



## Safety in numbers; the 1:10,000 time bomb

*Notes from a paper presented at the 2011 AA Conference at Warwick*

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### Arboricultural evolution!

Arboriculture is moving forward at pace; advancing technology is providing ever more complicated practical means of investigating trees, and with that progress comes an expectation that perhaps the more traditional management protocols also need to be modernised. Tree managers are now faced with such a bewildering choice of increasingly sophisticated tree assessment methodologies that it is difficult to know where to start. In my work as a consultant, I regularly speak to tree advisors who are genuinely worried that not adopting the 'latest fashion' may leave them vulnerable to criticism if a tree fails and they end up in court. I think it is fair to say this is a common perception, but is it true and do we have to drop the 'tried and tested' in the name of progress?

When I first started working in arboriculture back in the 1970s, assessing the risk from trees and deciding what to do was a relatively simple process. You looked at the tree, worked out what bits might fall off, considered the level of use nearby and came up with works to limit the harmful consequences. It was just common sense informed by experience and, although it seems rather basic looking back, it worked because tree risks were broadly maintained at a very low level, a legacy that we still enjoy today. I remember very well the relief many of us felt in the early 1990s when Mattheck published *The body language of trees*. For the first time, what we had all been doing for many years was given a formal name, visual tree assessment (VTA), and described within the broader tree management framework.

Unsurprisingly, more recent developments have provided us with increasingly complicated approaches to the basic aspects of tree management, and assessing the level of risk is no exception. Most notable is the emerging popularity of quantifying risk by inserting numbers into the risk management recipe to 'bake' a safe tree management cake! Indeed, on the surface, a quantified approach is deceptively alluring, with some obvious benefits. It is particularly attractive to practitioners with little experience because if an incident occurs, there is always the option to hide behind the recipe as a smokescreen against the inputs being wrong. Furthermore, numbers, by their very nature, imply precision, which is intuitively more comfortable than admitting your decisions are based on guesswork. There is undoubtedly significant momentum with these more complex approaches, but are they better than the traditional VTA and are arborists going to be vulnerable by not adopting them?

### HSE guidance on managing risk

Taking a step back from the very specialist subject of trees, the general starting point for managing risk in all work situations is the Health & Safety Executive (HSE) *Five steps to risk assessment* ([www.hse.gov.uk](http://www.hse.gov.uk)) and step 3 in that process is to "Evaluate risks and decide on precautions". On the HSE website, the use of a risk assessment matrix is advocated (Figure 1), where the level of risk is presented as a product of the likelihood of harm arising and the potential severity of that harm. It illustrates two approaches within the same conceptual diagram that can be termed qualitative and quantitative.

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The qualitative approach uses terms or descriptors to indicate the varying degrees within each range to arrive at a similar, word-orientated range describing the level of risk. In contrast, the quantitative approach substitutes numbers for the terms, with an increasing numerical value of the product indicating an increasing level of risk. Both approaches are indicated within the same diagram, with no favour or priority given to one or the other.

