



# Urban Tree Canopy Assessment

## Knox County and City of Knoxville, Tennessee

### 2021

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# Acknowledgments

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## Why is Tree Canopy Important?

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There are currently 157,000 acres of urban tree canopy (UTC) in Knox County and 24,000 acres of UTC in the City of Knoxville. This acreage of tree canopy accounts for 49% of the area in the County and 38% of the area in the City. The following data includes estimated benefits that UTC provides the community when modeling the amount of UTC in the County and City using i-Tree Landscape (a modeling program developed by the US Forest Service and other partners that quantifies tree benefits for selected areas):

- UTC in Knox County stores 5.5 million tons of carbon, equating to \$946,000,000 of benefits, and sequesters another 100 thousand tons of carbon dioxide per year, for an estimated \$17,000,000 per year of annual benefits.
- UTC in the City of Knoxville stores 767 thousand tons of carbon, equating to \$130,000,000 of benefits, and sequesters another 4 thousand tons of carbon dioxide per year, for an estimated \$3,600,000 per year of annual benefits.
- UTC in Knox County removes 9.2 million pounds of pollutants each year, estimating about \$18,000,000 of annual benefits for the community.
- UTC in the City of Knoxville removes about 1.4 million pounds of pollutants each year, estimating about \$4,800,000 of annual benefits for the community.
- Each year, UTC in Knox County transpires 20,610 million gallons of water, intercepts another 13,235 million gallons, and avoids 1,381 million gallons of runoff; providing the community with about \$12,300,000 in annual benefits.
- Each year, UTC in the City of Knoxville transpires 3,031 million gallons of water, intercepts another 1,904 million gallons, and avoids 355 million gallons of runoff; providing the community with about \$3,100,000 in annual benefits.

## Key Terms

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**Census Block** is a small section within a census tract used to measure census statistics. Census blocks in this report were taken from 2008 and 2018 census data.

**Census Tract** is a section of a county used to measure census statistics. These sections are larger than census blocks. Census tracts in this report were taken from 2010 Knox County census data.

**City of Knoxville Neighborhoods** are residential districts within the city. For this study, the neighborhood boundaries were used from previous urban tree canopy studies. Geographic features such as streets, railroads, highways, and ridges were used to delineate neighborhoods into similar sized boundaries. Not every official City of Knoxville neighborhood was assessed independently for this report.

**City of Knoxville Public Service Zones** are areas of Knoxville which are sectioned into zones for Public Service Department maintenance purposes such as tree maintenance, mowing, and brush pick-up.

**Elementary School Districts** identify the administrative boundaries for elementary schools in Knox County. Boundaries in this study were based on 2018 Knox County School districts and were used to subdivide Knox County into smaller geographies.

**Impervious** surfaces do not contain vegetation, such as pavement, buildings, trails and other hardscape.

**Other (non-canopy) Vegetation** is vegetation cover that includes shrubs, turf grass, and open green spaces. This green space could be recreational, residential, or agricultural.

**Possible Planting Area (PPA)** is land that is suitable for planting.

**Raw Change (UTC)** is the percentage of change in UTC from 2008 to 2018. This report mostly uses raw change to report on UTC.

**Relative Change (UTC)** is the percentage of change in the difference in UTC between 2008 and 2018 compared to the UTC in 2008. Relative change is shown in some parts of this report, but Raw Change is used for most of this study.

**Rights-of-Way (ROW)** is an area within Knox County where there is legal right for a government agency to utilize property owned by others for public improvements. For this study, typically the area adjacent to improved roads, highways, trails, and other public corridors.

**Soil and Dry Vegetation** is land surface with bare soil, gravel, rock, or sand. These could be most commonly found in undeveloped land or construction sites.

**Urban Tree Canopy (UTC)** is the amount of leaves, twigs, branches, and trunks of trees that cover an area when looking from above.

**Watersheds** are areas of land that catch and drain precipitation runoff from one common point. This study used Hydrologic Unit Code (HUC) 12 watershed geographies for Knox County.

## Process and Methods

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This Urban Tree Canopy Assessment of Knox County and the City of Knoxville was conducted by PlanIT Geo, LLC (PlanIT Geo) for Trees Knoxville and partnering organizations.

This Urban Tree Canopy (UTC) Assessment in the City of Knoxville and Knox County represents an important step in better understanding baseline conditions of the tree canopy, its distribution and value, and the importance of urban forestry during planning processes. The study encompasses approximately 526 square miles. It involves the use of high-resolution aerial imagery, LiDAR data, and GIS remote sensing technology.

### Land Cover Mapping

PlanIT Geo used spectral and spatial remote sensing analysis, particularly using object-based image analysis (OBIA) for various urban land cover classifications. PlanIT Geo utilized Feature Analyst software v5.2 for the OBIA classification, which uses spectral and texture analysis and pattern recognition through an iterative machine-learning approach. High resolution (1-meter), multi-spectral (4-band) NAIP imagery (U.S. Department of Agriculture National Agriculture Imagery Program) from 2008 and 2018, and LiDAR data (Tennessee LiDAR) collected in 2016 were used for this study. Through this process, there were 5 different land cover classes that were mapped for this study:

**Urban tree canopy (UTC)** mapping included all vegetation generally greater than 10-15 feet. Generally speaking, UTC is the amount of leaves, twigs, branches, and trunks of trees that cover an area when looking from above.

**Other (non-canopy) vegetation** was mapped as shrub/scrub vegetation, turf grass, and other open green space. Following the remote sensing classification of the tree canopy layer, PlanIT Geo was able to extract all other types of vegetation using a Normalized Difference Vegetation Index (NDVI) analysis. The results of this extraction represents all areas of other green space throughout Knox County.

**Impervious surfaces** includes all paved surfaces and hardscapes using existing GIS data that the City or County provided. These subcategories include buildings, streets, parking lots, sidewalks, and “other impervious areas” such as patios, driveways, trails, and other miscellaneous hardscape surfaces.

**Bare soil** includes all barren soil, gravel pits, exposed dirt/open construction, rock, and sand as well as dry (non-photosynthetic) vegetation.

**Water** was mapped from the base imagery and available hydrologic, surface water features provided by the City or County such as lakes, rivers, ponds, and streams.

Through the process of mapping land cover, the following GIS raster layers were produced in this study:

1. Five Land Classes (tree canopy, other vegetation, impervious, bare soil, and water);
2. Five Land Classes, with impervious areas subdivided into buildings, roads, and “other” impervious areas;
3. Urban Tree Canopy Classes subdivided into existing tree canopy, areas suitable for planting trees, and unsuitable areas for planting trees.

### **Urban Tree Canopy Analysis and Mapping**

After the different land covers were mapped, PlanIT GEO used GIS-based modeling processes to calculate the acreage and percent of each land cover type, as well as possible planting area (PPA), and impervious areas for 15 desired geographic scales. These scales included 1) Knox County, 2) City of Knoxville, 3) Knox County commission districts, 4) City of Knoxville council districts, 5) census tracts, 6) City of Knoxville zoning, 7) Knox County zoning, 8) City of Knoxville maintenance zones, 9) City of Knoxville neighborhoods, 10) Knox County watersheds, 11) 100 ft. stream buffer, 12) Knox County elementary school districts, 13) street ROW by census blocks, 14) City and County parks and public spaces, and 15) census blocks.

### **Potential Planting Areas (PPA)**

After mapping “Other (non-canopy) Vegetation” throughout the study area, PlanIT Geo was able to digitize and extract areas unsuitable for tree planting. These unsuitable areas include, but are not limited to, airports, above-ground utility corridors, golf course playing areas, utility corridors, and recreation fields. All remaining vegetation was classified as “Possible Planting Area.” Parking lots, sidewalks, and driveways mapped as impervious were also mapped “Possible Planting Area – Impervious,” where slight modifications of the landscape could result in plantable space with enhanced ecosystem benefits. PPA and PPA-Impervious were mapped and calculated for each of the 15 geographic scales.

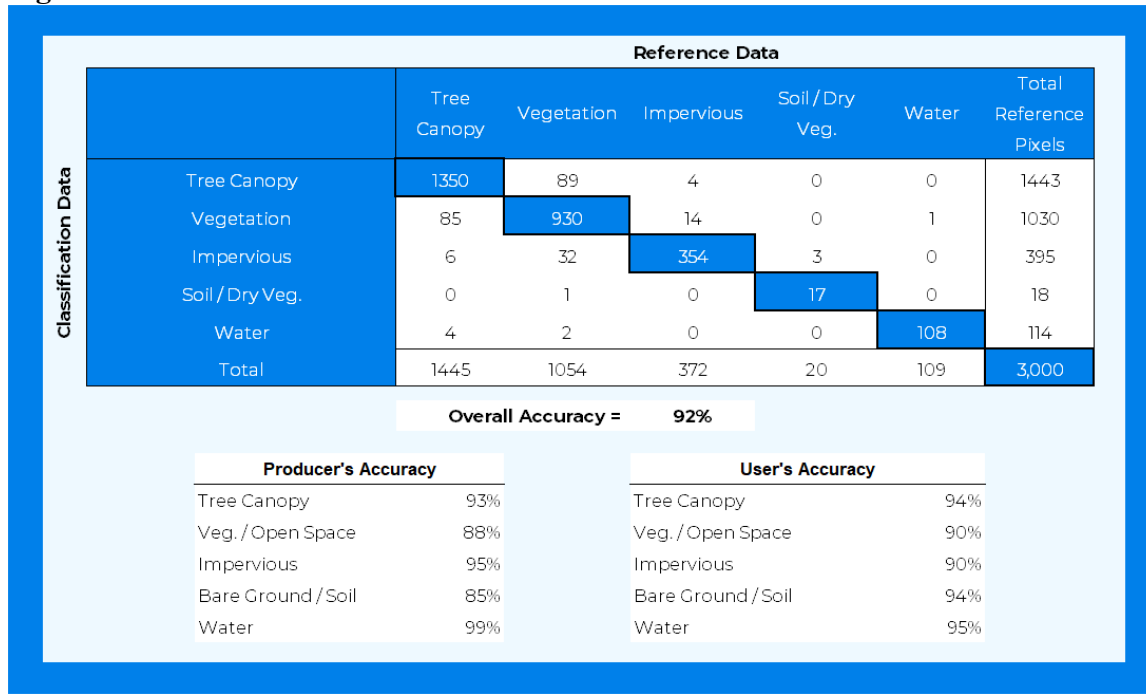
### **Tree Canopy Change**

Similar mapping methods used to map UTC in 2018 were used to map tree canopy using NAIP imagery from 2008. PlanIT Geo calculated the change in quantity and distribution of UTC within a 10 year period (2008-2018). Changes in UTC were assessed within each of the 15 geographic scales to locate specific areas of change and measure the amount of change that has occurred in the last decade.

# Accuracy Standards

After remote sensing mapping of all land cover classes, PlanIT Geo conducted a point-based assessment of the County to determine the accuracy of the study for quality control. 3,000 points were measured to see if the areas mapped by computer recognition were consistent when looking at the points manually. The result of the point-based assessment provided a standard error matrix (Figure A) for the 5 land covers mapped and assessed in the study. Quality control showed that the mapping process was 92% accurate for this study.

**Figure A**





# How Much Urban Tree Canopy Exists?

Chart 1 summarizes the land cover statistics of Knox County and the two major municipalities within the County. The higher percentage of tree canopy in the County is a result of having more rural and agricultural areas that contribute to the percentage of UTC. Chart 2 shows the changes of UTC within the County. Appendix A shows maps of UTC for different geographies across Knox County and the City of Knoxville.

**Chart 1: Knox County 2018 Land Cover Statistics**

| Location          | Total Acres | Tree Canopy (Acres) | Tree Canopy % | Non-Canopy Vegetation (Acres) | Non-Canopy Vegetation % | Impervious (Acres) | Impervious % | Soil & Dry Vegetation (Acres) | Soil & Dry Vegetation % | Water (Acres) | Water % |
|-------------------|-------------|---------------------|---------------|-------------------------------|-------------------------|--------------------|--------------|-------------------------------|-------------------------|---------------|---------|
| Knox County       | 336,867     | 157,567             | 47%           | 117,194                       | 35%                     | 47,474             | 14%          | 2,577                         | 1%                      | 12,055        | 4%      |
| City of Knoxville | 66,722      | 24,252              | 36%           | 18,514                        | 28%                     | 20,025             | 30%          | 335                           | 1%                      | 3,597         | 5%      |
| Farragut          | 10,343      | 3,864               | 37%           | 3,867                         | 37%                     | 2,264              | 22%          | 212                           | 2%                      | 136           | 1%      |

**Chart 2: Urban Tree Canopy Change Metrics**

| Location          | Total Area (Acres) | Land Area (Acres) | UTC 2008 (Acres) | UTC 2008 (%) | UTC 2018 (Acres) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) | Relative Change (%) |
|-------------------|--------------------|-------------------|------------------|--------------|------------------|--------------|------------------------------|----------------|---------------------|
| Knox County       | 336,867            | 324,812           | 157,030          | 48%          | 157,567          | 49%          | 538                          | 0%             | 0%                  |
| City of Knoxville | 66,722             | 63,125            | 24,984           | 40%          | 24,252           | 38%          | -732                         | -1%            | -3%                 |
| Farragut          | 10,343             | 10,207            | 3,512            | 34%          | 3,864            | 38%          | 352                          | 3%             | 10%                 |

Key findings on land cover statistics for Knox County and City of Knoxville:

- The City of Knoxville lost 732 acres (1%) of UTC in a 10 year period
- 1% loss of UTC in the City of Knoxville equates to an estimated loss of about \$115,000 of annual benefits to the community
- Knox County increased the amount of tree canopy by 532 acres
- The City of Knoxville makes up about 20% of the acreage within Knox County but contributes 15% of the UTC in the County
- The City of Farragut makes up 3% of the acreage within the County and contributes 2.5% of the UTC in the County
- The City of Knoxville makes up 42% of the impervious area in Knox County.

**Chart 3: Urban Tree Canopy Change by County Commission District Metrics**

|             | Commission District | Total Area | Land Area      | UTC 2008       | UTC 2008       | UTC 2018   | UTC 2018       | UTC Change           | Raw           |
|-------------|---------------------|------------|----------------|----------------|----------------|------------|----------------|----------------------|---------------|
|             |                     | (Acres)    | (Acres)        | (Acres)        | (%)            | (Acres)    | (%)            | 2008-2018<br>(Acres) | Change<br>(%) |
| Knox County | Commission 1        | 15,488     | 15,149         | 5,750          | 38%            | 5,207      | 34%            | -543                 | -4%           |
|             | Commission 2        | 14,855     | 14,845         | 5,622          | 38%            | 5,909      | 40%            | 287                  | 2%            |
|             | Commission 3        | 15,320     | 15,272         | 5,697          | 37%            | 6,118      | 40%            | 421                  | 3%            |
|             | Commission 4        | 24,061     | 20,323         | 10,545         | 52%            | 10,009     | 49%            | -536                 | -3%           |
|             | Commission 5        | 25,832     | 22,955         | 9,564          | 42%            | 9,786      | 43%            | 222                  | 1%            |
|             | Commission 6        | 40,790     | 39,263         | 16,655         | 42%            | 17,766     | 45%            | 1,111                | 3%            |
|             | Commission 7        | 36,870     | 36,774         | 16,991         | 46%            | 17,924     | 49%            | 934                  | 3%            |
|             | Commission 8        | 114,041    | 112,348        | 55,887         | 50%            | 55,612     | 49%            | -275                 | 0%            |
|             | Commission 9        | 48,768     | 47,494         | 30,102         | 63%            | 29,013     | 61%            | -1,089               | -2%           |
|             | <b>Totals</b>       |            | <b>336,025</b> | <b>324,423</b> | <b>156,813</b> | <b>48%</b> | <b>157,345</b> | <b>48%</b>           | <b>532</b>    |

**Chart 4: Urban Tree Canopy Change by City Council District Metrics**

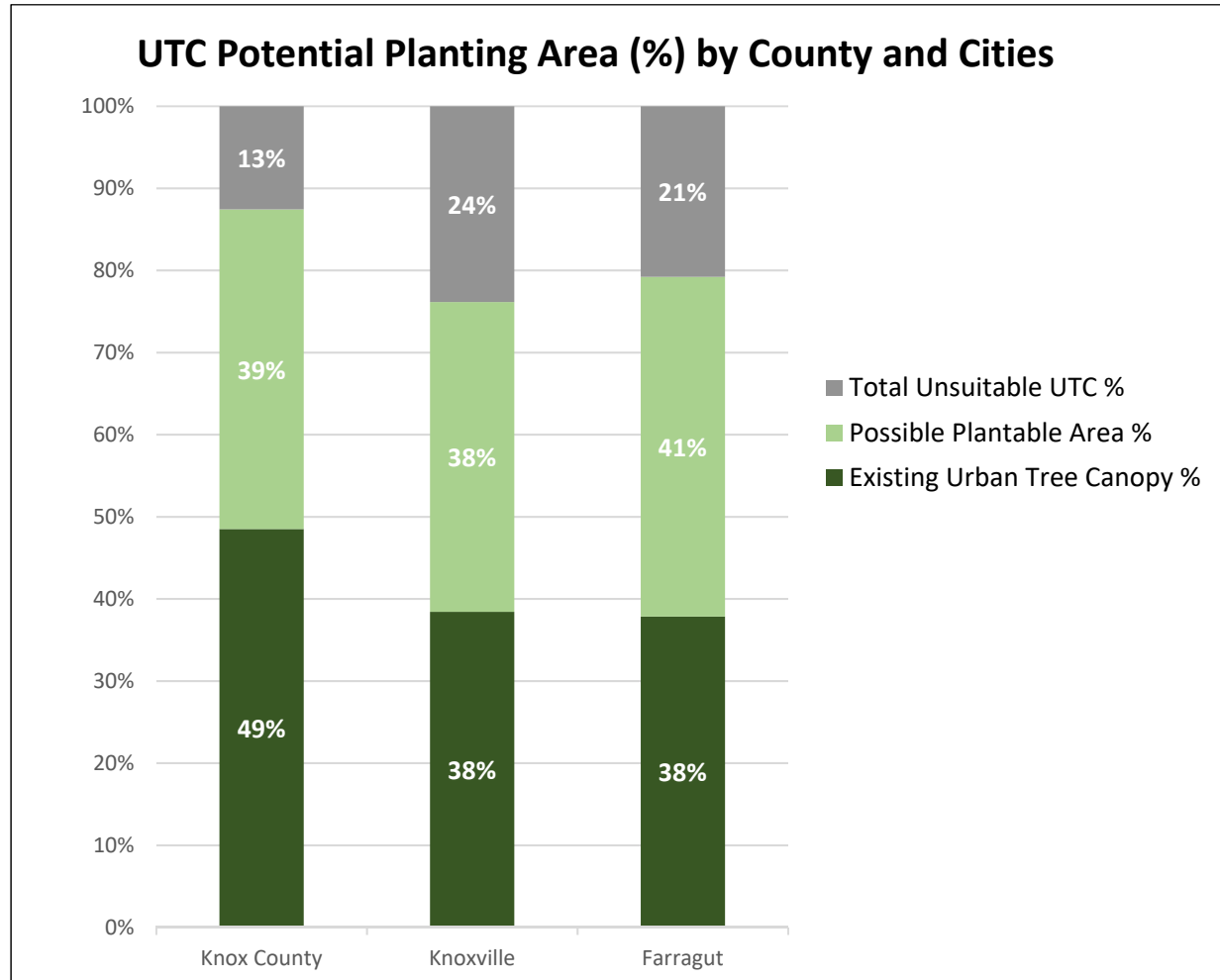
|           | City Council District | Total Area | Land Area     | UTC 2008      | UTC 2008      | UTC 2018   | UTC 2018      | UTC Change           | Raw           |
|-----------|-----------------------|------------|---------------|---------------|---------------|------------|---------------|----------------------|---------------|
|           |                       | (Acres)    | (Acres)       | (Acres)       | (%)           | (Acres)    | (%)           | 2008-2018<br>(Acres) | Change<br>(%) |
| Knoxville | CITY COUNCIL - 1      | 10,634     | 9,926         | 5,388         | 54%           | 4,944      | 50%           | -444                 | -4%           |
|           | CITY COUNCIL - 2      | 17,987     | 15,491        | 4,786         | 31%           | 4,500      | 29%           | -286                 | -2%           |
|           | CITY COUNCIL - 3      | 9,378      | 9,370         | 3,257         | 35%           | 3,501      | 37%           | 244                  | 3%            |
|           | CITY COUNCIL - 5      | 8,227      | 8,223         | 2,897         | 35%           | 3,097      | 38%           | 200                  | 2%            |
|           | CITY COUNCIL - 4      | 13,606     | 13,360        | 5,628         | 42%           | 5,498      | 41%           | -130                 | -1%           |
|           | CITY COUNCIL - 6      | 9,250      | 8,909         | 3,036         | 34%           | 2,717      | 31%           | -319                 | -4%           |
|           | <b>Totals</b>         |            | <b>69,081</b> | <b>65,279</b> | <b>24,992</b> | <b>38%</b> | <b>24,257</b> | <b>37%</b>           | <b>-735</b>   |

# How Much Urban Tree Canopy Could Exist?

This study looked at the existing pervious and vegetated areas throughout the County and looked at what percentage of that area could potentially accommodate UTC or Potential Planting Area (PPA). Areas such as sports fields, airports, and other spaces not suitable for tree cover were not included as PPA. Figure B shows the percentage of land area (excluding water), that could be planted or revert back to UTC. Planting trees alone will not typically allow a community to increase or maintain UTC. There are several important factors that promote UTC which include:

- Properly selecting and planting trees in specific targeted areas in need
- Implementing policies that promote trees being properly selected, planted, and maintained, and identifying any barriers such as lack of enforcement
- Establishing policy or incentives to preserve existing trees and routinely measure the success of tree related policy
- Targeting preservation measures that protect stands of trees and not just individual trees
- Increasing education on the proper care and maintenance of trees
- Identifying and addressing threats to UTC such as invasive species, unsustainable development practices, and improper maintenance
- Communicating the importance of UTC throughout the community

**Figure B**



# Planning

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The following criteria are important when targeting a geographic area for planting and/or prioritizing efforts of increasing or maintaining UTC:

- Percentage of existing UTC in a geographic area
- Percentage of potential planting area (PPA) in a geographic area
- Historical trends in a geographic area (UTC increasing or decreasing)
- Percentage of impervious surfaces in a geographic area
- Community goals and expectations of UTC
- UTC impacts on social and economic entities
- Ecosystem services and tree benefits provided by UTC

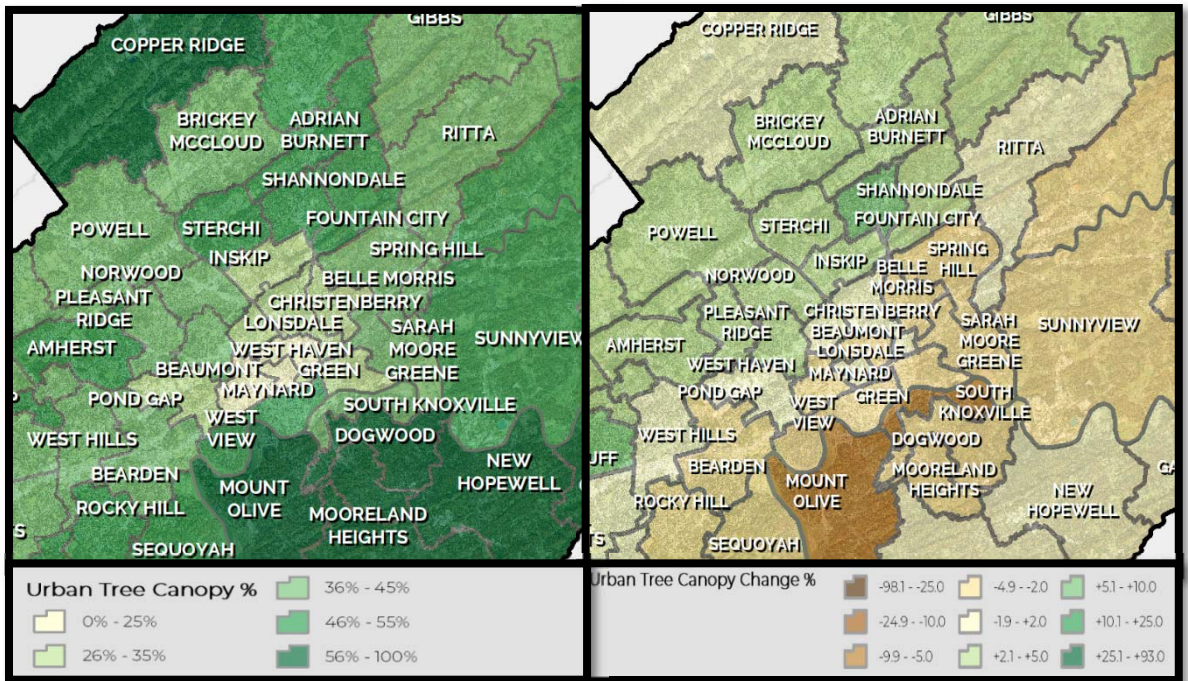
All of these criteria are important when planning how to allocate resources towards maintaining or increasing UTC within a geography. The following are some considerations when planning UTC goals:

- Most of the UTC in an area is on private property and impacted by the land use of that property (see zoning).
- It is not realistic to expect that all PPA within a geography could be planted or revert to UTC; however, communities could set specific UTC goals for a certain geography based on the existing PPA.
- Certain geographic and environmentally sensitive areas such as riparian buffers along streams, hilltops and slopes, areas with high impervious surfaces, and areas with high population density (downtown Knoxville) may require specific UTC goals.
- Many benefits of UTC are intangible but can be measured and areas prioritized using software programs such as i-Tree.
- Many intangible benefits of trees (such as carbon reduction) can be compared to other sustainability efforts within a community and resources weighted accordingly, but it is important to weigh all benefits of trees (trees can reduce carbon while also improving water quality, improving human health, etc.)
- It is vital to consider maintenance and follow-up care of trees when considering planting efforts and projects.

Many communities will set an overarching UTC goal and then target smaller geographic areas for specific UTC projects. Smaller geographic canopy goals (such as elementary school districts or neighborhoods) can also be valuable. Smaller geographic goals can be more measureable and attainable with specific projects. Local level support and input are also likely to be more impactful when making smaller localized UTC goals.

Figure C is an example of how to consider goals and objectives for a geographic area. Figure C shows UTC and the percentage of UTC change over a 10 year period for elementary school districts in central Knox County. Although the “Mount Olive” school district shows a high percentage of UTC that was lost over the course of ten years, it shows a relatively high percentage of UTC still exists in that district. This school district would not be a great location to target large amounts of resources towards tree planting, but rather to look at ways to preserve trees and look at what is contributing to the tree loss in that area.

