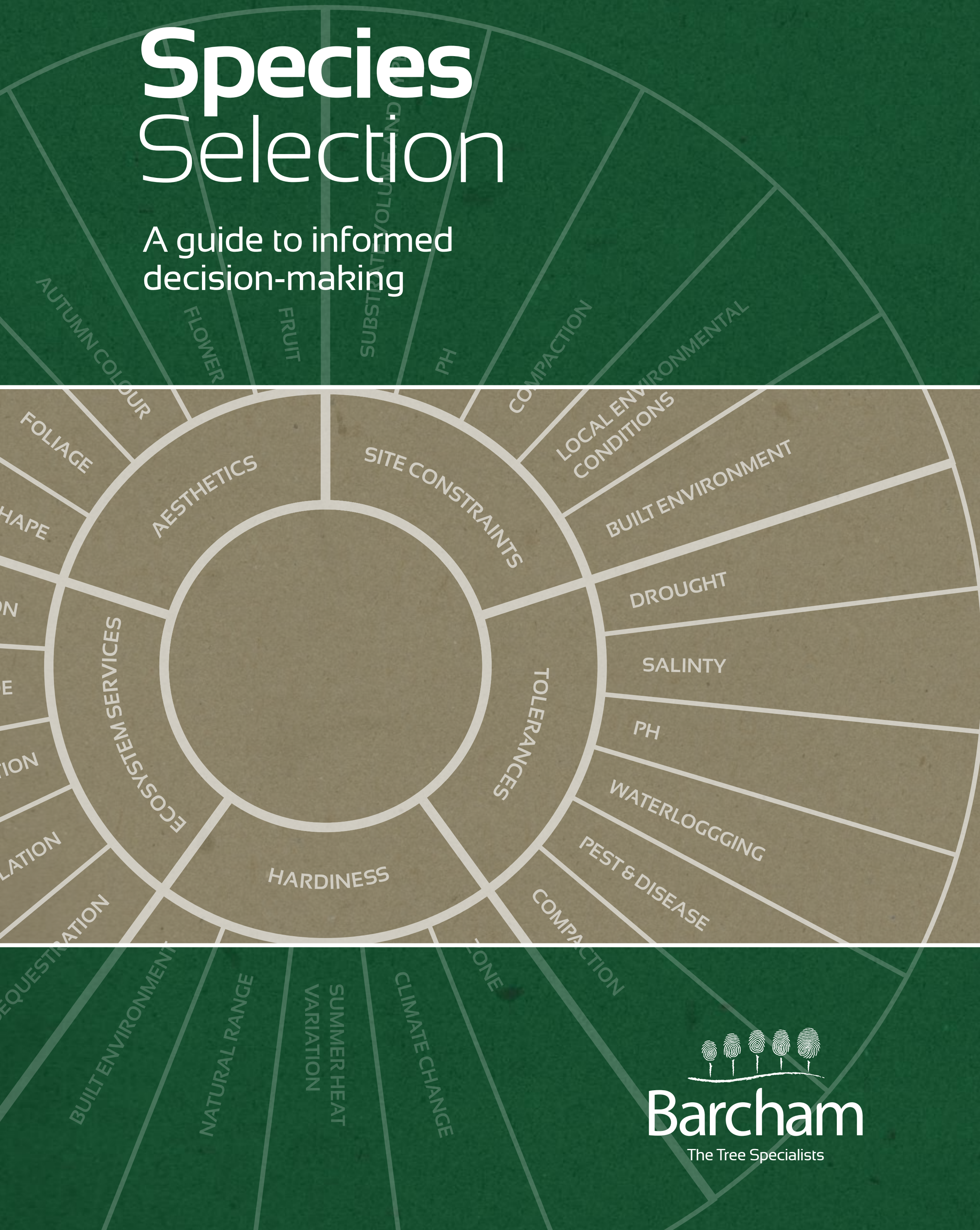
Species Selection

A guide to informed decision-making



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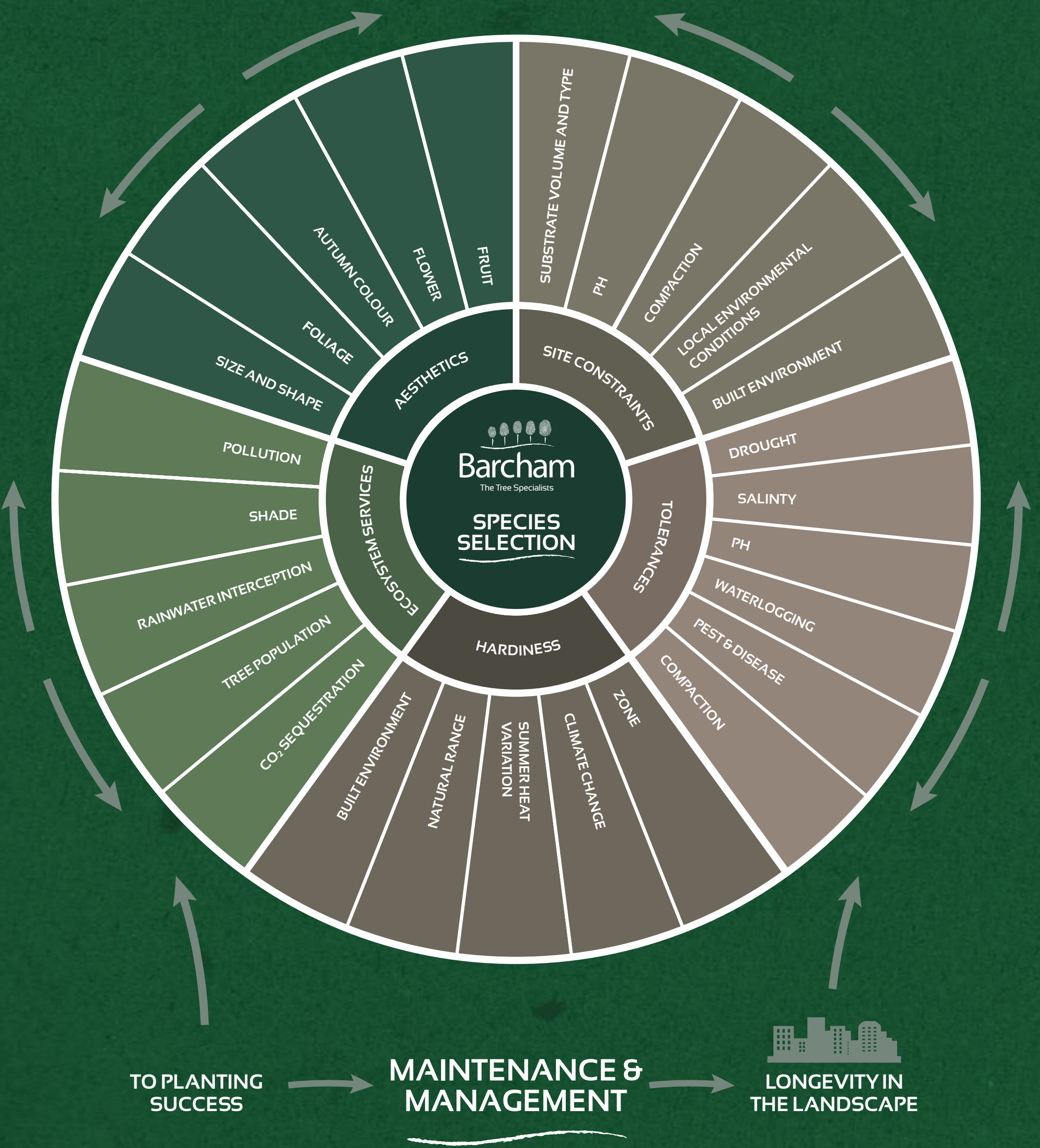
Species selection chart



BOTANICAL AND COMMON NAMES

For tree selection to be effective trees should be fully and correctly named. This is achieved by the using the binomial system of nomenclature. Details of this can be found in the National Plant Specification.

Introduction

The phrase 'The right Tree for the Right Place' is often used. It implies that for every planting situation there is a right tree. It suggests that there is an 'off the shelf' solution to tree selection and that all that is required is to go to the appropriate indexed compartment and the answer will be found with planting success subsequently guaranteed.

It denies the fact that the selection of trees, for any planting site, is the outcome of a thought process, it is an intellectual process. It involves the juxtaposition and combination of many factors, all of which will influence, positively or negatively, the likelihood of post planting success and longevity in the landscape. A knowledge of the tree species, where it occurs and thrives in nature, its specific tolerances and preferences, the ecosystem services and potential disservices it delivers, coupled with its aesthetic characteristics need to be matched with the environmental and other constraints present at any planting site.

There is never a single right answer and usually a compromise has to be found. However, this compromise can be a result of uniformed guesswork or reached, as a result of, an educated, evidence- based assessment of all the factors involved.

This handbook does not pretend to be a text book or offer a comprehensive guide to tree species selection but rather is a handy reference source outlining the many factors which inform the decision- making process and act as a stimulus to encourage those selecting trees to refer to more comprehensive and complete reference works.

The table of trees at the back of the guide is based on the Barcham Book 'A Time for Trees'. Again, it does not pretend to be a comprehensive guide to all tree species and the information on tree characteristics is based on the best evidence available at the current time. This does mean that there are gaps where information is unavailable or incomplete.

I hope you will find this guide useful, stimulating and thought provoking.

Keith Sacre
MSc Arb, BSc (Hons) Arb, MICFor, Chartered Arboriculturist.

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1.0

Site Constraints

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1.0 Site Constraints

Planting sites vary considerably. These variations all affect tree species choice to a greater or lesser degree. Conditions range from undisturbed natural soil through to highly disturbed urban substrates where soil is at a premium and often not a consideration at all. Prior to a tree species or species being selected, a comprehensive categorisation of the constraints present at any site should be developed, assessed and understood. Without this assessment, appropriate tree selection is almost impossible.

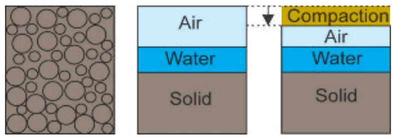
Constraints which impact on tree species choice:

Soil:

Soil, structure and texture: Impacts on soil water retention and movement, drainage, nutrient availability and vulnerability to compaction.

