Seattle 2016 LiDAR Canopy Cover Assessment

Seattle’s Urban Forestry Team
May 8, 2017
Today’s presentation

- Introduction
- Background
- 2016 LiDAR canopy cover assessment
  - Technology
  - Research questions
  - Study Findings
  - Equity
- Canopy cover change
- Development impacts
- Using the data
Project team

Urban Forestry Commission

University of Vermont Spatial Analysis Lab

FAS

OSE

SPU

S. Ctr.

Parks

SDOT

SCL

SDCI
What is urban forestry?

**Urban forestry** is the care and management of trees and understory plants in urban areas for the purpose of improving the urban environment.
Wild forest vs. urban forest
The importance of trees
Background
Seattle’s commitment

Seattle’s urban forest is a thriving and sustainable mix of tree and understory species and ages that creates a contiguous and healthy ecosystem that is valued by the City and all Seattle residents as an essential environmental, economic, and community asset.
Urban Forest Stewardship Plan

• Establishes goals - 30% citywide canopy cover
• Long-, mid-, and short-term strategies for achieving goals
• Implemented through annual workplans
• Managed via inter-departmental team
• To be updated in 2018
1. Create an ethic of stewardship
2. Replace/enhance benefits
3. Expand canopy to 30% by 2037
4. Increase health/longevity
Tracking progress

- SDOT, Parks inventories
- 2016 canopy cover assessment
- 2012 Seattle’s Forest Ecosystem Values
## Past assessments

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Canopy Cover</td>
<td>18%</td>
<td>22.5%</td>
<td>22.9%</td>
<td>26.3%</td>
<td>26.4%</td>
<td>29.6%</td>
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<tr>
<td>Margin of Error</td>
<td>+/- 5%</td>
<td>Not stated in report</td>
<td>Not stated in report</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Method</td>
<td>LiDAR Analysis (low resolution)</td>
<td>Categorical raster creation</td>
<td>Categorical raster creation</td>
<td>Ground sampling</td>
<td>Point-based random sample</td>
<td>Categorical raster creation</td>
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<tr>
<td>Data source</td>
<td>LiDAR</td>
<td>Satellite imagery</td>
<td>Satellite imagery</td>
<td>i-Tree Eco plots</td>
<td>Aerial photos</td>
<td>LiDAR, aerial photos</td>
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</table>
2016 LiDAR Canopy Cover Assessment
Jarlath O’Neil-Dunne
University of Vermont
Spatial Analysis Lab
LiDAR technology
Calculating canopy cover

91,776 acres (total area of the city including water) - 38,271 acres (area of water within the city boundary) = 53,505 acres (total area without water)

15,167 acres (total area of tree canopy) / 53,505 =

28%

Canopy Cover
Research questions

- Progress on citywide 30% goal
- Canopy cover in Seattle neighborhoods
- Progress on targets in different management areas
- Canopy cover in underserved neighborhoods
Study Findings
Progress achieving 30% canopy cover

28%
Progress achieving targets by Management Unit

Management Units
Percentage of city

- Single-Family Residential: 56%
- Multi-Family Residential: 11%
- Commercial/Mixed-Use: 11%
- Downtown: 7%
- Industrial: 4%
- Institutional: 2%
- Developed Parks: 1%
- Parks' Natural Areas: 1%

ROW = 27% of land
Progress achieving targets by Management Unit

Canopy Cover by Management Unit

- Single-Family Residential: 32%
- Multi-Family Residential: 23%
- Commercial/Mixed-Use: 14%
- Downtown: 10%
- Industrial: 6%
- Institutional: 25%
- Developed Parks: 34%
- Parks' Natural Areas: 89%
Progress achieving targets by Management Unit

