CONSERVATION OF ANCIENT WOODLAND

Ancient Woodland, its Importance, Management and Protection under British and European Legislation

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“I think that by retaining one’s childhood love of such things as trees, fishes, butterflies and toads, one makes a peaceful and decent future a little more probable, and that by preaching the doctrine that nothing is to be admired except steel and concrete, one merely makes it a little surer that human beings will have no outlet for their surplus energy except in hatred and leader worship”
George Orwell, ‘Some thoughts on the common toad’ (1946)

1. ANCIENT WOODLAND IN BRITAIN

1.1.1 History

At the height of the last glaciation (100,000 - 12,000 BC), most of Britain would have been bare of trees. Birch and willow scrub possibly persisted along the lower margins of the ice, with pine in places. Relicts of pre-glacial flora may have survived in sheltered bays along the western coasts of Great Britain and Ireland, but elsewhere as far as the south of England, ice swept the land clean.

Tundra and moorland followed the retreating ice, and then waves of colonisation by different tree species spread from the south. The first were birch, and aspen, then about 8500 BC pine and hazel spread north, replacing birch which became uncommon for several thousand years. Oak and alder followed the pine, then lime, elm, holly, ash, beech, hornbeam and maple in succession spread northwards.

The history of British woodland since the last glaciation is, in geological time, extremely brief, and is inextricably linked with the development of civilization. Natural wooded, grazed, landscapes became managed wood-pastures with the domestication of stock. (Marren, 1992)

A recent theory is that the wilderness in Western Europe was a mosaic of grassland, scrub, individual trees and groups or groves of trees (Vera, 2000).

It was not a closed, impenetrable wildwood, but was a park-like landscape, maintained by the grazing and browsing of wild herbivores such as elk *(Alces alces)*, European bison *(Bison bonasus)*, red deer *(Cervus elahpus)*, roe deer *(Capreolus capreolus)* or horse *(Equus ferus caballus)*. While it may have been true in Britain during earlier interglacials, however, since the last glaciation, the bison *(Bison bonasus)* and elk *(Alces alces)* which persisted on mainland Europe were extinct in Britain. Despite the fact that horse and deer grazing dates right back in history of Britain, the opinions whether it is possible to fully accept Vera's theory of pasture woodland for British Isles vary.

By 1086, the Domesday Book recorded many British woods. It is clear that by this time, coppice management was already widespread through English lowlands.

For the past two thousand years, British woods have been changing significantly. The large rural population could only develop by putting the most of the available land to work. There was a variety of rights established, even in the Royal Forests. The commoners had the freedom to graze cattle and pigs, cut underwood and lop dead boughs.

Almost all woodland in Britain shows, therefore, signs of past use and has been modified from the tall dense forests that are assumed to have been their prehistoric ancestors.

From Norman times onwards, all land has been owned by someone, the boundaries marked by fences, banks and hedges. Everyone needed firewood, the farmers were in need for pole-sized wood for handles, forgemasters needed small wood for charcoal, tanners the bark from young oak. Such wood was obtained from the underwood. The system of coppicing was fully established.

Most ancient woods in Britain have been managed as coppice for nearly 1000 years, leaving a legacy of semi-natural woodlands which can create a decent picture of natural vegetation.

1.1.2 Domesday Book (The Domesday Book Online)

The Domesday Book is a great land survey from 1086, commissioned by William the Conqueror to assess the extent of the land and resources being owned in England at the time, and the extent of the taxes he could raise. The information collected was recorded by hand in two huge books, in the space of around a year. William died before it was fully completed. It is the earliest semi-quantitative record of woodland. The area (including wood pasture) adds up to about 15 per cent of the land, more in ancient and less in planned countryside. The Domesday Book provides extensive records of landholders, their tenants, the amount of land they owned, how many people occupied the land (villagers, smallholders, free men, slaves, etc.), the amounts of woodland, meadow, animals, fish and ploughs on the land (if there were any) and other resources, any buildings present (churches, castles, mills, salthouses, etc.), and the whole purpose of the survey - the value of the land and its assets, before the Norman Conquest, after it, and at the time of Domesday. Some entries also chronicle disputes over who held land, some mention customary dues that had to be paid to the king, and entries for major towns include records of traders and number of houses.

Royal commissioners were sent out around England to collect and record the information from thousands of settlements; the country was split up into 7 regions, or 'circuits' of the country, with 3 or 4 commissioners being assigned to each. They carried with them a set of questions and put these to a jury of representatives - made up of barons and villagers alike - from each county. They wrote down all of the information in Latin, as with the final Domesday document itself. Once they returned to London the information was combined with earlier records, from both before and after the Conquest, and was then, circuit by circuit, entered into the final Domesday Book.

With the need to defend England from possible invasion threats from Scandinavia, and costly campaigns being fought in northern France, the vast army William amassed required substantial funding. The power to raise Danegeld - a uniform tax to pay for the defence of the country - had been inherited from the Anglo-Saxons, and William saw the need for the Domesday Book as a thorough assessment of the potential amount of tax he could raise from his subjects and their assets. The survey also served as a gauge of the country's economic and social state in the aftermath of the Conquest and the unrest that followed it.

The Domesday Book provides an invaluable insight into the economy and society of 11th century Norman England. For historians it can be used, amongst other things, to discover the wealth of England at the time, information about the feudal system existent in society (the social hierarchy from the king down to villagers and slaves), and information about the geography and demographic situation of the country. For local historians it can reveal the history of a local settlement and its population and surroundings, whilst for genealogists it provides a useful and fascinating resource for tracing family lines. Through the centuries the Domesday Book has also been used as evidence in disputes over ancient land and property rights, though the last case of this was in the 1960s.

An active but poorly documented period follows the Domesday Book, sparsely illuminated by charters and land grants in monastic archives. When systematic documentation reappears in the mid-thirteenth century, much of the change to the modern distribution had already happened. About a half the woodland of 1086 had turned into farmland or heath.

Comparing the 1086 figures with the area recorded as ancient woodland in the late twentieth century, between one-fifth and one-sixth of the Domesday woodland apparently survived until the 1930s, but only one-tenth was still intact (not grubbed or replanted) by 1990.

1.2 Definition and Indicators of Ancient Woodland

There can be no certain distinction between ancient and "not-ancient" woodland. For practical purposes the line has been drawn at the year 1600 because that was the time when first reasonably accurate maps were being produced. The planting that followed for some time afterwards took place mostly in orchards, parks and grounds of large houses, only rarely in woods. It can be assumed that virtually all woods in existence by the year 1600 were of natural (in contrary to planted) origin. The trees and shrubs in ancient woodlands may have been felled or cut for coppice at various times since 1600, but as long as the area has remained as woodland, i.e. the coppice stools have re-grown or the stand has been replanted soon after felling, then it still counts as ancient woodland. Because it may have been cut over many times in the past, ancient woodland does not necessarily contain old trees. If woodland has clearly been through a phase in the last 400 years when the land was open, for example as grassland, heath, moor or arable, then the site is classed as recent woodland. It may still have value for nature conservation, but it is not an ancient wood.
Some ancient woods may be 'primary' in the sense that they are on sites that have always been woodland, back to the pre-Neolithic wildwood. However in many cases ancient woods have been cleared in the distant past: for example they may contain the remains of early Medieval, Saxon, Roman or Iron Age remains. As long as there has been no complete clearance of the site since 1600 such woods are still 'ancient'. (Kirby, Goldberg, 2006)
Apart from the scientific point of view, there is usually a "feel" to ancient woodland, a sense of intimacy that is lacking in more recent woodland where such a complexity has not had time to evolve.
Such woods are characterised by the presence of certain "indicator" species. These are plants or animals which have great difficulty colonising sites once they have been cleared. Their presence does not mean that clearance has never taken place, but that any clearance must have been so long ago that its effects are negligible. Other factors should certainly also be taken into account when assessing sites. The indicator species chosen are commonly plants rather than animals. This is because plants are usually conspicuous, relatively easy to identify and do not hide or absent themselves when humans are present! The following list provides plant species whose presence usually indicates ancient semi-natural woodland (Rackham, 1980):

Adder's tongue *(Ophioglossum vulgatum)*
Alternate-leaved golden saxifrage *(Chrysosplenium alternifolium)*
Bird's nest orchid *(Neottia nidus-avis)*
Bitter vetch *(Lathyrus montanus)*
Bluebell *(Hyacinthoides non-scripta)*
Broad helleborine *(Epipactis helleborine)*
Butcher's broom *(Ruscus aculeatus)*
Columbine *(Aquilegia vulgaris)*
Common cow-wheat *(Melampyrum pratense)*

Common skull-cap *(Scutellaria galericulata)*
Dog's mercury *(Mercurialis perennis)*
Early purple orchid *(Orchis mascula)*

Golden saxifrage *(Chrysosplenium oppositifolium)*
Goldilocks *(Ranunculus auricomus)*
Greater butterfly orchid *(Platanthera chlorantha)*
Greater woodrush *(Luzula sylvatica)*
Green hellebore *(Helleborus viridis)*
Hairy St Johns wort *(Hypericum hirsutum)*
Hairy woodrush *(Luzula pilosa)*
Hard shield fern *(Polystichum aculeatum)*
Herb paris *(Paris quadrifolia)*
Large campanula *(Campanula latifolia)*
Lily of the valley *(Convallaria majalis)*
Moschatel *(Adoxa moschatellina)*
Nettle-leaved bellflower *(Campanula trachelium)*
Orpine *(Sedum telephium)*
Pale wood violet *(Viola reichenbachiana)*
Primrose *(Primula vulgaris)*
Ramsons *(Allium ursinum)*
Sanicle *(Sanicula europaea)*
Sessile oak *(Quercus petraea)*
Small teasel *(Dipsacus pilosus)*
Small-leaved lime *(Tilia cordata)*
Spindle *(Euonymus europaeus)*
Three-nerved sandwort *(Moehringia trinervia)*
Toothwort *(Lathraea squamaria)*
Violet helleborine *(Epipactis purpurata)*
Water avens *(Geum rivale)*
White climbing fumitory *(Corydalis claviculata)*
Wild daffodil *(Narcissus pseudonarcissus)*
Wild service tree *(Sorbus torminalis)*
Wood anemone *(Anemone nemorosa)*
Wood bitter cress *(Cardamine flexuosa)*
Wood forget-me-not *(Myosotis sylvatica)*
Wood horsetail *(Equisetum sylvaticum)*
Wood sorrel *(Oxalis acetosella)*
Wood speedwell *(Veronica montana)*
Wood spurge *(Euphorbia amygdaloides)*
Woodruff *(Galium odoratum)*
Yellow archangel (*Lamiastrum galeobdolon)*
Yellow pimpernel *(Lysimachia nemorum)*

Ancient woodland according the PPS9 (Planning Policy Statement 9):
"Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated. Local planning authorities should identify any areas of ancient woodland in their areas that do not have statutory protection (e.g. as a SSSI). They should not grant planning permission for any development that would result in its loss of deterioration unless the need for, and benefits of, the development in that location outweigh the loss of the woodland habitat. Aged or 'veteran' trees found outside ancient woodland are also particularly valuable for biodiversity and their loss should be avoided. Planning authorities should encourage the conservation of such trees as part of development proposals."
Ancient semi-natural woodlands are made up mainly of native species growing where their presence is apparently natural. They are important for several reasons – they contain many features deriving directly from natural conditions and cannot be recreated once they are destroyed, they provide homes for many "extinction prone" species. Ancient semi-natural woodlands form prominent historic and cultural features in many landscapes and collectively constitute a significant economic resource.
A starting point for identifying ancient woods is the ancient woodland inventory. Ancient woodland inventories are lists, by county, of sites greater than 2 ha that are thought to have been continuously wooded since 1600 AD. They include both ancient semi-natural stands and plantations on ancient woodland sites.
The inventories are not definitive registers of ancient woodland. The inventories are described as provisional: at any stage new information may become available that shows that woods not currently on the inventory are likely to be ancient or vice versa. In addition ancient woods less than 2 ha or open woodland such as ancient wood-pasture sites were generally not included on the inventories because the methods used could not identify them consistently. (Kirby, Goldberg, 2006)
Ancient wood is identified based on various types of evidence (Peterken, 1981, Rackham, 1980, Watkins, 1990) such as:
- presence on maps, particularly those from the early nineteenth century or before, and on all later maps;
- historical documents such as estate records, tithe and enclosure surveys;
- wood names reflecting nearby settlements, or old words relating to woods (hagg, frith, spring);
- their location towards the parish boundaries, on steep slopes or valley sides, or generally unsuitable agricultural ground;
- irregular woodland boundaries; or
- woodland boundaries that do not fit with seventeenth century (or later) enclosure patterns in the surrounding field boundaries.
Field surveys may show:
- Old/large coppice stools, or veteran trees;
- Well-developed boundary banks and ditches
- The presence of 'ancient woodland indicator' species, particularly in the ground flora (see above)
There are certain limitations to identification of ancient woodland. It is necessary to bear in mind that some early maps might have omitted some woods or mark their location as well as boundary wrongly. The main complication in identifying ancient woodlands is probably the fact that small woodlands were not included in any kind of record.
"Ancient woodland indicators" can occur in demonstrably recent woods which can be caused by geographical location or soil conditions.

Usually however a range of different strands point to a similar conclusion as to the origin of a wood. (Kirby, Goldberg, 2006)

In many cases it is not the wood itself that is dating back in history but the soil it is found on because the fact that the soil has not been disturbed for many centuries is one of the strongest arguments for identification.

Ancient semi-natural woodlands in Britain may be grouped according to their management history:

- relicts of medieval pasture woodland
- ancient high forests (mainly native pinewoods in Scotland, which may be treated as a geographically separate form of pasture woodland)
- ancient coppice woods in which the coppice layer has not been planted
- ancient woods on inaccessible sites such as ravines and cliffs

Ancient woodland can be found in two different forms - an ancient semi-natural woodland and plantations on ancient woodland sites. Both types of stand are classed as ancient woods.

Ancient semi-natural stands are those that are composed predominantly of trees and shrubs native to the site that do not obviously originate from planting. They include stands that may have been managed by coppicing or pollarding in the past, as well as those where the tree and shrub layer has grown up by natural regeneration.

Ancient replanted woodland sites (also called plantations on ancient woodland sites) are areas of ancient woodland where the original native tree cover has been felled and replaced by planted stock most commonly of a species not native to the site, for example conifers such as Norway spruce *(Picea abies)* or Corsican pine *(Pinus nigra var.maritima)*, but also broadleaves such as sycamore maple *(Acer pseudoplatanus)* or sweet chestnut *(Castanea sativa)*.

It's not always easy to distinguish between semi-natural stands and plantations because there are intermediates, for example small clearings within woods, old plantations of native species, semi-natural structured stands of introduced species, planted conifer stands that now contain a proportion of self-sown native broadleaves, or semi-natural tree layers with non-native understories or improved ground floras. Therefore a judgement may be necessary as to the balance between the planted/introduced elements versus the native/naturally regenerating elements. (Rackham, 1980)

Bearing in mind the system of grouping, the majority of ancient woodland that can nowadays be found in Britain has been coppiced.

1.3 Ecological Value and Conservation of Ancient Woodland in Britain

1.3.1 Value of Ancient Woodland

The ecological value and character of ancient semi-natural woodland varies considerably. Some, notably in less accessible upland areas, owe much of their current value to a relatively low intensity of past management, although none have been totally unaffected by human influence. Others, especially in the lowlands, have developed a distinctively rich flora and fauna through a long history of consistent silvicultural management. Some have lost many of their special characteristics through various types of disturbance and many have been reduced in size so much that their survival is at risk. All are part of the nation's heritage, and deserve forms of management which recognise their different values. Some are designated as Sites of

Special Scientific Interest (SSSIs), although this does not necessarily guarantee their survival against acid rain, the greenhouse effect or more mundane things like the grey squirrel or even sheer neglect.
Woods considered to be of high conservation value may have one or more designations that afford them varying levels of protection.
The benefits to man of nature conservation cannot easily be expressed as a list, because the items are clearly inter-related. Woodland in Britain has long been exploited. The consequences were initially slight, but eventually vast expanses of woodland were cleared, some woodland types were completely lost, and many species became extinct.
The modern forester claims to be a conservationist. He regards afforestation of upland moorland and the conversion of neglected coppice woods into plantations as good management which not only maintains the productive potential of the land but also increases it.
Nature conservation seeks to maintain as much as possible of the diversity, energy flows, and community structures and natural features characteristic of natural ecosystems by means of low intensity management methods and the preservation of at least some tracks of absolute or relative wilderness.
Society, taking long term view and remembering that some elements of the wilderness cannot be recreated if they are ever destroyed, must weight the benefits of nature conservation against the material benefits of high intensity management. (Forestry Commission)

1.3.2 Sites of Special Scientific Interest (SSSIs)

These are notified by Natural England, Scottish Natural Heritage or the Countryside Council for Wales, setting out the reasons for the importance of the site and a list of operations likely to damage the special interest of the site. These can't be carried out without written consent from the relevant body, unless it is an emergency operation or authorised by a planning permission on the site. However, the relevant body will be consulted on any planning application likely to have an effect on a SSSI and can object.
The Countryside and Rights of Way Act, which came into force in England and Wales in 2000, gives the statutory agencies a new power to refuse consent for damaging activities. It also increased the penalties for deliberate damage to SSSIs to up to £20,000 in the magistrates' court and unlimited fines in the crown court and introduced a new court power to order restoration of the damaged special interest where this is practicable. It also allows for third parties (i.e. not landowners or tenants) to be prosecuted for damage to SSSIs.

1.3.3 National Nature Reserves (NNRs)

National nature reserves are established and protected by means of nature reserve agreements with English Nature, Scottish Natural Heritage, Countryside Council for Wales, or Environment and Heritage Service. This designation does not afford them greater protection in law, and in practice most in Britain are designated
SSSIs as well.

1.3.4 European Protection

The highest level of protection is given to sites that form part of the European wide *Natura 2000* network of sites. These have one of the following designations:

- Special Protection Areas (SPAs) (habitat of threatened bird species) Designated under the EU Birds Directive.
- Special Areas of Conservation (SACs) (habitat of endangered species) designated under the EU Habitats and Species Directive.

1.3.5 Other Statutory Designations

Any project likely to have a significant effect on these sites is subject to intense scrutiny and is likely to be called in by the national government for consideration. Other statutory designations which do not give specific protection to woodland but which may lend weight to a campaign include:

- *National Parks*
- *Areas of Outstanding Natural Beauty* (AONBs) in England, Wales and Northern Ireland.

Woodland in these areas may be more valued, and proposals likely to affect valuable woodland will be subject to extra scrutiny e.g. by the National Park Authority.

Woods may also contain, or be part of, a *Scheduled Ancient Monument*. These historic sites are protected under the Ancient Monuments and Archaeological Areas Act (1979) and permission must be sought from the Department of Culture, Media and Sport before work can be carried out to them.

