London Borough of Harrow

Tree Strategy

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Environment and Enterprise
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Executive Summary

Trees provide a range of environmental, economic and social benefits. On a practical level trees help to mitigate and adapt to climate change and improve air quality. Generally they have a positive impact on those living and working in urban areas.

The residents of Harrow are fortunate to have a significant amount of mature tree cover across many parts of the Borough. Throughout the Borough residents are enjoying the foresight of previous generations of public spirited citizens who planted trees in streets and public spaces. Trees make a significant contribution to the quality of life and they provide character and many environmental benefits. The trees that are now dominating and shaping the character of Harrow are legacies left by Victorian, Edwardian and post-war designers.

This tree strategy is aimed at providing the framework which details the council's approach to the management and enhancement of its tree stock. It outlines the mechanism by which the Council will achieve its vision:

"To protect, improve, increase and sustain the tree population of Harrow for the benefit and enjoyment of current and future generations.''

The routine management of Harrow's trees involves:

- Surveying the tree stock on a regular basis to maintain a database that tracks the condition of each tree and assigns a risk rating based on that condition
- Planned cyclical maintenance on a four year cycle which includes tree pruning and tree felling
- Reactive maintenance and response to health & safety issues.
- Emergency work such as that following a storm

The strategy sets out how the Council will fulfill the following commitments:

- Maintain the managed tree stock on the highways, within school boundaries, housing estates and parks and woodlands on a proactive cyclical maintenance regime to ensure that trees are in a safe and healthy condition.
- Limit the felling of trees to those circumstances where it is essential or advisable.
- Undertake pruning works following best arboricultural practice and where possible for this to be scheduled, so as not to be detrimental to the tree species affected.
- Increase the role of street trees and woodland in minimising the impacts of and adapting to climate change.
- Encourage sponsors to support planting schemes on Council land.
- Offer a commemorative tree planting service.
- Undertake the phased removal and replanting of street trees to ensure the safety of trees and diversity of the age and species of trees to encourage future sustainability and biodiversity.
- Provide public information in advance of planned tree works and in advance of planting schemes.
- Continue to create a varied and sustainable tree population in the Council's Parks.

- Develop Woodland Management Plans for all Harrow's woodlands.
- Carry out emergency inspections of trees where necessary after scheduled inspections
- Use current planning legislation to protect those trees it considers are threatened or that it values. Applications to carry out work to protected trees will be evaluated carefully before permission is given.

Although the Council will deliver a wide range of services in its management of the tree stock, it will not provide services relating to:

- Minor loss of light or removal to improve sightlines unless there is a health and safety issue
- Bird fouling
- Satellite / TV reception signal disruption
- Pruning due to overhanging property
- Squirrels gaining access to property via trees
- Leaf, fruit or flowers and general debris fall
- Pruning/removing for speculative subsidence where no evidence provided
- Pruning/ removing because of an increase to household insurance policy
- Removing to improve Aesthetics
- Removing trees perceived to be too large
- Removal for drop kerb/ new driveway (when tree is deemed to live longer than 5 years)
- General pruning or removal requests that do not meet the criteria set out in this document

This is not an exhaustive list and Health and Safety will always be paramount.

The Council is considering a limited range of services that residents may be able to pay for directly. Please see Action Plan in Section 11.

The council intends to respond to queries, complaints and service requests on a timely basis with acknowledgement of queries within 5 working days and a follow up after action/inspection within 15 working days.

The Council's tree management service is funded from a number of sources as follows:

- The revenue budget covers cyclical, routine maintenance as well as emergency and reactive works
- The capital programme covers the cost of the replacement programme
- Section 106 Contributions covers specific projects in geographically restricted areas
- Grants cover the cost for the specific activities and projects.

The council will seek compensation from any external organisation responsible for significant damage to or removal of any council owned tree(s) to the value as calculated by Capital Asset Valuation for Amenity Trees (CAVAT).

1. Introduction

In 2008 the London Tree Strategy Guidance was published by the London Tree and Woodland Framework.[1] It outlined the importance for Councils to have a tree strategy so as to maximise the benefits that trees and woodlands bring to the residents and businesses within a local authority. It reinforced the fact that trees play an important role in towns and cities in an environmental, social and economic way.

The purpose of this document is to set out Harrow's tree strategy and to that extent it contains:

- Harrow's vision and strategic objectives for our trees;
- A description of the borough's tree stock and landscape;
- The criteria used for managing and planting trees in Harrow; and,
- The actions that the Council will take to realise its vision.

The strategy is based on wider nationwide and regional policies as well as other local policies as set out at Appendix A.

1.1 Harrow's vision

On a national level the Government recognises the value of trees and the need to plan for a sustainable future, particularly in an urban context. It encourages local authorities to produce long term plans for the care of their trees, and through various bodies, such as the Forest Authority, it seeks to encourage tree planting.

As a landowner and a local authority, Harrow Council has a duty, both moral and legal, that affects the management of its own trees and those belonging to private individuals. Harrow Council is responsible for the management of all trees on Council owned land including trees on the public highway and trees in parks and open spaces. The Council is committed to the high quality and proactive management of its tree stock and has defined its vision for the future of trees and woodlands in the borough as:

"To protect, improve, increase and sustain the tree population for the benefit and enjoyment of current and future generations.'' ***(Comments received re addition of the word augment)***

1.2 Aims and objectives

The aim of this strategy is ultimately to:

- Raise the quality and safety of the borough's tree stock;
- Raise the profile, value and understanding of trees and tree issues in the borough;

[1] The London Tree and Woodland Framework, Borough Tree Strategies, Guidance for Local Authorities on Producing a Comprehensive Tree Strategy, June 2008

To achieve the vision, this strategy has the following four objectives:

1. To ensure that there is a clear programme of maintenance and management to keep trees safe and healthy
2. To ensure that organisations and individuals in the Borough are aware of tree works in their neighbourhood and have a clear understanding of the principles that decide when the Council will intervene on tree matters
3. To improve the quality of life of all members of the community by creating a healthier and attractive environment by encouraging tree planting
4. To improve the local environment and biodiversity through the legal and physical protection of trees

2. The benefit that trees provide

Trees can provide a whole range of contributions to environmental, social and economic sustainability. They are an integral part of the urban environment and contribute to the health and wellbeing of the people living and working there. They help to establish a sense of place and continuity enabling people to connect with their neighborhood.

Some of the wide range of benefits that trees provide is set out below.

2.1 Environmental benefits

- They provide fresh and healthy spaces in an otherwise urban environment. Trees provide both structure and shade in these open spaces.
- Trees are an important component of biodiversity. A tree can accommodate and support difference species of insects, birds, mammals, fungi and mosses, as well as being a major source of pollen for bees.
- Trees play a crucial role in mitigating climate change by absorbing carbon dioxide.
- Trees are essential for improving air quality. Leaves absorb air pollutants such as ozone, carbon monoxide, and sulphur dioxide. Dust and other particulates are collected by leaves and washed to the ground by rain, rather than remaining in the air. Trees produce oxygen.
- Their role in reducing runoff during flash floods (providing an alternative to engineering solutions) is also being recognised. Vegetation also intercepts more rain thereby reducing the likelihood of flash flooding. The numerous leaves of plants and trees provide a greater area for water to evaporate from than flat surfaces.
- Trees increase biodiversity by providing natural links with parks and open spaces and allowing for the movement of wildlife.
- They can reduce noise levels by acting as a sound barrier.
- Trees can also be a source of local food and hence reduce the need to transport food.

2.2 Health and wellbeing

- Trees reduce air pollution and therefore they play a role in preventing premature deaths from chronic diseases.

- Trees provide shade, making outdoor leisure activities more pleasurable during hot weather. They also reduce the risk of skin cancers from harmful ultra-violet radiation.
- Trees play an important role in reducing stress and illness by providing psychological refreshment and a sense of well being through softening the built environment, creating character and a sense of place and permanence.
- Trees release scents and aromas that elicit a positive emotional response contributing to health and well-being.
- Most people prefer to live and work in green and leafy surroundings.
- They absorb, and therefore, reduce noise.
- Their cooling effect is especially important during extreme summer heat.

2.3 Economic

- Trees potentially have a positive effect on property values.
- The value of undeveloped land with mature trees tends to be higher.
- Trees provide a sustainable source of timber, mulch, charcoal and a sustainable source of woodchip biofuel.
- Trees provide employment through all aspects of the industry.
- Trees will be considered an integral part of urban design
- When planted strategically trees can reduce fuel costs for heating and cooling buildings.

2.4 Social

- Trees provide amenity, aesthetic value and historical continuity.
- Trees provide habitats for a broad range of wildlife.
- Trees mark the changing seasons with leaf changes and floral displays
- Trees symbolize community focal points.

3. Tree challenges

London is an urban environment and trees in the urban environment will inevitably conflict with people and infrastructure. The need for trees will conflict with the need for street lighting, traffic lights, surrounding buildings, utility services and pavements. This creates pressure on the tree to be pruned or felled. Given the importance of these trees for the reduction of pollution and increase in amenity, the Council will manage all trees with the intention to retain them in their environment for as long as possible and minimise their conflict with other urban activities.

Section 5 details how the Council will manage and maintain trees to minimise nuisance to residents. Future problems can be reduced by following the principle of planting the ‘right tree in the right place’; ensuring careful consideration is given to the location of new trees and the selection of species.

3.1 Threats to trees

Trees in the urban landscape are extremely susceptible to changes in their local surroundings, which can result in damage to their physiological processes, physical injury and potentially their death. They are growing in an often hostile environment and face a broad range of factors that can have a serious impact on their health.

Natural threats to trees include pests and diseases and extreme weather conditions which are predicted to be more frequent as a result of the effects of Climate Change (high winds, higher temperatures, and changes to seasonal rainfall patterns).

Other significant and common threats to trees come from construction activities (trenching for utility works, repairs to the public highway and new development works), vehicle damage, vandalism and dog damage as well as chemical damage such as the effect of salt application to melt snow and ice on footways and roads and gas leaks.

Finally, inappropriate or poor pruning may allow access for pest and diseases.

3.2 Pests and diseases

In recent years, there has been a significant increase in findings of new pests and diseases that threaten some of our most commonly found tree species such as Oak, Ash, Horse Chestnut and London Plane. The loss of such trees would have a devastating impact as they are large trees which provide a greater number of benefits and are often very prominent features in the borough landscape. Appendix B lists the pests and diseases that are of immediate concern to tree owners not only in Harrow, but throughout the country. Local authorities are sent regular updates by the Forestry Commission who is the government department responsible for the protection of Britain's forests and woodlands. The Council also receives the latest advice and management recommendations from the London Tree Officers Association (LTOA). Throughout the life of this strategy, we will ensure that regular surveys are carried out to determine the existence and extent of any outbreaks of new pests and diseases in the Borough.

3.3 Climate Change

The UK’s climate is changing. In summary, the UK is experiencing hotter and drier summers and warmer and wetter winters.

The UK may also see more extreme weather events, including heavy rain bursts (increasing risk of flash floods) and heat waves (increasing the risk of droughts and public health issues). In the last decade alone we have experienced some of the hottest and wettest summers on record. The most recent predictions for the UK suggest an overall increase in temperature and changes to rainfall patterns and wind speed.

Climate change has a direct and indirect effect on trees in a number of ways. A rise in carbon dioxide levels in the atmosphere causes an increase in tree growth and extends the growing season. Some tree species will experience earlier flushing of leaves and flowers. Lower summer rainfall and an increased rate of evaporation are likely to lead to longer periods of drought-induced stress on trees. An increase in the occurrence of storms will make trees more vulnerable to wind damage. Warmer summers and a rise in temperatures in general are likely to extend the life cycle and geographical range of certain pests and diseases. Trees under stress are much more susceptible to colonisation by insect pests and decay-causing fungi.

The role of trees and woodlands in urban areas will become much more important as climate change makes towns and cities increasingly unpleasant during heat waves. Trees produce oxygen and provide shade. They limit the urban heat island effect and intercept rainfall reducing the impact of storms. The Council will ensure appropriate provision is made by planting suitable trees that will withstand the predicted changes to climate and weather patterns.

Appendix C outlines further implications of Climate Change.

4. Trees in Harrow

The residents of Harrow are fortunate to have a significant amount of mature tree cover across many parts of the borough. Throughout the borough residents are enjoying the foresight of previous generations of public spirited citizens who planted trees in streets and public spaces. Trees make a significant contribution to the quality of life and they provide character and many environmental benefits. The trees that are now dominating and shaping the character of Harrow are legacies left by Victorian, Edwardian and post-war designers.

Harrow is a green borough and has a considerable stock of around 204,526 trees throughout all its various sites. There are around 21,000 trees on the public highways and around 60,000 spread throughout the various other maintained sites, which include:

- 76 Parks and open spaces – over 700 acres
- 38 community schools, of which Harrow manage the trees on request
- 50 Housing Estates plus numerous street properties;
- 30 Allotments;
- 9 Cemeteries 68 acres / 28 hectares.

The remaining stock is spread throughout 4 countryside sites of 253 acres / 102 hectares and 9 woodlands 68 acres / 28 hectares.

A tree stock survey was carried out in 2012/2013. The latest figures from Ashley Godfrey Associates show that Harrow Council is responsible for managing over 204,526 trees.

There are two areas considered to be ancient woodlands in Bentley Priory Open Space: Heriot's Wood and Lake Wood. There is also Pear Wood to the NE of the borough. There are other smaller areas in the borough: Weald Wood which includes a large ancient beech coppice and ancient hornbeam woodbank and Levels Wood with sessile oak standards and uncommon ground flora, both are parts of the Old Redding Complex. Stanmore Common may also be of ancient origin. The Spinney in Cannons Park has old oaks and rich ground flora of native bluebells and ramsons with smaller areas of wood anemone, goldilocks buttercup and several other ancient woodland indicator species present. Most of Harrow's woodland areas are recent secondary woodland that has developed in the last 50 years on what were previously open grazed commons or farmland. A long-term aim is to establish the extent of ancient woodland in Harrow.

Most of Harrow's woodland areas are recent secondary woodland that has developed in the last 50 years on what were previously open grazed commons or farmland. There are twenty – one woodland areas covering 217 hectares with an estimated 204,526 trees that are owned and managed or administered by Harrow Council. These areas are all listed in **Table**

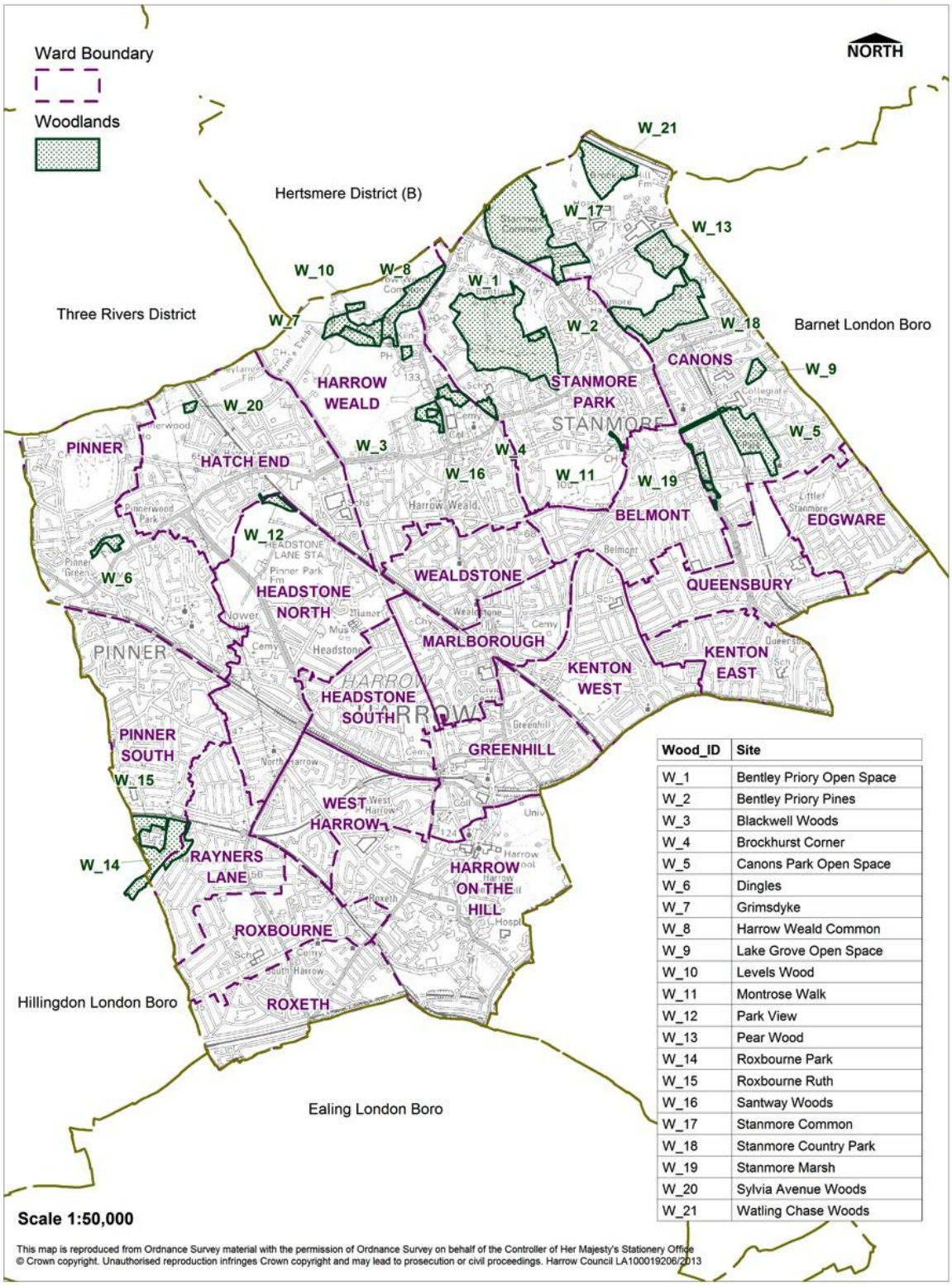
4.1 and are shown on **Figure 4.1.** The largest woodland area is Stanmore Common (55.5 hectares) followed by Bentley Priory (38.8 hectares). The smallest woodland is Montrose Walk (0.5 hectares).

Table 4.1 Harrow's Woodland Areas

Woodland Name	Area (Ha)
Stanmore common	55.05
Bentley Priory Open Space	38.79
Stanmore Country Park	29.56
Harrow Weald Common	24.13
Watling Chase Woods	16.21
Pears Wood	13.22
Grimsdyke	8.72
Off Brookshill	4.14
Roxbourne Park	3.55
Park View	3
Roxbourne Rough	2.79
Dingles	2.77
Canons Park Open space	2.72
Santway Woods	2.69
Levels wood	1.71
Lake Grove Open Space	1.7
Brockhurst Corner	1.62
Bentley Priory Pines	1.57
Stanmore Marsh	1.47
Sylvia Avenue Woods	1.09
Montrose Walk	0.51
Total	**217.01**

Figure 4.1 Harrow's Woodland Areas – Data Collected by Ashley Godfrey Associates 2012/2013

Harrow Tree Strategy - Woodlands



Wood_ID	Site
W_1	Bentley Priory Open Space
W_2	Bentley Priory Pines
W_3	Blackwell Woods
W_4	Brockhurst Corner
W_5	Canons Park Open Space
W_6	Dingles
W_7	Grimsdyke
W_8	Harrow Weald Common
W_9	Lake Grove Open Space
W_10	Levels Wood
W_11	Montrose Walk
W_12	Park View
W_13	Pear Wood
W_14	Roxbourne Park
W_15	Roxbourne Ruth
W_16	Santway Woods
W_17	Stanmore Common
W_18	Stanmore Country Park
W_19	Stanmore Marsh
W_20	Sylvia Avenue Woods
W_21	Watling Chase Woods

4.2 Tree distribution

Table 4.2 below identifies the number of highway & park trees by ward - Data Collected by Ashley Godfrey Associates 2012/2013

Table 4.2 - Numbers of trees managed by the Council per ward	
Ward	**Number of Trees**
Belmont	1742
Canons	1134
Edgware	980
Greenhill	1520
Harrow on the Hill	1639
Harrow Weald	2016
Hatch End	2743
Headstone North	2468
Headstone South	672
Kenton East	1290
Kenton West	1660
Marlborough	1237
Pinner	1184
Pinner South	2821
Queensbury	1130
Rayners Lane	1984
Roxbourne	1312
Roxeth	1186
Stanmore	2599
Wealdstone	910
West Harrow	1891
Total	**34,118**

4.3 Trees in streets

Harrow Council has the responsibility for all trees on the highway. The road side environment provides extremely difficult conditions for trees to survive. There is often intense pressure on the tree's local environment from underground cables, utility company's plant & equipment, traffic, buildings, and footpath refurbishment. Other threats to street trees include traffic pollution, road salts, other pollutants and vandalism. Nevertheless, trees do survive, albeit with a reduced life expectancy and with varying degrees of success.

Harrow has a large number of attractive tree-lined streets. Many of the borough's tree lined streets have tree populations that are mature. These trees were often planted at approximately the same time and therefore have similar life expectancies. Where appropriate, older forest type trees will be replaced by native species due to the added biodiversity benefits. Doing so would have the advantage of reducing maintenance costs. However, the substantial contribution that large trees make to the character of the borough;

their aesthetic benefits; and, their contribution to the natural environment must be safeguarded for future generations where possible.

4.4 Vehicle crossovers and trees

Public requests for vehicle crossovers have become increasingly common in recent years as the number of cars per household has increased. However, the increase in hard surfaces and reduction on green space can lead to an increased risk of flash flooding and loss of biodiversity. As such, permission for new crossovers is strictly controlled and applications are considered in accordance with current Council policy. If the tree is dead, dying or dangerous it will be removed and the construction can take place. If the tree is healthy and has a foreseeable life of more than 5 years then the tree will remain and the application will be refused. If the tree is over mature or in decline and is seen to have a life expectancy of 5 years or less then the application will be approved where the applicant would pay for the removal and replacement of two new trees in the locality.

At the discretion of the council's arboriculture officer a non mature healthy tree may be removed. If practicable it shall be replanted at the nearest appropriate location. If replanting is deemed impractical, two replacement trees will be required.

4.5 Trees in parks and public open spaces

Trees are fundamental to the structure of parks and open spaces. They are important to visitors and the overall environment and landscape character of the area.

The trees in the majority of the parks in Harrow have been surveyed and the details and condition of the trees has been entered onto the Council's tree management system. The survey of trees in parks and public open spaces will continue based on the risk assessment criteria described in Section 5 and any Health & Safety works deemed necessary will be undertaken. New planting in parks and other open spaces will include varying types of tree species. We will endeavour to select native species where appropriate.

4.6 Trees in housing areas

Trees within council housing estates will be inspected by officers on a four year cyclical basis. Most problems stem from the large number of trees planted within a restricted area, adjacent to properties. The risk assessment will be applied and works programmed based on the risk category, priority and cyclical maintenance criteria as set out in Section 5.

4.7 Woodlands

Harrow Council owns, manages or administers numerous woodland areas. In the case of the largest and most significant woodland areas it has a partnership agreement with Harrow Nature Conservation Forum (HNCF) who manages and maintains these woodlands. The remaining, mostly smaller woodland areas are largely unmanaged but nevertheless represent a significant natural resource in the Borough. The Council will work to develop further partnerships with voluntary organisations willing to invest time and resources into these valuable environmental assets. A strategic approach to the co-ordination of woodland management in the Borough will be promoted. This will be linked to the Harrow Biodiversity Action Plan and individual sites biodiversity management plans and visa versa. Woodlands within the Councils ownership will be managed with recreation, ecology, access, education and landscape values as goals. The Council will work towards increasing the amount of woodland cover. All of the above will be covered within new Woodland Management Plans for all of Harrow's woodlands.

This section provided a summary of Harrow's current tree stock. The full details and findings

from the most recent borough wide tree survey are given in Appendix D.

5. Tree management and maintenance

The responsibility for the management of the trees in Harrow fall within the Environment & Enterprise Directorate who are responsible for setting the policy and delivering the maintenance and planting regime. Tree management and maintenance will take into account planning strategies already in place, as appropriate. In addition, dead trees, where appropriate will not be removed from woodland and parks so that they can provide habitat for flora and fauna.

Trees that are privately owned are the responsibility of the landowner, although the Council can intervene and enforce against any private trees that are deemed to be a health & safety issue.

The routine management of Harrow's trees involves:

- Surveying the tree stock on a regular basis to maintain a condition database and assign a risk rating
- Planned cyclical maintenance on a four year cycle which includes tree pruning and tree felling
- Reactive maintenance as and when health & safety issues arise
- Emergency work such as that following a storm

The council will seek compensation from any external organisation responsible for significant damage to or removal of any council owned tree(s) to the value as calculated by CAVAT.

5.1 Surveying

Trees are constantly growing and changing. A programme of systematic planned inspections allows the Council to monitor trees for on-going issues and defects. These can then be dealt with through routine maintenance on a four year cyclical basis.

There are three main types of surveys carried out:

- A visual survey to quickly identify and deal with hazards – usually undertaken in response to a query or complaint about a particular tree.
- More detailed assessment, which includes taking measurements – this facilitates the cyclical maintenance and can also help to establish the monetary value of trees.
- Surveys to determine the suitability of Tree Preservation Orders as part of planning applications.

The results are held on a database. This is a database of all publicly owned trees on an integrated software system[2] that co-ordinates the management of trees by monitoring and

[2] Ezytreev

recording Council tree works, including new tree planting and works to existing trees. All publicly owned trees and Tree Preservation Orders are also recorded on the Council's corporate Geographic Information System.

5.2 Risk Assessments

Where it is necessary to remove a health and safety concern or to undertake work to maintain a tree previously topped[3], risk assessment procedures are employed to determine the extent of work required.

The risk assessment procedure is further informed by the arboriculturist's knowledge, the health of the tree and its effects on the local environment. This assessment identifies four categories of risk namely critical, high, medium and low risk. These categories are defined in Table 5.1 below which also sets out the actions that are based on the risk categorisation.

Table 5.1 – Risk classes

Risk	**Definition**	**Action**
Critical	A tree that has serious structural problems and requires urgent attention.	This may require removal or a severe reduction in size. These are treated as reactive works.
High	A tree that has structural problems not classed as urgent.	May require removal or major reduction in size. These will be incorporated into the maintenance cycle.
Medium	A tree that has structural problems developing, i.e. fungal decay has set in, but is still structurally sound.	This tree may require a more detailed non invasive inspection to determine the extent of the decay and/or inspections on a more regular basis to monitor the decay. These are incorporated in the maintenance cycle.
Low	A tree that is in a safe condition and does not pose a risk.	No action required.

Trees that are assessed to be a critical risk will be dealt with under reactive works. All other risk categories will be programmed in for cyclical maintenance based on the geographical priority zone as described below.

Table 5.2 – Priority zones

Priority Zone	**Locations**
High	Playgrounds, town centres and main roads
Medium	Housing estates and local roads
Low	Parks, woodlands and other locations

5.3 Planned cyclical maintenance

[3] removal of whole tops of trees or large branches to leave stubs

Planned maintenance is Harrow Council's preferred method of maintaining the boroughs tree stock in a safe and healthy condition.

A four year cyclical programme of maintenance is planned to begin in 2015/16. Year 1 will deal with outstanding works borough wide. Year 2 onwards the programme of works will be based on the surveys and risk assessment criteria detailed above with high priority works beginning immediately.

This cyclical programme will cover the following issues:

- Removal of trees that are deemed by the Council's tree officers to be dead, dying or dangerous.
- Grinding remaining tree stumps that have been left by historic operations.
- Critical young tree maintenance, i.e. ensuring young trees are secured upright to enable establishment, formative pruning and watering.
- Works to trees as a result of being implicated (with evidence) in insurance related subsidence.
- Pruning of trees which are causing an obstruction to road signs, street lights, traffic lights, and which are touching buildings.
- Removal of excessive basal and stem growth.
- Lifting low branches where they are interfering with pedestrians and vehicles (i.e. less than 2.5m or 8 feet over footways and 5.0m / 16 feet over carriageways).
- Organising pruning regimes including pollarding, where necessary.
- Continuous inspection and risk assessment of highway trees.
- Where appropriate dead trees from woodland, parks, could they be left to rot and provide habitat for flora and fauna

Tree pruning

Latest research has illustrated the importance of target pruning. Therefore, the Council will not carry out topping of trees but will utilise the target techniques for pruning highlighted within British Standards B.S. 3998 and The European Tree Pruning Guide.

The terminology and description of these pruning techniques are described below:

- Crown Lifting: This is the removal of lower branches back to a secondary branch of main trunk to provide a clear height from the ground.
- Crown Reduction: This is the removal of a specified percentage of branches from the edge of the crown all around the tree, back to secondary growth.
- Crown Thinning: This is the removal of a specified percentage of branches throughout the crown, back to a secondary branch or the main trunk.

The Council will resist unnecessary pruning of the Borough's tree stock, whilst ensuring resources are allocated to remedy health & safety concerns. The pruning of trees will only take place in circumstances where it is essential or advisable. This is most likely to occur when:

- A tree is causing an obstruction to a public highway, public right of way, footpath or access to property or growing low over gardens or open spaces where the public have access.
- A tree is causing a legal nuisance to an adjoining property.
- A tree may be contributing to soil shrinkage and structural damage to adjacent buildings or other built features, where it is felt that it is appropriate to restrict the size and moisture demand of the tree.
- A tree is creating an obstruction to repairs or maintenance of a property.
- A tree is blocking daylight from habitable rooms to a severe and unreasonable degree.
- A tree is restricting surveillance and needs to be managed to create a reassuring environment, reduce fear of crime, and increase citizen surveillance.
- A tree is physically in contact with a building and/or roof of a building.
- A tree is obstructing or interfering with street lighting or highway signage or is likely to do so.
- There is a need to remove dead, diseased or damaged branches.

Tree felling

Trees of amenity value are not be felled unless there is a very clear justification for the work and each case is carefully judged on its merits. Tree felling will be a part of the cyclical maintenance programme of works or reactive maintenance programme of works. Where the condition of a tree necessitates its removal the Council undertake to replant with a new tree in the same location or nearby provided this is practical and appropriate.

Inspections will cover the protected species under the Wildlife & Countryside Act 1981 and any evidence of bats will be investigated. Where evidence of birds nesting is found no work will be carried out until the nesting season is over.

The felling of trees only takes place in circumstances where it is essential or advisable. This is most likely to occur when:

- A tree is dead, dying, or diseased.
- A tree poses a danger to public safety and has been identified for removal following a risk assessment procedure.
- A tree is causing an obstruction to a public highway, public right of way, access to property or footpath, and where the obstruction cannot be removed by pruning the tree or other reasonable measures.
- A tree is causing a legal nuisance to an adjoining property, where pruning would not remedy the problem. Felling would only be acceptable when the nuisance is severe.
- There is incontrovertible evidence that a tree is the cause of structural damage to a building and where pruning would not provide a solution to the problem.
- A tree is of a size and species inappropriate to their situation according to the Council's tree officer.
- Pruning has failed to rectify a severe problem and has not been successful and

where felling is the last resort.

- Thinning out young and developing trees to encourage healthy growth and development following principles of best arboricultural practice.
- A tree has been identified for removal as part of the drop kerb tree policy.
- Essential highway works.

5.4 Reactive maintenance

Reactive works are carried out in response to an immediate health and safety hazard, such as fallen trees/branches, hanging branches, branches obstructing sightlines or access, or roots causing trip hazards.

Reactive works can include tree felling in response to emergencies.

Reactive maintenance is often undertaken in response to enquiries from other organisations, Council departments or members of the public. By increasing surveying in order to identify maintenance issues, which can be addressed through planned cyclical maintenance, the Council aims to reduce the need for reactive maintenance.

Reactive maintenance includes the following issues:

- Dead, dying or dangerous trees
- Legal nuisance, e.g. trees involved in insurance claims or obstructing access
- Trees posing an immediate threat to pedestrians and vehicles
- Overgrown trees or trees in close proximity to buildings
- Trees that are blocking street lights, obscuring traffic signals or obstructing traffic flow
- Trip hazards
- Insurance mitigation
- Hazardous pests and diseases

5.5 Emergency works

Emergency procedures are required to deal with issues that need an unexpected immediate response. This is likely to be either as a result of:

- Storm damage – when a tree or group of trees have or are at serious risk of falling or dropping branches injuring people or property, disconnecting or disrupting services or obstructing routes; or

- Unlawful removal or works to trees - when a tree protected by a Tree Preservation Orders or within a Conservation Area is felled or pruned without approval from the local planning authority.

