

A Report on the City of Des Moines 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 numerous benefits to the City of Des Moines 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 Des Moines Have?

Urban tree canopy (UTC) was mapped for over 90% of the city (Figure 1) using high resolution satellite imagery and light detection and ranging (LiDAR) data. 12,466 acres of the city are covered by tree canopy (termed Existing UTC). This corresponds to 27% of all land within the mapped area and 26% of the total area mapped (total area includes water). An additional 49% (22,257 acres) of this area could theoretically be improved to support urban tree canopy (termed Possible UTC). 16% of the mapped area is occupied by buildings and roads, areas where only small amounts of overhanging tree canopy could be established.

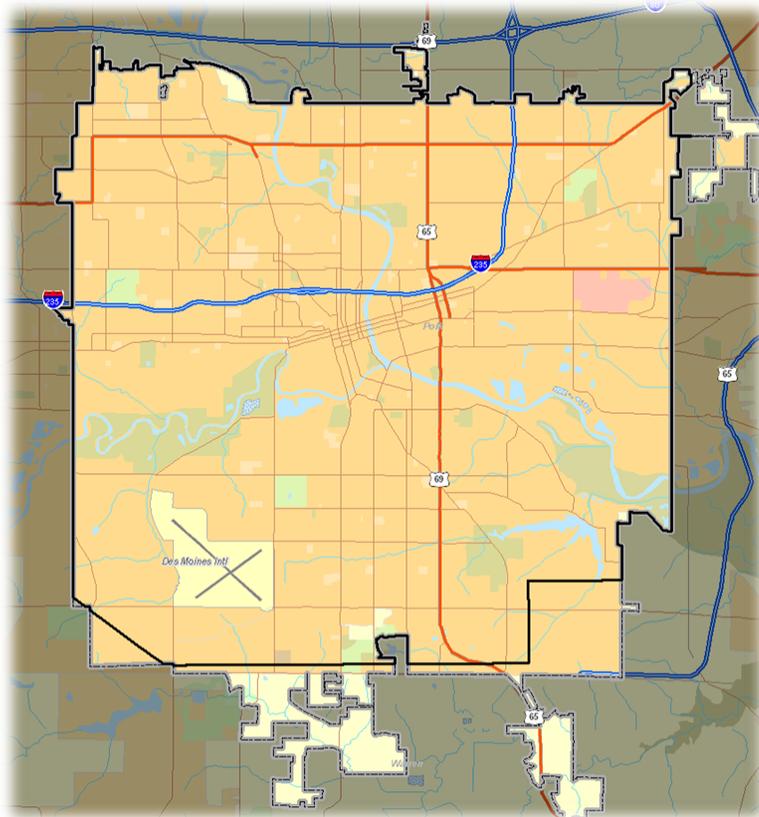
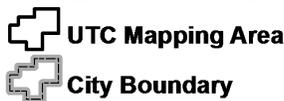


Figure 1: Mapping area for the UTC assessment. Over 90% of the city was mapped using a combination of 2007 satellite imagery and 2005 LiDAR data. The mapped area represents the region where both datasets were coincident.



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.

Project Background

The analysis of Des Moines' urban tree canopy (UTC) was carried out with funding from the USDA Forest Service and in collaboration with the Iowa Department of Natural Resources and Trees Forever. 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 Des Moines. This analysis was conducted based on year 2007 data.

