RECOGNISING AND CATEGORISING ANCIENT AND OTHER VETERAN TREES

WOODLAND TRUST

Practical Guidance

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Contents

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Introduction

Ancient and other veteran trees are some of our most special. They support life found nowhere else and host hundreds of species at any one time. Those that have stood in the same place for centuries are ecological theatres in which unique communities have evolved, and may include species yet to be discovered.

As survivors, they are witnesses to history and changes in climate and society. They have been present in landscapes for generations and are held dearly in people's hearts. Many are icons, place markers, and symbols of beauty and resilience.

The Woodland Trust work to ensure that ancient and other veteran trees are valued, protected and managed with care. This includes helping others to safeguard these special trees, which can be achieved most effectively when they are able to recognise and categorise them appropriately.

Using this guide

This guide uses a categorisation key to highlight the distinguishing characteristics of ancient and other veteran trees. The subsequent sections are structured and colour-coded according to the order of questions in the key and provide guidance that will help you decide whether a tree is ancient, veteran or neither. Further reading providing more technical detail is referenced throughout.

But why do ancient and other veteran trees need categorising? Recognising these special trees during activities like tree inspections or ecological assessments means we can protect them, recommend appropriate management, or understand their value relative to other trees. Of course, many other trees are important to wildlife and the landscape too, are treasured for aesthetic and cultural reasons, and may become the ancient and other veteran trees of the future.

MARK ZYTYNSKI/WTML

What are ancient and other veteran trees?

Ancient and other veteran trees may be old and are usually rich in habitat features. They may also be large or complex structures that are visually distinctive and pleasing to view and appreciate. Over time, trees grow, develop and age, accumulating a range of features — or microhabitats — that increase their ecological value (Fig. 1). Some features develop gradually from the passing of time and the ageing process. By contrast, others may develop more rapidly following natural and human impacts, such as lightning strikes or strong winds, previous management or accidental damage.

In the UK, 'ancient' and 'veteran' are the terms most commonly used to talk about our oldest trees, whilst other terminology may be used elsewhere. Tree conservation concepts and ideas vary by country and purpose[1]. Those working to protect or manage ancient and veteran trees, or conducting activities that may impact them, must be aware of the laws, regulations and guidance that apply in the relevant context.

The terms 'ancient' and 'veteran' are sometimes used interchangeably, but we also distinguish between them. Although all ancient trees are considered veteran trees, not all veteran trees are ancient; both terms draw attention to a tree's value and service to nature.

Ancient trees have developed beyond maturity into the ancient life phase and/or are old in comparison to other trees of the same species.

Other **veteran trees** are mature trees which, due to their life or environment, have significant decay features (a physical attribute they share with ancient trees) but are neither developmentally nor chronologically ancient.

Ancient and other veteran trees, including their surrounding soil and rooting environment, are irreplaceable habitats, meaning they would take a long time or be extremely difficult to recreate or restore. They are exceptionally valuable for biodiversity and ecosystem health. As keystone structures[2] they play a key role in maintaining ecological processes and supporting many species. They underpin the quality of woodland, wood pasture and parkland and, when found as scattered trees in other settings (for example, in fields and hedgerows), they form crucial connections across a landscape. Even in death, they retain their value to people and wildlife for decades as they continue to decay.

Introducing the life stage model

Understanding how trees grow and develop, as well as their responses to stress, damage and the environment, can help us recognise ancient and veteran trees. In particular, it highlights that there is a difference between chronological age — the time that has passed since a tree first grew from seed — and its development stage.

The life stage model describes a tree as it passes through developmental stages[3], generally simplified into three broad phases: young, mature and ancient[4] (Fig. 2). This model represents a tree's growth, change and reorganisation, from a seedling to a mature tree, and then to an ancient tree that may later die or rejuvenate and cycle through life stages again.

During the young phase, a tree builds its main stem (the trunk) and the crown develops. At maturity (which is not to mean reproductive maturity), the tree trunk continues to increase in girth and the tree builds its mature crown, maximising its canopy, then maintains the volume of its crown through continued growth and branch renewal. In the ancient phase, the trunk continues to increase in girth but may partially or entirely separate into functional units (see page 12), while the crown becomes smaller, growth is concentrated nearer the trunk, and a tree's overall structure becomes more complex.