**Figure C**



## Urban Tree Canopy by Elementary School District

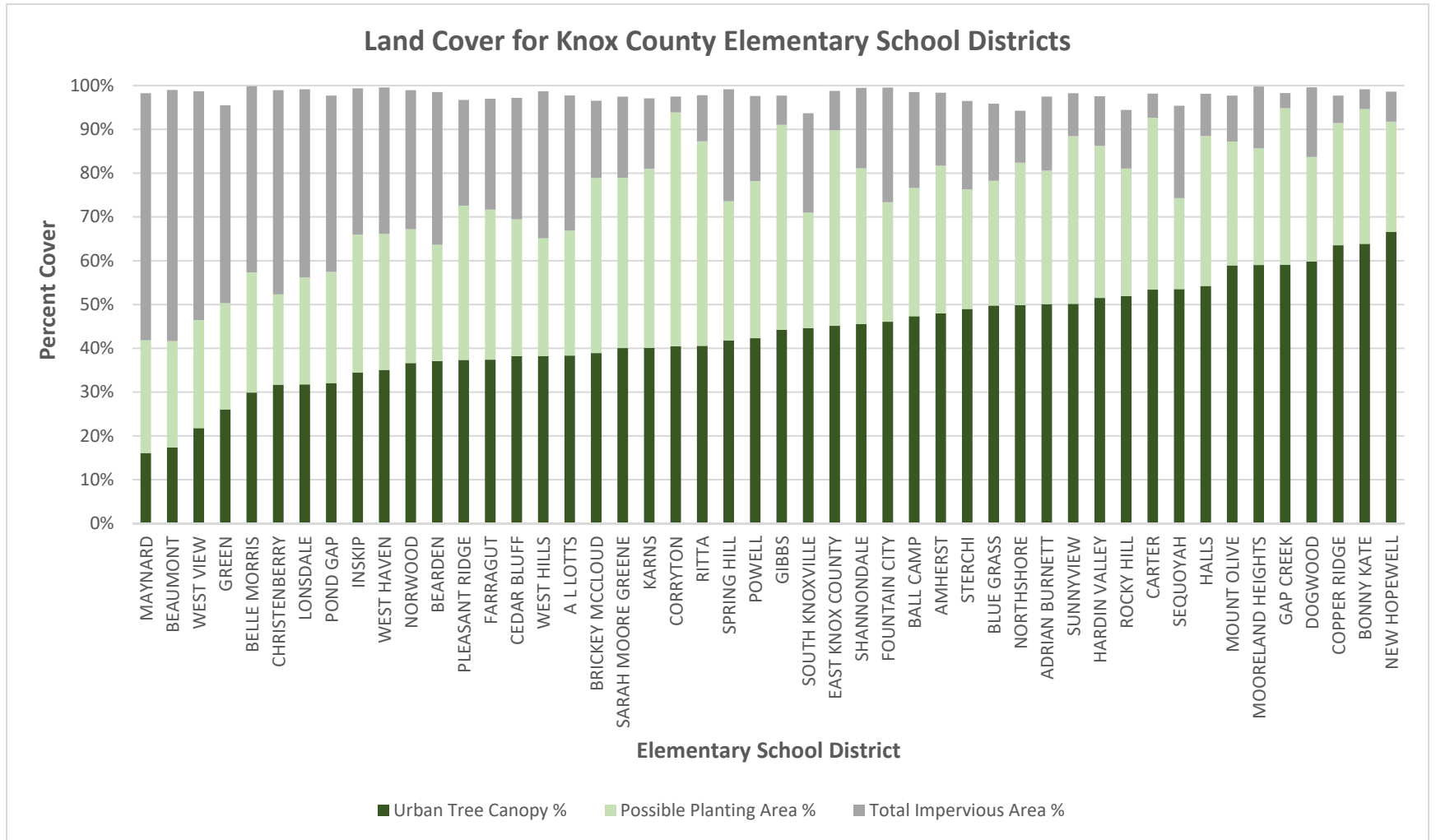
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In order to subdivide Knox County into smaller geographic scales and look at trends, this study assessed UTC in each of the current 48 elementary school districts. Elementary school districts offered an easy way to subdivide the entire County to encompass smaller communities. Tables 1 and 2 in Appendix B show the data for each of the Knox County elementary school districts.

Existing UTC within a geography and the direction a geography is trending will impact the level of amenities that trees provide and how to address tree related issues in that community.

- The school districts in the southern part of the County tend to be trending in a declining direction
- South Knoxville, Mount Olive, Belle Morris, Dogwood, and Mooreland Heights elementary school districts have the greatest decrease in UTC over a 10 year period (all over 5% in UTC lost)
- Fountain City, Cedar Bluff, Inskip, Ball Camp, and Karns elementary school districts all had the greatest increase in UTC over a 10 year period (all over 4% increase in UTC)
- The school districts that overlay the City of Knoxville and urban communities tend to have a lower percent urban tree canopy (see Appendix A, Maps 1 and 2)
- Maynard, Beaumont, West View, Green, and Belle Morris elementary school districts all have the lowest percentage of UTC in the County, while New Hopewell, Bonny Kate, Copper Ridge, Dogwood, and Gap Creek all have the highest percentage of UTC (Figure D)

**Figure D**



# Trees and Schools

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There is research that suggests that the presence of trees and green space in the environment in which students learn can greatly impact their performance.

Several studies suggest:

- Access to greenspace increases attention, interest, and motivation
- Presence of trees and greenspace decreases stress
- Being able to view trees on school grounds increases academic achievements and graduation rates
- Standardized math and reading scores positively correlate with canopy cover

2018 rankings were found for Knox County Schools. The top five performing schools in Knox County are Sequoyah Hills Elementary, Rocky Hill Elementary, Farragut Middle School, A L Lotts Elementary, and Northshore Elementary. Two of these five schools, Sequoyah Hills Elementary and A L Lotts Elementary are also found in the list of schools with the greatest percentage of canopy cover (found in bullet lists below). While trees can increase the academic success of students, there are many other factors that contribute to academic success. This explains why the top five schools for performance and the top five schools for canopy cover aren't identical.

UTC was measured for school grounds to know how much canopy cover exists and much PPA there is. To gain greater access to these benefits, it is essential to know the PPA. The results from the UTC assessment show that there is much room for increasing canopy cover on school grounds across the County, from those with the highest percentages of canopy cover to those with the lowest.

These five school grounds have the top 5 percentages of existing UTC, yet still a significant percentage of PPA:

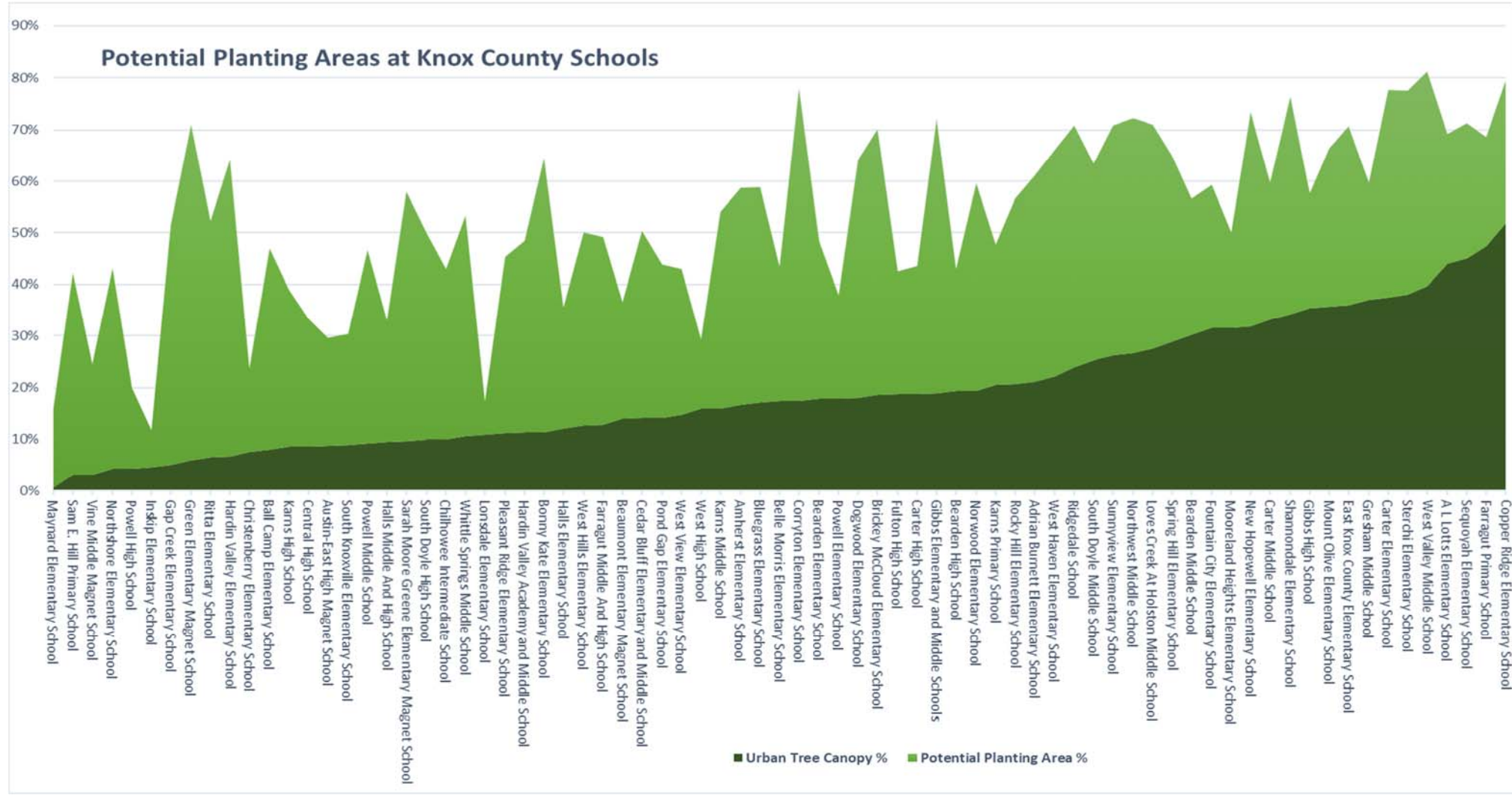
- Copper Ridge Elementary has a canopy cover of 52% and a PPA of 28%
- Farragut Primary School has a canopy cover of 47% and a PPA of 21%
- Sequoyah Elementary has a canopy cover of 45% and a PPA of 26%
- A L Lotts Elementary has a canopy cover of 44% and a PPA of 25%
- West Valley Middle School has a canopy cover of 40% and a PPA of 41%



These five school grounds have the lowest 5 percentages of existing UTC and have significant percentages of PPA:

- Maynard Elementary has a canopy cover of 1% and a PPA of 15%
- Sam E Hill Primary School has a canopy cover of 3% and a PPA of 39%
- Vine Middle Magnet School has a canopy cover of 3% and a PPA of 21 %
- Northshore Elementary has a canopy cover of 4% and a PPA of 39%
- Powell High School has a canopy cover of 4% and a PPA of 16%

Figure E



# Urban Tree Canopy by City of Knoxville Neighborhood

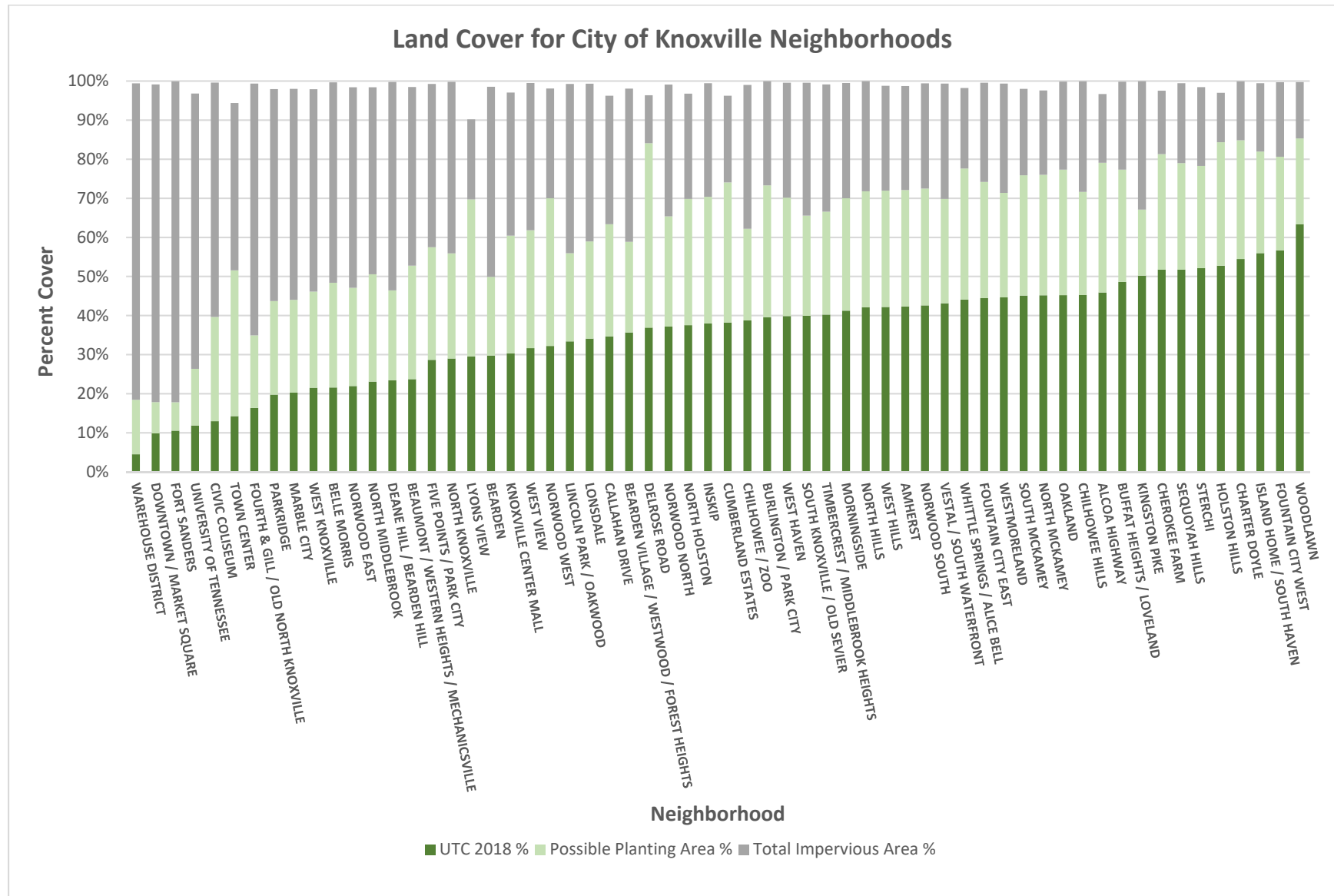
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In order to subdivide the City of Knoxville into smaller geographic scales and look at trends, this study assessed UTC in 60 different neighborhood zones. Since the City of Knoxville does not have neighborhood boundaries similar in size that cover every part of the City, neighborhoods were delineated by using geographic features such as highways, railroads, ridges, and other features to develop boundaries similar in size. Tables 3, 4, and 5 in Appendix B show the data for each of the City of Knoxville neighborhoods.

Existing UTC within a geography and the direction a geography is trending will impact the level of amenities that trees provide and how to address tree related issues in that community.

- There are 15 neighborhoods, mostly concentrated in the central urban part of Knoxville, which have a UTC under 25% (see Appendix A, Map 4).
- The Warehouse District, Downtown, Fort Sanders, University of Tennessee, and the Civic Coliseum have the lowest UTC in the City. The Warehouse District and Downtown are gaining canopy, therefore trending in the right direction.
- The average UTC in each neighborhood is 36%; 25 of the 60 neighborhoods fall below the City average.
- Of the 25 neighborhoods below 36% UTC, 7 are trending in the right direction.
- 19 of the 60 (33%) of neighborhoods are trending in the right direction and have increased the amount of UTC within their boundaries.
- Holston Hills, Sequoyah Hills, Morningside, Alcoa Highway, and Island Home/South Haven have lost the greatest amount of UTC between 2008 and 2018 respectively, all over 5% UTC (see Appendix A, Map 5).
- Most of the neighborhoods trending in the right direction tend to be located on the north side of the City.

Figure F



# Urban Tree Canopy by Watershed and Stream Buffer

The amount of UTC within a defined watershed impacts the overall quality of water resources by intercepting rainfall, transpiring water back into the atmosphere, and avoiding runoff into waterways. This runoff could contain pollutants harmful to stream health and increase erosion along streams. Erosion can be eliminated or avoided by the stabilization tree roots provide. Trees along banks act as stream buffers, reducing the harmful effects of runoff into waterways. UTC also works to reduce air pollution and carbon through sequestration and storage. Aquatic ecosystems are also benefitted by providing a habitat. Chart 5 shows UTC across HUC 12 watersheds within Knox County and the change in UTC from 2008 to 2018.

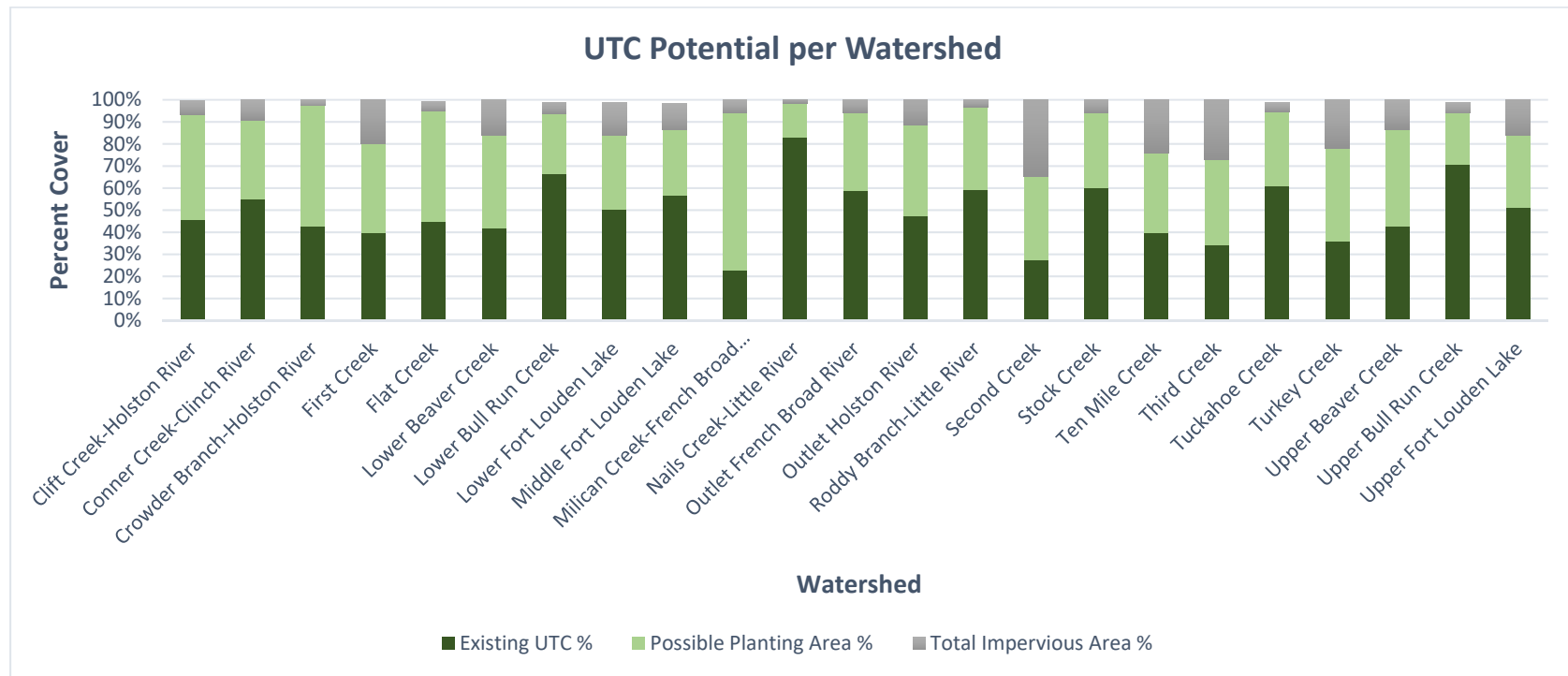
**Chart 5**

|                        | Watershed                        | Total Area (Acres) | Land Area (Acres) | UTC 2008   | UTC 2008       | UTC 2018   | UTC 2018   | UTC Change        | Raw        |
|------------------------|----------------------------------|--------------------|-------------------|------------|----------------|------------|------------|-------------------|------------|
|                        |                                  |                    |                   | (Acres)    | (%)            | (Acres)    | (%)        | 2008-2018 (Acres) | Change (%) |
| Knox County            | Clift Creek-Holston River        | 26,916             | 26,493            | 12,470     | 47%            | 12,075     | 46%        | -396              | -1%        |
|                        | Conner Creek-Clinch River        | 15,817             | 14,271            | 7,642      | 54%            | 7,846      | 55%        | 204               | 1%         |
|                        | Crowder Branch-Holston River     | 3,707              | 3,543             | 1,556      | 44%            | 1,515      | 43%        | -41               | -1%        |
|                        | First Creek                      | 13,854             | 13,842            | 5,148      | 37%            | 5,476      | 40%        | 328               | 2%         |
|                        | Flat Creek                       | 20,317             | 20,192            | 8,767      | 43%            | 9,008      | 45%        | 241               | 1%         |
|                        | Lower Beaver Creek               | 26,118             | 25,983            | 9,966      | 38%            | 10,824     | 42%        | 859               | 3%         |
|                        | Lower Bull Run Creek             | 22,686             | 22,614            | 14,686     | 65%            | 15,030     | 66%        | 344               | 2%         |
|                        | Lower Fort Loudon Lake           | 13,543             | 10,304            | 5,397      | 52%            | 5,201      | 50%        | -196              | -2%        |
|                        | Middle Fort Loudon Lake          | 9,415              | 7,823             | 4,555      | 58%            | 4,429      | 57%        | -126              | -2%        |
|                        | Milican Creek-French Broad River | 623                | 616               | 144        | 23%            | 141        | 23%        | -2                | 0%         |
|                        | Nails Creek-Little River         | 1,141              | 1,140             | 952        | 83%            | 944        | 83%        | -7                | -1%        |
|                        | Outlet French Broad River        | 26,559             | 25,464            | 15,226     | 60%            | 14,975     | 59%        | -252              | -1%        |
|                        | Outlet Holston River             | 25,883             | 25,411            | 13,023     | 51%            | 12,040     | 47%        | -984              | -4%        |
|                        | Roddy Branch-Little River        | 1,435              | 1,280             | 763        | 60%            | 757        | 59%        | -6                | -1%        |
|                        | Second Creek                     | 4,275              | 4,273             | 1,102      | 26%            | 1,167      | 27%        | 65                | 2%         |
|                        | Stock Creek                      | 13,292             | 13,181            | 8,044      | 61%            | 7,917      | 60%        | -127              | -1%        |
|                        | Ten Mile Creek                   | 10,923             | 10,906            | 4,104      | 38%            | 4,322      | 40%        | 218               | 2%         |
|                        | Third Creek                      | 11,085             | 11,075            | 3,740      | 34%            | 3,792      | 34%        | 53                | 0%         |
|                        | Tuckahoe Creek                   | 6,183              | 6,153             | 3,891      | 63%            | 3,759      | 61%        | -132              | -2%        |
|                        | Turkey Creek                     | 16,733             | 16,217            | 5,240      | 32%            | 5,791      | 36%        | 551               | 3%         |
| Upper Beaver Creek     | 31,493                           | 31,435             | 12,259            | 39%        | 13,339         | 42%        | 1,079      | 3%                |            |
| Upper Bull Run Creek   | 3,329                            | 3,323              | 2,255             | 68%        | 2,351          | 71%        | 96         | 3%                |            |
| Upper Fort Loudon Lake | 31,086                           | 28,820             | 15,928            | 55%        | 14,691         | 51%        | -1,237     | -4%               |            |
| <b>Totals</b>          | <b>336,412</b>                   | <b>324,359</b>     | <b>156,858</b>    | <b>48%</b> | <b>157,391</b> | <b>49%</b> | <b>533</b> | <b>0%</b>         |            |

Key findings from UTC in Knox County watersheds:

- Knox County had a UTC decrease in 12 watersheds, totaling a loss of 3,506 acres
- Knox County had a UTC increase in 11 watersheds, totaling a gain of 4,038 acres
- Upper and Lower Beaver Creek watersheds comprised almost half (48%) the UTC gain in the County
- Upper Fort Loudon Lake and Outlet to the Holston River watersheds comprised 63% of the lost UTC in the County
- Milcan Creek-French Broad River and Second Creek watersheds have the lowest UTC at 23% and 27% respectively
- 31,617.3 million gallons of water are being transpired/year (see Appendix B, Table 6)
- 20,492.6 million gallons of rainfall are being intercepted/year (see Appendix B, Table 6)
- 1,390.5 millions gallons of runoff are being avoided/year, providing an economic benefit of \$12,421,823/year (see Appendix B, Table 6)

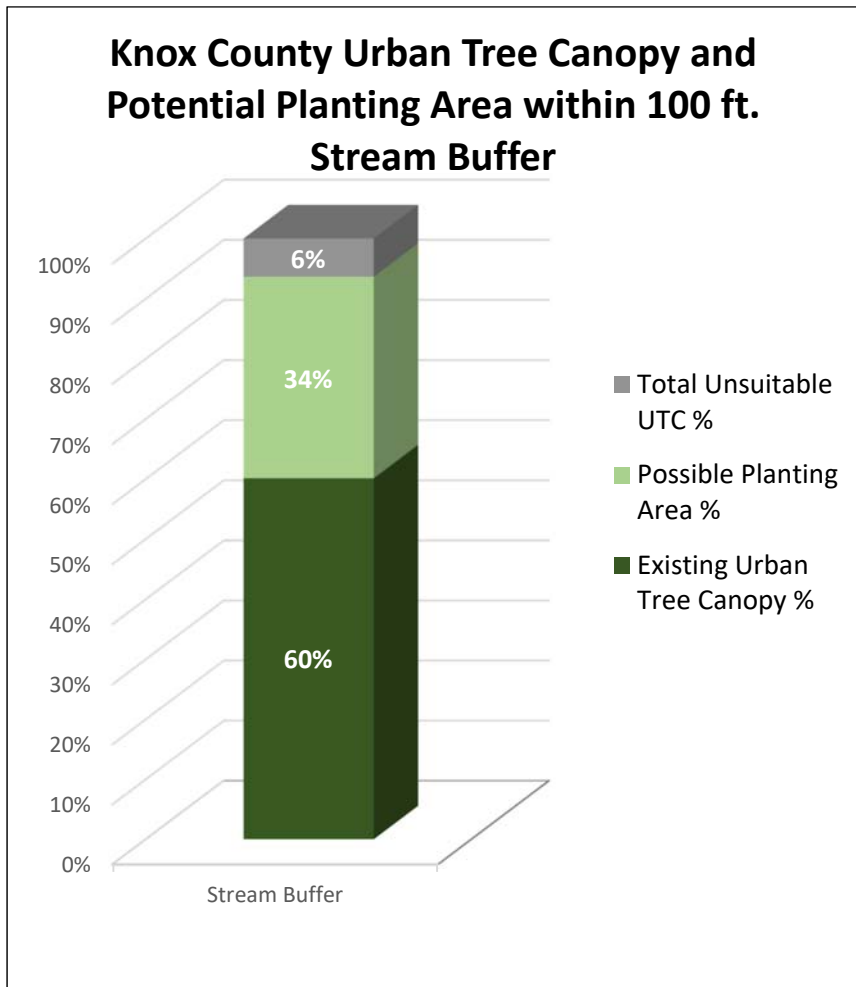
Figure G



Key findings of UTC and stream buffers:

- 34% of 100 ft. stream buffer space in Knox County does not have trees, but could be planted with trees
- 6% of the 100 ft. stream buffer space in Knox County is not suitable for trees

Figure H



# Urban Tree Canopy by City of Knoxville Zoning

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The City of Knoxville has different codes and ordinances that impact the allocation of trees across the City but most notably will influence the abundance of trees and the occurrence of trees on private property. This study looked at landcover, including UTC, at different zoning scales across the City. Historically, most UTC is found within parcels of land zoned for park use and residential property. UTC studies can help provide paths forwards for addressing UTC related questions, problems, and trends as it relates to zoning and regulations. The following are some of the key finding from the UTC study in relation to City of Knoxville Zoning:

- Residential zoned property comprises the largest amount of UTC in the City of Knoxville with 14,472 acres, followed by Natural Areas and Open Space (2,862 acres), ROW (2,515 acres), Commercial property (1,508 acres), and Industrial property (1,243) (See Chart 6).
- Residential zoned property accounts for over 14,000 acres (60%) of the 24,000 acres of trees in the City of Knoxville. Approximately 22% of the UTC within the City of Knoxville fall in ROW, Open Space, or Natural Areas.
- Commercial, Industrial, Downtown, South Waterfront, and Cumberland Avenue zoned property make up about 12% of the UTC in the City of Knoxville.
- Over a 10-year period, 756 acres of trees were lost in the City of Knoxville. Residential zoned property accounts for 515 acres (68%) of the UTC loss. Open Space and Natural Areas account for 8% of the land area within the City of Knoxville, but account for 16% of the UTC lost in the last 10 years.
- ROW within the City of Knoxville account for 6,050 acres (30%) of the impervious areas followed by Residential zoned property at 5,490 acres (27%), Commercial zoned property at 3,997 acres (20%), and Industrial zoned property at 2,679 acres (13%).
- Downtown and Cumberland Avenue zoned property has 8% and 6% UTC, and 86% and 91% impervious area respectively.
- Residential zoning types RN-1 and RN-2 account for 23,311 Acres (36%) of land, 12,025 Acres (50%) of UTC, and 7,298 acres (40%) of the potential planting areas within the City of Knoxville.
- Misc. (ROW) and Open Space (OS) make up 2,813 acres (16%) and 1,237 acres (7%) of potential planting area within the City of Knoxville, respectively.
- Commercial and Industrial zoned property accounts for 20% of the area within the City and 33% of the impervious area.