Soil profile: Undisturbed soils that have not suffered extensive human disturbance have a distinct soil profile. Such a soil profile is unlikely to be apparent on most urban planting sites. A detailed knowledge of the available substrate will enable will inform planned amelioration and volume available for root development

Soil pH: Has a major impact on the availability of plant nutrients It also effects the growth of plant roots and micro-organisms within the substrate present.



Soil drainage: Inadequate drainage can lead to anaerobic conditions in the soil. A lack of oxygen leads to root death and subsequently whole tree failure. The high levels of carbon dioxide, which result, can be toxic.

Soil compaction: As soil is compacted the physical resistance to tree root growth is increased, soil aggregates break down and pore space is diminished. This is reflected in increased soil bulk density. The respiration of roots and soil biota is adversely affected which in turn impacts on nutrient recycling and availability. Appreciable compaction of soil leads to physiological dysfunctions in plants.

Macro and microclimatic conditions:

Light levels: Light levels vary especially in urban environments. Planting sites can be in areas of permanent or partial shade or in areas where light levels vary considerably during the course of a day. Light levels are also influenced by surrounding infrastructure or vegetation. Artificial light from street lighting and other sources can also impact on tree growth and other phenological characteristics such as flowering time and leaf fall.

Site Constraints 1.0

Site Constraints
Tolerances
Hardiness
Ecosystems
Aesthetics

Pterocarya fraxinifolia, London.

Air movement: Air movement around trees in the built environment can be varied. These movements can often be localised and extreme.

Temperatures: Air and surface temperatures are influencing tree growth and development affected by the surface materials surrounding newly planted trees. These temperature fluctuations can often be extreme and localised. They have the potential to affect adversely, drainage, gaseous exchange and the availability of water and nutrients in addition to potentially causing physical damage to the newly planted tree.

Buildings and other infrastructure: Buildings and other infrastructure impact on shade patterns, light levels, air movement and water movement. The proximity of trees to buildings is another consideration with the potential for root induced below ground damage to buildings on shrinkable clays.

Existing tree cover: Existing tree cover can provide a useful indication as to which species will thrive or not in local conditions. Neighbouring tree canopy can also limit light and provide physical limitations to the development of young newly planted trees.

Competition from existing vegetation: Competition from existing vegetation, especially un-managed grass can impact adversely on newly planted trees. Much damage to newly planted trees is caused by inappropriate maintenance and injudicious use of grass cutting machinery.

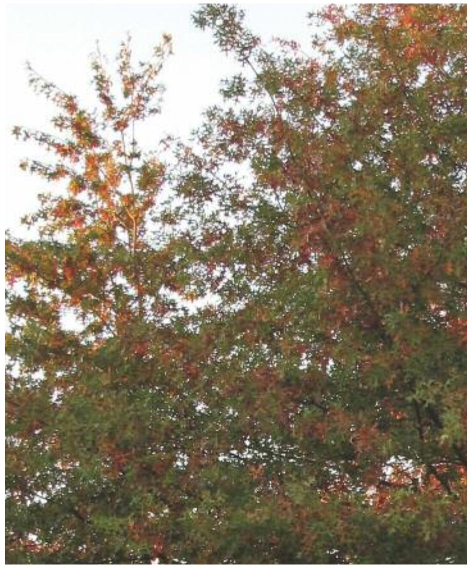
Betula ermanii, Vauxhall, London.

Site Constraints 1.1

Street furniture: The position and location of all street furniture, including CCTV cameras, can affect the suitability of any planting site. Street lighting can affect the natural phenological responses of trees causing abnormal variations in flowering time, leaf fall and other natural growth characteristics.

Underground services: The location of underground services is often a limitation and severe constraint on planting sites in the urban environment.

All the above constraints need to be considered and assessed prior to tree species selection taking place. Many of them can be ameliorated, modified or controlled through engineered solutions, design variations, horticultural or arboricultural techniques and modified maintenance practices. There will remain, after such interventions, variable environmental and other conditions on any site. These will often be localised.



Quercus palustris, Brieve, France.

Individual tree species have different genetic characteristics and strategies for coping with different environmental conditions. These characteristics and strategies manifest themselves in different tolerances, growth habits, attributes and adaptations which equip the species in question to succeed in its natural environment. Once the site conditions have been modified to the full extent possible tree species selection can begin. At this juncture tree species selection is about matching the tree and its natural characteristics with the prevalent environmental conditions and remaining constraints of the planting site.

Site Constraints
Tolerances
Hardiness
Ecosystems
Aesthetics

2.0

Tolerances

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Site Constraints
Tolerances
Hardiness
Ecosystems
Aesthetics

Drought

Diospyros lotus, Crete.

There are certain tree characteristics which suggest a degree of drought tolerance. Drought tolerant trees will often have small leaves or in the case of conifers, needles that have low surface area. Drought tolerant trees will often have deep sinuses which are the indentations between lobes on a leaf. Drought tolerant trees often accumulate waxes on their leaves or needles. These waxes are thought to prevent water loss and reflect light. This prevents the leaf temperature becoming too high. On some species leaf hairs, called trichomes, appear as grey or white pubescence. These reflect light and reduce water loss.

Tamarix, Cretian coastline.

Salt

There would appear to be no clear and consistent visual indicators as to a tree's tolerance of salt. All plants vary in their ability to grow in conditions of high salinity. Tolerance varies, often in the same species dependent on whether the salt is atmospheric (wind-blown) or present in the soil (highway de-icing salt). Trees which grow only in saline soils are called 'halophytic'. Plants of this type deal with salt in specific ways. Some have leaves which sequester the salt in special structures which then rupture releasing the salt back into the environment. Others have specialised structures that have evolved to collect salts which are then forced out through pores before they reach the vascular system of the plant. Some collect the salts and store them in plant cells that are less susceptible to salt than others in the plant.

Tolerances 2.0

Waterlogging

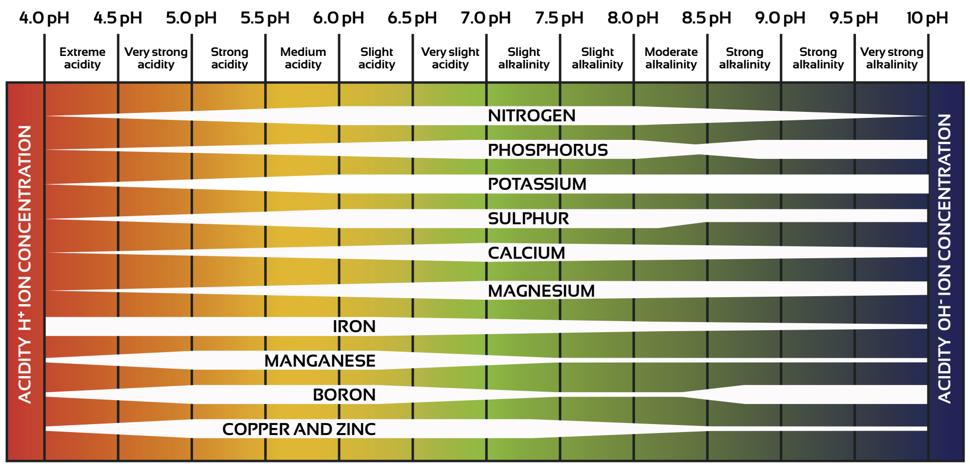
In waterlogged soils air spaces become filled with water which impacts on the diffusion of gases between the atmosphere, rhizosphere and roots. Root functioning is impaired which affects numerous physiological and metabolic processes. Dependent on the duration of soil saturation this can lead to wilting, chlorosis, abscission, reduced photosynthetic activity, blackening of roots and eventual death.

Flood and waterlogging tolerant tree species often have an ability to generate special adventitious roots and root structures. These root structures are filled with spaces between cells and aid in the diffusion of oxygen from lenticels on the lower stems and other bark tissues.

Some trees have very visible adaptations. A sub species of *Alnus incana* produces adventitious roots near the soil surface. *Taxodium distichum* produces clearly defined buttresses which are filled with air spaces. Others have genetically adapted to reproduce seed in the spring, at a time when floodwaters can assist in seed dispersal. These include *Salix spp, Populus spp, Acer saccharinum and Platanus orientalis.* All these have a capacity to tolerate varying levels of periodic waterlogging.

pH

The pH of a soil has a major impact on the availability of nutrients. It also affects the growth of plant roots and micro-organisms. Root growth is generally favoured at slightly acidic pH values (5.5 to 6.5). Fungi generally predominate in the soil adjacent to roots in the acid pH range, whereas at higher pH values bacteria become more prevalent.



Soil Compaction

There are very few, if any tree species which can survive when soil compaction is severe. Root development is inhibited, anaerobic conditions prevail and tree performance is impaired often to the point of eventual failure.

Shade

Trees have varying capacities to survive in shaded conditions. The success or otherwise of any selection will depend on the depth and duration of shade present. Pioneer species will require full sun while late successional species have evolved to grow successfully under existing tree canopy cover.

