

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

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.

How Much Tree Canopy Does Greenbelt Have?

An analysis of Greenbelt's urban tree canopy (UTC) based on land cover derived from high resolution aerial imagery (Figure 1) found that more than 2468 acres of the city is covered by tree canopy (termed Existing UTC); 62% of all land in the city. An additional 23% (919 acres) of the city could theoretically be improved (Possible UTC) to support tree canopy (Figure 2). Of the areas for Possible UTC, vegetated Possible UTC or grass and shrub areas are much easier for establishing new tree canopy. While establishing tree canopy on impervious UTC will have a greater impact on water quality.

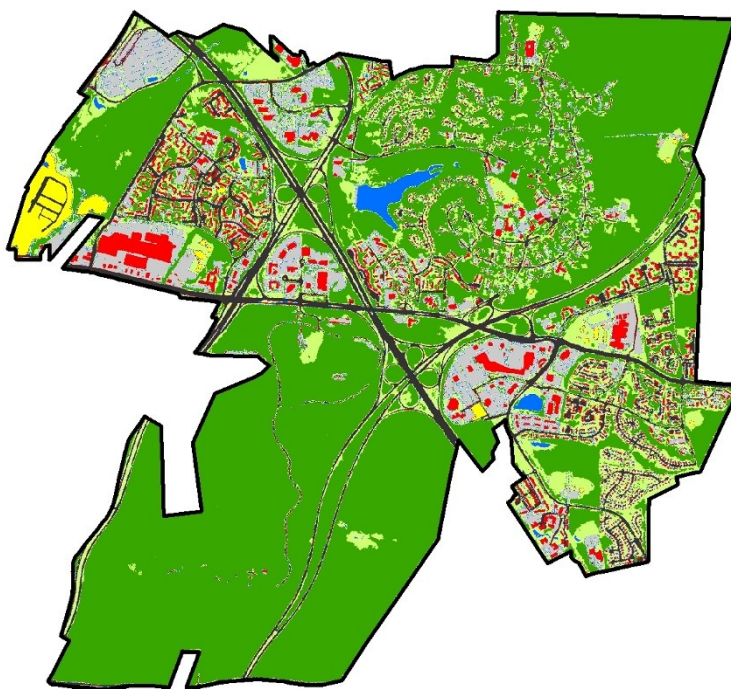


Figure 1: Land cover derived from high resolution aerial imagery for the City of Greenbelt.



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 aerial or 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.

Project Background

The analysis of Greenbelt's urban tree canopy (UTC) was carried out at the request of the Maryland Department of Natural Resources in collaboration with the City of Greenbelt. The analysis was performed by the Spatial Analysis Laboratory (SAL) of the University of Vermont's Rubenstein School of the Environment and Natural Resources in consultation with the USDA Forest Service's Northern Research Station.

The goal of the project was to apply the USDA Forest Service's UTC assessment protocols to the City of Greenbelt. This analysis was conducted based on year 2007 data.

UTC Metrics

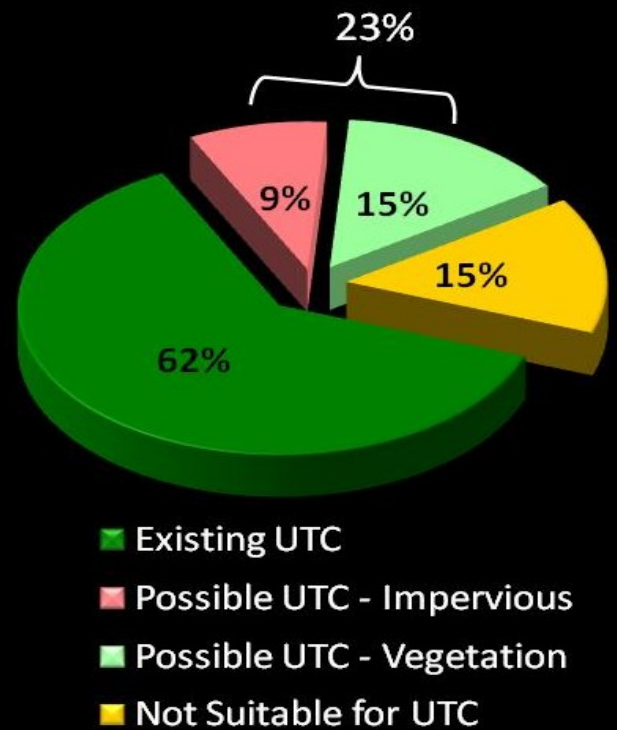


Figure 2: UTC metrics for Greenbelt based on % of land area covered by each UTC type.

