A Report on the City of Tampa’s Existing and Possible Urban Tree Canopy
Prepared For:
City of Tampa, Parks and Recreation Department

Prepared By:
University of South Florida
Shawn M. Landry

University of Florida
Dr. Michael G. Andreu and Melissa H. Friedman

University of Florida – Hillsborough County Extension
Robert J. Northrop

Analyses modeled after the Forest Opportunity Spectrum analysis developed by Dr. Morgan Grove of the USDA Forest Service Northern Research Station and Jarlath O’Neil-Dunne of the Spatial Analysis Laboratory at the University of Vermont.

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Citation:
**SUMMARY**

An analysis of Tampa’s urban tree canopy (UTC) using a top down approach based on high resolution imagery from 2006 found that 21,716 acres of the City is covered by tree canopy (termed Existing UTC). This corresponds to 29% of the City of Tampa land area. An additional 21,548 acres (slightly less than 29%) of Tampa could conceivably be covered by urban tree canopy (termed Possible UTC) if all land surfaces currently covered in grass and other vegetation were planted with trees. While it would not be desirable to cover all vegetated areas with tree canopy, these results clearly indicate significant opportunities to increase tree canopy throughout the City of Tampa.

More than two-thirds of Tampa’s Existing UTC is located in areas of residential (8,641 acres) and Public/Institutional (6,045 acres) land uses. The largest proportion of Possible UTC is located in the Public/Institutional land use (7,988 acres), followed next by residential areas (5,003 acres) and public right-of-way (3,026 acres). The spatial distribution of both existing and possible urban tree canopy is highly uneven throughout the City of Tampa. The maps provided in this document illustrate the areas of the City where tree canopy enhancement efforts might be targeted.

This analysis was completed as part of a series of scientific initiatives targeted at understanding the urban forest in Tampa, including: *City of Tampa Urban Ecological Analysis 2006-2007; Mayor’s Symposium on Community Trees and the Urban Forest; Mayor’s Steering Committee on Urban Forest Sustainability*; and a survey of *Perception and Attitudes Toward Community Trees and the Urban Forest*. The collective findings of all of these efforts should be used for the purpose of developing a long-term urban forest management plan for the Tampa’s urban forest.

**PROJECT BACKGROUND**

The analysis of Tampa’s existing and possible urban tree canopy (UTC) was completed as a follow-up to the City of Tampa Urban Ecological Analysis conducted in 2006-2007. The effort was conducted by the University of South Florida, the University of Florida and Hillsborough County Extension in collaboration with the City of Tampa Parks and Recreation Department. Funding for the project was provided by the 2007 Urban and Community Forestry Grant program administered by the Florida Department of Agriculture and Consumer Services. The project was modeled after the Forest Opportunity Spectrum analysis developed by the USDA Forest Service’s Northern Research Station and the Spatial Analysis Laboratory (SAL) of the University of Vermont and used with cities such as Baltimore, Maryland and New York City.

The goal of the project was to leverage the high resolution geospatial datasets developed during the Urban Ecological Analysis to compute UTC metrics at the parcel level and summarize this information both by land use and by spatial distribution. Detailed information on Tampa’s existing and possible UTC should inform strategic planning for urban forest planting, management and educational goal setting efforts in the City.

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EXISTING AND POSSIBLE TREE CANOPY

The high resolution geospatial dataset created for the City of Tampa Urban Ecological Analysis 2006-2007 was used to calculate total area of each land cover class (e.g. tree canopy, other vegetation, impervious, bare soil, water) for each parcel and right-of-way in the City. UTC metrics were calculated using the land cover information specific to each parcel (Figure 1).

Existing UTC was computed by simply summarizing the tree canopy land cover class. Possible UTC was computed by finding all areas in the land cover layer identified as other vegetation. In other words, Possible UTC is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface. Although tree canopy could be enhanced by removing impervious surfaces such as concrete to establish locations for tree planting, areas covered by impervious surfaces were not included as spaces for possible UTC in this analysis.

