

A Report on the City of Rutland'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. Establishing a UTC goal is crucial for those communities seeking to improve their green infrastructure. A UTC assessment that estimates the amount of tree canopy currently present (Existing UTC), along with the amount of tree canopy that could theoretically be established (Possible UTC), is the first step in the UTC goal-setting process.

How Much Tree Canopy Does Rutland Have?

An analysis of Rutland's urban tree canopy based on land cover derived from high-resolution aerial imagery (Figure 1) found that more than 1,784 acres of the city were covered by tree canopy (termed Existing UTC) representing 37% of all land in the city. An additional 51% (2,470 acres) of the city could theoretically be improved (Possible UTC) to support tree canopy (Figure 2). In the Possible UTC category, 14.7% (711 acres) of the city were Impervious Possible UTC and another 36.4% were Vegetated Possible UTC (1,760 acres). Vegetated Possible UTC, or grass and shrubs, is more conducive to establishing new tree canopy, but establishing tree canopy on Impervious Possible UTC will have a greater impact on water quality.



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

Project Background

The analysis of Rutland's urban tree canopy (UTC) was carried out in collaboration with the City of Rutland, the Vermont Agency of Natural Resources, and the USDA Forest Service. 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 Rutland. This analysis was conducted based on year 2008 data.

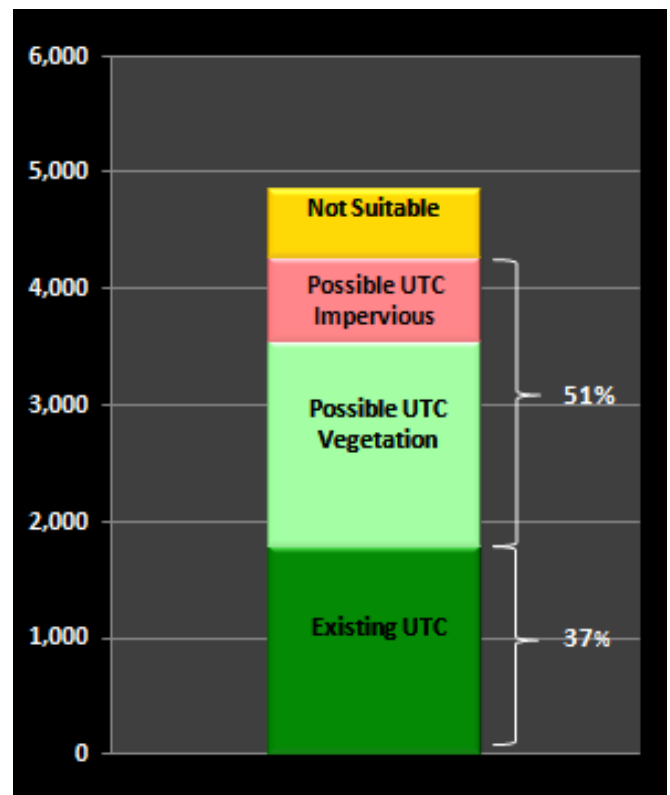


Figure 2: UTC metrics for Rutland based on % of land area covered by each UTC type.

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.

Impervious Possible UTC: Asphalt or concrete surfaces, excluding roads and buildings, that are theoretically available for the establishment of tree canopy.

Vegetated Possible UTC: Grass or shrub area that is theoretically available for the establishment of tree canopy.

Mapping Rutland's Trees

Prior to this study, the only available estimates of tree canopy for Rutland 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 2008 (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 30% tree canopy, compared to the more precise estimate of 37%.



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

Parcel Summary

Following computation of Existing and Possible UTC, the UTC metrics were summarized for each property in the city's parcel database (Figure 4). For each parcel, the absolute area of Existing and Possible UTC was computed along with the percent of Existing UTC and Possible UTC (UTC area/area of the parcel).

