£ The Value of Naturalistic Urban Planting in Runcorn, UK £

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Introduction:

The concept of ecosystem services was created as a means to communicate the value of biodiversity and ecosystem functioning within political and economic arenas (Gómez-Baggethun *et al.,* 2010). Constanza *et al.,* (1987) defines ecosystem services as "the benefits human populations derive, directly or indirectly, from ecosystem functions".

Research objective: To identify the ecosystem services of naturalistic urban planting and how these services respond to drivers of change.

Method:

Study area: This study has been carried out within the town of Runcorn, in Northwest England. During the development of Runcorn existing topography and vegetation was complemented by large scale landscaping and tree planting. This landscaping and planting began in 1966 and was completed in 1972.

Forty five randomly selected sites of naturalistic planting in Runcorn have been surveyed. Each individual tree was identified, recorded and the trunk diameter was measured at chest height (1.3 metres).

i-Tree Streets: The computer program i-Tree Streets (developed by researchers USDS Forest service in the United States of America) has been used to calculate a price for the annual energy conservation, carbon dioxide (CO_2) reduction, air quality improvement, and rainfall interception associated with urban trees. Energy conservation presents the contribution of the Urban planting toward conserving energy in terms of reduced natural gas use in winter and reduced electricity use for air conditioning in summer.CO_2 reduction is calculated from the amount of atmospheric CO_2 sequestrated by trees. Air quality quantifies the air pollutants (O_3, NO_2, SO_2, PM10) deposited on tree surfaces. Rainfall interception presents the reductions in annual rain water runoff due to interception by trees.

Results:

