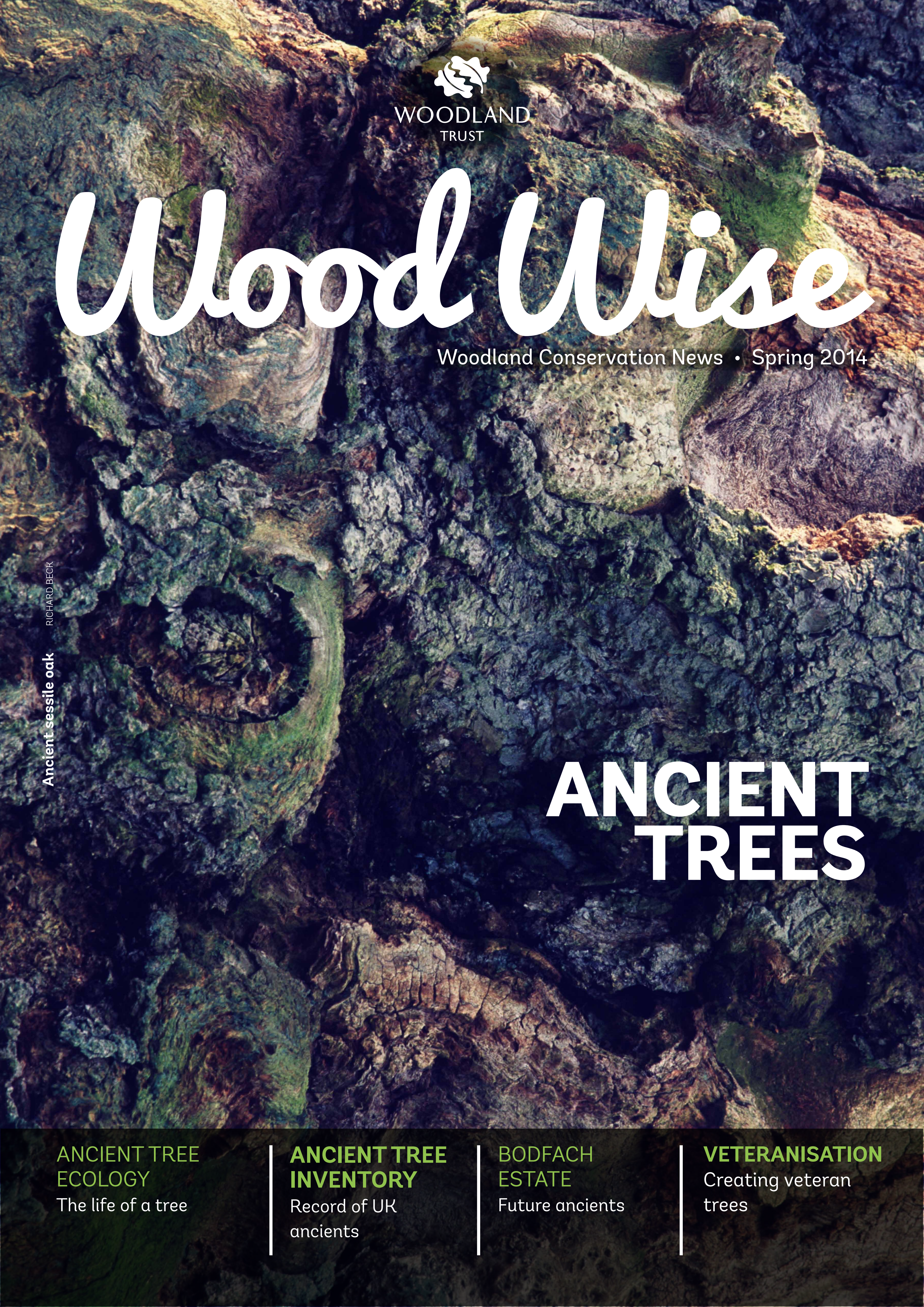


Ancient sessile oak

RICHARD BECK

WOODLAND TRUST

Wood Wise

Woodland Conservation News • Spring 2014

ANCIENT TREES

Ancient and special interest trees

EVELYN SIMAK

Ancient beech tree in Culyer's Grove

Ancient trees are among the oldest and most complex organisms on the planet. These wonders of nature are the select few that have survived the test of time, through human advancement, changing climatic conditions and extreme weather events.