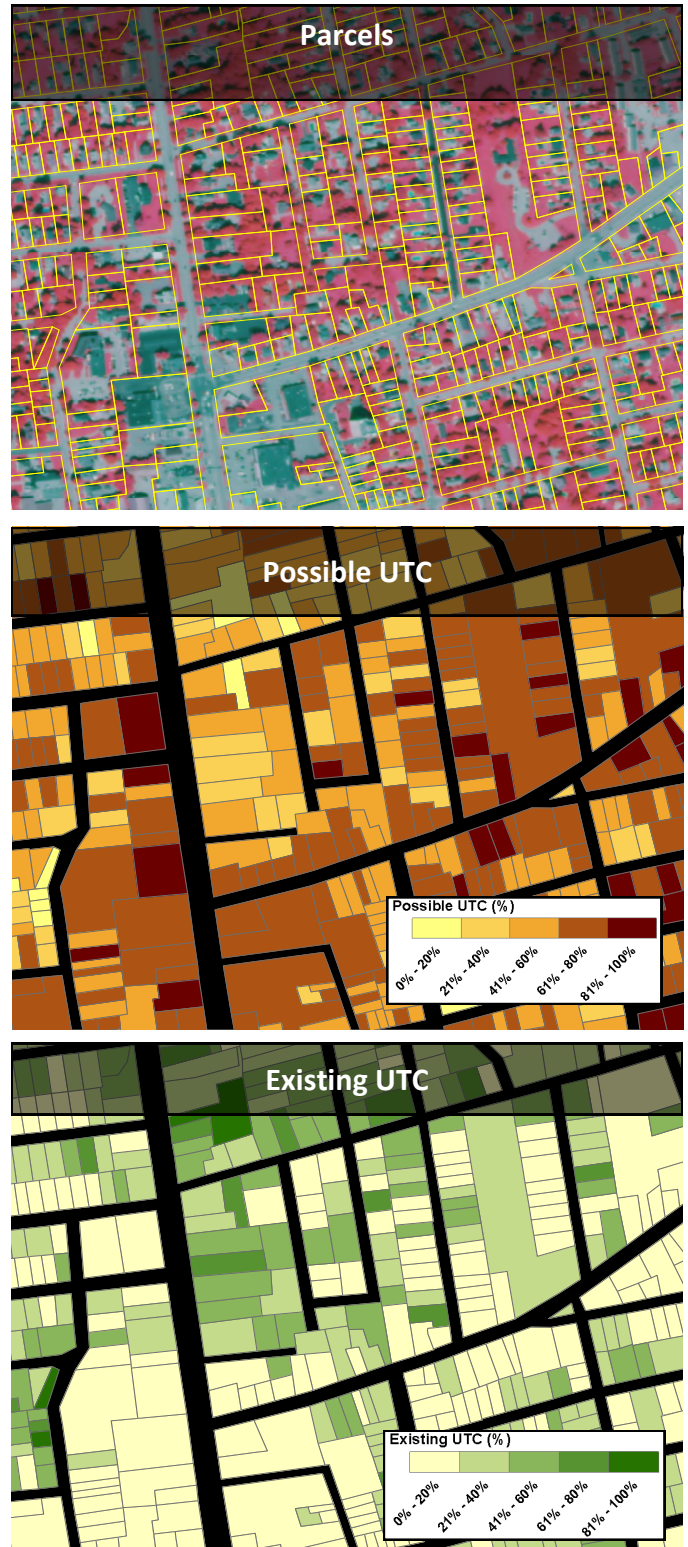


Figure 4: Parcel-based UTC metrics. UTC metrics are generated at the parcel level, allowing each property to be evaluated according to its Existing UTC and Possible UTC.

Zoning

An analysis of Existing and Possible UTC by zoning category was conducted using the most recent zoning layer for the city. As indicated in Figure 5 the largest zoning category by overall area, amount of tree canopy, and room to plant trees is “Single Family Residential.” Table 1 presents, for each zoning category, the UTC metrics computed as a percentage of all land in the city (% Land), as a percent of land area by the amount of land in the specified zoning category (% Category), and as a percent of the area for UTC type (% UTC Type). For example, land designated as “Single Family Residential” has the most Existing UTC in raw acreage, with 18% of all land in Rutland consisting of tree canopy in “Single Family Residential.” Park zoned land has the highest percentage of tree canopy relative to its land area at 75%. 48% of all tree canopy in the city is in “Single Family Residential.”