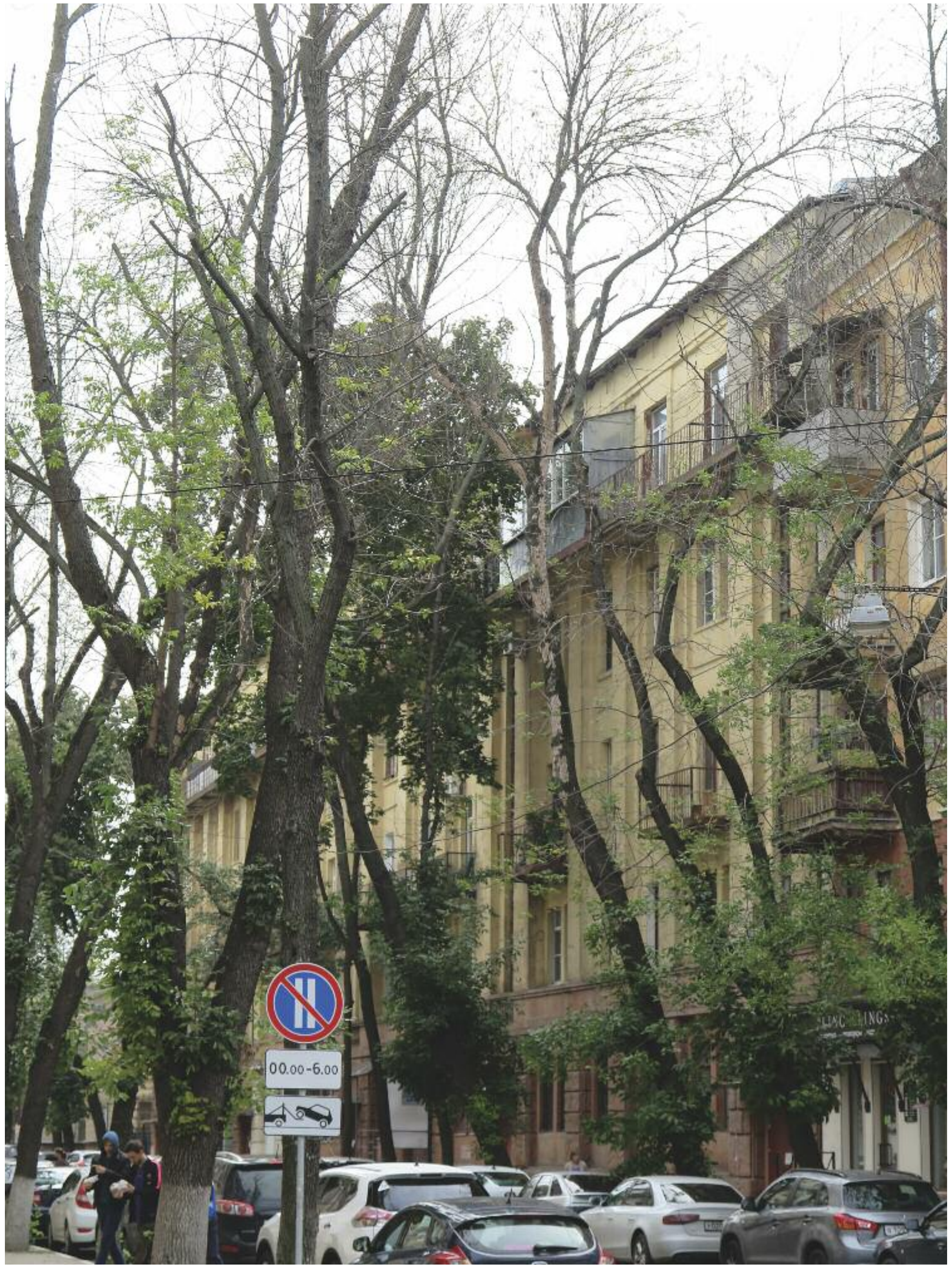
Styphnolobium japonicum full flower, Germany.

Pest and Disease:

All tree species are vulnerable to pest and disease. This vulnerability is exacerbated by threats from the importation of invasive pest and disease. These threats are on the increase and it is beyond the scope of this manual to list them in full. Some pest and diseases are host specific as is the case with Emerald Ash Borer and Ash Die Back; others are less discerning as with Asian Longhorn Beetle and *Xyllella fastidiosa* whose host range is wide and varied. Regular reference should be made to the DEFRA Plant Health Risk Register and advisory notifications issued by the Forestry Commission, Forest Research and the Arboricultural Association. Pest and Disease has been omitted from the table at the rear of this guide because information is constantly changing and other sources such as those listed above provide up to date information as it becomes available.

It is, however, widely accepted that diversity within any tree population will increase that population's resilience when faced with an outbreak of either an existing or new pest and/or disease. The creation of such diversity is an important consideration when selecting trees with the avoidance of monocultures paramount.

Biosecurity is enhanced if trees are selected from nurseries supplying home grown material. The transplanting of imported stock directly into the landscape should be avoided. The introduction of Oak Processionary Moth occurred from the direct importation of a single Oak tree from mainland Europe which was planted directly into the London landscape.



Impact of Emerald Ash Borer in Voronezh, Russia.

3.0

Hardiness

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Hardiness 3.0

Zone

The cold hardiness zone of different tree specie's is categorised by the specific geographic location using latitude, longitude and altitude or elevation. It categorises which tree species will thrive in specific climate zones and reflects the trees inherent genetic ability to withstand and tolerate low temperatures.

Range of Average Annual Minimum Temperatures for each Hardiness zone.
(Based on USDA Hardiness zone Map)

Zone	Fahrenheit	Celsius
Zone 1	Below -50°F	Below -45°C
Zone 2	-50° to -40°F	-45° to -40°C
Zone 3	-40° to -30°F	-40° to -34°C
Zone 4	-30° to -20°F	-34° to 28°C
Zone 5	-20° to -10°F	-28° to -23°C
Zone 6	-10° to 0°F	-23° to -17° C
Zone 7	0° to 10°F	-17° to -12°C
Zone 8	10° to 20°F	-12° to -6°C
Zone 9	20° to 30°F	-6° to -1°C
Zone 10	30° to 40°F	-1 to 4°C
Zone 11	Above 40°F	Above 4°C

Note: Caution should be exercised when referring to cold hardiness zone maps as locations which share a low temperature range may experience widely variable summer conditions

Natural Range

The natural range of a species reflects the geographic locations in which that species grows naturally.

Self sown *Platanus orientalis* in Crete.

Self sown *Platanus occidentalis Ithica*, USA.

Provenance

Provenance will directly affect the trees ability to tolerate and thrive in the designated hardiness rating. A tree species designated as having a cold hardiness rating of 6°C which originates in the south will struggle when faced with more extreme and possibly colder temperatures in the north.

Succession

Succession is the term used to describe the stage at which a species will begin to appear and thrive in natural forest/woodland environments. This successional status can affect the likelihood of a tree species thriving or not in any environment. A pioneer species may struggle to survive in a heavily shaded area while late succession types may struggle in an open, sun soaked, paved square.

A warm dry mountain slope with a limited soil volume may replicate conditions found in a paved urban environment. Here early succession species such as *Pinus nigra, Quercus petrea,* and *Koelreutaria paniculata* are likely to be successful. Similarly on an urban site fully exposed to the sun, pioneer species such as *Alnus cordata, Quercus frainetto, Quercus cerris* and *Sorbus intermedia* are likely to succeed.

Site Constraints
Tolerances
Hardiness
Ecosystems
Aesthetics

4.0

Ecosystems

Barcham
The Tree Specialists

Site Constraints
Tolerances
Hardiness
Ecosystems
Aesthetics

It is well recognised that trees deliver many ecosystem service benefits. It is possible to quantify many benefits, in both volumetric and monetary terms. Generally, the larger the tree the greater the benefits delivered.

Pollution

Tree species have varying capacities to ameliorate pollution. The capacity of any one species is inextricably linked to tree size, leaf area index and tree vigour.

Carbon sequestration

Again, linked to tree size. The larger the tree the more carbon sequestered and stored.

Rainwater interception

The ability to intercept, store and eventually release rainwater is influenced by species, tree size, canopy density and bark type. The smoother the bark the greater the rate of stem flow. Those trees which provide the greatest benefits are those which grow to 15 metres and above with large densely foliated evergreen canopies with negligible stem flow (*Picea abies, Quercus ilex*) being the most effective. Medium sized trees or large trees with open deciduous crowns (*Populus, Gingko biloba*) are less effective while small columnar shaped trees with smooth bark are least effective.

Shade provision and cooling through Evapotranspiration

Generally, the greater the leaf area the more shade and cooling from evapotranspiration. This may be modified by physiological characteristics such as water use efficiency or other morphological characteristics such as the size and distribution of leaves and crown architecture. The effectiveness of street trees may be restricted by limitations on available soil moisture.

Trees which have the potential to grow to 15 metres and above and have densely foliated canopies provide the greatest shade and cooling benefits, (*Quercus robur, Acer platanoides*). Trees with the potential to reach 10-15 metres but with open less densely foliated crowns offer less (*Robinia psuedoacacia, Styphnolobium japonicum*).

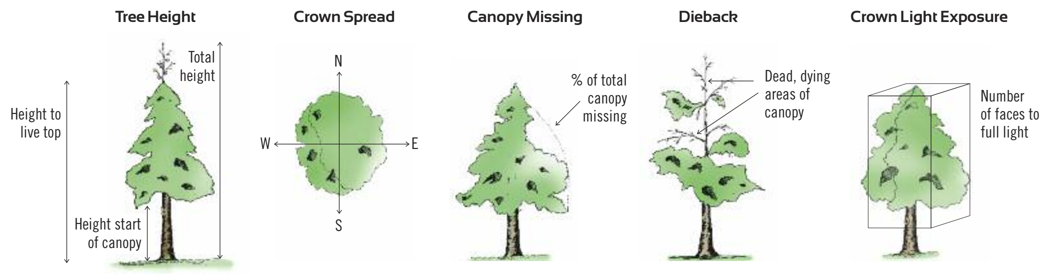
There are also many benefits, such as the contribution trees make to health and well-being which have yet to be quantified.

Note: The guide as to the ecosystem service benefits delivered by individual tree species as outlined in the table to the rear of this manual have been calculated using i-tree Eco on behalf of Barcham trees by Treeconomics. Over the past 8 years measurements from thousands of urban trees have been collected in towns and cities across the UK by Treeconomics and its project partners. This detailed information on trees structure (height, diameter, species etc) has been run through a sophisticated computer model called i-Tree Eco. This model is peer reviewed and used internationally to assess urban trees and calculate their benefits to society.

The results for all the tree species included in the table were sorted by both species and size. The trees were then grouped into like for like sizes before being ranked for their performance against each other. For some of the less common trees there were not enough records to obtain robust data. Consequently, not all trees listed in the table have been graded for the ecosystem services they provide.

Ecosystem Services 4.0

i-Tree Eco Tree Measurements



Treeconomics

Sequoia sempervirens, Oregon.

It is the whole tree population which delivers ecosystem service benefits. Tree populations are dynamic and vulnerable to threats particularly from invasive pests and disease. These tree populations need to be resilient. Diversity within the tree population is a major contributor to this resilience and therefore the enrichment of diversity should be a consideration when making a choice of species. Such diversity will also contribute to the future proofing of tree populations as the impacts of climate change materialise.