Using the land use information associated with each parcel, citywide UTC metrics were summarized by land use category (Figure 2). Table 1 shows metrics for each UTC type (Existing or Possible UTC). Land use categories are defined in Table 2. % Land Area indicates the percent of land in the City covered by each UTC type. % Land Use indicates the area of each UTC type as a percent of all land within the particular land use category, thus allowing for comparison of Existing UTC and Possible UTC in a given land use class. % Existing/Possible UTC indicates the proportion of citywide UTC area within each land use, thus showing the relative contribution of a land use category to either the Existing or Possible UTC.

![Figure 1. Calculating parcel-based UTC metrics.](#)

![Figure 2. Citywide UTC metrics summarized by land use.](#)
Table 1. UTC metrics by type, summarized by land use.

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Existing Tree Canopy</th>
<th>Possible Tree Canopy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Land Area</td>
<td>% Land Use</td>
</tr>
<tr>
<td>Agricultural</td>
<td>1%</td>
<td>21%</td>
</tr>
<tr>
<td>Commercial</td>
<td>1%</td>
<td>18%</td>
</tr>
<tr>
<td>Industrial</td>
<td>0%</td>
<td>11%</td>
</tr>
<tr>
<td>Public/Institutional</td>
<td>8%</td>
<td>28%</td>
</tr>
<tr>
<td>Utilities</td>
<td>2%</td>
<td>84%</td>
</tr>
<tr>
<td>Open Space</td>
<td>0%</td>
<td>31%</td>
</tr>
<tr>
<td>Residential (Total)</td>
<td>12%</td>
<td>38%</td>
</tr>
<tr>
<td>Single Family</td>
<td>10%</td>
<td>40%</td>
</tr>
<tr>
<td>Multi-Family and Other</td>
<td>1%</td>
<td>29%</td>
</tr>
<tr>
<td>Right of Way</td>
<td>3%</td>
<td>19%</td>
</tr>
<tr>
<td>Unknown</td>
<td>0%</td>
<td>12%</td>
</tr>
<tr>
<td>Vacant</td>
<td>2%</td>
<td>32%</td>
</tr>
</tbody>
</table>

% Land Area = \frac{\text{Area of UTC Type}}{\text{Area of all land}}

The % Land Area value of 12% for Existing UTC residential land indicates that 12% of Tampa’s land area is residential tree canopy.

% Land Use = \frac{\text{Area of UTC Type}}{\text{Area of all land in land use}}

The % Land Use value of 38% for Existing UTC residential land indicates that 38% of residential land is covered by tree canopy.

% Existing UTC = \frac{\text{Area of UTC Type}}{\text{Area of all UTC type}}

The % Existing UTC value of 40% for Existing UTC residential land indicates that 40% of Existing UTC lies in residential land use.

Table 2. Definitions of Land Use Categories.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural</td>
<td>Land classified as pasture, crop land, orchards, feed lots, fish farms, poultry houses, and other agricultural usage.</td>
</tr>
<tr>
<td>Commercial</td>
<td>All commercial land uses, including stores, hotels/motels, night clubs, restaurants, entertainment venues, office buildings, malls, markets, mixed-use and parking lots.</td>
</tr>
<tr>
<td>Industrial</td>
<td>Manufacturing, warehouses and storage, mining, packing plants and food processing.</td>
</tr>
<tr>
<td>Public/Institutional</td>
<td>Hospitals, libraries, fire/police stations, government offices, schools, courts, military, club/union halls and churches.</td>
</tr>
<tr>
<td>Open Space</td>
<td>Timber lands, golf courses, forests and park lands.</td>
</tr>
<tr>
<td>Residential</td>
<td>Single- and Multi-family residential, mobile home parks, condos, private retirement homes and institutional housing.</td>
</tr>
<tr>
<td>Right of Way</td>
<td>Right-of-way areas associated with roads and railroads, marinas and transit terminals. Defined in original parcel data or added through geoprocessing.</td>
</tr>
<tr>
<td>Unknown</td>
<td>Areas undefined in parcel data and secondary sources.</td>
</tr>
<tr>
<td>Vacant</td>
<td>Vacant lands, including abandoned/unused commercial, institutional and industrial lands, and non-agricultural acreage.</td>
</tr>
</tbody>
</table>
SPATIAL DISTRIBUTION OF EXISTING AND POSSIBLE UTC