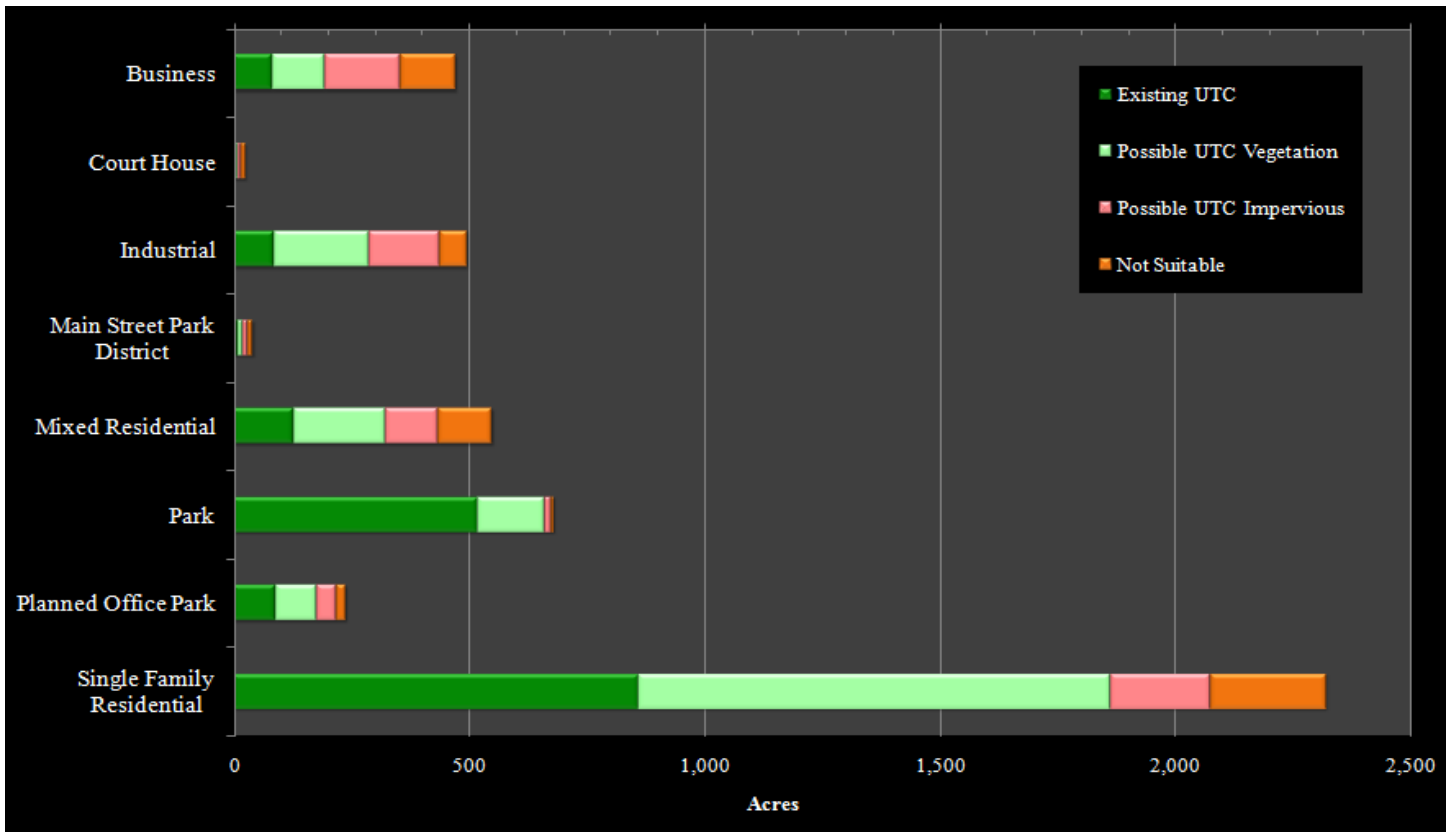


Figure 5: UTC metrics summarized by consolidated zoning class.