National precedents regarding ancient woodland protection:
- A minimum standard of 15 metre wide buffer strips between housing development and ancient woodland - exactly three times the basic size proposed by developers
- The exclusion of ecological assets including ancient woodland and wildlife buffers in assessing developable areas.
- An ecological management plan is required to ensure the conservation of ecological assets in the future. (Rackham, 1980)

Concern about the continuing loss of area and character of ancient woods contributed to the Government's decision to introduce the Broadleaves Policy in 1985. The Broadleaves Policy aims to maintain and increase the broadleaved woodland by encouraging good management for a wide range of objectives and giving special attention to ancient semi-natural woodlands to maintain their special features. It has generally been very successful in encouraging the expansion and better management of broadleaved woodland and in preventing further losses of ancient semi-natural broadleaved woodland. However, there is a need for policy guidance to take more account of local and regional factors, especially for semi-natural woodlands which vary greatly in character in response to differences in climate, soils and history.
Ancient woodlands of Britain are important historical monuments just for the reason that they have been used intensively for a long time. Most of the woods are composed of broadleaved trees – for there are only three native conifers – Scotch pine *(Pinus sylvestris)*, juniper *(Juniperus communis)* and yew *(Taxus baccata)*. Among the most widespread are ash *(Fraxinus excelsior)*, hazel *(Corylus avellana)* and elm *(Ulmus*

spp.). In the more continental parts of Britain, beech *(fagus sylvatica)* and hornbeam *(Carpinus betulus)* do very well too.
Unlike many other ancient forests throughout Europe, in Britain the ancient system of combining grazing and wood cutting on the same patch was widespread and on some places still exists! The wood-pasture is characterised by wide-spaced, often very old, trees set in grass. Although large old trees are normally rare in woods except along ownership boundaries, Britain has more trees aged over five hundred years than almost any other European nation. Apart from their dramatic appearance, such trees are very important for wildlife, especially for plants and animals associated with mature bark and dead wood. The main reason for their existence in today's landscape is probably remarkably stable land tenure as a large number of woods and parks have been owned by the same family or institution since Tudor times.

1.3.6 Nature Reserves in Woodlands

Nature reserves are areas within which management for nature conservation takes top priority. Most woodland nature reserves are ancient, semi-natural woodland and the majority are managed by organisations for which nature conservation is the primary objective. Other objects of management can be pursued on nature reserves; indeed it is entirely possible to take a crop of timber from some.
Nature reserves, like nature conservation fulfil several functions, though not necessarily on the same ground. Some are used for research; others for education and public enjoyment; and many protect rare species, natural features or rich communities containing numerous species. Most combine these functions in various ways and few require such careful protection that access can be forbidden.
The very existence of nature reserves implies that management for other objectives does not satisfy all the needs of nature conservation. This is inevitable to some extent, for nature reserves are sometimes required to maintain natural conditions which, by definition, must not be subject to management.
Large areas are often left unmanaged because the resources for management are not available or there is no urgency to decide on more active measures.

1.3.7 Values of Ancient Woodlands (Peterken, 1983)

1. They include all primary woodland, the lineal descendants of Britain's primeval woodland, whose wildlife communities, soils and sometimes structure have been least modified by human activities. Their tree and shrub communities may preserve the natural composition of Atlantic forests. Once destroyed, they cannot be recreated.
2. They provide baselines against which to measure the effects of man on, say, soils productivity of woodland communities, food-webs etc.
3. Their wildlife communities are generally but not invariably richer than those of more recent woods.
4. They contain a very high proportion of the rare and vulnerable wildlife species. Many of these species require the stability afforded by the continuity of suitable woodland.
5. Where large, old trees have been present for several centuries they provide refuges for characteristic inhabitants of primeval woodland such as lichens.

6. They contain other natural features which rarely survive in an agricultural setting such as streams in their natural watercourses and microtopographical conditions formed under periglacial conditions.
7. They are reservoirs from which the wildlife of the countryside has been maintained (and could be restored).
8. They have been managed by traditional methods for centuries. They are ancient monuments whose value to historians and village community consciousness is arguably as great as that of the older buildings a parish. Where traditional management continues or can be revived they are a living demonstration of conservation in the broader sense of a stable enduring relationship between man and nature.

1.3.8 Historical Features

Often overlooked aspects of many ancient woods are the historical features. Some of these relate directly to the traditional woodland management and include woodland boundary banks and ditches, sawpits, charcoal hearths, tracks and hollow ways and old quarries. Other features are preserved in woods from earlier land-uses such as field systems and lynchets (a type of bank created by ploughing). Old buildings, hillforts, wells and wartime structures may also be found. In some cases the vegetation helps pick up changes in soil conditions caused by these man made features, this is either due to changes in moisture or mineral content of the soil where the subsoil has been brought to the surface and mixed with the organic humus layer.
It is a good idea to map these archaeological features within the wood, so that they are not harmed by woodland management operations. This aspect of the historic environment is important to understanding the woods past and how its ecology has evolved. Old trees, including pollards, hedgerow stubs and ancient coppice stools, are all an important part of the historic environment of the wood. These woodland features have frequently been overlooked and are generally not recorded in archaeological surveys but are often better preserved here than on farmland, where they might only remain as crop marks identified by aerial survey. (Forestry Commission)
Traditional woodland management involved the construction of features which can still be found today, such as saw pits, charcoal hearths, woodbanks and ancient trackways. Ancient woodlands incorporated within the designed landscapes of the eighteenth and early nineteenth centuries may contain the remains of follies, gardens and carefully constructed pathways. (Thompson ed., 2003)
The purpose of woodbanks was to keep the village sheep, cows and horses out of the wood in order to protect seedlings and the new growth from coppice stools. The bank would have had a live hedge or fence on top with a ditch either side. The straight ones are likely to date from the enclosures in the early nineteenth century, but the irregular ones are almost certainly medieval or even earlier. Woodland owners had them constructed to mark their boundary in a permanent and immovable way, by digging first a ditch on the edge of their property, then piling the excavated earth up on their own side of the ditch which means that usually the woodbank belongs to the woodland, and the ditch is the dividing line.

1.4 Ancient Woods as Homes for Mammals

Most woodland mammals can live in quite small woods of around 5-10ha, either because of their territories are small or because they do much of their foraging outside the wood. Among native mammals only the red squirrel *(Sciurus vulgaris)* and the common dormouse *(Muscardinus avellanarius)* are more or less confined to woodland, but on the other hand woodland is an important habitat for all the others except for grass-feeders like the brown hare *(Lepus capensis)* and the field vole *(Microtus agrestis)*. Animals with large territorial ranges, like the badgers *(Meles meles)*, may built their burrows in small woods but wander out at night along a regular beat using hedgerows, railway embankments and other places with thick cover.

It would be misleading to claim that the best places for woodland mammals are ancient woods, since most British species are very adaptable. Two-thirds of the lowland mammals can breed in hedges.

Ancient woods are likely to provide old stumps and hollow coppice stools and trees than younger woods, offering secluded nesting sites for many of the smaller mammals, and roosts and nurseries for woodland bats.

Managed coppice benefits the majority of mammals. The wood mouse *(Apodemus sylvaticus)*, which is usually the commonest mammal in broadleaved woodland, is almost ubiquitous, occurring in large numbers at all stages of the coppice cycle, including recently bared ground. Common shrew *(Sorex araneus)* and bank vole (*Clethrionomys glareolus)* both need ground cover for their surface runs and only re-colonise the clearings after a year or two. Their density peaks after three or four years, when harvest mouse *(Micromys minutes)*, field vole *(Microtus agrestis)*., water shrew *(Neomys fodiens)* and pygmy shrew *(Sorex minutus)* also find congenial conditions. Red squirrel *(Sciurus vulgaris)*, and common dormouse *(Muscardinus avellanarius)* prefer more mature coppice, since hazel *(Corylus avellana)* does not produce any nuts until it is at least six years old, and a short cycle mat not suit them. Mammal numbers are much lower in old and neglected coppice, where the areas of greatest activity are likely to be along the scrubby edges of the wood, and wherever else are quantities of brambles *(Rubus spp.)*, hawthorns *(Crataegus spp.)*, blackthorns *(Prunus spinosa)* and other shrubs.

Another group of mammals most closely associated with ancient woodlands are bats. All sixteen resident British species of bat hunt insects in woodland and all except the horseshoe bats *(Rhinolophidae)* sometimes roost in hollows and holes in trees, where they find the darkness, seclusion and high humidity they need in daytime. (Marren, 1990)

Tree cavities provide very important roost sites for bats and a high proportion of our local bats are dependent on them - from the commoner noctule *(Nyctalus noctula)* (in Britain) and Leisler's bat *(Nyctalus leisleri)* (in Ireland) right through to our rarer old forest bats, barbastelle *(Barbastella barbastellus)* and Bechstein's *(Myotis bechsteinii)*. Bechstein's is believed to mainly use rot-holes in the larger boughs high in the canopy, whereas barbastelle *(Barbastella barbastellus)* may be more characteristic of hollow trunks.

The impacts of the accumulation of bat droppings and urine within the tree have not been studied. Bat guano makes good garden compost so presumably the tree is able to benefit from its degradation within its cavities. The guano probably supports an interesting invertebrate fauna, but this too has not been studied.

Mammals also use tree cavities, particularly squirrels *(gen. Sciurus)*, but also foxes *(Vulpes vulpes)*, mink *(Mustela lutreola)*, and anything else seeking dry sheltered conditions for resting, sleeping or even hibernation. (Ancient Tree Forum)

1.5 Ancient Woods as Homes for Birds

A wide range of birds nest inside tree cavities, some adopting existing cavities with little or no modification - such as owls *(Strigiformes)*, kestrels *(Falco tinnunculus)*, marsh tit *(Poecile palustris)*, tree-creeper*(Certhia familiaris)* - while others modify the cavity and its access considerably, e.g. woodpeckers*(Piciformes)* and nuthatch*(Sitta europaea)*.
Some are directly dependent on the trees for the bulk of their food, including foliage gleaners such as leaf-warblers *(Phylloscopidae*), while others are specialists on wood-decay invertebrates plus invertebrates which are merely sheltering in the wood, e.g. over-wintering or nocturnal insects. The woodpeckers *(Piciformes)* are the main birds specifically breaking into decaying wood in search of food - even nuthatch *(Sitta europaea)* and treecreeper*(Certhia familiaris)* are mainly gleaning prey from the external surfaces and shallow cavities. (Ancient Tree Forum)
About 92 species of birds nest in woodland in Britain, and the single richest area is probably the New Forest where no fewer than 75 of them breed regularly. So far it is not possible to compare the birds of specifically ancient woods with those of secondary woodland or plantations. To an even greater extent then mammals, birds exploit suitable conditions as they arise. Ancient woodland may be well account for the majority of breeding pairs of certain species with specialised requirements, such as nightingale *(Luscinia megarhynchos)*, wood warbler *(Phylloscopus sibilatrix)* and hawfinch *(Coccothraustes coccothraustes)* in broadleaved woods, and the more restricted Scottish crossbill *(Loxia scotica)* and crested tit *(Lophophanes cristatus)* in Caledonian pinewoods. Others like the woodpeckers *(Piciformes)* and nuthatch *(Sitta europaea)*, are most frequent in large broadleaved woods. Woods with the greatest variety of nesting birds are likely to combine large size with a favourable geographical location, a diverse structure and a wide range of vegetation, including thickest and old trees.
Woodland birds can be divided roughly into three groups: those which nest on or near the ground, including underwood and scrub, those which nest in mature trees, generally in holes and those which build nests in the tree tops. Most of woodland songbirds are coppice nesters or hole nesters.
The birds which depend most on broadleaved woods are woodpeckers *(Piciformes)*, marsh *(Poecile palustris)* and willow tit *(Poecile montanus)*, nuthatch *(Sitta europaea)*, treecreeper *(Certhia familiaris)*, redstart *(Phoenicurus ochruros)*, nightingale *(Luscinia megarhynchos)*, blackcap *(Sylvia atricapilla)*, garden warbler *(Sylvia borin)*, willow warbler *(Phylloscopus trochilus)*, chiffchaff *(Phylloscopus collybita)*, wood warbler *(Phylloscopus sibilatrix)*, pied flycatcher *(Ficedula hypoleuca)* and hawfinch *(Coccothraustes coccothraustes)*.
Managed coppice is famous for its spring bird-song, and in recently cut clearings birds like tree pipit *(Anthus trivialis)* and woodlark *(Lullula arborea)* use trees and shrubs as song or display flight-posts. As the coppice reaches its leafiest and densest stage, garden *(Sylvia borin)* and willow warbler *(Phylloscopus trochilus)*, blackcap *(Sylvia atricapilla)*, chiffchaff *(Phylloscopus collybita)* and nightingale *(Luscinia megarhynchos)* are among the most characteristic birds. After ten years or so, they in

turn yield place to chaffinches *(Fringilla coelebs)*, robins *(Erithacus rubecula)*, blackbirds *(Turdus merula)* and tits *(Paridae)*, and in old coppice most of the previously mentioned birds will nest in scrub at the edge of the wood. (Marren, 1990)

1.6 Ancient Woods as Homes for Invertebrates

There are more than 1700 different invertebrate species in Britain and Ireland which are dependent on decaying wood in order to complete their life cycles (Alexander, in prep. The invertebrates of living & decaying timber in Britain & Ireland). This represents about 6% of the entire British invertebrate fauna - wood-decay is a major resource! That means more than 1700 different life styles, since each species has very particular requirements. These statistics really bring home just how diverse a habitat wood-decay can be.

The key to understanding the ecology of these invertebrates is to develop an understanding of the two key processes involved:

- the aging process of woody plants
- the process of wood decay.

Very few invertebrates possess the necessary gut enzymes to break down the principle components of wood - cellulose and lignin. Most rely on fungi and/or micro-organisms to convert these compounds into more digestible materials. The exceptions to this - species which can digest cellulose - include goat moth *(Cossus cossus)*, longhorn beetles *(Cerambycidae)*, bark beetles *(Scolytidae)* and the very rare beetle *Lymexlon navale*.

The most important wood for wood-decay invertebrates is of course the living tree, for it is the living tissues which generate the wood which will ultimately decay. Dead wood has a limited existence; it decays and is ultimately re-cycled. Conservation of wood-decay communities requires conservation of a diverse age structure of woody plants in order to ensure continuity of wood-decay habitats. (Ancient Tree Forum)

Many people consider that coppicing is the best way of managing a wood to benefit invertebrates. This is probably true up to a point, but much depends on how often the wood is cut and whether parts are left for the species which need mature foliage or deep shade. Some woodland nature reserves seem to be managed largely in the interests of butterflies, most of which prefer open woods on short coppice rotations. Such conditions chiefly benefit species which need masses of flowers and bright sunshine. Ground beetles do well in coppice glades, as do wolf spiders *(Lycosidae)*, jumping spiders *(Salticidae)*, wood ants *(Formica rufa)* and some solitary bees and wasps. Leaf beetles *(Chrysomelidae)*, weevils *(Curculionidae)*, aphids *(Hemiptera)* and some moth caterpillars enjoy the juicy leaves of young coppice. Old coppice stools also contain a good deal of dead and decaying wood and pools of rainwater, and are notable breeding sites for rare flies. But the best coppiced woods for insects tent to be those which have been managed in this way without interruption for many decades. The results of coppicing on long neglected stands have sometimes been disappointing, probably because many of the invertebrates which would benefit most no longer live in that particular wood.

Other invertebrates flourish best in less intensively managed woods with more mature foliage. These include leaf-mining moths, crane flies *(Tupulidae)*, web spiders *(Agelenidae)*, bark lice *(Coccidae)*, many beetles and most of the species which live in leaf litter. About one fifth of the invertebrate fauna of natural forest depends on

dead or decaying wood – several hundred species of beetles and flies, and a smaller number of bees, wasps and ants, non-insects commonly found under loose bark or fallen logs, or hollow trees include woodlice *(gen. Armadilidum)*, millipedes *(Diplopoda)*, centipedes *(Chilopoda)*, pseudoscorpions *(Pseudoscorpionida)*, spiders *(Araneae)*, slugs *(Pulmonata)* and snails *(Gastropoda)*.

Trees need to be several hundred years old, preferably pollards, to reach their full potential as invertebrate habitats. Oak *(Quercus robur)*, beech *(Fagus sylvatica)*, hornbeam *(Carpinus betulus)* and Caledonian Scots pine *(Pinus sylvestris)*are the most important. Old trees typically have massive trunks with cavities, swollen bosses, broad, often broken limbs and dead wood of every description and state of decay. Once established, the conditions can last almost unchanged for centuries before the tree finally completely dies, its roots decay and the trunk topples down. Even the fallen log will, if left alone to rot, be used by invertebrates for many more years and it may take further quarter-century to rot away completely. (Marren, 1990)

Today's fauna is unique in time. The fauna of the ancient Wildwood of Britain and Ireland would have been particularly species-rich. Extinction has been a continuing process, in relation to a variety of factors but particularly fluctuating climate and as a result of the activities of people since prehistoric times. The fossil record includes many species which nowadays require visits to continental Europe to see them: *Rhysodes sulcatus* is a relict species of primary, wholly undisturbed forest, i.e. before it has been disturbed by human activity, and is most recently known in Britain at c.3000 BP. The click beetle (*Porthmidius austriacus)* appears to have become extinct during the Neolithic period. There is evidence for the presence in Britain of another species of stag beetle *(Lucanus cervus)* up until the Bronze Age.

Even many of our currently rare species were once much more widespread here. The rare chafer *(Gnorimus variabilis)*, for instance, used to occur in old trees on Tooting Common, London, now so long gone that none of the residents can remember there ever having been old trees there! It is currently confined in Britain to Windsor Forest. An interesting quirk is the story of the lime bark beetle *(Ernoporus caucasicus)* which was described in Britain from fossil remains found in the Somerset Levels long before anyone noticed that it was still alive and well and widespread across the Midlands! But it is not all decline. Species have been colonising too, although mostly in response to the activities of people! Many species have been accidentally introduced through commerce and others through the introduction of exotic plants for gardens and hothouse collections. Some of today's commonest wood-decay insects came originally from long away. Good examples are the weevil *Euophryum confine* and the small fungus beetle *(Cis bilamellatus)* which originate from New Zealand. The jewel beetle *(Agrilus sulcicollis)* is one of the latest arrivals, having been expanding its range across Europe in recent years and was first noticed in Britain in 1999 - did it fly the Channel or did it hitch a lift on a timber lorry?

Some species have established themselves in Britain firstly within buildings, but with global warming are not being able to live out of doors. An example is *Alphitobius diaperinus*, known as the lesser mealworm beetle for many years as it has been exploiting stored products and especially deep litter poultry houses, but now its other name of black fungus beetle is becoming more appropriate as it colonises old trees in the countryside. (Ancient Tree Forum)

1.7 Ancient Woods as Homes for Amphibians and Reptiles

Amphibians are also known to use old trees and decaying wood as places of shelter. The best known user is the protected great crested newt *(Triturus cristatus)*.
Grass snakes *(Natrix natrix)* hide, hibernate and lay eggs in hollow and decaying ancient trees.