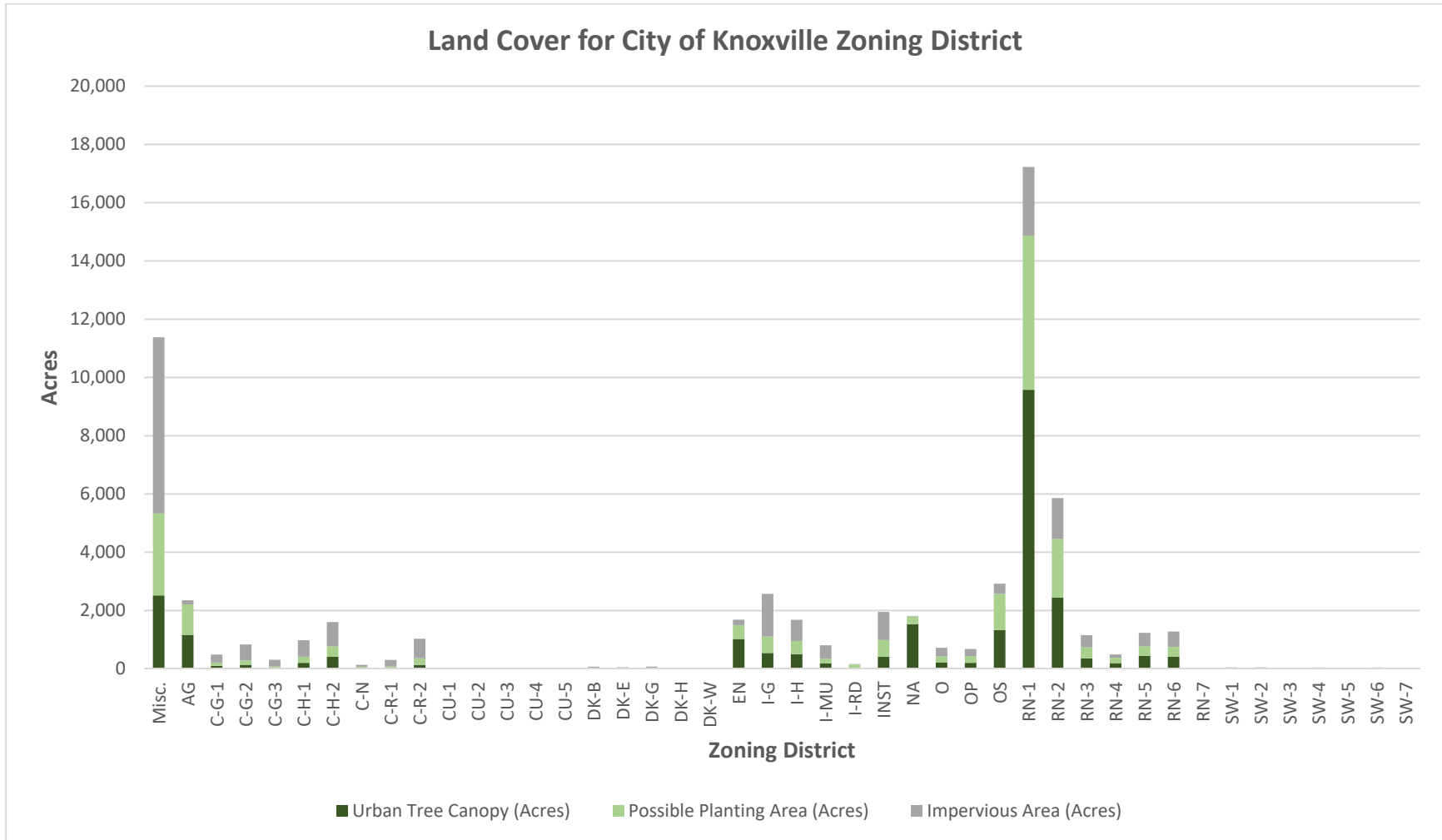
Figures I through K show land cover data and changes in UTC for individual Zoning type throughout the City of Knoxville. Appendix B, Tables 9 and 10 have detailed information for each individual Zoning type.



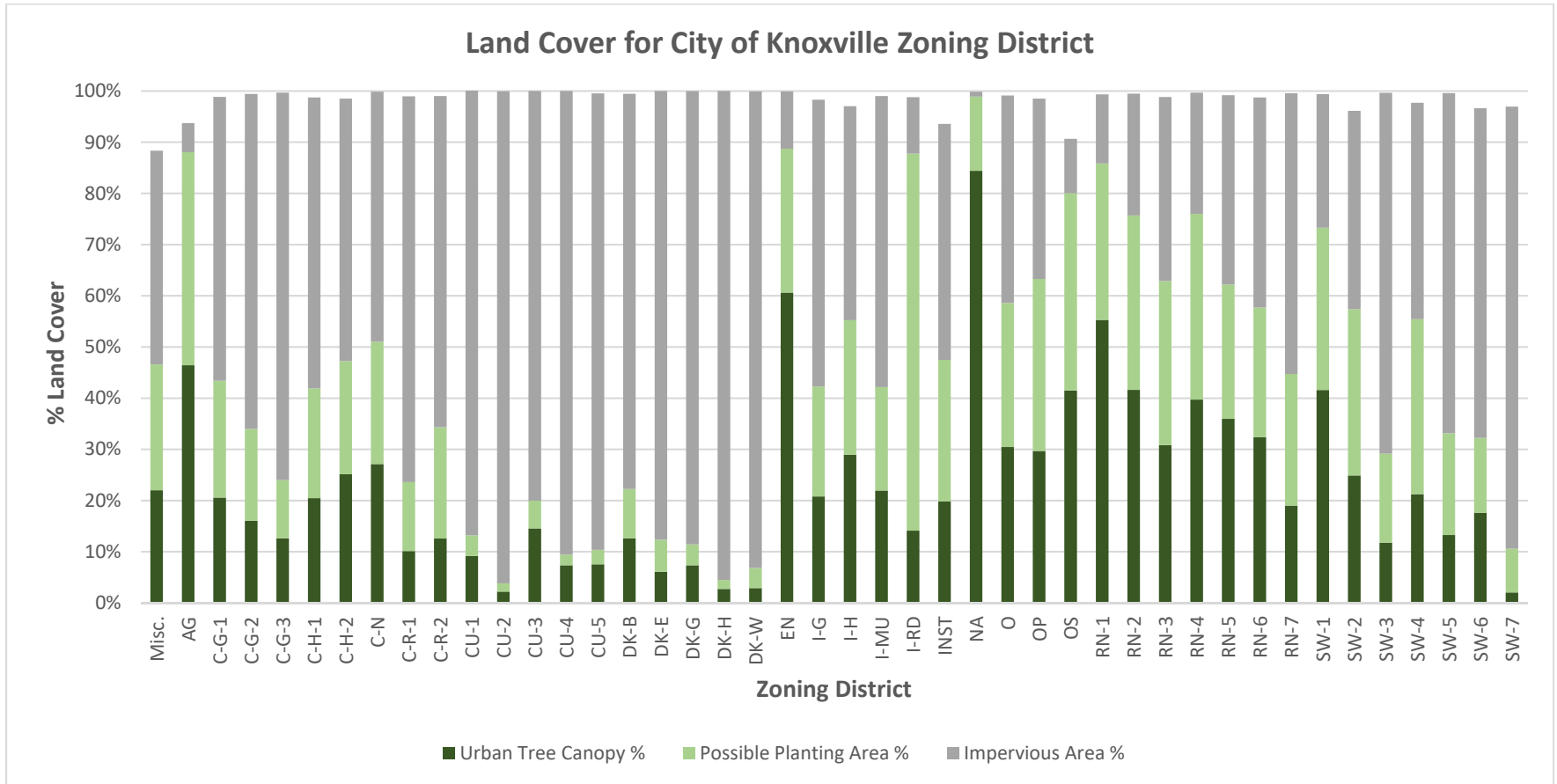
Chart 6

| Zoning Type                 | Total Area (Acres) | UTC 2008 (Acres) | UTC 2018 (Acres) | UTC Change (Acres) | % UTC      | % UTC Change | Impervious Area (Acres) | % Impervious | PPA (Acres)   | % PPA      |
|-----------------------------|--------------------|------------------|------------------|--------------------|------------|--------------|-------------------------|--------------|---------------|------------|
| Agricultural                | 2,504              | 1,197            | 1,162            | -35                | 46%        | -1%          | 147                     | 6%           | 1,042         | 42%        |
| Commercial                  | 7,146              | 1,504            | 1,508            | 4                  | 21%        | 0%           | 3,967                   | 56%          | 1,603         | 22%        |
| Cumberland                  | 32                 | 3                | 2                | -1                 | 6%         | -2%          | 29                      | 91%          | 1             | 3%         |
| Downtown                    | 245                | 17               | 19               | 2                  | 8%         | 1%           | 211                     | 86%          | 15            | 6%         |
| Industrial                  | 5,313              | 1,289            | 1,243            | -46                | 23%        | -1%          | 2,679                   | 50%          | 1,299         | 24%        |
| Institutional               | 2,074              | 411              | 411              | 0                  | 20%        | 0%           | 963                     | 46%          | 573           | 28%        |
| Open Space/<br>Natural Area | 5,022              | 2,983            | 2,862            | -121               | 57%        | -2%          | 370                     | 7%           | 1,499         | 30%        |
| Residential                 | 29,114             | 14,987           | 14,472           | -515               | 50%        | -2%          | 5,490                   | 19%          | 8,984         | 31%        |
| ROW                         | 11,434             | 2,544            | 2,515            | -29                | 22%        | 0%           | 6,050                   | 53%          | 2,813         | 25%        |
| South Waterfront            | 229                | 67               | 52               | -14                | 23%        | -6%          | 118                     | 51%          | 59            | 26%        |
| <b>Citywide</b>             | <b>63,114</b>      | <b>25,002</b>    | <b>24,246</b>    | <b>-756</b>        | <b>38%</b> | <b>-1%</b>   | <b>20,023</b>           | <b>32%</b>   | <b>17,887</b> | <b>28%</b> |

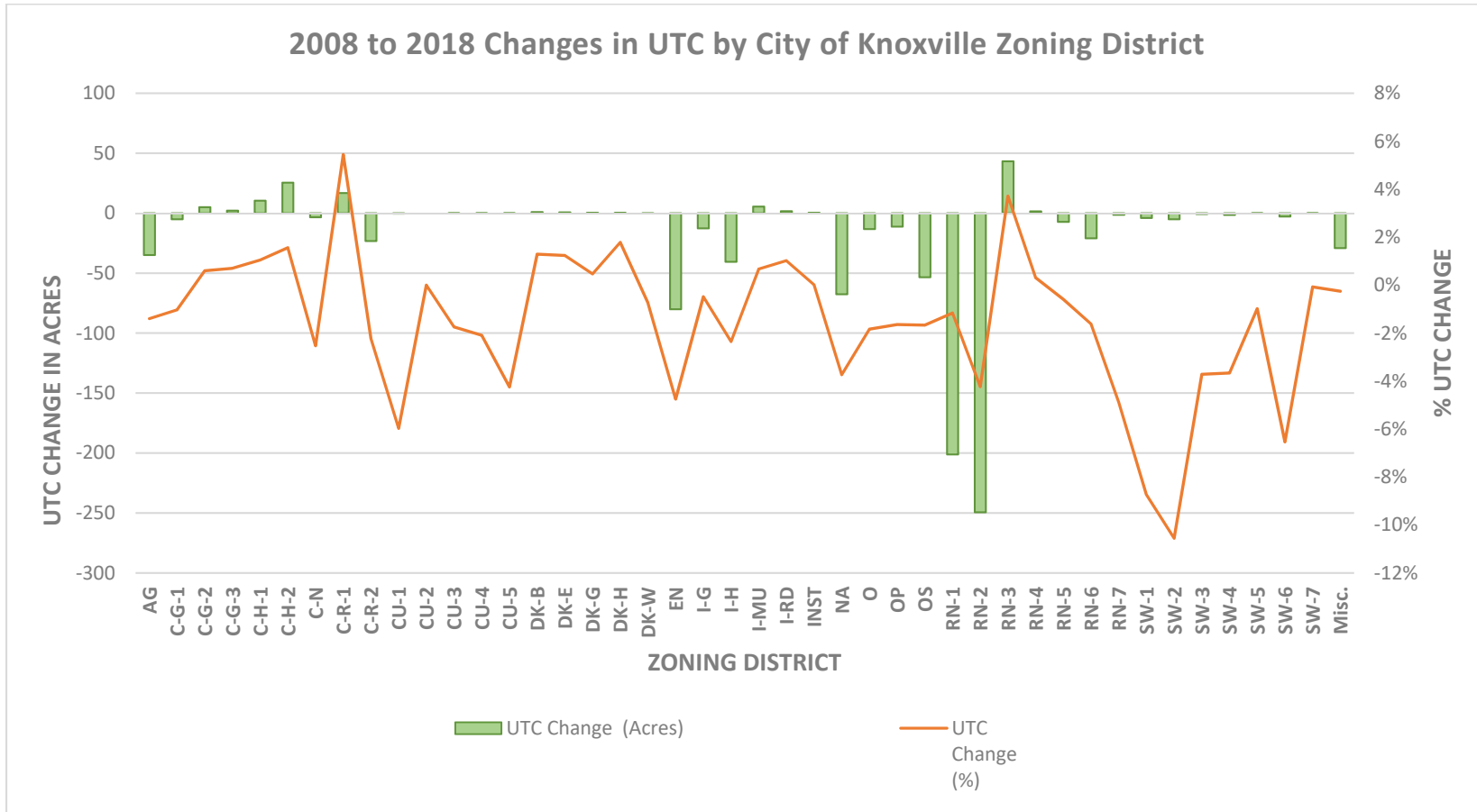
**Figure I**



**Figure J**



**Figure K**



# Urban Tree Canopy by Knox County Zoning

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The County Zones with the top 5 percent of UTC are:

- General Residential/Technology at 75%
- Floodway/Technology Overlay at 72%
- General Residential/ Floodway at 67%
- Office, Medical and Related Services/Technology Overlay (k) and Estate at 64%
- Agricultural/Historical Overlay at 63%

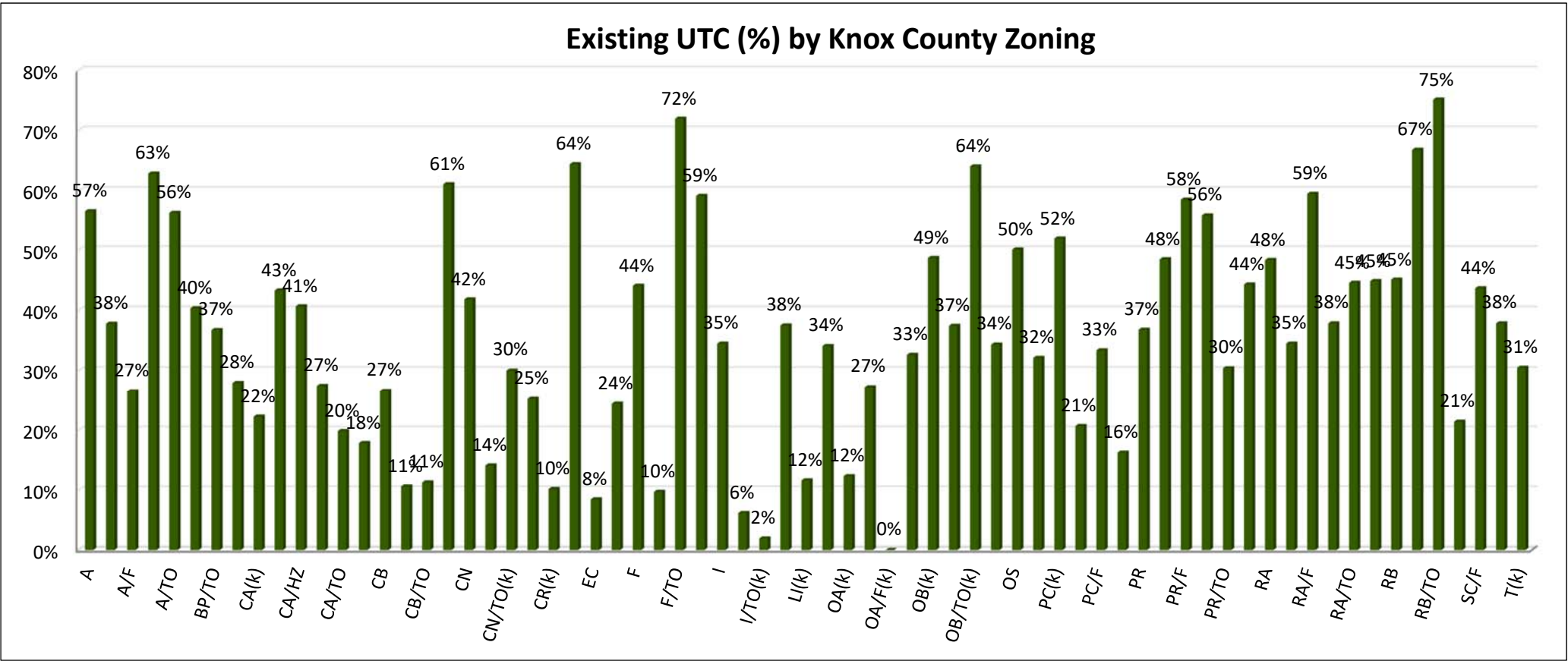
The County zones with the 5 smallest percentages of UTC are:

- Office Park/Floodway (k) at 0%
- Industrial/Technology Overlay (k) at 2%
- Industrial/Technology Overlay at 6%
- Employment Center at 8%
- Floodway/Historical Overlay and Regional Commercial (k) at 10%

Appendix B, Tables 11, 12, and 13 have information on Knox County Zoning Codes and their definition. In these tables, it is found that the General Business and Technology Overlay (k) zone saw the greatest decrease in canopy coverage at -29%. The zone with the greatest increase in canopy coverage is the Planned Commercial/Technology at +17%. Overall, Knox County saw a decrease in UTC of 1% between 2008 and 2018. Although the County saw an overall increase in UTC, most of that increase came from agricultural land that is no longer being used for agriculture and has reverted back to UTC. The area with the fifth most canopy cover is the Agricultural/Historical Overlay. There has been a decrease in canopy coverage in populated urban areas, such as Neighborhood/Commercial and General Business/Technology Overlay, which means efforts to increase and maintain canopy coverage need to take place in these urban areas in order for the public to take advantage of the benefits trees provide.

Figure L

### Existing UTC (%) by Knox County Zoning



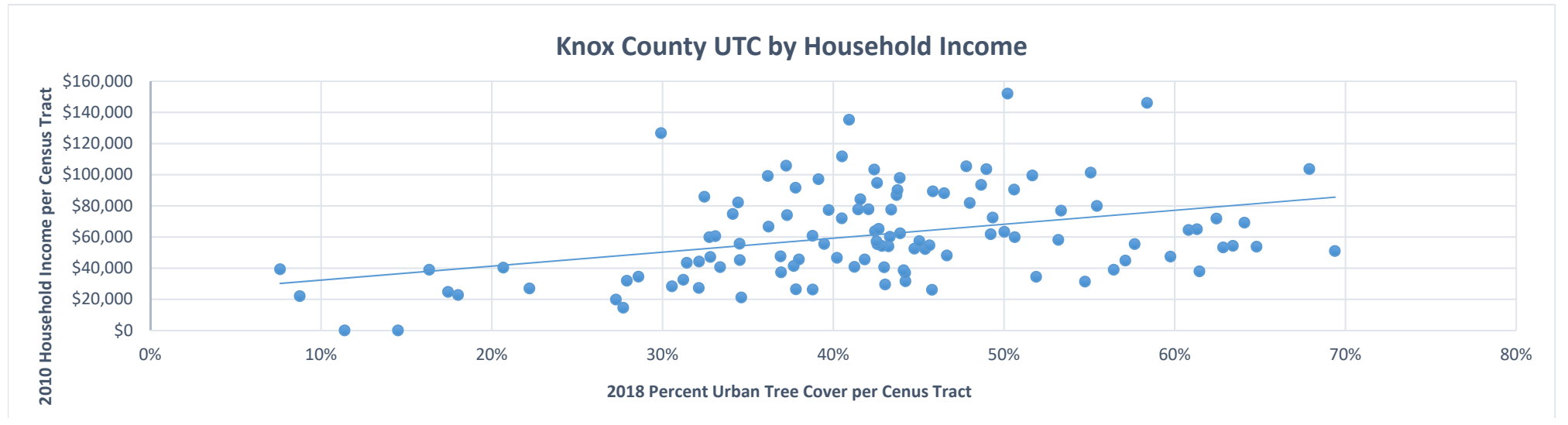
## Urban Tree Canopy by 2010 Census Data

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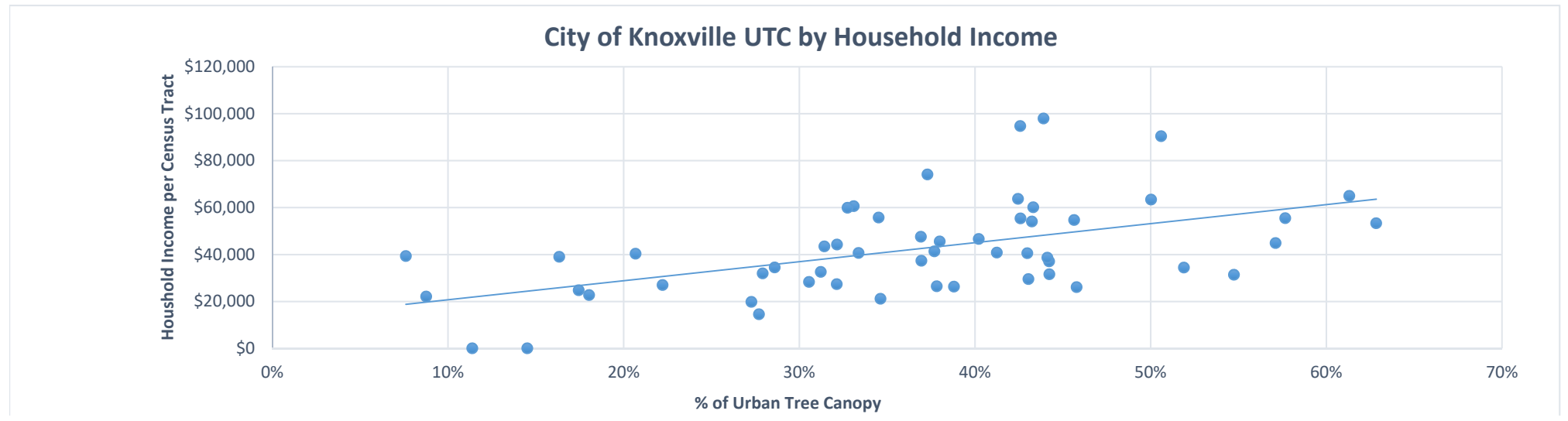
Tree equity is important to ensure that all neighborhoods have adequate UTC and that all members of that community can obtain all the health, economic, and environmental benefits that trees provide. In order to look at the equability of UTC throughout Knox County and the City of Knoxville, UTC was researched at each US Census Tract. Census Tract information, such as population density, race and ethnicity, income, and poverty, was compared to UTC data and trends from this study to measure tree equity. The following are some of the findings from the study:

- Both Knox County and the City of Knoxville showed that household income does correlate to the amount of UTC in a community (see Figures M and N).
- If looking at the average UTC within the County at 49% and the City at 38% UTC, average household income would be around \$70,000 and \$45,000 respectively.
- Both Knox County and the City of Knoxville showed that as poverty rates increased, it was more likely the community lost UTC between 2008 and 2018 (see Figures O through R).
- Minorities living in Knox County tend to live in areas with lower UTC, and mostly live within the City of Knoxville, where UTC is lower (see Figures S and T).
- Minority communities in the City of Knoxville were not likely to see lower or higher UTC when compared to other communities across the City (Figure T).
- Lower UTC and higher impervious areas tend to exacerbate the urban heat island effect. Figure V shows that people living in poverty are more likely to be living in neighborhoods with high impervious areas while minorities are slightly less likely.