5.6 Excluded works

The list below gives some of the more common requests received by the Council for work to trees which the Council will not undertake. The Council will not attend to prune or remove or take action when the following issues arise:

- Minor loss of light or removal to improve sightlines unless there is a health and safety

issue

- Bird fouling
- Satellite / TV reception signal disruption
- Pruning due to overhanging property
- Squirrels gaining access to property via trees
- Leaf, fruit or flowers and general debris fall
- Pruning/removing for speculative subsidence where no evidence provided
- Pruning/ removing because of an increase to household insurance policy
- Removing to improve Aesthetics
- Removing trees perceived to be too large
- Removal for drop kerb/ new driveway (when tree is deemed to live longer than 5 years)
- General pruning or removal requests that do not meet the criteria set out in this document

This is not an exhaustive list and Health and Safety will always be paramount.

The Council is considering a limited range of services that residents may be able to pay for directly. Please see Action Plan in Section 11.

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The Council is considering a limited range of services that residents may be able to pay for directly. Please see Action Plan in Section 11.

6. Tree planting programme

The maintenance and enhancement of the borough's tree population requires an ongoing programme of new and replacement planting.

A range of factors is taken into account when new trees are selected including scale, robustness, form, leaf density, rooting habit and appearance. In addition to this, a particular consideration when selecting trees for planting in Harrow is their tolerance of the soil conditions in London. We will target wards with fewer tree where practical. Where appropriate, the planting of fruit trees will be considered.

Opportunities for tree planting in streets, on highway verge, in public open space, parks, cemeteries and other public land, are being actively explored. The Council will continue to identify further opportunities in the future. The aim is to undertake to annually plant more trees than are removed. We will give priority, where practical, to vacant tree pit sites, areas (wards) where there are fewer trees and strengthening links between green spaces (Harrow Green Grid).

Where trees have been removed from the highway, it is important that they are replaced the following planting season. However, any new planting will need to take account of its future impact upon the local and wider environment.

6.1 Replacement planting

Replacement tree planting is important to replenish Harrow's tree stock lost through disease, age and development as well as those lost through storm damage. The size of tree and design layout is selected to complement the existing landscape character and be appropriate for the function and history of the site.

6.2 New planting

Trees will often form an important element of green infrastructure plans linking areas deficient in green amenity, for retail, housing or economic regeneration, on transport routes, as flood risk amelioration and to adapt to climate change.

New planting may include larger individual specimen trees planted as a focal point, smaller trees planted in groups, avenues and boulevards, trees planted as a screen or trees planted informally in woodland. In an urban setting, street tree planting can improve the sense of local identity and as part of a 'home zone' scheme, can have the effect of traffic-calming.

New tree planting is funded by the Council's capital programme and from grants that may be received from external sources.

The Council will consider merits of planting fruit trees to provide free fruit to residents only in suitable locations e.g. wide verges, open spaces and parks.

6.3 Planting priorities

Where funding becomes available, new trees will be planted in existing tree pits before new tree locations are considered.

New trees will be installed in areas of need and be suitable for the area they are being planted in. Priority will be given to areas with low density of trees.

Tree planting contribution to urban design in public places, town centre and district centres will be considered.

7. Community engagement

People generally like to have trees in their street; they soften the landscape, are attractive in the summer and provide habitats for birds. Because of this we understand that removing trees can cause upset so communicating our decisions regarding tree management is important.

The Council will provide public information in advance of planned tree works and planting schemes. To encourage community involvement in planting schemes, the Council will encourage sponsors to support planting on Council land. In addition to this, the Council will continue to offer a commemorative tree planting service (a tree and memorial plaque will be provided).

The success of the Tree Strategy will be greatest if it has the support and involvement of the community in its implementation. The following summarises the measures proposed to promote community engagement and involvement in the Tree Strategy:

- Inform residents via the Council website of the new aspects of the Strategy and consult on future revisions.

- Work with the Harrow Nature Conservation Forum in promoting greater community involvement in the management of Harrow's woods through the Tree Warden scheme.
- Provide a commemorative tree planting service
- Encourage sponsors to support tree planting on Council land
- Provide public information in advance of planned tree works and planting schemes

8. Subsidence and insurance claims

Tree roots can extract large quantities of water from the soil: a fully grown Poplar uses tens of thousands of litres in a year. When the soil is of clay, this will lead to drying shrinkage, the magnitude of which will depend upon the inherent properties of the clay and on the nature of the tree and its moisture requirements. If the tree roots take up the moisture from under, or near to, building foundations, the latter will subside.

The distance to which the roots of a tree spread depends largely upon the type of tree and its height. The roots of many common trees extend to a distance at least equal to their height. The roots of Willow, Oak, Elm and Poplar can extend to twice their height.

If damage to an adjoining property occurs which could possibly be associated with a Council managed tree, the property owner is entitled to submit a formal insurance claim.

8.1 Insurance claims

Each year, Council managed trees are implicated in insurance claims relating to possible or actual subsidence of properties. When an enquiry relating to tree damage to a building is received, Council officers will seek to clarify the technical issues and request the relevant reports and monitoring information to ascertain the facts concerning the problem. This requires close co-operation between the Council's insurance section, arboricultural section and structural engineers to resolve any issues in an expedient manner.

A number of factors are involved when determining the cause of subsidence to a building, the location of trees being just one factor. Monitoring of the subsidence, by recognised experts, is required over a number of months to ascertain the true reason for the problem.

It has been observed that there is a tendency to blame the nearest tree in cases of building damage or subsidence even without evidence. The Council will manage and process claims in accordance with the London Tree Officers Association (LTOA) Risk Limitation Strategy and the Joint Mitigation Protocol established by local authorities and insurance industry. It will require the following information as a minimum for any claims:

- An engineers report detailing damage to the building (location, nature, Building Research Establishment (BRE) category, cracks monitoring, drainage survey).
- Plan and profile of foundations.
- Site plan indicating location of structure in relation to trees and other vegetation in the vicinity.
- Arboriculture report.
- Results of soil investigation tests confirming profile, moisture content, plasticity index, soil moisture deficit and tree root identification.

The Council supports the LTOA approach and will work towards implementing effective tree management regimes and promoting appropriate future planting to minimise the risk of

subsidence now and in the future. It also recognises that in some cases management regimes will not be sufficient to reduce the risk of subsidence and it may be necessary for certain trees to be removed and replaced with a more suitable species.

Appendix E has further details on trees and their effect on buildings.

9. Tree protection

There are two ways in the Borough trees can be protected. One is through the Council using the legal means at its disposal, the other is by giving advice to tree owners.

The Council has a duty to protect trees that it decides are of a public amenity value that may be under threat by use of a Tree Preservation Order (TPO) through the powers of the Town and Country Planning Act 1990 and the Town and Country Planning (Trees Preservation) (England) Regulations 2012. These powers will be used following the National Planning Policy Guidance: Tree Preservation Orders and trees in conservation areas

A TPO takes away none of the responsibility of the owner towards their tree but it does give the Council a degree of control about what happens to it. A TPO allows the Council to make sure only appropriate work is carried out to the tree, and that felled trees are replaced where necessary. Applications must be made in writing to the Council in order to carry out works to protected trees and applicants are encouraged to consult with a tree surgeon or arrange a pre-application discussion with the tree officer before applying. Poor quality applications are discouraged and where it is claimed that a protected tree is dangerous, and then if a visit from the tree officer can not be arranged, a thorough arboricultural report must be submitted.

Application to fell protected trees to allow for development will be resisted. Alternative construction methods such as “no dig”[4] drive construction or pile foundations should be considered and if these are not suitable then a new design should be found.

Trees that are sited within a Conservation Area are protected under the Town and Country Planning Act 1990 (“the Act”). Under the Act, if the tree in the conservation area is not protected by a tree preservation order then the person wishing to undertake works to the tree are required to notify the local planning authority six weeks before carrying out certain works on trees unless an exception applies[5]. As such, before any works are approved by the Council, consideration will be given as to whether or not to protect the tree with a TPO.

The Council will enforce and prosecute where appropriate tree related contraventions and where appropriate will apply the maximum penalty.

On construction sites all work must be in accordance with BS58372012 “Trees in relation to Construction” and that foundation details follow the recommendations of the National House Building Councils Practice Note 3 “Building Near Trees”.

[4] Alternative method of paving construction avoiding the use of digging machinery and utilising base strengthening material that doesn’t damage tree routes
[5] S211 Town and Country Planning Act 1990

10. Monitoring the Tree Strategy

The Tree Strategy covers a three year period (2015 to 2018). An interim review, including public consultation will be carried out in 2016 to ensure the Strategy remains adequate and appropriate.

It will be necessary for monitoring to be carried out to allow the success of the Tree Strategy to be assessed and to assist in identifying areas where new or amended tree policy is necessary. A series of performance indicators have been identified to facilitate this monitoring and are detailed below: This includes:

- Number of new trees successfully established each year.
- Net increase of the tree population year on year
- Number of vacant tree pits
- Number of trees inspected every four years
- Number of management plans produced and successfully implemented for woodland sites.
- Numbers of parks and open spaces sites in which trees have been inspected and database updated.
- Number of insurance claims successfully defended and amount spent on insurance claims.
- Number of trees removed or permitted to be removed by the Council.
- Number of requests/complaints/queries responded and actioned within the agreed timescales.

11. Summary and Action Plan

This section summarises the key commitments within the Harrow Tree Strategy and sets out an action plan that enables the Council to achieve the objectives of the strategy.

The Council commits to managing the tree stock on the highways, within school boundaries, housing estates and parks and woodlands using a proactive cyclical maintenance programme to ensure that trees are in a safe and healthy condition. Unnecessary tree felling and tree pruning will be resisted and routine surveys will be carried out to assess tree condition and treatment.

Tree planting will be encouraged within the community and the Council will continue to seek opportunities to increase the Borough's tree stock by planting varied and site appropriate trees.

Individuals and organisations within Harrow will be kept informed of tree activity within their neighbourhoods and adequate information will be provided to help Harrow's residents understand what tree works the Council will do.

The four objectives of the Tree Strategy are set out below with measurable actions and indicative time frames. Together they will help Harrow Council protect, improve and sustain the tree stock for the benefit and enjoyment of current and future generations.

a. Action Plan

Objective 1: To ensure that the Council has a clear programme of maintenance and management to keep trees safe and healthy			
Number	Action	Target / Measurement	Time frame
1.1	Manage the tree stock using a proactive cyclical maintenance programme to ensure that trees are in a safe and healthy condition.	90% of Council maintained trees are safe and healthy.	March 2018- end of the 4 years cycle
1.2	Develop Woodland Management Plans for all Harrow's woodlands in conjunction with any existing Biodiversity Plans.	All Woodland Plans developed	March 2017
1.3	Carry out full tree survey	All publicly owned trees in Harrow surveyed	June 2015
1.4	To increase the tree population	Net increase in tree population year on year	February 2015
1.5	Reduce vacant tree pits to zero by 2019	Number of vacant tree pits	March 2019
1.6	Number of trees inspected every four years	100%	March 2019

Objective 2: To ensure that organisations and individuals in the Borough are aware of tree works in their neighbourhood and have a clear understanding of the principles that decide when the Council will intervene on tree matters			
Number	Action	Target / Measurement	Time frame
2.1	Make the Tree Strategy available to all and ensure web forms and call centre has details of what tree works the Council will do.	Tree Strategy adopted and available	April 2015
2.2	Provide public information in advance of planned tree works and in advance of planting schemes.	Number of complaints received drop year on year	April 2015
2.3	Investigate options for customers to pay for some Excluded Works to be carried out.		2015

Objective 3: To improve the quality of life of all members of the community by creating a healthier and attractive environment by encouraging tree planting			
Number	Action	Target / Measurement	Time frame
3.1	Encourage sponsors to support planting schemes on Council land.	Number of trees planted through sponsorship	On-going
3.2	Create a varied and sustainable tree population in the Council's Parks and Woodlands.	Trees planted in parks (The number, species and whether native or non-native)	Annually
3.3	Increase the role of street trees in minimising the impacts and adapting to climate change.	Trees planted in streets (The number, species and whether native or non-native)	Annually
3.4	Establish the extent of ancient woodland in Harrow	Extent of ancient woodland in Harrow	By 2020

Objective 4: To improve the local environment and biodiversity through the legal and physical protection of trees			
Number	Action	Target / Measurement	Time frame
4.1	Using legislation, protect trees that are threatened and evaluate protected trees carefully before permission is given to carry out works	Number of TPO trees illegally felled or pruned decreases	On-going
4.2	Limit the felling of trees to those circumstances where it is essential or advisable.	Number of trees felled decreases	On-going
4.3	Monitor and control pests and diseases	Number of treatments per year	On-going

London Borough of Harrow
Tree Strategy
2015 - 2018

APPENDICES

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NOTE: This Appendices consists of sections taken from the tree report compiled by Ashley Godfrey Associates as part the tree survey commission by Harrow Council in February 2013

APPENDIX A: POLICY CONTEXT

POLICY CONTEXT
National Policy

A Strategy for England's Trees, Woods and Forests[6]

Framework for the Strategy

Aims:

- Provide, in England, a resource of trees, woods and forests in places where they can contribute most in terms of environmental, economic and social benefits now and for future generations
- Ensure that existing and newly planted trees, woods and forests are resilient to the impacts of climate change and also contribute to the way in which biodiversity and natural resources adjust to a changing climate protect and enhance the environmental resources of water, soil, air, biodiversity and landscapes (both woodland and non-woodland), and the cultural and amenity values of trees and woodland
- Increase the contribution that trees, woods and forests make to the quality of life for those living in, working in or visiting England
- Improve the competitiveness of woodland businesses and promote the development of new or improved markets for sustainable woodland products and ecosystem services where this will deliver identifiable public benefits, nationally or locally, including the reduction of carbon emissions

Independent Panel on Forestry: Final Report, July, 2012

This report urges the Government to adopt a new approach to valuing and rewarding the management, improvement and expansion of the woodland ecosystems for the benefits they provide to people, nature and the green economy.

A new woodland culture is sought which envisages woodlands as:

- A contributor to a sustainable economic revival.
- Increasing the use of wood as a low carbon fuel and as a renewable raw material and promoting a more sustainable green economy.
- Places for appropriate tourism and recreation.
- Playing a key role in the restoration of ecosystems and the expansion of important natural habitats.
- Improving the well-being and health of the nation by giving more people access to nature, and more opportunities for outdoor activity and recreation.

To achieve this will mean getting more woods into sustainable management. It will require investment to develop supply chains for wood fuel and timber. The policy challenge is seen as getting the right incentives, infrastructure and support in place; and for both new and existing woodlands to be managed in the right way, for the long term.

[6]Published by the Department for Environment Food and Rural Affairs, 2007.

Incentives are required to open up existing woodlands to make them accessible to the public by supporting open access or pathways. This will create more opportunities for more people to enjoy the health and well-being benefits of woodlands.

Concern is expressed about the real decline in wildlife much of which depends on woodlands. Improving the condition of existing woodlands through sustainable management, expanding woodland cover, and restoring ancient woodlands and heathlands is needed. Expanding tree cover with appropriate species better able to cope with a changing climate is considered to be vital the ecosystem is to be sustained. The aim is to expand woodland cover from 10% to 15% of England's land area by 2060, and the area of woodland managed to the UK Forestry Standard increased from around 50% to 80% of the total, over the next ten years.

Woodlands have a role in moving towards a green economy in which economic growth and the health of natural resources sustain each other, and markets, business and Government better reflect the value of nature. Only 20% of the country's timber needs are met by UK production so there is an opportunity to market needs from existing under-managed woodlands.

London Policy

Connecting Londoners with Trees and Woodlands: **A Tree and Woodland Framework for London, March 2005, Greater London Authority**

The Mayor's commitment to maintaining and enhancing London's trees and woodland is reflected in this strategic Framework. The overall goal of the Framework is to provide a strategic approach to trees and woodlands which delivers the Mayor's vision for London within the context of the England Forestry Strategy. In doing so, the Framework seeks to ensure that the existing stock of trees and woodlands is managed and maintained to safeguard its value to London both now and in the future

The over-riding priority with respect to London's trees and woodlands is to safeguard the existing resource and to address any management deficiencies. A lack of management is identified as the reason for the reduction in the variety in age structure and composition of woodlands. There are threats to existing trees including human pressure, development, pollution, diseases, pests and invasive species, and, in the longer term, from climate change.

A much more proactive approach to management is promoted. Management principles for individual trees, groups of trees and woodlands need to be agreed and disseminated. The management of street trees, in particular, needs to be well planned to maintain their amenity value and to ensure renewal and long term survival.

Branching Out: The future for London's street trees, April 2011, Greater London Authority

Street trees play an important role in London's environment, providing multiple physical and aesthetic benefits to the population and reducing the impact of climate change on the capital. The Mayor has a strategic objective to increase canopy cover from 20 per cent to 25 per cent by 2025, and street trees are an important part of this aim.

The Mayor made a pledge to plant 10,000 additional street trees by 2012, targeting areas which lack street trees and where they could have a significant environmental impact. The Mayor's Street Tree Programme identified 40 priority areas in which local authorities and communities could apply for trees. The Mayor's programme has had a positive impact by increasing the number of street trees in the majority of participating boroughs.

With the end of the Mayor's programme in 2012, the Mayor has launched a partnership campaign to plant more trees across the capital, RE: LEAF which will continue to use the targeted planting approach.

Street tree budgets are under pressure from budgetary cuts and the rising costs of maintenance. Cyclical pruning is a cost effective basic maintenance technique which could be at risk if budgets are reduced. Failure to adequately maintain trees could lead to both higher costs for boroughs and depreciated tree stock.

The tree valuation approach, Capital Asset Valuation for Amenity Trees (CAVAT), is supported and enables local authorities to treat trees as assets and justify adequate funding support. The RE: LEAF campaign will highlight the importance of adhering to recognised tree maintenance standards.

Clearing the air: The Mayor's Air Quality Strategy, December 2010, Greater London Authority

The Mayor's Air Quality Strategy seeks to reduce air pollution in London so that the health of Londoners is improved.

Improvement of air quality in the public realm will be supported by increasing green cover in the private and public realms by planting trees in areas of poor air quality under the 'right place, right tree' principle. The Mayor has pledged that at least 10,000 trees will be planted on streets in 40 priority areas by the end of March 2012.

The intention is to increase tree canopy in Greater London from the current coverage of 20 per cent of total land cover to 25 per cent by 2025. This equates to approximately two million additional trees.

Local Policy

Harrow's Sustainable Community Strategy - Working together and working with you 2009-2020.

The Harrow Sustainable Community Strategy has been produced by the Harrow Partnership, a collaboration of representatives from agencies that deliver public services, community and voluntary organisations and businesses in Harrow. It sets out a long-term vision for the Borough.

The vision for Harrow is to have an improved quality of life and to be more sustainable. There will be a balance between the protection of wildlife and recreational use. Practical steps will be taken to mitigate the effects of climate change and adverse air quality. Reducing carbon dioxide emissions is considered to be an important overall objective, as will mitigating the effects of climate change. The protection and enhancement of trees and open space is seen as being important to ensure that Harrow preserves its green, leafy suburban appearance and will help to prevent the heat-island effect.

To achieve an improving environment, Harrow will continue to undertake a tree replacement programme to preserve and enhance Harrow's trees.

Harrow Biodiversity Action Plan, 2008.

The main aim of the Harrow Biodiversity Action Plan is to conserve, protect and enhance the biodiversity of the London Borough of Harrow.

The Woodland Habitat Action Plan includes the aim

'To conserve and enhance the condition of woodlands within Harrow for biodiversity'

The Action Plan notes that the majority of Harrow's woods are recent secondary woodland that has developed in the last 50 years on what were previously open grazed commons or farmland. Only two woods, Heriot's Wood within Bentley Priory nature reserve, and Pear Wood, are thought to be ancient, that is, dating back to at least 1600[7]. Recent secondary woodland has been assessed as often being of low biodiversity comprising largely of one or two species and a relatively uniform canopy. The Action Plan takes the view that management of overall biodiversity and amenity would be best served by felling significant areas of trees and restoring grassland or heathland, both of which are rarer habitats.

[7]Peterken, G. F.: Natural Woodland: Ecology and conservation in northern temperate regions. Cambridge University Press, 1996

APPENDIX B: PESTS AND DISEASES

TREE PESTS AND DISEASES

There has been a recent increase in the discovery of new pests and diseases, previously unknown or not present in the UK, indicating an increased level of threat to the health of trees. It is considered that the impact of climate change will serve to exacerbate this effect, in particular, by creating conditions more favourable to certain pests and diseases.

The following is an indication of the pests and diseases known to be present in the UK at present, with particular reference to those most likely to affect urban trees.

Ash Dieback (Chalara fraxinea)

Ash dieback is a serious disease caused by the fungus Chalara fraxinea. The disease causes leaf loss and crown dieback and usually leads to the death of the tree. It represents a very serious threat to Britain's Ash trees – it kills young trees very quickly and older trees resist for some time but most succumb eventually. The death rate is thought to be 85%.

The disease has existed widely across Europe since the early 1990s and in February 2012 was found in Ash trees in a nursery in Buckinghamshire which had been imported from Holland. Since then it has been found in a variety of locations across most of Britain but especially concentrated in East Anglia and the South East. It is treated as a quarantine pest under national emergency measures. It is believed to have arrived on infected trees imported to Britain, but has been discovered in older trees in East Anglia, Kent and Essex which have no connection with newly planted trees. It is therefore possible that it could have entered Britain by natural means such as being carried across the North Sea on wind or via birds or contaminated vehicles etc. from infected sites in Europe.

Trees need a high dose of spores to become infected; spores are produced from dead infected leaves during the period June to September. The tree will attack any species of ash and once infected they cannot be cured. However, not all trees die of the infection and some species are likely to have genetic resistance.

Ash dieback is not present in Harrow at the time of writing but when it arrives it will cause a significant problem due to the large proportion of the trees in Harrow which are Ash. At present the advice is to take no action other than keep an eye on infected trees to prevent them becoming unsafe; however, a tree removal programme will probably be needed in the future.

Decay Fungi (Bracket fungi)

A wood decay fungus is a variety of fungus that digests moist wood causing it to rot. Some attack dead wood, such as brown rot and some are parasitic and colonise living trees. Decay fungi are the most common problem affecting trees in Harrow.

White Rot - Ganoderma

Ganoderma is a genus of polypore mushrooms which grows on living wood and forms brackets or shelf mushrooms. Ganoderma applanatum produces very distinctive, shelf-like fruiting structures or brackets. They are most commonly found on stumps or near the base of living trees, often at the site of an old wound. It can cause decay of sapwood and heartwood in roots, butts and trunks of trees. It is a common cause of decay and death of beech, poplar, oaks, elms, ashand a wide range of other broadleaf species. It is widely spread in Harrow and tends to affect over-aged species in poor health. It is a common factor in insurance claims.

Brown Rot - Laetiporous Sulphureus

These bracket fungi grow as yellow shelf like structures on tree trunks and branches. It is a saprophyte and causes brown rot in the heartwood of trees on which it grows. It grows on

dead or mature hardwoods such as oak, cherry and beech. It is present in Harrow especially in over-aged oak and purple plum. It is often a factor in insurance claims.

Horse chestnut bleeding canker (*Pseudomonas syringae pathovar aesculi*)

Bleeding canker of the Horse Chestnut is a bacterium that causes death to Horse Chestnut trees. Symptoms visible on the heavily affected trees include extensive bleeding areas on their stems and sometimes on their scaffold branches.

Trees of all ages have been affected by the recent disease upsurge. Young trees with a stem diameter of only 10cm (4 inches) have been found with advanced symptoms. However, the impact on the environment can be particularly profound when large, mature trees are infected and disfigured by the disease. If the disease is severe and the areas of bark which have been killed are extensive, large trees can be killed. However, younger trees (10-30 years old) are at greater risk and can succumb to the disease in as little as three years as the smaller diameter of their trunks means that they can be girdled more quickly.

The Forestry Commission undertook a survey in 2007 to assess how widely trees are affected. It confirmed that bleeding canker on horse chestnuts is now very widespread with around 49% of all the trees assessed showing symptoms to some degree. The extent of the disease also varies in different parts of Britain. In London 49% of urban trees were found to show symptoms. This disease is present in Horse Chestnuts in Harrow, especially in the South of the borough in locations including Alexandra Park, but is not considered to be a major issue.

The initial hypothesis was that the recent spate of mild winters and wet springs had favoured spread and infection by the Phytophthoras previously found to cause bleeding cankers on horse chestnut. However, although climate change may be playing a part in the incidence of this disorder, it now seems that a causal agent other than *Phytophthora* - *Pseudomonas syringae* pv *aesculi*, a completely different pathogen, is responsible for the vast majority of the cases of stem bleeding and tree death over the past 4-5 years.

Horse chestnut leaf miner (cameraria ohridella)

The Horse Chestnut leaf miner was first found in Great Britain in 2002 in the London Borough of Wimbledon. From this initial area of infestation, the moth has spread rapidly, and it is now present across most of south-central England, East Anglia and the Midlands. The rate of spread in the UK (40-60 km/year) is similar to that seen on the continent. This disease is very prevalent in Harrow in locations across the Borough.

The moth greatly impairs the visual appearance of infected trees but there is no evidence that infestation, on its own, causes dieback or a decline in tree health, or tree death. Consequently, there is no reason to fell and remove trees just because they are attacked by *C. ohridella*. Even severely infested trees will re-flush as normal in the following spring.

The moth, once established, causes severe damage to the foliage of horse chestnut on an annual basis, and defoliation before normal leaf-fall in the autumn. The larvae mine within the leaves and at high population densities they can destroy most of the leaf tissues. Damage can be reduced by removing fallen leaves during the autumn and winter and either composting them thoroughly, to destroy the over-wintering pupae, or if the leaves are collected into smaller heaps, by covering them with a layer of soil or other plant material to prevent adult emergence in the following spring. Damage to trees in parks, gardens and in other urban situations can be reduced by removing fallen leaves during the autumn and winter, and this can help ensure that trees retain their vitality.

In the long-term, it is hoped that biological control will lead to a permanent reduction in the pest population.

Acute Oak Decline

Acute oak decline is affecting the native oak, the symptoms of which are black bleeding on the trunk and stems and the tree can suffer rapid dieback and death within three to five years. The disease has been found on sites in the east of England, southern England and the Midlands, and has possibly spread further than this.

The disease, which is attacking sessile and pedunculate oaks, is of great concern because of the speed with which it is damaging trees in woodlands.

Scientists from Forest Research have discovered a previously unknown bacterium which they believe is playing a key role. They are continuing investigations to obtain a better understanding of the disease, how it spreads, and what other factors might be involved. This information will form the basis of appropriate management strategies.

Meanwhile they have produced guidelines which stress the importance of monitoring the progress of the disease, of limiting access to infected trees, and of disinfecting boots, vehicle wheels, machinery and equipment to help prevent its spread. If an infected tree is to be used for timber, the guide recommends the bark and sapwood is removed and burnt on site, and the logs cut into planks on site before being removed. Planks can be kiln dried at high temperatures to kill any remaining bacteria. This disease is not a significant problem in Harrow.

Oak Processionary Moth (Thaumetopoea processionea)

Oak Processionary Moth defoliates oak trees and can cause them to die. Trees are weakened and become prone to attack by other pests. It has been found in trees in the west and south west of London. The moth first appeared in Great Britain in summer 2006 and has begun to breed in oak trees in several locations.

The caterpillars pose two problems. They severely defoliate oak trees by feeding on the leaves and have tiny hairs which are sharp, barbed and contain a toxin that can cause irritation and allergic reactions, thus posing a risk to human and animal health.

Like all defoliators, the larvae feed on the leaves of its host plant and can cause severe foliage loss when populations are high. However, it is generally not fatal to attacked trees, although the weakening of the trees might combine with other factors to cause a decline in their overall health. Trees will produce leaves the following spring and recover. Indications from attacks in Kew Gardens are that it will attack many species of oak, both those grown for timber and those for amenity purposes.

It is possible that the increase in this disease has been exacerbated by climate change; it is likely that the recent trend to milder winters, and in particular the reduced incidence of late spring frosts, which could kill significant numbers of young larvae, has been instrumental in the moth's ability to survive and breed further north than its traditional native range. It has been found in the four London Boroughs of Brent, Ealing, Hounslow and Richmond where eradication programmes have taken place. It is not known to be present in Harrow, however.

Massaria (Splanchnonema platani)

This disease, which affects London Planes, is a pathogen which has recently been observed in this country for the first time. It is not known to kill trees but attacks a V shape in the branches and has the ability to kill individual branches which then fall to the ground. The disease has been present in Germany and the Netherlands but last year was observed by workers in the Royal Parks. Branches were dying in Plane trees in Hyde Park and other Royal Parks and the disease, which spreads quickly, has now been observed in other London Boroughs. Although the disease does not kill the tree it causes a risk to public safety and will eventually lead to loss of canopy shape. Treatment involves felling affected

branches before they fall to the ground. There is now an infection rate of 23% in the Royal Parks. The disease tends not to affect managed trees but has recently been found to be present in Harrow in the South of the Borough.

Anthracnose of London Plane Trees

This is the most common disease of the London Plane; it is caused by the fungus gnomonia platani and symptoms are discrete spots of diseased tissue which develop on the leaves and stems. This normally causes little damage but, when climatic conditions are favourable to its development, such as a damp spring, symptoms can be spectacular. The fungus causes four different forms of damage; bud blight, twig blight, shoot blight and leaf blight. Symptoms are particularly evident in the spring when dead, brown leaves can be observed throughout the crown of the tree and parts of the crown may fail to flush. Local spread of the fungus occurs by rain splash; also fallen infected leaves can be wind borne and spread the disease over long distances. Control is generally impractical and unnecessary as affected trees normally recover in the same or following season. Some resistance is being observed in some cultivars of the London plane. London Planes in Harrow are affected by this disease.

Brown Tail Moth

The brown tail moth is found on many trees and hedgerows and feeds on the buds and young leaves of mainly rosaceous trees and shrubs but will also attach to other deciduous trees and can cause complete defoliation in a short space of time. Over the last few years there has been an increase in incidence particularly in southern parts of the UK. There have been few small outbreaks in Harrow but this is not a significant problem. The caterpillar can cause serious skin and eye irritations and breathing problems due to the irritant hairs. Caterpillars can be sprayed but in winter they produce a “tent” which protects them and trees need to be inspected during the colder months and the “tents” destroyed in order to control the moth.

Anthracnose of Weeping Willow

This is caused by the fungus marssonina salicicola. Symptoms are small brown or purplish spots developing on the leaves and young shoots starting in early spring which can cause distortion and death of the leaves and shoots. When the tree is severely attacked the crown can appear thin and untidy. Symptoms can last for several years. The fungus is thought to spread largely by rain splash and is particularly prevalent after a damp spring or early summer.

This disease can be controlled, but not eliminated, by the use of fungicide but this is only practical on smaller trees.

Poplar Canker

Poplar Canker is caused by the bacterium xanthomonas populi and can cause serious die back and sometimes death of trees. The characteristic symptom is a cankerous outgrowth on the main stem or branch which can vary in size and shape; the first symptom to develop is often on the one year old shoot near the leaf scar – a crack forms just below the bud.

The best method of control is the use of resistant varieties – examples being some of the varieties of the Italian black hybrid poplars such as the Lombardy Poplar, (P. nigra ‘italica’).

Fire Blight

This bacterium (Erwinia amylovora) attacks Pears and many Rosacea species. It commonly attacks red and wild hawthorn, whitebeam and mountain ash.

One of the first signs in spring is the wilting of young foliage, shoots and flowers which rapidly turn black and appear to be scorched. Slime may exude from infected areas. Infectious bacteria may move down the stem to larger branches below and kill them;

sometimes a whole tree may be killed. A number of insects are attracted to the slime and this is how the disease may be transmitted.

The disease may be controlled by pruning to remove infected parts and disinfection of pruning tools. However, where infection has spread to within about 60 cm of the main trunk, the tree is unlikely to survive and the tree should be felled and the wood burnt.