1.8 Ancient Woods as Homes for Flowering Plants

One of the most obvious differences between ancient and secondary woodland is in the composition of the ground flora. Even if the conditions in secondary woodland are perfect, many flowers cannot spread quickly because that is not in their nature. Flowers like wood anemone *(Anemone nemorosa)* and lily-of-the-valley *(Convallaria majalis)* are poor colonisers, producing relatively little fertile seed. An extreme example, the coralwort *(Dentaria bulbifera)*, rarely if ever ripens seed in Britain, relying instead on small bulbils. Poor powers of spread did not matter during that long; tranquil era when most of Britain was one big wood and all plant needed to survive was cling like a limpet to its own patch of soil. In modern conditions though, opportunism is proving a better survival tactic than mere persistence. Elders *(Sambucus spp.)* and nettles *(Urtica spp.)* are increasing, while the fate of wood anemone *(Anemone nemorosa)* and coralwort *(Dentaria bulbifera)* is closely linked to that of ancient woodland, and that can only mean decline since ancientness is, by definition, a fixed asset. In most districts of Britain, but especially in the South and East, it is possible to compile lists of flowering plants as well as ferns – as showed previously - which are found in ancient woods but rarely in hedges or recent secondary woodland. Since the geography of Britain is so varied though, it might be dangerous to generalise too freely about “ancient woodland indicator species”. Lists of plants associated with ancient woodland can be very useful but they need to be based on local knowledge, and it should be borne in mind that widespread plants grow more vigorously in some districts, and in certain soils, than others. In places where native woodland is unusually thick on the ground, one would be hard put to find any tree, flower or fern which ecologists could seize on as an infallible sign of ancient woodland. Nevertheless, although the presence or absence of individual “ancient woodland plants” is not always significant, the total number of species supported by a given wood definitely is. The richest woods for flowering plants in Britain are all ancient woods. They may contain upwards of 250 species.
Ancient woodland flowers often grow in patches, which implies that they spread vegetatively rather than by seed. When a new area of woodland grows up on neglected ground nearby, the rate at which plants can colonise it varies from species to species. Oxlip *(Primula elatior)* is creeping at a very slow pace – about a metre per year but dog’s mercury *(Mercurialis perennis)* is moving in faster and bluebell *(Hyacinthoides non-scripta)* faster still.
The remarkable persistence of woodland ancient plants means that they can survive along the “ghost boundary” of former woods in hedges. These few very modest plants are therefore historical artefacts, as significant as antique coins or fragments of pottery. And like pottery, their value lies not in themselves but in the association of that particular plant in that particular place.
A walk through any ancient wood reveals how the flora changes from place to place in a kaleidoscope whose facets are governed by soil, shade and water. Well-drained but still moist soils may carry a carpet of bluebells *(Hyacinthoides non-scripta)* or

yellow splashes of wild daffodil *(Narcissus pseudonarcissus)*, while boggy ground by a stream is likely to be a place of sedges and towering marsh thistles *(Cirsium palustre*). Deep soil may be heavily shaded by well-grown trees harbouring wild garlic *(Allium ursinum)*. Steep north-facing banks are especially favoured by mosses and ferns. (Marren, 1990)

1.9 Ancient Woods as Homes for Ferns and Horsetails

A wood full of ferns and horsetails has an undeniably prehistoric look which is fully justified by the geological record. The majority of ferns and horsetails have fairly precise needs and are more sensitive than most flowers to extremes of drought, heat and grazing pressure. A relatively large proportion of them are also poor colonisers, and they thrive best in undisturbed stable conditions. The most fern-rich places of all are rocky ravines, for these provide a mosaic of rock and soil, moist seepages and sheltered banks, but also must be about the least disturbed places in Britain. The most interesting part of a ravine is at the bottom, in the region of cool, moist, turbulent air around mosses stumps and tree roots, wet rocks and possibly a tumbling watercourse. Here, where the air is permanently saturated with damp, ferns abound, and it is the main place to find the glistering, translucent fronds of Tunbridge filmy-fern *(Hymenophyllum tunbrigense)* and Wilson's filmy-fern *(Hymenophyllum wilsonii)*, often embedded in pillows of moss. These are Atlantic species, extremely sensitive to drying and only common in places of high rainfall. The rarest filmy-fern of all, the Killarney fern *(Trichomanes speciosum)*, is so water demanding that it prefers to grow by or behind waterfalls. (Ancient Tree Forum)
The Atlantic woods of sessile oak *(Quercus petraea)* and birch which line the rocky western coast of Britain are among the richest places for ferns in the whole Europe. They provide in ideal measure the humid, shady, ungrazed conditions in which ferns thrive, and when one sees the elegant fronds tumbling down steep banks among mossed boulders and fallen logs one scarcely needs reminding that these are ancient woods.

1.10 Ancient Woods as Homes for Epiphytes

The various plants which exploit the bare wood surfaces of trees as a place to grow includes mosses, liverworts, lichens and algae. The gradual build-up of these species into recognisable communities, as species colonise, grow and reproduce, is a much extended process, taking decades and even centuries to reach the full expression of diversity that can be achieved in this country. So the richest sites tend to be those with the oldest trees - depending on local conditions of course, notably air pollution levels as most are intolerant. A combination of adequate light levels, humidity, shelter and so also contributes. The need for good lighting means that it is the large old open-grown trees which support the richest epiphyte communities, rather than trees in closed canopy woodland. (Ancient Tree Forum)
Mosses and lichens are free living plants and most of them need a firm, long-lasting surface like bark or rock, and the more delicate species grow most vigorously in permanently moist places like ravines, stream banks or shaded fallen logs. Many mosses and, particularly, lichens grow well only on trees, and then usually only on certain parts or at certain stages of growth. Old hardwood trees with their thick trunks

and fissured bark contain a kaleidoscope of micro-habitats in which these epiphytes can find a place.

1.11 Ancient Woods as Homes for Fungi

Almost any ancient wood of any size has the potential to support several hundred species of fungi, although seldom more than a small fraction of them will be visible on any single visit. (Marren, 1990)
In recent years there has been a dramatic change in the way we look at the roles of fungi. No longer is fungal decay and hollowing of ancient trees seen as detrimental, instead they seem to be the key to prolonging the lives of trees. Although we only perceive the tree, the relationship appears to be so close that every tree has been described as creating a unique and dynamic support system for fungi. Strip away the cellulose and lignin and you are likely to still see the whole tree in ghostly fungal relief. They can also be extremely large organisms - a honey fungus *(Armillaria mellea)* in the USA has been measured at over 50km in diameter. Some fungi can also very long lived; perhaps living forever as some are known to grow continuously.
Fungi fulfil a host of important roles in all parts of the tree - within cells, between cells and on the surface of all parts of the tree, from the leaves in the canopy down to the root hairs. They also occur throughout all stages of a tree's life.
In the woodland ecosystem many are essential as vital decomposers and recyclers of plant remains others are key transporters of nutrients for the health and optimum growth of plants. Most fungi can be separated into these two main groups:
- Decomposition (“recycling”) fungi - associated with wood, leaf litter and other plant and animal matter. The saproxylic fungi are associated particularly with wood decomposition of living standing trees and fallen decaying wood.
- Mycorrhizal (“food gathering”) fungi - forming symbiotic associations with the roots of trees.

In both groups some fungi are associated with a wide range of tree and plant species, others are very specific in their choice of partners.
The fungal fruiting body is a very tiny part of the organism; much is out of sight as a mycelium growing within and around plants tissues. The presence of fungal fruiting bodies has often led to much concern, however few fungi are major pathogens and in natural systems active pathogens may have a function in glade creation. They pose us a threat only in our dense single stand crops of trees or ornamental areas. Like other species in the ecology of ancient trees some of the fungi are rare and threatened. Of the 447 macro-fungi on the British Red Data Book list nearly 400 are from Ancient Woodland and lowland pasture woodland. Many of those naturally hollowing the heart wood of trees have very restricted distributions. Loss of habitat is still a major concern in the conservation of fungi. Major losses appear to be happening due to acidification and increased nitrogen levels in soils.
It is not only the trees which are dependent on fungi. Many woodland invertebrates could not take advantage of the wood without the fungi “softening” it up first. The invertebrate community changes as the decay process proceeds and some invertebrates are more dependent on the type of decay than of the species of tree. Other invertebrates are dependent on fungi fruiting bodies. (Ancient Tree Forum)

1.12 Distribution and Management Needs of Ancient Woodland in Britain

In 1984, the Forestry Commission estimated that Britain had 2,000,000ha (4.9 million acres) of woodland. The Nature Conservancy Council estimated that, of this, just one quarter – about 575,000ha (1.4 million acres) – is of probable ancient origin. The amount and distribution of ancient woods today has been determined by those factors which influenced the location and extent of woodland clearance. (Rackham, 1980)
Despite assertions that particular woods survive because they grow on steep slopes or heavy soils not suitable for agriculture, these factors are not the prime determinants of the location of ancient woods – equally steep and heavy sites nearby have actually been cleared. Rather the pattern of ancient woodland complements the pattern of settlement and cultivation in prehistoric and historic times. The distribution pattern was more or less produced by the time when it became more economic to retain woodland than clear it.
Sensitive management which takes account of the individual character and circumstances of woods, and also the particular objectives of owners, is essential if their values are to be successfully maintained. The appropriate form of management will vary considerably. In some cases, particularly some upland and many wet woodlands the most suitable management will be to reduce grazing and browsing pressures from deer or stock to levels which will allow natural regeneration or expansion of the wood to happen. More intensive forms of management may harm the unique wildlife interest of some of these woods. Elsewhere, especially in lowland woods with a long history of management systems such as coppice with standards, more active forms of silviculture will be appropriate and often necessary to conserve their character and wildlife as well as their value as an economic resource. (Brooks, 1991)
Semi-natural woods are composed of locally native trees and shrubs which derive from natural regeneration or coppicing rather than planting. Because of their natural features and appearance, semi-natural woods are valuable for nature conservation and in the landscape, and many are important for recreation and for historical and cultural interest. Management should aim to maintain and enhance these values in harmony with securing other benefits, including wood products.
Ancient semi-natural woodlands are of special value because of their long, continuous history. They are the nearest we have to our original natural woodland and include remnants of the post-glacial forest which have never been cleared. They are irreplaceable assets which support many rare plants and animals and make a vital contribution to conserving biodiversity. They also contain a wealth of evidence of our past. Many have been greatly modified in structure and composition by centuries of management, whilst retaining many natural features. Some are threatened by neglect in the face of pressures such as fragmentation and overgrazing.
Management proposals should be geared to sensitive and low-key methods which are suited to the natural dynamics of these woodlands. Natural regeneration will be preferred to planting wherever practicable.

Main management aims (Wildlife Trust):

- *Maintain and wherever suitable restore the natural ecological diversity;*
- *Maintain and where appropriate improve their aesthetic value.*

These two aims should be applied in every case. In the great majority of woods they should be compatible with each other but where conflicts do occur the first should tend to take priority over the second because of the national importance of ancient

semi-natural woodland for nature conservation. However, each wood should be assessed according to its importance in the landscape and for nature conservation.

- *Maintain the genetic integrity of populations of native species, so far as is practicable.*

This aim is relevant for semi-natural woodlands where the genetic integrity of native tree and shrub populations has not been seriously compromised by past introductions of non-native stock within or close to the woodland.

- *Take appropriate opportunities to produce utilisable wood.*

The production of utilisable wood, including timber, is not an obligatory aim for every woodland. It is possible to achieve all the other policy aims without it, and indeed in a minority of woods where minimal intervention is an appropriate philosophy, wood production may not be desirable. However, for many owners, securing an adequate income from their woodlands is essential in ensuring the continuity of management necessary to achieve these aims.

- *Enlarge the woods where possible.*

Expansion of ancient semi-natural woodlands is very often desirable, especially for small woods, to secure their long-term future.

- *Maintain semi-natural woodland types.*

Management should be based on growing species native to the site and appropriate to the pattern of soils within the site. Existing abundant species should remain a significant component.

- *Maintain or restore diversity of structure.*

A range of age classes within each site is preferred to the limited spread of ages usually encountered.

- *Maintain diversity of species, and increase where appropriate.*

Some woods have been simplified almost to monocultures of beech, oak or chestnut by past planting.

- *Maintain diversity of habitat.*

A diverse structure and mixture of species improves habitat diversity, but open areas are also extremely important. They can be temporary (recently cut areas) or permanent (e.g. rides).

- *Maintain a mature habitat.*

This can be achieved by retaining old, dead or dying trees either standing or fallen, and by increasing rotation lengths.

- *Minimise rates of change.*

Wildlife takes time to adjust, so change should not be too drastic. This applies both to the scale and sequence of felling, and the lay out of the wood.

- *Use low-key establishment techniques.*

Aggressive working methods should be avoided. The general rule should be to do the minimum necessary to ensure adequate establishment and growth.

Woods with a recent coppice history depend for their richness on the maintenance of open spaces and the varied structures created by sustained management.

Coppicing is recommended as a component of smaller woods and in those woods which are still coppiced or have been coppiced within the last 50 years or so, provided browsing can be controlled. Coppicing maintains the short cycle of light and shade to which the wildlife of most lowland ancient woods is adapted. It creates great habitat diversity and numerous edge habitats. It enables ride grassland to be maintained and preserves mixtures of trees and shrubs that have often remained stable for centuries. Narrow strips of coppice maintained beside rides in woods managed as high forest will also add to diversity.

Coppice is particularly appropriate for stands rich in chestnut, oak or birch. Coppice with standards will produce the greatest habitat diversity and creates an opportunity to grow large trees quickly. Groups of timber trees produce an intermediate condition between coppice and high forest which combines the benefits of both.
Many of the surviving and former wood pastures have such high value for nature conservation, landscape and public recreation that their management must be the subject of consultation with specialists and conservation organisations.
Individual prescriptions are required for each site, but in general some continued pasturage is desirable. The intensity of grazing and browsing must periodically be reduced to levels which allow a new generation of trees to become established. Regeneration should be natural. On the other hand, grazing intensity must not fall so low for so long that all open spaces fill with trees and old trees are choked to death by vigorous young trees growing close by. Where ancient trees are now isolated within enclosed high forest woods, it is desirable to give them enough space to continue vigorous growth and eventually to allow a few of the younger trees to form successors. Some of these should be pollarded to provide a continuous supply of pollard trees in future.
Management should aim to maintain and increase the number of large, old trees and the quantity of dead wood, even in woods managed as coppice or high forest. Large trees can be achieved by allowing some groups of trees to grow longer than might be commercially desirable, selecting examples of long-lived species (oak, beech) which occupy wind firm sites. Particular mature trees may already be known to be important (e.g. as bat roosts, or as habitats for rare fungi). These should be retained and eventual replacements developed by retaining trees at the edges of compartments and in inaccessible corners.
Dead wood can be provided by leaving individual windblown trees where they lie, subject to access, safety and marketing objectives. This is especially appropriate for fallen trees in difficult corners, along stream sides and on margins.
In coppice woods, old stools can be retained by cutting above the level of the last cut. Stub trees and pollards should be maintained by periodic cutting, including trees growing on woodland margins.
Each wood is unique in its characteristics and its relationship to the surrounding landscape. Many form part of distinctive, even unique landscapes and possess a form which expresses their individual history. Whilst some appear uniform, most encompass significant small scale variety of site conditions. Within practicable limits, the aim should be to reflect this inherent diversity in future management.
(Forestry Commission)

1.13 Importance of Ancient Forest

All forestry activity plays a role in shaping England’s landscape and wildlife habitats, so is in some way linked to the management of the natural environment. However, it would be misleading to suggest that these linkages are universally strong or positive. Forestry in England takes a variety of forms and is motivated by a range of objectives – from systems dominated by fast growing, non-native conifers, designed to maximise timber production, to activities concerned with the management and regeneration of semi-natural broadleaved woodlands for conservation and amenity uses. Initiatives to encourage the harvesting, processing and marketing of timber are often linked to the

management of the environment, in that they can help to sustain the future of England's semi-natural woodlands.

Given that forestry in the UK is now increasingly regarded as unviable on commercial grounds alone, increasing importance is now placed on multi-purpose forestry systems, which place greater emphasis on conservation, landscape and amenity uses. As a result, the economic impacts of woodlands are increasingly dominated by conservation, sporting and tourism related activity. (Forestry Commission)

The semi-natural ancient forest as well as biodiversity in general provides many beneficial functions and services. Let's take closer look at the most important ones.

- Regulation functions, including a variety of essential life support systems and ecosystem services
    - flood defence and water regulation
    - water purification
    - climate regulation
    - carbon sequestration
- Cultural functions
    - aesthetic pleasure
    - recreation and tourism
    - health benefits
    - education and scientific research
    - spiritual benefits
    - sense of place and identity
- Provisioning services – water, coppice products etc.
- Supporting services - soil formation, photosynthesis, and nutrient cycling

It is also important to realise that nature is for many people valuable not only from the socio-economic point of view but for its own sake.

Ancient woodlands are widely recognised as being irreplaceable habitats, although many are not protected through designation. Local authorities have a key role to play in the protection of this unique resource through the planning process. This role has been strengthened in England by the publication of Planning Policy Statement 9, which requires local authorities to identify any areas of ancient woodland that do not have statutory protection.

2. ANCIENT TREES

2.1 Definition

An ancient tree can be described as being biologically, aesthetically or culturally important due to its age; one that is in the ancient stage of its life; or a tree that is old relative to others of the same species.
Ancient trees themselves are very old trees, often in excess of 200 years. They are typically large, with spreading crowns and have often been pollarded. There is always a considerable quantity of dead wood within them. Ancient trees are also found in a range of other habitats including woodland and hedgerows in farmland. Ancient trees are therefore not strictly connected to ancient woodlands, however, in terms of wildlife conservation; they often deliver similar effects and services on an individual level.
Ancient trees are rare, so many of the species of fungi, lichens and insects that are only found on ancient trees are rare too. Because they age and hollow, ancient trees provide cavities for some of the most charismatic birds, mammals and reptiles.
Today, many ancient trees stand unprotected, often just from neglect or a lack of awareness of their great importance to our heritage and wildlife.

2.2 Conservation

2.2.1 Legal Instruments

There are some legal instruments, which can be used to protect ancient trees in Britain, namely:
- Tree Preservation Orders
- Site designations
- Planning restrictions
- Wildlife Legislation

In the UK ancient trees have no automatic right of protection. They have no equivalent to Scheduled Ancient Monument status, as important archaeological sites do, and often remain completely unprotected from destruction.
There are several conservation organisations in the UK aiming to give appropriate protection to ancient trees. One of them and probably the most important one is Woodland Trust. They actively campaign for:

- creation of a new designation of ‘historic tree’ to protect ancient trees from development pressure
- changes to be made to Tree Preservation Order legislation, so that dying and dead ancient trees have greater protection
- ancient trees to be identified and conserved throughout the UK Biodiversity Action Plan
- important landscapes with concentrations of ancient trees, to be protected through effective historic and conservation designations
- the creation of wood pasture to extend existing sites, with young, open grown trees, which will become the ancient trees of the future

- the buffering of important sites from surrounding intensive land use

- ancient trees to be recorded on local authority development plans, so they can be properly considered in planning decisions.

2.2.1.1 Tree Preservation Order

A 'Tree Preservation Order' or TPO is usually made by a local planning authority (usually the local council) to protect specific trees (or particular woodland) from deliberate damage and destruction, which could include felling, lopping, topping, uprooting or otherwise wilful damage.

The advantage of a TPO is that it can normally be initiated fairly quickly – within hours of a tree being identified as in immediate danger – provided it is worthy of protection and the local authority can move quickly enough..

They can be placed on any tree (including hedgerow trees), but not hedgerows themselves, and are most commonly used for urban and semi-urban settings, and for trees with high 'amenity' or 'nature conservation value'.

Once a TPO is made it is usually takes immediate effect, but can be confirmed or terminated at any time up to six months' time, with or without modifications. Modifications can be a change in description or map details, or a removal of certain trees from the order, but cannot include extra trees to be protected - if the Authority wants to add trees to the order as originally made it is usually necessary to make a new Order. The landowner is still responsible for the trees, their condition and any damage they might cause at all times. (Naturenet)

A tree with a TPO placed on it, requires written permission from the council before any work can be done that might affect it in any way. Without this permission, the person concerned (including the landowner) may be prosecuted.

