

## EXECUTIVE SUMMARY - URBAN TREE CANOPY IN THE CITY OF ATLANTA

Tree canopy is defined as the layer of leaves, branches, and stems of trees that cover the ground when viewed from above. Tree canopy coverage is affected by local geography and climate, as well as land use patterns and development densities. Studying urban tree canopy coverage helps cities better understand and manage their forest resources and maximize benefits associated with a healthy urban forest.

In the Piedmont region where Atlanta is situated, the predominant ecosystem is made up of deciduous forest. Left to natural processes, close to 100% of the land here would be covered by forests. Other ecological regions such as those characterized by desert, prairie, meadow, evergreen forest, bodies of water, and other features have canopy coverage that reflects those geographies. In urban settings, development patterns and land use have the greatest impact on the natural landscape. Unlike most major cities, especially older industrialized cities, Atlanta retains large portions of its native forest landscape that include areas with old growth character, mature trees, and diverse native plant communities. These urban forests are found in parks, nature preserves, residential yards, and other private properties. Urban trees and forests offer important benefits such as cleaner air and water, life-sustaining habitat for wildlife, and enhanced physical, mental, and spiritual health for residents. The exceptional quality of Atlanta's forest land provides further incentive for its careful study and management.



FIGURE 1. CHAMPION ASH TREE AT TANYARD CREEK

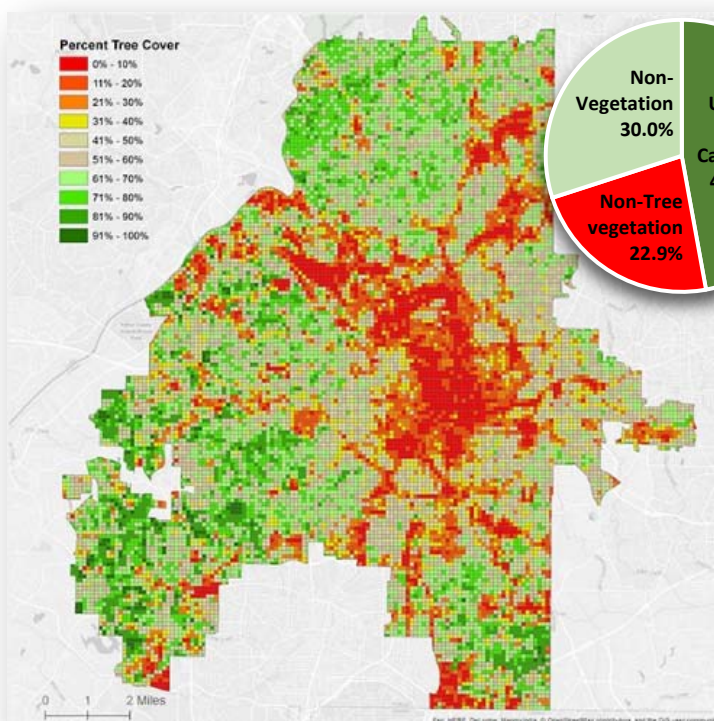


FIGURE 2. URBAN TREE CANOPY DISTRIBUTION

Atlanta's Department of City Planning completed the first ever city-wide analysis of tree canopy utilizing 2008 satellite imagery. This baseline analysis revealed that Atlanta's overall tree canopy coverage was 47.9% and that canopy coverage within the city varied tremendously, from less than 10% downtown and along transportation corridors to over 90% in nature preserves and along stream corridors. Over the last two years, through a contract with Georgia Tech's Center for Spatial Planning Analytics and Visualization, the City completed a second tree canopy analysis utilizing 2014 satellite imagery. The research team estimates that in October 2014, the overall tree canopy coverage was approximately 47.1% (40,740 acres), which is not a statistically significant change from the baseline. The remainder

of the city’s land cover was non-tree vegetation such as grass, shrubs, and other plants (22.9%/19,758 acres) and non-vegetation such as buildings, streets, and pavement (30.0%/25,921 acres). Accurate comparisons of *overall* canopy change from 2008 to 2014 are difficult because the City annexed over 2,000 acres and changed its boundaries during this period. However, a close evaluation of areas *within the city of Atlanta* that showed significant canopy gain and loss provided a greater understanding of patterns, trends, and underlying causes of the changes in the quantity and quality of tree canopy. It also showed that canopy coverage fell to around 45% in 2014 when “false growth” of invasive and low quality trees on cleared land was taken into account.

