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Ancient trees, icons of our most important wooded landscapes in Europe

Ancient trees, which have only recently been properly recognised in the UK, have not so far featured significantly in the debate about old growth woodlands. Moreover recent justification that the original woodland cover of Europe was a dynamic mosaic of habitats from open glades to closed forest (Vera 2000) suggests we should re-evaluate the origins of ancient trees and their direct lineage back to the original wildwood and their importance in identifying old growth woodlands for biodiversity.

ANCIENT TREES AND OLD GROWTH WOODLAND

Old growth is described in many different ways and in northern Europe it appears to be used in the same way as our term 'primeval'. In North America, old growth is often used for stands with stems over a certain size and a level of standing and fallen dead wood. By comparison, in mainland Europe, primeval woodland is considered to be old forest in a natural state characterised by :

1. a wide range of different aged trees,

2. abundant dead wood

3. continuous small scale changes and

4. grazing by animals significantly influencing the mosaic structure of varied density.

Both terms relate to late-successional stands irrespective of their origin. They describe present day habitat structure. As some primeval or old growth late-successional woodlands are known to have been cleared in the distant past and different species have now become the dominant ones, they do not indicate continuity of the same principal species of tree on the site down through the ages. Over time various seral stages may well have occurred and in this context the concept of local climatic climax becomes rather dubious.

Few of the definitions for old growth state the age of trees which need to be present to qualify for this designation. However, Peterken (1996) proposed a definition that could be applied to both managed and unmanaged woods in Europe and relates to stands having an age of more than 200 years. This definition

Old growth woodland at Heilige Hallen, Germany. A long term minimum intervention beech woodland. (Photograph: Ted Green).

appears to have led to little debate about the use of the minimum stand age of 200 years, which is arbitrary. More recently Peterken (2000) has proposed that the stand age for old growth should be reduced to 150 years for the purposes of developing an inventory. As oaks usually only reach maturity at 300 years of age, beech is entering its post mature stage at 200 years and birch in most circumstances in the lowlands would be considered ancient at 100 years, age and tree species should be taken into consideration in our definitions of old growth.

Nor do definitions make it clear how many trees over a certain age are necessary for a stand to be considered old growth. It is unlikely that a woodland site containing one or two 200-year-old trees would be termed old growth especially if the old trees that remain are in ancient boundaries or are edge trees. But, more importantly, one ancient oak or light demanding old tree or shrub, such as crab apple, wild service or hazel, in the middle of a stand should alert us to the possibility of direct linkage with the wildwood and recent history of the site, say within 3-500 years as pasture woodland.

In many of the definitions it is implied that the sites are primary i.e. have always been woodland dating back to original forest cover and it is very important that this is more explicit. There is evidence that secondary woodlands, with a stand age of more than 200 years, do not have the same biodiversity value as primary sites where there has been a continuous presence of old trees back into the past; unless the secondary woods are located very close (less than 0.25 km) to primary old growth woodlands and species can migrate across as the stand ages. Evidence from studies of epiphytic lichens in the New Forest show that the recovery rate of lichens in clear felled woodlands takes place as the stand ages beyond 200 years where they can be re-colonised from nearby old woodlands. On the other hand studies of coleoptera indicate that where continuity of old trees has been broken, then on isolated sites, the species diversity is not known to recover.

Hence Rose (1992) has argued for a definition of old growth that specifically incorporates the continuous presence of old trees reaching back into the past.

Owing to forestry demands for sound timber, few old trees are found in commercial high forests. Old growth, with a continuity of ancient trees, appears to be found more often in remnant pasture woodland, now increasingly recognised as the closest in structure to the original wildwood, virgin forest or forestris (Vera, 2000). Old growth pasture woodland with this continuity has a dynamic mosaic structure so diverse as to give rise to the greatest species diversity. Pasture woodland is still present in some royal hunting forests and common land. It can be glimpsed in more man-made landscapes such as parkland or in wooded country such as farmland that is full of old boundary, 'working' trees [pollards, shreds and bundles] in hedgerows and banks. Working trees, created by man's intervention, are extremely valuable for their biodiversity but they will tend to disappear if no new pollards are created.

Old growth woodland. (Photograph: Ted Green).

In the UK today, by comparison with lowland northern Europe, habitats with concentrations of big old trees are still remarkably frequent. There are some examples of such habitats in Denmark but they are extremely rare in lowland France and Germany due to the cultural history of forest management. Similar habitats are however found in montane forests across the uplands of Europe in very rugged terrain comprising steep slopes and rocky outcrops, making them the least touched by man. These places still retain great biodiversity of for example bryophytes and lichens. In these situations the old trees may be less obvious as they are often much smaller in size due to the extreme growing conditions.