The local council holds details of TPOs and landowners should be informed of any new ones that are made. The relevant local authority Tree Officer will be able to tell you if a particular tree has a TPO already.

Making a TPO is a 'discretionary power', which means the council does not have to do it. There is no legal reason why a council has to make an order, but once one has been made, they have a duty to enforce it.

However, TPOs do not offer absolute protection for trees. Applications can be made to remove a tree, even with an order, for a variety of different reasons. They can be terminated or modified and there are a range of exemptions:

For instance, trees on land controlled by local authorities, or the Crown are not normally granted TPOs. Works on dying, dead, dangerous and nuisance trees are excluded. Works approved by the Forestry Commission under a felling licence are also allowed. Acts of Parliament and the granting of detailed planning permission also usually override an existing TPO. (Woodland Trust)

2.2.1.2 Statutory Designation

Even if the tree itself is not covered by a Tree Preservation Order, it is worth investigating whether the site on which it resides has any legal protection of its own, such as a statutory designation.

For instance, any work involving trees on sites with a designated conservation status, such as a –

- **Site of Special Scientific Interest** (also known as an SSSI or ASSI in Northern Ireland)
- **National Nature Reserve** (NNRs)
- **Special Area of Conservation** (SAC) – a European designation

- Special Area of Protection - a European designation specifically designed to protect birds
All above mentioned will require prior approval from the relevant agency. (Woodland Trust)

2.2.1.3 Planning Restriction

If a tree is threatened by development, certain planning restrictions may be used to help protect it. However, it is necessary to act quickly and lodge an objection early in the process.
Once it has been granted, planning permission overrides other objections and even Tree Preservation Orders. Methods that can be employed to protect an ancient tree threatened with development include:
- Checking the development plan and quoting relevant policies in your objection
- Checking if it resides in a Conservation Area
- Finding out who are the local councillors for the area in which the tree is located.
- Explain concerns to them – put forward the views of local residents - and ask for their help in guiding you through the system
- Putting the case to the local planning authority, and/or planning committee
- Finding people and local organisations, especially local groups of national pressure associations, who may share the same concerns and write letters to object to plans as well
Trees in relation to construction are covered by a British Standard BS 5837 and Tree Work is covered by BS 3998. British Standard 3998 is currently under review.
The local authority tree officer should be able to explain how a proposed development meets the requirements of the two Standards.(Woodland Trust)

2.2.1.4 Wildlife Legislation

Even if the tree itself and the site, is not protected, it may still have legal protection, if it provides a home to another species, which does have legal protection:
For example, all bats species in the UK have protection under the Wildlife and Countryside Act (1981) and the Countryside and Rights of Way Act (2000)
These laws provide protection for all bats and their roosts, some birds, fungi, lichens and invertebrates. (Woodland Trust)

2.2.2 Ancient Trees and European Law

The Woodland Trust is also trying to influence the proposals of European legislation. The main aims are to:
- allow the Natura 2000 designation to be extended to includes sites with ancient trees, as already happens in Scandinavia
- review the species associated with ancient trees and schedule the most threatened under the EU Habitats Directive
- make ancient trees a European cultural sustainability indicator

- encourage landscapes with ancient trees, such as wood pasture or ancient hedgerows, to be included in national, regional and community cultural strategies. (Woodland Trust)

3. COPPICE

3.1 Definition

Coppice is an ancient system of woodland management which has its origins in prehistory and has often been used to provide regular supplies of small-wood with many uses, including fuel, building, fencing, charcoal, tan-bark, turnery and crafts. However, the active management of coppice woodlands has been declining for more than a century and many of those remaining are neglected. Over the past decade a growing awareness of the importance of coppice for conservation, and a revival of traditional country crafts, has led to a resurgence of interest in these woodlands.
Current government policy is encouraging the development of community forests and stimulating public participation in woodlands which will probably lead to the creation of new areas of mixed coppice that are managed for their wildlife interest, suitability for community involvement and potential to yield produce for local use.
The word “coppice” comes from the French word couper, to cut. (Agate, 2002) It is a traditional method of woodland management. The stems of young trees are cut down to near ground level after which multiple new shoots will emerge from the stools, enabling the cycle to be repeated. That means a sustainable supply of timber for future generations.
Coppices or “copses” are woodlands cut on a fairly short rotation of five to thirty years. In most cases, one part of the wood, called a “coupe” (pronounce “coop”), is harvested each year. The coppice trees and their produce are known as “underwood”. Underwood species are all deciduous. Periodic cutting greatly extends the life of most trees, so that coppiced stools may be many hundreds of years old. (Agate, 2002) Typically a coppice woodland is harvested in sections or coups on a rotation which ensures the crop being availbale each year within the same woodland. It has the effect of providing a rich variety of habitats, as the woodland always has a range of different-aged coups that also mean changing light levels on the woodland floor prompting the flowering of many woodland plants. The woodland is more efficient as the straight poles provide useable timber especially for the traditional woodland crafts. A coppiced wood yields three main products – sticks and brushwood from the underwood (commonly know as coppice), timber from standard trees scattered amongst the underwood, and pasture from the herbaceous layer beneath the underwood and grassy rides and clearings.
Coppicing has been a way of harvesting wood for a long time. Far from being destructive, it has been actually the reason why many woodlands have survived keeping a very important genetic link back to the ancient woodlands. (Warren, Fuller, 1993)

3.2 History of Coppice Management

The earliest evidence of coppice management in Britain have been dated to the Neolithic wooden tracways built across the peat of the Somerset Levels.(2200-2500 BC.) Coppicing continued in its growth, and by the mid 13th century, most of our woodlands were managed as coppice. The system was still spreading into some remote districts of Britain as late as the 18th century as there were no records of coppicing in many parts of Scotland before 1700. In most parts of Britain, the traditional coppice system was improved from the 17th century onwards. Some

coppices were cleared or changed to other systems, whilst in other districts new coppices were created. Many surviving coppices were reorganised and planting became a significant component of the system.
Traditional coppice management and plantation forestry co-existed from the 17th century and although each retained its separate identity, they did influence each other.
The main decline of coppice management started in the late 19th century. When fuels like coal and oil came to be widely used, firewood was no longer valuable. There was less demand for, and less money in all the products of coppicing and it fell into a general decline throughout the country. Many woodlands were left without their traditional management, and the wildlife that thrived with the coppice cycle began also to decline.
In the early 20th century coppice management was often continued at a loss. Between 1920 and 1950 numerous woods were coppiced for the last time.
Luckily enough in the 1980's the government decided that Britain's forests were more than just timber factories.
A new sort of coppice has emerged in which fast-growing species such as poplars and willows are grown in dense plantations and harvested on short rotation to provide fuel. This short rotation coppice is of limited value for nature conservation compared with time honoured coppice systems. However, it may prove attractive to some species by increasing habitat diversity in, for example, arable landscapes. (Warren, Fuller, 1993)

3.3 Effects of Coppicing

Broadleaved woodlands which have been coppiced over a long span of time are rich in wildlife, especially flowering plants, birds and invertebrates. Coppicing retains an overall continuity of woodland cover so that species which have difficulty in colonising new habitats, including many rare and local plants and invertebrates, are able to survive. Coppicing maintains a small scale structural diversity, with a constantly changing pattern of cut-over areas, scrub like thickets and open canopy. In the first few years after felling, herbaceous plants germinate and flower, and then survive as seeds during the period when the canopy is closed, until the next felling allows the cycle to continue. In coppice derived from natural woodland, groupings of native tree and shrub species are able to persist indefinitely, with the loss of only a few species which do not tolerate coppicing.
Where coppice management is discontinued, more uniform conditions gradually develop, with fewer clearings and less varied structure. This results in the decline or disappearance of many of the habitats which are maintained under continuous coppice management, along with the species which depend on these.
When coppice woodlands are converted to high forest, the floristic and structural diversity decreases, and the amount of woodland edge available for birds and insects decline. The ground flora changes most if the coppice species are felled and the site is replanted with beech or evergreen conifers, less so when oak, ash or larch are used. When conversion is done by singling, the effects are less drastic.
It is easy to get carried away with enthusiasm for coppicing, but there is little point in resuming a coppice programme for a woodland unless there is reasonable certainty that it can be sustained. The conservation value comes with the range of habitats which develop under a continuous cycle of coppicing. (Brooks, 1991)

3.4 Coppice System

The idea of coppiced wood was to create highly systematic and productive area. Ideally, the underwood is cut on a certain year of rotation – usually 5-25 years – whereby a certain part of the wood is cut each year after it has grown for the stated number of years. Standards are grown on a multiple of the underwood rotation (usually less then 100 years). In this way the material yield from a coppice as well as its overall condition should remain constant, while the particular distribution of age classes in the underwod changes annually.
In practice, mismanagement or the change of demand can create different pattern. Thus the most important feature of coppice management is flexibility.

3.4.1 Underwood Management

Coppice involves cutting all the woody growth in a compartment of the wood, then allowing new shoots to grow from the stool (permanent woody base from which coppice shoots arise). In a coppice-with-standards a proportion of the timber trees is retained into the next rotation and some samplings are spared to grow into standards.
Underwood is usually cut close to the ground; therefore coppice stools are mostly low or subterranean. Exceptionally, the underwood is cut higher allowing low-cut pollards to develop.
Many of the larger coppice stools originated in the Middle Ages, and might have been almost immortal if coppicing had continued unchanged as the individual stools can live for many hundreds years, developing often into a ring of separate stools as they expand.
Underwood rotations were generally of 5-30 years. In the Middle Ages some East Anglian coppices were cut every three years. On the other hand, some coppices were neglected for more then a century.
Underwood was usually cut when it reached usable or marketable size. (Brooks, 1991)

3.4.2 Management of Standards

Although traditionally there were simple coppicing systems (without growing standards), the coppice-with-standards system proved to be more productive and demand covering. The timber trees of coppice woods were grown on a longer rotation than the underwood and yielded larger timber, which was mostly used in buildings. Oak *(Quercus robur)* was traditionally the main timber tree, followed by limes *(Tilia spp.)*, alders *(Alnus glutinosa)* and beech *(Fagus sylvatica)*.
New standards were produced by promotion of coppice shoots from the stumps of felled standards and by natural regeneration. Planting was usually not necessary. (Brooks, 1991)

3.4.3 Traditional Grazing in Coppices

Deer, cattle, horses and sheep were commonly allowed to graze in coppices, and hogs were admitted to feed on acorns in autumn. Many coppices were actually enclosed as

deer parks, while others formed part of the woodlands of the forest, where they were a subject to grazing by both the King's deer and the commoners' stock.
Grazing had to be controlled if the underwood was not to be damaged. Animals were excluded from freshly cut coppices for about 4-7 years for example by means of hedges. The most common way of preventing animals grazing the new shoots of coppiced woods was to dig a trench and deposit the earth on the woodland side of the trench to make a bank. This would prevent domestic animals and deer from entering the woodland area. (Brooks, 1991)

3.5 Suitable Species

Most native broadleaved species coppice, but some are stronger than other. The species used were those naturally occurring such as oak *(Quercus robur),* lime (*Tilia spp.),* hazel (*Corylus avellana),* ash (*Fraxinus excelsior),* field maple (*Acer campestre),* alder (*Alnus glutinosa),* willow (*Salix caprea)* and, after its introduction by the Romans, sweet chestnut (*Castanea sativa).*

3.6 Managing Coppice for Wildlife

The numbers and kinds of plants and animals found in an actively coppiced wood are strongly influenced by both past and present management. Much can be done to enhance a coppiced wood for wildlife through careful planning of the management. It is essential, however, to decide the objectives of the management before planning the programme of coppicing in detail, because some groups of plants and animals have conflicting requirements. Where a scarce or vulnerable species, such as the heath fritillary *(Melitaea athalia)* or common dormouse *(Muscardinus avellanarius),* is known to be present, then clearly the management plan should take special account of its needs. In other woods an appropriate objective may be to encourage as high a diversity of species as possible.

The main issues in drawing up a coppice management plan (Warren, Fuller, 1993):

Rotation length
Many of the especially interesting flowers, butterflies and birds of coppice depend on the early stages, before canopy has closed. Indeed, the survival of some of these species within individual woods hinges on the constant creation of new areas of young growth. Species differ in their exact requirements. The first three years are particularly important to many plants, but migrant birds mainly depend on years 4-10. It is highly desirable, therefore, that substantial areas of young coppice of all ages up to 10 years are always present.
Although this can be achieved by cutting on short rotations of, say, 12 years (though even this would be long for, say, commercial hazel *(Corylus avellana)*), this approach can be extremely labour-intensive in a large wood and the cycle is too short for the underwood to be valuable. Furthermore, longer rotations create a wider range of habitats. Old coppice does have its own wildlife interest, which should not be overlooked: it can be rich in fungi, mosses and small animals such as slugs and moths. Suitable tree holes for nesting common dormice *(Muscardinus avellanarius)* are often confined to older coppice. Indeed, for common dormice *(Muscardinus avellanarius)*

rotations of less than 12 years seem undesirable. One solution can be to operate both short (less than 15 years) and long (25-35 years) rotations within the one wood. Such a split rotation can tilt the balance in favour of a predominance of young coppice but also ensures that a certain amount of old coppice is always present. Ideally at least one panel should be cut every year. However, in some woods it may be more realistic financially, or where labour is short, to cut a larger area every few years. In such cases an acceptable interval between cuts would be two or three years.

The size of panels

Some huge butterfly colonies are supported by very small areas (for example half to one hectare). On the other hand, the same area may form just a part of the territory of one pair of whitethroats *(Sylvia communis)*. Very small panels may suffer shading from adjacent taller coppice and excessive browsing by deer *(Cervidae)*, which tend not to venture far from the cover of more mature coppice. To encourage large breeding populations of migrant birds it is best to create extensive areas of young and middle aged coppice extending continuously over at least four or five hectares. This can be achieved by cutting adjacent blocks of at least half a hectare. In general, panels of less than a third of a hectare are undesirable, while panels of between a half and one hectare are probably best. Where wood is known to hold an important population of dormice, it is best to cut panels no larger than 0.5 hectare. In such woods extensive areas of very young coppice should not be created because these will be devoid of food for common dormice *(Muscardinus avellanarius)*.

The layout of coppiced wood

Cutting in slightly irregular shapes can increase the length of edge between panels of different age. This may be beneficial to some species.

Special attention should always be given to rides, for these can be important habitats in their own right. They can also be used to link areas of young coppice – some butterflies, for example, may colonise new areas of suitable habitat by moving along the rides. Where only a part of a wood is to be managed as underwood, it is best to coppice those parts closest to the rides.

The number of standards

Woods with standard trees are generally richer in wildlife than those without. Standard trees create an additional stratum of vegetation which is important for many insects and birds. They provide holes for nesting birds and they can introduce dead wood, which is usually scarce in coppice. If the aim is to create open sunny panels, good for flowers and butterflies, and to grow vigorous underwood which benefits breeding birds, then the number of standards must not be too great. The typical range is about 30 – 80 per hectare, but the optimum number depends on the size of the trees. The more large trees, the lower the overall number of standards that is compatible with good underwood.

The boundaries of many ancient woods were marked by pollarded trees, whose branches were cut periodically at some height above the ground.

The regular cycle of coppice management creates an open woodland habitat favoured by many plants and animals. Shade liking plants usually flower well in the next year and then die back (perennials to a vegetative state) until the shade starts to return as the coppice shoots grow. The sun liking plants sprout from dormant seeds and flower well for two or three years. The dense shade of the last 2 or 3 years of each cycle

prevents invasive grasses and shrubs from taking over. In over-mature coppice, the dense canopy reduces the light available to plants on the woodland floor and only the most tenacious survive, often by growing in late winter before the canopy casts its dense shade. The amount of light can change from 5%, prior to cutting, to almost 100% just after cutting. Following coppicing, the extra light that reaches the woodland floor stimulates a riot of colour from various native plants as they burst into flower. (Marren, 1990) These may include daffodils (*Narcissus pseudonarcissus*), bluebells (*Hyacinthoides non-scripta*), wood anemones (*Anemone nemorosa*), violets (*Viola riviniana*), wood spurge (*Euphorbia amygdaloides*) and primroses (*Primula vulgaris*). These plants which can survive vegetatively under the old coppice canopy are soon joined by others like foxgloves (*Digitalis purpurea*) and St John's worts (*Hypericum sp.*) which germinate from buried seed.

The warm microclimate and diverse vegetation of young coppice is a haven for Insects. Large numbers of ground species such as wolf spiders *(Lycosidae)* and ground beetles *(Carabidae)* establish a year after cutting followed by numerous and diverse species in years two to five. Woodlands support more species of butterfly than any other habitat in the UK. Most butterflies have just one, or a small number of plants which their larvae will feed on. Usually these plants occur in open sunny areas created by coppicing or along woodland rides. Species such as the Duke of Burgundy fritillary *(Hamearis lucina)* whose larvae thrives on primrose *(Primula vulgaris)*, and the heath fritillary *(Melitaea athalia)* which needs cow wheat *(Melampyrum pratense)*, wood sage *(Teucrium scorodonia)* or foxglove *(Digitalis purpurea)*, have declined because of loss of habitat in neglected woodlands.

The flourishing insect life benefits birds and different species prefer different parts of the coppice cycle. In very open coppice, during the first three or four months of growth, tree pipits *(Anthus trivialis)* may be the first to colonise, followed by yellowhammers *(Emberiza citronella)*, linnets *(Carduelis cannabina)* and whitethroats *(Sylvia communis)*. By the third or fourth year, when low vegetation is becoming dense, there will be summer visitors such as the garden warbler (*Sylvia atricapilla)*, willow warbler *(Phylloscopus trochilus)*, nightingale *(Luscinia megarhynchos)*, blackcap *(Sylvia borin)*, and chiffchaff *(Phylloscopus collybita)*. They remain until about the 10th year and rapidly decrease afterwards. Old coppice species include the robin *(Erithacus rubecula)*, blackcap *(Sylvia borin)* and blue tit *(Cyanistes caeruleus)*. If the coppice contains large mature standard trees woodpeckers *(Picidae)*, nut-hatches *(Sitta europaea)* and tree creepers *(Certhia familiaris)* will often be present. (Marren, 1990)

Small mammals, like birds, are strongly influenced by the coppicing cycle. Mice, shrews and voles are often the first to appear in recently cut coppice. By the third year the small mammal population will probably be at a peak before decreasing gradually until the cycle is repeated. Coppiced woodland in the south and west England is one of the most important habitats of the common dormouse *(Muscardinus avellanarius)* which needs a high diversity of tree species to provide food throughout the year. Dormice spend most of their lives in branches and foliage and require a continuous canopy of coppice and standards, but do not thrive in very old coppice.

4. POLLARDING

For many centuries in Europe, trees were maintained at a certain height with regular pruning. This practice called pollarding, maintains a tree at a specified height, sometimes for centuries, and provides a formal look to landscapes. Traditionally, trees have been maintained at 6-9m tall. Pollarding can be used to keep a large, mature tree small if it was located in a place with restricted soil space, such as a planter, narrow soil strip, car park or footpath cut out.

Once begun it is essential that pollarding continues. Preferably, the pollarding process should begin when a tree is very young. A knuckle of tissue called the pollard head resembling a ball develops several years after the first cut was made. Most shoots grow from this tissue, which enlarges slightly each year. Most are orientated upright; they do not branch and grow at a rapid rate. Shoots originating below a pollard head should be removed each time the tree is pruned.

A clear distinction should be made between pollarding and topping. Topping can be harmful to trees and can initiate decay inside a tree. Pollarding is a high maintenance practice requiring re-pruning every 2 to 5 years.