**Figure M**

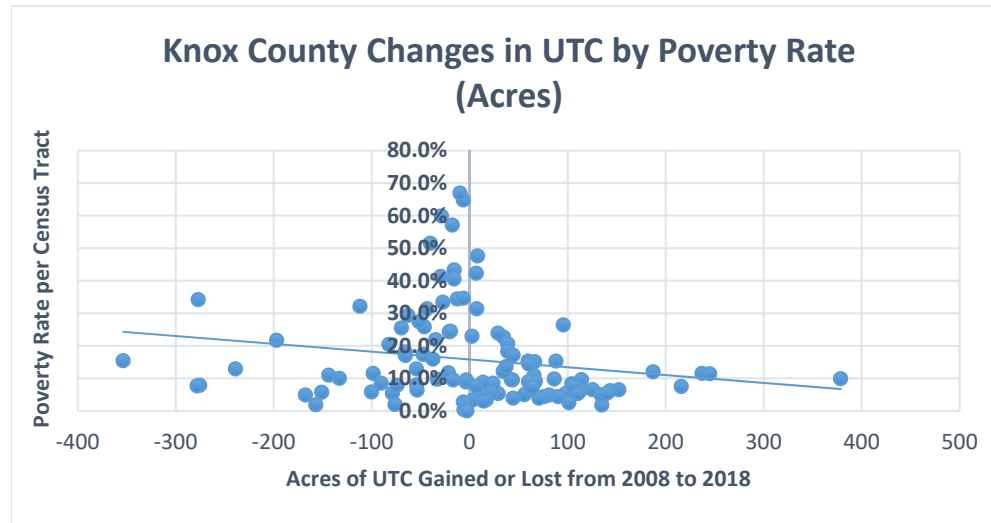


**Figure N**

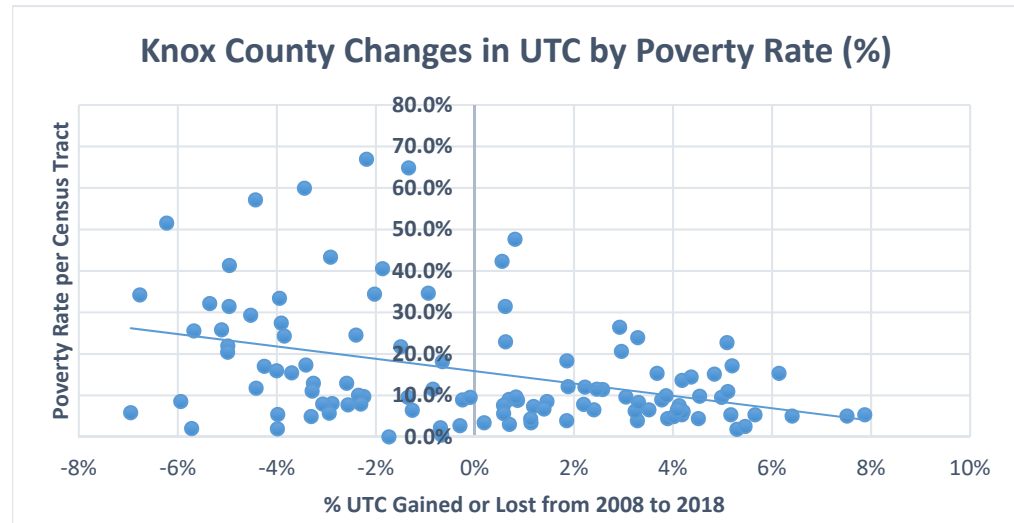




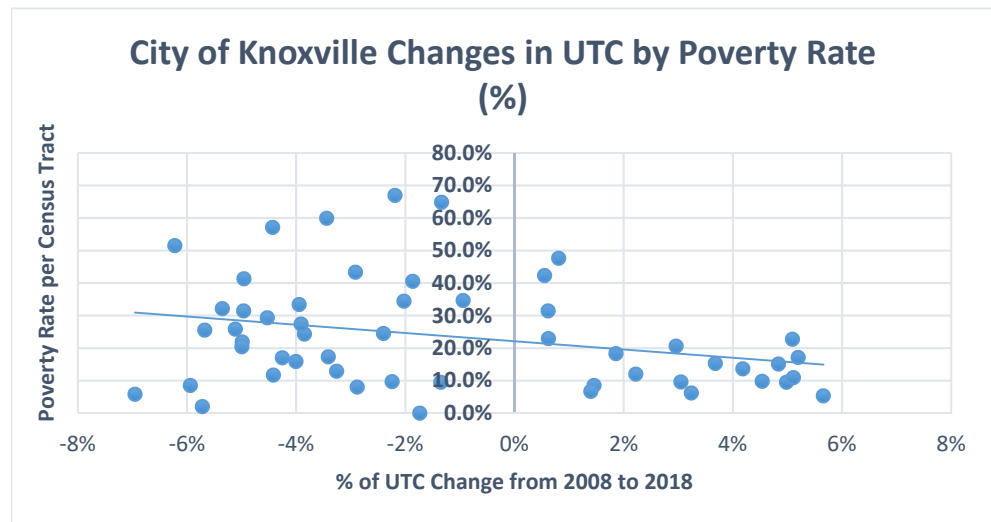
**Figure O**



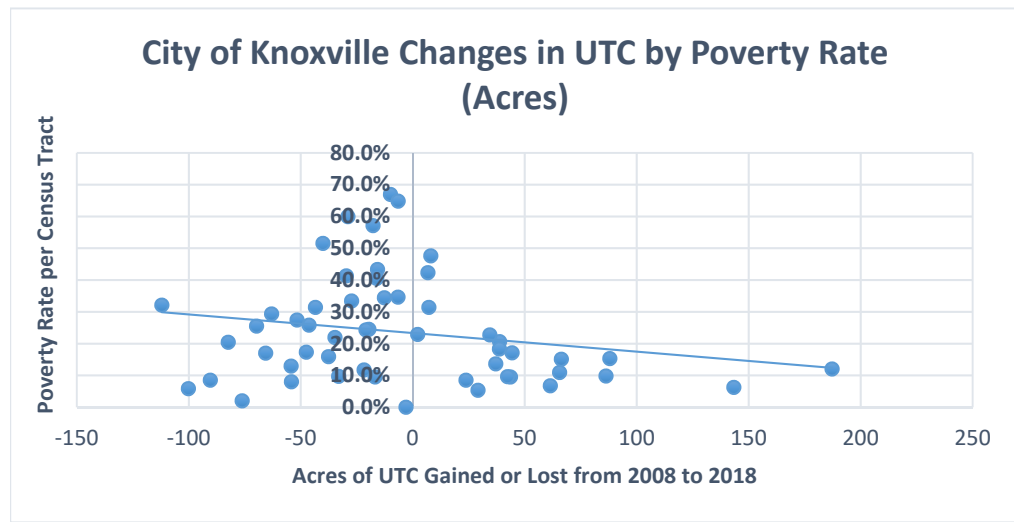
**Figure P**



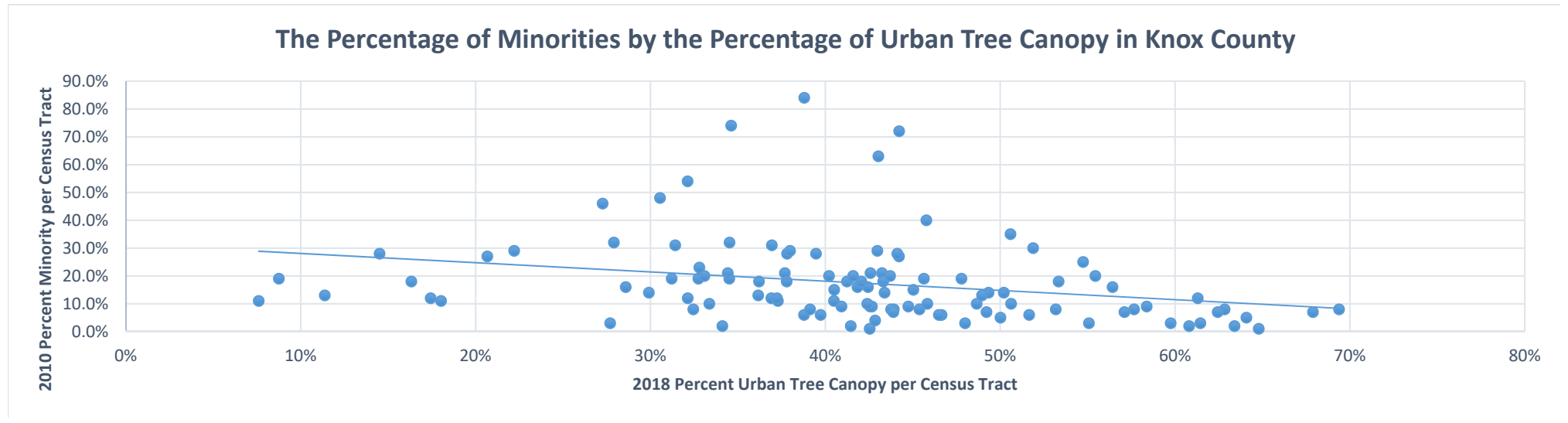
**Figure Q**



**Figure R**



**Figure S**



**Figure T**

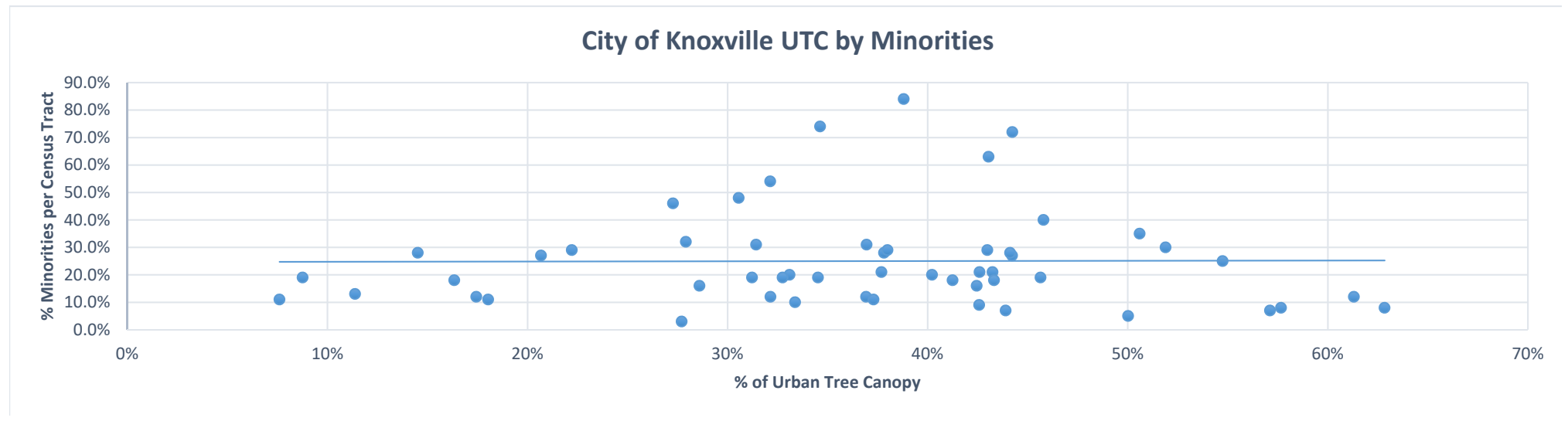


Figure U

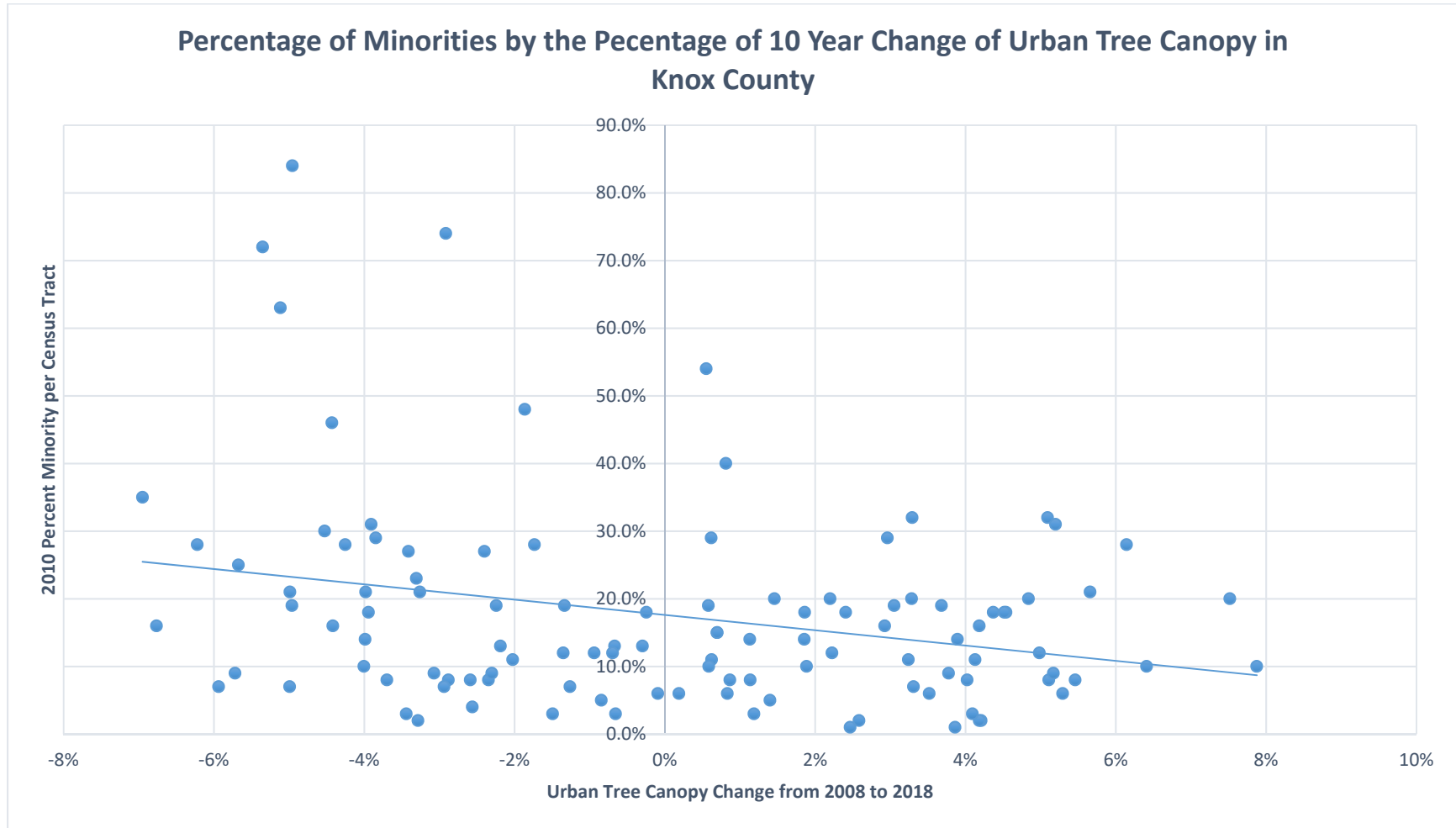
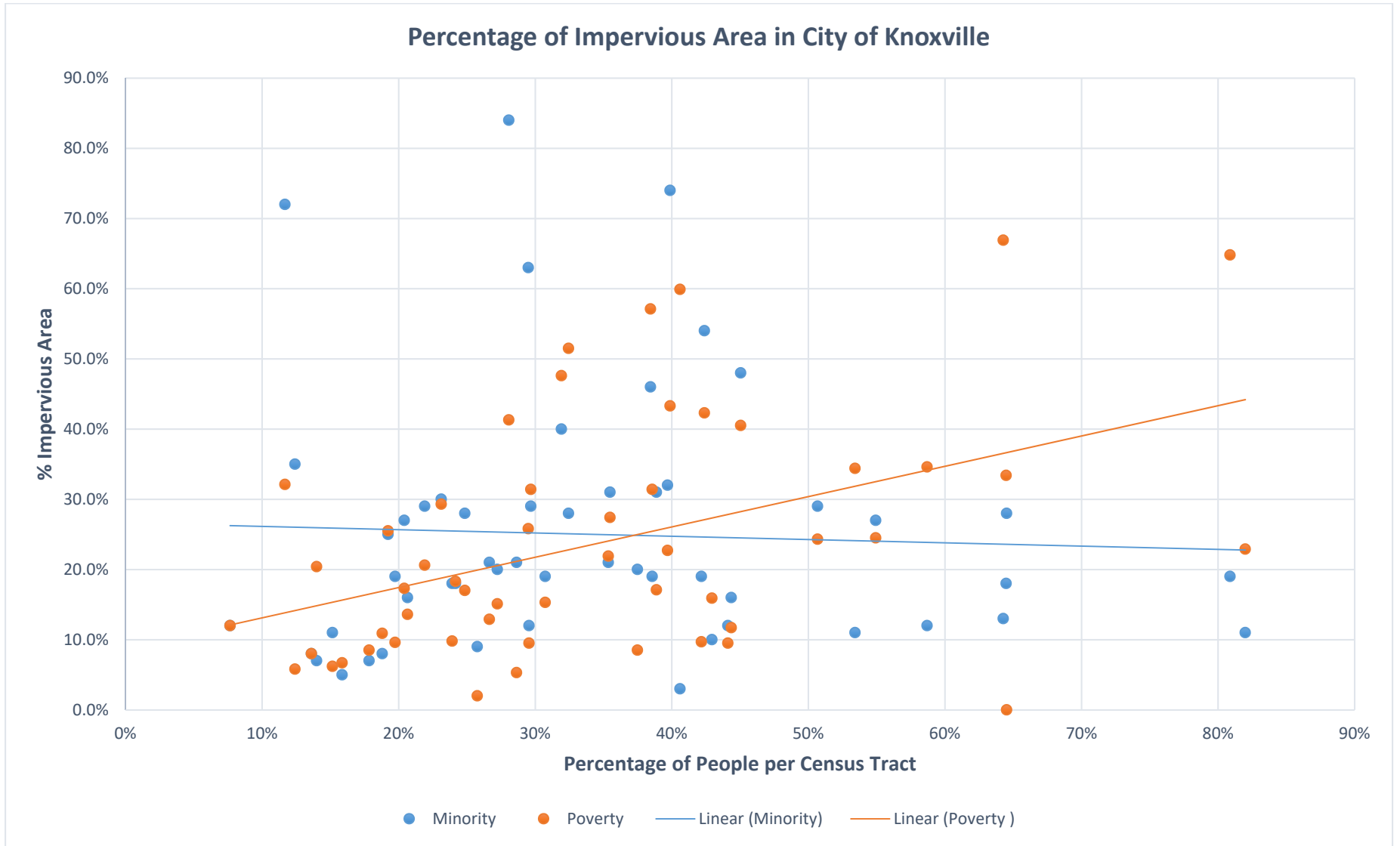


Figure V



# Recommendations

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The Urban Tree Canopy Assessment provides extensive information for the City of Knoxville and Knox County about the distribution of tree resources and the urban forest. The findings from this study can be used to:

- Develop urban tree canopy goals for different geographies including the City of Knoxville, Knox County, or smaller scales such as neighborhoods or elementary school districts
- Establish baseline urban tree canopy cover information to track and monitor progress on tree decisions and goals
- Develop or refine policies to ensure that the right measures are in place to maintain and increase UTC
- Integrate trees and the information from the study into other sustainability goals such as stormwater and water quality programs, air quality initiatives, climate preparedness and mitigation practices, and watershed protection programs
- Ensure tree equity across all communities in the City of Knoxville and Knox County
- Inform the public about the findings and develop community driven recommendations on how to proceed with urban forestry goals
- Educate the public about the importance of urban tree canopy and the social, economic, and environmental benefits that are impacted by trees
- Create an urban forestry master plan for the community to determine how to best manage its tree resource in order to maximize the benefits trees provide its residents
- Build protections and expand UTC in critical areas such as riparian corridors, slopes and hilltops, urban centers (such as downtown Knoxville), school and medical campuses, and along street ROW and other areas with high impervious land cover

## Conclusions

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The Urban Tree Canopy Assessment provides baseline information on urban tree canopy across Knox County and the City of Knoxville. The social, economic, and environmental benefits that trees provide a community are impacted by the amount of UTC in an area. Many communities have realized the importance of trees and have made strong efforts to increase and/or maintain UTC. What one community does may not work or be feasible for another, and there is not one specific number or percentage that a community must obtain. Rather, a community should look at how UTC will be addressed and balanced with other community needs. For example, the City of Knoxville has lost about 1% tree cover in the last ten years, but that does not mean tree programs and planting efforts are not working. The City may need to rethink what role trees play in the community and look at areas where UTC changes have been more dramatic or could easily be improved in time. The County had a small increase in the amount of UTC, but should look at where gains are being made and where losses are occurring. For example, the County has a large amount of agricultural land that may have been removed from agricultural programming and be reverting back to trees, while UTC may be lost in urban or populated areas, where it makes the most impact.

When looking at the total area (including water) of Knox County, 47% of the County is covered with trees and another 35 to 39% could be potential planting area that could accommodate trees. However, it is not realistic to expect that all parking lots and all other non-canopy vegetation could revert to UTC (Figure W). The City of Knoxville has 36% UTC with a potential planting area of 28 to 38% (Figure X) when including water. Both the City and the County have room to expand UTC, but must weigh those efforts with others needs in the community. By breaking the County and City into smaller geographic areas such as watersheds, neighborhoods, school districts, or census tracts, both communities could get more specific and targeted UTC goals that work. Preservation may be a priority for one geographic area, while planting efforts is better suited in another. Engaging the public is essential for future planning efforts. This report and study are key for that public process.

Figure W

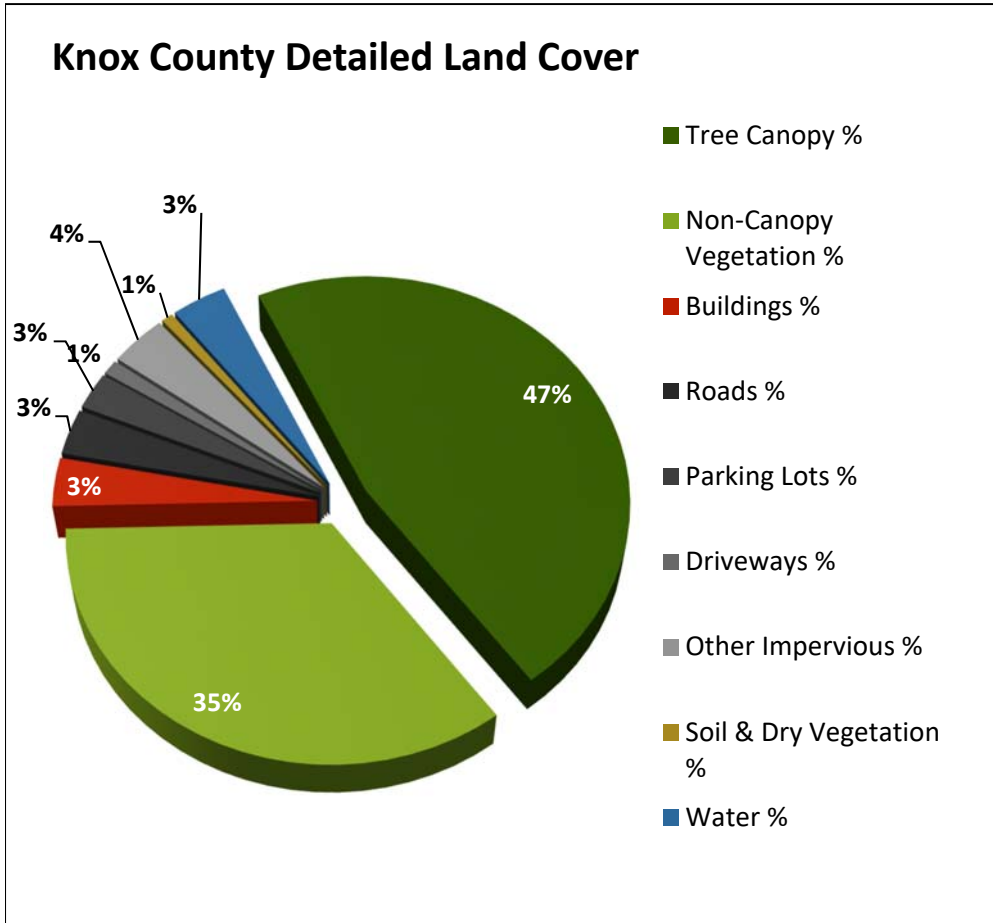
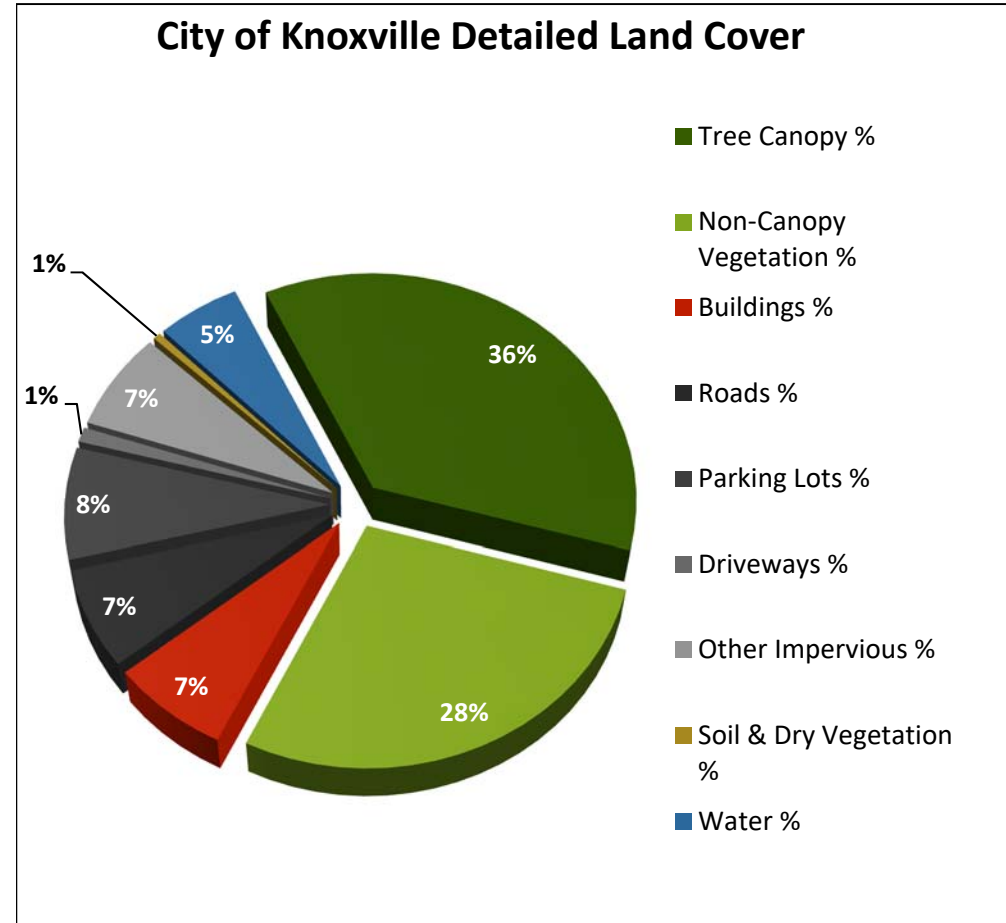