Tree selection is just one part of a process. Success in achieving longevity in the landscape must be combined with appropriate management and maintenance post planting. Consideration needs to be given to planting depth, irrigation, surface compaction, mulching, staking and tying and all the other factors outlined in BS 8545 Trees: From Nursery to Independence in the Landscape. Without this, no matter how informed and well thought out species selection is, it is unlikely young trees will reach their full genetic potential or deliver the ecosystem services they may be capable of.

Site Constraints
Tolerances
Hardiness
Ecosystems
Aesthetics

Ecosystem Disservices

BVOC's

Nearly all plants produce Biogenic Volatile Organic Compounds during reproduction, growth and defence. Several popular tree species and associated management practices contribute to the production of secondary air pollutants particularly ground level ozone. These include *Liquidamber, Quercus* and *Salix*.

The release of BVOC's is not a constant but generally increases with increases in temperature and light levels. Levels of release are also increased when trees are exposed to periods of severe drought, high levels of air pollution and when plant tissue is damaged.

BVOC emission is relatively harmless in remote areas where concentrations of other air pollutants such as nitrous oxide and nitrogen dioxide are relatively low. In urban situations design is all important and the planting of trees that emit high levels of BVOC alongside a busy road as a closed canopy should be avoided. In this situation air circulation is reduced and emissions are forced down to a pedestrian level.

Quercus robur fastigiata, Koster, Sweden.

Ulmus New Horizon, Dresden, Germany.

Allergy potential

The allergy potential of any tree species in inextricably linked to the amount of pollen produced, the flower type and the sex of the tree.

Carya cordiformus, Sheffield Park.

There are three principle types of flower to be found on trees. Perfect flowered trees produce flowers which have both male and female parts on the same flower. Examples include *Malus, Pyrus* and *Magnolia*. These are usually pollinated by insects. Monoecious trees have separate male and female flowers on the same tree. Examples include *Pinus, Cypress, Betula, Carrya* and *Juglans*. Not all monoecious trees cause allergies. They are invariably wind pollinated. The third type are dioecious trees where each individual tree will be either male or female and pollination requires pollen to move, usually in the air, from male to female for seed to be produced. Examples include *Acer rubrum, Ilex, Fraxinus, Populus, Morus* and *Salix*.

On most occasions trees with perfect flowers are least likely to cause allergy. Allergenic reaction is related to the size of and volume of pollen produced and the ease with which it is dispersed into the atmosphere.

It is not suggested trees which produce high levels of pollen should not be planted but that a balance is struck in design. Those areas to be planted which are in close proximity to vulnerable targets groups such as young children or the elderly should not have high pollinating male dioecious trees or heavy pollen producing monoecious trees planted in close proximity.

Other disservices which need to be considered

Fruit can often be considered problematic when shed in inappropriate areas. (*Prunus, Malus*). Some trees produce brittle limbs as they develop. (*Fraxinus angustiflolia, Robinia psuedoacacia*). Some trees have invasive root systems (*Populus, Salix*) while others produce shallow root systems (*Betula, Prunus*).

Site Constraints
Tolerances
Hardiness
Ecosystems
Aesthetics

5.0

Aesthetics

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Aesthetic and other characteristics

The range of characteristics exhibited by trees is vast far beyond the scope of this manual to explore in full. Factors such as size, crown shape, crown spread and growth rate are of obvious importance when any design brief is being considered. Whether a tree is evergreen or deciduous, the size shape and density of foliage, the degree and extent of autumn colouring, the colour and timing of flowers, the presence of other characteristics such as ornamental bark are all factors to be taken into consideration when choosing a tree or trees. These considerations have to be balanced against the constraints of the site, the inherent tolerances and strategies adopted by different tree species, the potential for delivery of ecosystem services and of course disservices.

Zelkova serrata, Sweden.

Aesthetic and other characteristics 5.0

Twisted *Fagus sylvatica*, Cornwall.

Site Constraints
Tolerances
Hardiness
Ecosystems
Aesthetics

BOTANICAL NAME	COMMON NAME	FAMILY	TOLERANCES: Drought	Salt	Water logging	Shade	HARDINESS ZONE: Zone	Succession	Natural Range
Acer buergerianum	Trident Maple	Sapindacea	Mod-tolerant		Mod-sensitive	Mod-tolerant	5-8(9)		China, Taiwan Japan
Acer campestre	Field Maple	Sapindacea	Mod-tolerant	Mod-tolerant	Mod-tolerant	Mod-tolerant	(4)5-8	Pioneer	Europe, Western Asia and North Africa
Acer cappadocicum	Caucasian Maple	Sapindacea	Mod-tolerant		Mod-tolerant	Mod-tolerant	6-9		Caucasus, Northern Iran, Western Himalaya
Acer x freemanii	Freeman's Maple	Sapindacea	Mod-tolerant		Mod-tolerant	Mod-tolerant	3-9	Pioneer	Eastern North America
Acer ginnala	Amur Maple	Sapindacea	Mod-tolerant	Mod-tolerant	Mod-tolerant	Mod-tolerant	3-8		Russia, Mongolia, China, Japan, Korea
Acer griseum	Paperbark Maple	Sapindacea	Mod-sensitive		Mod-sensitive	Mod-tolerant	5-7(8)		Central China
Acer lobelli	Lobels Maple	Sapindacea	Mod-tolerant		Mod-tolerant	Mod-tolerant	6.0		Southern Italy, Balkans
Acer negundo	Box Elder	Sapindacea	Mod-tolerant	Intolerant	Mod-tolerant	Mod-tolerant	3-9	Pioneer	North America
Acer platanoides	Norway Maple	Sapindacea	Mod-tolerant	Mod tolerant	Mod-tolearnt	Tolerant	4-7	Late succession	Continental Europe
Acer psuedoplatanus	Sycamore	Sapindacea	Mod-sensitive	Mod tolerant	Mod-sensitive	Tolerant	4-7	Late succession	Continental Europe, parts of Western Asia
Acer rubrum	Canadian Maple	Sapindacea	Mod-tolerant	Intolerant	Mod-tolerant	Mod-tolerant	3-9	Pioneer	Eastern North America
Acer saccharinum	Silver Maple	Sapindacea	Mod-tolerant	Intolerant	Mod-tolerant	Mod-tolerant	3-9		Eastern North America
Acer saccharum	Sugar Maple	Sapindacea	Mod-tolerant	Intolerant	Sensitive	Tolerant	4-8		Eastern North America
Aesculus x carnea	Red Horse Chestnut	Sapindacea	Mod-sensitive	Mod-tolerant	Mod-sensitive	Mod-tolerant			Hybrid x between A. hippocastanum - A.pavia
Aesculus hippocastanum	Horse Chestnut	Sapindacea	Mod-sensitive	Mod-tolerant	Mod-sensitive	Mod-tolerant	4-7	Late succession	Balkan peninsula
Aesculus indica	Indian Horse Chestnut	Sapindacea	Mod-sensitive		Mod-sensitive	Mod-tolerant	5-7		West Napal
Ailanthus altissima	Tree of Heaven	Simaroubaceae	Tolerant	Good	Mod-tolerant	Mod-tolerant	4-8	Early Succession	China, North Vietnam
Alnus cordata	Italian Alder	Betulaceae	Tolerant		Mod-tolerant	Mod-tolerant	5-7	Pioneer	Corsica, Southern Italy, Greece
Alnus glutinosa	Common Alder	Betulaceae	Mod-sensitive	Mod-tolerant	Tolerant	Mod-tolerant	4-7	Pioneer	Europe, Western Asia and North Africa
Alnis incana	Grey Alder	Betulaceae	Mod-sensitive	Mod-tolerant	Mod-tolerant	Mod-tolerant	2-6	Pioneer	Europe, Caucasus
Alnus spaethii	Spaeth Alder	Betulaceae	Mod-tolerant		Mod-tolerant	Mod-tolerant	4-7	Pioneer	Hybrid between A. japonica and A.subcordata
Amelanchier arborea	Downey Serviceberry	Rosaceae	Mod-sensitive		Mod-tolerant	Tolerant	4-9		Eastern North America
Amelanchier lamarkii	Serviceberry, Juneberry	Rosaceae	Mod-sensitive		Mod-sensitive	Mod-tolerant	4-9		Eastern North America
Aralia elata	Japanese Angelica Tree	Araliaceae	Mod-sensitive		Sensitive	Mod-tolerant	3-9		Japan, Korea, China, Manchuria
Arbutus unedo	Strawberry tree	Ericaceae	Tolerant		Sensitive	Mod-tolerant	7-9	Early succession	Mediterranean
Betula albosinensis	Chinese Birch	Betulaceae	Mod-sensitive		Mod-sensitive	Mod-tolerant	5-6	Pioneer	China
Betula ermanii	Erman's Birch	Betulaceae	Sensitive		Sensitive	Intolerant	5-6	Pioneer	Asia, North China, Russia, Korea, Japan
Betula nigra	River Birch	Betulaceae	Mod-sensitive		Mod-tolerant	Intolerant	3-9	Pioneer	Eastern North America
Betula maximowicziana	Monarch Birch	Betulaceae	Mod-sensitive		Sensitive	Intolerant	5-6	Pioneer	Japan, North East Asia
Betula papyrifera	Paper Birch	Betulaceae	Sensitive	Mod-tolerant	Sensitive	Intolerant	2-6(7)	Pioneer	North America
Betula pendula	Silver Birch	Betulaceae	Sensitive	Mod-tolerant	Sensitive	Intolerant	2-6	Pioneer	Northern Europe, West Asia
Betula pubescens	Common White Birch	Betulaceae	Sensitive		Mod tolerant	Intolerant		Pioneer	Newfoundland, Europe
Betula utilis	Himalayan Birch	Betulaceae	Mod-sensitive		Mod-sensitive	Mod-tolerant	5-6	Pioneer	Himalaya, Western Nepal
Carpinus betulus	Hornbeam	Betulaceae	Mod tolerant		Sensitive	Mod-tolerant	(4)5-7	Late succession	Europe, Western Asia
Carpinus japonica	Japanese Hornbeam	Betulaceae	Mod-tolerant		Sensitive	Mod-tolerant	(4)5-7		Japan
Carya illinoinensis	Pecan	Juglandaceae	Mod-sensitive		Mod-tolerent	Intolerant	5-9		Southern USA
Castanea sativa	Sweet Chestnut	Fagaceae	Mod-tolerant		Sensitive	Mod-tolerant	5-7		Mediterranean, Northern Turkey, Caucasus
Catalpa bignoniodes	Indian Bean Tree	Bignoniaceae	Mod-sensitive	Mod-tolerant	Sensitive	Mod-tolerant	5-9.	Pioneer	Eastern North America
Celtis australis	Nettle Tree	Cannabaceae	Tolerant		Mod sensitive	Mod-tolerant			Meditteranean, Balkans
Celtis occidentalis	Hackberry	Cannabaceae	Mod-tolerant		Mod-sensitive	Mod-tolerant	3-9	Pioneer	Eastern North America
Cercidiphyllum japonicum	Katsura Tree	Cercidiphyllaceae	Sensitive		Mod-sensitive	Mod-tolerant	4-9	Late succession	China, Japan, Eastern Himalayas
Cercis canadensis	Redbud	Fabaceae	Mod-tolerant		Sensitive	Mod-tolerant	4-9	Pioneer	Eastern North America, Mexico
Cercis siliquastrum	Judus Tree	Fabaceae	Tolerant		Sensitive	Mod-tolerant	(6)7-8	Pioneer	South Eastern Europe, Western Asia
Cladastris kentukia	Yellow wood	Fabaceae	Mod-sensitive		Sensitive	Mod tolerant	4-8		Eastern North America
Clerodendrum trichotomum	Harlequin glorybower	Verbenaceae	Mod-tolerant		Mod-sensitive	Intolerant	(6)7-9		China,Japan, Korean peninsula, Taiwan
Corylus avellana	Hazel	Betulaceae	Mod-sensitive	Intolerant	Sensitive	Mod-tolerant	4-8	Late succession	Europe
Corylus colurna	Turkish Hazel	Betulaceae	Mod-tolerant	Intolerant	Sensitive	Intolerant	4-7	Pioneer	South East Europe, Western Asia
Crateagus x grignonensis	Grigon Hawthorn	Rosaceae	Mod-tolerant		tolerant	Mod-tolerant	4-7		Hybrid
Crateagus laevigata	Woodland Hawthorn	Rosaceae	Tolerant		Sensitive	Mod-tolerant	4-7		Hybrid
Crateagus x lavallei	Lavallee Hawthorn	Rosaceae	Moderate	Mod-tolerant	Sensitive	Moderate	4-7		Hybrid
Crateagus monogyna	Common Hawthorn	Rosaceae	Tolerant		Sensitive	Intolerant	4-7	Late succession	Europe, Northern Africa, Russia, Afganistan
Crateagus monogyna Stricta		Rosaceae	Mod-tolerant		Sensitive	Mod-tolerant	4-7		

