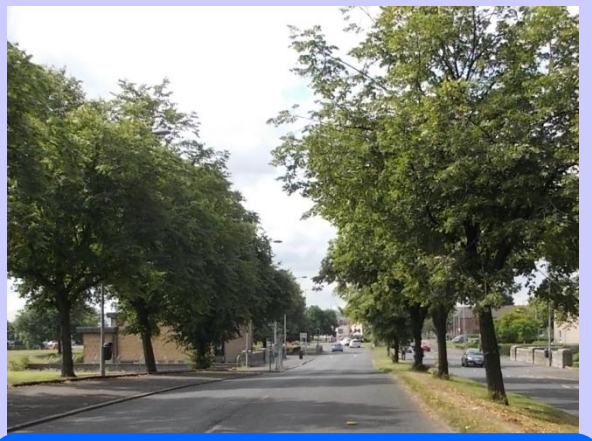
Valuing ecosystem services provided by Glasgow's urban trees

Urban forests are a valuable source of ecosystem services in towns and cities. They improve local air quality, offer shade and cool the air, capture carbon, reduce flooding and provide food and habitat for animals, such as insects and birds. Valuing ecosystem services helps tree officers to manage urban trees, and town planners and landscape architects plan where trees can be planted for the maximum benefit. In summer 2013, Forest Research in partnership with Glasgow City Council and Forestry Commission Scotland conducted a study to measure and value Glasgow's urban trees using i-Tree Eco, a model developed by the i-Tree Cooperative in the US.



The ecosystem services provided by Glasgow's urban trees were valued at more than £4.5 million per year

Background

Urban trees benefit people who live and work in towns and cities by providing a range of ecosystem services and these can be valued using models like i-Tree Eco.

The i-Tree Eco study in Glasgow focussed on the ecosystem services: carbon capture, rainwater interception, the removal of air pollution, habitat provision and visual amenity.

The threat to trees posed by pests and diseases, such as Chalara ash dieback, and the cost to replace Glasgow's urban trees if they were lost was also calculated.

Objectives

This project aimed to:

- Identify tree location, species, sizes and health
- Calculate the ecosystem services they provide
- Determine where more trees could be planted

Methods

Forest Research surveyed 200 plots selected at random across Glasgow.

Information on 898 trees was recorded, including species, height and canopy size. Details about the location were also recorded, including information about land uses and ground cover.

The cost of replacing the trees was calculated using tree valuation methods published by the Council of Tree and Landscape Appraisers and the London Tree Officers Association.

Data collected in the field was combined with local climate, phenology and air pollution data and submitted to Davey Tree (part of the i-Tree Cooperative) for modelling in i-Tree Eco v5 to produce estimates of ecosystem service provision, adjusted for UK prices to assess their value.

Findings: Glasgow's Urban Forest...

- Has an above average tree density of 112 trees per hectare. Canopy cover is high compared to the average in England, but lower than in Edinburgh
- Has a higher proportion of large trees (stem diameter >60 cm) than previous UK i-Tree studies, although a lack of medium sized trees puts this at risk in the future
- Has ash (13%), hawthorn (11%) and alder (7%) as the top-3 most common species present. 65% of the trees are native to Scotland. Willows and oaks, of all the tree species present, support the most insect species
- Is healthy on the whole - 90% of trees are healthy with less than 5% of the trees displaying more than 25% of their crowns dying-back
- Is mostly found in parks (55%), on vacant land (17%) and in residential areas (12%).

Ecosystem Service Provision: Glasgow's trees...

- Intercept 812 000 m^3 of rainfall per year, equivalent to £1.1 million in sewerage charges
- Remove 283 tonnes of air pollution each year; worth £1.4 million in health damage costs
- Store 183 000 tonnes of carbon, which is worth £40 million
- Remove an estimated 9 000 tonnes of carbon from the atmosphere every year. This is worth £2.04 million and is enough to offset 177% of the total estimated annual CO_2 emissions produced by all the cars owned in Glasgow
- Have a replacement value of £4.6 billion. An alternative valuation taking account of the health of the trees and their visual amenity valued Glasgow's urban forest at £4 billion
- …in terms of ecosystem service provision, Ash, Hawthorn and Sycamore are the three most important species due to their size, leaf area and frequency across Glasgow's Urban Forest.

Threats to and opportunities for Glasgow's Urban Forest

- Acute oak decline and Chalara dieback of ash are significant biological threats to Glasgow's urban forest. Both are already present in the UK and could affect 17% of the tree population
- Regeneration poses a real threat as vacant land holds a significant number of Glasgow's trees
- Up to 32% of Glasgow's urban space is available to plant new trees or shrubs.

Recommendations

This study demonstrates the value that urban trees provide, for all who live in, work in and visit Glasgow. Up to 32% of Glasgow's urban space could be planted with trees. As trees capable of attaining large stature, such as limes, oaks and pines, provide more ecosystem services per tree so species choices should reflect this. It is recommended that more small and medium trees are planted to obtain a healthy range of sizes overall. Three tree species were very common, making up more than 30% of the population. Planting a wider variety of species would decrease the risk of the urban forest succumbing to pests and diseases. A repeat survey is recommended every 5-10 years to support the management and planning of Glasgow's urban forest.

Partners
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