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City of Tampa Urban Forest Management, Monitoring and Policy

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Introduction

The direct and indirect benefits provided by trees to people living within densely populated towns and cities have been well-documented (e.g., Grey and Deneke, 1986; Nowak and Dwyer, 2007). In addition to providing an aesthetic benefit, trees and forests can sequester and store carbon (e.g., Nowak, 1994b; Nowak and Crane, 2002), moderate urban temperatures (Oke, 1989), reduce heating and air conditioning requirements (McPherson, 1994) and mitigate air pollution (Escobedo and Nowak, 2009; Escobedo et al., 2008b; Nowak, 1994a). Trees have been associated with an increase in residential property values (Anderson and Cordell, 1988; Tyrvaenen and Miettinen, 2000) and consumers prefer business districts with trees (Wolf, 2005). Research also suggests that the presence of trees may have benefits for human health (Lovasi et al., 2008; Takano et al., 2002), social cohesion (Kweon et al., 1998), neighborhood vitality (Sullivan et al., 2004), and reduced aggression and crime (Kuo and Sullivan, 2001a, b). Public opinion surveys have shown that urban residents recognize and value these benefits, but also express concern about some of the problems associated with trees (Escobedo et al., 2008a; Landry, 2013; Lohr et al., 2004). Consequently, an intrinsic goal of urban forest management is to maximize the benefits associated with trees while minimizing the costs and problems.

Urban forest management is not a new phenomenon; cities have been managing trees and forests for centuries (Grey and Deneke, 1986; Lawrence, 1988, 1995). However, recently many cities have developed urban forest management plans (aka master plans) that explicitly aim to quantify and then increase the social, environmental and economic benefits of the urban forest (ACTrees, 2013). In November 2013, the City of Tampa, Florida joined cities such as Seattle and Pittsburgh, by adopting a comprehensive urban forest management plan (Northrop et al., 2013) that links forest monitoring, education, government processes and programs, and regulatory policies to the achievement of specific quantifiable long-term urban forest goals. This article was developed in conjunction with a “Trees in the City” field trip offered at the Association of American Geographers 2014 Annual Meeting in Tampa. The purpose of this article is to provide an overview of urban forest management, monitoring and policy in the City of Tampa, Florida.

Study Area and Methods

The City of Tampa (28°N, 82°W) is located on the west coast of Florida at approximately the mid-point of the peninsula. Figure 1 is a map of the City of Tampa political jurisdiction as of 2011 (Tampa, 2010). Total area of the study area is 117 square miles (75,108 acres). Tampa is a relatively young city. Its population has increased from only 720 persons in 1880, to over 100,000 by 1930, 274,970 in 1960, 280,015 in 1990, 303,447 in the year 2000 and 335,709 in

2010 (Landry and Pu, 2010; US Census Bureau, 1990, 2000, 2010). Tampa is also a city that continues to experience growth within the urban core. The total number of housing units increased within the City of Tampa from 135,776 units in the year 2000 to 157,130 in the year 2010.

