2024 NORTH PORT TREE CANOPY ASSESSMENT

Development Services Department

Natural Resources Division

To better understand the distribution of tree canopy and vegetation cover throughout the City of North Port, Florida.

May 2024

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North Port FLORIDA
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Introduction

Trees are invaluable to our existence and the environment, serving a crucial role for the City of North Port and the global ecosystem. They absorb carbon dioxide, release oxygen, provide habitat for numerous species, contribute to biodiversity conservation, and enrich our landscapes and overall well-being. Trees also play a role in the City's stormwater management by mitigating stormwater flow. Their presence offers additional benefits, such as enhancing property values and promoting the City's balanced development goals, which make North Port a more appealing place to live. Urbanization, with its impervious surfaces, impacts natural areas, leading to the creation of "Urban Heat Islands" (UHI) that absorb and retain heat, increasing energy costs, air pollution, and heat-related health risks. However, canopy-forming plants such as trees, large shrubs, and woody plants counteract the UHI effect by absorbing solar radiation and releasing moisture, reducing surface temperatures.

In alignment with North Port's policies and priorities, trees and native vegetation are significant components of the City's long-term strategic vision to create an innovative, friendly, engaging, and sustainable community where residents, businesses, and visitors can flourish. Owing to these attributes, North Port strives to assess, preserve, and maintain the overall number of trees and formulate policies to support tree canopy management and enhancement.

In 2024, the City of North Port celebrated its 24th anniversary as a recognized Tree City USA. This esteemed recognition is the result of collaborating initiative between the Arbor Day Foundation, the U.S. Forest Service, and the National Association of State Foresters. The City of North Port achieved this recognition by meeting the four prerequisites of the program: establishing a tree board or department, enacting a tree-care ordinance, allocating a minimum annual community forestry budget of $2 per capita, and observing and proclaiming Arbor Day. Additionally, the City is in the process of revising its Unified Land Development Code, tree ordinance, and Comprehensive Plan. These proactive measures underscore the City's commitment to enhancing the protection of trees and natural resources, thereby contributing to a greener and more sustainable future for its residents.

Background

Urban tree canopy assessments are important tools that can help communities better understand their environmental sustainability status and set future goals for improvement. The effort and expense of these assessments are justified as they enhance our understanding of the overall urban canopy, a key component of sustainability and well-being for North Port's citizens.

Community tree canopies can be assessed using two fundamental methods: the "bottom-up approach" and the "top-down approach." The bottom-up approach involves collecting field data, much like in a traditional tree inventory, including tree species, size, condition, etc. This method offers detailed information that can be converted into a dataset layer and can be useful for policy decisions, tree monitoring and management. While it provides a high level of detail, it is labor-

intensive and does not offer a high-resolution mapping of canopy coverage or other land features.

In contrast, the top-down approach uses aerial or satellite images. It can cover both large and small geographic areas. However, its ability to assess the quantity and distribution of different tree species is limited.

Over the past 15 years, the City of North Port has conducted two significant studies as part of broader research. The insights gained from these previous studies, coupled with the data from this study, can assist in evaluating the effectiveness of policies, regulations, and programs. Moreover, it can spotlight opportunities for enhancing and balancing North Port's urban canopy coverage and trends, contributing to a greener and more sustainable cityscape.

The initial study, referenced here, was conducted by Sarasota County in 2013. It employed a hybrid data gathering approach, which involved calibrating surface data points using aerial imagery, with the i-Tree Canopy software serving as the primary tool for this study. A subsequent study was carried out by the Florida Department of Agriculture and Consumer Services, which engaged a private vendor to determine the state's canopy cover through the interpretation of aerial imagery, utilizing the top-down canopy assessment approach.

Our research also refers to the Tree Equity Score (TES), an open-source data metric. This measure, conceived by the non-profit organization American Forests, assesses the extent to which the vital advantages of urban tree canopies are accessible to cities and towns throughout the U.S. The score is calculated based on a combination of factors including tree canopy coverage, climate conditions, and demographic and socioeconomic data.

The current Canopy Assessment report uses data from the two previously referred studies and the TES, as they provide both current and historical data for the area. This report also identifies similarities and differences in the methodologies, thereby offering a more comprehensive understanding of the advantages and disadvantages of each method. Recognizing its efficacy and practicality, the North Port staff chose to replicate the methodology used in the 2013 Sarasota County Tree Canopy Study by utilizing the i-Tree software. This enabled our team to compare the current North Port Canopy Assessment data with the historical data from the Sarasota County study, as the same methodology was employed.

Sarasota County Tree Canopy Study (2013)

In 2013, a tree canopy study was conducted by Sarasota County estimating the percentages of tree and vegetation canopy and ground cover in comparison to other types of cover, such as water, bare ground, and impervious surfaces. This study quantified the proportion of cover using statistical interpolation, a method that estimates new data points within the range of a known data set. The study encompassed Sarasota County as a whole and each of its four individual

municipalities including the City of North Port with the Myakka State Forest and Orange Hammock Wildlife Management Area (Figure 1).

In 2013, the City of North Port demonstrated a diverse range of land cover types, according to the Sarasota County Tree Canopy Study (Figure 1). The most prevalent category, Trees or Shrubs, constitutes 36% of the total area, signifying a significant presence of greenery. Following this, Groundcover, which makes up 29% of the land, contributes to the natural landscape and serves as an important habitat. Bare Ground, accounting for 23%, represents areas devoid of significant vegetation or man-made structures. Man-made structures, denoted by Impervious Surfaces, comprise 9% of the city, including buildings, roads, and other infrastructure. Lastly, Open Water bodies such as lakes, ponds, and canals make up 3% of the City's area. This distribution reflects the balance between natural and man-made elements in the city's landscape.

The study concluded that the distribution of cover in North Port was similar to that in the more rural areas of Sarasota County, east of I-75. The coverage was characterized by relatively high percentages of tree and ground cover, and a relatively low percentage of impervious surface cover.

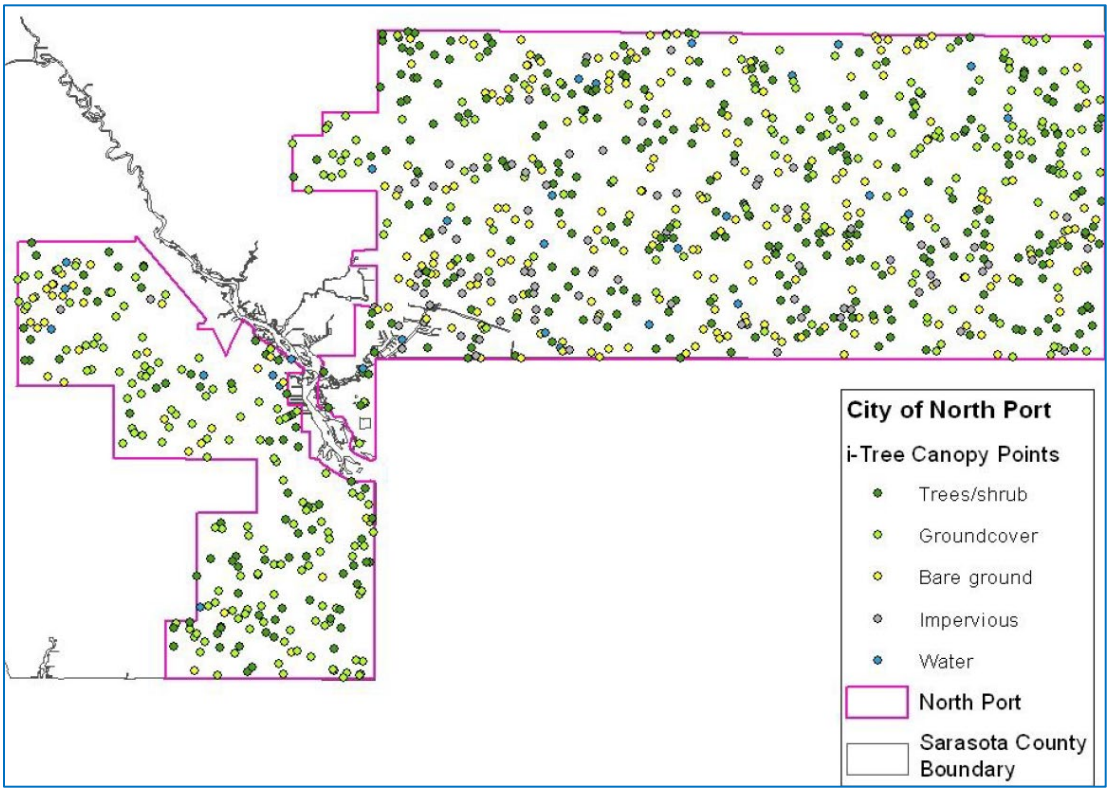

Figure 1. Cover class distribution for the city of North Port, per the Sarasota Tree County Canopy Study (2013).

