Summary of evidence: Wood-pasture and parkland

1 General introduction

This summary sets out Natural England's assessment of the key evidence relating to the priority habitat wood-pasture and parkland. It provides a statement of the current evidence base, presenting:

- what we know (with supporting data and key references);
- areas that are subject to active research and debate; and
- what we do not yet know from the evidence base.

It also provides information on Natural England research and key external research programmes to show how we are seeking to fill gaps.

This summary forms part of a suite of summaries covering all of Natural England's remit. The summaries are not systematic reviews, but enable us to identify areas where the evidence is absent, or complex, conflicting and/or contested. These summaries are for both internal and external use and will be regularly updated as new evidence emerges and more detailed reviews are completed.

2 Introduction to wood-pasture and parkland

The priority habitat wood-pasture and parkland is described in Joint Nature Conservation Committee's (JNCC) UK Biodiversity Action Plan (BAP) priority habitat pages as: areas that have been managed by a long established tradition of grazing allowing, where the site is in good condition, the survival of multiple generations of trees, characteristically with at least some veteran trees or shrubs. The tree and shrub component may have been exploited in the past and can occur as scattered individuals, small groups, or as more or less complete canopy cover. Other semi-natural habitats, including grassland, heathland, scrub etc, may occur in mosaic beneath the trees. While oak, beech, alder, birch, ash, hawthorn, hazel or pine are often the dominant tree species, a wide range of other tree and shrub species may occur as part of wood pasture systems.

A full description can be found on JNCC's website: **www.jncc.defra.gov.uk/pdf/UKBAP_BAPHabitats-65-WoodPastureParkland2011.pdf**

Wood-pasture can be the result of very long-term agro-forestry management, and parkland is associated with stately homes and 'designed' landscapes. Traditional orchards may be considered a form of wood pasture.

The habitat is the product of historic land management systems, and represents a vegetation structure rather than being a particular plant community. Typically this structure consists of large, open-grown or high forest trees (often pollards), which may be hundreds of years old, at various densities, in a matrix of grazed grassland, heathland and/or woodland floras. Grazing animals are fundamental to the existence of this habitat.

The veteran trees provide ecological continuity, and provide habitat niches for saproxylic (wood decay) invertebrates, lichens, fungi, bats and hole-nesting birds. Some of these species are of European importance.

A small number of sites which support wood-pasture and parkland are protected through statutory site designation; 12 Sites of Special Scientific Interest (SSSIs) note wood-pasture and parkland as being a feature of interest, and two of these have been notified for the veteran tree populations they support.

Woodland is generally under-represented in the SSSI series, and wood-pasture and parkland as a habitat was not recognised as having value in its own right until relatively recently. It is one of six priority habitats grouped within the broader habitat description of 'mixed broadleaved woodland'. At the time the Nature Conservation Review (NCR) was being compiled in the 1970s (Ratcliffe 1977), veteran trees and the wood-pasture habitat in which they were found was often referred to as degraded woodland. As a result, the habitat is under-represented in the NCR. When the protected site series was being renotified in the 1980s, wood-pasture was still not fully appreciated. Survey work, such as that carried out by Harding and Rose in the 1970s and 1980s (Harding & Rose 1986), has increased our understanding of the value of this habitat in its own right. Peterken (1981) listed wood-pasture as a separate woodland type in his woodland classification system. Kirby *et al.* (1995) summarised wood-pasture conservation in Britain. There are still big gaps in our knowledge.

Wood-pasture and parkland is considered in the summary of evidence under the following headings:

- What we know about wood-pasture and parkland sites.
- What we know about veteran trees.
- Areas subject to active research and debate.
- What we don't know.

3 Summary of evidence

What we know about wood-pasture and parkland sites

3.1 Wood-pasture and parkland sites support a mosaic of habitats. They can be of value for hole-nesting birds (Smith 2007), saproxylic invertebrates (Alexander 2011, 2012), lichens, fungi on the trees or in the surrounding grassland (Rayner 1992), the historic environment, and landscape (Dallas *et al.* 2007; Natural England 2014).