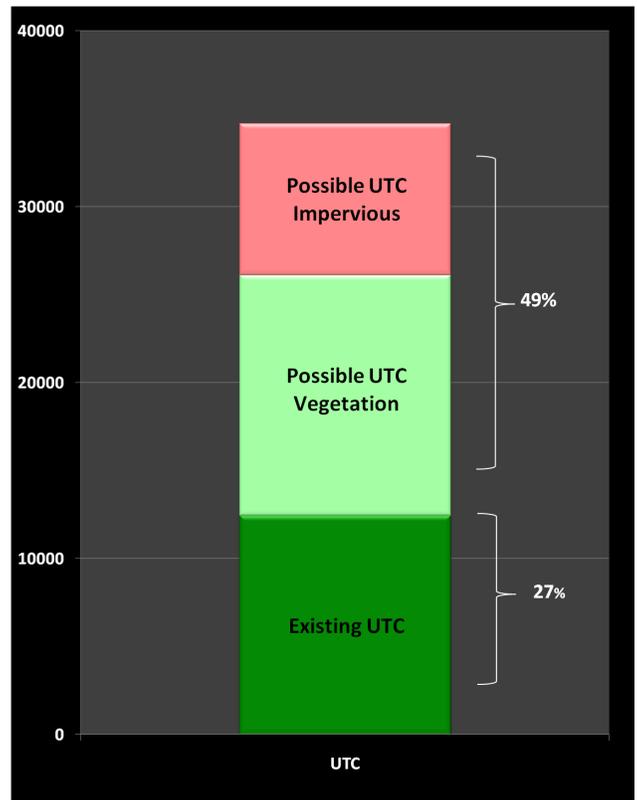


Figure 2: UTC metrics for the city. Percentages are based on % of land area (excludes water).

Mapping Tree Canopy

This study represents the most detailed inventory of tree canopy in Des Moines to date. These estimates are higher when compared to previous ones, such as those obtained using the 2001 National Land Cover Dataset (NLCD 2001) tree canopy layer (Figure 3a). While NLCD 2001 is valuable for analyzing land cover at the regional level, it is derived from relatively coarse, 30 meter resolution satellite imagery. High-resolution data (Figure 3b) in combination with advanced automated processing techniques, allowed for more detailed land cover mapping (Figure 3c). NLCD 2001 estimated the city to have only 14% land cover, compared to the actual amount of 27%.