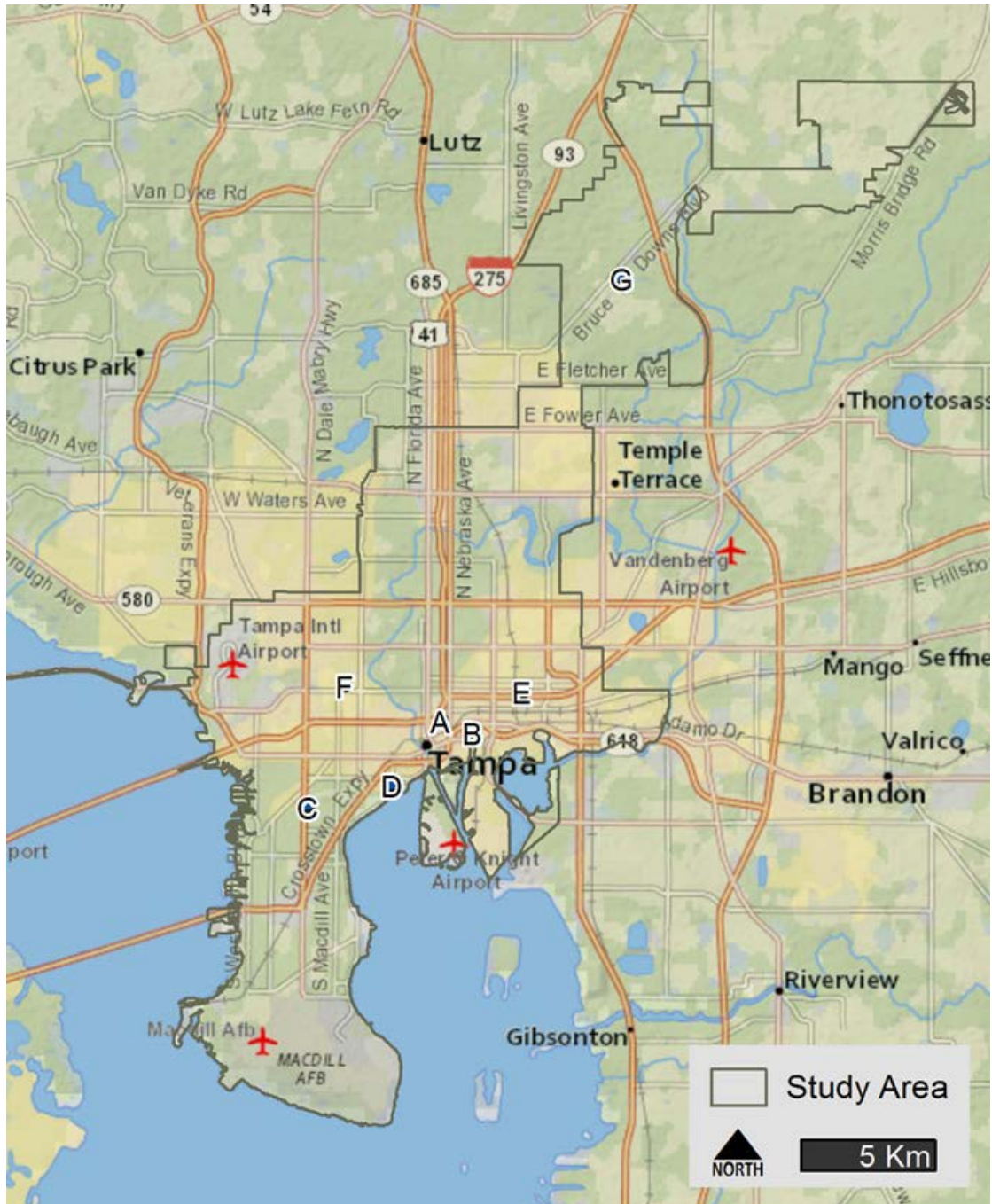


Figure 1. Study Area with select locations labelled: A) Downtown Tampa; B) Channelside District; C) South Tampa; D) Hyde Park; E) East Tampa; F) West Tampa; G) North Tampa.

The content of this article came from several sources. Published articles, reports and popular press sources are used to provide background information about Tampa's history with trees. Results from previous research and collaborative efforts led by the authors have been summarized (Andreu *et al.*, 2008; Landry *et al.*, 2013; Landry *et al.*, 2009), and the authors have added previously unpublished descriptions of methods and processes used to produce these reports. Finally, a handful of semi-structured interviews were conducted by the lead author with key informants who were knowledgeable of issues associated with tree regulation and management within the City of Tampa and involved in the development of the Urban Forest Management Plan (Northrop *et al.*, 2013). Interviewees included a city administrator, a city natural resources staff member, a landscape architect and a custom home builder. Although this is a small number of interviewees, it was expected that their diversity in professional background is sufficient to provide useful information. Interviews were recorded to ensure the accuracy of quotes. These informants were asked four questions about the plan, including: 1) Who were the primary actors that pushed for the development of the plan; 2) What were the issues that motivated people to think a plan was necessary; 3) Do you think the process used to develop the plan was successful; and 4) What do think will be the impact of this plan? Although a detailed analysis of the results from these interviews is not included here, the diverse opinions of key informants are used to provide a more complete description of the recent history of urban forest management within the City of Tampa.

A Brief History of Trees in Tampa

Humans have long had a close relationship with trees and forests in the Tampa area. The city was once covered by extensive forests of upland pine trees, intermixed with wetland forests of large cypress trees and other hardwood species, mangroves, wet prairies and numerous oak species. A map developed to estimate circa 1820 vegetation and land use in Hillsborough County (see figure 2) shows that Tampa was likely covered by extensive pine forests (Lee, 1979). Downtown Tampa (see figure 1 labels) was a xeric (*i.e.*, dry) oak hardwood forest and the Channelside District was a salt marsh. South Tampa was covered in pine, interspersed with wet prairie, marshes and hydric hammocks; Hyde Park was grassy scrub. East Tampa was almost entirely pine forest. West Tampa was dotted by marshes, cypress and hydric hammock. North Tampa had extensive wetlands, cypress strands, wet prairies, hydric hammocks and marshes.

Tampa's forest ecosystems have long been impacted by the actions of people. Native populations in Florida managed forests for thousands of years by starting fires for hunting and agriculture (TBHC, 2006). Spanish visitors logged large cypress along the Hillsborough River for use as ship masts (Jahoda, 1973). During the last half of the nineteenth century, sawmills in the Tampa area supplied pine lumber and turpentine, and workers milled cedar into pencils for northern markets (Covington, 1957; Maio *et al.*, 1998). Similar to the widespread harvesting in the northern U.S. that occurred a century earlier, the forests of the Tampa area had been extensively cut by the early twentieth century (Leighty *et al.*, 1958).