This life stage model is just that: a simplified description to help us understand the trees we observe. The model implies a linear progression from a young tree towards senescence and death. However, trees are subject to many different types of stress in their environment and thus often diverge from this model. They have evolved survival strategies such as epicormic growth, adventitious rooting, layering and suckering that can enable them to live on and grow almost indefinitely[5] (Fig. 3).

Figure 1. Ancient and other veteran trees contain unique microhabitats and are host to hundreds of species at any one time. These include animals and plants, fungi and other microbes that use microhabitats as shelter for breeding or larval development, as a substrate, or as a food source.

Due to their hidden nature, tree roots and their soil environment are easily overlooked and under-appreciated. Where trees have persisted for a long time, so too has the soil around and beneath them. This soil reserve and community of life within is, therefore, also precious.

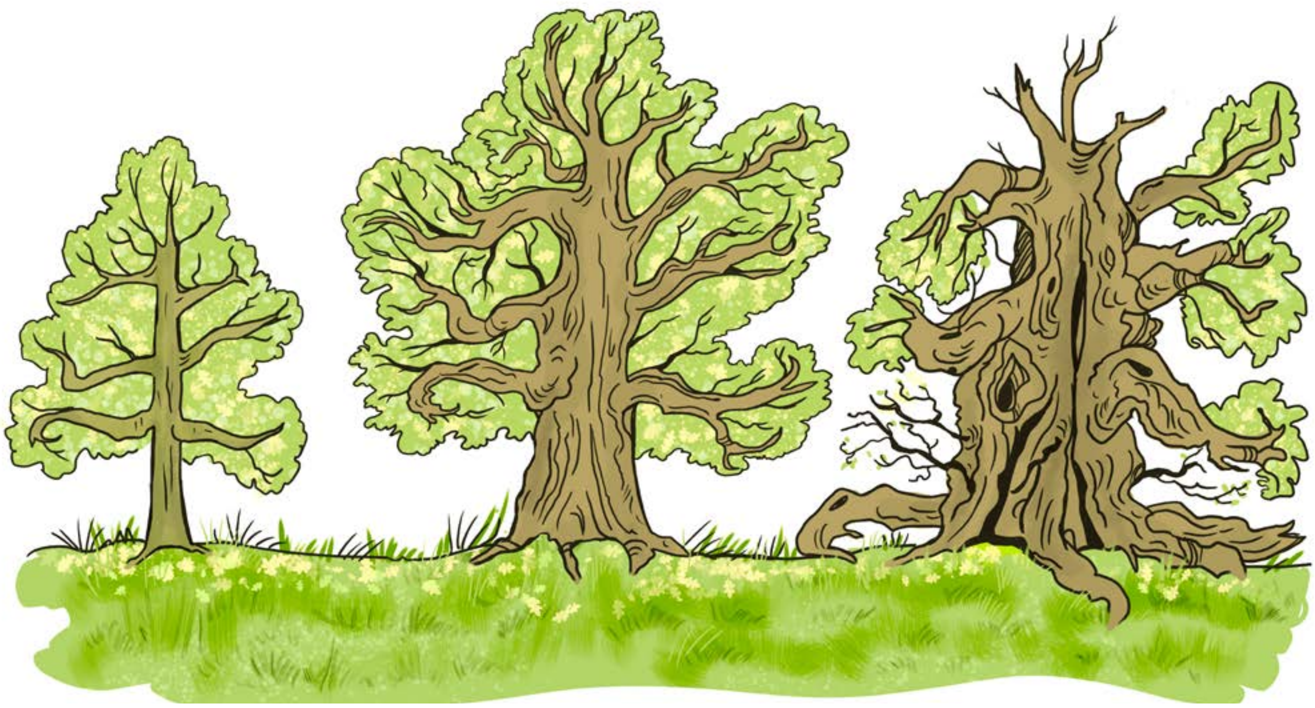


Figure 2. The life stage model is a useful one, but we must remember that tree development may not be a linear process.

