

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

Project Background

The analysis of the City of Vinton's urban tree canopy (UTC) was carried out by the Virginia Department of Forestry in collaboration with the City of Vinton and the Roanoke Valley—Alleghany Regional Commission. Assistance was provided by the Virginia Geospatial Extension Program (VGEP) at Virginia Tech's Department of Forestry and by 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 Vinton. 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, conserving 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 or aerial imagery such as trees, or water.

Existing UTC: The amount of UTC present within parcel boundaries.

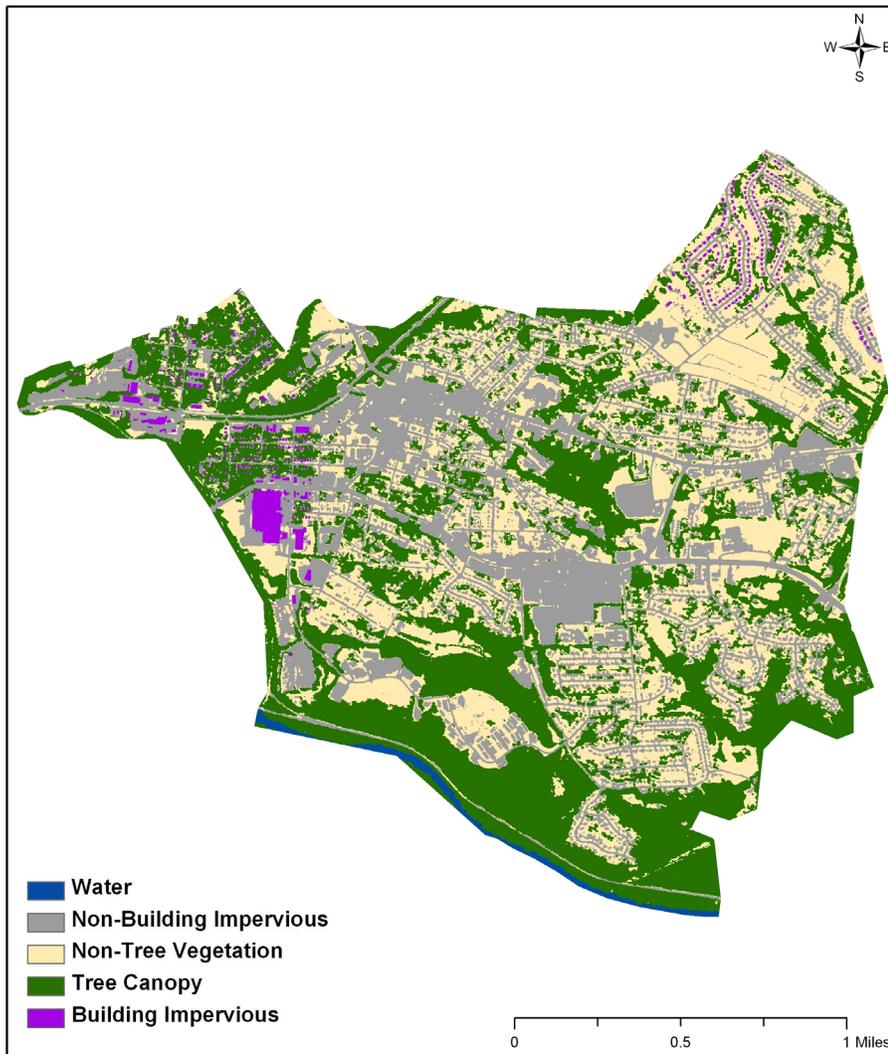
Possible UTC: The amount of land that is theoretically available for the establishment of tree canopy within parcel boundaries. Possible UTC excludes areas covered by tree canopy, roads, buildings, and water. It is the combination of Possible UTC - Vegetation and Possible UTC - Impervious.

Possible UTC - Vegetation: The amount of land that is theoretically available for the establishment of tree canopy in non-tree vegetation areas within parcel boundaries. This excludes areas covered by tree canopy, impervious surfaces, and water.

Possible UTC - Impervious: The amount of land that is theoretically available for the establishment of tree canopy in impervious areas within parcel boundaries. This includes impervious areas (roads, parking lots, and sidewalks) except for buildings.