It is estimated that the majority of Northern Europe's oldest trees are found in the UK. They support a great number of other species and are also significant parts of human history and culture. For example, Cromwell's Oak in Wiltshire is said to be the tree from which Oliver Cromwell hung four Royalists in 1643.

Ancient trees have surpassed maturity and are old in comparison to other trees of the same species. They mostly have large diameter trunks and are likely to be hollow. Retrenchment of the canopy will have reduced its upward growth. Although these trees are in the final stage of their life they are very much alive and can carry on aging for centuries.

Along with ancients, there are other trees of special interest:

Veteran trees display certain features such as wounds or decay that offer habitats for other species like fungi and wood boring insects. Ancient trees may be veterans but not all veterans are ancient, as these traits may have developed due to environmental incidents rather than time. For example, a limb broken off a young tree due to high winds can allow decay fungi in to create rot holes.

Champion trees are those with the greatest height or trunk girth for their kind in the UK. Those with large girths tend to be ancient, but the tallest are often still young and in the prime of their upward growth.

Heritage trees have significant links to human history and culture, they can be ancient but not all are. These include the famous oak that Charles II hid in.

Notable trees tend to be grand mature trees that stand out in their environment as they are comparatively larger than others around them.

Even though they are proven to be of ecological and cultural significance, protection for ancient trees in the UK remains weak. But work is being done to highlight ancient tree hotspots and to lobby for better protection. The following articles look at ancient tree ecology, the important ancient tree inventory, future ancients at Bodfach and veteranisation of non-ancients.

Rural landscape with ancient tree by Artist Paul Sandby

Ancient tree ecology

Ancient trees are biological miracles. The range of species they support during life and death is simply staggering. For some, such as native oaks, *Quercus* sp., this support for other species can span over a thousand years. In old-growth areas (those with a long history of trees of special interest growing in close proximity) this could mean you are only 20 generations of oak tree away from those that recolonised the land after the last ice age.

The Fortingall Yew, *Taxus baccata*, in Perthshire, Scotland, is perhaps the oldest tree in the UK. Modern experts estimate it to be between 2,000 and 3,000 years old, although some think it could be far older – maybe even 5,000 years old.

Few trees in woodland settings reach ancient status, while they are young and vigorous they can compete with their neighbours. Once they decline with old age, their canopy retrenches and the younger trees around them will outcompete them to reach the space in the canopy for light and the water/nutrients in the soil. As they are shaded out the older trees die off relatively quickly.

In open settings, such as wood pasture and parkland, trees do not have to compete excessively with each other for space, light, water or nutrients. Their root systems can expand much further, as can their crowns. Then as they reach over-maturity and the crown begins to shrink, growing more out and down than up, they are not over-shaded by younger trees and can spend much longer alive and aging.

Open-grown trees generally have short, squat, fat trunks with large diameters and spreading limbs, some of which can be almost horizontal. They also have large dome-like crowns. These features are unlikely to develop in more closely grown woodland as those trees tend to have more slender, taller trunks to compete for light high in the canopy, and smaller crowns due to contact with those of neighbouring trees.

Trees in open settings have a greater volume of wood overall, in the trunk, limbs and roots. The slow aging process allows more time for this wood to grow and decay, and to form relationships with or provide substrate or shelter for a greater variety of organisms.