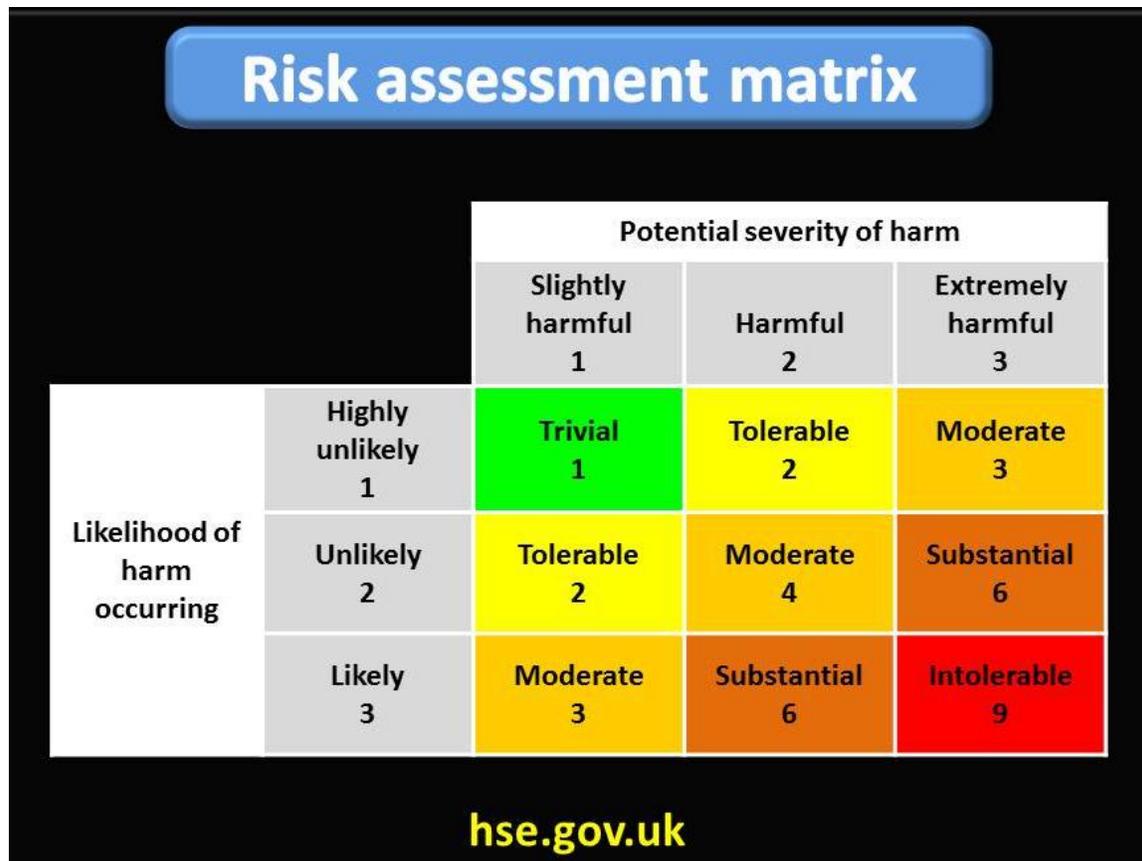
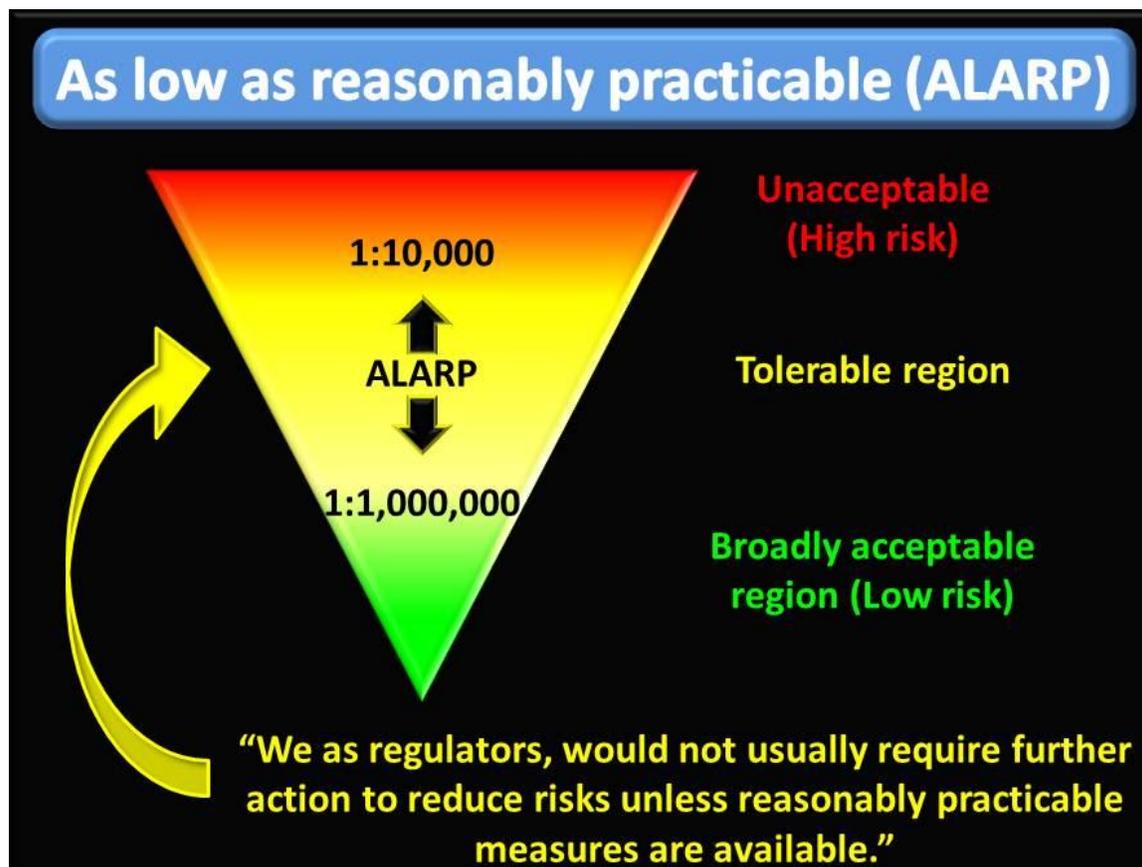


Figure 2: HSE advocates both qualitative and quantitative approaches to risk assessment.

