

# A Report on the City of Lexington's Existing and Possible Urban Tree Canopy

## Project Background

The analysis of Lexington's urban tree canopy (UTC) was carried out at the request of the Virginia Department of Forestry in collaboration with the City of Lexington and the Chesapeake Bay Program. The analysis was performed by the Virginia Geospatial Extension Program (VGEP) at Virginia Tech's Department of Forestry in consultation with the Spatial Analysis Laboratory (SAL) of the University of Vermont.

The goal of the project was to apply the USDA Forest Service's UTC assessment protocols to the City of Lexington. This analysis was conducted based on year 2008 data.

## Why is Tree Canopy Important?

Urban tree canopy (UTC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above. Urban tree canopy provides many benefits to communities including improving water quality, saving energy, lowering city temperatures, reducing air pollution, enhancing property values, providing wildlife habitat, facilitating social and educational opportunities, and providing aesthetic benefits.

## Key Terms

**UTC:** Urban tree canopy (UTC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above.

**Land Cover:** Physical features on the earth mapped from satellite imagery such as trees, grass, water, and impervious surfaces.

**Existing UTC:** The amount of urban tree canopy present when viewed from above using aerial or satellite imagery.

**Possible UTC:** The amount of land that is theoretically available for the establishment of tree canopy. Possible UTC excludes areas covered by tree canopy, roads, buildings, and water.

**Possible UTC - Impervious:** The amount of land that is theoretically available for the establishment of tree canopy in impervious areas. This excludes areas covered by tree canopy, non-tree vegetation, roads, buildings, and water.

## How Much Tree Canopy Does Lexington Have?

Figure 1 shows the analysis of Lexington's urban tree canopy (UTC) based on high resolution aerial imagery found that more than 649 acres of the city is covered by tree canopy (termed Existing UTC). This corresponds to **44%** of all land within the city (Table 1). An additional 45% (631 acres) of the city could theoretically be improved to support urban tree canopy (termed Possible UTC), Table 2.