Zoning	Existing UTC			Possible UTC Vegetation			Possible UTC Impervious		
	% Land	% Category	% UTC Type	% Land	% Category	% UTC Type	% Land	% Category	% UTC Type
Business	2%	17%	5%	2%	24%	6%	3%	35%	9%
Court House	0%	14%	0%	0%	25%	0%	0%	29%	0%
Industrial	2%	18%	5%	4%	41%	11%	3%	30%	8%
Main Street Park District	0%	22%	1%	0%	26%	1%	0%	24%	1%
Mixed Residential	3%	23%	7%	4%	36%	11%	2%	20%	6%
Park	11%	76%	29%	3%	21%	8%	0%	2%	1%
Planned Office Park	2%	38%	5%	2%	36%	5%	1%	18%	2%
Single Family Residential	18%	37%	48%	21%	43%	57%	4%	9%	12%

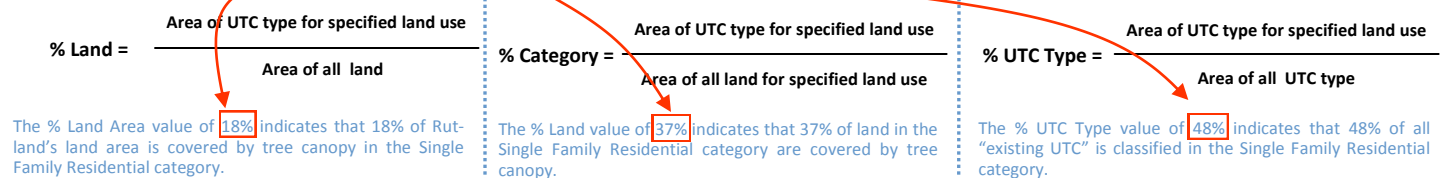


Table 1: UTC metrics were summarized by consolidated zoning class. For each zoning category, UTC metrics were computed as a percent of all land in the city (% Land), as a percent of land area by zoning category (% Category), and as a percent of the area for UTC type (% UTC Type).

Storm Water Impaired Watersheds

Moon Brook overlaps the Eastern section of the City and has been identified as a Section 303(d) storm water impaired watershed by the Federal Clean Water Act. There are 113 sub-watersheds within the City boundary covering 36%(1,783 acres) of the city and 32% of the 5,545 acre watershed. Figure 6 summarizes two UTC categories– Existing UTC (right) and Possible UTC (left) for these sub-watersheds within Rutland.