Cover Class Distribution	
Trees or Shrubs	36%
Groundcover	29%
Bare Ground	23%
Open Water	3%
Impervious Surface	9%

Table 1. Estimated cover class percentage distribution for the city of North Port, per the Sarasota County Tree Canopy Study (2013).

Florida Urban Tree Canopy Assessment (2024)

The Florida Urban Tree Canopy Assessment was conducted by the Florida Department of Agriculture and Consumer Services in collaboration with a private vendor to determine the extent of trees in Florida, particularly in 495 urban areas. The study aimed to map the extent of tree coverage across Florida, with a particular focus on 495 urban areas. High-resolution aerial imagery and Light Detection and Ranging (LIDAR) was utilized to delineate the existing tree canopy in these areas (Figure 2). The outlined area represents the canopy cover of trees exceeding 10 feet in height.

In contrast to the 2013 Sarasota County Tree Canopy Study, this assessment did not account for shorter trees, less than 10 feet in height, and woody shrubs within the urban canopy. One of the key objectives of the Florida Canopy Assessment was to establish a visual data reference that captured both the current and historical conditions of the existing tree canopy, as well as identifying potential areas with sparse coverage.

The study estimated that the city of North Port has a total potential plantable space of 48%, which is above average when compared to similar urban areas in the region. The City was further divided into several census areas, with the study estimating the approximate urban forest canopy coverage and distribution for each of these areas (Figure 3).

The study revealed a fluctuating trend in the overall urban tree canopy coverage for the city of North Port. It was recorded at 32% in 2013, increased to 39% in 2017, and then decreased to 34% in 2021 (Table 2). The increase in canopy coverage between 2013 and 2017 could be attributed to the City's varying development patterns and the natural growth and maturation of trees. As trees mature, they expand their canopy, contributing to an overall increase in canopy coverage. The improved resolution of aerial imagery used between the two time periods or a variation in the data gathering, and analysis methods could be other possible explanations for this increase.

The most recent dataset from 2021 indicated a 4% decrease in canopy coverage, likely due to the more rapid growth and development within the City over the past 10 years, which necessitated tree removal for lot clearing. While storm activities, such as Hurricane Irma in 2017, may have also impacted the canopy, it is not expected to have had a significant effect. The effects of

Hurricane Ian in 2022 have also not been reflected in this map. Overall, the data from the assessment can serve as a valuable reference for future research and planning initiatives related to the City's canopy.

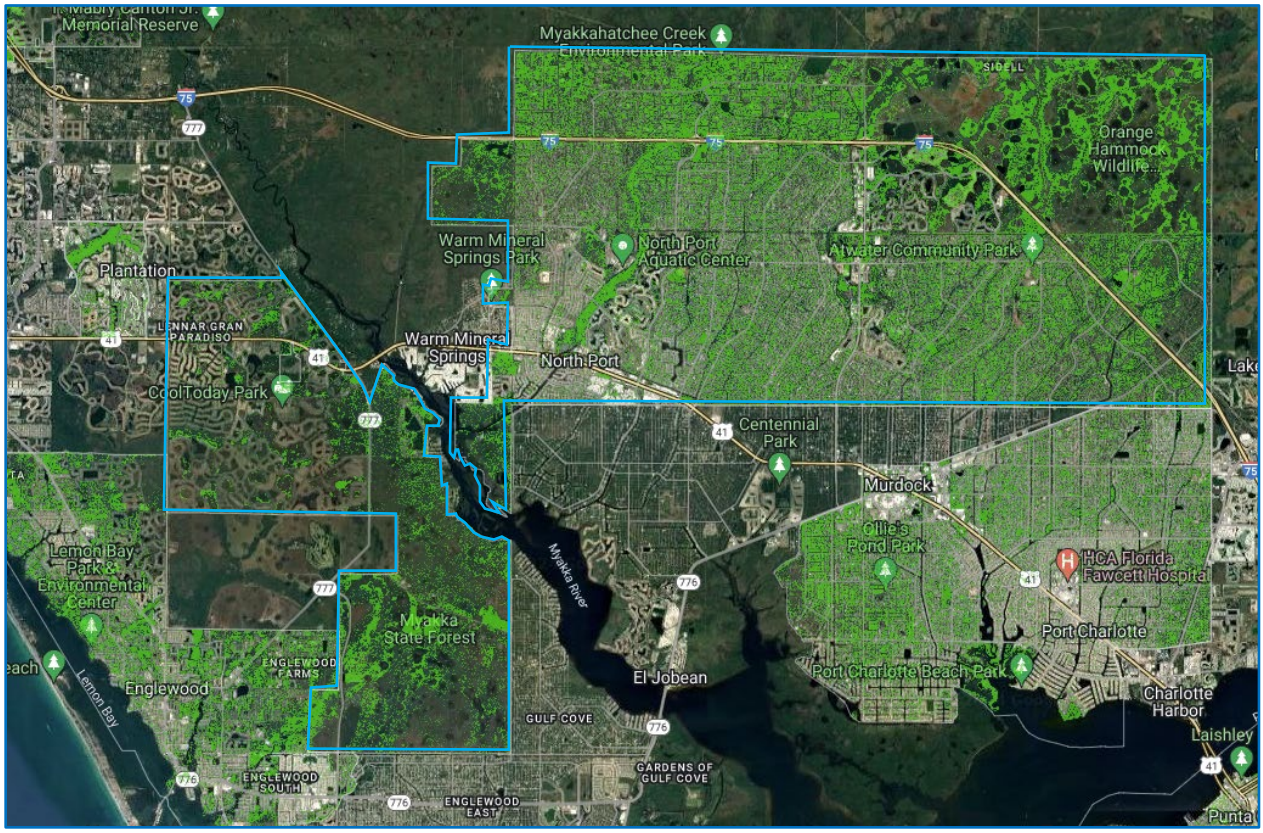

Figure 2. Urban tree canopy coverage of city of North Port's, conducted by Florida Department of Agriculture and Consumer Services (2024).

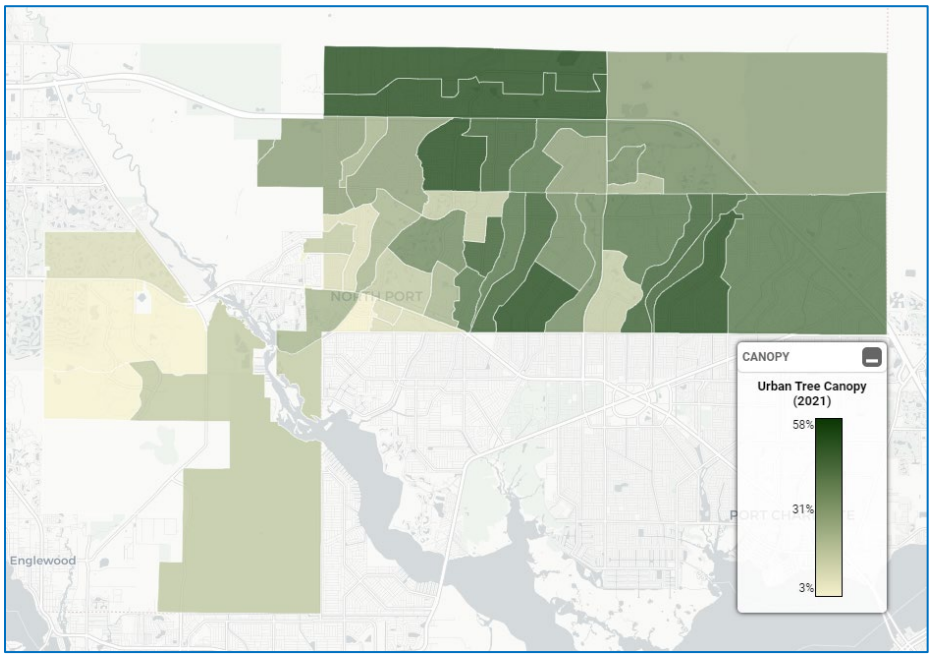

Figure 3. Urban tree canopy percent coverage for the city of North Port's census areas, conducted by Florida Department of Agriculture and Consumer Services (2024).