Mapping Greenbelt's Trees

Prior to this study the only available estimates of tree canopy for Greenbelt were from the 2001 National Land Cover Dataset (NLCD 2001). While NLCD 2001 is valuable for analyzing land cover at the regional level, it is derived from relatively coarse, 30 meter resolution satellite imagery (Figure 3a). Using high-resolution (1 meter) aerial imagery acquired in the summer of 2007 (Figure 3b), in combination with advanced automated processing techniques, land cover for the city was mapped with such detail that single trees were detected (Figure 3c). NLCD 2001 estimated the city to have only 47% tree canopy, compared to the actual amount of 63%.

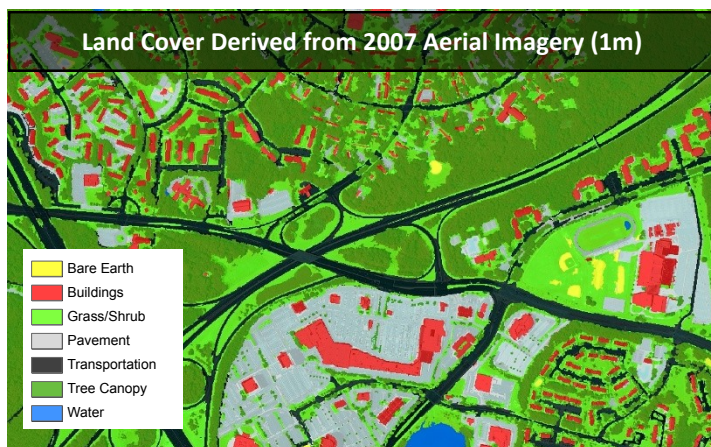
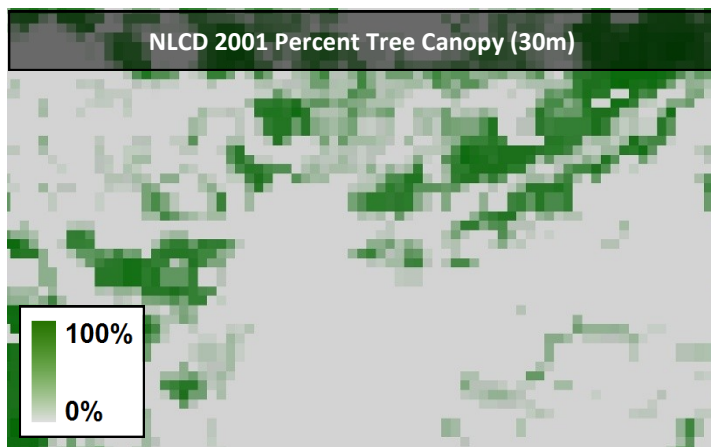


Figure 3a, 3b, 3c: Comparison of NLCD 2001 to high-resolution land cover.

Parcel and Land Use Summary

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 4). Subsequently, land use information from the city's parcel database was used for examining Existing UTC and Possible UTC (Figure 5) by land use category. Table 1 provides a detailed summary of the UTC metrics by land use. For each land use category UTC metrics were computed as a percentage of all 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). For example, land designated as "housing" had the most Existing UTC in raw acreage (26% by % Land), but "culture and recreation" parcels had the highest percentage (97%) by land use category.

