NATIONAL TREE SAFETY GROUP

Common sense risk management of trees

Guidance on trees and public safety in the UK for owners, managers and advisers

NTSG

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Guidance on trees and public safety in the UK for owners, managers and advisers

The Health and Safety Executive was consulted in the production of this publication. It endorses the sensible, proportionate, reasonable and balanced advice to owners on managing the risk from trees set out in the guidance.

“Safety is but one of the many goals to which we aspire; the mistake that is often made is to focus on safety as if it is the only goal”

PROFESSOR DAVID BALL
Centre for Decision Analysis and Risk Management
Middlesex University

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N|T|S|G

The National Tree Safety Group

The National Tree Safety Group (NTSG) is a broad partnership of organisations that have come together to develop nationally recognised guidance on tree safety management that is proportionate to the actual risk from trees. NTSG membership is open to all interested stakeholder organisations and groups.

NTSG MEMBERSHIP

Professional bodies

- Arboricultural Association
- B/213 Trees Committee of the British Standards Institution (BSI)
- Institute of Chartered Foresters
- London Tree Officers Association
- Royal Institution of Chartered Surveyors
- The Tree Council
- Visitor Safety in the Countryside Group

Tree owners and managers

- British Holiday & Home Parks Association Ltd
- Confederation of Forest Industries (UK) Ltd
- Country Land and Business Association
- English Heritage
- Essex County Council
- Forestry Commission
- National Farmers Union

Organisations with heritage and/or conservation interests

- Ancient Tree Forum
- Campaign to Protect Rural England
- English Heritage
- National Trust
- Woodland Trust

Risk research consultants

- Centre for Decision Analysis and Risk Management, Middlesex University

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Foreword

We are most aware of unlikely and unusual events, and those things which are most important to us are often the least appreciated and taken for granted. Terrorist attacks, severe earthquakes or tsunami are part of our news but not part of most of our lives. Few of us ever experience the tragic consequences of a fatality or a serious injury as a consequence of tree failure. However, while, happily, such tree-related events are rare, when they do occur they are newsworthy because of their very infrequency. The infrequency of tree failure events is in contrast to the ubiquity of trees, which define our landscape from the centre of our capital cities to the most remote of places. The majority of us see trees every day, they populate our countryside and towns, our parks and gardens to such an extent that we can easily forget their importance to our quality of life.

Naturally and rightly, fatal and serious accidents are investigated and can result in litigation. In such cases, there is a need for the health and safety authorities and the courts to understand both the value of trees and the context of the management of trees and good practice against which any individual case can be compared. This also provides a benchmark for managers to work with. However, because of the importance of trees in our landscape and society, the infrequency of tree failure events and the wide range of environments in which trees occur, great care needs to be taken not to create another level of burdensome regulation.

This guidance has not been a hastily drawn up document. Sometime at the end of 2007 a group of us, drawn from as wide as possible a range of organisations interested in trees, met to discuss how best to codify the best, generally accepted and balanced approach to managing risks from trees. This group organised, in April 2008, a well-attended conference at the Royal Geographical Society and following this debate the National Tree Safety Group was formed. From the outset, the group wished to draw together current information and good practice to develop a common sense and practical approach to managing risks from trees. It commissioned research into risk relevant to tree management and undertook to produce a suite of information and guidance on managing the risks from trees, of which this is the main document. It has been an extraordinary journey bringing together arboriculturists and foresters, the public, private and charitable sectors, landowners and managers and the rural and the urban. What has been rewarding and delightful has been the extent of common understanding born from a common love and knowledge of trees. We would like to thank all those whose funding, hard work, time and energy has made this document possible. While there are too many to name individually, we would like to thank Jim Smith particularly for his final editing and overseeing of the production of this guidance.

Judith Webb MBE and **Sir Harry Studholme**
Chairs of the National Tree Safety Group

Preface

As I write this preface, we have just experienced two weeks of almost continuous gale force winds during a period when our deciduous broadleaved trees are in full leaf; the saving grace for us, as tree managers, is that it has been an exceptionally dry spring, with over nine weeks of drought and root to soil is un-lubricated. If it had been a wet spring, we may well have been busy clearing up fallen trees. Winds are a climatic factor that all arboriculturists feel uneasy with, as it is a test of our tree management skills and, in particular, our judgement.

As the Head of the Arboretum, I am responsible for the curation and management of more than 14,000 specimen trees at the Royal Botanic Gardens, Kew, managing a team of five arborists who, in their daily work, carry out hazard evaluation of our collections in order to avoid litigation and maintain our duty of care for our staff who work under them and our million visitors a year who walk beneath them. Many of these specimens are old and extremely rare, both in their natural habitat and in private collections, and removal may not be practicable from a conservation standpoint. Therefore, a more in-depth risk assessment with a list of possible controls, such as thinning end weight, scaffold removal, cable bracing, fencing to keep out the public, or diverting the target will be needed to reduce the risk rating before the saw.

With my family, I have just visited and been inspired by a huge black walnut (*Juglans nigra*) in a famous London park boasting the largest of its kind in the British Isles. It has extremely large, heavy scaffolds, with open cavities, supported by several cables. There is also evidence of previous branch failure on the huge bole, but, for added comfort, the drip line is surrounded by a permanent fence, keeping the public out should the tree decide the end has come. This incredible walnut tree can still be admired by visitors to the park in safety and the arborist or garden manager can sleep comfortably at night.

Fortunately, many tree managers are well aware of the many benefits that trees provide, particularly our veteran trees with what I call their "Harry Potter" characters, whether they grow in woodlands, private gardens or urban areas, and life would be dull without our beautiful treescape. However, we are often faced with the dilemma of removal or retention in the name of health and safety. This is where a common sense approach is necessary before wielding the chainsaw and options to save are often overlooked.

At last, we have a guidance document produced by the National Tree Safety Group that will help all of us who work in the tree sector to make that judgement call. The strength of this document is that it has been produced by calling on the expertise of tree professionals from a wide range of interests and focuses on proportionate reaction against the benefits that trees provide: at last, a common sense approach.

Tony Kirkham
Head of the Arboretum
Royal Botanic Gardens, Kew

1 Introduction

“Trees form part of the overall landscape and their presence has many different benefits depending on how the land is used”

■ **The Lucombe Oak, Phear Park, Exmouth; retained as children’s play equipment.** © *The Tree Council*

The National Tree Safety Group's (NTSG) aim is to develop a nationally recognised approach to tree safety management and to provide guidance that is proportionate to the actual risks from trees.

This guidance is based on a set of basic principles developed by the NTSG for considering and managing tree safety in the public interest. These principles are set out in the position statement, *Managing risks from trees* at Appendix 1. The overall approach is that a balance should be struck between risks and benefits. This document gives guidance supporting the NTSG position, which can be summarised as:

The NTSG believes that one fundamental concept should underlie the management of risks from trees. It is that the evaluation of what is reasonable should be based upon a balance between benefit and risk. This evaluation can be undertaken only in a local context, since trees provide many different types of benefit in a range of different circumstances.

The NTSG position is underpinned by a set of five key principles:

- trees provide a wide variety of benefits to society
- trees are living organisms that naturally lose branches or fall
- the overall risk to human safety is extremely low
- tree owners have a legal duty of care
- tree owners should take a balanced and proportionate approach to tree safety management.

Managing the risk from trees is the responsibility of the owners and managers of the land on which they grow. There are many different types of landowner and trees grow in many different environments. This guidance has been developed to support the work of all those involved in tree management; whether connected with streets, parks, public open spaces, businesses such as hotels or farms, private estates, woodland, commercial forestry or private gardens. This document's content and structure reflects the NTSG's five key principles.

Context

This document integrates and updates issues concerning trees and their management for human safety, bringing together concepts from several other national guidance documents.

In recent years, many owners and managers of trees have been seeking clear and concise guidance on what is expected of them in terms of fulfilling their moral and legal responsibilities with respect to the trees on their estate or property. There is a pervasive perception in today's risk-averse society that the decisions people may make about the safety of trees on their land could result in an incident with serious legal and financial consequences, not to mention loss of life and injury.

The NTSG believes that guidance which assists in setting a standard of action for tree owners, challenging this risk-averse approach, would be beneficial. This document is supported by a wide range of stakeholders involved in the ownership

and management of trees. It provides guidance for inspecting and maintaining trees; guidance that is reasonable and proportionate to: the low risk from trees, the benefits of trees, and the health and safety obligations of those responsible for trees. As a national guidance document produced by an authoritative and representative group, its content and recommendations, if followed, should assist trees owners involved in personal injury or compensation claims when presented to the court as supporting documentation.

Undoubtedly, important trees have been removed, and there is anecdotal evidence to suggest that, across all the different ownership categories, trees have been and are being removed unnecessarily due to the fear of litigation. In many cases, the value of trees is not easy to express in monetary terms. However, credible methods of tree valuation are becoming more accepted and tree owners can ascribe a financial value to their trees if they wish to do so. It is harder still to put a financial value on all the ecosystem services that trees provide across the broad spectrum of land use types. These include environmental and societal values – those esoteric and social values enjoyed by everybody but whose benefits are indirect. Examples are: better mental health, biodiversity, improved local environment and social cohesion. Set against these benefits are the costs of maintenance and the fear of litigation. The NTSG position statement argues that it is reasonable to include societal value and benefit in the calculation of what is reasonable where a landowner or manager is acting in the public interest. This document sets out the NTSG position and seeks to put forward a credible and defendable approach to tree risk management.

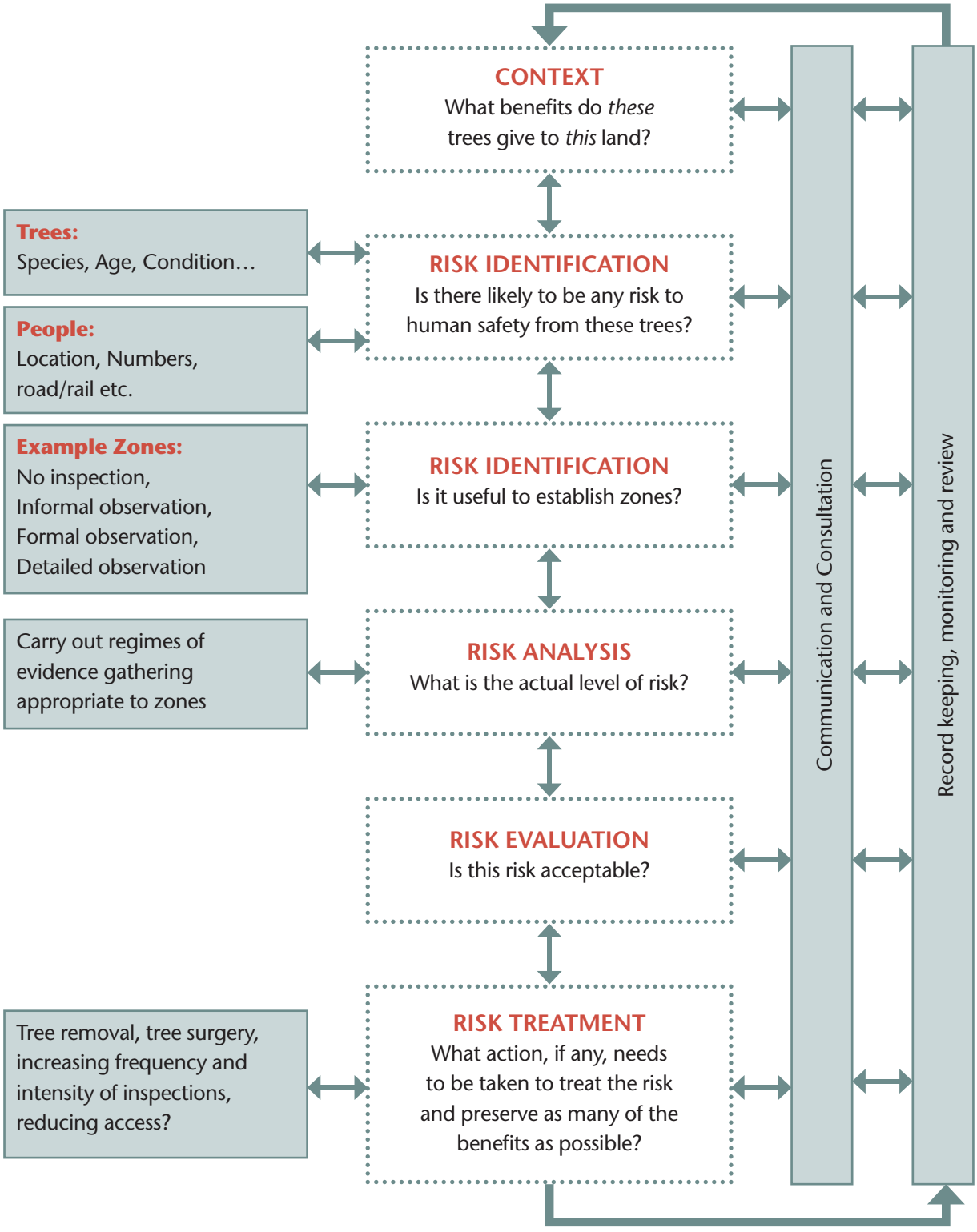
The objectives of tree risk management

The management of risk, when properly organised, enables an organisation, among other things, to:

- increase the likelihood of achieving its objectives
- identify and control the risk
- comply with relevant legal and regulatory requirements
- improve stakeholder confidence and trust.

Trees form part of the overall landscape and their presence has many different benefits depending on how the land is used. Not all trees are managed and, even for those that are, such management forms a component of overall land management. Human safety is one part of that management. It is important to recognise, therefore, that risk management can be undertaken only by understanding the trees and their value to people in the context within which they grow. This context naturally includes their distribution in relation to the population that might be harmed. The requirement under health and safety legislation is to have a suitable and sufficient risk assessment, and to apply measures that are reasonable and practicable. This guidance shows an integrated approach to that process within the wider context of land ownership and management.

Figure 1. **Risk Management Process**



Securing the many benefits of trees to society

Trees are fundamental to our wellbeing and quality of life. Their size, number and age make them one of the most visible and continuous aspects of our lives. Their beauty and majesty have inspired artists, poets and writers. Trees may be significant to us personally, marking historical occasions, commemorating a birth, family event or celebration of a life.

In seeking to provide guidance on tree risk management, it is first necessary to identify those benefits accrued from the presence of trees that are secured for society, by following the risk management process. These are the objectives or goals of the risk management process. In the context of this document, these objectives are the many benefits that trees bestow on our lives. Appendix 2 provides further detail on these benefits and it looks at some of the many benefits provided by the millions of trees in the United Kingdom (UK) and examines their contribution to our health, wealth and wellbeing.

Briefly, these include, but are not limited to, the various ecosystem services that trees as one element of the natural environment provide to our society. These ecosystem services cover a wide spectrum of benefits ranging across social, economic and environmental areas. It is now broadly accepted that failure to value, consider and enhance those natural elements that provide these ecosystem services diminishes our society as a whole. This approach builds on traditional conservationist attitudes and recognises linkages between land, water, air and biodiversity.

Trees are integral to most natural land-based ecosystems, providing a wide range of ecosystem services to humankind, including mitigating the harmful effects of climate change as well as assisting with climate adaptation. Trees are an important part of the economy, providing timber and non-timber forest products. They also bring communities together, playing a part in their cultural and spiritual values and aesthetic appreciation.

> *"Three hundred years growing. Three hundred years standing. Three hundred years decaying."* ***Peter Collinson (1776) on the life cycle of English oak and sweet chestnut.***

Their importance is recognised in international, national and local government policies, and many non-governmental organisations have policies dedicated to conserving trees and their biodiversity.

The overall approach to tree management can be established only if the advantages particular trees offer are evaluated in their own local context. People's safety is undoubtedly an important consideration, whether trees are managed for their cultural, amenity, heritage or environmental benefits or for timber production and other commercial interests. However, the NTSG believes the safety aspect of tree management must be evaluated alongside these other benefits and the management practices that seek to provide them. The consideration of benefit before the examination of risk and legal obligation highlights the importance of context.

“The overall approach to tree management can be established only if the advantages particular trees offer are evaluated in their own local context”

■ **Boundary hedgerow trees.** © *The Tree Council*

The scale of what is reasonable cannot be developed in any other way. It is not sufficient to say that trees provide benefits and their overall risk is low and so nothing need be done to any tree anywhere. It is, however, reasonable to conclude that, in many cases, nothing at all needs to be done to the trees, since the likelihood of a death or injury is tiny given that trees are extremely unlikely to fall on people. Such a consideration, assuming it is accurate, would be enough to satisfy the requirement for a suitable and sufficient risk assessment under health and safety legislation.

Even where there is a potential for people to be harmed, management action to reduce the risk could also vary considerably depending on the tree's value.

The Health and Safety Executive (HSE), in producing guidance for HSE inspectors and local authority enforcement officers, has stated that:

> *"…public safety aspects can be addressed as part of the approach to managing tree health and tree owners should be encouraged to consider public safety as part of their overall approach to tree management."* [1]

Acknowledging trees are living organisms that naturally lose branches or fall

In recent years, there has been a step change in society that appears on one level to demand a more natural holistic provision of green infrastructure and outdoor space. At the same time, it also demands that people are increasingly cosseted from the rough edges of nature when they use or interact with it. This dilemma seems to stem from a societal change that encourages litigation as a means of resolving disputes, creating a driver that makes some tree owners greatly more risk-averse than they would otherwise have been.

■ **Economic benefits: providing income, jobs and a sustainable resource.** © *Forestry Commission/John McFarlane*

■ **Social benefits: providing recreation and improved physical and mental wellbeing.**
© Forestry Commission, Coed Y Cymoedd FD

The consequence of this for tree owners is the perception that those natural features and characteristics of trees that have evolved over millennia as part of complex ecosystems present risk to people and are therefore problematic and require intensive management. Examples are: deadwood, shedding branches, cavities, decayed timber, fallen trees, split branches etc.

Trees' capacity for long life and their ability to grow to great height and size makes them important to people, providing durable and useful materials, and protection from the elements. When allowed to complete their natural life cycle, trees provide habitat supporting a diversity of dependent species and, generally, as trees age, their associated biodiversity increases. Trees are keystone species. Their importance for biodiversity is such that, when they are removed from an ecosystem, the entire set of connections between inter-dependent species breaks down and the system collapses.