How Much Tree Canopy Does Vinton Have?

Figure 1 shows the urban tree canopy (UTC) analysis for Vinton, which is derived from high resolution aerial imagery. 776 acres of Vinton is covered by tree canopy (termed Existing UTC). This corresponds to 38.5% of all land area within the city (Table 1). An additional 377 acres of the city could theoretically be improved to support urban tree canopy (termed Possible UTC), Table 2.



UTC Classes	Existing UTC		
	Acres	% Total Area	% Land Area
Tree Canopy	776	38.2%	38.5%
Non-Tree Vegetation	643	31.6%	31.9%
Non-Building Impervious	569	28.0%	28.2%
Buildings	28	1.4%	1.4%
Water	15	0.8%	0.0%
Total Area	2032	100.0%	100.0%

Table 1: Existing UTC area and percentages for the City * % Total Area includes area covered by water.

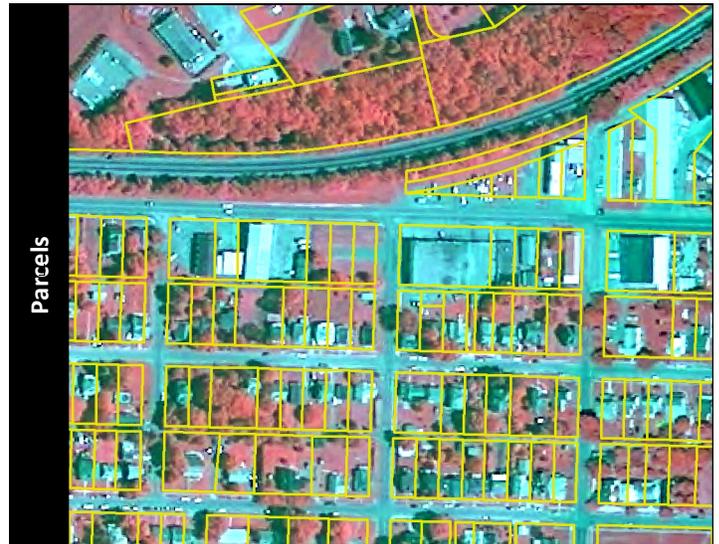
Figure 1: Land cover for the City of Vinton.

Mapping Vinton's Trees

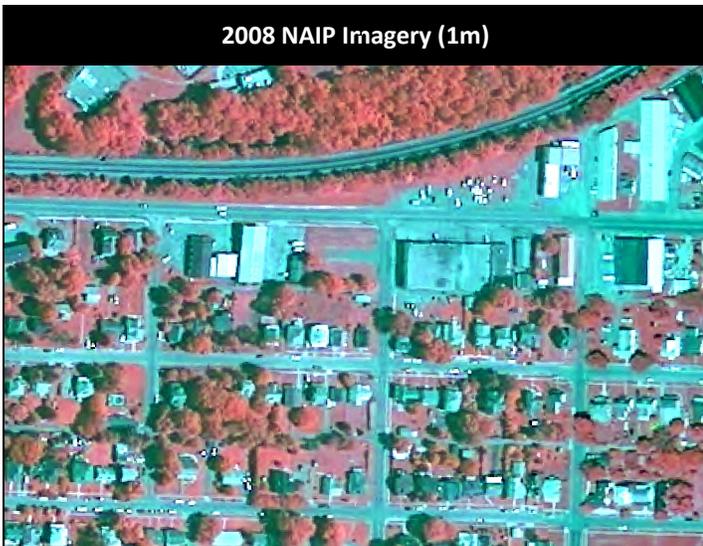
Using high-resolution (1 meter) National Agriculture Imagery Program (NAIP) imagery acquired in the summer of 2008 (Figure 2a) in combination with remote sensing techniques, land cover data for the city was generated (Figure 2b). An accuracy assessment was conducted. Single trees (tree canopies larger than 16 square meters) were detected with a 93% accuracy.

Who "Owns" Vinton's Trees?