Figure X

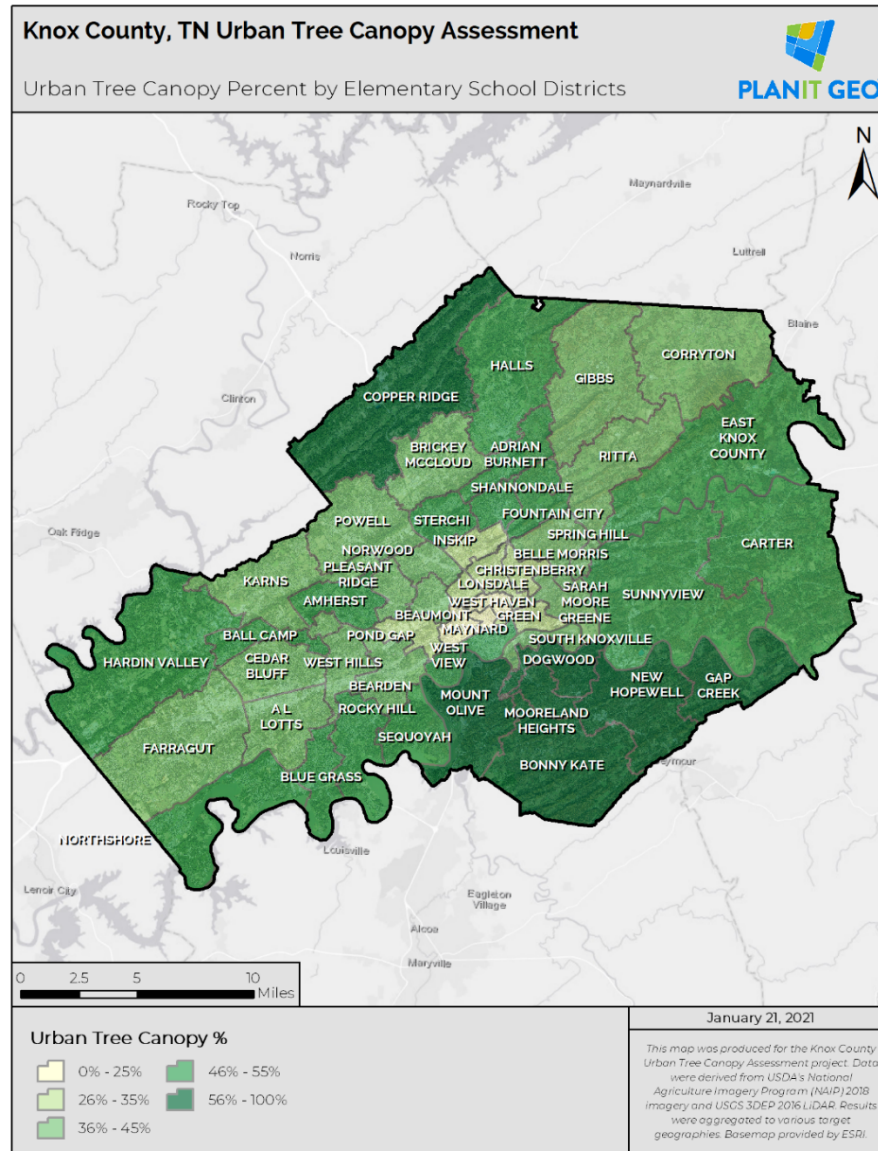


# Appendix A

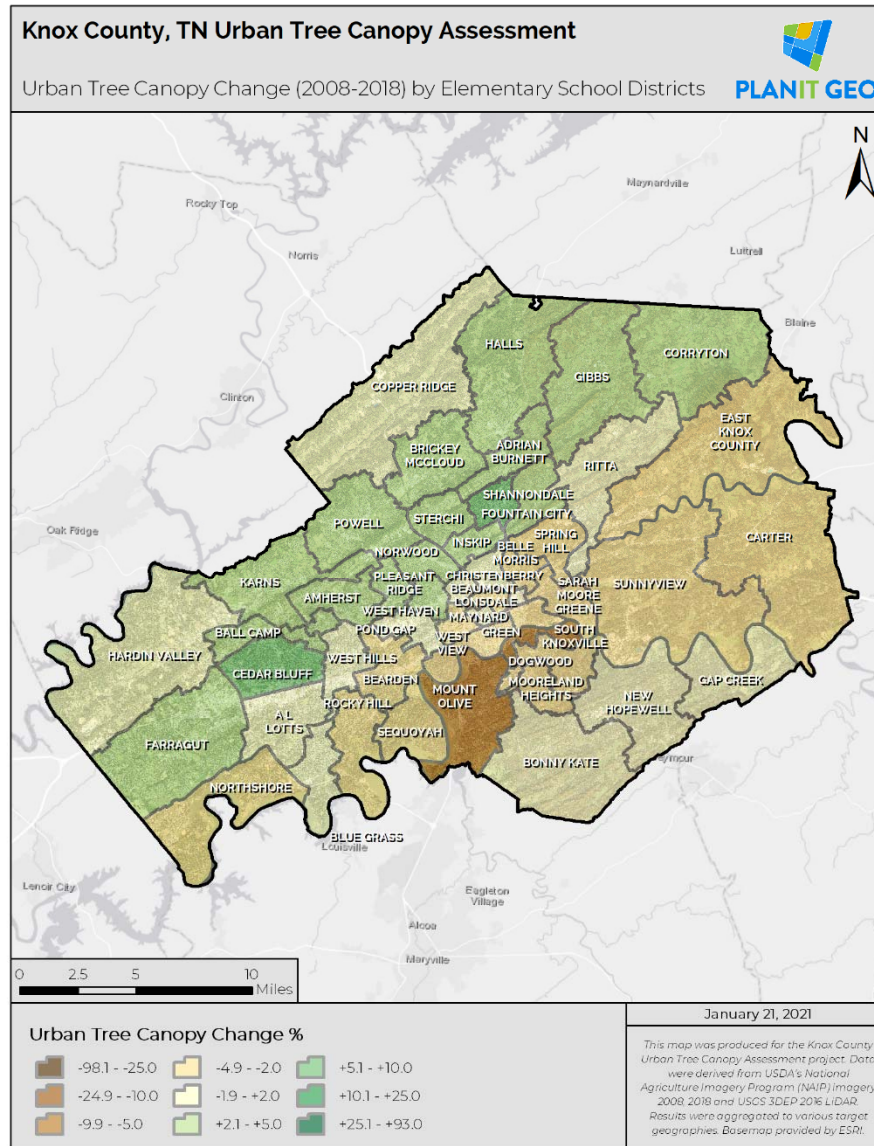
## Maps



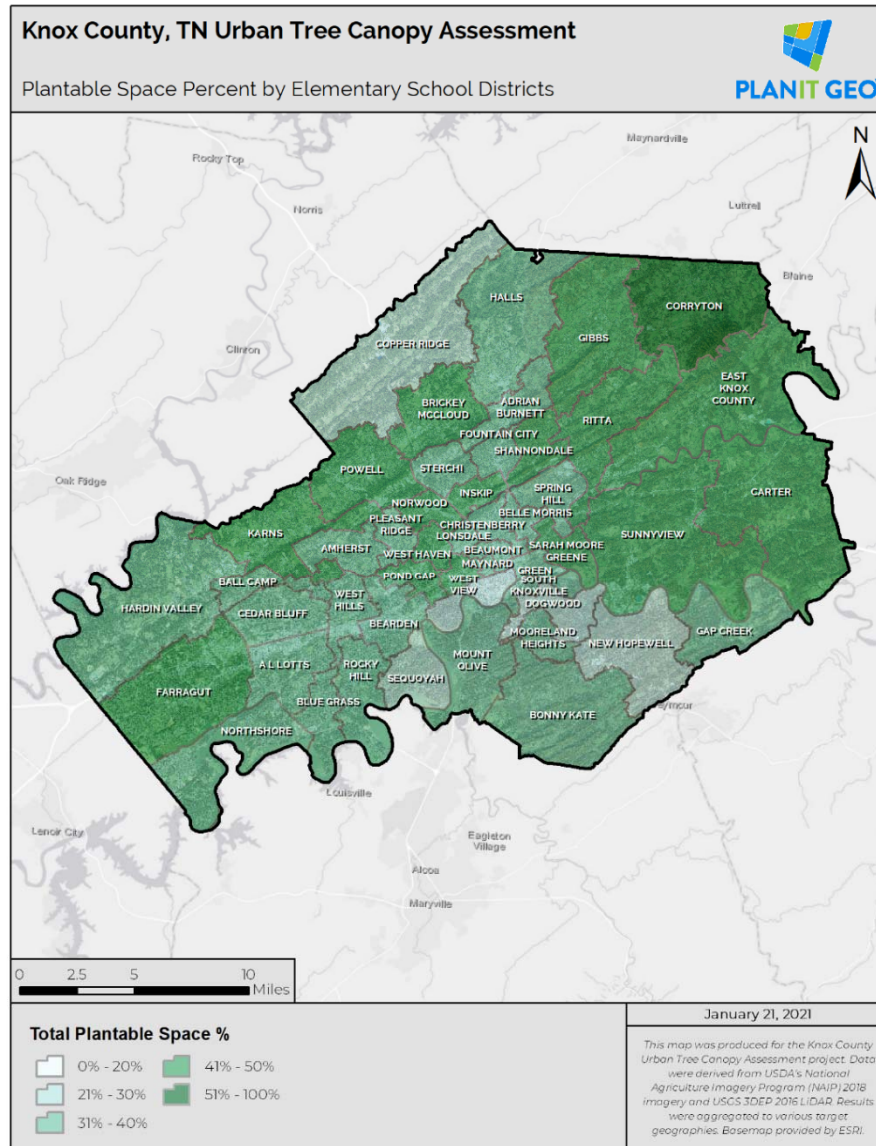
# Map 1



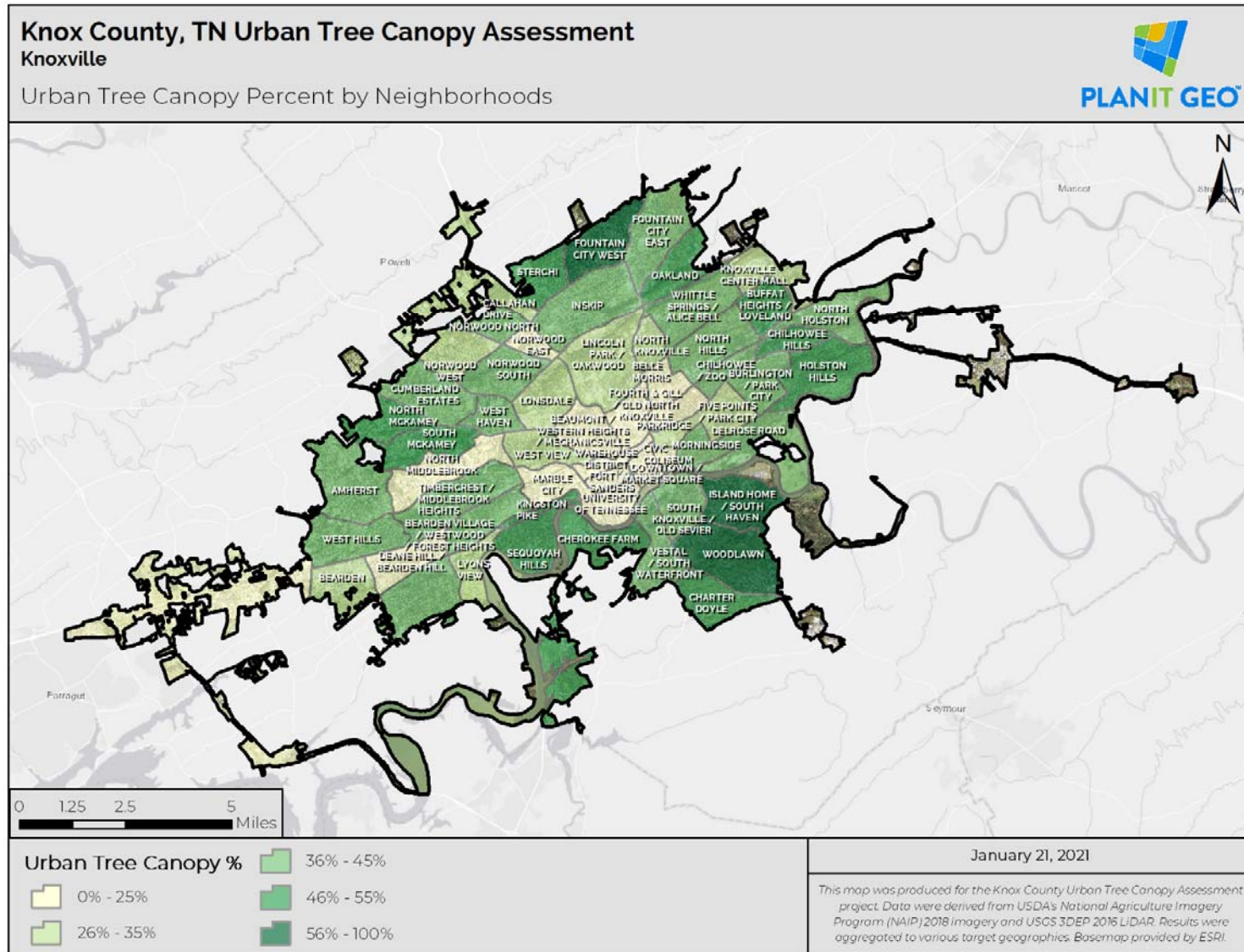
## Map 2



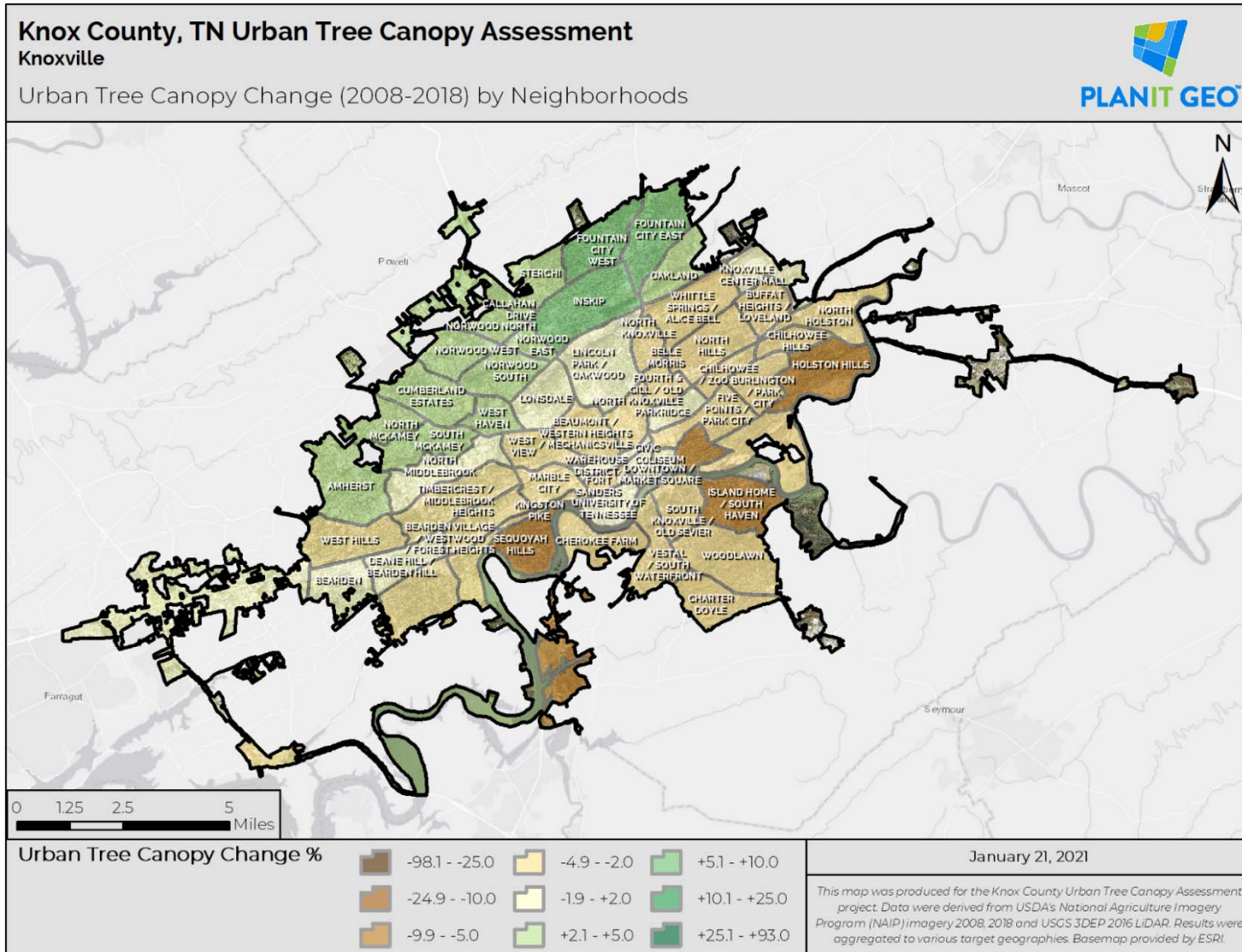
### Map 3



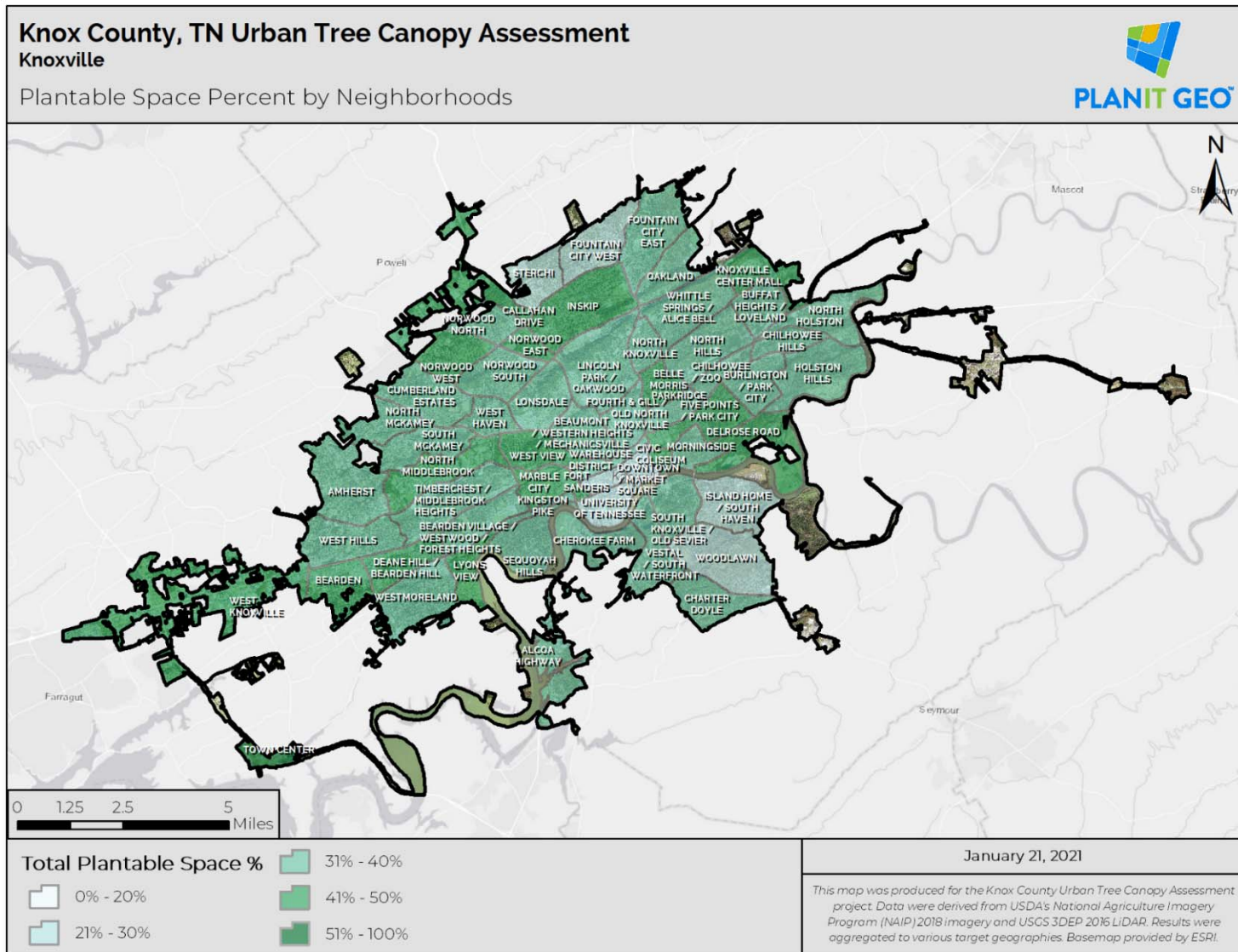
Map 4



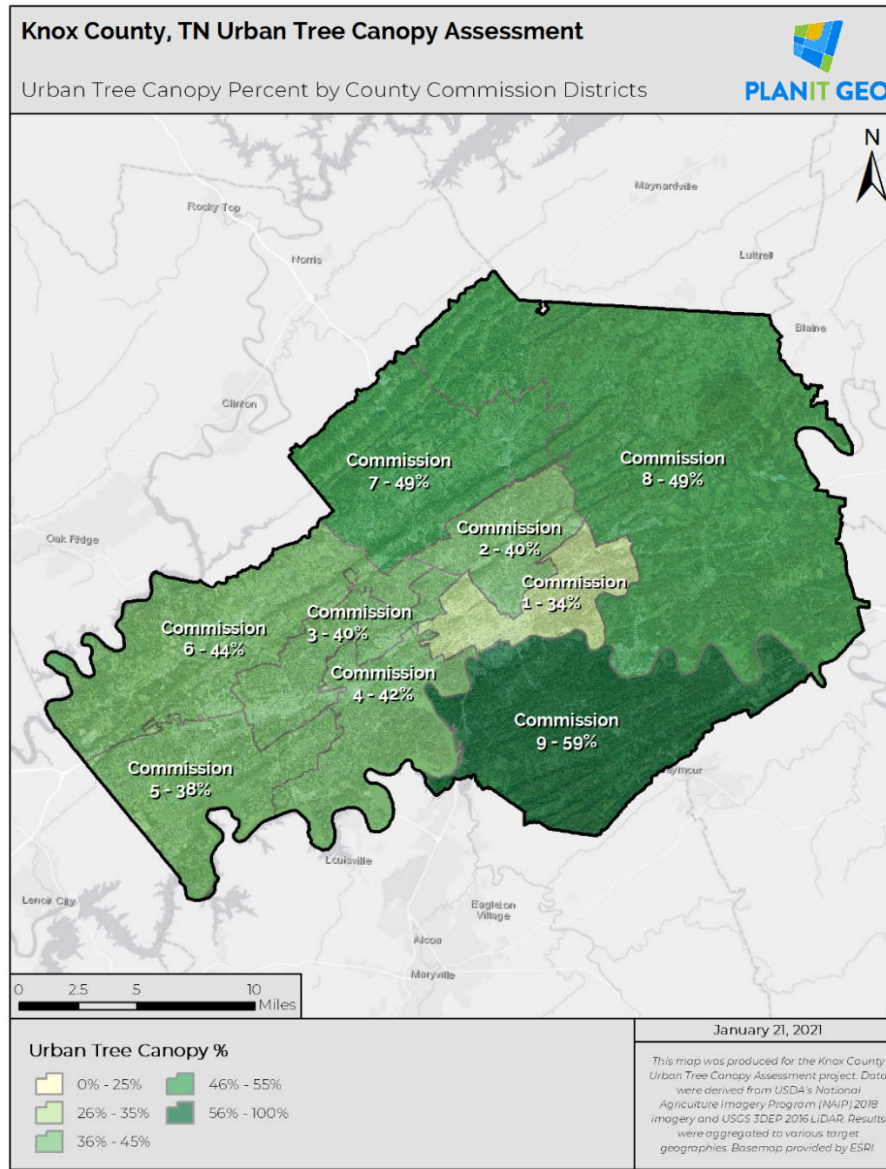
Map 5



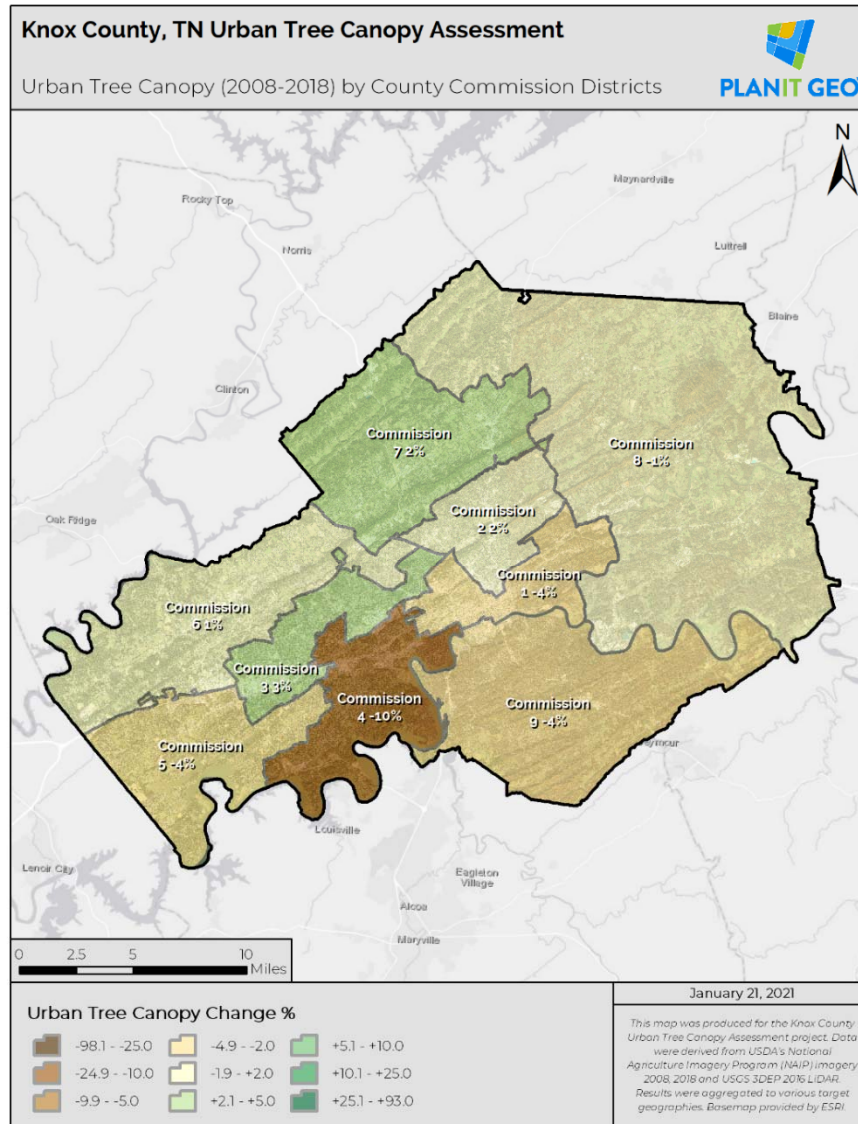
# Map 6



# Map 7

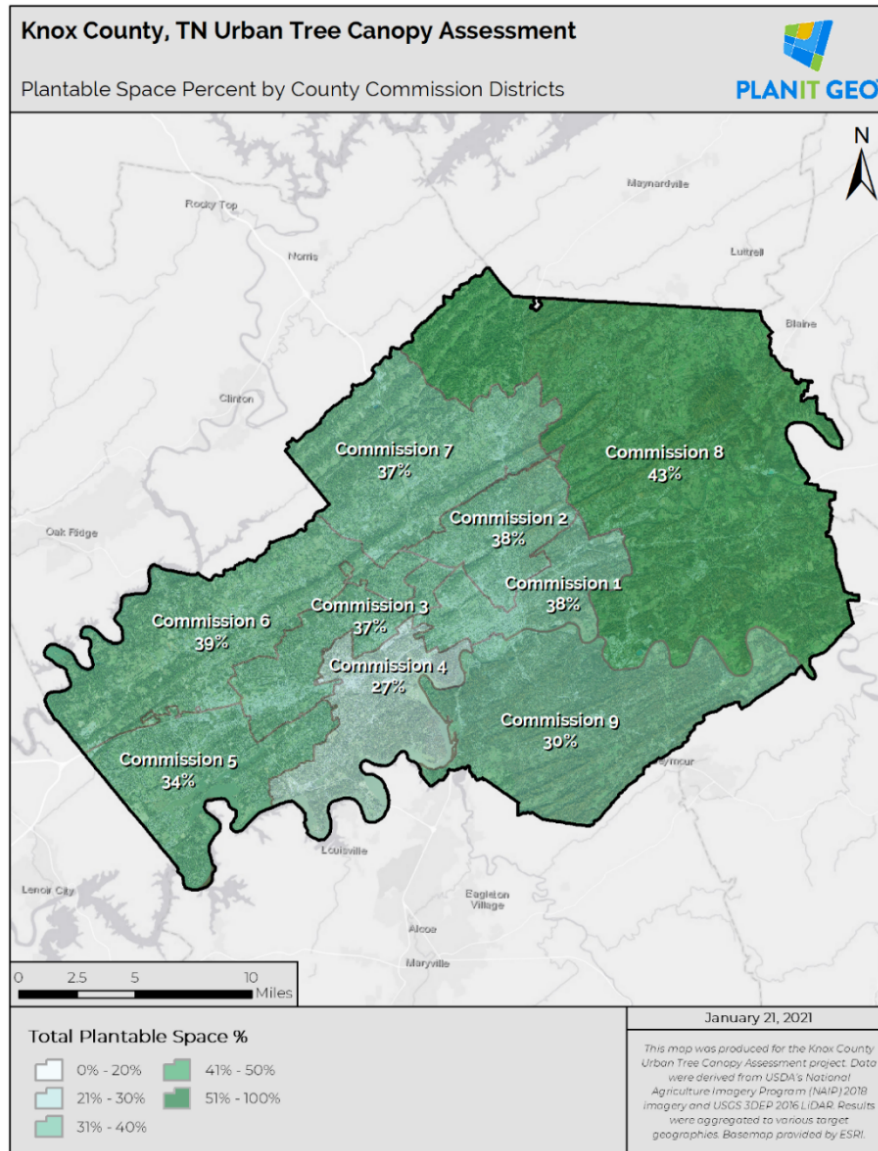


# Map 8

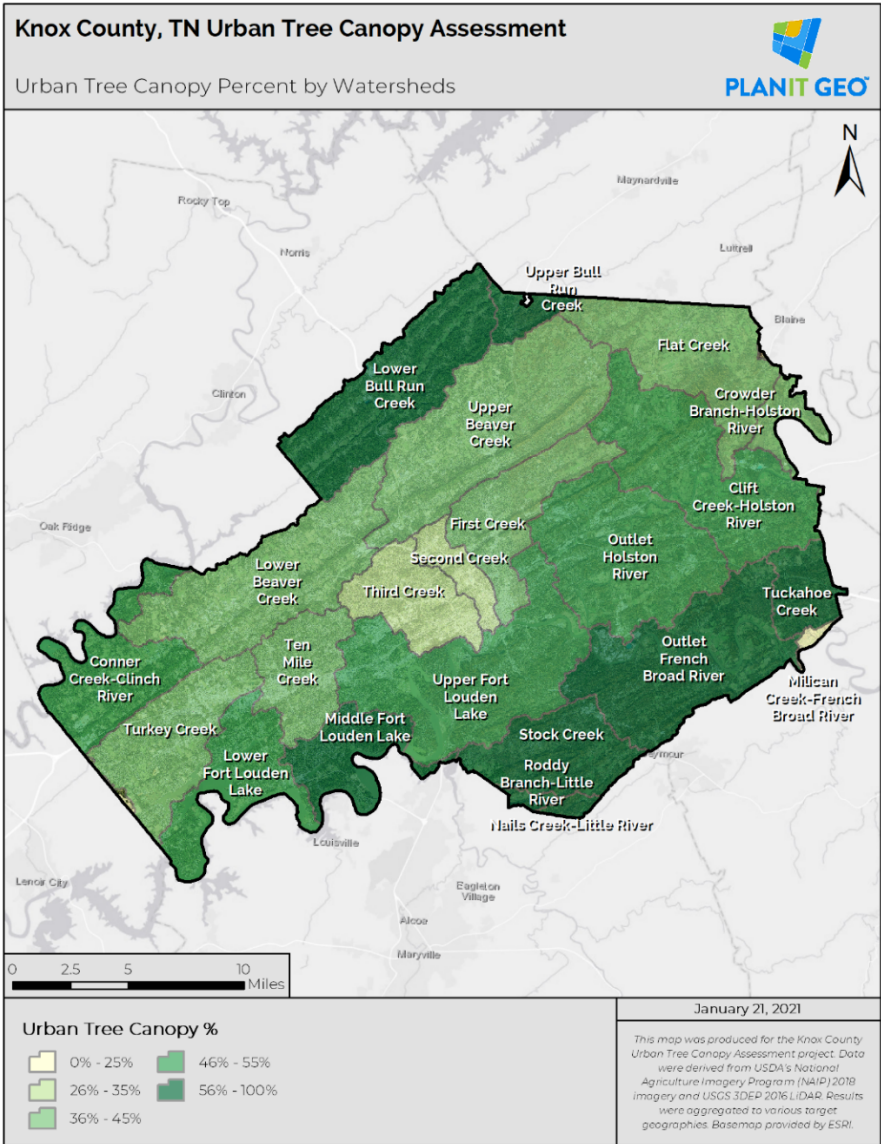




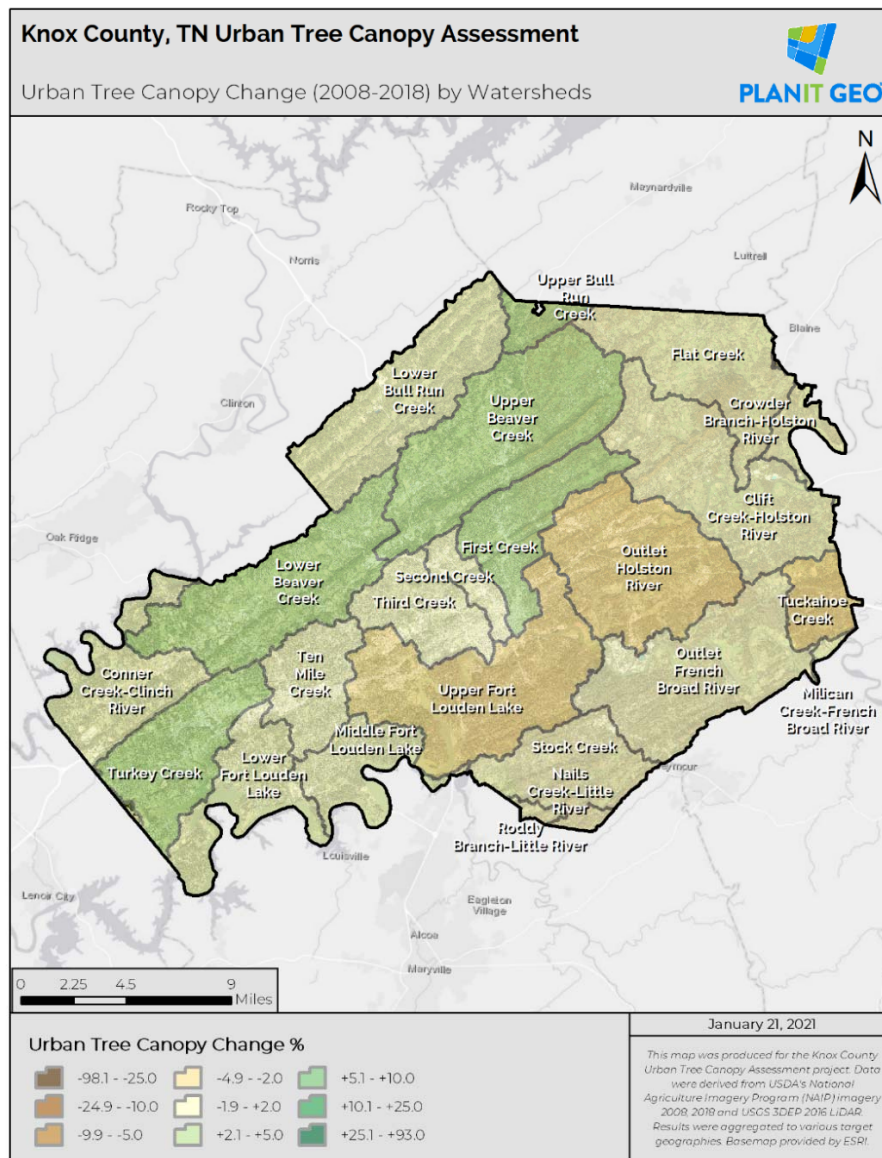
# Map 9



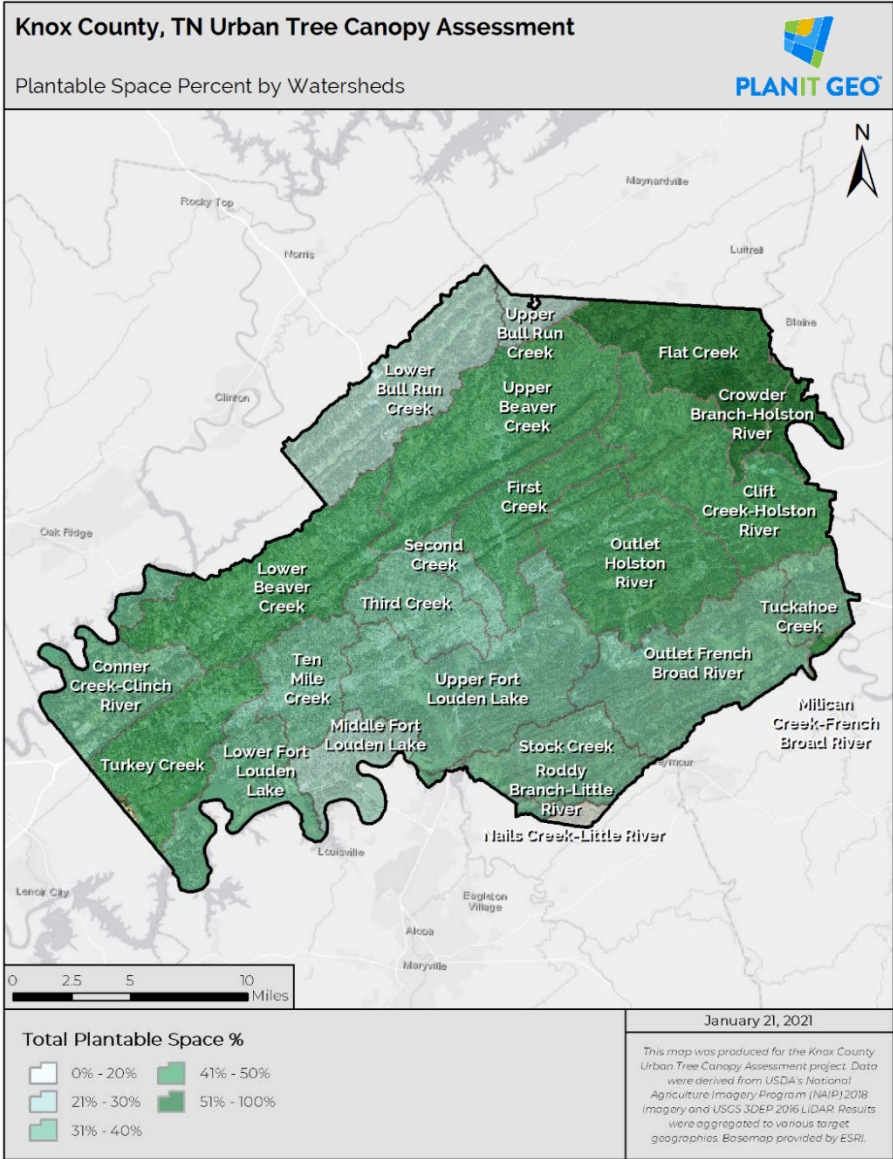
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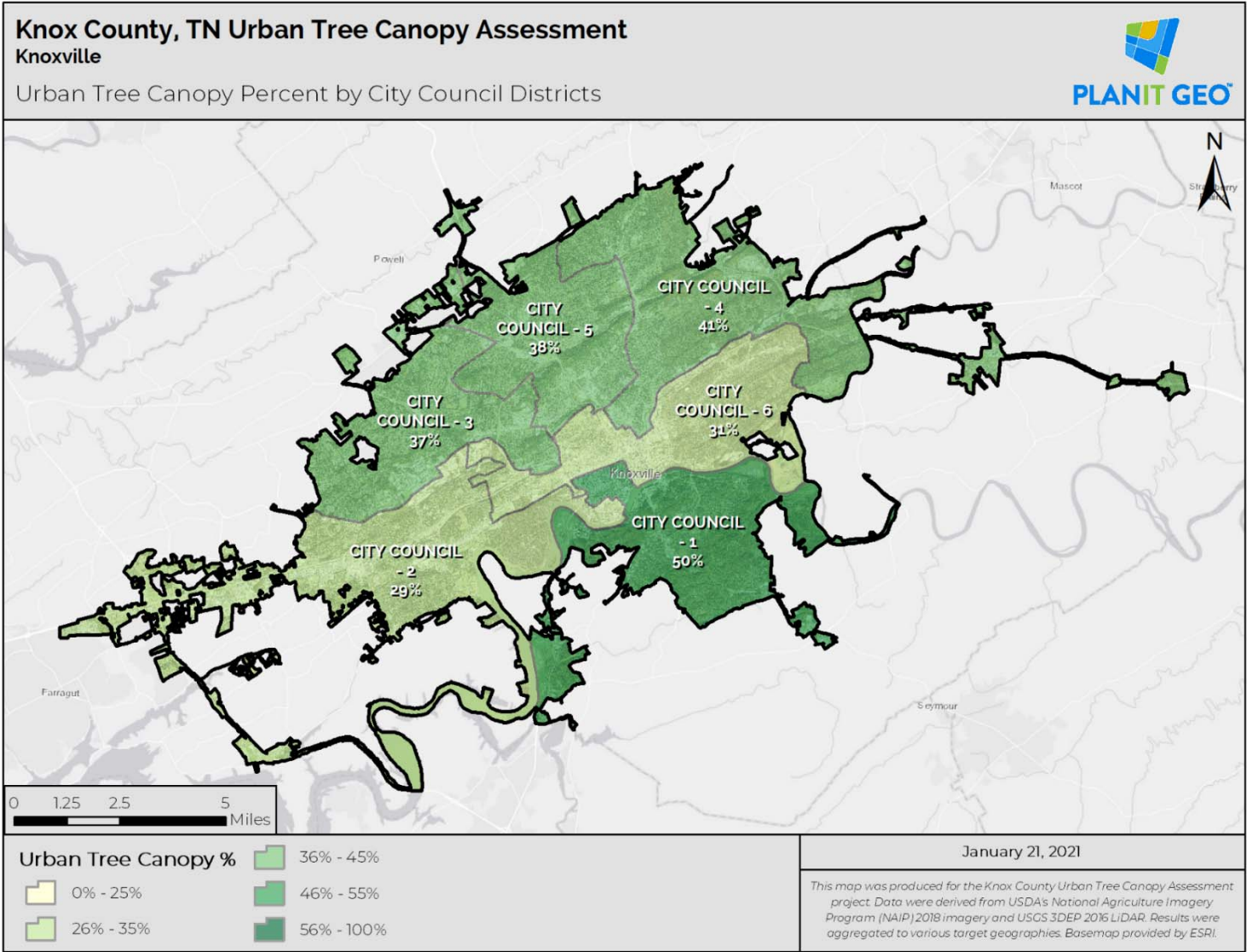
# Map 11



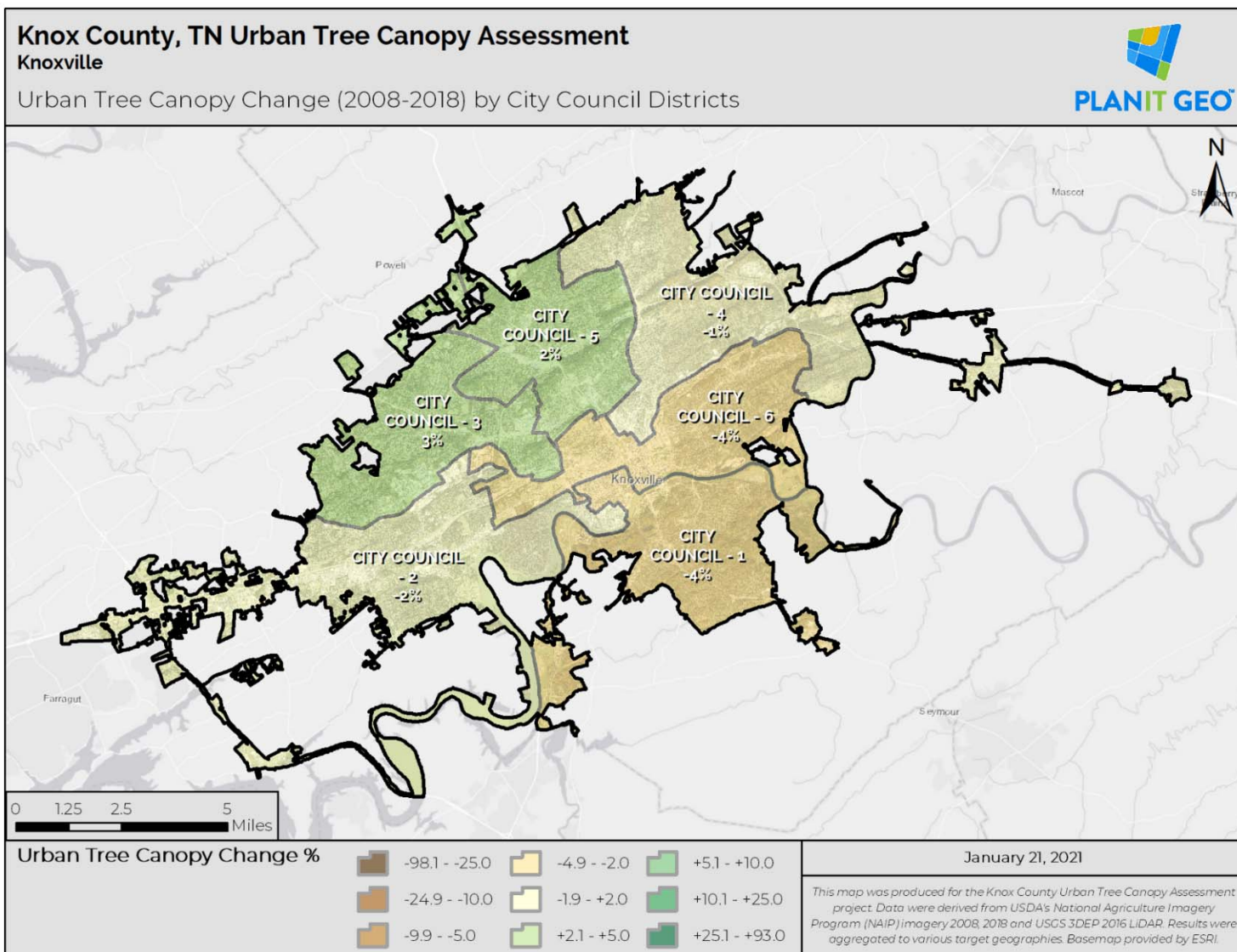
# Map 12



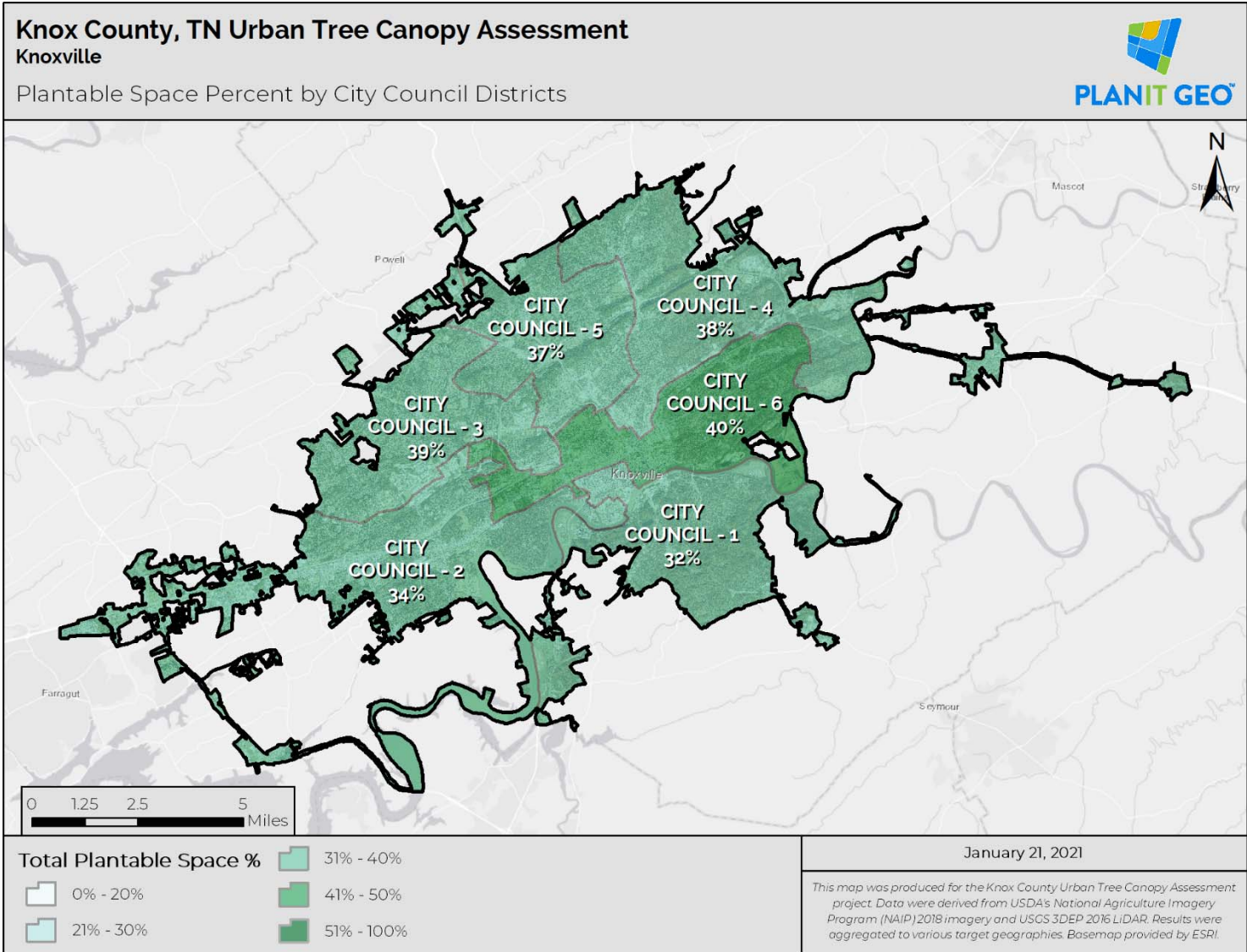
# Map 13



## Map 14



# Map 15



## **Appendix B**

### **Tables**



**Table 1**

| UTC Metrics by Elementary School District A-G |                            |                    |       |       |                         |              |              |                              |                |
|---|----------------------------|--------------------|-------|-------|-------------------------|--------------|--------------|------------------------------|----------------|
|   | Elementary School District | Total Area (Acres) | UTC % | PPA % | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
| Knox County                                   | A L LOTT                   | 5,921              | 38%   | 29%   | 31%                     | 40%          | 38%          | -81                          | -1%            |
|   | ADRIAN BURNETT             | 3,898              | 50%   | 30%   | 17%                     | 46%          | 50%          | 143                          | 4%             |
|   | AMHERST                    | 3,913              | 48%   | 34%   | 17%                     | 45%          | 48%          | 125                          | 3%             |
|   | BALL CAMP                  | 2,766              | 47%   | 29%   | 22%                     | 43%          | 47%          | 131                          | 5%             |
|   | BEARDEN                    | 4,278              | 37%   | 27%   | 35%                     | 41%          | 37%          | -149                         | -4%            |
|   | BEAUMONT                   | 893                | 17%   | 24%   | 57%                     | 21%          | 17%          | -30                          | -3%            |
|   | BELLE MORRIS               | 1,487              | 30%   | 27%   | 43%                     | 35%          | 30%          | -70                          | -5%            |