ILLUSTRATIONS: CAROLINE MIEKINA

EMMA GILMARTIN/WTML

Figure 3. Trees reaching the ancient life phase can continue to live in this phase for a very long time. For example, thanks to strategies such as layering and epicormic growth, as shown here in this wild apple.

Categorisation key

To recognise ancient and other veteran trees, look for clues that indicate their age and for features that make them ecologically important. **As no single attribute will identify every ancient or veteran tree, our approach is to consider the range of evidence available**.

The context in which we try to distinguish between ancient, veteran or other mature trees will vary and frame the level of certainty required to categorise them. Categorisation helps to assign value to special trees, but sometimes it is neither easy nor necessary to tell them apart.

Work through the following key and refer to the related sections to decide how to categorise a tree. Provide evidence to support the answer to each question. This evidence lends transparency to the categorisation process and aids peer review and support.

EMMA GILMARTIN/WTML

1. Is the tree in the ancient life phase? (see page 10)	Yes — an ancient tree (developmentally ancient)
	No/Don't know — continue to question 2

Supporting evidence and reasoning:

Is there evidence of **crown retrenchment**? Signs of a gradual transition from the mature to ancient life stage may be indicated by an episodic shrinking of the outer crown and changes to crown shape and structure.

Is there evidence of the development of independent **functional units**? The development of separate parts of the roots, trunk and crown into (more or less) independent functional units creates the complex structures that are characteristic of ancient trees.

2. Is the tree old, relative to its species? (see page 12)	Yes — an ancient tree (chronologically ancient)
	No/Don't know — continue to question 3

Supporting evidence and reasoning:

Is there **historical, cultural or contextual** evidence of chronological age? Written references or accounts, old documents, maps or artwork may provide evidence that places a tree in its location at a given time or establishes an association with historic land use or events.

Does the **trunk girth** of the tree provide an indication of overall age? Depending on tree form and setting, trunk girth may provide a useful indication of the life stage of a tree. The relationship between trunk size and age varies significantly between tree species and growing conditions and can provide only a broad estimation of age.

3. Does the tree have a significant amount of heart rot or hollowing, or other significant decay features? (see page 16)	Yes — a veteran tree (may or may not be ancient)
	No / Don't know — unlikely ancient or other veteran tree (but it may have other value for nature and people)

Supporting evidence and reasoning:

Significant decay features, in terms of **ecological importance, irreplaceability, or amount** relative to the size and species of a tree are the key attribute that distinguishes veteran trees from other mature trees.

Is there evidence of significant **heart rot and hollowing**? A significant **amount of advanced heart rot or hollowing of the trunk, relative to the tree species and size** is a key characteristic of ancient and other veteran trees, and in some instances, may be a single qualifying feature to distinguish veteran trees from other mature trees.

Is there a significant accumulation **of other decay features** that are **long-lasting** and **advanced** in their development? Non-exhaustive examples include advanced and **substantial cavities** (e.g. woodpecker cavities, rot-holes, branch hollowing), **long-standing injuries** or **storm damage**, and large diameter deadwood (e.g. dead branches with substantial heartwood or ripewood that also have advanced decay). In some instances, these **other decay features** may not be sufficiently significant in extent to be used as a single qualifying feature but may be used to build the evidence required to distinguish veteran trees from other mature trees.

1. Recognising the ancient life phase

A tree can be considered to have entered the ancient life phase when it has passed beyond maturity and exhibits certain changes to its crown and trunk. Two of the most obvious attributes of a tree in the ancient life phase are crown retrenchment and segmentation into individual functional units — both examples of reorganisation within a tree. **Consider the presence of these attributes as supporting evidence that a tree is in the ancient life phase.**

In addition, these trees usually also have very well-developed wood decay features such as substantial heart rot and hollowing and/or other significant decay **(see page 16).**

Crown retrenchment

Crown retrenchment is one of the potential mechanisms of crown reorganisation typically observed in a tree's ancient life phase. This ageing-related phenomenon is thought to occur in response to specific physiological stress that comes with a tree's age, size and complexity[6,7]. Crown retrenchment describes the episodic shrinking of the outer crown and changes to crown shape and structure. This coincides with crown reorganisation, which involves the development of new epicormic shoots within the mid and lower crown, or lower than its previous reach. As the retrenched crown of an ancient tree is typically smaller and closer to the ground than when it first reached maturity, a tree may be described as having 'grown downwards'.