The HSE go further into describing how it expects decisions to be made regarding risk management in *Reducing risks, protecting people – HSE’s decision-making process* ([www.hse.gov.uk](http://www.hse.gov.uk)). In that document, the HSE framework for the tolerability of risk is set out in a diagrammatic form that I have embellished and reproduced as Figure 2. The enhancements are the addition of colour to indicate each region and the introduction of the numerical levels of risk of death that HSE advise form the approximate boundaries between each region. In general terms, the red area at the bottom, broadest part of the triangle indicates the region of unacceptable risk, the green area at the top, narrowest part indicates the region of broadly acceptable risk and the yellow area between indicates the tolerable region where risks need to be kept as low as reasonably practicable (ALARP). Regarding the ALARP region, the HSE go on to clarify that: “We as regulators, would not usually require further action to reduce risks unless reasonably practicable measures are available.”

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**Figure 2:** The HSE tolerability of risk framework with its risk of death thresholds indicating the approximate boundaries to each region.

This broad guidance sets out a framework for decision-making in the context of the workplace, but how does this translate to the world of trees and the people who are responsible for them, the duty holders? In recent years, there has been a keen focus on quantifying tree risks and a number of methods have been developed with very detailed explanations. These are all clearly much more complex than the traditional qualitative approach, but does this apparent sophistication make them better or preferred in any way? Indeed, are tree managers who make a choice either way going to be found wanting if an incident occurs and they have to defend their selection in court? These are important questions facing all those charged with caring for trees and the answers are not obvious at a superficial glance. Trying to decide on whether to use a quantitative or qualitative approach to risk assessment is undoubtedly a challenge, but there are some very strong clues emerging for those who take the time to look.

### Published and emerging guidance

Some insight into which choice to make can be gleaned from reviewing existing and emerging technical guidance. One of the most useful references is the HSE Sector

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Information Minute (SIM), *Management of the risk from falling trees*, published in 2007 ([www.hse.gov.uk](http://www.hse.gov.uk)). Although this document is aimed at HSE enforcement officers for criminal prosecutions under the 1974 Health & Safety at Work Act, there is evidence from recent court judgments that it may be referenced in civil cases as well. A close analysis of this document reveals no references to quantitative methods of risk assessment, and it relies solely on qualitative terms to describe levels of risk.

An emerging document that is likely to be considered important is the National Tree Safety Group publication *Bringing common sense to tree management*, published as a consultation draft in early 2010 ([www.ntsug.org.uk](http://www.ntsug.org.uk)). It has not yet been published in its final form, but as with the HSE SIM, there is no reference to a quantified approach in the published draft. Instead, qualitative terms are used wherever levels of risk are described.

More recently, the International Society of Arboriculture (ISA) has assembled a large group of international tree risk management specialists and worked up a document called *Best management practice for tree risk assessment* ([www.isa-arbor.com](http://www.isa-arbor.com)). ISA anticipate that it will be published by early 2012, with an expectation that it will be relevant to the international tree risk management community. This document specifically favours a qualitative approach and includes two matrices very similar to the basic HSE guidance. However, it also makes it clear that just because, in this instance, a qualitative approach has been adopted, this does not preclude a quantitative approach from best management practice.