|   | BLUE GRASS                 | 3,926              | 50%   | 28%   | 18%                     | 50%          | 50%          | -12                          | 0%             |
|   | BONNY KATE                 | 14,765             | 64%   | 31%   | 5%                      | 65%          | 64%          | -162                         | -1%            |
|   | BRICKEY MC CLOUD           | 7,187              | 39%   | 40%   | 18%                     | 36%          | 39%          | 234                          | 3%             |
|   | CARTER                     | 21,299             | 53%   | 39%   | 6%                      | 56%          | 53%          | -469                         | -2%            |
|   | CEDAR BLUFF                | 5,383              | 38%   | 31%   | 28%                     | 33%          | 38%          | 273                          | 5%             |
|   | CHRISTENBERRY              | 1,975              | 32%   | 21%   | 47%                     | 34%          | 32%          | -39                          | -2%            |
|   | COPPER RIDGE               | 20,358             | 64%   | 28%   | 6%                      | 62%          | 64%          | 362                          | 2%             |
|   | CORRYTON                   | 14,276             | 40%   | 53%   | 4%                      | 38%          | 40%          | 325                          | 2%             |
|   | DOGWOOD                    | 3,958              | 60%   | 24%   | 16%                     | 64%          | 60%          | -177                         | -5%            |
|   | EAST KNOX COUNTY           | 20,106             | 45%   | 45%   | 9%                      | 48%          | 45%          | -523                         | -3%            |
|   | FARRAGUT                   | 15,390             | 37%   | 34%   | 25%                     | 34%          | 37%          | 495                          | 3%             |
|   | FOUNTAIN CITY              | 2,106              | 46%   | 27%   | 26%                     | 41%          | 46%          | 116                          | 6%             |
|   | GAP CREEK                  | 6,920              | 59%   | 36%   | 3%                      | 60%          | 59%          | -42                          | -1%            |
| GIBBS   | 13,340                     | 44%                | 47%   | 7%    | 40%                     | 44%          | 496          | 4%                           |                |
| GREEN   | 1,447                      | 26%                | 24%   | 45%   | 29%                     | 26%          | -43          | -3%                          |                |