An important symbiotic relationship is formed between tree roots and mycorrhizal fungi in the soil. The tree supplies the fungus with carbohydrates produced through photosynthesis, while the mycelial network of the fungus acts like an extended root system, providing the tree with water, mineral salts and metabolites. It is estimated that around 90 per cent of plants rely on this symbiosis for survival.

Wood decay fungi also play a significant role in the lifecycle of a tree. The hollowing of trees by fungi is a natural process that creates habitat for a variety of vertebrate and invertebrate species. For example, chicken of the woods, *Laetiporus sulphureus*, causes brown rot in the heartwood of trees; this rot is favoured by the vulnerable cardinal click beetle, *Ampedus cardinalis*. Over cautious management can result in the felling of a tree showing signs of decay, but this removes important veteran habitat features from the environment. Hollowing trees are also not necessarily structurally unsound, indeed the great storm of 1987 showed hollow trees may be as strong, if not stronger, than younger solid trees because they are more flexible.

Many species feed on the fruiting bodies produced by fungi. Red squirrels, *Sciurus vulgaris*, eat fungi as part of their varied diet. Badgers, *Meles meles*, wood mice, *Apodemus sylvaticus*, yellow necked mice,

DAVID BAIRD

Ancient tree and Ivy

Apodemus flavicolis, nationally scarce fungus weevil ,*Platyrhinus resinosus*, and slender slugs, *Limax tenellus*, are among the range of organisms that feed on fungi.

Saproxylic invertebrates rely on ancient, veteran and dead trees for survival. These species all require decaying wood at some point in their lifecycle. As wood decays and changes over time it offers different characteristics that support different suites of species. So it is important to leave decaying and dead wood in the landscape. However, its availability has reduced in modern times, not helped by people ‘tidying up’ nature, and has led to the decline of a number of species, such as stag beetles, *Lucanus cervus*, whose larvae feed on dead wood.

Invertebrates are an important food source for many other species. Lesser spotted woodpeckers, *Picoides minor*, use their sharp, powerful beaks to feed on larvae and wood boring insects in mature trees.

Rot holes can be created when branches die or are broken off. The latent fungi in a dead branch or broken socket may be triggered by the changes to their environment and start to colonise and break down non-living heartwood so the branch or the socket can rot back into the trunk. These rot holes provide homes for a wide range of species. Brown long-eared bats, *Plecotus auritus*, roost in rot holes formed where branches are lost. Tawny owls, *Strix aluco*, need large holes created by the loss of sizeable limbs from mature trees to nest in and raise their young. The rot can cause hollowing of the tree which makes great habitat for barbastelle bats, *Barbastella barbastellus*, that roost deep inside in winter. Hornets, *Vespa crabro*, also make nests in hollow trees.

Old and flaking bark can provide habitat for cobweb beetle, *Ctesias serra*, larvae to live under. This can also be ideal for barbastelle bats as they use loose bark to roost behind in the summer.

Many lichens, especially rare and specialist species, need the bark of ancient trees. As ash, *Fraxinus excelsior*, ages its bark becomes more alkaline and provides ideal substrate for delicate, acid-intolerant lichens to grow on. However, the acidity or alkalinity of tree bark does vary between species. The lichen *Lobaria pulmonaria* or lungwort is an old-growth lichen that grows on the bark of mature deciduous trees. It is particularly sensitive to atmospheric pollution and loss of habitat.

KEN THOMAS

European hornet on oak tree

Ancient trees offer biological continuity above and below ground, including a lot of invisible biodiversity that you may never realise is there.

ROB ATHERTON

Tawny owl in tree hole

Lungwort lichen, *Lobaria pulmonaria*

The Ancient Tree Inventory

The Ancient Tree Inventory (ATI) is a living database of ancient, veteran and notable trees in the UK. It has been developed through a partnership between the Woodland Trust (WT), Tree Register of the British Isles and Ancient Tree Forum (ATF). By drawing together thousands of records, a map of the UK's most valuable trees has been created. Most records are from ordinary citizens, gathered during the Ancient Tree Hunt (ATH), others are from partner organisations and specialists.

