
100	15	Citrus sinensis	18.2	0.00	57.3	8.40	13.3	1.95	0.6	1.43	22.7	3.33	93.2	3.80	24.29	34.80
103	1	Citrus aurantifolia	12.6	0.00	24.3	3.56	2.8	0.41	0.4	0.87			56.8	2.32		3.60
103	2	Citrus aurantifolia	6.1	0.00	4.5	0.66	1.3	0.20	0.1	0.23			15.0	0.61		1.04
103	3	Leea guineense	4.4	0.00	1.9	0.28	1.1	0.17	0.1	0.15			9.7	0.39		0.71
103	4	Tabernaemontana divaricata	4.5	0.00	1.8	0.27	0.1	0.01	0.0	0.01			0.5	0.02		0.04
103	5	Codiaeum variegatum	5.5	0.00	3.2	0.46	1.5	0.22	0.1	0.14			9.2	0.38		0.74
103	6	Schefflera arboricola	10.6	0.00	14.2	2.09	3.4	0.49	0.0	0.10			6.7	0.27		0.87
109	1	Dypsis lutescens	5.3	231.71	1.7	0.25	0.0	0.00	0.2	0.42			27.5	1.12		1.55
109	2	Dypsis lutescens	13.3	132.06	4.3	0.63	0.1	0.01	0.4	1.03			67.3	2.74		3.79
109	4	Dypsis lutescens	16.0	237.18	7.9	1.15	0.1	0.01	0.9	2.16			140.2	5.72		7.88
110	1	Ptychosperma	15.9	56.57	5.9	0.86	0.1	0.01	0.3	0.67	13.0	1.91	43.7	1.78	13.39	17.76
110	3	Dracaena marginata	11.1	258.41	1.5	0.22	0.0	0.00	0.2	0.36			23.2	0.94		1.31
110	4	Dracaena marginata	10.4	256.77	2.2	0.33	0.1	0.01	0.3	0.61			39.4	1.61		2.22
110	5	Dracaena marginata	6.7	378.66	1.0	0.15	0.1	0.01	0.1	0.19			12.6	0.51		0.72
110	6	Tabernaemontana divaricata	7.6	0.00	6.3	0.93	2.0	0.29	0.0	0.06			3.8	0.15		0.50
		Total		**41,413**	**25,680**	**3,766**	**887**	**130**	**67**	**158**	**1,279**	**188**	**10,299**	**420**	**1,412**	**2,307**

Carbon storage and gross carbon sequestration value is calculated based on the price of $0.14666 per kilogram.
Avoided runoff value is calculated by the price $2.361/m³. The user-designated weather station reported 140.2 centimeters of total annual precipitation.
Energy saving value is calculated based on the prices of $280.00 per MWH and $19.24 per MBTU. Trees less than 10ft/3m tall or further than 60ft/18m away from buildings do not provide energy benefits to nearby buildings.
Pollution removal value is calculated based on the prices of $1.61 per kilogram (CO), $11.55 per kilogram (O3), $1.72 per kilogram (NO2), $0.63 per kilogram (SO2), $400.91 per kilogram (PM2.5).
Structural value is the compensatory value calculated based on the local cost of having to replace a tree with a similar tree.
A value of zero may indicate that ancillary data (pollution, weather, energy, etc.) may not available for this location or that the reported amounts are too small to be shown.

Appendix 5. Post-Hurricane Changes in Species Abundance in Residential Yards of the Rio Piedras Watershed.