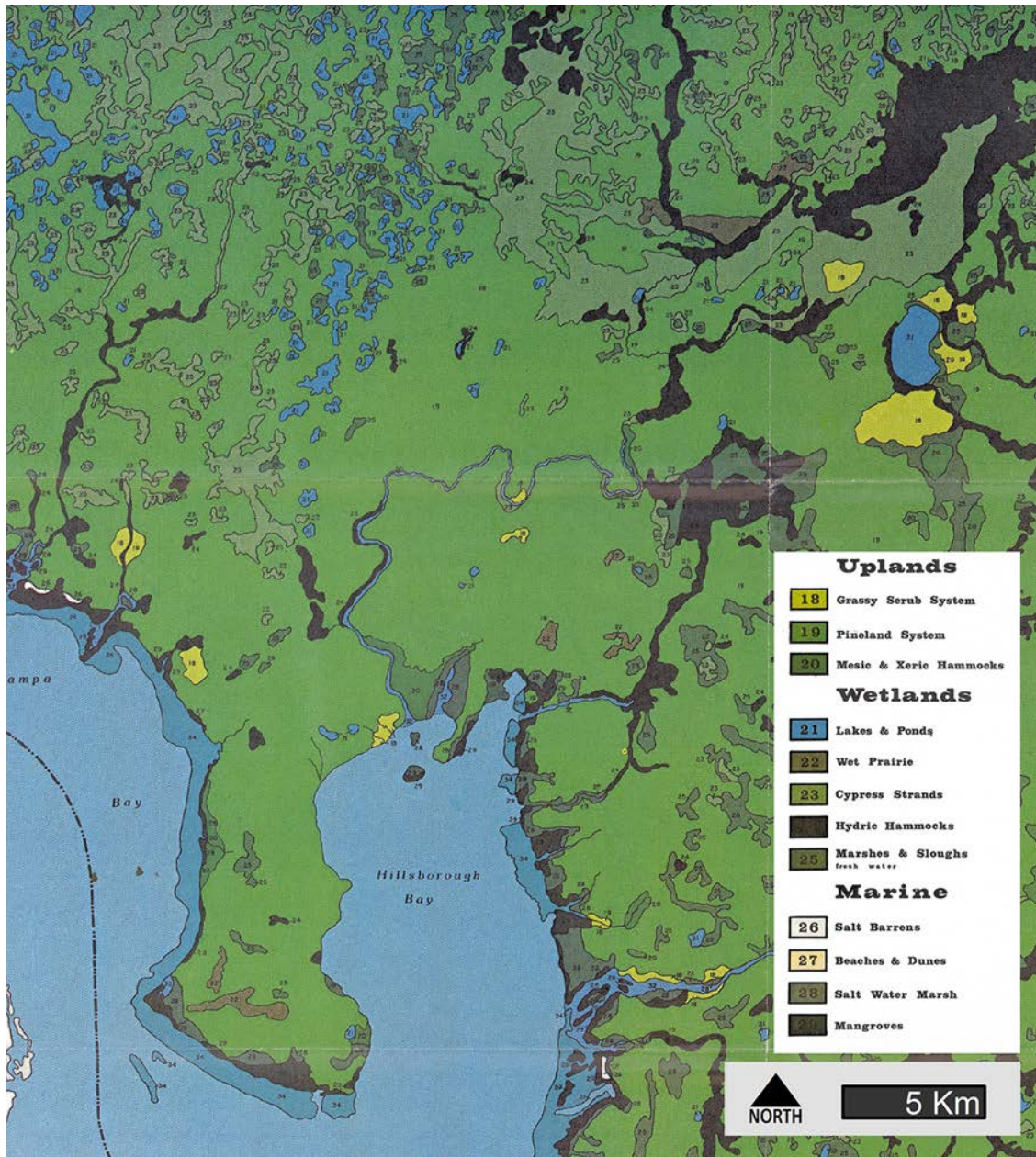


Figure 2. Circa 1820 vegetation map shows extensive pine forests in the Tampa area (source: Lee 1979).

Settlement of the Tampa area by United States residents began with the establishment of Fort Brooke in 1824, two years after Florida became a U.S. territory (Gannon, 2003). However, land ownership was prevented and timber resources were protected for use by the military within the 16-square mile military reserve established around the fort (Chamberlain, 1985). It was not until 1848 that President Polk signed legislation giving Hillsborough County title to 160 acres to establish Tampa and allowing it to sell parcels to the 1200 residents of the town (Brown, 1999). The United States Bureau of Land Management General Land Office survey map from circa 1952 (see Figure 3) shows the 160 acres that was established as Tampa. Population growth

was slow as a result of wars with the Seminoles, hurricanes (in 1848 and 1852), yellow fever, Civil War, and the lack of a railroad link to the rest of the country. In 1880, there were only 720 people living in Tampa (Mormino and Pozzetta, 1998). An 1869 account of the route from downtown Tampa to the west (figure 3; A to B), a route parallel to today's Interstate 275, describes the undeveloped character of the open pine flatwoods forests which once dominated the Tampa landscape:

...the route, for the greater part of the distance of seven miles, is through an open forest of pines, of the species previously met with; the lack of undergrowth afforded pleasant and shaded vistas in every direction. In following the sandy road we waded through broad and shallow pools, miniature lakes made by the recent rains... (Stearns, 1869, p. 456)