Trees on the database are classed as Trees of Special Interest (TSI). There are three categories: ancient, veteran and notable. Information on the overlap and differences between TSIs can be found in the introduction and *Ancient Tree Guide no 4: What are ancient, veteran and other TSIs*. Through its form and type every special tree can tell us about its past. However, ancient trees are the grand masters, being ecological and sometimes archaeological living time machines.

Some individual TSIs are keystone structures that play unique roles not provided by younger trees. Where they grow in close proximity and in sufficient number, with a long history of similar trees in that area, they may collectively be defined as 'old growth'.

First 128,000 records

Knowledge of the number, size and age of trees in wood-pasture and parkland landscapes (significant for their open-grown TSIs) is important in assessing the quality of sites. Generally, the more ancient and veteran trees there are in clusters or close proximity, the more important that population for biodiversity and the more likely it is old growth.

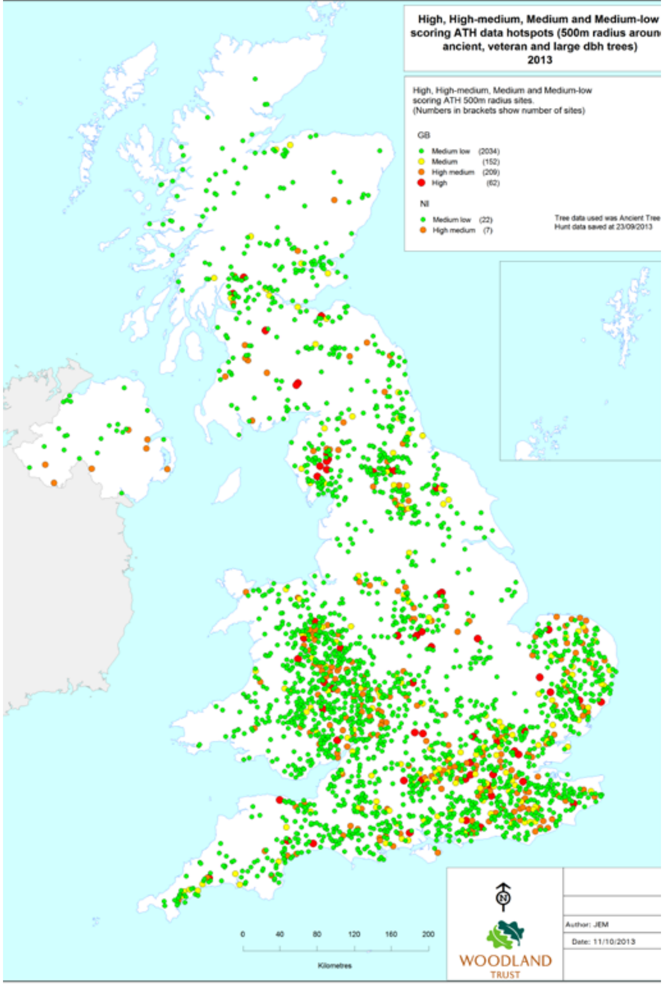
In 2006, Natural England developed a Joint Nature Conservation Council protocol[i] to assess potential Sites of Special Scientific Interest (SSSI). Priority criteria are the numbers of ancient, veteran and large diameter trees. A 'high value' TSI area must contain 15 or more ancient trees and 100 or more veteran trees. The population must also have 15 or more large diameter trees – trees with a diameter of at least 1.5m at breast height. Many UK sites have significantly higher numbers than these minimum high value criteria.

WTPL, ANCIENT TREE HUNT

Ancient ash

Medium value sites can vary between having 14 ancient trees, 99 veteran trees and 14 large diameter trees (note the difference between high value and medium value sites might only be two or three trees), and at the lower end having just one ancient, 11 veterans and 6 large diameter trees. Sites without any ancient trees are placed in the low to unclassified value category.

