

Discussion Paper

# Trees in our towns

The role of trees and woodland  
in managing urban water  
quality and quantity

December 2012



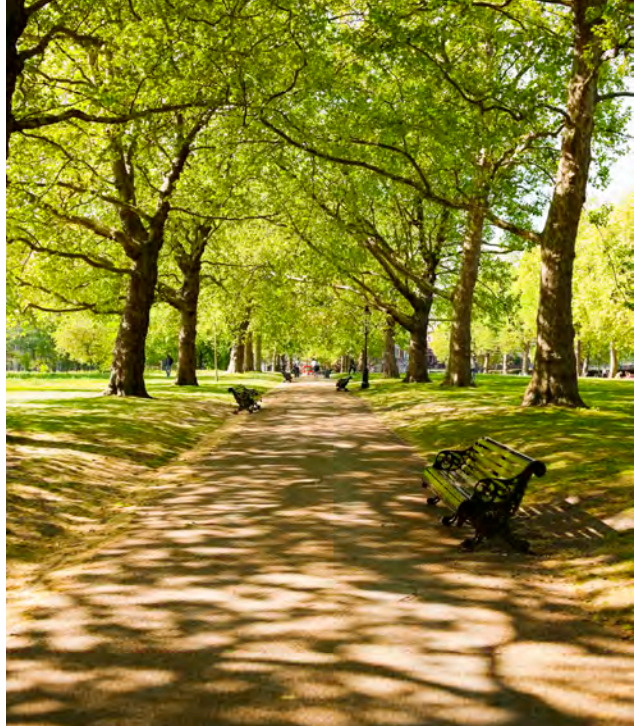
WOODLAND  
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# Trees in our towns

How integrating trees into our towns and cities can improve water quality, help mitigate flooding and benefit society.

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*istock/Stacey Newman*

*Trees help create places where people want to live, work and visit.*

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## Introduction

This report focuses on the role of trees, tree planting and green space in managing water in urban areas. Trees in villages, towns and cities can play an important part in water management, including safeguarding water quality and contributing to flood alleviation. While central and local government have a critical role, individuals and businesses are also key to improving local water quality and reducing flood risk.

Previous research has looked at the role of trees and woods in water management across the landscape and specifically in urban areas<sup>1</sup>. This report aims to relate this research to specific measures which people and businesses can take to help improve water quality and reduce the risk of flooding in urban areas.

Increasing woodland and tree cover in urban areas also brings a range of additional benefits: improved air quality, mitigating the 'urban island heat' effect, supporting wildlife, and providing pleasant places to walk and relax.

With estimates indicating that air pollution reduces life expectancy in the UK by seven to eight months, trees can help by removing pollutants such as ozone, nitrogen dioxide and particulates from the air. Poor air quality combined with high temperatures also increases the risks of cardiovascular and respiratory disease, especially in the elderly and vulnerable. Tree shade can help mitigate the effect of the urban heat island, where built-up areas absorb and retain heat more than the surrounding landscape.

Trees, woods and green spaces are also special places which people cherish. Alongside providing vital habitat for wildlife, regular access to green space has been shown to support healthy lifestyles. Regular connection with the natural environment has been linked to reductions in obesity, heart disease, diabetes, cancer, stress, ADHD, aggression and criminal activity. Trees inspire us, soothe us and offer places for exercise, rest and play.



*Istock/Libby Chapman*

*Pollution in urban areas comes from a wide range of sources and is carried through runoff into drains and water courses.*

## Why is water an issue?

In recent years, we have seen an increase in flooding in the UK. Heavy storms are becoming more common and it is predicted that changing weather patterns are likely to continue<sup>2</sup>. Winter rainfall has also increased throughout the UK over the last 40 years. While heavy and prolonged rainfall is undoubtedly a primary cause of flooding, there are many factors which contribute to flood risk and water quality, including the capacity of the drainage system and sewers to cope with increased rainfall; more homes in vulnerable areas such as flood plains, and changes in land use in urban areas<sup>3</sup>.

### Water quality

Water quality is affected by the type and quantity of pollutants entering water bodies such as streams, lakes and rivers. Pollution in urban areas comes from a range of sources including;

- pollutants from cars and transport in exhaust emissions,
- leaking oil, rubber and metal from tyres and brakes
- soaps and grease from cleaning vehicles
- chemicals and fertilisers used in parks and gardens
- silt and soil washed from vegetation, bare areas of gardens and the landscape of towns
- discarded food waste and refuse
- animal faeces, for example from dogs, cats and birds

Any of these can end up entering drainage water, adding to the costs of treatment or damaging water bodies. These pollutants can have a direct toxic effect on aquatic life, or add sediments to the water making it muddier and cloudier. They can also enrich the nutrient status of the water leading to 'eutrophication'.