Appendix 3 develops the argument that overstating a tree's potential to cause death or injury risks the over-zealous removal of the whole tree or dead wood and other habitats, which play a crucial role in maintaining some of the benefits of trees in both the rural and urban context.

It is a particular challenge of tree management that, unlike man-made structures, it is entirely normal and natural for trees to shed parts and eventually to fall. This guidance and the NTSG position statement argue strongly that decisions about risk can be undertaken only by making balanced judgments. Technical estimates of a tree's likelihood to fail are only part of the picture – in many instances, the level of risk is insufficient to warrant an inspection.

The information in Appendix 3 reinforces the concept that management must focus on the role and function of trees as living organisms as one part of a complex ecosystem.

Understanding the risks from trees

2

The overall risk to human safety is extremely low

This chapter outlines the HSE's decision-making framework, known as the Tolerability of Risk (ToR) Framework. It describes three levels: whether a risk is unacceptable, tolerable or broadly acceptable. There is an expectation that:

- both the level of individual risks and the societal concerns engendered by the activity or process must be taken into account when deciding whether a risk is unacceptable, tolerable or broadly acceptable
- a suitable and sufficient risk assessment must be undertaken to determine the measures needed to ensure that risks from the hazard are adequately controlled
- there is a need to guard against disproportionate activity to control risk that provides diminishing returns on investment in risk reduction.

Research by the Centre for Decision Analysis and Risk Management (DARM) on behalf of the NTSG (see below) has addressed this point. It demonstrates that the overall risk to the public from falling trees is extremely low, representing about a one in 10 million chance of an individual being killed by a falling tree (or part of a tree) in any given year[1]. The research also shows that there is limited societal concern about risks of this type (although there may be adverse publicity in the immediate aftermath of an individual incident). The analysis indicated that it would be unlikely that adjustments to the current overall management regime would reduce the risk to health and safety in any significant way.

Real risks and public concerns

Trees grow in many different situations, and within areas of widely varying levels of public access or other human activity. Where it is appropriate to manage trees, this management should seek to enhance their significance (in terms of value, access and other benefits) and all the other ecosystem service, biodiversity and social benefits they provide, and to manage the undesirable impacts they can have (such as damage to property and risk to human safety). Considerable concern and uncertainty about managing trees for safety has arisen in the last few years. This has largely been stimulated by a number of court cases and other responses to rare incidents where a falling tree or branch has killed or injured a person. Addressing these concerns requires information about the "real" risk involved and the level of public concern.

Risk tolerability: a philosophy of risks, values, benefits and costs

Very simply, a hazard is something that can cause harm and here, the hazard is a tree. Risk is characterised by reference to potential events and consequences, or a combination of the two. It is often expressed as a combination of an event's consequences and the likelihood of it occurring. In this case, a potential consequence is death or serious injury. The important part of the assessment is the likelihood of either occurring. Levels of risk are judged against a baseline, which is usually the

current overall maintenance or control regime for that hazard (the tree). When assessing a tree, owners and managers need to judge whether the management measures they adopt will fulfil society's reasonable expectations. "Reasonableness" is a key legal concept when considering the risks of trees to the public and tree owners' obligations. Deciding what is reasonable can be undertaken only with regard to the trees' place within the wider management context and how that context influences decisions locally. The HSE presented this expectation in its risk philosophy, outlined in Figure 2 (see also Figure 1).

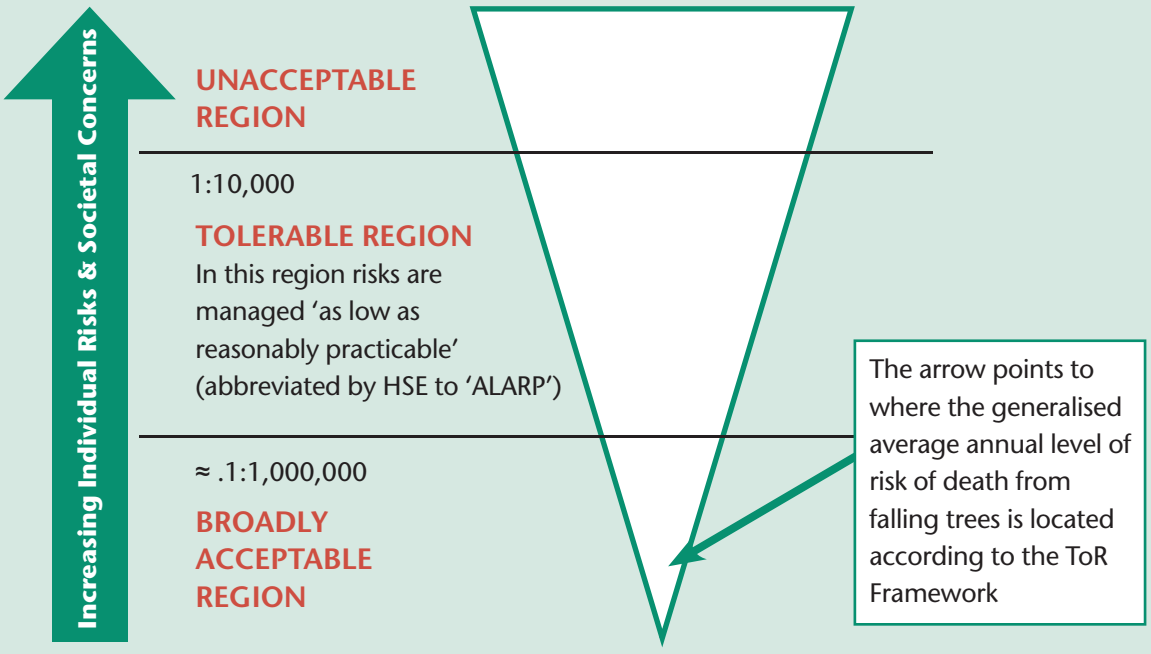
The HSE says that, for practical purposes, any activity or practice giving rise to risk in the upper zone would be prohibited unless exceptional reasons could be given. The bottom zone, in contrast, represents a level of risk which is taken as broadly acceptable. The HSE states:

> *"Risks falling in this region are generally regarded as insignificant and adequately controlled. We, as regulators, would not usually require further action to reduce risks unless reasonably practicable measures are available. The levels of risk characterising this region are comparable to those that people regard as insignificant or trivial in their daily lives."* [2]

Hazards with risk levels falling in the intermediate band may be tolerated in order to secure the associated benefits, providing that:

- The nature and level of the risks are adequately assessed and the results are used

Figure 2. Tolerability of Risk Framework[1] (ToR)
Visual presentation of the level of general annual risks of death from falling trees – note the 'tolerable region' is where risks are managed as low as reasonably practicable ('ALARP')



[1] The diagram is based on *Reducing risks, protecting people* (HSE 2001) Figure 1: 'HSE framework for the tolerability of risk'.

to determine control measures. The assessment of the risk needs to be based on the best available evidence and, where evidence is lacking, on the best available scientific advice.

- The residual risks are not unduly high and kept as low as reasonably practicable (the ALARP principle[3]).
- The risks are periodically reviewed to ensure that the risk is controlled so far as is reasonably practicable (SFAIRP) and they still meet the ALARP criteria, for example, by ascertaining whether further or new control measures need to be introduced to take account of new knowledge or new techniques for reducing or eliminating risks.

An obvious question relating to the above concerns the precise likelihood of death or serious injury associated with the threshold between the three zones. How many incidents a year do there have to be before a risk moves from tolerable to unacceptable? The HSE says that it is often unnecessary to specify the threshold because good practice is often spelled out or implied in legislation, approved codes of practice (ACoPs) or other guidance. However, based on its experience, the HSE has proposed guidelines[4] for where these thresholds lie. This is very important when seeking to establish what a reasonable standard of control is.

Accordingly, the HSE has identified that an individual risk of death of one in one million per year for both workers and the public corresponds to a very low level of risk, and this should be used as a guideline for the threshold between the broadly acceptable and tolerable regions. It points out that this level of risk is extremely small when compared with the general background level of risk which people face and engage with voluntarily.

Research into deaths from falling trees

Guidance to help owners and managers make reasonable decisions about tree management needs to be backed up by reliable data on the actual level of risk posed by falling trees. Therefore, the National Tree Safety Group commissioned the Centre for Decision Analysis and Risk Management at Middlesex University to quantify the risk of fatal and non-fatal injuries from falling or fallen trees and branches to the UK public. The research identified 64 deaths during the 10 years after 1 January 1999[5]. With a UK population of roughly 60 million, this leads to an overall estimated risk of about one death in 10 million people per year from falling or fallen trees and branches.

So far as non-fatal injuries in the UK are concerned, the number of accident and emergency cases (A&E) attributable to being struck by trees (about 55 a year) is exceedingly small compared with the roughly 2.9 million leisure-related A&E cases per year. Footballs (262,000), children's swings (10,900) and even wheelie bins (2,200) are involved in many more incidents.

© The Tree Council

A COMPARISON OF RISKS OF DEATH

Table 1 is reproduced from HSE's *Reducing risks, protecting people* with the risk of falling and fallen trees added for comparative purposes.

Table 1. Annual risk of death from various causes over entire population

Cause of death	Annual risk	Basis of risk and source
Cancer	1 in 387	England and Wales 1999
Injury and poisoning	1 in 3,137	UK 1999
All types of accidents and other external causes	1 in 4,064	UK 1999
All forms of road accident	1 in 16,800	UK 1999
Lung cancer from radon in dwellings	1 in 29,000	England 1996
Gas incident (fire, explosion or carbon monoxide poisoning)	1 in 1,510,000	GB 1994/95–1998/99
From trees	1 in 10,000,000 or less if high wind incidents are excluded	This study
From lightning	1 in 18,700,000	England and Wales 1995–99

Significance of the identified risks

The individual risk of death attributable to trees is 10 TIMES LESS than the threshold of one death in one million per year that the HSE says people regard as insignificant or trivial in their daily lives. Because trees present a very low risk to people, owners and managers should be able to make planning and management decisions within this context and avoid unnecessary intervention, survey and cost.

The expectation of society and the courts reflects the fact that trees grow in many different types of location. By carefully considering how trees fit into a particular local context, owners and managers can better identify those areas and situations requiring action. It will also help them ensure that any management is proportionate and strikes an appropriate balance between the real risks and benefits.

The public perception of risk

One reason why trees fall into the "low" level of risk category is because over past decades, in the majority of cases, appropriate and timely management decisions have taken place. Hazardous trees have been identified and remedial works undertaken. As detailed in Appendix 3, it is natural for trees to shed branches and ultimately fall down. These events happen all the time and people have learnt how to live with them. However, it is accepted in risk management that it is the perception of risk as well as the actual risk itself that generates problems.

HSE refers to the role of perception in its Sector Information Minute (guidance for HSE inspectors and local authority enforcement officers) as follows:

> *"The risk, per tree, of causing fatality is of the order of one in 150 million for all trees in Britain or one in 10 million for those trees in, or adjacent to areas of public use. However, the low level of overall risk may not be perceived in this way by the public, particularly following an incident."* [6]

■ **Brodsworth Hall, South Yorkshire.** © *English Heritage/Bob Skingle*

As with other serious incidents involving loss of life or injury, people can become more worried by falling trees after someone has just been killed by one and it has been widely reported in the media.

Accidents from falling trees – newsworthiness

It can be reliably predicted that if a falling tree kills a member of the public, there will be a passing story in the local, and occasionally national, media. This is because unusual events, such as tree-related deaths, are more likely to be newsworthy than commonplace accidents, even though the latter pose a far greater risk and cause much more harm overall.

This newsworthiness does not imply a greater statutory duty to control the hazard, or that it would be in the public interest to attempt to do so. There might be a stronger case for this were trees more likely to kill large numbers of people in one accident or were they to arouse societal concerns[7], but there is no evidence that this is the case.

Likewise, trees are not known to invoke societal concerns as a result of the risk of harm that they present. In fact, there is far more evidence of true public societal concern being sparked when trees are felled; the concern being a public desire for the retention and preservation of trees.

There are many records of very strong local concern following the removal or threat of removal of trees, sometimes on alleged health and safety grounds. This strength of feeling could increase as more people realise that trees of significant stature are being lost.

Many local authorities undertake extensive consultation exercises before undertaking tree removal within sensitive areas. The benefits of these discussions are that better presentation of the pros and cons for retention and removal, with intelligent debate between all parties, greatly improve the concerned residents' perception and understanding of the works carried out in their locality.

The pressures on tree owners to follow a risk-averse approach have never been greater. Publishing a tree strategy which clearly indicates how these management decisions are taken and by whom allows a local authority to temper a risk-averse outlook. As the House of Lords Select Committee on Economics has put it:

> *"…the most important thing government can do is to ensure that its own policy decisions are soundly based on available evidence and not unduly influenced by transitory or exaggerated opinions, whether formed by the media or vested interests."* [8]

Evaluation of what is reasonable

The HSE believes that:

> *"…public safety aspects can be addressed as part of the approach to managing tree health and tree owners should be encouraged to consider public safety as part of their overall approach to tree management."* [9]

This is a useful position to establish, even though it is almost certainly not necessary to agree that "tree health" is the only relevant criterion in managing trees. This statement suggests that the HSE accepts that human safety is to be considered within a wider management context rather than in isolation. The courts have frequently referred to this trade-off in civil cases. The first stage of an evaluation, therefore, should focus on the context and role of the trees themselves. In the context of the low level of risk noted already, the HSE SIM further states that:

> *"Given the large number of trees in public spaces across the country, control measures that involve inspecting and recording every tree would appear to be grossly disproportionate to the risk."* [9]

What is inherent in this evaluation is a sense of proportion. This can be achieved only by considering the tree's place in a wider management context and people's relationship to that context locally.

Managing the risk from trees

Exposure to an element of risk is an unavoidable consequence of all environments where trees are part of leisure activities. In such circumstances, proportionate tree management allows people to accept risk from trees as part of a stimulating and beautiful environment. People enjoy what they perceive to be "natural" or "unmanaged" countryside. They value trees that have been subject to minimal or no intervention, and are prepared to accept a degree of risk because of the pleasure they derive from visiting or participating in leisure activities in these environments[10]. Tree management[11] or the lack of it should not expose people to significant likelihood of death, permanent disability or life-threatening injuries. Accidents are on occasions unavoidable. Such risk is tolerable only in the following conditions:

- the likelihood is extremely low
- the hazards are clear to users
- there are obvious benefits
- further reducing the risks would remove the benefits
- there are no reasonably practicable ways to manage the risks.

For example, a mature tree in a city park presents a low but present risk of falling on somebody, even if it is frequently inspected and treated. This risk is broadly acceptable. The likelihood is typically low and people benefit from the retention of a feature that is inextricably linked to why they visit the park.

In its position statement, the NTSG argues that it is reasonable that sufficiently large organisations that own or manage trees develop a management strategy (in line with practice in other sectors). This strategy may strike a balance between risks present and benefits accrued. The balance should be based on a risk assessment involving a risk/benefit trade-off between safety and other goals, which should be spelled out in the strategy. Organisations that publish and maintain a tree strategy or

■ **Bute Park, Cardiff, typical urban park with mature trees.** © *Forestry Commission/Isobel Cameron*

management plan, part of which includes information on their risk management plan for the trees they own, are much better placed to demonstrate they have fulfilled their duty of care. Where trees are grown for timber, this usually includes felling trees as part of routine operations; as may be the case for other commercial operations and public utilities that incorporate trees on their site. Non-commercial trees frequently have social and environmental value as well, and are important to human health and wellbeing. The NTSG's position is that, wherever possible, the presumption should be that such trees be retained and allowed to complete their life cycle with minimal management interventions.

Such a reasonable strategy, articulating the benefits of trees, should, in the view of the NTSG, carry as much weight in protecting the tree owner against litigation following an incident as any factory's reasonable risk management policy. It is important to note that this is an emerging area within the field of managing safety risks to the public. The way that courts take benefit into account in civil and criminal cases is discussed in Chapter 3.

Things to remember

Research to date supports the position that the risk from trees in most instances is no more than a routine and recognised risk of life, which most people accept without question. In other words, planning decisions about the management of trees in general should proceed on a rational, cost-effective basis as trees do not invoke additional concerns about perceived risk. Public safety is not the only concern when deciding how to manage trees. Other broader concerns, such as ecological, landscape and aesthetic value, should also be taken into account.

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3 What the law says

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Tree owners have a legal duty of care

Chapter 3 covers the law in respect of an owner's liabilities for injury to others caused by the fall of a tree or branch in England, Scotland, Wales and Northern Ireland. There are slight differences in terms of how the law in each country deals with trees and liabilities with respect to safety and the duty of care arising from tree-related incidents (see pages 31-37). Generally, due to a lack of case law in Scotland and Northern Ireland, much of the case law cited is English. The advice given below is based on an evaluation of past court decisions. It is not intended to provide an exhaustive exposition of the law relating to trees or the ownership of land[1].

Chapter 3 also addresses the role of this guidance document within the legal framework.

The role of this guidance

This document, supported by a wide range of stakeholders involved in the ownership and management of trees, seeks to provide guidance for the inspection and maintenance of trees that is reasonable and proportionate to the low risk posed by trees, to the benefits of trees, and to the health and safety obligations of those who are responsible for trees. This document may be presented to a court for consideration as supporting documentation in any case involving death or personal injury caused by a falling tree or branch. Reported judgments already demonstrate that courts will consider publications of this nature when addressing the duty of care.

It must, however, be appreciated that the guidance in this document will not in itself determine a court's judgment in an individual case. First, all cases are sensitive to their own facts. Second, a court will always reserve to itself the decision as to whether a tree owner has acted as "a reasonable and prudent landowner". This guidance can, however, inform the court in the making of that decision.

The legal framework

Under both the civil law and criminal law, an owner of land on which a tree stands has responsibilities for the health and safety of those on or near the land and has potential liabilities arising from the falling of a tree or branch. The civil law gives rise to duties and potential liabilities to pay damages in the event of a breach of those duties. The criminal law gives rise to the risk of prosecution in the event of an infringement of the criminal law.

The civil law

The owner of the land on which a tree stands, together with any party who has control over the tree's management, owes a duty of care at common law to all people who might be injured by the tree. The duty of care is to take reasonable care to avoid acts or omissions that cause a reasonably foreseeable risk of injury to persons or property.