This treatment of trees goes back many centuries, and was used to take regular crops of firewood in areas where domestic beasts grazed. A pollard tree can live a very long time; some of those in the Forest are more than 600 years old. As they age, these trees have a fascinating, rugged beauty, and are home to a special range of insects, fungi and lichens. They are often described as living sculptures. (Brooks, 1991)

Pollard trees surrounded by grassland belong to a very ancient type of landscape called “wood pasture” which was far more common in the Middle Ages than it is today. Where it has been preserved, wood pasture is of great historic interest, offering us a kind of “window on the past”, a chance to feel a little of what life was like hundreds of years ago.

Most common species to pollard: Elm *(Ulmus spp.)*, Willow *(Salix spp.)*, Poplar *(Populus spp.)*, Sycamore *(Acer pseudoplatanus)*, Lime *(Tilia spp.)*.

Pollarding and shredding of trees were widespread and common practices in Britain until the eighteenth century. Trees were an important source of fodder and their branches were regularly lopped so that sheep and cattle could eat their twigs and leaves. The branches could be used for firewood and other purposes. By the mid-nineteenth century, however, the practice of pollarding was becoming increasingly rare, although, luckily enough, pollarding has not died out completely and continues even in some areas of the UK. The most common form of current pollarding in Britain is so called re-pollarding, i.e. reintroduced pollarding after years of neglect. A good example of this practice is Hatfield Forest where there are 894 ancient pollards there. Pollarding was reintroduced in the 1970s and the main objective is to keep the trees alive as long as possible, maintaining them as a wildlife habitat for the newer generations.

In Europe, on the other hand, pollarding remains common in several Mediterranean, Balkan and Scandinavian countries.

5. EUROPEAN LEGISLATION – NATURA 2000

5.1 Natura 2000

There are few natural undisturbed forest areas remaining in the EU and most forests of conservation importance are either planted or have been managed over long periods of time. The overall objective is to safeguard biodiversity in the European Union through the establishment of a common framework for the conservation of animal and plant species as well as natural and semi-natural habitats that have been identified as being of Community interest. The aim is to maintain or restore these interests to a favourable conservation status. The principal EU laws for the conservation of habitats and species of high nature value are the Habitats and Birds Directives. These Directives have been adopted unanimously by the Council of Ministers and with the support of the European Parliament. The establishment of Natura 2000 is a key objective of these Directives.

Natura 2000 is the most ambitious undertaking ever at EU level for the conservation of the shared wildlife heritage. It complements measures already being taken at national level to protect wildlife and represents a major collective effort by the Member States in the field of nature protection. It is also fully in line with the international obligations, significantly contributing at Community level to the aims of a range of international nature conventions.

Natura 2000 is a network of nature conservation sites for the 21st century. In May 1992 the UK and other European Union (EU) governments brought in a new law to protect the most seriously threatened habitats and species across Europe. The EU law is known as the 'Habitats Directive' and it works with the earlier 'Birds Directive' which was introduced in 1979. At the heart of these Directives is the creation of a network of EU -wide protected sites. These sites comprise both Special Protection Areas (SPAs) for birds identified under the Birds Directive and Special Areas of Conservation (SACs) for habitats and species under the Habitats Directive. Some Natura sites can be both SPA and SAC.

The Habitats Directive has introduced several innovative features:

- It establishes the principle of conserving habitats for their own sake and not only because they host rare or threatened species
- It introduces a "Biogeographical Region" approach which allows for more meaningful comparison between Member States with similar biodiversity
- It provides for a strong level of protection for sites in Natura 2000 with proactive (positive management), preventive and procedural (dealing with plans and projects) safeguards.

Establishment of the Natura 2000 network involves the close co-operation and co-responsibility between the Commission and the Member States. The main forum for exchange is the Habitats Committee, comprised of officials from the competent national nature authorities and chaired by the Commission. The Habitats Committee is aided by a scientific working group, which advises on technical issues. The overall aim is to ensure a common approach, especially as regards scientific and legal interpretative issues. (Natura 2000)

5.2 Natura 2000 and Woodland Habitat

Forest habitat types of European conservation interest, 59 of them, are listed under the "Forest category" of Annex I of the Habitats Directive. Of these, 42% are of priority interest under the Directive because they are considered among the most threatened habitat types for which the EU has a particular global responsibility. These include several types in the United Kingdom such as "residual alluvial forests," "bog woodland" and "Caledonian Forest".
The Annex I forest habitat types correspond to (sub)-natural woodland vegetation comprising native species forming forests of tall trees, with typical undergrowth.
The Natura 2000 network aims to capture a proportion of the examples of each of the habitats in the various Member States. This end result will be a complex algorithm of the extent and significance of the habitats across Europe as a whole, in the various biogeographic zones and in the individual States themselves and of the political resolve of the EU constituents. Meanwhile, a further problem we encountered is the extraordinary difficulty of obtaining accurate information about the number, location and size of the candidate Special Areas of Conservation in order to assess whether the significance of the national capital of each of the woodland habitats is reflected in the candidate SACs. Our request for formal permission to access this information centrally through the database at the European Topic Centre on Nature Conservation in Paris was rejected by the European Commission. (JNCC)

5.3 Managing Natura 2000 Woodland Sites

The creation of the Natura 2000 network is intended to ensure that these habitats and species are maintained at, or, where appropriate, restored to a favourable conservation status. It has been necessary to dispel a number of myths that have emerged concerning the implications of Natura 2000 designation on the rights of users, and landowners:
- *"Natura 2000 sites will all become nature reserves"* Although Natura 2000 forest sites will include unexploited nature reserves; this is not a prior requirement of the Directive. In fact, the philosophy of Natura 2000 is not about creating nature reserves where human activities are to be excluded. The majority of sites are likely to be privately owned areas and the emphasis will be on ensuring that any human activities are sustainable, with a view to maintaining the conservation values of the sites. The reality is that Member States will have a choice of mechanism to use to manage the sites including statutory, contractual and administrative measures.
- *"We will have to stop all our activities within a site for the sake of preserving nature"* The reality is that conserving species and habitats is not necessarily incompatible with human activities. In fact, nature conservation provides additional opportunities for human use, including activities such as environmental tourism, pursuit of leisure activities and labelling of natural products. Any restricting or stopping of certain activities that are a significant threat to the species or habitat, need to be addressed on a case by case basis.
- *"Brussels will dictate to us what can or cannot be done in each site"* The reality is that the Directive and Natura 2000 are based on the principle of subsidiarity. The provisions of the Directive clearly make the Member States responsible for the management of Natura 2000 sites. The Commission has consistently promoted the development of management plans, both as an instrument for ensuring appropriate

conservation management of the sites, and being the framework for judging the compatibility of different uses with conservation objectives. They also represent an excellent way to actively involve key interest groups, who may be affected by the designation, in management decisions. Given the extensive range of habitat types and situations, no standard formula can be applied. However, as a general rule it will be important to ensure continuation of traditional management regimes, which very often have been crucial in creating and maintaining the habitats, which are valued today. Careful management planning for Natura 2000 forests may prove to be particularly important, given that many of the sites concerned are relatively small in size.
- *"Once a site is included in Natura 2000 it becomes untouchable as regards future development"* The Directive does not, a priori, prevent any new activities or developments within a Natura 2000 site from taking place. This needs to be judged on a case-by-case basis. Article 6 of the Habitats Directive requires that any new plan or project that is likely to have a significant effect on a site must undergo a prior appropriate assessment. If a proposed activity is likely to cause significant damage to a site and all possible alternatives have been exhausted it may still go ahead if it is of overriding public interest and if compensatory measures are provided. In the case of developments which will have an adverse impact on sites which host priority habitats or species the Directive requires the Commission to give an opinion on whether an overriding public interest is involved. Activities affecting the integrity of a site are equally relevant under Article 6 whether inside or outside its boundaries, Forestry can also have an impact on Natura 2000 sites designated for other habitat types and species of Community interest. It is estimated that more than 15% of the territory of the Community will be included in Natura 2000. Therefore, afforestation must be carried out in such a way that it does not negatively affect Natura 2000 areas or other ecologically important sites in the Member States. Planting in such sites should only be encouraged when it contributes to, or is fully compatible with, their nature conservation value.
Natura 2000 areas can both provide several ecosystem services (e.g. cultural values, recreation and tourism) and support the maintenance of services outside the actual areas. In the latter case Natura 2000 areas can, for example, assist in maintaining species diversity and population levels in the region or, in the case of wetlands, contribute to the purification and supply of water. Consequently, integrating Natura 2000 areas into regional and local planning can bring significant benefits by contributing to the supply and maintenance of ecosystem services in the area. The role of Natura 2000 areas in providing ecosystem services will be of high importance in the future as the management of Natura 2000 areas is integrated into the broader context of regional development. (Natura 2000)

5.4 Protection of British Ancient Woodlands under Natura 2000

Although ancient woodlands – as generally speaking very variable compilation of habitats - are not directly protected by European Law in terms of Natura 2000, The Habitats Directive requires that Member States should endeavour to encourage the management of landscape features that are of major importance for wild flora and fauna. It is this ecological continuity that makes ancient woodland by far the most species rich and species abundant habitat in Britain. Not only that, it is also the habitat that contains the most endangered species or Red Data Species - species in danger of extinction. Ancient woodland – as shown earlier - supports many species which are

actually included in Annex II of Habitat Directive as well as it can consist of different types of habitats listed in Annex I.
The protection of ancient woodland under Natura 2000 in Britain can be based on following habitat types:
9120 - Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) – Biodiversity Action Plan Habitat: Lowland beech and yew woodland
9130 - *Asperulo-Fagetum* beech forests - Biodiversity Action Plan Habitat: Lowland beech and yew woodland
9160 - Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli* - Biodiversity Action Plan Habitat: Lowland wood pastures and parkland
9180 - *Tilio-Acerion* forests of slopes, screes and ravines - Biodiversity Action Plan Habitat: Upland mixed ashwoods
9190 - Old acidophilous oak woods with *Quercus robur* on sandy plains
91A0 - Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles - Biodiversity Action Plan Habitat: Upland oakwood
91C0 - Caledonian forest - Biodiversity Action Plan Habitat: Native pine woodlands
91D0 - Bog woodland - Biodiversity Action Plan Habitat: Wet woodland; Native pine woodlands
91E0 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) - Biodiversity Action Plan Habitat: Wet woodland
91J0 - *Taxus baccata* woods of the British Isles - Biodiversity Action Plan Habitat: Lowland beech and yew woodland; Upland mixed ashwoods

Example of species that are listed in Annex II of Habitat Directive benefiting from ancient woodland in Britain:
1079 - *Limoniscus violaceus* - Violet click beetle
1083 - *Lucanus cervus* - Stag beetle
1303 - *Rhinolophus hipposideros* - Lesser horseshoe bat
1304 - *Rhinolophus ferrumequinum* - Greater horseshoe bat
1308 - *Barbastella barbastellus* – Barbastelle
1323 - *Myotis bechsteinii* - Bechstein's bat
1386 - *Buxbaumia viridi* - Green shield-moss

The UK Biodiversity Action Plan (BAP) was published in January 1994 in response to Article 6 of the Biodiversity Convention, to develop national strategies for the conservation of biological diversity and the sustainable use of biological resources. (DEFRA, 1994) The UK BAP included contributions from Government, statutory conservation agencies, the academic world and the voluntary sector. It committed the then Government and its agencies to 59 programmes or tasks: to conserve species and habitats; to develop public awareness and understanding; and to contribute to biodiversity work in the European and global context.

6. EXAMPLES OF CONSERVATION OF ANCIENT WOODLANDS IN BRITAIN

6.1 Sherwood Forest

6.1.1 Introduction

Thinking on the global scale, Sherwood Forest is the ultimate example of ancient forest in the UK. The Sherwood Forest is as typically English for many people as for example the Stonehenge or attractions of London. The reason doesn't often lie in the woodland itself but in the legends that are surrounding it. The forest is beloved for its connection to Robin Hood, the legendary 13th century bandit who supposedly hid there from his nemesis, the sheriff of Nottingham, in between stealing from the rich and giving to the poor.

6.1.2 Past and Present

Evidence of flint tools shows some use of the Sherwood area by prehistoric hunter-gatherers. During the late Iron Age and Roman periods, human habitation and farming was more common. By the 9th century, farming communities were making a greater impact on the Sherwood landscape. Most of these communities still exist today. Names ending in "by" like Thoresby, are Scandinavian in origin, "Thorpe" as in Gleadthorpe are Danish, and "feld" (field) as in Mansfield, are Roman (Centre Parks).
The name "Sherwood" was first recorded in 958AD when it was called Sciryuda, meaning "the woodland belonging to the shire". It became a Royal hunting forest after the Norman invasion of 1066, and was popular with many Norman kings, particularly King John and Edward I. The ruins of King John's hunting lodge can still be seen near Clipstone.
"Forest" was a legal term, and meant an area subject to special Royal laws designed to protect the valuable resources of timber and game ("Vert and Venison") within its boundaries. These laws were strictly and severely imposed by agisters, foresters, verderers (wardens) and rangers, who were all employed by the Crown.
In the 1200s, popularly thought to be the time of Robin Hood, Sherwood covered about 100,000 acres, which was a fifth of the entire county of Nottinghamshire. The main London to York road, the Great North Way, ran straight through Sherwood, and travellers were often at the mercy of robbers living outside of the law.
Medieval Sherwood was not - as many imagine - a continuous swathe of dense virgin forest. It comprised birch *(Betula spp.)* and oak *(Quercus robur)* woodland, interspersed with large areas of open sandy heath and rough grassland. Sherwood also contained three Royal deer parks, near Nottingham Castle, Bestwood and Pittance (Clipstone) Park (Centre Parks).
Medieval woodland was by no means wild. It was a productive resource, carefully managed. Landowners got the most value from their woodland by using techniques such as coppicing and pollarding to produce poles and laths for building. Underwood was collected and sold for domestic fuel, and the woodland supported several industries, such as charcoal burning and the stripping of oak *(Quercus robur)* bark to use in tanning leather. The autumn crop of acorns produced in oak woodland was used to feed pigs. Cattle, sheep and deer grazed wood pasture.
In the 12th and 13th centuries, various Christian monastic orders had established large estates within Sherwood Forest, on land granted to them by the Crown. Among the abbeys founded during this period were Rufford, Thurgarton and Newstead.

Established forest communities grew larger, and new ones were created, some often marked by the name "woodhouse", such as Mansfield Woodhouse. Markets also appeared, as at Mansfield and Market Warsop.
After Henry VIII closed all the English abbeys in 1536 (The Dissolution), former monastic land was granted or sold into private ownership, and much of this land was gradually converted into country house estates. But for some time, within the depths of the forest, life for the peasant classes continued as it always had.
King James I loved to hunt in Sherwood, but his son, the ill-fated Charles I was the last king to the use it as a hunting forest. He was executed as a result of the English Civil Wars. During this time of unrest, the forest suffered from a lack of proper management. During the late 1600s, King Charles II revived as best he could the game reserves and general management of Sherwood.
By the 18th century, large areas of Crown land in Sherwood had been sold or gifted to nobles and court favourites. These private landlords created the fine country estates of Thoresby, Rufford, Welbeck, Wollaton and Newstead. Because of the titled aristocrats who owned them, these estates became collectively known as the 'Dukeries'. They saw great profit made in Sherwood from the grazing of animals, agriculture and the growth and selling of timber for buildings, furniture, and the ships of the British navy. Birch *(Betula spp.)* was used as domestic fuel, and even oak bark was used in the leather tanning industry. By 1830, the areas of Bilhaugh and Birklands near Edwinstowe, the last of the Crown's land in Sherwood, had been sold.
During Victorian times, Sherwood became a tourist attraction, with interest in the ancient "greenwood" fuelled by romantic novels set in medieval times, such as Walter Scotts' Ivanhoe. (Sherwood Forest Web Site)
The main areas visited centred around the Major Oak, one of many hundreds of old Sherwood oaks. Its earliest recorded name was the Cockpen Tree in the mid 1800's, as the sport of cock fighting once took place there. In 1790, Major Hayman Rooke, a noted archaeologist, included the tree in his popular book about the ancient oaks of Sherwood. Since then, The Major ('s) Oak has become its new name. Due to its national importance, conservation measures to the tree have been carried out continually since 1908. Today, this world famous oak, at least 800 years old, weighs an estimated 23 tons, its trunk circumference is 33 ft (10m) and its branches spread to over 92 ft (28m). (Center Parks)
The industrialisation of the 19th and 20th centuries bought a major impact on Sherwood. Coal mining, new coal towns and villages, the coming of the canals, railways, factories, roads, farming, grazing, ship building and industrial use, Victorian tourism, private ownership, conversion to country estate deer parks: all these impacted on the Sherwood landscape. During two world wars, areas of the forest were requisitioned for military camps, ammunition stores and training areas, and the national need for softwood timber changed the Nottinghamshire landscape with the introduction of extensive conifer plantations.
By the 1950s, Birklands was part of the Thoresby estate owned by the Manvers family, and woodland management had ceased there, because the area had become uneconomic to maintain. Now undisturbed by commercial forestry, the ecology of this mature native woodland flourished. A landmark since Victorian times, the Major Oak and its surrounding woodland continued to be popular with a growing number of tourists interested in the Robin Hood legend. The growth of car ownership made it easier for visitors from further afield to access the forest.

Birklands was designated as a Site of Special Scientific Interest (SSSI) in 1954; this area being selected as the part of old Sherwood Forest still best maintaining its historical character and wildlife interest.(Center Parks)
Today, Sherwood Country Park is a heritage site of international significance, with annual visitor figures of around 500,000. (FCVisitor Survey 2005)

6.1.3 Nature Reserve

The Sherwood Forest reserve is managed by Nottinghamshire County Council and Forest Enterprise, in partnership with Defence Training Estate and the Thoresby Estate.
The NNR comprises the ancient forests of Birklands and Budby South. The name Birklands comes from the Viking phrase "birch land" and the forest is thought to be over a thousand years old. Budby South Forest is an open uncultivated heathland reminiscent of the landscapes which were formerly much more extensive across Sherwood. (Nottinghamshire County Council)
Once part of the ten-thousand acre Royal Forest of Sherwood, the woodland is dominated by native oaks *(Quercus robur)* and other native trees such as silver birch *(Betula pendula)*, rowan *(Sorbus spp.)*, holly *(Illex aquifolium)* and hawthorn *(Crataegus monogyna)*.
The reserve contains more than a thousand ancient oaks *(Quercus robur)* most of which are known to be more than five hundred years old. The most famous of these, the Major Oak, may be nearly twice that age.
The forest is home to approximately a thousand beetle and spider species - many of which are rare - and over two-hundred species of fungi have been recorded. Local birdlife includes the great-spotted woodpecker *(Dendrocopos major)*, green woodpecker *(Picus viridis)*, tawny owl *(Strix aluco)*, redstart *(Phoenicurus phoenicurus)* and nightjar *(Chordeiles minor)*. The area also supports a number of bat species, including the noctule *(Nyctalus noctula)*.
Large tracts of dry sandy heathland, dominated by heather *(Ericaceae)*, gorse *(Ulex spp.)* and bracken *(Pteridium spp.)*, were once widespread across the great Forest of Sherwood and important remnants of this landscape are found on Budby South Forest and other open areas of the NNR. The heathland is important for a range of characteristic breeding birds such as the tree pipit *(Anthus trivialis)* and woodlark *(Lullula arborea)* and also has a rich invertebrate fauna.