Total UTC summarized by land use provides only a partial picture of Tampa’s Existing and Possible UTC. The spatial distribution of both existing and possible urban tree canopy is highly uneven throughout the City of Tampa. The remaining pages of this report provide maps showing the geographic distribution of Existing and Possible UTC by selected land use categories. Land use categories were selected to represent those with the greatest potential for UTC enhancement, including commercial, industrial, public/institutional, residential (all types) and single-family residential, and public right-of-way. To facilitate visualization of spatial variation, UTC was aggregated to the geographic unit of the Census block group. All values for UTC represent the percentage of land area within each land use category. The first set of maps shows the total Existing UTC (left page) and Possible UTC (right page) for all land use categories.

The maps provided in this document illustrate the areas of the City where tree canopy enhancement or management efforts might be targeted, and they serve as the scientific basis to guide strategic planning efforts. The results and conclusion sections of document follow the maps and provide further suggestions regarding the appropriate use of this information.
TOTAL OF ALL LAND USE CATEGORIES

Existing Tree Canopy

Urban tree canopy (UTC) was analyzed using a top down approach based on high resolution satellite imagery from April, 2006. “Existing UTC” is the percentage of land currently covered by tree canopy. “Possible UTC” is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface.
Possible Tree Canopy

Urban tree canopy (UTC) was analyzed using a top down approach based on high resolution satellite imagery from April, 2006. "Existing UTC" is the percentage of land currently covered by tree canopy. "Possible UTC" is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface.
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**Possible Tree Canopy**

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**INDUSTRIAL LAND USES**

*Existing Tree Canopy*

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Possible Tree Canopy

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Public / Institutional Land Uses

Existing Tree Canopy

Urban tree canopy (UTC) was analyzed using a top down approach based on high resolution satellite imagery from April, 2006. "Existing UTC" is the percentage of land currently covered by tree canopy. "Possible UTC" is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface.
Possible Tree Canopy

Urban tree canopy (UTC) was analyzed using a top-down approach based on high-resolution satellite imagery from April, 2006. "Existing UTC" is the percentage of land currently covered by tree canopy. "Possible UTC" is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface.
RESIDENTIAL LAND USES (ALL TYPES)

Existing Tree Canopy

Urban tree canopy (UTC) was analyzed using a top down approach based on high resolution satellite imagery from April, 2006. "Existing UTC" is the percentage of land currently covered by tree canopy. "Possible UTC" is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface.
Possible Tree Canopy

Urban tree canopy (UTC) was analyzed using a top down approach based on high resolution satellite imagery from April, 2006. "Existing UTC" is the percentage of land currently covered by tree canopy. "Possible UTC" is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface.
SINGLE FAMILY RESIDENTIAL LAND USES

Existing Tree Canopy

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Possible Tree Canopy

Urban tree canopy (UTC) was analyzed using a top down approach based on high resolution satellite imagery from April, 2006. "Existing UTC" is the percentage of land currently covered by tree canopy. "Possible UTC" is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface.
RIGHT-OF-WAY LAND USES

Existing Tree Canopy

Urban tree canopy (UTC) was analyzed using a top down approach based on high resolution satellite imagery from April, 2006. "Existing UTC" is the percentage of land currently covered by tree canopy. "Possible UTC" is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface.
Existing and Possible Tree Canopy

**Possible Tree Canopy**

Right-of-way LU
Possible UTC
- < 10%
- 10.1% - 20%
- 20.1% - 30%
- 30.1% - 40%
- 40.1% - 50%
- > 50%