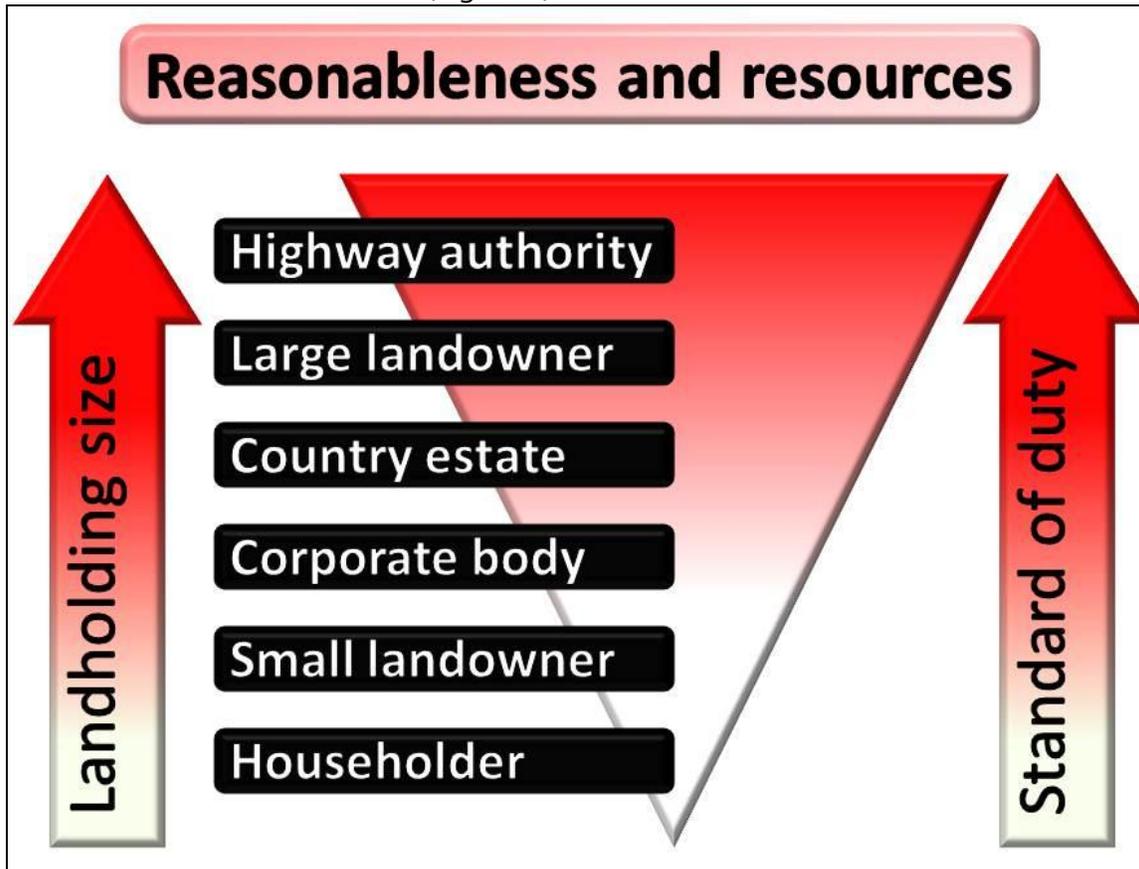
### Reasonableness and practicability

In my experience of legal cases, the practical reality is that in most instances, the level of risk is clearly at one end or the other of the risk spectrum illustrated in Figure 1, and the course of action is obvious. Most difficulties seem to arise in the ALARP region and so it is worth considering what '*as low as reasonably practicable*' means when managing trees. In a civil context, when disputes cannot be settled between the disagreeing parties, the courts will make the final decision, so what the courts interpret as reasonable and practicable is of some relevance. However, this approach involves a significant degree of guesswork because very few cases ever get to court, which provides limited opportunity for clarification from those who make the final decisions.

One recent lower court judgment in the case of *Selwyn-Smith v Gompels* ([www.aie.org.uk](http://www.aie.org.uk)), illustrates the difficulties with trying to draw reliable conclusions in these matters. In considering whether a tree owner had acted reasonably, the judge reviewed whether domestic householders should educate themselves through published literature before carrying out an inspection of their own trees. His view was this was a step too far, a position that attracts some sympathy because it would certainly be an extreme burden on all domestic householders who owned trees to have to do this. In arriving at his conclusion, the judge referred to *Goldman v Hargrave (1967)* as a relevant precedent identifying the principle that the standard of

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the duty of care varies according to the resources available to the duty holder, i.e. large land owners and managers such as country estates or highway authorities would be expected to apply a higher standard of management than smaller land owners such as domestic householders (Figure 3).



**Figure 3:** A conceptualisation of the position advocated in *Selwyn-Smith v Gompels*, i.e. that established case law supports the principle that the standard of the duty of care increases with the size of landholding and the resources available to the duty holder.