**Table 2**

| UTC Metrics by Elementary School District H-Z |                            |                    |       |       |                         |              |              |                              |                |
|---|----------------------------|--------------------|-------|-------|-------------------------|--------------|--------------|------------------------------|----------------|
|   | Elementary School District | Total Area (Acres) | UTC % | PPA % | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
| Knox County                                   | HALLS                      | 13,827             | 54%   | 34%   | 10%                     | 51%          | 54%          | 400                          | 3%             |
|   | HARDIN VALLEY              | 20,986             | 52%   | 35%   | 11%                     | 50%          | 52%          | 350                          | 2%             |
|   | INSKIP                     | 1,878              | 34%   | 31%   | 33%                     | 30%          | 34%          | 91                           | 5%             |
|   | KARNS                      | 9,743              | 40%   | 41%   | 16%                     | 36%          | 40%          | 412                          | 4%             |
|   | LONSDALE                   | 933                | 32%   | 24%   | 43%                     | 34%          | 32%          | -16                          | -2%            |
|   | MAYNARD                    | 487                | 16%   | 26%   | 56%                     | 17%          | 16%          | -5                           | -1%            |
|   | MOORELAND HEIGHTS          | 2,324              | 59%   | 27%   | 14%                     | 64%          | 59%          | -105                         | -5%            |
|   | MOUNT OLIVE                | 8,754              | 59%   | 28%   | 10%                     | 64%          | 59%          | -408                         | -5%            |
|   | NEW HOPEWELL               | 10,282             | 67%   | 25%   | 7%                      | 68%          | 67%          | -98                          | -1%            |
|   | NORTHSHORE                 | 9,703              | 50%   | 33%   | 12%                     | 52%          | 50%          | -184                         | -3%            |
|   | NORWOOD                    | 2,208              | 37%   | 31%   | 32%                     | 33%          | 37%          | 80                           | 4%             |
|   | PLEASANT RIDGE             | 2,044              | 37%   | 35%   | 24%                     | 34%          | 37%          | 78                           | 4%             |
|   | POND GAP                   | 2,253              | 32%   | 25%   | 40%                     | 34%          | 32%          | -35                          | -2%            |
|   | POWELL                     | 8,308              | 42%   | 36%   | 19%                     | 40%          | 42%          | 198                          | 2%             |
|   | RITTA                      | 9,963              | 41%   | 47%   | 11%                     | 40%          | 41%          | 57                           | 1%             |
|   | ROCKY HILL                 | 5,941              | 52%   | 29%   | 13%                     | 54%          | 52%          | -114                         | -2%            |
|   | SARAH MOORE GREENE         | 2,990              | 40%   | 39%   | 19%                     | 44%          | 40%          | -115                         | -4%            |
|   | SEQUOYAH                   | 7,296              | 53%   | 21%   | 21%                     | 57%          | 53%          | -228                         | -4%            |
|   | SHANNONDALE                | 3,437              | 46%   | 36%   | 18%                     | 42%          | 46%          | 136                          | 4%             |
|   | SOUTH KNOXVILLE            | 1,706              | 45%   | 26%   | 23%                     | 50%          | 45%          | -85                          | -6%            |
|   | SPRING HILL                | 3,535              | 42%   | 32%   | 26%                     | 46%          | 42%          | -137                         | -4%            |
|   | STERCHI                    | 2,955              | 49%   | 27%   | 20%                     | 45%          | 49%          | 115                          | 4%             |
|   | SUNNYVIEW                  | 22,859             | 50%   | 38%   | 10%                     | 54%          | 50%          | -752                         | -3%            |
|   | WEST HAVEN                 | 1,613              | 35%   | 31%   | 33%                     | 33%          | 35%          | 35                           | 2%             |
| WEST HILLS                                    | 3,291                      | 38%                | 27%   | 34%   | 38%                     | 38%          | 5            | 0%                           |                |
| WEST VIEW                                     | 1,286                      | 22%                | 25%   | 52%   | 25%                     | 22%          | -41          | -3%                          |                |

**Table 3**

| UTC Metrics by Neighborhoods A-D |   |                    |       |       |                         |              |              |                              |                |
|----------------------------------|---|--------------------|-------|-------|-------------------------|--------------|--------------|------------------------------|----------------|
|                                  | Neighborhood                                | Total Area (Acres) | UTC % | PPA % | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
| Knox County                      | ALCOA HIGHWAY                               | 1,122              | 46%   | 33%   | 18%                     | 52%          | 46%          | -63                          | -6%            |
|                                  | AMHERST                                     | 1,797              | 42%   | 30%   | 27%                     | 38%          | 42%          | 83                           | 5%             |
|                                  | BEARDEN                                     | 1,008              | 30%   | 20%   | 49%                     | 31%          | 30%          | -13                          | -1%            |
|                                  | BEARDEN VILLAGE / WESTWOOD / FOREST HEIGHTS | 937                | 36%   | 23%   | 39%                     | 39%          | 36%          | -36                          | -4%            |
|                                  | BEAUMONT / WESTERN HEIGHTS / MECHANICSVILLE | 918                | 24%   | 29%   | 46%                     | 27%          | 24%          | -32                          | -3%            |
|                                  | BELLE MORRIS                                | 512                | 22%   | 27%   | 51%                     | 25%          | 22%          | -20                          | -4%            |
|                                  | BUFFAT HEIGHTS / LOVELAND                   | 741                | 49%   | 29%   | 22%                     | 53%          | 49%          | -34                          | -5%            |
|                                  | BURLINGTON / PARK CITY                      | 818                | 40%   | 34%   | 27%                     | 44%          | 40%          | -35                          | -4%            |
|                                  | CALLAHAN DRIVE                              | 1,459              | 35%   | 29%   | 33%                     | 32%          | 35%          | 39                           | 3%             |
|                                  | CHARTER DOYLE                               | 1,038              | 54%   | 30%   | 15%                     | 58%          | 54%          | -38                          | -4%            |
|                                  | CHEROKEE FARM                               | 984                | 52%   | 30%   | 16%                     | 55%          | 52%          | -26                          | -3%            |
|                                  | CHILHOWEE / ZOO                             | 435                | 39%   | 23%   | 37%                     | 42%          | 39%          | -15                          | -3%            |
|                                  | CHILHOWEE HILLS                             | 502                | 45%   | 26%   | 28%                     | 50%          | 45%          | -22                          | -4%            |
|                                  | CIVIC COLISEUM                              | 160                | 13%   | 27%   | 60%                     | 15%          | 13%          | -3                           | -2%            |
|                                  | CUMBERLAND ESTATES                          | 1,291              | 38%   | 36%   | 22%                     | 35%          | 38%          | 38                           | 3%             |
|                                  | DEANE HILL / BEARDEN HILL                   | 873                | 23%   | 23%   | 53%                     | 25%          | 23%          | -10                          | -1%            |
|                                  | DELROSE ROAD                                | 1,372              | 37%   | 47%   | 12%                     | 42%          | 37%          | -66                          | -5%            |
| DOWNTOWN / MARKET SQUARE         | 333   | 10%                | 8%    | 81%   | 9%                      | 10%          | 4            | 1%                           |                |

**Table 4**

| UTC Metrics by Neighborhood F-N |                                     |                    |       |       |                         |              |              |                              |                |
|---------------------------------|-------------------------------------|--------------------|-------|-------|-------------------------|--------------|--------------|------------------------------|----------------|
| Knox County                     | Neighborhood                        | Total Area (Acres) | UTC % | PPA % | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
|                                 | FIVE POINTS / PARK CITY             | 1,016              | 29%   | 29%   | 42%                     | 31%          | 29%          | -27                          | -3%            |
|                                 | FORT SANDERS                        | 279                | 11%   | 7%    | 82%                     | 14%          | 11%          | -10                          | -4%            |
|                                 | FOUNTAIN CITY EAST                  | 1,509              | 44%   | 30%   | 25%                     | 39%          | 44%          | 89                           | 6%             |
|                                 | FOUNTAIN CITY WEST                  | 1,172              | 57%   | 24%   | 19%                     | 39%          | 57%          | 64                           | 5%             |
|                                 | FOURTH & GILL / OLD NORTH KNOXVILLE | 685                | 16%   | 19%   | 64%                     | 39%          | 16%          | -28                          | -4%            |
|                                 | HOLSTON HILLS                       | 1,567              | 53%   | 32%   | 13%                     | 39%          | 53%          | -122                         | -8%            |
|                                 | INSKIP                              | 1,895              | 38%   | 32%   | 29%                     | 39%          | 38%          | 96                           | 5%             |
|                                 | ISLAND HOME / SOUTH HAVEN           | 1,278              | 56%   | 26%   | 17%                     | 39%          | 56%          | -74                          | -6%            |
|                                 | KINGSTON PIKE                       | 205                | 50%   | 17%   | 33%                     | 39%          | 50%          | -9                           | -4%            |
|                                 | KNOXVILLE CENTER MALL               | 822                | 30%   | 30%   | 37%                     | 39%          | 30%          | -3                           | 0%             |
|                                 | LINCOLN PARK / OAKWOOD              | 1,925              | 33%   | 23%   | 43%                     | 39%          | 33%          | -7                           | 0%             |
|                                 | LONSDALE                            | 1,040              | 34%   | 25%   | 40%                     | 39%          | 34%          | 6                            | 1%             |
|                                 | LYONS VIEW                          | 630                | 30%   | 40%   | 20%                     | 39%          | 30%          | -19                          | -3%            |
|                                 | MARBLE CITY                         | 746                | 20%   | 24%   | 54%                     | 39%          | 20%          | -15                          | -2%            |
|                                 | MORNINGSIDE                         | 486                | 41%   | 29%   | 29%                     | 39%          | 41%          | -27                          | -6%            |
|                                 | NORTH HILLS                         | 1,291              | 42%   | 30%   | 28%                     | 39%          | 42%          | -64                          | -5%            |
|                                 | NORTH HOLSTON                       | 1,123              | 38%   | 32%   | 27%                     | 39%          | 38%          | -26                          | -2%            |
|                                 | NORTH KNOXVILLE                     | 476                | 29%   | 27%   | 44%                     | 39%          | 29%          | -22                          | -5%            |
|                                 | NORTH MCKAMEY                       | 784                | 45%   | 31%   | 22%                     | 39%          | 45%          | 19                           | 2%             |
| NORTH MIDDLEBROOK               | 1,292                               | 23%                | 27%   | 48%   | 39%                     | 23%          | -17          | -1%                          |                |
| NORWOOD EAST                    | 368                                 | 22%                | 25%   | 51%   | 39%                     | 22%          | 15           | 4%                           |                |
| NORWOOD NORTH                   | 549                                 | 37%                | 28%   | 34%   | 39%                     | 37%          | 26           | 5%                           |                |
| NORWOOD SOUTH                   | 1,060                               | 43%                | 30%   | 27%   | 39%                     | 43%          | 37           | 4%                           |                |
| NORWOOD WEST                    | 904                                 | 32%                | 38%   | 28%   | 39%                     | 32%          | 40           | 4%                           |                |

**Table 5**

| UTC Metrics by Neighborhood O-Z |                                   |                    |       |       |                         |              |              |                              |                |
|---------------------------------|-----------------------------------|--------------------|-------|-------|-------------------------|--------------|--------------|------------------------------|----------------|
| Knox County                     | Neighborhood                      | Total Area (Acres) | UTC % | PPA % | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
|                                 | OAKLAND                           | 942                | 45%   | 32%   | 23%                     | 41%          | 45%          | 36                           | 4%             |
|                                 | PARKRIDGE                         | 480                | 20%   | 24%   | 54%                     | 21%          | 20%          | -6                           | -1%            |
|                                 | SEQUOYAH HILLS                    | 1,071              | 52%   | 27%   | 20%                     | 59%          | 52%          | -77                          | -7%            |
|                                 | SOUTH KNOXVILLE / OLD SEVIER      | 875                | 40%   | 26%   | 34%                     | 45%          | 40%          | -42                          | -5%            |
|                                 | SOUTH MCKAMEY                     | 1,054              | 45%   | 31%   | 22%                     | 41%          | 45%          | 42                           | 4%             |
|                                 | STERCHI                           | 844                | 52%   | 26%   | 20%                     | 48%          | 52%          | 34                           | 4%             |
|                                 | TIMBERCREST / MIDDLEBROOK HEIGHTS | 1,567              | 40%   | 26%   | 33%                     | 44%          | 40%          | -60                          | -4%            |
|                                 | TOWN CENTER                       | 380                | 14%   | 37%   | 43%                     | 17%          | 14%          | -9                           | -3%            |
|                                 | UNIVERSITY OF TENNESSEE           | 634                | 12%   | 15%   | 70%                     | 14%          | 12%          | -12                          | -2%            |
|                                 | VESTAL / SOUTH WATERFRONT         | 1,096              | 43%   | 27%   | 30%                     | 48%          | 43%          | -48                          | -4%            |
|                                 | WAREHOUSE DISTRICT                | 333                | 4%    | 14%   | 81%                     | 3%           | 4%           | 4                            | 1%             |
|                                 | WEST HAVEN                        | 591                | 40%   | 30%   | 29%                     | 36%          | 40%          | 21                           | 4%             |
|                                 | WEST HILLS                        | 1,358              | 42%   | 30%   | 27%                     | 45%          | 42%          | -43                          | -3%            |
|                                 | WEST KNOXVILLE                    | 3,194              | 22%   | 25%   | 52%                     | 20%          | 22%          | 46                           | 1%             |
|                                 | WEST VIEW                         | 832                | 32%   | 30%   | 38%                     | 36%          | 32%          | -40                          | -5%            |
|                                 | WESTMORELAND                      | 1,556              | 45%   | 27%   | 28%                     | 48%          | 45%          | -50                          | -3%            |
| WHITTLE SPRINGS / ALICE BELL    | 1,400                             | 44%                | 34%   | 21%   | 47%                     | 44%          | -47          | -3%                          |                |
| WOODLAWN                        | 1,864                             | 63%                | 22%   | 14%   | 68%                     | 63%          | -82          | -4%                          |                |

**Table 6**

| UTC Metrics by Watersheds: Hydrology Quality |                                  |                    |            |            |                         |              |              |                              |                |  |  |   |                          |
|--|----------------------------------|--------------------|------------|------------|-------------------------|--------------|--------------|------------------------------|----------------|--|--|---|--------------------------|
|  | Watershed                        | Total Area (Acres) | UTC %      | PPA %      | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | UTC Change (%) | Transpiration (Millions of Gallons/Year) | Rainfall Interception (Millions of Gallons/Year) | Avoided Runoff (Millions of Gallons/Year) | Avoided Runoff (\$/Year) |
| Knox County                                  | Clift Creek-Holston River        | 26,916             | 46%        | 48%        | 6%                      | 47%          | 46%          | -396                         | -1%            | 1,704.9                                  | 1,117.1  | 25.8                                      | \$230,536                |
|  | Conner Creek-Clinch River        | 15,817             | 55%        | 36%        | 9%                      | 54%          | 55%          | 204                          | 1%             | 3,047.6                                  | 1,902.2  | 37.0                                      | \$330,300                |
|  | Crowder Branch-Holston River     | 3,707              | 43%        | 55%        | 3%                      | 44%          | 43%          | -41                          | -1%            | 787.5                                    | 512.0  | 7.0                                       | \$62,637                 |
|  | First Creek                      | 13,854             | 40%        | 41%        | 25%                     | 37%          | 40%          | 328                          | 2%             | 693.6                                    | 435.7  | 81.3                                      | \$726,136                |
|  | Flat Creek                       | 20,317             | 45%        | 50%        | 4%                      | 43%          | 45%          | 241                          | 1%             | 2,785.0                                  | 1,903.2  | 34.7                                      | \$309,780                |
|  | Lower Beaver Creek               | 26,118             | 42%        | 42%        | 17%                     | 38%          | 42%          | 859                          | 3%             | 1,357.4                                  | 852.7  | 159.0                                     | \$1,420,893              |
|  | Lower Bull Run Creek             | 22,686             | 66%        | 27%        | 5%                      | 65%          | 66%          | 344                          | 2%             | 2,820.2                                  | 1,783.2  | 38.9                                      | \$347,307                |
|  | Lower Fort Loudon Lake           | 13,543             | 50%        | 33%        | 15%                     | 52%          | 50%          | -196                         | -2%            | 1,036.3                                  | 677.5  | 58.2                                      | \$519,776                |
|  | Middle Fort Loudon Lake          | 9,415              | 57%        | 30%        | 12%                     | 58%          | 57%          | -126                         | -2%            | 893.8                                    | 566.5  | 90.8                                      | \$811,070                |
|  | Milican Creek-French Broad River | 623                | 23%        | 71%        | 6%                      | 23%          | 23%          | -2                           | 0%             | 760.1                                    | 481.9  | 3.8                                       | \$33,617                 |
|  | Nails Creek-Little River         | 1,141              | 83%        | 16%        | 2%                      | 83%          | 83%          | -7                           | -1%            | 825.2                                    | 574.5  | 3.6                                       | \$32,316                 |
|  | Outlet French Broad River        | 26,559             | 59%        | 35%        | 6%                      | 60%          | 59%          | -252                         | -1%            | 2,337.3                                  | 1,525.6  | 32.4                                      | \$289,438                |
|  | Outlet Holston River             | 25,883             | 47%        | 41%        | 14%                     | 51%          | 47%          | -984                         | -4%            | 1,618.5                                  | 1,039.3  | 108.5                                     | \$969,504                |
|  | Roddy Branch-Little River        | 1,435              | 59%        | 37%        | 4%                      | 60%          | 59%          | -6                           | -1%            | 743.9                                    | 498.6  | 30.5                                      | \$272,272                |
|  | Second Creek                     | 4,275              | 27%        | 38%        | 48%                     | 26%          | 27%          | 65                           | 2%             | 123.9                                    | 77.9   | 14.5                                      | \$129,765                |
|  | Stock Creek                      | 13,292             | 60%        | 34%        | 6%                      | 61%          | 60%          | -127                         | -1%            | 1,083.2                                  | 712.5  | 16.6                                      | \$148,064                |
|  | Ten Mile Creek                   | 10,923             | 40%        | 36%        | 31%                     | 38%          | 40%          | 218                          | 2%             | 492.4                                    | 309.3  | 57.7                                      | \$515,504                |
|  | Third Creek                      | 11,085             | 34%        | 39%        | 35%                     | 34%          | 34%          | 53                           | 0%             | 462.4                                    | 290.5  | 54.2                                      | \$484,073                |
|  | Tuckahoe Creek                   | 6,183              | 61%        | 34%        | 4%                      | 63%          | 61%          | -132                         | -2%            | 1,338.1                                  | 855.6  | 11.7                                      | \$104,106                |
|  | Turkey Creek                     | 16,733             | 36%        | 42%        | 26%                     | 32%          | 36%          | 551                          | 3%             | 604.5                                    | 379.6  | 70.4                                      | \$629,189                |
| Upper Beaver Creek                           | 31,493                           | 42%                | 44%        | 14%        | 39%                     | 42%          | 1,079        | 3%                           | 1,745.9        | 1,096.9                                  | 204.6  | \$1,827,947                               |                          |
| Upper Bull Run Creek                         | 3,329                            | 71%                | 23%        | 5%         | 68%                     | 71%          | 96           | 3%                           | 2,405.6        | 1,675.3                                  | 20.8   | \$186,116                                 |                          |
| Upper Fort Loudon Lake                       | 31,086                           | 51%                | 33%        | 20%        | 55%                     | 51%          | -1,237       | -4%                          | 1,950.0        | 1,225.0                                  | 228.5  | \$2,041,477                               |                          |
|  | <b>Totals</b>                    | <b>336,412</b>     | <b>49%</b> | <b>39%</b> | <b>14%</b>              | <b>48%</b>   | <b>49%</b>   | <b>533</b>                   | <b>0%</b>      | <b>31,617.3</b>                          | <b>20,492.6</b>                                  | <b>1,390.5</b>                            | <b>\$12,421,823</b>      |

**Table 7**

| UTC Metrics by Watersheds: Pollution |                                  |                    |            |            |                         |              |              |                              |                     |                               |                               |
|--------------------------------------|----------------------------------|--------------------|------------|------------|-------------------------|--------------|--------------|------------------------------|---------------------|-------------------------------|-------------------------------|
| Knox County                          | Watershed                        | Total Area (Acres) | UTC %      | PPA %      | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | UTC Change (%)      | Air Pollution Removal \$/Year | Air Pollution Removal lb/Year |
|                                      | Clift Creek-Holston River        | 26,916             | 46%        | 48%        | 6%                      | 47%          | 46%          | -396                         | -1%                 | \$258,610                     | 757,696.4                     |
|                                      | Conner Creek-Clinch River        | 15,817             | 55%        | 36%        | 9%                      | 54%          | 55%          | 204                          | 1%                  | \$37,110                      | 1,462,462.2                   |
|                                      | Crowder Branch-Holston River     | 3,707              | 43%        | 55%        | 3%                      | 44%          | 43%          | -41                          | -1%                 | \$99,852                      | 373,887.7                     |
|                                      | First Creek                      | 13,854             | 40%        | 41%        | 25%                     | 37%          | 40%          | 328                          | 2%                  | \$1,090,311                   | 315,315.6                     |
|                                      | Flat Creek                       | 20,317             | 45%        | 50%        | 4%                      | 43%          | 45%          | 241                          | 1%                  | \$299,469                     | 1,366,552.9                   |
|                                      | Lower Beaver Creek               | 26,118             | 42%        | 42%        | 17%                     | 38%          | 42%          | 859                          | 3%                  | \$2,133,534                   | 617,033.5                     |
|                                      | Lower Bull Run Creek             | 22,686             | 66%        | 27%        | 5%                      | 65%          | 66%          | 344                          | 2%                  | \$379,040                     | 1,217,979.6                   |
|                                      | Lower Fort Loudon Lake           | 13,543             | 50%        | 33%        | 15%                     | 52%          | 50%          | -196                         | -2%                 | \$879,430                     | 504,901.6                     |
|                                      | Middle Fort Loudon Lake          | 9,415              | 57%        | 30%        | 12%                     | 58%          | 57%          | -126                         | -2%                 | \$1,376,702                   | 433,608.0                     |
|                                      | Milican Creek-French Broad River | 623                | 23%        | 71%        | 6%                      | 23%          | 23%          | -2                           | 0%                  | \$71,930                      | 411,315.1                     |
|                                      | Nails Creek-Little River         | 1,141              | 83%        | 16%        | 2%                      | 83%          | 83%          | -7                           | -1%                 | \$94,037                      | 454,783.8                     |
|                                      | Outlet French Broad River        | 26,559             | 59%        | 35%        | 6%                      | 60%          | 59%          | -252                         | -1%                 | \$336,627                     | 1,069,617.0                   |
|                                      | Outlet Holston River             | 25,883             | 47%        | 41%        | 14%                     | 51%          | 47%          | -984                         | -4%                 | \$1,410,968                   | 724,798.1                     |
|                                      | Roddy Branch-Little River        | 1,435              | 59%        | 37%        | 4%                      | 60%          | 59%          | -6                           | -1%                 | \$608,436                     | 403,014.7                     |
|                                      | Second Creek                     | 4,275              | 27%        | 38%        | 48%                     | 26%          | 27%          | 65                           | 2%                  | \$194,846                     | 56,348.5                      |
|                                      | Stock Creek                      | 13,292             | 60%        | 34%        | 6%                      | 61%          | 60%          | -127                         | -1%                 | \$165,453                     | 481,253.6                     |
|                                      | Ten Mile Creek                   | 10,923             | 40%        | 36%        | 31%                     | 38%          | 40%          | 218                          | 2%                  | \$774,042                     | 223,851.2                     |
|                                      | Third Creek                      | 11,085             | 34%        | 39%        | 35%                     | 34%          | 34%          | 53                           | 0%                  | \$726,848                     | 210,202.6                     |
|                                      | Tuckahoe Creek                   | 6,183              | 61%        | 34%        | 4%                      | 63%          | 61%          | -132                         | -2%                 | \$167,508                     | 649,159.8                     |
| Turkey Creek                         | 16,733                           | 36%                | 42%        | 26%        | 32%                     | 36%          | 551          | 3%                           | \$945,833           | 274,394.7                     |                               |
| Upper Beaver Creek                   | 31,493                           | 42%                | 44%        | 14%        | 39%                     | 42%          | 1,079        | 3%                           | \$2,744,706         | 793,762.8                     |                               |
| Upper Bull Run Creek                 | 3,329                            | 71%                | 23%        | 5%         | 68%                     | 71%          | 96           | 3%                           | \$150,467           | 1,254,253.3                   |                               |
| Upper Fort Loudon Lake               | 31,086                           | 51%                | 33%        | 20%        | 55%                     | 51%          | -1,237       | -4%                          | \$3,065,420         | 886,532.4                     |                               |
| <b>Totals</b>                        | <b>336,412</b>                   | <b>49%</b>         | <b>39%</b> | <b>14%</b> | <b>48%</b>              | <b>49%</b>   | <b>533</b>   | <b>0%</b>                    | <b>\$18,011,179</b> | <b>14,942,725.1</b>           |                               |