**Canopy Distribution Across the City**

While Atlanta enjoys some of the highest quantity of overall tree canopy coverage within the city limits of a major US city, the canopy coverage varies widely across the city’s 243 neighborhoods. Densely developed and urbanized areas such as Downtown (1,256 acres), Atlantic Station (163 acres), and Lenox (152 acres) had less than 8% canopy coverage. A dozen single-family residential neighborhoods outside the city’s core had canopy coverage of 70% or greater. The highest canopy coverage was in the Boulder Park (78%) and Butner-Tell (77%) neighborhoods of southwest Atlanta.

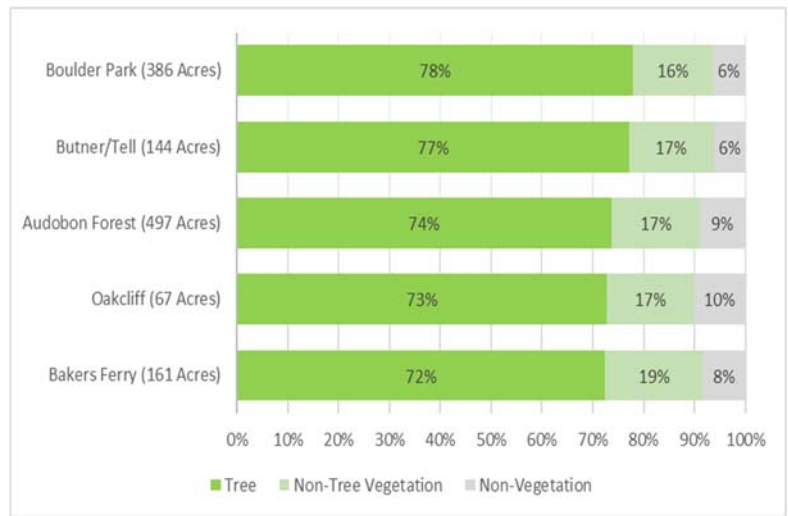


FIGURE 3. FIVE HIGHEST TREE CANOPY NEIGHBORHOODS

Park land makes up approximately 4.5% land in the city and contains approximately 5% of the city’s tree canopy. The average tree canopy coverage on park land (48%) does not differ much from the city’s overall tree canopy coverage of 47.1%, reflecting the varied uses of Atlanta’s parks, ranging from open lawn to nature preserves.



FIGURE 4. SKYLINE VIEW FROM PIEDMONT PARK

Among parks over 50 acres in size, canopy coverage ranges from a low of 18% at Lakewood to a high of 89% at Cascade Springs Nature Preserve.

Tree cover is very important to water quality and is a strong predictor of watershed health. Atlanta contains 311 small-area watersheds (the area of land that drains into a common body of water). Average tree canopy cover for

the city’s small-area watersheds is 47.4%. Several watersheds feeding into Peachtree Creek and the South River have less than 10% canopy cover. Ten of the 20 small-area watersheds with the highest tree canopy coverage (over 70%) are along Utoye Creek.

### Tree Canopy Distribution by Zoning Designation

Canopy coverage is strongly related to zoning and land use. The largest land use in Atlanta is single-family, with residential neighborhoods making up 61% of the city’s land area. The next largest zoning designations are industrial (11% of total land area), residential multi-family (9% of total land area), and special public interest (6% of total land area). Figure 5 below shows canopy coverage for several zoning categories, as well as the percentage that each area contributes to Atlanta’s total tree canopy.

Tree Canopy Coverage by Zoning		
Zoning Category	Canopy Coverage within Zoning Area	Contribution to Overall Tree Canopy
Single-Family Residential	58%	76%
Multi-Family Residential	40%	8%
Industrial	26%	6%
Commercial	23%	2%
Other	NA	8%

