Dublin City Tree Strategy 2016–2020

Comhairle Cathrach Bhaile Átha Cliath
Dublin City Council

Nature is not a place to visit. It is home.

— Gary Snyder

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Woodland at St. Anne's Park
Photo by Liz Stowe

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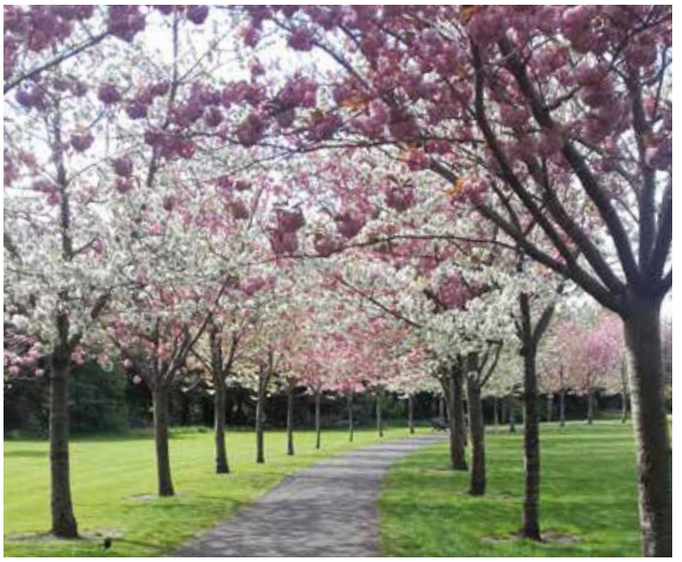
London Plane, The Four Courts, Dublin.
Photo by Anthony Woods.

1.0 The Role of the Tree Strategy



Beech Tree, Bushy Park. Photo by Anthony Woods.
Cherry Blossom, Herbert Park.

A planted tree is a promise. It is through growth over time that a tree can fulfil its potential to deliver its full range of benefits and, through these, a return on investment. As such, trees have a very different lifecycle to most other public assets: their value increases with time.

Tree strategies in turn are relatively long-term, reflecting the life expectancy of trees and the broader aspiration of tree population management. The Tree Strategy seeks to provide a coordinated approach to the management of trees in Dublin City. The strategy will set out a vision for the management of public trees according to a long-term plan. It also creates a greater awareness of, and appreciation for this valuable resource within the local authority, other relevant agencies and among the public.

The Strategy comprises three main sections:

- **Trees in Dublin City** – A review of the city's Treescape, the importance of urban trees, their current management and a review of existing data on the urban tree population.
- **Tree Policy** – A description of the general and specific policies Dublin City Council has regarding trees and tree work.
- **Action Plan** – A framework to implement the tree policy, setting out appropriate objectives and associated actions, responsibilities and target dates for completion.

2.0 **Trees in Dublin City**

O'Connell Street, early 20th century.

2.1 Dublin City Treescape

Trees help define Dublin as a capital city and are an important asset. Within the natural setting of the river, the bay and the mountains to the south, Dublin City's identity is expressed in a pattern of tree lined streets and open spaces.

Trees form an integral part of the urban fabric of Dublin City whether they are in public or private ownership. The river Liffey, with the canals, containing both the 'old' city and the unique Georgian squares and streets, together with the larger areas of Victorian architecture both north and south of the canals, underpin the city's strong character and identity, which is recognised internationally.

In the historical development of the city, tree planting has been carried out to great effect and to the continued appreciation of its citizens and visitors. A review of older city maps and records indicates the use of tree planting in parks, streets and private lands, which has created a legacy and tradition for our city that must be sustained for future generations.

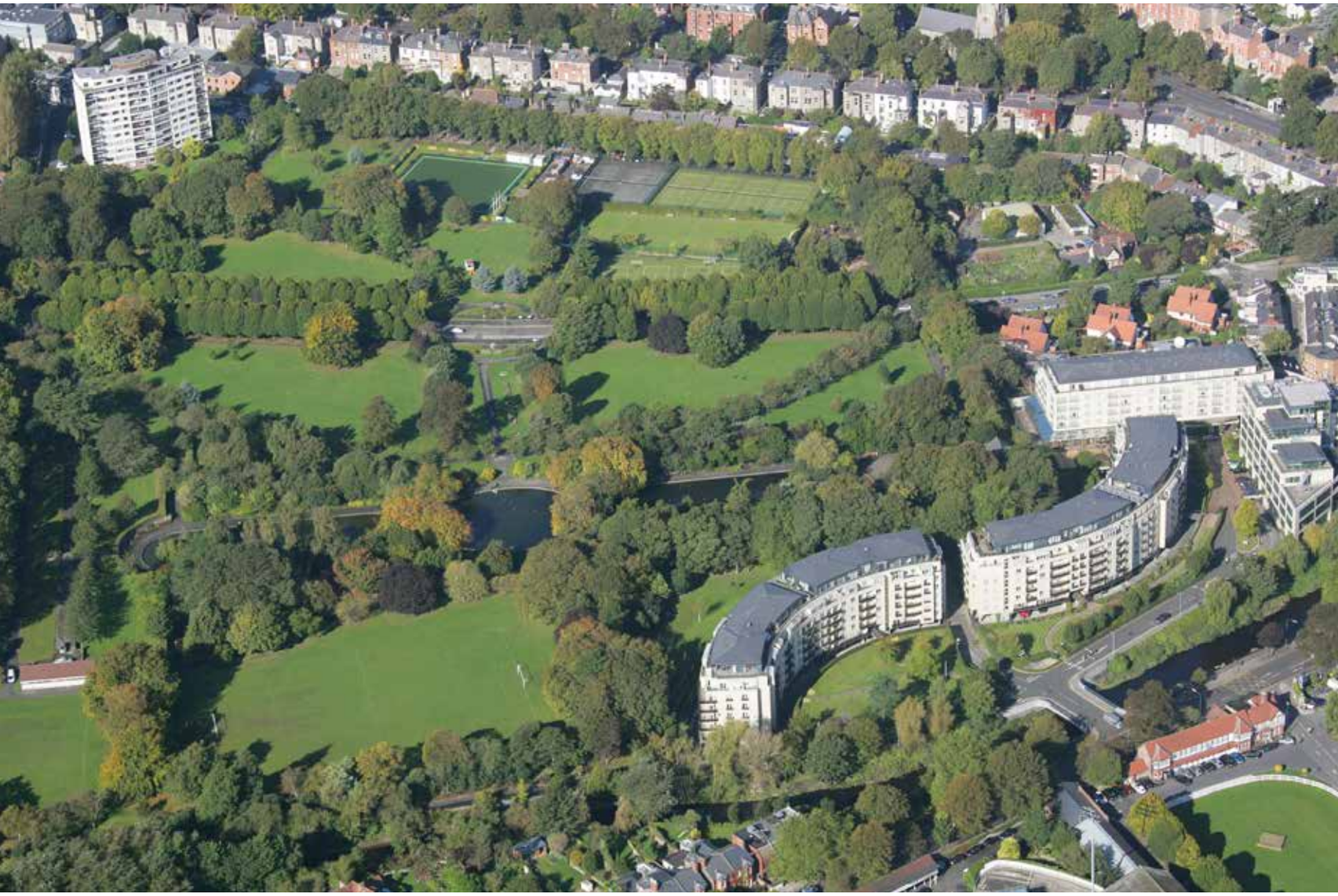
Trees contribute to urban design and can help define spaces, as at the front of the GPO and reinforce views as is most evident along Griffith Avenue. They can also create areas of particular urban character and ambience as the use of the term Dublin's leafy suburbs suggests and they provide a verdant frame for our historic buildings.

According to the Dublin Chamber of Commerce, 500,000 people travel within Dublin City Centre every day. This is made up of circa. 235,000 work related trips, 45,000 education trips, and 120,000 visitors/tourists/shoppers. These figures alone highlight the importance of having the city's public transport, cycling and walking system interwoven with a quality, diverse population of urban trees. In short, the vision promoted by the strategy is for a capital city where our public trees are managed effectively and sustainably to enhance the city environment in which to live, work and visit.

Herbert Park.
Photo by Peter Barrow.

Dublin City Squares.

Trees along Grand Canal Dock.



London Plane leaves.
Photo by Anthony Woods.

2.2 Current Management

The city's public trees have been actively managed by the Parks Service since its establishment in the 1950s. Our public trees together with privately owned trees collectively help to create an urban forest of great value. There are an estimated 60,000 street trees and 40,000 trees in public parks within the city. Tree works involve tree planting and establishment operations, as well as tree surgery works which are carried out directly by parks staff or by specialist contractors. An average of 5,230 trees in total are planted across the city each year consisting of 1,827 standard trees and 3,403 smaller transplants. Tree Planting is organised through an annual tree planting programme, whereby staff, responding to planting requests and new planting opportunities, forward their tree schedule for central coordination and procurement.

Please refer to Appendix 11 for a Review of Existing Data on Dublin City's trees including Analysis of Annual Tree Planting

Benefits of Trees

2.3 Importance of Trees in the City

Trees are a valuable functional component of the urban landscape – they also make a significant contribution to people's health and quality of life. Within the city, trees clean the air, provide natural flood defences, mask noise and promote a general sense of wellbeing. Within the higher density areas of the city trees have considerable beneficial impacts on the lives of those who do not have immediate access to other more traditional types of open space. Trees, for example, can add colour, interest and beauty to our busy streets.

Within the city, urban trees contribute significantly towards many environmental and social benefits, such as journey quality, biodiversity, temperature regulation and habitat.

Some of these benefits or ecosystem services are visualised in the illustration to the right.

Within the city, trees clean the air, provide natural flood defences, mask noise and promote a general sense of wellbeing.

Aesthetic
Trees bring a sense of place and maturity to new developments, whilst larger species help to create a more human scale to old and existing townscapes.

Storing Carbon
As trees grow they accumulate carbon in their woody tissues, reducing the amount of this greenhouse gas in the atmosphere.

Urban Forest Food
Trees provide fruit and nuts for wildlife and humans. They also provide an important source of nectar for bees and other insects.

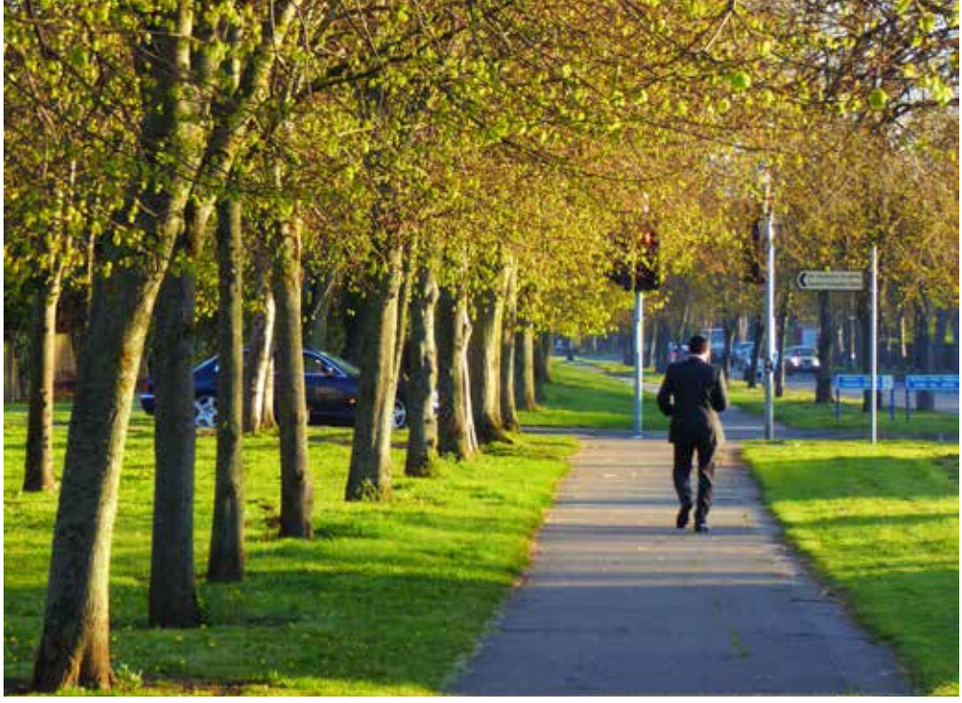
Biodiversity and Habitat
An increase in tree diversity will benefit a host of insects, birds and mammals in our towns and cities.

Landscape Screening
Not everything in cities is aesthetically pleasing and in some instances, trees and other vegetation can be of assistance in screening undesirable views.

Assists Recovery
Helps improve recovery times from illness, reduces stress and improves mental health and wellbeing.

Focal Point
Improves social cohesion. Reduces crime.

Reproduced with kind permission from Valuing London's Urban Forest
(Treeconomics, 2015)



Trees coming into leaf along Vernon Avenue.
Photo by Marc Coyle.

Ecosystem Services provided by Urban Trees

Trees play a crucial role in capturing pollutants and particulates from the air. Street trees can significantly improve air quality, which can in turn provide health benefits, if planned, planted and maintained carefully.

Air Pollution Removal

Trees play a crucial role in capturing pollutants and particulates from the air. Street trees can significantly improve air quality, which can in turn provide health benefits, if planned, planted and maintained carefully. The problems caused by poor air quality are well known, ranging from human health impacts to damage to buildings and smog. Trees make a significant contribution to improving air quality by reducing air temperature (thereby lowering ozone levels), directly removing pollutants from the air, absorbing them through the leaf surfaces and by intercepting particulate matter (e.g. smoke, pollen, ash and dusts). Trees can also indirectly help to reduce energy demand in buildings; resulting in fewer emissions from gas and oil fired burners, excess heat from air conditioning units and reduced demand from power plants.

Carbon Storage and Sequestration

Carbon storage relates to the carbon currently held in trees' tissue (roots, stem, and branches), whereas carbon sequestration is the estimated amount of carbon removed annually by trees. Trees can help mitigate climate change by sequestering atmospheric carbon as part of the carbon cycle. Since about 50% of wood by dry weight is comprised of carbon, tree stems and roots can store up carbon for decades or even centuries. Over the lifetime of a single tree, several tons of atmospheric carbon dioxide can be absorbed.

Horse Chestnut leaves.
Photo by Anthony Woods.

Robin on a twig.
Photo by Anthony Woods.

Stormwater Runoff

Surface water flooding occurs when rainfall runs off land and buildings at such a rate that it is unable to drain away in streams, rivers, drains or sewers. Large urban areas are particularly at risk because the coverage of impermeable surfaces such as buildings, pavements, roads and parking areas means that rainwater cannot permeate into the ground or be absorbed by plants and trees or stored in ditches and ponds. In addition, this runoff can quickly become polluted, as the rain effectively washes urban streets and buildings carrying high concentrations of hydrocarbons, metals, dust, litter and organic materials into local streams and rivers where the concentration can cause serious pollution to those watercourses. Climate change predictions suggest more intense rainfall events during summer months, and generally wetter conditions through winter months, which will intensify the problems. During rainfall a proportion of the precipitation is intercepted by vegetation (trees and shrubs) whilst a further proportion reaches the ground. The root systems of urban trees promote infiltration and water storage in the soil. Together this slows the passage of stormwater into the piped drainage network.

Health and wellbeing

Trees play an important role in reducing the risk of skin cancers by providing shade from harmful ultraviolet radiation. Our stress and illness levels are often lower where trees are planted, as trees provide psychological refreshment and a sense of wellbeing through softening the urban environment. As trees mature, they create character and a sense of place and permanence whilst releasing scents and aromas that create a positive emotional response.

Research published in Horizon – the research magazine of the European Union has shown that exposure to trees helps to prolong life and improve mental health (Roberts, J and Boorman E, 2015).

Habitat Provision

Dublin's trees are a key component of the valuable urban habitat and make up a significant and highly visible component of the capital's biodiversity. Some species in the capital subject to legal protection are strongly associated with trees, such as bats and birds (many of which nest in trees and shrubs). Trees and shrubs also provide food for many animal, plant and fungi species, from non-vascular plants, such as mosses, to insects, birds and mammals.

Pollinating insects provide ecosystem services in urban areas by pollinating flowers and producing food. The diverse nature of urban land use offers a wide range of pollinator habitats, but trees offer an important source of pollen at particular times of year when other sources are unavailable.

There is potential for the City's tree stock to develop in the future, and provide greater environmental and social benefits for future generations. As the amount of healthy leaf area equates directly to the provision of benefits, future management of the tree stock is important to ensure canopy cover levels continue to increase. This may be achieved via new planting and the protection and management of existing trees to develop into a stable, healthy, age and species diverse, multilayered tree population.

Catkins over the city.
Photo by Anthony Woods.

2.4 Variation in Tree Canopy Cover

The amount of tree canopy cover varies across the city. There are a number of factors that account for the difference in tree cover between areas. Some areas have a historical legacy of tree planting which accounts for the mature trees enjoyed in those areas today. Space above and below ground is another key factor and perhaps the most critical. Footpaths must be wide enough to accommodate new tree planting while not impeding accessibility. The volume of services / utilities above and below ground in the form of underground pipes and overhead cables can also present a barrier to the establishment of trees in urban areas. Direct damage / vandalism to newly planted trees can also be an impediment to urban tree planting. Local community involvement and interaction supported by the City Council achieves the best results in reducing vandalism and anti-social activity.

There are a number of factors that account for the difference in tree cover between areas. Space above and below ground is a key factor and perhaps the most critical.

2.5 Dublin's Tree Canopy Study

University College Dublin, on behalf of the Council's Parks Service is currently undertaking a research study of the Tree Canopy of the city. The research objective is to map and analyse Dublin's Tree Canopy. The information from the assessment will assist in prioritising locations for tree planting efforts and establish urban forestry plans. Similar studies have been undertaken in Seattle, Toronto and London.

The research analysis will examine coverage based on land use, key areas with a deficit of tree canopy and the potential environmental services delivered by trees, such as air quality and carbon storage. These factors will be compared with other cities to determine how Dublin fares at an international level.

Improving the city's tree canopy will have numerous benefits. Trees help keep the air clean and free from pollution, removing greenhouse gases from our atmosphere and acting as a natural air conditioner. The results of this important environmental indicator will be used to aid decision making on green infrastructure targets for Dublin city. When the study is complete it will be possible to make recommendations regarding tree canopy cover in Dublin. These recommendations will include:

- A target for an increased level of tree cover within the entire Dublin area.
- A hierarchy of priority in terms of which areas are in most need of increased tree canopy cover.