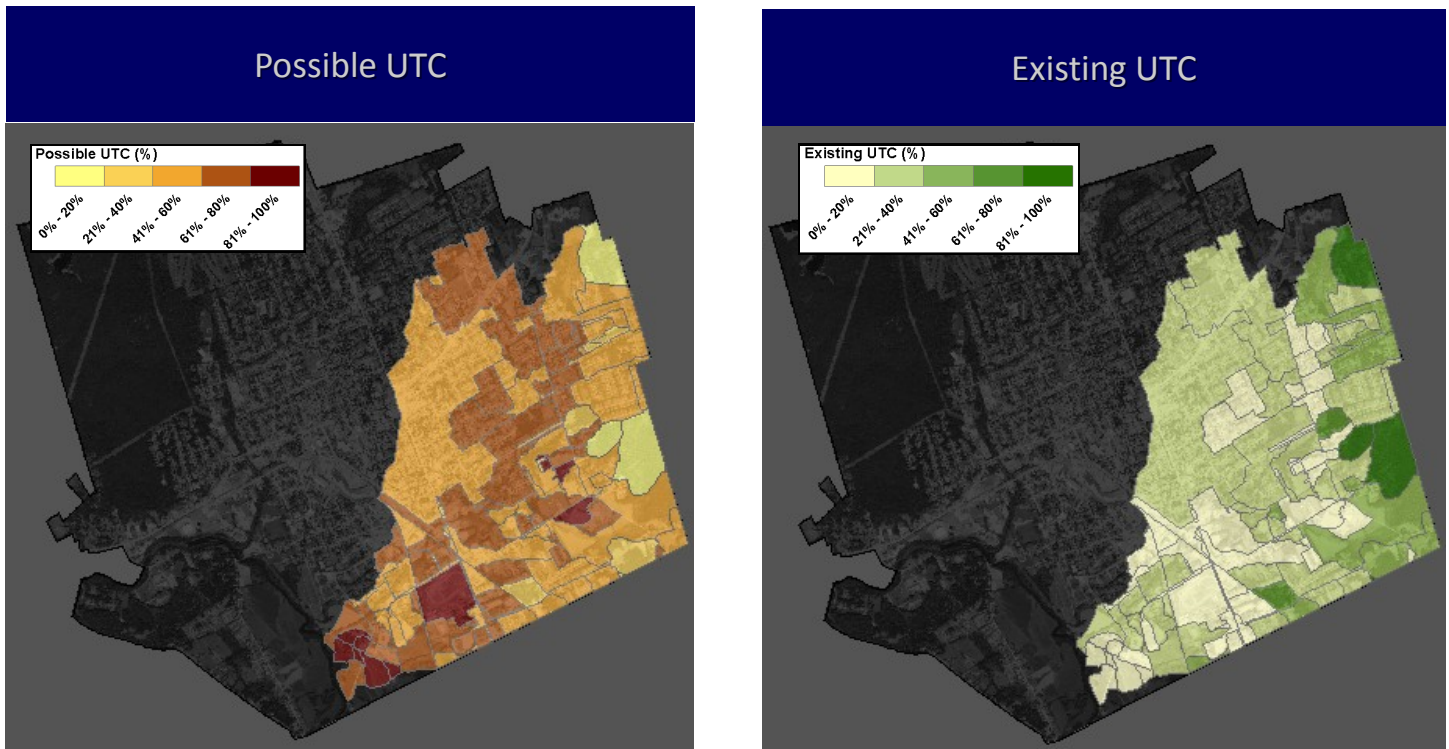


Figure 6. Possible UTC (left) and Existing UTC (right) as a percentage of land area by Storm water impaired watershed boundaries.

Decision Support



Parcel-based UTC metrics were integrated into the city's existing GIS database. Decision makers can use GIS to identify 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
Owner	Church
Address	10 Lincoln Way
Existing UTC	6%
Possible UTC	64%
Possible UTC—Vegetation	24%
Possible UTC—Impervious	40%

Figure 7: GIS-based analysis of parcel-based UTC metrics for decision support. In this example, GIS is used to select an individual parcel. The attributes for that parcel, including the parcel-based UTC metrics, are displayed in tabular form providing instant access to relevant information.

Moon Brook Watershed Stream Buffer Analysis

Tree canopy currently exists on 58% (36 acres) of the land area within a 35-foot buffer of all streams in the Moon Brook watershed. This is slightly lower than the city-wide stream buffer coverage of 64%. Summary of canopy for individual streams in the watershed reveals significant variation in coverage. Sixty-two percent of the buffer area for the main stem of Moon Brook is classified as tree canopy, while just 17% of the buffer of an unnamed tributary (Tributary 4) in the southwestern portion of the watershed is covered with canopy (Figure 10).

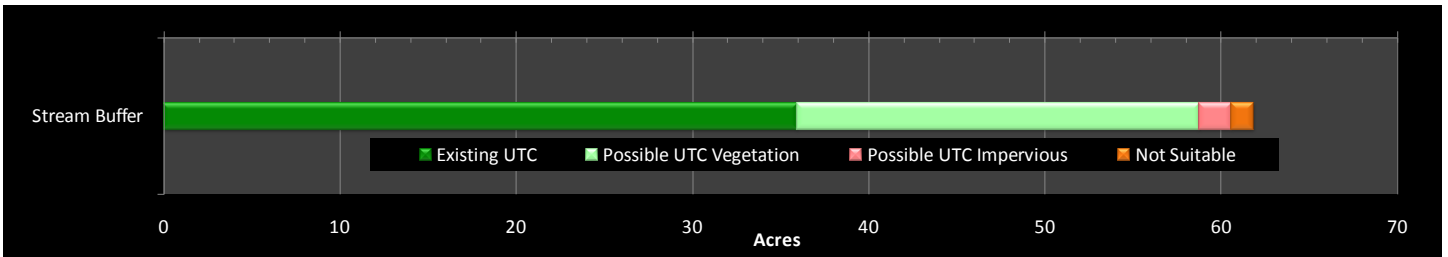


Figure 8: UTC metrics summarized for 35-foot buffer of all streams in the Moon Brook watershed.