FIGURE 5. CANOPY COVER BY ZONING CATEGORY

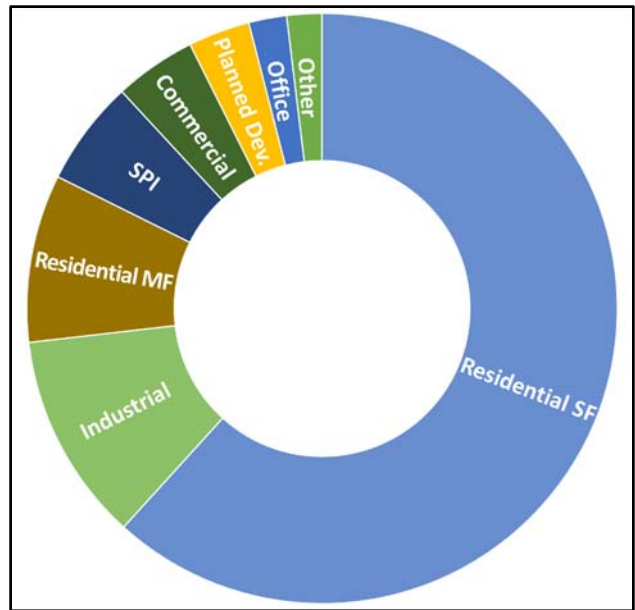


FIGURE 6. CITY LAND AREA BY ZONING CATEGORY

Sorting data by designated zoning category is the best way to analyze land use, but it is important to note that some zoning categories (e.g. mixed use and special public interest) allow several uses. In addition, underlying zoning may not reflect current land use such as in the case of land that is underdeveloped or vacant. This may explain the relatively high canopy coverage on residential multi-family land (40%), industrial land (26%), and commercial land (23%), all of which typically leave little space for trees when fully developed to the maximum lot coverages allowable per zoning requirements.

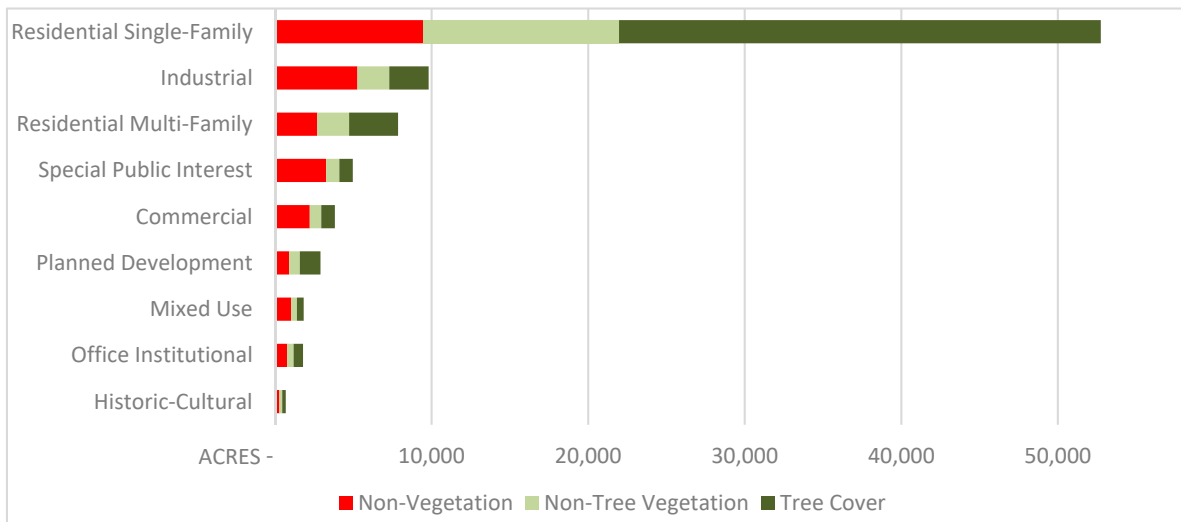


FIGURE 7. LAND COVER DISTRIBUTION BY ZONING CATEGORY

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## 2008 - 2014 URBAN TREE CANOPY CHANGE

A primary objective of the second canopy study was to quantify the canopy change between 2008 and 2014 at multiple geographic levels across the city, starting with the city as a whole and analyzing down to 6-acre grid cells. At the city-scale, interpretation of overall change was complicated because the City annexed approximately 2000 acres of land during this time and changed its boundaries, making it difficult to measure *overall canopy change* precisely. The total *acreage* of the City's urban tree canopy (UTC) was higher in 2014 (40,740 acres) than it was in 2008 (40,524 acres). However, since the physical boundaries of the City expanded, the observed *percentage* of tree canopy for the city as a whole was lower with 47.1% in 2014 vs. 47.9% in 2008.