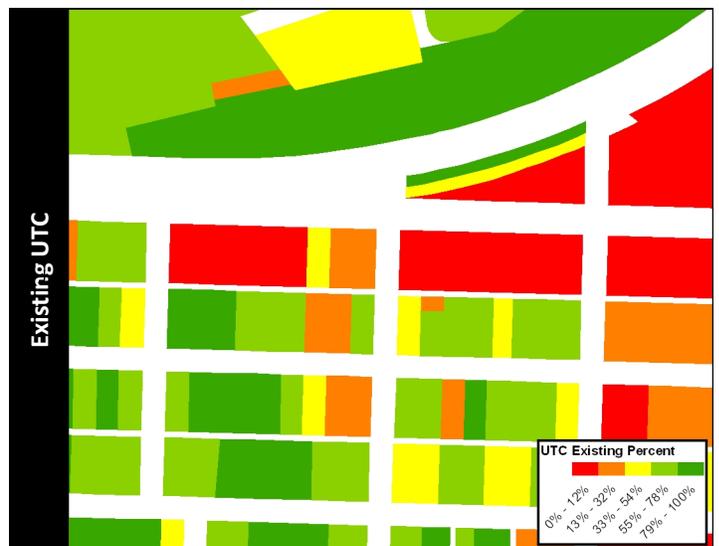
The detailed land cover mapping conducted as part of this assessment allowed the percentage of Existing and Possible UTC to be calculated for each parcel of land (Figure 3). Using this data, ownership patterns for Existing UTC and Possible UTC (Figure 4) can be examined.



Parcels

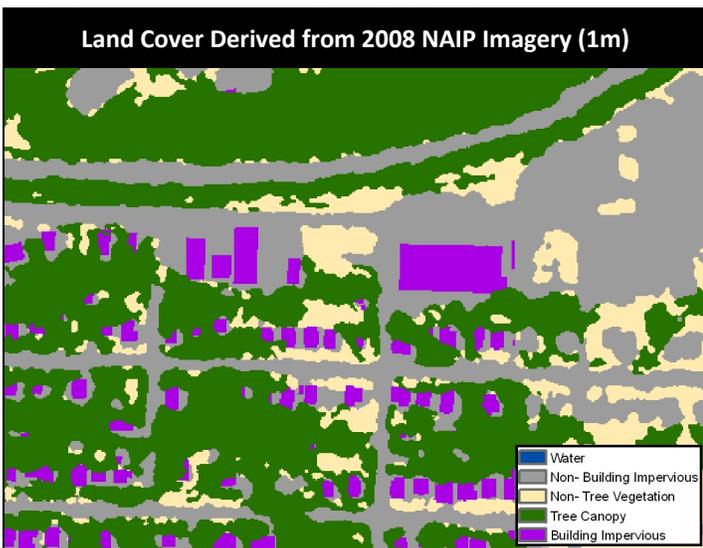


2008 NAIP Imagery (1m)



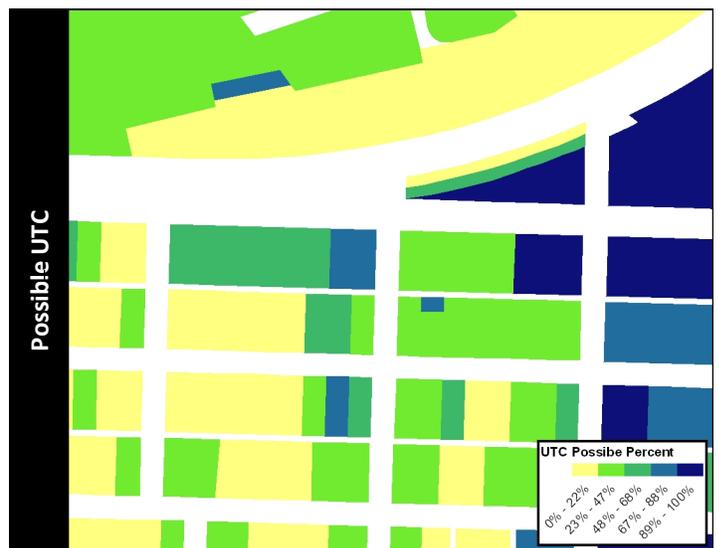
Existing UTC

UTC Existing Percent
 0% - 12%
 13% - 30%
 31% - 54%
 55% - 70%
 71% - 100%



Land Cover Derived from 2008 NAIP Imagery (1m)

