Wooded Heaths in the High Weald

A research project to further the understanding of the ecology and management of the woodland / heathland mosaic

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by

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CONTENTS

SUMMARY

This project is aimed at raising the profile of wooded heaths in the High Weald, although the information contained in it is relevant to all heathy areas in southern England. Many of the sites considered to be lost heathland are also mapped as semi-natural ancient woodland, and separating which sites are historically heath and which are historically woodland has caused problems. The existing programmes aimed at restoring either heathland or semi-natural woodland have not addressed adequately the fact that there is a spectrum of biotopes between 'heathland' and 'woodland'. The Weald Heathland Initiative is seeking guidelines that will establish wooded heaths as an integral component of both heathland and woodland. This will assist management, contribute to targets for restoration and which will also be compatible with the economic targets of Forest Enterprise.

In order to achieve the aims of this project, the Record Centre Survey Unit has commissioned and collated a desk study of the history, ecology and cultural importance of wooded heaths, a protocol for the survey and assessment of wooded heaths and the digitisation of historical maps of the area on ArcView Geographical Information System, linking these with aerial maps. The information thus gathered has been presented in a report consisting of three Sections:

Section I. Wooded Heaths in the High Weald

Section II. Wooded heath Survey and Assessment Protocol

Section III. Mapping High Weald Wooded Heaths, Past and Present (*Submitted separately*)

It is hoped that this work will contribute to ensuring that wooded heaths acquire a status equal to that of open heath and ancient woodland, and that the conservation of the entire heath / wooded heath / woodland continuum will be seen to be the responsibility of heathland and woodland managers. An appropriate management strategy should help to achieve this, and will reconcile perceived conflicts of interests between heathland and woodland conservation, and facilitate the conservation of all these habitats in the High Weald area.

SECTION I WOODED HEATHS IN THE HIGH WEALD

1. INTRODUCTION

1.1. Background

The High Weald Area of Outstanding Natural Beauty (AONB) is an area of 1,450 square kilometres lying within the High Weald Natural Area (Patmore, 1997). It was designated as an AONB by the government in 1983 to conserve and enhance the natural beauty of this historic countryside of rolling hills and deeply cut valleys draped by small, irregular fields, abundant woods and hedges, scattered villages and farmsteads and sunken lanes. Broadleaved woodland is the predominant land cover in the High Weald, some areas of which are on the provisional Ancient Woodland Inventory which is administered by English Nature (EN). Heathlands occur along the wooded ridges of the High Weald and additionally, heathy habitats can be found within semi-natural ancient woodlands, where they may once have been managed under a pasture woodland management system. These 'wooded heaths' or 'heathy woods' are an important element of the High Weald biotope mosaic. In the 20th Century, intensive agriculture, forestry plantations, house and road building have destroyed both semi-natural broadleaved woodland and heathland. Some 50% of the Weald's open heathland is estimated to have been lost since the beginning of the 19th Century (Sussex Biodiversity Partnership, 1998), a loss which elevates the national importance of the remaining areas.

The 1992 Earth Summit in Rio de Janeiro resulted in the endorsement of the Convention of Biological Diversity, which in the UK led to the production of the National Biodiversity Action Plan. Priority Habitats, including both broadleaved woodland and heathland, were the subject of both National and Local Habitat Action Plans (HAPs), one feature of which was the setting of measurable targets aimed at their conservation and restoration.

In order to achieve these targets for the Lowland Heathland HAP, EN set up *Tomorrow's Heathland Heritage*, a national umbrella project funded by the Heritage Lottery Fund. This project aims to restore 58,000 ha and to recreate 6000 ha of lowland heath in the UK by 2005. The Weald Heathland Initiative Project operates within *Tomorrow's Heathland Heritage*, and is a five-year programme of work established by a partnership between the High Weald AONB Unit, English Nature, East Sussex County Council, West Sussex County Council, Kent High Weald Project, Ashdown Forest Conservators, the Royal Society for the Protection of Birds and the Department of Farming and Rural Affairs. Heathland restoration work is being carried out on a target 1500ha in the Weald and includes scrub clearance, bracken control, heather cutting and fencing, with the introduction of grazing in some areas to achieve sustainable, long-term management.