6.1.4 Management

The Sherwood Biodiversity Action Plan (BAP) is closely linked to the Nottinghamshire BAP where plans have been written for our local and nationally scarce habitats and species.

Species and habitats covered in Sherwood BAP are:

- soprano pipistrelle bat *(Pipistrellus pygmaeus)*
- common pipistrelle bat *(Pipistrellus pipistrellus)*
- Daubenton's bat *(Myotis daubentonii)*
- Leisler's bat *(Nyctalus leisleri)*

- noctule bat *(Nyctalus noctula)*
- Natterer's bat *(Myotis nattereri)*
- nightjar *(Caprimulgus europaeus)*
- badger *(Meles meles)*
- common crossbill *(Loxia curvirostra)*
- kingfisher *(Alcedo atthis)*
- all reptiles
- brown hare *(Lepus europaeus)*
- birds of conservation concern (red and amber list species)
- lowland heathland with lowland dry acid grassland.
-lowland wood pasture
- broadleaved woodland
- standing open water with associated fen marsh and swamp
- neutral grassland

Park rangers say the collection of ancient oaks *(Quercus robur)* is one of the greatest in Europe. But they see an increase in the trees' rate of decline.
Over the centuries, the forest was carved up for farms, mines, towns and logging. Sherwood timber built medieval ships and even part of London's St. Paul's Cathedral.
Currently 997 ancient oaks stand on the 180 hectares known as the "beating heart of the forest," Izi Banton, the forest's chief ranger, said. About 450 are still living, and of those, 250 are in good shape, while the other 200 are particularly vulnerable. The remainder are standing deadwood, still valuable to the forest because of the life they support.
Each oak *(Quercus robur)* has its own management plan and some even have names, like Medusa, Stumpy and Twister. Rangers monitor them closely, watching for branches that look droopy or stressed, anxious to ensure that each tree lives as long as possible, said Paul Cook, a senior ranger.
Ancient oaks survive about 900 years, of which 300 years are spent growing and 300 dying. Of the seven trees already lost this year, four were felled by high winds on one February night. (Nottinghamshire County Council)
With fallen trees go the mostly unique kinds of beetles, moths and bats that live in them.
The oaks *(Quercus robur)* and wildlife will become more vulnerable as long as they remain isolated from the rest of the forest, Brady said. The rescue plan would focus on planting 250,000 trees to knit the parts of the forest back together.

6.1.5 The Major Oak

This giant tree, with an average diameter of 337cm, a height of 16m and weighing an estimated 23t, has been here for about 800-1000 years. The exact age of this magnificent tree can only be estimated. Its huge size is a clue, and yet at the same time as some oaks grows faster than other; the enormous trunk conceals the real answer.
As John Palmer (2002) states, the large canopy of the Major Oak, the leaves and branches, with a spread of nearly 30m points to it being a tree that has grown up with

little or no competition from oaks nearby. This has allowed the large branches and network of leaves to spread out. Its huge trunks forming as the tree demands food, water and structured support which increased during its continued growth, as it still does today.

The Domesday Book in 1086 noted that Sherwood Forest covered most of Nottinghamshire above the River Trent. Large trees were seen as a medium of prophecy and knowledge. These trees were associated with woods like Sherwood. Large oaks were frequently depicted as dwelling places for woodland spirits and legend has it that Robin Hood hid from his enemies inside the Major Oak.

There are several theories as to what caused the tree to grow into the size and shape it is today.

One is that the major Oak may in fact be more than one tree! Perhaps as a consequence of a chance germination of an acorn some 800 years ago, three or four trees began to grow close to one another. The tree we see today is the product of these young saplings fusing together as they grew to form one enormous oak. There are large grooves visible on the outside, and the hollow interior is actually several open chambers combined together, which is evidence that this is a possibility.

Another theory is that the tree has been pollarded. This was a system of tree management that enabled the foresters to grow more than one crop of timber from a single tree. This was repeated every 40-50 years causing the trunk to grow large and fat, the tops of which became swollen after several centuries of this cropping. This system of management allowed trees to grow longer than unmanaged trees. Some have been found to be 1000 years old. This tree was probably spared from the final forester's axe because of its hollow rotted trunk. The tree was probably spared also because of its landscape and heritage value. Romantic stories of Robin Hood only added weight to the case for the tree's preservation.

However, there are at least 20 oaks in England and Wales with a girth greater than the Major Oak, so oak trees this large may not have been unusual a few hundred years ago.

The Major Oak has received special attention throughout this century.

In 1908, metal straps and chains were installed high up in the canopy to support the weakest branches. Large holes were covered in lead sheeting to prevent rain entering, but unfortunately this was later removed.

Supports in the form of wooden poles were also first used for support about this time.

By 1972 the pressure of thousands of visitor's feet (220,000 per year) was beginning to take its toll, causing the upper branches to die back, soil compaction had prevented rain water, and minerals from the leaf litter decomposition, percolating down to the roots nourishing the tree.

In 1975 when the new Visitor Centre was built by Nottinghamshire Council, a fence was installed around the great tree, preventing further damage from the ever increasing number of visitors to Sherwood. This fence keeping visitors away from the tree helped to save it for the future, as it still does today. (Palmer, 2002)

A tree company (Tree Surgeons) was brought in to treat the tree by removing decaying branches, cover up gaping holes, replace some of the old chains and straps and give the exposed wood, both inside and outside, a coat of arboricultural paint to prevent further decay. However, a complete eradication of fungi can prove almost impossible and can sometimes be seen on the tree in autumn.

In the mid 80's more supports were added, these prevent sideways, horizontal movement of the larger lower limbs.

In 1994 the grass under the tree's canopy which had originally been introduced for aesthetic purposes, was removed to prevent it taking soil nutrients from the tree. Inert mulch was then spread to prevent the soil from drying out. Outside the "drip circle" the natural regeneration of the woodland flora is being allowed to grow back. The tree is now inspected on a daily basis by the Ranger staff, whilst Tree Surgeons visit the site on a seasonal basis to check the oak for routine maintenance and rout feeding.
The Major Oak is listed as being an English or pedunculate oak *(Quercus robur).*
The Major Oak's enormous interior is also useful for hibernating insects and mammals such as bats, queen wasps, butterflies and a variety of spiders. All make use of the valuable protection and shelter the tree has to offer during the winter weather.

6.1.6 Natura 2000 in the Sherwood Forest

A part of the Sherwood Forest has been designated as Special Area of Conservation (SAC). It covers over 270ha and is called Birklands and Bilhaugh. It is the most northerly site selected for old acidophilous oak woods and is notable for its rich invertebrate fauna, particularly spiders, and for a diverse fungal assemblage, including *Grifoa suphurea* and *Fistulina hepatica*. Both native oak species, *Quercus petraea* and *Quercus robur*, are present, with a mixture of age-classes, so there is good potential for maintaining the structure and function of the woodland system and a continuity of dead-wood habitats.
Majority of this habitat (9190 Old acidophilous oak woods with *Quercus robur* on sandy plains) can be classified as ancient woodland. It is one of only four known outstanding 9190 localities in the United Kingdom. (Natura 2000)
The site lies within Sherwood Forest which is popular for recreation. Visitor pressure can damage the fragile habitat. Historically the site would have been grazed. Cessation of this is causing birch invasion, altering the open nature of the understorey and causing the scrubbing-up of the grass/heath glades. These problems will be addressed by a management committee and in the management plan. The lack of younger trees may lead to a loss of dead wood in the future, with consequences for dead-wood beetles. This situation is being monitored in collaboration with Nottingham University. Air pollution from the industrial towns causing a reduction in lichen diversity is a problem. (Nottinghamshire County Council)

6.2 The New Forest

6.2.1 Introduction

Nowhere else in Europe is there a mixture of medieval wood-pasture and heath to match the New Forest, the least modified landscape in the whole of lowland England.
The New Forest is an ancient forest, first designated in 1079 for hunting by William the Conqueror. The New Forest National Park was created on 1 March 2005 following confirmation of the designation by Alan Michaels, Rural Affairs Minister.
It is the first National Park in the South East of England and will cover a 571 square km area with an estimated population of approximately 34,400. The park is the smallest of the National Parks now in existence in the UK.(The New Forest National Park)

6.2.2 Management
6.2.2.1 Introduction

According to The New Forest National Park Authority, the main woodland industry was hazel *(Corylus avellana)* coppicing for hurdles, thatching spars, hedge binders and other purposes. Such woods are often very rich in wild flowers and with an intricate pattern of banks and rides. Where the conflict between tree regeneration and grazing arose, the trees were cut as pollards. This practice ceased in the New Forest by the seventeenth century. The oldest trees are oak *(Quercus robur)* and beech *(Fagus sylvatica)* pollards, which had once stood in open pasture rather than, as now, in woodland.

The New Forest is unique not only within Britain but the whole Europe. Pig grazing was a common right known as pannage. Large woods were needed because of good acorn crops and beechmast yields, which are erratic in Britain. Although pannage was already in decline in the 11th century, it continued in some counties much later. Today it survives as a common right only in the New Forest.

There are areas of ancient woodland which are today almost exactly as they were hundreds of years ago.

The forest has experienced considerable deforestation at different times. An important use of the forest was to provide wood for shipbuilding. During the 17th Century, the Royal Navy built many galleons from New Forest timber.

These woodlands are unenclosed and open to the browsing of deer, ponies, cattle and pigs, hence their description as pasture woodlands. There are also a limited number of pre-inclosed woodlands fenced within statutory inclosures.

The New Forest woods are semi-natural since they are the result of both natural processes and the influence of people through the centuries. In total it covers some 3,692 hectares of woodland on the open forest.

The Deer Removal Act of 1851 reduced the grazing pressure on these woodlands and allowed regeneration of oaks and beeches to occur to create a dense woodland canopy in many areas.

The woodland in The New Forest is one of the richest locations in Britain for beetles, fungi and other groups which rely on deadwood, both standing and fallen. In an effort to maintain this biodiversity of deadwood species, the Forestry Commission and English Nature made an agreement in 1983 which restricted the removal of firewood from certain woods. These woods are known as “inviolate” woods.

The Forestry Commission is responsible for caring for and maintaining the future growth and development of the woodlands of the New Forest. Its policy for the last fifty years has largely been one of non-intervention but ecological studies are indicating that the structure of many of the woodlands is changing and are now presenting a cause for concern.

Regeneration of these ancient woodlands is not occurring in some areas as rapidly as would be preferred for sustainability. This can be attributed to climatic factors, such as the drought of 1875-6 and the storms of 1987 and 1990 and varying pressures from grazing.

6.2.2.2 Management Objectives (Forestry Commission)

- Pasturage - maintain the traditional use of the Open Forest as grazing land subject to common rights of pasturage.

- Aesthetics - Maintain the ornamental character of the woods.

- Historic - Maintain the living traditions and historic practices.

- Public Access - Visitors and residents should continue to have access to the Open Forest, for quiet enjoyment of the 'natural' environment.

- Nature Conservation - Maintain and restore the semi-natural ecosystems and processes together with their range of naturally associated species.

- Archaeology - Maintain the artefacts left by past use of the Forest.

- Timber and other wood products - Timber and fuel wood may be taken from the unenclosed woods where it is an integral part of the management system and to the degree that it does not conflict with other objectives of management.

6.2.2.3 Summary of the Management Plan for the New Forest Woodlands

- Mainly focus on maintenance and enhancement of the existing woodlands which will include maintaining their visual appearance and sustaining pasturage and other historic practices.

- Minimum intervention will be the general policy.

- Current configuration of the woods to be generally retained to avoid loss of their traditional pattern, meaning and historical context.

- Where tree recruitment required, temporary fencing will be erected as the most cost effective mechanism to achieve regeneration of oak in pasture woodlands.

- Elsewhere, management will concentrate on removal of exotic species and inappropriate plantings of native species, directing firewood collection away from core deadwood habitats, and the introduction of practices which would re-create and sustain the old spreading trees of the past.

- Removal of Scots pine and birch recommended only where it would not compromise the existing woodland structure and where it threatens the grazing status of the forest as a whole. Birch is accepted for its ability to suppress bracken and nurse young oak and beech regeneration on woodland margins.

- In planning all future programmes the risks of damage must be assessed and weighed against the benefits expected.

- Monitoring baseline parameters is essential to guide future management decisions.

6.2.2.4 Management Options (Forestry Commission)

1) The Passive Option
If the woods have survived this long, why interfere now? These woods are natural in the sense that they consist mainly of native trees, perpetuated for many generations mainly by natural regeneration. The option is simply to leave them alone, much as they have been left for as long as anyone can remember. They have been left to respond naturally to whatever happens in and around them.

2) The Traditional Option
The woods would remain unfenced to allow pasturage and pollarding of younger trees would occur to perpetuate the existing character of the woods. Timber and firewood salvage would be permitted but controlled under the existing agreement. This option would result in woods which looked managed but this would be in keeping with the history and tradition of the woods.

3) The Natural Option
From an ecological and nature conservation point of view these woods are valuable, partly because they are more natural than most other woods and possess many of the characteristics of the primeval forest, containing many species which depend on the deadwood. This option is to allow the woods to function as naturally as possible. It would involve fencing to reduce grazing and browsing to levels which would allow regeneration to grow unchecked in any canopy gaps.
No silviculture would be allowed and no dead wood would be removed. This option could not be applied to the Forest as a whole but to specific woods within the Forest.

6.2.2.5 Pollarding

In these woodlands, wood was harvested and renewed by lopping trees above the reach of the animals with the leaves and branches being used as fodder and fuel. This was widely practised throughout the New Forest until the end of the 17th century.
The top would be cut off a young tree often at a height convenient to a man standing on be the back of a wagon. New branches would be allowed to grow from around the cut surface, to be cut again after a number of years depending on what the wood was to be used for.
In the New Forest, the branches would often have been left on the ground for the deer and commoners' animals to feed on - then the wood would be used for firewood. Pollarding was done in a similar way to coppicing except that the branches were cut higher up so that the deer, ponies and cattle could not reach the new growth. Pollarding resets the biological time clock of trees, so trees managed in this way could live for a very long time - often far longer than non-pollarded trees. The practice of pollarding however stopped the trees growing tall and straight and they were therefore unable to provide good timber for shipbuilding. Such timber was required in large quantities until the 19th century. In 1698 an act of Parliament made it illegal to start pollarding any more oak trees within the New Forest, meaning that any of the pollard oaks and beech seen within the Forest today must have been first pollarded before this date and be over 300 years old. Those that had been pollarded continued to be so up

until the Deer Removal Act of 1851 when it was no longer necessary to provide winter fodder for the deer, ponies and cattle. (Tubbs, 1986)
Holly pollarding is still being carried out in the Forest each winter to provide additional food for ponies. The process also benefits some species of lichen as it allows light into the trunks of oak *(Quercus robur)* and beech *(Fagus sylvatica)*, therefore creating the best conditions for lichens. The pollarding of some young oak and beech trees may be started again soon in certain areas of the New Forest to help maintain the aesthetic value of the woods.

6.2.3 Natura 2000 in the New Forest

The New Forest has been recognized as a place that deserves special protection a long time ago. I have chosen it as a case study because of its unusual vast coverage by ancient wood that has been treated in the same traditional way for many hundreds of years.
Presently the National Park covers 57,086ha, roughly half of which comprises the New Forest Special Area of Conservation (SAC). The New Forest SAC is one of the most important sites for wildlife in the United Kingdom and is widely recognised as being of exceptional importance for nature conservation throughout Europe. (JNCC)
The New Forest supports a complex mosaic of wildlife habitats, formerly common in lowland Western Europe but now rare and fragmented. Located in the South of England, it has always been an area of public interest and is currently subject to over 20 million tourist visits per year. In 1995 the UK Government proposed 29,000ha of the New Forest area as a Special Area of Conservation (SAC) under the EU Habitats Directive.
The New Forest SAC comprises extensive wet and dry heaths with rich valley mires and associated wet and dry grasslands, ancient pasture and enclosed woodlands, a network of clean rivers and streams and frequent permanent and temporary ponds. There are outstanding examples of thirteen habitats of European interest represented here.
Other protection status afforded to the Forest includes Ramsar, SPA, SSSI, NNR, and is treated as a National Park. SAC's together with SPA's combine to form the NATURA 2000 network.
As said in Natura, the large areas of the Forest protected as sites of national and international importance are clearly of the highest priority for nature conservation. However, in many cases past management, or simply neglect have led to deterioration in their nature conservation value. The Government has set a target of achieving favourable condition for 95% protected sites nationally by 2010. However, in the New Forest the sheer size and complexity of the areas concerned, and the number of organizations and individual involved, means that the production and implementation of detailed management plans requires considerable resources.
A very important start has been made with the publication of the “New Forest SAC Management Plan” which brings together the very considerable body of ecological and cultural knowledge relating to the core of the Forest. In detail the management needs of the various habitats and sites, emphasising the importance of continued grazing by commoners’ stock and the restoration of areas affected by drainage works and forestry plantations in the past. The implementation of the SAC Management Plan aims to achieve favourable condition for all the major habitats within the SPA. Habitats in favourable condition are those which have stable or increasing area,

posses key features indicating high quality, have the ability to support a range of typical species and are not obviously under any future threat.
A considerable amount of work has already been carried out through management agreements with landowners and the large-scale restoration of habitats made possible by funding from the European Union Project (LIFE II). In addition the Forest Design Plans set out an agreed long-term programme for the Crown Land Inclosures, reducing the area of conifer plantation in favour of the restoration of heathland, mires and broad-leaved woodland.
A successful bid for LIFE III funding enabled further practical work to be carried out, focussing on the sustainable management of wetland habitats, and in particular on restoring natural stream channels, riverine woodland, wet grassland and valley mires.
The New Forest, safeguarded by its unique legislation, is the supreme survivor of the old unenclosed, unimproved landscape of heaths, woods and bogs. Woods used as pasture were widespread in the whole region. (The New Forest LIFE)

In the New Forest there are three woodland habitats defined under Habitat Directive which can be classified as ancient woods:

- *9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)*
The New Forest is the largest area of mature, semi-natural beech *Fagus sylvatica* woodland in Britain and represents *Atlantic acidophilous beech forests* in the most southerly part of the habitat's UK range. The mosaic with other types of woodland and heath has allowed unique and varied assemblages of epiphytic lichens and saproxylic invertebrates to be sustained, particularly in situations where the woodland is open and the tree trunks receive plenty of light. The traditional common grazing in the Forest by cattle and ponies provides opportunities to explore the impact of large herbivores on the woodland system.
Atlantic acidophilous beech forest
The UK has a substantial proportion of European *Ilici-Fagion* woodlands which are a distinctive Atlantic form of acidophilous beech-oak forest with holly and oceanic herbs. Along with the examples from north-west France, they show no additional distinctive floristic features compared with the Lusitanian character of the beech-holly woodlands of northern Spain, but the striking physiognomy and historical interest of some British stands gives them a particular character.

