The Impacts of Three Periods of Housing Development on the Urban Forest in Shrewsbury

Steve Shields
Tree & Woodland Amenity Protection Officer
Trees Are Good!
Trees Require Space & Resources

- Trees are living organisms that have complex needs.
- They are susceptible to change and disturbance to their environment.
- If we are to continue to benefit from urban trees then it is vital that we provide space and resources for them to establish and grow.
The Changing Urban Environment

The urban environment is one which is rapidly changing and expanding and this provides both threats and opportunity for our urban forest.

Growing Population – the UK population is predicted to grow by 15% over the next 25 years (ONS National Population Projections 2012).

To meet the demands of a larger population will require an increase in housing, services and infrastructure.
Background

- The Town & Country Planning Act 1990, places a general duty on the Local Planning Authority to make provision for the preservation and planting of trees when granting planning permission (section 197 TCPA 1990)

- Trees in Towns II identifies that built development is considered a significant threat to the extent and condition of the urban forest (Britt & Johnston 2008)

- The Tree Design Action Group guidance recommended that the planting and protection of urban trees is embedded into policies and other plans (Pauli M. ed. (2012)

- Research published by ciria notes that ‘The majority of applications for development are determined by the Local Planning Authority, in accordance with the policies in the local development plan. Effective local policies are vital for tree protection’ (Armour et al 2012)
How much do we know about our Urban Forests?
The Urban Forest in Shrewsbury

- What is the extent?
- Who owns it?
- What is it comprised of?
- What are the costs?
- Is it changing?

- What condition is it in?
- Where is it?
- What are the benefits?
- What are the threats?
- Is it sustainable?
The Shrewsbury i-Tree Project

FINDING THE ANSWERS
Research Questions

- Does the current Urban Forest meet our needs and is it viable and sustainable?

- What are the long-term implications of any change in respect of the quality, quantity and viability of the urban forest resource?

- What factors impact on the urban forest resource and can they be controlled by local government policy, tree management practice or by strategic planning?
Project Objectives

- Identify study areas
- Gather data about the Shrewsbury’s urban forest
- Verify data
- Digitise data
- Extrapolate and analyse data
- Evaluate results from data analysis
- Develop conclusions
Research Methodology

- Physical study area defined as the current urban area of Shrewsbury and the proposed urban extensions 2248.5 ha
- Sample survey undertaken in accordance with itree sample inventory protocol to provide a standard deviation of +/- 10%.
- Species, height, canopy size, ownership, age class and life expectancy recorded for all trees and large shrubs in sample plots
- Data on land use and ground cover recorded for all sample plots
## Volunteers and the Shrewsbury i-Tree Project

<table>
<thead>
<tr>
<th></th>
<th>No plots completed</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volunteers</strong></td>
<td>99</td>
<td>Site of varying complexity but all were mostly accessible / visible from a public open space.</td>
</tr>
<tr>
<td><strong>Coordinator / Tree Officers</strong></td>
<td>84</td>
<td>Difficult plots, or plots requiring permission for access single/multiple back gardens, school grounds and the like.</td>
</tr>
<tr>
<td></td>
<td>47</td>
<td>Sites done by desk assessment, open grassland, car parks / hard standing and industrial units etc.</td>
</tr>
</tbody>
</table>
VOLUNTEERS AND THE SHREWSBURY i-TREE PROJECT

Break-down of co-ordinator time on survey elements by hours
Main physical study area stratified to provide discrete areas:

- Commercial & Industrial
- Institutional
- Open space
- Residential pre 1950 (279 ha)
- Residential 1951 – 1984 (840.5 ha)
- Residential 1985 – present (320 ha)
Research Methodology

- Data verified by in field checks and desktop assessment
- All data loaded into excel spreadsheets for analysis
- Data extrapolated for study areas
- Results calculated
Results

### Urban Forest Metrics Summary

<table>
<thead>
<tr>
<th>Study Area</th>
<th>Canopy Cover</th>
<th>Trees per Ha (Total)</th>
<th>Average Tree Canopy Diameter</th>
<th>Average Stem Diameter @ 1.5m</th>
<th># Species Ha</th>
<th>Ownership</th>
<th>Age Class</th>
<th>LE **</th>
<th>Size Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Shrewsbury Town (2248.5)</td>
<td>14%</td>
<td>77.6 (172,320)</td>
<td>4.2m</td>
<td>21.9cm</td>
<td>65</td>
<td>Public 41% Private 59%</td>
<td>1 17% 2 48% 3 35%</td>
<td>1 16% 2 43% 3 41%</td>
<td>L 40% M 30% S 30%</td>
</tr>
<tr>
<td>Residential Areas up to 1950 (279)</td>
<td>17.8%</td>
<td>85.5 (23,865)</td>
<td>4.6m</td>
<td>22.3cm</td>
<td>37</td>
<td>Public 12% Private 88%</td>
<td>1 20% 2 53% 3 27%</td>
<td>1 18% 2 42% 3 40%</td>
<td>L 44% M 35% S 21%</td>
</tr>
<tr>
<td>Residential Areas 1951 – 1985 (840.5)</td>
<td>12.7%</td>
<td>89.4 (75,458)</td>
<td>5.0m</td>
<td>21.1cm</td>
<td>50</td>
<td>Public 35% Private 65%</td>
<td>1 21% 2 48% 3 31%</td>
<td>1 22% 2 40% 3 38%</td>
<td>L 38% M 20% S 42%</td>
</tr>
<tr>
<td>Residential Areas 1985 – present day (320)</td>
<td>10%</td>
<td>67.2 (21,547)</td>
<td>3.8m</td>
<td>19.8cm</td>
<td>31</td>
<td>Public 38% Private 62%</td>
<td>1 27% 2 55% 3 18%</td>
<td>1 18% 2 42% 3 40%</td>
<td>L 32% M 28% S 40%</td>
</tr>
</tbody>
</table>