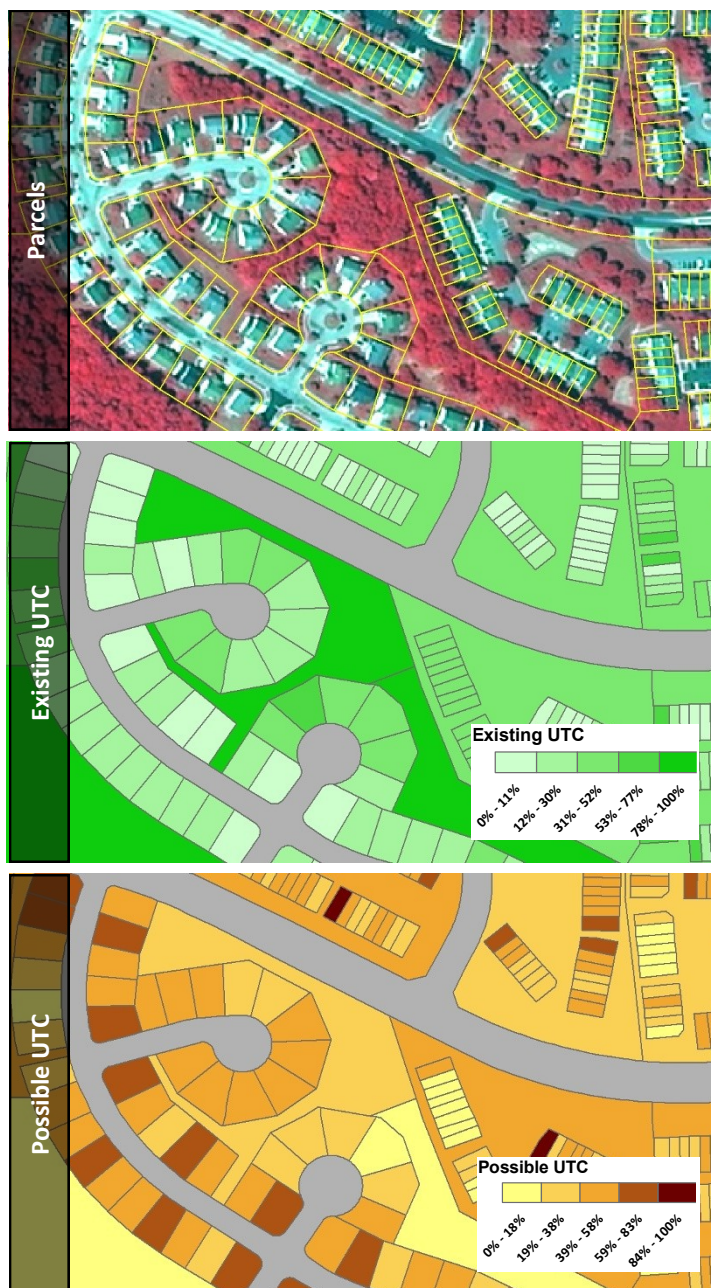


Figure 4: UTC metrics summarized at the parcel level.

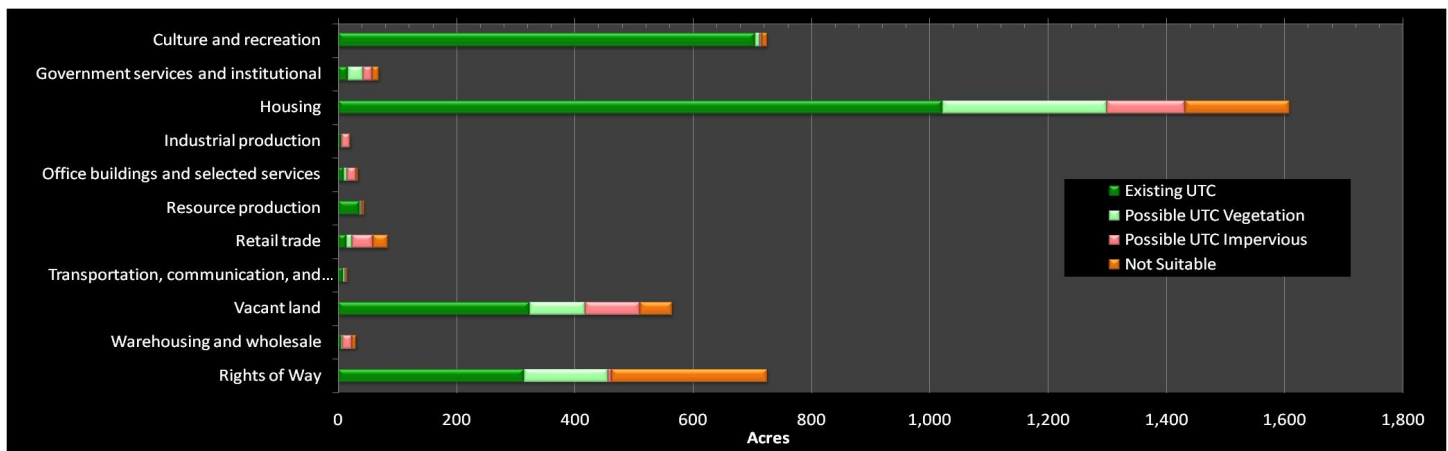


Figure 5: UTC metrics summarized by parcel land use.