If fire blight is known to be causing serious damage in an area, it is unwise to plant susceptible trees, such as members of the Rosaceae family other than relatively resistant species.

Honey Fungus

The most common root disease in British trees is that caused by honey fungus. Trees in parks or gardens with a previous history of woodlands are more likely to be affected than roadside trees. It does not cause large numbers of deaths in a short period of time, but causes death of a small number of trees either suddenly or following gradual die back. The presence of creamy white fungal skin beneath the bark of the base of the tree confirms diagnosis. Dead trees or stumps can lead to infection of nearby healthy trees. No proven chemical control exists and infected roots and stumps must be removed and destroyed. A number of species are now thought to be relatively resistant to the disease.

Dutch Elm Disease

Dutch Elm Disease is one of the most serious tree diseases in the world. It is caused by two related species of fungi in the genus *Ophiostoma* which are disseminated by elm bark beetles.

It first appeared in Europe in 1910 and caused the loss of between 10 and 40% of elms in different European countries. At the end of the 1960's a far more destructive outbreak of the disease occurred caused by a different and far more aggressive Dutch Elm Disease fungus. As a result, within a decade, about 20 million elms out of an estimated UK elm population of 30 million were dead and by the 1990s the number was probably well over 25 million.

With these losses, Dutch elm disease remains by far our most destructive tree disease. However, although further cycles of disease can be expected, the elm will survive to provide a potential contribution to future landscapes.

Phytophthora kernoviae

Phytophthora kernoviae is a fungus like pathogen which was discovered on rhododendrons and a beech tree in Cornwall. It is particularly virulent and has since been found causing potentially lethal infections on two English oaks and forty-five beech trees, as well as infecting other ornamental trees and shrubs. All this has increased concern about the potential impact of this pathogen. Little is known about the organism and at present infected trees and shrubs are destroyed.

Phytophthora ramorum

This is a fungus-like pathogen which is causing extensive damage and mortality to trees and other plants in parts of the United Kingdom. It had not affected many specimens in the England until 2009, when *P. ramorum* was found infecting and killing large numbers of Japanese larch trees in South West England. Then in 2010 it was found on Japanese larches in Wales, Northern Ireland and the Republic of Ireland.

Pine-tree Lappet (Dendrolimus pini),

Adults, and more recently in September 2009, larvae of pine-tree lappet have been captured in various traps in pine forests in Scotland. The finding of larvae provides the first conclusive evidence of a local breeding population, rather than long-distance migrants that have been known to occasionally make their way to Great Britain along the south coast.

Red band needle blight

Red band needle blight, caused by the fungus *Dothistroma septosporum,* has been found on a range of conifer species in Great Britain. Pine species are by far the most common hosts, and Corsican pine is the main species affected. The disease has been found on Corsican pine in all of the Forestry Commission's districts in England, the majority in Wales and several in Scotland

Prevention of disease

Preventative methods include the careful choice and preparation of the planting site and the use of resistant varieties. The use of a range of species can help reduce the effect of losses from disease. The wide scale planting of elms in some towns such as Basildon, which were then destroyed through disease, provides a salutary lesson.

Tree disorders, as opposed to diseases, can be caused by adverse environmental causes, such as pollution of the air by toxic fumes.

APPENDIX C: CLIMATE CHANGE

CLIMATE CHANGE

CLIMATE CHANGE AND ADAPTATION

Climate change is the rise in average global temperature due to increasing levels of greenhouse gases in the earth's atmosphere. Based on the UK Climate Projections 2009[8] it is predicted that in the future London will have hotter summers and wetter winters. The Greater London Authority (GLA) anticipates that average temperatures in the summer will increase by 1.6°C by the 2020s, by 2.7°C by the 2050s and by 3.9°C by the 2080s. Summers will also be drier with between 20% and 50% less rainfall by 2080. Winters will be wetter, with the average winter 6 per cent wetter by the 2020s, 14% wetter by the 2050s and 19 per cent wetter by the 2080s.[9]There will be more frequent and intense extreme events notably heatwaves.

The 'urban heat island' describes the warmth of the surfaces and atmosphere that urban areas often experience in comparison with the rural areas that surround them. This warmth stimulates trees to come into leaf earlier in the spring in London compared to rural areas, and the number of nights with frost is reduced.

On an average summer day, the centre of London is marginally cooler (0.5 - 1°C) than rural areas, as the fabric of the buildings and roads that make up the urban realm absorbs solar energy. By early evening, the buildings and roads start to radiate this stored energy as heat, which escapes slowly, especially in narrow or tall streets where it is re-absorbed and re-radiated from the buildings that line the street. This absorption and retention of heat is why urban areas can be warmer at night than rural areas and is known as the 'urban heat island effect'.

The urban heat island effect in London peaks between 2 am and 4 am. During prolonged periods of hot, dry weather, the intensity of the urban heat island can build up night after night. During the heatwave of 2003, the centre of London was up to 10°C warmer than the surrounding greenbelt.[10]

There is increasing concern about the likely impact of climate change on trees. The way in which climate affects tree growth and the health of trees is complex. Key changes in the atmosphere and the climate and weather of London are likely to have different effects on tree growth in the future.

Many insect pests have the potential to become more damaging as a result of climate change. This outcome is based on the expectation that trees will become more drought stressed during the summer months, and that development of pests will accelerate, possibly leading to higher population growth. However, it is also likely that the pests' natural enemies will also benefit which makes it difficult to be clear about what the overall effects will be. One example is the horse chestnut leaf miner (Cameraria ohridella). This insect has spread across Europe and is now established in London. It is thought that the speed of spread may be related to recent climate change.

A higher level of carbon dioxide in the atmosphere is likely to result in an increase in the growth rate of trees with increased water use efficiency. However, this is likely to result in an increase in the leaf area of trees creating higher wind resistance. It may well create an

[8]Department for Environment, Food and Rural Affairs (Defra). *UK Climate Projections2009*. June 2009.
[9]The Spatial Framework for London -the Importance of London's Urban Canopy. Isabel Dedring, Mayor's Environment Advisor November 2009. Presentation to the Trees and Urban Climate Adaptation Seminar, The Royal Geographical Society.
[10]The draft climate change adaptation strategy for London, Mayor of London 2010.

imbalance in nutrients in the trees. Ozone pollution will reduce the growth rate of trees and will impair the rate of passage of water vapour or carbon dioxide through the small pores of the tree. It will also increase the susceptibility of trees to drought.

There are some advantages that will result from an increase in temperatures. Increased temperatures will result in a longer growing season and there will be a lower risk of damage to trees as a result of the cold weather in the winter. There may be potential to use species that are currently considered to be insufficiently hardy to grow in Harrow. The disadvantages of the increased temperatures include a delay in the hardening of the tree growth and a risk of damage resulting from spring and autumn frosts. The longer growing season will reduce the time available for water levels in the soil to recharge.

Drier summers could lead to more frequent and intense summer droughts leading to an increased mortality rate. Heavier rainfall in the winter months could lead to root death and reduced root stability. Higher velocity winds in the winter will increase the risk of wind damage.

APPENDIX D: TREE SURVEY DATA – Extract from Ashley Godfrey Associates Survey report 2012/13

PUBLIC TREES.

Harrow Council is responsible for the maintenance and management of trees in a variety of locations including highways, parks and open spaces, housing areas, allotments and cemeteries.

The Mayor of London's Supplementary Planning Guidance[11] on the preparation of Borough tree and woodland strategies outlines the requirements for a robust tree and woodland strategy. The guidance indicates that the crucial stage in the process is to undertake a qualitative and quantitative assessment of the current tree and woodland stock within each land use category.

This section sets out to quantify and understand the mix and make up of public trees within Harrow.

4.1 Methodology

There is a comprehensive inventory of trees in Harrow that are managed by the Council and held on an EzyTreev database. This is updated regularly as part of the tree inspection process and the tree works ordering system. Information is recorded against individual trees or groups.

This database was interrogated and data extracted for a range of attribute data including:

Species

Age

Height

Diameter

Spread

Health/Condition

SULE

CAVAT

Land Use

The data could be broken down to ward level and spatial information in the form of X and Y co-ordinates enabled the trees to be accurately mapped using a Geographical Information System.

4.2 The current stock of Public Trees

The tree strategy needs to be based on a good understanding of the nature and extent of the trees being managed by the Council. All current guidance indicates that this is essential before any meaningful management plans can be developed. This section of the report focuses on publically managed trees.

4.3 Numbers of Trees and Tree Density

The wards with the highest numbers of Council Managed Trees are Headstone North (2468), Stanmore (2599), Hatch End (2743) and Pinner South (2821). The lowest numbers of Council Managed Trees are found in Headstone South (672), Wealdstone (910) and Edgware (980). The results for each ward are shown in **Table 4.2** below.

[11]Green Infrastructure & Open Environments: Preparing Borough Tree and Woodland Strategies, Supplementary Planning Guidance, Greater London Authority 2012

Table 4.1: Numbers of Trees managed by the Council per Ward

Ward	Number of Trees
Belmont	1742
Canons	1134
Edgware	980
Greenhill	1520
Harrow on the Hill	1639
Harrow Weald	2016
Hatch End	2743
Headstone North	2468
Headstone South	672
Kenton East	1290
Kenton West	1660
Marlborough	1237
Pinner	1184
Pinner South	2821
Queensbury	1130
Rayners Lane	1984
Roxbourne	1312
Roxeth	1186
Stanmore	2599
Wealdstone	910
West Harrow	1891
Total	**34118**

4.4 Trees Species

Of the trees owned by Harrow Council the most numerous in terms of individual species is the common ash (fraxinus excelsior) with almost 2,000 individual specimens. This is followed by the English or pedunculate oak (quercus robor) with over 1600 specimens and the Norway maple (acer plantanoides) with over 1500. Other species with over 1,000 specimens are, in order of magnitude, the common hawthorn (crataegus monogyna), silver birch (betula pendula) and cherry or purple plum (prunus cerasifera pisardii). Other species which are strongly represented are the London plane (platanus x hispanica), horse chestnut (aesculus hippocastanum) and sycamore (acer pseudoplatanus) as well as other species of cherry/ plum. (See **Table 4.2** below)

Harrow has a total of 320 different species/ sub species of tree among the trees which it owns. This represents a very high degree of variety. For example there are 40 different species of prunus (cherry, plum and peach) and 33 different species of maple among the Council's tree stock. There are also many less common species such as the Indian Bean tree, Golden Rain tree, Tree of Heaven, White Mulberry and the Foxglove tree.

The great variety of species planted by the Council is a deliberate policy to counteract the effects of climate change. This is felt to be a more successful strategy in view of the unknown future conditions and the greater challenge of spread of diseases due to climate

change. This means that the Council's stock is less exposed to the threat of disease and adverse conditions. This is preferable to concentrating solely on the planting of drought tolerant species, of which there are very limited numbers in any event. Species which tolerate drought include gleditsia (Honey Locust) and Liquidambar (Sweet Gum), both of which are well represented among Harrow's trees.

The Trees in Towns Survey found lower levels of species richness than are found in Harrow. The number of different species varied from the highest in the South West Region (196 species) to the lowest in the North East (148). The highest number of species in an individual town was in Richmond upon Thames with 247. However the results are not strictly comparable with the Harrow figures due to the different methods of collecting the data (the Trees in Towns Survey data was gathered from sample areas of all the land use typologies whereas the Harrow data is not a sample but only covers trees owned by Harrow Council.) Nevertheless, 320 different species in Harrow is a very high figure representing great diversity of species.

Table 4.2 Tree Species – Council Managed Trees.

Species	Common Name	Number	Percentage
Fraxinus excelsior	Common Ash	1998	5.9%
Quercus robur	English Oak	1646	4.8%
Acer platanoides	Norway maple	1530	4.5%
Crataegus monogyna	Hawthorn	1227	3.6%
Betula pendula	Silver birch	1062	3.1%
Prunus cerasifera Pissardii	Cherry/ purple plum	1039	3.0%
Prunus cerasifera Nigra	Cherry / purple plum	868	2.5%
Platanus x hispanica	London plane	851	2.5%
Prunus kanzan	Flowering cherry	813	2.4%
Prunus avium	Wild cherry	790	2.3%
Aesculus hippocastanum	Horse Chestnut	771	2.3%
Acer pseudoplatanus	Sycamore	750	2.2%

In terms of the higher order of classification, i.e. the genera, that which is most strongly represented among the Council Managed Trees is the genus prunus (including cherry, plum and peach) with over 6,500 specimens (just under one fifth of all trees) , followed by acer (sycamore and maples) with over 4,000 or 12% and fraxinus (ash) with almost 2,500 (7%). Other genera which are strongly represented are quercus (oaks) with almost 2,000; malus (apples) with 1,700, betula (birch) with 1,600 specimens and tilia (lime) with over 1500 specimens. (See **Table 4.3** below).

This pattern is consistent with that in many outer London boroughs where rosaceous species tend to predominate (such as prunus and malus). This contrasts with the situation in the inner London boroughs where there tends to be a predominance of Victorian species such as London Plane and Lime.

Table 4.3– Public Trees – Most Common Genera

Genus	Species	Number	%
Prunus	Cherry, plum, peach	6,617	19.4%
Acer	Sycamore, Maples	4,110	12.1%
Fraxinus	Ashes	2,372	7.0%
Quercus	Oaks	1,956	5.7%
Malus	Apples	1,711	5.0%
Betula	Birches	1,632	4.8%
Tilia	Limes	1,537	4.5%
Total (all trees)			34,119

Distribution of tree species by ward

The distribution of species within the wards is considered in terms of the predominant species in each ward. This is a different calculation from that obtained by comparing the

numerical distribution of species by ward due to the fact that the total number of Council Managed Trees in each ward varies so widely. The total number of Council Managed Trees in each ward varies considerably from the lowest in Headstone South (672 trees) to the highest in Pinner South (2821 trees). **Common Ash (Fraxinus Excelsior)** Harrow contains 1998 Common Ash trees which represents 5.9% of all Council Managed Trees in the borough. When the species distribution is considered for each ward certain wards contain higher proportions of ash trees when compared with concentrations of other species in that ward.

Concentrations of ash trees are highest in the wards of Pinner (13.3% of all Council Managed Trees in that ward) followed by Stanmore (10.7%), Canons (8.4%), Harrow on the Hill (8.1%), and Harrow Weald (7.9%). Other wards in which the proportion of ash trees exceeds the average for the borough as a whole are Pinner South, Headstone North and Greenhill. **English Oak.** There are 1646 English oak specimens (quercus robur) in the borough which represent 4.8% of Harrow Council Managed Trees. The oaks are particularly concentrated in the wards of Harrow Weald where oaks comprise 12.5% of all Council Managed Trees, Stanmore (11.2%), Headstone North (8.7%) and Pinner (8.6%).

Norway Maple Harrow contains 1530 acer platanoides trees or 4.5% of all Council Managed Trees. (There are in addition much small numbers of the red cultivar “Crimson King” and the variegated “Drumondii” which are not included in these figures.)Wards with the highest proportions of the Norway Maple are Kenton West (9.7%), Edgware (9.1%) and Headstone (7.9%). In addition there are many wards with concentrations higher than the average for the borough including, in descending order, Harrow on the Hill, Queensbury, Canons, Roxbourne, Hatch End, Headstone and Belmont.

Common Hawthorn (Crataegus Monogyna) The fourth most common tree is the Common Hawthorn with 1227 specimens (3.6%). Wards with the highest proportions are Kenton East and Kenton West and Pinner South (all over 7% of specimens) followed by Harrow Weald and Headstone North. **Silver Birch (Betula Pendula)** There are 1062 or 3.1% Silver Birch among Council Managed Trees. Particular concentrations occur in the wards of Kenton East and West (over 7%), Harrow Weald and Queensbury.**Purple Plum (Cherry Plum)**Harrow contains 1039 specimens of Prunus cerasifera “pissardii” and 868 of Prunus cerasifera “Nigra” which together make up 5.5% of Harrow Council trees.The cultivar “pissardii” is particularly concentrated in the wards of Kenton West and Queensbury where is represents over 9% of all Council Managed Trees and also in Belmont, Roxeth, Kenton East and Headstone South. The cultivar “Nigra” is strongly represented in Edgware (over 9%), Roxbourne and Rayners Lane (over 8%) and Canons and Kenton East. **Other Species** The London Plane is particularly important in West Harrow where it is the highest occurring species accounting for 10.2 % of all trees. Limes (Tilia Europaea and Tilia Cordata) are important in Hatch End, together accounting for over 9% of its trees. Cupressus or Cyprus is important in Marlborough ward where it represents 9.4% of all council trees and is the dominant species.

General picture

Large broadleaved tree species (including alders, ash, beech, elms, Eucalyptus spp., horse chestnut, limes, oaks, poplars, planes, sycamore and hornbeams) make up approximately 32.32 % of the total number of trees. Small broadleaved trees (including birches, cherries, hawthorn, holly, Malus spp.,maples, Pyrus spp., Sorbus spp., willows, magnolias, laburnums and laurels) made up some 58.06 % of the overall total. Conifers comprised 9.62 % of the total number of trees.

The proportion of large broadleaved species among Harrow Council's trees is similar to that found in the Trees in Towns Survey but the proportion of small broadleaved species is much greater than the Trees in Towns figure of 42% and the proportion of conifers is smaller than the figure of 27% in the Trees in Towns survey.

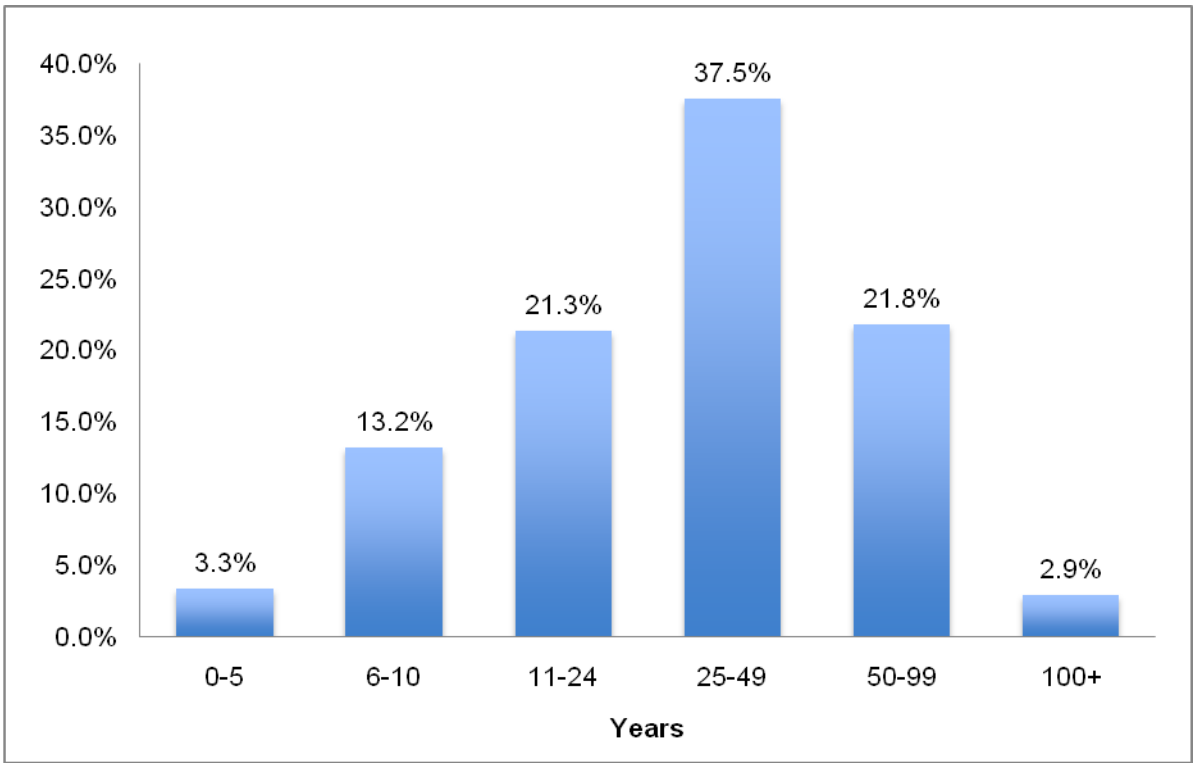
4.5 Age

Council Managed Trees in Harrow are classified in the following six age bands:

0-5 years
6-10 years
11-25 years
25-49 years
50-99 years
100+ years

The overall age breakdown of Council Managed Trees is shown in **Chart 4.1** below.

Chart 4.1: Age of Council Managed Trees in Harrow



The largest proportion of trees is within the 25-49 age group (37.5%). This is similar to the data from the Trees in Towns II Study[12] which reported that in London as a whole 40% of trees were within the 25-49 age group (see **Chart 4.2** below). The second largest group in Harrow is the 50-99 year age group (21.8%) compared to the London data which has only 10% of trees in this group. The third largest group in Harrow is the 11-24 years age group (21.3%) compared to the London findings that there were 43% of trees in the age group, the largest proportion of trees in London. Trees in Towns II found that 0% of trees in London were aged 0-5% whilst in Harrow this figure is 3.3%. This suggests that trees in Harrow have an older age profile that trees in London as a whole.

Chart 4.2: Proportion of Trees in Each Age Class - London

For the purposes of this audit it is more meaningful to examine the age of trees at ward level. The wards with the highest proportions of young trees (aged 0 to 5 years) are Marlborough (9.4%) and Harrow on the Hill (8.1%). The wards with the lowest proportion of trees in this age group are Edgware (0.5%, Headstone South (0.7%), Queensbury (0.9%) and Kenton West (0.9%). This compares to the Borough average of 3.3%.

Slightly older trees (aged 6 to 10years) count for 13.2% of the Borough's trees. In Wealdstone nearly half (47.3%) of all trees are in this age group. This is most likely to be a result of Wealdstone being a Priority Area in the Mayor's Street Tree Programme. There are approximately 1 in 4 trees of this age in Roxbourne (28%) and Headstone South (24.3%). Queensbury ward has the lowest proportion (2.5%) of trees of this age.

There is a relatively high proportion of trees in the age group 11 to 24 years with 21.3% in the Borough as a whole and a relatively high proportion in a number of wards with the highest being in Harrow Weald (29.7%) and Belmont (29.7%). The lowest proportion of trees in this age group is in Wealdstone (13.2%).

The largest proportion of Council trees in the Borough (37.5%) are in the age group 25 to 49 years old. Trees of this age account for nearly half of all trees in Marlborough (49.2%),

[12] The Trees in Towns data is not strictly comparable because it includes both public and private trees and shrubs.

Pinner (48%) and Headstone South (47.5%). The lowest proportion of trees of this age is in Roxeth (29.3%).

Approximately 1 in 5 trees in the Borough fall into the 50 to 99 year age group. (21.8%). There are a relatively large proportion of trees of this age in Queensbury (35.1%) and Headstone North (31.5%. By contrast there are small proportions of trees in this age group in Wealdstone (4.7%) and Headstone South (4.9%).

Only 2.9% of trees in the Borough are 100 years or over. The highest proportion of tree in this age group is in Hatch End (8.1%) and the lowest is in Edgware (0.1%), Headstone South (0.1%) and Marlborough (0.1%).

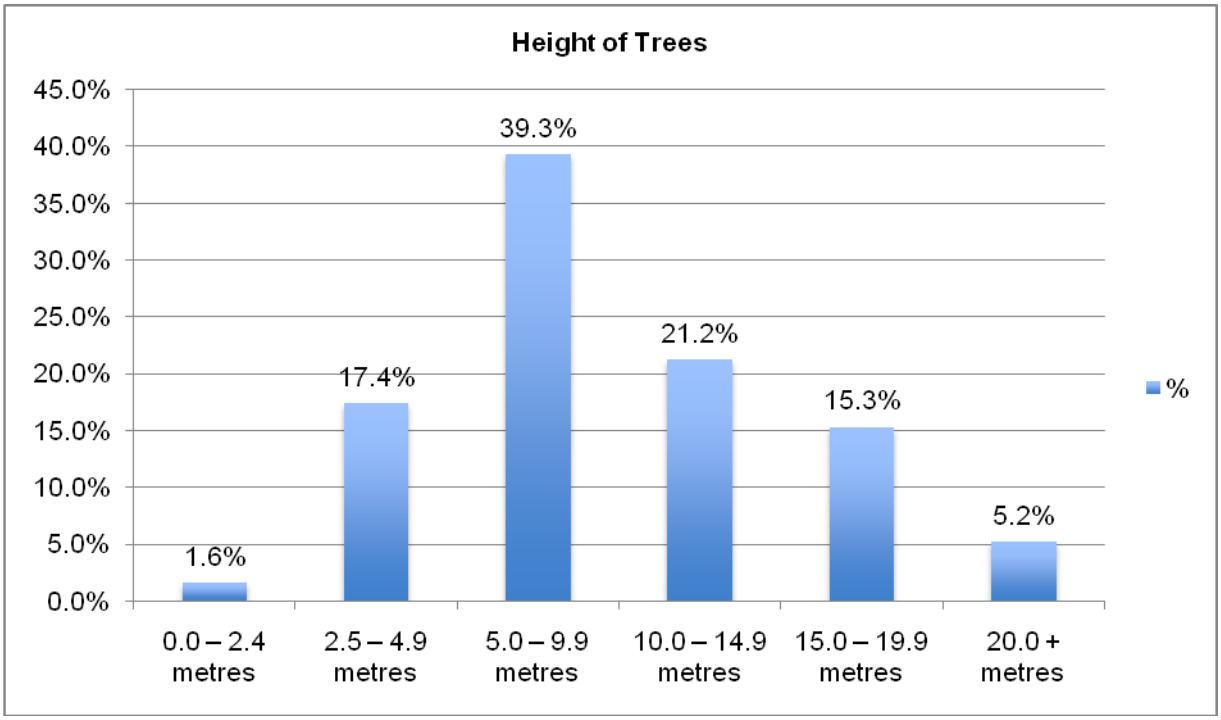
4.6 Height

Tree height is estimated from the ground to the top of the tree, and recorded in one of the following six bands:

0.0–2.4 m
2.5–4.9 m
5.0–9.9 m
10.0–14.9 m
15.0–19.9 m
20.0+ m.

The height profile of trees in the Borough is shown in **Chart 4.3** below.

Chart 4.3: Height of Council Managed Trees



Only 1.6% of trees in the Borough are 2.4 metres or less in height compared to 5% for London as a whole (see **Chart 4.4** below). By ward the proportion varies from 3% in both Roxeth and Belmont down to just 0.4% in Headstone South. Only 3 wards have less than 1% trees of this height.

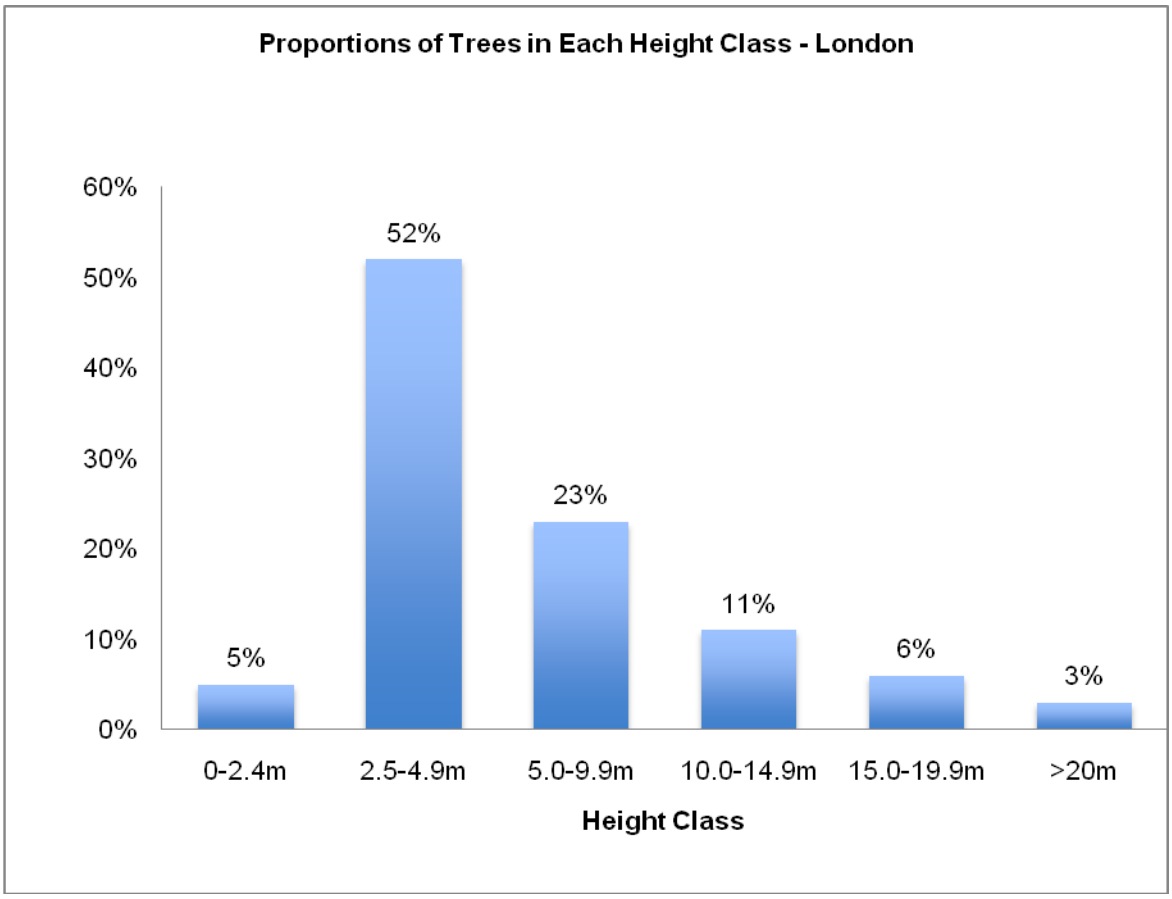
The proportion of trees in the 2.5 metres to 4.9 metre height band is 17.4% in the Borough which is significantly different to the London finding that 52% of trees are in this height class.

However in the wards the proportion varies significantly with 52.6% in Wealdstone and 9.8% in Queensbury and 9.9% in Harrow Weald. The figure for Wealdstone reflects the planting programme initiated in the ward for the Mayor's Street Tree Programme.

The largest proportion of trees in the Borough (39.3%) is in the height band of 5.0 to 9.9 metres whilst the London data indicated only 23% in this class. More than half of all Council Managed Trees in Belmont (57.6%) and West Harrow (56.2%) are in this band. The lowest proportion of trees of this height is in Roxbourne (24.2%) and Canons (28.4%).

One in five (21.2%) trees in the Borough fall within the 10.0 to 14.9 metre category twice as much as London (11%). The ward with the highest proportion of trees in this height band is Pinner (28.9%) followed by Queensbury (26.8%) and Pinner South (26.4%). Significantly lower proportions are found in Wealdstone (8.7%) and Belmont (12.3%).

Chart 4.4: Proportions of Trees in Each Height Class - London



The second tallest group is 15.0 to 19.9 metres and 15.3% of Council Managed Trees fall into this group, again twice as much as in London (6%). Stanmore (30%) has the highest proportion of trees in the group. The lowest proportions are in Wealdstone (2.9%) and Headstone South (6.0%).

The tallest height group is 20+ metres with 5.2% of trees in the Borough falling into this band, a result that is similar to London (3%). Within the wards there is a considerable difference in the proportion of trees in this height band with Hatch End (13.6%), Harrow Weald (11.0%) and Harrow-on-the-Hill (10.3%) having higher proportions of the tallest trees compared to the Borough average. Wards with fewer trees of this height include Headstone South (0.0%), Wealdstone (0.1%), Belmont (0.3%), Roxeth (0.6%) and Rayners Lane (0.6%).