The Dublin Tree Canopy Study Proposal can be viewed at *http://bit.ly/TreeCanopyStudyProposal*

3.0 **Tree Policy**

Dublin City Council owns and manages an estimated 100,000 trees, comprising individual street trees, groups, hedgelines and woodlands in areas of public open space and parklands. The remaining trees within the city are in private ownership.

This chapter outlines the general and specific policies Dublin City Council has regarding trees and tree work. The policy describes in broad terms Dublin City Council's approach to tree management work and situations where the Council is likely to consider pruning, felling or other forms of tree management work for public trees.

Dublin City Council recognises the benefits of trees in the city where they improve amenity and urban environmental quality and provide shelter and screening. Trees also help the urban environment in less obvious ways, for example by absorbing atmospheric pollution including carbon dioxide, filtering dust and noise, stabilising soils and providing habitats for wildlife. Dublin City Council is committed to conserving the City's trees and woodlands and increasing the overall stock of trees.

Policy Monitoring and Review

This policy will be subject to annual monitoring to pick up any emerging issues. A more thorough review of the policy will be undertaken every five years to adjust and incorporate any new changes in legislation, local policy, working practices or technical developments which may arise.

Aerial view of St. Anne's Park.

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Weeping Willow.
Photo by Anthony Woods.

3.1 Duties and Responsibilities

Landowners are responsible for the safety and maintenance of trees growing on their land.

The Council is responsible for all trees on Council-owned or 'taken-in-charge' land, including road verges, public cemeteries, public footpaths, open spaces, parks and social housing. The Parks Service manages public trees that are in council ownership. The Council is not responsible for trees on verges or open spaces that have not been taken-in-charge or where there is a private management company.

Landowners are responsible for the safety and maintenance of trees growing on their land. The Parks Service manage public trees that are in council ownership.

Autumn colours in St. Anne's Park

3.2 Tree Protection and Preservation

3.2.1 Tree Preservation Orders

The Council will protect trees in accordance with existing Tree Preservation Orders (TPOs) and (subject to resources) explore the allocation of additional TPOs for important / special trees within the city, based on their contribution to amenity or the environment.

Tree Preservation Orders (TPOs) may be made under Section 45 of the Local Government (Planning and Development) Act, 1963 and subsequent acts. Part XIII of the Planning and Development Act 2000 sets out the provisions for TPOs. A TPO can be made if it appears to the planning authority to be desirable and appropriate in the interest of amenity or the environment. A TPO can apply to a tree, trees, group of trees or woodland.

The principle effect of a TPO is to prohibit the cutting down, topping, lopping or wilful destruction of trees without the planning authority's consent. The order can also require the owner and occupier of the land subject to the order to enter into an agreement with the planning authority to ensure the proper management of the tree, trees or woodland.

A TPO may be proposed by writing to the planning department indicating the location of the trees in question (ideally by including a map) and the reasons why they should be protected. An assessment will then be made as to the suitability of the trees for preservation by TPO.

See Appendix 1 for details of TPOs in the DCC administrative area.

3.2.2 City Development Plan – Identification and Preservation of Trees

The Council's Development Plan will identify trees, groups of trees or woodlands that form a significant feature in the landscape, or are important in setting the character or ecology of an area, as objectives for preservation wherever possible.

Under the Local Government Planning and Development Act (2000) Dublin City Council has a duty to put in place development plans within which, among other things, trees woodlands and hedgerows of social, amenity and environmental value are identified and their preservation prioritised.

3.2.3 Protection of Trees that are a habitat for endangered species

Dublin City Council will use its powers to protect trees that are a potential habitat for (or used by) protected species. The Council will have regard to legislative requirements and the procedures outlined in the Council's Biodiversity Action Plan.

Certain species of flora and fauna, which are particularly endangered, are protected by law. The Wild Birds Directive lists wild birds, which must be protected while the Habitats Directive provides for the protection of threatened species of flora and fauna. The Wildlife Act and the Habitats regulations implement the above Directives into Irish legislation and again provide for the protection of endangered species.

The Habitats Regulations provide legal protection to protected species wherever they are found. Several of the species covered by the Regulations are found in woodland and/or trees. Protected species commonly associated with trees include bats, nesting birds, badgers and red squirrels.

The removal of trees that provide a habitat for protected species can have the following negative impacts:

- Loss of bird nests (during the bird breeding season);
- Loss of bat roosts, bat commuting routes and bat feeding sites;
- Loss of habitat for protected species or
- Loss of important invertebrates, including those that may require deadwood habitat.

3.2.4 Trees that function as wildlife corridors

Dublin City Council will protect trees, hedgerows or groups of trees which function as wildlife corridors or 'stepping stones' in accordance with Article 10 of the EU Habitats directive and the procedures outlined in the Council's Biodiversity Action Plan.

3.2.5 Ancient and Species Rich Hedgerows

The City Council will review Ancient and Species rich hedgerows within the City (as identified in the 2006 Survey of ancient and species rich hedgerows in Dublin City) and protect existing hedgerow sections.

3.2.6 Legal Requirements for Tree Felling

There is a deficit in current legislation governing felling of trees within Dublin City (that are not subject to a TPO, planning condition or located within a conservation area) as the requirement for a felling licence for the uprooting or cutting down of trees does not appear to apply where the tree in question is less than 30m (100 feet) from a dwelling or where the tree in question is standing in a city council area.

The Forestry Act 2014 contains the main provisions for the felling of trees. Under this act it is an offence for any person to uproot or cut down any tree unless the owner has obtained permission in the form of a felling licence from the Forest Service

The information in this chapter is intended as a guide and does not constitute legal advice.

3.3 Development, Planning and Trees

3.3.1 Protection of Existing Trees

Dublin City Council will consider the protection of existing trees when granting planning permission for developments and will seek to ensure maximum retention, preservation and management of important trees, groups of trees and hedges.

The successful retention of suitable trees is a benchmark of sustainable development. Trees of good quality and condition are an asset to a site and significantly increase its attractiveness and value. They add a sense of character, maturity and provide valuable screening, shelter and privacy and will often have a useful life expectancy beyond the life of new buildings.

The Tree Strategy for the City provides the vision and direction for long-term planning, planting, protection and maintenance of trees, hedgerows and woodlands within Dublin City and will be a material consideration in the determination of planning applications and other development.

The successful retention of suitable trees is a benchmark of sustainable development.

3.3.2 Information to accompany planning applications

Where there are trees within an application site, or on land adjacent to it that could influence or be affected by proposed development (including street trees), the planning application must include a detailed submission prepared by a suitably qualified Arboriculturist in accordance with British Standard 5837: 2012 'Trees in relation to design, demolition and construction – Recommendations'.

A tree survey must be submitted where there are trees within a proposed planning application site, or on land adjacent to an application site that could influence or be affected by the development. Information will be required on which trees are to be retained and on the means of protecting these trees during construction works. Where development is proposed it is essential that existing trees are considered from the very earliest stages of design and prior to an application for planning permission being submitted. Root systems, stems and canopies, with allowance for future movement and growth, need to be taken into account in all projects.

Tree survey and tree protection information

For minor and major applications where trees might be affected, the application must be accompanied by the information below prepared by a suitably qualified Arboriculturist (who through relevant education, training and experience, has expertise in the field of trees in relation to construction) in accordance with British Standard 5837:2012 'Trees in relation to design, demolition and construction – Recommendations';

- Tree survey
- Tree retention / removal plan
- Tree protection plan
- Details of retained trees and Root Protection Areas (RPA) shown on the proposed layout
- Arboricultural impact assessment
- Arboricultural method statement.

Depending on the site some or all of the following may also be required:

- Details of existing and proposed finish levels
- Details for all special engineering within the RPA and other relevant construction details
- Schedule of works to retained trees
- Arboricultural site monitoring schedule
- A strategic hard and soft landscape design including species and location of new tree planting
- Tree and Landscape Management Plan.

Pre-planning

To assist with pre-planning discussions, proposals should be accompanied by a tree survey where there are trees within a proposed planning application site or on land adjacent to an application site that could influence or be affected by the development. The tree survey should be undertaken by an arboriculturist in accordance with BS 5837 to record information about the trees on or adjacent to the site. The results of the tree survey, including material constraints arising from existing trees that merit retention, should be used to inform feasibility studies and design options.

3.3.3 Design of Vehicular Access

In the design of vehicular entrances, the impact on adjacent trees will need to be considered. Entrances should be located to avoid conflicts with street trees.

Where a conflict is unavoidable and where a tree, located on-street, requires removal to facilitate a new or widened vehicular entrance and cannot be conveniently relocated within the public domain then a financial contribution will be required in lieu.

Beech leaves.
Photo by Anthony Woods.

3.3.4 Tree Bonds

Where trees and hedgerows are to be retained, the Council will require a developer to lodge a tree bond to cover any damage caused to them either accidentally or otherwise as a result of non-compliance with agreed / specified on site tree-protection measures.

This bond will be returned on completion of the development once it is established that the, trees / hedgerows are in a satisfactory condition and have not been unnecessarily damaged by development works. Where damage occurs the sum deducted from the tree bond will be calculated in accordance with a recognised tree valuation system, such system to be selected by the Council, (e.g. Helliwell, CAVAT).

3.3.5 Tree Planting integral to Development

Dublin City Council will encourage and promote tree planting in the planning and design of private and public developments.

Trees are considered an integral feature of the space around new buildings and adequate space (above and below ground) must be provided to allow new tree planting to be incorporated successfully. New tree planting should be planned, designed, sourced, planted and managed in accordance with 'BS 8545:2014 Trees: from nursery to independence in the landscape – Recommendations'. New planting proposals should take account of the context within which a tree is to be planted and plant appropriate tree species for the location.

For practical guidance when planning for trees on development sites please refer to Appendix 2. Planning and Protection for Trees on Development Sites

Trees along Grand Canal Dock.

Adequate fencing prior to commencement of construction works is essential to prevent damage to the root zone of retained trees.

3.4 Green Infrastructure

3.4.1 Opportunities for New Tree Planting

The City Council will identify opportunities for new tree planting to ensure continued regeneration of tree cover across the city, taking account of the context within which a tree is to be planted and planting appropriate tree species for the location.

Trees are important elements of green infrastructure, contributing to urban cooling through evapotranspiration and providing micro-climatic effects that can reduce energy demands in buildings. They therefore represent a key resource that can significantly contribute to climate change adaptation.

Trees can offer many benefits, including:

- Providing visual amenity, softening or complementing the effect of the built environment, and adding maturity to new developments.
- Displaying seasonal change and providing opportunities for wildlife in built-up areas.
- Making places more comfortable in tangible ways by contributing screening and shade, reducing wind speed and turbulence, intercepting rainfall, and reducing glare.

3.4.2 Tree planting within Pop up Parks

Encourage trees to be incorporated in the provision of temporary green spaces (pop up parks) either planted into the soil or within moveable containers, as appropriate.

3.4.3 Trees as a component of Sustainable Urban Drainage Systems

Encourage the use of trees within sustainable urban drainage systems (SUDS), as appropriate.

SUDS seek to manage rainfall in a way similar to natural processes, by using the landscape to control the flow and volume of surface water, prevent or reduce pollution downstream of development and promote recharging of groundwater. Trees can help control storm water runoff because their leaves, stems, and roots slow rain from reaching the ground and capture and store rainfall to be released later. Natural vegetation, including trees, in SUDS helps attenuate flows, trap silts and pollutants, promotes infiltration and prevents erosion. Incorporating tree planting within SUDS offers multiple benefits, including attractive planting features, and increased biodiversity whilst helping to ensure adaptation to climate change.

For more detailed guidance please refer to Appendix 3. Sustainable Urban Drainage Systems (SUDS), and Trees.

Weeping Willow.
Photo by Anthony Woods.

Technical Solutions

Roof Gardens
Although more complex, trees can be planted on roofs in some locations. Developers and designers must seek advice from an arboriculturist and a structural engineer.
£ £ £ £ £
●●○○○
XXXXX

Planters
Avoid where possible. Planters need more intensive maintenance and can limit tree growth. As always, right place, right tree.
£ £ £ £ £
●●○○○
XXXXX

Micro Climates / Wind Tunnelling
Trees make a significant contribution to improving the microclimate in terms of urban cooling, rain interception and storm water management as well as aiding the environmental performance of buildings.

Street Trees
Streets present the best opportunity within the urban realm for larger species trees to grow to maturity. Suitable soil volume and root space is required.
£ £ £ £ £
●●●●●
XXXXX

Utilities
Locating new street trees in Dublin is notoriously difficult. Do not rely on ground radar to find all of the utilities. Wherever possible, dig trial holes to avoid disappointment. Most tree roots grow in the first 600mm depth of soil. Services should be located outside this zone.

Newly Constructed Central Reservations
Footways can be a difficult places to locate street trees due to utilities and other obstacles. Therefore, planting in the central reservation can be an alternative solution for street tree planting.
£ £ £ £ £
●●●●●
XXXXX

Structural Landscape
These constrained locations should only occur where attempts to plant trees directly into the soil have failed. Maximise the soil depth, propose the right tree for the location, and always seek professional advice from a landscape architect, arboriculturist and a structural engineer.
£ £ £ £ £
●●●○○
XXXXX

Key

£ £ £ £ £	Expense of installation
●●●●●	Benefit
XXXXX	Maintenance

Time in Years
30
20
10

Developers and designers should always seek advice from an arboriculturist, and highways and structural engineers.

From *The Canopy* (2010). Copyright Trees and Design Action Group Trust.

Particular care is needed to avoid damaging trees when installing and maintaining services such as water, gas, electricity and cable TV.

3.5 Public Roads, Footpaths, Utilities and Trees

The Design Manual for Urban Roads and Streets (2013) outlines how street trees are an integral part of street design as they contribute to the sense of enclosure, act as a buffer to traffic noise / pollution and enhance place. A traffic calming effect can also be achieved, where trees are planted in continuous rows and their canopies overhang, at least in part, the vehicular carriageway. Street trees can also be used to enhance legibility by highlighting the importance of connecting routes and distinguishing one area from another through variations in size and species selection.

Please refer to Appendix 4. Extract from Design Manual for Urban Roads and Streets.

3.5.1 Inspection and maintenance of Public Trees

The City Council will ensure that public trees do not present a danger to the public by carrying out essential maintenance. Trees will be inspected regularly to ensure that they do not interfere with either the pedestrian movement or traffic flow in the vicinity.

A balance needs to be drawn between retention of trees for positive amenity benefit and the public roads and footpaths being kept clear of obstruction and safe for pedestrian/vehicular use.

3.5.2 Tree and Utilities

- The Council will require utility providers to consult with Parks and Landscape Services on works proposals that may affect trees.
- The council will require utility providers to adhere to guidance document: Trees and Utilities / Trench Works in Appendix 5.
- The City Council aims to protect all trees affected by such works and will seek damages in the event of loss or damage.

Particular care is needed to avoid damaging trees when installing and maintaining services such as water, gas, electricity and cable TV.

3.5.3 Council works – Consultation

The Parks Service will be consulted at the earliest possible stage on Council works proposals that may affect trees. Adequate provision shall be made for the protection and retention of important trees in accordance with British Standard 5837:2012 'Trees in relation to design, demolition and construction – Recommendations'.

3.5.4 Privately Owned Trees – hazardous to public road users

Where a privately owned tree or other vegetation is a potential hazard to public road users, or where it obstructs or interferes with the safe use or maintenance of a public road, the road authority may serve a written notice on the owner or occupier of land requiring the preservation, felling, cutting, lopping, trimming or removal of the vegetation within a specified period.

Landowners are responsible for the safety and maintenance of trees growing on their land.
If a privately owned tree / vegetation is causing an obstruction to a footpath or road, powers exist under Section 70 of the Roads Act 1993 which enable the Roads Authority to deal with the matter. The section allows for the serving of notice on the landowner setting out remedial works to be carried out. Failing action by the landowner, the Roads Authority can arrange to have the necessary works carried out and seek to recoup the cost of the works from the landowner concerned.

3.5.5 Pavement Lift

The Council will undertake measures to make safe an unacceptable trip hazard on a public footpath or road caused by the growth of a Council owned / managed tree.

Where trees are considered to be causing damage to paths or footpaths, the Council will not normally consider tree removal except where there is a risk to public health which cannot otherwise be mitigated. It is often possible to repair paths to take account of adjacent trees and tree roots. Where roots protrude, the path can be re-laid around the tree with flexible material to provide a smooth surface using asphalt or preferably resin bonded gravel (where appropriate) which will allow free flow of air and water to the root zone. The Parks Service will explore engineering solutions to reduce trip hazards and will liaise with Roads Maintenance in relation to their annual work plan to repair pavements where pavement lift has occurred.

For further guidance please refer to Appendix 6. Conflicts between hard surfaces and tree roots.

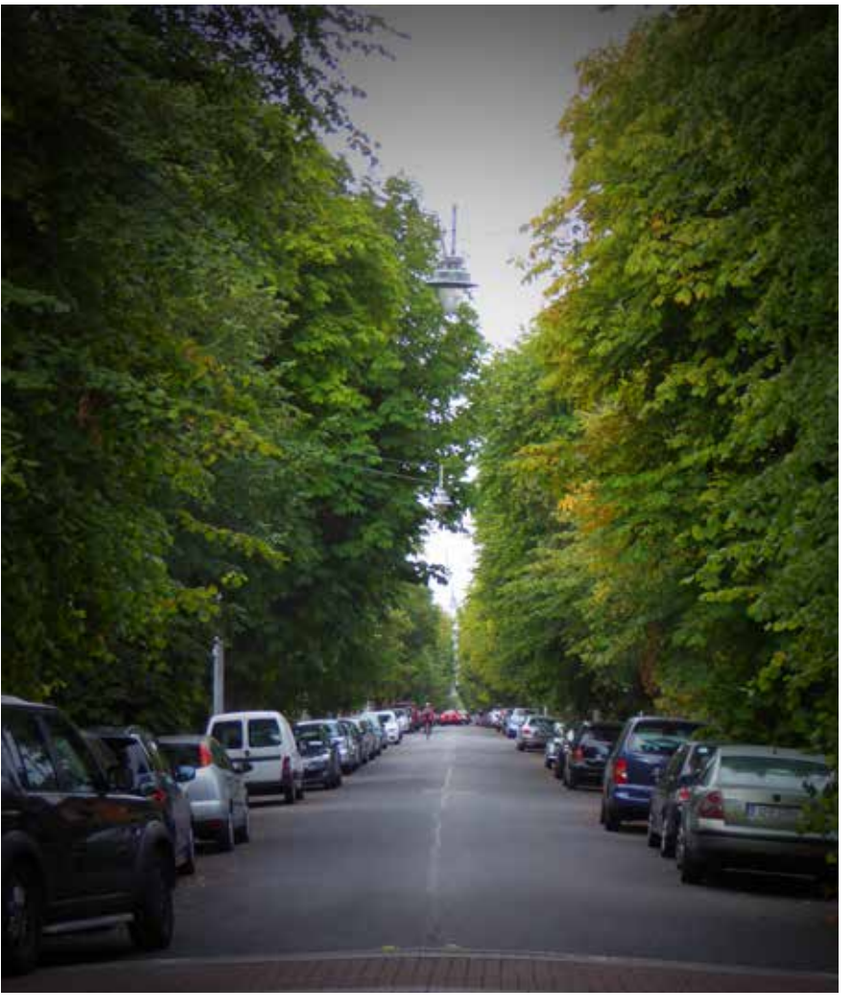
3.5.6 Footpath / Road obstruction due to trees

The Council will undertake work to a tree in Council ownership / management where a tree is causing an obstruction to a public highway, public footpath or cycleway, public right of way, access to property or public open space, where reasonably feasible.