The 6-acre grid cell analysis yielded more information about the change over time. Researchers observed tree canopy *loss* greater than one acre in 413 cells and tree canopy *gain* greater than one acre in 298 cells. The project team then visually inspected over 750 sites using the satellite photos from both years and subsequently visited 150 locations to verify site conditions. This detailed validation provided added confidence and revealed important trends. Most notable, the site visits revealed that numerous (575) cells detected on the imagery as "canopy gain" were in actuality, previously cleared sites with scrubby vegetation and invasive plant growth. These sites were misclassified in the imagery analyses as tree canopy growth.

**Areas Losing UTC:** There were at least fifteen sites (10 acres or larger), across the city where the change results indicated noticeable (>50%) or complete loss of urban tree canopy. Most of these sites had been cleared and graded for new development, which is not unexpected for a growing city. What was surprising, however, is that the greatest observed losses of tree canopy resulted from redevelopment of single-family houses. Overall, at the sites visited, the number of single-family residential units (density) did not appear to change much between 2008 and 2014, but the size of the single-family homes increased substantially.

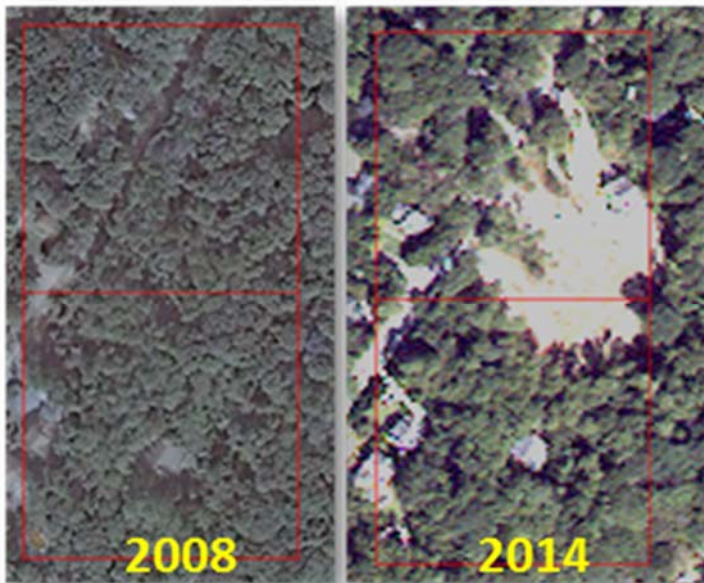


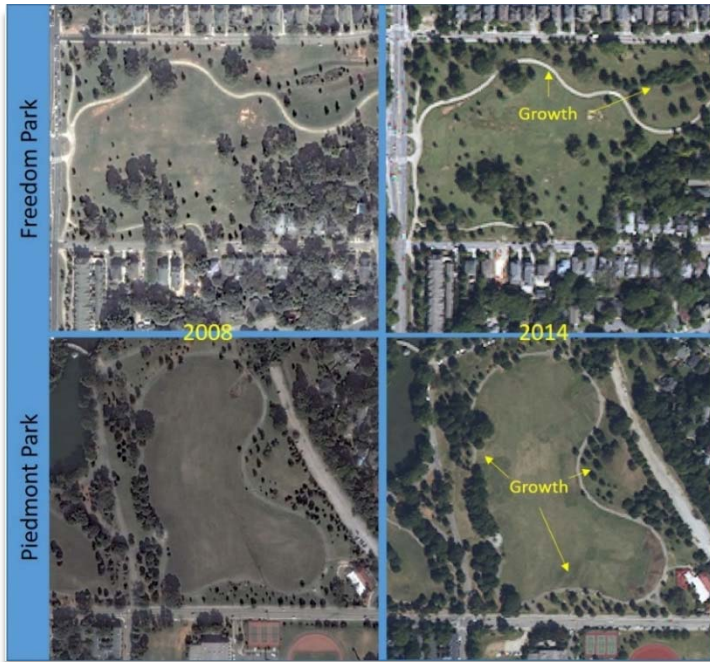
FIGURE 8. SINGLE-FAMILY REDEVELOPMENT, 6-ACRE GRID CELLS

plant trees on roughly 2,500 acres of land. To minimize canopy loss or achieve no-net loss, the City needs to permanently protect Atlanta's few remaining large tracts of undisturbed forest and modify regulations to limit the loss of existing tree canopy in new developments and redevelopments.