The Sussex Lowland Heathland HAP has as one of its targets the recreation of at least 800 ha of heathland from forestry or other land by 2010, where possible linking together or enlarging existing sites (Sussex Biodiversity Partnership, 1998). The Sussex Woodland HAP has comparable targets, one

of which is the restoration of 10% of planted ancient woodland to semi-natural woodland (Sussex Biodiversity Partnership, 2000). Land ownership and existing land management are likely to be important factors in setting and achieving targets identified in both HAPs

The strategy under which the Forestry Commission (FC) operates has changed from promoting policies aimed solely at commercial timber production to those aimed at promoting rural development, recreation, tourism, the environment and conservation (Forestry Commission, undated) alongside the more traditional economic objectives. Indeed, the UK Woodland Assurance Scheme (UKWAS) stipulates the full or partial restoration of Plantations on Ancient Woodland Sites (Spencer, 2002).

1.2. Woodlands or heathlands – a perceived conflict

The sum result of these initiatives is a drive to conserve, restore and recreate areas of both broadleaved woodland and heathland in the High Weald. Forest Enterprise (FE), as one of the participants in these initiatives, has also to encompass an economic aspect, as some of the areas likely to have restoration potential to either semi-natural woodland or heathland is currently under forestry plantation. On some sites, there has been a perceived inconsistency between heathland restoration and areas included in the provisional Ancient Woodland Inventory. In particular, the FC has questioned whether it is appropriate to remove tree cover permanently in ancient woodlands. Part of the problem is that the Inventory is not always a clear guide to the presence or absence of ancient woodland. The Ancient Woodland Inventory project was started in 1981 by EN's predecessor, the Nature Conservancy Council. The project aimed to list all likely ancient woods (sites believed to have been continuously wooded since at least 1600) and to identify those areas that were still semi-natural (composed predominantly of trees and shrubs, natural to the site and not obviously planted). It listed only those woodlands larger than 2ha.

As well as the omissions and potential discrepancies in the Inventory, there is also the question of the range of habitats associated with heaths and woods. At one end of the range, there are sites clearly identified as heathlands, which are currently under plantation forestry. At the other end, there are well-documented ancient woodlands, which contain some typically heathland plants, for example heather *Calluna vulgaris*, as an element in their ground and shrub layers in open space such as rides and glades. Some ancient woods, such as the Charts found in West Kent and Surrey, were grazed commons. Although these have a strong heathy element in their flora, they appear to have been continuously wooded and should probably be considered as abandoned pasture woodland that was once perhaps similar to the New Forest today. In addition, the ground flora of some woodlands included in the AWI may be dominated by heathland indicators in open or recently felled areas. Detailed examination of the historical data from such sites can reveal a complex management history, with a mixed pattern of woodland, grazing, and shifting agricultural use. This may question the validity of assumptions about the continuously wooded nature of these woods.

Many of the sites considered to be lost heathland are also mapped as semi-natural ancient woodland, and separating which sites are historically heath and which are historically woodland is causing problems. The existing programmes aimed at restoring either heathland or semi-natural woodland have not addressed adequately the fact that there is a spectrum of biotopes between 'heathland' and 'woodland'. This spectrum may loosely be termed 'wooded heaths', 'heathy woods' or 'woodheaths'. The WHI partnership is seeking guidelines that will establish wooded heaths as an integral component of both heathland and woodland, that will assist management, contribute to targets for restoration and which will also be compatible with the economic targets of FE in the south-east region.

