

Tree Canopy Evaluation

Overview



Canopy evaluations are frequently requested by tree managers of all kinds. From the municipal urban forester to the landscape architect to the campus sustainability director or facilities manager, establishing a baseline percent canopy cover for historical comparison or future projection purposes is becoming more and more common. People seek this type of assessment and the statistics it provides for a variety of reasons; to track effectiveness of policy choices, to monitor the changing urban forest, to set quantifiable goals, etc.

Tree canopy evaluations can take several forms, depending on the goals of the canopy study, how the results will be used, data availability and budget.

Options

Basic Evaluation – i-Tree Canopy Assessment

The simplest option is an i-Tree Canopy project; these assessments use classification of randomly generated points within your study area to derive percent tree canopy, along with other land use classes of interest. An i-Tree Canopy project could be as simple as Tree vs. Non-tree points, or have upwards of five or more land cover classes. The results can be used to establish a benchmark canopy cover that can be monitored over time, as well as used for change analysis comparing a contemporary horizon year with historical imagery. i-Tree Canopy provides a powerful snapshot of your canopy cover based on statistically validated random sampling methods.

i-Tree Canopy v6.1
Cover Assessment and Tree Benefits Report
Estimated using random sampling statistics on 5/28/19



Cover Class	Description	Abbr.	Points	% Cover
Tree	Tree, non-shrub	T	277	55.4 ±2.22
Non-Tree Vegetation	Grass and low vegetation	NT	159	31.8 ±2.08
Water	Water	W	7	1.40 ±0.53
Bare Soil	Bare soil	B	25	5.00 ±0.97
Impervious	Roadways, driveways, buildings, etc.	I	32	6.40 ±1.09

Figure 1: Output from i-Tree Canopy tool; part of a simple report that also includes estimated environmental benefits provided by the canopy cover of the study area.

Standard Evaluation - Aerial Imagery Urban Tree Canopy Evaluation

The next step up in time and complexity is a GIS-based aerial imagery Urban Tree Canopy evaluation (UTC). Conducted using GIS software, an aerial imagery UTC has an advantage over an i-Tree Canopy assessment in that every single pixel within your study area is classified as tree, impervious, etc. as opposed to just random sample points. The power in this type of assessment is the ability to compare canopy coverage and potential canopy across a variety of geographies, whether across Census tracts, different parks, city council districts, anyway you want to compare and report on the data. The historical change analysis piece is also an option, with a requisite greater time investment.