If a person is injured by a falling/fallen tree or branch, potential causes of action arise against the tree owner in negligence for a breach of the duty of care, in the tort of nuisance and, where the injured person was on the land of the tree owner at the time of the injury, under the Occupiers' Liability Acts of 1957 or 1984 (OLA 1957, OLA 1984), (for Scotland see the Occupiers' Liability (Scotland) Act 1960, for Northern Ireland see the Occupiers' Liability Act (Northern Ireland) 1957 and Occupiers' Liability (Northern Ireland) Order 1987).

Some Regulations under the Health and Safety at Work etc Act 1974 may also give rise to liability under the civil law as well as under the criminal law (for which see page 36). However, a discussion of the applicable regulations is beyond the purview of this guidance.

NEGLIGENCE

The dutyholder

This is the person who has control of the tree's management whether as owner, lessee, licensee or occupier of the land on which the tree stands. The relevant highway authority is responsible for trees on land forming part of the highway.

The person to whom the duty is owed

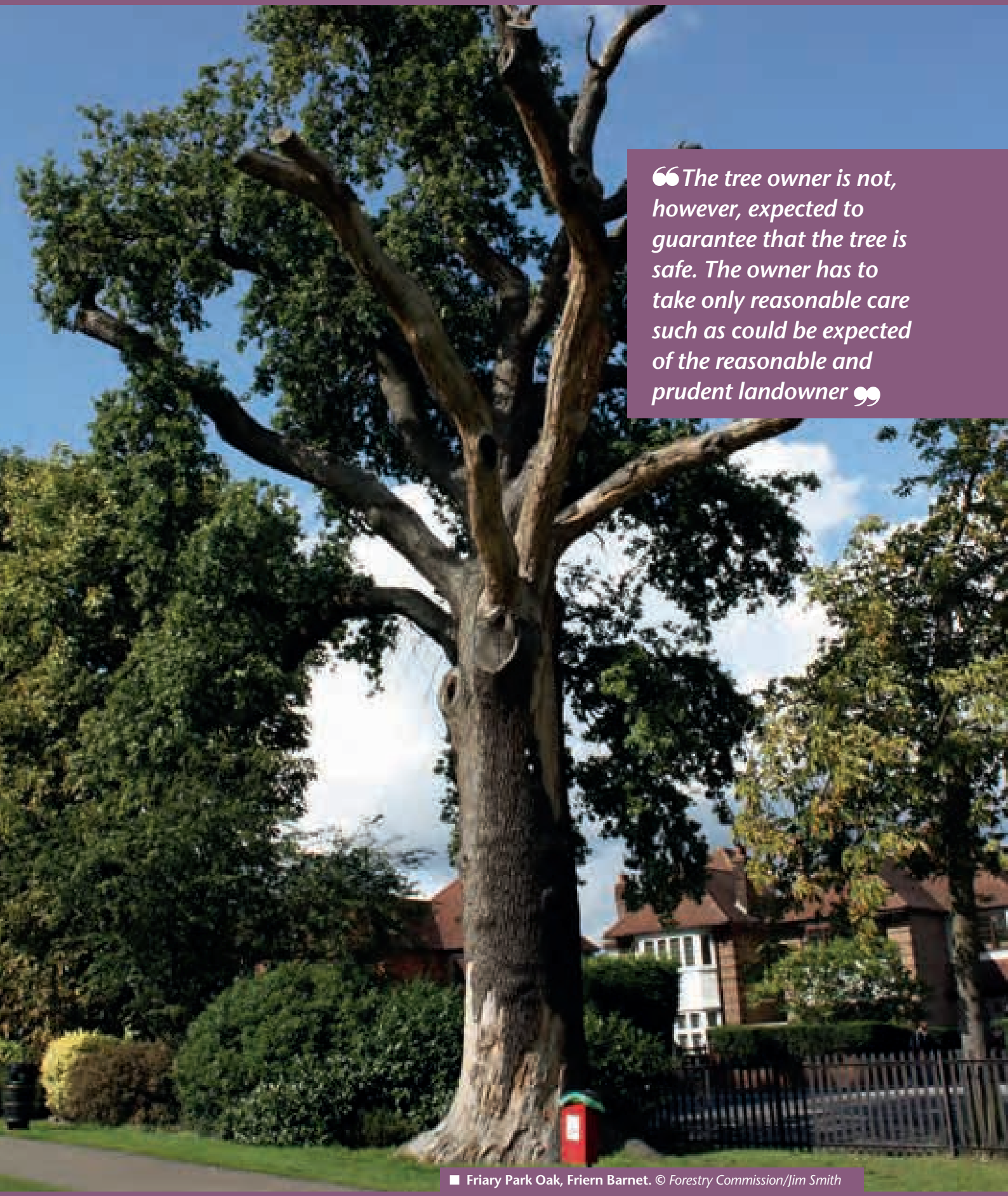
This is any person who can be reasonably foreseen as coming within the tree's vicinity and being injured by a fall of the tree or a branch from the tree. Those using highways, footways, public footpaths, bridleways, railways and canals are likely to come within striking distance of trees on adjacent land. In public spaces, and semi-public spaces such as churchyards and school grounds, those working in or visiting them can be expected to come within the vicinity of trees. On private land, visitors and employees can also be expected to come within the reach of trees. Trespassers may also, in certain circumstances, be expected to come within the vicinity of trees on private land.

The duty owed

This can be stated in general terms as being a duty to take reasonable care for the safety of those who may come within the vicinity of a tree. The courts have endeavoured to provide a definition of what amounts to reasonable care in the context of tree safety, and have stated that the standard of care is that of "the reasonable and prudent landowner"[2]. The tree owner is not, however, expected to guarantee that the tree is safe. The owner has to take only reasonable care such as could be expected of the reasonable and prudent landowner.

The duty owed under the tort of nuisance is owed by a tree owner to the occupier of neighbouring land. The duty, however, is no different to the general duty owed under the tort of negligence.

A highway authority has a potential liability for fallen trees and branches for which it is responsible by virtue of section 41(1) of the Highways Act 1980, which gives rise



“The tree owner is not, however, expected to guarantee that the tree is safe. The owner has to take only reasonable care such as could be expected of the reasonable and prudent landowner”

■ **Friary Park Oak, Friern Barnet.** © *Forestry Commission/Jim Smith*

to a duty "to maintain the highway". It is open to question whether the duty extends to the maintenance of highway trees[3]. However, assuming the duty does so extend, the highway authority may, by section 58, defend itself by proving "that the authority had taken such care as in all the circumstances was reasonably required to secure that part of the highway to which the action relates was not dangerous for traffic". The duty under section 41(1) is, therefore, little different to that which arises under the common law in negligence. Similarly, the duty to maintain trees planted under section 96 of the Highways Act 1980 requires the highway authority to take only "reasonable" care. A highway authority also has the power under section 154(2) of the Highways Act 1980 (see also s.91 Roads (Scotland) Act 1984) to require trees growing on land adjacent to the highway that are dead, diseased, damaged or insecurely rooted, to be removed by those responsible for the trees and, in default of removal, to take action itself to have the trees removed. A failure to utilise the power in any particular case is unlikely to give rise to liability in the light of *Stovin v Wise*[4]. Similarly, it will not assist a person responsible for a tree growing adjacent to a highway to blame the highway authority for failing to require him to remove a tree that is found to have been dangerous.

It is the duty holder's fundamental responsibility, in taking reasonable care as a reasonable and prudent landowner, to consider the risks posed by their trees.

The level of knowledge and the standard of inspection that must be applied to the inspection of trees are of critical importance. It is at this point that the balance between the risk posed by trees in general terms, the amenity value of trees and the cost of different types of inspection and remedial measures becomes relevant.

THE STANDARD OF INSPECTION

The courts have not defined the standard of inspection more precisely than the standard of "the reasonable and prudent landowner". It has been recognised that this test sounds simpler than it really is: "it postulates some degree of knowledge on the part of landowners which must necessarily fall short of the knowledge possessed by scientific arboriculturists but which must surely be greater than the knowledge possessed by the ordinary urban observer of trees or even of the countryman not practically concerned with their care"[5].

In individual cases, the courts have sought to apply this general standard to the facts of each case[6]. However, there is no clear and unambiguous indication from the courts in regard to the extent of the knowledge about trees a landowner is expected to bring to tree inspection in terms of type and regularity of inspection. Generally, the courts appear to indicate that the standard of inspection is proportional to the size of and resources available (in terms of expertise) to the landowner[7,8,9,10&11]. It is of note that the HSE states in the HSE Sector Information Minute *Management of the risk from falling trees* (HSE 2007), that: "For trees in a frequently visited zone, a system for periodic, proactive checks is appropriate. This should involve a quick visual check for obvious signs that a tree is likely to be unstable and be carried out by a person with a

■ **Routine tree inspection.** © *Andy Tipping, Barnet Council*

working knowledge of trees and their defects, but who need not be an arboricultural specialist. Informing staff who work in parks or highways as to what to look for would normally suffice".

In general terms, a landowner must identify those trees which might, if they fell, pose a risk to people or property. He should then inspect such trees and identify any obvious defects in the trees. If the landowner does not have sufficient knowledge of trees to enable him to identify such obvious defects, he should engage someone who has. Having identified a defect, the landowner (if sufficiently knowledgeable), or someone with appropriate knowledge and expertise, should assess the risk posed by the defect and take appropriate action, which might mean further monitoring of the defect, pruning of the tree or felling (see Chapter 4).

A number of commonly encountered obvious defects are illustrated in Figure 3 in Chapter 4 General features to look out for when assessing a tree.

THE OCCUPIERS' LIABILITY ACT 1957

The Occupiers' Liability Act 1957 provides for the liability of an occupier of land when an accident occurs on the land to a person who is a "visitor" to the land (for Scotland

see the Occupiers' Liability (Scotland) Act 1960, for Northern Ireland see the Occupiers' Liability Act (Northern Ireland) 1957). The occupier owes a duty to the visitor to "take such care as in all the circumstances of the case is reasonable to see that the visitor will be reasonably safe in using the premises for the purposes for which he/she is invited or permitted by the occupier to be there"[12]. The duty of care under the Act is effectively the same as that at common law in respect of the torts of negligence or nuisance.

A person visiting land by virtue of the National Parks and Access to the Countryside Act 1949, the Countryside and Rights of Way Act 2000 (CRoWA) or the Marine and Coastal Access Act 2009 is not classed as a "visitor" within the meaning of OLA 1957[13]. The person cannot, therefore, bring a claim under the OLA 1957. However, he/she may still potentially bring a claim in negligence or, if appropriate, under OLA 1984.

THE OCCUPIERS' LIABILITY ACT 1984

The Occupiers' Liability Act 1984 provides for an occupier's liability to people other than visitors, in particular trespassers, in circumstances where the occupier knows of the potential presence of such people on their land and of the risk posed to them by features of the land such as trees, and the risk is one against which, in all the circumstances, the occupier may reasonably be expected to offer them some protection. For Northern Ireland see the Occupiers' Liability (Northern Ireland) Order 1987.

The duty under section 1 of the Act to a person on "access land" in the exercise of a right to roam conferred by section 2(1) of CRoWA 2000 will be determined having regard to the fact that the existence of the right ought not to place an undue burden upon the occupier, and having regard to the importance of maintaining the character of the countryside[14].

The duty under OLA 1984 is also limited in that no duty will arise in respect of risks resulting from any natural feature of the landscape (which will include a tree), nor from any river, stream, ditch or pond[15], providing that the occupier does not intentionally or recklessly create the risk[16].

WARNING NOTICE

A warning notice that warns of a specific danger posed by a tree (or trees) may be sufficient to absolve an occupier from liability in that they may, by such notice, have taken all reasonable care for the visitor's safety in the circumstances[17]. However, in general, a landowner should not rely upon warning signs alone to protect against a danger. A business occupier cannot by reference to any contract term, or to a notice, exclude or restrict his liability for death or personal injury resulting from negligence or a breach of duty under OLA 1957[18], save where the access to the land is given for educational or recreational purposes (unconnected with the purpose of the business)[19].

THE COMPENSATION ACT

Section 1 of the Compensation Act 2006 provides that:

> *"A court considering a claim in negligence or breach of statutory duty may, in determining whether the defendant should have taken particular steps to meet a standard of care (whether by taking precautions against a risk or otherwise), have regard to whether a requirement to take those steps might:*
>
> *(a) prevent a desirable activity from being undertaken at all, to a particular extent in a particular way, or*
>
> *(b) discourage persons from undertaking functions in connection with a desirable activity."*

The term "a desirable activity" is not defined by the Act and is likely to be construed so as to give a wide meaning to the term. It is likely, therefore, that it includes an activity such as the growing of trees. While the Act reinforces the importance of being able to balance the amenity, health, and other intrinsic biodiversity values of trees against the risk posed by a tree, it is doubtful whether it will materially alter the courts' approach to claims arising from falling trees. The Act applies only to civil claims and not to criminal prosecutions.

The criminal law

The Health and Safety at Work etc Act 1974 places a duty on employers to ensure, so far as is reasonably practicable, that in the course of conducting their undertaking, employees and members of the public are not put at risk (sections 2(1) and 3(1) respectively, see also section 3(2) in respect of self-employed persons). The acts of felling or lopping a tree clearly fall within the scope of this duty. It is also likely that the growing and management of trees on land falls within the scope of the duty if such operations fall within the employer's undertaking.

The duty is subject to the words "so far as is reasonably practicable". This proviso requires an employer to address the practical and proportionate precautions which can be taken to reduce a risk. The courts have generally been unwilling to take into account environmental or aesthetic values when considering whether a step is reasonably practicable, confining the consideration to whether a precautionary step can "practically" be undertaken[20]. Nevertheless, in *HSE v North Yorkshire County Council* (20.5.10) Wilkie J., when directing the jury as to the meaning of "reasonably practicable", identified as a material consideration "the benefits of conducting the activity".

He said (NTSG emphasis):

> *"Now, in this context what does 'reasonably practicable' mean? Well, as you have been told correctly, it is a narrower concept than what is physically possible. It requires a computation to be made by the employer in which the amount of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk, whether in terms of money, time or trouble,* ***or the benefits of conducting the activity****, are placed in the other. If there is a gross disproportion between them where the risk to health and safety is insignificant in*

relation to the sacrifice and/or loss of benefit involved in averting that risk then the defendant discharges the onus upon him and is entitled to be acquitted, but if the defendant does not persuade you of that on the balance of probabilities then you would convict."

The Management of Health and Safety at Work Regulations 1999 require employers, and self-employed persons, by regulation 3 to "make a suitable and sufficient assessment of the risks to the health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking". This requires an employer, and a self-employed person, to undertake a risk assessment of the tree stock on the land which forms part of the undertaking.

Breach of the duty under the Act, or the regulations derived from the Act, can give rise to a criminal prosecution against the employer. Enforcement of the Act is vested in the HSE and, in some instances, local authorities. The HSE has provided guidance for its inspectors and local authority enforcement officers in connection with the inspection of trees in the Sector Information Minute *Management of the risk from falling trees* (HSE 2007)[21].

The responsibilities under criminal law primarily arise in respect of employers, self-employed persons and those who control a business undertaking. However, responsibilities under criminal law can also, in exceptional circumstances, arise in respect of manslaughter by corporate undertakings or individuals, leading to a police investigation and possible prosecution (see the Work Related Death Protocol 2003). There has been no prosecution for manslaughter in respect of falling trees.

Reasonable, balanced tree risk management

4

“A sense of proportion is vital. This can be achieved only by considering the tree’s place in a wider management context and people’s relationship to that context locally”

© The Tree Council

Introduction

Tree owners should take a balanced and proportionate approach to tree management

Chapter 4 develops the general approach to enhancing good practice in the sector. It recognises that trees are managed for a variety of reasons and therefore that the expectation of a "suitable and sufficient risk assessment" referred to by the HSE varies with context.

In general, the risk from trees has certainly reached the situation where residual risks (those that remain after management for safety) are sufficiently low that investment in additional measures is likely to be disproportionate to any safety benefit. As the HSE itself notes in *Reducing risks, protecting people*:

> *"Any informed discussion quickly raises ethical, social, economic and scientific considerations, for example: …how to achieve the necessary trade-offs between benefits to society and ensuring that individuals are adequately protected; the need to avoid the imposition of unnecessary restrictions on the freedom of the individual."*

Chapter 4 also shows that a sense of proportion is vital in this evaluation. This can be achieved only by considering the tree's place in a wider management context and people's relationship to that context locally.

HOW THIS GUIDANCE RELATES TO OTHER DOCUMENTS

There are many documents offering guidance for managing trees in the context of public safety. These tend to be aimed at professionals such as those involved in general tree surveying[1], and to cover specific issues connected with tree hazard assessment and management[2] and tree-related risk[3]. Some national and specialist organisations have also produced guidance including for forestry[4] and nature conservation[5,6] and for health and safety regulators[7]. There is also policy guidance for wider sector interests in trees, including for parks[8], greenspaces[9] and access to the countryside[10].

While tree safety inspection and risk management is usually only a small part of an organisation's wider remit, these may have implications for broader tree management. For example, tree inspection is naturally encompassed within the guidance for highway inspectors as part of their overall responsibility for public safety[11]. Although guidance devised for the play sector[12] does not refer specifically to trees, it may nonetheless be highly relevant to the formulation of tree safety policies.

These examples, though by no means exhaustive, demonstrate the scope of advice and guidance already brought to bear on tree safety management. Because the range of advice is not necessarily proportionate to the risk and does not necessarily take account of the benefits that trees provide, the NTSG has drafted this stakeholder-supported document, based on wide consultation, to provide an integrated approach to reasonable tree risk management.

Extremely low risk of harm

HSE guidance for its inspectors and local authority enforcement officers on the standard of tree risk management and the DARM research commissioned by the NTSG on behalf of landowners confirm that the overall real risk of serious harm from trees in the UK is "extremely low"[13]. Indeed, the levels of risk are so low that they are "comparable to those that people regard as insignificant or trivial in their daily lives", near the bottom of the spectrum of what the HSE considers as acceptable risk:

> *"Risks falling into this region are generally regarded as insignificant and adequately controlled. We, as regulators, would not usually require further action to reduce risks unless reasonably practicable measures are available. The levels of risk characterising this region are comparable to those that people regard as insignificant or trivial in their daily lives. They are typical of the risk from activities that are inherently not very hazardous or from hazardous activities that can be, and are, readily controlled to produce very low risks."*[14]

Legal requirements

The law requires only that people should "take reasonable care to avoid acts or omissions which cause a reasonably foreseeable risk of injury to persons or property"[15]. What does this mean in practice? Chapter 3 outlines the legal background surrounding tree owners' responsibility for the safety of their trees. The generally agreed standard to be achieved is that of a "reasonable and prudent landowner".

