Pollarded oak. Hatfield Forest SSSI, Essex

6. Wood pasture and parkland

Climate change vulnerability: **Low**

Introduction

The structure and composition of wood pasture and parkland is heavily influenced by past management. Two key wood-pasture tree species, beech and common oak, are not generally regarded as being at risk across large areas of England (Berry, Onishi & Paterson 2012). However beech dominated wood pasture in the south of England will be increasingly vulnerable to drought, particularly on freely-draining soils and soils subject to seasonal waterlogging. More generally, drought and an increased frequency of storms pose a threat to veteran trees, which are a distinctive feature of much wood pasture and parkland. Due to the modified nature of the habitat, its persistence will depend on ensuring appropriate management decisions, such as replanting specimen trees, the choice of tree species (including the use of non-native species), and the level of grazing.

Habitat Description

Wood pastures and parkland are the products of historic land management systems and designed landscapes, and represent a vegetation structure rather than a particular plant community. Typically, this structure consists of large, open-grown or high forest trees (often pollards) at various densities, in a matrix of grazed grassland, heathland and/or woodland floras. They have been managed by a long-established tradition of grazing, allowing the survival of multiple generations of trees, characteristically with at least some veteran trees or shrubs (Bergmeier et al 2010). They frequently represent the best sites in England for old-growth features and deadwood, supporting a wide range of specialist fungi and invertebrate species (Webb, Drewitt & Measures 2011).

The tree and shrub component will have been managed over centuries, but in a diversity of ways and can occur as scattered individuals, small groups, or as more or less complete canopy cover. Depending on the degree of canopy cover, other semi-natural habitats, including grassland, heath and scrub may occur in mosaic with woodland communities. While oak, beech, alder, birch, ash, hawthorn, hazel or pine are often dominant, a wide range of other tree and shrub species may occur as part of wood-pasture systems. Parkland differs from wood pasture in that deliberate planting, often with non-native species into a designed landscape, represents a significant component. Parklands are frequently designated for their historic and landscape value.

Lowland wood-pastures and parkland are most commonly associated with oak – bracken -bramble woodland (W10), beech - bramble woodland (W14), beech – wavy hair grass woodland (W15), and oak - birch - wavy hair grass woodland (W16), although others may occur. Upland examples may show more resemblance to W11 (sessile oak - downy birch - wood sorrel) and W17 (sessile oak -downy birch - greater fork moss) woodland types. In addition, the more open wood pastures and parkland may include various scrub, heathland, improved and unimproved grassland NVC communities.

This habitat is most common in lowland southern England. These sites are often of national historic, cultural and landscape importance, for example in the New Forest. This habitat also occurs in the uplands, but is less understood than that in the lowlands.

Potential climate change impacts

Cause	Consequence	Implications
Hotter summers		■ Increased sun-scorch leading to bark-death of beech. ■ Reduced generation time of insect pests such as Oak pinhole borer (Platypus cylindrus) and Oak buprestid (Agrilus pannonicus) (Read et al 2009).
Warmer winters	Fewer frost events	■ Greater survival of tree pests, such as grey squirrel and species of deer, resulting in increased browsing and grazing pressure and reduced regeneration. (Read et al. 2009). ■ Greater over-wintering survival of insect pests leading to increased abundance and pressure (Ray, Morison & Broadmeadow 2010).
Changed seasonal rainfall		■ Trees rely on mycorrhizal fungi to help resist pathogens and provide nutrients. These fungi may be susceptible to drought, water-logging or changes in soil temperature (Lonsdale and Gibbs, 2002).
Drier summers	Drought Greater risk of fire	■ Increased loss of mature and veteran trees and loss of associated saproxylic invertebrates, lichens and fungi. ■ Beech is particularly vulnerable because of shallow rooting on soils subject to water-logging. This may be exacerbated in wood pasture and parkland compared to closed canopy woodland due to increased transpiration rates (Berry, Onishi & Paterson 2012). ■ Changes in ground flora composition are most likely if canopy trees die. ■ Vulnerability will differ according to local climate, soils and catchment hydrology. ■ Premature death of mature and veteran trees.
Wetter Winters	Raised winter water tables and increased risk of flooding	■ There is an increased likelihood of wind throw if tree-root depth becomes restricted by increased rainfall and water logging on sites with impeded drainage (Ray, Morison & Broadmeadow, 2010). ■ The impact of flooding will differ between species, with, for example, willow and alder able to withstand flooding longer than other species.
Increased frequency of extreme events	High winds Extremes of soil temperature and moisture Drought	■ Increased frequency of wind throw, leading to the loss of mature and veteran trees and an increased break up of large, unstable crowns in veteran trees, particularly those that have fallen out of the pollard cycle. ■ Loss of veteran trees leading to a loss of specialist species associated with veteran tree habitat (primarily fungi, invertebrates and lichens), although insect larvae within trees may be protected from extreme conditions. ■ Greater incidence of environmental stress, resulting in increased susceptibility to other pressures such as pests and disease. ■ See drier summers above. Note that the impacts of a dry summer are exacerbated if it follows a dry winter, meaning that the summer starts with a lower soil moisture content.
In combination		■ Increasing prevalence and range expansion of pests such as Oak processionary moth (Thaumetopoea processionea), Gypsy moth (Lymantria dispar) and pathogens such as Phytophora (Read et al 2009), leading to the potential loss or significant reduction in key species including oak, beech and ash.