NEVILLE FAY/WTML

Figure 4. A tree with a crown showing retrenchment may retain remnants of the former branch structure, above the remaining healthy crown, which can eventually lead to a stag-headed appearance.

Crown retrenchment is sometimes obvious, owing to the presence of a healthy lower crown below dead, attached branches (Fig. 4). In other cases, it is not obvious, especially during the transition from the mature to the ancient phase. As these fine adjustments are made gradually over 'tree time', they mostly only become apparent in retrospect. In other words, it is easier to identify the outcome than the process. It is also worth noting that trees of any age or life stage may respond to water stress or dieback, whatever its cause, by reorganising their crowns, but the process is often less gradual and the outcome less predictable (for example, the tree might decline and die).

Crown retrenchment is more noticeable in some tree species than others. This is because trees have more than one way to relieve stress. For example, some types of adventitious growth occur very readily in some species but not in others. Further, as trees diverge from the linear life stage model, different parts can be in different life stages in morphological terms. So, sometimes it is not accurate to say that 'the tree' has undergone retrenchment, when in effect this may only apply to some parts of the crown. Furthermore, crown retrenchment is unlikely to be seen in trees managed by regular cutting (for example, managed pollards) as no part of the crown is allowed to reach maturity owing to interruption — and rejuvenation — of growth (Fig. 5).

ARCHIE MILLS/WTML

Figure 5. Managed pollards may not show signs of retrenchment.

Functional units

A further attribute of ancient trees is the development of parts of the roots, trunk and crown into (more or less) independent functional units[8], giving rise to a very complex structure. As each new annual ring of sapwood must serve an ever-increasing trunk girth over time, the energy required to form them cannot be maintained, and the trunk circumference eventually becomes discontinuous and, in the advanced state, becomes visibly segmented into columns surrounding the hollow or decaying interior of the trunk (Fig. 6). In favourable conditions, new, adventitious roots may also develop within the hollowing trunk, re-accessing nutrients released by decay and forming new vascular columns and connections between the crown and the root stem (Fig. 7). Although some interdependence may remain between these functional units, they can, to some degree, be thought of as separate trees — comprising physiologically functional connections between roots, trunk and leaves. At this stage, the colonial nature of trees is most evident.

RIGHT & LEFT IMAGE, EMMA GILMARTIN/WTML

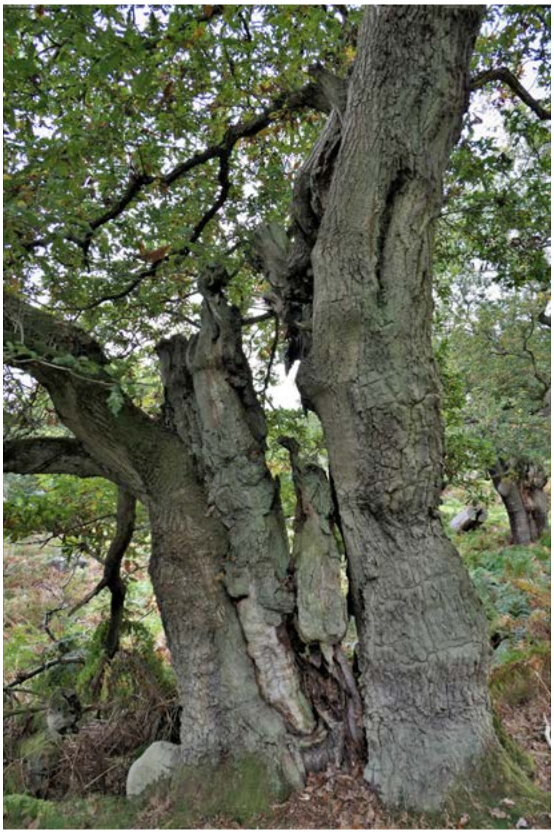


Figure 6. Segmentation of a very large tree into individual functional units.