- 9130 *Asperulo-Fagetum beech forests*
The New Forest is the largest area of mature, semi-natural beech *(Fagus sylvatica)* woodland in Britain; much of it is a form of W14 *Fagus sylvatica – Rubus fruticosus* woodland that conforms to the Annex I type *Asperulo-Fagetum beech forests*. The mosaic with other types of woodland and heath has allowed unique and varied assemblages of epiphytic lichens and saproxylic invertebrates to be sustained, particularly in situations where the woodlands are open and the tree trunks receive plenty of light. The traditional common grazing in the Forest by cattle and ponies provides opportunities to explore the impact of large herbivores on the woodland system.
Asperulo-Fagetum beech forest
Even conceding a broader British range for this woodland type in planted and self-sown stands of beech beyond its generally accepted natural north-western European limit at the Chilterns, the UK examples of the Asperulo-Fagetum comprise but a small

proportion of the vast and complex range of beech and mixed-beech forests that extends right across the north-west European lowlands into the mountains of the centre and south. Also, compared with many other parts of Europe, our stands are small and scattered - partly because of the limited occurrence in the UK of more calcareous rocks and superficials and partly because of the general primacy of ash and oak in *Carpinion* communities through much of the wooded British lowlands. Beech *(Fagus sylvatica)* arrived late here but we have also long had a silvicultural preference for oak *(Quercus spp.)*, in contrast to much of central Europe, where beech *(Fagus sylvatica)* is the more highly regarded timber tree. Despite these features, British stands, along with those in north-east France, have a distinctive Atlantic feel to their floristics, even if this is expressed partly through the absence of Continental plants and somewhat muted with the often deep shade cast by beech *(Fagus sylvatica)*.
Woodlands dominated by beech, alone or with other trees, comprise the major forest types across much of central Europe. They are particularly important in the lowland and colline landscapes to the north of the Atlantic and Continental biogeographic zones but continue to make a prominent contribution at higher altitudes in the warmer south, where cooler temperatures in the mountains of the Alpine and Mediterranean zones sustain a zone with beech *(Fagus sylvatica)* above other deciduous or evergreen broadleaf forest.

- 9190 *Old acidophilous oak woods with Quercus robur on sandy plains*
The New Forest is representative of old acidophilous oak woods in the southern part of its UK range. It is the most extensive area of active wood-pasture with old oak *(Quercus* spp.) and beech *(Fagus sylvatica)* in north-west Europe and has outstanding invertebrate and lichen populations. This site was preferred over other sites that lack a succession of age-classes because, although scattered over a wide area, the oak stands are found within a predominantly semi-natural landscape with a more balanced age-structure of trees. The traditional common grazing in the Forest by cattle and ponies provides opportunities to explore the impact of large herbivores on the woodland system. The New Forest has been identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe.
Old acidophilous oak woods
Britain has relatively little of this now much reduced and fragmented woodland type characteristic of the extensive plains of impoverished acid sands across the North Sea/Baltic Plain, and it is a rarer landscape element with us than in some smaller EU Member States. The floristics, structure and context of these woodlands are rather consistent right across the range and British examples are quite typical - apart from the absence of a few species with us and in that the associated heaths in sites towards the west of Britain are somewhat more varied and species-rich than their Continental counterparts. In that part of the country, though, the woodlands themselves begin to acquire a more oceanic character that places them in 91A0 Old oak woods with *Ilex* and *Blechnum*. The stands also often share the same history of exploitation as is seen elsewhere - for timber, pasture and, more recently, pine afforestation - and are likewise probably also vulnerable to eventual colonisation by beech *(Fagus sylvatica)*.

6.3 Forest of Dean

6.3.1 Introduction

The Forest of Dean, covering around 11,000ha, lies between the two famous rivers of the Welsh Borders - the Severn and the Wye. In its original extent it never passed beyond these two natural boundaries, but it can scarcely be described now as covering a breadth of territory so extensive.
Its physical location determines much of its character. It is basically an undulating plateau, folded into three main ridges, surrounded by ridges of limestone and sandstone forming an outer rim to the central basin. This landform, coupled with the isolation created by being bounded by two large rivers (except in the north), has led to a feeling of containment and remoteness. Extensive broadleaved woodlands and coniferous plantations cover much of the central plateau and this exacerbates the sense of exclusion. (The Royal Forest of Dean)
The area has a very strong sense of history and identity. Within the Forest itself there is an enhanced air of secrecy; lanes twist off into the woods and, constantly, there are glimpses of past industrial activity - tips, quarry faces, old equipment, and disused railways. Around the edge of the forest are a number of sprawling settlements where housing and industry are interspersed with open grazing land, occasional dereliction and woodland. These settlements have developed in a formless way, as a result of sporadic development over time, often with development following the roads. Some have the feel of Welsh mining villages while others, with small dwellings and large gardens, have more of the feel of the fertile orchards of the lowlands. In places there is a sense of dereliction, due to abandoned industrial workings and mines and run-down outbuildings.

6.3.2 Past and Present

Although physically isolated by the two rivers, the Forest of Dean has been an area of activity from early on. Tribal strife between the Silures and Celts was only brought to an end when they united against the Romans. During Roman domination, the deposits of iron ore and the abundant local supplies of charcoal were exploited to produce iron. The remains of shallow workings are still visible at Scowles. In the 8th century, Offa consolidated the kingdom of Mercia and defended it against the Welsh tribes, building the dyke that runs north-south through the west of the area. The
Normans continued this line of defence, building castles at Goodrich and St Briavels, and also continued the exploitation of the iron.
In the 12th century the Cistercians established Abbeys in the area, at Tintern, Flaxley and Abbey Dore. However, the main influence on the majority of the area was the creation of a Royal Forest in the 13th century. This established the basis of the current land use pattern, with woodland cover retained in the central areas and settlements restricted to the margins. (The Royal Forest of Dean)
As far back as the reign of Henry the Second, the Forest did actually comprise all the land that these two boundaries encompassed. Then, if you wished to perambulate the Forest boundary, you would have had to have started where the Wye empties its waters into the Severn, just below the ancient town of Chepstow, and paced along the Severn side until you reached the city of Gloucester, you would have had to turn westward from the busy city, and followed the winding course of the Leadon river to

Newent, you would then have passed on through Herefordshire until the old castle at Goodrich stopped your westward progress; thence turning due south, and following closely the banks of the Wye, you would again have found yourself at Chepstow.

From this it will be seen that in olden times the Forest was almost completely surrounded by a natural water boundary; for, with the exception of the Herefordshire land, which was then included in the forest, the three rivers already named flowed round the hills and dales of ancient Dean.

Since the reign of Henry the Second many changes have taken place, both in the extent and condition of this district. When Edward the First came to the throne the Forest boundary, as it was known in Henry's time, had been greatly reduced. On the north side the rich lowlands of Herefordshire and Gloucestershire and on the south the fair spreading pastures that lie between Chepstow and Lydney had been gradually cut off. By Royal grant, or by private purchase, these tracts of soil had been secured for purposes of cultivation: and thus the first inroad was made upon the original extent of the Forest of Dean.

During the reign of Edward the First the encroachment which his accession to the throne had found complete, was still further repeated. For as it happened, previous to his reign, the north and south extremities of the Forest had been curtailed; in like manner it happened during his reign that the east and west sides of the Forest were similarly treated. Once more it was the land best adapted for agricultural purposes that cut off from the Forest territory, but from that time to this the boundary has remained nearly unchanged. (The Royal Forest of Dean)

This process of curtailment has reduced the range of Dean Forest to the central hills which occupy the district now lying between Newnham and Coleford, on the east and west, and Mitcheldean and Bream, on the north and south.

As technology improved, coal was produced in substantial quantities from deep pits but, because of the fragmented nature of the coal mining and the poor quality of the coal, the industry never expanded as it did elsewhere in the country. Not until 1838, when tramroads were built and an Act of Parliament began to consolidate the mines, did the industry expand. Thus by 1880, 63 collieries were producing 800,000 tons of coal. This increased to one million tons in 1904, when the collieries were grouped into seven areas and deeper seams were exploited. This level of production however was short-lived, with a sharp decline after the Second World War, and the last big pit closed in 1965.

Extensive areas of oak *(Quercus robur)* were planted in the late 19th century and the first forestry school in the country was set up in 1904. In 1919 the (then) Forestry Commission took over the management of the forest areas and a further spate of replanting followed, with the central area designated a National Forest Park in 1938. The sometimes conflicting interests of timber production, the extraction of minerals and grazing rights continue, with additional pressures from those seeking recreation in the countryside.

This 'Queen of Forests' boasts a spectacular range of natural beauty combined with an aura of magic and mystery that has been the inspiration for many great artists and writers including JRR Tolkien, Dennis Potter and JK Rowling.

6.3.3 Areas of Interest

The Forest of Dean is made up of four quite different landscape areas:
The ancient Royal Forest lies at the very heart of the district with the market towns of Coleford and Cinderford offering an insight into the industrial heritage and history of this fascinating area.
The Wye Valley is an Area of Outstanding Natural Beauty and forms the western border of the Forest, separating England from Wales. This unique area offers endless opportunities for outdoor activities such as canoeing and fishing on what is perhaps Britain's most unspoilt major river.
The Vale of Leadon is a quintessentially unspoilt English area featuring rolling farmland, vineyards and black and white timbered buildings centred around the picturesque town of Newent in the northern part of the district.
The Severn Vale, through which flows the country's longest river, is famous for its tidal bore, Blaisdon Plums and Perry Pears. The old Severnside port of Lydney is the area's main town, and is a thriving business and shopping area.
The Forest of Dean although a working forest one area called Nags Head is a Bird Sanctuary with nesting boxes fastened to the trees, also deer *(Cervidae)* and wild boar *(Sus scrofa)* run free in the Forest and it is even possible to spot one of the rare white deer.

6.3.4 Coppicing in the Forest of Dean

Most ancient woods have been managed for most of their history by coppicing. Today, coppicing on an industrial scale, to feed the iron works and limestone kilns, has largely died out, although it increasingly continues in wildlife reserves and some Forestry Commission woodlands. Signs of former coppicing are easy to find within Forest of Dean: the multi-stemmed trees grown from coppice stools and the rich variety of trees and shrubs that were supported by the coppice system.
Foresters in the Forest of Dean have been at the forefront of these pioneering techniques, and are slowly working towards a multi-purpose form of forestry, including come back of techniques which seem to be forgotten. It is extremely difficult to renew the tradition of coppicing on places where it disappeared; however, first experimental attempts have already been done.

6.3.5 Management Objectives

- Appropriate management of species-rich acid, neutral and calcareous grasslands and wet permanent pastures and protection of wildlife and historic features from bracken, scrub or livestock encroachment.

- Maintenance of historic field boundary patterns and tall, mixed hedgerows, hedgerow trees and stone walls and provide appropriate management for wildlife, including farmland birds, common dormice *(Muscardinus avellanarius)* and bats.

- Management of broadleaf woodlands including wood pasture and coppice.

- Protection of traditional orchard trees, ancient and parkland trees in pasture or arable fields to retain them as important features in the landscape.

- Protection of historic features, including industrial archaeology from deterioration.

- Prevention of soil erosion in cultivated fields on sloping ground in close proximity to watercourses to enhance water quality / minimise diffuse pollution and benefit riparian species.

6.3.6 Natura 2000 in the Forest of Dean

Forest of Dean has been selected and designated as SAC due to species listed in Annex II of Habitat Directive.
This complex of sites on the border between England and Wales contains by far the greatest concentration of lesser horseshoe bat **(***Rhinolophus hipposidero)s* in the UK, totalling about 26% of the national population. It has been selected on the grounds of the exceptional breeding population, and the majority of sites within the complex are maternity roosts. The bats are believed to hibernate in the many disused mines in the area.
It also supports about 6% of the UK population of greater horseshoe bat *(Rhinolophus ferrumequinum).* The site contains the main maternity roost for bats in this area, which are believed to hibernate in the disused mines in the Forest. (JNCC)

6.4 Leigh Woods

I have chosen the ancient woodland of Leigh Woods protected under Natura 2000 as a site that is to some extent very different from the previously mentioned internationally known locations. Leigh Woods represents urban woods of a big cultural and recreational value to local people.

6.4.1 Location, Conservation and Management

On Bristol's doorstep, Leigh Woods offers wonderful views of the Avon Gorge, woodland sculptures and rare trees. The rare Wild Service Tree can be found here as well as the Bristol whitebeam *(Sorbus bristoliensis)*, found only in the Avon Gorge.
Leigh Woods is largely broadleaved ancient woodland with some areas of conifers. It is a Site of Special Scientific Interest, a Site of Nature Conservation Interest and a National Nature Reserve. It is owned and managed by the Forestry Commission and The National Trust, 180ha (440 acres).
Leigh Woods is one of the finest broadleaved woods in Wessex. The National Trust owns about a third and Forest Enterprise owns the rest. To the north there's ancient woodland with standards and old coppice. To the south you'll find former pasture woodland of oak and small-leaved lime, including many old pollards. As you walk the trails, look for the rare Bristol whitebeam *(Sorbus bristoliensis)* and for Bristol rockcress *(Arabis scabra)* on the steep slopes above the River Avon. If visiting in the summer, you may see orchids *(Orchidaceae)*, western-spiked speedwell *(Veronica*

spicata hybrida) and white-letter hairstreak *(Satyrium w-album)* butterflies. In the autumn this is a great location for a fungi foray.

Leigh Woods was saved from development forever when it was bequeathed to the National Trust in 1909 by George Wills. The Trust now owns about a third of the wood. The rest is owned by the Forestry Commission.

The wood consists of two main types of woodland. To the south is an area of former pasture woodland with old pollards, mainly oak *(Quercus robur)* and some small-leaved lime *(Tilia cordata).* To the north, the area comprises ancient woodland of old coppice with standards and contains a rich variety of trees.

The majority of this area was historically part of the Ashton Court estate. It was grazed by sheep and cattle; the mosaic of grassland, scrub and old pollarded trees created is called wood pasture. Pollarding is a traditional form of management where selected trees, largely oak *(Quercus robur),* were cut 3-4m above the ground so the stock couldn't eat the fresh shoots. The pollards would have been cut periodically to produce a crop of poles that could be used. These pollards are historically important as well as being a vital habitat for many rare insects, fungi and bats. Most of the trees found here today were planted just before the First World War. (Forestry Commission)

The parish wall a 1.5m high stone wall that runs across the site also marks an old ownership boundary. Wild Service tree, Yellow Archangel and Wood Anemones can be found in the wood to the north of the wall and show that this is an area of ancient woodland. The parish wall divides the woods into two quite different parts. On the Leigh Court side there is "ancient woodland" and on the Ashton Court side there are remnants of "wood pasture". Both of these have a very long history, but in places they have been changed or added to by tree planting in the nineteenth and twentieth centuries: creating four distinct types of woodland.

It is very different in character as historically the understorey of lime *(Tilia cordata)* and hazel *(Corylus avellana)* was coppiced and the oak *(Quercus robur)* trees were grown for timber. Areas of ancient woodland can be found at the north end of the NNR and also on the gentler slope of the gorge and in Paradise Bottom at the north end of the Leigh Woods. These areas survived because of the National Trusts ownership and also the inaccessible nature the wood on the Gorge side and in the wet valley at Paradise.

The top end of the valley above Paradise Bottom was landscaped by Humphrey Repton to create a picturesque setting for Leigh Court above. This area has recently been restored by the Forestry Commission, many of the exotic trees he planted here including giant redwoods *(Sequoiadendron giganteum)* and fulham oak *(Quercus cerris)* can still be seen. The wood to the south was felled during the Second World War and was replanted with a variety of species by the Forestry Commission in the 1950s. A lot of the ancient woodland species have survived and the result is diverse and interesting woodland.

The woods on the Ashton Court side of the parish wall are much younger than the ancient woodland. For several centuries, sheep and cattle grazed here, so the area became open grassland with pollarded trees until, in the last century, grazing stopped. Then the woodland was able to grow again and the Plain is all that survives of the grassland.

During the Second World War, enemy blockades prevented the import of timber and many woods were felled. Here, the felled areas were replanted with fast growing conifers and beech. As the trees reach the appropriate size, these plantations are being

thinned out and the native, “natural” species are allowed to grow. (Forestry Commission)
On the steep grassy slopes above the river Avon, Bristol rockcress *(Arabis scabra)* can be seen in flower in April; orchids *(Orchidaceae)* and western spiked speedwell *(Veronica spicata hybrida)* in June and July. Look out for raven *(Corvus corax)* in April and peregrine falcon *(Falco peregrinus)* in May. Many butterflies and moths are about in summer including white-letter hairstreak *(Satyrium w-album)* during July. In autumn the woodland is well worth visiting to see many different fungi.
There are trails throughout the woodland, including an all ability trail, and a diverse programme of events throughout the year.

6.4.2 Coppicing in Leigh woods

The stems are cut down to ground level then left to grow again. The stumps are called stools, and some of them in Leigh Woods, which are still sprouting, could be 1000 years old. Many woods are coppiced like this to provide a continuous crop of small timber for firewood, charcoal-making and woodland crafts.
In the woods on the Leigh Court side of the parish wall you can find small-leaved lime *(Tilia cordata)* trees, wild service trees *(Sorbus torminalis)* and, in spring, the white flowers of wood anemones *(Anemone nemorosa)*. These species are only found in ancient woodlands which have survived since primeval times. To improve this valuable habitat, which is rich in wildlife, traditional management by coppicing is being revived in selected areas.

6.4.3 Leigh Woods – Public Leisure and Education

When talking about Natura 2000, there is always a need to answer the question of socio economic value. As mentioned before, the ancient woodland has many functions and values, amongst others the cultural one. It is even more obvious in case of Leigh Woods because it is an urban woody area playing an important role in leisure and education for the local public.
Local schools get very closely involved in a number of schemes fostering interest in wildlife and nature in their pupils.

Forest Schools’ activities
Forest Schools originated in Denmark back in the 1980s, using the natural environment as classrooms for pre-school children. Its aim was to give children the opportunity to learn social, physical and educational skills at the same time as encouraging an appreciation and understanding of the natural world.
The idea was introduced into the UK eight years ago and has proved to be a benefit to all ages and types of learners, from pre-school children to disaffected young people.
At Leigh Woods, the National Trust has used the concept of Forest Schools to provide experiential learning activities, often delivered through the Forest of Avon and their Wood Schools Programme. Over 200 children and young people have enjoyed these activities, from earth education activities to wood crafts.
The team at Leigh Woods has watched the children's self-confidence build, along with their enjoyment and understanding of the environment. (National Trust)

Guardianship
Guardianship schemes were originally designed to build up a close, mutually beneficial relationship between a school and their local National Trust site. There are now over 100 guardianship schools across the UK working with National Trust staff to develop active and imaginative programmes to bring the National Curriculum to life.
Leigh Woods has developed a Guardianship with Parson Street Primary School, an inner city school which, though only three miles away, is in a starkly contrasting environment from the tranquillity and beauty of Leigh Woods.
The teachers and learning support assistants plan visits in conjunction with National Trust staff so that all the children in the school visit the woods once a year. They cover the broad spectrum of the primary curriculum as well as ensuring a variety of experiences for each year group.
Examples of work are recorded in a logbook, illustrating the children's inspiration from the site and their thank you letters also show how they value the help and expertise of the staff at Leigh Woods. They began their Guardianship two years ago and everyone involved is very keen to develop it. With the woods' ever-changing scenery, the children will experience something new as they move to the next year group and regular visits will give them a sense of responsibility in respecting and caring for their precious environment. (National Trust)

Orienteering Trail
The National Trust in Bristol, in conjunction with the British Orienteering Federation, has launched a Leigh Woods Special Orienteering Trail.
The Leigh Woods Special Orienteering Trail is a 2.5 km permanent trail designed for beginners and is based around the purple all-ability trail, making it accessible to all, including wheelchair users. It has been created by the National Trust and the British Orienteering Federation as a resource for groups to use independently in the woods.
The marker points on the trail have plaques from which rubbings can be taken. These are particularly relevant to school groups using the trail as they depict many of the different birds and animals found in the woods, such as long tailed tits *(Aegithalos caudatus)* and butterflies. (National Trust)

6.4.4 Natura 2000 in Leigh Woods

Leigh Woods contains many rare species of fauna and flora; some of them are even endemic. The site has been chosen as a candidate SAC for its lime – maple ancient forest though.