3.2 Wood-pasture and parkland is a priority habitat which supports 41% of the priority species associated with woodland and listed in Section 41 of the Natural Environment and Rural Communities (NERC) Act (Webb *et al.* 2010).

3.3 The key biodiversity features of wood-pasture and parkland sites are contained within their veteran trees, and the saproxylic (wood decay) species they support. (Webb *et al.* 2010).

3.4 The ecological continuity provided by the wood decay inside veteran trees is not found in any other habitat. The value of dead wood in wood pasture systems is usually greater than dead wood found elsewhere because of the ecological continuity represented by the veteran trees (Harding & Rose 1986; Kirby & Drake 1993; Forest Enterprise 2002).

3.5 Wood-pasture and parkland is widespread across the UK, but England holds the largest area of lowland parkland (Rose & Harding 1978). It is a habitat not considered to be forestry, agriculture or grassland, but is of value to all. Wood-pastures in the uplands are less studied and are poorly understood compared with those in the lowlands.

3.6 Wood-pasture and parkland is descended from medieval deer parks, royal hunting forests and chases and wooded commons (Rackham 1986). By studying the location of veteran trees, it may be possible to trace the location of Royal Hunting Forests and deer parks dating from the medieval period in the landscapes of today.

3.7 Pollarded or worked trees provide a cultural link to medieval times and earlier (Rackham 1986).

3.8 Wood pasture and parkland forms an important component of many designed landscapes created in the 18th and 19th centuries (Bullock *et al.* 2004; Cookson & Tickner 2013).

3.9 Agri-environment schemes have funded management plans for some important parkland sites. (Cookson & Tickner 2013). However, the opportunity to ensure effective management of parkland trees was missed in many agri-environment schemes (see review by Ecoscope 2003).

3**.10 Parkland management plans, produced by Natural England through agri-environment schemes, are a valuable resource for parkland managers.** They are a repository of information about a site and are a valuable reference source for site managers (Cookson & Tickner 2013).

What we know about veteran trees

3.11 The conditions created by wood decay fungi in veteran trees provide a mosaic of micro-habitats which support rare saproxylic invertebrates (Harding & Rose 1986; Alexander 2011, 2012). 'A single 400-year-oak, especially a pollard with its labyrinthine compartment boundaries, can generate a whole ecosystem of such creatures for which ten thousand 200-year-oaks are no use at all' (Rackham 2006).

3.12 Nearly 11% of the saproxylic beetles found in veteran trees are considered Threatened in Europe, a further 13% are considered Near Threatened (IUCN European Red List, Nieto & Alexander 2010).

3.13 Management techniques such as pollarding and stock grazing, which were in widespread use in the past, created the right conditions for wood decay to develop and be maintained. These techniques are no longer practised on many wood-pasture sites (Rotherham 2013).

3.14 Wood-pasture forms part of the cultural heritage of Europe, and may add significantly to the preservation of regional biodiversity (Bergmeier *et al.* 2010).

3.15 Specialist tree surgery can increase the life span of veteran trees (Read 1996; Lonsdale 2013). Such surgery might be undertaken within important veteran tree populations. Arboricultural work,

for example crown reduction which reduces the density of branches, is thought to increase the life span of veteran trees by reducing the likelihood of catastrophic break-up.

3.16 An obstacle to wider recognition of the value of specialist arboricultural operations is that the outcome of such work is rarely published. Rare exceptions include publications about work carried out on beech at Burnham Beeches (Read 1996; Read *et al.* 2010; Read *et al.* 2013), on oak at Windsor (Alexander *et al.* 2010; Alexander & Green 2013), and a general report on pollarding by Green (2006).

3.17 Hollow oaks are important for a range of biodiversity (Ranius 2002; Manning *et al.* 2013).

3.18 Estimates have been made of ideal tree densities for the populations of saproxylic invertebrates they support (Ranius & Jansson 2000; Alexander 2002a; Bergman 2006). Bergman (2006) proposed an average density of 2.8 ancient oaks per hectare as desirable. This allows space to sustain a population of veteran trees, at the same time allowing space for tree regeneration and for other habitats such as grassland or heathland. A similar approach to assessing the value of veteran trees in England has not been carried out. In Norway individual hollow oak trees can be protected, unlike in England and other European countries.