Eutrophication is the process by which a body of water acquires high concentrations of nutrients, especially phosphates and nitrates. This can cause excessive growth of algae which, as they die and decompose, depletes the water of available oxygen leading to the death of fish and other wildlife. Under particular environmental conditions, the decay of algal blooms can lead to a build up of bacteria which release toxins that are a danger to humans and pets, and can cause the death of fish and other aquatic life.

When storm water can infiltrate into the soil (or through porous surfaces), plants and microbes can filter and break down many of the common pollutants<sup>4</sup>. However following heavy rainfall, when drains can be overwhelmed, pollutants dissolved or suspended in the storm waters may be carried directly into water bodies.

**“Around two thirds of all the flooding in 2007 was as a result of surface water run off”**

## Flooding

**Surface water flooding can be a real danger to people and property, and represents the most significant flood risk to UK households.** In towns, the large areas of hard surfaces unable to absorb rainfall, such as concrete and tarmac, often mean that water quickly collects on the surface before rushing down streets and into drains, overwhelming them. The way we live can exacerbate the problem - by paving over our front gardens to provide parking spaces for cars for example, we reduce the availability of porous surfaces where rain water can infiltrate and increase the risks associated with surface water run off.

Following the 2007 floods, the Pitt Review identified the paving over of front and rear gardens as a major factor in surface water movement in towns and cities. Around two

thirds of all the flooding in 2007 was as a result of surface water run off<sup>5</sup> and with heavier storms predicted to become more frequent, finding ways to better manage water becomes increasingly urgent.

The Pitt Review charged the Environment Agency to work with local authorities to address issues of surface water flooding. Local authorities are committed to managing surface water more sustainably, including improving the capacity for infiltration into the ground and use of green space for storage of water following extreme downpours. This enables water to be increasingly managed on the surface, rather than relying on wholesale upgrade of the sewer system which is recognised as both costly and a lengthy process<sup>6</sup>.



*Istock/Agmit*

*A combination of increased frequency of heavy rainfall, more hard surfaces and a loss of trees and green space all contribute to increasing flood risk and a resulting decline in water quality.*



*iStock/justhavealook*

*Incorporating trees and green space into urban design can help slow the rate at which water enters drains and sewers.*

## How can trees and green space help?

Trees and other green spaces intercept rain, reducing the volume and rate of runoff. The leaves, branches and trunks of trees slow the speed at which rain reaches the ground, with some rain evaporating into the atmosphere<sup>7</sup>. For native deciduous trees, the interception effect is greatest during the summer (when in full leaf), but they still intercept up to 12% of rainfall during the winter<sup>8</sup>.

Interception by trees increases the volume of water that infiltrates into soil, giving drains longer to carry rain away. Slowing the speed at which rainwater reaches the drains both reduces the risk of surface water flooding and pollutants harming water quality.

Preliminary research results from the University of Manchester indicate that trees can reduce runoff by as much as 80% compared to asphalt<sup>9</sup>. Results from modelling suggest that increasing tree cover across an urban area by 10% can reduce surface water runoff by almost 6%<sup>10</sup>.

However, in many places there has been a decline in the number of older trees with large spreading crowns, with smaller alternatives often chosen as replacements. These smaller crowned trees are often easier to manage but have a reduced capacity to intercept rain. A report for Government entitled 'Trees in Towns II' challenged this trend, highlighting the "undeniable" importance of mature and ancient trees<sup>11</sup>.

Recent years have also seen a decline in the numbers of trees planted in urban areas. When combined with a loss of trees planted during the Victorian era, this should send a warning signal about the future for trees in our towns and cities – especially when we also consider all the other benefits trees in urban areas bring such as shade and shelter, helping to improve air quality and creating habitat for wildlife.



Henry Law

An increase in paved areas has exacerbated runoff. Using porous or permeable surfaces and planting trees and other green space can increase infiltration and reduce the risk of surface flooding.



*Sustainable Urban Drainage Scheme developed at Percival Triangle in London Islington.*

*Craseman Landscape Architecture*



# How can we increase urban tree cover?

## Planting in public spaces – parks and developments

Maintaining and increasing tree cover in urban areas is one critical element among a range of measures to manage water sustainably. Trees, in addition to and as part of Sustainable Urban Drainage Schemes (SUDS), can reduce the risk of flooding, as well as helping to allow natural processes to break down pollutants in drainage waters<sup>12</sup>.