Tree pruning to achieve the following height clearance is considered appropriate where reasonably practical and where it can be achieved without harming tree health or form:
Pedestrian areas: 2.5m
Cycleways: 3m
Distributor roads / streets: 4.5m

Any works necessary to prevent an obstruction in the width of a public footpath due to the presence of a Council owned tree will be considered on a case-by-case basis.

Unter den Linden (under the Lime trees), Berlin.



St. Lawrence Road, Clontarf.
Photo by Marc Coyle.

Congestion of underground services poses a challenge to urban tree planting and in particular, tree roots.
Photo by Marc Coyle.

3.5.7 Street light obstruction

The Council will undertake work to a tree in Council ownership / management to ensure that trees do not unduly obstruct the streetlight.

Tree pruning will be undertaken where reasonably feasible to address obstruction of a street light. Where a tree is removed from a roadside verge, due to proximity to a public lighting column, a replacement tree will not normally be planted back into the same verge. Alternative public lighting solutions should be explored for areas of existing mature trees. These solutions can add to the visual amenity of the streetscape such as in the example below from St. Lawrence Road Clontarf.

The Design Manual for Urban Roads and Streets (2013) recommends that new lights should be positioned away from trees, which in time may grow to envelop the lanterns or cast shadows which will render the lighting less effective.

3.5.8 Road traffic sight-lines obstruction / Traffic signal / Street sign obstruction

The Council will undertake work to a tree in Council ownership / management to maintain clear sight lines, where reasonably feasible, at road junctions and access points and for traffic signals and street signs.

Signals and signs should be located to avoid conflicts with existing trees. Where an unavoidable ongoing pruning requirement arises as a result of sightlines / road signs / traffic signals being obscured by tree growth / regrowth, consideration will be given to the removal of trees to minimise ongoing repeat maintenance costs.

3.5.9 De-icing Salt Damage to Trees

Salt damage, as a result of the use of thawing salts (sodium chloride) on paved surfaces near trees, is a well-known phenomenon. Mitigation requires a combination of tree and non-tree-based measures.

Please refer to Appendix 7. De-icing Salt Damage to Trees.

Tree surgeon at work.

Trees are living organisms and are constantly growing and changing. Trees in urban areas require careful management.

3.6 Tree Management

Trees are living organisms and are constantly growing and changing. Trees in urban areas require careful management. Tree management should include regular inspections and programmed maintenance work. This maintenance may include the removal of some trees, pruning of others and replacement planting of trees, with the aim of maintaining the overall tree cover in a safe and healthy condition. Young trees and woodland plantations require a high degree of care and nurture to ensure proper establishment, particularly in the first 5 years. Young trees require careful watering in dry seasons, especially the first summer after planting. They also require feeding, weed control, pest control and replacement of those that die.

3.6.1 Care and maintenance of Private Trees

Tree owners have a duty of care towards others and should regularly inspect trees in their ownership or care, maintaining them in a good and safe condition.

Private trees whether in gardens, residential or business premises make a significant contribution to the visual amenity of Dublin City and provide an important habitat for wildlife. They may act as landmarks, identify a particular location, provide a foil to the urban townscape and impart a sense of character to the area. In some places the character of the townscape is derived from a single tree; in others from the impact of groups of trees which are both visible and accessible to the public.

Landowners are responsible for the safety and maintenance of trees growing on their land. If a privately owned tree / vegetation is a potential hazard to public road users, or where it obstructs or interferes with the safe use or maintenance of a public road, powers exist under Section 70 of the Roads Act 1993 which enable the Roads Authority to deal with the matter. The section allows for the serving of notice on the landowner setting out remedial works to be carried out. Failing action by the landowner, the Roads Authority can arrange to have the necessary works carried out and seek to recoup the cost of the works from the landowner concerned.

3.6.2 Care and maintenance of Public Trees

Dublin City Council is required to maintain trees it owns or manages, in a safe condition, having regard to public safety.

The Council is responsible for all trees on Council-owned or ‘taken-in-charge’ land, including road verges, public cemeteries, public footpaths, open spaces, parks and social housing. The Parks Service manages public trees that are in council ownership. The Council is not responsible for trees on verges or open spaces that have not been taken-in-charge or where there is a private management company.

The Council will adopt a proactive and systematic good practice approach to tree management and inspection with the aim of promoting good tree health, condition, diversity, public amenity and a balanced age profile.

3.6.3 Quality of service and Public Notification

Customer care – Customers will be treated in accordance with the Council's Customer Care Policy.

Public notification (tree works) – Pruning and felling works listed in the annual tree care programme will be presented annually to the relevant Local Area Committee Meetings. The Council will endeavour to contact local resident groups prior to additional major tree works or tree removal but this is not always possible.

Public notification (tree planting) – Tree planting works listed in the annual tree care programme will be presented annually to the relevant Local Area Committee meetings. Additional and replacement tree planting may be carried out without prior consultation.

The Council receives many requests for trees to be pruned or felled. Individual requests, queries and recommendations will be dealt with efficiently, consistently and fairly, having regard to the positive public contribution that trees make throughout the city. The Council will avoid unnecessary tree works.

There is no statutory requirement for the City Council to consult with adjoining occupiers prior to undertaking routine maintenance works to City trees. Adjoining occupiers may, however, be consulted if considered appropriate.

3.6.4 Proactive Tree Management

The Council will adopt a proactive and systematic good practice approach to tree management and inspection with the aim of promoting good tree health, condition, diversity, public amenity and a balanced age-profile. This approach will highlight necessary works at an early stage and enable hazards to be identified and made safe in a cost effective way.

A rolling work programme for the inspection of street trees and trees on City Council owned and / or maintained open spaces in the City is managed by the Parks Service.

Trees are pruned to ensure that they do not present a hazard to the users of both footpaths and roads and to give adequate clearance from adjoining properties whilst maintaining a well-balanced and healthy tree. Specific requests for pruning by residents and businesses are considered but these have to be assessed in relation to the amenity of the trees, the environmental benefits and the tree management regime.

The Parks Service actively seeks to preserve the city's stock of trees by only allowing removal in exceptional circumstances. If a tree has to be removed a replacement tree is replanted wherever possible. Trees of an appropriate size and species are selected to preserve and enhance amenity and environmental benefits.

Tree Pruning

Excessive/heavy tree pruning can weaken trees and make them more susceptible to decay and disease, particularly older trees. Trees often respond to excessive pruning by producing a flush of vigorous growth that can exacerbate existing problems and increase long-term maintenance requirements.

Appropriate pruning, can however, prolong the life of a tree that may otherwise have to be removed (for example a veteran tree). Each case will be judged individually on its merits.

3.6.5 Quality of work

All tree works will be undertaken as per British Standard BS 3998:2010 Tree Work — Recommendations and current Health and Safety requirements. All staff / contractors undertaking tree works shall be competent, with appropriate training, experience and qualifications.

Tree surveys will comply with current best practice. Staff undertaking tree works will be given appropriate training and guidance, which will include health and safety implications and awareness of protected species (such as bats, red squirrels and nesting birds).

Tree surgery contractors engaged to work on amenity trees shall be competent and adequately qualified, trained, experienced and insured.

Best practice examples of acceptable types of pruning are shown in Appendix 8. Crown Lifting and Crown Reduction.

Tree topping (reduction in height) on the other hand causes large wounds, exposing trees to decay pathogens and causing their long-term decline, as well as being unsightly and potentially unsafe. Topping is therefore only considered where trees have serious defects, that cannot be otherwise reasonably addressed, and their short-term retention is essential or highly desirable*. See Appendix 9 'Why Topping Hurts Trees'.*

Tree planting works will be undertaken in accordance with the following British Standards

- BS 4043:1989 – Recommendations for Transplanting Root-Balled Trees
- BS 4428:1989 – Code of practice for general landscape operations (excluding hard surfaces).
- BS 8545:2014 Trees: from nursery to independence in the landscape – Recommendations.

Conker.
Photo by Anthony Woods.

3.6.6 Protected species

Where tree works have the potential to affect protected species or their habitat, the Council will have regard to legislative requirements and the procedures outlined in the Council's Parks Biodiversity Policy.

Essential tree works will be undertaken in a way that minimises adverse impact and ecological advice will be sought where necessary. Protected species commonly associated with trees include bats, nesting birds, badgers and red squirrels.

3.6.7 Ivy on trees

Ivy on trees is normally retained except where removal is necessary to aid visual tree health assessment or where ivy growth is excessive and adversely affecting tree health.

Common Ivy is a native plant of great importance to wildlife. It provides important nesting sites for blackbirds, wrens and other birds, and its nectar is of particular value to insects, particularly butterflies, and bees which often depend on it for survival during winter and early spring.

3.6.8 Standing deadwood

Where it is safe and appropriate to do so, standing deadwood will be left in situ to provide a habitat for native species and contribute to local biodiversity.

3.6.9 Tree stump treatment

When a street tree is felled it is not always possible to replant at the same time. Under these circumstances a short tree stump is left as a temporary measure. Tree stumps are then removed later once there are a sufficient number for their removal to be economical. Stumps are typically left around 1.3 metres (about 4 feet) tall, with the tops chamfered to remove rough edges and only stumps greater than 15cm (6 inches) diameter are retained, otherwise the tree is felled to ground level.

3.6.10 Approach to specific tree threats

The Council will take reasonable steps to address specific tree threats.

Unauthorised pruning, removal or damage to Council owned trees

Unauthorised works or damage to Council-owned trees may result in a charge being levied. This charge will reflect the amount of damage sustained and where the life / safety of the tree(s) is undermined it will include the cost of total replacement and compensation for loss of tree value. These charges will be drawn up by professional parks staff and each case will be assessed on an individual basis using a recognised tree valuation system (e.g. CAVAT / Helliwell).

Vandalism

Local community involvement and interaction achieves the best results in reducing vandalism and anti-social activity. The Council will support and encourage local residents in developing a greater sense of civic responsibility and ownership of local open space.

Local liaison – The Council will liaise with local Gardaí and resident groups to discourage and address serious acts of vandalism to trees.

Legal action – Where practicable the Council will pursue legal action against individuals who have damaged Council-owned trees.

Trees planted by residents on Council land

Inappropriate trees and shrubs planted on Council land without prior written permission are to be removed.

Pests and diseases

Signs of tree pests and diseases will be investigated and action taken, having regard to current best practice.

3.6.11 Tree Sculpture

Subject to resources, Tree Sculpture will be explored where appropriate, as a way to engage the public and allow trees to continue to make a contribution to public amenity after they have reached the end of their safe useful life span.

Tree Sculpture at St. Anne's Park.

Silver Birch leaves.

3.7 Living with Trees

"The tree which moves some to tears of joy is in the eyes of others only a green thing that stands in the way…"

WILLIAM BLAKE (Letter to the Rev. John Trusler. August 1799)

Street trees and trees in open spaces make a substantial contribution to the appearance of the townscape and add significantly to the amenity of the area. They also have an environmental benefit providing a wildlife habitat, shading and improved air quality, making the City a pleasant place to live, work and visit.

Residents' views on trees can vary and a tree that is highly valued for its beauty by an individual can be perceived as a nuisance to another. Most communication received by Dublin City Council in relation to trees usually occurs when they become an apparent problem. As people rarely contact the council to state they are happy about the presence of local trees a somewhat distorted picture of public perception of trees can develop.

It is important to seek alternatives to felling or severe pruning when conflicts arise, so that the trees can remain for the silent majority who value them. The Council's role is to try to achieve a compromise, which is acceptable to the community at large but not necessarily to every individual within the community and to safeguard the tree population for the future within available resources.

This section of the Tree Policy aims to outline the approach of Dublin City Council to the most common communication and representations received in relation to living with trees.

Operating Procedure for Enquiries

3.7.1 Tree Strategy as a guiding principle

All requests for works to trees or woodlands on council land will be assessed and authorised by Parks and Landscape Services with reference to this strategy.

Dublin City Council is committed to ensuring that the trees under its care are properly managed and that tree works are carried out to a high professional standard. All decisions regarding tree works will comply with this tree strategy.

3.7.2 Response to General Enquiries

The Parks Service is responsible for informing the public about the enquiries relating to tree work, giving reasons for refusal if necessary. All enquiries will be dealt with in accordance with the Customer Charter.

The Council's Customer Service is usually the first point of contact for enquiries or complaints from the public, including those relating to trees. The Parks Service is responsible for informing the public about the enquiries relating to tree work, giving reasons for refusal if necessary.

When considering works to trees the council must ensure compliance with any legislation or restrictions affecting works. The Wildlife Act prohibits cutting of vegetation on uncultivated land between March 1st and August 31st. While street trees are considered to be cultivated, works on hedgerows will not be carried out during this period.

Arboricultural research indicates that trees should not be pruned during leaf unfolding or when leaves are falling as these periods are when the tree puts a high demand on energy reserves. Planned pruning works will not normally be carried out in these periods.

3.7.3 Tree Related Emergencies

Any tree-related emergencies are referred for immediate action in accordance with Council emergency procedures. An emergency is defined as a tree that is in immediate danger of collapse or a tree that is causing a public obstruction requiring urgent attention.

The loss of leaves from trees in the autumn is part of the natural cycle and cannot be avoided by pruning.

Conflicts between dwellings and trees

3.7.4 Leaf Fall

The Council will not prune or fell a Council owned tree to remove or reduce leaf fall or remove fallen leaves from private property.

The loss of leaves from trees in the autumn is part of the natural cycle and cannot be avoided by pruning. The composting of leaves is encouraged as a way of environmentally recycling this valuable resource. In addition, the council organises a street cleaning service which sweeps leaves from most streets and residential roads during the autumn period.

The maintenance of gutters is the responsibility of the property / landowner. *Where gutters are regularly blocked by fallen leaves the installation of gutter guards by the landowner may provide a low maintenance solution.*

3.7.5 Public trees that overhang neighbouring properties / roots encroaching into garden

The Council will not prune trees that overhang neighbouring properties unless the trees are dangerous or are causing actionable nuisance.

The Council has no legal obligation to prune overhanging trees unless they are causing direct damage to an adjacent property or are imminently dangerous. This reflects the Council's position as an owner of thousands of trees and the resources available. Given that many thousands of Council trees overhang boundaries, it is not an effective use of resources to prune every overhanging limb.

Tree roots in gardens are a natural occurrence and root presence is unlikely to be affected by tree pruning. However, situations where a tree is genuinely generating root encroachment to an exceptional, severe and unreasonable degree are dealt with on a case-by-case basis.

3.7.6 Trees touching private property

If a tree in Council ownership / managed by the Council is touching private property (dwelling house, boundary wall, garage, etc.), the Council will take appropriate action to alleviate the problem.

The Council will prune trees to provide clearance from properties where they touch windows, walls, roofs or gutters. In most cases the solution will be for the Council to prune the tree, but in some circumstances it may be more appropriate to fell the tree. Where such situations arise they will be assessed on a case by case basis.

3.7.7 Trees and damage to private property

Most trees growing near buildings cause no damage. Lightly loaded structures, if they have inadequate foundations, may be affected by tree roots. Tree roots are unlikely to directly penetrate sound footings. Where evidence is provided which demonstrates a Council owned tree is the cause of damage, the Council will take appropriate action on a case by case basis.

The perceived threat of damage by tree roots is sometimes a worry people have about trees near to buildings. Much of this concern is unwarranted as most trees growing near buildings cause no damage but trees may cause damage in some circumstances. Direct damage results from the pressure that may be exerted by tree roots or trunks. This may affect lightly loaded structures (particularly if they have inadequate foundations) such as garden walls, driveways and patios, for example. Tree roots are unlikely to directly penetrate sound footings. Where evidence is provided which demonstrates a Council owned tree is the cause of damage, the Council will take appropriate action on a case by case basis.

3.7.8 Shading

Tree Works will not normally be carried out to address shading of direct sunlight.

Trees are often perceived to block light to nearby properties and the level of alleged nuisance is variable and subjective. There is currently no legal right to direct sunlight and there is no expectation for existing buildings or other structures to be removed for this reason.

However, situations where trees are genuinely blocking daylight from habitable rooms to an exceptional, severe and unreasonable degree may be dealt with on a case-by-case basis. Minor pruning works may be acceptable in some situations, however any decision would take into account the health and significance of the tree, its contribution to wider public amenity, the orientation of the house, and whether the tree was already present when the occupier moved into the property.

3.7.9 Obstruction of a view

Tree Works will not normally be carried out to improve the view from a private property.

There is no legal right to a 'view'. Vegetation and trees grow and, over time contribute to the City's urban fabric. It would be impracticable to prune every tree that affected a view, and this would have a major negative impact on public amenity.

3.7.10 Tree considered too big / too tall

The council will not prune or fell a council owned / managed tree because it is considered to be 'too big' or 'too tall'.

Residents may feel apprehensive about the size of a tree and consider it dangerous. However, trees are not dangerous just because they are perceived as tall, too big for their surroundings or move in the wind. Tree movement in high winds is natural and one of the ways they are able to withstand strong winds.