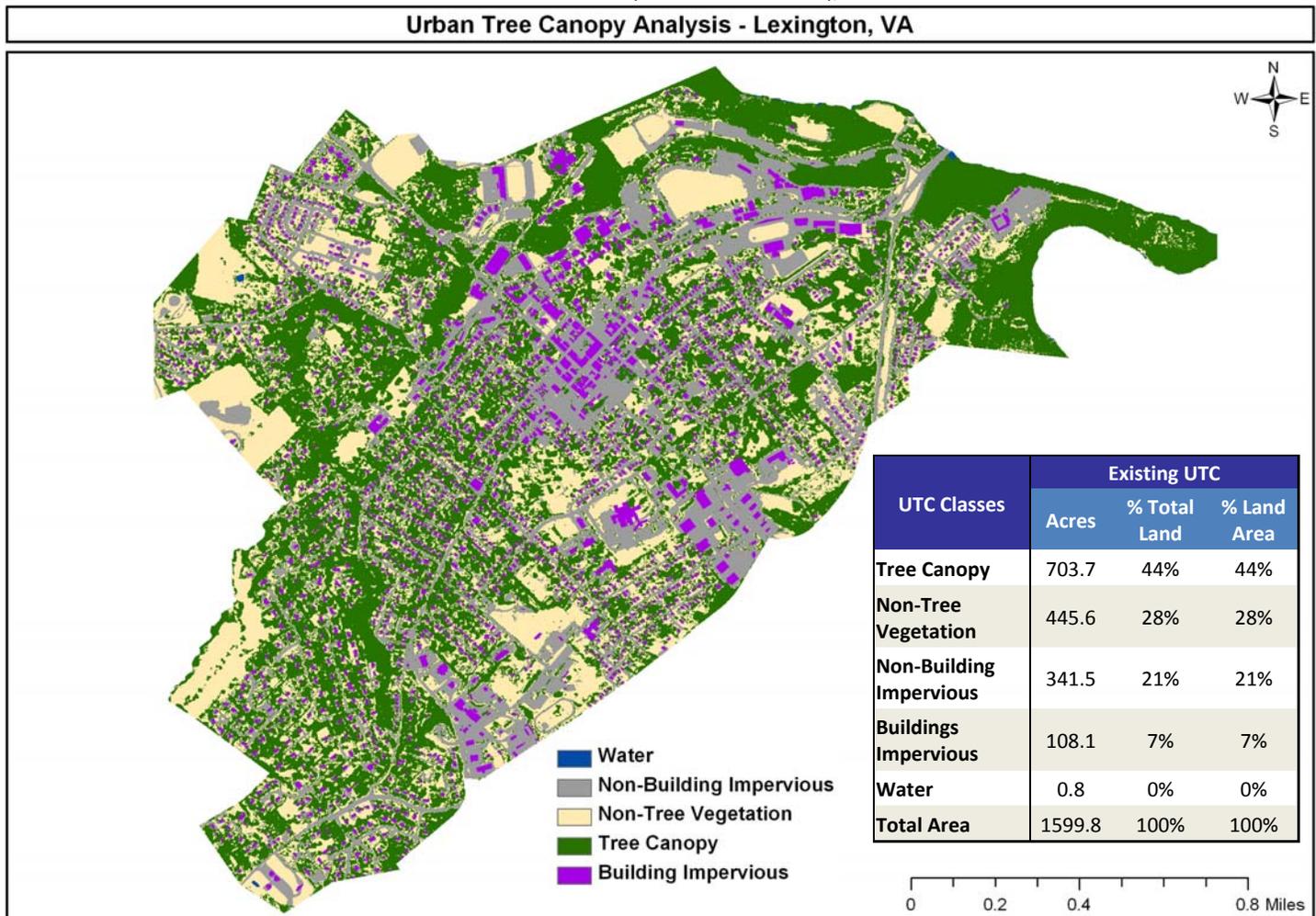


Figure 1 & Table 1: Land cover for the City of Lexington. Existing UTC area and percentages for the City.

## Mapping Lexington's Trees

Using high-resolution (1 meter) National Agriculture Imagery Program (NAIP) imagery acquired in the summer of 2008 (Figure 2a) in combination with remote sensing techniques land cover for the city was mapped with such detail that single trees (larger than 16 square meters) were detected with 90% accuracy (Figure 2b).

## Who "Owns" Lexington's Trees?

The detailed land cover mapping conducted as part of this assessment allowed the percentage of Existing and Possible UTC to be calculated for each parcel of land (Figure 3). Subsequently, land use information from the city's parcel database was used to examine ownership patterns for Existing UTC and Possible UTC (Figure 5).

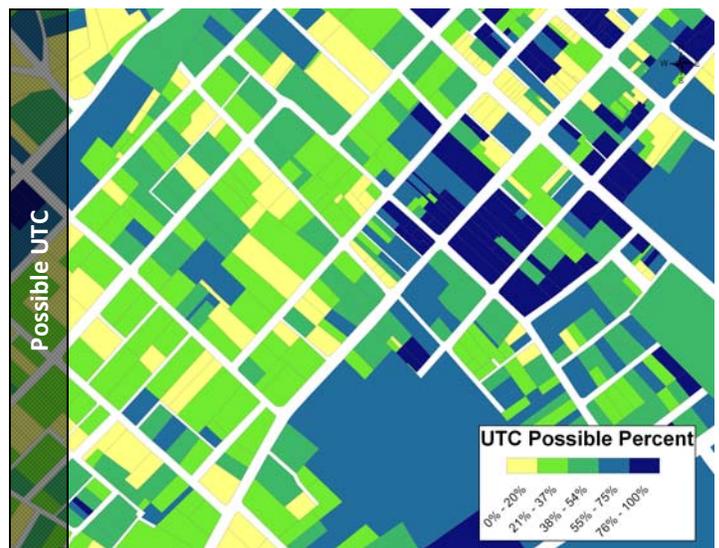
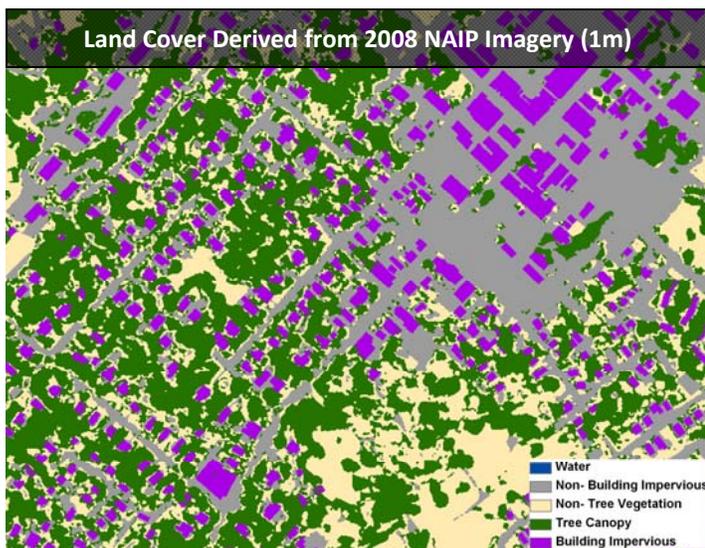
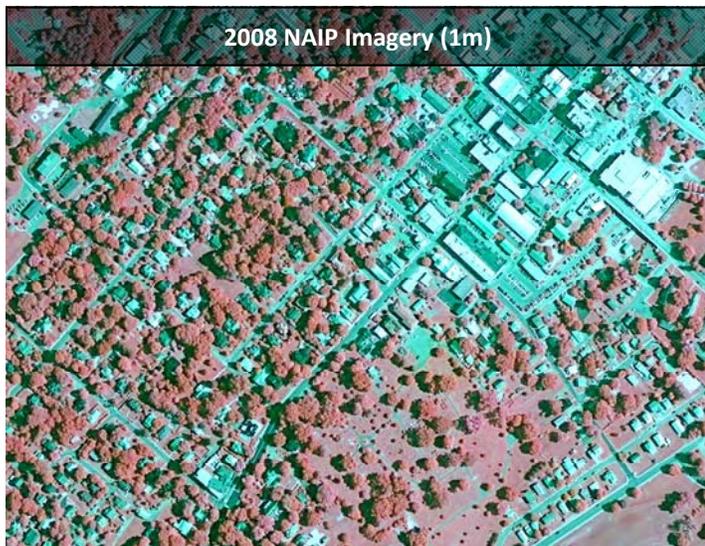