In the future old trees will be found increasingly in minimum intervention reserves as the stands age. However they will be of a very different form from those open grown, ancient hulks of our wood pastures. We therefore need to be cautious about minimum intervention reserves because it appears that at sites such as La Tillaie, Fontainebleau and Bialowieza, which have developed into a high forest structure, the species composition and structure is changing markedly due to the lack of grazing. As the old canopy oaks, which date back to previous pasture woodland or even directly to the wildwood, die out they are not being replaced. Oak is not able to regenerate naturally in the confines of the high forest but requires open conditions and the protection of thorn scrub. Instead the canopy becomes dominated by shade tolerant species with shorter life spans.

The change in tree species composition from lack of grazing and mobility of the habitat will undoubtedly have a significant effect on biodiversity - although there will be some associated species transfer, for example many saproxylic organisms and mycorrhizal fungi are not host specific. And with the exclusion of large herbivores there will also be structural and microclimatic changes towards more dense, dark woodland which will have significant impacts on the flora and fauna associated for at least part of their life cycles with open spaces in woodland. Sites with old trees without the mechanisms to maintain dynamic structural characteristics will not be so valuable.

There appears to be a need for an accepted Europe-wide definition of ancient old growth woodland that recognises the significance for biodiversity due to

the continuity of:

• Primary (ancient - UK) woodland cover;

• Unbroken tree and shrub species representation on such sites;

• Varied age structure especially old and ancient trees, including old pollard trees, even if their presence today is only sparse and relic;

• Diversity of stand structure in which a sustainable supply of a variety of old tree forms of a full range of species can regenerate through the influence of large grazing herbivores and their predators [including diseases] or severe terrain in natural woodland processes.

From this definition it would be possible to identify variations for other types of old growth (Sanderson, in prep) for example

• recent old growth - ancient or secondary sites which were cleared and now have site native species of between 200 and 400 years

• mature young growth - ancient or secondary woodland sites which now have site native species, but the trees have yet to reach maturity.

As an initial starting point to ensure no valuable woodland with old trees is overlooked and if resources can be provided, identifying woodland stands over 150 years would be useful. It provides information on sites with potential to develop old growth characteristics to compare with ancient old growth. Site comparative work in the New Forest indicates that the bird fauna of recent old growth can recover more quickly than the lichen flora by the mature young growth stage [Smith 1992]. There are so few sites left in Europe with a continuity of old trees that stands which are evolving in the right direction are of great importance. They not only would allow scientific study to evaluate the rate and degree of recovery as has been shown in the New Forest but may also provide the future old growth in a dynamic landscape mosaic of semi-natural habitats originally found in the wildwood.

DECAYING WOOD HABITATS IN ANCIENT TREES AND IN THE OLD GROWTH WOODLAND

Many definitions of old growth refer to the presence of significant levels of decaying wood

Dead-wood has a limited existence - it decays and is ultimately recycled. So it is necessary to have a sustainable, successional supply. Conservation of wood decay communities requires conservation of a diverse age structure of living trees right through to senility and death, because it is the living tissues that generate the wood and will ultimately decay. A continuity of different wood decay habitats - both in terms of quantity and in diversity of species, size and structure i.e. throughout the tree and provided by fallen wood in different environments, is therefore necessary to ensure a continuity of wood decay communities.

But above all else, the single most important wood decay resource is large, old, standing, living and dying trees, including former pollards that are developing columns of decay in the dead, heartwood or centre of the tree.

Down through the centuries in Europe we have very heavily exploited decaying wood and much of the wildlife associated with it has now become extremely rare. In traditional systems nearly every piece of wood would have been utilised by man. Today, dead trees are still cleared to make way for new tree crops; 'sanitation' felling and burning is still widely practised to protect forestry crops; and a tidiness mentality overrides all. Mechanised operations encourage more intensive exploitation of timber produce, reducing the final age of standing tree crops and at the same time increase the efficiency of sanitation and tidiness activities. Decaying wood has little opportunity to develop in these circumstances and hence the decline in biodiversity.

There have been international calls for protection of important decaying wood habitats but these have been sadly neglected.

THE PLACE OF ANCIENT TREES IN THE HISTORY AND ECOLOGY OF LOWLAND DECIDUOUS WOODED LANDSCAPES

The lowland European woodland scene is increasingly accepted as having been a dynamic mosaic of glades or open space, scrub, individual open grown trees and groves of trees (Vera, 2000). The nearest habitat we have today is known by the terms wood pasture or pasture woodland. This landscape contained a high proportion of oak, hazel and other light demanding species which require grazed, thorny scrub landscapes in which to regenerate successfully.