North Port City Boundaries	
Total Acres	66,697 (acres)
Land Acres	65,091 (acres)
Urban Tree Canopy (2013)	21,148 (acres)
Urban Tree Canopy (2017)	25,520 (acres)
Urban Tree Canopy (2021)	21,979 (acres)
Potential Plantable Space	31,140 (acres)
Urban Tree Canopy (2013)	32%
Urban Tree Canopy (2017)	39%
Urban Tree Canopy (2021)	34%
Potential Plantable Space	48%

Table 2. Canopy coverage for the city of North Port, according to the Statewide Community Tree Canopy Assessment, Florida Department of Agriculture and Consumer Services (2024).

Tree Equity Score

The Tree Equity Score (TES) is a metric designed to assess the extent to which the vital advantages of an urban tree canopy are accessible to various communities. It was developed by American Forests to address environmental inequities in tree distribution that are common to cities and towns across the U.S. It is derived from tree canopy cover, climate, demographic and socioeconomic data. The score ranges from 0 to 100, with lower scores indicating a higher priority

for tree planting. A score of 100 means the neighborhood has generally achieved its tree planting objectives.

In North Port, most areas have a TES of 88 or higher, while a few smaller areas have a score between 54 and 69. Not all areas of the City have been evaluated for equity score. Figure 4 depicts the areas with lower TES in orange, whereas areas with higher TES are depicted in bright green. The TES parameter suggests that North Port currently has a relatively high tree equity score. This implies that the benefits of the urban tree canopy are, with few exceptions, evenly distributed across the City's census areas.

When Compared to neighboring municipalities, North Port's tree equity typically matches or surpasses the average grade for these areas. This suggests that the city is currently providing its residents with relatively evenly distributed canopy coverage benefits. This is in contrast to neighboring municipalities where a higher discrepancy exists. However, it's important to note that the Tree Equity Score in North Port may decrease and become more unbalanced in the future due to high rates of uneven development. Even with a high Tree Equity Score (TES), there is always significant room for improvement. This includes increasing tree canopy coverage by planting and rewilding, particularly in areas with a lower TES. Furthermore, actions such as lot preservation can play an important role in maintaining and increasing the city's TES.

In conclusion, the Tree Equity Score is a valuable tool for guiding investment in urban canopy and promoting environmental equity. It helps cities like North Port identify areas where more investment is needed and track their progress towards achieving a more balanced city landscape.

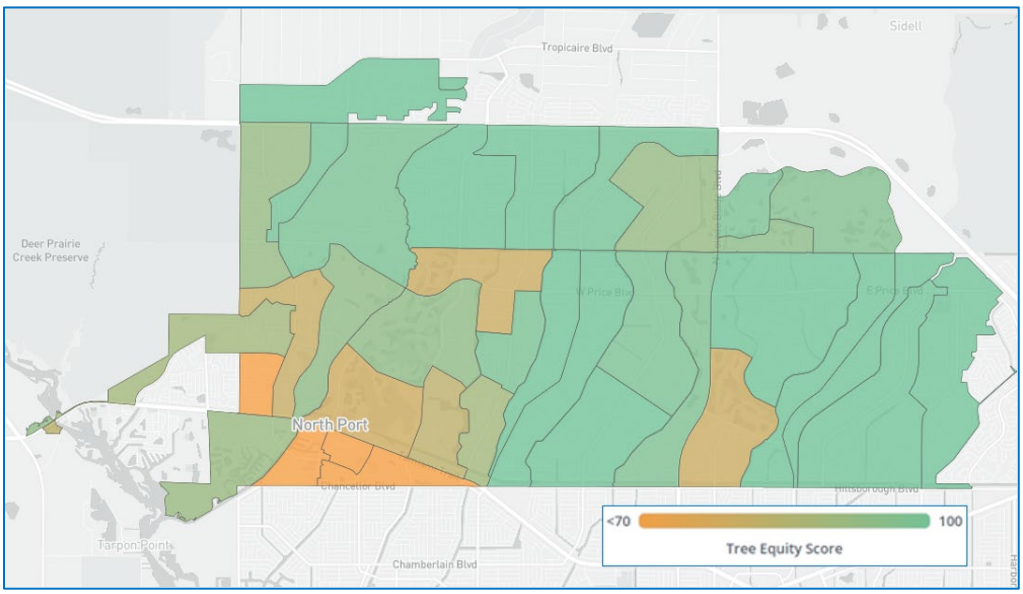

Figure 4. Urban Tree Equity Score (TES) for the available city of North Port's census areas, conducted by American Forests (2024).

North Port Canopy Assessment Overview

North Port's Natural Resources Division staff has explored various software options for the tree canopy assessment. The methodology used in the 2013 Sarasota County Tree Canopy Study, which employed the i-Tree software, was chosen for its convenience and compatibility. This software was deemed a logical choice for North Port's canopy assessment due to its unique features, user-friendliness, and capabilities. It also ensures consistency with the previous canopy study methodology used by Sarasota County.

The i-Tree software can categorize land cover and tree canopy in any region using random sampling of aerial images. It can also quantify the environmental benefits of tree canopies, such as carbon dioxide sequestration, air quality improvement, and stormwater management. These capabilities provide valuable insights for the City's environmental evaluations.

As an open-source, peer-reviewed product that is free to use, i-Tree Canopy is a cost-effective choice for North Port's Natural Resources Division. It stands out for its ease of use and its ability to determine statistically accurate land cover types, making it one of the simplest methods available. Users can specify the area of interest, such as a neighborhood or city limits, and any cover types of interest. This makes i-Tree Canopy a versatile tool for various applications.

Methodology

Shapefiles of the North Port municipal area were uploaded into the i-Tree Canopy to establish the boundaries of the study area. These boundaries were simplified for this assessment, making them smoother compared to the more detailed official city boundaries. Five cover classes were defined with the software (as shown in Figures 5 to Figure 9). The i-Tree Canopy program then generated 1,000 random points for the North Port municipality, including the Myakka State Forest and the Orange Hammock Wildlife Management Area (Figure 10). City staff categorized each point into one of the five categories, as follows:

- Trees and Shrubs: Trees, large shrubs, and woody plants that provide canopy and overstory (Figure 5).
- Groundcover: Small shrubs (understory), herbaceous plants, and grasses (Figure 6).
- Bare Ground: Turf (yards or golf courses), agricultural fields, dirt, or exposed soil, and human or livestock disturbed vegetated lands and pastures (Figure 7).
- Impervious: Hard surfaces (e.g., roadways, sidewalks, rooftops, driveways) (Figure 8).
- Water: Open water surface features (e.g., ponds, lakes, bays, canals, ditches) (Figure 9).

The entire process was then repeated on a smaller scale, where 500 randomly generated points were established for both the Myakka State Forest (Figure 12) and the Orange Hammock Wildlife Management Areas (Figure 14) to estimate the cover. Two additional assessments were conducted for North Port's area: one excluding the Myakka State Forest (Figure 16), and another

excluding both the Myakka State Forest and the Orange Hammock Wildlife Management Area (Figure 18). Both assessments used 750 data points.

The i-Tree procedure recommendations guided the determination of the point count, ensuring an even distribution across the three delineated study areas. The quantity of study points was generally proportional with the area size. Furthermore, all areas and coverage classes maintained a Standard Error (SE) of under 2%. For a summary of i-Tree Canopy's technical guidelines, please consult Appendix A, titled "i-Tree Canopy Technical Notes".