4.7 Diameter

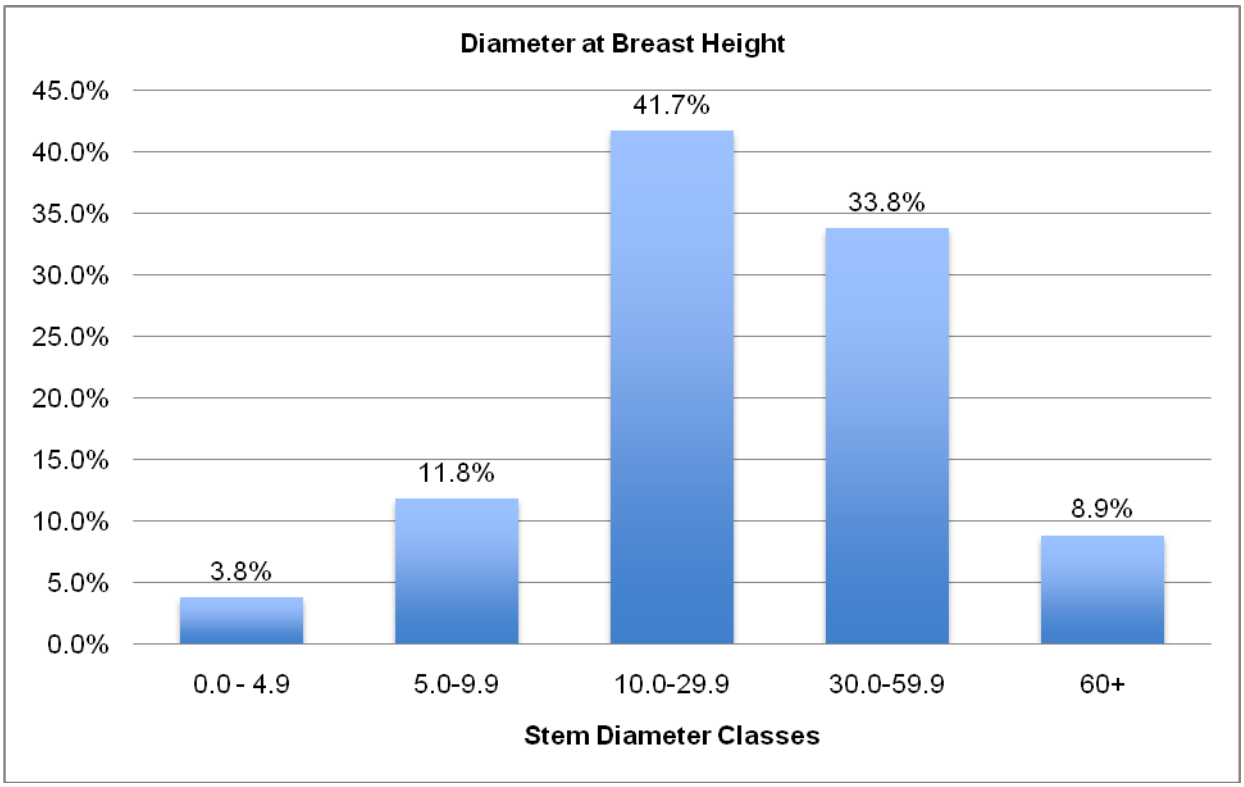
Diameter (dbh) is the trunk diameter at breast height which is measured at 1.5 metres above ground level using a diameter tape. For multiple-stemmed trees the average was recorded.

The trunk/stem diameter was recorded as being within one of the following five bands:

0.0-4.9 cm
5.0-9.9 cm
10.0-29.9 cm
30.0-59.9 cm
60+ cm.

The range of the trunk diameters of Council Managed Trees is shown in **Chart 4.5** below.

Chart 4.5: Diameter at Breast Height of Council Managed Trees.

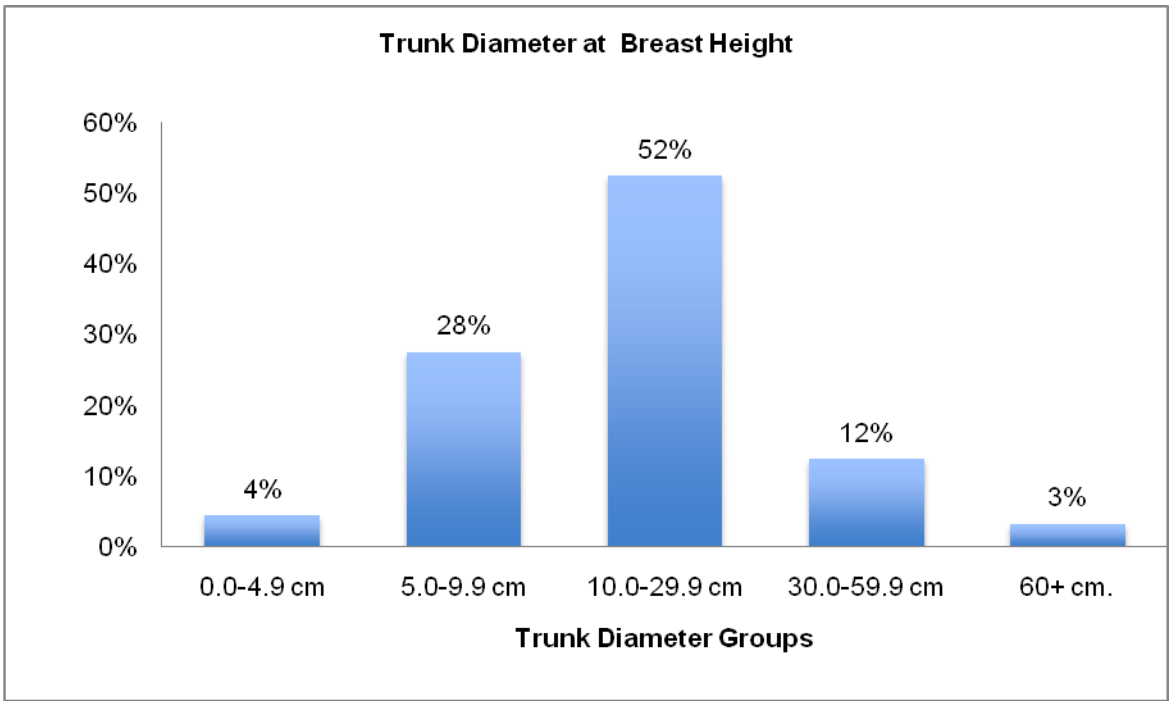


Council Managed Trees with the smallest diameter of 0.0 to 4.9 cm's account for just 3.8% of all Council Managed Trees which is similar to the London figures in Trees in Towns II (see **Chart 4.6** below)**.** The largest proportions of trees in this class are in Wealdstone (13.1%) and Headstone South (8.9%). Much smaller proportions are found in Queensbury (0.3%) and Rayners Lane (0.9%). This distribution follows a similar pattern for the slightly larger diameter class of 5.0 to 9.9 cms which make 11.8% of Council Managed Trees compared to 28% of London trees. The largest proportions of trees in this class are in Wealdstone (36.3%) and Headstone South (27.2%). Again the smallest proportion is in Queensbury (5.6%) followed by Pinner (7.4%), Kenton West (7.5%), Pinner South (7.6%) and Rayners Lane (7.9%).

Two in five (41.7%) of Harrow trees fall into the next largest diameter band of 10.0 cm to 29.9 cm compared to 52% in London. Higher proportions of trees in this band are found in the wards of Rayners Lane (51.6%), Kenton East (50.4%) and Harrow-on-the-Hill (49.7%). A

much lower proportion of trees in Wealdstone (30.9%) and Roxbourne (31.9%) are in this band.

Chart 4.6: Diameter at Breast Height of Trees - London



One in three (33.8%) trees in the Borough fall within the 30 to 59.9 cm's stem diameter class whilst the proportion in London is far lower (12%). The ward with the highest proportion of trees with this dbh is Queensbridge (47.4%) followed by Pinner (42.0%), Edgware (39.5%) and Headstone North (39.4%). The lowest proportions are in Wealdstone (18.9%) and Headstone South (20.5%).

In Harrow, Council Managed Trees with the largest diameter of 60 cm's and more constitute 8.9% of the total, higher than in London (3%). Harrow Weald (15.2%) and Stanmore (13.2%) have a higher proportion than other wards whilst Wealdstone (0.9%) and Headstone South (1.9%) have the lowest proportion.

4.8 Crown Spread

Average crown spread is obtained by measuring the longest and shortest extent of the crown and averaging the figures. It is an important measure for the calculation of canopy cover, which is the percent of a fixed area covered by the crown of an individual tree.

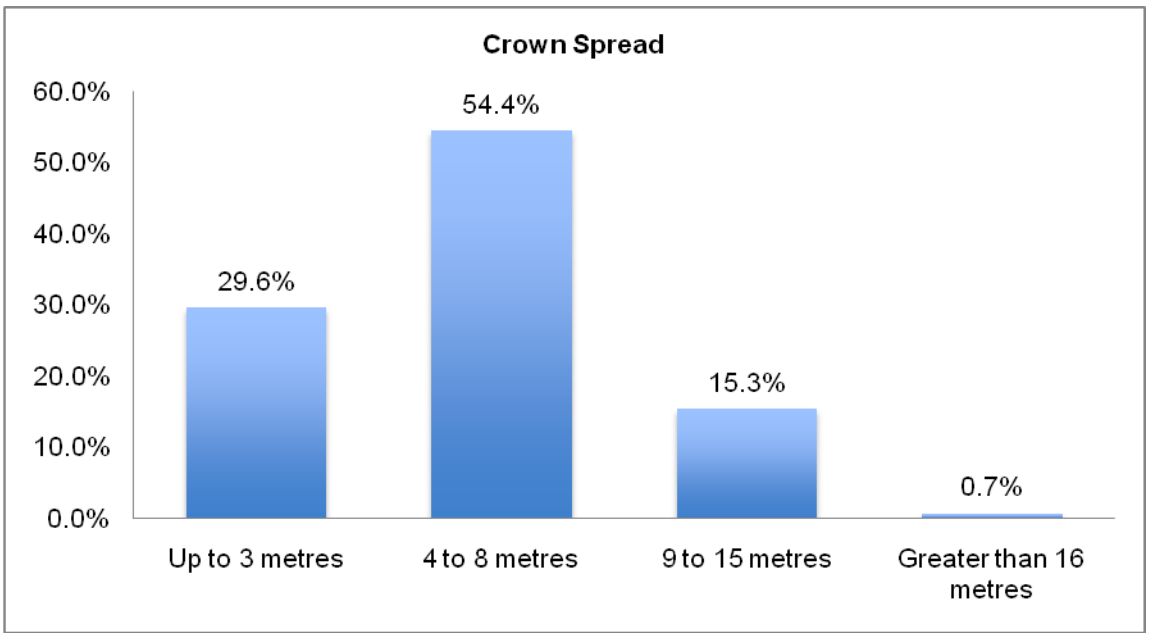
The maximum diameter of crown spread was recorded and entered in one of the following four bands:

Table 4.8: Crown Spread

Band Number	Crown Spread
1	Up to 3 meters
2	4 to 8 meters
3	9 to 15 meters
4	Greater than 16 meters

Council Managed Trees in Harrow fall into the four bands as shown in **Chart 4.7** below.

Chart 4.7: Crown Spread of Council Managed Trees.



The smallest band is up to 3 metres and one in three trees in the Borough (29.6%) fall into this category. The ward with the highest proportion of trees with the smallest crown spread is Wealdstone (56.6%) again a reflection of the recent planting programme in the ward. There is also a significant proportion in Belmont (36.9%) and West Harrow (36.4%). There are fewer trees with this spread in Queensbury (16.5%) and Pinner (17.5%).

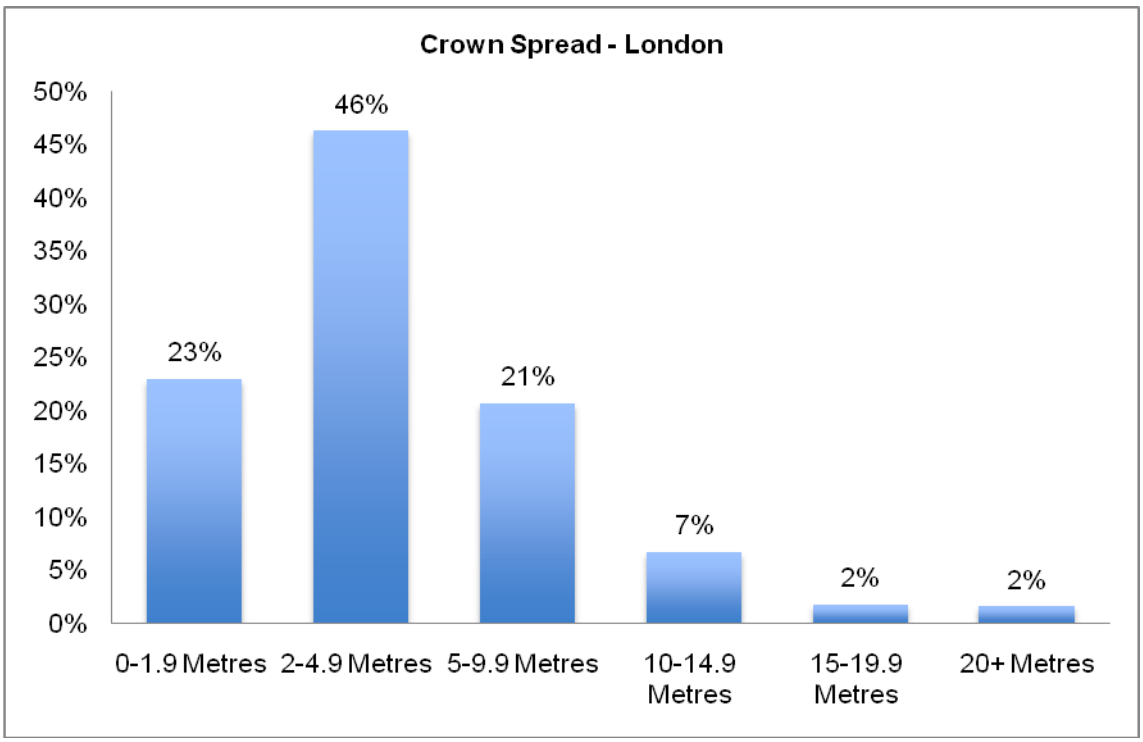
The highest proportion of trees is in the 4 to 8 metres crown spread, which includes 54.4% of Council Managed Trees. Trees with a crown spread that falls into this band constitute a high proportion of trees in Queensbury (65.5%) and Pinner (63.3%).

15.3% of trees in the Borough are in the 9 to 15 metres band and the highest proportions are in Hatch End and Headstone South (both 24.9%)

The smallest proportion of trees is within the crown spread in excess of 16 metres (0.7%). Larger proportions are found in Kenton West and Kenton East (both 1.5%) and the fewest are in Marlborough and Headstone South (0%).

The London figures produced for Trees in Towns II are not directly comparable because different spread measurements are used (see **Chart 4. 8** below) but broadly speaking they reflect a similar pattern to the Harrow results.

Chart 4.8: Crown Spread - London



4.9 Health/Condition

Trees were allocated to one of five tree condition categories, taking into account health, vigor, local environment, vandalism, pests and diseases, etc.:

Excellent represents a 100% to 90% condition; the tree is nearly perfect in condition, vigor, and form and generally applicable to small DBH trees that are well established and large trees that are successfully established.

Good - no evidence of disease or damage; full leaf, no die-back, good branch structure.

Fair - minor evidence of disease/damage with minor deadwood but not life threatening.

Poor condition - extensive evidence of disease or damage; life threatening. Dieback in crown or poor callus growth on wounds.

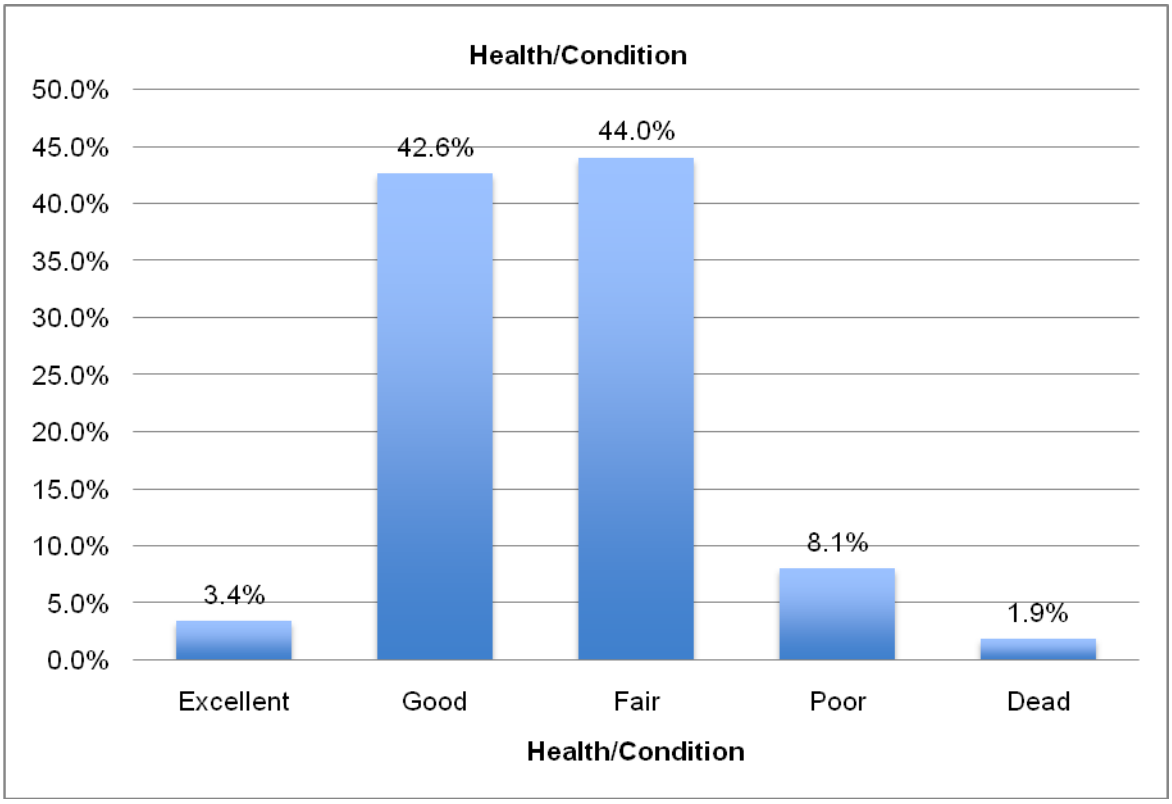
Dead - obviously moribund, severely diseased.

Only 3.4% of the Borough trees could be described as being 'Excellent'. The ward with the highest proportion of excellent trees is Canons (10.9%) followed by Roxeth (7.8%) and Rayners Lane (7.6%). There are few trees in Queensbury (0.6%) and Headstone South (0.7%), Kenton West (0.8%) that have been assessed as 'Excellent'. This is shown in **Chart 4.9** below.

Over two in five trees in the Borough (42.6%) are considered to be in 'Good' condition. Wards where a high proportion of trees have been assessed as being in 'Good' condition are Roxeth (59.8%), Kenton East (58.3%) and Harrow Weald (58.3%). The lowest proportions of trees in 'Good' condition are in Belmont (25.4%) and Marlborough (38.7%). The London results (see **Chart 4.10** below**)** are only assessed a being 'Good'**.** However 71% of trees in London were assessed as being in this condition. The combined result of excellent and good in Harrow is 42.6%, considerably less than the London figures produced for Trees in Towns II.

The highest proportion of Council Managed Trees in the Borough (44%) have been assessed as being 'Fair' compared to 25% for London. Belmont (58.9%) has the highest proportion of 'Fair' trees followed by Marlborough (56.3%) and Queensbury (52.1%). The lowest proportions of 'Fair' trees are found in Roxeth (25.2%), Kenton East (26.5%) and Harrow Weald (27.1%).

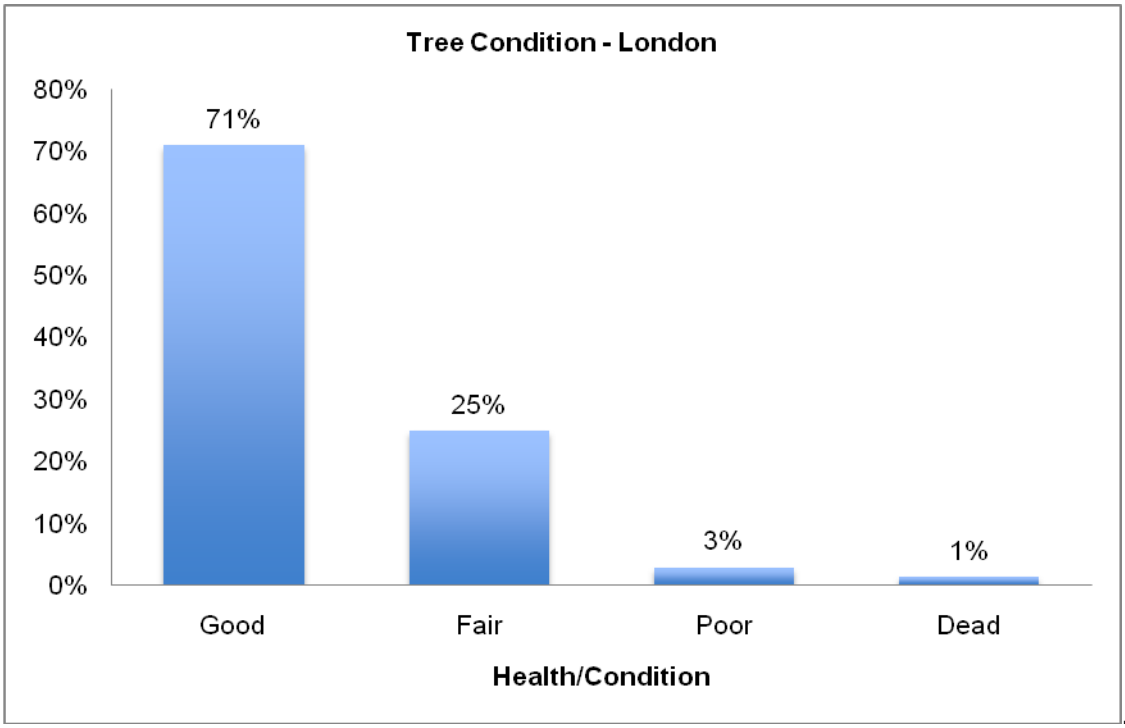
Chart 4.9: Health/Condition of Council Managed Trees.



Only 8.1 % of Council Managed Trees in the Borough have been assessed as being in a 'Poor' condition although the London figure was much lower at 3%. The ward with the highest proportion of trees in 'Poor' condition is Headstone North (13.1%), followed by Kenton West (12.5%) and Belmont (11.9%). Wards with a low proportion of 'Poor' trees are Roxbourne (3.6%) and Canons (3.9%).

Finally, 1.9% of all Council Managed Trees in the Borough are classified as being 'Dead' although this is only 0.5% of Council Managed Trees in Roxeth and 0.9% in Canons. Wards with a higher proportion of 'Dead' trees are Wealdstone (3.0%), Stanmore (2.9%), and the three wards of West Harrow, Headstone South and Harrow-on-the-Hill (2.7%).

Chart 4.10: Condition of Trees - London



4.10 Safe Useful Life Expectancy (S.U.L.E.)

Information derived from the visual inspection of Council Managed Trees is used to determine the SULE rating. This rating gives an estimate of the expected life span of the tree and takes into account age, life span of the species, local environmental conditions, location and tree safety. The ratings are sub divided into the following bands:

<5 years

5-10 years

10-20 years

20-40 years

40-80 years

80+ years

Trees with an anticipated long life span have a SULE greater than 40 years. Trees with an anticipated medium life span are within the bands covering 15 to 40 years. A short life span is in the range of 5 to 15 years.

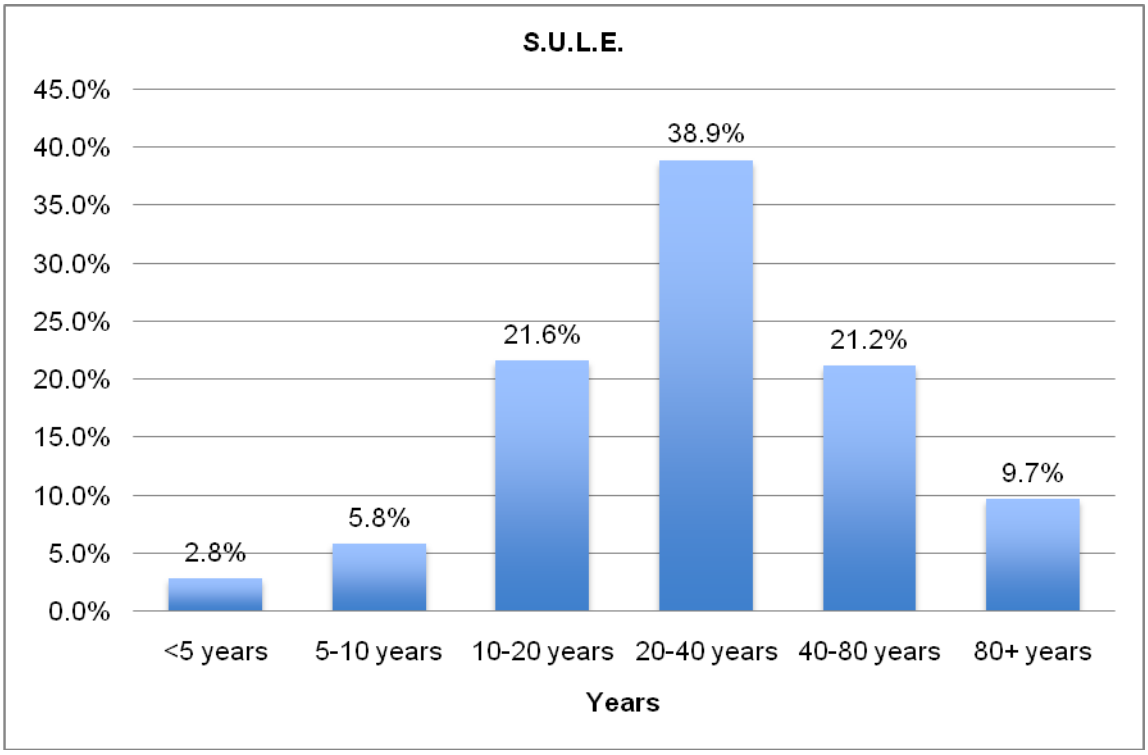
The largest proportion of Council Managed Trees in the Borough (38.9%) has a SULE of between 20 and 40 years. About 1 in 5 trees have a SULE of 10 to 20 years (21.6%) and the same applies to trees with a SULE of between 40 and 80 years (21.2%). There are a small proportion of trees with a SULE of more than 80 years (9.7%). Similarly, there are small proportions of Council Managed Trees with a short life span of 5 to 10 years (5.8%) and less than 5 years (2.8%). This is shown in **Chart 4.6** below.

Higher proportions of trees with a SULE of less than 5 years are found in Kenton East (4.6%), Belmont (4.6%) and Kenton West (4.4%). The lowest proportions of these short life trees are in Pinner South (1.0%) Roxbourne (1.5%) and Roxeth (1.5%).

Council Managed Trees with a SULE of between 5 and 10 years are more prevalent in Kenton West (14.2%), which has a significantly higher proportion than the wards of Belmont (9.5%) and Kenton East (9.5%). There are fewer trees that fall into this category in Harrow-on-the-Hill (2.1%) and Wealdstone (2.4%).

Trees with an anticipated long life span with a SULE of 40 to 80 years are strongly represented in Wealdstone (46.8%) with 2 in 5 trees in Harrow Weald (38.4%) being in this band. Wards with a low proportion of Council Managed Trees with an anticipated longer life span are Pinner (9.5%) and Kenton West (9.6%).

Chart 4.6: Council Managed Trees – S.U.L.E.



A relatively higher proportion of Council Managed Trees in Kenton West (36.7%) and Pinner (30.5%) have a SULE of 10 to 20 years. Wards with the lowest proportions of trees in this band are in Harrow Weald (11.2%), Wealdstone (12.0%) and Harrow-on-the-Hill (13.0%).

Council Managed Trees with a medium life span of 20 to 40 years SULE have a higher representation in Roxeth (52.5%), Pinner South (48.0%) and Pinner (47.0%). Wealdstone (22.5%) has the lowest proportion in this band.

Finally, Council Managed Trees with a SULE of over 80 years constitute 1 in 5 of trees in Canons (20.0%) and slightly less than this proportion in Hatch End (17.1%). Wards with the fewest Council Managed Trees in this band are in Pinner (3.0%), Harrow-on-the-Hill (3.9%) and Headstone North (5.7%).

4.11 CAVAT (Capital Asset Valuation for Amenity Trees)

CAVAT (Capital Asset Value for Amenity Trees) provides a basis for considering trees as public assets rather than liabilities. The Town and Country Planning Act 1990 Section 198, states that trees have value as a public amenity. CAVAT provides a method for assessing the value of the amount of public benefits that each particular tree provides. CAVAT works by calculating a unit value for each square centimeter of tree stem, by extrapolation from the average cost of a range of newly planted trees, and then adjusting this to reflect the degree

of benefit that the tree provides to the local community. The final value provides a realistic assessment of the contribution of the tree to the amenity of a neighbourhood.

The CAVAT is calculated in Ezytreev and is broken down into six bands as follows:

£0 > £499

£500> £999

£1,000>£1,999

£2,000>£4,999

£5,000>£9,999

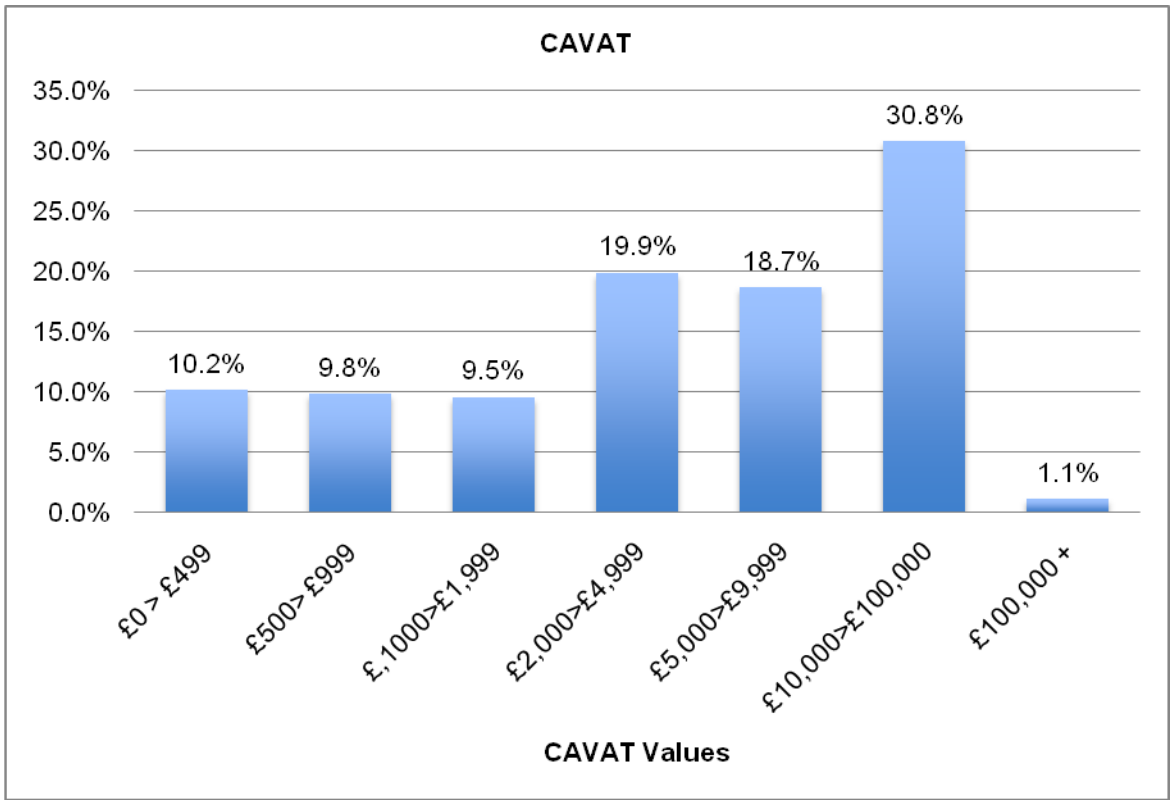
£10,000>£100,000

£100,000 +

Council Managed Trees in the Borough are valued at £319,907,621 in total although not all trees have been valued so this figure is an underestimate. Approximately 1 in 3 trees have been valued at between £10,000 and £100,000 (30.8%) and a further 1 in 3 trees are valued at below £1,999 (29.5%). Approximately 1 in 5 trees fall into the £2,000 to £4,999 band (19.9%) slightly more than those valued within the £5,000 to £9,999 band (18.7%). Finally, trees with a CAVAT value above £1,000,000 comprise just 1.1% of all Council Managed Trees. The results are shown in **Chart 4.7** below.