Oak leaves.
Photo by Anthony Woods.

3.7.11 Trees and drains

The City Council will not prune, fell or cut the roots of a Council owned / managed tree to prevent roots entering a drain that is already broken or damaged.

The Council will not normally take action in response to complaints that trees are damaging drains. Tree roots do not have the capacity to break into a sound drain but they may invade drains that are already broken or damaged. Trees themselves very rarely break or damage the drain in the first place. Tree roots found in a drain are usually symptomatic of an underlying problem requiring repair of the broken pipe. The Council's presumption is that the appropriate way to deal with tree root blockage of drains is to ensure that the drains are watertight. Any concerns about the condition of public drains should be reported to the Drainage Section. Householders are usually responsible for the maintenance of the drains within their own property.

For further guidance please refer to Appendix 10. Damaged Pipes.

Honeydew is a natural and seasonal problem and the severity varies from year to year depending on conditions.

Honeydew on leaf.

3.7.12 Privately Owned Trees that overhang neighbouring private properties.

If a tree is growing on privately owned land, then the maintenance rests entirely with the landowner.

The best way to resolve problems with trees or hedges growing in adjacent properties is for property owners to talk to their neighbours and to try to come to an amicable agreement.

The interactions between neighbours on such issues are private matters and are best dealt with by the parties concerned through discussion, mediation or ultimately through civil procedures.

3.7.13 Tree and hedge disputes between private landowners

Residents with issues in relation to trees and hedges on neighbouring properties are encouraged to try to resolve the issues between the two parties or seek independent legal advice. Involvement in resolving tree and hedge disputes between private landowners is not considered part of the remit of the City Council. Unlike the UK there is currently no legislation in Ireland regulating the height of hedges.

3.7.14 Trees and Solar Panels

The Council will not prune or fell a Council owned / managed tree to facilitate installation or improve natural light to a solar panel.

Whilst the Council appreciates that there is a need to provide renewable energy resources, trees have an important role in maintaining and improving local amenity, in addition to contributing to local and national targets in tackling climate change. The presence of trees must be fully appreciated when considering a suitable location for the placement of solar panels.

3.7.15 Television, broadband, mobile telephone and satellite reception

Tree works will not be carried out to improve reception of the above services where the trees in question would not otherwise require works.

Dublin City Council recognises television, broadband, mobile telephone and satellite reception are important to residents. However, a balance has to be found between these services and the local environment. The Council will encourage residents to seek reasonable alternative solutions to improve reception of these services rather than requesting tree pruning or removal.

The flush of extra growth associated with pruning will often make the problem worse, and the tree might not be the main cause of the problem. In most cases relocating the receiver or satellite dish, or using a booster, can resolve the situation and is far less destructive than felling or pruning a tree. Residents are advised to seek specialist advice. Removal or pruning of trees throughout the city to enable clear reception would have a major adverse impact on local amenity and cannot be considered.

Blackbird nest.

Hawthorn Berries.

Blackthorn Flower.

Seasonal or Minor Inconveniences

3.7.16 Sticky Deposits from Honeydew (dripping sap)

The Council will not prune or fell a council owned tree solely to remove or reduce honeydew or other sticky residue from trees.

Certain species of tree, for example lime and sycamore, are susceptible to aphids or other leaf feeding insects. Honeydew is the sugary sap / sticky deposit which results from insects feeding and once on surfaces is subsequently colonised by sooty mould fungi giving it a black appearance. Honeydew is a natural and seasonal problem and the severity varies from year to year depending on conditions. A balance between the inconvenience of honeydew deposits and the wider benefits of trees must be achieved and as such there is unlikely to be justification for the pruning or removal of trees due to honeydew deposits.

Residents are advised to make their own arrangements to minimise the problem; regular car washing, covering the car or parking in an alternative location. Where honeydew affects cars, warm soapy water will easily remove the substance.

3.7.17 Bird Droppings

The Council will not prune or fell a Council owned tree solely to remove or reduce bird droppings.

Bird droppings can be unpleasant but the problem is not considered a sufficient reason to prune or remove a tree. Nesting birds are protected under the Wildlife Acts 1976-2012 and Birds and Natural Habitats Regulations 2011. Warm soapy water will usually be sufficient to remove bird droppings.

3.7.18 Fruit/Berries/Nuts/Blossom

The Council will not normally fell or prune Council owned trees solely to alleviate problems caused by natural and/or seasonal phenomena such as fruit/berries, nuts or blossom.

Falling fruit, berries, nuts or blossom are natural and seasonal occurrences and are judged a relatively-minor, short-term inconvenience when considering the many benefits of having trees within the urban environment.

Fruiting trees are welcomed in many locations for having the double benefit of spring blossom and autumn fruit. This makes fruit trees good for wildlife and a source for foraging.

However, where fallen fruit is leading to exceptional problems of a severe and unreasonable degree this will be dealt with on a case-by-case basis subject to resources.

3.7.19 Insects

The Council will not prune or fell a Council owned tree to remove or reduce incidence of perceived pests such as bees, wasps, or other insects.

3.7.20 Pollen

The Council will not prune or fell a council owned tree to remove or reduce the release of pollen.

CCTV and Anti-social behaviour

3.7.21 Trees affecting CCTV

The Council will not normally prune or fell a Council owned / managed tree to improve CCTV sightlines.

Exceptions may include Garda CCTV, trees adjacent to CCTV cameras that monitor ATMs or within the field of view being covered to ensure that public security is not compromised. The installation of new CCTV cameras must take into consideration existing trees to prevent requests for unnecessary pruning works or the removal of trees to improve desired sightlines.

3.7.22 Crime and Anti-social behaviour

Where a Council owned tree is associated with criminal activity and/or anti-social behaviour, measures to reduce the problem will be considered on a site-by-site basis.

Where a tree is associated with criminal activity and/or anti-social behaviour, steps to reduce the problem will typically require the coordination of a number of agencies including the Gardaí. Pruning or felling a tree is not always the answer to the problem.

Oak leaves.
Photo by Anthony Woods.

3.8 New Tree Planting

New and replacement planting is essential to ensure continuity of the City's tree stock. However, City streets can offer an unnatural environment for trees. Streets are where most of the city's services, cables, pipes and overhead wires are found, together with junction boxes, letter and telephone boxes, street lights, signs and access chambers. The presence of this equipment above and below ground makes it difficult to find large enough spaces to plant trees. Also in residential areas, verges have often been surfaced with tarmac.

When mature street trees are felled it is often impossible to remove the tree stump without damaging services and this leaves little chance of planting a replacement tree in the same place. Locations for new street trees should be chosen with great care and efforts concentrated on streets that still have verges and new road schemes where space for tree planting (above and below ground) can be planned at the outset. Major development or redevelopment offers the best opportunity for sustainable tree planting.

The planting of trees should respect and enhance the amenity of an area, reinforcing its character and appeal. An increase in tree planting is actively sought in areas of the City where trees would add to the amenity. In densely developed areas, trees can be used to create areas for relaxation by using suitable street corner sites to locate individual trees with seating underneath. This can contribute to the creation of additional open spaces in the City.

The amount of underground space required to accommodate healthy root systems of mature trees is important.

3.8.1 Replacement Planting

The Council aims to ensure, subject to available budget resources, that every tree felled should be replaced to ensure that over the years, the city retains its tree stock for future generations, although it is not always practical or prudent to replace a tree in the same location or with the same species that was previously planted.

Replacement planting is essential to ensure continuity of the tree stock. If a site where a tree was removed is suitable to support a new tree, the site may be replanted with a suitable tree species. Because the stump has to be placed on a stump removal list and sufficient time needs to elapse to allow breakdown of residual underground root material, the process from removal to replanting may take up to 3-5 years. Replacement tree planting will only take place during the dormant season. Replacement trees do not have to be in the exact same location as the felled tree and a nearby location may be more practical and appropriate.

3.8.2 Targeted Planting

Areas targeted for new tree planting will be those where trees have been removed or where there is an identified need to increase the overall tree cover in the area.

Requests from Council members and local residents for new trees in their road or area will be taken into consideration within the planting programme. Individual requests will be prioritised according to the number of trees already on the street, including those in front gardens and on adjacent land.

3.8.3 Planting the right tree in the right place

The principle of planting the 'right tree in the right place' will apply for all new and replacement tree planting, taking account of the context within which a tree is to be planted and planting appropriate tree species for the location.

The concept of "*right tree, right place*" is fundamental to urban tree management. This focuses on making sure suitable tree species are selected to match their intended function and available growing space conditions. This applies both to city street trees and trees in public parks and woodlands. Understanding the space constraints trees will experience at maturity is critical to selecting the appropriate species. Tall, narrow crown forms are suitable for narrow spaces between buildings; low growing species are suitable for planting under utility wires; and large spreading canopies are suitable for open parks. In all cases, the amount of underground space required to accommodate healthy root systems of mature trees is important.

The careful selection of appropriate tree species and planting location is essential to minimise future nuisance issues and unnecessary maintenance costs. Potential sites for tree planting will be inspected to assess their suitability for new trees, considering factors such as services, sight lines, warning signs and traffic signals, space for future growth, etc.

Street tree planting must be designed to take account of pedestrian needs and other highway activity (for example loading, unloading, proximity to bus stops), as well as below ground conditions. Pavement width and footfall are important considerations and trees should be planted only where they do not create a hazard for the general public, especially visually impaired people or wheelchair users.

When positioning new street trees, the Council will specifically aim to:

- Avoid future obstruction of public lighting columns by ensuring that the fully mature new tree canopy will be ideally greater than 5m, but certainly no less than 3m from the lighting column
- Seek to ensure that future tree growth does not compromise a minimum footpath width of 1.2m
- Make adequate soil volume a priority to sustain tree health and longevity when selecting planting sites and preparing pits for tree planting.

3.8.4 Best practice – Standards of work

Tree planting and establishment will be carried out in accordance with best horticultural and arboricultural practice.

The Parks Service is committed to achieving a very high standard of workmanship and setting a good example to others. The Council's Tree Planting Programme will be implemented between November and March as this is accepted to be the most appropriate time of the year for planting of bare-root and root-balled trees. Tree planting will be carried out by adequately trained or supervised staff, and followed by appropriate post-planting maintenance.

All tree planting works will be undertaken in accordance with the following British Standard Codes of Practice:

- BS 3936-1:1992 Nursery stock specification for trees and shrubs
- BS 3998:2010 Tree work. Recommendations
- BS 4043:1989 Recommendations for Transplanting Root-Balled Trees
- BS 4428:1989 (Section 7) Recommendations for General Landscape Operations
- BS 8545:2014 Trees: from nursery to independence in the landscape – Recommendations

Whilst all trees are beneficial to an urban environment, it is the larger species that are the particularly significant elements that can match and compliment the architecture of the city in scale and create great city places.

3.8.5 Priority

Resources for tree planting will be allocated in the order set out below:
Replacement trees – Replacement of dead trees and existing tree stock that has been removed.
Priority areas for tree planting – Where these are designated by the Council.
Requests from residents – Individual requests will be taken into account with regard to the number of trees already in the locality, including front gardens and land adjacent to roads.

3.8.6 Species Selection

The choice of tree species is dependent on suitability to the planting location and local landscape character. A greater variety of trees can be planted in parks and open spaces than on streets and species will be selected on suitability to setting, biodiversity value and visual appearance.

The selection of street trees is guided by their mature size, water demand, crown shape and future management requirements.

Having too many of the same type of tree in the City is a concern because of the increased risk of a loss of one or more species of tree to disease or other environmental factors. It is possible to enhance the resilience of the City's tree population by increasing the variety of new trees planted and to this end the Council will adopt a best practice 'rule of thumb' guide to plant no more than 10% of same tree species, no more than 20% from the same genus and no more than 30% from the same family.

3.8.7 Large Canopied Trees

The Council will also seek to plant large canopy trees, wherever possible, to achieve the maximum benefits that trees provide. Large-growing tree species confer much greater benefits to urban areas than small trees. Where space allows, preference will be given to planting as large a tree as is appropriate for the location.

Planting large species trees in urban environments brings a host of social, environmental and economic benefits. Many of our finest urban trees are a living legacy from the Victorian era and a substantial number are now nearing ultimate maturity.

With careful planning, Dublin city can accommodate more large trees. In the context of climate change, the importance of protecting and planting new stock in urban areas has never been more critical.

Whilst all trees are beneficial to an urban environment, it is the larger species (i.e. trees that can attain heights of over 15m) that are the particularly significant elements that can match and compliment the architecture of the city in scale and create great city places.

'The benefits of large species trees in urban landscapes: *a costing, design and management guide*' produced by the UK Construction Industry Research and Information Association (CIRIA) showed that the annual net benefit of planting large species trees is 92% greater than for small species trees. The net benefits are such that large trees pay for themselves within five years. The growing body of research referenced in the guide provide a convincing argument that it makes sound financial sense to plant larger species trees.

The evidence shows that large species trees are key to creating climate-proof, happy and healthy cities for the future. It is vital that large species trees are seen as part of an integrated urban ecosystem, rather than being considered merely as ornamentation. Large trees are a vital component of the green infrastructure in Dublin City.
The Design Manual for Urban Roads and Streets (2013) recommends that on *Arterial* and *Link* streets with no on street parking a verge of 1.5–2m should be provided as a buffer and to facilitate the planting of large street trees.

On heavily-trafficked arterial and link streets with multiple lanes in urban areas, designers should consider the street as a boulevard with a median that is no less than 2m wide, to provide areas of pedestrian refuge and allow for the planting of large trees.

3.8.8 Approval for Tree Planting

The approval of the Council's Parks Service must be obtained in advance of all new tree planting on Council owned land.

Residents and resident associations must first seek and obtain permission from the Council before engaging in projects to plant trees and shrubs within Council managed streets, roadside margins or open space environments.

3.8.9 Memorial Tree Planting

Requests to accommodate tree planting as a memorial will be assessed in accordance with the Guidelines on memorial dedication of benches and trees in Dublin City Parks. Due to potential sensitivities surrounding memorial tree plantings, any such planting in public spaces would have to carefully consider the selection of suitable sites where the risk of vandalism or damage to the tree would be minimal.

Tree height diagram

Small 5–8m

Medium 8–15m

Large 15m+

Community tree planting.

3.9 Engagement with the Community and Relevant Stakeholders

3.9.1 Involvement of City Community

Where practicable the Council will encourage and facilitate the involvement of local communities, schools and other stakeholders in tree planting, management and educational activities.

The city community within Dublin includes those who are resident, working, studying or visiting. Through volunteer opportunities the community is encouraged to take an active role in their local green spaces and streetscapes, fostering a sense of ownership and engagement. This also promotes relationships between individuals in this diverse community through social interaction during these activities, and also educates people about their local green space and the flora and fauna which can be found in Dublin City. This can involve activities such as planting,tree sponsorship, wildlife habitat creation and wildlife surveys.

3.9.2 Volunteers

The Council will examine opportunities to encourage and facilitate the work of volunteers with the aim of raising local tree awareness.

Opportunities may involve volunteers getting their hands dirty helping to plant as part of larger scale planting improvements, or conducting wildlife surveys of birds or other fauna. Wildlife surveys may be undertaken independently by regular volunteers with support from Parks Service staff, or as part of formally organised wildlife activity days. Local schools form a vital part of the community and are frequently involved in all these activities. There are also key links to the school curriculum and so activities can focus on educating young people about the biodiversity and ecology of the City.

Tree Wardens – The Council will consider a tree warden scheme to empower members of the community to become voluntary tree wardens who would gather information about their local trees, get involved in local tree matters and encourage local projects involving trees and woods.

3.9.3 Education and awareness

The Council, through education, will aim to raise the awareness and appreciation of trees.

The Council will support tree-related educational initiatives in communities, schools and third level institutions. The Council will organise tree related events during National Tree Week in Spring, and on Tree Day in the Autumn.

Native Tree Trails

There are eight Native Tree Trails in Dublin City Council Parks. On the southside of the city there are three which are located in Bushy Park, Markievicz Park in Ballyfermot, and Herbert Park in Ballsbridge. On the northside of the city there are five which are located in Poppintree Park, Johnstown Park, Albert College Park, St Anne's Park and Tolka Valley Park.

The trails help to introduce a selection of Ireland's native trees. There are 15 native trees signposts in each park. To find them users navigate their way around the park using The Native Tree Trail Booklet available at http://www.dublincity.ie/main-menu-services-recreation-culture-dublin-city-parks/downloads-links

Each trail has its own booklet complete with a trail map and is packed with interesting and fun facts about native trees as well as plenty of space for users to sketch their tree discoveries.

Millennium Arboretum – St. Anne's Park

To celebrate Dublin's Millennium year in 1988, the Parks Department in cooperation with the Tree Council of Ireland, initiated the Millennium Arboretum. Consisting of 16 acres located just off the main avenue, the arboretum is planted with over 1000 types of trees and was sponsored by 1000 participants.

3.9.4 Communication and cooperation

The Council will foster good communication and cooperation on tree-related issues between all relevant stakeholders.

Cooperation within the Council

All Council departments that impact on trees will engage and cooperate on tree-related issues. Council departments making tree-related decisions, or designing or implementing works that affect trees, will consult with the Parks Service at an early stage. The Parks Service will provide advice or assistance, as appropriate.

Cooperation with external stakeholders

The Council will foster cooperation between external stakeholders on tree-related issues.

The Council will continue to be a member organisation of the Tree Council of Ireland, which promotes the planting, care and conservation of trees in both rural and urban areas.

Laburnum.
Photo by Anthony Woods.

4.0 **Action Plan 2016–2020**

Dublin City Council strives to improve the quality of life for people in the city. Trees contribute to the quality of urban life. The Council aims to provide the city with a diversity and abundance of healthy, attractive trees, cared for and managed to a high standard.

The Tree Strategy for Dublin City is used to direct and define the things that need to be done to achieve the aims and objectives for the trees, hedges and woodlands in the city.

Larch.

4.1 Aims and Objectives

There are four key aims for the City's Trees:

- Protect the trees that we have.
- Care for trees to promote healthy growth and development.
- Plant more trees to ensure a sustainable urban tree canopy.
- Communicate effectively with the public and stakeholders regarding trees.

These aims translate into 4 specific objectives:

- Protect
- Care
- Plant more
- Communicate

Acorns.
Photos by Anthony Woods.