Water
 Non-Building Impervious
 Non-Tree Vegetation
 Tree Canopy
 Building Impervious



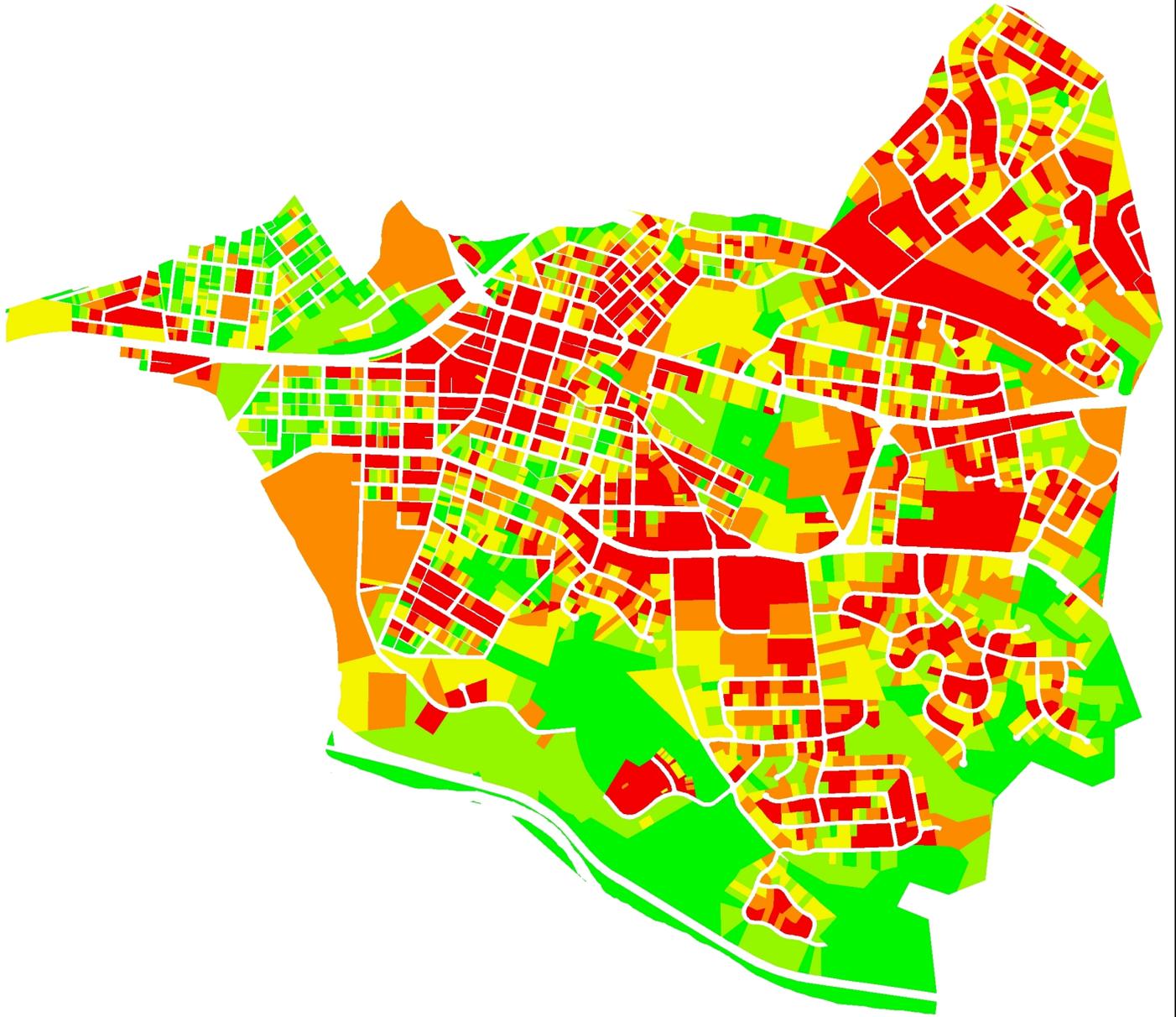
Possible UTC

UTC Possible Percent
 0% - 22%
 23% - 41%
 42% - 60%
 61% - 80%
 81% - 100%

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 Analysis Summarized by Parcels - Vinton, VA



0 0.5 1 Miles

UTC Existing Percent	
0% - 12%	33% - 54%
13% - 32%	55% - 78%
79% - 100%	



Figure 4: UTC metrics summarized by property parcel.