Responsible management

Landowners who already sensibly manage their trees can be reasonably confident that there is no need for any radical change driven by a fear of the law, though they may find this guidance useful when reviewing management practice. Responsible management should seldom result in large-scale tree removal for safety reasons. No tree can be guaranteed to be safe. As long as we retain trees, we cannot achieve zero risk. A disproportionate response to the actual risks posed by trees leads to unnecessary intervention, particularly alongside roads and public places. Disproportionately responding to risk itself runs the risk of diminishing the landscape and depriving the whole community of the enjoyment of trees and their wider benefits.

ESSENTIALS OF A REASONABLE, BALANCED APPROACH

The number of trees for which owners are responsible varies enormously, as do the means available for their management. This guidance offers a framework for tree owners to manage their trees reasonably, informed of the reasons why trees are important. Such a framework allows the owner to establish a proportionate approach to practical tree management for the reasonable safety of visitors and passers-by. This approach is based on achieving a balance between, on the one hand, the benefits trees provide to the environment and to people, and, on the other hand, risks posed

■ **An obvious feature indicating a defect: a root rotting fungus (*Meripilus giganteus*) on a beech tree.** © *The Tree Council*

to public safety. This is a non-defensive approach involving a proportionate response to risk. It is defendable in law and does not require excessive risk management or undue intervention.

LOW RISKS AND COMMON SENSE

Generally speaking, the existing tree management regimes in the UK's towns, cities and countryside contribute to the acknowledged low risk of anyone being killed or injured by a fallen or falling tree or branch. The normal practices that have prevailed over the past decades have, in large measure, been reasonable and proportionate. These management regimes have worked in conjunction with people's commonsense approach to appraising risk from trees.

DEFENDABLE PRACTICE

A key objective for most owners and managers is to maintain a defendable position at the lowest cost while avoiding undesirable loss of valued trees. Defendable management is consistent with a duty of care based on reasonable care, reasonable likelihood and reasonable practicability. Landowners and managers who know how important their trees are tend to take an interest in them; including their setting and how people use their land, the benefits that trees bring and their structural features. It is reasonable that decisions regarding tree safety are considered against a background of the general low risk from falling trees. Being reasonable involves taking actions proportionate to the risk. This inevitably involves a judgment for owners, duty holders and advisers. Reasonable tree management has both reactive and proactive elements. While the owner or manager may need to react to events involving dangerous trees as they arise, it is also prudent to have forward-looking procedures to keep

tree-related risks at an acceptable level. These procedures do not need to be complicated and may be incorporated into a tree strategy where applicable.

Defect, obvious defect, hazard and risk

WHAT IS A DEFECT?

The term "defect" can be misleading, as the significance of structural deformities in trees (variations from a perceived norm) can be extremely variable. Indeed, deformities can be a response to internal hollowing or decay, compensating for loss of wood strength and providing mechanical advantage, allowing the tree to adapt to wind and gravitational forces. With inadequate understanding, so-called *defects* may be erroneously confused with *hazards* and, furthermore, hazards with *risk* – so unless the risk of harm arising from a hazard is properly taken account of, management can be seriously misinformed, potentially leading to costly and unnecessary intervention.

NTSG definition: "a defect in the context of the growing environment of a tree is a structural, health or environmental condition that could predispose a tree to failure".

WHAT IS AN OBVIOUS DEFECT?

The courts and specialist literature often apply the term "obvious" when referring to tree defects of which an owner or adviser should be aware. Obvious defects are likely to be so apparent that most people, whether specialist or not, would recognise them. While obvious defects may include external indications of potential structural failure, they take many forms, not all of which are significant hazards. Defects pose risks only where there is a likelihood of harm. An obvious risk defect might be a large tree that is clearly breaking up over a well-used road. A person doing a safety inspection is on the lookout for obvious defects posing a serious and present risk, particularly where the danger is immediate.

WHAT IS A HAZARD?

Simply put, a hazard is a situation or condition with the potential to cause harm. With regard to trees, this means that any part of the tree – its trunk, branches or crown – that might fail structurally, collapse and fall onto a person or property, causing injury or damage, is a hazard. As all trees have this potential, they and their components are hazards.

RISK IS THE PROBABILITY OF HARM AND SEVERITY OF CONSEQUENCES FROM A PARTICULAR HAZARD

Although all trees are potentially hazardous, the level of risk is relative to the number of people and the presence of valuable property that could be harmed or damaged in the event of root, branch or trunk failure[16]. The extent of risk is therefore both relative to the number of people within the falling distance of the tree and the degree of harm that could be caused should the tree structurally fail. The area where trees grow

■ **A wood decay fungus (*Ganoderma applanatum*) that may have implications for tree stability.**

can be characterised according to the level of pedestrian, vehicle or other use – and 'zoned' in terms of their level of usage. Therefore, if the tree was to collapse and no one was within reach of it, then there would be no risk. So, a large tree presents a negligible risk regardless of whether or not it is hazardous, if it is growing in an area where few people go.

Key steps in tree safety management

THE ESSENTIALS

A reasonable and balanced approach forms the basis of a tree safety strategy for sensible tree safety management. By a "strategy", we mean a plan that guides management decisions and practice, in a reasonable and cost-effective way, typically covering three essential aspects:

- zoning: appreciating tree stock in relation to people or property
- tree inspection: assessing obvious tree defects
- managing risk at an acceptable level: identifying, prioritising and undertaking safety work according to level of risk.

A tree safety strategy may not necessarily be supported by extensive records. It may be self-evident through general prudent practice and behaviour. Alternatively, a strategy may be explicitly formulated and expressed through documents relating to management practice. If reasonably carried out, the strategy should meet the duty of care required by law, without the need for an overly bureaucratic approach or excessive paperwork. In the event of an accident, documents may provide supporting evidence that reasonable care has been taken.

KEEPING RECORDS

Records, including maps, provide the basis for safety management reviews and, in the extremely rare event of an accident, can be important proof of reasonable tree management. It is not necessary to record every tree inspected; however, records of trees presenting a serious risk and requiring treatment are useful, as is a record of how they have been treated. When inspections are carried out, records can demonstrate that the owner or manager has met a key component of their duty of care. Other useful ways of demonstrating reasonable assessment and management of trees include recording recommendations for work and when tree work has been carried out.

Zoning

Zoning is a practice whereby landowners and managers define areas of land according to levels of use. This practice prioritises the most used areas, and by doing so contributes to a cost-effective approach to tree inspection, focusing resources where most needed. It contributes to sensible risk management and a defendable position in the event of an accident. It may be a reasonable outcome of the zoning process to decide that no areas require inspection. Classifying levels of use in this way requires only a broad assessment of levels of use. Typically, two zones, high and low use, may be sufficient. High use zones are areas used by many people every day, such as busy roads, railways and other well-used routes, car parks and children's playgrounds or where property may be affected. While owners and managers may deem it appropriate to use a more sophisticated approach, designating three or more

■ **A high-use urban area used by many people every day. Requires regular inspection.** © *Forestry Commission/Jim Smith*

■ **Great Wood, Somerset.** © *Forestry Commission/Ross Hoddinott*

zones, in the event of an accident whichever system is adopted may require justification according to the standard set.

WHAT TO CONSIDER AND WHO SHOULD DO THE WORK

As a first step in tree risk management, the trees' location in the context of levels of use is key to understanding what risks, if any, may be associated with them. The assessment should consider all the trees on the property and determine which are in areas of high public access, or could fall onto areas of public use or onto property that could be damaged.

Normally, the best person to do an initial assessment is someone familiar with the land, how it is used and what trees are present. Typically, this could be the landowner, occupier or land manager. It does not require a tree specialist to zone a site.

TREES WITHIN FALLING DISTANCE OF ROADS, RAILWAYS ETC.

Annually, among the relatively few accidents from falling trees, the greatest risk to public safety has proved to be from trees within falling distance of where people move at speed in vehicles. However, even trees in well-used areas pose an overall level of risk to public safety that is extremely low. On average over the past decade, four people a year have died from roadside trees falling onto vehicles or from collisions with fallen trees, mainly because:

- risk of harm from falling trees is related to the force of impact
- the likelihood and extent of harm is influenced by the speed at which vehicles may impact
- risks are higher when vehicles are travelling at speed in high winds.

It is both the high usage of roads and the speed at which people travel along them that makes this the most likely way that people will be killed by trees[17].

■ **A low-use zone used by a few people variably may only require irregular inspection.** © *The Tree Council*

TREES IN AREAS WITH LOW PUBLIC USE REQUIRE LESS FREQUENT INSPECTION

Trees in areas of low public use require zoning, but in many instances may only require irregular inspection, if any. If the management decision is not to undertake an inspection but to do only a visual check or, indeed, not to do a visual check due to the area's low use, this needs to be recorded as part of the zoning plan.

NOT ALL TREES ALONGSIDE ALL ROADS POSE A SIGNIFICANT RISK

Not all roads are busy roads and not all roadside trees are large enough to kill or injure if they fall. It is nonetheless reasonable that certain roadside trees, particularly those alongside busy public roads, should be inspected. This also applies to trees alongside railways, where the train speed and number of people who could be affected in one incident increases the level of risk.

TREES IN AREAS OF HIGH PUBLIC USE REQUIRE AN INSPECTION REGIME

It is reasonable to inspect trees within falling distance of other well-used areas, such as car parks, gardens open to the public or urban public spaces. Zoning according to the levels of public use helps to decide in which areas trees pose higher risks than others and how to allocate tree inspection resources reasonably. Inspection will vary

according to the site's circumstances and the owner's policy, influenced by levels of use and the importance of their trees. Even in well-used areas, inspecting and recording each tree is not always necessary (see types of inspection). Trees with structural faults, but valued for their habitat or amenity interests, that are retained in frequently-used areas may require specific assessment and management. On the other hand, trees in well-used natural woodland or woodland surrounding housing or a public park may only warrant an informal or non-onerous prioritised system of assessment to identify trees warranting closer inspection.

Trees in infrequently-used areas

The risk of death or serious injury from trees in infrequently-used areas is so low that it is reasonable that these should receive no formal inspection or visual check. However, owners may need to respond to any reports of problems.

Tree inspection

The three types of inspections are:

- informal observations
- formal inspections
- detailed inspections.

Following zoning according to levels of public use, it is necessary to identify which trees require inspection. This is carried out on-site simply by walking or driving around the areas with trees (see Formal inspections section below). The selection of a tree for closer inspection is influenced by its size, condition and the level of use within its falling distance. A sensible judgment is required so that the landowner does not waste resources. For example, groups of young trees near well-used areas may be generally considered to pose low risk and not warrant further inspection.

The term inspection may cover a whole range of activities, from a superficial informal observation, to a quick, visual check and then to a detailed, device-assisted inspection. Inspections are carried out by non-specialists through to specialists trained to different levels of competence and experience. While technology can assist in inspecting important trees under exceptional circumstances, normal, day-to-day observation is the most useful source of information and provides the principal basis of tree assessment. The interested, non-expert, caring tree owner or observant passer-by plays a tremendously important part in maintaining the acknowledged low level of threat posed by trees in the UK. The level of resources allocated to tree inspection is influenced by the number and quality of trees and the type and level of surrounding use.

INFORMAL OBSERVATIONS

Informal observations of trees contribute to wider management and tree safety. In some circumstances, informal observation may be considered reasonable and appropriate. People with good local knowledge and familiarity with local trees and

their surroundings are generally aware of them, including potentially dangerous situations that may arise from them. Given the general extremely low risk posed by trees, public safety can be addressed as part of the property's wider management.

Choosing to manage the risk by informal observation is not a reason to do nothing. The decision to rely on informal observations must sit within a management framework that acknowledges, responds to and acts upon any defects reported by these informal observations.

Typically, where owners rely on informal observation, they look at their trees in relation to their health and structural condition, and act upon any circumstances posing unacceptable risks. Similarly, staff responsible for managing or maintaining the property do not go out of their way to assess the trees. They are instructed to be aware of the trees' health and condition as part of their other daily tasks, identifying structural weakness or actual failure that pose an imminent threat to public safety and that would be patently apparent to a non-expert.

Reports of tree-related safety problems arising from informal observations by staff or members of the public reporting should be acted upon. Initially, this may take the form of a formal inspection by a competent member of staff or an external inspector. This may then result in no further action being required, or in tree surgery, felling or implementing measures to manage the area within falling distance of the tree.

FORMAL INSPECTIONS

In a formal inspection, someone visits the tree with the specific purpose of performing an inspection that is not incidental to other activities. The spectrum of formal inspection ranges from survey work for tree inventories, to health and condition assessments. These may be carried out through "drive-by" and "walk-over" inspections or ground-based visual checks. Drive-by and walk-over inspections are accepted types of reasonable risk assessment under certain circumstances. It should be noted that reliance on drive-by inspections is not appropriate in busy urban areas. Initial drive-by inspections can, when appropriate, assist in deciding where tree management, walk-over or detailed inspection might be necessary. Walk-over inspections may not identify hidden features, such as fungal fruiting bodies tucked in the tree's roots. Simple formal inspection, through ground level visual checks in the course of walk-over surveys, provides a useful, cost-effective means of identifying clear and present signs of immediate instability (uprooting or other structural failure). This is an important means of identifying when pressing action is needed, including further specialist inspection.

DETAILED INSPECTIONS

Given that most trees present an extremely low risk, it is unreasonable to expect that every tree in a given area should receive a detailed inspection; to do so would be grossly disproportionate to the benefit gained in risk reduction. The need for detailed inspection typically applies only to individual, high-value trees which have been

identified from informal observation or formal inspection, as giving high-priority concern in well-used zones. The detailed inspection is normally prioritised according to the level of safety concern. It usually entails an initial ground-level, visual assessment by a competent specialist looking at the exterior of the tree for signs of structural failure. In a few special cases, further detailed investigations may be required, involving one or more of the following: soil and root condition assessments, aerial inspections of upper trunk and crown, or other procedures to evaluate the nature of suspected decay and defects, including using specialist diagnostic tools. Detailed inspections are therefore unusual, typically reserved for trees valued for their heritage amenity or habitat and which are suspected of posing a high level of risk, as already identified through owner interest or a previous formal or informal assessment.

Who can carry out tree inspections?

WHO CAN MAKE INFORMAL OBSERVATIONS?

People with good local knowledge and familiarity with local trees are suited to carrying out informal observations. Typically, this does not require a tree specialist, but rather those closely associated with a property, such as the owner, gardener, other employee or agent, who understands the way the property is used (areas most and least frequented) and the extent of the danger, should a tree be found that is falling apart or uprooting. Reports of problems by staff or members of the public are a fundamental part of informal observations and should be acted upon.

WHO CAN MAKE A FORMAL INSPECTION?

Formal inspections do not necessarily require specific qualifications but do require general tree knowledge and the ability to recognise normal and abnormal appearance and growth for the locality. Inspectors need the capacity to assess approximate tree height and falling distance from the tree to the area of use and when to request a detailed inspection. They also need an ability to recognise obviously visible signs of serious ill health or significant structural problems, such as substantial fractured branches or a rocking root plate which, were they to cause tree failure, could result in serious harm.

WHO CAN DO A DETAILED INSPECTION?

Detailed inspections require an appropriately competent person, experienced in the field of investigation that is to be carried out. Whoever is commissioning the detailed inspection should satisfy themselves as to the suitability of the inspector's qualifications, experience and professional indemnity and public liability insurance. Professional bodies who can offer guidance are listed in the contacts section at the end of this document. A specialist involved in conducting a detailed tree inspection should be able to demonstrate the reasonable basis for allocating risks according to priority, and identify cost-effective ways of managing those tree-related risks.

Risk acceptability, prioritising treatment and inspection frequency

When inspecting trees for public safety, the inspection primarily looks for external features indicating mechanical (structural) defects that pose a significant risk to public safety, concentrating on risks that are either immediate or reasonably foreseeable in the near future. The inspection will not normally identify trees that fall outside these categories for action.

IMMEDIATE RISK TO PUBLIC SAFETY

Immediate risk of serious harm is a risk of such immediacy and consequence that urgent action is required. In most cases, immediate risks are likely to be clearly observable in the course of informal or formal inspection and must be dealt with immediately, whether by means of tree work, eg felling, or through site management. For example, where a large tree is found with an obviously lifting root plate or actively separating heavy branch within falling distance of a busy road, this may involve stopping or diverting traffic or felling, crown weight reduction or branch removal. Most immediate risks have a reasonable likelihood of being identified by non-specialists and specialists.

NON-IMMEDIATE RISKS POSED BY TREES TO PUBLIC SAFETY

Risk of serious harm in the near future is non-immediate and can be reasonably managed at an acceptable level by a planned, cost-effective response. Action will be needed when inspections identify trees posing risks in the near future. Once identified, the response may involve prioritised treatment of the tree or site to manage the risk within the near future at an acceptable level, or further specialist assessment to clarify the extent of risk and treatment.

RISKS NOT REQUIRING A RESPONSE IN THE NEAR FUTURE

Where trees are identified as not posing a risk in the near future, there is no specific requirement for additional management. Existing informal and/or formal inspection procedures should be sufficient.

SPECIAL TREES

Informal and formal inspections both have a reasonable likelihood of identifying trees posing a risk of serious harm in the near future. Important trees that owners want to retain, eg for heritage, habitat or visual amenity, but which may present a significant risk, are likely to require specialist detailed inspection to manage them without serious loss of the benefits they provide.

FREQUENCY OF INSPECTION

Informal tree inspections contribute significantly to public safety, being important for deciding when action is needed and when more formal assessment is appropriate.

■ **Obvious defects.** © *The Tree Council*

A cracking within earth around base of root plate
B large cavity at base potentially colonised with wood decay fungi
C splitting or fractures in trunk or branches
D decay in old pruning wounds
E branches attached at structurally weak unions

OBVIOUS FEATURES INDICATING IMMEDIATE SERIOUS STRUCTURAL FAILURE

Such features are surprisingly few, and include:

- actively lifting root plate
- heavy limb actively splitting or breaking away from the tree
- stem fractured, moving and opening enough to "pinch".