BOTANICAL NAME	ECOSYSTEM SERVICES: Carbon Seq	Avoided Rainwater Runoff	Pollution Removal	Total Benefits Index	ECOSYSTEM DISSERVICES: BVOC Emissions	Allergy Potential ((f) female)	AESTHETIC AND OTHER QUALITIES: Mature Height (m)	Crown Spread (m)	Crown Shape	FOLIAGE: Deciduous	Evergreen	Autumn Colour	FLOWER: Monoecious	Dioecious	Colour	Period	Fruit	Ornamental Bark
Acer buergerianum	High	Medium	Medium	Low	Low	High	10-15	10	Ovoid	•					White	Late Spring	Samara	
Acer campestre	High	Medium	Medium	Medium	Low	Medium	10-15	5-10	Globular	•						Late Spring	Samara	
Acer cappadocicum	High	Medium	Medium	Medium	Low	Medium	15-20	10-15	Ovoid						Yellowish	Late Spring	Samara	
Acer x freemanii	High	Medium	Medium	Medium	Low	Medium	10-15	5-10	Ovoid	•		•			Red	Early Spring	Samara	
Acer ginnala						Medium	10-15		Ovoid	•					Yellow	Late Spring	Samara	
Acer griseum	High	Medium	Medium	Medium	Low	Medium	5-10										Samara	
Acer lobelli							10-15										Samara	
Acer negundo						None (f)	15-20	10-15	Globular	•				•	Red	Early Spring	Samara	
Acer platanoides	High	Medium	Medium	High	Low	High	20+										Samara	
Acer psuedoplatanus	High	High	High	High	Low	High	20+	20+	Globular	•					Greenish	Late Spring	Samara	
Acer rubrum						Medium	20+		Ovoid	•		•	•				Samara	
Acer saccharinum	Medium	Medium	Medium	Medium	Low	High	20+	15-20	Ovoid	•		•			Greenish	Early Spring	Samara	
Acer saccharum						Medium	20+	10	Globular	•		•			Greenish	Late Spring	Samara	
Aesculus x carnea	High	High	High	High	Low	Medium	15-20	10-15	Globular	•					Red/pink	Late Spring	Husk (conker)	
Aesculus hippocastanum	High	High	High	High	Low	Medium	20+	15-20	Globular	•					White	Late Spring	Husk (conker)	
Aesculus indica	High	High	High	High	Low	Medium	10-15	10-15	Globular	•					White	Early Summer	Husk (conker)	
Ailanthus altissima	High	High	High	High	Low		20+	10-15	Globular	•					Greenish	Early Summer	Samara	
Alnus cordata	High	Medium	Medium	Medium	Low	High	15-20.	5-10	Conical	•			•		Catkins	Early Spring	Stalked cone	
Alnus glutinosa	High	Medium	Medium	Medium	Low	High	15-20	5-10	Ovoid	•			•		Catkins	Early Spring	Stalked cone	
Alnis incana	High	Medium	Medium	High	Low	High	15-20	5-10	Conical	•			•		Catkins	Early Spring	Stalked cone	
Alnus spaethii	High	Low	Low	Medium	Low	High	15-20	5-10	Ovoid	•						Early Spring	Stalked cone	
Amelanchier arborea						Low	5-10	5	globular	•		•			White	Early Spring	Berry	
Amelanchier lamarkii						Low	5-7	5	globular	•		•			White	Early Spring	Berry	
Aralia elata						Medium	5-10	5-10	Vase	•		•			White	Early Autumn	Small, round	
Arbutus unedo	High	Low	Low	Low	Low	Low	5-10	5	globular		•				White	Late Autumn	Strawberry like	
Betula albosinensis	High	Medium	Medium	Medium	Low	High	10-15		Ovoid	•		•	•		Catkins	Late Spring	Catkin	•
Betula ermanii	High	Medium	Medium	Medium	Low	High	10-15	10	globular	•		•	•		Catkins	Late Spring	Catkin	•
Betula nigra	High	Medium	Medium	Medium	Low	High	10-15	10	Ovoid	•		•	•		Catkins	Late Spring	Catkin	•
Betula maximowicziana	High	Medium	Medium	Medium	Low	High	10-15	5-10	Ovoid	•		•	•		Catkins	Late Spring	Catkin	•
Betula papyrifera	High	High	High	High	Low	High	10-15	5-10	Ovoid	•		•	•		Catkins	Late Spring	Catkin	•
Betula pendula	High	Medium	Medium	Medium	Low	High	10-15	5-10	Columnar	•		•	•		Catkins	Late Spring	Catkin	•
Betula pubescens	High	Low	Low	Low	Low	High	10-15	5-10	Conical	•		•	•		Catkins	Late Spring	Catkin	•
Betula utilis	High	Medium	Medium	Medium	Low	High	10-15	5.10	Ovoid	•		•	•		Catkins	Late spring	Catkin	•
Carpinus betulus	High	Medium	Medium	Medium	Low	Medium	20+	10-15	Ovoid	•			•		Catkins		Drooping fruit	
Carpinus japonica	High	Medium	Medium	Medium	Low	Medium	10-15		Vase	•		•	•		Catkins		Drooping fruit	
Carya illinoinensis						High	30+	30+	Ovoid	•			•		Catkins		Nut	
Castanea sativa	High	High	High	High	Low	Low	25-30	20-25	Globular	•			•			Late Summer	Nut	
Catalpa bignoniodes	High	Low	Low	Medium	Low	Medium	10-15	5-10	Irregular	•					White	Early Summer	Long seed pod	
Celtis australis						Medium	20-25		Globular	•			•			Late Spring	Drupe	
Celtis occidentalis						Medium	30-35		Globular	•			•			Late Spring	Drupe	
Cercidiphyllum japonicum						Low	25-30		Globular	•		•		•		Late Spring	Pod (female)	
Cercis canadensis	High	Medium	Medium	Medium	Low	Low			Globular								Pod	
Cercis siliquastrum	High	Medium	Medium	Medium	Low	Low			Globular								Pod	
Cladastris kentukia						Medium	10-15	10	Globular	•		•			White	Early summer	Pod	
Clerodendrum trichotomum	High	Low	Low	Low	Low	Low	10		Globular	•					White	Late summer	Berry (black)	
Corylus avellana	High	Low	Medium	Medium	Low	Medium	0-5		Globular	•					Catkins	Late winter	Nut	
Corylus colurna	High	Medium	Medium	Medium	Low	Medium	20-25		Ovoid	•		•	•		Catkins	Late winter	Nut	
Crateagus x grignonensis	High	Low	Low	Low	Low	Low	5-10		Globular	•					White	Late spring	Pome	
Crateagus laevigata	High	Low	Low	Low	Low	Low	5-10		Globular	•					White	Late spring	Pome	
Crateagus x lavallei						Low	5-10		Globular	•					White	Late spring	Pome	
Crateagus monogyna	High	Low	Low	Low	Low	Low	10-15		Globular	•					White	Late spring	Pome	
Crateagus monogyna Stricta						Low											Pome	

Cornus controversa variegata, Cornwall.