Figure 7. Functional units formed by adventitious rooting within the trunk.

2. Ageing trees

Accurately determining the age of a tree can be difficult. The age of many trees is usually estimated relative to something else (for example, 'pre-dating the adjacent church'), which is often good enough.

Different tree species have longer or shorter average lifespans — with certain traits meaning some species are more associated with longevity than others. The age in years to be considered ancient will not be the same for every tree of a given species. For certain species, however, there are enough observations of the population structure to indicate an approximate age band for trees to be regarded as chronologically ancient. For example, oaks usually have ageing-related characteristics by 400 years, but birches, by contrast, may be considered ancient by 150 years. For other species there may be general agreement on the age considered ancient, but further research is needed to produce guidance based on a sufficient sample of a species' population.

To determine whether a tree is chronologically ancient, consider both age and species. Several sources may be used to determine or approximate the age of trees. They include:

- ring counts
- historical, cultural or contextual evidence
- trunk girth.

Ring counts
It is possible to determine the age of a tree by counting the number of growth rings within its main trunk. These growth rings are the visible banding between the seasonal production of new woody tissues. They can be counted to age a tree with good accuracy. Ancient and other veteran trees are, however, likely to be hollow, due to their centremost tissues having decayed away, preventing a complete ring count. This hollowing contributes to the longevity of some trees but is also the reason why we may never know their precise age. Further, the method of coring trees to extract wood for ring counting causes damage to living tissues, so it is mostly unnecessary and only advised for well-defined scientific research. We therefore do not recommend ring counts as a method to age ancient and other veteran trees[9].

Historical, cultural or contextual evidence
Sometimes there may be historical evidence that a tree is old. This evidence may come in the form of written references or accounts (including records of tree planting), or old documents such as maps, postcards and artwork that places a tree in its location at a given time (Fig. 8). In some cases, a tree's age can be approximated because it is part of a cohort that established after a datable event such as windthrow, commemorative planting or the construction of a building.

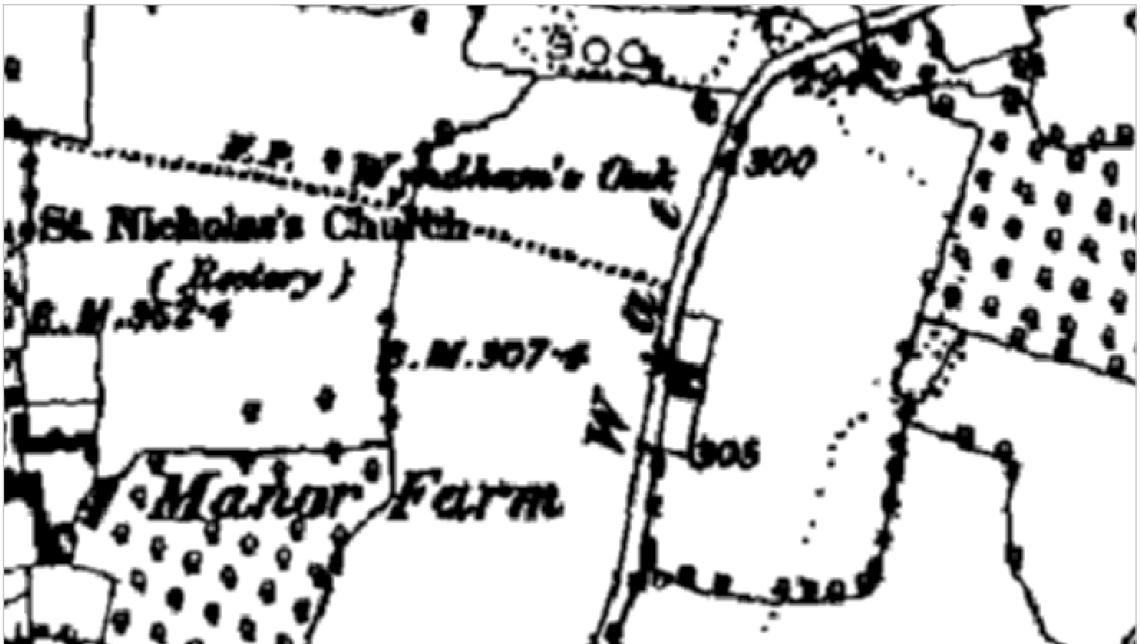


Figure 8. A historic map showing the location of the Wyndham Oak. Old maps can be used to evidence that a tree was notable at the time of production, but don't indicate the age of the tree itself.