Table 1: Urban Forest Metrics Summary

* Age class is based on 3 classes, 1, young and semi mature trees, 2, trees in early maturity, 3, trees that are mature to late maturity

** Life Expectancy is based on 3 classes, 1, trees expected to survive less than 10 years, 2, trees expected to survive between 10 & 40 years, 3, trees expected to survive beyond 40 years. This is based on the assessor’s opinion of the tree’s condition, longevity of the species, location of the tree and any relevant environmental factors.
# Shrewsbury Urban Forest Benefits

<table>
<thead>
<tr>
<th>Structural Value</th>
<th>£511,878,884</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pollution Removal</strong></td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>Kg/PA</td>
</tr>
<tr>
<td>397</td>
<td>+/− SE</td>
</tr>
<tr>
<td>27</td>
<td>£/PA²</td>
</tr>
<tr>
<td>O₃</td>
<td>21,527</td>
</tr>
<tr>
<td>1,478</td>
<td>2,159.09</td>
</tr>
<tr>
<td>NO₂</td>
<td>2,159</td>
</tr>
<tr>
<td>145</td>
<td>62,153.20</td>
</tr>
<tr>
<td>SO₂</td>
<td>1,360</td>
</tr>
<tr>
<td>90</td>
<td>2,542.80</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>1,043</td>
</tr>
<tr>
<td>72</td>
<td>547,009.3</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>7,212</td>
</tr>
<tr>
<td>498</td>
<td>613,888.56</td>
</tr>
<tr>
<td>Total</td>
<td>336,982</td>
</tr>
</tbody>
</table>

| **Carbon Storage**      | Tonnes       |
| 110,519.2               | 7,614        |

| **Carbon Sequestration**| Tonnes       |
| 4,383.3                 | 301          |

1. Based on CAVAT assessment. 2 Based on UK Social Damage Cost. 3. Based on UK Costs PA = Per Annum SE = Statistical Standard Error

CO Carbon
O₃ Ozone
NO₂ Nitrous Dioxide
SO₂ Sulphur Dioxide
PM₂.₅ Particulate Matter less than 2.5 microns
PM₁₀ Particulate Matter greater than 2.5 but less than
Composition & Species Diversity

Area A - Thirty-seven different species of tree were recorded in the sample. The most frequent occurring species was Lawson cypress (14.5%) followed by birch (8%), holly (6%), yew, apple, cherry, leylandii & Norway maple (4.5%). The top five ranking species make up 37.5% of the total urban forest in this area.
Area B - fifty different species recorded in the sample. The most frequent occurring species was apple (13.5%) followed by hawthorn (10.5%), ash (9.8%), Lawson cypress (9.3%) birch (5.6%). The top five ranking species make up 48.7% of the total urban forest in this area.
Area C - thirty-one different species recorded in the sample. The most frequent occurring species was ash (15%) followed by hawthorn (11%), field maple (8%), apple (7%) Lawson cypress (6%). The top five ranking species make up 47% of the total urban forest in this area.

Species Composition; Area C

- Ash: 31%
- Hawthorn: 15%
- Field Maple: 11%
- Apple: 8%
- Grey Alder: 7%
- Sycamore: 6%
- Lawson Cypress: 5%
- Beech: 4%
- Ornamental Cherry: 3%
- Rowan: 3%
- Silver Birch: 3%
- Other: 3%
Physical Structure

Tree Distribution by Size Class

- S
- M
- L

Size Class

Frequency %

C  B  A
Physical Structure

DBH Range of Trees by Study Area

<table>
<thead>
<tr>
<th>DBH Class (cm)</th>
<th>Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 20</td>
<td>21</td>
</tr>
<tr>
<td>21 - 40</td>
<td>28</td>
</tr>
<tr>
<td>41 - 60</td>
<td>24</td>
</tr>
<tr>
<td>61+</td>
<td>25</td>
</tr>
<tr>
<td>0 - 20</td>
<td>4</td>
</tr>
<tr>
<td>21 - 40</td>
<td>5</td>
</tr>
<tr>
<td>41 - 60</td>
<td>2</td>
</tr>
<tr>
<td>61+</td>
<td>6</td>
</tr>
<tr>
<td>0 - 20</td>
<td>4</td>
</tr>
<tr>
<td>21 - 40</td>
<td>10</td>
</tr>
<tr>
<td>41 - 60</td>
<td>4</td>
</tr>
<tr>
<td>61+</td>
<td>10</td>
</tr>
</tbody>
</table>

Frequency %

- A: 65%
- B: 63%
- C: 70%
- Shrewsbury: 65%
- Ideal: 40%
- C: 30%
- Ideal: 20%
Age Structure

Distribution by Age Class

- Shrewsbury
- Area A
- Area B
- Area C

- Young
- Early Mature
- Mature / Late Mature
Life Expectancy

Area A

Area B

Area C

Life Expectancy

> 10 yrs  10 - 30 yrs  30+ yrs
The Next Steps
References

- Town & Country Planning Act 1990
- Map Data © 2015 Google
Acknowledgements

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