Urban Tree Canopy Summarized by Property Parcels

Using the parcel data provided by the City of Vinton, Existing and Possible UTC were summarized by property parcels. This summary excludes any area outside of property parcel boundaries and areas covered by water. Vinton has 51.6% (599 acres) Existing UTC and 32.5% (377 acres) Possible UTC. Possible UTC has two components, Possible UTC - Vegetation and Possible UTC - Impervious. 16.5% (191 acres) of parcel land area is associated with Possible UTC - Vegetation. 16.0% (186 acres) of parcel land area is associated with Possible UTC - Impervious (Figure 5). Figure 4 shows Existing UTC throughout the City of Vinton.

Urban Tree Canopy Summarized by Zoning

Using the zoning data provided by the City of Vinton, Existing and Possible UTC were summarized by zoning category (page 5). The zoning category R1 has the largest amount of land area with 746 acres (Table 3). The R1 category also contains 45.8% of the Existing UTC in the city. Zoning Categories R2 and GB are 2nd (15.3%) and 3rd (6.2%) in Existing UTC respectively. Figure 6 compares zoning categories with greater than 20 acres by the amount of land area within the categories. Figure 7 shows the spatial distribution of Possible UTC by Zoning category for the City.

UTC Parcel Metrics	Acres	% Parcel Land Area
Parcel Land Area	1159	100%
Existing UTC	599	51.6%
Possible UTC	377	32.5%
Possible UTC - Vegetation	191	16.5%
Possible UTC - Impervious	186	16.0%
Not Suitable for UTC	44	3.8%

Table 2: Acres and percent land area from UTC metrics summarized by property parcels. *Not Suitable for UTC includes all water areas some of which may lay outside of parcel boundaries.

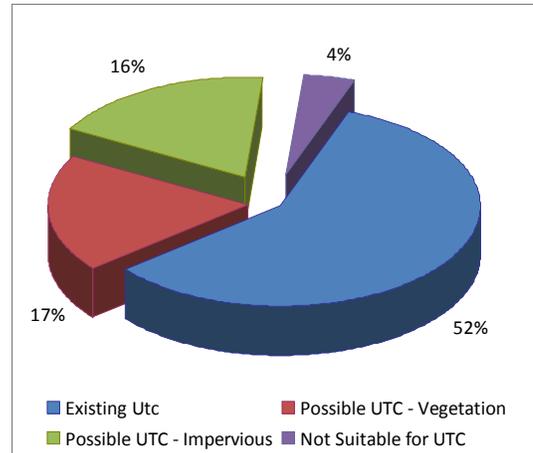


Figure 5: Pie chart showing Vinton UTC distribution.