3.19 It is important to allow light to reach veteran trees, especially light demanding species such as oak (Vera 2000; Widerberg *et al.* 2012). Light levels can be increased around veteran trees by 'haloing' (removing secondary tree or scrub growth that is affecting the veteran canopy). This promotes epicormic growth from dormant buds lower on the tree which provides a lower canopy, and enhances the ability of the trees to naturally retrench, while maintaining photosynthetic vigour.

3.20 Veteran fruit trees are important for saproxylic invertebrates (Lush at al. 2009). Plums planted about 60 years ago and apples planted about 80 years ago are used by saproxylic invertebrates.

3.21 Beech trees established across the south of England in the early 1800s are now reaching the end of their lives (Mountford & Peterken 2000). Their loss is likely to have a significant impact on the biodiversity and cultural value of the sites they are found on.

Areas that are subject to active research and debate

3.22 The Ancient Tree Hunt, an Heritage Lottery Fund - funded project run by the Woodland Trust, has trained hundreds of volunteers to record the location and main features of veteran trees across the UK **www.ancient-tree-hunt.org.uk/**. This information can be used to identify sites of value because they support veteran tree populations, some of which might be of sufficient value to be notified as SSSIs.

3.23 The anniversary of the birth of Lancelot 'Capability' Brown in 2016 has provoked a number of research projects on the parklands he designed. Natural England let two contracts in 2012 – one to look at the contribution that five Capability Brown parks make to biodiversity and habitat connectivity, the results of which are yet to be published , and a second to consider the contribution that Environmental Stewardship has made to parkland management (Cookson & Tickner 2013 – see 3.8-3.10 above). In addition English Heritage has proposed several research topics including one on the biodiversity value of historic Brown parklands, particularly with regard to the veteran trees they contain.

3.24 Natural England is producing an inventory of wood-pasture and parkland sites in England. The provisional results, published in March 2014, indicate that there are 278, 050 ha of wood-pasture and

parkland in England. Around 21% (58, 292 ha) of the wood-pasture and parkland polygons overlap with Sites of Special Scientific Interest, yet only 12 SSSI citations mention wood-pasture and/or parkland or a population of veteran trees as an interest feature. More work is required to refine the inventory. A joint project with the Woodland Trust and the Ancient Tree Forum is working to identify the priority sites where management action is required to achieve and/or maintain favourable condition, as well as establishing how to fill priority knowledge gaps.

3.25 A PhD at the University of Cardiff with Professor Lynn Boddy (part funded and supervised by Natural England) will increase our understanding of the behaviour of late stage decay fungi in beech, including how the fungi become established; how their communities change over time; the location, rates and patterns of decomposition in relation to wood anatomy; and how this impacts on the organisms dependent on this habitat. Late stage wood decay provides important habitat niches for some rare and declining invertebrates.

3.26 The Veteran Tree Initiative produced a Specialist Survey Methodology (SSM) in 1997 for use when surveying sites for their veteran trees (English Nature). There is a need to develop methods for evaluation of the data gathered through this process, as well as a need for further field testing to determine whether it would benefit from any revisions.

3.27 Tree coring is regarded by some as a legitimate activity to age trees, for example, in designed landscapes. Research to collate this data and assess whether its value outweighs the risk to the future health of cored trees is underway (2014) in a project funded by Scottish Natural Heritage.

3.28 The 'VETree' project, **www.vetree.eu/en/page/1/** led by the Ancient Tree Forum, is using European-sourced money to provide training in the reasons for and techniques required to carry out 'veteranisation' of younger trees. In this approach, younger trees are 'damaged' in a way that may speed up the process of wood decay development, found otherwise only on very old trees. This sort of management approach will help bridge the identified and commonplace generation gap, to the benefit of specialist invertebrates and fungi.

What we don't know

3.29 There is currently no definitive inventory which identifies the location and extent of the priority habitat wood-pasture and parkland. Attempts have been made to map wood-pasture and parkland (Alexander & Lister 2004; Harvey *et al.* 2004; Lush 2012; Bannister 2013) and these efforts have been combined into a dataset for England which can be downloaded from the MAGIC website. This provisional dataset needs to be ground-truthed to improve confidence in the information it contains.