The project team identified over 100 properties where single-family homes were demolished and rebuilt or renovated with a much larger building footprint, resulting in a loss of tree cover (150 acres total) and an increase in impervious surface area (75 acres). Since the majority of the city's tree canopy is found on single-family land, this single-family redevelopment trend has a significant impact on the city's urban tree canopy.

Fortunately, the City has recognized concerns about tree loss and has set a policy goal of achieving and maintaining a minimum of 50% tree canopy. While this may be difficult to achieve in the short-term, this goal can be accomplished with a multi-faceted approach. To increase canopy coverage from 48 to 50%, the City must both prevent loss of canopy and

**Areas Gaining UTC:** The project team also identified areas showing an increase in canopy coverage. Several locations showing canopy gain were the result of the rapid growth of trees planted in new subdivisions or on individual properties around 2008. Sites that were cleared prior to 2008 and had almost no tree cover at that



time show up to 25% canopy coverage in 2014. While this growth is positive, it should also be noted that many of these trees are quick growing and non-native or ornamental trees (such as cryptomeria, Chinese elms, and crape myrtles). As such, they do not provide the same long-term ecological benefits as native trees such as oaks, beeches, hickories, elms, and others that likely made up the mature hardwood forests that covered many of these sites prior to being cleared.

It is important to note that numerous sites showing growth in tree canopy were unfinished or partially unfinished subdivisions (i.e., land cleared, roads and sewer constructed but no buildings), which are often referred to as “pipe farms”. Of the 32 identified pipe farms, most of which are in the southeast and southwest

FIGURE 9. CANOPY GAIN IN FREEDOM AND PIEDMONT PARKS

corners of the city, fifteen are greater than 25 acres in size. The largest, which was cleared in 2004, is roughly 80 acres. These sites are now overgrown, typically with small, tightly spaced volunteer pines or quick-growing invasive trees. The imagery shows that some of these sites are at close to 100% growth in UTC since 2008. However, visits revealed that sites were often populated with a monoculture of young pines or poor quality invasive trees that do not provide the ecosystem services of forested land. Most likely, they also represent temporary growth since the sites are stalled developments that will be cleared again when development plans are implemented. Based on extensive site visits and review of the satellite imagery, the project team estimates that this “false” growth represents approximately 900 acres or 2.3% of the city’s canopy, indicating a more accurate estimate of canopy at approximately 45% in 2014.



FIGURE 10. PIPE FARM REGROWTH

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## SINCE 2014

The trends observed between 2008 and 2014 have likely continued, based on field observations in 2016/17 and permitting trends. New building permits in the city of Atlanta increased from approximately 491 in 2012 to over 1,320 in 2017. In the same period, building permits for single-family residential lots, where the highest canopy cover is found, grew from approximately 301 to just over 677 in this period, and was highest in 2016 at 695. Approximately 30% - 40% of new single-family residential permits in each given year were issued for building a new house on the site of a demolished single-family home.

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## RECOMMENDATIONS

The canopy change analysis provides documented, science-based data that can be used to inform decision-making related to urban trees and urban forest management in Atlanta. Information about canopy change between 2008 and 2014 provides a tool to help the City evaluate and quantify how the interaction of policy, land use, and the free market affect urban tree canopy in Atlanta over time.

Specific recommendations for consideration and discussion:

- Permanently protect some of the few remaining large tracts of undisturbed mature forests.
- Identify methods for reducing tree loss during redevelopment of single-family and other properties.
- Evaluate policy decisions related to land development, specifically as it relates to “pipe farms” (partially developed sites).
- Identify measures to prevent clearing of large sites that will not be completed.
- Evaluate maximum allowable lot coverages for impervious surfaces, especially for residential land.
- Implement conservation measures for new subdivisions.
- Identify incentives for re-development of under-developed and cleared land, and incentives for protecting land with the highest ecological value.
- Consider expanding riparian buffers to increase tree cover along streams in impaired watersheds.
- Evaluate open space requirements for multi-family and other developments.
- Align replanting requirements with the species of trees that are removed or require replanting of native trees to ensure tree replacements are of similar quality to the removed trees.
- Obtain high resolution satellite imagery and update canopy analysis every four years to facilitate the evaluation of tree canopy change and the impact of policies over time.