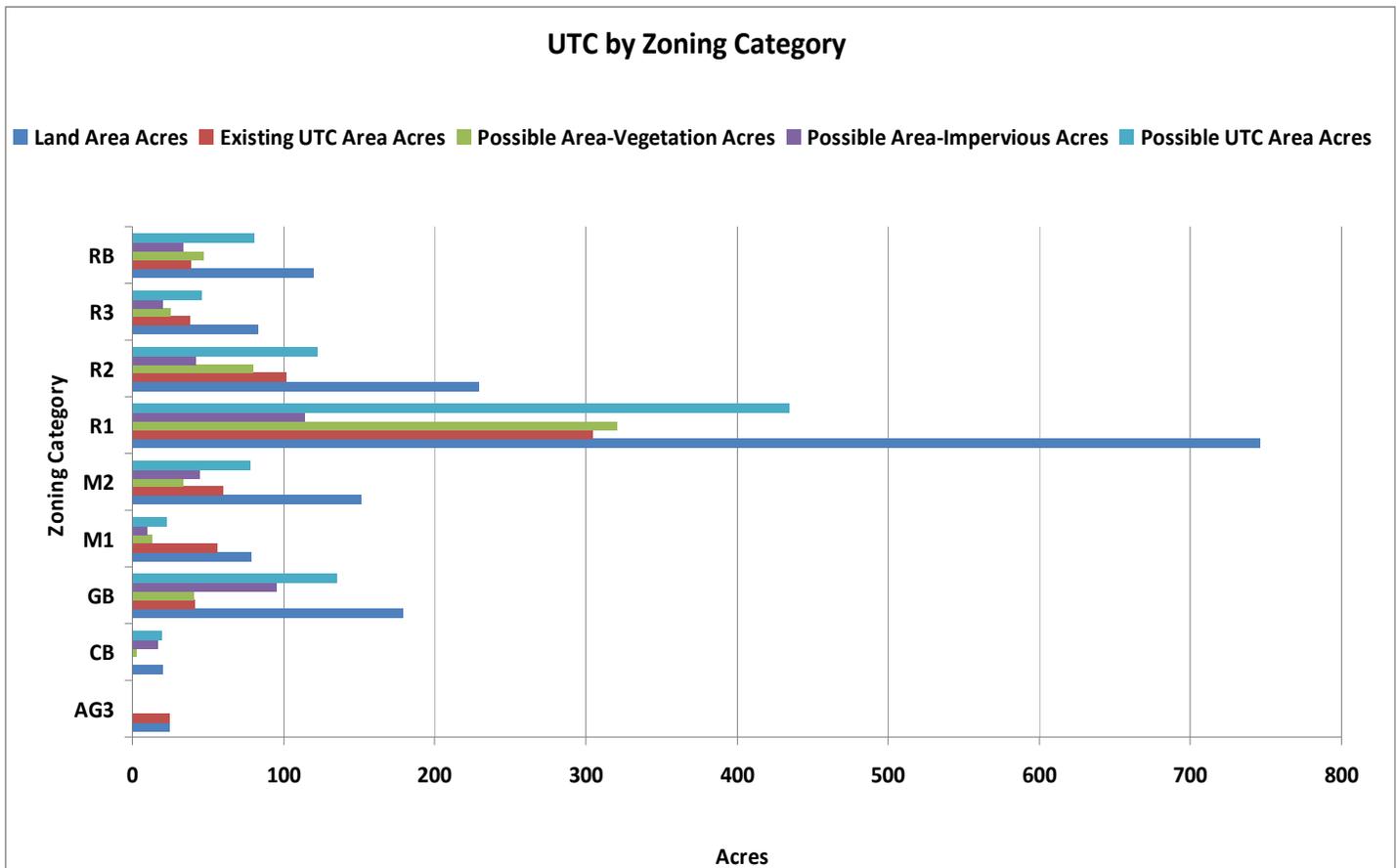


Figure 6a: UTC metrics for zoning categories with more than 100 acres of land area (not including water).

Urban Tree Canopy Summarized by Zoning Category

Zoning Category	Land Area (Acres)	Existing UTC		Possible UTC Vegetation		Possible UTC Impervious	
		% Land Area	% Zoning Category	% Land Area	% Zoning Category	% Land Area	% Zoning Category
AG3	25	1.5%	99.5%	0.0%	0.4%	0.0%	0.1%
CB	20	0.0%	2.9%	0.2%	13.1%	1.0%	84.0%
GB	179	2.5%	23.1%	2.5%	22.6%	5.8%	53.3%
M1	79	3.4%	71.0%	0.8%	17.1%	0.6%	11.9%
M2	151	3.7%	39.5%	2.0%	22.1%	2.8%	29.7%
R1	746	18.6%	40.8%	19.7%	43.0%	7.0%	15.3%
R2	229	6.2%	44.3%	4.9%	35.0%	2.6%	18.4%
R3	84	2.3%	45.1%	1.6%	30.4%	1.2%	24.4%
RB	120	2.4%	32.2%	2.9%	39.3%	2.1%	28.0%

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

The % Land Use value of 2.4% indicates that 2.4% of "RB" land is covered by tree canopy.