Figure 2a, 2b: Comparison of 2008 NAIP imagery to the resulting high-resolution land cover.

Figure 3: UTC metrics summarized at the property parcel level

## Urban Tree Canopy Summarized by Property Parcels

Using the parcels provided by the City of Lexington, Existing and Possible UTC was summarized by parcel (Figure 5). This excludes any area within the public right-of-way which includes all area not within property parcels. Lexington has 47% (650 acres) Existing UTC with a possible increase of 28% (392 acres) in vegetation areas as well as 17% (239 acres) in impervious areas (Figure 4). This can be compared to the summarization of Existing and Possible UTC by land use zoning (page 4). Existing and Possible UTC was summarized by land use zones provided by the City of Lexington. The land use zone General Residential has the largest amount of land area with 632 acres (Table 3). General residential also has the largest amount of Existing UTC, 25%. Looking at Table 3, you can see that Suburban Residential is 2nd in land area as well as Existing UTC. Figure 6 shows Possible UTC by Land Use Zone for the City.

UTC Parcel Metrics	Acres	% Parcel Land Area
Parcel Land Area	1388	100%
Existing UTC	648.9	47%
Possible UTC	630.7	45%
Possible UTC - Impervious	238.8	17%
Possible UTC - Vegetation	391.9	28%
Not Suitable for UTC	108.9	8%

Table 2: Acres & percent land area from UTC metrics by parcels.

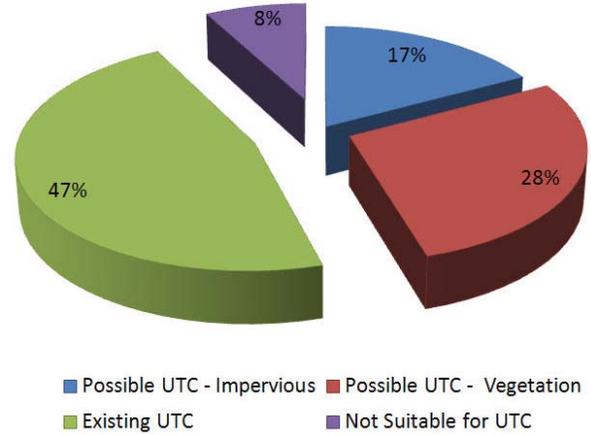


Figure 4: Pie chart showing Lexington's UTC distribution.