The ATI is therefore useful for making provisional assessments of wood-pasture and parkland site quality, and for finding new areas of significance. Those of sufficient quality can be put forward for national designation. The analysis of the ATI data up to September 2013 is shown in map opposite. The red areas show the most important high value hotspots, as defined by the criteria above. Orange is medium-high, yellow medium and green is low value.



Ancient tree hotspots using ATI data 2013

Although the ATI offers a provisional assessment of TSI populations and distribution, the dataset is still incomplete and current results can only be used as a guide. An expert qualitative assessment suggests the database may only contain around 20% of all ancient, veteran and large diameter trees. Also, some areas have not separated out ancients from veterans enough, so numbers of ancient trees are often underrepresented. The English Nature (now Natural England) Specialist Survey Method Review estimated there were 9 million trees with dead wood habitat value in the British Isles.

Protecting ancient and other veteran trees

The aim of the ATI data analysis is to develop landscape scale strategies to protect existing valuable hotspots, restore where necessary, buffer and extend landscapes rich in TSIs. This should make them more resilient to future change.

Many major UK concentrations of ancient and veteran trees lack national or local protection. The wood-pasture and parkland priority habitat is poorly represented in SSSIs or Special Areas of Conservation (SAC). Although some sites have been identified, extended or are in the process of being designated (i.e. Stock Gaylard, Castle Hill, Gregynog, Bushy Park).
The ATF and WT recommend any high or medium-high quality tree or woodland hotspot should be considered old growth and be equivalent to a SAC (also known as a Natura 2000 site in Europe). However, there is currently no mechanism available to update the Annexes in the Habitats Directive, so this seems unlikely in the short term. Perhaps another landscape designation such as Biosphere Reserve could be used, or a new one created such as Important Tree Area to match the Important Bird Areas.

Creation of a map layer showing TSIs and hotspots would help prioritise high value sites for buffering and extending, and allow the best of old-growth habitats to feature in the creation of resilient landscape strategies.

For example, research in Sweden[ii] has shown that a sustainable landscape for some key beetle species would require a minimum of 57 hectares (ha) with 2.8 hollows oaks per ha – a total of 160 hollow oaks. While the most demanding hollow tree beetles were estimated to need an area of 954 ha. Data analysis in 2011 indicates approximately 198 sites (medium to high value) would meet this minimum requirement in the UK (see above), but very few fit the upper limit category.

Flagship citizen science project

JILL BUTLER

King John Oak, Devon

The quality of tree records from the ATH is remarkable and demonstrates how valuable citizen science projects can be, for example with robust methods of verification. The majority of trees recorded were completely new and show a UK rich in TSIs that we should value above others because of their age, size or condition. There are great benefits from this natural capital of old and decaying trees. Finding and recording the trees has helped to better recognise them as individuals, as hotspots and as part of historic landscapes.

The project also inspired owners, government agencies and authorities at national and local level, NGOs, communities and individuals to seek ways to safeguard the future of TSIs. By comparison with people, most trees are very long lived organisms, but TSIs face unprecedented threats and the ATI is only provisional as trees are constantly being lost. However, it does allow us to record the details of a tree for perpetuity and to record loss as it happens. This helps build an evidence base for proactive action by stakeholders.

An international perspective

Recent research provides shocking evidence of massive declines in some of the largest organisms on Earth. Tree losses are primarily due to intentional removal, new pests and diseases, root compaction and damage (especially from intensive agricultural practices), competition and removal due to forestry intensification, and fire. However, the biggest danger is that loss is iterative and cumulative (one tree here, another there) so it is remarkably difficult to see the overall picture until very late in the day. If such trees are lost and populations continue to collapse, as predicted, the ecological, historical and landscape roles of these keystone structures will disappear, roles that cannot be filled by younger trees.
Around the world, many countries are starting

to recognise the importance of ancient trees and other TSIs. Sweden has a growing on-line catalogue of over 423,000 trees (www.tradportalen.se) and many other European countries have more limited registers of nationally important trees. The WT and ATF are campaigning for a national priority to safeguard the lives of TSIs for as long as possible. It should also be a Europe-wide aim for all countries to record old, hollow and pollarded trees, and the habitats where they occur. This information should then be used to raise awareness of these large, very long-lived organisms, and help to conserve global old-growth biodiversity and the history associated with it.