- No Parcels in Land Use
- County Boundaries
- Tampa Limits
- Highways
- Major Roads

Urban tree canopy (UTC) was analyzed using a top-down approach based on high resolution satellite imagery from April, 2006. "Existing UTC" is the percentage of land currently covered by tree canopy. "Possible UTC" is the increased percentage of tree canopy that could be added if trees were planted on land not covered by buildings and impervious surface.
RESULTS

- 29% of the City of Tampa’s land area is covered by tree canopy (termed Existing UTC) and encompasses 21,716 acres.
- Roughly the same amount of land, slightly less than 29%, could conceivably be covered by urban tree canopy (termed Possible UTC) if all land surfaces not covered roads, building and other impervious surfaces were planted with trees.
- Nearly one-third (30%) of the land area in Tampa falls within the residential category, which is mainly composed of single-family homes (85% of residential land). Residential land has a relatively high percentage of Existing UTC, with 38% of all residential classified as tree canopy. Tree canopy on residential land could be increased to 60% if the additional 22% of residential land classified as Possible UTC were planted.
- Tampa’s second largest land use type, Public/Institutional, accounts for another 29% of the city’s land area. Existing UTC accounts for 28% of Public/Institutional land, while Possible UTC represents a much larger 37% of land in this use category, or 7,988 acres.
- Over 16% of Tampa’s land area is right-of-way, largely comprising roads and the bordering right-of-way land. Surprisingly, 19% of all right-of-way land if covered by Existing UTC (2,300 acres), and Possible UTC represents another 25% of the land use (3,026 acres), not including the tree canopy that could overhang a road.
- Commercial and industrial areas represent a much smaller percentage of Tampa’s land area, together comprising only 11% of the city’s land area. Existing UTC is relatively low in these land use categories, 11% for industrial and 18% for commercial. However, Possible UTC represents an additional 19% of industrial land (570 acres) and 13% of commercial land (717 acres).
- 21,548 acres of land in Tampa is classified as Possible UTC. Nearly 75% of all Possible UTC is located in the Public/Institutional (7,988 acres), residential (5,003 acres) and public right-of-way (3,026 acres).
- The spatial distribution of both existing and possible urban tree canopy is highly uneven throughout the City of Tampa. Existing UTC is lowest in the areas of downtown Tampa, Ybor City, the Port of Tampa, the USF area and the airport. However, even these areas represent locations of Possible UTC. Whether of not they represent areas of desirable tree canopy is a determination to be made by the citizens of Tampa and their representative leaders.
- The maps provided in this document illustrate the areas of the City where tree canopy enhancement or management efforts might be targeted. A close examination of the individual land use maps shows the general locations of Existing and Possible UTC, revealing that opportunities for tree canopy enhancement exist within most areas of Tampa.
CONCLUSIONS

1. Funded by the Urban and Community Forestry Grant program administered by the Florida Department of Agriculture and Consumer Services, this analysis leveraged the high resolution geospatial datasets developed for the City of Tampa Urban Ecological Analysis conducted in 2006-2007\(^2\) and the approach\(^3\) employed in cities such as Baltimore and New York City to determine the existing and possible urban tree canopy in Tampa.

2. Tampa’s urban tree canopy is a vital and valuable city asset. According to the Urban Ecological Analysis\(^2\), there are approximately 7.8 million trees in the City. These trees reduce the city’s carbon footprint by currently storing over half-million tons of carbon, and sequestering 46,525 tons of carbon per year. Shade provided by trees results in annual residential energy savings\(^4\) valued at over $4.2 million in Tampa. Tampa’s trees remove 1,369 tons per year of pollutants such as carbon monoxide (CO), nitrogen dioxide (NO\(_2\)), ground-level ozone (O\(_3\)), particulate matter (PM\(_{10}\)) and sulfur dioxide (SO\(_2\)). The current replacement value\(^5\) of all trees in the City of Tampa is over $1.4 billion. The annual value of pollution removal, carbon sequestration and energy savings is $11.5 million dollars. In addition to the estimated economic value, trees most likely provide many additional benefits for Tampa’s residents, including: increased property values; providing habitat for wildlife; reducing stormwater runoff; cooling the city by reducing the urban heat island effect; increasing the life of road surfaces; and contributing to an overall quality of life.