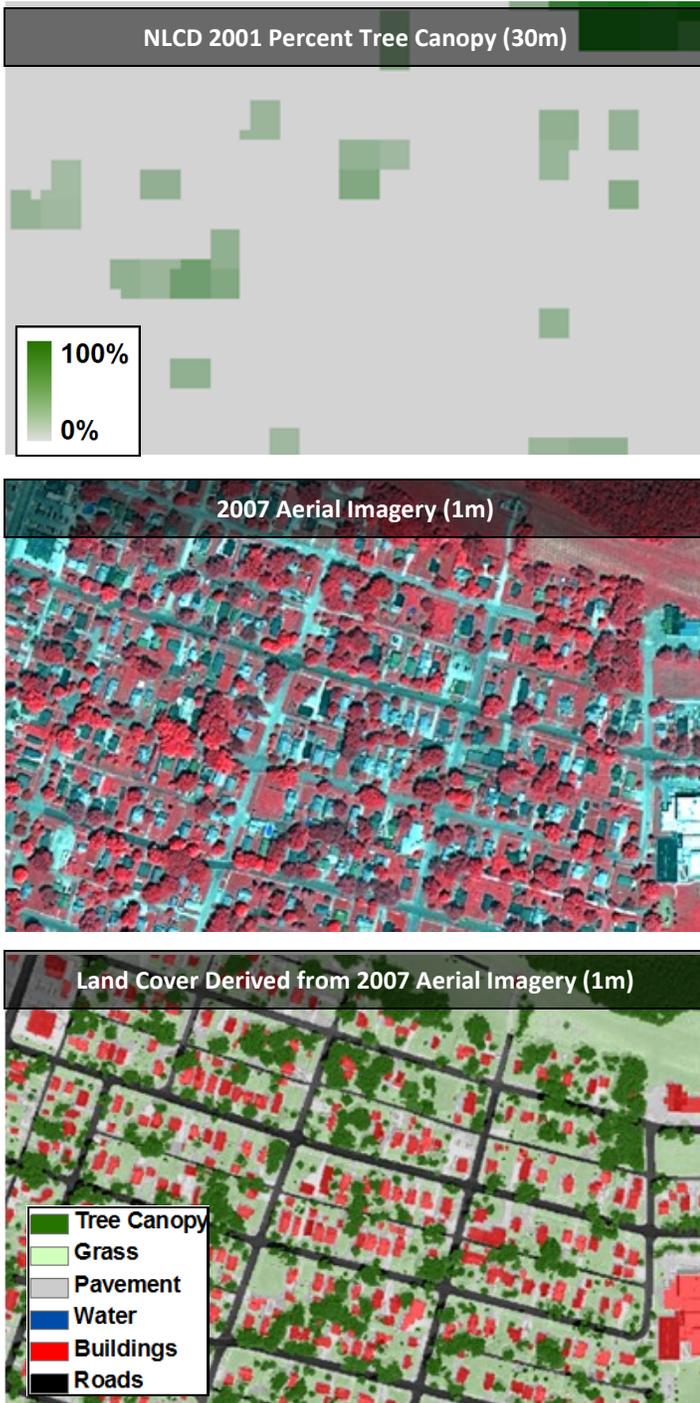


Figure 3a, 3b, 3c: Comparison of NLCD 2001 to high-resolution land cover.

Who "Owns" the 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 4). This allowed ownership patterns for Existing UTC and Possible UTC (Figure 5) to be examined by incorporating land use information from the city's parcel database. The majority of Des Moines' tree canopy and the majority of the land available to plant new trees is on land designated as "residential" and "government" (Figure 5). School parcels occupy a small percentage of Des Moines' overall land base (3%), but a high percentage (74%) of this land is either grass/shrub or impervious/bare soil, and could be improved to support tree canopy. Although agricultural land is not heavily forested (29%), actively farmed areas were excluded from Possible UTC computations making the overall Possible UTC within agricultural lands the lowest (29%) of all land use types.