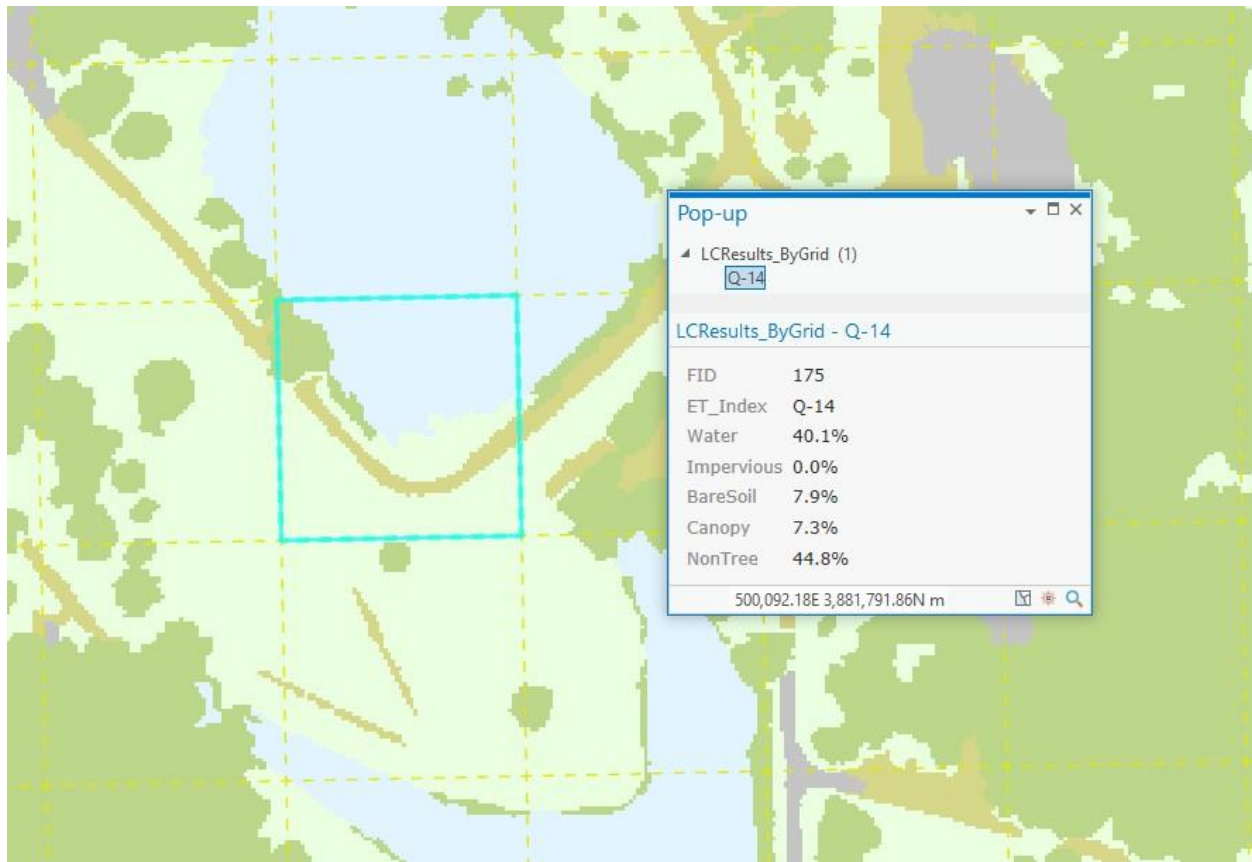


Figure 2: Example of the land cover percentages from the aerial imagery classification joined to a polygon layer for reporting purposes. In this example, by maintenance grid zone.

Premium Evaluation – Comprehensive Urban Forest Analysis with LiDAR



The Tree Species Identifier (TSI) is a system that analyzes LiDAR (aerial laser-scanning data) to provide individual tree attributes including species, height, and canopy area. The TSI process is a discrete analysis of each tree rather than an extrapolated sampling and provides the most complete urban canopy assessment available. A LiDAR UTC is able to derive attributes for all trees within the study area, even those on private property or in non-maintained areas that would not be captured during a typical ground-based tree inventory.

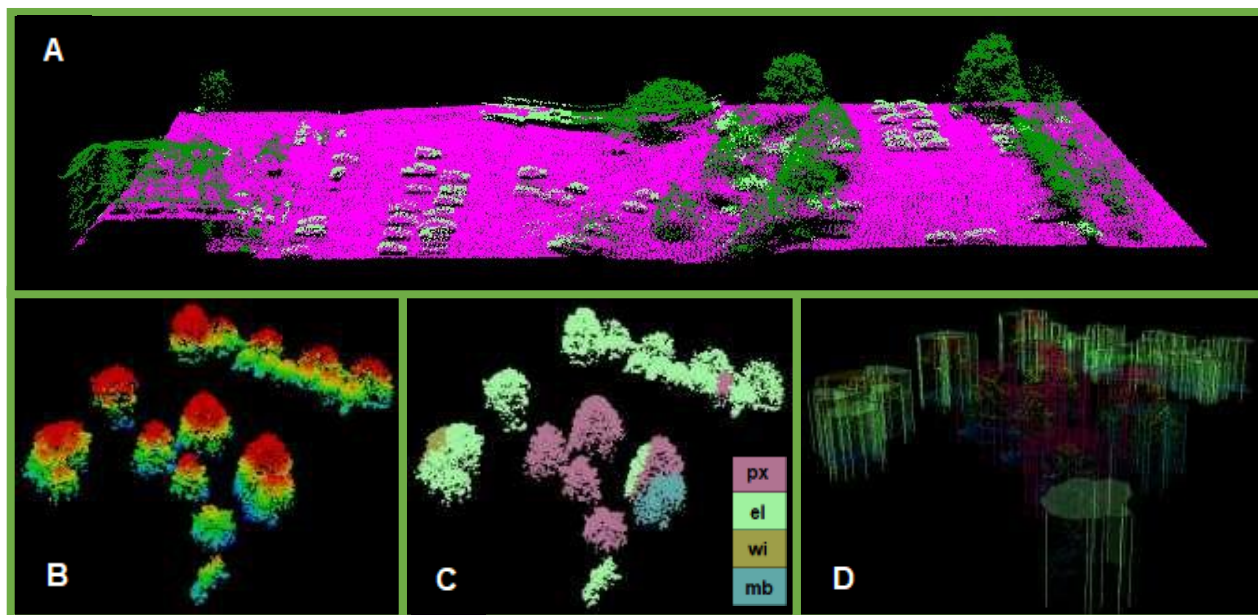


Figure 3: The full LiDAR of Subset 1 (A) can be seen above. As most trees within this subset occur on the right-hand side of the parking lot, the three sub-images are focused there. The sub-images are broken down as follows: (B) LiDAR classified by elevation, (C) LiDAR classified by species, (D) LiDAR with TSI segmentation superimposed on top.

The outputs of the LiDAR-incorporated UTC look much like the imagery only UTC, with the option of additional geospatial outputs such as an attributed point layer of each tree crown segmented out from the LiDAR point cloud.

TREE ID	SPECIES	HEIGHT (ft)	CANOPY AREA (sq ft)	BIOMASS (lb)
1	elm	28.5	551.1	44.3
2	elm	45.1	529.8	166.9
3	elm	46.9	444.3	220.2
4	elm	34.0	397.3	134.5
5	elm	42.3	491.3	102.7
6	willow	36.3	568.2	177.9
7	pine	40.6	858.7	242.1

What You Need to Get Started

1. Identify the goal of the study.
2. Boundary shapefile of the study area.
3. Determine land cover classes of interest.
4. Horizon years of interest (i.e. latest available imagery/LiDAR only, 2007 and 2017, etc.).
5. Approach (Option 1, 2 or 3 as outlined above).

Please contact the Consulting Advisor team at consulting@bartlett.com to find out more information or to schedule a conference call or webinar presentation. You can also visit www.bartlett.com/bartlett-consulting.cfm to learn more about the Bartlett Consulting team.

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