OBVIOUS FEATURES THAT MAY INDICATE STRUCTURAL FAILURE

It is inappropriate to react to tree defects as though they are all immediately hazardous. Growth deformities and other defects do not necessarily indicate structural weakness. When noting features that might indicate a likelihood of weakness or collapse, it is important that concern for risk of failure is restricted to events likely in the near future. Trees exhibit a wide range of such features, and the scope for interpreting their significance is complex, particularly when considering the likelihood of non-immediate failure. For example, anomalies in tree growth may indicate internal decay and hollowing; but anomalies in form may be attributable to the tree having compensated for the decay, by mechanically adapting to natural processes.

Guidance relating to inspection frequency varies greatly; there is no uniformly accepted frequency appropriate to all situations. The decision is a judgment for the owner, agent or adviser, applying sensible reasonable behaviour in taking account of the site circumstances as a basis for good practice. Examples are given in Chapter 5 in connection with several types of land holding and circumstances.

General tree features to look for when inspecting trees

Safety inspection needs to consider features that might affect the structure and their significance as hazards. Figure 3 illustrates a tree with a range of defects that would be expected to be clearly identifiable from a basic visual check.

Management

SITE CONSIDERATION

Management options are guided by the overall aims that might be defined in a site's strategy document. In general, choosing which risk control measures to use while conserving the tree involves weighing up the costs and benefits. Trees bestow a wide range of benefits (see Appendix 2) and these should be considered along with the risks the tree may present. One cost-effective way to reduce the risk, without the costs involved in tree maintenance, is to manage access to the site.

MANAGING THE TREES FOR HABITAT AND AMENITY VALUE

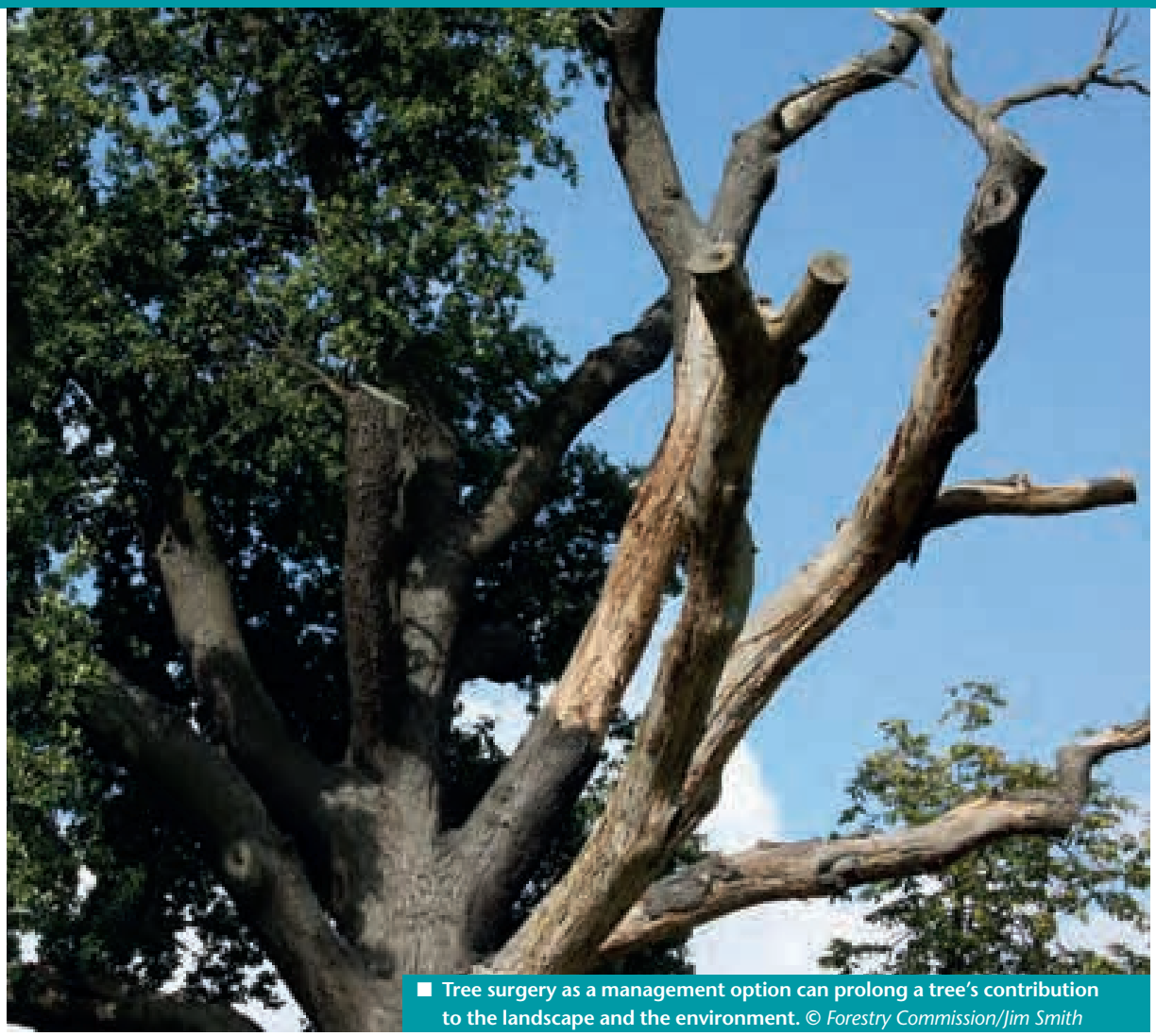
When all the options for managing the area within falling distance of the tree have been explored or where public exclusion from the area is neither desirable nor practical, remedial tree work will be necessary. It is advisable to undertake the minimum work necessary to reduce risk to an acceptable level. Management options should be discussed with the person carrying out the work. Where biodiversity and habitat have high value, a range of treatment options may be appropriate to retain maximum habitat balanced with the need for adequate safety. With high value trees, felling will be a last resort after taking into consideration all other options. Even when felling is specified, it may be possible to remove a tree's crown and retain the upright, dead stem for its habitat value as a monolith. Felled trees and trunks may also be left on the ground to provide important deadwood habitat.

MANAGING THE TREES WITH VARYING INSPECTION REGIMES

Management options also include increasing the frequency and intensity of monitoring the tree's condition.

MANAGING THE AREA WITHIN FALLING DISTANCE OF TREES

Where important trees are found to present significant risks, resources will influence decisions on retention. When a tree risk assessment has identified a situation requiring action, options are available for managing people away from the danger zone. This



■ **Tree surgery as a management option can prolong a tree's contribution to the landscape and the environment.** © *Forestry Commission/Jim Smith*

manages the risk without directly interfering with the tree, as well as protecting habitat, landscape or other benefits

REDUCING RISKS BY MANAGING ACCESS

For sites where special events greatly increase the number of people in the area within falling distance, restricting access is the best option. A large number of people on a site in very wet conditions can compact soil and harm tree roots. Though the effects of root damage can be slow to develop, they increase risks of tree failure.

Ways to reduce risks in well-used areas include:

- deterring informal parking beneath trees; damage to roots may not be apparent for many years and increases risk of failure
- re-locating facilities such as play equipment, seats, picnic tables, barbecues, information boards, commemorative plaques, hides, fishing platforms, horse jumps, feeding centres etc.
- re-routing paths and tracks where legally allowed
- redesigning mown paths in areas of long grass, a proven method of directing people away from high-risk zones
- placing structures and assembly points beyond the falling range of trees.

Effective ways of deterring access are:

- planting brambles and thorny shrubs
- using logs or piles of deadwood
- allowing grass to grow
- leaving brushwood around the tree
- temporary exclusion in adverse weather conditions
- changing the area's use, eg to hay meadow and for grazing.

REDUCING RISKS BY PROVIDING INFORMATION AND INTERPRETATION

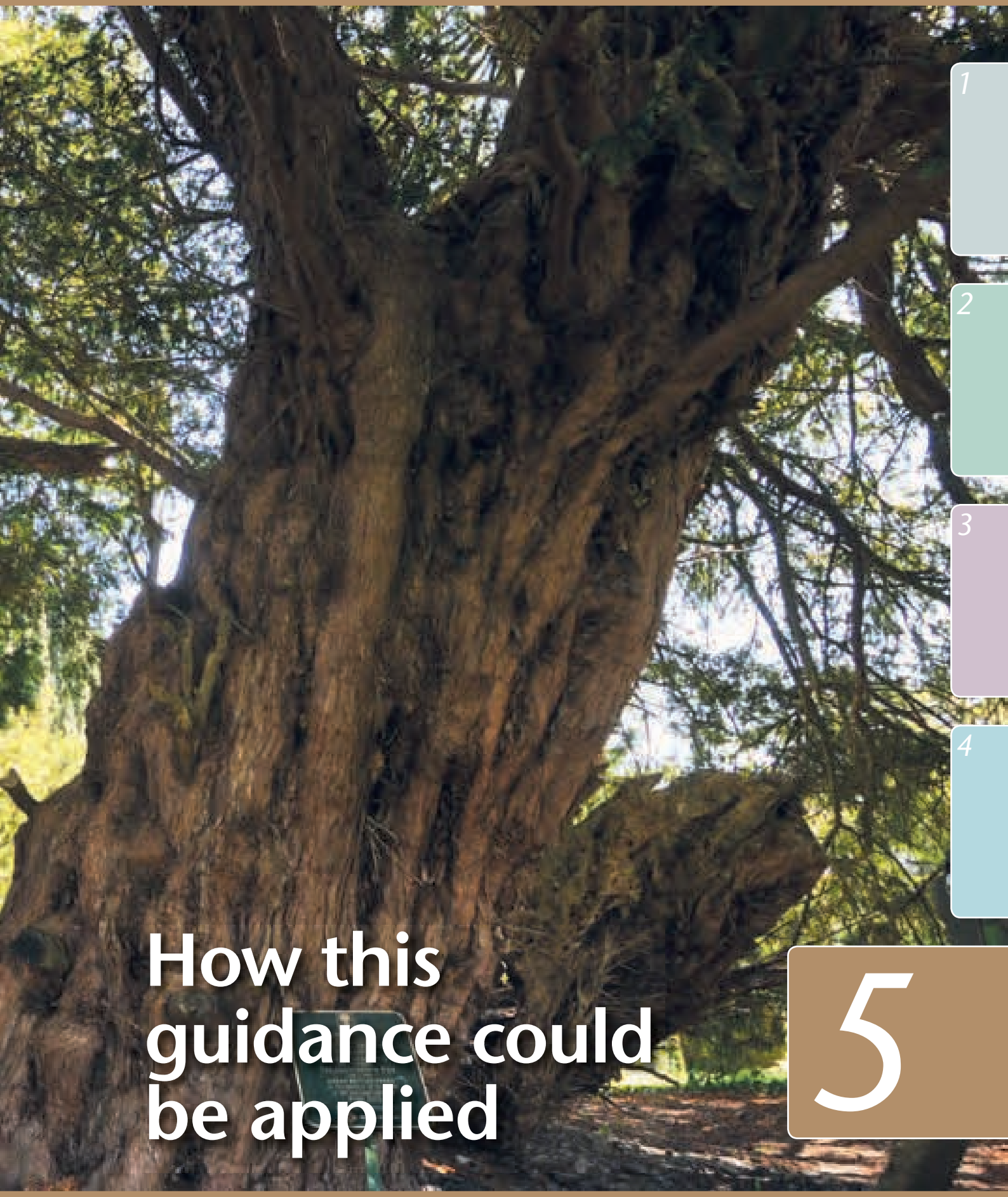
Providing information to the public can also play an important part in managing risks. Explanation and interpretation of the risks and chosen management options is also helpful in increasing public understanding of the issues. This can include the use of signs and notices, either at points of entry or car parks, or out on site.

BALANCING RISK WITH BENEFITS

Outdoor activity increases in fine weather, with people remaining longer in certain areas. In summer, one option to reduce risk from falling branches is by the simple practice of not mowing under the trees' drip-line. However, within the play sector there is a strong recognition that it is important for children to get "back to nature", including interaction with trees. Decisions need therefore to balance benefits with risks when considering segregating trees and people.

Insurance

Eliminating trees to remove all risk is undesirable and disproportionate in the light of all the wide range of benefits they provide. Even if all the advice and guidance contained in this document is followed, there will always be a residual risk. Violent storms and unpredictable events can result in tree failures leading to harm. Insurance provides for such eventualities, as it does in other spheres of life. Owners are advised to have insurance appropriate to their circumstances and to ensure that anyone who advises them, or does work to trees, is also appropriately and adequately insured.



How this guidance could be applied

5

This chapter contains some scenarios detailing suggestions of how to carry out a management plan's safety component in a reasonable and proportionate way. They are indicative examples to assist tree owners who should look for the closest scenario to their particular circumstances.

They are:

1. Householder
2. Business – restricted or limited public access (farm/private estate)
3. Business – open to the public (hotel)
4. Local authority – rural
5. Local authority – city council
6. Large estate with public access

Scenario 1: Householder

GENERAL DESCRIPTION

Scenario 1 is a detached home, it has several trees and shrubs. Some are on the boundary. Two trees in the front garden overhang the council-owned pavement and a quiet, residential road.

OWNERSHIP / CONTROL OF MANAGEMENT

Responsibility	As the owner of the land, the owners have responsibility and a duty of care.
Arboricultural competence	The owners are keen gardeners but have no specific arboricultural knowledge and therefore are regarded as lay people.

HOLDING

Land area	0.2 hectares
Number of trees	Seven trees, including a mature walnut and two large apple trees.

ACCESS

Private access: there is no public right of way over the land. Two trees overhang the public road.

BENEFITS OF TREES

The owners enjoy their garden and the trees in it. As well as providing colour, shade and ornamental interest, they give them some privacy from the road and neighbouring properties. They enjoy harvesting the fruit and nuts and also appreciate the wildlife they attract. They understand the contribution that their trees make to the wider environment, in terms of the "pleasant leafy neighbourhood" and how this increases the value of their home.

NATURAL LIVING ORGANISMS

The owners know that if the two trees overhanging the road were to fall or lose a limb, passers-by and road users could be affected. The road is regularly used by local, residential traffic; occasionally

people walk by on the pavement throughout the day. As far as safety is concerned, they classify these two trees as the most important in the garden, and do not consider these trees to be of concern though they recognise that they have an obligation to prevent them from impeding access along the footpath and road. The remaining trees are considered to be of low importance.

REASONABLE, BALANCED TREE SAFETY MANAGEMENT

Management	The owners check their trees as part of their general care for the house and garden. If they detect anything unusual about them, they call a local tree surgeon, who can tell if any remedial work needs to be done. There is no regular frequency to this process.
Competence	As reasonable and prudent landowners responsible for trees, they are able to recognise and understand the significance of obvious visual defects and be able to carry out their own inspection that may result in needing to obtain further advice. They use a recommended tree surgeon they believe is capable of providing such advice and undertaking any work required.
Records	They do not keep any formal record of their ad hoc observations, but they do keep records of correspondence and invoices for any advice or work carried out.
Reasonableness	They do not normally worry about their trees but are occasionally concerned that in strong winds parts of a tree could fall. They have given this thought and within the range of costs they have for their property as a whole they consider their expenditure on the trees to strike a reasonable balance, maintaining them in good health while meeting their duty of care to others. They believe that they have an informal but effective plan for the care of their trees that is affordable.

■ *Managing Trees for Safety* – **an NTSG guide for homeowners www.forestry.gov.uk/publications ISBN 978-0-85538-842-3**

Scenario 2: Business – restricted or limited public access

GENERAL DESCRIPTION

Scenario 2 could relate to a wide range of businesses where public access is not commonplace. This could be farmland, quarries and other land where, by the nature of the landholding or type of business, the land is excluded from general access. In this instance, we have used a farm.

The land is a mixed arable and livestock farm, with farmhouse and farm buildings, barns and yards. The land is made up of pasture and arable fields, some steep wooded ground, two small areas of managed woodland shelterbelts, plus many individual hedgerow trees, some of which are next to public paths and highways. The farm owner employs a farm manager, one other permanent worker on the land and sub-contracts work at busy times.

OWNERSHIP / CONTROL OF MANAGEMENT

Responsibility	The owner of the farm has overall responsibility for managing its affairs. His farm manager reports to him and has day-to-day responsibility for organising the activities of staff and sub-contractors. The manager is also responsible for ensuring the health and safety of employees and visitors.
Arboricultural competence	The farm owner and manager are experienced in a wide range of agricultural activities, with the manager holding a certificate of competence to use a chainsaw. Both he and the owner have a basic understanding of tree identification and can recognise most obvious defects and symptoms of tree features that might indicate structural weakness.

HOLDING

Land area	250 hectares
Number of trees	Approximately 7,000

ACCESS

A minor B road runs across the land, which is also bordered for half a mile by a busy A road. The tree-lined access driveway from the main public road to the farm buildings is frequently used by the owner, the farm's employees and regular business visitors.

BENEFITS OF TREES

The owner takes his responsibility as a guardian of the countryside seriously. He recognises the many benefits of having trees on his land, including the sustainable supply of firewood for his household, ad hoc supply of timber for fencing and other minor construction works, as well as shelter for livestock and reduction of wind and water erosion. The trees along the busy main road reduce the amount of noise from traffic, and those along the driveway provide an attractive, shaded approach to his home. He is also aware that the trees enhance the capital value of his farm.

NATURAL LIVING ORGANISMS

The owner has lived on the farm all his life and has witnessed the growth and decay of trees here and elsewhere. One of the veteran oaks in the pasture is completely hollow. He has seen mature trees suffering storm-damaged, broken branches and observed the subsequent re-growth without the need for any human intervention and has experience of the avenue trees that had fallen across the drive during a stormy night.