An important component of this landscape comprised trees of all ages either as individuals grown in the open or in groves. From present day communities we know that highly specialised species with saproxylic, mycorrhizal and epiphytic niches are associated with the late-succession old growth. Many of these species appear to have poor or limited mechanisms for dispersal and as they require a continuity of nearby old trees in the landscape to survive, it can be assumed that the landscape contained a frequent distribution of old trees.

The dynamics of this habitat are only just starting to be understood. Large herbivores are clearly significant in the ecology, as are shrubs - especially thorny shrubs within which individual or groves of trees could establish and develop. The more invisible role of fungi, nematodes, protozoa and bacteria is yet to be fully considered as part of the dynamics of the system. Their role in the creation of glades, longevity of trees and the population fluctuations of the grazing animals, needs further elucidation as the ecology of the woodland structure for example below ground among the soil and root systems is surely as dynamic as above ground.

As population pressures increased in mediaeval times, more and more of the open grassy areas of the savannah landscape on better land were converted to agriculture and the scrub areas were organised into coppice with standards (maiden trees). However in Britain even in the mid 18th century many rural populations were still utilising the commons, heaths and pasture woodlands for small wood production and for grazing as significant supplements to their subsistence living conditions. The working trees such as pollards and shreds would have provided a continuity of decaying wood habitats to mimic those in the trunks and large limbs of open grown ancient trees of the wildwood.

In the mid 18th Century the demand for wood products changed from faggots or sticks to larger sized pieces of wood. This led to more high forest management involving continuous cover techniques to maintain rotations of larger diameter timber. From a biodiversity perspective this has mimicked and maintained the continuous presence of groves in one location and benefited specialist species of dense or deep woodland.

Traditionally grazed areas were enclosed and converted to agriculture or high forest. Stock was actively discouraged from gaining access to dense woodland where it has an impact on seed or generative regeneration. During the 20th Century significant declines in pastoralism and coppice management meant further loss of some of the habitats which most closely mimicked parts of the wildwood structure as they changed to groves of mainly young trees and often into conifer plantations.

What remains is for the most part a static, rigid landscape that has been fragmented into generally small isolated parcels of monoculture high forest surrounded by intensive monoculture agriculture. Modern foresters and farmers have relentlessly removed the intermediate scrub stage which provided the protection in which trees could regenerate and was at the heart of the dynamic nature of the original landscape. It has also become the bane of conservationists as they try to conserve the pure herb rich and heathy swards of the original wildwood because they can no longer migrate around the mosaic landscape.

Fortunately the original wildwood landscape can still be perceived today in old hunting forests and parks and in wooded commons - areas where traditional grazing and woodcutting has continued to mimic the natural processes in the wildwood.

ANCIENT OPEN GROWN TREES AS INDICATORS OF A LOST LOWLAND WILDWOOD LANDSCAPE

Ancient trees may be our best indicator of these last areas of the original deciduous wildwood in lowland Europe. Where there are still sufficient old trees in these landscapes one can still find some of the rarest and most threatened species and communities remaining in Europe today. They are host to a biodiversity found nowhere else especially fungal, entomological and lichen diversity.

Although one individual old tree, even a completely

An open grown oak tree showing wide and spreading branches. (Photograph: Ted Green).

dead tree, can be host to a wide variety of species, it is generally accepted that the larger, older and more numerous the trees the richer the biodiversity of the habitat. This is clear from the richness of sites in the UK with large concentrations and continuity of old trees such as Windsor Forest and Great Park and the New Forest. Similarly the mycorrhizal and decay waxcap fungi communities of the grasslands may indicate great continuity of habitat management by grazing.

Oaks are renown for the diversity of species associated with them. There is no other species in Europe with so many species of insect associated with the foliage (Darlington 1974, Morris 1974). Oaks have 350 species of lichens associated with them and as they age they are host to a range of very rare and endangered species especially saproxylic and mycorrhizal and epiphytic ones. Many other trees too as they age become host to assemblages of species which are extremely rare in Europe.

Indexes of ecological continuity have been developed using lichens [Rose 1976] and saproxylic beetle fauna [Alexander 1988, 1994]. They point to continuity of the sites least disturbed by man. Fungi can provide further examples for sites such as Windsor Great Park and Forest. Not only has it been shown to be by far the top site in the UK for saproxylic beetles it is also well recognised for its exceptional fungal flora.

Pasture woodlands are renowned amongst entomologists, mycologists, lichenologists and lower plant specialists for the diversity and continuity of their plant and animal communities.