**Table 8**

| UTC Metrics by Watersheds: Carbon |                                  |                    |            |            |                         |              |              |                              |                        |                             |                     |                                   |          |
|-----------------------------------|----------------------------------|--------------------|------------|------------|-------------------------|--------------|--------------|------------------------------|------------------------|-----------------------------|---------------------|-----------------------------------|----------|
|                                   | Watershed                        | Total Area (Acres) | UTC %      | PPA %      | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | UTC Change (%)         | Carbon Storage (\$ and lbs) |                     | Carbon Sequestration (\$ and lbs) |          |
|                                   |                                  |                    |            |            |                         |              |              |                              |                        |                             |                     |                                   |          |
| Knox County                       | Clift Creek-Holston River        | 26,916             | 46%        | 48%        | 6%                      | 47%          | 46%          | -396                         | -1%                    | \$8,144,715                 | 477,539.6           | \$1,075,225                       | 6,304.4  |
|                                   | Conner Creek-Clinch River        | 15,817             | 55%        | 36%        | 9%                      | 54%          | 55%          | 204                          | 1%                     | \$144,350,646               | 846,379.5           | \$1,747,682                       | 10,247.3 |
|                                   | Crowder Branch-Holston River     | 3,707              | 43%        | 55%        | 3%                      | 44%          | 43%          | -41                          | -1%                    | \$44,619,055                | 216,617.5           | \$969,768                         | 5,686.1  |
|                                   | First Creek                      | 13,854             | 40%        | 41%        | 25%                     | 37%          | 40%          | 328                          | 2%                     | \$30,173,137                | 176,915.9           | \$784,957                         | 4,602.5  |
|                                   | Flat Creek                       | 20,317             | 45%        | 50%        | 4%                      | 43%          | 45%          | 241                          | 1%                     | \$154,851,420               | 907,949.4           | \$2,622,265                       | 15,375.3 |
|                                   | Lower Beaver Creek               | 26,118             | 42%        | 42%        | 17%                     | 38%          | 42%          | 859                          | 3%                     | \$61,486,148                | 360,515.3           | \$1,119,255                       | 6,562.6  |
|                                   | Lower Bull Run Creek             | 22,686             | 66%        | 27%        | 5%                      | 65%          | 66%          | 344                          | 2%                     | \$171,982,980               | 1,008,397.8         | \$1,688,689                       | 9,901.4  |
|                                   | Lower Fort Loudon Lake           | 13,543             | 50%        | 33%        | 15%                     | 52%          | 50%          | -196                         | -2%                    | \$48,195,648                | 282,588.3           | \$703,701                         | 4,126.1  |
|                                   | Middle Fort Loudon Lake          | 9,415              | 57%        | 30%        | 12%                     | 58%          | 57%          | -126                         | -2%                    | \$41,651,359                | 244,216.9           | \$528,283                         | 3,097.5  |
|                                   | Milican Creek-French Broad River | 623                | 23%        | 71%        | 6%                      | 23%          | 23%          | -2                           | 0%                     | \$46,477,808                | 272,516.0           | \$252,981                         | 1,483.3  |
|                                   | Nails Creek-Little River         | 1,141              | 83%        | 16%        | 2%                      | 83%          | 83%          | -7                           | -1%                    | \$51,690,545                | 303,080.2           | \$519,629                         | 3,046.8  |
|                                   | Outlet French Broad River        | 26,559             | 59%        | 35%        | 6%                      | 60%          | 59%          | -252                         | -1%                    | \$114,226,847               | 669,752.9           | \$1,152,858                       | 6,759.6  |
|                                   | Outlet Holston River             | 25,883             | 47%        | 41%        | 14%                     | 51%          | 47%          | -984                         | -4%                    | \$75,438,798                | 442,324.7           | \$1,142,196                       | 6,697.1  |
|                                   | Roddy Branch-Little River        | 1,435              | 59%        | 37%        | 4%                      | 60%          | 59%          | -6                           | -1%                    | \$45,526,681                | 266,969.2           | \$451,206                         | 2,645.5  |
|                                   | Second Creek                     | 4,275              | 27%        | 38%        | 48%                     | 26%          | 27%          | 65                           | 2%                     | \$5,246,161                 | 30,760.1            | \$165,298                         | 969.2    |
|                                   | Stock Creek                      | 13,292             | 60%        | 34%        | 6%                      | 61%          | 60%          | -127                         | -1%                    | \$52,647,385                | 308,690.5           | \$518,155                         | 3,038.1  |
|                                   | Ten Mile Creek                   | 10,923             | 40%        | 36%        | 31%                     | 38%          | 40%          | 218                          | 2%                     | \$20,906,562                | 122,582.6           | \$645,409                         | 3,784.2  |
|                                   | Third Creek                      | 11,085             | 34%        | 39%        | 35%                     | 34%          | 34%          | 53                           | 0%                     | \$19,569,592                | 114,434.6           | \$616,731                         | 3,616.1  |
|                                   | Tuckahoe Creek                   | 6,183              | 61%        | 34%        | 4%                      | 63%          | 61%          | -132                         | -2%                    | \$74,630,775                | 437,586.9           | \$1,505,452                       | 8,827.0  |
|                                   | Turkey Creek                     | 16,733             | 36%        | 42%        | 26%                     | 32%          | 36%          | 551                          | 3%                     | \$26,062,438                | 152,813.4           | \$703,379                         | 4,124.2  |
|                                   | Upper Beaver Creek               | 31,493             | 42%        | 44%        | 14%                     | 39%          | 42%          | 1,079                        | 3%                     | \$79,540,275                | 466,373.1           | \$1,361,678                       | 7,984.0  |
| Upper Bull Run Creek              | 3,329                            | 71%                | 23%        | 5%         | 68%                     | 71%          | 96           | 3%                           | \$151,300,658          | 887,129.9                   | \$1,533,245         | 8,990.0                           |          |
| Upper Fort Loudon Lake            | 31,086                           | 51%                | 33%        | 20%        | 55%                     | 51%          | -1,237       | -4%                          | \$89,109,925           | 522,483.4                   | \$1,473,631         | 8,640.5                           |          |
| <b>Totals</b>                     | <b>336,412</b>                   | <b>49%</b>         | <b>39%</b> | <b>14%</b> | <b>48%</b>              | <b>49%</b>   | <b>533</b>   | <b>0%</b>                    | <b>\$1,557,829,558</b> | <b>9,518,617.7</b>          | <b>\$23,281,673</b> | <b>136,508.8</b>                  |          |



**Table 9**

| UTC Metrics by City of Knoxville Zoning A-E |                            |  |                    |       |             |       |                         |                   |              |              |                              |                |
|---|----------------------------|--|--------------------|-------|-------------|-------|-------------------------|-------------------|--------------|--------------|------------------------------|----------------|
|   | Knoxville Zoning Type Code | Zoning Type                                  | Total Area (Acres) | UTC % | PPA (Acres) | PPA % | Impervious Area (Acres) | Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
| Knoxville                                   | Misc.                      | ROW, Railroad                                | 14,494             | 22%   | 2,813       | 25%   | 6,050                   | 42%               | 48%          | 46%          | -35                          | -1%            |
|   | AG                         | General Agricultural                         | 2,584              | 46%   | 1,042       | 42%   | 147                     | 6%                | 22%          | 21%          | -5                           | -1%            |
|   | C-G-1                      | General Commercial                           | 490                | 21%   | 112         | 23%   | 272                     | 55%               | 15%          | 16%          | 5                            | 1%             |
|   | C-G-2                      | General Commercial-more intense than 1       | 840                | 16%   | 151         | 18%   | 550                     | 65%               | 12%          | 13%          | 2                            | 1%             |
|   | C-G-3                      | General Commercial-more intense than 2       | 309                | 13%   | 35          | 11%   | 234                     | 76%               | 19%          | 20%          | 10                           | 1%             |
|   | C-H-1                      | Highway Commercial                           | 996                | 20%   | 212         | 21%   | 566                     | 57%               | 24%          | 25%          | 25                           | 2%             |
|   | C-H-2                      | Highway Commercial-more intense than 1       | 1,626              | 25%   | 359         | 22%   | 834                     | 51%               | 30%          | 27%          | -3                           | -3%            |
|   | C-N                        | Neighborhood Commercial                      | 134                | 27%   | 32          | 24%   | 65                      | 49%               | 5%           | 10%          | 17                           | 5%             |
|   | C-R-1                      | Regional Commercial                          | 308                | 10%   | 42          | 13%   | 232                     | 75%               | 15%          | 13%          | -23                          | -2%            |
|   | C-R-2                      | Regional Commercial-more intense than 1      | 1,042              | 13%   | 226         | 22%   | 674                     | 65%               | 15%          | 9%           | 0                            | -6%            |
|   | CU-1                       | Lake Avenue                                  | 7                  | 9%    | 0           | 4%    | 6                       | 87%               | 2%           | 2%           | 0                            | 0%             |
|   | CU-2                       | Cumberland Avenue                            | 16                 | 2%    | 0           | 2%    | 15                      | 96%               | 16%          | 15%          | 0                            | -2%            |
|   | CU-3                       | White Avenue/Hospital                        | 5                  | 15%   | 0           | 5%    | 4                       | 80%               | 9%           | 7%           | 0                            | -2%            |
|   | CU-4                       | White Avenue/Neighborhood                    | 2                  | 7%    | 0           | 2%    | 2                       | 91%               | 12%          | 8%           | 0                            | -4%            |
|   | CU-5                       | Seventeenth Street                           | 2                  | 8%    | 0           | 3%    | 2                       | 89%               | 11%          | 13%          | 1                            | 1%             |
|   | DK-B                       | Downtown Knoxville Boulevards Subdistrict    | 73                 | 13%   | 7           | 10%   | 56                      | 77%               | 5%           | 6%           | 1                            | 1%             |
|   | DK-E                       | Downtown Knoxville Edge Subdistrict          | 50                 | 6%    | 3           | 6%    | 44                      | 88%               | 7%           | 7%           | 0                            | 0%             |
|   | DK-G                       | Downtown Knoxville Grid Subdistrict          | 75                 | 7%    | 3           | 4%    | 66                      | 89%               | 1%           | 3%           | 0                            | 2%             |
|   | DK-H                       | Downtown Knoxville Historic Core Subdistrict | 14                 | 3%    | 0           | 2%    | 13                      | 96%               | 4%           | 3%           | 0                            | -1%            |
|   | DK-W                       | Downtown Knoxville Warehouse Subdistrict     | 34                 | 3%    | 1           | 4%    | 31                      | 93%               | 65%          | 61%          | -80                          | -5%            |
| EN  | Established Neighborhood   | 1,688  | 61%                | 474   | 28%         | 189   | 11%                     | 21%               | 21%          | -13          | 0%                           |                |

**Table 10**

| UTC Metrics by City of Knoxville Zoning I-S |   |   |                    |            |               |            |                         |                   |              |              |                              |                |
|---|---|---|--------------------|------------|---------------|------------|-------------------------|-------------------|--------------|--------------|------------------------------|----------------|
|   | Knoxville Zoning Type Code              | Zoning Type   | Total Area (Acres) | UTC %      | PPA (Acres)   | PPA %      | Impervious Area (Acres) | Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
| Knoxville                                   | I-G                                     | General Industrial  | 2,620              | 21%        | 561           | 21%        | 1,468                   | 56%               | 31%          | 29%          | -41                          | -2%            |
|   | I-H                                     | Heavy Industrial  | 1,743              | 29%        | 453           | 26%        | 728                     | 42%               | 21%          | 22%          | 5                            | 1%             |
|   | I-MU                                    | Industrial Mixed-Use  | 814                | 22%        | 164           | 20%        | 463                     | 57%               | 13%          | 14%          | 2                            | 1%             |
|   | I-RD                                    | Research and Development  | 179                | 14%        | 119           | 74%        | 20                      | 11%               | 20%          | 20%          | 0                            | 0%             |
|   | INST                                    | Institutional   | 2,088              | 20%        | 573           | 28%        | 963                     | 46%               | 88%          | 84%          | -68                          | -4%            |
|   | NA                                      | Natural Areas   | 1,917              | 84%        | 262           | 14%        | 18                      | 1%                | 32%          | 30%          | -13                          | -2%            |
|   | O                                       | Office  | 726                | 30%        | 204           | 28%        | 294                     | 41%               | 31%          | 30%          | -11                          | -2%            |
|   | OP                                      | Office Park   | 698                | 30%        | 230           | 34%        | 246                     | 35%               | 43%          | 42%          | -53                          | -2%            |
|   | OS                                      | Open Space  | 3,311              | 42%        | 1,237         | 39%        | 351                     | 11%               | 56%          | 55%          | -201                         | -1%            |
|   | RN-1                                    | Single Family Residential Neighborhood-Low Density, Large Lots  | 17,470             | 55%        | 5,291         | 31%        | 2,358                   | 13%               | 46%          | 42%          | -249                         | -4%            |
|   | RN-2                                    | Single Family Residential Neighborhood-Low Density, Small Lots, primarily single family dwellings                       | 5,890              | 42%        | 2,007         | 34%        | 1,401                   | 24%               | 27%          | 31%          | 43                           | 4%             |
|   | RN-3                                    | General Residential Neighborhood-Medium Density, primarily single and two family dwellings                              | 1,172              | 31%        | 373           | 32%        | 421                     | 36%               | 39%          | 40%          | 2                            | 0%             |
|   | RN-4                                    | General Residential Neighborhood-Mixed Medium Density, single family, two family, and townhouse dwellings               | 493                | 40%        | 179           | 36%        | 117                     | 24%               | 37%          | 36%          | -7                           | -1%            |
|   | RN-5                                    | General Residential Neighborhood-Medium Density, mix of single family, two family, townhouse, and multifamily dwellings | 1,240              | 36%        | 325           | 26%        | 459                     | 37%               | 34%          | 32%          | -21                          | -2%            |
|   | RN-6                                    | Multifamily Residential Neighborhood-High Density, all housing types  | 1,295              | 32%        | 327           | 25%        | 531                     | 41%               | 24%          | 19%          | -1                           | -5%            |
|   | RN-7                                    | Multifamily Residential Neighborhood-Most Intense High Density in townhouse and multifamily deveopments                 | 27                 | 19%        | 7             | 26%        | 15                      | 55%               | 50%          | 42%          | -4                           | -9%            |
|   | SW-1                                    | South Waterfront-Old Sevier, Scottish Pike  | 47                 | 42%        | 15            | 32%        | 12                      | 26%               | 35%          | 25%          | -5                           | -11%           |
|   | SW-2                                    | South Waterfront-River Road, Goose Creek Row, Island Home Ave   | 52                 | 25%        | 16            | 32%        | 20                      | 39%               | 15%          | 12%          | -1                           | -4%            |
|   | SW-3                                    | South Waterfront-Sevier Ave   | 22                 | 12%        | 4             | 17%        | 15                      | 70%               | 25%          | 21%          | -1                           | -4%            |
|   | SW-4                                    | South Waterfront-Scottish Pike, Campus Cove, Quay Village   | 43                 | 21%        | 14            | 34%        | 18                      | 42%               | 14%          | 13%          | 0                            | -1%            |
|   | SW-5                                    | South Waterfront-Bell Tower Walk  | 16                 | 13%        | 3             | 20%        | 11                      | 66%               | 24%          | 18%          | -3                           | -7%            |
| SW-6  | South Waterfront-Henley Gateway         | 45  | 18%                | 6          | 15%           | 29         | 64%                     | 2%                | 2%           | 0            | 0%                           |                |
| SW-7  | South Waterfront-Waterfront Marketplace | 14  | 2%                 | 1          | 9%            | 12         | 86%                     | 22%               | 22%          | -29          | 0%                           |                |
|   | <b>Totals</b>                           |   | <b>66,710</b>      | <b>38%</b> | <b>17,887</b> | <b>28%</b> | <b>20,023</b>           | <b>30%</b>        | <b>40%</b>   | <b>38%</b>   | <b>-756</b>                  | <b>-1%</b>     |

**Table 11**

| UTC Metrics by Knox County Zoning A-E |                       |  |                    |       |             |       |                               |                         |              |              |                              |                |
|---------------------------------------|-----------------------|--|--------------------|-------|-------------|-------|-------------------------------|-------------------------|--------------|--------------|------------------------------|----------------|
|                                       | Zoning Type Code      | Zoning Type                                    | Total Area (Acres) | UTC % | PPA (Acres) | PPA % | Total Impervious Area (Acres) | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
| Knox County                           | A                     | Agricultural                                   | 176,438            | 57%   | 64,310      | 37%   | 8,702                         | 5%                      | 56%          | 57%          | 143                          | 0%             |
|                                       | A(k)                  | Agricultural (k)                               | 3                  | 38%   | 2           | 55%   | 0                             | 8%                      | 58%          | 38%          | -1                           | -20%           |
|                                       | A/F                   | Agricultural/Floodway                          | 14                 | 27%   | 10          | 73%   | 0                             | 0%                      | 21%          | 27%          | 1                            | 6%             |
|                                       | A/HZ                  | Agricultural/Historical Overlay                | 110                | 63%   | 37          | 34%   | 3                             | 3%                      | 70%          | 63%          | -8                           | -7%            |
|                                       | A/TO                  | Agricultural/Technology Overlay                | 710                | 56%   | 229         | 32%   | 70                            | 10%                     | 54%          | 56%          | 19                           | 3%             |
|                                       | BP                    | Business and Technology Park                   | 6                  | 40%   | 2           | 27%   | 2                             | 32%                     | 34%          | 40%          | 0                            | 6%             |
|                                       | BP/TO                 | Technology Overlay                             | 1,081              | 37%   | 401         | 37%   | 252                           | 23%                     | 31%          | 37%          | 59                           | 5%             |
|                                       | CA                    | General Business                               | 3,905              | 28%   | 1,398       | 36%   | 1,316                         | 34%                     | 27%          | 28%          | 31                           | 1%             |
|                                       | CA(k)                 | General Business (k)                           | 90                 | 22%   | 41          | 46%   | 22                            | 25%                     | 22%          | 22%          | 1                            | 1%             |
|                                       | CA/F                  | General Business/Floodway                      | 12                 | 43%   | 5           | 45%   | 0                             | 1%                      | 42%          | 43%          | 0                            | 1%             |
|                                       | CA/HZ                 | General Business/Historical Overlay            | 25                 | 41%   | 8           | 33%   | 6                             | 26%                     | 45%          | 41%          | -1                           | -5%            |
|                                       | CA/HZ(k)              | General Business/Historical Overlay (k)        | 1                  | 27%   | 0           | 37%   | 0                             | 35%                     | 24%          | 27%          | 0                            | 4%             |
|                                       | CA/TO                 | General Business/Technology Overlay            | 87                 | 20%   | 29          | 33%   | 38                            | 44%                     | 16%          | 20%          | 3                            | 4%             |
|                                       | CA/TO(k)              | General Business/Technology Overlay (k)        | 5                  | 18%   | 2           | 33%   | 2                             | 48%                     | 46%          | 18%          | -1                           | -29%           |
|                                       | CB                    | Business and Manufacturing                     | 1,649              | 27%   | 472         | 29%   | 717                           | 43%                     | 25%          | 27%          | 29                           | 2%             |
|                                       | CB(k)                 | Business Manufacturing (k)                     | 15                 | 11%   | 6           | 41%   | 7                             | 47%                     | 29%          | 11%          | -3                           | -18%           |
|                                       | CB/TO                 | Business and Manufacturing/Technology Overlay  | 334                | 11%   | 120         | 36%   | 167                           | 50%                     | 7%           | 11%          | 14                           | 4%             |
|                                       | CH                    | Highway Commercial                             | 32                 | 61%   | 4           | 12%   | 8                             | 26%                     | 54%          | 61%          | 2                            | 7%             |
|                                       | CN                    | Neighborhood Commercial                        | 41                 | 42%   | 16          | 38%   | 8                             | 18%                     | 50%          | 42%          | -3                           | -8%            |
|                                       | CN(k)                 | Neighborhood Commercial (k)                    | 18                 | 14%   | 8           | 42%   | 8                             | 42%                     | 36%          | 14%          | -4                           | -22%           |
|                                       | CN/TO(k)              | Neighborhood Commercial/Technology Overlay (k) | 6                  | 30%   | 3           | 57%   | 1                             | 13%                     | 21%          | 30%          | 1                            | 9%             |
|                                       | CR                    | Regional Commercial                            | 45                 | 25%   | 19          | 44%   | 12                            | 28%                     | 25%          | 25%          | 0                            | 1%             |
|                                       | CR(k)                 | Regional Commercial (k)                        | 1                  | 10%   | 0           | 25%   | 0                             | 63%                     | 5%           | 10%          | 0                            | 5%             |
|                                       | E                     | Estate   | 449                | 64%   | 127         | 29%   | 29                            | 6%                      | 69%          | 64%          | -18                          | -4%            |
| EC                                    | Employment Center     | 118  | 8%                 | 82    | 69%         | 11    | 10%                           | 8%                      | 8%           | 1            | 1%                           |                |
| EC(k)                                 | Employment Center (k) | 348  | 24%                | 203   | 58%         | 6     | 2%                            | 29%                     | 24%          | -17          | -5%                          |                |

**Table 12**

| UTC Metrics by Knox County Zoning F-O |                              |  |                    |       |             |       |                               |                         |              |              |                              |                |
|---------------------------------------|------------------------------|--|--------------------|-------|-------------|-------|-------------------------------|-------------------------|--------------|--------------|------------------------------|----------------|
|                                       | Zoning Type Code             | Zoning Type  | Total Area (Acres) | UTC % | PPA (Acres) | PPA % | Total Impervious Area (Acres) | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
| Knox County                           | F                            | Floodway   | 8,928              | 44%   | 1,816       | 48%   | 107                           | 1%                      | 46%          | 44%          | -56                          | -1%            |
|                                       | F/HZ                         | Floodway/Historical Overlay                                  | 0                  | 10%   | 0           | 65%   | 0                             | 22%                     | 29%          | 10%          | 0                            | -19%           |
|                                       | F/TO                         | Floodway/Technology Overlay                                  | 42                 | 72%   | 9           | 22%   | 1                             | 3%                      | 64%          | 72%          | 3                            | 8%             |
|                                       | HZ                           | Historical Overlay   | 113                | 59%   | 34          | 31%   | 10                            | 9%                      | 57%          | 59%          | 2                            | 2%             |
|                                       | I                            | Industrial   | 8,778              | 35%   | 3,273       | 38%   | 2,257                         | 26%                     | 35%          | 35%          | -54                          | -1%            |
|                                       | I/TO                         | Industrial/Technology Overlay                                | 3                  | 6%    | 0           | 14%   | 3                             | 80%                     | 2%           | 6%           | 0                            | 4%             |
|                                       | I/TO(k)                      | Industrial/Technology Overlay (k)                            | 5                  | 2%    | 0           | 1%    | 5                             | 97%                     | 3%           | 2%           | 0                            | -1%            |
|                                       | LI                           | Light Industrial   | 236                | 38%   | 106         | 45%   | 29                            | 12%                     | 37%          | 38%          | 1                            | 0%             |
|                                       | LI(k)                        | Light Industrial (k)   | 97                 | 12%   | 37          | 38%   | 40                            | 41%                     | 6%           | 12%          | 5                            | 6%             |
|                                       | OA                           | Office Park  | 103                | 34%   | 33          | 32%   | 32                            | 31%                     | 32%          | 34%          | 2                            | 2%             |
|                                       | OA(k)                        | Office Park (k)  | 3                  | 12%   | 1           | 25%   | 2                             | 62%                     | 5%           | 12%          | 0                            | 8%             |
|                                       | OA/F                         | Office Park/Floodway   | 7                  | 27%   | 3           | 44%   | 2                             | 22%                     | 41%          | 27%          | -1                           | -14%           |
|                                       | OA/F(k)                      | Office Park/Floodway (k)                                     | 1                  | 0%    | 0           | 13%   | 0                             | 21%                     | 11%          | 0%           | 0                            | -11%           |
|                                       | OB                           | Office, Medical and Related Services                         | 525                | 33%   | 198         | 38%   | 139                           | 27%                     | 33%          | 33%          | -1                           | 0%             |
|                                       | OB(k)                        | Office, Medical, and Related Services (k)                    | 21                 | 49%   | 7           | 32%   | 4                             | 19%                     | 41%          | 49%          | 2                            | 7%             |
|                                       | OB/TO                        | Office, Medical and Related Services/Technology Overlay      | 255                | 37%   | 88          | 35%   | 70                            | 27%                     | 36%          | 37%          | 3                            | 1%             |
|                                       | OB/TO(k)                     | Office, Medical, and Related Services/Technology Overlay (k) | 58                 | 64%   | 12          | 20%   | 7                             | 13%                     | 69%          | 64%          | -3                           | -5%            |
| OC                                    | Civic and Institutional Zone | 18   | 34%                | 8     | 47%         | 2     | 14%                           | 49%                     | 34%          | -3           | -15%                         |                |
| OS                                    | Open Space                   | 330  | 50%                | 84    | 26%         | 22    | 7%                            | 51%                     | 50%          | -4           | -1%                          |                |

**Table 13**

| UTC Metrics by Knox County Zoning P-T |                          |                                    |                    |            |               |            |                               |                         |              |              |                              |                |
|---------------------------------------|--------------------------|------------------------------------|--------------------|------------|---------------|------------|-------------------------------|-------------------------|--------------|--------------|------------------------------|----------------|
|                                       | Zoning Type Code         | Zoning Type                        | Total Area (Acres) | UTC %      | PPA (Acres)   | PPA %      | Total Impervious Area (Acres) | Total Impervious Area % | UTC 2008 (%) | UTC 2018 (%) | UTC Change 2008-2018 (Acres) | Raw Change (%) |
| Knox County                           | PC                       | Planned Commercial                 | 1,309              | 32%        | 485           | 37%        | 378                           | 29%                     | 30%          | 32%          | 22                           | 2%             |
|                                       | PC(k)                    | Planned Commercial (k)             | 144                | 52%        | 53            | 37%        | 12                            | 8%                      | 50%          | 52%          | 3                            | 2%             |
|                                       | PC(k)/TO                 | Planned Commercial/Technology      | 52                 | 21%        | 27            | 54%        | 12                            | 24%                     | 4%           | 21%          | 9                            | 17%            |
|                                       | PC/F                     | Planned Commercial/Floodway        | 9                  | 33%        | 6             | 66%        | 0                             | 1%                      | 31%          | 33%          | 0                            | 3%             |
|                                       | PC/TO                    | Planned Commercial/Technology      | 263                | 16%        | 92            | 35%        | 123                           | 47%                     | 11%          | 16%          | 12                           | 5%             |
|                                       | PR                       | Planned Residential                | 23,199             | 37%        | 8,496         | 37%        | 5,470                         | 24%                     | 35%          | 37%          | 334                          | 1%             |
|                                       | PR(k)                    | Planned Residential (k)            | 584                | 48%        | 150           | 26%        | 134                           | 23%                     | 60%          | 48%          | -69                          | -12%           |
|                                       | PR/F                     | Planned Residential/Floodway       | 57                 | 58%        | 19            | 34%        | 4                             | 7%                      | 58%          | 58%          | 0                            | 0%             |
|                                       | PR/HZ                    | Planned Residential/Historical     | 3                  | 56%        | 1             | 38%        | 0                             | 6%                      | 76%          | 56%          | -1                           | -20%           |
|                                       | PR/TO                    | Planned Residential/Technology     | 698                | 30%        | 255           | 37%        | 201                           | 29%                     | 32%          | 30%          | -15                          | -2%            |
|                                       | PR/TO(k)                 | Planned Residential/Technology     | 104                | 44%        | 24            | 23%        | 27                            | 26%                     | 50%          | 44%          | -6                           | -6%            |
|                                       | RA                       | Low Density Residential            | 17,904             | 48%        | 6,112         | 34%        | 2,942                         | 16%                     | 46%          | 48%          | 354                          | 2%             |
|                                       | RA(k)                    | Low Density Residential (k)        | 11                 | 35%        | 5             | 49%        | 2                             | 15%                     | 32%          | 35%          | 0                            | 2%             |
|                                       | RA/F                     | Low Density Residential/Floodway   | 1                  | 59%        | 0             | 23%        | 0                             | 17%                     | 64%          | 59%          | 0                            | -5%            |
|                                       | RA/HZ                    | Low Density Residential/Historical | 53                 | 38%        | 24            | 45%        | 8                             | 15%                     | 43%          | 38%          | -3                           | -5%            |
|                                       | RA/TO                    | Low Density Residential/Technology | 215                | 45%        | 72            | 33%        | 47                            | 22%                     | 40%          | 45%          | 10                           | 5%             |
|                                       | RAE                      | Low Density Residential/Estate     | 1,497              | 45%        | 499           | 34%        | 298                           | 20%                     | 44%          | 45%          | 11                           | 1%             |
|                                       | RB                       | General Residential                | 7,338              | 45%        | 2,677         | 37%        | 1,248                         | 17%                     | 44%          | 45%          | 89                           | 1%             |
|                                       | RB/F                     | General Residential/Floodway       | 3                  | 67%        | 0             | 19%        | 0                             | 0%                      | 83%          | 67%          | 0                            | -16%           |
|                                       | RB/TO                    | General Residential/Technology     | 5                  | 75%        | 1             | 25%        | 0                             | 0%                      | 73%          | 75%          | 0                            | 2%             |
| SC                                    | Shopping Center          | 254                                | 21%                | 80         | 31%           | 117        | 46%                           | 19%                     | 21%          | 6            | 2%                           |                |
| SC/F                                  | Shopping Center/Floodway | 2                                  | 44%                | 1          | 45%           | 0          | 11%                           | 58%                     | 44%          | 0            | -14%                         |                |
| T                                     | Transition               | 29                                 | 38%                | 12         | 41%           | 6          | 20%                           | 35%                     | 38%          | 1            | 3%                           |                |
| T(k)                                  | Transition (k)           | 7                                  | 31%                | 2          | 22%           | 3          | 47%                           | 24%                     | 31%          | 0            | 7%                           |                |
| <b>Totals</b>                         |                          |                                    | <b>258,806</b>     | <b>51%</b> | <b>92,336</b> | <b>37%</b> | <b>25,156</b>                 | <b>10%</b>              | <b>51%</b>   | <b>51%</b>   | <b>904</b>                   | <b>0%</b>      |

## Resources

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