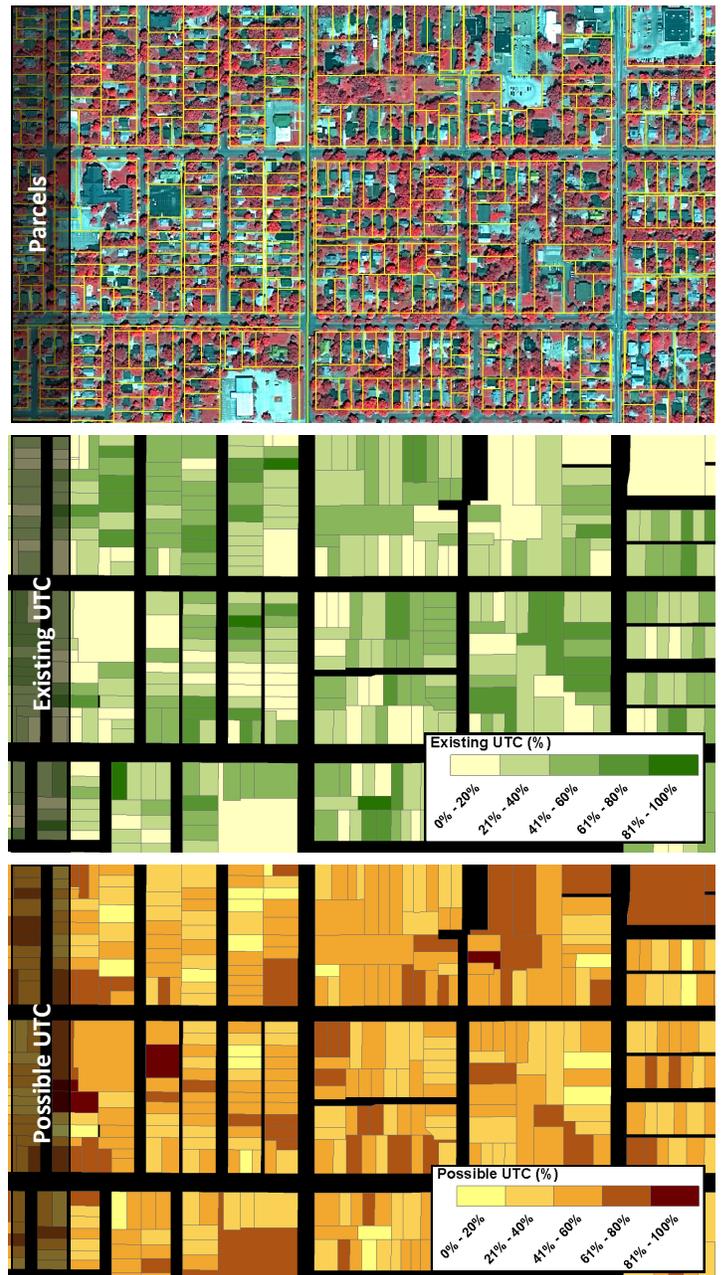


Figure 4: UTC metrics summarized at the property parcel level

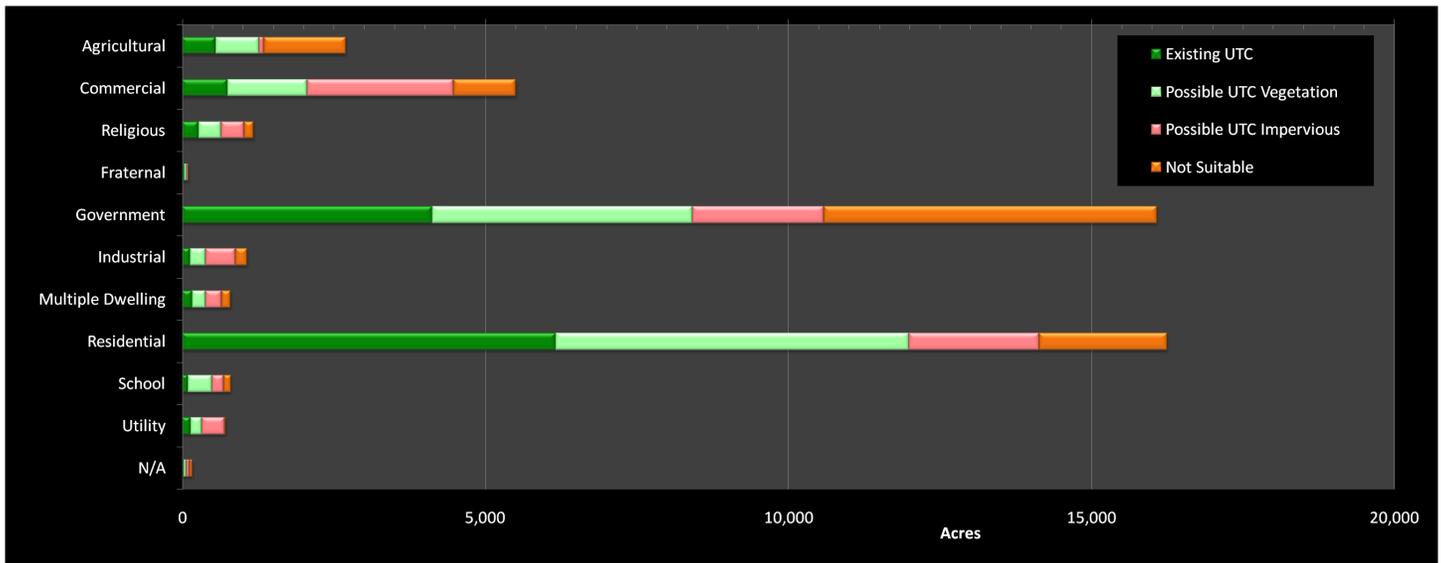


Figure 5: UTC metrics summarized by parcel land use.