BOTANICAL NAME	COMMON NAME	FAMILY	TOLERANCES Drought	Salt	Water logging	Shade	HARDINESS ZONE Zone	Succession	Natural Range
Crateagus prunifolia	Broa Leaved Cockspur Thorn	Rosaceae	Mod-tolerant		Sensitive	Mod-tolerant	4-7		
Davidia involucrata	Handkerchief Tree	Davidaceae	Mod-sensitive		Mod-sensitive	Mod-tolerant	6-7(8)		China
Eucommia ulmoides	Rubber Tree	Eucommiaceae	Tolerant		Mod-sensitive	Mod-tolerant	(4)5-7		In cultivation only
Euonymous europaeus	Spindle Tree	Celastraceae	Mod-tolerant		Mod-sensitive	Mod-tolerant	4-7		Europe. Western Asia
Fagus orientalis	Oriental Beech	Fagaceae	Mod-sensitive	Intolerant	Sensitive	Tolerant	4-7		South Eastern Europe, Western Asia,
Fagus sylvatica	Common Beech	Fagaceae	Mod-sensitive	Intolerant	Sensitive	Tolerant	4-7	Late succession	Europe
Ficus carica	Common Fig	Moraceae	Mod-tolerant		Sensitive	Mod-tolerant	7		Western Asia, South East Europe
Gleditsia triacanthus	Honey locust	Fabaceae	Tolerant	Mod-tolerant	Mod-tolerant	Intolerant	4-9		Central USA
Gymnocladus diocia	Kentucky Coffee Tree	Fabaceae	Mod-tolerant	Mod-tolerant	Mod-sensitive	Mod-tolerant	3-8		Eastern USA
Juglans nigra	Black Walnut	Juglandaceae	Mod-sensitive		Sensitive	Intolerant	4-9	Pioneer	Eastern USA
Juglans regia	Common Walnut	Juglandaceae	Mod-sensitive		Sensitive	Intolerant	(5)6-9		Europe, Western Asia, China
Koelreutaria paniculata	Pride of India	Sapindacea	Tolerant	Mod-tolerant	Sensitive	Mod-tolerant	5-8	Pioneer	China
Lagerstroemia indica	Crape Myrtle	Lythraceae					(6)7-9		
Liquidamber styraciflua	Sweetgum	Altingiaceae	Mod-sensitive	Mod-tolerant	Mod-tolerant	Intolerant	5-9	Pioneer	North Eastern USA
Liriodendron tulipifera	Tulip Tree	Sapindacea	Mod-sesnitive	Intolerant	Sensitive	Mod-tolerant	4-9		North West USA
Magnolia grandiflora	Southern Magnolia	Magnoliaceae	Mod-sensitive	Mod-tolerant	Sensitive	Tolerant	(6)7-9(10)		South East Asia
Magnolia kobus	Kobushi Magnolia	Magnoliaceae	Mod-sensitive		Mod-sensitive	Mod-tolerant	4-8		Japan and South Korea
Malus spp		Rosaceae	Mod-sensitive	Mod-tolerant	Mod-sensitive	Mod-tolerant			Hybrid primarily
Mespilus germanica	Medlar	Rosaceae	Mod-tolerant		Sensitive	Mod-tolerant	(4)5-8		Europe, Caucasus, Western Asia
Morus alba	White Mulberry	Moraceae	Mod-tolerant	Mod-tolerant	Sensitive	Mod-tolerant	(4)5-8(9)		Central, North China
Morus nigra	Black Mulberry	Moraceae	Mod-tolerant		Sensitive	Mod-tolerant	5-9.		Western Asia
Nothofagus antartica	Antartic Beech	Fagaceae	Mod-sensitive		Mod-sensitive	Mod-tolerant			Chile, Argentina
Nyssa sylvatica	Black Tupelo	Nyssaceae	Mod-sensitive	Mod-tolerant	Mod-sensitive	Mod-tolerant	4-9		Eastern USA
Ostrya carpinifolia	Hop Hornbeam	Betulaceae	Mod-tolerant		Mod-tolerant	Mod-tolerant	3-9		Southern Europe and Western Asia
Parrotia persica	Persian Ironwood	Hamamelidacae	Mod-tolerant		Mod-sensitive	Mod-tolerant	(4)5-8		Western Asia
Paulownia tomentosa	Foxglove Tree	Paulowniaceae	Mod-tolerant		Sensitive	Mod-tolerant	(5)6-9	Pioneer	China
Platanus x hispanica	London Plane	Platanaceae	Mod-tolerant		Mod-tolerant	Mod-tolerant	(4)5-8(9)		Hybrid
Platanus orientalis	Oriental Plane	Platanaceae	Mod-tolerant		Mod-tolerant	Mod-tolerant	4-9		Balkan peninsula, Western Asia
Populus alba	White Poplar	Salicaceae	Mod-sensitive	Mod-tolerant	Sensitive	Mod-tolerant	3-8(9)		Central Southern Europe, North Africa, C Asia
Populus nigra	Black Poplar	Salicaceae	Sensitive		Mod-tolerant	Mod-tolerant	3-9		Europe, North Africa, Western Asia
Populus tremula	Eurasian Aspen	Salicaceae	Mod-sensitive		Mod-sensitive	Mod-tolerant	2-5		Europe, Algeria, Russia, Northern Asia
Prunus avium	Wild Cherry	Rosaceae	Mod-sensitive		Sensitive	Mod-tolerant	3-8	Pioneer	Europe, Western Asia
Prunus cerasifera	Cherry Plum	Rosaceae	Tolerant		Sensitive	Mod-tolerant	(4)5-8		Central Europe, Asia
Prunus dulcis	Almond	Rosaceae	Tolerant		Sensitive	Intolerant	5-8		Likely Southern Europe
Prunus maackii	Manchurian Cherry	Rosaceae	Mod-sensitive		Sensitive	Mod-tolerant	3-6		Manchuria, Korean penninsula
Prunus padus	Bird Cherry	Rosaceae	Mod-sensitive		Mod tolerant	Mod-tolerant	3-6		Central Europe, Asia
Prunus sargentii	Sargent's Cherry	Rosaceae	Mod-tolerant		Sensitive	Mod-tolerant	4-7		Northern Japan, Korean peninsula
Prunus serrula	Tibetan Cherry	Rosaceae	Mod-sensitive		Sensitive	Mod-tolerant	5-6		Western China
Pterocarya fraxinifolia	Wing nut	Juglandaceae	Mod-sensitive		Mod-tolerant	Mod-tolerant	(5)6 -8(9)	Pioneer	Western Asia, Caucasus, Northern Iran
Pyrus calleryana Chanticleer		Rosaceae	Tolerant	Mod-tolerant	Sensitive	Intolerent	5-8(9)		China,Japan, Vietnam
Quercus castanifolia	Chestnut Leaved Oak	Fagaceae	Mod-tolerant		Sensitive	Mod-tolerant		Pioneer	Western Asia, Caucasus
Quercus cerris	Turkey Oak	Fagaceae	Tolerant		Sensitive	Mod-tolerant	5-7	Pioneer	Southern Europe, Western Asia
Quercus coccinea	Scarlet Oak	Fagaceae	Tolerant		Sensitive	Mod-tolerant	4-9	Pioneer	Eastern USA
Quercis frainetto	Hungarian Oak	Fagaceae	Tolerant		Sensitive	Mod-tolerant	4-9	Pioneer	South eastern Europe, Balkans
Quercus ilex	Holm Oak	Fagaceae	Tolerant		Sensitive	Mod-tolerant	4-8		Mediterranean, Eastern Asia
Quercius imbricaria	Shingle Oak	Fagaceae	Mod-tolerant		Mod-sensitive	Mod-tolerant	4-8	Pioneer	Eastern USA
Quercis palustris	Pin Oak	Fagaceae	Tolerant	Mod-tolerant	Mod-tolerent	Mod-tolerant	4-8	Pioneer	Eastern USA
Quercus petrea	Sessile Oak	Fagaceae	Mod-tolerant		Mod-tolerent	Mod-tolerant	4-8	Pioneer	Europe, Western Asia
Quercus robur	English Oak	Fagaceae	Mod-sensitive	Mod-tolerant	Mod-sensitive	Mod-tolerant	4-8	Pioneer	Europe, Western Asia
Robinia psuedoacacia	False Acacia	Fabaceae	Mod sensitive	Mod-tolerant	Sensitive	Intolerant	4-8(9)	Pioneer	Eastern USA
Salix alba	White Willow	Salicaceae	Sensitive		Tolerent	Intolerant	2-8(9)	Pioneer	Europe, Asia, North Africa
Salix babylonica	Weeping Willow	Salicaceae	Sensitive		Mod-tolerant	Intolerant	(5)6-8		China