3. This report presents very broad generalizations. The City of Tampa and other stakeholders should use the underlying geospatial dataset of Existing UTC and Possible UTC summarized by parcel in order to target individual or groups of parcels for UTC enhancement.

4. The Tampa Comprehensive Plan – Building Our Legacy A Livable City recognizes the benefits of urban trees and emphasizes the retention and enhancement of tree canopy for both environmental value and contribution to quality of life (Objective 38.27). The generalized summary and geographic information provided in this report should serve as a reference to citizens, businesses, government staff and others involved in implementing the comprehensive plan. For example, form-based zoning efforts should consider both Existing and Possible UTC during individual neighborhood planning projects.

5. Although the citywide tree canopy is relatively extensive for residential land, there are many residential areas in Tampa where the Existing UTC is quite low but where there exists Possible UTC. Educational programs, incentives or other initiatives could be employed in addition to the existing regulatory mechanisms to motivate residents to increase UTC in their communities.

6. Public/institutional lands represent a significant opportunity to increase UTC, not only because of the extensive acreage of Possible UTC land in this category (7,988 acres), but because the local government is directly (i.e. ownership) or indirectly (i.e. tax breaks) involved in the management of a large amount of this land. The generalized maps provided in this document

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\(^3\) The project was modeled after the Forest Opportunity Spectrum analysis developed by the USDA Forest Service’s Northern Research Station and the Spatial Analysis Laboratory (SAL) of the University of Vermont.

\(^4\) Potential energy savings for commercial, industrial, public/institutional and other land uses was not determined.

\(^5\) The replacement or compensatory value of a tree is the amount of money it would cost to replace a tree with a similar size and species, as estimated by the Council of Tree and Landscape Appraisers.
show the areas of the city where the greatest opportunities might exist for tree canopy enhancement on public/institutional lands.

7. The *Tampa Comprehensive Plan – Building Our Legacy A Livable City* includes a focus on street tree planting within scenic corridors, as part of annual public/private beautification efforts, and as an element of new form-based zoning efforts. Analysis of Possible UTC on right-of-way lands indicates the potential to more than double citywide right-of-way tree cover and the maps suggest opportunities to enhance tree canopy exist within many areas of Tampa. City staff should use these maps and the underlying geospatial dataset to target specific areas for right-of-way UTC enhancement.

8. Commercial and industrial lands are characterized by high amounts of impervious surface and relatively low percentage of tree canopy, but numerous apparent opportunities increase UTC within these land uses. Despite representing a small percentage of Tampa’s overall land area, enhancing tree canopy within these areas could help mitigate the effects of extensive impervious surfaces by reducing stormwater runoff, improving stormwater quality and reducing the urban heat island effect. Marketing and education efforts designed to illuminate these benefits should initially be targeted based upon areas with the greatest Possible UTC combined with knowledge of existing stormwater problem areas.

9. The generalizations presented in this report can be used to inform strategic planning for urban forest planting, management and educational goal setting efforts in the City. This information will be most valuable, however, when guided by policy. It is strongly recommended that the Tampa Parks and Recreation Department develop an overall strategy for this purpose, including a long-term Urban Forest Management Plan. Such a plan would be guided by Tampa’s Comprehensive Plan and would integrate the scientific results of the *Urban Ecological Analysis*, the issues identified during the *Mayor’s Symposium on Community Trees and the Urban Forest*, and the vision, goals and strategies developed by the *Mayor’s Steering Committee on Urban Forest Sustainability.*