Land Use	Existing UTC			Possible UTC Vegetation			Possible UTC Impervious		
	% Land	% Category	% UTC Type	% Land	% Category	% UTC Type	% Land	% Category	% UTC Type
Agricultural	1%	21%	4%	2%	26%	5%	0%	3%	1%
Commercial	2%	14%	6%	3%	24%	10%	5%	44%	18%
Religious	1%	23%	2%	1%	31%	3%	1%	32%	3%
Fraternal	0%	29%	0%	0%	39%	0%	0%	22%	0%
Government	9%	26%	33%	9%	27%	31%	5%	13%	16%
Industrial	0%	12%	1%	1%	24%	2%	1%	46%	4%
Multiple Dwelling	0%	21%	1%	0%	28%	2%	1%	32%	2%
Residential	14%	38%	49%	13%	36%	43%	5%	13%	16%
School	0%	12%	1%	1%	50%	3%	0%	24%	1%
Utility	0%	19%	1%	0%	25%	1%	1%	52%	3%
N/A	0%	17%	0%	0%	23%	0%	0%	32%	0%

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

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

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

The % Land Area value of 14% indicates that 14% of the city's land area is tree canopy in areas where the land use is residential.

The % Land Use value of 38% indicates that 38% of residential land is covered by tree canopy.

The % UTC Type value of 49% indicates that 49% of all Existing UTC lies in areas of residential 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 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).

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
GP	7824062280018
Land Use	Multiple Dwelling
Adjusted Value	\$271,500
Existing UTC Area	2860
Existing UTC Percent	14%
Possible UTC Area	11,216
Possible UTC Percent	54%
Possible UTC Vegetation	36%
Possible UTC Impervious	18%

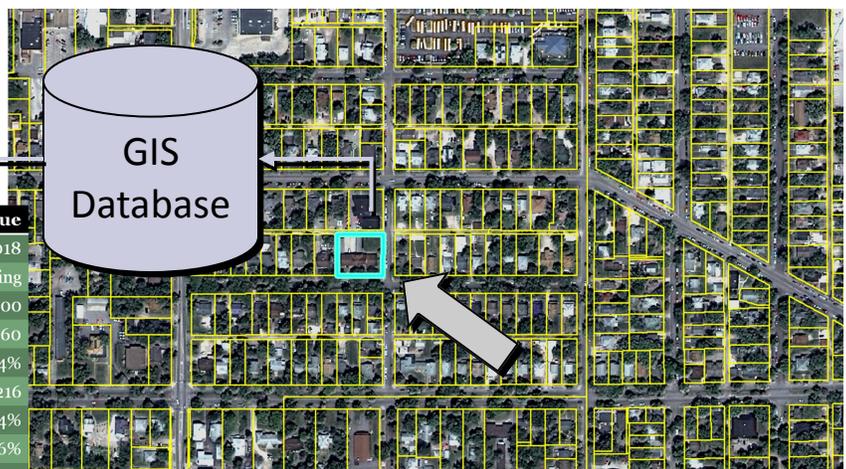


Figure 6: Parcel-based UTC metrics can be target tree plantings.

Conclusions & Recommendations

- Des Moines' 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.
- Des Moines should consider establishing a UTC goal, but any goal must be coupled with a maintenance plan to preserve existing tree canopy.
- Targeted tree planting efforts can be performed using the UTC parcel database that was produced as part of this assessment.
- Occupying 27% of the city's land area, tree canopy in Des Moines is on par with cities such as Providence, RI and New York, NY. It should be noted that Des Moines in many other ways is different than other cities with respect to land cover as 5% of the land is actively farmed.
- Tree canopy within 80ft stream buffers is considerably higher (61%) than the average tree canopy in the city.
- Tree canopy is lowest in Ward 2 (25%) and highest in Ward 4 (33%).
- Ewing Park has 17% of tree canopy in all parks. It has 45% of its land area covered of tree canopy.
- By land use, residential and government-owned lands have the most tree canopy and the most room for tree canopy. Approaches for preserving and planting trees on these two land use types will differ. Preserving and increasing tree canopy on residential lands will require incentives and education.
- Commercial, industrial, and agricultural parcels also offer ample opportunity for UTC increases. As these parcels are generally larger in size, the opportunity exists to engage in more directly in larger scale greening initiatives.
- 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