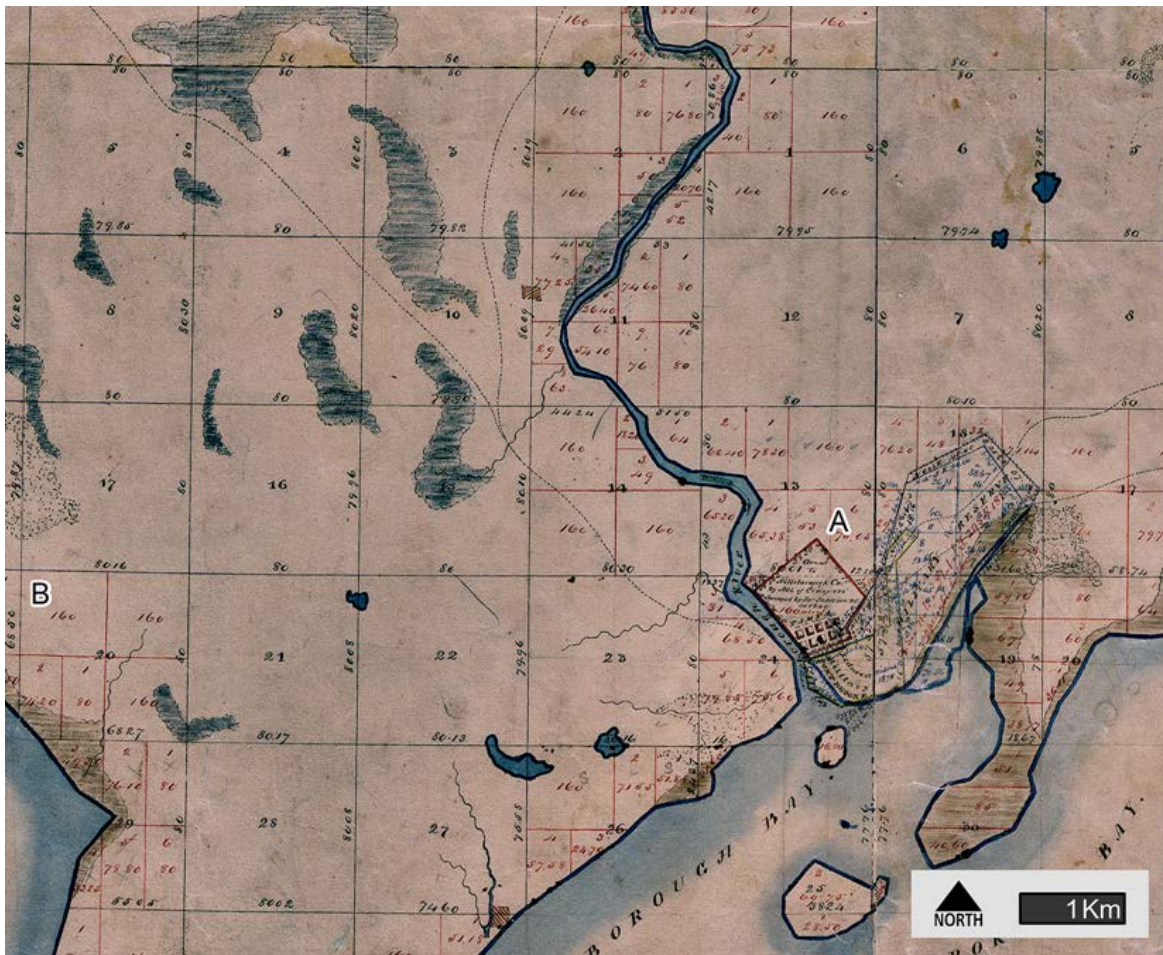


Figure 3. Circa 1852 General Land Office Survey map shows original 160 acre area of Tampa. Labels A to B indicates path of present-day Interstate 275 (source: www.glorerecords.blm.gov).

Large-scale population growth and development of forested lands came to the City of Tampa during the last two decades of the nineteenth century. Growth was facilitated by the building of Henry Plant's Florida Transit and Peninsula Railroad in 1884 connecting Tampa to Jacksonville, and the dredging of shipping channels in Tampa Bay to allow larger cargo ships to reach the port. Since that time, the population of Tampa has grown from only 720 persons in 1880 to become one the largest metropolitan areas in Florida with 335,709 people in 2010 (US Census

Bureau, 2010). Along with the growth in population, the jurisdictional boundaries of the City have grown through land annexation. Formerly native forests have become intermixed with urban development, and forests once harvested for timber have been replanted with residential landscapes. The physical boundary between the urban and wild native forest has been blurred, along with the ecological functions and values that forests provide. As shown by current satellite imagery (see Figure 4), Tampa residents now live within a mosaic of urban development and patches of trees, forests and other vegetation; an urban forest.

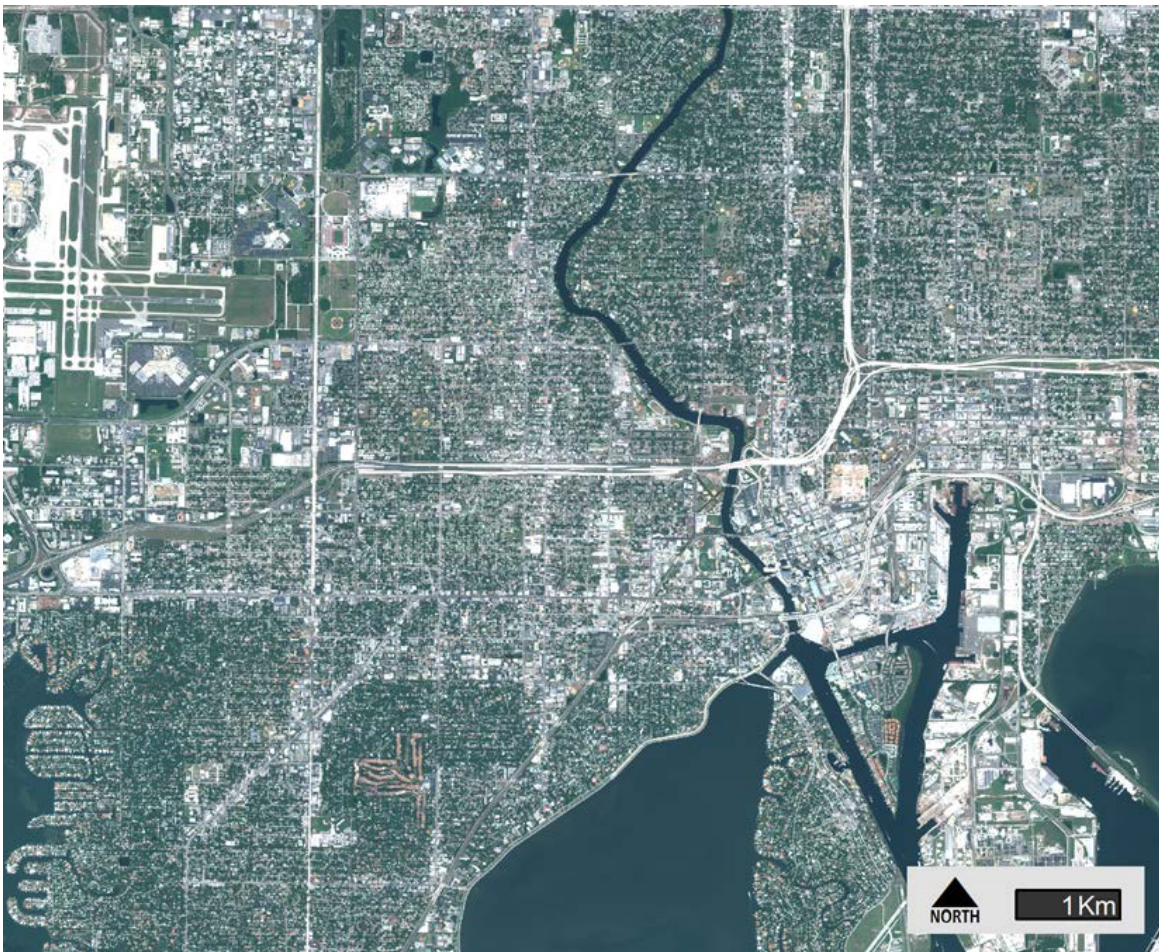


Figure 4. Satellite image of downtown Tampa and surrounding area from April 2011 (source: Digital Globe, WorldView2 image)

