Developing a Spatial Form Model to Assess Canopy Cover and Other Urban Forestry Metrics for Guelph

Research Purpose

- This study explores whether the city of Guelph has enough plantable space to achieve its 40% Canopy Cover Goal
- Researchers investigated how GIS (Geographic Information System) can be used in urban forest management
- They wanted to create a model that automates the process of determining common urban forestry metrics

The research questions include:

- What is Guelph’s existing canopy cover?
- What is Guelph’s potential plantable space?
- Can 40% potential canopy cover be achieved? What is Guelph’s Maximum Potential Canopy Cover?
- What is a more realistic canopy cover that can be achieved in Guelph (Assuming not all plantable space will be planted to maximum potential due to design and practical concerns)

Spatial Form Models

- Focus on displaying the structure, distribution, and analysis of geographical features
- Features are represented by points, lines, and areas
- Two different data models: raster (rectangular grids) and vector (X and Y coordinates)
- Allow the user to create/extract new information

About the Model

- Model developed in ESRI’s ArcGIS 10.2.2 using the ArcMap and ModelBuilder applications
- Wanted the model to be easy to use, affordable, and replicable by other municipalities
- Used leaf-on SPOT 6 satellite imagery and a specific format of City of Guelph vector shapefiles (popular vector data format for GIS)

Benefits of the Analysis

- Spatial guide displayed where the City’s existing canopy cover and other land covers are
- Identified where plantable spaces exist and what areas should be targeted for future planting
- Results from this analysis can influence design decisions at the site scale
- These studies could provide evidence supporting new zoning by-laws and/or site plan control by-laws

Limitations

- Imagery – is June too early?
- Perceived land cover – canopy can grow over other land covers
- Shrub or tree?
- Utilities as schematic plans
- Spatial data age
- Software limitations

Urban Forestry Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Cover Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Canopy Cover</td>
<td>28.6%</td>
</tr>
<tr>
<td>Potential Plantable Space (P)</td>
<td>22.2%</td>
</tr>
<tr>
<td>Non-Plantable due to proximity to hydro line</td>
<td></td>
</tr>
<tr>
<td>Max Potential Canopy Cover (M) = E + P</td>
<td></td>
</tr>
<tr>
<td>Relative Canopy Cover (%) = E / M</td>
<td>56.3%</td>
</tr>
</tbody>
</table>

Results

<table>
<thead>
<tr>
<th>Urban Forest Metric</th>
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<tr>
<td>Maximum Potential Canopy Cover</td>
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</tbody>
</table>

But...

What is actually plantable? Not all that is plantable will be planted, due to various design-based decisions (ex. You would not plant a sporting field or cemetery to 100%).

Conclusion

- If 52% of the available plantable space were planted, the City of Guelph could achieve their 40% canopy cover goal
- Therefore, to achieve 40% canopy cover, 11.5% of Guelph’s total area needs to be planted

Researchers

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