### Urban Tree Canopy Analysis Summarized by Property Parcels- Lexington, VA

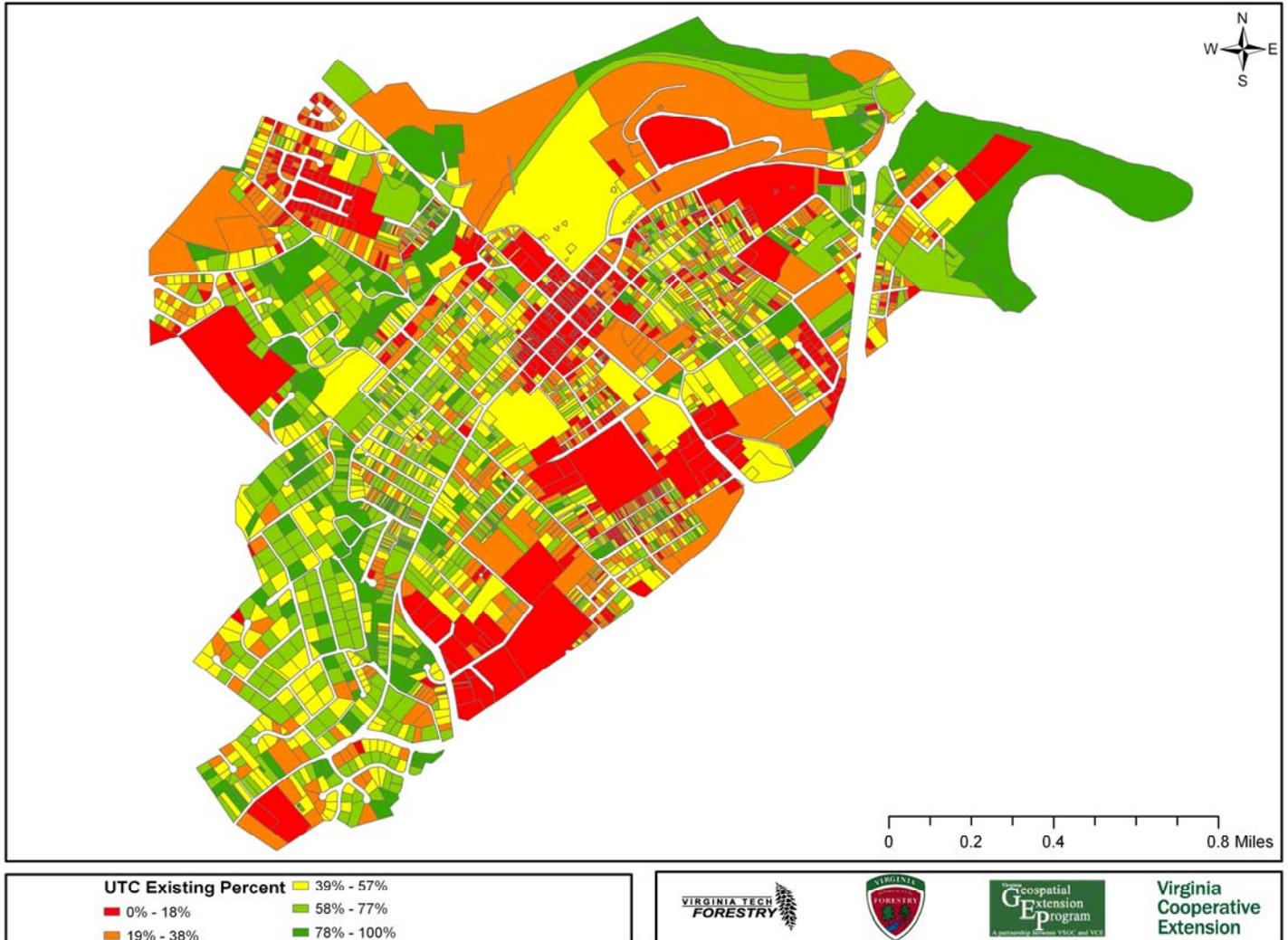


Figure 5: UTC metrics summarized by parcel

## Urban Tree Canopy Summarized by Lexington's Land Use Zones

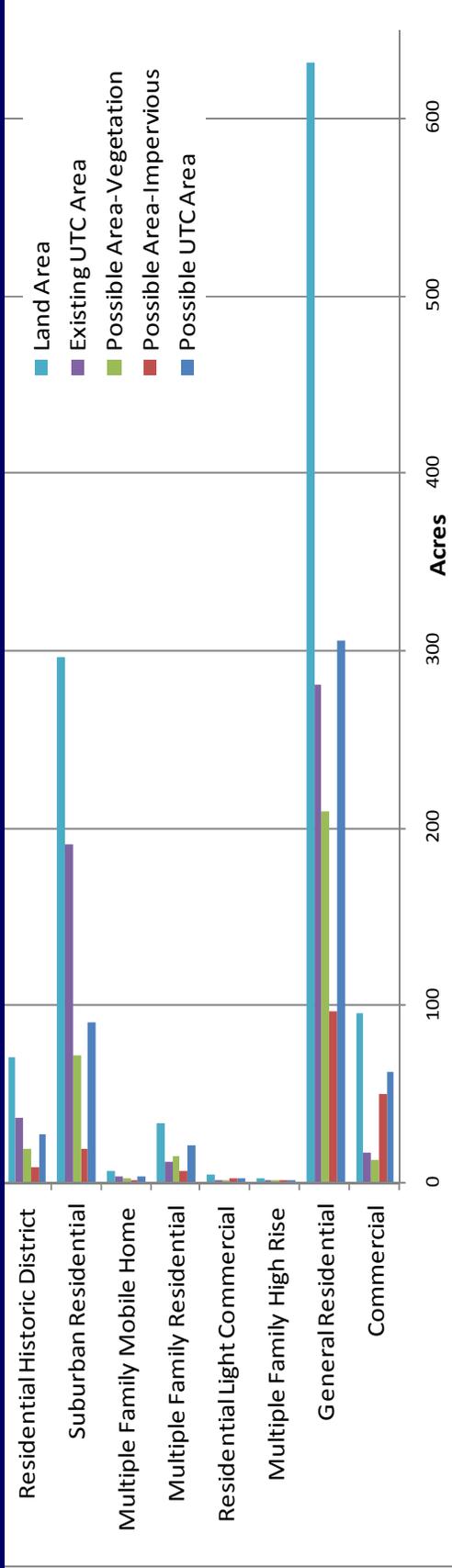


Figure 5: UTC metrics summarized by land use.

Land Use	Land Area	Existing UTC		Possible UTC Vegetation		Possible UTC Impervious		
		% Land	% Zoning Category	% Zoning Category	% UTC Type	% Land	% Zoning Category	% UTC Type
Commercial	96	1.4%	17.2%	1.1%	12.9%	4.4%	52.5%	27.4%
General Residential	632	24.6%	44.3%	18.3%	33.0%	8.5%	15.3%	52.9%
Multiple Family High Rise	2	0.1%	36.4%	0.0%	22.2%	0.0%	21.9%	0.3%
Multiple Family Mobile Home	6	0.2%	43.3%	0.2%	30.2%	0.1%	20.3%	0.7%
Multiple Family Residential	33	1.0%	32.9%	1.3%	44.1%	0.5%	18.0%	3.3%
Residential Historic District	70	3.1%	50.8%	1.6%	26.5%	0.7%	11.1%	4.3%
Residential Light Commercial	4	0.1%	23.8%	0.0%	7.9%	0.2%	46.5%	1.1%
Suburban Residential	296	16.7%	64.3%	6.3%	24.2%	1.6%	6.2%	10.1%

$\% \text{ Land} = \frac{\text{Area of UTC type for specified land use}}{\text{Area of all land}}$   
 $\% \text{ Category} = \frac{\text{Area of UTC type for specified land use}}{\text{Area of all land for specified land use}}$   
 $\% \text{ UTC Type} = \frac{\text{Area of UTC type for specified land use}}{\text{Area of all UTC type}}$

The % Land Area value of 17% indicates that 17% of Lexington's land area is tree canopy in areas where the land use is "suburban residential."  
 The % Land Use value of 64% indicates that 64% of "suburban residential" land is covered by tree canopy.  
 The % UTC Type value of 35% indicates that 35% of all Existing UTC lies in areas of "suburban residential" land use.

Table 3: UTC metrics by type, summarized by land use. For each land use category UTC metrics were computed as a percent of all zoned land in the city (% Land), as a percent of land area by land use category (% Category) and as a percent of the area for the UTC type (% UTC Type).