Toward a Science-Based Urban Forest Management

The City of Tampa has been protecting and regulating trees for more than forty years, since the original tree ordinance was adopted in 1972. At that time Tampa was expanding and the typical mode of new development involved clearing and leveling large plots of land in order to build on bare ground. It was not uncommon for residents to watch as centuries old Southern Live Oak trees (*Quercus virginiana*), among the South's most important icons, were bulldozed to make room for new suburban housing developments. By comparison with ordinances adopted in other U.S. jurisdictions at about the same time (Coughlin et al., 1988; Lapping and Kurtz, 1976), the City of

Tampa's original and subsequent tree ordinances were very restrictive; regulating the removal of nearly all trees (i.e., trunks greater than two inches in diameter) on private and public lands. The criteria for removal were generally limited to trees which posed a safety hazard, trees which prevented the development or use of a parcel, and diseased or damaged trees. The detailed requirements of the ordinances were modified over time, but the regulations addressed site clearing and landscaping requirements on new development, and tree removal and replacement on new and existing developments (K. Beck, City of Tampa Parks, personal communication, April 26, 2007 and May 8, 2009).

In the decades since the adoption of the 1972 tree ordinance, the City of Tampa has continued to experience tremendous land development and redevelopment pressures. The population of Tampa increased by more than 20% since 1970 (www.census.gov). Based on a 2006 report (Tampa, 2006), the growth in housing averaged 1,164 new units per year between 1985 and 2006. The same report indicated that between 2000-2006, Tampa averaged 2,144 new units per year. Much of the development during the 1980s and 1990s occurred within the newly annexed suburban lands (Tampa annexed 66 km² between 1981 and 1998). In contrast, growth pressure during the early 2000s also took place in older areas of the City where protection of large trees was in conflict with the redevelopment of smaller single-family homes into larger homes or multi-family complexes.

The tree versus building conflict seems to have been associated with political conflicts between home builders, regulatory staff and neighborhood residents. There were a large numbers of variance requests to remove large trees in existing neighborhoods, nearby residents voiced complaints about the removal of many grand trees, and City staff was caught in the middle with the responsibility to enforce tree regulations. A landscape architect interviewed by the lead author reminds us that home construction is a for-profit business, such that when it comes to expensive mitigation efforts related to tree protection "...developers would not spend a dime that he was not forced to spend." The interviewee then said that residents often have the viewpoint, "That tree is essential to the world" and that there is a "...community demand for [tree] regulation." The same interviewee then emphasized that City staff enforcing tree ordinances were required to be in the position "of arguing whether a tree needed to be preserved." A single large tree, protected under the City's regulations, could add many thousands of dollars in cost and result in weeks or months of delay for a redevelopment project that knocked down one house to build a new one. According to a custom home builder who was interviewed for this study, a difference in property value could be "...\$200,000 – 300,000 based on whether a lot is buildable or not depending on the trees." The lead author had first-hand experience that illustrates the importance of trees on whether a developer would be interested in purchasing and redeveloping a property. In May of 2013, the lead author contacted a developer who recently redeveloped several homes in his neighborhood to ask about the "tear-down" value of his own property. The developer responded with a single question, "Do you foresee any tree issues if we were to build there? That's pretty much the only thing we look for when we look at properties."

According to a City of Tampa natural resources staff member, the early 2000s were a period with "Lots of tension between [City staff and] builders because the regulations were slowing them up." The interviewee further summarized what led to a regulatory change that would ultimately lead to the development of science-driven urban forest management and regulation within the City. According to the interviewee, the Tampa administration planned to revisit and revise the regulatory process, "The tensions were getting so high. The [Tampa Bay] Builders Association, at that time, figured that 'well, if you're going to start this [revision of the regulatory process] up

all over again, we need to understand why you're doing it.' And they are the ones that asked for the canopy analysis." According to the custom home builder, for several years the building sector had been "...pushing for a tree study to establish a baseline, as a way of grading ourselves whether we were moving toward or away from our goals." Speaking in 2014, the natural resources staff member reflected on the role of the Tampa Bay Builders Association, "... I really have to give them a lot of credit for initiating this process." The city administrator, the custom home building and the landscape architect who were interviewed suggested that the tree study and subsequent management plan moved away from a focus on single-tree protection and toward a quantitative approach to the management of the urban forest. According to the custom home builder, "I have been dealing with tree issues since the first ordinance and it has always been a single tree issue... it is hard to do business in that environment... as you look at the whole, it is going to be beneficial to all parties."

In 2006, the City modified its tree ordinance (Ord. No. 2006-74, § 9, 3-23-06) to require a tree canopy analysis and urban forest monitoring every five years. Since that time, two major urban forest research and monitoring projects have been completed (Andreu et al., 2008; Landry et al., 2013) and in 2013 the City adopted a comprehensive urban forest management plan (Northrop et al., 2013). The 2006 revision to the tree ordinance initiated a science-based process of urban forest management in the City of Tampa. The next sections of this article summarize the results of these efforts.