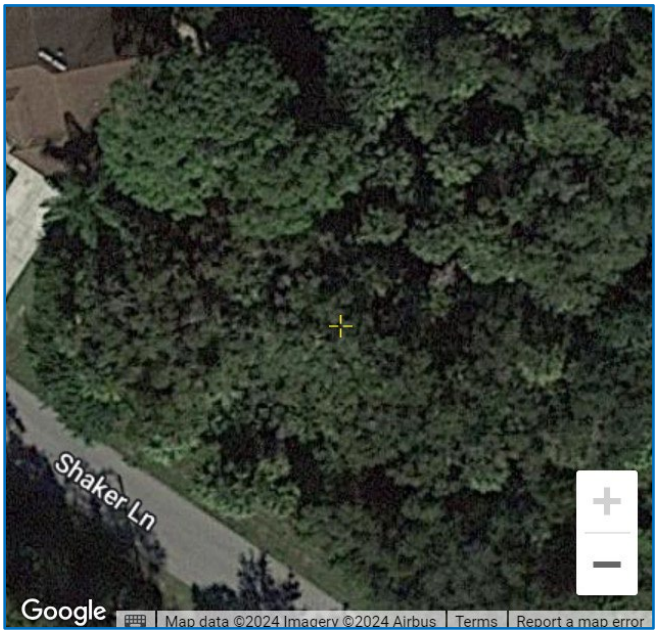

Figure 5. Tree or Shrub surface point example.

Figure 6. Ground Cover surface point example

Figure 7. Bare Ground surface point example.

Figure 8. Open Water cover surface point example.

Figure 9. Impervious Surface cover point example.

Results

North Port city limits, including Myakka State Forest and Orange Hammock Wildlife Management Area

The results evaluated a total of 1000 points and encompassed the entire North Port municipality, including the Myakka State Forest and Orange Hammock Wildlife Management Area. The City's area (Figure 10) revealed a tree and shrub canopy cover exceeding 38% (Figure 11). This canopy, or overstory, consists of trees, large shrubs, and woody plants.

The overall vegetative cover, including small shrubs (understory), herbaceous plants, and grasses, accounts for 22%. North Port has approximately 21% of bare ground cover, which includes turf (like yards and golf courses), agricultural fields, dirt and exposed soil, and areas disturbed by human activity or livestock. The City also has about 9% of impervious surfaces, which include hard surfaces such as roadways, sidewalks, rooftops, and driveways. The assessment identified 6% of the area as open water surface features, including ponds, lakes, canals, and ditches.

In addition to the above, an extra 500 points within the Myakka State Forest were assessed (Figure 12). The surface identified in this forest had a tree/shrub canopy cover of 55%, and the ground cover, including smaller vegetation, was at 37%. The Myakka State Forest had a bare ground percentage of 3%, indicating minimal soil exposure. Notably, no impervious surfaces were identified within the Myakka State Forest, suggesting minimal coverage of man-made structures. Open water features constituted 5% of the area (Figure 13).

Beyond the previously mentioned areas, an additional 500 points were evaluated within the Orange Hammock Wildlife Management Area (Figure 14). The identified surface in this area exhibited a tree/shrub canopy cover of 47%. The ground cover, which includes smaller vegetation, accounted for 52%. The Orange Hammock Wildlife Management Area showed a bare ground percentage of just 1%, indicating a minimal exposure of soil. Notably, the absence of impervious surfaces within the Orange Hammock Wildlife Management Area implies a lack of man-made structures. The assessment did not identify any open water features based on the random sample size and distribution (Figure 15).

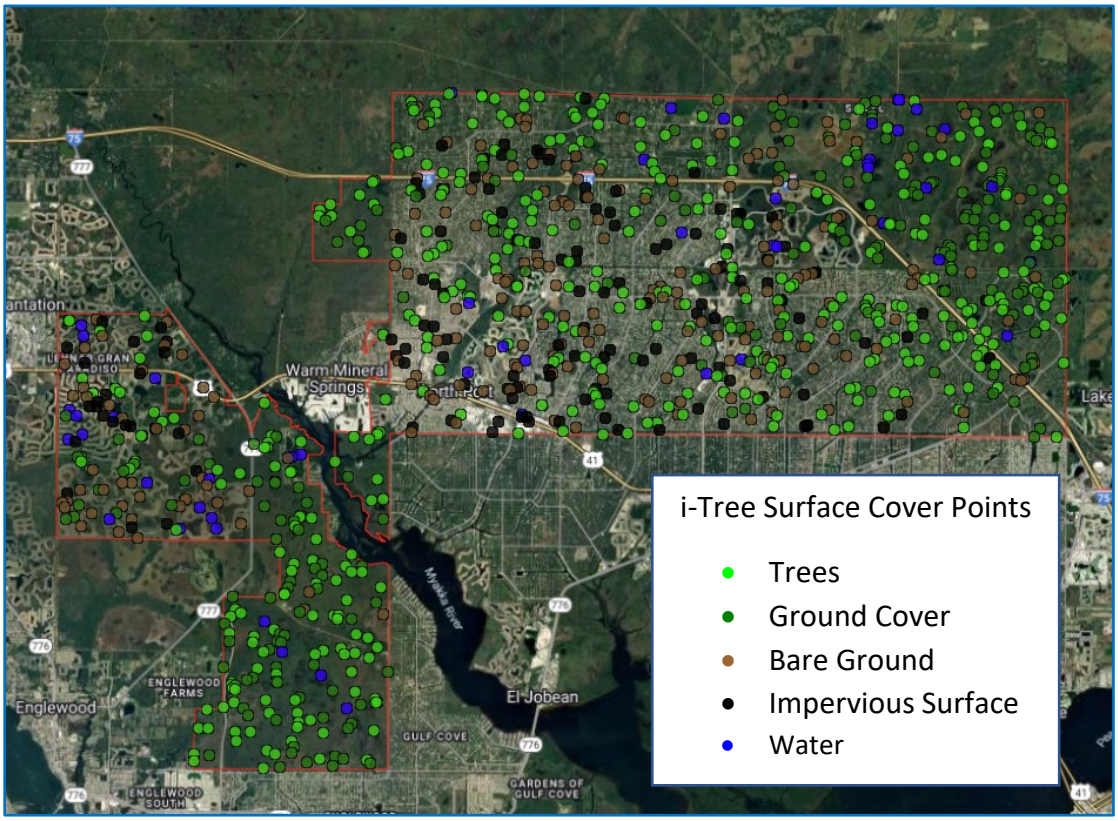

Figure 10. Distribution of i-Tree surface points in the city of North Port, including Myakka State Forest and Orange Hammock Wildlife Management Area.

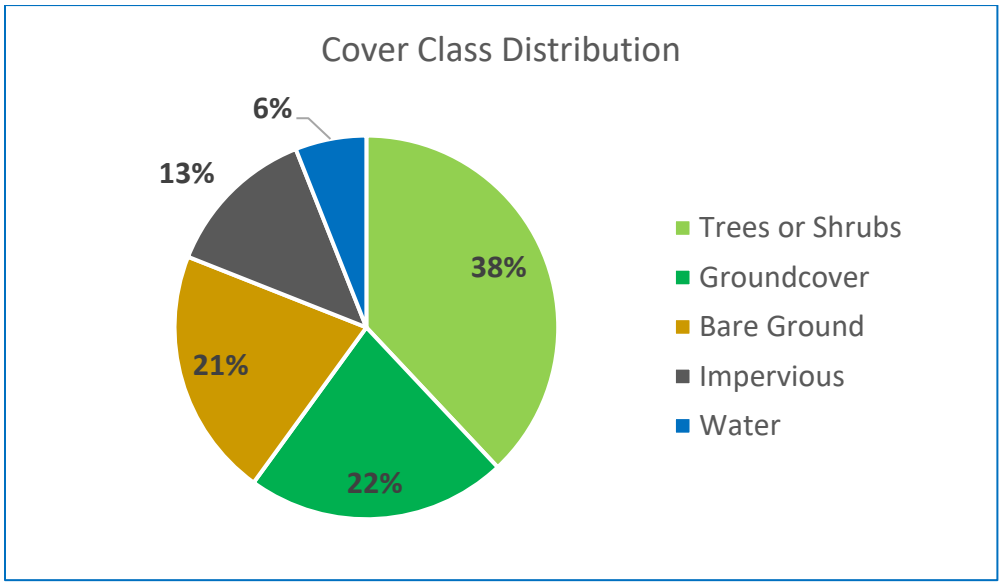

Figure 11. Percent distribution of i-Tree surface cover points in the city of North Port, including Myakka State Forest and Orange Hammock Wildlife Management Area.

