

Root protection areas for veteran trees: part 2

Jim Mullholland and Jill Butler

Picture 1: Oak, Studley Royal, Ripon. Roots in excess of 20mm were traced as far away c.30m. (David Lonsdale)

In the first article in this series we discussed an update to the Forestry Commission and Natural England standing advice *Ancient woodland and veteran trees: protecting them from development, specifically relating to the size of root protection areas for veteran trees*.*

We also presented the results of root investigations of a veteran oak at the 2017 ARB Show that illustrated the extent of 20mm diameter roots around this tree, which had a minimum radius of 23m (root radar did not continue beyond this point). With this information, we were able to compare the minimum root protection area recommended by BS5837:2012 and standing advice with the extent of actual roots.

In this article we present some additional information with the aim of stimulating discussion around the topic of root protection areas. This may become more relevant to arboriculturists in England if the government changes the National Planning Policy Framework policies in relation to ancient and other veteran trees. The policies may protect these very special trees from 'deterioration' and root protection areas will be a very important consideration if so.

Tree roots and buildings

In their seminal work *Tree Roots and Buildings*, published in 1981 (second edition published in 1989), Cutler and Richardson present data from the Kew Root Survey as well as some other sources. In excess of 11,000 tree records form the dataset upon which the book was produced. These data largely

originate from subsidence insurance claims; the book aims to assist those involved with planting trees in proximity to buildings as well as those assessing insurance claims.

Among other information, the book sets out the maximum tree-to-damage distance recorded in these data. To further the discussion on the distance tree roots can spread, we have included some of these maximum figures in Table 1 (as a proxy for root spread). It should be noted that the trees recorded were largely in urban environments

and therefore the majority are unlikely to be veteran trees. Similarly, these data were gathered in relation to insurance claims and therefore form a targeted dataset; it is entirely possible that the roots of the tree species detailed below extend greater distances than are highlighted in these data.

These data illustrate that tree roots can extend a great distance from the trunk. Taking the data for oak as an example, the known **maximum** root spread of this species is double the maximum radius for root protection areas recommended by BS5837:2012. As a small piece of maths revision, the formula for calculating the area of a circle is πr^2 . The square (2) within the formula means that increasing the radius (r) of a circle increases the area by the power of 2, i.e. the area of a circle with a radius of 2m is

Common name	Genus	Max. tree-to-damage distance (m)	Sample size
willow	<i>Salix</i> spp.	40	124
oak	<i>Quercus</i> spp.	30	293
poplar	<i>Populus</i> spp.	30	191
horse chestnut	<i>Aesculus</i> spp.	23	63
ash	<i>Fraxinus</i> spp.	21	145
lime	<i>Tilia</i> spp.	20	238
maple	<i>Acer</i> spp.	20	135
beech	<i>Fagus</i> spp.	15	23
plane	<i>Platanus</i> spp.	15	327
hawthorn	<i>Crataegus</i> spp.	11.5	65
rowan, service tree, whitebeam	<i>Sorbus</i> spp.	11	32
birch	<i>Betula</i> spp.	10	35

Table 1: Root spread data from Cutler and Richardson (1989).

* *Root protection areas for veteran trees*, ARB Magazine 180: 66.

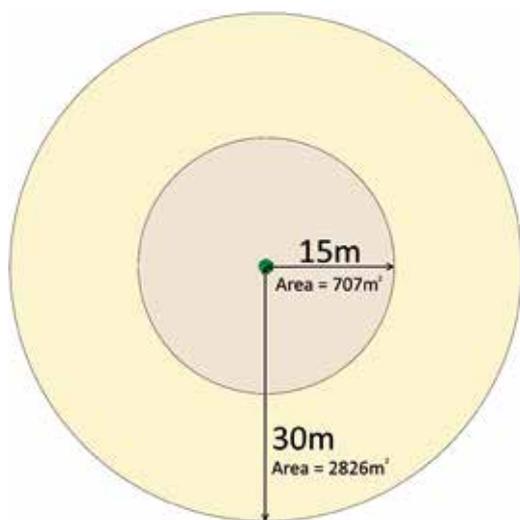


Figure 1: An illustration of the relationship between the radius and the area of a circle.

four times larger than a circle with a radius of 1m. Therefore, assuming its roots were evenly distributed, the oak tree from the data above would have roots that cover an area four times the **maximum** root protection area recommend by BS5837:2012: see Figure 1. To think about that another way, even with a 15m root protection area, only a quarter of the rooting area for such a tree would be protected.

