City of Tampa 2011 Urban Forest Analysis
The Structure, Composition, Function and Economic Benefits of Trees and the Urban Forest

September 2013

Executive Summary

Acknowledgments

Authors

Dr. Shawn M. Landry, University of South Florida
Robert J. Northrop, UF/IFAS Extension, Hillsborough County
Dr. Michael G. Andreu, University of Florida
Carolyn Cheatham Rhodes, University of Florida

Project Contributors

Jan Allyn, University of South Florida
Kathy Beck, City of Tampa
Catherine Coyle, City of Tampa
Jarlath O'Neil-Dunne, University of Vermont
Dr. Ruiliang Pu, University of South Florida

Sponsors

Citation for full report:

Landry, Shawn M., Robert J. Northrop, Michael G. Andreu, and Carolyn C. Rhodes. 2013. City of Tampa 2011 Urban Forest Analysis: The Structure, Composition, Function and Economic Benefits of Trees and the Urban Forest. Final Report to the City of Tampa, September 2013. City of Tampa, Florida.

For questions or comments concerning the City of Tampa Urban Forestry efforts contact Kathy Beck, Natural Resource Coordinator, City of Tampa Planning and Development at Kathy.Beck@tampagov.net.

Executive Summary

The City of Tampa Urban Ecological Assessment provides a detailed scientific look into the economic and ecological values of the City of Tampa's urban forest. The City of Tampa tree ordinance (Ord. No. 2006-74, § 9, 3-23-06) requires a re-inventory of Tampa's tree canopy and urban forest every five years. This report provides detailed information about the 2011 conditions of the urban forest, as well as how the forest and associated benefits have changed over the five-year monitoring interval since 2006–7. Included is detailed information about the distribution of Tampa's tree canopy cover, results of extensive field sampling that describe forest composition, structure and health, and model results that quantify the economic benefits and ecosystem services provided by Tampa's urban forest. The outcomes from this study can serve as the basis for enhancing the understanding of the urban forest's values, improving urban forest policies, planning and management, and providing empirical data for the inclusion of trees within environmental regulations.

Satellite and high-resolution aerial photography from 2011 was used to classify and map the location of tree canopy, other vegetation, water, bare earth and impervious land cover. This accurate map was compared to the high-resolution map created in 2006. A four-decade long record of NASA Landsat satellite photographs was used to examine how tree canopy has changed since 1975 in Tampa.

- Tree canopy covered 32% of the City in 2011. An additional 32% of land area was covered by other vegetation (i.e., grass, short plants and shrubs), indicating large areas potentially available for tree planting.

- Tree canopy covered approximately 24,290 (+/- 1,215) acres of land in 2011 and 22,104 (+/- 1,105) acres in 2006.

- There was a slight, but not necessarily significant, increase of zero to 3% tree canopy cover between 2006 and 2011.

- Change in tree canopy between 2006 and 2011 varied throughout the City and ranged from a loss of more than 15% tree cover to a gain of greater 15%.

- The total acreage of tree canopy within the Residential 10 Units/Acre land use (37,035 ac) is twice as much as the land area covered by trees for all other land uses combined (17,285 ac).

- Public or Quasi-public represents four of the top twelve land use categories in terms of acreage of tree canopy, including: Environmentally Sensitive Areas (5,857 ac tree canopy); Right-of-way (2,742 ac); Public/Semi-public (733 ac); Recreation and Open Space (686 ac).

- By Planning District, the New Tampa Planning District has the highest proportion of tree canopy cover (45%), followed by USF Institutional (37%), South Tampa (29%), Central Tampa (27%) and Westshore TIA (15%).

- Based on the US Forest Service definition of Possible Urban Tree Canopy and the distribution of other vegetation in Tampa (e.g., grass and shrubs), the possibility of additional tree planting appears fairly large in all of the planning districts, in most zoning and land use categories, in all City Council Districts, and in many neighborhoods.
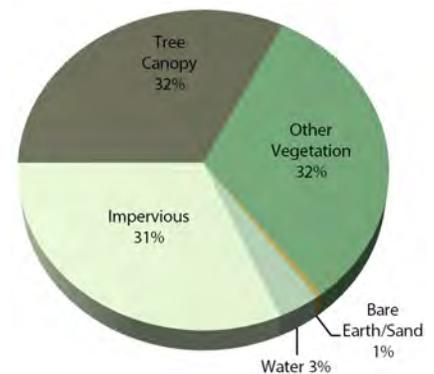
Approximately two-hundred permanent field plots were randomly distributed within the City, and sampled in 2006–7 and again in 2011. Forestry measurements were collected from these plots and then analyzed using the U.S. Forest Service i-Tree Tools to determine the vegetative structure, functions, and values of the urban forest in Tampa.

- Based on the 2011 field sampling, it was estimated that there were approximately 8.7 million trees in Tampa (i.e., a tree is defined as a woody stem with a diameter of at least 1 inch). This inland region (non-coastal areas; excluding mangroves) of the urban forest contained an estimated 4.4 million trees represented by 90 tree species.

- There was an increase in the estimated number of trees from 2006 to 2011 in all but three land use categories: Public/Quasi-public/Institutions, Public Communications/Utilities, and Right-of-way/Transportation.

- The top ten tree species, based on total number of stems, included: white mangrove, non-native invasive Brazilian pepper, red mangrove, black mangrove, cabbage palm, laurel oak, live oak, Carolina laurel cherry, sweetgum and the white lead tree (also a non-native invasive).

- The highest diversity of tree species was found in the Residential, Recreational/Open Space/Natural, and Right-of-way/Transportation land use categories.

- 82.6% of all trees (including mangroves) have a diameter of 6 inches or less.

- Tree density, the number of trees per acre, was highest on the Recreational/Open Space/Natural (453 trees/ac) and Vacant (280 trees/ac) land use categories.

- The best available scientific models calculated with i-Tree Tools were used to estimate a monetary value that the ecosystem services of the urban forest provides to the residents, businesses and visitors of City of Tampa. These values include only a portion of the potential benefits provided by trees and the urban forest.

- Pollution removal by trees and shrubs was 1,163 tons/year and valued at $9.9 million/year. Pollutants include carbon monoxide, ozone, sulfur dioxide, nitrogen dioxide and particulate matter less than 10 microns. Values estimated include health effects and externality costs associated with pollutants.

- Carbon storage was 619,000 tons and valued at $44.1 million. This includes the amount of carbon bound up in the above-ground and below-ground parts of woody vegetation.

- Carbon sequestration rate was 52,600 tons/year and valued at $3.7 million/year. This is the annual removal of carbon dioxide from the air by vegetation.

- Oxygen production was 127,000 tons/year. A specific monetary value is not calculated, but oxygen is obviously important.

- Building energy savings was valued at $4.7 million/year and the associated avoided carbon emissions were valued at $578 thousand/year. This includes only residential energy savings resulting from shade provided by trees.

- Avoided cost of stormwater management was $10.8 million/year as a result of the estimated interception of 162 million cubic feet/year of rainfall by leaves of trees.

- Compensatory value was $1.83 billion. The compensatory value is an estimate of the amount of money it would cost to replace the trees in the City of Tampa if they were removed (e.g., deliberately or due to a storm).

- The overall annual value of all of the benefits mentioned above is approximately $34.6 million/year.