Urban Forest Monitoring and Analysis

In 2006, the City of Tampa provided funding to the University of South Florida, University of Florida and the UF/IFAS Hillsborough Extension Service to design and conduct an assessment of the City's urban forest. The analysis was designed to provide detailed information about the current condition of the urban forest, as well as how the forest and associated benefits have changed over time. The results of these efforts included urban tree canopy maps and maps of temporal change utilizing remote sensing technologies, field sampling designed to quantify forest composition, structure and health, and U. S. Forest Service i-Tree modeling (USDA, 2006) that estimated the economic benefits and ecosystem services provided by Tampa's urban forest. The City of Tampa's initial urban forest assessment took place in 2006 (Andreu et al., 2008) and a follow-up assessment was conducted five years later, in 2011 (Landry et al., 2013). Detailed urban forest assessment methods and results can be found in either document.

Results of the 2011 urban tree canopy mapping and analysis indicate that 32% of the land area within the City was covered by canopy while an additional 32% of land area was covered by other vegetation (i.e., grass, short plants and shrubs). Figure 5 shows the distribution of tree canopy cover within the City of Tampa, clearly indicating a wide range of tree cover within and between neighborhoods. Based on the US Forest Service definition of Possible Urban Tree Canopy (Grove et al., 2006; Locke et al., 2010) and the distribution of other vegetation in Tampa (e.g., grass and shrubs), the possibility of additional tree planting appears fairly large in many neighborhoods of the City. A change analysis based on four different estimation methods (i.e., Landsat, dot-based photointerpretation, land cover classification and i-Tree field sampling) indicate that there was a slight increase of up to 3% tree canopy cover between 2006 and 2011 (Table 1). Analysis of long-term change concluded that average citywide tree canopy cover had returned to 1970s levels, but that change was not positive in all areas of the City.

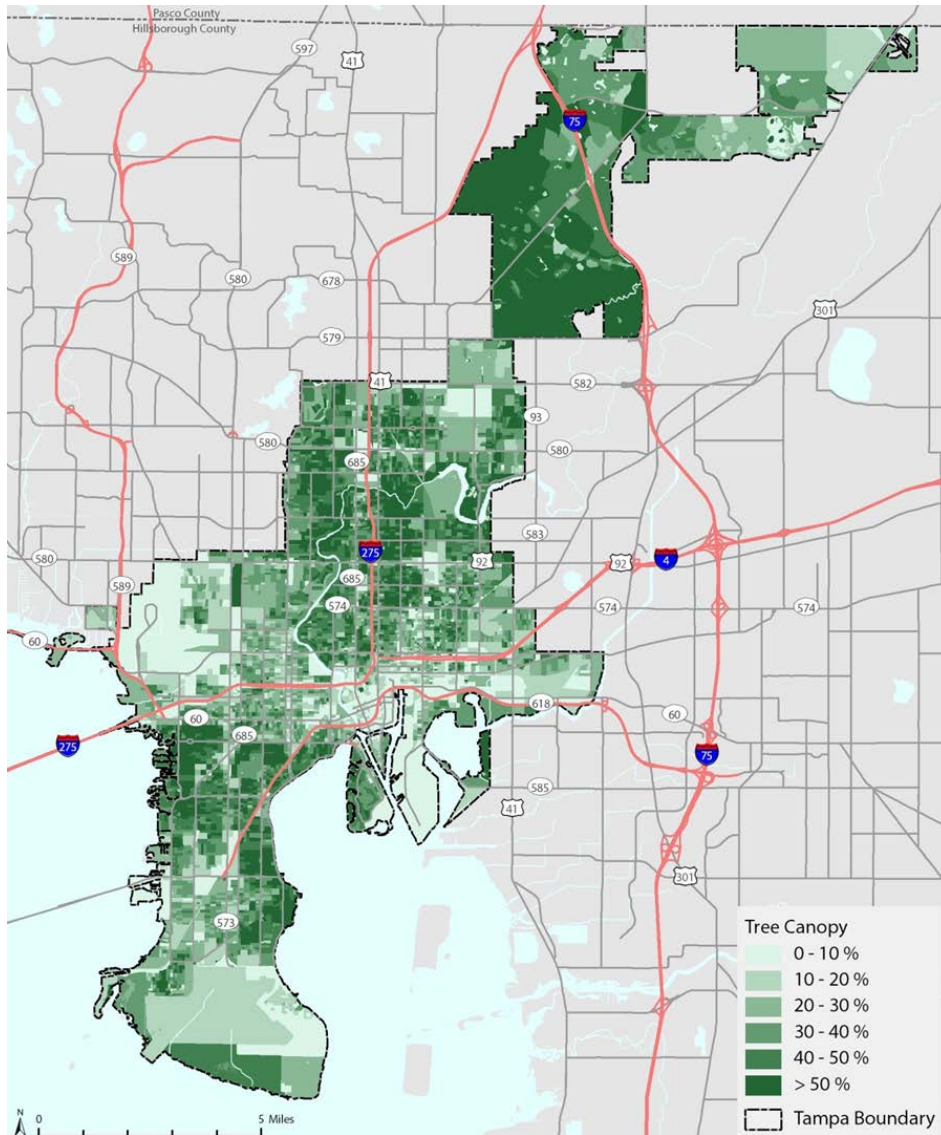


Figure 5. Map of 2011 Tree Canopy Cover aggregated by Census block.

Method	Tree Canopy Estimates		
	2006	2011	2006 □ 2011 Change
Landsat image analysis	22%	24%	2% increase
Field Sampling Methods	28%	28%	No change
Land cover classification	29%	32%	3% increase
Dot-based change analysis	31%	33%	2% increase

Table 1. Multiple Analyses of 2006-2011 Tree Canopy Change.