Adaptation responses

The heavy influence of historic and current management on the structure, function and condition of wood pasture and parkland provides flexibility in designing appropriate adaptation and also managing change. However, when making management decisions, consideration of the landscape and cultural value of the site will normally be necessary, particularly when dealing with historic parklands and other 'designed' landscapes.

An important value of veteran trees, which are often the main feature of wood-pasture and parkland, is the ecological continuity in the dead and decaying wood they contain. Consequently, adaptation is likely to focus on actions that promote the longevity of existing mature and veteran trees and ensuring that new generations of appropriate species and genotypes are planted to replace trees as they are lost (and preferably before they are lost), thereby ensuring the continuing structural heterogeneity of sites. Also, management of younger trees to encourage the development of dead and decaying wood to fill the gap between veterans and younger trees will be important.

Flexibility of grazing and the development of effective contingency plans to respond to increased climatic variation and an increase in extreme events will also be important adaptive actions.

Some of the potential adaptation options for this habitat are outlined below.

- Where possible, reduce the impacts of other non-climatic pressures, such as pests and diseases, pollutants and development pressures. Adjust grazing levels according to environmental conditions to avoid over and under-grazing and compaction.
- Maintain pasture rather than arable land use under the trees to avoid adverse impacts on root systems.
- Protect mature and veteran trees from over and under-grazing.
- Ensure adequate regeneration and replanting to establish new generations of trees to replace individuals and species that are lost or likely to be lost under climate change. These new trees should be protected from grazing and competition, and should be managed to provide appropriate conditions for saproxylic invertebrates (ie decaying wood). Young trees may be protected from grazing and browsing by fallen branches and dead wood, giving an additional reason for retaining dead wood.
- Management of veteran trees to reduce the likelihood of catastrophic failure, for example by reducing the crown to reduce the sail effect in high winds and improving the protection for individual veteran trees. The benefits of undertaking crown works on veteran trees need to be weighed against the risks, and the guidance of a suitably qualified arboriculturalist can provide advice.
- Consider introducing or reinstating pollarding to semi-mature trees less vulnerable to storms and drought, to accelerate the development of veteran tree features and niches for specialist fungi and invertebrates, but consider the risk from crown works, as outlined above. Pollarding to reduce crown density can also help to reduce the possibility of catastrophic failure.
- Ensure that standing and fallen deadwood is not cut up and is only moved if absolutely necessary, as it represents a key niche requirement for many specialist species.
- Trees blown over by storms may grow new stems if the roots are undamaged or the horizontal trunk remains connected to the root system, if left uncut and not 'tidied up' or removed from the site, where there are no safety concerns.
- Develop fire management plans, especially in wood pasture and parkland where the threat of fire is thought to be high, such as those with a bracken rich or heather understorey. Introduce grazing animals, or other appropriate management, to reduce the amount of litter in sites with a lot of bracken.

- Develop contingency plans for outbreaks of new pests and diseases and other extreme events.
- When planting, understand soil type and heterogeneity across a site to better match species to planting location, including a consideration of the likely direction of climate change. Species choice is particularly challenging for future veteran trees, given the long planning horizon.
- Consider selecting more drought-tolerant species, or provenance from the southern parts of a species' range, when replanting. Where possible, select species whose decay fungi and mechanisms create similar conditions to existing species. For example, sweet chestnut grows faster than oak, but has similar heartwood and rots in a similar way, so some of the species associated with oak will find sweet chestnut a suitable alternative host.
- Consider planting non-native/exotic species (eg cedar, redwood) where these are consistent with landscape character and designated/designed landscapes.
- New trees need to be established with sufficient space to grow with open crowns, if they are to provide habitat niches for those species dependent on the specific conditions in the trees, including many lichen species.
- Buffer and expand existing sites through planting or by encouraging natural regeneration.

Veteran oak, Calke Abbey, Derbyshire

Relevant Environmental Stewardship options

Maintenance of wood pasture and parkland (HC12)

Restoration of wood pasture and parkland (HC13)

The aim of these options is to maintain, restore and enhance the wildlife, historic and landscape character of parkland and wood pasture. The ongoing commitments are the protection and management of the trees and the continuation of livestock grazing. The options will often require the preparation of a management plan that will form the basis of the agreement. Capital items for tree management may also be used with this option.

Creation of wood pasture (HC14)

This option is used to create wood pasture on sites that are known to have been wood pasture previously, or on sites adjacent to or linking existing areas of wood pasture. The preferred method of creation will be by careful and flexible grazing management to allow trees and shrubs to develop by natural regeneration. In some cases is might be necessary to sow a specified grass seed mixture, and in most cases will it be necessary to ensure the establishment of the next generation of trees by planting new ones.

Further information and advice

Natural England **Veteran Trees: A guide to good management (IN13)**.

Forestry Commission Scotland (2009 **Management of ancient wood pasture**.

The Ancient Tree Forum.

Woodland Trust **Ancient Tree guide no. 5 Trees and Climate Change**.

Buglife. Advice on managing BAP habitats for invertebrates. **Lowland wood pastures and parklands**.

JNCC (2011) UK BAP habitat description **Wood Pasture and Parkland**.

Key evidence documents

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