Evaluating Urban Vegetation Using LiDAR and High Resolution Imagery

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Objectives

• Assess the extent and density of “urban” tree cover
  - Extraction of tree canopy
  - Calculation of tree cover density

• Produce high resolution land cover
  - Assess permeable vs non-permeable surfaces in built environments
    - Separate natural and man-made surfaces
    - Quantify each surface for future surface permeability study

• Build a web application to share the results
## Data

- **LiDAR point cloud (2006)**
  - LAS files
  - Classes
  - Returns

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Default - These are the points that are a mixture of the remaining points after the ground classification. These would contain bridges, overpasses, buildings, cars, parts of vegetation, etc.</td>
</tr>
<tr>
<td>2</td>
<td>Ground - These are points on the bare earth surface. They are from the automated processing, as well as the manual surface review.</td>
</tr>
<tr>
<td>8</td>
<td>Model Key - These are the educated, thinned points to represent the final bare earth surface. This is from our automated processing. These are the points that we have used to generate the final contours.</td>
</tr>
<tr>
<td>9</td>
<td>Water - These are points inside of hydrographic features, as collected by photogrammetric methods. These are from automated processing, as well as the manual surface review.</td>
</tr>
<tr>
<td>12</td>
<td>Non-Ground - These are points that are identified as first of many return or intermediate of many returns from the LiDAR pulse. These are points that are most likely vegetation returns or points identified to be not on the ground surface.</td>
</tr>
<tr>
<td>15</td>
<td>Road Edges - These are the points that fall within +/- 1.5' of road break lines.</td>
</tr>
</tbody>
</table>

Source: LAS files metadata (http://www.pasda.psu.edu/uci/FullMetadataDisplay.aspx?file=pamap_lidar_LAS.xml)
Data

- NAIP multispectral (4-band) aerial imagery (2010)
  - Red, green, blue & infrared
Methodology

**BREAKLINES**
- Double Line Drains
- Lakes & Ponds
  - Features to Polygons to Raster

**NAIP (4 BANDS)**
- Water
  - Roads
  - Bare Ground
  - Artificial Surfaces
  - Grass Land
  - Structures
  - Trees

**LAS FILES**
- Ground
  - Non-Ground (Structures)
  - Tree Canopy Density
Land Cover Accuracy Assessment

Sligo: 94.67%

Porter: 95.67%

Clarion: 94.33%
Web Application
Demo:
http://maps.clarion.edu/LandCoverExtractor

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