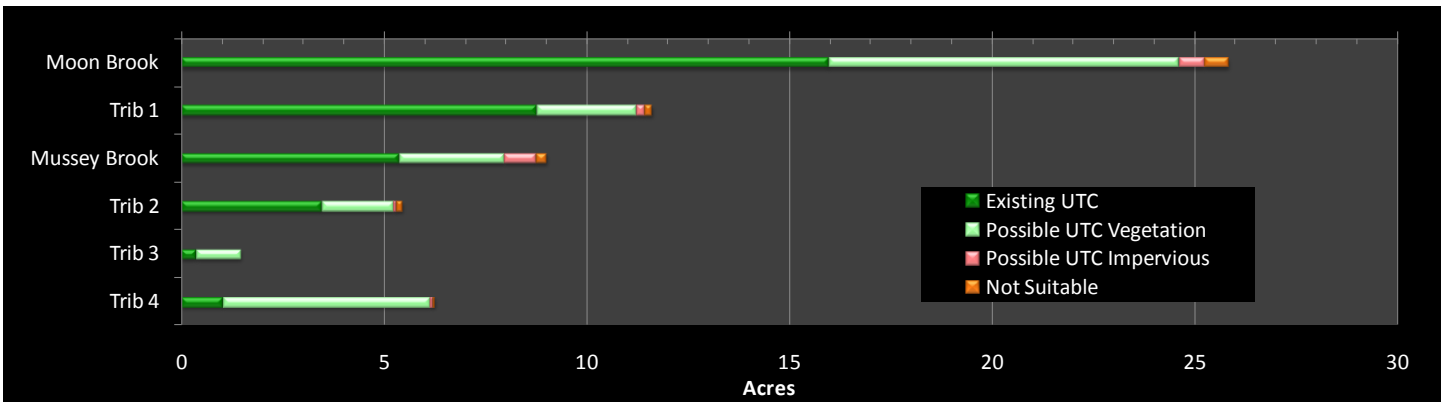


Figure 9: UTC metrics summarized for all 35 foot buffer of all streams in the Moon Brook watershed.