The growth and form of a tree might have been influenced by management or other past activities around it. A tree may have been managed traditionally (for example, as a pollard or coppice) (Fig. 9) or as part of a designed landscape (for example, an avenue) and so have a smaller trunk girth relative to another unmanaged tree of the same species in similar growing conditions. Many such trees can go unnoticed and are not always valued appropriately. **Use a range of sources and an understanding of a site, a landscape and its history to build evidence of chronological age**. This means that the categorisation of a tree as ancient can be aided by information not gleaned from the tree itself.

JUDITH PARRY/WTML

Figure 9. Ancient coppice stool.

A historic coppice stool can be many hundreds of years old, yet the above ground parts may only comprise re-growth in a young or mature developmental phase. These developmentally young shoots may have habitat value comparable to any other tree, but the soil environment, rooting system and the decayed stool can be ancient and therefore extremely valuable.

MARK ZYTYNSKI/WTML

Figure 10. Detailed tree ring research has been conducted by specialist dendrochronologists for species like yew, oak and Scots pine. Partial ring counts and ring width measurements have been collected for hundreds of trees to refine estimations of tree age and its relationship with measurable girth. The age of individual trees can, however, be hotly debated, especially in the case of yew[10] .

Trunk girth

A tree's girth can indicate the age of the overall tree. Instead of counting growth rings, measuring trunk girth is a more usual method of estimating tree age, using size as a proxy for ring count. This relationship between trunk size and tree age has been studied and generalised in several ways for some common species[11] (Fig. 10). These generalisations provide only estimates, so they should be used with caution and together with other evidence.

Trunk girth is affected by tree growth rate, which varies according to site conditions, environmental factors, damage and past management. Consider the influence of soil type, depth and fertility or by climate and microclimate, including exposure, altitude or incidence of storm damage (Fig. 11). Trees growing in environmentally challenging places with poor soils and harsh climates (for example, in upland areas) may be significantly smaller in size than the same species growing under more productive conditions. The growth of a tree might also have been affected by competition from other trees. Girths of mature trees growing in closed canopy woodland or grown near to one another (in avenues, for example) are likely to be significantly smaller than those growing in open situations.

Tree trunks are not circles in cross-section and become segmented in the ancient life phase (see page 12, Functional units). The trunk of a tree in the ancient phase may be extensively decayed or fragmented or have developed into individual functional units. In this phase, the link between measurable girth and age becomes even more tenuous, no longer reflecting the years a tree has lived.

For these reasons, ancient and other veteran trees should be recognised and categorised as such, irrespective of a relatively small trunk girth. A large girth adds weight to a judgement that a tree is chronologically ancient, but a small girth does not necessarily provide the same indication that a tree is not. **Refer to the most current collated data on the size ranges of trees recorded in the Ancient Tree Inventory**[12]. Interpret these data in conjunction with other evidence rather than as a single attribute.

ARCHIE MILLS/WTML

Figure 11. As a general, practical rule, the largest trees are not necessarily the oldest ones, especially within a species.

3. Assessing decaying wood features

Trees accumulate features associated with decay over time. Some of these features, such as those initiated by physical damage, can develop at any moment, including relatively early in a tree's life[13]. Other decay features take longer to arise and are linked to tree development (see page 10, Recognising the ancient life phase). Altogether, these decay features provide a diverse and ever-changing suite of resources for a range of species and communities (Fig. 12). They encompass microhabitats that support a range of ecological functions, such as providing shelter, foraging sites or breeding sites.