BOTANICAL NAME	ECOSYSTEM SERVICES Carbon Seq	Avoided Rainwater Runoff	Pollution Removal	Total Benefits Index	ECOSYSTEM DISSERVICES BVOC Emissions	Allergy Potential ((f) female)	AESTHETIC AND OTHER QUALITIES Mature Height (m)	Crown Spread (m)	Crown Shape
Crateagus prunifolia						Low			
Davidia involucrata						Low	10-15		Globular
Eucommia ulmoides						None (f)	15-20		Ovoid
Euonymous europaeus						Medium	5-10		Globular
Fagus orientalis						Medium	30+		Globular
Fagus sylvatica	High	High	High	High	Low	Medium	30+		Globular
Ficus carica	High	Low	Low	Low	Low	Low	10		Globular
Gleditsia triacanthus	High	Low	Low	Medium	Low	Medium	30+		Ovoid
Gymnocladus diocia						None (f)	25-30		Globular
Juglans nigra						High	30-40		Globular
Juglans regia	High	High	High	High	Low	High	25-30	15	Globular
Koelreutaria paniculata	High	Medium	Medium	Medium	Low	Low	15-20		Globular
Lagerstroemia indica	High	Low	Low	Low	Low	Low			
Liquidamber styraciflua	Low	Medium	Medium	Medium	Medium	Medium	15-20		Columnar
Liriodendron tulipifera	Medium	Medium	Medium	Medium	Low	Low	50-60+		Columnar
Magnolia grandiflora	High	Medium	Medium	Medium	Medium	Low	25-30		Ovoid
Magnolia kobus	High	Medium	Medium	Medium	Low	Low	15-20	6-8	Ovoid
Malus spp	High	Low	Low	Low	Low	Low	5-6		Ovoid
Mespilus germanica	High	Low	Low	Medium	Low	Low	5-8		Irregular
Morus alba	High	Medium	Medium	Medium	Low	None (f)	10-15		Globular
Morus nigra	High	Medium	Medium	Medium	Low	None (f)	10-15		Gobular
Nothofagus antartica	High	Low	Low	Low	Low	Low	15		Ovoid
Nyssa sylvatica						None (f)	20-25		Conical
Ostrya carpinifolia						Medium	15-20	10-12	Globular
Parrotia persica						Low	15-25		Irregular
Paulownia tomentosa						Low	15-20		Globular
Platanus x hispanica	High	High	High	High	Medium	High	40	25+	Globular
Platanus orientalis	High	High	High	High	Medium	High	30	25+	Globular
Populus alba	High	Medium	Medium	Medium	Medium	None (f)	20-25		Ovoid
Populus nigra	High	Medium	Medium	Medium	Medium	None (f)	35-40		Ovoid
Populus tremula	High	Medium	Medium	Medium	Medium	None (f)	35-40		Ovoid
Prunus avium	High	Medium	Medium	Medium	Low	Medium	20-25	8-10	Globular
Prunus cerasifera	High	Low	Low	Low	Low	Medium	7-9		Globular
Prunus dulcis						Medium	8-10	4-5	Globular
Prunus maackii						Medium	10-12		Ovoid
Prunus padus	High	Low	Low	Medium	Low	Medium	18-20	5-6	Ovoid
Prunus sargentii						Medium	10-15		Globular
Prunus serrula						Mediun	8-10		Globular
Pterocarya fraxinifolia						Medium	30+	25-30	Globular
Pyrus calleryana Chanticleer	High	Low	Medium	Medium	Low	Low	10-15	5-8	Ovoid
Quercus castanifolia	High	Low	Low	Medium	Medium	High	30+	20-25	Globular
Quercus cerris	High	Low	Low	Medium	Medium	High	35+	25-30	Globular
Quercus coccinea							20-25	15-20	Globular
Quercis frainetto	High	Low	Low	Medium	Medium	High	25-30	20-25	Globular
Quercus ilex	High	Low	Low	Medium	Medium	High	25	20	Globular
Quercius imbricaria	High	Low	Low	Medium	Medium	High	30+		Globular
Quercis palustris	High	Medium	Medium	Medium	High	High	20-25		Globular
Quercus petrea	High	Medium	Medium	Medium	High	High	35+	25-30	Globular
Quercus robur	High	Medium	Medium	Medium	Medium	High	35+	25-30	Globular
Robinia psuedoacacia	High	Medium	Medium	High	Low	Medium	25		Vase
Salix alba	High	Medium	Medium	Medium	Medium	None (f)	25-30		Irregular
Salix babylonica						None (f)	15-20		Weeping

BOTANICAL NAME	FOLIAGE Deciduous	Evergreen	Autumn Colour	FLOWER Monoecious	Dioecious	Colour	Period	Fruit	Ornamental Bark
Crateagus prunifolia								Pome	
Davidia involucrata	•					White bracts	Late Spring	Drupe	
Eucommia ulmoides	•				•	Indistinct		Winged (female)	
Euonymous europaeus	•		•			Yellow/green	Late spring	Husk (orange)	
Fagus orientalis	•		•	•		Indistinct	Late Spring	Nut (small)	
Fagus sylvatica	•		•	•		Indistinct	Late Spring	Nut (small)	
Ficus carica	•			•		Indistinct		Pear shaped	
Gleditsia triacanthus	•		•	•		Indistinct	Early Summer	Pod	
Gymnocladus diocia	•		•		•	Green/white	Early Summer	Pod	
Juglans nigra	•		•	•		Indistinct	Late Spring	Husk (nut)	
Juglans regia	•		•	•		Indistinct	Late Spring	Husk (nut)	
Koelreutaria paniculata	•		•			Yellow	Late Summer	Capsule	
Lagerstroemia indica									
Liquidamber styraciflua	•		•			Indistinct	Ealy Summer	Spikey capsule	
Liriodendron tulipifera	•		•			Indistinct	Summer	Winged seed	
Magnolia grandiflora		•				White	Late Summer	Folicles	
Magnolia kobus	•					White	Early Spring	Folicles	
Malus spp	•					White/pink	Late Spring	Crab apple	
Mespilus germanica	•					White	Late Spring	Medlar	
Morus alba	•				•	Indistinct	Late spring	Mulberry	
Morus nigra	•				•	Indistinct	Late Spring	Mulberry	
Nothofagus antartica	•			•		Indistinct	Early Summer	Nutlet	
Nyssa sylvatica	•		•		•	Greenish	Late Spring	Drupe (black)	
Ostrya carpinifolia	•			•		Catkins	Late Spring	Husk (nutlets)	
Parrotia persica	•		•			Pink		Spikey capsule	
Paulownia tomentosa	•					Light purple	Late Spring	Capsule	
Platanus x hispanica	•			•		Indistinct	Late Spring	Plane ball	•
Platanus orientalis	•			•		Indistinct	Late Spring	Plane ball	•
Populus alba	•				•	Indistinct	Early Spring	Capsule (female)	
Populus nigra	•				•	Indistinct	Early Spring	Capsule (female)	
Populus tremula	•		•		•	Indistinct	Late Winter	Capsule (female)	
Prunus avium								Drupe (red)	
Prunus cerasifera	•					White	Early Spring	Drupe (red)	
Prunus dulcis	•					White	Early Spring	Drupe	
Prunus maackii	•					White	Late Spring	Drupe (black)	•
Prunus padus	•					White	Late Spring	Drupe (black)	
Prunus sargentii	•		•			Pink	Early Spring	Drupe (black)	
Prunus serrula	•		•			White	Late Spring	Drupe (red)	•
Pterocarya fraxinifolia	•			•		Catkins	Late Spring	Nutlets	
Pyrus calleryana Chanticleer	•		•			White	Late Spring	Pome (rare)	
Quercus castanifolia	•			•	•	Indistinct	Late Spring	Acorn	
Quercus cerris	•			•		Indistinct	Late Spring	Acorn	
Quercus coccinea	•			•		Indistinct	Late Spring	Acorn	
Quercis frainetto	•			•		Indistinct	Late Spring	Acorn	
Quercus ilex		•		•		Indistinct	Late Spring	Acorn	
Quercius imbricaria	•			•		Indistinct	Late Spring	Acorn	
Quercis palustris	•		•	•		Indistinct	Late Spring	Acorn	
Quercus petrea	•			•		Indistinct	Late Spring	Acorn	
Quercus robur	•			•		Indistinct	Late Spring	Acorn	
Robinia psuedoacacia	•					Cream	Early Summer	Pod	
Salix alba	•				•	Indistinct	Late Spring	Capsule	
Salix babylonica	•				•	Indistinct	Late Spring	Capsule	

Abies procera Glauca, Cornwall.