4.2 An Action Plan for trees in Dublin City

The action plan is the framework to implement the tree policy and achieve the objectives. The action plan sets out the key actions, responsibilities and target dates for completion. It is concerned with finding ways to secure effective management of the tree stock and to achieve a modest increase in tree cover. The action plan identifies work needed to study the location, distribution and condition of the trees in the city and to monitor changes and trends. The anticipated end result of the action plan will be to improve the contribution of trees to the wellbeing of the people who live, work in or visit Dublin, to benefit wildlife and to promote the character and distinctiveness of Dublin as a capital city.

In order to achieve the key actions of the Tree Strategy, it will be necessary to identify and allocate sufficient resources for tree management. The action plan will ensure that this can be done in a focused and efficient manner, making best use of available resources.

Action Plan Monitoring and Review
The action plan will be subject to annual monitoring to assess progress and to pick up any emerging issues. A more thorough review of the action plan will be undertaken every five years to adjust and incorporate any new changes in legislation, local policy, working practices or technical developments which may arise.

The action plan is the framework to implement the tree policy and achieve the objectives. The action plan sets out the key actions, responsibilities and target dates for completion.

4.3 Action Plan Schedule 2016–2020

Objective 1: Protect Existing Trees, Woodlands and Hedgerows

	ACTION	Timeframe
1.1	Propose model planning conditions for tree protection to act as a guide when the City Council is considering the imposition of conditions on planning permissions (to ensure that existing trees worthy of retention are protected and not damaged during and/or after construction).	2017
1.2	Liaise with the Tree Council of Ireland in relation to the establishment of a working group to lobby for legislative change to improve the protection of amenity trees.	2017
1.3	Develop protocols for dealing with trees and utilities in consultation with the main utility providers to ensure utility companies protect existing public trees when undertaking works.	2018
1.4	Review Ancient and Species Rich Hedgerows within the City (as identified in the 2006 Survey of ancient and species rich hedgerows in Dublin City) and protect existing hedgerow sections.	2020

Objective 2: Care for Trees, Woodlands and Hedgerows to promote healthy growth and development

	ACTION	Timeframe
2.1	Seek to provide a full-time Tree Officer Post to coordinate sustainable urban tree management at a citywide level in liaison with Parks Superintendents and District Parks Officers.	2016/17
2.2	As arboriculture work is specialised and requires trained experienced teams to carry out works it is proposed (as part of the Parks Services workforce review) to up-skill existing staff to form tree crews. Their work will include tree survey and risk assessment and tree works.	2017
2.3	Procure Tree Management Software to facilitate proactive and cost effective management of public trees.	2016
2.4	Survey the City's public trees and using the tree management software create a baseline inventory to better understand the urban tree resource and determine future needs.	2017-20
2.5	Develop a Tree Safety Management Policy to ensure public trees are inspected and managed in accordance with best practice.	2016
2.6	Train key staff in Tree Inspection and Tree Work Specification to ensure public trees are inspected and managed in accordance with best practice.	2016-20
2.7	Develop a Framework for Tree Work Contracts to ensure works are carried out according to industry best practice, by competent practitioners to ensure value for money.	2017
2.8	Review Management Plans for Council Woodlands on a 5 year Basis.	2020

Scots Pine.

Conker.
Photos by Anthony Woods.

Objective 3: Plant more Trees to ensure a sustainable urban tree canopy

	ACTION	Timeframe
3.1	Produce guidance on species of public trees suitable for urban planting.	2018
3.2	Establish a cross-departmental Trees and Sustainable Urban Drainage Systems (SUDS) working group to promote and pilot water-sensitive urban design (WSUD) incorporating urban tree planting.	2016
3.3	Use the results of the Tree Canopy Study to set targets for new tree planting and establish a hierarchy of priority in terms of which areas of the city are most in need of increased tree canopy cover.	2017
3.4	Explore the feasibility of a scheme 'to sponsor or adopt a tree' to facilitate support for tree planting in the city's open spaces, parks, grass verges and streets.	2018

Objective 4: Communicate effectively with the public and stakeholders regarding trees

	ACTION	Timeframe
4.1	Develop a frequently asked questions document on common tree issues and make available on the council webpage.	2017
4.2	Update and expand the Trees page on the Council website to provide information about the value and contribution of trees to Dublin City.	2017
4.3	Review the educational Tree Trails and explore opportunities for their further enhancement.	2019
4.4	Review the interpretation and information available for the Millennium Arboretum in St. Anne's Park and explore opportunities for further enhancement.	2019
4.5	Continue to promote Tree Week and National Tree Day in association with the tree council and facilitate the involvement of local communities in tree planting and educational activities.	Ongoing

Appendix 1: **Existing Tree Preservation Orders in Dublin City 2016–2020**

Tree Preservation Orders (TPOs) may be made under Section 45 of the Local Government (Planning and Development) Act, 1963 and subsequent acts. Part XIII of the Planning and Development Act, 2000 sets out the provisions for TPOs. A TPO can be made if it appears to the planning authority to be desirable and appropriate in the interest of amenity or the environment. A TPO can apply to a tree, trees, group of trees or woodland. The principle effect of a TPO is to prohibit the cutting down, topping, lopping or wilful destruction of trees without the planning authority's consent. The order can also require the owner and occupier of the land subject to the order to enter into an agreement with the planning authority to ensure the proper management of the tree, trees or woodland.

Scots Pine.
Photo by Anthony Woods.

Tree Preservation Orders in Dublin City Council Area

1. Dublin Corporation Tree Preservation (Watermill Road / All Saints Drive, Adjoining St. Anne's National School) Order 1989.
Consisting of a group of 67 *Quercus ilex* (Holm Oak), which were part of the original St. Anne's estate.

2. Dublin Corporation Tree Preservation (St. Patrick's House) Order 1994.
Consisting of 1 *Acer pseudoplatanus* (Sycamore), previously in grounds of St. Patrick's Convent and now part of a housing estate.

3. Dublin City Council Tree Preservation Order (No.1) 2008 Dartmouth Square Park, Dublin 6**.**
Consisting of the group of trees on the eastern boundary of the park. 7 trees (1 x *Acer platanoides* Norway maple, 3 x *Tilia sp*. Limes, 1 x *Fraxinus pendula* Weeping Ash, 1 x *Acer pseudoplatanus* Sycamore, 1 x *Juglans nigra* Black Walnut).

4. Dublin City Council Tree Preservation Order (No.2) 2008 Dartmouth Square Park, Dublin 6.
Consisting of the group of trees on the southern boundary of the park. 23 trees (1 x *Acer platanoides* Norway maple, 9 x *Tilia sp*. Limes, 3 x *Acer pseudoplatanus* Sycamore, 1 x *Juglans nigra* Black Walnut, 5 x *Ilex aquifolium* Holly, 2 x *Taxus baccata* Yew, 1 x *Quercus cerris* Turkey Oak 1 x *Prunus laurocerasus* Cherry laurel).

5. Dublin City Council Tree Preservation Order (No.3) 2008 Dartmouth Square Park, Dublin 6**.**
Consisting of the group of trees on the western boundary of the park. 6 trees (3 x *Tilia sp*. Limes, 2 x *Acer pseudoplatanus* Sycamore, 1 x *Ilex aquifolium* Holly).

6. Dublin City Council Tree Preservation Order (No.4) 2008 Dartmouth Square Park, Dublin 6.
Consisting of the group of trees on the northern boundary of the park. 32 trees (7 x Tilia sp. Limes, 6 x *Ilex aquifolium* Holly, 1 x *Quercus cerris* Turkey Oak, 3 x *Acer pseudoplatanus* Sycamore,1 x *Prunus laurocerasus* Cherry laurel, 7 x *Ulmus procera* Elm, 5 x *Acer platanoides* Norway maple, 1 x *Taxus baccata* Yew, 1 x *Juglans nigra* Black Walnut).

Appendix 2:
Planning and Protection for Trees on Development Sites

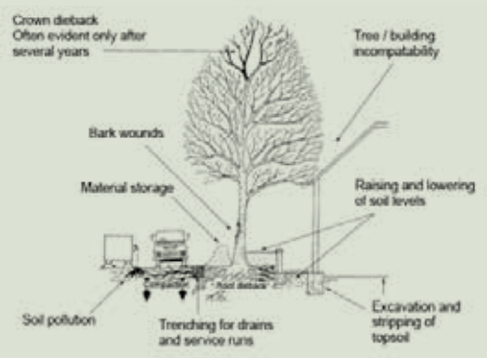
This section offers practical guidance for development when planning for trees on development sites.

How trees sustain damage

During development, trees may be damaged by activities which take place both above and below ground. The diagram opposite illustrates some of the causes and effects of development activity near to trees.

Consideration should be given to how the trees may be protected during the design, demolition and construction phases and during future maintenance of the development.

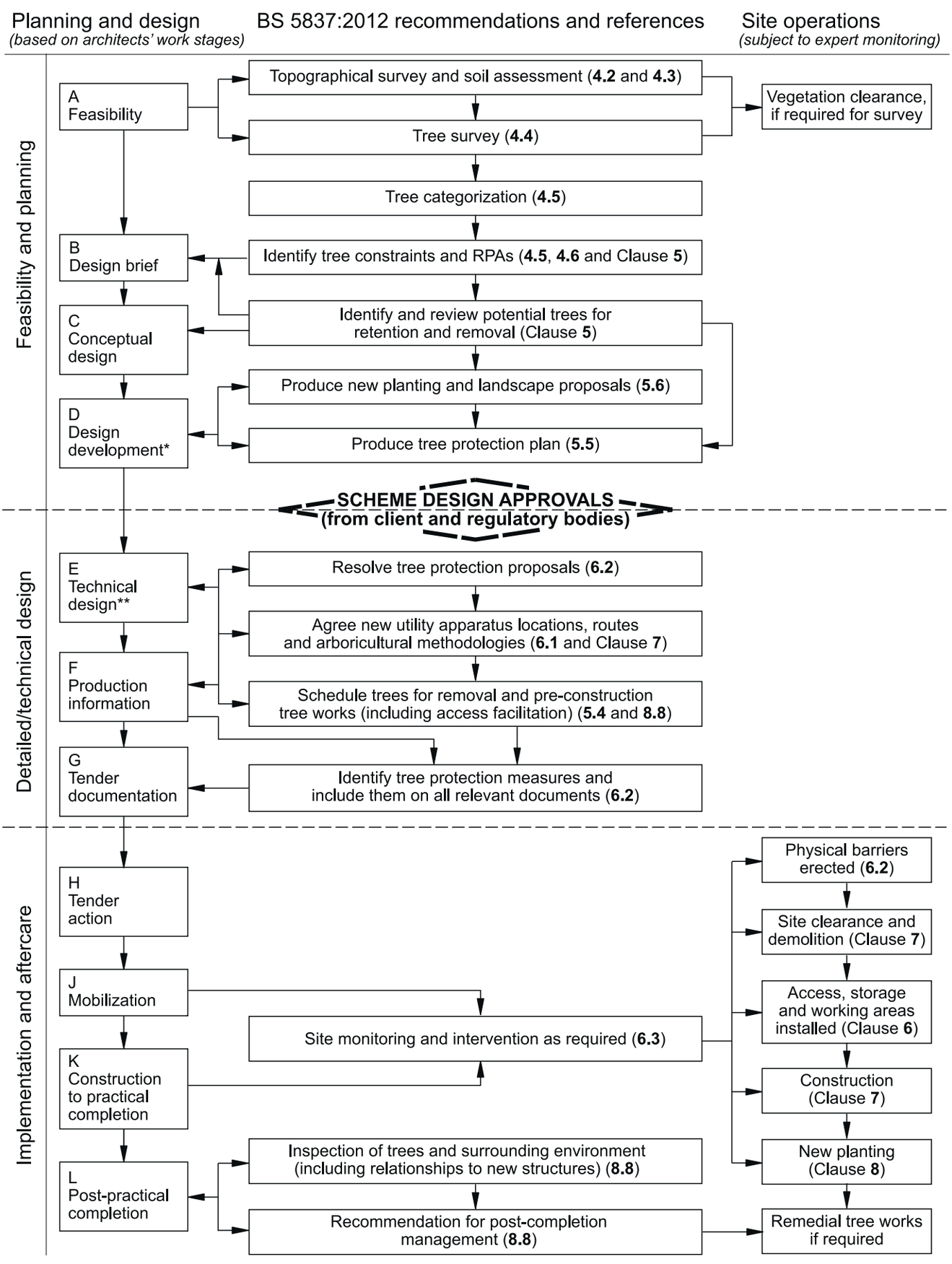
British Standard 5837:2012 'Trees in relation to design, demolition and construction – Recommendations' provides guidance where tree retention or planting is proposed near to construction, the objective being to achieve a long-term harmonious relationship. The good practice recommended in the British Standard is intended to assist in achieving this objective. The standard follows a logical sequence of events that has tree care at the heart of the process and is summarised as a flow diagram shown on opposite page.



Causes and effects of development activity near trees.

The design and construction process and tree care

(Source: BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations)



Planning for Trees on Development Sites

The following is a basic checklist for planning for trees on development sites in Dublin City, including the impact of development on trees in the long term.

Design Stage

- Arrange pre-application discussion with Planning Officer and Parks Professional.
- Carry out land survey to establish contours.
- Seek arboricultural advice.
- Carry out tree survey including adjoining private and street trees (Identify TPO trees).
- Identify Tree Constraints and Root Protection Areas.
- Establish trees to be retained / removed.
- Carry out ecological survey including bat survey.
- Locate sub surface infrastructure – archaeology and services.
- Determine positioning of site huts, scaffolding and cranes, site entrances, and any other buildings and structures to be located on site during demolition and construction.
- Determine proximity of trees to the new build and any buildings to be retained on site including window cleaning system.
- Formulate Tree Protection Plan.

New Planting

- Consider how the trees relate to and affect the surroundings and their impact on history, architecture and tradition.
- Consider ground conditions, required root space / soil volume and scale and proportion of trees when fully grown.
- Frame desirable and hide undesirable views.
- Protect and enhance significant views of important buildings, historic City landmarks and skyline features.
- Preserve or enhance the City's heritage assets and their settings.
- Plant for the long term with emphasis on quality rather than quantity (trees of stature).

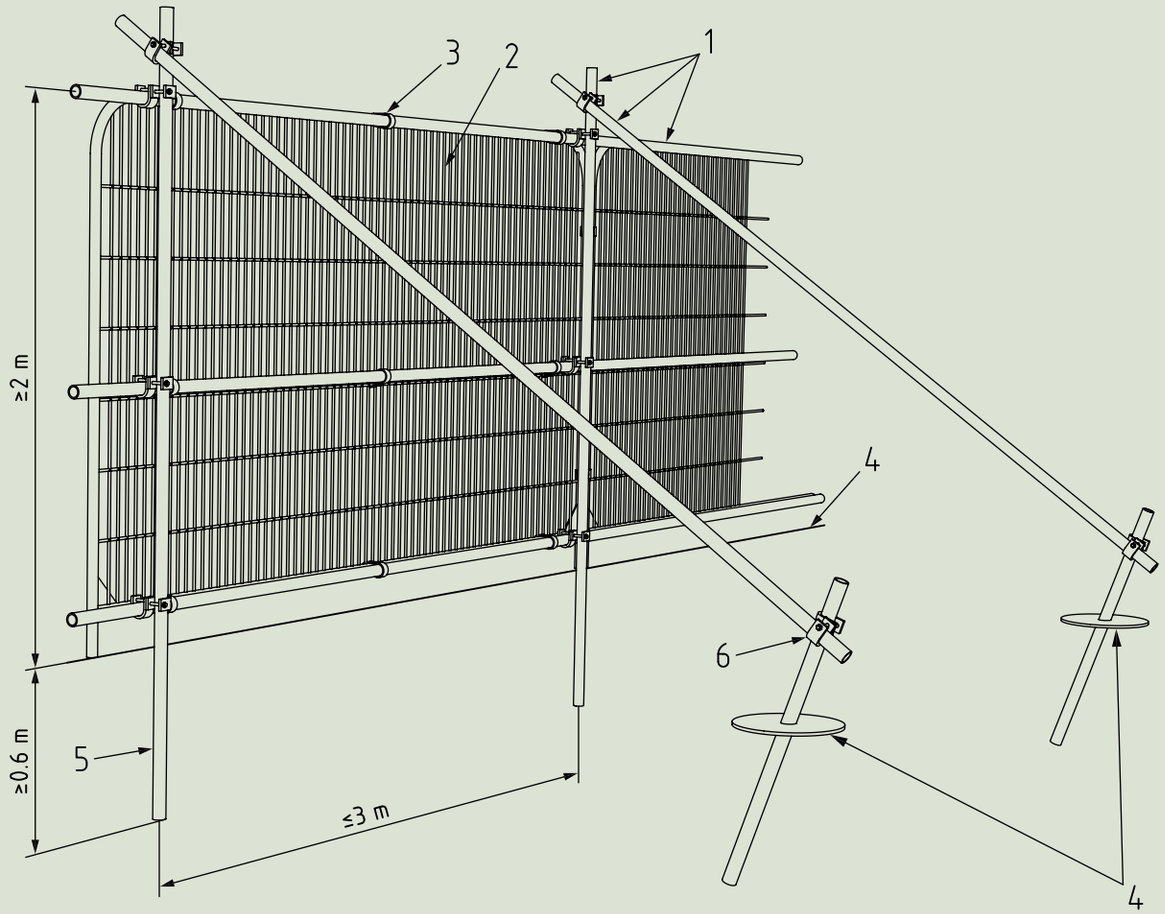
Demolition and construction

- Establish root protection area / construction exclusion zone around trees to be retained.
- Install protection measures (i.e. barriers / fencing / warning notices) prior to commencement of works. (See Figure 2 'Specification for Protective Barrier' from BS 5837 on next page).
- Make all parties aware of protection measures.
- Ensure site huts, scaffolding and cranes, temporary site entrances, and any other buildings and structures to be located on site during the demolition and construction phase do not interfere with trees, including their canopies and root system.
- Store and dispose of materials so as not to interfere with the wellbeing of the trees.
- Consider archaeological implications when removing or digging tree pits and arrange archaeological recording where appropriate.
- Monitor works on site.