3.30 The value of 'non-woodland' trees in the landscape in providing connectivity between sites for different species is poorly understood. Scattered trees are keystone structures and their ecological contribution could be disproportionately large (Manning *et al.* 2006). In England we have limited evidence of the role played by trees outside woodlands in habitat/landscape connectivity. The spatial configuration of trees in the landscape, along with their individual features might have a strong influence on species occurrence and movement. Landscape trees could provide stepping stones or corridors to allow movement between woodland patches, and they may function as 'islands' of habitat in their own right. We need to increase our understanding of the potential impact that loss of trees from the landscape might have, particularly on invertebrates, bats and hole-nesting birds. We need to develop advice about their appropriate management, retention and replacement.

3.31 What role do fruit trees and scrub species play in providing the conditions suitable for wood decay species of fungi and invertebrates?

3.32 Trees are being lost from the wider countryside, and hedgerow trees are disappearing at a faster rate than they are being replaced (Defra 2008). We don't know how many or at what rate we are losing veteran trees from the countryside, other than from hedgerows. A method to assess veteran tree attrition rates is needed. Ash is the most frequent tree species in England's hedgerows, and is threatened by ash dieback, a serious disease caused by the fungus *Chalara fraxinea*, which usually leads to tree death.

3.33 What is the critical size of a veteran tree population, at a site and/or in a landscape, to ensure sustainable populations of veteran trees and the species they support for the next 200, 500 and 1000 years?

3.34 What is the best way of filling the time gap between veteran trees and their successors? Does deliberate 'veteranisation', by whatever means, realistically help fill the gap between veteran trees and the next generation?

3.35 What is the critical distance between a veteran tree population and the trees on which 'veteranisation' is carried out to be of greatest benefit to the saproxylic species that depend on those trees?

3.36 What is best practice for managing a wood-pasture and parkland site? We need to know:

- ideal stocking densities;
- impact of veterinary products on the trees and mycorrhizal fungi;
- densities of tree planting;
- how the trees and the species that depend on them interact with the grassland/heathland in which they are growing, as well as the soil micro-organisms; and
- economics of managing the site and maintaining favourable condition sustainably in the 21st century.

3.37 What contribution do protected sites and agri-environment schemes make to protecting wood-pasture and parkland habitat? Do Sites of Special Scientific Interest (SSSIs) and Special Areas for Conservation (SACs) make a positive impact on protecting wood-pasture and parkland priority habitat? What impact do agri-environment options have on the condition of the priority habitat wood-pasture and parkland, and the veteran trees they support?

3.38 Veteran pollards are a cultural and heritage feature from a lost traditional land management technique. What new approaches should be adopted when thinking about new uses and approaches to safeguard the future of wood-pasture sites?

3.39 We do not know the timescales for tree response following 'haloing', and further research is required.

3.40 What is the resource of upland wood-pasture and parkland sites? Much of our knowledge of wood-pasture and parkland sites is based on work carried out in the lowlands of England, and yet the priority habitat description now includes upland sites.

3.41 We don't fully understand the requirements of the rare species that depend upon wood decay habitat (saproxylic invertebrates, lichens and fungi) in terms of what they need to fulfil their lifecycle needs. Topics include: the interrelationships between fungi and invertebrate species; the role of isolated and hedgerow trees; the contribution of deadwood, and how the quantity and quality of dead wood is assessed; whether site management history is important for saproxylic invertebrates; the age at which veteran trees start rotting and becoming useful to saproxylic species; and the role of fruit trees and scrub species in filling the age gap amongst veteran trees.

3.42 Resolving potential conflicts on some historic parkland sites between management required for biodiversity interests and that required for the interest of the historic parkland is not always easy. Sites may be notified as a Site of Special Scientific Interest for their biological interest, as well as being on the English Heritage Register of Parks and Gardens, which has its own management requirements (English Heritage 2008). Occasionally, the management required to achieve both outcomes is not compatible.