Low value trees in the band of £0 to £999 account for over half the Council Managed Trees in Wealdstone (54.7%) and approximately a third of trees in both Headstone South (37.0%) and Roxbourne (28.8%) are in this band. The lowest proportion of trees valued at below £999 is in Queensbury (5.9%) and Roxeth (11.2%).

Chart 4.7: CAVAT Values for Council Managed Trees.



The highest proportions of trees valued at between £1,000 and £4,999 are in Harrow-on-the-Hill (41.7%) and Kenton East (37.1%). Most other wards have about 1 in 5 trees within this value band with the lowest being Canons (20.7%).

Council Managed Trees in the £5,000 to £9,999 band account for 1 in 3 trees in Harrow-on-the-Hill (34.6%) but only about 1 in 8 in Wealdstone (12.0%).

Almost a half of Council Managed Trees in Hatch End (47.4%) are in the higher value band of £10,000 to £100,000 and 2 in 5 trees in Canons (40.0%). This compares with low proportions of trees in this band in Harrow-on-the-Hill (0.0%) and Wealdstone (12.0%).

Finally, the ward with the most trees of the highest value of over £1,000,000 are in Harrow Weald (4.2%) with several wards not having any trees of this value.

4.12 Land Use and CAVAT

Harrow Council owns a total of 34,118 trees. Almost half (48.1%) are street or highway trees and almost a third (32.0%) are located in parks and open spaces. The full breakdown of where trees are located is shown in **Table 4.11**.

Table 4.11: Location of Harrow Council Trees.

Location	%	Number
Highways	48.1%	16415
Parks and Open Spaces	32.0%	10905
Education	10.5%	3594
Housing	5.5%	1869
Cemetery	1.8%	601
Allotments	0.4%	152
Civic Centre	0.4%	152
Car Parks	0.4%	148
Social Services	0.4%	136
Harrow Arts Centre	0.2%	60
Leisure Centre	0.2%	58
Library	0.1%	26
Drainage	0.0%	2
Total		**34118**

The two main land uses with trees that are managed by the Council are Highways (48.1%) and Parks and Gardens (32.0%). The CAVAT values of trees within each land use are shown in **Table 4.12** below.

The proportion of Highway trees that have been valued is 91.1% of the total and the value of these trees is £142,692,239. The proportion of trees in Parks and Gardens that have been valued is slightly lower (84.2%) than for Highways and the value of these trees is £140,340,760.

Table 4.12: Land Use and CAVAT

Owner name	Tree value	Number	Number Valued	% Valued
Highways	£142,692,239	16415	14959	91.1%
Parks and Open Spaces	£140,340,760	10905	9181	84.2%
Education	£12,618,030	3594	675	18.8%
Housing	£12,245,432	1869	722	38.6%
Cemetery	£6,934,002	601	394	65.6%
Allotments	£1,543,970	152	143	94.1%
Car Parks	£1,473,315	148	143	96.6%
Social Services	£1,414,642	136	64	47.1%
Leisure Centre	£302,777	58	57	98.3%
Library	£216,154	26	21	80.8%
Drainage	£83,177	2	1	50.0%
Harrow Arts Centre	£43,123	60	2	3.3%
Civic Centre		152	0	0.0%

Parks and Gardens

There are 10,905 trees located in Parks and Gardens. However, the definition of Parks and Gardens used in the database is broad and includes a number of spaces that are not strictly speaking parks. The definition of Parks and Gardens applied in the Open Space, Sport and Recreation Study[13] is more precise. This study identified 29 Parks and Gardens and there are 8,502 trees located in these spaces.

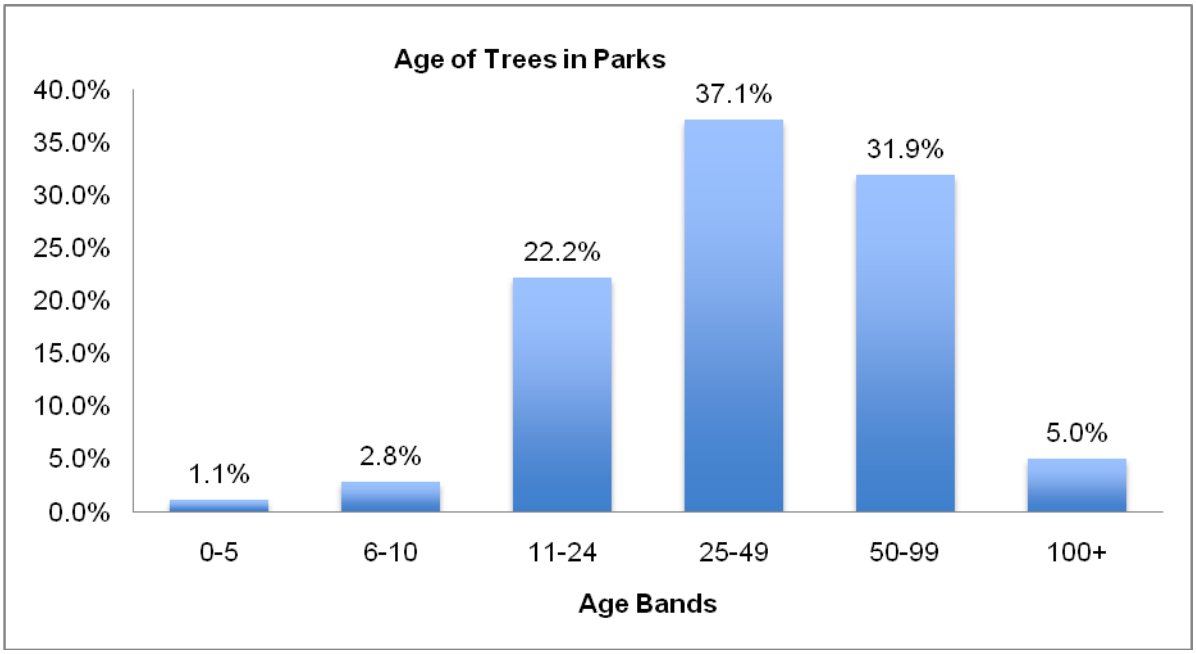
The age of trees in these Parks and Gardens is shown in **Chart 4.8** below. The largest proportion of trees falls within the 25 to 49 age band with nearly one in three trees (31.9%) in the 50 to 99 year age group. There are over 400 trees that are over 100 years old (5%).

This analysis shows that nearly three quarters (74%) of the trees in Parks and Gardens in Harrow are over 25 years old.

One in five trees is in the 11 to 24 age group. Only a small proportion of trees have been planted in the last 10 years (3.9%).

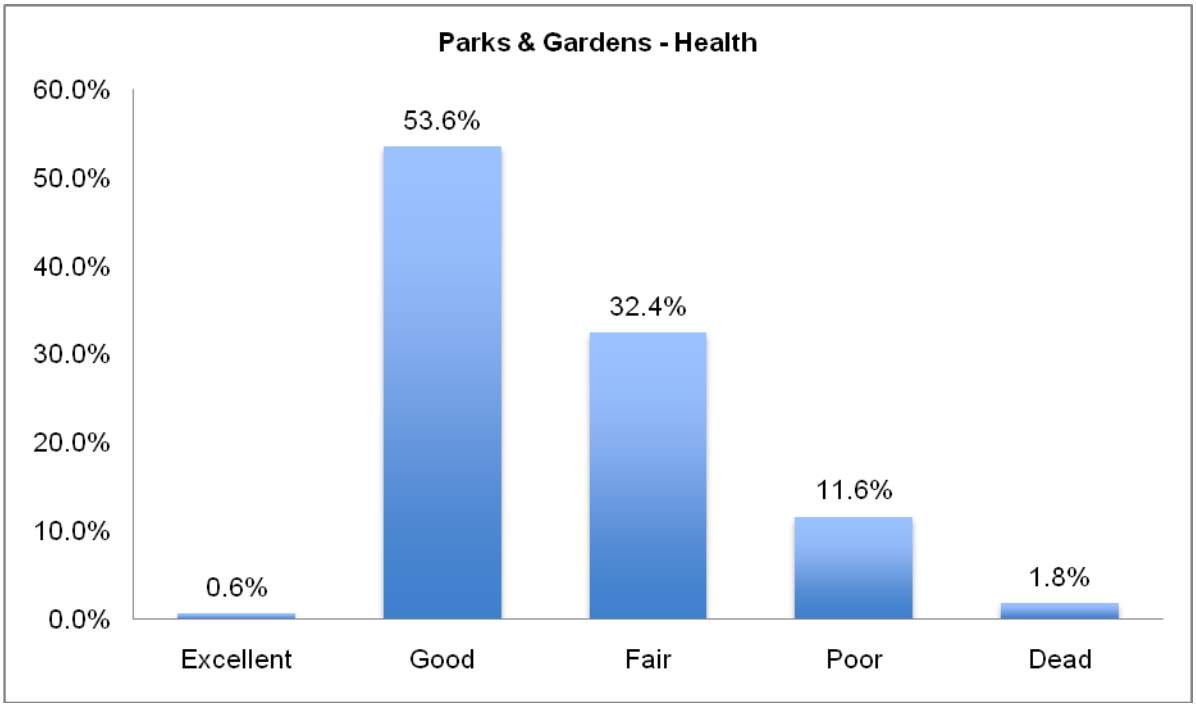
[13]London Borough of Harrow – Open Space, Sport & Recreation Study, 2010

Chart 4.8: Age of Trees in Parks and Gardens



Turning to the health of trees in Parks and Gardens, over half of trees (53.6%) are in 'Good' health. However, one in three trees was assessed as being in 'Fair' condition and more than one in ten as being 'Poor' (see **Chart 4.9**. below)

Chart 4.9: Health of trees in Parks and Gardens



4.1 Key Issues for Council Managed Trees

Imbalance in age classes

There is an imbalance between the older and younger age groups with 62.2% of all Council Managed Trees being aged between 25 and over 100 years. Over a third of Council Managed Trees are aged between 25 and 49 years (37.5%). This compares with just over 1 in 6 Council Managed Trees that are under 10 years old (16.5%). This may well result in a problem of succession in the future as the older trees reach a point where they need to be replaced.

Health of Trees

Whilst a significant proportion of trees have been assessed as being 'Good' or 'Excellent' (46%) there is a large group of trees assessed as being only 'Fair' (44%) in addition to trees that are 'Poor' (8.1%). Many of the street trees are rosaceous species which have become over aged and are declining in health.

Insurance Claims

Main problems are fungi – e.g. galloderma. Galloderma tends to be a symptom of an old tree in poor condition; it occurs on a living tree when the tree is subject to other stresses and is implicated in many insurance claims.

Ash Die Back

Ash dieback is a disease of ash trees caused by the fungus Chalara fraxinea. The disease causes leaf loss and crown dieback in affected trees and it may lead to tree death. Common ash (Fraxinus excelsior) is the most frequently affected species although Fraxinus angustifolia and the 'Pendula' ornamental variety of common ash have also been reported as hosts. There are 2019 Fraxinus excelsior and 16 Fraxinus angustifolia 'Pendula' among the Council's tree stock. It is likely that these trees will require removal and replacement in the near future.

Tree Replacement

There are occasions when problems associated with certain trees require their removal because damage to property has resulted from tree roots, trees are over mature and require expensive maintenance, or have a reduced safe useful life expectancy. These need to be replaced with either younger trees of the same species or a more suitable species.

There is a need for a planned approach to the removal of unsuitable trees, or trees reaching the end of their safe useful life expectancy, and replanting with appropriate replacements to create a more sustainable tree population that is diverse in age and species.

One example is that of Italian Alder which has been widely planted as a street tree in the past but is unsuitable for this location due to its vigorous root system. A replacement programme is needed in order to plant more suitable species.

Low number of trees

Some wards such as Headstone South, Wealdstone and Edgware have significantly fewer trees than wards such as Pinner South and Hatch End.

Canopy Cover

There has been a trend of planting smaller scale trees when replacing larger broadleaved specimens. This is partly a result of the invasive nature of some existing species. These larger species trees confer the greatest benefits for urban areas in climate adaptation and also mitigation measures. This may well result in a reduction of total canopy cover in the Borough; however, one solution would be to re-plant with larger numbers of trees to compensate for the reduced overall canopy cover which would otherwise occur.

5. PRIVATE TREES

Guidance on the preparation of tree and woodland strategies produce by the Mayor of London makes it clear that it is necessary to consider all trees in the Borough whether the trees are on public or private land.

Trees in private gardens are a significant resource of trees in Harrow. Individual property owners and residents have the influence over the type of trees planted and the level of management they receive and the range of species and quality of these trees are considerable.

5.1 Methodology

A comprehensive audit of all private trees in the Borough was not feasible. The Mayor of London's guidance for preparing a Tree and Woodland Strategy[14] in these circumstances is to undertake a statistically valid random sample on each major land use form. This should cover: numbers, species diversity, age classes and designated value of tree stock within specific land use types. Six major land use types are identified in Trees in Towns II. These are:

Low Density Residential Areas (LDR).

Medium Density Residential Areas (MDR).

High Density Residential Areas (HDR).

Town Centres and Commercial Areas.

Industrial Areas.

Open Space.

Data on trees in open space is available in Ezytreev. Samples of the residential areas, town centres and industrial areas were therefore required.

The identification of areas of the Borough with different residential densities used for this study was based on the Characterisation Study undertaken for the Local Development Framework[15]. The Characterisation Study provides an understanding of the defining characteristics of different types of residential areas. The principal characteristic of Harrow is the traditional, Metroland housing which is common to many outer-London boroughs. The Character Assessment of Harrow's Residential Areas examines the variations in architectural detail, spaciousness, layout and building form of Harrow's suburbs. Maps were produced showing defined areas to be one of 142 Character Areas.

Each Character Area had a typical housing density; however no detail was obtained as to actual housing density figures.

For the purposes of this particular study the actual housing density of each Character Area was obtained using GIS mapping. The different Character Areas were then classified according to whether they had high, medium or low density housing. The categories applied were:-

30 dwellings per hectare for low density

30-50 dwellings per hectare for medium density

[14]Preparing Tree and Woodland Strategies, Supplementary Planning Guidance, Greater London Authority, 2012

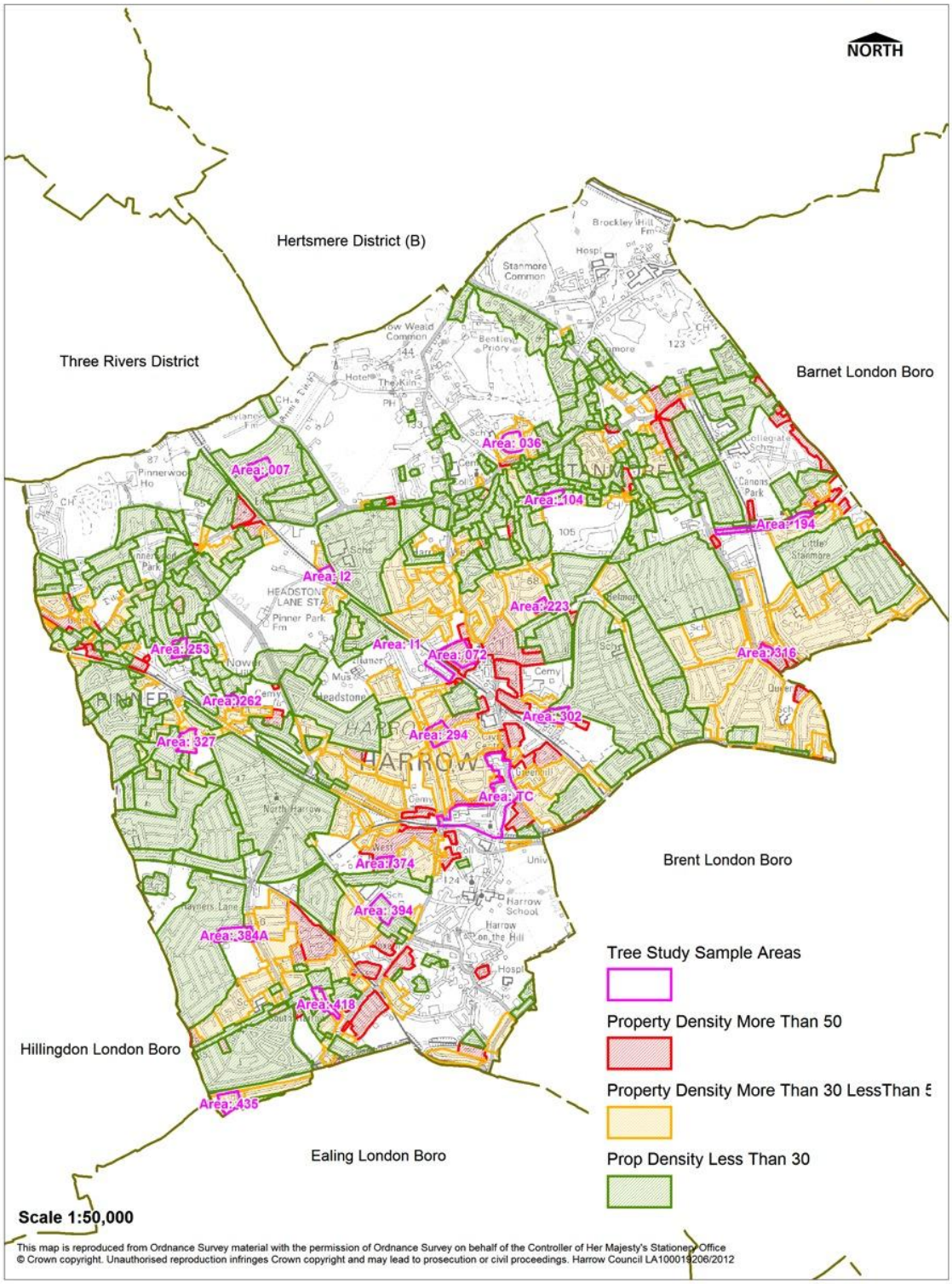
[15]Character Assessment of Harrow's Residential Areas, London Borough of Harrow, 2012.

50+ dwellings per hectare for high density

Each Character Area is relatively small and one ward could include a number of such areas. Property Densities are shown on **Map 5.1**

Map 5.1: Property Density in each Ward

Harrow Tree Strategy - Sample Areas and Property Density



Application of Sample Area Data

The number of trees in each sample area was measured on the ground. Using the GIS to measure the hectares of each sample area enabled the calculation of the density of trees in the areas which had been surveyed.

The mean tree density for the Low, Medium and High residential sample areas was then determined. The results are shown in **Table 5.1** below.

Table 5.1: Tree Densities

Residential Density	Tree Density
Low	77.47 per ha
Medium	54.53 per ha
High	46.82 per ha

The mean tree densities were then applied to provide an estimate of the number of trees in all the Character Areas in the Borough. The results were analysed on a Ward basis to provide an estimate for the total number of trees within the residential areas in each Ward.

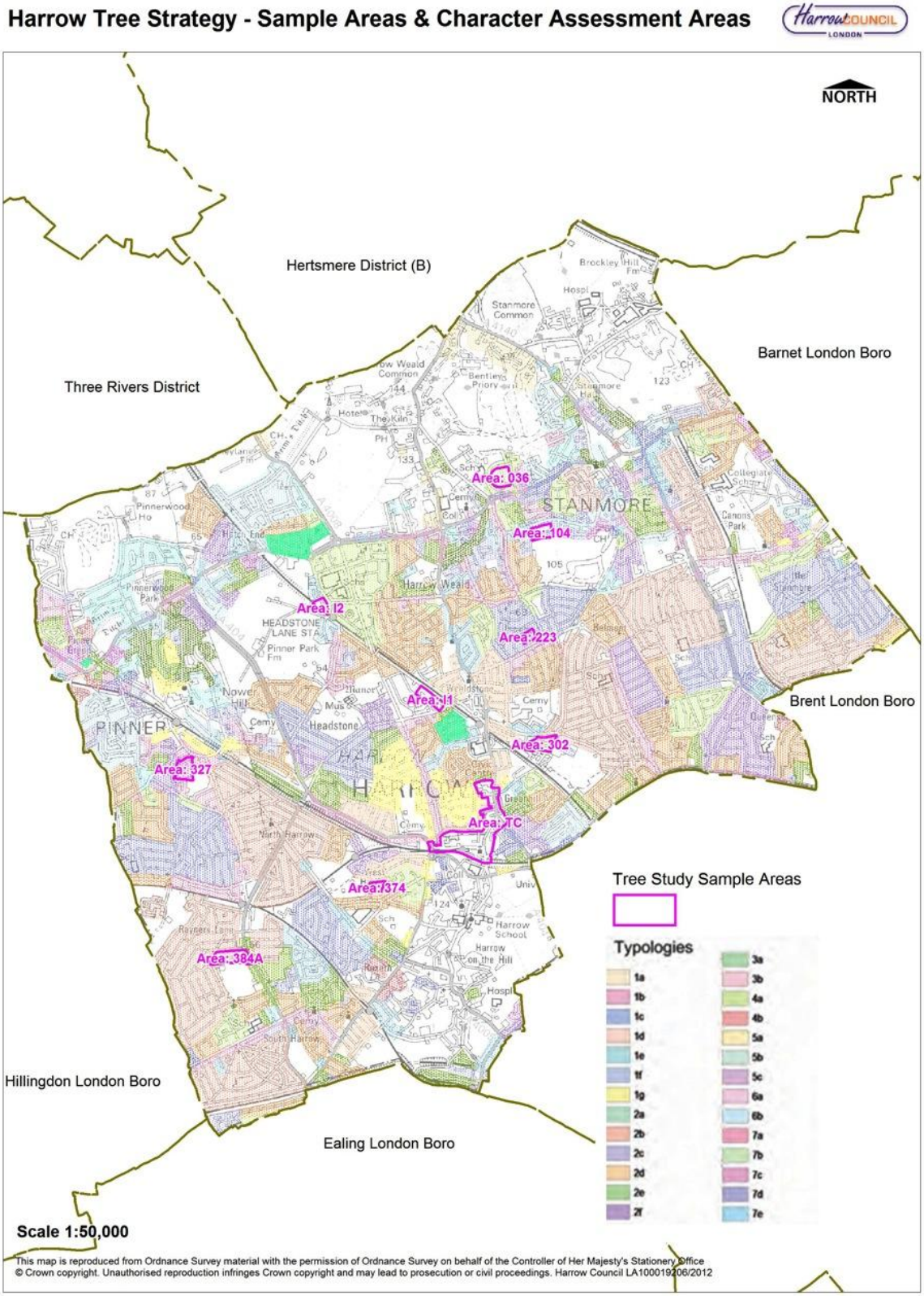
The data recorded for each tree in each sample area covered the following attributes:

Age
Height
Health
Diameter
Crown Spread
Contribution to the Urban Environment
Maturity
Management
SULE (Safe Useful Life Expectancy)

CAVAT (Capital Asset Valuation for Amenity Trees)

The average percentage for each attribute for Low, Medium and High residential density areas was then calculated.

Map 5.2: Character Areas and Sample Areas.



Employing the method applied in Trees in Towns II, sample areas measuring approximately 200 metres by 200 metres were identified for each Character Area typology. The limited resources available to undertake the survey meant that the number of areas surveyed was limited to seven, including two low density, three medium density and two high density areas In selecting these sample areas, a reasonable geographical spread across the Borough was sought. The sample areas are shown on **Map 5.2**.

Sample areas for both Town Centre (Harrow Town Centre) and two Industrial Areas were also identified. These are also shown on **Map 5.2**.

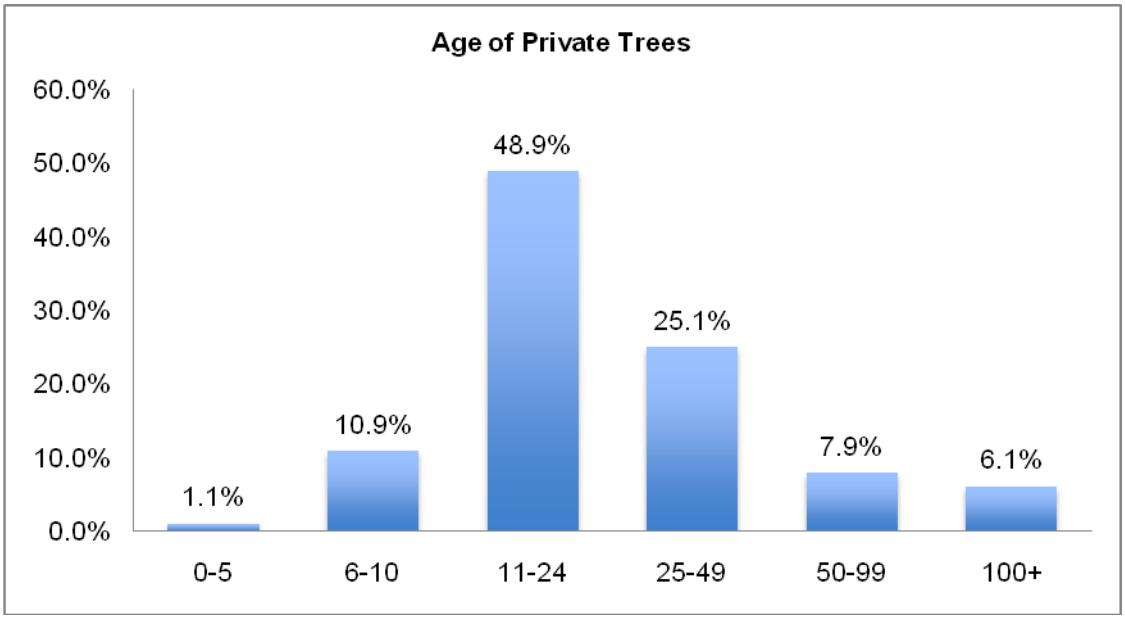
Field surveys were then undertaken of each sample area. Data were recorded for every visible tree or group of trees within each selected sample area plot. Where possible, access to back gardens was sought otherwise every reasonable effort to view the trees was made. Trees could be viewed from front boundaries, across rear gardens and from adjoining land. The position of trees was recorded either on a computer tablet or on paper maps.

5.2 Age

Private trees have been classified in the same age bands were used for Council Managed Trees.

The overall age breakdown of private trees is shown in **Chart 5.1** below.

Chart 5.1: Age of Private Trees



Private trees have a slightly younger age profile than public trees with most trees being within the 11 to 24 year age band (48.9%) although 1 in 4 trees are in the 25 to 49 years age band (25.1%). There are a lower proportion of private trees in the 50 to 99 years age band (7.9%) compared to public trees (21.8%). The proportion of Young private trees aged 0 to 10 years (12.1%) is relatively small.

For the purposes of this audit it is more meaningful to examine the age of trees at ward level. Wards with a higher proportion of trees in the 11 to 24 year age band include Hatch End (54.7%), Belmont (54.3%), and Headstone North (54.0%). Lower proportions are found in Wealdstone (32.6%) and Queensbury (34.8%).

An above average proportion of trees in the 25 to 49 year age group are indicated in Wealdstone (40.9%), Queensbury (38.6%) and Kenton East (38.3%) with low proportions in Hatch End (19.4%), Rayners Lane (20.4%) and Kenton West (20.4%). The wards with the

highest proportions of young trees (aged 6 to 10 years) are Marlborough (11.5%) and Canons (11.5%). The wards with the lowest proportion of trees in this age group are Kenton East (9.7%) and Queensbury (9.8%). This compares with the Borough average of 10.9%.

The 50 to 99 year age group accounts for 11.9% of private trees in the Borough. There are a relatively larger proportion of trees of this age in Wealdstone (14.2%), Queensbury (13.5%) and Kenton East (13.4%). By contrast there are small proportions of trees in this age group in Hatch End (5.7%) and Belmont (5.9%).

Only 6.1% of private trees in the Borough are 100 years or over. The highest proportion of tree in this age group is in Hatch End (7.8%) and Belmont (7.7%) and the lowest is in Wealdstone (1.6%), Queensbury (2.6%) and Kenton East (2.7%).

5.3 Species

Wherever possible the species of trees in the sample areas was identified. In only a small number of instances it was not possible to identify the actual species but in most cases it was possible to identify the genus.

Table 5.5: Most Common Private Tree Species

Species	Number of Trees	Classification
Malus unidentified species	1047	Small Broadleaf
X cupresocyparis leylandii	932	Conifer
Chamaecyparis lawsoniana	796	Conifer
Acer pseudoplatanus	399	Large Broadleaf
Prunus	268	Small Broadleaf
Fraxinus excelsior	214	Large Broadleaf
Tilia	167	Large Broadleaf
Betula pendula	95	Small Broadleaf
Quercus robur	93	Large Broadleaf

The most numerous species found in the residential sample areas was Cypress with 1728 specimens in total. Just over half were Leyland Cypress and just under half were Lawson's Cypress. There were over a thousand malus (apple) trees planted in rear gardens.

Other species that were strongly represented were Sycamore (Acer pseudoplatanus), Prunus () and Common Ash (Fraxinus excelsior) and Lime (Tilia().

Table 5.5 shows the most common private tree species.

5.4 Maturity

In undertaking the survey of sample areas for private trees it was possible to include categories used in Trees in Towns II and not be constrained by the limits imposed by Ezytreev. The survey therefore included maturity as another measure of the tree stock. Tree maturity differs from age because maturity is dependent on species, and the normal life expectancy of that species. Small tree species such as birches and cherries have a life expectancy of only 50-70 years and therefore likely to be Mature in a relatively short period of time. Large species, such as English oak - Quercus robur, Limes – Tilia, Scots pine - Pinus sylvestris and Sycamore - Acer pseudoplatanus have a life expectancy of 200-300 years, and would reach maturity at a much greater age.

Tree maturity was estimated and entered in one of the following five categories:

Young - obviously planted within the last three years (unless as a heavy or extra-heavy standard).

Semi-Mature - recently planted and yet to attain mature stature; up to 25% of attainable age.

Early Mature - almost full height, crown still developing and seed bearing; up to 50% of attainable age.

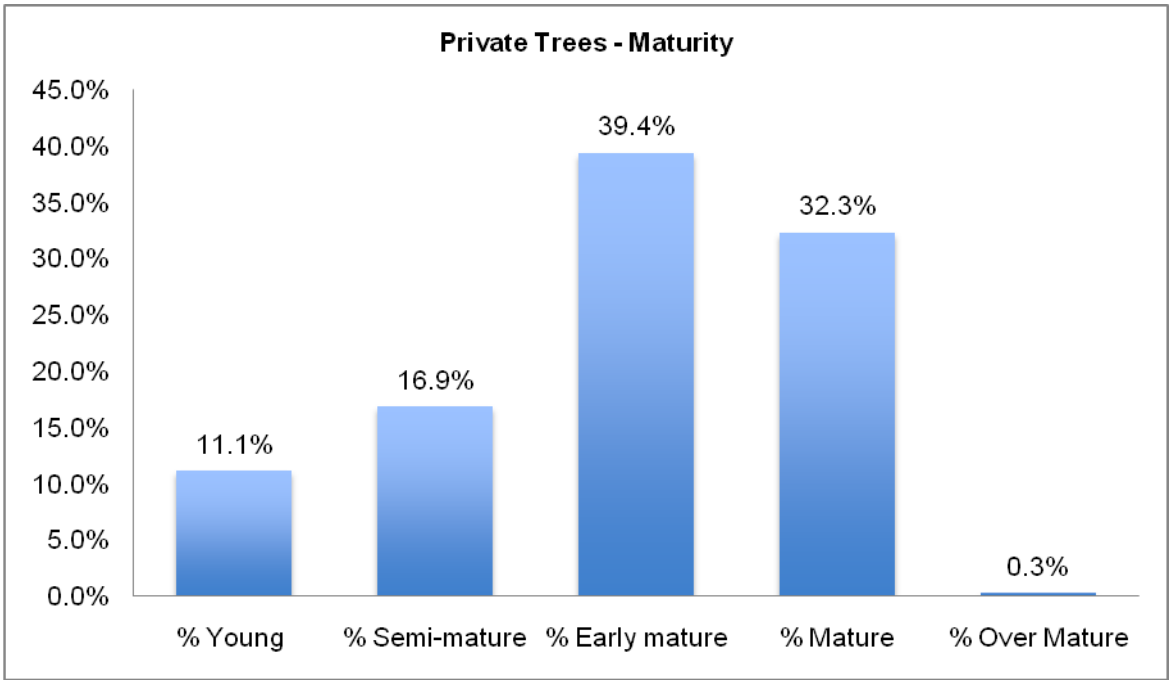
Mature - full height, crown spread, seed bearing; over 50% of attainable age.