Long-term Management

- Set up a tree maintenance regime for the protection of the existing and new trees.
- Ensure any trees overhanging a highway are maintained in a safe condition; provide sufficient headroom for vehicles; do not obscure any traffic signs or sight lines or interfere with street furniture, including lighting columns and CCTV.
- Ensure trees on private footways are maintained to prevent trip hazards and the fruit fall.
- Ensure relevant consents / permissions are obtained as and when future maintenance work is required.

Default Specification for protective barrier



Key

1. Standard scaffold poles.
2. Heavy gauge 2m tall galvanised tube and welded mesh infill panels.
3. Panels secured to uprights and cross-members with wire ties.
4. Ground Level.
5. Uprights driven into the ground until secure (minimum depth 0.6m).
6. Standard scaffold clamps.

(Source: BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations). Permission to reproduce extracts from British Standards is granted by BSI Standards Limited (BSI). No other use of this material is permitted. British Standards can be obtained in PDF or hard copy formats from the BSI online shop: www.bsigroup.com/Shop

Infiltration trench directs footway surface water runoff to structural soil supporting the trees in Melbourne, Australia.
Image: © City of Melbourne (Copyright TDAG Trust)

Appendix 3. Sustainable Urban Drainage Systems (SUDS) and Trees

Surface water management and provision of green infrastructure are fundamental elements of urban design. Well-designed SUDS with rich plantings and quality building materials can provide a centrepiece, gateway feature or community enhancement in residential and high streets, on public squares, near bus stops and transport interchanges or in surface car parks.

The simple integration and/or protection of trees in hard landscapes reduce(s) and attenuate(s) surface water runoff. Big trees with large, dense canopies manage the most surface water. The first strategy to increase the surface water utility of trees in hard landscapes is to provide non-compacted, well-aerated rooting environments that will effectively support tree growth.

The presence of a large tree will in itself reduce the rate and volume of surface water runoff generated by the surrounding hard landscape. Where the tree-growing media is used to provide additional water management capacity, an overflow system will typically be provided. This might include an overflow inlet and / or an under drain, connected either to a surface water storage tank (such as a rainwater collection system for harvesting) or to the conventional drainage system.

Impact on the surfacing sub-base

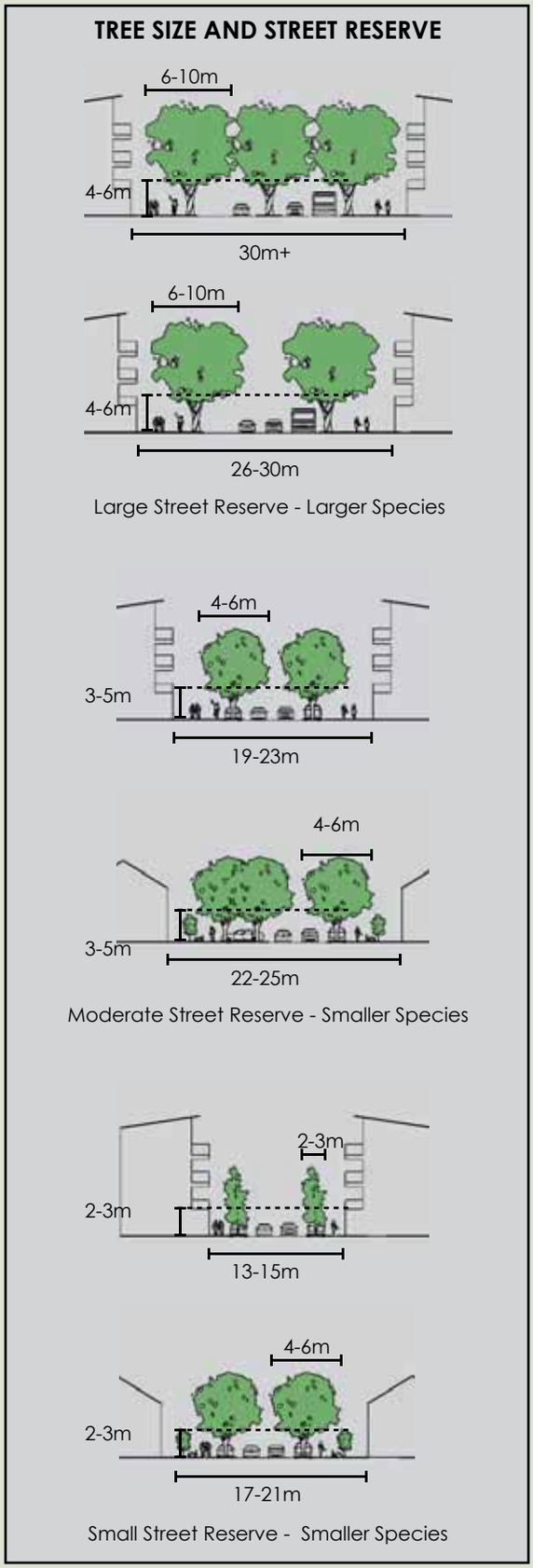
Where trees are used as part of SUDS, the tree-rooting environment should be designed so that water cannot enter the sub-base of adjacent hard surfaces. Details such as the design of the kerb haunching running around the surface opening that is taking in surface water runoff can usually be adapted to ensure the sub-base of adjacent non-permeable hard surfaces remains dry.

Design options for surface water runoff management systems with trees

Sustainable urban drainage can be further enabled through the use of pervious surfacing over all or part of the rooting zone of the tree or by otherwise facilitating drainage of the surrounding surface into the rooting area. When adequately sized and appropriately designed with structural soil, crate or raft systems or as bio retention planters (i.e. rain gardens), the tree-rooting environment can manage the runoff generated by paved areas extending significantly further than its own drip line. (TDAG, 2014)

The SUDS Manual produced by the UK Construction Industry Research and Information Association (CIRIA) is the industry reference for best practice guidance on the planning, design, construction, operation and maintenance of SUDS.

General guide to the canopy width and clearance height of street trees



Appendix 4.
Extract from Design Manual for Urban Roads and Streets

Street trees are an integral part of street design as they contribute to the sense of enclosure, act as a buffer to traffic noise / pollution and enhance place. A traffic calming effect can also be achieved, where trees are planted in continuous rows and their canopies overhang, at least in part, the vehicular carriageway. Street trees can also be used to enhance legibility by highlighting the importance of connecting routes and distinguishing one area from another through variations in size and species selection.

The planting of trees should be considered an integral part of street design. In general, the size of the species selected should be proportionate to the width of the street reserve. See examples left:

- Larger species, with a canopy spread greater than 6m will be best suited to wider streets, such as Arterial and Link streets.
- Smaller species with a canopy spread of 2–6m will be best suited to narrower streets such as Local streets.
- Designers may seek to vary this approach in keeping with the characteristics of a place.
- For example: Sparse planting may be more appropriate in a Centre, enhancing its urban qualities.
- Smaller species may be more appropriate where buildings are located in close proximity to the street edge carriageway (i.e. to take account of overshadowing and growth restrictions).
- Larger species may be desirable within suburbs, to enhance the greener character associated with these places.

To be effective, trees should be planted at intervals of 14–20m. This may be extended periodically to facilitate the installation of other street facilities, such as lighting. Designers should also consider the impact of root growth. Tree roots may need to be contained within individual tree pits, continuous soil planting strips or using other methods to restrict growth under pavements/ toward services.

Tree Roots under Footpath
Photo courtesy of the Urban Horticulture Institute, Cornell University.

Appendix 5. Trees and Utilities / Trench Works

This section provides guidance on the planning, design and implementation of trench works to avoid / minimise damage to trees and should be followed by utilities / operators and their contractors.

Context: Trees and Trench Works along Public Roads

Trees (and hedges) are an important element of green infrastructure along public roads and streets. Trees play an essential role in the environment and visual amenity of both rural and urban landscapes. Along public roads and streets the space available for both trees and utilities is often very restricted, and they are frequently forced to share the available space below ground.

Most roots are found in the top 600mm of soil and often grow out further than the tree's height. Along public roads and streets, tree roots in many cases, grow not only under the footpath (where present) but may also extend under the carriageway. If roots are damaged the tree may suffer irreversible harm and eventually die.

Existing trees therefore, are an important factor to consider during the design and construction of trench works. Damage to tree roots by severance or soil compaction can have a detrimental impact on the tree's ability to absorb the essential water and nutrients needed by the tree to survive. Severance or damage to larger woody roots can also compromise the tree's stability, leading to potential wind-throw.

Consultation with Local Authority Parks Service (or owner in the case of privately owned trees)

For works in proximity to public trees, the City Council and in particular the Parks Service must be consulted at an early stage before works are undertaken that may affect trees. A Tree Survey and detailed plans showing the routing of all services in the proximity of trees are essential, and should also show the access space needed for excavating and laying the service.

Advice should be sought from the local authority park superintendent / tree officer. On major projects, a consultant arboriculturist should be employed to liaise with the local authority park superintendent / tree officer.

Certain trees are subject to Tree Preservation Orders (TPOs). Trees protected by a TPO must not be wilfully damaged or destroyed and cannot be cut down, uprooted, topped or lopped without the local planning authority consent.

Compensation (in the form of a charge being levied on the utility / operator) will be sought in the case of non-compliance and tree damage. This charge will reflect the amount of damage sustained and where the life / safety of the tree or trees is undermined it will include the cost of total replacement. These charges will be drawn up by Local Authority Professional Parks Staff (or Arboricultural Consultant appointed by the local authority).

For privately owned trees the owner or their agent should be consulted at an early stage prior to commencement of works.

Industry Best Practice guidelines for Trench works in proximity to trees

Utilities / operators and their contractors should avoid damage to trees by carrying out works in accordance with best industry practice, as stated in the most current version (at the time of the works) of the following guidance documents:

British Standard 5837:2012 'Trees in relation to design, demolition and construction – Recommendations' gives recommendations and guidance on the relationship between trees and design, demolition and construction processes.

National Joint Utilities Group (NJUG). Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees. Volume 4, issue 2 seeks to provide constructive advice on how to minimise damage to trees by undertakers (utilities). The guidelines have been prepared in collaboration between representatives of the utilities, the arboricultural and urban forestry professions and the Department for Communities and Local Government in the U.K.

Design & Construction Process for Trench Works in Proximity to Trees

This flow diagram illustrates the recommended work flow to follow during the planning, design and implementation of trench works to avoid / minimise damage to trees. Each stage of the process should be in accordance with BS 5837 and the NJUG guidelines.

Roots of Beech Tree, Bushy Park.
Photo by Anthony Woods.

Appendix 6. Conflicts Between Hard Surfaces and Tree Roots

Integrity of surfaces and above-ground Structures

A common feature of older planting is that maturity can result in significant disruption of hard surfacing close to the trunk by large structural roots. Roots are very small when they start growing into base layers then increase in diameter, resulting in lifting or cracking of the hard surfacing. When the lifting is excessive, a trip hazard may be created.

Tree-based solutions for surface integrity:

Species selection

Root damage to hard surfaces around trees often occurs where water-demanding species with fast-growing, shallow roots are planted such as willow (*Salix spp*.) and poplar (*Populus spp*.). The Design Manual for Roads and Bridges (UK) on footway design recommends that new developments give preference to trees that have deep rather than shallow roots. It also emphasises, and this is perhaps more critical, that "sufficient space must be provided for root growth".

While general rooting habit is an important factor to consider when selecting tree species, it will not in itself meet the problems of surface upheaval. A primary influencing factor of root architecture is soil profile and structure. As a result, root behaviour in urban environments can be quite different from that observed in natural, temperate forest settings.

Rooting volume and aeration

If the rooting environment provided is not rich in oxygen-rich voids for roots to grow through, roots will exploit voids and oxygen wherever it is available in their immediate surroundings, such as in footway sub-bases. Planning for and providing ample, well oxygenated, void-rich growing medium for roots is one of the most important considerations in any comprehensive strategy for avoiding damage.

Infrastructure-based solutions for surface integrity:

Accounting for trunk flare

At the point where the tree trunk joins the roots, a transition area transfers wind and crown loads in the trunk to the roots. The tree puts on more wood in this area to resist this force. The extra wood swells the base of the tree and this is called the trunk flare or root collar. When trunk flare comes into contact with an object, the tree adds wood in that location, in response to the restriction, to provide increased stability. The radial force exercised by this increase in wood can damage hard surfaces and walls. It is therefore critical that the design of the hard surface around each tree anticipates the growth of the trunk flare. Increasing the distance from the edge of the hard surface to the base of the tree will help avoid damage. In tight urban spaces, the width of a tree opening will be limited by pedestrian traffic and accessibility concerns. However, it is not a requirement that all tree openings should be of the same size: flexibility with tree opening dimensions will enable the opening size to be maximised where space allows, while maintaining pedestrian-comfortable pinch points. Good urban designers can develop solutions to vary the size of the openings while still accomplishing well-designed spaces. Design standards should encourage a flexible approach, while establishing minimum dimensions in the context of anticipated trunk flare growth.

Surfacing sub-base

The type and thickness of material for the sub-base layer can also influence the incidence of surface upheaval. Root damage mainly emerges in lightly constructed hard surfaces that are laid on a base layer of compacted sand. Research has shown that a sub-base made of compacted coarse gravel with limited size range and no fine particles can decrease root penetration.

Surfacing and edge details

The type of surfacing next to the tree opening also influences strategies for managing conflicts between hard surfaces and tree roots. Some materials, such as asphalt, brick and loose-set paving stones, can adapt to the dynamic movement of the surface caused by root expansion. Adding a layer of woven geotextile or geogrids under the paving can make the pavers rise in smoother lines, reducing tripping hazards.

Underpinned hard surfaces (i.e. supported from underneath so as to 'float' above the soil and the tree roots) offer the most effective, but also the most expensive, civil engineering solution to eliminate risks of upheaval and reliably grow large trees. This might be delivered through the use of load-bearing tree planting systems, such as structural substrates, crates or raft systems.

No-dig surfacing

Where new surfacing close to existing trees is unavoidable, it has to be designed so that there is minimal disturbance to the tree roots and to the tree-rooting environment. In such circumstances, it is important to:

- Limit digging, since a large proportion of the roots are likely to be in the top layer of soil.
- Limit soil compaction.
- Make sure that water can still get through.
- Make sure that gas exchange can continue to take place.

Where hard surfacing is being retrofitted around existing trees, as recommended in Arboricultural Practice Note 12 (available at https://www.trees.org.uk/Trees.org.uk/files/b6/b6a05a2e-ec86-4d23-aa92-42fdec8d67c0.pdf) no-dig surfacing provides one possible solution to achieve all the above, while also helping to prevent risks of surface upheaval by roots.

A no-dig surfacing installation typically involves first laying a robust yet permeable geotextile membrane over the existing ground, then laying

and securing a cellular confinement system on top of this, and then filling the cells with no-fines angular stone of 20–40mm. On top of the confinement system, a permeable sub-base is laid with a permeable surface on top of the sub-base to complete the installation. Pavers over sand are one example of permeable sub-base and surface.

Root deflectors

Root deflectors are intentionally designed physical impediments to lateral root growth. Often constructed from plastics and installed so as to surround the root ball of the tree, root deflectors redirect initial lateral root growth downward and away from the kerb and the hard surface, etc. In theory, by directing buttress roots to grow deeper, the forces that they exert will dissipate through a larger volume of soil before reaching the hard surfacing above. By leading roots to surface further away from the root flare, root deflectors also allow remedial root pruning that might be conducted as a last resort to address surface distortion, to be carried out with much-reduced impacts on tree health and structural integrity.

On this basis, root deflectors are often systematically specified for trees in hard landscapes and feature as a requirement in many street and footway design manuals. A review of the available evidence on the structural stability of trees and field verification on the impact of deflective devices for tree roots invites greater caution in prescribing their use:

- Root deflectors (particularly when 600mm deep and over) inhibit lateral root development and, in doing so, go against the root structure established by nursery providers to maximise establishment stability and good future root design. While nursery practices are anchored in long-accumulated knowledge on root pruning and architecture, root deflectors are only about 35 years old. Their impact on the stability of mature trees is not known.
- Available research on the effectiveness of root deflectors shows a high level of sensitivity to soil types and species.

A comprehensive review conducted in 2008 of available research on the impact on root density, diameter and mean depth proved inconclusive.

Addressing existing root-inflicted damage to surfacing

Several strategies are available to alleviate or remediate root damage to hard surfaces:

- Resurfacing the area affected by root damage, using flexible surfacing materials. This will not remove the problem but will alleviate the trip hazard, pending full resurfacing of the affected footway or paved area when the rising of the footway level may occur, combined or not with retrofitting of a load-bearing solution in the rooting environment or applying non-invasive soil de-compaction techniques.
- Bridging the footway over the roots. Bridges are simply footways that are raised above the root growth beneath. They may be supported by concrete piers or the sub-base layer.
- Increasing the size of the surface opening (the area between the tree trunk and the edge of the surrounding hard surface) and enhancing the quality of the rooting environment immediately around the root ball of the tree (applying non-invasive soil decompaction introducing organic matter). This will only be possible where enough space is available to introduce greater protection of the surface opening (e.g. kerb, low railing), while maintaining the usability of the surrounding hard surface.
- Retrofitting a load-bearing solution in the rooting environment. Raft systems and stone-based structural substrates can be installed around existing trees to provide an enhanced growing environment for tree roots and alleviate pressure on the road, footway or other surfacing.
- Root pruning. The removal of roots will have the greatest negative impact on tree health and stability. It should only be considered as a last resort before removal and conducted under expert supervision.

Regardless of the strategy chosen, it is important that:

- All excavations around the root ball of an existing tree are conducted by trained operatives with non-invasive excavation tools (e.g. vacuum or pressurised air powered excavators).
- Care is taken to avoid suffocating roots with additional soil build up or reducing root volume by lowering soil levels.

Alder Catkins.
Photo by Anthony Woods.

Trees and Design Action Group Case Study: Structural soil for resilient footways in Slaney Road, Walsall, England

Slaney Road, a narrow residential street in Walsall with a main road at one end and a local park at the other, had turned into a highway maintenance headache. Plane trees (Platanus x hispanica) planted in narrow footways had outgrown their planting environment: trunks obstructed the footways while roots had severely damaged surfaces in the footways and carriageway as well as pushed kerbs and adjacent property walls.