Examples collected by the ATF

There are a growing number of anecdotal records collected by supporters of the Ancient Tree Forum which make for interesting reading. Below we include a small selection to illustrate the distances the roots of certain tree species can travel.

Oak tree, Studley Royal, Ripon

Picture 1 shows the land adjacent to a veteran tree that had been ploughed for the first time. Roots in excess of 20mm were traced through the newly ploughed pasture as far away as the person stood in the right of the picture (c.30m). As the roots were traced away from the tree, it was noticeable that their diameter rapidly reduced in size within a short distance from the tree, reflecting a change in the function of the roots from primarily structural to the uptake of water and nutrients. Beyond this, the diameter did not reduce significantly with increasing distance.

Beech tree, Epping Forest

Pictures 2 and 2a illustrate a beech tree with roots in excess of 20mm found 30m from the trunk; the stem diameter was 1630mm. Erosion of the top soil had revealed the 'skirt' of roots which could be traced far beyond the tree crown to where the people are standing in Picture 2a. Similar to the oak example above, the taper of the roots is remarkably slight and so could have extended well beyond those that were on the surface and easy to see.

Poplar tree, Knepp Estate

Picture 3 shows the obligate mycorrhizal fungus *Leccinum duriusculum* (poplar bolete)



Pictures 2 and 2a opposite: Beech, Epping Forest. Roots in excess of 20mm were found 30m from the trunk. (Jill Butler)

fruiting over 25m from nearest tree, recorded by Ted Green. The poplar has a stem diameter of c.400–500mm. Using the calculation from BS5837:2012 (12 × stem diameter) the root protection area would have a radius of 4.8–6m.

Oak tree, Windsor

Picture 4 shows the ectomycorrhizal fungus *Caloboletus radicans* (rooting bolete) 20m from an ancient oak, recorded by Ted Green. The oak has a stem diameter of c.1500mm. Using the calculation from BS5837:2012 the root protection area would have a radius of 18m but would be capped at 15m.

Discussion

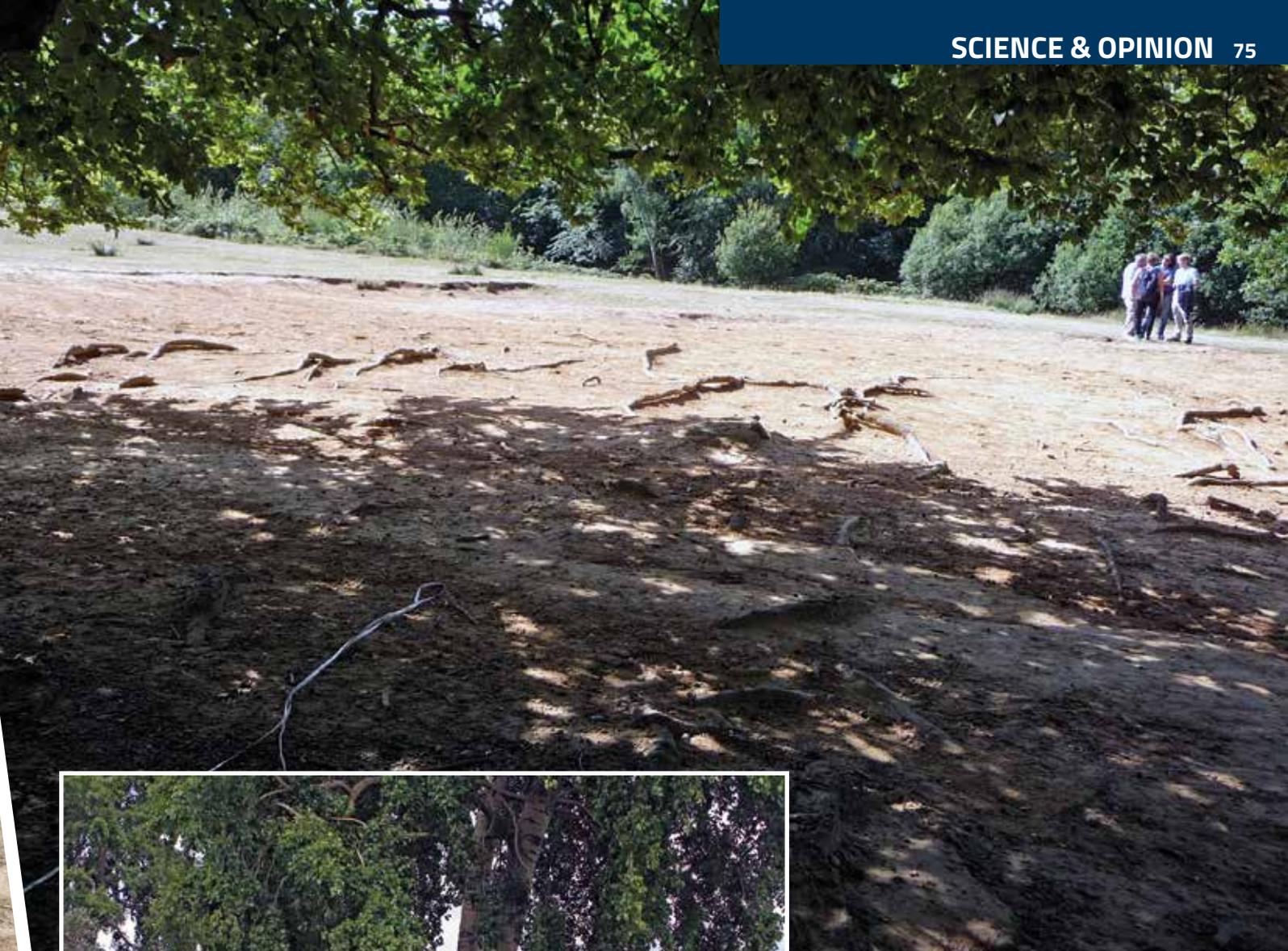
These examples highlight how little we understand about how far roots and their associated mycorrhizal partners can extend. Are these extreme examples or is it common for tree roots to travel this far? How significant are the small-diameter roots outside of the structural root plate? How much further do the mycorrhizal fungi grow than the roots?