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

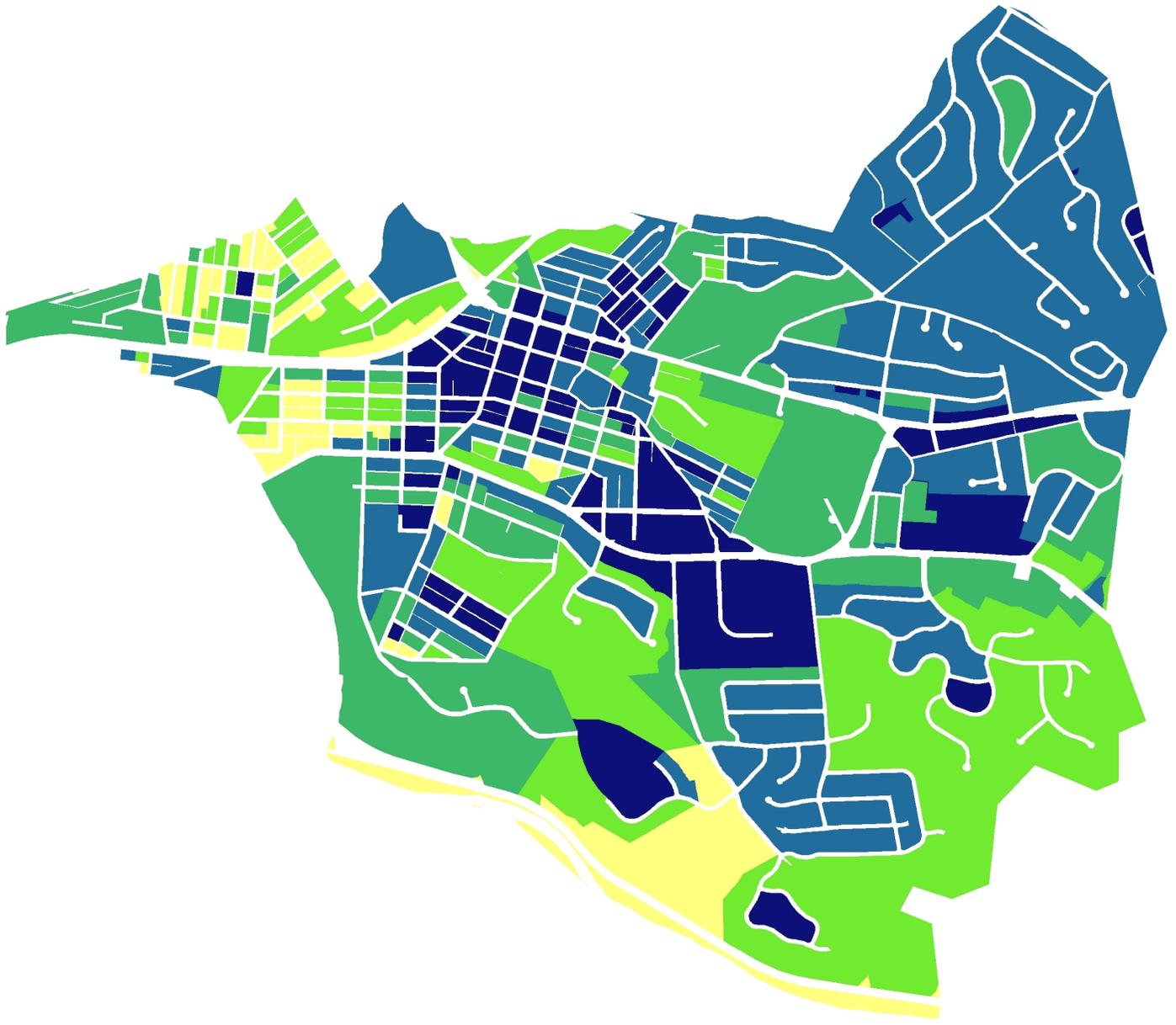
The % Category value of 32.2% indicates that 32.2% of Vinton's land area is tree canopy in areas where the land use is "RB".

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

The % UTC Type value of 5.8% indicates that 5.8% of all Existing UTC lies in areas of "RB" land use.

Table 3: UTC metrics by type, summarized by zoning categories with greater than 20 acres. For each category UTC metrics were computed as a percent of all zoned land in the city (% Land Area), as a percent of land area by zoning categories (% Zoning Category) and as a percent of the area for the UTC type (% UTC Type).