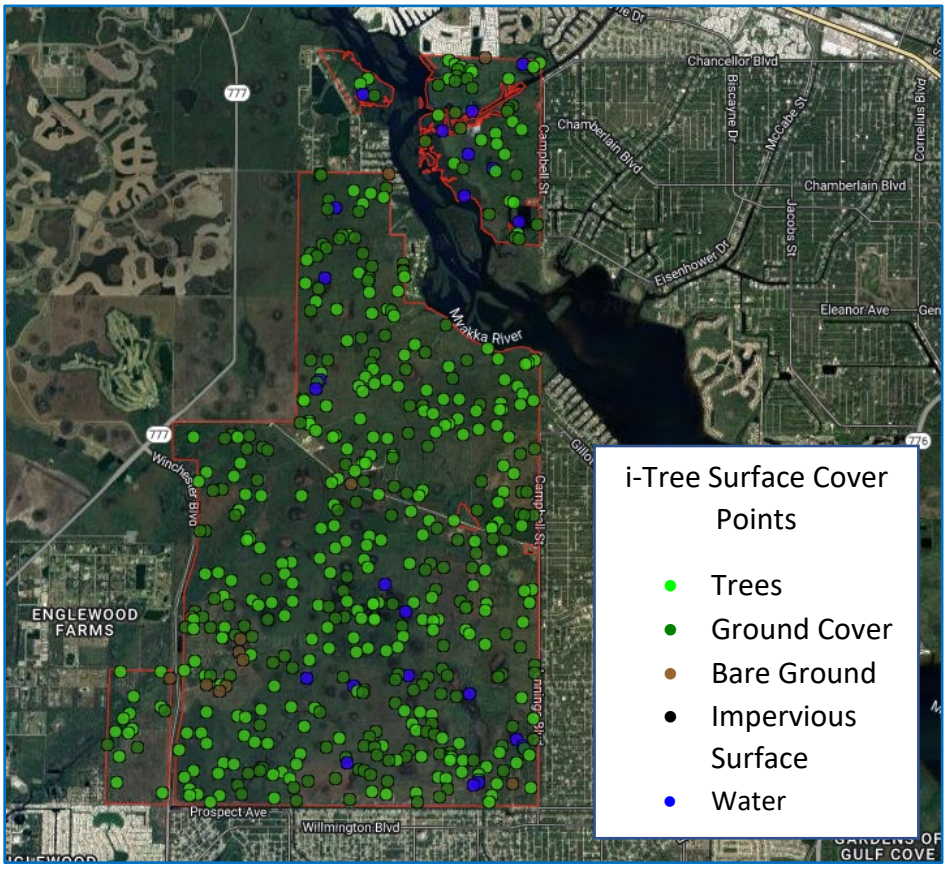

Figure 12: Distribution of i-Tree surface points in Myakka State Forest, city of North Port.

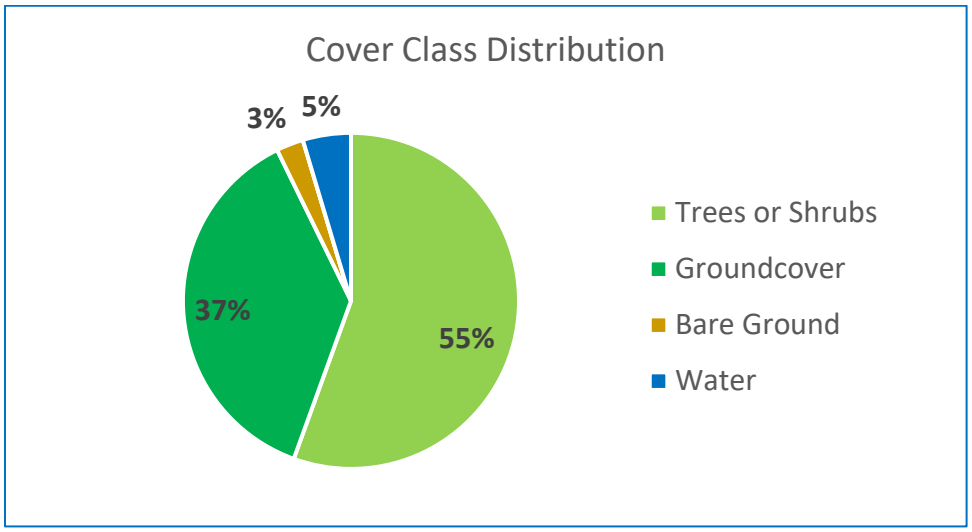

Figure 13. Percent distribution of i-Tree surface cover points in Myakka State Forest, city of North Port.

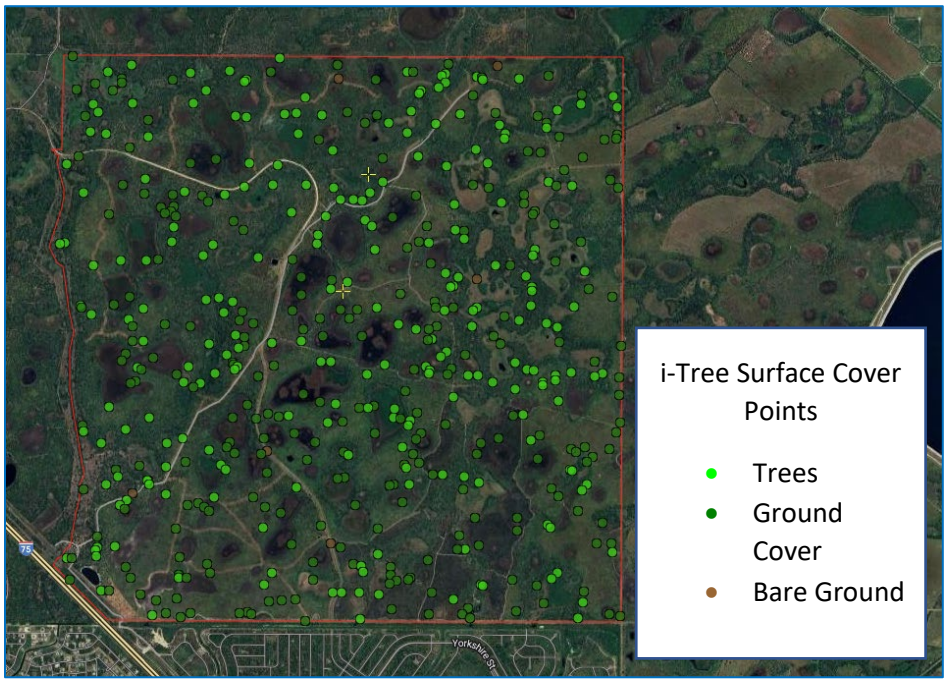

Figure 14. Percent distribution of i-Tree surface cover points in Orange Hammock Wildlife Management Area, city of North Port.

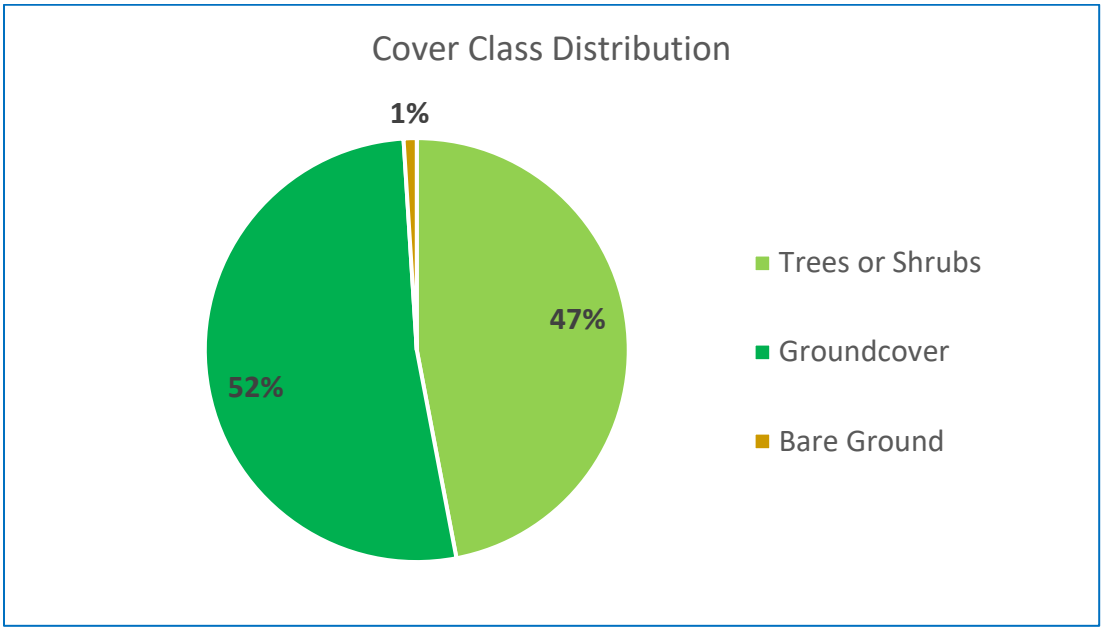

Figure 15. Percent distribution of i-Tree surface cover points in Orange Hammock Wildlife Management Area, city of North Port.