Following consultation with local residents and representatives, it was decided that approximately 60% of the trees would be removed in the narrowest portion of the street and replacement planting would take place. While consensus was reached, there were conflicting views, including strong dissatisfaction with the conditions of surfaces in the street, concerns over the recurring cost of patching and other remedial works, and attachment to the majestic streetscape created by the mature trees.

To succeed in meeting the agreed brief, the highway maintenance team and urban forestry officers adopted a collaborative approach to the footway reconstruction, carriageway resurfacing and tree replacement. The rooting environment for the replacement trees was engineered with a medium-size aggregate structural soil consisting of 80% single size stones and 20% fine sand and soil mix. The structural soil was laid one-metre deep, except in a few locations where the layout of underground services required a shallower depth.

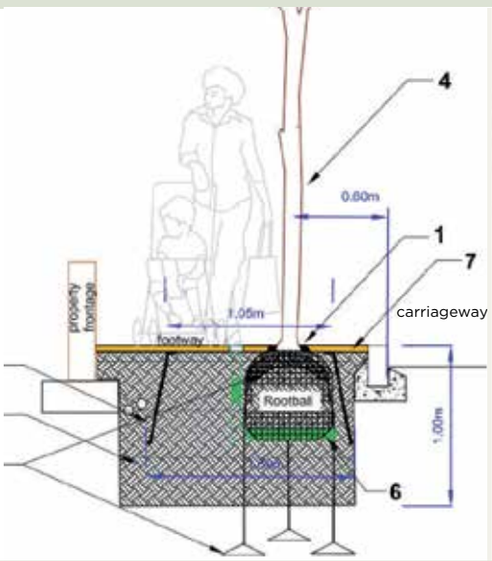
For replanting, 14 extra heavy standard sweet gum trees (Liquidambar styraciflua “Red Star”) were preferred to planes due to their drought tolerance, striking autumn colours and smaller overall size yet ability to maintain continuity of leaf shape for the avenue affect. Each tree was fitted with a root deflector and an irrigation ring. The surface immediately around each tree was finished with a porous resin-bonded layer of aggregate that was loosened around the trunk base to allow for growth and flare. The £27,000 scheme was funded through the highway maintenance budget and completed in 2010.

(*From Trees in the Townscape: A Guide for Delivery (2014). Copyright Trees and Design Action Group Trust.)*

Below left: Tree planting detail used on Slaney Road. Image © Walsall Council.

Below right: Sweet gum trees planted to replace mature limes that had overgrown their location. Image © Anne Jaluzot.

Not to scale: for illustrative purposes only
1. Loose pea gravel for trunk expansion.
2. Root deflector.
3. Structural soil.
4. Liquidambar styraciflua “Red Star”.
5. Root ball anchoring system.
6. Irrigation / aeration system.
7. Resin-bound gravel.



Metre-high black units installed on streets of Copenhagen, during the winter months only, to protect trees from the effects of salt spray on busy traffic routes.
(TDAG, 2014) Image © Anne Jaluzot.

Appendix 7. De-icing Salt Damage to Trees

Salt damage, as a result of the use of thawing salts (sodium chloride) on paved surfaces near trees, is a well-known phenomenon. Damage may occur when a high concentration of salt is present in the surface water runoff entering the tree-rooting environment. Damage also occurs when tree branches are exposed to melted salt water blown into the air by traffic.

Indirect damage may occur when physical and chemical soil properties are adversely affected by the salt. The presence of sodium can lead to the disintegration of the soil particles and the production of fines which enter and clog soil pores. This reduces aeration and promotes soil compaction. Salt also alters the osmotic potential of the soil solution. The tree therefore has to use more energy to absorb water from the soil matrix.

Mitigation requires a combination of tree and non-tree-based measures:

- Minimising the amount of De-icing salt utilised in highway winter service operations
- Adjusting the tree planting environment design, allowing for the temporary installation of protective barriers for salt spray in the winter alongside heavily trafficked streets, as routinely done in Copenhagen pictured on the right.
- If surface water runoff is directed to the pit, ensuring high drainage rate and dilution with non-contaminated water (roof-runoff).
- Selecting salt-tolerant species. In 2011, Forest Research provided a simple rating of the soil salt tolerance of common species in the UK, shown in the following table.
- Flushing the tree opening and planting hole with water in the spring after a bad winter.
- Avoiding pollarding after a bad winter.
- Avoiding as much as possible, placing street salt bins near to existing trees. (TDAG, 2014)

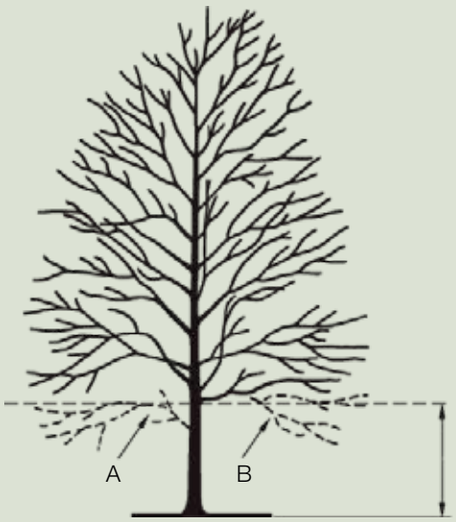
Tolerance	Species
Tolerant	*Alnus glutinosa*
Tolerant	*Elaeagnus*
Tolerant	*Gleditsia triacanthos*
Tolerant	*Pinus nigra (all varieties /subspecies)*
Tolerant	*Picea pungens*
Tolerant	*Quercus robur*
Tolerant	*Robinia pseudoacacia*
Tolerant	*Salix alba*
Tolerant	*Ulmus glabra*
Intermediate	*Acer campestre*
Intermediate	*Alnus incana*
Intermediate	*Crataegus monogyna*
Intermediate	*Carpinus betulus*
Intermediate	*Fagus sylvatica*
Intermediate	*Fraxinus excelsior*
Intermediate	*Picea abies*
Intermediate	*Pinus contorta*
Intermediate	*Pseudotsuga menziesii*
Intermediate	*Sorbus aucuparia*
Intermediate	*Thuja occidentalis*
Sensitive	*Acer pseudoplatanus*
Sensitive	*Aesculus species*
Sensitive	*Betula pubescens*
Sensitive	*Cornus species*
Sensitive	*Corylus species*
Sensitive	*Larix decidua*
Sensitive	*Platanus x hispanica*
Sensitive	*Prunus avium*
Sensitive	*Tilia cordata*
Sensitive	*Tilia platyphyllos*

Appendix 8. Crown Lifting and Crown Reduction

Crown Lifting

Crown lifting involves pruning to achieve a desired vertical clearance above ground level or other surface. This is sometimes necessary to facilitate site usage.

Crown Lifting

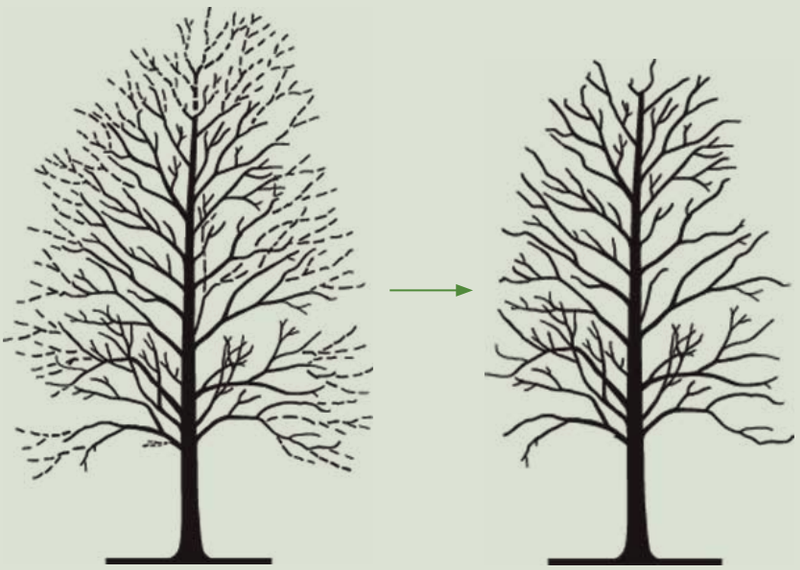


Clearance to be specified by the removal of either main branches (A) or secondary branches (B)

Crown Reduction

Crown reduction alleviates biomechanical stress by reducing both the leverage and the sail area of the tree, and can allow retention of a tree in a confined space. It can also be used to create a desired appearance or to make the tree more suited to its surroundings. Unlike topping, it retains the main framework of the crown and therefore a high proportion of the foliage-bearing structure, which is important for the maintenance of vitality. Not all species or individual trees are appropriate candidates for reduction (BS 3998:2010).

Crown Reduction



a) Before crown reduction, showing material to be removed.

b) After crown reduction.

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Why Topping Hurts Trees

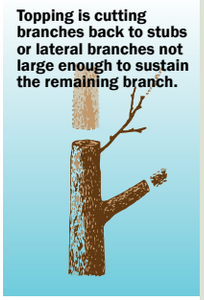
Learn why topping is not an acceptable pruning technique and discover recommended alternatives.

Topping is perhaps the most harmful tree pruning practice known. Yet, despite more than 25 years of literature and seminars explaining its harmful effects, topping remains a common practice.

What is Topping?

Topping is the indiscriminate cutting of tree branches to stubs or to lateral branches that are not large enough to assume the terminal role. Other names for topping include "heading," "tipping," "hat-racking," and "rounding over."

Topping is often used to reduce the size of a tree. A homeowner may feel that a tree has become too large for his or her property, or that tall trees may pose an unacceptable risk. Topping, however, is not a viable method of height reduction and certainly does not reduce future risk. In fact, topping will increase risk in the long term.



Topping is cutting branches back to stubs or lateral branches not large enough to sustain the remaining branch.

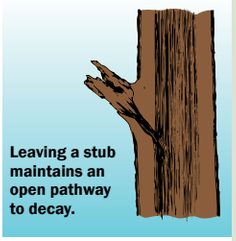
Topping Stresses Trees

Topping can remove 50 to 100 percent of a tree's leaf-bearing crown. Leaves are the food factories of a tree. Removing them can temporarily starve a tree and trigger various survival mechanisms. Dormant buds are activated, forcing the rapid growth of multiple shoots below each cut. The tree needs to put out a new crop of leaves as soon as possible. If a tree does not have the stored energy reserves to do so, it will be seriously weakened and may die.

A stressed tree with large, open pruning wounds is more vulnerable to insect and disease infestations. The tree may lack sufficient energy to chemically defend the wounds against invasion, and some insects are actually attracted to the chemical signals trees release.

Topping Leads to Decay

Correct pruning cuts are made just beyond the branch collar at the point of attachment. The tree is biologically equipped to close such a wound, provided the tree is healthy enough and the wound is not too large. Cuts made along a limb between lateral branches create stubs with wounds that the tree may not be able to close. The exposed wood tissues begin to decay. Normally, a tree will "wall off," or compartmentalize, the decaying tissues, but few trees can defend the multiple severe wounds caused by topping. The decay organisms are given a free path to move down through the branches.



Leaving a stub maintains an open pathway to decay.

Topping Can Lead to Sunburn

Branches within a tree's crown produce thousands of leaves to absorb sunlight. When the leaves are removed, the remaining branches and trunk are suddenly exposed to high levels of light and heat. The result may be sunburn of the tissues beneath the bark, which can lead to cankers, bark splitting, and death of some branches.

Topping Can Lead to Unacceptable Risk

New shoots develop profusely below a topping cut.

The survival mechanism that causes a tree to produce multiple shoots below each topping cut comes at great expense to the tree. These shoots develop from buds near the surface of the old branches. Unlike normal branches that develop in a socket of overlapping wood tissues, these new shoots are anchored only in the outermost layers of the parent branches and are weakly attached.

The new shoots grow quickly, as much as 20 feet (6 m)in one year in some species. Unfortunately, the shoots are prone to breaking, especially during windy or icy conditions. While the original goal was to reduce risk by reducing height, risk of limb failure has now increased.

Topping Makes Trees Ugly

The natural branching structure of a tree is a biological wonder. Trees form a variety of shapes and growth habits, all with the same goal of presenting their leaves to the sun. Topping removes the ends of the branches, often leaving ugly stubs. Topping destroys the natural form of a tree. Without leaves (for up to six months of the year in temperate climates), a topped tree appears disfigured and mutilated. With leaves, it is a dense ball of foliage, lacking its simple grace. A tree that has been topped can never fully regain its natural form.

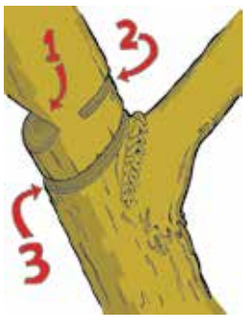
Topping Is Expensive

The cost of topping a tree is not limited to only the job cost. Some hidden costs of topping include:

- Increased maintenance costs. If the tree survives, it will likely require corrective pruning within a few years (e.g., crown reduction or storm damage repair). If the tree dies, it will have to be removed.
- Reduced property value. Healthy, well-maintained trees can add 10 to 20 percent to the value of a property. Disfigured, topped trees are considered an impending expense.
- Increased liability potential. Topped trees may pose an unacceptable level of risk. Because topping is considered an unacceptable pruning practice, any damage caused by branch failure of a topped tree may lead to a finding of negligence in a court of law.

Alternatives to Topping

Sometimes a tree must be reduced in height or spread, such as for providing utility line clearance. There are recommended techniques for doing so. Small branches should be removed back to their point of origin. If a larger limb must be shortened, it should be pruned back to a lateral branch that is large enough (at least one-third the diameter of the limb being removed) to assume the terminal role. This method of branch reduction helps to preserve the natural form of the tree. However, if large cuts are involved, the tree may not be able to close over and compartmentalize the wounds. Sometimes the best solution is to remove the tree and replace it with a species that is more appropriate for the site.



Proper branch reduction preserves natural form.

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Proper Mulching Techniques
Palms
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Appendix 10. Damaged Pipes

Direct damage caused by root intrusion can occur with surface water and sewer pipes. One of the primary causes of this problem lies with the inadequate performance of the elastomeric rings used as joints to assemble pipe segments. Research has shown that roots have a penetration force of 15 to 20 bar per square cm, whereas the commonly used rubber joints only withstand six bar pressure. While older clay pipes are more prone to intrusion, the problem also affects concrete and plastic apparatus, since all use joints with insufficient resistance. The research conducted has shown that in real life (as opposed lab settings), root intrusion – if it does occur – tends on average to happen after two decades following the installation. This long lead time creates little incentive for resource-constrained water companies and their suppliers to invest in the development of higher performance elastomeric joints.

For new developments or retrofit situations where older pipes are being replaced, suitable preventative and protective measures include:

- Provision of an adequately sized, non compacted and well-aerated growing environment for the trees.
- Choice of tree species with slower root growth.
- Use of welded polyethylene (PE) pipes. This requires more expensive supplies and higher skilled labour, which results in total installation costs being on average 30% higher than non-welded options.
- PVC pipes assembled with solvent cement joints. This technique is commonly used in Australia.
- Use of geotextile liners along the backfill material (rather than around the root ball of the tree) to discourage root growth into the pipe bedding.

For existing sewers, application of in-pipe liners can provide an effective remedial solution to pipe intrusion, granted the material used are able to resist a pressure of 2 bar. As in-pipe polyester liners typically shrink after application, this ensures that, should roots penetrate in the interstice found between the pipe and its liner, it is the pipe, rather than the new liner, that collapses under the radial pressure exercised by roots.

Limitations are:

- Use of liners reduces the effective diameter of pipes.
- Where a high number of side connections exist, lining does not remove the weak point associated with the pipe connection. Using seals called ‘top hats’ at lateral connection can significantly reduce this risk.
- Liners do not address issues associated with roots found in manholes. However, roots found in manholes are much easier to remove. (TDAG, 2014)

Appendix 11. Review of Existing Data on Dublin City's Trees

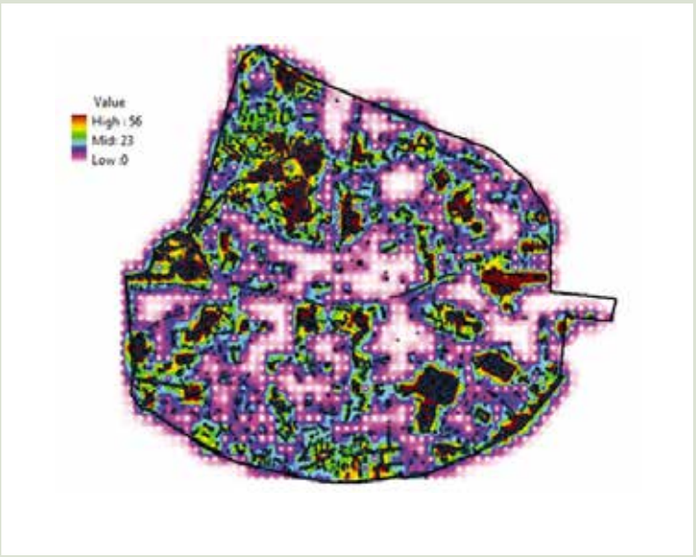
An Inventory of Trees in Dublin City – 2010

Tine Ningal, Gerald Mills, Pamela Smithwick – School of Geography, Planning and Environmental Policy, University College Dublin (UCD), Dublin.

This study published in Irish Geography, provided a comprehensive inventory of trees in Dublin's city centre. The study area was defined as the area between the Grand and Royal Canals and the resulting inventory provided an important first step toward an assessment of the environmental value of Dublin's trees.

Using satellite imagery, and active fieldwork, a UCD Geography PhD student catalogued the trees in Dublin's city centre. The survey findings showed over 10,000 trees covering more than 800,497 sq metres between the two canals, or 6% of the total land area.

Approximately 63% of the trees were identified as being located in private spaces (such as gardens), and 37% were recorded in public spaces. According to the data, there was 1 tree for every 50 residents living between the canals.



The distribution of trees in Dublin. The circles indicate the position of individual trees and the shaded area indicate levels of tree density (trees per hectare).

3D impression of all trees and buildings.

Of the 10,000 plus trees identified, 2,500 (25%) were tagged as 'street trees' – trees located along streets. Each of these street trees was individually surveyed during 9 months of fieldwork to capture more detailed information, including: species, size, age, and health status.

The survey showed that 84% of Dublin city centre's 2,500 street trees belong to just 4 species – Lime (38%); London Plane (27%); Maple (14%); and Hornbeam (5%).