What is also highlighted by examples 1 and 2 (oak tree, Studley Royal, Ripon, and beech tree, Epping Forest) is an interesting phenomenon that can be easily overlooked: the limited change in diameter of roots outside of the

structural root plate. Unlike the above-ground parts of the tree that grow in the air, which provides little support, roots grow in a soil matrix that supports them. Roots outside of structural root plate don't need to invest the same energy as branches into support. Therefore, identifying small-diameter roots (c.20mm) does not indicate that the root will terminate within a short distance.

The extent of the structural root plate can be identified by a change in diameter, known as the zone of rapid taper (ZRT) (Eis, 1974), with roots distal to the ZRT having a significantly smaller diameter than those proximal to the tree. As a result, the diameter of roots outside the structural root plate can be relatively small close to the tree, making the significance of these roots easy to overlook.

This presents difficulties when providing recommendations to guide operations being undertaken within a root protection area. To facilitate such works, a sensitive excavation methodology is often specified along with guidance on the size of roots that may be severed to permit access (often a maximum diameter for roots that may be severed). Providing guidance that only small diameter roots may be severed, e.g. those less than 20mm, is typically based on the theory that



Picture 3: The obligate mycorrhizal fungus *Leccinum duriusculum* fruiting over 25m from nearest tree. (Jill Butler)

small diameter roots will not travel much further, and therefore do not form a significant proportion of the root area. However, due to this lack of taper witnessed in examples 1 and 2, severing a small diameter root (c.20mm) may remove a significant length of coarse roots, associated fine roots and mycorrhizae (as highlighted by examples 3 and 4), which can cover a large soil volume and form a significant resource for the tree.

Conclusion

The move to a root protection area with a radius of 15 times the diameter for veteran trees, or 5m beyond the crown, without a cap of 15m is a welcome change brought about by the standing advice *Ancient woodland and veteran trees: protecting them from development*. However more evidence is required to further our understanding of how far roots and mycorrhizae travel as well as the morphology of roots, specifically in relation to taper outside of the structural root plate. The implications of providing guidance for severance based on the diameter of roots is likely to be less predictable than corresponding guidance for cutting branches, for which the full extent of the branch and leaf area to be removed can be readily observed.

If readers have examples they feel would be valuable to the discussion, especially if

these can be supported by photographs or written records, the Ancient Tree Forum would like to hear from you. Please email training@ancienttreeforum.co.uk.

References

Cutler, D.F., and Richardson, I.B.K. (1989). *Tree Roots and Buildings*. Longman Scientific and Technical, Harlow

Eis, S. (1974). 'Root system morphology of western hemlock, western red cedar, and Douglas-fir'. *Canadian Journal of Forest Research* 4(1): 28–38



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The articles on pages 73–77 have been provided by the Ancient Tree Forum, which champions the biological, cultural and heritage value of Britain's ancient and veteran trees.