Species	Pre-hurricane # individuals	Post-Hurricanne # individuals	% Lost
Acalypha wilkesiana	1	0	100.00
Adonidia merrilli	6	6	0.00
Allamanda blanchetii	1	1	0.00
Annona muricata	10	10	0.00
Annona reticulata	1	1	0.00
Araucaria heterophylla	1	1	0.00
Ardisia elliptica	2	2	0.00
Ardisia solanacea	1	0	100.00
Artocarpus altilis	3	3	0.00
Averrhoa carambola	4	4	0.00
Azadirachta indica	1	1	0.00
Bougainvillea glabra	2	2	0.00
Breynia disticha	1	1	0.00
Brunfelsia pauciflora	1	1	0.00
Caesalpinia ferrea	3	3	0.00
Cajanus	8	4	50.00
Callistemon citrinus	2	1	0.00
Calophyllum antillanum	1	1	0.00
Carica papaya	3	1	66.67
Caryota mitis	1	0	100.00
Cestrum diurnum	6	6	0.00
Chrysobalanus icaco	4	3	25.00
Chrysophyllum cainito	2	1	50.00
Citharexylum spinosum	1	1	0.00
Citrus	2	1	50.00
Citrus aurantifolia	12	9	25.00
Citrus limon	2	2	0.00
Citrus reticulata	1	1	0.00
Citrus sinensis	8	8	0.00
Citrus x jambhiri	1	1	0.00
Clerodendrum quadriloculare	4	3	25.00
Coccoloba pubescens	1	0	100.00
Coccoloba uvifera	2	2	0.00
Cocos nucifera	2	1	50.00
Codiaeum variegatum	14	11	21.43
Cordyline fruticosa	1	1	0.00
Cupressus sempervirens	4	0	100.00

Appendix 5. Post-Hurricane Changes in Species Abundance in Residential Yards of the Rio Piedras Watershed.

Species	Pre-hurricane # individuals	Post-Hurricanne # individuals	% Lost
Dovyalis hebecarpa	1	1	0.00
Dracaena	2	2	0.00
Dracaena fragrans	2	2	0.00
Dracaena marginata	8	8	0.00
Dracaena reflexa	1	1	0.00
Duranta	23	20	13.04
Duranta erecta	4	4	0.00
Dypsis lutescens	22	17	22.73
Euphorbia	1	0	100.00
Ficus benjamina	27	25	7.41
Ficus carica	1	1	0.00
Ficus lyrata	1	1	0.00
Flacourtia indica	1	1	0.00
Graptophyllum pictum	2	1	50.00
Hibiscus rosa-sinensis	39	36	7.69
Inga vera	1	1	0.00
Lagerstroemia indica	1	1	0.00
Leea guineense	4	1	75.00
Livistona	1	1	0.00
Malpighia emarginata	4	3	25.00
Mammea americana	1	1	0.00
Mangifera indica	11	8	27.27
Melicoccus bijugatus	1	1	0.00
Morinda citrifolia	3	3	0.00
Moringa oleifera	1	1	0.00
Murraya paniculata	3	3	0.00
Musa acuminata	27	13	51.85
Musa x paradisiaca	88	34	61.36
Mussaenda frondosa	1	1	0.00
Myrciaria floribunda	1	1	0.00
Ochna serrulata	2	2	0.00
Persea americana	5	4	20.00
Phoenix dactylifera	1	1	0.00
Phyllanthus acidus	2	2	0.00
Pimenta racemosa	3	2	33.33
Pithecellobium dulce	1	1	0.00
Plumeria	2	1	50.00

Appendix 5. Post-Hurricane Changes in Species Abundance in Residential Yards of the Rio Piedras Watershed.

Species	Pre-hurricane # individuals	Post-Hurricanne # individuals	% Lost
Plumeria alba	1	1	0.00
Plumeria rubra	1	1	0.00
Polyscias guilfoylei	1	1	0.00
Psidium guajava	14	11	21.43
Pterocarpus indicus	2	2	0.00
Ptychosperma	2	2	0.00
Ptychosperma macarthurii	30	21	30.00
Punica granatum	2	2	0.00
Roystonea borinquena	7	7	0.00
Roystonea regia	3	1	66.67
Salvia	1	0	100.00
Schefflera	1	1	0.00
Schefflera arboricola	4	4	0.00
Schinus terebinthifolius	3	3	0.00
Syzygium cumini	1	1	0.00
Syzygium jambos	1	1	0.00
Syzygium malaccense	1	1	0.00
Tabernaemontana divaricata	4	4	0.00
Tamarindus indica	1	1	0.00
Tecoma stans	1	1	0.00
Theobroma cacao	1	1	0.00
Thespesia grandiflora	1	1	0.00
Total Stems	**502**	**368**	**Ave/yard= 16.94%**