REASONABLE, BALANCED TREE SAFETY MANAGEMENT

Management	All farm staff are instructed to look out for any signs of tree problems anywhere on the farm, and report to the manager. He has made it clear he wants to know immediately of any serious, obvious problems such as a tree that is clearly falling apart or uprooting. The manager undertakes the first formal inspection of the trees alongside the two roads. He finds one tree where the root plate is lifting and another where a large branch has badly split. He arranges for the first to be felled immediately and for the second to have the branch cut back. He finds three other trees that he has serious concerns about but which he would like to keep, so he arranges for a qualified arboriculturist to have a look at them to advise as to what, if any, work is required to prevent immediate risk of collapse. Having carried out this initial inspection and completed the remedial work required, unless there is a change in circumstances the trees in these areas will be subject to the same informal inspection regime as the other trees on the farm until the situation is re-assessed in five years' time.
Competence	The farm staff's general working knowledge is considered adequate for identifying any areas for concern. However, if any trees are identified that the manager is uncertain about how best to deal with, he calls in a local tree specialist.
Records	The results of the manager's formal inspection of the roadside areas are kept in a file in the farm office along with the results of the arboriculturist's survey and a note of the remedial work carried out. As part of the informal survey regime, the manager keeps a note of any trees reported to him by the public or other farm staff and records his response to those reports in the file in the farm office.
Reasonableness	These records are considered important in that, in the unusual circumstance where he might have to show a reasonable system exists, he can demonstrate "the conduct to be expected from a reasonable and prudent landowner".

Scenario 3: Business – open to the public

GENERAL DESCRIPTION

Scenario 3 could relate to a wide range of situations where the visiting public make up the core element of the business. This could be hotels, holiday camps, sports and leisure complexes and shopping centres. In this instance, the business is a hotel. The Grange Hotel, a large Georgian building set back from a busy main road in well-manicured grounds with many mature and specimen trees. The hotel has 30 bedrooms and two function rooms, plus a popular restaurant and bar. Residents and other visitors are encouraged to enjoy the walkways and lawns in the gardens. The driveway from the road leads past the hotel main entrance to a large, tree-lined car park at the rear.

OWNERSHIP / CONTROL OF MANAGEMENT

Responsibility	The hotel owner, a businesswoman, has overall responsibility for managing the hotel's affairs. The hotel employs five full-time hotel staff, including a deputy manager, two duty managers and chef plus additional part-time kitchen, waitress and service staff. There is also a full-time head gardener and his part-time assistant. The owner relies on the head gardener's advice in respect of any work needed to the trees but recognises that she carries ultimate legal responsibility. Due to the nature of the business, the emphasis on this duty of care is appreciated and actively discharged by the owner towards her employees, guests and the general public.
Arboricultural competence	The owner is not knowledgeable in arboricultural matters. She would be regarded as a lay person. However, as a reasonable and prudent landowner responsible for trees, the owner employs staff able to recognise and understand the significance of obvious defects and carry out a visual inspection that may result in obtaining further advice. The head gardener cares very much about the trees and all the horticultural works for which he has responsibility. However, he has no formal arboricultural qualifications but considerable experience of trees and their problems over his 30-year career.

HOLDING

Land area	Five hectares
Number of trees	Approximately 700

ACCESS

The public has full access to all the grounds. At the front of the hotel, there are about 30 mature trees alongside the main road, a busy thoroughfare with both vehicular and pedestrian traffic. There is regular traffic on the driveway and in the car park.

BENEFITS OF TREES

The hotel owner, as an astute businesswoman, is well aware that fine trees and well-kept gardens add considerably to the enjoyment of visitors and the appeal of the establishment. Customers frequently make compliments about the fine, and in some cases rare, tree species, highlighted by

the immaculately tended lawns and flower beds. She understands that these benefits and value are balanced against the risk-reduction costs associated with maintaining the trees in good condition.

NATURAL LIVING ORGANISMS

The head gardener spends a considerable amount of time in the garden, so he soon notices if a tree has changed in appearance or has some other problem that might cause it to be unsafe. He also observes them through the seasons in different stages of growth and dormancy.

REASONABLE, BALANCED TREE SAFETY MANAGEMENT

Management	The owner and head gardener have agreed that a formal, five-yearly inspection regime should cover all the trees on the property together with informal observation in the course of their general duties. In the course of his other duties, the head gardener keeps a general eye on the trees and notices any significant change to their condition. The owner is satisfied that the head gardener is sufficiently knowledgeable about the grounds, their use and the trees to identify obviously hazardous changes in trees, such as broken, hanging branches or partially uprooted trees following a storm. The head gardener's initial inspection of all of the trees revealed six that caused him some concern and one in particular that he identified as potentially dangerous. He discusses these trees with the owner and she engages an arboricultural contractor to inspect any trees that the head gardener is concerned about. The contractor provides a written report on these trees, detailing any remedial work required, prioritised according to his view of the level of concern for public safety. Between them the owner and the head gardener decide to undertake the recommended work using a tree contractor. This report and invoices for the work are filed in the head gardener's office.
Competence	The head gardener has no formal qualifications, his experience and regular presence on site mean he is more than capable of identifying immediate hazards. Employing a fully competent and approved contractor for those trees where the head gardener is not sure of his diagnosis, gives the owner the confidence that a reasonable maintenance system is in place from the point of view of tree health and public safety.
Records	The written survey is updated as necessary and kept on record along with invoices and correspondence records of any work carried out. The head gardener also keeps a note of his observations and comments in a diary as and when they arise as part of his normal record keeping in relation to the care of the gardens.
Reasonableness	While recommended works should be carried out within a specified time scale, sometimes for economic and other practical reasons all work may not be completed precisely on time. Higher priority trees having recommended works take precedence over lower priority trees. The hotel owner considers her management strategy and practice provides a reasonable balance between the costs of risk control and benefits gained from risk reduction. This management strategy also maintains large trees making a diverse contribution to the property, some being old with holes in branches and hollow trunks; features which are important for wildlife.

Scenario 4: Local authority – rural

GENERAL DESCRIPTION

Scenario 4 relates to a county or district authority that is predominately rural. The council serves 1.1 million people who are mainly concentrated in several large towns. However, more than 70 per cent of its land area is rural, devoted to agriculture, divided among 130 parish councils containing numerous villages and hamlets. The county council employs two tree officers responsible for the sustainable and safe management of its trees.

OWNERSHIP / CONTROL OF MANAGEMENT

Responsibility	The county council has direct responsibility for trees: • On highway land, in seven district areas, for roads and rights of way • In 370 schools • In five country parks • In other numerous owned or managed parcels of land. The tree team provides an advisory and contract management service, working in partnership with eight local arboricultural contractors.
Arboricultural competence	Both tree officers are qualified to a minimum of National Qualification Framework Level 3, equivalent to a Technician's Certificate. Planning matters are outsourced to a competent qualified tree consultant. They occasionally seek additional expertise and capacity from other independent arboricultural consultants.

HOLDING

Land area	25,000 hectares
Number of trees	Approximately 350,000

ACCESS

The vast majority of the county council's land is accessible, with a network of 4,500km of highway, 3,300km of footpaths, bridleways and byways, 400 hectares of accessible woodland, many open spaces and five country parks. Much of the estate is in frequent use by the public.

BENEFITS OF TREES

The county council practises a tree management regime according to its limited resources while recognising the wide and many benefits trees provide. The council seeks to manage its diverse tree stock in a sustainable and safe manner, something most residents notice and appreciate.

NATURAL LIVING ORGANISMS

The tree stock varies considerably in age and species, from newly-planted and self-sown saplings to trees more than 500 years old. The council appreciates the importance of a wide age profile among its trees. It recognises that weather, development, construction and other factors subject trees to stresses and strains, physical and physiological damage, both above and below ground. The authority understands that despite these rigours, most trees respond, adapt and survive, by reactive growth and retrenchment, layering and natural regeneration. Part of the skill in managing the stock is to recognise these variables, carefully balancing the benefits of the trees with risks posed by them.

REASONABLE, BALANCED TREE SAFETY MANAGEMENT

Management	The authority's finite resources are allocated to ensure it reasonably meets its duty of care by demonstrating a defendable, proactive tree management regime. Currently, highway trees are formally inspected each year, by highway inspectors who have received initial, basic tree survey training and who refer concerns on to the tree officers. Other land is categorised according to frequency of use and rated high, medium and low. Competent arboricultural staff survey high use areas every three years. They survey medium areas more reactively and informally, with the aim of every five years. They inspect the lowest category less intensively with hedgerow trees receiving regular drive-by inspection.
Competence	The two tree officers carry out the proactive survey work and respond to public enquiries, with each tree officer being responsible for a geographical area.
Records	The tree officers use a fit-for-purpose GIS-based computer management system to inspect and audit its tree stock, capturing data electronically on site.
Reasonableness	Surveys have shown that the residents value trees and their open spaces. The council is also committed to fulfilling its duty of care, ensuring its residents, visitors and staff live, work and play in a reasonably safe environment. Despite reduced public funds, the county council demonstrates its commitment by allocating resources to its specialist staff, its tree strategy, ongoing programmed inspection regime and software management system.

Scenario 5: Local authority – city council

GENERAL DESCRIPTION

Scenario 5 could relate to any metropolitan authority, London borough, county or district council which contains a large conurbation. In this instance, we will use a metropolitan authority.
The council is responsible for managing the following land. It covers the city centre, the outlying suburbs and some rural land in the Green Belt. The overall population is around 200,000. The city council employs one arboricultural manager and three tree officers. They proactively manage all street and park trees and respond to more than 2,000 public queries a year. A separate council officer in the planning department deals with tree preservation orders and development issues.

OWNERSHIP / CONTROL OF MANAGEMENT

Responsibility	The local authority has responsibility for all municipal property and services within the city boundary, including trees. This includes: • Highways: 25,000 street trees • Parks: 120 different open spaces covering 345 hectares and one municipal golf course • Housing: 6,000 trees on council estates and individual gardens • Schools: 102 schools • One cemetery and seven closed churchyards. The council contracts out tree work to approved companies and the manager and his team manage a budget of more than £400,000 for all tree management and maintenance requirements, including planting. The city is built on a shrinkable clay soil and tree officers spend much of their time dealing with subsidence issues.
Arboricultural competence	The manager and his team manage the city council's tree stock in relation to amenity, public, political and environmental interest, building-damage risk and public safety. They are all qualified in arboriculture and have different levels of experience. Details of all the public trees are held on a specialised database, as the authority's insurance service requires evidence of management.

HOLDING

Land area	7,250 hectares
Number of trees	Approximately 300,000

ACCESS

The city is accessible to all, including visitors. Many of the parks are Victorian in design and many city trees date from that time. In the suburbs, there is an ageing tree stock of mostly plums and hawthorn, many with recognised defects.

BENEFITS OF TREES

The city is proud of its parks and the public interest in street trees is well documented. The council published a tree strategy outlining its approach to its different responsibilities. One aim is to increase street tree cover by two per cent a year for 10 years. Funding is in place to achieve this target, though this is under review. Because its tree strategy aims proactively to manage and maintain a healthy, sustainable tree population for public benefit, the council considers that its tree risk management policy is reasonable and cost-effective and is compatible with all its other tree-related policy objectives.

NATURAL LIVING ORGANISMS

Under the arboricultural manager's influence, staff throughout the city council's departments have become increasingly aware of the role the tree stock plays in their overall environmental policy. This has led to the increased retention of dead wood, both in living and dead trees and managing tree safety issues in more innovative and responsible ways.

REASONABLE, BALANCED TREE SAFETY MANAGEMENT

Management	Due to the risk of subsidence in the area, street trees are inspected and managed on a three-year cycle. This obviously includes highlighting any trees found in a poor condition. Schools and parks are inspected every two years and housing trees every four. The areas described above are managed proactively throughout the year. The tree officers record all tree inspections and any emergency work carried out. If they remove a street tree, they assess the location for replanting to keep in line with the council's stated strategic increase in its tree stock. Colleagues in the highways and housing departments, as well as school caretakers, assist by reporting dead trees or trees with fungi growing on them.
Competence	The tree officers carry out the main survey work. They look after all areas of public land in the city, with each officer responsible for a specific area.
Records	The tree officers keep records using the software system designed for the purpose.
Reasonableness	The council is committed to following its published tree strategy, which the council cabinet accepted as policy. Tree safety is only one element of managing trees. The manager and his team are aware of the importance of having a proactive system. In recent years, a change in the way they manage trees in less formal parkland has seen an increase in monoliths and standing dead timber. This has led to an increase in biodiversity and saved money. The tree officers' knowledge of the district and the tree stock has helped save countless trees under threat from subsidence claims and residents who have concerns. The tree strategy explains unambiguously the council's intentions with respect to managing trees in the city. While these systems are in place, there are still over 100 incidents of tree failure a year in the city, though these are usually the trees in the suburbs, mostly small ornamental trees which were all planted at the same time and are coming to the end of their lives.

Scenario 6: Large estate with public access

GENERAL DESCRIPTION

Scenario 6 could relate to a wide range of large landholdings where public access is the norm. This could include country estates, amenity woodlands, waterways and heritage land. In this instance, we have used a private estate open to the public. The estate has been in the family for generations. The estate is predominantly arable but with some grassland and 600 hectares of woodland. The historic house, ornamental gardens, park and woods contain many important veteran trees. Approximately 2,000 hectares are farmed in hand with the remainder tenanted; all the woodland and all the trees are retained and managed by the estate. The main house and its garden are open to the public throughout the year. Three car parks serve the main house, ornamental gardens, restaurant and the farm shop. During the summer, several events take place in the grounds – a craft fair, a caravan rally, a carnival, jazz festival and balloon fiesta. For the past three years, a television gardening programme has followed the seasonal cycle in the ornamental grounds through the eyes of the head gardener. The park and some of the woodland is open seasonally some of the year.
The estate employs a general manager who has overall responsibility for implementing policy, and strategic and operational decisions. Departmental heads are responsible for the house, the estate, the gardens, visitor facilities and catering. The estate's general manager is responsible for day-to-day tree safety. The estate also employs two gardeners, a farm manager, three farm staff, a head gamekeeper, two under-keepers and a woodman. An external forestry agent is employed to assist with the management of the woods. The estate is divided by several public roads, notably a busy A road which runs through it from north to south.

OWNERSHIP / CONTROL OF MANAGEMENT

Responsibility	The estate owner has overall responsibility for managing its affairs. The department heads report to him and they have day-to-day responsibility for managing their respective responsibilities. The strategic responsibility for the safety of all trees on the estate is held by the estate's general manager. As a reasonable and prudent landowner responsible for trees, the owner employs experienced staff who are able to recognise and understand the significance of obvious defects in trees, in the context of their location. They are able to carry out a visual inspection that may result in obtaining further advice.
Arboricultural competence	The farm manager is experienced in a wide range of agricultural activities and the woodman, one of the gamekeepers and the two gardeners have certificates to use a chainsaw. The woodman and the head gardener can identify the most common trees and can recognise the obvious signs that a tree may be hazardous. The external forestry agent advises on most tree-related issues and determines if tree safety work is required; if he feels the issue is beyond his level of competence, he will recommend a suitably qualified arboriculturist.

HOLDING

Land area	5,000 hectares
Number of trees	Approximately 450,000

ACCESS

The estate is divided by several public roads, notably the busy A road. The estate is criss-crossed by footpaths, some of which run alongside or through, the woodland. The house and garden are open year round and the park and woodlands open for some of the year. During the summer months, the park is used for public events.

BENEFITS OF TREES

The owner has known the estate all his life and lived there for much of it, he values his trees and woodlands. The trees and woods are very important to him, they enhance the landscape where he lives and provide valuable habitat for game birds and wildlife. As such, he sees investment in their maintenance as a good use of funds. In the winter, he and his friends see shooting as an important leisure activity. The rest of the year he appreciates the biodiversity provided by the other wildlife on the estate. Some of the veteran trees also give him a link with his family's heritage and presence in the area. Most of the work that his trees and woodlands require costs him money, and he is prepared to invest a reasonable amount in his trees.

NATURAL LIVING ORGANISMS

Having lived on the estate for most of his life, the owner is well aware of how the trees and woods have changed over the years. He has experienced trees being felled and replanted which are now of significant size. During the great storm of 1987, many trees blew over, many more lost branches. The scars and cavities resulting can still be seen on many of the larger trees. Recently, a mature beech lost a huge branch; fortunately no one was underneath it at the time. These events help the owner to understand that trees are living things and as they grow it is part of their nature to lose branches, develop cavities and eventually fall into a long, slow decline. He also recognises that often trees can recover from quite severe damage and live for many years with these features without being a danger to anyone.

REASONABLE, BALANCED TREE SAFETY MANAGEMENT

Management	Until recently, the estate had no formal tree safety management plan, relying on staff and others to report problems and dealing with them as they arose. Although the owner was not aware of anyone being killed or injured by a falling tree or branch on the estate, two years ago he decided that it would be prudent to adopt a slightly more proactive formal approach. In a meeting with the estate's general manager, head gardener, farm manager and woodman, an estate map was used to identify the areas that they thought merited more formal inspection. For this first formal inspection they decided to include the A road, all the public roads, the garden, the visitors' car park and the park. They decided to continue with the existing informal system on the rest of the estate. The owner also wrote a letter to all the staff telling them that he had asked the general manager to lead on the estate's tree safety plan and to report any trees that they were concerned about directly to him. The general manager and the woodman carried out the first formal tree inspection. They inspected the trees alongside the roads and in the park. This was mostly a quick visual inspection, stopping for a closer look at some of the bigger, older trees that were more likely to have problems, walking where the trees were closer together or where a wood grew alongside the road. The head gardener and the under-gardener inspected the trees in the garden and the car park. The roadside tree survey found three trees requiring attention and as they were not considered to be important for landscape or environmental reasons one was felled and the other two had limbs removed. No trees in the park needed attention. However, they decided some of the park's veteran trees needed protection, and, in future, event organisers would be instructed not to place marquees or other structures under or close to these trees. In the garden, in addition to the "secret" hollow oak, in a corner not used by the public, they found an old lime tree with a large cavity in it. The owner was very keen to keep the tree so, following discussion with the forestry agent, the general manager employed an arboriculturist to inspect it. He reported that the cavity was not affecting the tree's structural integrity. He recommended no work for now and another inspection in three years' time. Following the initial inspection and remedial work, the owner decided that, unless there was a change in circumstances, the trees alongside the A road and the lime tree in the garden would be formally re-inspected in three years time and those in the other areas in five years. Until that time, the trees in these areas would be subject to the same informal inspection regime as the other trees on the estate.
Competence	Employees able to recognise the significance of most tree features. When a greater level of expertise is required the forestry agent recommends a suitable arboriculturist.
Records	The results of the formal inspection are kept in a file in the estate office along with the results of the arboriculturist's report and a note of the remedial work carried out. The general manager also keeps records of any trees reported to him and the action that he took.
Reasonableness	The estate owner believes that, in the unlikely event of an accident involving one of his trees, the system he has put in place is sufficient to demonstrate "the conduct to be expected from a reasonable and prudent landowner".