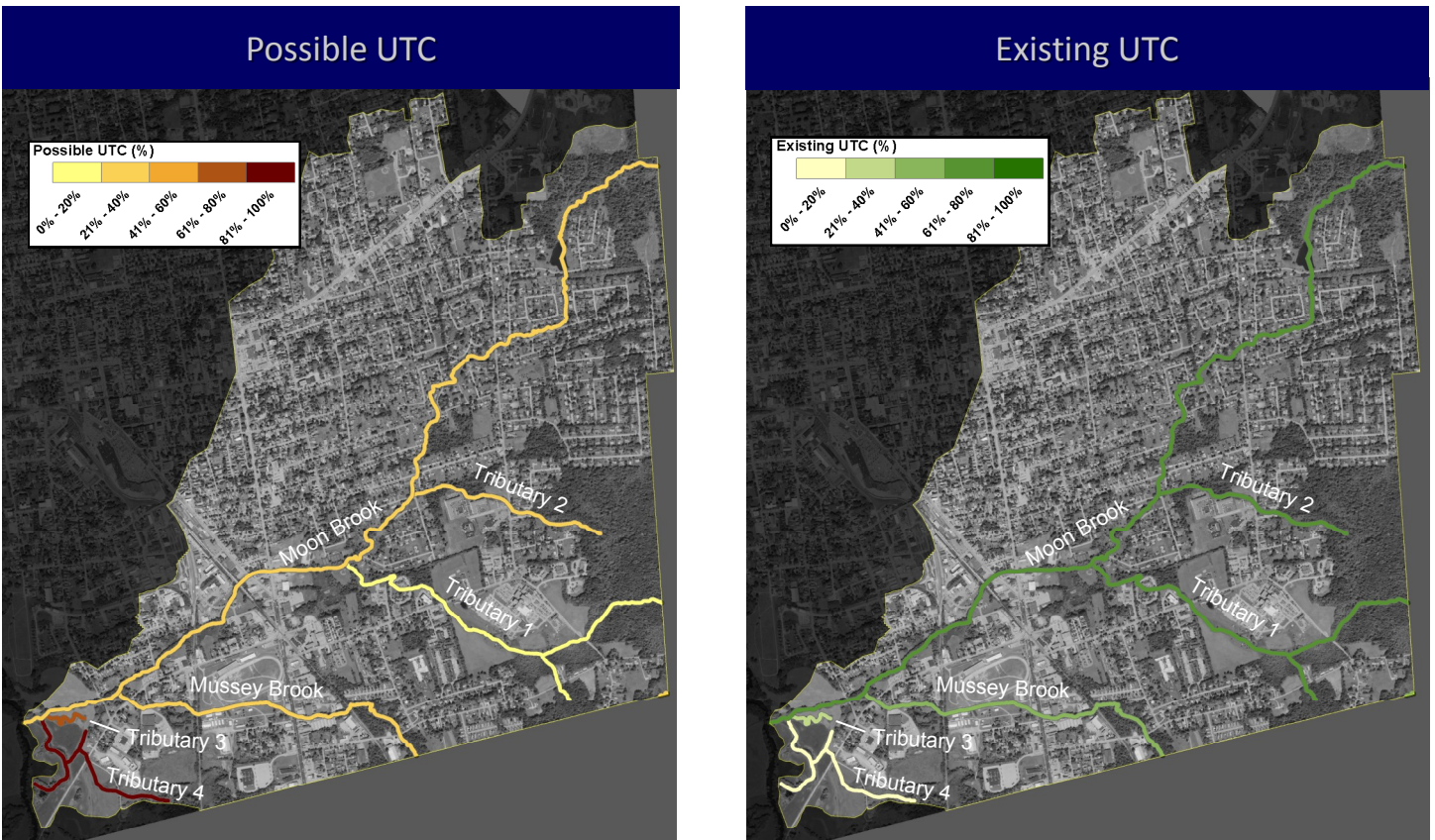


Figure 10. Possible UTC (left) and Existing UTC (right) as a percentage of stream buffer land area.

Conclusions

- Rutland’s urban tree canopy is a vital city asset that reduces stormwater runoff, improves air quality, reduces the city’s carbon footprint, enhances quality of life, contributes to savings on energy bills, and serves as habitat for wildlife.
- Rutland should consider establishing a UTC goal. Such a goal should not be limited to increasing the city’s overall tree canopy; it should also focus on increasing tree canopy in those parcels or blocks that have the least Existing UTC and highest Possible UTC.
- Zoning-level summaries can be used for targeting tree planting and preservation efforts within different regions of the City.
- With Existing UTC and Possible UTC summarized at the parcel level and integrated with the city’s GIS database, individual parcels and subdivisions can be examined and targeted for UTC improvement.
- 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, which degrades water quality. The establishment of tree canopy on these parcels will help reduce runoff during periods of peak overland flow.
- 64% of land within a 35 foot buffer of every waterway in Rutland, is classified as tree canopy. Past planning efforts and regulations have lead to greater than average tree canopy in these areas, likely benefitting water quality.
- Research (Geotz et al., 2003) indicates that for small watersheds 37% tree canopy results in a “fair” stream health rating, and 45% tree canopy results in a stream health rating of “good.” Within the Moon Brook watershed 80% of subwatersheds have below 37% tree canopy and 88% have below 44% tree canopy.
- Within the city’s rights-of-way (ROW) there is 15% Existing UTC and 40% Possible UTC, indicating that there is room for increasing street trees.
- By ownership type, it is Rutland’s residents that control the largest percentage of the city’s tree canopy. Programs that educate residents on tree stewardship and provide incentives for tree planting are crucial if Rutland is going to sustain its tree canopy in the long term.
- Possible UTC within the transportation rights-of-way (ROW) is 39%. Accordingly, a “street trees” initiative should be employed to increase tree canopy in along roads.