At first glance to a layperson, it would seem that the principle illustrated in Figure 3 is an example of reasonableness in action, but caution is required before accepting this as a reliable position. The difficulty is that it carries an implication that the standard of the duty of care could vary for the same tree, depending on the ownership, which has troublesome aspects. Advocates against this position would correctly argue that the case is a lower court case and, as such, carries no weight in establishing legal principles. Although, on this point, the judge does reference the higher ranked appeal decision, there is a counter position that this principle should not be applied to trees; the appeal related to an emergency situation and managing trees is too remote from this for it to be reasonably applied. Ultimately, this will be one for the lawyers to decide, but it does illustrate the difficulty for arborists trying to work out what the courts will be expecting as a reasonable standard of tree management.

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In contrast to the lack of reliable clues from court judgments, the HSE SIM is more helpful. On the matter of inspecting trees, it clearly sets out the intuitively attractive position 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." It is common sense that to regularly inspect literally millions of trees is not a practical possibility and certainly not within the reasonable availability of resources. Similarly, in the same document, HSE advocate that, where there is a need to check trees, the starting point is a quick visual check rather than a detailed inspection. Furthermore, that check can be carried out by a person with a working knowledge of trees rather than by an arboricultural specialist. These provide very useful indicators of what reasonable and practicable mean in terms of tree management, and provide a credible benchmark as to what the courts are likely to expect.

### Legal precedents

In recent years, there have been a number of legal cases outside arboriculture relating to the reliability of statistical and probabilistic methods. Most recently, in *R v T [2010] EWCA 2493*, the Court of Appeal indicated that 'mathematical formulae', such as likelihood ratios, should not be used by forensic scientists to analyse data where firm statistical evidence did not exist. Indeed, this case was reported in Issue 62 of *Your Witness*, the *Newsletter of the UK Register of Expert Witnesses* ([www.jspubs.co.uk](http://www.jspubs.co.uk)), where the author concluded: "The Court of Appeal has got it right in this case. Justice is not served by dressing up expert's guesses as pseudo-science."

Again, whether this can be reasonably applied to quantitative approaches to tree risk assessment is a matter for the lawyers to decide. However, there seems to be wide agreement within the tree assessment community that probabilistic methods of assessing the level of risk are effectively best-guesses because there is no reliable data on tree failure rates or impact harm according to branch size. Indeed, in the light of this judgment, there has to be some doubt about whether expert evidence based on probabilistic methods will be accepted by the courts. If that does turn out to be the case, it could be a significant factor affecting which approach arborists adopt.

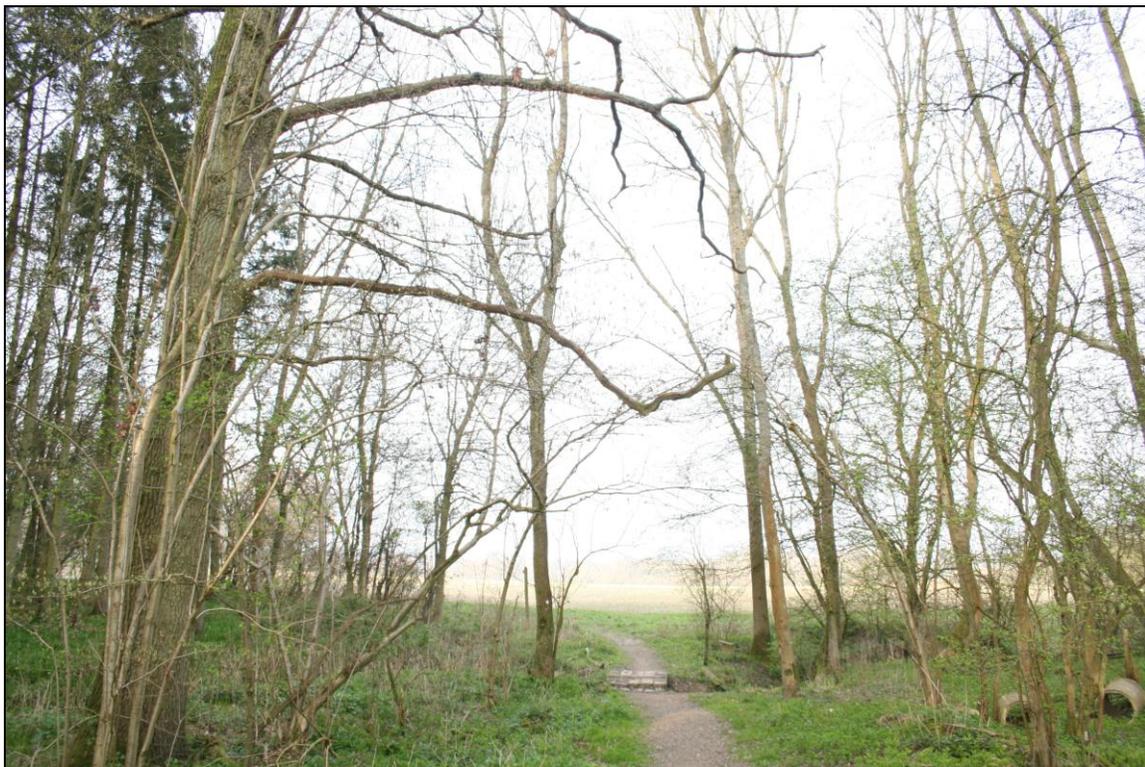
### Why reasonableness and practicability really matter