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[i] http://jncc.defra.gov.uk/pdf/sssi_ptC2plusveterantreesaddedin06.pdf

[ii] *Bergman, K-O (2006) Living coastal woodlands: conservation of biodiversity in Swedish archipelagos. Swedish Forest Agency. Butler J E, Rose, F., Green, E E (2001) Ancient Trees, icons of the most important wooded landscapes in Europe. NACONEX*

JILL BUTLER

Holt Wood, National Trust, post hollowing

Bodfach's future ancients

The Bodfach estate near Llanfyllin, Wales, has been owned by Simon and Maggie Baynes since 2007. Its origins are not clear but there are records of it from 1160. The estate consists of 46 hectares of woods, parkland, fields and gardens.

The parkland area contains eleven magnificent ancient oak, Quercus sp., trees, as well as a number of veteran and notable open-crowned trees. Some of these trees could be over 500 years old and are a beautiful element of the historical landscape. It is one of only 15 important collections of ancient and large diameter trees currently known in Wales.

The 1st Epoch Ordnance Survey from the mid-1800s (the most detailed survey of the site ever undertaken) shows many more old and mature trees that have sadly been lost in the past 150 years. The remaining ancients are worryingly all of a similar age. So the special wildlife that depends on the habitats created by veteran trees will have nowhere to go if these trees are lost from the park.

It is essential for saproxylic invertebrates and other species to have continuity of habitats across the landscape. Rot holes and flaking bark are among the particular niches required by these specialists for survival, but these habitats often take a very long time to develop. Trees outside woods represent a significant proportion of native tree cover in the UK. They are also under threat from development, climate change, etc., and need to be protected.

Maggie and Simon were keen to replace the missing trees, to return the park to its former glory and support wildlife. A trained Ancient

Tree Hunt volunteer surveyed the site to work out which of the old trees were still standing. The historic map was compared with modern aerial survey photos to allow them to pinpoint the locations of the missing trees.

As part of the Woodland Trust's celebrations to mark the Diamond Jubilee, 60 new parkland trees were planted using the enthusiastic help of local school children. The majority of species planted were sessile oaks, *Quercus petraea*, but a number of others were also used to match the existing pattern within the landscape.

Simon and Maggie Baynes were delighted with the project, saying: "As the owners of such an historic estate we feel a huge responsibility, not just to protect what is here already, but to add to it for the benefit of future generations. Her Majesty's Diamond Jubilee has provided an excellent opportunity to do just that, by planting a new generation of parkland trees that, in centuries to come, will be able to take their place among the ancient trees that add so much to their beautiful surroundings."

It is hoped the young trees will survive and prosper to become the ancients and veterans of the future – providing homes for vulnerable species and enjoyment for humans.


CLARE MORGAN

Llanfyllin School at Bodfach planting

Veteranisation of trees

Experts have become increasingly concerned about the loss of ancient trees in our modern landscape, and the lack of future ancients coming through to replace them. The specialist species that rely on the variety of habitat niches created over time in aging trees are declining with ever decreasing ancients to colonise. Ancient oaks, *Quercus* sp., are particularly important and at risk.

In southern Sweden millions of oak trees were felled from the 1800s to the mid-1900s. This was mainly driven by the need to build ships for war and conflict between the peasants and the crown/nobles over ownership of the oak trees, which led to the expression 'tender oak trees and young noblemen should be hated'. It is estimated that only one or two per cent of the oak landscape from the 1700s has survived.