References and Footnotes

CHAPTER 1

1. Health and Safety Executive (2007). *Management of the risk from falling trees*. HSE Sector Information Minute, SIM 01/2007/05. (Guidance for HSE inspectors and local authority enforcement officers).

CHAPTER 2

1. DARM Research.
2. Health and Safety Executive (2001). *Reducing risks, protecting people – HSE's decision-making process*. HSE Books. Sudbury.
3. ALARP is shorthand for "as low as reasonably practicable".
4. These are not rigid benchmarks and should be interpreted with common sense.
5. Of these, 18 people died during windy weather. This is probably an underestimate of the number of wind-related cases. Although over those 10 years there was roughly one death every two months, on 27 October 2002 five people were killed during windy weather and on 18 January 2007 three people were killed. It would therefore seem that the mean annual death rate is 6.4, but this falls to about 4.6 if high wind events are excluded.
6. Health and Safety Executive (2007). *Management of the risk from falling trees*. HSE Sector Information Minute, SIM 01/2007/05. (Guidance for HSE inspectors and local authority enforcement officers).
7. Societal concerns have been defined by the HSE as: "… the risks or threats from hazards which impact on society and which, if realised, could have adverse repercussions for the institutions responsible for putting in place the provisions and arrangements for protecting people, eg Parliament or the Government of the day".
8. House of Lords Select Committee on Economic Affairs (2006). *Government policy on the management of risk*, Vol. 1 para 34.
9. Health and Safety Executive (2007). *Management of the risk from falling trees*. HSE Sector Information Minute, SIM 01/2007/05. (Guidance for HSE inspectors and local authority enforcement officers).
10. The HSE has endorsed the trade-off between risk and benefit in the context of children's play.
11. The term "tree management" does not imply that specific activities to inspect and treat trees are always appropriate. In many remote or wilderness areas, for example, a reasonable policy might be to leave the trees alone completely.

CHAPTER 3

1. For a more extensive analysis of the law relating to trees see *The Law of Trees, Forests and Hedgerows* by Charles Mynors, Sweet & Maxwell (2002), second edition to be published Autumn 2011.
2. *Caminer v Northern & London Investment Trust Limited* [1951] AC 88.
3. *Chapman v Barking and Dagenham LBC* [1997] 2 EGLR 141.
4. [1996] AC 923.

5. *Caminer v Northern & London Investment Trust Limited* [1951] AC 88 at 100.
6. *Noble v Harrison* [1926] 2 KB 332; *Shirvell v Hackwood Estates* [1938] 2 All ER 1; *Cunliffe v Bankes* [1945] 1 All ER 459; *Brown v Harrison* (1947) 63 TLR 484; *Lambourn v London Brick Co Ltd* (1950) EG 28th July 1950; *Lane v Trustees of the Tredegar Estate* [1954] EGD 216; *Quinn v Scott* [1965] 1 WLR 1004; *Knight v Hext* [1980] 1 EGLR 111; *Chapman v London Borough of Barking & Dagenham CA,* unreported 13th July 1998 (1st instance [1997] 2 EGLR 141); *Poll v Viscount Asquith of Morley* 11th May 2006; *Corker v Wilson* 10th November 2006; *Atkins v Sir James Scott* 14th August 2008; *Selwyn-Smith v Gompels* 22nd December 2009.
7. *Chapman v London Borough of Barking CA* 13th July 1998.
8. *Quinn v Scott* [1965] 1 WLR 1004.
9. *Poll v Viscount Asquith of Morley* 11th May 2006; *Atkins v Sir James Scott* 14th August 2008.
10. *Caminer v Northern & London Investment Trust Limited* [1951] AC 88.
11. *Corker v Wilson* 10th November 2006; *Selwyn-Smith v Gompels* 22nd December 2009.
12. See also the Occupiers' Liability (Scotland) Act 1960.
13. s. 1(4) Occupiers' Liability Act 1957.
14. s. 1A Occupiers' Liability Act 1984.
15. s. 1(6A) of the Occupiers' Liability Act 1984.
16. s. 1(6C) of the Occupiers' Liability Act 1984.
17. s. 2(4) Occupiers' Liability Act 1957.
18. s. 2(1) Unfair Contract Terms Act 1977.
19. s. 1(3) Unfair Contract Terms Act 1977.
20. *Hampstead Heath Winter Swimming Club v The Corporation of London* [2005] EWHC 713 (Admin) para. 65 (contrast s. 1 of the Compensation Act 2006 in respect of civil claims).
21. Health and Safety Executive (2007). *Management of the risk from falling trees*. HSE Sector Information Minute, SIM 01/2007/05. (Guidance for HSE inspectors and local authority enforcement officers).

CHAPTER 4

1. Fay, N, Dowson, D & Helliwell, R (2005). *Tree Surveys: A Guide To Good Practice*. The Arboricultural Association.
2. Lonsdale, D (2000). *Managing hazards from trees: A general guide.* Forestry Commission, London.
3. Ellison, MJ (2005). Quantified tree risk assessment, used in the management of amenity trees. *Journal of Arboriculture* 31: 57–65.
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6. RSPB (2006). Code of Practice 50, Tree Safety Management.
7. Health and Safety Executive (2007). *Management of the risk from falling trees.* HSE Sector Information Minute, SIM 01/2007/05, HSE Field Operations Directorate, Sudbury. (Guidance for HSE inspectors and local authority enforcement officers).

8. Royal Parks, Section 21 – Tree Management.
9. Commission for Architecture in the Built Environment (2007). *Living with risk: promoting better public space design*. CABE, London.
10. Visitor Safety in the Countryside Group (2005). *Managing Visitor Safety in the Countryside – principles and practice*. VSCG, Nottingham.
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12. Play England (2008). *Managing Risk in Play Provision: Implementation Guide*. DCSF.
13. Health and Safety Executive (2007). *Management of the risk from falling trees*. HSE Sector Information Minute, SIM 01/2007/05. (Guidance for HSE inspectors and local authority enforcement officers).
14. Health and Safety Executive (2007). *Management of the risk from falling trees*. HSE Sector Information Minute, SIM 01/2007/05. (Guidance for HSE inspectors and local authority enforcement officers).
15. *Caminer v Northern & London Investment Trust Limited* [1951] AC 88.
16. In technical literature about tree risk, the people or property that might be harmed are commonly termed "targets" and the area within the tree's potential falling distance is referred to as the "target area". We have avoided using these terms as they imply intention and that when a tree or branch falls, causing damage, it is the result of a single traceable action, which it seldom is. The imagery could obscure understanding of events.
17. Of the small total number of people killed by trees (averaging 6.4 a year), 68 per cent between February 1999 and October 2008 were killed on roads (from falling trees or colliding with falling trees).

Appendix 1

Managing risks from trees: a position statement from the National Tree Safety Group

Introduction

The National Tree Safety Group (NTSG) is an inclusive organisation with representatives from governmental and non-governmental agencies, professional and corporate bodies involved in the management of trees. Its membership is open to all stakeholders with responsibility for trees[1]. The NTSG's aim is to develop a nationally recognised approach to tree safety management and to provide guidance that is proportionate to the actual risks posed by trees. A main outcome stipulated in its terms of reference is to produce a set of basic principles for considering and managing tree safety in the public interest. This statement, *Managing risks from trees*, sets out those principles. The overall approach is that a balance should be struck between risks and benefits.

The statement aims to support the work of all those involved in tree management – whether connected with streets, parks, public open spaces, businesses such as hotels or farms, private estates, woodland, commercial forestry or private gardens.

Context

There has been wide concern about the way that tree management addresses public safety. Fear of litigation is leading many landowners to remove trees in the name of "health and safety". The effect is to shift the focus away from more fundamental objectives.

People's tendency to remove trees for fear of them failing ignores dependable evidence that associated deaths and injuries are very rare indeed. Despite the fact that millions of trees grace our landscape and that nearly everybody passes under trees every day, there are only about six deaths a year from trees. Felling is also an exaggerated response to the actual risk of prosecution. Court judgments have recently shown regard for the landowner undertaking reasonable and proportionate tree assessment and management without the implied need for burdensome record keeping or costly professional surveying. A number of recent lower court judgments against the responsible defendant landowner have been overturned in the higher court in favour of the wider common good. Indeed, the HSE itself has made only one successful tree-related prosecution following members of the public being killed by falling trees or branches.

The NTSG has produced this position statement in response to growing concern over the unnecessary removal of trees. Neither the law nor the regulators require the NTSG or anybody else to develop a single policy that states how safety should be managed in all circumstances. Management of the risk is the responsibility of the owners and managers of the land (and the trees). However, a coherent underlying

risk philosophy articulated by such an inclusive organisation will undoubtedly aid all types of tree owner in considering what constitutes reasonable management in their particular circumstance.

Striking a balance between risk and benefits

The spirit of the Health and Safety at Work etc Act 1974 and other legislation that addresses people's safety in the face of risk of death or injury suggests that the operators, in this case tree owners and managers, are the people best placed to assess the risk and take the necessary action to reduce it to a reasonable level[2]. The act obliges them to reduce the risk as far as is reasonably practicable. The HSE's general approach is to set out the (safety) objectives and to give duty holders considerable choice as to the measures they should put in place to meet these objectives.

The HSE also recognises the complexity of the decision-making involved. It recognises that there are necessary trade-offs between benefits to society and ensuring that individuals are adequately protected, including the need to avoid imposing unnecessary restrictions on people's freedom.

For such a non-prescriptive regime to work, however, duty holders must have a clear understanding of what they must do to comply with their legal obligations[3], and the NTSG will produce detailed guidance to support this statement of principle:

The NTSG believes that one fundamental concept should underlie the management of risks from trees. It is that the evaluation of what is reasonable should be based upon a balance between benefit and risk. This calculation can be undertaken only in a local context, since trees provide many different types of benefit in a range of different circumstances.

This underpins a set of five key principles:

- trees provide a wide variety of benefits to society
- they are living organisms and naturally lose branches or fall
- the risk to human safety is extremely low
- tree owners have a legal duty of care
- tree owners should take a balanced and proportionate approach to tree safety management.

Trees and risk

There are billions of trees in the United Kingdom and they make a vital contribution to our health, wealth and wellbeing. Nowhere in the UK can be thought of as untouched by human activity, but not all trees are actively managed. Where it occurs, tree management means many different things depending on its underlying purpose. Trees grown by the Forestry Commission to supply timber are not dealt with in the same way as a tree on a busy street. While tree safety management in both cases focuses on deaths and physical injuries resulting from accidents, the approach needs to strike a balance between both the benefits and the risks from trees. Although people's safety is undoubtedly an important consideration whether trees are

managed for their cultural, amenity, heritage or environmental benefits or for timber production and other commercial interests, it must be evaluated alongside the other benefits.

Because trees present a very low risk to people, owners and managers should be able to make decisions within this context and avoid unnecessary intervention, survey and cost. In so doing, they can reduce unacceptable risks while optimising the many values conferred by trees. Good tree safety management does not seek to eliminate risk, but to reduce it to a reasonable level. In some situations, people exposed to risks from trees are expected to make reasonable decisions about their own interaction with trees, particularly during extreme weather.

Trees grow in many different types of location and the expectation of society and the courts reflects this. By carefully considering how trees fit into a particular local context, owners and managers will be better able to identify those areas and situations requiring some action. It will also help them ensure that any management is proportionate, achieving a fair balance between the real risks and benefits.

Evaluation of what is reasonable

The HSE believes that:

> *"Public safety aspects can be addressed as part of the approach to managing tree health and tree owners should be encouraged to consider public safety as part of their overall approach to tree management."* [4]

This is an encouraging position from the regulator, even if tree health may be a term that causes some discussion within the tree world. It would certainly seem that the HSE, and by implication the courts, will accept that human safety is to be considered within a wider management context rather than being evaluated in isolation or in response to some notional protocol.

The first stage of an evaluation, therefore, looks at the role of the trees themselves. In a private garden, there is no presumption that it is reasonable to expect owners to do anything other than react to obvious signs of danger (which they are likely to do anyway since it is themselves or their property that is most in danger). There is clearly a concept of scale in the consideration of reasonableness and, in the context of the low level of risk noted already, the HSE SIM further states that:

> *"Given the large number of trees in public spaces across the country, control measures that involve inspecting and recording every tree would appear to be grossly disproportionate to the risk."*

What is inherent in this evaluation is a sense of proportion. This can only be achieved by considering the trees' place in a wider management context and the relationship of people to that context.

In some circumstances trees are managed as a crop. This context is closer to the type of workplace environment that the Health and Safety at Work etc Act 1974 was

designed to address. Here, the primary focus is on planting, maintaining and harvesting the crop for maximum income. In this simple model of a commercial forest, benefit can be equated to profit in the same way as in a factory or farm. In this case, one might expect a formal health and safety policy to address workforce and visitor safety. Leaving aside the question of amenity use by visitors, it seems logical to apply cost benefit analysis to the valuation of safety interventions as outlined in the Tolerability of Risk Framework[5]. And, given the low level of risk to the public, it is likely that nearly all the investment will be focused on worker safety. This type of calculation might be appropriate for other commercial operations and public utilities that incorporate trees on their site.

The evaluation seems more complicated when it comes to considering the risk to the public from trees in urban and rural open spaces. In many cases, trees may be looked after by local government or public bodies such as the National Trust, which must bear the safety costs. Undoubtedly, the trees benefit the organisation, but this benefit is not expressed as an income[6]. It is this dissociation of costs and benefits that leads to the unnecessary loss of trees. Here the benefits are to the public, but the owner, or manager, shoulders the costs and the liability. The establishment of what is reasonable in terms of public safety in these circumstances requires the adoption of a different basis of calculation. It is for this that the NTSG, in common with other sectors of public risk such as play provision, is now arguing.

Managing the risk from trees

People enjoy what they perceive to be "natural" or "unmanaged" environments and value trees that have received minimal or no intervention. People are prepared to accept a degree of risk because of the value of the trees, and the pleasure they derive from visiting or participating in leisure activities in treed environments. Therefore, it is acceptable that tree management does not seek to eliminate all risk of minor and easily-healed injuries. Tree management should not expose people to significant likelihood of permanent disability or life-threatening injuries. However, it may on occasions be unavoidable that tree management exposes people to the very low risk of serious injury or even death. This is only tolerable in the following conditions:

- the likelihood is extremely low
- the hazards are clear to users
- there are obvious benefits
- further reducing the risks would remove the benefits
- there are no reasonably practicable ways to manage the risks.

For example, a mature tree in a city park presents a low but irremovable risk of falling on somebody, even if it is frequently inspected and treated. This risk is usually tolerable. The likelihood is typically low and people benefit through retention of a feature that is inextricably linked to why they visit the park. Further reducing this risk is not possible without removing the tree and taking away the benefits.

The NTSG considers that it is reasonable to expect sufficiently large organisations that own or manage trees to develop a formal policy (in line with practice in other sectors). This policy should strike a balance between the risks and the benefits. This balance should be based on a risk assessment involving a risk-benefit trade-off between safety and other goals, which should be spelt out in the policy. The NTSG argues for the presumption to be that, given their social and environmental value and their importance to human health and wellbeing wherever possible, amenity trees should not be felled. Such a reasonable policy, articulating the benefits of trees, should carry as much weight in protecting the policymaker against litigation following an incident as any reasonable risk management policy in a workplace setting.

Conclusion

Safety management should not be considered in isolation. It should be considered only as part of an integrated management plan that focuses on the wider management of the trees within a particular setting. Establishing the reasons for the tree being there will always dictate the resources invested in its maintenance, whether it is being grown as timber, is an outstanding veteran tree in the park of a stately home or is a self-seeded intruder that needs to be cleared for site development.
A situation has arisen where some of those responsible for trees are managing them defensively, through fear of litigation. This circumstance is exacerbated by the fact that, generally speaking, while the public gets the benefit of the trees, it is the owners and managers who bear the legal duty and attendant cost. This unnecessary loss of trees, which the landowner would have otherwise retained, can be addressed if the public good (in terms of health, environmental and social benefits for example) is brought into the calculation of benefit to demonstrate a reasonable position that will be accepted by the courts.

NOTES

1. Membership currently includes the Forestry Commission, The Arboricultural Association, The Country Land and Business Association, the Woodland Trust, the Ancient Tree Forum, The Confederation of Forest Industries, English Heritage, The National Farmers' Union, The Institute of Chartered Foresters, The B/213 Trees Committee of The British Standards Institution, The Royal Institution of Chartered Surveyors, The London Tree Officers Association, the Visitor Safety in the Countryside Group and the National Trust.
2. *Reducing risks, protecting people*, HSE 2001.
3. The HSE Sector Information Minute, although produced for its own inspectors, also gives useful insight into their current thinking. (HSE, SIM 01/2007/05, *Management of the risk from falling trees*).
4. HSE, SIM 01/2007/05, *Management of the risk from falling trees*.
5. The Tolerability of Risk Framework is used by the HSE to judge what is reasonable for investment in safety. It is set out in *Reducing risks, protecting people*, HSE 2001.
6. And although techniques exist to estimate a monetary value by surveying people's willingness to pay for such intangible benefits, this is not practicable in the circumstances of tree risk management.

Appendix 2

The benefits of trees

Trees are fundamental to our wellbeing and quality of life. Their size, number and age make them one of the most visible and continuous aspects of our lives. Their beauty and majesty have inspired artists, poets and writers. Trees may also be significant to us personally, marking historical occasions, commemorating a birth, family event or celebration of a life.

Trees are integral to most natural ecosystems, providing a wide range of related benefits to humankind (ecosystem services), including mitigating the harmful effects of climate change. Trees are an important part of the economy, providing timber and non-timber forest products. They also bring communities together, playing a part in their cultural and spiritual values and aesthetic appreciation.

Their importance is recognised in international, national and local government policies, and many non-governmental organisations have policies dedicated to conserving trees and their biodiversity.