<table>
<thead>
<tr>
<th>Management Unit</th>
<th>2016 canopy cover</th>
<th>2037 canopy goal (set in 2007)</th>
<th>Over/Under goal</th>
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</thead>
<tbody>
<tr>
<td>Single-Family Residential</td>
<td>32%</td>
<td>33%</td>
<td>-1</td>
</tr>
<tr>
<td>Multi-family Residential</td>
<td>23%</td>
<td>20%</td>
<td>+3</td>
</tr>
<tr>
<td>Commercial/Mixed-use</td>
<td>14%</td>
<td>15%</td>
<td>-1</td>
</tr>
<tr>
<td>Downtown</td>
<td>10%</td>
<td>12%</td>
<td>-2</td>
</tr>
<tr>
<td>Industrial</td>
<td>6%</td>
<td>10%</td>
<td>-4</td>
</tr>
<tr>
<td>Institutional</td>
<td>25%</td>
<td>20%</td>
<td>+5</td>
</tr>
<tr>
<td>Developed Parks</td>
<td>34%</td>
<td>25%</td>
<td>+9</td>
</tr>
<tr>
<td>Parks’ Natural Areas</td>
<td>89%</td>
<td>80%</td>
<td>+9</td>
</tr>
<tr>
<td>City total</td>
<td>28%</td>
<td>30%</td>
<td>-2</td>
</tr>
<tr>
<td>Right-of-way (runs through all other MUs)</td>
<td>23%</td>
<td>24%</td>
<td>-1</td>
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Progress achieving targets by Management Unit

Canopy cover distribution
by management unit

ROW = 22% of total canopy
What’s the canopy cover in different areas of Seattle
What’s the canopy cover in different areas of Seattle

- Ballard: 25%
- Central: 31%
- Delridge: 38%
- Downtown: 10%
- East: 36%
- Greater Duwamish: 15%
- Lake Union: 21%
- Magnolia/Queen Anne: 30%
- North: 35%
- Northeast: 31%
- Northwest: 32%
- Southeast: 30%
- Southwest: 31%
What’s the canopy cover in different areas of Seattle.
Canopy cover in SDOT’s Street Tree Management Units
Conifer to deciduous tree ratio

28%  

72%
Largest trees and tree groves

6,338 large trees
3,188 tree groves
Relationship between canopy and environmental equity

High number of people of color but little tree canopy (11%) in this Census tract.

There is a statistically significant inverse relationship between tree canopy and people of color.

Not many people of color and lots of tree canopy (55%) in this Census tract.
Relationship between canopy and environmental equity
Equity implications
Tree canopy and heat island effect
Canopy within SCL’s 10ft minimum clearance distance
Canopy cover trend
Canopy cover trend
Canopy cover trend

- **Single-Family**
  - 2007: 39%
  - 2010: 38%
  - 2015: 36%

- **Multi-Family**
  - 2007: 25%
  - 2010: 24%
  - 2015: 24%

- **Commercial/Mixed Use**
  - 2007: 10%
  - 2010: 16%
  - 2015: 15%

- **Downtown**
  - 2007: 10%
  - 2010: 10%
  - 2015: 9%

- **Industrial**
  - 2007: 8%
  - 2010: 8%
  - 2015: 7%

- **Institutional**
  - 2007: 28%
  - 2010: 27%
  - 2015: 25%

- **Developed Parks**
  - 2007: 38%
  - 2010: 38%
  - 2015: 37%

- **Parks’ Natural Area**
  - 2007: 88%
  - 2010: 87%
  - 2015: 88%

- **City-wide**
  - 2007: 33%
  - 2010: 33%
  - 2015: 31%

- **Right-of-Way**
  - 2007: 28%
  - 2010: 25%
  - 2015: 24%
Urban forest challenges
Development Impact
Using the findings
Conclusion
Links

Final report and webinar recording:
http://www.seattle.gov/trees/canopycover.htm

GIS canopy cover layer:
Questions?

Sandra.Pinto_de_Bader@seattle.gov
(206) 684-3194
www.seattle.gov/trees