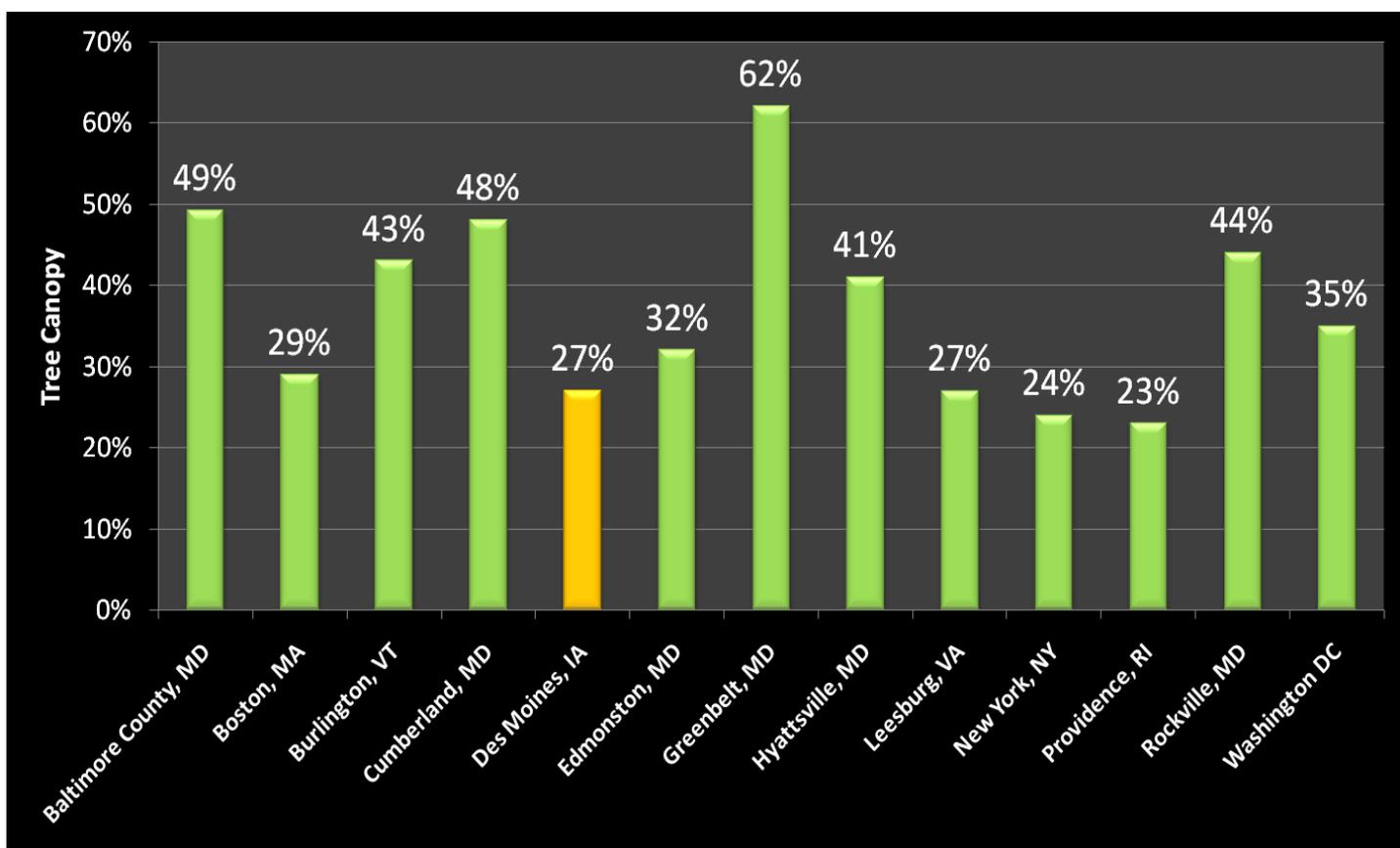


Figure 6: Comparison of Existing UTC with other selected cities that have completed UTC assessments.

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Additional Information

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