North Port city limits, excluding Myakka State Forest

The research conducted for the City's region, except for the Myakka State Forest (as shown in Figure 16), reveals that the canopy of trees and shrubs encompasses 38% of the area, while ground cover accounts for 16%. The data further indicates that impervious surfaces cover 14% of the area, with 25% being bare ground. Open water was identified in 7% of the area (Figure 17).

The study underscores the benefits of the canopy for the region, derived from the existing canopy and the i-Tree software (refer to Tables 2, 3, and 4). For example, trees and other vegetation absorb and retain a portion of rainfall through interception, evaporation, and transpiration processes, thereby reducing the net rainfall that turns into runoff. The hydrological benefits of the trees for the city of North Port are estimated to include potential transpiration of 12,602.33 million gallons. Transpiration, coupled with the evaporation of rainfall from leaves and soil, can alleviate the impacts of urban heat islands. Typically, urban forests exhibit cooler temperatures than non-forested urban areas.

In addition, the annual carbon storage is gauged at 30.54 kilotons, with a potential storage of 111.98 kilotons of Carbon Dioxide (CO_2). As per the i-Tree software, the stored carbon equates to an approximate monetary value of $5,208,687 annually. This figure does not account for the already stored 766.98 kilotons of Carbon and 2,812.3 kilotons of Carbon Dioxide, which amounts to a total of $130,809,666 worth of stored carbon. Lastly, Table 4 highlights the substantial quantities of Carbon Monoxide, Nitrogen Dioxide, Ozone, Sulfur Dioxide, and Particulate Matter less than 2.5 microns that are removed annually.

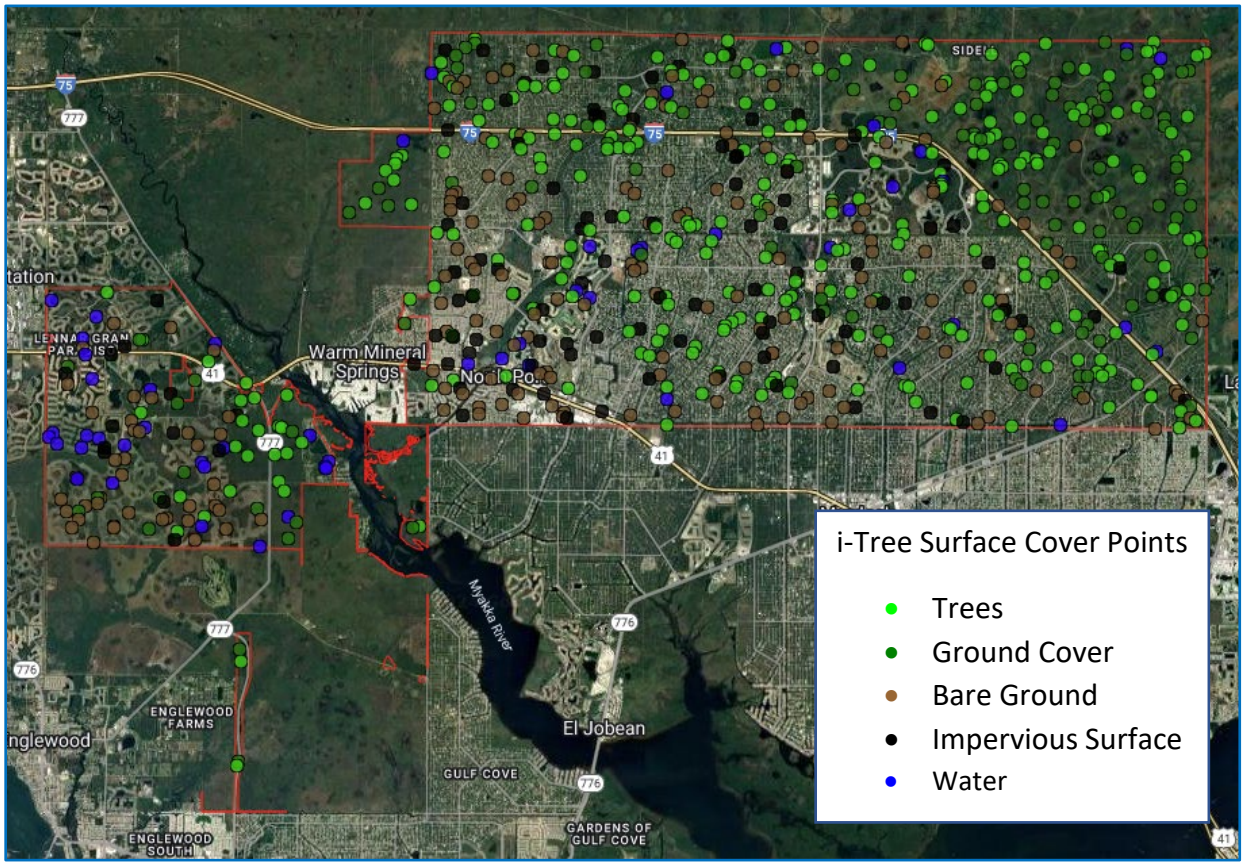

Figure 16. Distribution of i-Tree surface points in the city of North Port, Florida, excluding the Myakka State Forest.

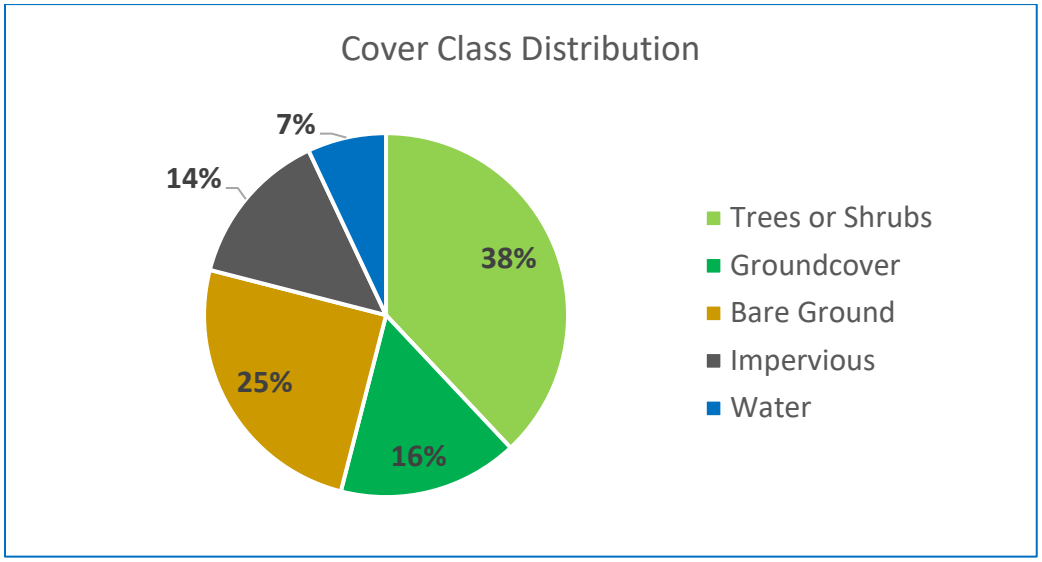

Figure 17. Percent distribution of i-Tree surface cover points in Myakka State Forest, city of North Port.