BOTANICAL NAME	COMMON NAME	FAMILY	TOLERANCES				HARDINESS ZONE			ECOSYSTEM SERVICES				ECOSYSTEM DISSERVICES		AESTHETIC AND OTHER QUALITIES			FOLIAGE			FLOWER					
			Drought	Salt	Water logging	Shade	Zone	Succession	Natural Range	Carbon Seq	Avoided Rainwater Runoff	Pollution Removal	Total Benefits Index	BVOC Emissions	Allergy Potential ((f) female)	Mature Height (m)	Crown Spread (m)	Crown Shape	Deciduous	Evergreen	Autumn Colour	Monoecious	Dioecious	Colour	Period	Fruit	Ornamental Bark
Salix caprea	Goat Willow	Salicaceae	Mod-sensitive		Mod-tolerant	Mod-tolerant	4-8	Pioneer	Europe, Asia	High	Medium	Medium	High	Medium	None (f)	10-15		Irregular	•				•	Indistinct	Late Spring	Capsule	
Salix daphnoides	Violet Willow	Salicaceae	Sensitive		Mod-tolerant	Mod-tolerant	4-8		Europe						None (f)	10-15		Ovoid	•				•	Indistinct	Late Spring	Capsule	
Sorbus aria	Whitebeam	Rosaceae	Tolerant	Mod-tolerant	Sensitive	Mod-tolerant	5		Europe	High	High	High	High	Low	Low	15-20	5-8	Oval	•					White	Late Spring	Pome (red)	
Sorbus aucuparia	Mountain Ash	Rosaceae	Mod sensitive	Mod-tolerant	Sensitive	Mod-tolerant	3-6	Late succession	Europe	High	Low	Low	Medium	Low	Low	5-20	5-8	Oval	•		•			White	Late Spring	Pome (red)	
Styphnolobium japonicum	Japanese Pagoda Tree	Fabaceae	Mod-tolerant		Sensitive	Mod-tolerant	4-7	Pioneer	Central and Western China, Korea						Medium	20-25	15-20	Globular	•		•			Cream	Late Spring	Pod (rare in UK)	
Tamarix tetandra	Tamarisk	Tamaricaceae	Tolerant	Mod-tolerant	Sensitive	Intolerant	3-8		South Eastern Europe						Medium	4-6		Irregular	•					Pink	Early Summer	Capsule	
Taxus baccata	Common Yew	Taxacea	Tolerant		Sensitive	Tolerant	(5)6-7	Mid succession	Europe, Western Asia, North Africa						None (f)	15-18		Irregular		•			•		Early Spring	Red Nut (female)	
Tilia americana	American Lime	Malvaceae	Mod-tolerant		Sensitive	Tolerant	3-9(9)	Late succession	Eastern USA, South esatern Canada	Medium	Medium	Medium	Medium	Low	Medium	35-40	20+	Oval	•		•			Cream	Early Summer	Nut Like (10mm)	
Tilia cordata	Small leaved Lime	Malvaceae	Mod-sensitive		Sensitive	Tolerant	3-7	Late succession	Europe, Western Asia	Medium	Medium	Medium	Medium	Low	Medium	30+	15+	Globular	•		•			Cream	Early Summer	Nut Like (5mm))	
Tilia x euchlora	Caucasian Lime	Malvaceae	Mod-sensitive		Sensitive	Mod-tolerant	3-7	Late succession	Hybrid	Medium	Medium	Medium	Medium	Low	Medium	20+	15+	Oval	•		•			Cream	Early Summer	Nut Like (sterile)	
Tilia europaea	Common Lime	Malvaceae	Mod-sensitive		Sensitive	Mod-tolerant	3-7	Late succession	Hybrid	Medium	Medium	Medium	Medium	Low	Medium	30+	15+	Oval	•		•			Cream	Early Summer	Nut Like (8mm)	
Tilia henryana		Malvaceae	Mod-sensitive		Sensitive	Mod-tolerant	3-7	Late succession	China						Era mm	15-20	5-8	Oval	•		•			Cream	Late Summer	Nut Like (5-6mm)	
Tilia mongolica	Mongolican Lime	Malvaceae	Mod tolerant		Sensitive	Mod-tolerant	4-6	Late succession	Mongolia, China	Medium	Medium	Medium	Medium	Low	Medium	10	5-8	Oval	•		•			Cream	Late Summer	Nut Like (5-6mm)	
Tilia platyphylos	Broad leaved Lime	Malvaceae	Mod-sensitive		Sensitive	Tolerant	4-6	Late succession	Europe, Western Asia	Medium	High	High	High	Medium	Medium	35-40	20	Oval	•		•			Cream	Early Summer	Nut Like (9mm)	
Tilia tomentosa	Silver Lime	Malvaceae	Mod-tolerant		Sensitive	Mod-tolerant	4-6	Late succession	South East Europe, Balkans, Western Asia	Medium	Medium	Medium	Medium	Low	Medium		10-15	Oval	•		•			Cream	Early Summer	Nut Like(7mm)	
Ulmus spp.	Elm	Ulmaceae	Mod-tolerant	Mod-tolerant	Mod-sensitive	Mod-tolerant	4-6		DED resistant cultivars	Medium	High	High	High	Low	Medium	20+	8-10	Variable	•					Indistinct	Early Spring	Winged Nutlets	
Zelkova serrata	Japanese Zelkova	Ulmaceae	Mod-tolerant		Sensitive	Mod-tolerant	(4)5-8		China, Japan	High	Medium	Medium	Medium	Low	High	25-30		Vase	•			•		Indistinct	Late Spring	Drupe	
CONIFERS																											
Abies fraserii	Fraser Fir	Pinaceae	Mod-sensitive		Mod-sensitive	Tolerant	4-7	Late succession	Eastern USA						Low	15-25		Columnar		•				Indistinct	Early Summer	Cone (3-6cm)	
Abies koreana	Korean Fir	Pinaceae	Mod-sensitive		Mod-sensitive	Tolerant	5-6(7)	Late succession	South Korea						Low	10-15.		Conical		•				Indistinct	Early Summer	Cone (4-9cm)	
Abies nordmanniana	Caucasian Fir	Pinaceae	Mod-sensitive		Mod-sensitive	Tolerant	4-6	Late succession	Eastern Europe,Western Asia						Low	30-50		Conical		•				Indistinct	Early Summer	Cone (10-12cm)	
Cedrus atlantica	Atlas Cedar	Pinaceae	Tolerant		Sensitive	Mod-tolerant	6-9		Morroco, Algeria	Medium	High	High	High	Medium	Low	40-50		Conical		•		•			Late Summer	Cone (5-8cm)	
Cedrus deodora	Deodor Cedar	Pinaceae	Tolerant		Sensitive	Mod-tolerant	7-8(9)		Afghanistan, Northern India, Western Nepal	Medium	High	High	High	Medium	Low	40-50		Conical		•					Late Summer	Cone (8-10cm)	
Cedrus libani	Cedar of Lebanon	Pinaceae	Tolerant		Sensitive	Mod-tolerant	5-7		Lebanon, Syria	Medium	High	High	High	Medium	Low	30-40		Conical		•					Early Autumn	Cone (8-10cm	
Chamaecyparis lawsoniana	Lawson Cypress	Cupressaceae	Mod-tolerant		Sensitive	Mod-tolerant	5-7		North Western USA						High	60-70		Conical		•		•		Indistinct	Late Spring	Cone (10mm)	
Cryptomeria japonica	Japanese Cedar	Cupressaceae	Mod-tolerant	Mod-tolerant	Mod-sesnitive	Mod-tolerant	5-6	Late succession	Japan						Low	45-50		Conical		•		•		Indistinct		Cone (1-3cm)	
x Cuprocyparis leyandii	Leyland Cypress	Cupressaceae	Tolerant		Sensitive	Intolerant	6-10		Hybrid						High	25+		Columnar		•		•		Indistinct			
Cupressus macrocarpa	Montery Cypress	Cupressaceae	Tolerant	Mod-tolerant	Sensitive	Intolerant	6-10		California	Medium	High	High	High	Medium	High	25-40		Conical		•		•		Indistinct		Cone (3-4cm)	
Gingko biloba	Maidenhair Tree	Ginkgoaceae	Tolerant		Sensitive	Mod-tolerant	4-8(9)		China						None (f)	25-30.		Ovoid	•		•		•	Indistinct	Early Spring	Drupe (female)	
Larix decidua	Common Larch	Pinaceae					3-6	Pioneer		Medium	Medium	Medium	Medium	Low	Low												
Larix x eurolepsis		Pinaceae					3-6	Pioneer		Medium	Medium	Medium	medium	Low	Low												
Larix kaempferi	Japanese Larch	Pinaceae					3-6	Pioneer		Medium	Medium	Medium	Medium	Low	Low												
Metasequoia glyptostroboides	Dawn Redwood	Cupressaceae	Mod tolerant	Intolerant	Sensitive	Mod-tolerant	(4)5-8	Pioneer		Medium	High	High	High	Medium	Low	30-35		Conical		•		•		Indistinct	Late Spring		
Pinus nigra Austriaca	Austrian Pine	Pinaceae	Tolerant	Mod-tolerant	Sensitive	Mod-tolerant	3-7	Pioneer	Central, Southern Europe	Medium	Medium	medium	Medium	Medium	Low	35-40		Conical		•				Indistinct	Late Spring	Cone	
Pinus maritima	Corsican Pine	Pinaceae		Mod-tolerant			3-7	Pioneer		Medium	Medium	Medium	Medium	Medium	Low												
Pinus pinaster	Martitme Pine	Pinaceae	Mod-tolerant		Sensitive	Intolerant	3-7		Mediterranean	Medium	Medium	Medium	Medium	Low	Low	35-40		Conical		•				Indistinct	Late Spring	Cone	
Pinus pinea	Italian Stone Pine	Pinaceae	Tolerant		Sensitive	Mod-tolerant	3-7		Iberean peninsula	Medium	Medium	Medium	Medium	Low	Low	20-25		Conical		•				Indistinct	Late Spring	Cone	
Pinus radiata	Montery Pine	Pinaceae	Mod-tolerant		Sensitive	Mod-tolerant	3-7		California	Medium	Medium	Medium	Medium	Low	Low	35-40		Irregular		•				Indistinct	Late Spring	Cone	
Pinus strobus	Eastern White Pine	Pinaceae	Mod-sensitive	Intolerant	Sensitive	Mod-tolerant	3-7		Eastern USA, Southern Canada						Low	70-80		Conical		•				Indistinct	Late Spring	Cone	
Pinus sylvestris	Scots Pine	Pinaceae	Tolerant	Mod-tolerant	Mod-sensitive	Intolerant	3-7	Pioneer	Europe, Northern Asia	Medium	Medium	Medium	Medium	Low	Low	35-40		Conical		•				Indistinct	Late Spring	Cone	
Pinus wallichiana	Bhutan Pine	Pinaceae	Mod-sensitive		Sensitive	Intolerant	5-7		Himalayas	Medium	Medium	Medium	Medium	Low	Low	40-50		Conical		•				Indistinct	Late Spring	Cone	
Sequoiadendron giganiticum	Wellingtonia	Cupressaceae	Mod-tolerant		Sensitive	Mod-tolerant	6-8	Pioneer	California USA	Medium	Medium	Medium	High	Medium	Medium	50-60		Conical		•		•		Indistinct	Late Spring	Cone (2-3cm)	
Sequoia sempervirens	Coastal Redwood	Cupressaceae	Mod-tolerant		Sensitive	Tolerant	7-9		Northern California, Southern Oregon USA	Medium	Medium	Medium	High	Medium	Medium	50-60		Conical		•		•				Cone (2-3cm)	
Taxodium distichum	Swamp Cypress	Cupressaceae	Mod-tolerant	Mod-tolerant	Mod-sensitive	Mod-tolerant	4-11		South central, south eastern USA	Medium	Medium	Medium	Medium	Medium	High	35-50		Conical	•			•		Indistinct	Early Spring	Cone (2-4cm)	

Pterocarya fraxinifolia, Kew, London.

6.0 CONCLUSION

FINAL THOUGHTS

The selection of trees for successful planting and longevity in the landscape is a complex process involving many decisions and potential decision makers. Hopefully this guide will be of use and aid that process.

However, I still believe the subject is a specialism and that specialist advice should be sought throughout the decision making process. It has to be remembered, that no matter how educated and thoughtful the choice of species is, poor planting technique coupled with poor and inadequate post planting maintenance will inevitably lead to failure.

Contacts
If you would like to discuss the subject, in greater detail, then please contact: keith@barchamtrees.co.uk

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Further useful reading:

A Guide to Tree Species Selection: Trees and Design Action Group (TDAG)

Applied Tree Biology: Andrew Hirons and Peter Thomas. Wiley/Blackwell

BS8545: Trees from Nursery to Independence in the Landscape

Its Time for Trees: Barcham Trees

Manual of Woody Landscape Plants: Michael A. Dirr

Recommended Urban Trees: Site Assessment and Tree Selection for Stress Tolerance: Nina Bassuk et al. Cornell University

The Urban Forest: Cultivating Green Infrastructure for people and the Environment. David Pearlmutter et al. Springer Press

Trees for Tough Urban Sites: Dr Henrik Sjoman. Swedish University of Agricultural Science

Trees in the Urban Landscape: Site Assessment, Design and Installation: Peter Trowbridge and Nina L Bassuk.

The above is by no means a fully comprehensive list of references but are titles I have found particularly useful and informative during the preparation of this guide.

Also recommended are:

https://citree.ddns.net/?language=en which is a particularly good data-based aid to tree species selection prepared at the International School of Forestry and Forestry Products, Thrandt, Germany.

Arboricultural Association: www.trees.org.uk

Trees and Design Action Group: www.tdag.org.uk

Thank you on an individual level to Dr Henrik Sjoman.
Dr Andrew Hirons and Kenton Rogers for lengthy discussions and guidance in the preparation of this manual.

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