Land Use	Existing UTC			Possible UTC Vegetation			Possible UTC Impervious		
	% Land	% Category	% UTC Type	% Land	% Category	% UTC Type	% Land	% Category	% UTC Type
Culture and recreation	18%	97%	33%	0%	1%	2%	0%	0%	1%
Government services and institutional	0%	24%	1%	1%	3%	6%	0%	2%	4%
Housing	26%	64%	48%	7%	38%	64%	3%	18%	31%
Industrial production	0%	24%	0%	0%	0%	0%	0%	2%	3%
Office buildings and selected services	0%	28%	0%	0%	1%	1%	0%	2%	4%
Resource production	1%	80%	2%	0%	0%	1%	0%	0%	1%
Retail trade	0%	17%	1%	0%	1%	2%	1%	5%	8%
Transportation, communication, and...	0%	52%	0%	0%	1%	1%	0%	0%	0%
Vacant land	8%	57%	15%	2%	13%	22%	2%	13%	21%
Warehousing and wholesale	0%	17%	0%	0%	0%	1%	0%	2%	4%
ROW	8%	43%	15%	4%	20%	33%	0%	1%	1%

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

The % Land Area value of 26% indicates that 26% of Greenbelt's land area is tree canopy in areas where the land use is "housing."

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

The % Land Use value of 64% indicates that 64% of "housing" land is covered by tree canopy.

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

The % UTC Type value of 48% indicates that 48% of all Existing UTC lies in areas of "housing" land use.

Table 1: UTC metrics by type, summarized by land use. For each land use category UTC metrics were computed as a percent of all land in Greenbelt (% 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).

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
Parcel ID	158878
Land Use	Housing
Legal Square Footage	41,000
Existing UTC Area	7,319
Existing UTC	18%
Possible UTC Area	33,659
Possible UTC	82%
Possible UTC - Vegetation	82%
Possible UTC - Impervious	0%

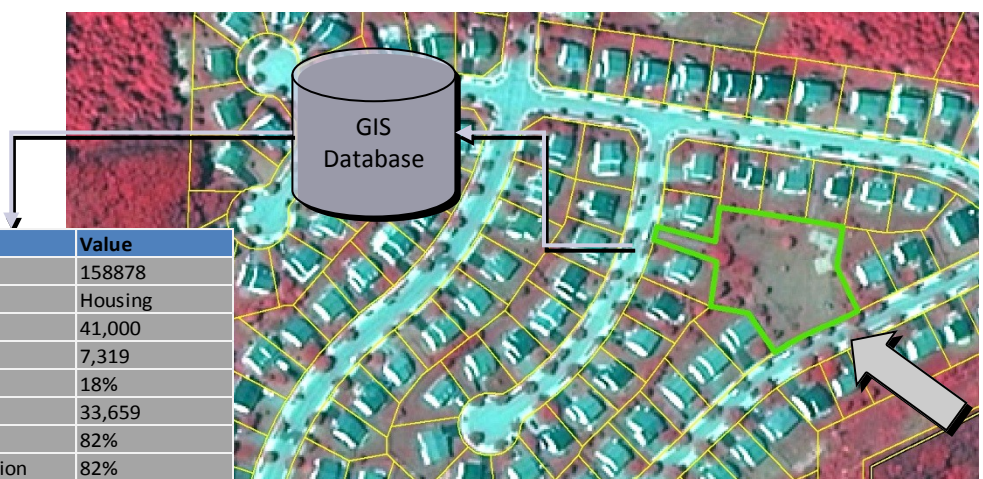


Figure 6: Parcel-based UTC metrics can be used to support targeted UTC.

Conclusions & Recommendations

- Greenbelt'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 62% of the city's land area, Greenbelt clearly has above average tree canopy, both in the state of Maryland and in comparison to cities of similar size.
- Given Greenbelt's relatively high amount of tree canopy, the City's primary challenge will be preserving its trees and forest for future generations through maintenance and regeneration.
- With Existing and Possible UTC summarized at the parcel level and integrated in the City's GIS database, individual parcels can be identified and targeted for UTC preservation and improvement.
- Over 30% of the total Existing Tree Canopy is concentrated in the Southern portion of the City. Preserving tree canopy in this area is crucial to maintaining the city's overall tree canopy.
- By ownership type, it is Greenbelt's residents that control the largest percentage of the city's tree canopy. Programs that educate residents on tree stewardship and incentives provided to residents that plant trees are crucial if Greenbelt is going to sustain its tree canopy in the long term.
- Of particular focus for UTC improvement should be parcels within the city that have large contiguous impervious surfaces. These parcels contribute high amounts of runoff, degrading water quality. The establishment of tree canopy on these parcels will help to reduce runoff during periods of peak overland flow.
- Within rights-of-ways a "greenstreets" initiative could be employed to convert impervious traffic islands and medians into vegetated spaces.