Benefit	Amount (Mgal*)	±SE	Value (USD)	±SE
Avoided Runoff	20.09	±0.93	$179,509	±8,325
Evaporation	1,657.47	±76.87	N/A	N/A
Interception	1,665.74	±77.25	N/A	N/A
Transpiration	2,568.38	±119.12	N/A	N/A
Potential Evaporation	12,602.33	±584.48	N/A	N/A
Potential Evapotranspiration	12,602.33	±584.48	N/A	N/A

Table 2. Estimated hydrological tree benefits for the city of North Port, excluding the Myakka State Forest. The currency is in USD (United States Dollars) and all values are rounded. The standard errors (SE) of removal and benefit amounts are based on the SE of the sampled and classified points. *Mgal = millions of gallons

Description	Carbon (kT*)	Standard Error	CO_2 Equiv. (kT*)	±SE	Value (USD)	±SE
Sequestered annually in trees	30.54	±1.42	111.98	±5.19	$5,208,687	±241,572
Stored in trees (Not an annual rate)	766.98	±35.57	2,812.27	±130.43	$130,809,666	±6,066,787

Table 3. The Tree Benefit Estimates for Carbon Absorption, estimated for the city of North Port, excluding the Myakka State Forest area. Amount sequestered is based on i-Tree Canopy software data estimates. *kT = kilotons (1,000 tons)

Description	Amount (T*)	Standard Error	Value (USD)	±SE
Carbon Monoxide removed annually	10.10	±0.47	$3,951	±183
Nitrogen Dioxide removed annually	50.54	±2.34	$1,240	±58
Ozone removed annually	537.37	±24.92	$62,320	±2,890
Sulfur Dioxide removed annually	50.48	±2.34	$214	±10
Particulate Matter less than 2.5 microns removed annually	26.56	±1.23	$130,430	±6,049
Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	190.95	±8.86	$374,102	±17,350
Total	**866.00**	**±40.16**	**$572,257**	**±26,541**

Table 4. Tree Benefit Estimates for Air Pollution. Currency is in United State Dollars (USD) and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. *T = tons (2,000 pounds).

North Port city limits, excluding Myakka State Forest and Orange Hammock Wildlife Management Area

For this section the study assessed a total of 1000 points within the City's jurisdiction, excluding the Orange Hammock Wildlife Management Area and the Myakka State Forest. An additional canopy assessment was carried out, revealing that this specific area of North Port identifies a tree and shrub canopy cover of 34%, along with a ground cover of 14%. Furthermore, the City also exhibits a bare ground cover of 26%. Impervious surfaces, which include roadways, sidewalks, rooftops, and driveways, constitute 19% of the City's overall cover. Lastly, the area features an 8% water cover, encompassing open water bodies such as ponds, lakes, canals, and ditches.

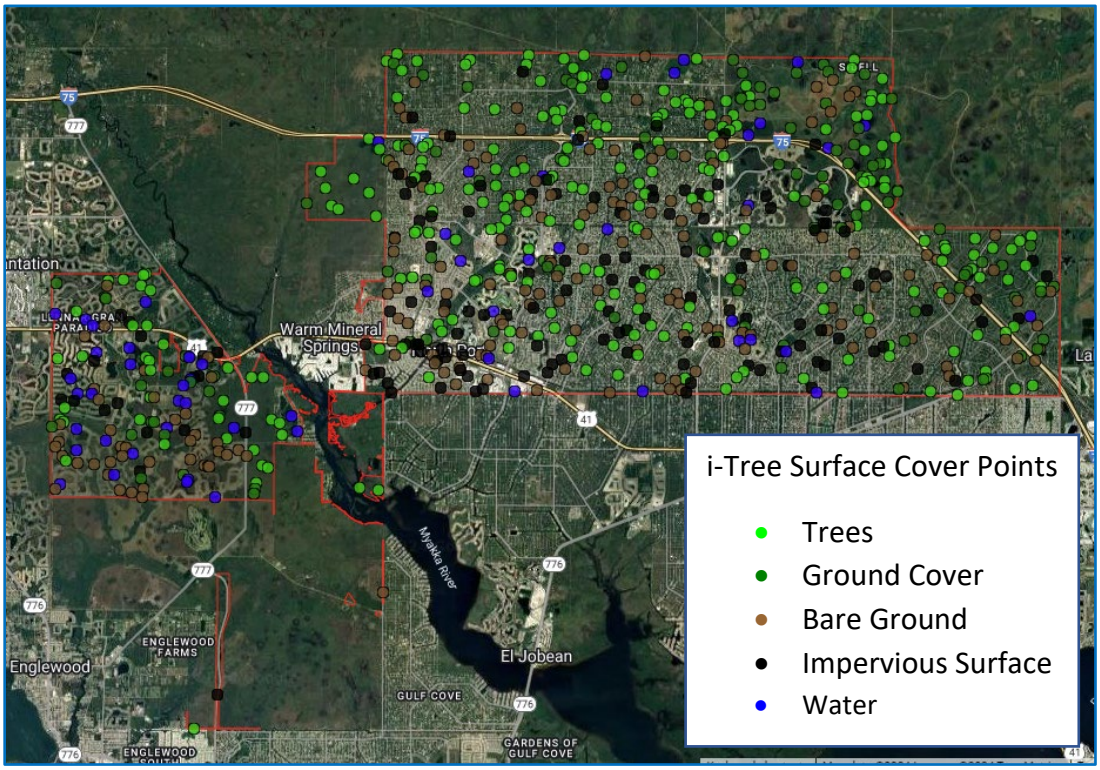

Figure 18. Distribution of i-Tree surface cover points in the city of North Port, Florida, excluding Myakka State Forest and Orange Hammock Wildlife Management Area.

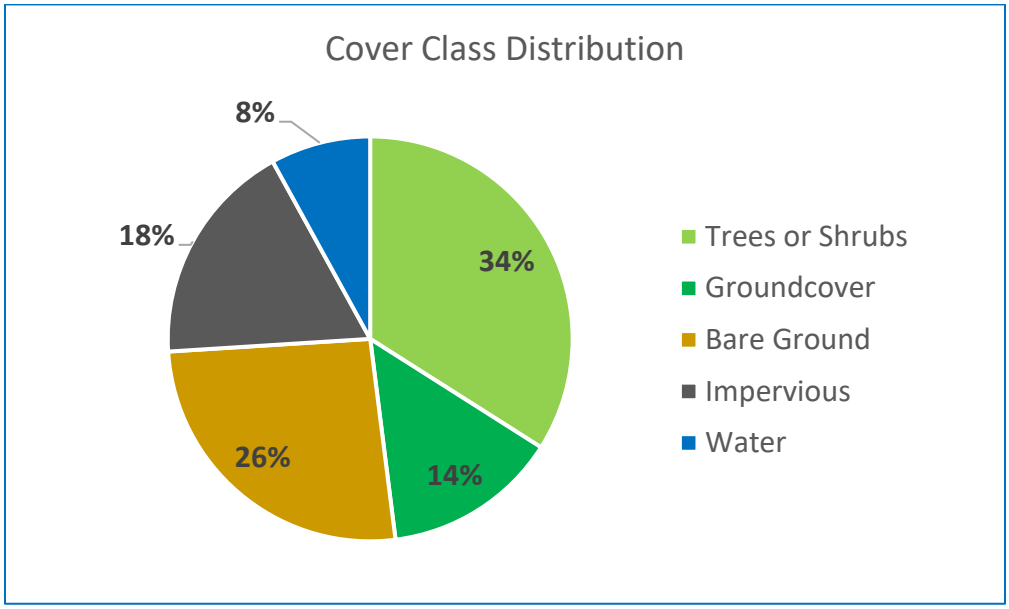

Figure 19. Percent distribution of i-Tree surface cover points in the city of North Port, Florida, excluding Myakka State Forest and Orange Hammock Wildlife Management Area.

Discussion

Initial observations from the Sarasota County Canopy Study and the City's development patterns suggest a comparable distribution of canopy between the two assessments. However, there is a noticeable decrease in ground cover and an increase in impervious coverage between the two. A minor increase in open water surface areas was also noted.

The current North Port Tree Canopy Assessment, which encompasses the Myakka State Forest and Orange Hammock Wildlife Management area, indicates a 38% canopy coverage, 22% ground coverage, and 21% bare ground (Table 5). Impervious surfaces and surface water constitute 13% and 6% of the area, respectively. The 2013 Sarasota County Tree Canopy study reveals that the canopy makes up 36% of the total area, indicating a similar presence of trees. Ground cover, accounting for 29% of the land, contributes to the natural landscape and provides a vital habitat for species such as the Florida scrub-jays and gopher tortoises. Bare ground, representing 23% of the area, denotes regions devoid of significant vegetation or man-made structures. Man-made structures, represented by impervious surfaces, make up 9% of the City's area cover, including buildings, roads, and other infrastructure. Open water bodies, such as lakes, ponds, and canals, constitute 3% of the North Port's area.