A substantial amount and variety of decay features are typically found in a tree by the ancient life phase and are also the attributes that identify other veteran trees. **What distinguishes a veteran tree from another mature tree is the significance of these decay features. Significance relates to the value of decay habitats in terms of their ecological importance, irreplaceability, or amount relative to the size and species of tree. Significant decay features provide sustained ecological continuity and complexity for associated organisms.**

Where appropriate, a suitable recording system such as the Specialist Survey Method (SSM)[14] or tree-related microhabitats (TreMs) typology[15] can be used to note both the presence and absence of decay features. The use of a reproducible recording system helps to demonstrate that they have been searched for, identified and given appropriate consideration in a way that is transparent and reviewable.

It is often the case that there is limited research on the specific ecological requirements of species associated with veteran trees and decaying wood, including that of rare or specialist species (Fig. 13). **The presence of these species of conservation concern provides supporting evidence of significant decaying wood features.**

ILLUSTRATION: CAROLINE MIEKINA

Figure 12. Some decaying wood features can host relatively species-poor but highly distinctive communities, where other features can contain a high diversity of different microhabitats, in turn hosting multiple community types within a feature. In addition, some tree species tend to host different types of features more than others.

Figure 13. Many specialist animals, plants and fungi are supported by veteran trees.

Heart rot and hollowing

Heart rot is the decay of wood in the inner areas of the tree's trunk and larger branches. As trees produce a new layer of outer wood each year, the oldest woody tissues eventually become inactive and increasingly redundant. The onset of decay in these tissues is a normal and vital part of the development of trees[16].

Heart rot often starts during the mature life phase and can develop not only at the base of a tree but also at height and within its limbs. Decay pockets that start in multiple parts of the trunk and branches may remain localised, or in time may coalesce into more extensive decay columns. Heart rot decay increases in volume as the tree continues to grow. The older or larger a tree, the more likely it is to have heart rot and hollowing.

Heart rot and hollowing should be judged as significant if there is a substantial amount of advanced heart rot or hollowing, relative to the tree species and size. Heart rot is typically visible as decaying central wood, exposed where major breakage has occurred (in the trunk or major branches) or at cavity openings (Fig. 14). Its presence may sometimes be indicated by one or more fruit bodies of an identified heart rot fungus[17]. It is not always easy to see the presence or know the extent of heart rot and hollowing, but there are non-invasive techniques for detecting and assessing its presence, for example: using a sounding hammer or a specialised decay detection device. A qualified assessor may demonstrate the extent of heart rot and hollowing when it is suspected but there are no visible large or accessible cavities.