The key point for oak tree development appears to be when they are around 200 years old. After this point hollowing frequency increases fairly rapidly and the bark becomes more suitable for epiphytic lichens. Beech also shows a similar relationship between age and species diversity. However, natural mortality among ancient trees is 1 to 2 per cent per year and many are cut down in the landscape due to human development. Along with natural catastrophic events, we could feasibly lose our oldest trees by the middle of the 21st century.

There is no quick and easy way to create an ancient tree that has taken hundreds of years to mature. However, since at least the 1990s people have shown that intentional 'damage' to younger trees can speed up the process of creating habitats, such as rot holes and dead wood, which older trees offer.

This may offer a stop-gap solution for some specialist wildlife, but it is no substitute for the real thing. In his book *Woodlands*, Professor Oliver Rackham says 'the future of veteran trees depends on not felling middle-aged trees when they start to decay'.

Veteranisation activity

Forms of tree veteranisation have been around for centuries in the form of pollarding, which encourages hollowing more quickly. Over the last few decades veteranisation work has been carried out in Italy, the US and UK. However, the work and techniques have rarely been properly evaluated, so there is still no conclusive evidence for the efficacy of veteranisation.

Veteranisation is a technique appropriate for sites where there is a large age gap between the ancient trees and the next generation. It is also important to ensure as a priority that there are enough trees that will have the opportunity to grow old naturally. Veteranisation has often been used as an alternative to felling trees, which would otherwise have to be removed because they are shading the ancient trees. Veteranisation is **never** appropriate for veteran or ancient trees.

An international trial project to evaluate veteranisation of oak (2012-2037) has been established by the County Administrative Board of Kalmar in partnership with Nordens Ark and Pro Natura, and partly funded by the Swedish Environment Agency. The aim of the project is to establish whether veteranisation of oak trees works to create habitat suitable for species to colonise using tools to stimulate the process, rather than time. A network of sites was established over a large geographic area (southern Sweden 16 sites, Norway 1 site and England 3 sites), and the number of treatments tested were kept at a relatively low level (five in total) to make replication and evaluation easier.

To guarantee there is good variation in the type of substrate created and the method used to create it, the treatments selected covered a broad spectrum. However, care was taken to prevent the treated trees from being excessively or mortally damaged. It is hoped the techniques used will mimic nature as closely as possible, to ensure success and so as not to cause alarm – deliberate damage to trees can be upsetting for many people.

At Tinnerö, a site in Östergötland, Sweden, a complimentary project is also taking place. Over five years 400 oak trees will be veteranised, using the same methods as the international oak veteranisation trial project plus eight additional treatments. Although this may sound like a large number of trees are affected, it is only 10 per cent of the total population of young trees on the site.

International trial method

At each of the project's sites, 49 trees with a diameter between 25 and 60 centimetres (cm) were selected with a maximum age of 120 years. It was important that the trees were healthy with no visual signs of hollowing or holes in the trunk, but the trees could have dead branches under 10 cm in diameter. All the trees were tagged and GPS coordinates taken.

Of the 49 trees:

- 21 needed to have at least one branch greater than 10 cm in diameter below a height of 8 metres (m) on the trunk - the remaining 28 can have or not.
- 35 trees were treated with one of the five selected treatments; 14 are control trees – the selection process was random. The location of treatment (north, east, south or west) on the trees was distributed as evenly as possible.

All treatments, besides the ground treatment, were carried out using climbing spikes and cut material was left in situ as far as possible. Practical work was carried out between 1st September and 31st October 2012 on 19 of the 20 sites, on one site the work was done in November 2012. Three teams of skilled arborists carried out the work.

Treatment 1
– nest box in living oak

Cut a long rectangular wedge from the centre of the tree trunk, remove a strip from the inside of the wedge and a piece from the top and replace it in the hole to leave a gap at the top, nails were used to secure the "lid" in place.