3.43 We do not know how important England's veteran tree populations are on a European scale. Rose and Harding (1978) suggest that England holds the largest proportion of veteran oak trees in northwest Europe – if true then they should be given greater conservation priority in the UK. This knowledge gap could be filled by mapping all the known populations across Europe, using existing survey data, to place England and the UK in a European context.

3.44 What is the likely impact of climate change and disease on trees and hence on landscape character? Understanding what impact climate change and diseases such as *Chalara* are likely to have on landscape character, particularly the veteran trees, the habitat and the species that rely on them (Berry *et al.* 2007). For example, the beech trees that are a distinctive feature of landscapes such as the Chilterns and the Cotswolds are vulnerable to drought. Elsewhere the current drive for more tree planting as a response to climate change may alter the character of other more open landscapes.

3.45 Increase our understanding of the ecosystem services provided by wood-pasture and parkland sites. There has not been a full assessment of the value of wood-pasture and parkland for the ecosystem services provided by the habitat (UK National Ecosystem Assessment 2011).

3.46 Guidance and training of land managers. Lack of knowledge amongst land managers about veteran tree ecology and management can result in poor outcomes for veteran trees and their wood-pasture habitat.

4 Current Natural England projects

4.1 We are developing a method to make information about our current evidence projects available to everyone. In the meantime a list of Natural England's evidence projects that were current in 2014 can be seen on the National Archives at:
http://webarchive.nationalarchives.gov.uk/20140711133551/http://www.naturalengland.org.uk/ourwork/evidence/register/default.aspx

4.2 In 2014 Natural England let a contract to a consortium led by Keith Alexander to devise an approach to assess the importance of non-woodland trees to saproxylic invertebrates. This is linked to the Woodland Creation and Ecological Networks (WrEN) project, a research collaboration between Natural England (Nicholas MacGregor), University of Stirling, Forest Research, Scottish Natural Heritage

and the National Forest Company, which is investigating the importance of different ecological network attributes for woodland species.

4.3 In December 2014, the Peoples Trust for Endangered Species supported by Natural England, submitted a bid to the Heritage Lottery Fund for funding to train and support volunteers to recognise and assess sites which have wood-pasture and parkland priority habitat. The outcome of the submission should be learned in March 2015.

4.4 The Woodland Trust and Natural England are exploring ways of working together to extend our knowledge of the location of wood-pasture and parkland sites.

4.5 Natural England is supporting a PhD project led by Professor Lynn Boddy at Cardiff University, which will investigate the role of late stage decay fungi in beech in providing appropriate conditions for S41 saproxylic invertebrates. Other partners include the City of London Corporation and the Crown Estates at Windsor.

5 Key external research programmes

5.1 English Heritage: Heritage at Risk. The Heritage at Risk programme, set up in 2008, aims to identify England's historic assets that are at risk of loss through neglect, decay or development, or are vulnerable to becoming so. The programme is used to establish the extent of risk and to help assess priorities for action and funding decisions. (English Heritage 2009, 2010, 2011). Some of the parks listed as being at risk will support the priority habitat wood-pasture and parkland.

5.2 English Heritage: Lancelot 'Capability' Brown 300 Celebration. 2016 marks the 300th anniversary of the birth of Lancelot 'Capability' Brown (1716-1783). English Heritage is one of a host of partners developing a national Capability Brown 300 celebration and festival for 2016. Their report: 'Lancelot 'Capability' Brown: A research impact review' prepared for English Heritage by the Landscape Group, University of East Anglia (Gregory *et al.* 2013) reviewed the research carried out to date with the aim of stimulating a wider discussion about research needs and opportunities, and also to inform English Heritage's next National Heritage Protection Plan future applied research activity. There is an opportunity to work closely with our heritage colleagues to benefit the biodiversity on these parkland sites, particularly where they support the priority habitats such as wood pasture and parkland

5.3 Woodland Trust Ancient Tree Inventory development. An HLF-funded project run by the Woodland Trust, the Ancient Tree Hunt began in 2004. It encourages volunteers to gather records of large, old trees in the countryside. The online database is a valuable record of the number and location of ancient trees across the UK **www.ancient-tree-hunt.org.uk/**.

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ISBN 978-1-78354-173-7