At low altitudes it is the presence of large old trees and a long history of large old trees, both open grown trees with a squat form and tall high forest form trees, which make this habitat of special nature conservation interest [Alexander 1998]. In more upland areas the age of old trees may be well be less marked.

A review is required of the landscapes and situations in which old trees are found and the value of these in historical and biodiversity reconsidered. We need to consider regenerating pasture woodland landscapes around our existing remnants of ancient trees to provide them with enough habitat in which to regenerate, especially where there are sufficient old trees for continuity to be a possibility.

SOME OF THE IMPORTANT OLD GROWTH SITES SWITH LARGE CONCENTRATIONS OF ANCIENT TREES LEFT IN BRITAIN AND MAINLAND EUROPE

In a European Context, Britain may hold a very high percentage of the remaining lowland pasture woodland and ancient trees and have the greatest potential for continuity of old trees in these areas into the future.

• Windsor Great Park, Savernake Forest (with plans to re-introduce grazing) in Wiltshire, the New Forest, Melbury Park, Boconnoc Park in Cornwall, Brampton Bryan Park in Herefordshire, Parham Park in West Sussex, Dolmellyn Lyn in Wales and Abernethy Forest on Speyside, Scotland- just a few of the UK sites with major concentrations of ancient trees and their exceptional assemblages of rare associated species demonstrating great continuity. These and many more important areas need to be recognised at a pan-European level and their continuity of old growth maintained for the future. Policies for their conservation need to maximise and extend old growth potential.

Outside the Mediterranean region very few old growth pasture woodland sites still exist, some of the best remaining areas (in the authors' direct experience) are:

• Sierras Urbasa and Andia, Navarra, Northern Spain and Irati / Forets de Sare and St Pee in the Northern Pyrenees - these are outstanding landscapes with large areas full of concentrations of ancient especially pollarded 'working' trees. These landscapes show the full range of mosaic habitats associated with pasture woodland. They probably contain exceptional assemblages of rare associated species. These sites need to be properly recognised and the continuity of old growth maintained for the future. Buffering and extending must be a priority to maximise old growth potential.

• Gorges de Solle, Forêt de Fontainebleau, France- one of the few remnants within this important forest that still retains the original pasture woodland structure.

• Central Vosges, France - several montane locations including the Tête du Chat Sauvage where over 1000m the steep, unstable boulder scree terrain has produced a great diversity of structure and has kept man's impact to an absolute minimum as evidenced by the exceptional lichen and bryophyte flora.

Many old growth woodlands have changed due to changes in grazing pressure through the introduction of minimum intervention objectives.

• Bialowieza, Eastern Poland - the largest protected primeval woodland in Europe now in minimum intervention surrounded by a very large commercial forest which extends greatly into Byelorussia. The remnants of old growth outside the strict reserve need great protection from commercial logging. The grazing history of this area is of great interest especially the re-introduction of European bison into the whole forest complex.

• La Tillaie, Forêt de Fontainebleau, France / Heilige Hallen, East Germany - small areas of very long term minimum intervention beech high forest in commercial forests isolated from other reserves or minimum intervention areas. Greatly modified by man by the removal of ancient traditional grazing. Such long term minimum intervention sites would greatly benefit from buffering and extending by pasture woodland systems.

Old growth woodland. (Photograph: Ted Green)

THREATS TO THE FUTURE OF OLD TREES

The main threats to ancient trees in the UK are:

* The lack of recognition of importance and therefore gradual loss of trees through clearance for firewood or development or bad management.

• The lack of understanding of the origins and natural development of old trees and therefore changes in management practices which are directly in contradiction of best practice.

• The lack of the next generation of old trees

• Continuing isolation and fragmentation of habitats.

CONCLUSIONS

As a priority we need therefore to:

• Identify where our ancient trees and old growth woodlands can be found. The Ancient Woodland Sites Register in Britain is insufficient as a basis for identifying the last remnants of the wildwood [Sanderson 1998]. The Register generally only indicates the remnants of dense woodland developed from coppice with standards management in the past five or so centuries. Other registers need to be investigated and updated such as the Historic Parks and Forests and the Commons Register to identify the presence of old trees as well as heathland and grassland sites. We should look more closely at those traditional agricultural landscapes where old trees remain in hedgerows and fields.

• Develop European-wide policies to protect old growth from exploitation and buffer and extend important sites.

Through recreating extensive landscapes where there is sufficient space to accommodate the full age range of different species of tree to ensure old trees of the future. Landscape scale approaches are necessary to allow the habitats to move again as they would in the past and sufficient in area to ensure no loss of biodiversity.

• We need woodland management policies which recognise the value of grazing in woodland. We need to be aware that designations of minimum intervention which exclude issues of grazing may lead to loss of biodiversity •

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