Tree Species	Count	Percentage (%)
Hornbeam	116	5
Lime	970	38
London Plane	697	27
Maple	354	14
Other	415	16
Total	2,552	100

Breakdown of Street Trees: 41 different species were identified. Four species dominant (84%). Lime species account for more than one third of street trees.

The researchers also estimated that the street trees convert about 42,000 kg of carbon each year (equivalent to over 40,000 car trips in the city centre) and store approximately 1 million kg of carbon at any given time. They also suggest that 81% of the carbon storage is conducted by just one species of tree: the London Plane.

Tine Ningal, the UCD Geography PhD student who conducted the survey outlined how "Street trees can play a particular role in urban design and city planning. Placed along roadsides and in the median strip of busy streets, they can be used to regulate access to sunshine, restrict air flow, provide shelter, scavenge air pollutants and manage noise at street level."

Dr Gerald Mills from the UCD School of Geography Planning and Environmental Policy, who supervised the research explained how "A tree planting policy can be an important part of a broader environmental strategy aimed at improving the quality of life in urban areas but this requires up-to-date knowledge of the current tree stock."

Summary of Findings:

- Currently, there is one tree for every 50 residents.
- London Planes account for over 80% of Carbon storage and over 66% of carbon sequestration.
- The City Centre and other busy spots are relatively devoid of trees.
- Certain streets experience high traffic density but are devoid of trees.

Analysis of Annual Tree Planting

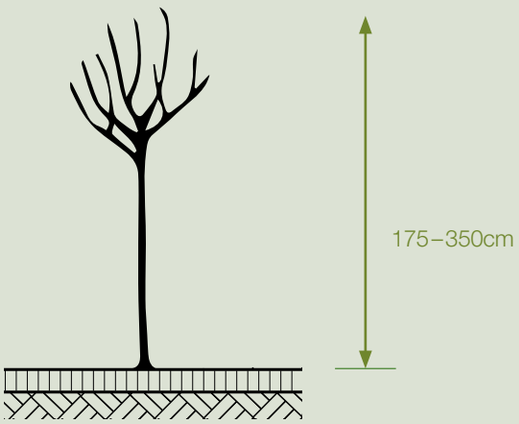
The information presented in this section is based on data available for the previous three planting seasons: 2012/2013, 2013/2014, 2014/2015.

Types of Plant Material used for Tree planting

Two different types of plant material are used for Tree planting: Standard Trees (6–8cm girth and above) and whip planting.

Standard Trees

Standard Trees are defined as trees with a substantially upright stem, clean of lateral growths, supporting a branched crown.



Standard Trees growing in the nursery.

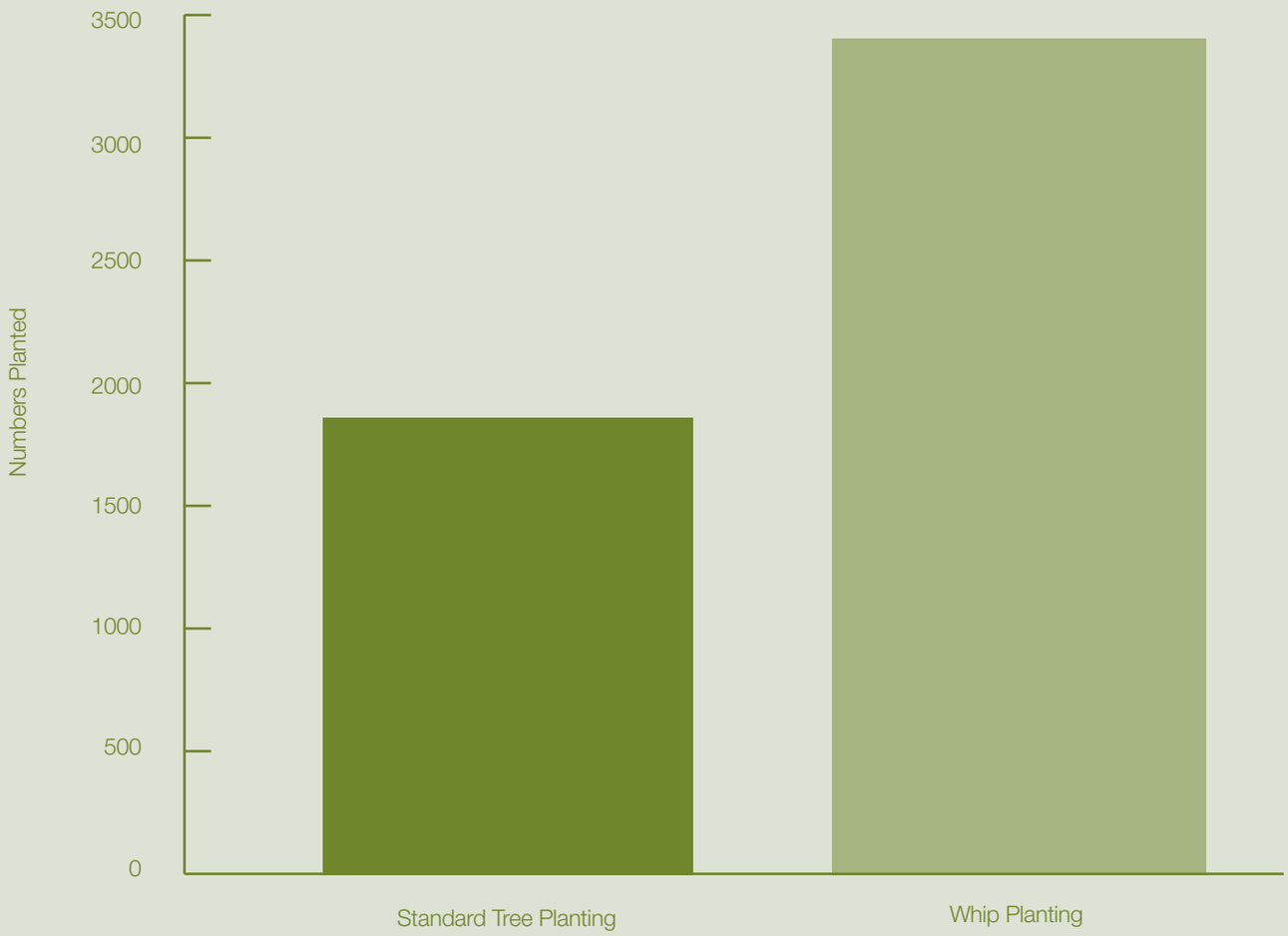
Whip Planting

Whips are defined as transplants consisting of only a single slender stem, without significant side branching. Whips are small young trees, typically two years old and between 60-90cm tall. Whips are typically used for woodland and hedge planting.

Whips planted with spiral rabbit guard.

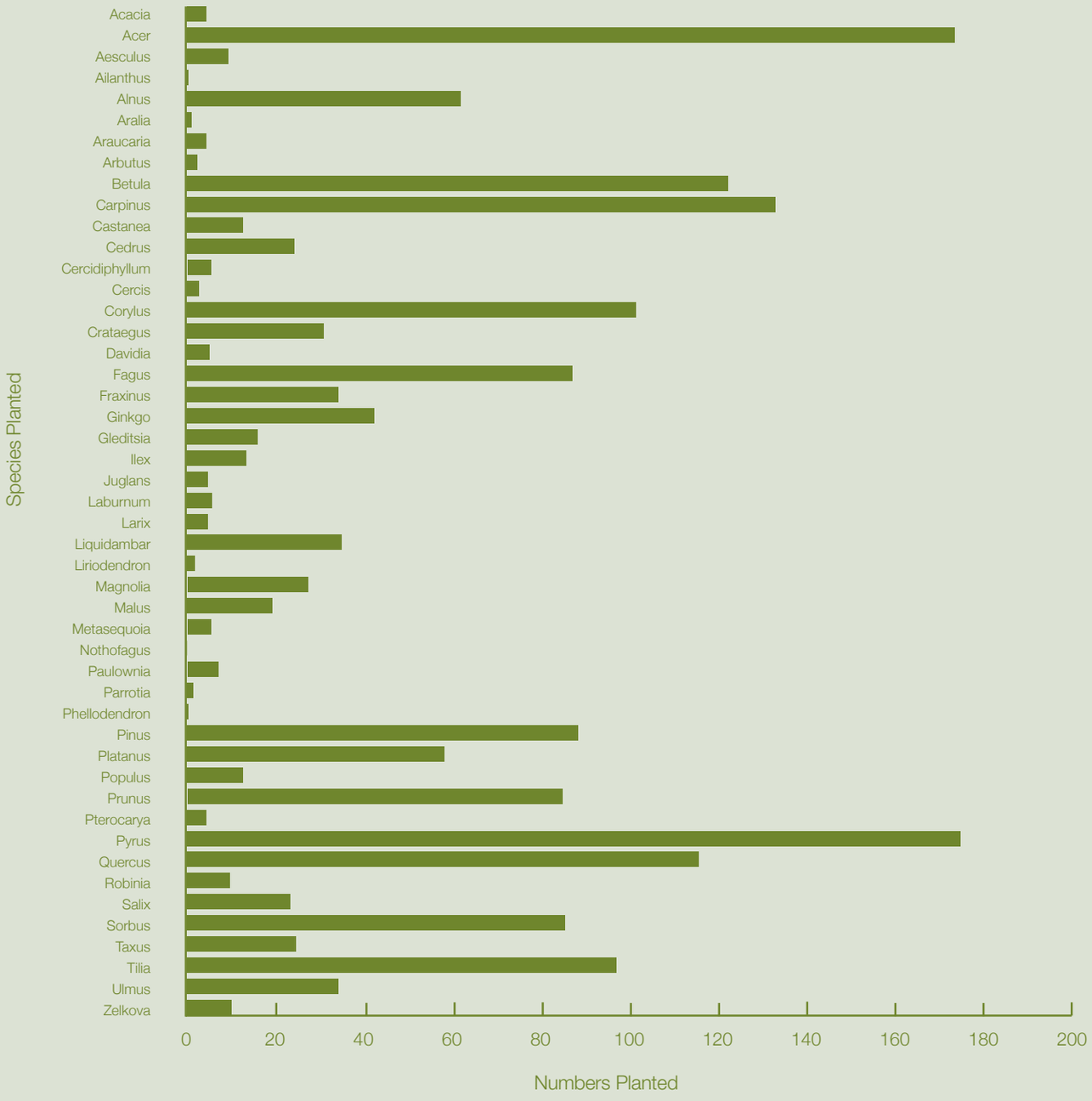
Total Number of Trees Planted each year

An average of 5,230 trees in total are planted across the city each year consisting of 1,827 Standard Trees and 3,403 Whip planting.



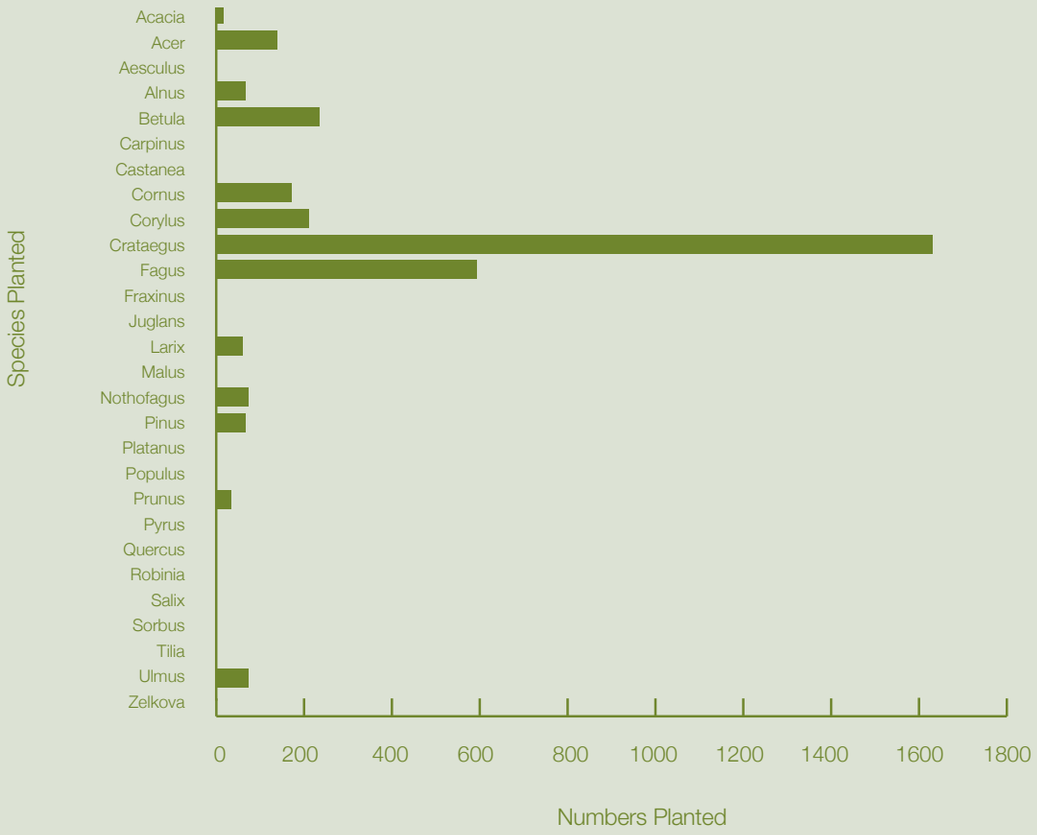
Analysis of Species of Standard Trees Planted

The chart below illustrates the species of Standard Trees planted and amount of each species planted averaged over the previous three planting seasons.



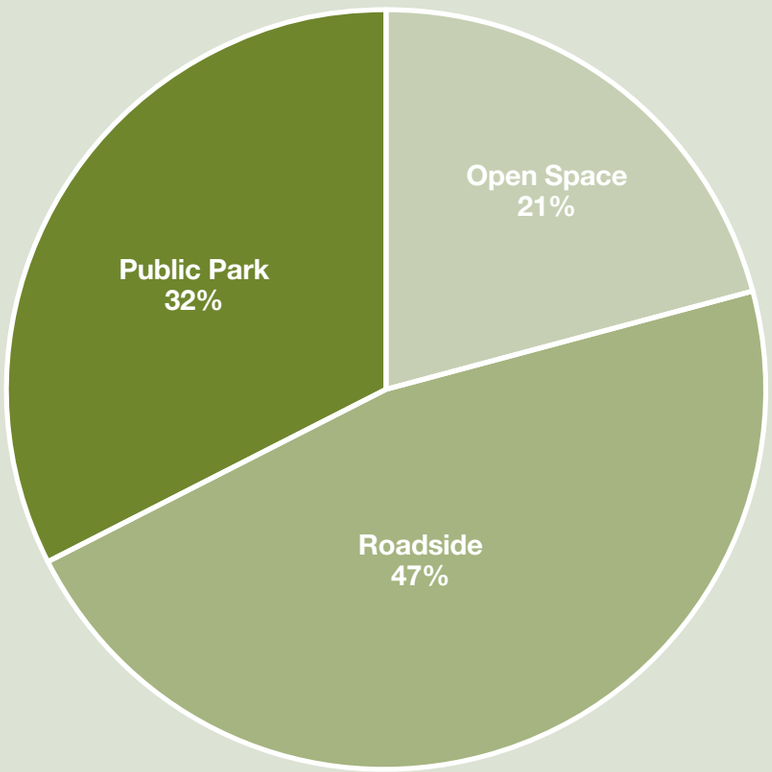
Analysis of species of Whips (small, young trees) planted

The chart below illustrates the species of whips planted and the amount of each species planted, averaged over the previous three planting seasons. The most dominant species used is Crataegus (Hawthorn), with over 1,600 whips of this species planted each per year. The use of Crataegus for hedging accounts for the vast majority of this planting.



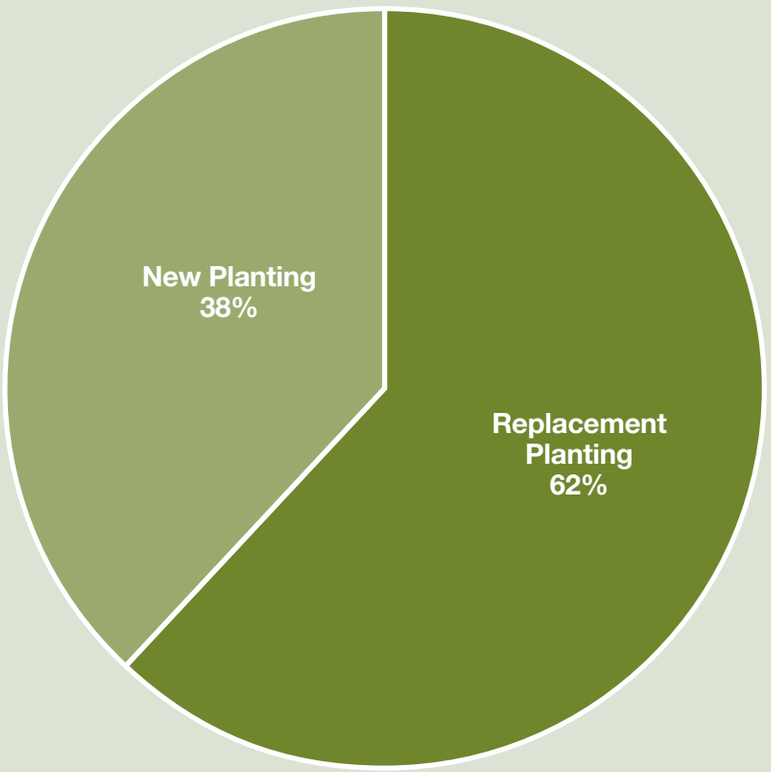
Where Standard Trees Are Planted:

The pie chart below shows the breakdown in terms of locations of where Standard Trees are planted each year. As can be seen from the chart, almost half of all annual tree planting occurs along the roadside, either in grass strips or along footpaths, while a third of all planting occurs in public parks and a fifth in smaller neighbourhood open spaces.



New and Replacement Planting of Standard Trees

New planting is carried out to create green networks of trees where suitable space above and below ground exists. As the city's tree stocks in certain areas reach ultimate maturity for their particular species, replacement planting is carried out, with the aim being to maintain the overall tree cover in a safe and healthy condition. The figure for replacement planting also includes replacement of newly planted trees that fail to establish.



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Notes

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