Once we evaluate the surface coverage results from this study and exclude the Myakka State Forest and Orange Hammock Wildlife Management area, the cover distribution shifts to 34% canopy, 14% ground, and 26% bare ground, with impervious surfaces rising to 18% (Table 5). This underscores the significant natural coverage in the areas excluded (Figures 14 and 16) and a further reduction of natural area and shift towards an increase in impervious areas.

Upon comparing these datasets, we have identified a similar canopy coverage but a significant shift in ground cover. This could be attributed to the lack of natural area management and fire suppression, leading to a reduction in ground cover due to dense vegetation, including Category I invasive species. The City's rapid growth and development over the past decade, which necessitated lot clearing, would likely be a key contributing factor in this reduction. While storm activities, such as Hurricane Irma in 2017 and Ian in 2022, may have affected the canopy, no clear trends were identified between the two datasets. The data also revealed a notable 4% surge in impervious surfaces. The expansion of open water surfaces could be partially linked to the construction of new stormwater retention ponds that accompany new developments.

As the City's Department of Natural Resources completes future canopy assessments, the documentation, tracking, and recognition of canopy coverage trends will be enhanced. Current discrepancies in surface area might be attributed to procedural variations between North Port's staff and Sarasota County's Environmental Protection team. It's important to acknowledge that there may be a margin of error and slight operational differences in the methodologies of the two studies, with a potential 2% error margin that could influence the datasets.

Further research, which includes a more detailed i-Tree Canopy analysis and a division of the City area into smaller sections, is being considered for the future. This research could assist in identifying the distribution of trees and canopy coverage on a more detailed scale, thereby highlighting areas that lack sufficient canopy coverage. In addition, it would be beneficial to conduct a tree inventory that includes information on species composition, age, and health of the tree canopy, as well as heritage trees on public property. Work on this initiative is anticipated to begin in the calendar year 2025, as a detailed plan needs to be established. Lastly, the Natural Resources department recommends conducting such a canopy assessment every 2 years. This would allow us to evaluate the data, monitor important trends, and identify areas that are prime candidates for habitat management.

North Port Area Surface Coverage				
	2013 Sarasota County Tree Canopy Study, including MSF* and OSHWA*	2024 North Port Tree Canopy Assessment, excluding MSF* and OHWMA)	2024 North Port Tree Canopy Assessment, excluding OHWMA*	2024 North Port Tree Canopy Assessment, including MSF* and OSHWA*
Trees or Shrubs	36%	34%	38%	38%
Groundcover	29%	14%	16%	22%
Bare Ground	23%	26%	25%	21%
Open Water	3%	8%	7%	6%
Impervious Surface	9%	18%	14%	13%

Table 5. Comparison between i-Tree surface cover points distribution in the city of North Port, according to the 2013 Sarasota County Tree and the North Port Tree Canopy Assessment (*MSF – Myakka State Forest; OHWMA - Orange Hammock Wildlife Management Area).

Conclusion

The task of measuring urban surface coverage is vital in both preserving and enhancing the benefits of urban trees and natural ecosystems. For any developed area, it's crucial to maintain a balanced habitat, with each tree evaluated for its role and its contribution to the well-being of residents and the environment.

This canopy assessment's data underscores the importance of ongoing conservation efforts to protect and improve these habitats, given their critical role in supporting biodiversity. To maintain a minimum of 35% coverage of canopy and woody shrubs, the City could explore various strategies. One approach could be to protect priority urban forest areas through acquisition and conservation measures. In the face of growth and development, forest loss can be mitigated by adopting urban canopy conservation and tree planting rules, open space natural habitat design, and context-sensitive development, which are incorporated into the pending ULDC rewrite.

Existing forest canopies can be preserved by implementing regulations that incentivize tree conservation. Moreover, North Port could increase tree planting by reforesting city-owned areas that lack coverage, starting with priority sites. The City could also encourage reforestation on private lands by creating educational programs, fostering stewardship, and offering incentives to the residents of our community. This canopy assessment can provide knowledge of areas that can be identified for planting. This comprehensive approach will ensure the preservation and enhancement of our urban canopy, contributing to a healthier and more sustainable environment for North Port's residents.

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Appendix A

i-Tree Canopy Technical Notes

This tool is designed to allow users to easily and accurately estimate tree and other cover classifications (e.g., grass, building, roads, etc.) within their city or any area they like. This tool randomly lays points (number determined by the user) onto Google Earth imagery and the user then classifies what cover class each point falls upon. The user can define any cover classes that they like, and the program will show estimation results throughout the interpretation process. Point data and results can be exported for use in other programs if desired.

There are three steps to this analysis:

1. Import a file that delimits the boundary of your area of analysis (e.g., city boundary). Some standard boundary files for the US can be located on the US Census website. Data from these sites will require some minor processing in GIS software to select and export a specific boundary area polygon.

2. Name the cover classes you want to classify (e.g., tree, grass, building). Tree and Non-Tree are the default classes given but can be easily changed.

3. Start classifying each point: points will be located randomly within your boundary file. For each point, the user selects from a dropdown list the class from step 2 that the point falls upon. The more points that are interpreted, the more accurate the estimate.

Credits

The concept and prototype of this program were developed by David J. Nowak, Jeffrey 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

The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. Thus, the classes that are chosen for analysis must be able to be interpreted from an aerial image. 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. Information on calculating standard errors can be found below. Another limitation of this process is that the Google imagery may be difficult to interpret in all areas due to relatively poor image resolution (e.g., image pixel size), environmental factors, or poor image quality.

Calculating Standard Error and Confidence Intervals from Photo-Interpreted Estimates of Tree Cover

In photo interpretation, randomly selected points are laid over aerial imagery and an interpreter classifies each point into a cover class (e.g., tree, building, water). i-Tree v4 / i-Tree Canopy v1 www.itreetools.org 2/14/2011 From this classification of points, a statistical estimate of the amount or percent cover in each cover class can be calculated along with an estimate of uncertainty of the estimate (standard error (SE)). To illustrate how this is done, let us assume 1,000 points have been interpreted and classified within a city as either "tree" or "non-tree" as a means to ascertain the tree cover within that city, and 330 points were classified as "tree".

To calculate the percent tree cover and SE, let:

N = total number of sampled points (i.e, 1,000)
n = total number of points classified as tree (i.e., 330), and
p = n/N (i.e., 330/1,000 = 0.33)
q = 1 – p (i.e., 1 - 0.33 = 0.67)
SE = √ (pq/N) (i.e., √ (0.33 x 0.67 / 1,000) = 0.0149)
Thus, in this example, tree cover in the city is estimated at 33% with a SE of 1.5%. Based on the SE formula, SE is greatest when p=0.5 and least when p is very small or very large (Table 1).

Table 1. Estimate of SE
(N = 1000) with varying p.

p	SE
0.01	0.0031
0.10	0.0095
0.30	0.0145
0.50	0.0158
0.70	0.0145
0.90	0.0095
0.99	0.0031

Confidence Interval

In the case above, a 95% confidence interval can be calculated. "Under simple random sampling, a 95% confidence interval procedure has the interpretation that for 95% of the possible samples of size n, the interval covers the true value of the population mean" (Thompson 2002). The 95% confidence interval for the above example is between 30.1% and 35.9%. To calculate a 95% confidence interval (if N>=30) the SE x 1.96 (i.e., 0.0149 x 1.96 = 0.029) is added to and subtracted from the estimate (i.e., 0.33) to obtain the confidence interval.

SE if n < 10

If the number of points classified in a category (n) is less than 10, a different SE formula (Poisson) should be used as the normal approximation cannot be relied upon with a small sample size (<10) (Hodges and Lehmann, 1964). In this case: SE = (√n) / N For example, if n = 5 and N = 1000, p =

n/N (i.e., 5/1,000 = 0.005) and SE = √5 / 1000 = 0.0022. Thus, the tree cover estimate would be 0.5% with a SE of 0.22%.