Over mature - full size, die-back, small leaf size, poor growth extension.

'Early Mature' trees made up the largest proportion of private trees (39.4%) with approximately one in three trees in the 'Mature' group (32.3%). 'Young' trees are approximately one in ten of all private trees (11.1%) and 'Semi-mature' are approximately one in six of all private trees (16.9%). Finally, the number of 'Over mature' trees is small (0.3%). The results are shown in **Chart 5.2** below.

Whilst not strictly comparable because the results are for both public and private trees, Trees in Towns II found that in terms of maturity, most trees were either semi-mature (41%) or early mature (27%). The proportions of young (14%), mature (17%) or over-mature (0.2%) trees were relatively small. The regional results for London show that most trees were either semi-mature (59%) or early mature (32%). 'Mature' trees are just 7% of London trees and the figures for 'Over mature' trees are similar to the private trees in Harrow (0.05%). This suggests that the sample of private trees in Harrow is slightly more mature than both the national results and the results for the London region.

Chart 5.2: Maturity of Private Trees



There are a higher proportion of 'Young' trees in Greenhill (13.3%), Kenton East (13%) and Kenton West (13%). The lowest proportion of 'Young' trees is in Hatch End, Queensbury and Roxeth (all have10.4%).

Proportions of 'Semi- mature' trees are highest in Queensbury (18.1%), Canons (17.5%), Harrow-on-the-Hill (17.5%) and Hatch End (17.5%). The lowest proportion is in Kenton West (14.1%).

‘Early mature’ is the largest group in the Borough and the largest proportion of these trees is in Roxeth (43.9%) followed by Hatch End (43.8%). Low proportions are found in Greenhill (27.1%) and Kenton East (30.0%).

The highest proportions of ‘Mature’ trees are found in Greenhill (44.1%) and Kenton East (42%). Low proportions are found in Roxeth (28.1%) and Hatch End (28.3%).

‘Over mature’ trees are not significant in number with the highest proportion being in Greenhill (0.9%).

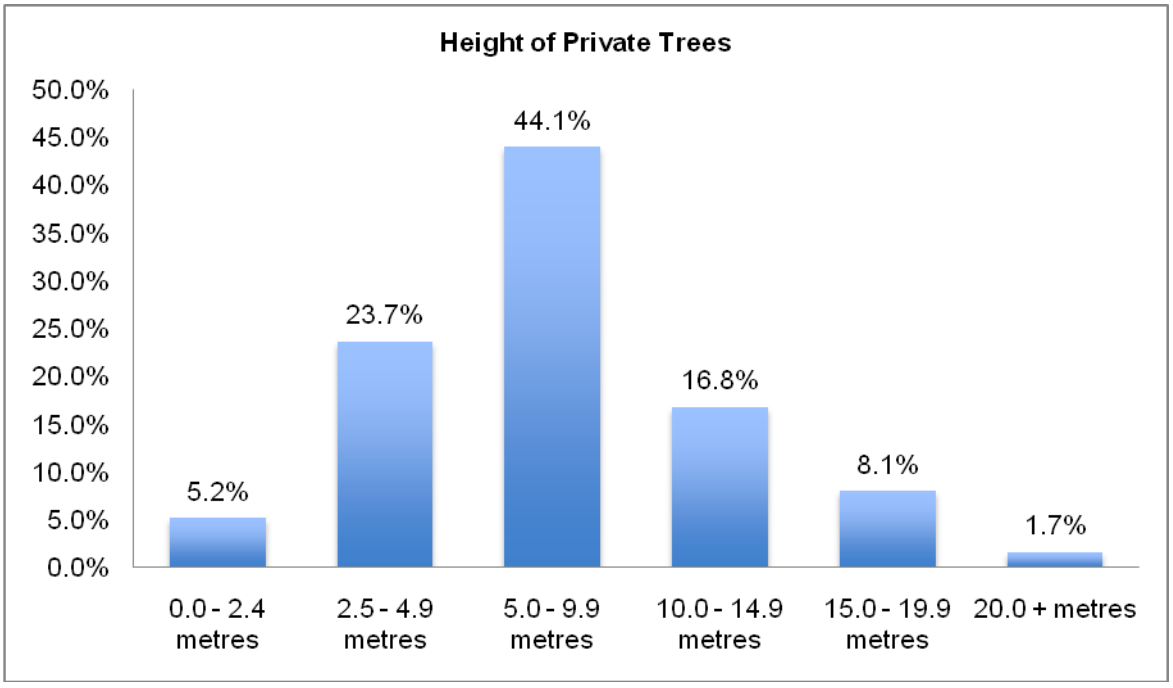
5.5 Height

Tree height is estimated from the ground to the top of the tree, and recorded in one of the following six bands:

0.0–2.4 m
2.5–4.9 m
5.0–9.9 m
10.0–14.9 m
15.0–19.9 m
20.0+ m.

The height profile of private trees in the Borough is shown in **Chart 5.3** below.

Chart 5.3: Height of Private Trees



There are more private trees in the Borough that are less than 5 metres in height (28.9%) compared to Council Managed Trees (19%). By ward the proportion varies from 23.5% in Greenhill to 31.3% in Queensbury. Other wards with a high proportion are Roxeth (30.7%) and Hatch End (30.3%).

As is the case with Council Managed Trees (39.3%), the largest proportion of private trees in the Borough (44.1%) is in the height band of 5.0 to 9.9 metres. Proportions range from 46.9% in Roxeth to 35.9 % in Greenhill. There are fewer trees of this and Kenton East (36.8%).

Taller trees over 10 metres in height are more commonly found in Greenhill (40.5%) and Kenton West (40.0%). There are fewer trees of this height in Hatch End (22.3%) and Canons (22.4%).

5.6 Diameter

The trunk/stem diameter for the trees in the sample areas was recorded as being within one of the following five bands:

0.0-4.9 cm

5.0-9.9 cm

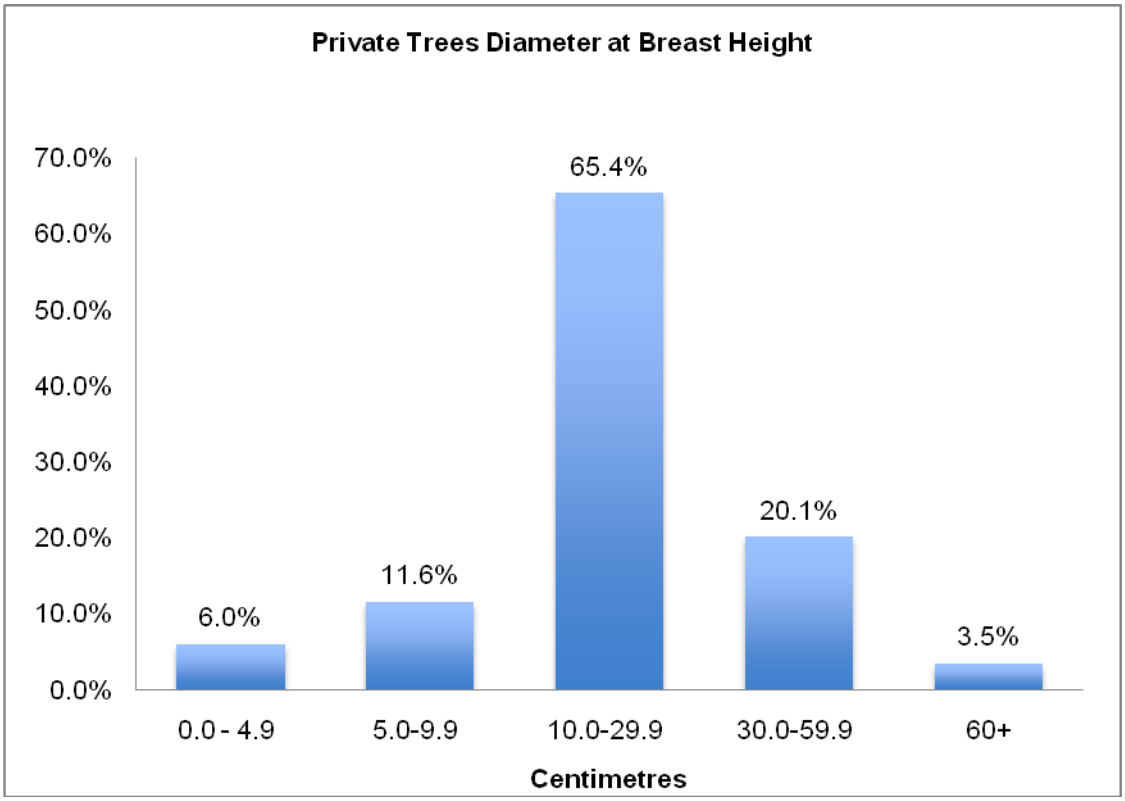
10.0-29.9 cm

30.0-59.9 cm

60+ cm.

The range of the trunk diameters of private trees is shown in **Chart 5.4** below.

Chart 5.4: Diameter at Breast Height of Private Trees in the Borough.



The majority of private trees in the Borough (65.4%) have trunk/stem diameter (dbh) of between 10 cm and 29.9 cm. The proportion of trees with this diameter ranges from 56.2% in Wealdstone to 68.9% in Belmont.

Trees of over 30 centimetres trunk/stem diameter (dbh) account for 23.6% of private trees and trees with a diameter of over 60 cm account for just 3.5%. The wards with most larger diameter trees are Wealdstone (7%) and Greenhill (6.3%).

There are only 6% of private trees with the smallest trunk/stem diameter (dbh) of 0.0 to 4.9 cm with most wards having a similar proportion the range being from Kenton East and Queensbury (both 4.6%) to Hatch End (6.6%). In total, 17.6% of private trees have a trunk/stem diameter (dbh) of less than 10 cm.

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5.7 Crown Spread

The maximum diameter of crown spread was recorded and entered in one of the following six bands:

0.0–1.9 m

2.0–4.9 m

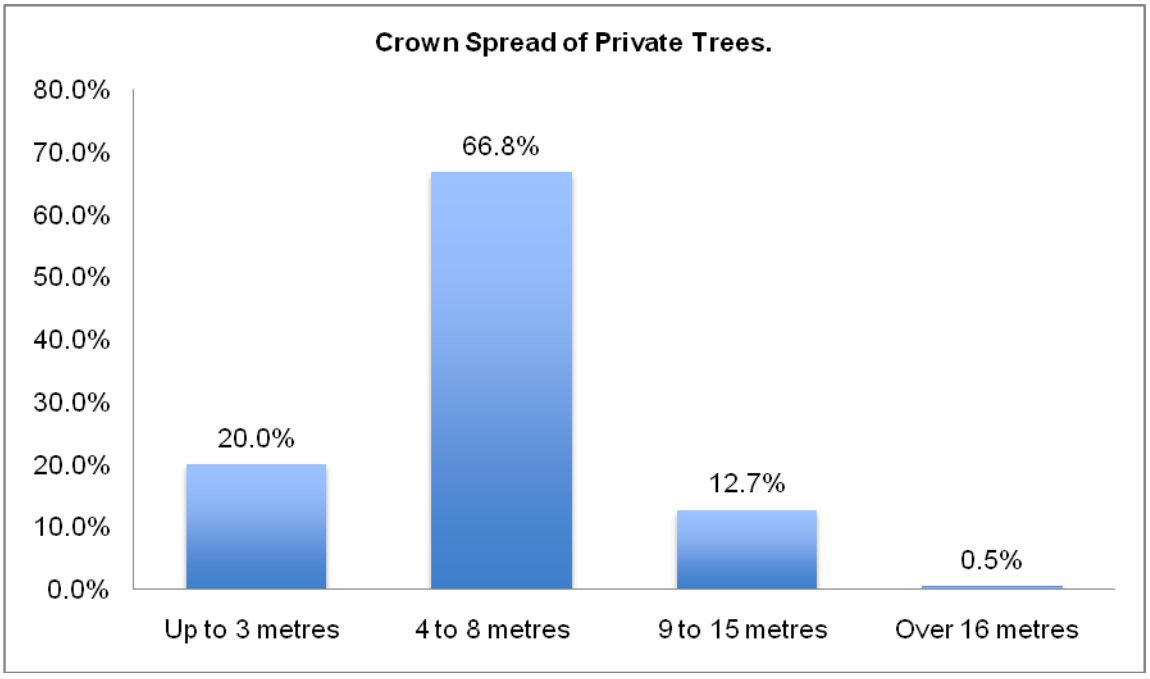
5.0–9.9 m

10.0–14.9 m

15.0–19.9 m

20.0+ m.

Chart 5.5: Crown Spread of Private Trees.



Two thirds (66.8%) of private trees have crown spreads of 4 to 8 metres. The wards with the highest proportion of private trees with this spread are Roxeth (70.6%) and Hatch End (70.4%). The lowest proportion is Greenhill (56.1%).This is shown in **Chart 5.5** above.

1 in 5 (20.0%) of private trees have a spread of less than 3 metres. Hatch End (17.5%) has fewer private trees with a smaller spread and Greenhill (26.5%) has the most.

Larger crown spreads will provide greater canopy cover. The Crown Spread Band 9 to 15 metres accounts for 12.7% of the total. The largest proportion of trees with a crown spread of this diameter is in Kenton West (16.2%), Kenton East (16.0%) and Greenhill (15.6%). The ward with the lowest proportion of trees in this band is Queensbury (11.1%).

There are very few trees with a crown spread of over 16 metres (0.5%). Higher proportions are found in Greenhill (1.8%), Kenton West (1.7%) and Kenton East (1.7%).

5.8 Health/Condition

Trees were allocated to one of five tree condition categories, taking into account such factors as health, vigor, local environment, vandalism, pests and diseases:.

Good - no evidence of disease or damage; full leaf, no die-back, good branch structure.

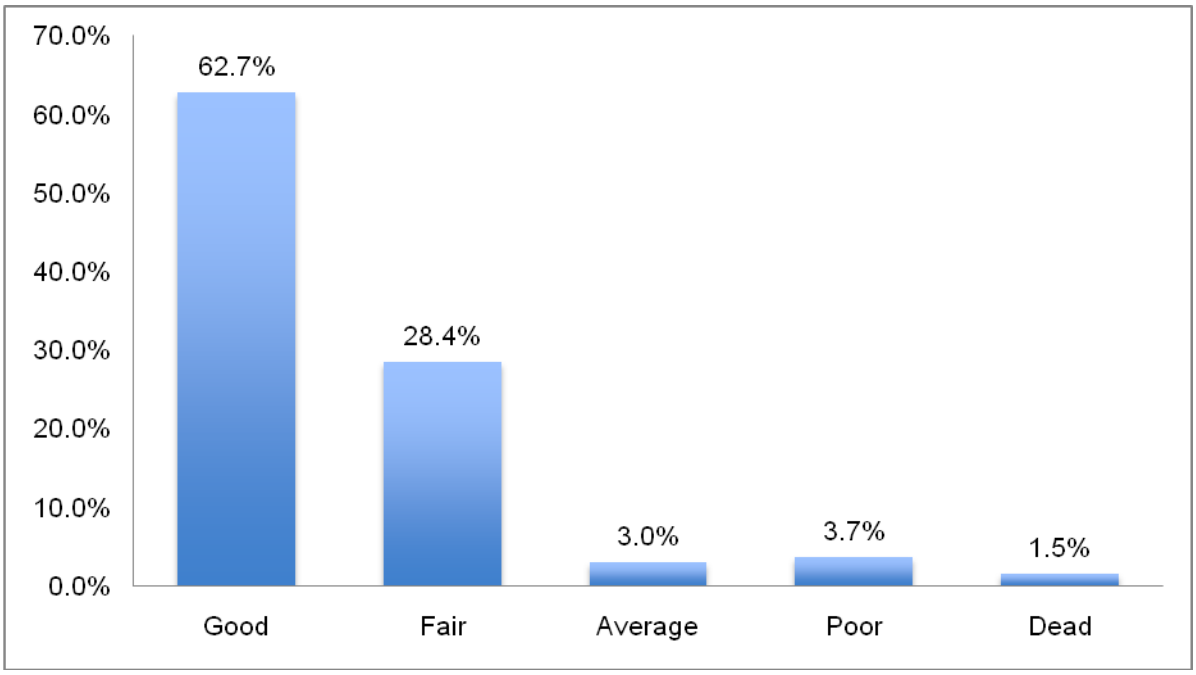
Fair - minor evidence of disease/damage; minor deadwood, not life threatening.

Average condition - includes problems such as some epitomic growth, a small degree of bark peel on the trunk, some die back in the canopy, strangulationdueto Ivy and also may have a wound on the trunk.

Poor condition - extensive evidence of disease or damage; life threatening. Dieback in crown, poor callus growth on wounds.

Dead/Dying - obviously moribund, severely diseased.

Chart 5.6 Health/Condition of Privately Owned Trees.



Almost two thirds (62.7%) of private trees could be described as being 'Good'. The ward with the highest proportion of good trees is Harrow-on-the-Hill (64.3%) followed by Edgware (63.9%) and Queensbury (63.6%). There are few trees in Kenton East (61.3%) and Kenton West (61.1%) that have been assessed as 'Good'. This is shown in **Chart 5.6** above.

Over one in four private trees (28.4%) are considered to be in 'Fair' condition. Wards where a high proportion of trees have been assessed as being in 'Fair' condition are Hatch End (31.4%) and Canons (31.3%). The lowest proportions of trees in 'Fair' condition are in Greenhill (19.2%).

A small proportion of private trees (3%) have been assessed as being 'Average'. Kenton West (10.0%) and Kenton East (9.9%) have the highest proportion of 'Average' trees. Low proportions of 'Average' trees are found in Queensbury (0.3%), and Roxeth (0.5%).

Only 3.7 % of private trees have been assessed as being in a 'Poor' condition. The wards with the highest proportion of trees in 'Poor' condition are Greenhill (4.2%), Kenton East (4.1%) and Kenton West (4.1%). Several wards have a lower proportion (3.5%) of 'Poor' trees including Canons, Harrow Weald, Hatch End, Queensbury, Roxbourne, Roxeth, and Stanmore

Finally, 1.5% of private trees are classified as being 'Dead'. Wards with a higher proportion of 'Dead' trees are Kenton East (2.2%), Kenton West (2.2%) and Greenhill (2.1%).

5.9 Safe Useful Life Expectancy (S.U.L.E.)

Private trees were assessed for their SULE rating to provide an estimate of the expected life span of the tree taking into account age, life span of the species, local environmental conditions, location and tree safety. The ratings are sub divided into the following bands:

<5 years

5-10 years

10-20 years

20-40 years

40-80 years

80+ years

Trees with an anticipated long life span have a SULE greater than 40 years. Trees with an anticipated medium life span are within the bands covering 15 to 40 years. A short life span is in the range of 5 to 15 years.

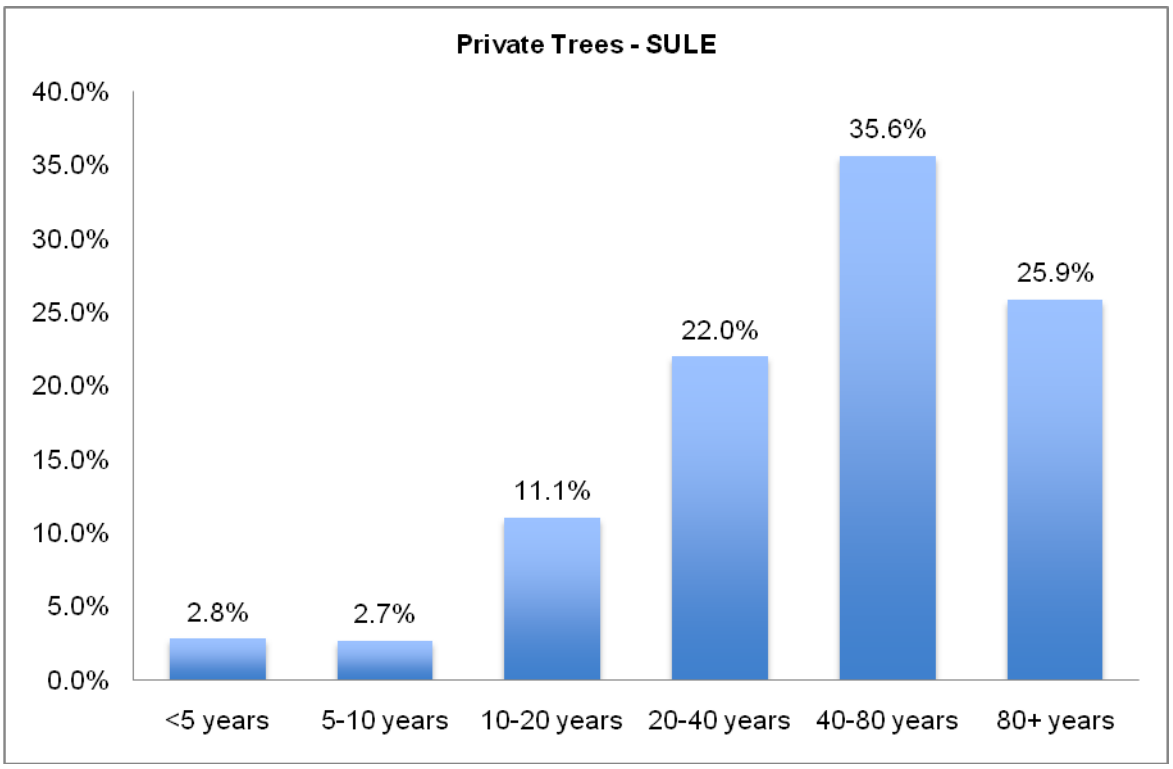
The largest proportion of private trees in the Borough (35.6%) has a SULE of between 40 and 80 years. About 1 in 5 trees have a SULE of 10 to 20 years (22%) and 1 in 4 trees have a SULE of more than 80 years (25.9%). There are a small proportion of trees with a SULE of less than 10 years (5.5%). This is shown in **Chart 5.7** below.

Trees with an anticipated long life span with a SULE of 40 to 80 years are more prevalent in Hatch End (36.3%), Harrow Weald (36.2%) and Canons (36.2%). Wards with a low proportion of private trees with an anticipated longer life span are Harrow-on-the-Hill (33.9%) and Wealdstone (34.0%)

Private trees with a medium life span of 20 to 40 years SULE have a higher representation in Hatch End (23.6%) and Stanmore (23.6%). Wealdstone (17.8%) has the lowest proportion in this band.

Higher proportions of trees with a SULE of 10 years and less are found in Kenton East (8.3%), Kenton West (8.4%) and Greenhill (8.3%). The lowest proportions of these short life trees are in Queensbury (4.3%), Roxeth (4.4%), Hatch End (4.6%) and Canons (4.6%).

Chart 5.7: Private Trees – S.U.L.E.



A relatively higher proportion of private trees in Greenhill (23.2%) and Kenton West (20.7%) have a SULE of 10 to 20 years. Wards with the lowest proportions of trees in this band are in Hatch End (6.6%) and Roxeth (6.6%).

Finally, private trees with a SULE of over 80 years are more prevalent in Hatch End (15.1%) and Canons (28.9%). Wards with the fewest private trees in this band are Kenton West (15.1%), Kenton East (15.5%) and Greenhill (15.8%).

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5.10 CAVAT (Capital Asset Valuation for Amenity Trees)

CAVAT provides a method for assessing the value of the public benefits that each particular tree provides. The final value provides a realistic assessment of the contribution of the tree to the amenity of a neighbourhood.

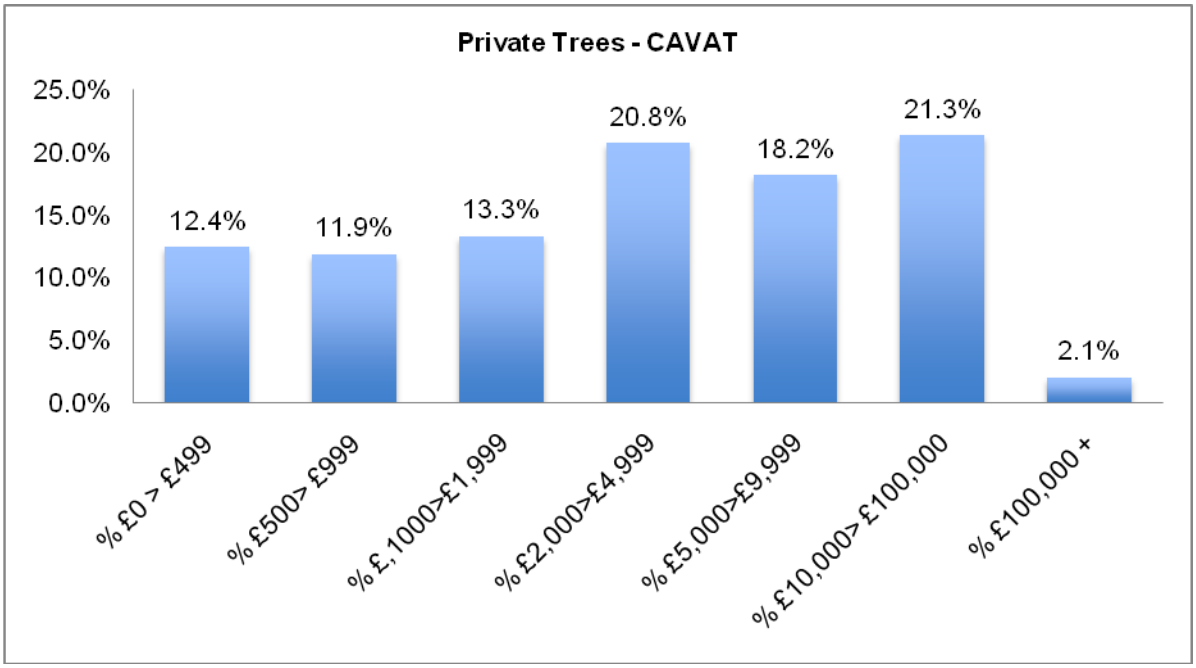
The CAVAT is calculated in Ezytreev and is broken down into six bands as follows:

£0 > £499
£500> £999
£1,000>£1,999
£2,000>£4,999
£5,000>£9,999
£10,000>£100,000
£100,000 +

The estimated value[16] of private trees is £2,819,203,952.

Approximately 1 in 5 trees have been valued at between £10,000 and £100,000 (21.3%). A further 1 in 5 trees fall into the £2,000 to £4,999 band (20.8%) slightly more than those valued within the £5,000 to £9,999 band (18.2%). Approximately 1 in 8 trees fall into the £1,000 to £1,999 band (13.3%) and a similar number fall into the two lowest bands £0 to £499 (12.4%) and £500 to £999 (11.9%). Finally, trees with a CAVAT value above £1,000,000 comprise just 2.1% of all private trees. The results are shown in **Chart 5.8** below.

Chart 5.8: CAVAT Values for Private Trees



Ward results do not vary significantly from the overall Borough average for most of the valuation bands. However, whilst the proportion of the highest value trees is low (2.1%),wards with a relatively higher proportion of high value trees are Hatch End (2.4%),Roxeth (2.4%), Roxbourne (2.3%), Stanmore (2.3%),Canons (2.3%) and Harrow Weald (2.3%). Wards with a lower proportion of high value trees are Greenhill (1.3%), Kenton East (1.5%), Kenton West (1.5%) and Wealdstone (1.5%).

5.11 Contribution to the Urban Environment

The contribution of trees to the urban environment is primarily concerned with the tree's impact in landscape terms. Consideration is given to how well the tree complements the local area, enhances the landscape, architecture and 'sense of place'. For example, helping to buffer sound from a busy road or providing valuable shade. A tree that is in the wrong place, or is too big for its situation may detract.

Contribution to the urban environment is not included in the data for public trees recorded on Ezytreev but was included in the Trees in Towns II study when it was used to asses both public and private trees. Trees in Towns II reported that the highest proportion and density of trees making an 'outstanding' contribution was recorded in open space plots (26%) and the

[16]This value was derived by multiplying the number of trees in each valuation band by the mean value for each valuation band.

lowest proportion in medium density residential areas (8%). The survey of private trees primarily focused on trees in residential areas.

Contribution of trees to the urban environment was recorded in one of five categories:

COE1 - Category A (outstanding contribution)

COE2 - Category B (significant contribution)

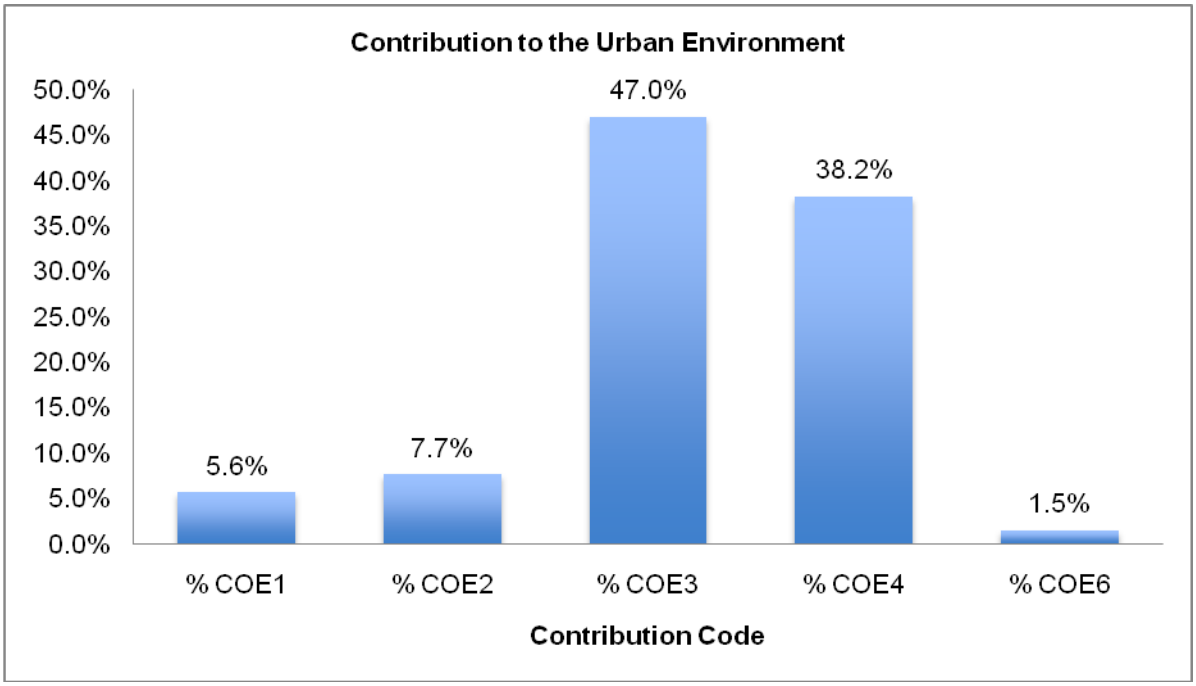
COE3 - Category C (some contribution)

COE4 - Category D (neither contributes nor detracts)

COE6 - Category E (detracts)

Nearly half (47%) of trees were assessed as making 'some contribution'. Just over a third of trees were considered to 'neither contribute nor detract' (38%). There were relatively few trees that were considered to make an 'outstanding contribution' (5.6%) and slightly more trees were assessed as making a 'significant' contribution (7.7%). Finally, a small proportion (1.5%) of trees were considered to 'detract' from the urban environment.

Table 5.9: Private Trees – Contribution to the Urban Environment



Wards with a relatively high proportion of trees of 'outstanding' value include Hatch End (6.3%) and Roxeth (6.3%). Wards lacking in trees of 'outstanding' value were Greenhill (3.9%) and Wealdstone (4.3%). Trees making a 'significant contribution' were far more prevalent in Greenhill (20.1%) with much lower proportions in Roxeth (3.3%) and Hatch End (3.7%).