Imagine this scenario. A mature ash tree on a field boundary adjacent to an infrequently used public footpath through a large estate has horizontally orientated branches extending over the path. A small branch dies that is about 7m off the ground, roughly 100mm in diameter at its base and about 4m in length. It is obviously dead because it has no buds and areas of dead bark are falling off, which can be clearly seen from ground level. The path is walked on an annual basis by a person with a working knowledge of trees and the tree is subjected to a quick visual check. The inspector notes the branch and assesses that the risk is at the lower end of the risk spectrum; deciding that because the branch is not that big and the path has a very low level of use, remedial works are not appropriate. On a calm day, the branch breaks



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where it is attached to the trunk and falls hitting an unfortunate walker who happened to be beneath at the wrong moment. The walker suffers significant head injuries and a court case follows, with a sum for damages agreed between the parties. The court has to decide on liability, i.e. whether the duty holder met the appropriate duty of care.



**Figure 4:** The dead branches on the oak in the foreground are likely to remain on the tree for many years. However, similar branches on the ash near the bridge are much more prone to fail soon after death.

The defendant argues that the duty is to do what is reasonable in all the circumstances, and that to inspect the tree annually by a person with a working knowledge of trees is an appropriate starting point. In these particular circumstances, the level of risk was assessed as not sufficient to warrant any intervention.

The claimant accepts that the inspection regime is satisfactory, but argues that whilst the level of risk is an important consideration, so is how reasonable and practicable it is to deal with the risk. In particular, the claimant emphasises and relies on several points. Firstly, that unlike a defect where there could be a range of opinion on whether it would ever fail, i.e. an included bark union or a branch with a decaying wound, the failure of a dead ash branch in this situation is inevitable; it is not whether the branch will fail, but when. As anyone with a working knowledge of trees would know, it is a recognised feature of ash that branch wood deteriorates very quickly, whereas similar sized oak or sweet chestnut branches rarely, if ever, fail soon after death. Furthermore, because the path was used by the public, albeit infrequently, the



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combination of that use and the inevitable failure meant that the potential for harm was reasonably foreseeable. Secondly, the claimant argues that dead ash branches break off so easily that a contractor with a simple throwline could remove the hazard in a matter of minutes by breaking the branch off. In practical terms, the cost of cure is very low and well within the resources available to a large landowner.

Of course, this is a very specific set of circumstances that are unlikely to arise in the majority of situations, and so it is more of a hypothetical conundrum than a practical reality. However, it could happen and it does illustrate how the level of risk will not necessarily be the sole consideration if such a case ever gets to court. Furthermore, it is not hard to imagine the outcome where the potential for harm was easily foreseeable and the remedy to the problem would have been cheap and easy to administer. Needless to say, in this instance, speculation does not produce a reliable answer and ultimately it would be for the courts to decide.

### Conclusions

In summary, it seems unlikely that practitioners opting for the traditional qualitative approach to assessing the risk from trees will be vulnerable to criticism for that choice if a tree failure occurs. However, there is some doubt about whether probabilistic approaches using incomplete or unreliable data will be accepted by the courts. When cases get to court, although the level of risk is important, it is unlikely that this will be the only issue of weight because reasonableness and practicability are very potent legal considerations. For these reasons, duty holders who have relied solely on an assessment of the level of risk as the basis for meeting their duty of care, irrespective of whether they have used a quantitative or qualitative approach, could be sitting on a time bomb just waiting for the next failure to trigger.