# Urban Tree Canopy Analysis Summarized by Land Use Zoning - Lexington, VA

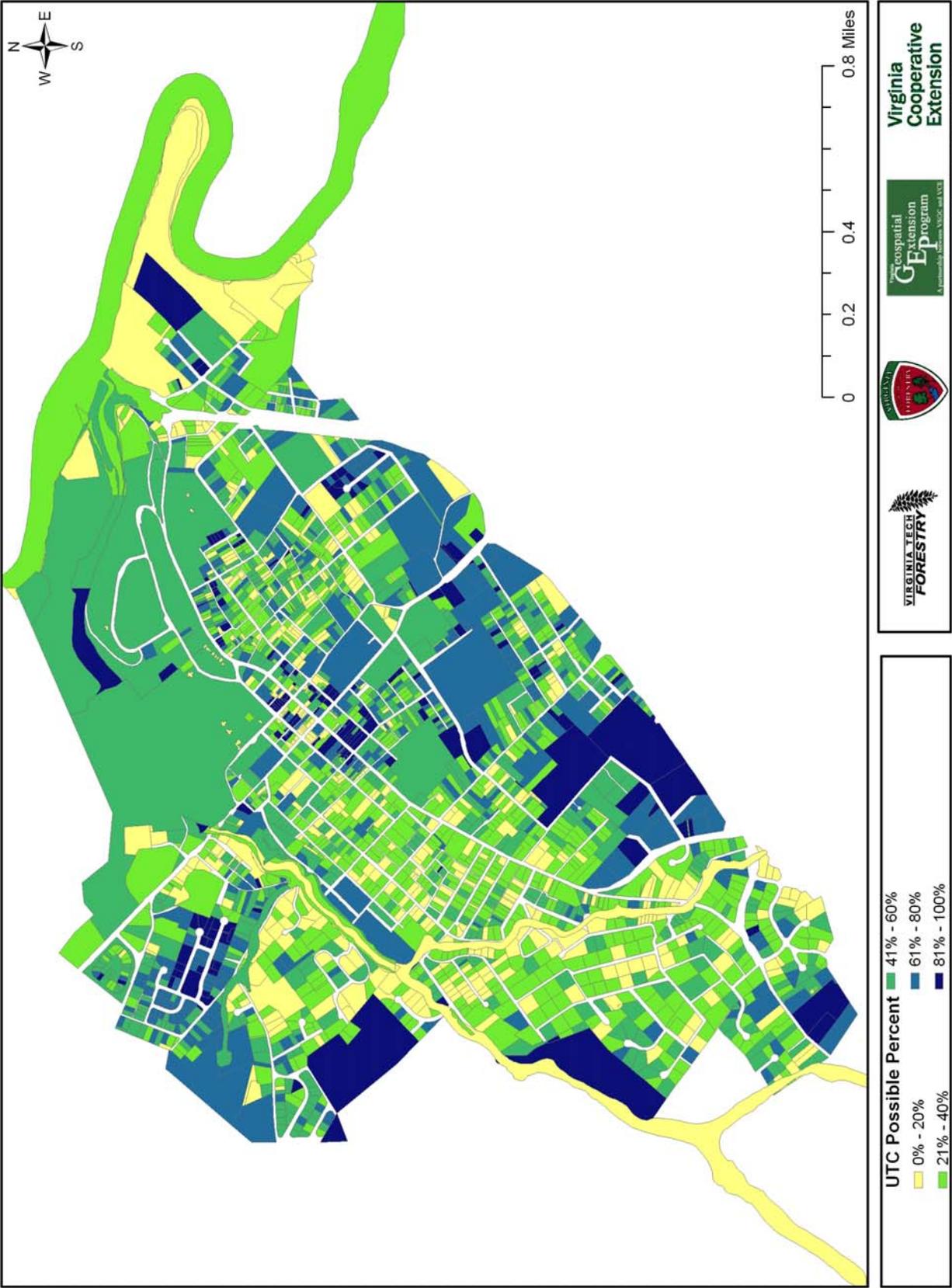


Figure 6. Possible percentage increase of UTC mapped using land use zoning provided by the City of Lexington.

## Where to Plant Trees?

Decision makers can use GIS to find out specific UTC metrics for a parcel or set of parcels. This information can be used to estimate the amount of tree loss in a planned development or set UTC improvement goals for an individual property.