Nearly half of all private trees were assessed as making 'some contribution' with higher proportions in Harrow-on-the-Hill (51.3%), Wealdstone (50.7%) and Edgware (50.4%). Fewer trees were making this level of contribution in Stanmore (45.5%) and Hatch End (45.5%).

Trees that were considered to 'neither contribute nor detract' accounted for the second largest proportion of private trees. Higher proportions of these trees are found in Roxeth (43.4%) and Hatch End (43.2%). Lower proportions were evident in Greenhill (23.7%) and Kenton East (26.6%).

Only a small proportion of trees were assessed detracting from the urban environment. A slightly higher than average proportion of these trees is found in Greenhill (2.1%), Kenton East (2.1%) and Kenton West (2.1%).

5.13 Management History

The survey for Trees in Towns II recorded any evidence of recent or historical management of the tree. Trees were assessed and allocated to one of the following three management categories:

A - no evidence of management

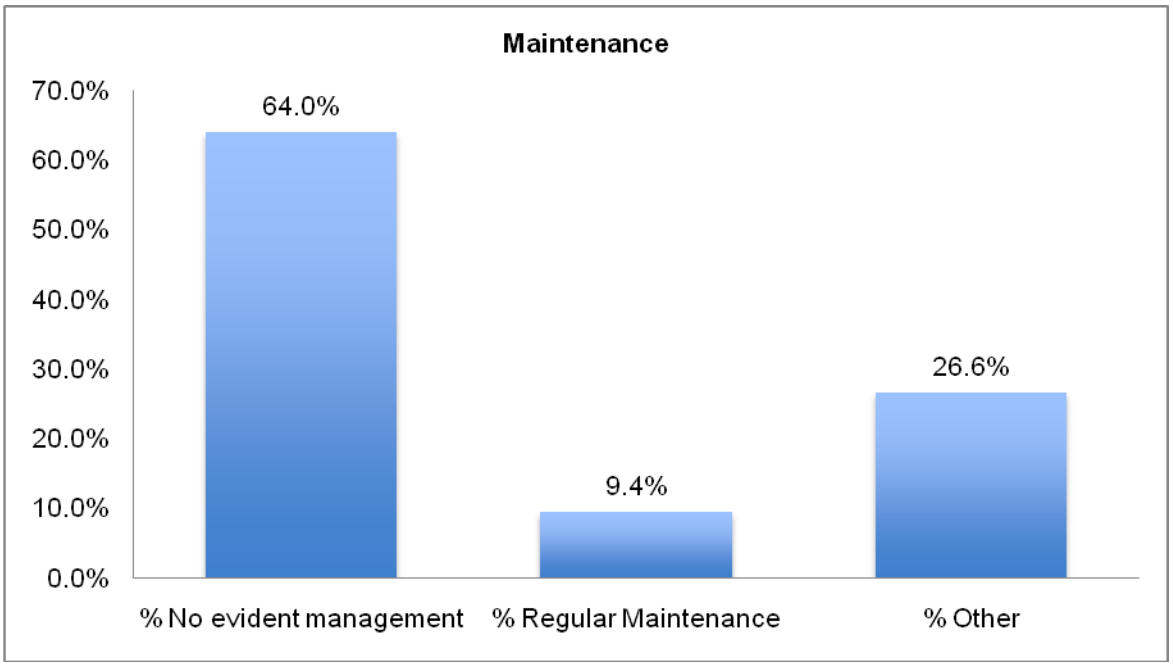
B - regular management e.g. coppicing, pollarding, or regular cutting for hedges

C - other management which appears to have been carried out occasionally, but not on a regular basis e.g. 'dead-wooding', topping, tree surgery.

Regular management includes work such as crown thinning, lifting, minor pruning, coppicing, pollarding, etc., which had been undertaken on a regular basis, was recorded in category B. Trees that had been subjected to major works, but at long intervals, or once only operations, such as topping were allocated to category C.

The results shown in **Chart 5.10** are projections based on the sample survey of private trees.

Chart 5.10: Management History



For the majority of private trees there was no evidence of management (64%). Regular maintenance was evident in the case of just below 1 in 10 trees (9.4%). In the case of the remaining trees there was only evidence of occasional management which had not been undertaken on a regular basis.

Wards where there was an increased likelihood of no evidence of management of the private trees include Kenton West (68.9%), Kenton East (68.5%) and Greenhill (67.5%). Wards with a below average incidence of lack of management include Queensbury (61.8%) and Harrow-on-the-Hill (61.9%).

A higher proportion of trees in Queensbury (11.0%), Roxeth (10.9%) and Hatch End (10.7%) showed evidence of regular maintenance. Regular maintenance was less evident in Greenhill (5.1%), Kenton West (5.1%) and Kenton West (5.2%).

Wards where there was a greater proportion of trees for which management appeared to have been carried out occasionally, but not on a regular basis, include Harrow-on-the-Hill (29.1%), and Wealdstone (28.3%). A lower proportion of trees that fall within this category occur in Stanmore (26.0%), Kenton West (26.0%), Marlborough (26.0%) and Roxbourne (26.0%).

5.14 Town Centres

Following the guidance in Trees in Towns II and in the Mayor's Guidance a survey was undertaken in the main town centre in the Borough of Harrow. Only one sample area was surveyed but this was quite a large area 26.12 hectares in size. It includes the pedestrianised shopping centre and the land to the north including a major supermarket and car park and other large stores.

All the trees were included in the survey regardless of ownership. This included street trees and trees on land owned by shops and other commercial units. The survey encompassed a total of 348 trees including 255 individual specimens and 93 trees present in groups. The density of trees was 13.21 trees per hectare.

Species

There was a wide variety of species with a total of 44 different species present. The most numerous species are shown in **Table 5.14** below.

Table 5.14 Tree species in Town Centre Sample

English name	Latin name	Classification	Number	Percentage
Common Ash	Fraxinus excelsior	Large broadleaved	48	13.8%
Wild Cherry	Prunus avium	Small broadleaved	31	8.9%
Common Whitebeam	Sorbus aria	Small broadleaved	31	8.9%
Hornbeam	Carpinus betulus	Small broadleaved	26	7.5%
Sweet Gum	Liquidambar Worplesdon	Small broadleaved	22	6.3%
Acer pseudoplatanus	Sycamore	Large broadleaved	22	6.3%
Rowan	Sorbus aucuparia	Small broadleaved	17	4.9%
Norway Maple	Acer platanoides	Large broadleaved	16	4.6%
Apple	Malus species	Small broadleaved	14	4.0%
Cherry/ Plum	Prunus (other species and hybrids)	Small broadleaved	14	4.0%
London Plane	Platanus x hispanica	Large broadleaved	12	3.4%

The species present in greatest number was the Common Ash comprising 13.8% of the sample. However, 34 of the 48 specimens were present as part of a number of groups and only 14 were stand-alone specimens. Also, Sycamore trees comprised 6.3% but again most of these were part of a group of trees.

Aside from Fraxinus, Sorbus was the predominant genus in the town centre with the common whitebeam being the most numerous of the Sorbus species and the rowan or

mountain ash present in smaller numbers (see **Table 5.14** above). Together these made up almost 14 % of trees. There were significant numbers of hornbeam, mainly in the car park of a large supermarket, and also a strong presence of Liquidambar, mainly as Young street trees in streets in and around the pedestrianised town centre (7.5% and 6.3% respectively). The wild cherry and other prunus species together made up almost 13 % of the sampled trees and apple a further 4%. Thus rosaceous species were well represented.

Most of the species above are small broadleaved types and there was clearly a predominance of small broadleaved species in the town centre. Apart from the Common Ash and Sycamore, the only large broadleaved species present in significant numbers were Norway Maple and London Plane with 4.6% and 3.4% respectively. There were small numbers of other large broadleaved species such as lime and oak; however, apart from a small number of ginkgo biloba, there were virtually no conifers in the sample area.

Age

The age distribution of the town centre sample was very much within the middle of the spectrum with almost 90% of trees aged between 11 and 49 years. There were no trees in either the youngest age bracket (0 to 5 years) or the oldest (100+ years). Small proportions were aged 6 to 10 years and 50 to 99 years (6.0% and 5.7% respectively). By far the largest category was the 11 to 24 age group which included 73% of all trees.

Height

Over three fifths of trees were between 5 and 10 metres in height (60.9%). Similar but much smaller numbers were in the categories 2.5 to 5 metres and 10 to 15 metres (16.4% and 15.8% respectively. There were no trees which were shorter than 2.5 metres and only one specimen greater than 20 metres.

Trunk Diameter

Almost three quarters of all trees had a trunk diameter within the range of 10 and 30 centimetres. A further 16% measured between 5 and 10 centimetres. No trees were smaller in diameter than this and 12.3% had a trunk size greater than 30 centimetres.

Crown Spread

Just under three quarters of all trees had a crown spread of between 4 and 8 metres. Similar but much smaller numbers had a canopy spread of under 3 metres (15%) and 9 to 15 metres (13.5%). No tree had a spread greater than 16 metres.

Health

Overall the health of the trees was good with almost two thirds in good health and one third rated as Fair. Only a small number were considered to be in poor health (18 trees or 5.2%).

Management

The majority of trees by far had no evidence of management at all (72.7%). Just under one quarter (24.1%) showed signs of occasional maintenance and only a very small number had been subject to regular maintenance (11 trees or 3.2%).

Contribution to the Urban Environment

A small number of trees were rated as having an outstanding contribution to the urban environment and almost one sixth were rated as making a significant contribution (3.4% and 13.8 % respectively). By far the greatest number of trees was felt to make just some contribution to the urban environment (78.4%). A small number were felt to neither enhance nor detract from the environment. No trees were found which detracted from the environment. Trees, which made an outstanding contribution were generally large and well

located in terms of being seen from several vantage points and included the species London Plane, Caucasian Lime, Purple Beech and Horse Chestnut.

SULE

Almost three quarters of trees had an estimated life expectancy of between 20 and 80 years. Almost one half are expected to live another 20 to 40 years and a further one quarter 40 to 80 years. Just under one tenth are expected to live longer than 80 years. Very small numbers have a life expectancy lower than 10 years (3.4%) and a further 17.2% are expected to live between 10 and 20 years.

CAVAT

The value of individual trees varies between the lowest at £166 and the highest at £64,412. Almost one third of individual specimens were valued at between £10,000 and £100,000.Almost one fifth (19.8%) of all trees were valued at between £2,000 and £5,000 and just under one fifth were valued between £1,000 and £2,000 (17%). Smaller numbers were valued in the bands £5,000 to £10,000 and £500 to £1,000 (both 13.5%). Only 6.9% were valued at less than £500.

5.15 Industrial Areas

Industrial Area Samples

Following the guidance in Trees in Towns II and the Mayor's Guidance surveys were undertaken in two small industrial areas in Harrow. The first was Hailsham Drive, an area of 3.12 hectares with 36 trees comprising 17 individual specimens and 19 trees within 2 groups. The second area surveyed was Chantry Road which is 1.55 hectares in size and contained 19 individual trees.

The tree density in Hailsham Drive was 11.53 per hectare and in Chantry Road it was 12.25 trees per hectare. The total area surveyed was 4.67 hectares so that average tree density was 11.77 trees per hectare. The canopy cover in Hailsham Drive was 4.52% and in Chantry Road it was 0.96%.

Species

The predominant species was silver birch with one group of 14 specimens in Hailsham Drive and a single tree in Chantry Road. Other trees which were well represented were Prunus species with 10 individual specimens and the genus Sorbus with 5 Sorbus intermedia (the Swedish Whitebeam) and a group of 5 Sorbus aria (Common Whitebeam) all in Hailsham Drive. There were 3 sycamore trees and 3 Lawson's cypress but all other species were present in numbers of 2 or fewer. In total there were 16 different species.

Age

Two thirds of specimens were aged 11 to 24 years (66.7%). An additional one tenth were between 6 and 10 years old (19.6%) and there were no trees younger than this. The proportion aged 25 to 49 was 13.7% with no tree older than 49 years. Thus, almost all the trees were aged 24 years or younger (86.3%).

Height

In terms of the height of trees there was a fairly even spread across the height bands with roughly one third in the 3 middle bands. The highest proportion were between 5 and 10 metres (37.3%) followed by one third between 10 and 15 metres (33.3%) and fewer than one third between 2.5 and 5 metres (27.5%). No trees were shorter than this and only one tree was taller than 15 metres.

Trunk Diameter

Over four fifths of trees had a trunk diameter at breast height of between 10 and 30 centimetres (82.4%). Of the remainder a small proportion had a trunk diameter of between 5 and 10 centimetres and between 30 and 60 centimetres (both 7.8%) and only one tree was smaller than this at less than 5 centimetres. There were no trees greater than 60 centimetres in diameter.

Maturity

Over one half of the trees (56.9%) were early- mature and over one quarter were mature (27.5%). The remainder were younger than this with 7.8% being semi-mature and 7.8% were young.

Crown Spread

Almost three quarters of all trees had a crown spread of between 4 and 8 metres (72.5%). Fewer than one fifth had a small spread of 3 metres or less (17.6%) and one tenth fell into the 9 to 15 metres bracket (9.8%). No tree had a crown spread greater than 15 metres.

Health

All the trees were in either a good or fair condition with almost all (88.2%) in a good condition and the remaining 11.8% in a fair condition. There were no trees classified as either average or poor.

Management

In terms of the level of management there were none of the trees had been subject to regular maintenance. Three quarters of all trees had no evidence of any management and one quarter showed signs of occasional maintenance (76.5% and 23.5% respectively).

Contribution to the Urban Environment

Over four fifths of the trees were considered to make some contribution to the urban environment (82.4%) and a further 11.8% made a significant contribution. A further 5.9% were felt neither to contribute nor detract from the environment; no tree made an outstanding contribution and none detracted from the urban environment. Examples of trees which made a significant contribution were mature specimens of Robinia pseudo acacia (False Acacia) and Fraxinus ornus (Manna Ash).

SULE

More than four fifths of all trees are expected to live another 20 to 80 years with two fifths having a life expectancy of 20 to 40 years and two fifths that of 40 to 80 years (both 42.2%). Less than 10% had a life expectancy of 80 or more years and of 10 to 20 years (7.8% and 9.8% respectively). No tree had a life expectancy less than 10 years.

CAVAT

The value of individual trees varied from £237 to £71,000. There was a wide spread across the range of CAVAT bands with trees in all categories except for £100,000+. One third were valued at between £10,000 and £100,000 (33.3%) and just under one third within the range £2,000 to £5,000 (29.4%). One fifth were valued at between £1,000 and £2,000 and fewer than this at £500 to £1,000 (19.6% and 13.7% respectively). One tree was valued at £5000 to £10,000 and one at under £500.

5.16 Issues for Private Trees

Concern about building subsidence is an issue for owners of private trees and many trees are removed unnecessarily as a consequence. The conversion of front gardens to hard standing and built development in rear gardens has resulted in losses to garden space and the trees growing there. These losses also contribute to increased run-off having a negative impact on drainage management.

6. WOODLANDS

There are two ancient woodlands in Harrow. These are Heriot's wood within Bentley Priory, and Pear Wood which both date from at least 1600[17] Most of Harrow's woodland areas are recent secondary woodland that has developed in the last 50 years on what were previously open grazed commons or farmland.

There are twenty woodland areas covering 217 hectares with an estimated 204,526 trees that are owned and managed or administered by Harrow Council. These are all listed in **Table 6.1** and are shown on **Map 1** below. The largest woodland area is Stanmore Common (55.5 hectares) followed by Bentley Priory (38.8 hectares). The smallest woodland is Montrose Walk (0.5 hectares).

Woodland Name	Area (Ha)
Stanmore common	55.05
Bentley Priory Open Space	38.79
Stanmore Country Park	29.56
Harrow Weald Common	24.13
Watling Chase Woods	16.21
Pears Wood	13.22
Grimsdyke	8.72
Off Brookshill	4.14
Roxbourne Park	3.55
Park View	3
Roxbourne Rough	2.79
Dingles	2.77
Canons Park Open space	2.72
Santway Woods	2.69
Levels wood	1.71
Lake Grove Open Space	1.7
Brockhurst Corner	1.62
Bentley Priory Pines	1.57
Stanmore Marsh	1.47
Sylvia Avenue Woods	1.09
Montrose Walk	0.51

6.1 Methodology

In order to estimate the number of trees and species composition of each woodland, sample areas were selected and surveyed. The method employed is that provided by the My Forest website. This is shown in **Diagram 1** below.

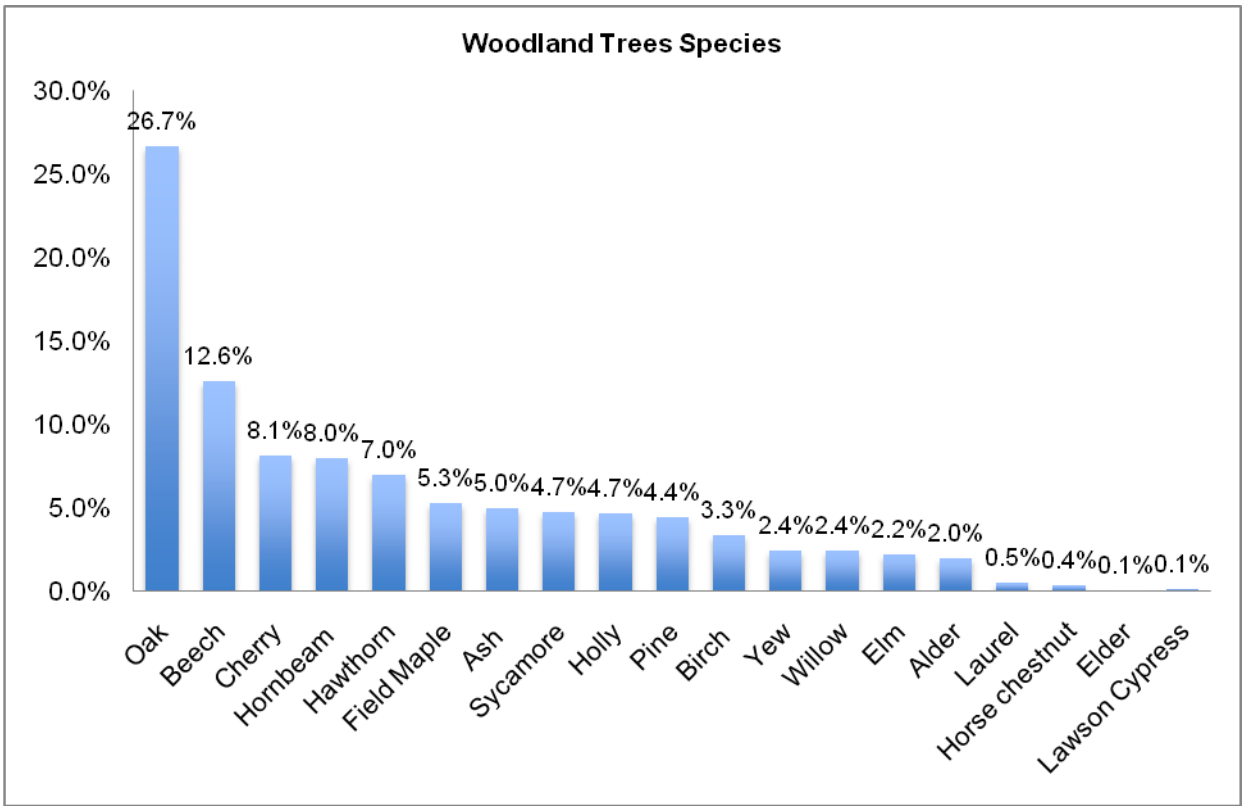
[17]Natural woodland: Ecology and conservation in northern temperate regions, George F. Peterken, 1996

The aim was to identify sample areas that would, in total, provide a representative sample of the whole woodland. Four random plots were selected across each woodland. A sample area was defined by marking out a circular area with a radius of 5.6 meters. Within these circle details of the species, height, trunk diameter, age of each tree was recorded. It was then possible to calculate the stocking density for each woodland and from this to estimate the number of trees in total for each woodland.

6.2 Tree Species

Over one in four trees in all woodlands are oak (26.6%) and of these 0.9% were classified as small oak trees. The range of tree species in the woodlands is shown in **Chart 6.1** below.

Chart 6.1: Tree Species in Woodlands

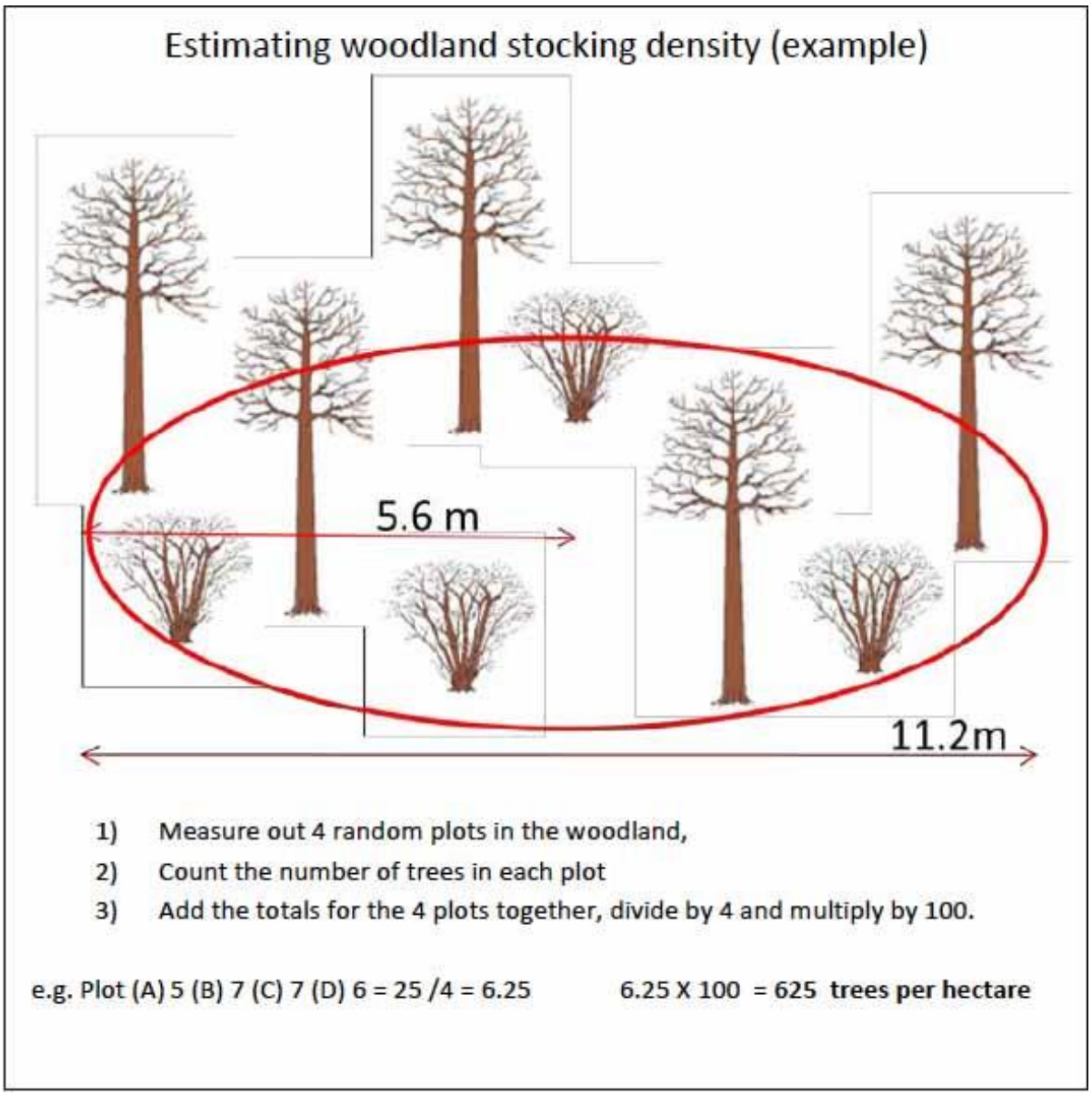


The top six species are shown in **Table 6.1** below.

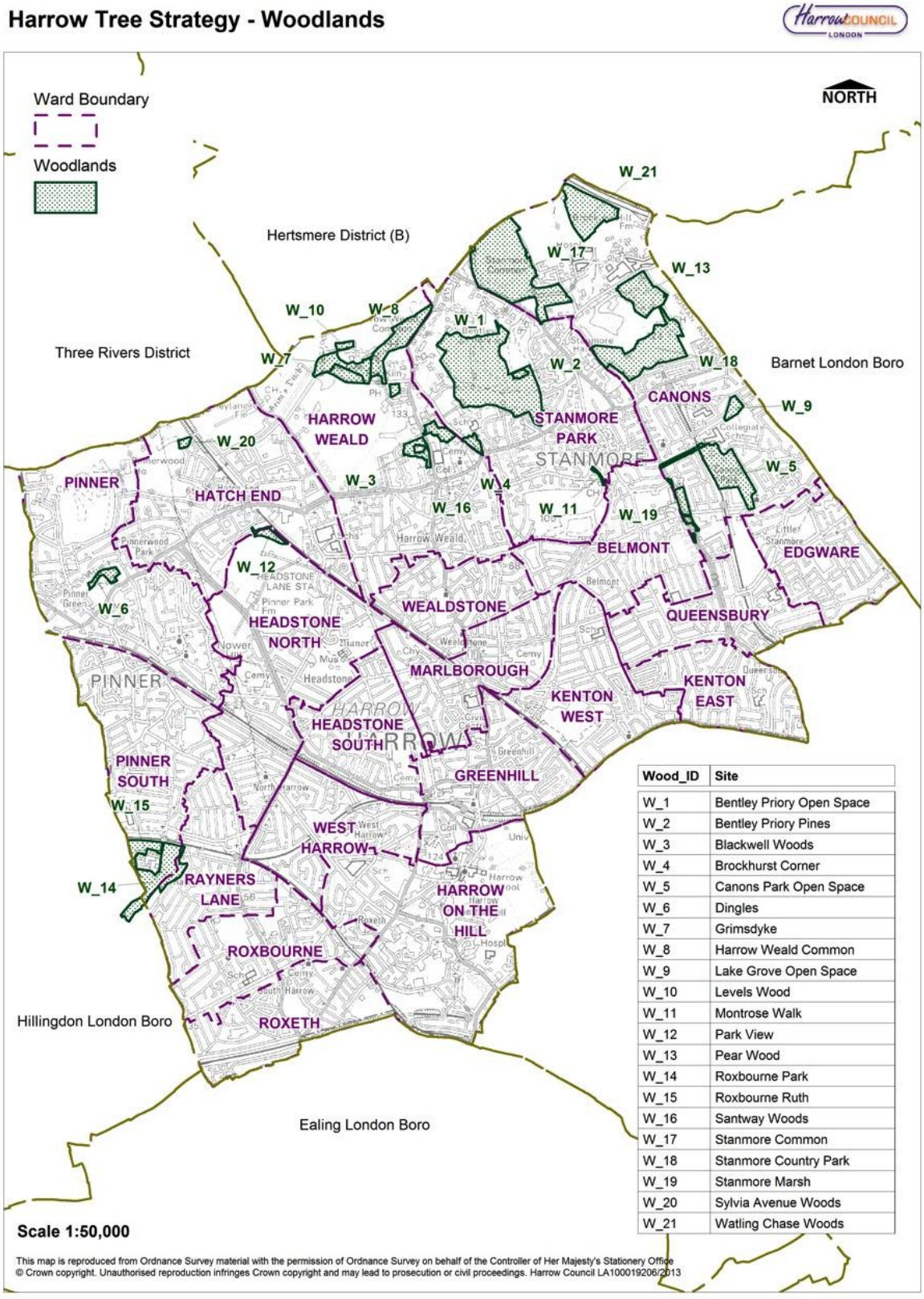
Table 6.1: Top six species in Harrow Woodlands

Species	%
Oak	26.7%
Beech	12.6%
Cherry	8.1%
Hornbeam	8.0%
Hawthorn	7.0%
Field Maple	5.3%

Diagram 1: Selection of Sample Areas



Map 6.1 Woodlands in Harrow



Wood_ID	Site
W_1	Bentley Priory Open Space
W_2	Bentley Priory Pines
W_3	Blackwell Woods
W_4	Brockhurst Corner
W_5	Canons Park Open Space
W_6	Dingles
W_7	Grimsdyke
W_8	Harrow Weald Common
W_9	Lake Grove Open Space
W_10	Levels Wood
W_11	Montrose Walk
W_12	Park View
W_13	Pear Wood
W_14	Roxbourne Park
W_15	Roxbourne Ruth
W_16	Santway Woods
W_17	Stanmore Common
W_18	Stanmore Country Park
W_19	Stanmore Marsh
W_20	Sylvia Avenue Woods
W_21	Watling Chase Woods

6.3 Individual Woodlands

The Greater London Authority performed a habitat survey of Harrow in 2003, which identified three types of woodland in Harrow. It is estimated that there are 4.8 ha of coniferous woodland, 244.4 ha of native broadleaved woodland and 35 ha of non-native broadleaved woodland.

The survey of woodlands provided a profile of each woodland area. The character of the woodland is defined by the species composition, height, age and maturity, trunk size and the condition of the trees.

Bentley Priory

Bentley Priory comprises an ancient[18]and long-established woodland, unimproved neutral grassland, scrub, wetland and open water. Within Bentley Priory, Heriot's Wood forms the largest ancient woodland in the borough, and is dominated by Hornbeam and Oak. Many of the hornbeam trees are mature multi-stemmed standards derived from old coppice stools.

Bentley Priory covers 38.8 hectares and contains an estimated 30,000 trees. About half the trees are Hornbeam (50%), with Oak (30%), Hawthorn (10%) together with smaller numbers of Beech and Pine (both 5%). Average height of each species is for Oak (19 metres), Hornbeam (10 metres), Pine (15 metres) and Beech (15 metres). Most of the trees were assessed as being 'Mature' and their condition is considered to be 'Good'. SULE for most trees is 80 years.

Stanmore Common

Stanmore Common is the largest woodland covering 55.05 hectares. It is common land that was formerly used for pig husbandry by local "commoners". Many of the trees were removed by the 17th century, creating areas of open heathland that was grazed by sheep until the end of the 19th century, when livestock numbers fell and secondary woodland appeared.

It is regarded as being predominantly secondary woodland but in part is considered to be heathland. Mature woodland on the south and west sides suffered significant felling around the 2nd World War.

Being mainly secondary woodland, trees are not particularly old with Oak assessed as being the oldest (40 years), Beech (30 years) and the other species between 20 and 25 years. Only Birch is considered to be 'Mature' with Yew, Ash, Hawthorn and Cherry being 'Semi-mature' and Oak, Beech and Ash assessed as being 'early mature'.

Nearly half of all trees are Oak (45%) with smaller proportions of other trees including Cherry (15%), Birch (10%) and Beech (10%). Other species represented include Willow, Ash, Hawthorn and Yew (all 5%).

The average height of trees ranges from the highest, Birch (15 metres), Willow (14 metres) and Oak (14 metres) to the smaller species such as Yew, Ash, Hawthorn and Beech (all 9 metres). The condition of all trees is considered to be 'Good'. SULE is 80+ years for all trees except Birch (40-80 years).

Stanmore Country Park

[18]The concept of 'ancient woodland' was developed in the 1970s and 1980s when studies showed that woodlands that have had a continuous woodland cover for centuries were typically of higher nature conservation value than those that had developed recently.

The species composition of the woodland of Stanmore Country Park is made up mainly of Sycamore (65%) and Oak (20%) with smaller areas of Elm, Hawthorn and Hornbeam (all 5%). The wild service tree, which is relatively rare in London, is also found. Hornbeam is characteristic of ancient woodland, so these areas may have been wooded for a considerable time.

The oldest trees are the large Oaks which are estimated to be 65 years on average with large Sycamores estimated as 50 years and small Oaks at 40 years. Other species are younger, mainly less than 15 years. In terms of maturity only the large Oaks and the large Sycamores are 'Mature'. SULE is estimated to be 80+ years for most species apart from Elder which is 5 to 40 years.

Old Redding Complex

The Old Redding Management Plan[19] splits Harrow Weald Common into three main areas (shown as **W7**, **W8** and **W10** on **Map 2**). All three sections are registered in Harrow as Common Land.