This type of approach requires planting trees and constructing drainage swales and ponds close to the areas which generate runoff, such as around housing developments, business parks, large car parks and roads. Ideally these natural features should be included as part of the urban design, along with measures to increase porous surfaces wherever possible. Trees can also help make urban spaces more attractive to businesses, generating inward investment.

However the retrofitting of trees into areas at risk from surface water flooding can also make a significant contribution to reducing runoff. This includes planting of street and verge trees, trees in car parks, planting of banks and slopes prone to runoff and in parks and gardens.

Local authorities and other public bodies could consider planting trees on their hard surfaced areas and open spaces. In some circumstances, this can actually be cheaper than management of open spaces. A report to the Woodland Trust by Land Use Consultants suggested that even complex mixed woodland planting can be cheaper to maintain than amenity grassland<sup>13</sup>.

## Private spaces - gardens, grounds and businesses.

In residential areas, action by households and neighbours can make a real difference to the risk of run off and flooding. While measures such as green roofs can be expensive, simple changes such as installing water butts to capture water from roofs and gutters can help manage storm waters.

Businesses can also help by installing rainwater storage tanks to capture water coming from the roofs of offices and commercial buildings. This water may also be used to irrigate landscaped areas or in the flushing systems of WCs, reducing water use and meter charges. When paving over drives or gardens, or creating large new areas of hard standing, using porous materials such as gravel or permeable paving blocks will have a big impact. This increases the percentage of water which can infiltrate into the sub base, reducing the load on sewers and associated pollution.

In both new developments and existing premises, tree planting by businesses brings a range of benefits. In addition to water management, trees provide shade and shelter, reducing energy costs for air conditioning in summer and heating in winter.

Concern is sometimes raised about the impact of tree roots on buildings and underground services. It is important to choose the right tree for the space available. However even in small gardens, a space for trees or shrubs can usually be found, without causing any harm. There are many trees to choose from but native species are particularly good for supporting wildlife in urban areas. For help and advice choosing a tree, visit: [woodlandtrust.org.uk/water](http://woodlandtrust.org.uk/water)

## Community and school plantings

Around two thirds of urban trees are in private or less accessible public grounds - gardens, schools, allotments and churchyards. Maintaining and planting more of these trees gives people the chance to increase tree cover in their area.

Planting in school grounds, especially around hard surfaced areas, reduces runoff and helps lower children's exposure to UV radiation<sup>14</sup>. Tree planting gives children the chance to take an active role in improving their school, learn about the natural environment and gain new skills and experiences. Natural shade protects children during playtimes and helps create outdoor learning areas.

The UK also has the world's highest rate of childhood asthma<sup>15</sup>. While some hay fever sufferers are allergic to tree pollen, trees capture airbourne pollutants, improving air quality overall.

Community tree planting schemes can transform neighbourhoods - improving their appearance, supporting wildlife and managing water. Community garden projects or communal space plantings (such as allotments) can make a big impact on water in a relatively short space of time (with care taken to secure the necessary permissions).

The Localism Act 2011 is intended to increase the influence local communities have over planning. People can get involved through the consultation process with Local Plans and in the development of Neighbourhood Plans. These are important frameworks which shape the way land is used. Further information on how to get involved can be found at [planninghelp.org.uk](http://planninghelp.org.uk)

## We can all do our bit

Trees and green spaces are vital features in our villages, towns and cities. Not only do they help create beautiful areas where people want to live, work and visit, but also help improve air quality, provide shelter and shade and support wildlife. Critically they offer a sustainable and effective way to manage water, both reducing the risk of surface water flooding and improving water quality.

While Government and public bodies have an important role in managing urban green space, we can all do our bit to make our towns and cities better and safer places. Planting trees is a great activity for people of all ages and abilities – from a pot on a balcony to a new tree in your garden or community space, watching your tree grow is a satisfying and rewarding experience.

Small actions can make a big difference - you can find out more about tree selection, planting and aftercare alongside information about the Woodland Trust's free tree packs for schools and community groups at [woodlandtrust.org.uk/planting](http://woodlandtrust.org.uk/planting)



WTPLJJanette Wickens

School children with the Ham United Group in Richmond plant a Woodland Trust free community pack to enhance their local park.

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Flooding in Dyers Lane, Ormskirk in 2012, where some residents needed to be evacuated.

Geograph / Bryan Pready



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