9180 *Tilio-Acerion forests of slopes, screes and ravines*
Avon Gorge is representative of *Tilio-Acerion* forests in south-west England on the limestone cliffs and screes of a large river gorge. It is important because of the high concentration of small-leaved lime *(Tilia cordata)*, compared with other sites in the region, the presence of rare whitebeams *(Sorbus spp.*), including two unique to the Avon Gorge (*S. bristoliensis* and *S. wilmottiana*), and other uncommon plants, such as green hellebore *(Helleborus viridis)*. Other characteristic species include soft shield-fern *(Polystichum setiferum)* and hart's-tongue *(Phyllitis scolopendrium)*. Species-rich transitions to scrub and grasslands are associated with the woodland. Small groves of yew *(Taxus baccata)* also occur on some of the stonier situations.

Tilio-Acerion forest
Despite the local or rare occurrence of *Tilia cordata* and *T. platyphyllos* and the non-native status in the UK of *Acer pseudoplatanus* and *A. platanoides,* there is no doubt that there are good stands of woodlands that could be broadly defined, on both their floristics and ecology, as belonging to the alliance *Tilio-Acerion*. Among the numerous associations characterised from this widely distributed woodland type of ravines and rocky slopes throughout Europe, British examples span the northern limit of more Continental plants and the southern boundary of northern montane and continental northern species characteristically found in these communities. On balance, our stands are most similar to the *Tilio-Acerion* woodlands of south Scandinavian river valleys. (Natura 2000)

6.5 Thurlbear Wood

6.5.1 Introduction

I have chosen Thurlbear Wood as typical representative of small ancient woodland. Small scaled areas of ancient woodland are scattered in the British landscape and despite being often overlooked, they play a vital role in its stability and development
Thurlbear Wood lies on the limestone scarp and plateau about 6km SE of Taunton. It is a Somerset Wildlife Trust nature reserve, where human history and natural history combine to create a truly fascinating place.The 40 acres (16.2 ha) of the reserve forms part of a larger Forestry Commission holding, and is a Site of Special Scientific Interest. (Ancient Tree Forum)

6.5.2 Flora

The wood consists predominantly of ancient woodland with oak *(Quercus robur)* and ash *(Fraxinus excelsior)* standards, but also has hazel *(Corylus avellana)* and field maple *(Acer campestre)* coppice. Open glades and rides contribute to a diverse ground flora.
Large parts of the woodland are species-rich and have a history of traditional management as coppice-with-standards. Pendunculate oak *(Quercus robur)* is the dominant canopy tree with ash *(Fraxinus excelsior)* scattered throughout. The shrub layer is dominated by hazel *(Corylus avellana)*, but has a diversity of other species including field maple *(Acer campestre)*, common dogwood *(Cornus sanguinea)*, spindle *(Euonymus europaeus)*, guelder rose *(Viburnum opulus)*, wayfaring tree *(V. lantana)* and crab apple *(Malus sylvestris)*. Ancient woodland indicator species include wild service tree (Sorbus torminalis), small-leaved lime *(Tilia cordata)* and wych elm *(Ulmus glabra)*. Frequent sallows *(Salix caprea)* occur in the understorey where the water table is high throughout most of the year. A few sessile oaks *(Quercus petraea)* occur on an area of more sandy acid soil and a small number of standards of non-native species, including larch *(Larix decidua)* and pine *(Pinus sp.)*, remain and are retained to add to the species/structural diversity.
The base-rich soils support a diverse ground flora that also includes a number of ancient woodland indicators such as greater butterfly orchid *(Platanthera chlorantha*), lesser butterfly orchid *(P.bifolia)*, bird's nest orchid *(Neottia nidus-avis)* and common

broomrape *(Orobanche minor)*. Other significant woodland plant species include wood anemone *(Anemone nemorosa)*, sweet woodruff *(Galium odoratum)*, stinking iris *(Iris foetidissima)*, common cow-wheat *(Melampyrum pratense)*, enchanter's nightshade *(Circaea lutetiana)*, wood melick *(Melica uniflora)*, wood millet *(Milium effusum)*, early purple orchid *(Orchis mascula)*, goldilocks *(Ranunculus auricomus)*, sanicle *(Sanicula europaea)*, wood vetch *(Vicia sylvatica)* and wood speedwell *(Veronica montana)*. Autumn gentian *(Gentianella amarella)* is also present.
The moist conditions within the woodland are also ideal for lower plants; over 100 species of fungi and 50 of mosses and liverworts have been recorded. The lichens *Enterographa crassa*, *Lecanora conizaeoides* and *Parmelia perlata* also occur and adder's tongue fern *(Ophioglossum vulgatum)* has been recorded.
Areas of glade contain a rich calcareous flora, including such species as yellow-wort *(Blackstonia perfoliata)*, carline thistle *(Carlina vulgaris)*, dyer's greenweed *(Genista tinctoria)*, wild thyme *(Thymus polytrichus)* and bee orchid *(Ophrys apifera*), while scrub areas contain calcicole shrubs. (SWT)

6.5.3 Fauna

Records of a number of bat species including noctule *(Nyctalus noctula*), Daubenton's *(Myotis daubentonii)* and pipistrelle *(Pipistrellus sp.)* have been made along the rides and glades. Dormice *(Muscardinus avellanarius)* are also present in most areas and brown hares *(Lepus capensis)* have been seen within the wood. A number of active badger *(Meles meles)* setts occur within the reserve and roe deer *(Capreolus capreolus)* and grey squirrel *(Sciurus carolinensis)* are relatively common. Adder *(Vipera berus)* and slow worm *(Anguis fragilis)* have also been recorded.
A diverse woodland bird population includes resident green woodpecker *(Picus viridis)* and nuthatch *(Sitta europaea)* and other important nesting birds include nightingale *(Luscinia megarhynchos)*. Woodcock *(Scolopax rusticola)* are occasionally recorded in winter and hobby *(Falco subbuteo)* has been recorded in the past. A small rookery remains in trees near the northern boundary of the reserve.
There is a diverse invertebrate fauna within the woodland. Speckled wood *(Pararge aegeria)* butterflies are common throughout and the silver-washed fritillary *(Argynnis paphia)* occurs. A range of other butterflies and moths have been recorded including significant species such as grizzled skipper *(Pyrgus malvae)*, dingy skipper *(Erynnis tages)*, brown argus *(Aricia agestis)*, Duke of Burgundy *(Hamearis lucina)*, white-letter hairstreak *(Strymonidia y-album)*, dark green fritillary *(Argynnis aglaja)*, white admiral *(Ladoga camilla)*, wood white *(Leptidea sinapis)* and marsh fritillary *(Eurodryas aurinia)*. The moths brown scallop *(Philereme vetulata)*, dotted chestnut *(Conistra rubiginea)*, marbled pug *(Eupithecia irriguata)*, mocha *(Cyclophora annulata)*, little thorn *(Cepphis advenaria)* and ruddy carpet *(Catarhoe rubidata)*. Several notable species of beetle have also been recorded including the raspberry flea beetle *(Batophyla aerata)*. (SWT)

6.5.4 Past and Present

An Inquisition Post Mortem of William de Monte Acuto in 1320 gives the extent of the Manor of Thurlbear and includes 40 acres of woodland and a farm with adjoining land. Mrs Sixsmith in her "A History of Thurlbear" states that this almost certainly

refers to Church Farm (previously Simon's Court – perhaps named after Simon de Monte Acuto) and the woodland is therefore likely to be Thurlbear Wood.
The Priory of Taunton owned land in Thurlbear and there is reference in 1538 to the lease of land from the Prior of Taunton to John Carvanell (a tenant of William Portman) that included "a close lying under the wood called Priors Wood and a close called Priors Wood" (in 1855 a field just across the road from Thurlbear Church was called Priors Mead and the western part of Thurlbear Wood may have been Priors Wood).
Both 19th Century Portman Estate maps show Thurlbear Wood as comprising a separate eastern and western section, the boundary between them being marked on the ground by a clear bank with old coppiced wytch elm *(Ulmus glabra)* and hazel *(Corylus avellana).* Various factors, including the irregular shape of the wood along the parish boundary between Thurlbear and West Hatch, the presence of ancient woodland banks, large pollarded boles and coppice stools (some estimated at 200+ years old), and ancient woodland indicators such as wild service tree and small-leaved lime *(Tilia cordata),* suggest that both these areas are very ancient woodland sites.
In the late 19th Century the Portman Family lived mainly in Bryanston in Dorset and their interest in the Somerset estate appears mainly to have been for hunting and shooting. The woods were apparently in a poor state as Joseph Low was appointed as woods manager and wrote a report in 1887; following which oak *(Quercus robur)* standards were extensively planted in 1890 (vestiges of some very large stumps still remain from the felling of an earlier crop).
Limestone quarrying and burning was a major operation in the area and there are three small, shallow quarries and an old limekiln within the reserve. This latter structure probably dates from the 19th Century and burnt coal, the use ceasing about 1900. To the north of the kiln are several earthworks, probably tracks, but their function is not clear. An old track from the larger quarry ran north along the present ride 4 to the northern boundary, exiting the Reserve through a gap in the bank.
Areas of the reserve comprise a number of old fields that have been invaded by secondary wood or overgrown by scrub. Some anthills can still be seen in places, indicating absence of ploughing.
The Forestry Commission (FC) rented the woods from the Crown Commissioners in 1947 and managed the area until the licence agreement was made with the Somerset Trust for Nature Conservation (STNC - now SWT) from 1 January 1977. STNC began negotiations to manage the reserve in 1974 following discussions with FC and the Nature Conservancy Council (NCC- now EN). The initial work was undertaken by DR. E. G. Neal (see "Woodland Ecology", 1953). The Reserve was officially opened on 16 April 1976 by the Deputy Mayor of Taunton Deane. (SWT)

6.5.5 Management

Management Aims
1. Maintain and enhance the structural and species-diversity of the woodland habitats including the glades, rides, scrub and interfaces.
2. Maintain the historical features.
3. Maintain public access and the interpretation facilities.
All management is dependent on resources and changing conditions.

6.5.6 Ancient Woodland in the Thurlbear Wood

Ash-maple woods are a much loved and prominent feature of the South West. These semi-natural woods grow on calcareous (limestone/chalk) ground are dominated by ash *(Fraxinus excelsior)* trees, with associated maple *(Acer campestre)*, small-leaved lime *(Tilia cordata)*, elm *(Ulmus spp.)* and oak *(Quercus spp.)*. They contain a wealth of characteristic plants and animals and evidence of past management which has shaped the woods into those we are familiar with today. Although ancient woods are most valued for their wildlife, the ash is one of the few trees which freely regenerate and secondary ash woods, such as those on coastal landslips and abandoned agricultural land, are of considerable value. (Our South West)

The current structure of the Thurlbear Wood reflects the ways in which it has been managed either for timber or further back in time as royal hunting forests. Today ash-maple woods are mainly either high forest (forest dominated by tall trees) or coppiced woodland, where fewer tall trees (called “standards”) share the woodland with an understorey of coppiced trees. Both features are present on the site. Beyond these are still a few remnants of old wood pasture, where woods were used to graze livestock. These woods support a variety of rare plants and animals requiring a stable, undisturbed environment and are recognised as being of European importance.

7. CONCLUSION

It is often believed that the history of British woodland was a story of decline, neglect and destruction. For at least thousand years, Britain has had less woodland than most European countries and has taken correspondingly more care of its woods.

Ancient woodland is a very distinguish feature of British landscape. Each ancient wood expresses not only the natural landscape in which it is rooted and the trees and shrubs of which it is composed, but also the use that mankind has made of it, often over countless generations. Each has been to varying degrees hard-worked, loved, misunderstood, exploited or protected.

The ecological value of ancient woodland varies considerably and so does the level of its legal protection. While some ancient woods are still not protected at all and therefore very prone to destruction, others are treated as not only British but European treasure.

The semi-natural ancient forest as well as biodiversity in general provides many beneficial functions and services.

Often overlooked aspects of many ancient woods are the historical features. Ancient woodlands of Britain are important historical monuments just for the reason that they have been used intensively for a long time. Unlike many other ancient forests throughout Europe, in Britain the ancient system of combining grazing and wood cutting on the same patch was widespread and on some places still exists.

The most widespread ancient woodland management activity of the past as well as the present is coppicing on some places accompanied by pollarding or grazing. Coppice can have a significant impact on wildlife. The numbers and kinds of plants and animals found in an actively coppiced wood are strongly influenced by both past and present management.

European legislation in form of Natura 2000 does not protect ancient woodland as one of its protection categories for an obvious reason – the quality of ancient wood from the conservation point of view is extremely variable. Many woodland categories of Habitat Directive do, nevertheless, cover forest types which often occur in ancient woodland.

The example areas show the importance of ancient woodland in landscape and offer a view of ancient woodland site protected under European legislation.

8. SOURCES OF INFORMATION

AGATE, E., (2002). *Woodlands – a practical handbook.* Wallingford: British Trust for Conservation Volunteers.

Ancient Tree Forum /Internet/, 05/2008, http://www.woodland-trust.org.uk/ancient-tree-forum/

BROOKS, A. /ed./, 1991, *Woodlands: A Practical Conservation Handbook.* Wallingford: British Trust for Conservation Volunteers.

Centre Parks /Internet/, 05/2008, http://www.centerparcs.co.uk/sherwood

DEFRA – *Biodiversity Action Plan UK* (1994). London: HMSO.

Forestry Commission /Internet/, 05/2008, http://www.forestry.gov.uk/

Forestry Commission – Visitor Survey 2005, Sherwood Forest /Internet/, 05/2008, www.forestry.gov.uk/pdf/sp2005report.pdf/$FILE/sp2005report.pdf

George Orwell /Internet/, 06/2008, http://www.george-orwell.org/Some_Thoughts_on_the_Common_Toad/0.html

Joint Nature Conservation Committee (JNCC) /Internet/, 02/2007, http://www.jncc.gov.uk/

KIRBY, K., GOLDBERG, E. 2006, *Ancient Woodland: Guidance Material for Local Authorities*. Peterborough: English Nature.

MARREN, P. 1992, The Wild Woods, A Regional Guide to Britain's Ancient Woodland. London: Nature Conservancy Council.

MARREN, P. 1990, *Woodland Heritage*. London: David&Charles.

National Trust /Internet/ 12/2006, http://www.nationaltrust.org.uk/main/w-global/w-localtoyou/w-wessex/w-wessex-countryside/w-wessex-countryside-oak_woods.htm

Natura 2000 /Internet/, 02/2007, http://www.natura.org/

Natural England /Internet/, 05/2008, http://www.naturalengland.org.uk/

Naturenet /Internet/, 02/2008, http://www.naturenet.net/

Nottinghamshire County Council /Internet/, 05/2008, http://www.nottinghamshire.gov.uk/

Our South West /Internet/ 06/2008, http://www.oursouthwest.com/Wild_Hab/Countryside/Ash%20Maple%20Woodland/ashmaplE.htm

Palmer, J. 2002. The Major Oak. /Internet/ 05/2008, http://www.eyemead.com/majoroak.htm

PETERKEN, G.F. 1981. *Woodland Conservation and Management*. London: Chapman and Hall.

PETERKEN, G.F. 1983. Woodland conservation in Britain. *In*: WARREN, A. & GOLDSMITH, F.B. /eds./. *Conservation in perspective*, Chichester: Wiley.

Planning Policy Statement PPS9, 2005, London: Government Department

RACKHAM, O. 1980. *Ancient woodland*. London: Edward Arnold.

Sherwood Forest Web Site /Internet/, 05/2008, http://www.sherwoodforest.org.uk/

Somerset Wildlife Trust (SWT) /Internet/, 08/2008, http://www.somersetwildlife.org/

The Domesday Book Online /Internet/, 06/2008, http://www.domesdaybook.co.uk/faqs.html#1

The New Forest LIFE /Internet/, 01/2007, http://www.newforestlife.org.uk/

The New Forest National Park /Internet/, 01/2007, http://www.newforestnpa.gov.uk/

The Tree Council /Internet/, 05/2008, http://www.treecouncil.org.uk/

The Royal Forest of Dean /Internet/ 05/2008, http://www.fweb.org.uk/dean/

The Woodland Trust /Internet/, 06/2008, http://www.woodlandtrust.org.uk/

THOMPSON, R.N., HUMPHREY, J.W., HARMER, R. and FERRIS, R., 2003. *Restoration of native woodland on ancient woodland sites.* Forestry Commission Practice Guide.

TUBBS, C.R. 1986. *The New Forest*. London: Collins.

Vera, F.W.M., 2000. *Grazing Ecology and Forest History*, Wallingford: CABIPublishing

Warren, M.S., Fuller, R.J. 1993. *Coppiced Woodlands: Their Management for Wildlife.* Peterborough: JNCC.

WATKINS, C 1990 *Woodland Management and Conservation.* Newton Abbott: David & Charles.

Wildlife Trust /Internet/, 06/2008, http:www.wildlifetrusts.org/

9. FURTHER READING

Ancient Tree Hunt /Internet/, http://www.ancient-tree-hunt.org.uk/

BROWN, A.E., BURN, A.J., HOPKINS, J.J. and WAY, S.F. (1997). *The EC Habitats Directive: selection of Special Areas of Conservation in the UK.* Report 270. Peterborough: JNCC.

CONOVER, M. R., 2002, *Resolving Human-Wildlife Conflicts: The Science of Wildlife Damage Management*, Toronto: CRC Press.

GHK Consulting Ltd, 2004, *Revealing the value of natural environment in England*, Report to DEFRA, Plymouth

KETUNNEN, M. & BRINK, P. 2006. *Value of biodiversity* - Documenting EU examples where biodiversity loss has led to the loss of ecosystem services. Final Report for the European Commission. Institute for European Environmental Policy (IEEP), Brussels.

LOVETT-JONES, G., MABEY, R. 1993, *The Wildwood*. London: Aurum Press Limited.

RACKHAM, O. 1976 *Trees and Woodland in the British Landscape*. London: J.M.Dent

READ, H., FRATER, M., WRIGHT, J. 1999. *Woodland Habitats*. London: Routledge.

STARR, C. 2005. *Woodland Management – A Practical Guide.* London: Crowood Press Ltd.

WATTS, C. *et al*. 2005. *Forest Network Habitats*. Edinburgh: Forest Research.

WHITBREAD, A.M. 1990. *How relevant is the identification of ancient woodland to woodland conservation in the upland counties of Britain?* Quarterly Journal of Forestry, 84,
29-36.

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73 Woodland Trust & Game and Wildlife Conservation Trust, Woodland creation and management for pheasants â€“ a best practice guide. 74 Forestry Commission England, 2010, Managing ancient and native woodland in England. 75 Sage et al., 2005, Biological Conservation, 122: 243â€“252. 76 Kirby, 2001, Forestry, 74: 219â€“229. 77 CÃ´tÃ© et al., 2014, Annual Review of Ecology, Evolution, and Systematics, 35: 113â€“147. 78 Forestry Commission Scotland, 2014, Scotlandâ€™s Native Woodlands: Results from the Native Woodland Survey of Scotland. 79 Highways Agency, 2013, A21 Tonbridge to Pembury Dualling Scheme Re