Trees in cities and towns

Around 85 per cent of the UK population lives in urban areas, where the pressures of modern living are often most evident. Trees are an integral component of greenspaces in our towns and cities. Most local authorities have policies or strategies for protecting and maintaining trees in their area and employ professional arboriculturists (tree officers or consultants) to undertake this vital work.

The Environment and Social Justice Review[1] argues that the quality of greenspace acts as a powerful indicator of whether an area is a good place to live, while the Cabinet Office Strategy Unit advocates urban greenspace and green infrastructure as a primary element affecting quality of life[2]:

> *"Trees bring people together. They contribute to a sense of place and play an important role in fostering social cohesion and reducing negative social behaviours."* [3]

Ninety-two per cent of survey respondents in the Park Life Report[4] said they visit parks and greenspaces, and 97 per cent believe that parks and greenspaces help to create a good place to live.

The Royal Commission on Environmental Pollution recognised the benefits that the natural environment provides in urban areas[5]:

> *"Our towns and cities have always relied on the natural environment to provide water, regulate climate and accept waste. Now, the natural environment offers opportunities for increasing flexibility and resilience in the face of new environmental and social challenges including climate change."*

By the 2080s, average annual temperatures in the UK may have increased by between 1°C and 5°C, with higher summer temperatures and milder winters.

Increased winter rainfall and drier summers, particularly in the south and east, will be accompanied by more frequent storms, heatwaves and other severe weather events.

The impact of climate change will be felt acutely in built-up areas where the "urban heat island effect" will further increase temperatures. Concrete, brick, tarmac and other hard surfaces will also impede water infiltration, increasing the risk of surface water flooding. These effects are likely to increase significantly unless measures are taken to adapt to climate change.

The UK low carbon transition plan highlights the role of greenspace and trees in providing shade and shelter, which help adapt buildings to climate change and reduce their energy budgets[6].

- Each year, 33 million people make 2.5 billion visits to urban greenspaces. Access to urban greenspace can increase longevity as well as engendering positive feeling about the local community[7]. Well-designed tree planting can create a "calmer and more social atmosphere" that enhances community security and minimises concealment for anti-social activities[8].
- Living near green spaces increases people's likelihood of choosing walking over all other forms of transport. (Nancy Humpel, Neville Owen & Eva Leslie (2002). Environmental factors associated with adults' participation in physical activity. *American Journal of Preventive Medicine* 22, 188–199.)
- For every 1°C increase in temperature above 21°C, heat-related deaths increase by three per cent[9]. An increase of 10 per cent in urban green cover in high-density residential areas in Greater Manchester would decrease the expected maximum surface temperature in the 2080s by around 2.5°C (and up to 4°C). Conversely, removing 10 per cent green cover would increase the expected maximum surface temperature by 7°C[10].
- One mature tree can give off up to an average of 450 litres of moisture a day, the cooling equivalent of five room-sized air conditioners left on for 19 hours. (Nicholas-Lord, D (2003). Green cities and why we need them, *New Economics Foundation*, London, p13. Available at: www.urbanwildlife.org.uk/assets/userfiles/000074.pdf)
- Trees strategically placed around buildings can reduce energy consumption producing 10–50 per cent savings in air conditioning costs[11] and 4–22 per cent in savings from winter heating costs[12].
- Trees intercept precipitation and in urban areas can reduce the pressure on the drainage system and lower the risk of surface water flooding. Research by the University of Manchester has shown that increasing tree cover in urban areas by 10 per cent reduces surface water run-off[13] by almost six per cent[14].
- During 1999–2000, publicly-maintained street trees in Davis, California produced nearly $1.7 million in tangible benefits for residents – a net return of $3.78 for every $1 spent on their management[15].
- The City of New York has, using the i-Tree valuation system, been able to demonstrate annualized benefits of $5 for every $1 invested in the management of its tree population across the five boroughs.

Trees in the countryside

In the countryside, trees are important for residents and visitors alike. This importance is likely to grow as populations increase, towns and cities expand and the climate changes. Despite the centuries-long importance of trees, woods and forests to the UK economy, and a drive for afforestation during the last century, the UK remains one of the least forested countries in Europe.

Trees and woodland can help manage water quality and reduce the risk of flooding when planted at a river catchment scale. River basin management plans produced for England and Wales recognise the role of woodland planting in reducing the risk of surface water runoff, affecting the quality of rivers and streams[16].

- Woodland can reduce floods from hill slopes and in headwater catchments, and may have a marked impact on flood flows at a local level, particularly in the UK which has less than 12 per cent woodland cover[17].
- Each year, the UK loses 2.2 million tonnes of topsoil to erosion[18]. Trees and woodland can help reduce soil erosion, protecting a vital resource and reducing the risks of surface water runoff. Runoff from farmland, brownfield and contaminated sites can lead to rivers and streams becoming clogged up and contaminated [19,20].
- Soil infiltration rates were 60 times higher under young hedgerows and shelter belts than heavily grazed pasture in Mid Wales, with infiltration rates improving within two years of tree planting[21].
- Shade from trees next to water courses reduces the temperature and improves oxygen levels in the water, benefiting fish and other wildlife[22].
- Trees can play a vital role in adapting farming systems to climate change, including through providing shelter and shade for livestock and crops, and in managing surface water runoff and pollution of water courses.
- Trees provide shelter for crops, reducing wind and rain damage and water loss and encouraging crop pollination[23]. They may reduce the incidence and severity of some crops' pests and diseases[24]. Windbreaks of trees help increase crop yields, particularly during dry summers[25].
- Mature trees in the countryside provide a range of ecosystem services, including critical habitat for wildlife, particularly when growing scattered through agricultural landscapes, supporting connected networks for colonising species[26].
- Based on savings to the engineering costs of flood control, the value of existing woodlands for flood alleviation is around £1,200 per hectare in a river catchment in south-east Northumberland[27].

Health benefits

Trees may offer important health benefits; yet removing trees seldom takes account of the risks to human health and wellbeing.

- Each year, 24,000 people in the UK die prematurely from the effects of air pollution[28]. Leaves and branches take fine, harmful particulates out of the air, reducing the risk of respiratory illness and saving health care costs[29,30]. Doubling the tree canopy cover in the West Midlands alone could prevent around 140 premature deaths per year[31].
- Asthma rates among children aged 4–5 in the UK (around 15 per cent of all children and higher in urban areas) fell by a quarter for every additional 343 trees per square kilometre. (First ref: *Using woodland for soil protection and sediment control*, Nisbet, TR, Orr, H, & Broadmeadow, SB, in proceedings of the SAC and SEPA Biennial Conference on Land Management in a Changing Environment, Edinburgh, 26–27 March 2008, pp84–90, 2008. Second ref: Stress recovery during exposure to natural and urban environments, Ulrich, RS, Simmons, RF, Losito, BD, Fiority, E, Miles, MA & Zeison, M, *Journal of Environmental Psychology* 11, 1991; Restorative qualities of favourite places, Korpela, K & Hartig, T, *Journal of Environmental Psychology* 16: pp221–233, 1996; Assessing public perception of landscape: the LANDMAP experience, Scott, A, Landscape Research 27, pp271–295, 2002.)
- Trees and woodland can decrease sulphur dioxide, nitrogen dioxide and ozone concentrations in the air, benefiting human health[32]. Conversely, the loss of mature trees can have significant human and economic costs.
- Trees not only store carbon, but their removal of carbon gases, principally carbon monoxide, has considerable cardiovascular health benefits[33].
- Trees reduce stress and improve mental health, and can reduce hospital recovery time[34]. The quality of natural features and trees in the city helps reduce mental fatigue and stress[35], improves the concentration of those suffering from attention deficit disorder and benefits child development[36].
- A barrier of trees over 15 metres wide may reduce noise levels by 5–10 decibels and lessens nuisance by screening the perception of noise[37].
- Prison inmates in cells with a green outlook place fewer demands on health services[38,39].
- If every household in England had good access to quality green space, it could save around £2.1 billion a year in healthcare costs, which stand at £110 billion a year in the UK, or 8.5 per cent of all income. (Stone, D (2009). An estimate of the value and cost effectiveness of the expanded WHI scheme 2009, Natural England.)

Economic benefits

For centuries, trees have provided wood for house and ship building as well as furniture; fencing, screening and baffling; paper and cardboard; animal bedding; renewable energy; and heat. As part of the development of a low-carbon economy, wood and wood products now play a major role as a renewable resource and in the storage of carbon. Trees and woodlands have an important role to play in supporting commercial enterprises and rural development that contribute to local and national growth.

- A total of around 8.8 million tonnes of softwood and hardwood timber was produced in the UK in 2008.
- Forest industries significantly contribute to national employment and wealth. In 2005, they generated 167,000 jobs and gross value-added value worth £7.2 billion[40].
- Processing companies currently invest around £100 million per year in sawmills, panel plants and paper mills, using home-grown timber.
- England's woodlands remove around one million tonnes of carbon from the atmosphere every year, equivalent to the annual emissions from 625,000 homes[41].
- By increasing our existing woodland cover by 23,000 hectares per year over the next 40 years, we can reduce the total annual greenhouse gas output by 10 per cent.
- Using timber in the UK's new and refurbished homes could store an estimated additional 10 tonnes of carbon (equivalent to 36.7 metric tonnes of carbon dioxide emissions) by 2019.
- Investment in new and expanded woodlands plays an important role in brownfield and urban land regeneration, in economic development, and in attracting inward investment.
- Trees and greenspace enhance property values. For example, in London the area of greenspace is the fifth most significant indicator explaining variation in house prices[42]. In north-west England, a city park can enhance property values by almost 20 per cent[43], smaller local parks can enhance the value of flats by more than seven per cent, and larger dwellings by more than nine per cent.
- Greenspace with good levels of tree cover is much less costly to maintain than grassed areas. Reference: Although grass management practices vary considerably and it is difficult to arrive at national averages, an estimate based on Standard Costs for London, which assumes mown grass receives around six cuts a year, indicates an annual maintenance cost approaching £4,000 per hectare per annum. Whereas tree/woodland maintenance, excluding fencing and mammal control, although also varying considerably, was never more than £200 per hectare per annum. This is a significant cost advantage that, when considered alongside the additional possibility of greenspace with trees benefiting from woodland grants throughout the UK, makes the inclusion of trees into greenspace doubly attractive. (*The Case for trees* (2010), Forestry Commission, p10.)

Finally

The many research findings above show just how much we rely on trees. They are essential to a healthy environment and cohesive communities, they cool hot places, condition the air we breathe and even contribute to psychological balance and human longevity. They are not, however, there just for us. They are also vital for biodiversity. Appendix 3 describes their biodiversity contribution.

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Appendix 3

Trees are living natural organisms

"Three hundred years growing. Three hundred years standing. Three hundred years decaying." ***Peter Collinson (1776) on the life cycle of English oak and sweet chestnut.***

Trees are long lived organisms

Their capacity for long life and ability to grow to great height and size give trees their importance for humans, providing durable and useful materials, and protection from the elements. When allowed to go through their natural life cycle, trees provide habitat supporting a diversity of dependant species, and generally, as trees age, their associated biodiversity increases. Trees may be thought of as keystone species, in that their importance for biodiversity is such that, when removed from an ecosystem, the entire set of connections between inter-dependant species breaks down and systems collapse.

Trees are natural shedders

Unlike man-made structures, it is entirely normal and natural for parts to break and fall from trees. Leaves and twigs are regularly shed. Branches die and live branches may become wind damaged or overextended, occasionally falling to the ground. On rare occasions, roots can snap under wind load causing the entire tree to collapse. These types of structural tree failures are natural and, in rare instances, can cause death, injury and damage to property.

Young trees' strategy is to rise above the competition

When young, a tree puts energy into attaining height above the surrounding competition, expanding and ascending its stem, forming a trunk to support a crown with branches that can bear sufficient leaf capacity to create surplus carbohydrate energy. This surplus energy further supports and permits crown expansion, growth, defence and eventual seed production.

Annual growth rings

In the early stages of growth, the trunk is mainly sapwood with an outer protective covering of bark. The vascular tissues in sapwood are made up of woody (xylem) and non-woody (phloem) vessels, conductive tubes formed in annual "rings" for the transport of water and organic products respectively. Layers of sapwood are laid down each year. While we tend to think of these as annual "rings", they are seen as rings only if the tree is cut down and we look at the trunk in cross-section. In fact, this annual woody layer is laid down over the entire outer body of the tree, from the furthest small root to the topmost branch; like a veneer-skin, or a virtual new plant spread just beneath the bark. The growth of annual rings can vary year by year, their width being influenced by climatic events. They are typically reduced after drought or

flooding or when the tree suffers physical damage such as bark loss, compaction of the soil within its rooting zone, root damage or soil removal.

Essential function of sapwood

Sapwood is fundamental to all life processes in the tree. Its importance lies in connecting roots in the soil to the atmosphere, transporting water (via outer woody xylem vessels) to the uppermost crown leaves for sugars to be manufactured through photosynthesis (using sunlight, water and carbon dioxide). These sugars are then transported throughout the tree (via phloem vessels, located just beneath the bark) for growth and storage. Sapwood channels immense amounts of water via the xylem, inspiring the idea that living trees are "fountains of the forest"[1].

Why water is a key to understanding tree growth and health

For sapwood to function, it needs the outer bark to 'lock in' water effectively. Thus, when the seal of bark is broken through damage, sapwood around the damage starts drying out, ceases to function and dies. The change in internal water conditions after bark loss and sapwood death creates habitat in which different fungi may flourish. Some of these decay and recycle wood. A common cause of these changes is when trees shed branches after storms or when shading from light causes natural branch death, resulting in change in water activity around the dead or fallen branch stub; creating conditions ideal for stimulating local fungal activity.

Healthy, mature and old trees mostly comprise non-living wood

During early growth years, the wood under the bark is entirely comprised of conductive vessels. Oak and sweet chestnut wood may continue like this for around 20 or so years, after which the oldest (innermost/first year) "ring" dies off, becoming the first ring of the "heartwood"[2]. Each year thereafter, a new outer layer of sapwood is laid down and the next, innermost ring dies off, and is relegated to the non-living heartwood. When the tree is 30 years old, its cross-sectional area is still mostly sapwood. But from then on, the ratio of the area of sapwood to heartwood reduces. After 50 years or so, there are likely to be equal areas of sapwood and heartwood. After 200 or 300 years, the now large tree will be mostly composed of a non-living inner heartwood (or ripewood) core.

Crown retrenchment: controlling distances required to move water

When fully mature, while the annual new layer of sapwood is laid down over a trunk with still expanding girth, the crown's foliar capacity may also start to reduce in volume naturally. At this stage, trees naturally diminish their height and spread. Some

tree professionals refer to this process as "growing downwards", while others use the term "crown retrenchment" as it describes how trees reduce supply lines (for water, nutrients and sugars) from their roots to upper crown leaves. The onset of crown retrenchment marks the beginning of the ancient phase, when trunks may also increasingly become hollow, producing a very rare habitat. Retrenchment is a survival strategy, which the tree can repeat, enabling the ancient state to be the longest phase of a tree's life.

A tree can be mostly non-living, even hollow, yet be very healthy

A mature tree trunk is mostly composed of non-living wood and a small cross-sectional area of living outer sapwood. As long as the roots are able to function and the branches are not too shaded or damaged, it is likely that the life-giving functional sapwood can supply all the tree's needs. When old and large enough, an array of decay fungi colonises the wood, creating veteran tree habitat. Fungi are the key organisms involved in breaking down the constituents of wood, creating veteran habitat conditions suitable for a succession of organisms to gain entry and interact, each with their specialist life styles. Old hollow trees are often found still standing after storm events, while nearby younger solid trees may be uprooted. One reason for this is that because they are older and have undergone crown retrenchment, they present lower wind resistance, compared to younger, taller trees. Old pollard trees may similarly withstand uprooting due to their reduced crown height, though they may be more susceptible to shedding large pollard branches.

Roots are vital and easily damaged

While it is easy to have some idea of how a tree functions above ground, much of the tree's life takes place within and around its root system, below ground. Highly complex ecosystems are associated with the soil-rooting environment. Here, special interactions take place that are mostly still not well understood. Roots are essential to tree survival, anchoring the tree and drawing water and nutrients from the soil. Trees have evolved slowly and gradually. They are not particularly adapted to impacts of human development, such as inhospitable urban soils, or soil compaction from people and vehicles, and having their roots severed during utility trenching. Being hidden from view, roots may be unintentionally damaged, leading to reduced tree stability and shortened life expectancy. Such damage tends to be hidden and progressive, often becoming evident only as poor leaf condition decades later.

How trees incorporate decay – compartmentalisation

While we may think of a dead branch on a tree as a sign of ill health, in a great many cases this is a wrong interpretation. Trees benefit by allowing branches to die and be shed. So, when seeing this process, we may be witnessing an evolved survival strategy. Trees, when wounded (such as from storm damage, torn or lost bark or

decay), have a highly developed capacity to adapt by protecting the organism as whole. Trees incorporate decay into their roots, trunks and branches, growing and developing healthy tissue around it. This capacity to "compartmentalise" (wall off) decay and grow around dead and decaying wood has evolved to such an extent that old trees can have entirely hollow trunks and enormous branch cavities, with no detriment to their vitality, particularly when the outer living sapwood has not been unduly damaged or compromised.

> *"If a healthy tree is defined as a plant without active infections, then there is no such plant as a healthy tree. Trees have hundreds, or even thousands, of active infections that are compartmentalised."* ***Alex Shigo***[3]

Trees do not need people

Six per cent of British invertebrate fauna, as many as 1,700 species, depend on other species that, in turn, depend upon decaying wood habitat for part of their life cycle[4]. These habitats are naturally generated through the ageing process and are the very features that are commonly thought of as structural "defects" and equated to hazards in trees. Although it may be important for human safety, it would be wrong to believe that all management intervention is necessarily carried out for the tree's benefit. Trees have their own inbuilt mechanisms for dealing with damage and decline. If trees were left to their own devices and allowed to go through their natural life cycle free from human intervention, tree failure of any nature would be irrelevant, being part of complex natural processes, integral to the way trees have evolved. It is only where there is a close association between humans and trees that tree failure takes on any significance, and that the concepts of hazards and risk from trees have any meaning at all. Chapters 2 to 4 explore the reality of the risks posed by trees, to arrive at a balance between conserving their important qualities while managing risks at an acceptable level.

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Notes

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