Attribute	Value
Land Use	Exempt Commercial
Owner	St Peter & Paul Catholic Church
Address	320 Cathedral Street
Existing UTC	5%
Possible UTC	72%
Possible UTC—Vegetation	47%
Possible UTC—Impervious	25%



Figure 7: Parcel-based UTC metrics can be used to support targeted UTC.

## Conclusions

- Lexington’s urban tree canopy is a vital city asset, reducing stormwater runoff, improving air quality, reducing the city’s carbon footprint, enhancing quality of life, contributing to savings on energy bills, and serving as habitat for wildlife.
- Occupying 47% of the city’s land area, Lexington clearly has above average tree canopy, both in the states of Maryland and Virginia and in comparison to cities of similar size (Figure 8).
- With Existing UTC summarized by parcel comprising 47% of the city’s land area, Lexington has only 20% of parcels having less than 20% canopy coverage.
- 44% (207 acres) of the existing tree canopy is located within General Residential, Suburban Residential, Residential Historic District land use zones.

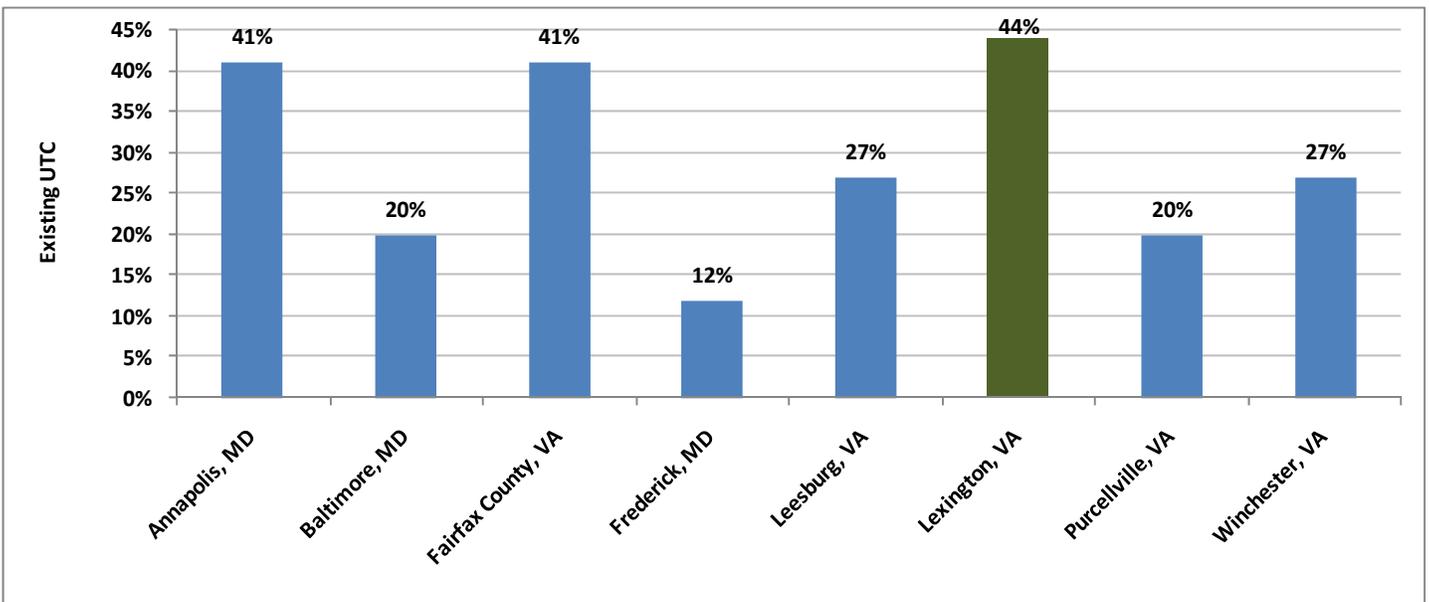


Figure 8: Comparison of Existing UTC with other selected cities that have completed UTC assessments.

### Prepared by:

Jennifer McKee  
 Geospatial Project Developer  
 Virginia Geospatial Extension Program  
 Department of Forestry  
 Virginia Tech  
 540-231-9115  
 jmckee@vt.edu  
<http://www.cnr.vt.edu/gep>

### Additional Information

The study was conducted with funding from the Virginia Department of Forestry. More information on the UTC assessment project can be found at the following web site.  
<http://nrs.fs.fed.us/urban/utc/>