English Heritage has designated Grim's Dyke as a Scheduled Monument. This, together with Grim's Dyke Open Space and Levels Wood is Grade II listed in the English Heritage Register of Parks and Gardens. Natural England recognises Weald Wood as ancient woodland (i.e. one that dates back to before 1600). The Mayor of London has designated the entire area as a Site of Metropolitan Importance for Nature Conservation.

Harrow Weald Common.

Harrow Weald Common is the largest area (24.13 hectares). It is a remnant of the once extensive woodland of the Forest of Middlesex. It includes two areas of ancient woodland; Weald Wood and Levels Wood. Following the Enclosure Acts, gravel extraction was granted as one of the common rights of Harrow parishioners, and this industry was carried on until the late C19th.

Tree species are mainly Beech (45%), Birch (25%) Oak (15%) and Holly (15%), which forms a dense shrub layer. The average height of the large Beech trees is 22 metres and Oaks are 21 metres on average, the height of Birch is 14 metres. There are also several Sequoia 'Wellingtonia' redwood trees. The large Beech, Oak and Birch trees are 'Mature' with other trees assessed as being 'Semi mature'. The condition of all species is 'good'. SULE is 80+ years for Oak and small Beech and 40-80 years for the large Beech and the Birch.

Levels Wood

Levels Wood is just 1.71 hectares. There are indications that it is ancient woodland. Both pedunculate and sessile oak are present. It is estimated that overall Beech make up 30% and Oaks 20% of the wood. There are large specimens of both species. Large Beeches are on average 110 years old, large Oaks are on average 160 years old and small oaks 110 years old. The large Beeches and Oaks are 'Mature', Smaller trees are considered to be 'Semi mature'. Holly makes up the remaining 50% of the wood. The condition of all trees is considered to be 'Good'. Most trees have a SULE of 80+ years.

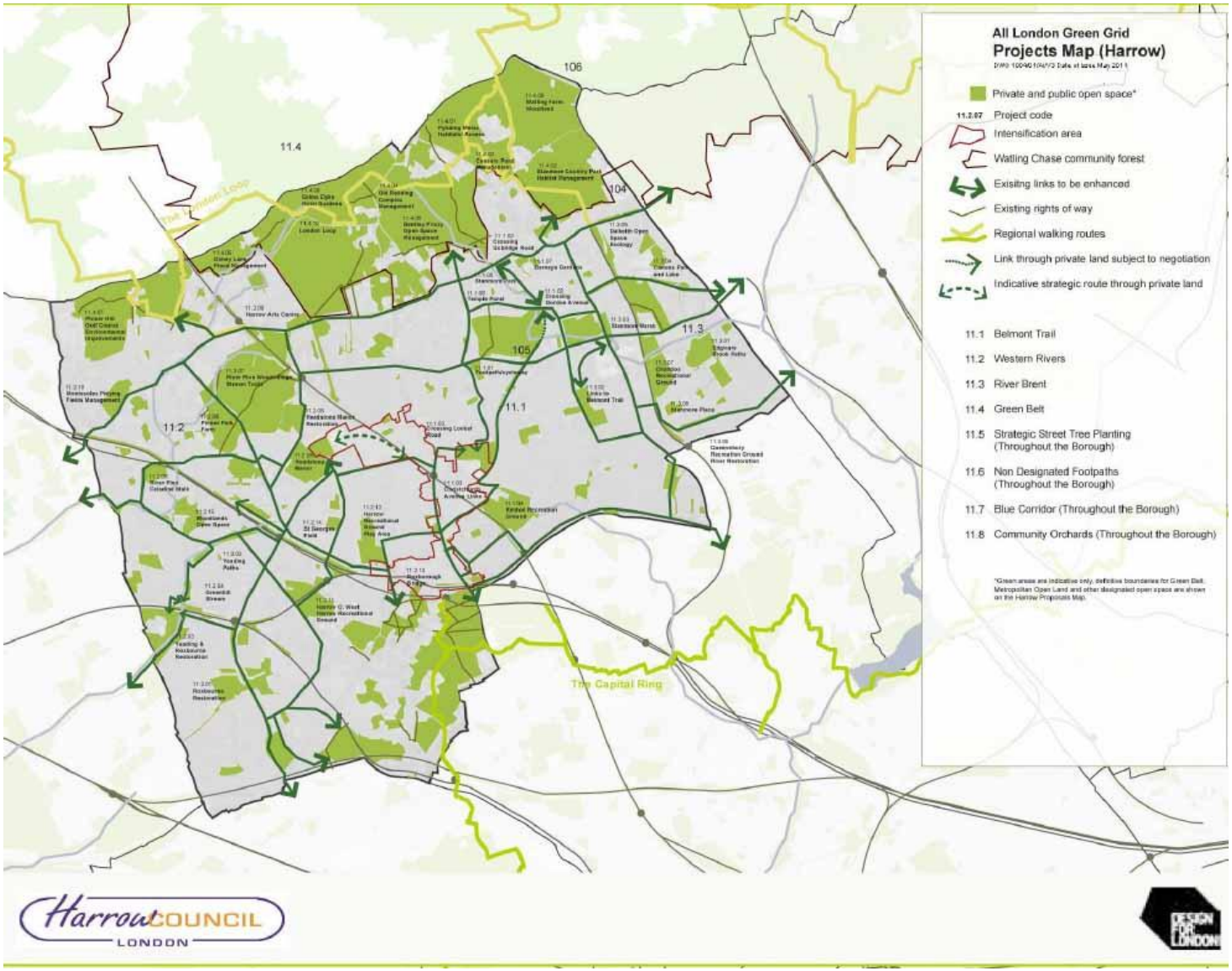
Grimsdyke

The Grimsdyke Wood is also known as Grim's Dyke Open Space and covers an area of 8.72 hectares. The survey found that an estimated 50% of trees are large (30%) or small (20%) Beech. Birch constitutes 30% of trees and Oak 20%. The estimated age of the large Beech

[19]Management Plan: Old Redding Complex Local Wildlife Site April 2010 – March 2015 (Revised July 2010) London Borough of Harrow January 2010

trees is 90 years, the large birches 70 years and the oaks 55 years. The condition of all trees is considered to be ‘Good’. Most trees have a SULE of 80+ years.

Map 2: Harrow's Green Grid



Watling Chase Community Forest

The Watling Chase Community Forest is 16.21 hectares. It was set up in 1991 and is one of 12 Community Forests in England. Species planted in the forest are Pine (25%), Field Maple (40%), Alder (15%), Cherry (10%), Oak and Ash (both 5%).The estimated age of all the trees is 30 years i.e. when the forest was set up. The majority of trees are in only a 'Fair' condition as a consequence of the damage done to bark by horses grazing in the forest. The SULE is hard to estimate given the condition of the trees.

Pear Wood

Pear Wood lies to the north of Stanmore Country Park and covers an area of 13.22 hectares. It is ancient woodland and there are references to the wood dating back to around 1250. The dominant trees are Beech (40%), Holly (40%) and Oak, Sycamore, Cherry and Birch (all 5%).The condition of all trees is considered to be 'Good'. The large Beeches, the Oak Sycamore and Holly are all 'Mature' with small Beeches and Cherry being 'Semi mature'. Most trees have a SULE of 80+ years although this is reduced to 40-80 years for the larger Beeches. All these woodlands are key components of Harrow's Green Grid. Harrow's Core Strategy sets out how Green Grid projects will seek to create linkages between open spaces including woodlands. The Green Grid is shown in **Map 2**.

Other Woodlands

There are a further eleven woodlands on significantly smaller sites which range in size from the woodland off Brookshill adjacent to Harrow Weald Park (4.14 hectares) to Montrose Walk (0.51 hectares). Details of each woodland are provided in **Table 6.2** below.

6.4 Sustainable Woodland Management

The Government's approach to sustainable forestry commitments is set out in the UK Forestry Standard, which was first published in 1998. It followed on the commitments made at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, and at the second Ministerial Conference on the Protection of Forests in Europe (MCPFE) in Helsinki in 1993, which defined sustainable forest management as:

> "The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems".

A key principle of the Government's Strategy[20]for trees is the long-term sustainable management of trees, woods and forests. The emphasis of forest policy is on supporting the delivery of multifunctional benefits of woodlands and forests. There is firm evidence that woodlands generate substantial public good benefits, including recreation, biodiversity, landscape and carbon sequestration as well as significant economic benefits.

The management of broadleaved woods has declined over the last 100 years as markets for woodland produce such as fuel and building materials have disappeared. The flora and fauna of woodlands are the side-effects of the mosaic of light and shade created by regular cutting for products and the different habitats that result from this work. Without being worked, many woodlands, including several in Harrow, have become dominated by an even-aged canopy restricting the growth of new trees and stifling shrubs of the understory and ground flora, and in many cases invasive non-native species such as rhododendron have taken over.

[20]A Strategy for England's Trees, Woods and Forests, Department for Environment, Food and Rural Affairs (DEFRA), 2007.

Table 6.2: Other Woodlands

Woodland Name	Area (Ha)	Species	Stocking Density %	Number of trees	Height (metres)	dbh - (cm)	Age (years)	Maturity	Condition	Safe Useful Life Expectancy (SULE)
Brockhurst Corner	1.62	Ash	25	334	15	20	20	Early Mature	Good	80+
		Elm	15	200	4	4	10	Young	Fair	10-20
		Small Oak	15	200	7	17	25	Early Mature	Good	80+
		Oak	10	133	13	38	70	Mature	Good	80+
		Hawthorn	25	334	5	6	15	Early Mature	Fair	80+
		Horse Chestnut	10	133	5	11	15	Semi Mature	Fair	80+
Dingles	2.77	Ash - large	25	536	24	55	100	Mature	Good	40-80
		Cherry	10	214	6	6	15	Semi Mature	Fair	80+
		Oak	15	321	22	40	100	Mature	Good	80+
		Ash- small	30	642	4	5	12	Semi Mature	Fair	80+
		sycamore	20	428	24	60	100	Mature	Fair	40-80
		Yew	<5		4	6	20	Semi Mature	Good	80+
Lake Grove Open Space	1.7	Ash	25	786	17	32	60	Mature	Good	40-80
		Elm	65	2044	8	6	15	Semi Mature	poor	5-40
		Oak	<5		17	50	110	Mature	Good	80+
		Yew	5	157	4	5	10	Semi Mature	Good	80+
		Hawtorn	5	157	4	5	5	Young	Good	80+
Montrose Walk	0.51	Oak	10	57	22	87	115	Mature	Fair	40-80
		Holly	45	258	3	5	10	Semi Mature	Good	80+
		Sycamore	15	86	23	35	40	Mature	Good	80+
		Yew	15	86	3	5	10	Semi Mature	Good	80+
		Ash	10	57	20	25	30	Mature	Fair	40-80
		Hornbeam	5	28	14	40	40	Mature	Fair	80+

Off Brookshill	4.14	Horse chestnut	10	269	23	85	150	Mature	Good	80+
		Scots Pine	10	269	23	60	75	Mature	Good	80+
		Yew	20	538	3	5	10	Young	Good	80+
		Oak	10	269	21	90	90	Early Mature	Good	80+
		Ash	5	134	21	60	80	Mature	Good	40-80
		Hornbeam	10	269	20	55	80	Mature	Good	80+
		Laural	35	941	5	15	20	Mature	Good	80+
Park View	3	Hawthorn	25	675	9	13	25	Mature	Fair	40-80
		Oak	40	1080	9	15	30	Early Mature	Good	80+
		Cherry	30	810	15	21	40	Mature	Fair	40-80
		Sycamore	5	135	9	10	20	Early Mature	Good	80+
Roxbourne Park	3.55	Ash	15	718	10	15	25	Early Mature	Good	80+
		Hawthorn	45	2155	6	14	30	Mature	Fair	40-80
		Elm	35	1676	7	11	12	Dead	poor	<5
		Sycamore	5	239	10	30	40	Mature	Fair	20-40
		Poplar	<5		19	30	40	Mature	Good	40-80
Roxbourne Rough	2.79	Hawthorn	65	1994	5	10	25	Mature	Fair	40-80
		Willow	30	920	6	56	30	Mature	Fair	40-80
		Ash	5	153	18	35	40	Mature	Fair	40-80
Santway Woods	2.69	Large Ash	35	753	25	43	90	Mature	Good	40-80
		Ash	15	322	15	30	30	Early Mature	Good	80+
		Horse chestnut	10	215	15	25	30	Early Mature	Good	80+
		Hawthorn	20	430	5	7	15	Early Mature	Fair	40-80
		Small Oak	10	215	19	27	50	Early Mature	good	80+
		Oak	5	107	22	75	150	Mature	Good	80+
		Yew	5	107	2	5	10	Young	good	80+
Stanmore Marsh	1.47	Oak	30	388	17	35	70	Mature	Good	80+

		Hawthorn- large	30	388	6	18	60	Mature	Fair	40-80
		Hawthorn- small	20	258	4	4	30	Early Mature	Fair	40-80
		Ash	5	64	17	50	70	Mature	Fair	40-80
		Holly	5	64	8	16	30	Early Mature	Fair	80+
		Elm	5	64	8	10	20	Early Mature	poor	5-40
		Yew	5	64	6	7	20	Semi Mature	Fair	80+
Sylvia Avenue Woods	1.09	Hawthorn	40	479	9	21	60	Mature	Fair	40-80
		Holly	20	239	3	4	10	Semi Mature	Good	80+
		Hawthorn	5	59	3	3	10	Semi Mature	Good	80+
		Elder	10	119	4	6	15	Mature	Fair	5-40
		Lawson cypress	20	239	18	30	60	Mature	Good	40-80
		Yew	5	59	3	3	8	Early Mature	Good	80+

Climate change may also have an impact on woodlands and there are indications that species such as the oak are already being affected on drier soils. Woodlands need to be managed to ensure that they have the capacity to cope with any problems that global warming may bring and thus contribute to the mitigation of a warmer climate.

6.5 Management Approaches

Until the late 19th century English woodlands were managed by coppicing, thinning, felling, pollarding and grazing, in order to provide fuel, small wood and timber[21]. However, it is not realistic to aim to achieve the same level of activity today. Nevertheless, active woodland management may well help to 'open up' woodlands and, thus, increase ground flora diversity.

Currently, the Council employs both traditional and modern forestry practices with the aim of increasing the biodiversity of Harrow's woodlands, notably in Bentley Priory. Depending on the site, maintenance and habitat improvement work may be carried by:

Council contractors. these carry out work such as mowing in grasslands and tree surgery or felling to make trees safe.

Local volunteer working parties. these working parties are organised by Harrow Conservation Forum. Small groups of volunteers work on the woodland sites to clear scrub and maintain paths.

Volunteers from the British Trust for Conservation Volunteers (BTCV).- BTCV teams undertake such tasks as scrub clearance, fence repair and creating boardwalks.

Farmers -farmers bring stock onto Bentley Priory for grazing. This is the best method for encouraging a mix of vegetation including wild flowers in unimproved grassland.

Woodland management methods are likely to be appropriate at different times and in different places, ranging from coppicing, ride management, clear-fell in some areas, non-intervention, pasture woodlands, fire breaks etc. The challenge of good woodland management will be to select appropriate management regimes for particular places.

The following approaches could be considered for woodlands in Harrow:

Coppicing

Coppicing is an effective method to produce certain types of timber. It could be adapted to produce fuel wood and minor produce, while at the same time increasing species richness. The possibilities for woodland types suitable for coppicing might be: oak standards over hazel, chestnut, hornbeam, ash, sycamore and oak. A range of broadleaved scrubby woods could be regenerated to coppice on a short (15-20 years) rotation.

The majority of ancient woodland in Harrow would have been managed by a system known as "coppice with standards" whereby the understorey, such as hazel or hornbeam, was cut on a regular cycle of seven to twenty five years, with the stumps regenerating for the next cut. Coppicing provides a sustainable supply of wood and prolongs the life expectancy of broadleaf tree species indefinitely.

Coppicing needs to be established in a series of linked or adjacent blocks to enable a regular cycle to be established. It should be at a sufficient scale to allow light to penetrate down to the ground. The regular pattern of cutting creates temporary areas which help to create diverse layers of vegetation. There is evidence that where coppice has been

[21] Rackham, O, Trees and Woodland in the British Landscape, 1976.

reinstated in London woods this has often restored ground flora and promoted habitats for species such as dormice, as well as providing local woodland products.[22]

Cutting Rides

Historically rides are a means of accessing woodland for management purposes. The creation of rides with an irregular scalloped edge would allow greater light penetration and vary the habitat diversity and structure. It would also to allow for better access to the woodlands. This variation in habitat diversity and structure may encourage greater flora diversity and therefore be beneficial for birds and invertebrates.

Thinning.

Thinning is an effective management regime that can enhance biodiversity by increasing light to the woodland floor. It can also improve recreational opportunities by opening up woodlands and improving access. It is also more likely to produce more saleable sized material.

Continuous Cover Forestry

Continuous cover forestry seeks to promote the structural, visual and biological diversity of forests. It involves the removal of small areas of the canopy to allow natural regeneration with the aim of producing mixed species woodland with a variety of ages similar to that in natural woodland. It has the advantage of having a lower impact on woodland biodiversity and appearance compared with other methods.

6.6 Biomass

It has been argued that making woodlands more financially viable will stimulate woodland management[23]. Much of the annual growth available for harvesting in English woodlands is currently not harvested. Bringing this under-managed woodland resource back into sustainable long-term management is seen to be an essential aim of the Government's strategy.

Management of woodlands would inevitably give rise to logs and branches. Use as fuel would help to meet national and regional policies for renewable energy and a growing demand for wood fuel in London.

A Wood Fuel Strategy for England[24] envisages production of an additional 2 million tonnes of wood for fuel by 2020. In London there is also support in the Mayor's Energy Strategy[25]for biomass as a renewable fuel in boilers and combined heat and power (CHP) units.

The London Plan requires that larger developments produce 20% of their energy needs from on-site renewable sources. Wood fuel is often the most cost effective practical way of meeting this requirement.

Harrow's Core Strategy Reflects the London Plan requirements:

Responding to Climate Change

[22]Coppicing hornbeam at Coldfall Wood in Haringey increased the number of ground flora species threefold within one year of cutting.
[23]Woodland Management for Timber and Wood Products: The Impact on Public Good Outputs, A report to the Forestry Commission and Defra, Slee W, Urquhart J, Taylor D, Countryside and Community Research Unit, University of Gloucestershire, 2006.
[24]Forestry Commission, 2007
[25]Delivering London's energy future, Mayor of London,

The Development Management Policies DPD and the Area Action Plan will compliment London Plan policies by establishing requirements for sustainable design and construction techniques that maximise the energy efficiency of new buildings, minimise the use of mains water, minimise carbon dioxide emissions in accordance with the London Plan energy hierarchy, and seek to promote and secure opportunities for decentralised energy, especially within the Harrow and Wealdstone Intensification Area, onsite renewable energy generation and urban greening.

The main application for wood fuel in London is for heating larger buildings with either wood chip or wood pellets. Prices for wood fuel are highest for smaller building integrated systems because of delivery costs and the requirement for higher fuel quality. Local wood fuel production and use can work very effectively for these systems. Demand is still small but set to increase rapidly with increasing numbers of planning applications including wood boilers and CHP systems.

Larger scale district heating systems, often linked to CHP systems, draw fuel from a wider area. The price paid for fuel at these larger district systems may be lower, reflecting their ability to accept a wider range of fuel quality. However, bulk users provide an established demand that could facilitate the development of new wood fuel production centres.

Two types of wood fuel need to be considered. Wood pellets can be used in domestic stoves and boilers but are equally suitable for large boilers and CHP units. Wood chip is best used in boilers and CHP units at larger than domestic scale. Wood chip is less processed than wood pellet and costs approximately two thirds the pellet price. Analysis of planning applications in London showed an increasing preference for wood pellets.[26]

The development of wood fuel production requires a central processing site which provides a convenient disposal point for tree surgeons. The large diameter of some logs that are

Photograph 6.1: Chip store at Central Nurseries, Croydon.

[26] Producing fuel from London's Trees and Woodlands, Forestry Commission.

©City Suburban Tree Surgeons

produced by tree surgeons require large chippers and log splitters to process them. The capacity of this machinery is high and maximising its use is essential to the viability of wood fuel production. At least 10,000 tonnes a year throughput is required.

The UK's first Tree Station was established in 2001 by the London Borough of Croydon at Central Nurseries and was funded by the Carbon Trust, the Norlands Foundation and the Scottish Power Green Energy Trust. Tree surgery waste is processed into fuel suitable for use in wood chip boilers. Bio Regional, Croydon Council and the Carbon Trust manage and operate the timber station at Central Nurseries. Timber waste is collected at transfer stations located around London and then bulk transferred to the timber station at Croydon. The timber station produces fuel quality woodchip from tree surgery waste produced by arboricultural contractors. The woodchip produced is used in sites such as Mercia and Slough heat and power stations in the production of electricity. It also supplies fuel grade chip to customers with large woodchip boilers which provide heating for various municipal buildings. The site has static and mobile screening facilities for woodchip and wood chippers that are capable of dealing with large volumes of logs. These chippers have been specifically designed to produce fuel quality chip to a high standard. The Tree Station currently supplies 4,000 tonnes of woodchip a year and increased capacity will allow production to increase to 90 tonnes per day, i.e. 10,000 tonnes per year.

6.7 Sustainable Woodland Management (Certification)

Woodland Management Plans and Woodland Certification are considered to be the best method for achieving verifiable and sustainable management of the woodland under local authority control.

The UK Woodland Assurance Scheme (UKWAS) was launched in June 1999 with the backing of a wide range of organisations in the environmental and forestry sectors. This is a voluntary scheme for the independent assessment of forestry management and is the only

national standard for sustainable forest management. It means that timber growers can use the scheme to assure buyers and retailers that their wood products come from forests managed in an environmentally sound way.

Independent certification against UKWAS is a way that woodland owners can demonstrate that woodland is managed sustainably. It provides owners with the opportunity to sell timber into markets where the assurance of sustainably grown timber is a requirement.

6.8 Issues for Woodlands

Harrow Council owns, manages or administers at least twenty woodland areas. In the case of the largest and most significant woodland areas it has a partnership agreement with Harrow Nature Conservation Forum (HNCF) who manage and maintain these woodlands. The remaining, mostly smaller woodland areas, are largely unmanaged and in a poor condition but nevertheless represent a significant natural resource in the Borough. There may be potential to develop further partnerships with voluntary organisations willing to invest time and resources into these valuable environmental assets.

2. There is a need for positive management of existing woodlands in order to increase their resilience, biodiversity and contribution to landscape character. The only woodland with a Management Plan is the Old Redding Complex and the focus of this document is the area's status as a Local Nature Reserve. The recommendations relate to the enhancement of habitat diversity by gaining more open and woodland edge habitats in selected places rather than the management of the woodland. Management Plans are required for all Harrow's woodlands.

3. The pressures on our trees and woodlands are increasing. The incidence of pests and diseases is increasing and as the climate changes this threat will continue to grow.

4. Trees and woodlands have a key role to play in supporting the Borough's need to adapt to the changing climate. It will also be important to manage existing tree cover to increase its resilience to climate change, and to ensure that woodlands evolve in response to changes that are likely to occur.

5. It is important that all sections of society have the opportunity to enjoy urban woodlands. Legislation in the UK requires organisations, in particular public authorities, to actively eliminate unlawful discrimination and promote equality of opportunity. There is evidence that minority ethnic groups, women and people with disabilities are largely under-represented in the use of their woodlands. Their location and the lack of infrastructure such as paths, car parking, signposting and lack of public transport limit access to Harrow's woodlands.

6. Woodlands can help reduce the risk of flooding associated with higher rainfall and more intense rainfall events. Woodland has the effect of intercepting rainfall, slowing and reducing the rate at which it runs-off into rivers and watercourses. This can reduce peak river flows and reduce the risk of flooding, or the requirement for investment in engineered flood defences. Woodland areas therefore need to be considered as part of the integrated management of river catchments.

7. The growing emphasis on developing low carbon energy sources means there is potential for the Council to become involved in the provision of woody biomass for energy generation. This presents an opportunity to increase the supply of woody biomass from existing woodland to the existing processing and distribution chain.

8. There is a growing recognition that active outdoor recreation and exercise can make a significant contribution to health and well-being, helping to tackle obesity and improving people's physical and mental health. Woodlands can provide important opportunities for outdoor recreation and can accommodate paths and longer distance walking routes. There

may be an opportunity to develop practical partnerships with health providers with the aim of developing and promoting woodland based recreational provision.

APPENDIX E: EFFECT OF TREES ON BUILDINGS

EFFECT OF TREES ON BUILDINGS

The dry weather of 1976 produced exceptional circumstances, which resulted in a large number of claims being made to insurance companies for damage to buildings as a result of ground movement. In some cases this movement was attributed to tree roots which had reduced the moisture content in the ground.

Tree roots can extract large quantities of water from the soil: a fully grown poplar uses over 50,000 litres in a year. When the soil is of clay, this will lead to a drying shrinkage, the magnitude of which will depend upon the inherent properties of the clay and on the nature of the tree and its moisture requirements. If the tree roots take up the moisture from under, or near to, foundations, the latter will subside.

The majority of damage to buildings which has been caused by trees and their root systems occurs in the shrinkable clay soils commonly found in the South East of England. The majority of buildings in Harrow are built on London Clay and are therefore vulnerable to this effect.

The buildings, which have been damaged by ground movement are those which have been constructed with limited foundation systems or where the depth of foundation is less than 1 metre below the ground level. Tree root damage is therefore related to foundation construction, type and depth.

To minimize the risk of damage to a building, a safety factor needs to be determined when considering the location of trees. The safety factor is the minimum distance which a specific type of tree should be located from a property. This assumes that buildings will not have a foundation of less than 0.75 metres. This safety factor gives an indication of the zone of influence of the tree roots over the range of the trees' development from the minimum growth in a clay soil in an urban area to the maximum growth in the most favourable circumstances. The safety factor is the reasonable distance that a tree root will extend and be likely to cause damage to a building.

The distance to which the roots of a tree spread depends largely upon the type of tree and its height. The roots of many common trees extend to a distance at least equal to their height. The roots of willow, oak, elm and poplar can extend to twice their height.

If damage to an adjoining property occurs which could possibly be associated with a Council managed tree, the property owner is entitled to submit a formal insurance claim[27].

Street Trees

The local authority has a duty of to take reasonable care to prevent damage to a property as a result of tree root damage involving local authority street trees.

The local authority also has a duty pursuant to the law of nuisance. A nuisance is a condition or activity, which unduly interferes with the use or enjoyment of land. The type of nuisance in tree root subsidence cases is that which causes physical damage to a neighbour's land.

Finally, there is a duty of care in negligence. If it was reasonably foreseeable that there was a real risk of damage a property through the encroachment of roots from the tree then local authority is under a duty of care to prevent such consequences as are reasonably

[27]Davey -v- Harrow Corporation [1957] 2 WLR 941; [1957] 2 All ER 305; [1958] 1 QB 60 Council held liable for damage caused by encroaching roots - "once it is established that encroachment by roots is a nuisance, it must follow that if damage is thereby caused, an action on the case will lie."

foreseeable[28]. In such case the defendant is liable because he is considered negligent in relation to his neighbour, and here nuisance and negligence coincide[29].

In order to make a successful claim for negligence the claimant must establish that:

The activity of the tree by the encroachment of the roots, whether directly through penetration or indirectly through the extraction of moisture from the soil caused or materially contributed to damage to the Property[30]

It was reasonably foreseeable on the part of the defendant that there was a real risk of damage to the property through the encroachment of roots from the tree

The claimant has suffered damage recoverable in law.

Where a claimant points to a local authority tree as being the cause of subsidence damage to their property it may not be a sufficient defence for the local authority to demonstrate that reasonable precautions to prevent or minimise the risk had been taken[31].

Despite these high profile court cases there is continued uncertainty about how local authorities should respond to insurance claims. The London Tree Officers Association (LTOA) has responded to this situation by producing a revised Risk Limitation Strategy. This document asserts that the issue of building movement due to the shrinkage of clay soils caused by lack of rainfall is one that continues to incorrectly implicate trees as being the material cause in a great many of these claims. In the past, many claims which have been supported by questionable evidence have resulted in trees being identified as the cause of movement when in fact damage has been the result of other factors including defective drainage and other vegetation.

In 2007, the 'The Chainsaw Massacre'[32] report was published which documented the fact that 40,000 of London street trees had been felled in the previous five years with only 5% having been felled as a result of subsidence claims. One key aspect that was highlighted was the need for Insurance companies and their loss adjusters to provide better quality investigations with nationally recognised guidance to avoid unnecessary subsidence claims.

Local authorities therefore needed to put in place risk strategy to minimise claims. The Risk Limitation Strategy for Tree Root Claims (3rd Edition) aims to reduce the number and cost of tree root claims to local authorities within London and to retain trees where possible. The document outlines two approaches for dealing with alleged subsidence:

- Firstly, an approach to tree management to minimize the risk of a tree causing building subsidence.
- Secondly, guidance on how a local authority should proceed once a claim has been received.

The LTOA recommends that local authorities should undertake preventative action rather than wait for claims to arise. A programme of cyclical pruning in those areas affected by subsidence is promoted and, where appropriate, that selective removal and replacement should be undertaken.

[28]*Clerk and Lindsell* at 20-39 – 20-40:
[29]Delaware Mansions - v - City of Westminster
[30]Loftus-Brigham – v – London Borough of Ealing, Court of Appeal 2003
[31]Raphael v London Borough of Brent (2007)
[32]Chainsaw massacre: A review of London's street trees, Greater London Authority May 2007

Local authorities which have already adopted the recommendations of the strategy have made substantial financial savings in dealing with alleged subsidence claims and have been able to retain trees that would otherwise have been removed.

The LTOA recommend that the following action points should become an integral part of the tree strategy particularly in relation to the issue of trees and building movement.

Publicly Owned Trees:

- Local authorities instigate a regime of cyclical pruning of council tree stock in areas predisposed to building movement where this is appropriate.
- Local authorities provide dedicated resources for dealing with subsidence generated claims directed at Council Managed Trees.
- Local authorities instigate a regime of selective removal and replacement of street tree stock in areas predisposed to building movement where this is appropriate.

Privately owned Trees:

- Local authorities provide dedicated resources for dealing with subsidence generated Conservation Area notifications and Tree Preservation Order applications.
- Local authorities review all existing unsettled claims providing dedicated resources to challenge those unwarranted claims based on poorly investigated and inaccurate evidence or where in the case of preserved trees the Town & Country Planning (Trees) Regulations 1999 can provide relief from the claim.

All Trees:

- Local authorities challenge unwarranted claims based on poorly investigated or inaccurate evidence.

Joint Mitigation Protocol

In response to the need to establish a more collaborative approach between local authorities and the insurance industry the Joint Mitigation Protocol (JMP) was launched on the 16th of May 2008.

The JMP is an agreed method of subsidence claims management where trees are implicated as being the cause of building movement. It seeks to establish best practice in the processing and investigation of tree root induced building damage, benchmarking time scales for responses and standards of evidence.

The principal aims are to speed up the process of claims handling, decision making and mitigation implementation leading to resolution, while at the same time recognising the value of trees in the built environment and providing local authorities with all the investigative evidence required at the beginning of the process. This allows a timely decision to be made on what course of action is appropriate in respect of the tree in question. The protocol seeks to ensure that trees that should be retained will be retained and claims will be processed quickly so resident's properties are repaired without unnecessary delay.

Complementary to the JMP, the development of tree pruning criteria has been agreed with the insurance industry so that trees are pruned when implicated in subsidence claims rather than always being targeted for removal. The aim is to provide a specification that result in the trees' crown volume being reduced to a state that existed prior to there being any damage and then subsequently maintained at this scale by instigating a regular regime of management.

It is important that the pruning work specified complies with the guidance given in BS 3998[33] while at the same time achieving a reduction in the tree's water uptake in line with the findings of the Hortlink 212 Project's research[34].

[33]BS 3998 Recommendations for tree work. The revised draft covers a wide range of issues related to carrying out tree work, including specifying work, risk management on work sites, crown management and structural support.
[34]Controlling Water Use of Trees to Alleviate Subsidence Risk, Horticulture LINK project 212 Final report – May 2004.