Results of the 2011 i-Tree field sampling estimated that there were approximately 8.7 million trees in Tampa (a tree is defined as a woody stem with a diameter of at least one inch), including coastal mangroves. The top ten tree species, in descending order based on total number of stems, include: 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). Excluding mangroves, the urban forest in Tampa contained an estimated 4.4 million trees represented by 90 tree species. The highest diversity of tree species was found in the Residential, Recreational/Open Space/Natural, and Right-of-way/Transportation land use categories.

Estimates of ecosystem services were calculated using i-Tree Tools to estimate the monetary value of benefits to residents, businesses and visitors to the City of Tampa (see Table 2). These values included only a portion of the potential benefits provided by trees and the urban forest. Pollution removal by trees and shrubs was estimated 1,163 tons/year and valued at \$9.9 million/year, including health effects and externality costs associated with carbon monoxide, ozone, sulfur dioxide, nitrogen dioxide and harmful particulate matter smaller than 10 microns. This includes the amount of carbon bound up in the above-ground and below-ground parts of woody vegetation. The carbon sequestration rate was 52,600 tons/year and valued at \$3.7 million/year. Oxygen production was 127,000 tons/year. Residential building energy savings resulting from shade provided by trees was valued at \$4.7 million/year and the associated avoided carbon emissions were valued at \$578,000/year. 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. The overall annual value of all of the benefits above is approximately \$34.6 million/year. In addition, total carbon storage was 619,000 tons and valued at \$44.1 million, and compensatory value of \$1.83 billion reflects the amount of money it would cost to replace all trees in the City of Tampa if they were removed either deliberately or due to a storm.

Feature	2006	2011
Number of Trees	7,817,000	8,677,000
Compensatory Value	\$1.6 billion	\$1.8 billion
Carbon Storage	525,000 tons (\$37.4 million)*	619,000 tons (\$44.1 million)*
Pollution Removal	1,258 tons/year (\$10.7 million/year)**	1,163 tons/year (\$9.9 million/year)**
Gross Carbon Sequestration	48,000 tons/year (\$3.4 million/year)*	52,600 tons/year (3.7 million/year)*
Value of Energy Conservation	\$4.6 million/year	\$4.7 million/year
Rainfall Interception	n/a	\$10.9 million/year
Reduced Health Impacts	n/a	\$5.4 million/year

*Value for carbon estimated at \$71.2/US short ton.
 **Pollution removal value is calculated based on the prices of \$1,136 per ton (carbon monoxide), \$15,565 per ton (PM10). Ozone, sulfur dioxide, nitrogen dioxide and particulate matter less than 2.5 microns are calculated based on US EPA BenMAP model. Energy savings values calculated by \$117.6/MWh and \$17.72/MBtu

Table 2. Estimates of the value of ecosystem services associated with Tampa's Urban Forest

The monitoring and assessment efforts supported by the City of Tampa have led to additional academic research efforts. Multispectral IKONOS and WorldView2 satellite imagery purchased for tree canopy mapping has been used to test land cover classification (Pu et al., 2011) and tree species mapping (Pu and Landry, 2012) techniques. Tree canopy estimates were used to examine environmental equity implications of disproportionate street tree distributions (Landry and Chakraborty, 2009) and to examine the impact of Tampa's tree ordinance (Landry and Pu, 2010). Several social surveys have been conducted (Escobedo et al., 2008a; Northrop et al., 2010), including a Master's thesis (Foster, 2010) and a recently completed doctoral dissertation (Landry 2013) that utilized a household questionnaire and semi-structured interviews to better understand street tree management.

Tampa and the surrounding Tampa Bay Watershed has become an important location for urban forest research involving the U.S. Environmental Protection Agency (www.epa.gov/ged/tbes), the U.S. Forest Service (Schwert et al., 2014) and Florida's major universities. One of the most enduring outcomes of these efforts has been the formation of a very strong partnership between individuals from government, businesses, neighborhoods associations, advocacy groups and academia to facilitate urban forest research, management and education within the City of Tampa. This partnership led to the development of the City's Urban Forest Management Plan which will be described in the next section of this paper.

City of Tampa Urban Forest Management Plan

As a follow-up to the original urban forest assessment (Andreu et al., 2008), the City of Tampa started a multi-year process to develop a comprehensive Urban Forest Management Plan. The urban forest assessment, as highlighted in the previous section, provided information about the structure, diversity, health and distribution of trees and the urban forest, and how the tree canopy had changed over time. However, the report was purposefully designed not to make recommendations about specific management strategies or regulatory policies. The reason for this deliberate approach is illustrated by a discussion held during a February 2008 meeting between the authors, Tampa's Mayor Pam Iorio, and her executive staff. After the authors presented the results of the urban forest assessment, including the fact that there was 28% tree canopy cover in 2006, the Mayor then asked (paraphrasing) how much tree canopy is right for the City? The authors responded by asking the question (paraphrasing), what do you want from the urban forest? The exchange highlighted the futility of developing urban forest management plans and policies without first understanding the long-term needs and desires of the community.

The City of Tampa initiated the discussion about urban forest management when it was awarded an Urban and Community Forestry Grant from the State of Florida in 2008. The grant supported a half-day public symposium with 128 attendees who learned of the research results and then outlined major concerns and issues associated with Tampa's trees and urban forest (Tampa, 2009). The symposium was followed by formation of a multi-stakeholder Steering Committee, which was led through a facilitated process to develop a vision statement, goals and strategies to guide urban forest policy and management efforts with the City. Committee members represented the same diverse individuals and groups who had often been in conflict over tree protection regulations, including: neighborhood groups, residents, builders and developers, advocacy groups, architects, foresters and others (see Northrop et al., 2013). The Committee's vision statement, approved by consensus, emphasizes research, education and management to

promote the benefits of the urban forest, calling upon the city to “Maintain and expand Tampa’s urban forest in recognition of the many benefits it provides, including: enhancing quality of life for present and future citizens, attaining numerous economic and ecological benefits Nature provides, and seizing opportunities to better understand our natural environment through scientific research and public education” (Northrop et al., 2013). This vision would be carried through and remain part of the management plan that was ultimately adopted in 2013.