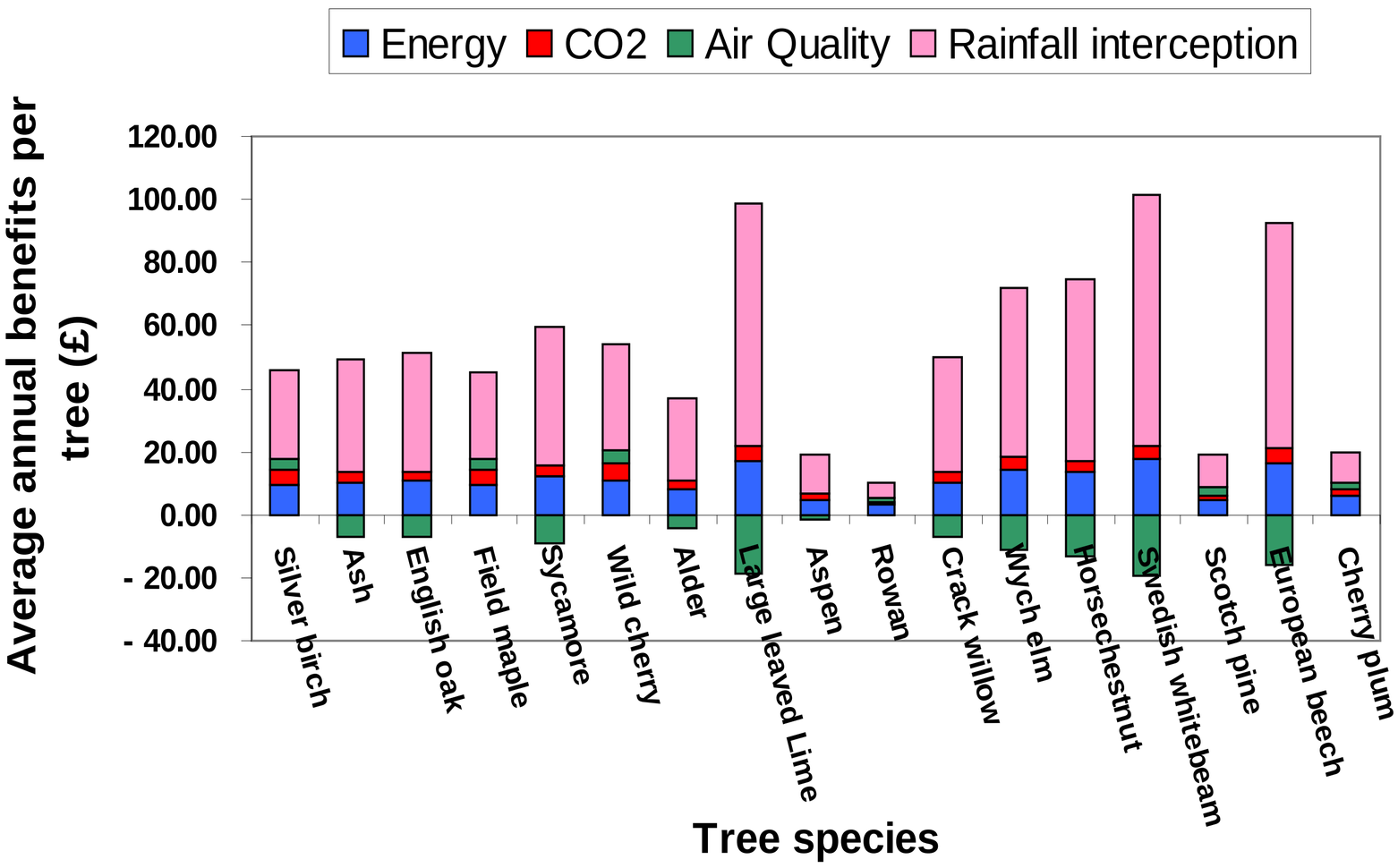

Figure 1 The average annual price value per tree for the 17 most common tree species recorded in Runcorn. Where there is a negative value for air improvement this indicates that maintenance costs are higher than the benefit produced.

Ecosystem services	Price (£)
Energy conservation	10.32
Carbon dioxide reduction	3.68
Air quality improvement	-3.79
Rainfall interception	35.51
Total	45.72

Table 1 average annual benefits of each tree recorded in the sampling sites.

3,184 trees were recorded in the sampling sites. All forty five sites cover 160,130m^2 at 0.02 trees per m^2. There is a total of 862,052m^2 of naturalistic planting in Runcorn.

0.02 x 862,052 = 17,241 trees.

£45.72 x 17,241 = **£788,258** per year

Discussion:

Built up areas can cause alterations to water flow; this is due to expanses of tarmac and concrete. These impervious surfaces cause surface run off; which can cause flooding and degrade water quality (Alberti *et al.,* 2003). Water regulation carried out by urban vegetation can help reduce these effects (de Groot *et al.,* 2002). Rainfall interception was the most valuable service of Runcorn's trees. The energy conservation of Runcorn's trees is also a valuable service. There is a growing concern that rising temperatures due to climate change may have an adverse effect on public health in the UK especially within urban areas. Runcorn is expected to experience warmer, drier summers and warmer, wetter winters. Trees will help mitigate the adverse impacts of climate change through the provision of shade and reduced flooding (Gill *et al.,* 2007).

Ecosystem services are increasingly recognised as a concept that can aid the sustainability of ecosystems. Recommendation 17 in Lawton *et al.* (2010) is for the government to create markets and payment for ecosystem services to encourage the value of ecosystem services to be taken into account when making decisions that affect the natural environment (Lawton *et al.,* 2010). The results presented here demonstrate that Runcorn's trees are worth a large amount each year for the provision of four ecosystem services.

Calculated benefits and costs from I-Tree Streets are approximations as there is limited knowledge about the physical processes at work and their interactions makes estimates imprecise (e.g., fate of air pollutants trapped by trees and then washed to the ground by rainfall).

Future work: Four future scenarios for areas of naturalistic urban vegetation have been developed and the associated changes to their ecosystem services will be calculated. These scenarios represent a range of possible situations that could occur between 2011 and 2060. The aim of these scenarios is to stimulate thought, discussions and new ideas amongst and owners regarding future management strategies of areas of naturalistic urban vegetation to *circa* 2060.

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