Height: lower part of the hole is 4m above the ground.

Width: maximum of 1/3 of the stem diameter or at least 10cm.

Length: 50 cm

Top the tree, leaving at least half of the live crown, ensuring the cut surface has a 'natural fracture cut'.

VIKKI BENGTSSON

Nest box creation

Treatment 2
– woodpecker hole

Saw a slightly oval-shaped hole into the tree.

Height: lower limit of the hole is 4m above the ground.

Size: approximately 8cm wide and 12cm long, and into the centre of the trunk.


VIKKI BENGTSSON

Woodpecker hole

Treatment 3
– horse damage to trunk

Remove the bark from the tree trunk and top of any surface roots – remove all living tissue.

Height: from ground level to 1m in height.

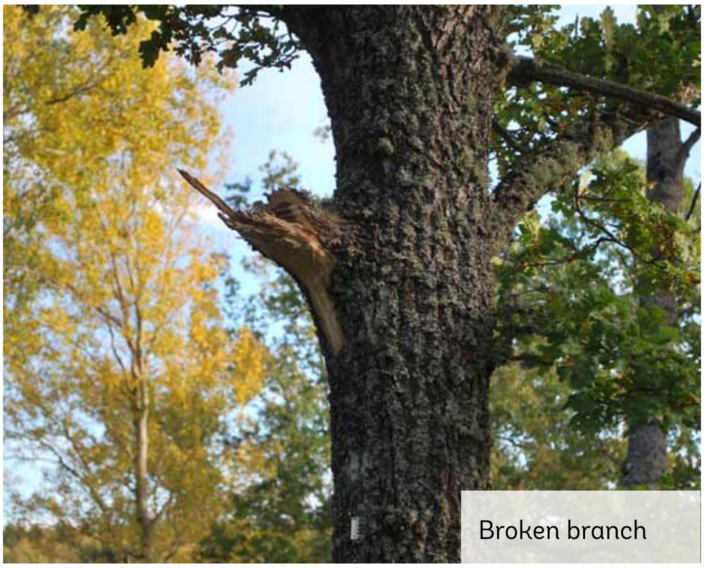
Width: 1/3 of the girth of the trunk.

Horse damage

VIKKI BENGTSSON

Treatment 4
– broken branch

Saw off the lowest live branch which is at least 10cm in diameter. Cut the branch 20cm from the trunk, cut halfway through from the top and then pull/push the branch to rip it the rest of the way. Cut the remaining part to look like a natural fracture.



Broken branch

IDAMARIA HORLIN

Treatment 5
– ring-barked branch

Remove the bark and living tissue all the way round the lowest live branch which is over 10cm in diameter. Ring bark the branch about 20cm from the trunk for a width of 20cm.

Ringbarking a branch

VIKKI BENGTSSON

It is hoped that during the 25 year life of the project the trees and treatments will be assessed to evaluate their ability to produce suitable habitat. Key research areas include looking at the structures created and the speed of creation, and species colonisation and succession, especially fungi, insects, mammals, lichens, mosses and birds. A brown long-eared bat was reported to have moved into one of the nest box treatments after the first season. Callous growth and early signs of decay have also been noted at some sites.

Veteranisation is a technique that could also be used when halo thinning around veteran trees. Treatments such as ring barking can be carried out on trees near the veteran, along with selected felling to allow more light to the veteran tree. This could more quickly offer further suitable habitat for some species living within key substrates in the veteran.

This work is an important step in bridging the gap, for some species, in a landscape lacking in a sustainable population of ancient trees. But we also need greater protection for those ancient trees we have and more ancient trees must be allowed to develop and survive to replace those we lose. Trees work on much longer timescales than the ordinary human life. We must adjust our thinking accordingly and support these magnificent giants.


WTPL - KAREN FISHER

Ancient tree Chirk Castle

Editor: Kay Haw (Woodland Trust)

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