A Comparison of Urban Tree Populations within Four UK Towns and Cities

Trees, People and the Built Environment 2014

Heather Rumble, Kenton Rogers, Kieron Doick and Tony Hutchings
Comparing urban tree populations

The problem - Urbanisation

- 80% live in cities
- This will increase

- Environmental problems
  - Pollution
  - Flooding
  - Loss of wildlife
  - Urban heat island
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The solution – Trees?

• Provide numerous ecosystem services
  • Carbon capture
  • Filter airborne pollutants
  • Alleviate flooding
  • Provide habitat
  • Cool surrounding areas
  • Increase mental wellbeing
  • Aesthetic appreciation

Gaeser, 2009
Comparing urban tree populations

- How many trees are in the urban environment?
- What ecosystem services do they provide?
- What is driving urban tree populations?
- What challenges do urban trees face?
i-Tree

- Developed by the USDA
- Used worldwide
- Field based method to assess the ecosystem services provided by trees
Comparing urban tree populations

- How many trees are in the urban environment?
- What ecosystem services do they provide?
- What is driving urban tree populations?
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Comparing urban tree populations

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• What ecosystem services do they provide?
• What is driving urban tree populations?
• What challenges do urban trees face?
Comparing urban tree populations

• What is driving urban tree populations?
  • Species
  • Size
  • Land use types

• What challenges do urban trees face?
  • Pests and diseases
    • Diversity
  • Climate change
    • Drought
    • Waterlogging
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- Four i-Tree surveys
- 200-241 plots sampled
- Recorded land characteristics
- Recorded tree characteristics
  - Species
  - Height
  - Canopy width
  - DBH
  - Health
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Species composition – top ten species

All four study areas
• *Acer psuedoplatanus*
• *Fraxinus excelsior*

Three study areas
• *Cupressocyparis leylandii*
• *Crataegus monogynna*
• *Betula pendula*
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Individuals factor map (PCA)

Dim 1 (46.29%)
Dim 2 (29.21%)

Torbay
Wrexham
Edinburgh
Glasgow
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Edinburgh

- Sycamore: 12%
- Holly, common: 11%
- Silver birch: 8%
- Leyland cypress: 6%
- Ash, common: 6%
- Beech, common: 5%
- Rowan, common: 5%
- Other species: 35%
- Cherry (genus): 4%
- Wych elm: 4%
- Scots pine: 4%

Wrexham

- Sycamore: 16%
- Hawthorn, common: 12%
- Silver birch: 11%
- Ash, common: 5%
- English oak: 4%
- Goat willow: 4%
- Hazel, common: 4%
- Wild cherry: 4%
- Willow (genus): 4%
- Leyland cypress: 5%
- Other species: 31%

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Top ten species frequencies

Most common species

- Wrexham
- Glasgow
- Torbay
- Edinburgh

Frequency/%
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Frequency by land use type

Frequency/%

Land use type

- Park
- Agriculture
- Other
- Institutional
- Vacant
- Cemetery
- Residential
- Golf course
- Transport
- Commercial
- Utility
- Multi-family
- Wetland

- Edinburgh
- Glasgow
- Torbay
- Wrexham
Comparing urban tree populations

Size distributions

<table>
<thead>
<tr>
<th>Size class</th>
<th>Edinburgh</th>
<th>Glasgow</th>
<th>Torbay</th>
<th>Wrexham</th>
<th>&quot;Ideal&quot;</th>
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<tbody>
<tr>
<td>&lt;20</td>
<td>80%</td>
<td>60%</td>
<td>70%</td>
<td>50%</td>
<td>60%</td>
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<tr>
<td>20-40</td>
<td>40%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
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<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>20%</td>
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<tr>
<td>60+</td>
<td>10%</td>
<td>0%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
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</tbody>
</table>
Comparing urban tree populations

Diversity - The “10:20:30” rule

No species more than 10%:

- **Edinburgh**
  - *Acer pseudoplatanus*, 12%
  - *Ilex aquifolium*, 11%

- **Glasgow**
  - *Fraxinus excelsior*, 13%

- **Torbay**
  - *Cupressocyparis leylandii*, 16%
  - *Fraxinus excelsior*, 13%

- **Wrexham**
  - *Acer pseudoplatanus*, 17%
  - *Crataegus monogyna*, 13%
  - *Betula pendula*, 12%
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Diversity - The “10:20:30” rule

No genus more than 20%:

None

No family more than 30%:

None
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Private or public

Edinburgh
- Private: 64%
- Public: 27%
- Either: 9%

Glasgow
- Private: 56%
- Public: 42%
- Either: 2%

Torbay
- Public: 63%
- Private: 20%
- Either: 17%

Wrexham
- Public: 70%
- Private: 27%
- Either: 3%
Comparing urban tree populations

<table>
<thead>
<tr>
<th>City</th>
<th>Residential</th>
<th>Park</th>
<th>Commercial</th>
<th>Institutional</th>
<th>Agriculture</th>
<th>Vacant</th>
<th>Golf course</th>
<th>Multi-family</th>
<th>Transport</th>
<th>Cemetery</th>
<th>Other</th>
<th>Utility</th>
<th>Wetland</th>
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<td>Edinburgh</td>
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Diversity

<table>
<thead>
<tr>
<th>Land use type</th>
<th>Shannon Wiener diversity</th>
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<tbody>
<tr>
<td>TOTAL</td>
<td>3.2</td>
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<tr>
<td>Park</td>
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<tr>
<td>Institutional</td>
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<tr>
<td>Agriculture</td>
<td>1.5</td>
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<tr>
<td>Vacant</td>
<td>1.2</td>
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<tr>
<td>Golf course</td>
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<tr>
<td>Multi-family</td>
<td>0.9</td>
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<tr>
<td>Transport</td>
<td>0.8</td>
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<tr>
<td>Cemetery</td>
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<tr>
<td>Other</td>
<td>0.5</td>
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<tr>
<td>Utility</td>
<td>0.4</td>
</tr>
<tr>
<td>Wetland</td>
<td>0.3</td>
</tr>
</tbody>
</table>
Response to drought

- Wrexham
- Glasgow
- Torbay
- Edinburgh

Frequency/%

- ≤2
- >2, ≤3
- >3, ≤4
- >4, ≤5
- No index value

Title
Response to waterlogging, Glasgow

- ≤2: 48%
- >2, ≤3: 12%
- >3, ≤4: 18%
- >4, ≤5: 4%
- Data not available: 18%
Conclusions

• i-Tree
  • i-Tree data can be used beyond ecosystem services
  • i-Tree provides a standardised data collection method

• UK tree populations
  • Self-seeding pioneers most common
  • Abundances similar to Trees in Towns II
Conclusions

• Diversity
  • Maintained land uses generally more diverse
  • Some species exceeded 10% abundance
  • Genus and family limits were not exceeded
    • Tree officers may have data missing when assessing this

• Resilience to climate change
  • Torbay had lots of drought tolerant species
  • Glasgow had few waterlogging tolerant species
Acknowledgements

- Edinburgh City Council
- Glasgow City Council
- Wrexham County Borough Council
- Torbay Borough Council
- NRW
- FC Scotland
- i-Tree, USDA
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- CEH
- SEPA

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