Picture 4: The ectomycorrhizal fungus Caloboletus radicans 20m from an ancient oak. (Jill Butler)

Ancient and Other Veteran Trees:

Further Guidance on Management

Recognised as essential reading for those who care for and manage ancient and other veteran trees, this handbook is available to buy online directly from the ATF. Every copy sold will help the charity continue its work.

The book brings together the collective wisdom of ATF founders, trustees and other ancient tree specialists and is edited by David Lonsdale. You can buy the book from www.ancienttreeforum.co.uk/resources.

Remembering the ATF in your will

The Ancient Tree Forum is a very small charity, so any support you can give us will make a big difference. Leaving a legacy for the ATF will help us to care for and protect the UK's oldest and most special trees through work such as:

- Raising awareness of their wildlife, heritage and cultural value
- Lobbying for their better protection



- Helping to secure and expand future generations of ancient trees
- Developing our understanding of ancient trees and how to manage them
- Providing advice, guidance and training on managing ancient and veteran trees
- Providing opportunities for people to enjoy ancient trees

To find out more about leaving a legacy for the ATF, see the 'Support us' pages of our website – www.ancienttreeforum.co.uk.



Finalising the VETcert standard

Having received over 350 responses to the public consultation on the Veteran Tree Management Standards, the Ancient Tree Forum was tasked with the job of collating and analysing them.

Overall the feedback was positive and constructive: a relief for all involved. Thank you to everyone who took the time to respond to the consultation; your comments were invaluable in helping us improve the standards. Run in parallel with the public consultation, the standards were reviewed by our independent expert, Dr David Lonsdale. David, having gone through the standards with a fine-tooth comb, provided a number of useful comments to help guide the finalising process.

With these comments suitably digested, the partner team met during March in Brno, Czech Republic. Our hosts for the meeting were our Czech Partners, Safe Trees, who took the opportunity to show off their wonderful new offices as well as to introduce us to some Czech culture.

The meeting gave the partners the opportunity to discuss various project matters, including reporting, timesheets, and of course the Veteran Tree Management Standards. We worked through the comments received, with each partner representing the views from their home countries. The difficult task of deciding how to amend the standards then followed. Partners ruminated on the comments and then put fingers to keyboard to resolve the points. The native English speakers perhaps got too hung up on choosing the exact use of particular words or phrases; there was much confusion from our European partners when we discussed, at length, the nuances between a 'tree survey' and a 'tree inspection'. Evidently in most other European languages the two words mean exactly the same thing!

Despite making good headway, it was apparent that a two-day meeting was not

long enough to consider and incorporate the necessary changes. As a result, following the meeting, there were a few late night Skype conversations held to resolve the comments.

The production of the standards has taken over a year, with input from hundreds of people, many of whom have given up a large amount of their time to help improve the standards. The Ancient Tree Forum would like to thank all of those who have assisted with this process. It's heartening to see so many people engage with the project and help us further the discipline of veteran tree management.

With the standards almost finalised the project can look to the next task. In January, the third work item commenced: the production of new training material. This element is being led by one of our Swedish partners, Pro Natura.

Two new education videos, similar to those produced as part of the VETree project, were filmed at Hatfield Forest. The topics for these videos are 'pole thinning of lapsed pollards' and 'reduction via ring barking'. The films are currently in post-production and will be made available by the end of the project.

Not content with just one new work item to tackle, the Arboricultural Association provided an update on their work item: setting up of the accreditation scheme. The Association set out how they see the scheme working, ensuring it provides a high quality product for a fair price. Over the next six months they will work out the nuts and bolts that will form the accreditation scheme (see page 29).

The VETcert is an Erasmus+ funded project which seeks to raise standards in veteran tree care across Europe. The project will conclude in August 2019, after which the accreditation scheme will be available for professionals to apply to. For more information contact Jim Mullholland: training@ancienttreeforum.co.uk

News update



ATF at the ARB Show

The Ancient Tree Forum tent was in the same position as last year at the ARB Show, next to the veteran oaks at the north of the site. As always we delivered an action-packed schedule across the two days. Whether you attended one of our talks, bought a book or simply wanted to say hello, thank you for stopping at the Ancient Tree Forum tent.

Veteran tree training

2018's Valuing and Managing Veteran Trees, a three-day advanced course for trainers, will be delivered in Hereford on Wednesday 4 July to Friday 6 July. This interactive course will provide attendees with the knowledge and skills to be able to deliver their own training courses. For more information see the 'events' section of our website.

www.ancienttreeforum.co.uk