Urban Tree Canopy Analysis Summarized by Zoning - Vinton, VA



0 0.5 1 Miles

UTC Possible Percent	43% - 64%
0% - 20%	65% - 85%
21% - 43%	86% - 100%




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Figure 7: Possible percentage increase of UTC mapped using zoning categories provided by the City of Vinton.

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%

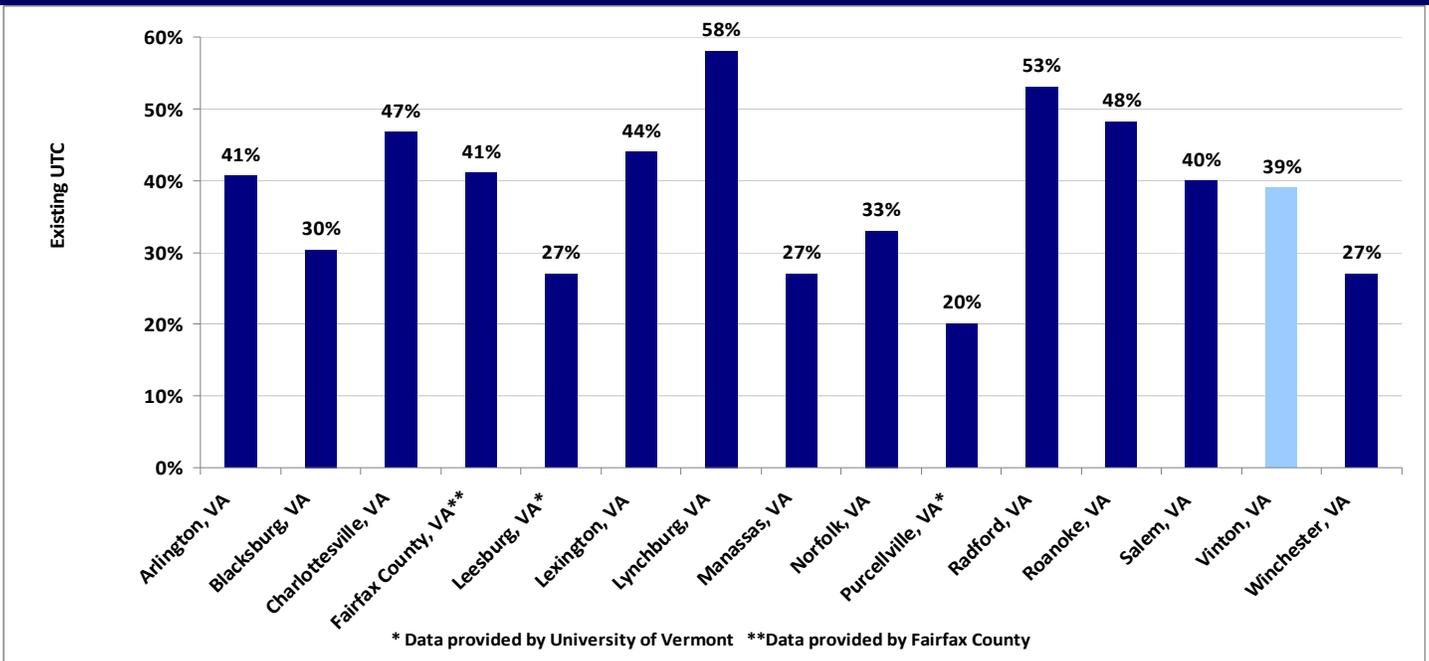


Figure 8: Parcel-based UTC metrics can be used to support targeted UTC.

Conclusions

- Vinton's urban tree canopy is a vital community asset, reducing storm water 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.
- With 38.5% tree canopy cover, Vinton has similar coverage to Arlington, Fairfax County, and Salem. Figure 9 shows how Vinton compares to other Virginia localities participating in Urban Tree Canopy Assessments.
- When summarized by parcels, Vinton has 51.6% Existing UTC. Over 56% of all parcels have greater than 50% canopy coverage.
- 45.8% of Vinton's Possible UTC is within the R1 Zoning Category.

Urban Tree Canopy Comparison



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Additional Information

The study was conducted with funding from the VDCR and VDOF. More information on the UTC assessment project can be found at the following web sites:
<http://www3.cnr.vt.edu/gep/VA.UTC.html>
<http://nrs.fs.fed.us/urban/utc/>



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