In 2011, the City partnered with the authors to complete an urban forest management plan as part of the second 5-year monitoring effort required by the 2006 tree ordinance (Ord. No. 2006-74, § 9, 3-23-06). When asked to identify the primary actors who pushed for the development of a management plan, the interviewed City Administrator said, “The strongest advocate would be our internal staff, recognizing some of the shortcomings of how we viewed trees in the past.” The interviewee suggested that the City had not been overly successful dealing with past challenges related to conflicts between trees and infrastructure, or hurricanes and other issues, and stated, “Looking forward... to be successful, our urban forest folks were able to advocate for a study.” The interviewee went on to say that “Our current mayor is very much an advocate of urban spaces and places... recognizing that trees enhance the pedestrian experience, he was on board.”

The plan was to include specific recommendations on policies, procedures and practices, and provide information required by policy makers, planners, utilities, environmental managers, businesses and citizen volunteers to optimize the benefits of the urban forest while minimizing management costs (Northrop et al., 2013). The plan followed a model for strategic urban forest planning developed by Clark et al. (1997) and Kenney et al. (2011) which recommended using a series of management criteria and performance indicators to measure urban forest management success. Over the course of two years, the authors assisted the City with a process to develop the plan, including facilitation of numerous meetings, including: open public meetings, separate meetings with an Internal Technical Advisory Committee of City department representatives (e.g., Public Works, Parks and Recreation, Planning and Development and others), and oversight meetings with the original Steering Committee. The components of the plan were organized hierarchically such that each level of the plan had to be in compliance with the level above (Figure 6). All plan components had to be in-line with the vision and goals developed by the original Steering Committee, and a set of guiding principles mandated by the City administration. Management criteria, objectives and performance indicators were developed to establish targets that would indicate a more sustainable urban forest management. Finally, alternatives for action were developed that would be expected to incrementally move the performance indicators to the next level, and prioritize the actions that would guide the first 5-year planning horizon. The plan incorporates adaptive management: oversight is provided by an Internal Technical Advisory Committee; there is a requirement to provide annual progress reports to City Council; and it is expected that changes will be made to improve the plan as needed.



Figure 6. Hierarchical organization of Management Plan elements.

Plan development required a very large amount of work effort on the part of all participants largely because it was purposely designed to be an inclusive process. The same diverse group of individuals, business groups and agencies who disagreed about tree management in the past were asked to work toward compromise solutions (Northrop et al., 2013). Commenting on the inclusive nature of the effort, the landscape architect who was interviewed acknowledged, “It was a good effort at including everyone who wanted to come. Everyone was invited.” The custom home builder suggested that the diverse audience led to a more comprehensive plan, “The way we approached it was done very well. It considered a lot of things. It took everyone’s comments.” After a two year development process, the draft plan was presented at a public workshop of the Tampa City Council on November 14, 2013. In the past, a City Council workshop about tree regulations would often be characterized by contentious comments from the public and from Council Members; all comments at the November 14th workshop were supportive of the draft plan, which the City Council adopted a week later.

The final plan is designed to provide actionable steps to move the City of Tampa toward a more sustainable urban forest for all residents. It contains over 30 performance criteria, each with multiple possible alternatives for action. The actions range from simple changes, such as requiring City departments to plant only tree species appropriate for the area, to long-term goals such as forming a consortium of planning agencies to foster regional cooperation on issues related to tree management (Northrop et al., 2013). Despite the plan’s apparent complexity, the natural resources staff member emphasized the plan’s realism, “...it was not a bunch of pie in the

sky statements... it was not one of those plans about the feel good stuff... it took little bites and made it a reality. We understand where we are and where we need to go, and we take actionable steps. It was supported. People got it. People saw that it was a real plan to manage the forest.” Although it is far too soon to judge the plan’s success given its long-term planning horizon, all of the interviews suggest that the impact should be positive. The custom home builder, someone who had frequently been constrained by tree regulations, suggested that it should have a positive long-term impact. The interviewee stated, “If we continue down this role then the impact is going to be a more secure urban forest. We will be able to make modification, but it should have a positive outcome 15-20 years from now.” The interviewee further commented that the positive impact is expected because, “It is establishing the parameters by which decisions are going to made.” The natural resources staff member recognized that long-term success will require that the plan remain adaptive, “The secret will be to keep it adaptive. Like any regulatory framework, it changes and we need to be able to keep up with change.” One of the immediate impacts of the Management Plan has been that urban forestry staff has been included at an early stage of discussions that involve impacts to trees (i.e., a stage when alternative plans can be considered). According to the natural resources staff member, the urban forestry staff is now being asked to be involved: “They all realized that we got to start talking urban forestry in the City of Tampa. Urban forestry now has a seat at the table.”

Conclusion

The view from the window of an airplane landing at Tampa International Airport is one of a fairly verdant coastal city. Citywide tree canopy cover was 32% and total vegetation cover was 64% in 2011 (Landry et al., 2013). The same analysis indicates a gradual increase in tree cover since the mid-1980s. Despite this trend toward a greener city, Tampa still has many areas with much less vegetation. Furthermore, the increase in tree canopy during the past four decades coincided with conflict and political arguments about tree regulations between developers, residents and city staff. After a multi-year, inclusive, stakeholder effort to develop a comprehensive urban forest management plan, the City of Tampa adopted such a plan in 2013. There seems to be general agreement amongst the small, diverse group of key informants interviewed for this article that the new plan, coupled with the 5-year interval monitoring requirement, will result in a positive benefit for all stakeholders. As with any long-term adaptive management plans, the full impacts of the plan will not be visible for many years.

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