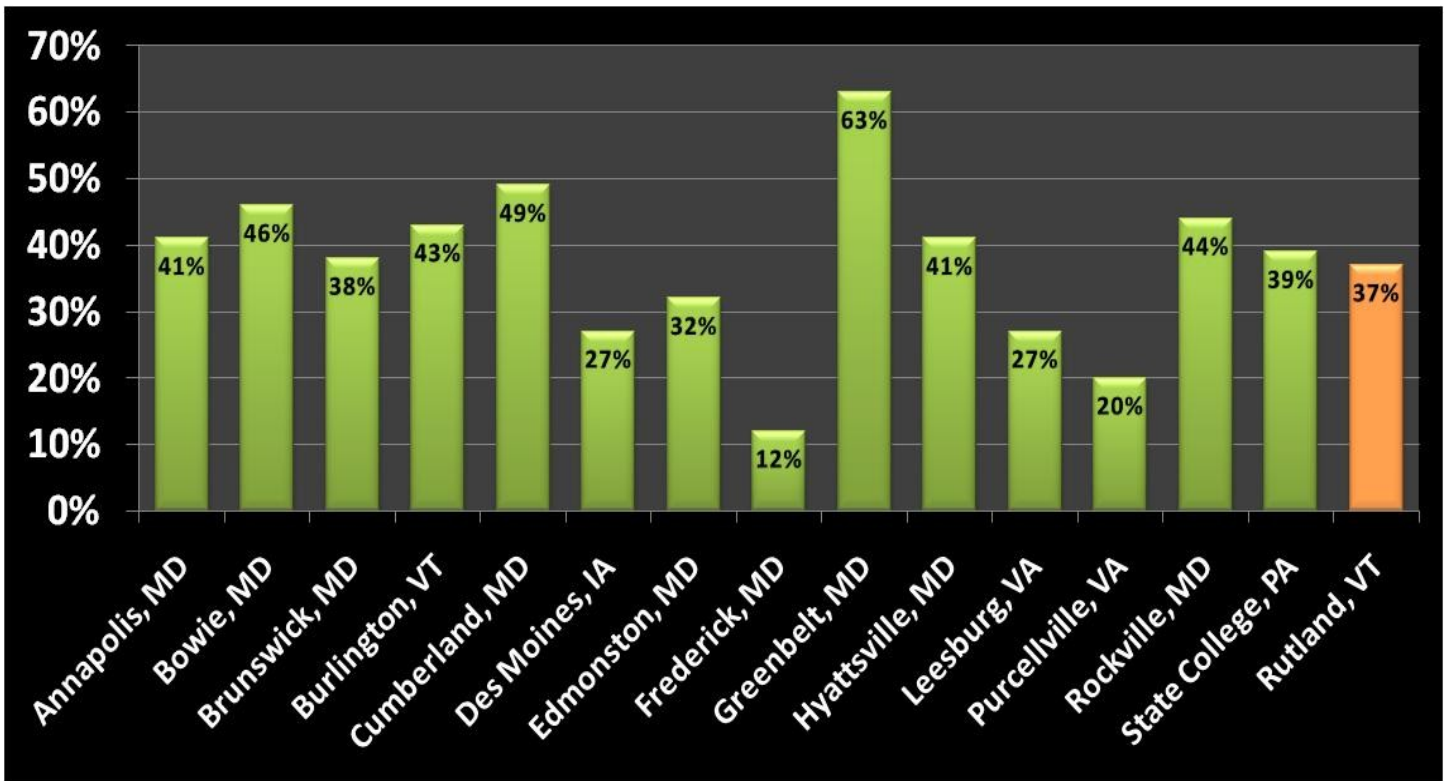


Figure 11: Comparison of Existing UTC with other selected cities that have completed UTC assessments.

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Additional Information

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<http://nrs.fs.fed.us/urban/utc/>



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