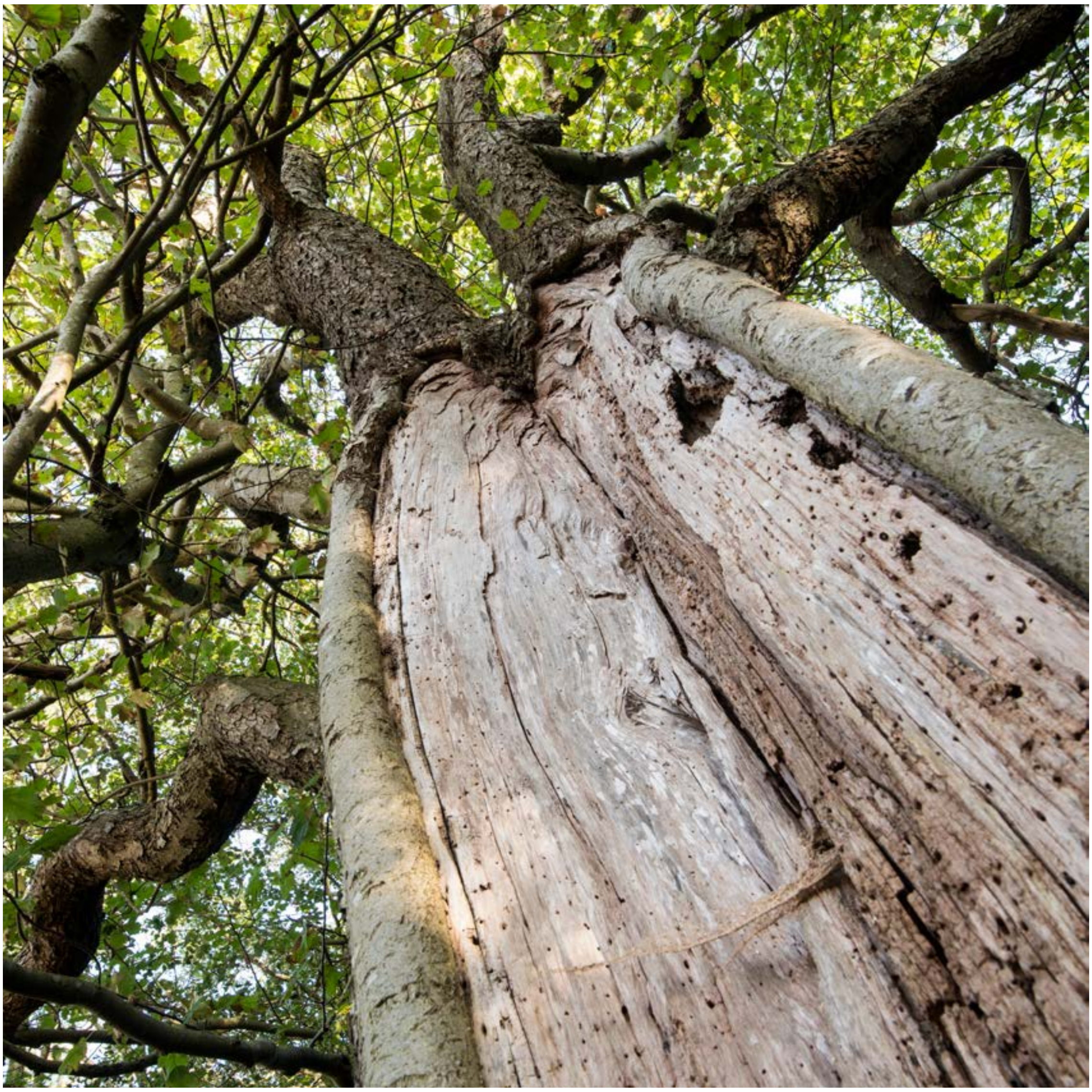
Figure 14. Exposed and decaying heartwood, and decay fungi, can indicate the presence of heart rot and potential hollowing.

Other decay features

Wood decay other than heart rot and hollowing develops when sapwood becomes dysfunctional through bark damage and wounding (including pruning). Disease or dieback episodes can also result in dead branches or areas of decaying wood in either branches or trunks. **Other decay features should be judged as significant if they comprise a substantial amount of either long-lasting or advanced state decay, relative to the tree species and size.**

Examples of long-lasting features include decay columns in bark and sapwood, such as strip cankers or large, dead branches containing mainly or only heartwood (Fig. 15). Advanced state decay might include any other areas of the trunk and branches that are very well-decayed or host 'late successional' decay-associated species.

Trees that support decay features can be noted as having such without being ancient or veteran. Trees with the beginnings of heart rot and hollowing will only see decay advance and increase in volume over time. As such, if this habitat is deemed insignificant now, it will become more valuable as it develops. This is important for the connectivity and continuity of veteran trees and decaying wood and should be acknowledged during other site-level, habitat or ecological condition assessments. The use of a suitable recording system can help to identify the most important habitats of today and the potential veteran trees of the future.



ROBERT READ/WTML

Figure 15. Long-lasting decay in the trunk, resulting from earlier damage rather than heart rot.

Useful resources

If you need more advice about recognising and categorising ancient and other veteran trees, there is help and resources available through:

- the Ancient Tree Forum https://www.ancienttreeforum.org.uk/
- the Woodland Trust https://www.woodlandtrust.org.uk/

Two established systems that can aid in recognising, categorising and recording decay features are:

- the Specialist Survey Method (SSM), which provides a system for recording old trees according to their habitat features
- the Tree Related Microhabitats (TreMs) field list, which provides a typology for categorising decay features.

If you'd like to check whether a tree has already been verified as ancient or veteran or want to record a currently unrecorded ancient or other veteran tree, visit the Ancient Tree Inventory, https://ati.woodlandtrust.org.uk

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