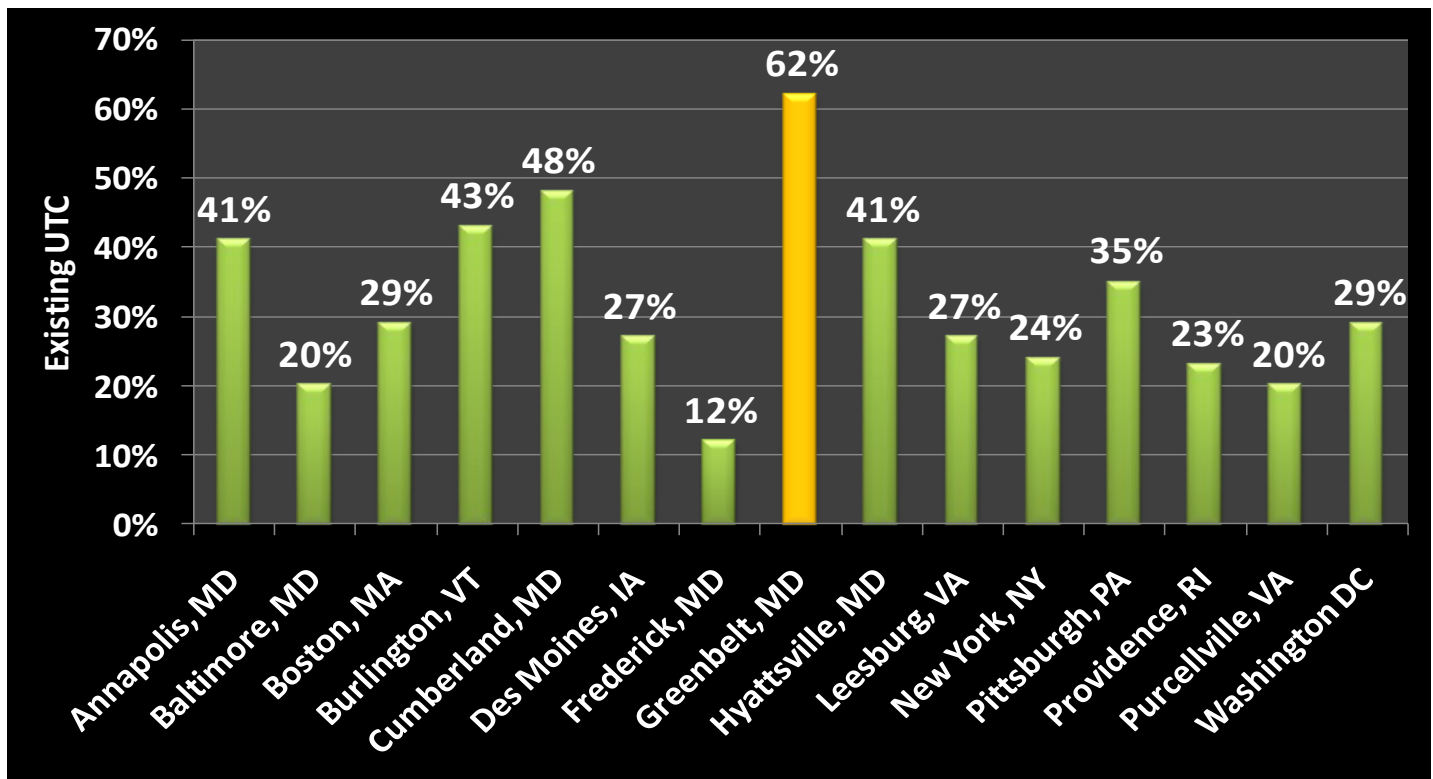


Figure 6: Comparison of Existing UTC with other selected cities that have completed UTC assessments.

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Additional Information

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