1.3. Aims

This survey covers a considerable range of issues and interests. Its aims may be summarised as follows:-

i. To conduct a desk study of wooded heaths, covering their history and cultural importance, broadening the understanding of this habitat.
ii. To review woodland and heathland definitions, and develop definitions for the wooded heath matrix
iii. To establish recognition of heaths and wooded heaths as part of a mosaic in the restoration under PAWS.
iv. To identify management options
v. To map present distribution of wooded heaths and to enable direct comparison of past and present extent of woodland / heathland matrix across the High Weald.
vi. To use these digitised maps to identify potential sites for heath, wooded heath and woodland restoration maintaining connectivity.
vii. To identify economic opportunities

2. UNDERSTANDING WOODED HEATHS

2.1. Historical review

2.1.1. The evolution of heathlands

The exact nature of the original wilderness prevalent in lowland UK is still the subject of lively debate, but generally is thought to have been a dynamic mosaic of woodland, scrub and open, grazed areas some of which would have been heathy. The potential for heathland as part of the woodland mosaic is supported by an analysis of existing soil cover, which indicates that there are some 853,800ha of acidic, sandy or peaty soils in lowland England (Symes and Day, 2003). All of these soils could have supported some form of heathland vegetation at some stage in the past.

The history of land management in southeast England from the Mesolithic period to the present day has been well-documented (Brandon, 1997 & 2003; Tubbs, 2001; Vera, 2000 and many others) and seems well-understood. Irrespective of the original character of the wilderness, once the first land clearance for agriculture by Mesolithic people had begun, an increase in the pollen of heather and associated plants (Smith and Howard, 1996) indicates an expansion in heathland. Since the Mesolithic, there have been repeated attempts to cultivate or farm potentially heathland areas and agricultural practices have indeed modified many of them. Some were more readily suited to arable or pasture, others failed due to poor soil fertility and the land reverted to heathland (Symes and Day, 2003). Other areas of potential heath would have retained their tree cover, especially in the numerous game reserves and parklands that were the preserve of royalty and nobility. Woodlands were also maintained to provide a source of timber for ships, buildings and many other purposes.

Taking into account this generalisation, it seems that by the mid-1700s, the area of lowland heathland probably reached its maximum extent, with perhaps 230,000 ha in England (Symes and Day, 2003). This was a time when rural populations were relatively high and needed grazing land and sources of fuel but agrarian technology had not developed sufficiently to allow successful and permanent conversion of heathland to agriculture. Detailed accounts of rural England started to appear from the 17th century onwards (Aubrey, 1685; Defoe, 1888 and Cobbett, 1830), and a picture of a southern English landscape that would be rather unfamiliar today can be built up. Grass pastures, hay meadows and arable fields were fewer and there was more woodland, together with vast acres of common grazing often known as ‘waste’, a word applied to uncultivated land.

Historically, common grazing lands served a variety of purposes and provided a range of materials including timber, underwood, rough grazing, gorse for fuel, bracken for animal bedding, heather for thatching and so on, as well as being fundamental to the Wealden iron industry. Within the limits of contemporary knowledge, many of these areas were carefully managed to achieve the objectives that were important at the time. Sheep, cattle, horses, pigs and geese were all grazed on the waste as of customary right. These

domestic animals were just as often turned out into woodland as onto open ground and both were regarded as pasture. Many heaths and heathy woods were also managed as rabbit warrens. Grazing in woodland inevitably deterred tree regeneration as well as having considerable impact on ericaceous and other plants in the field layer. Heather and dwarf gorse *Ulex minor* were both important as winter browse in heaths and heathy woods (Tubbs, 2001). Common grazing was also needed along the drove roads as stock had to be driven to markets, fattening pastures and other destinations (Cobbett, 1830). But management of all such areas was not necessarily constant and probably changed significantly over time as different products changed in economic importance. The most likely constants would have been grazing, turf-cutting for fuel and some form of tree harvesting.

Common lands on more fertile soils would inevitably have been more productive than those on infertile, sandy soils. The continual removal of dung, wool and meat helped to reduce the fertility still further, and in acid areas, ultimately encouraged the development of completely treeless heaths (White, 1789). Plants such as gorse *Ulex europaeus*, bracken *Pteridium aquilinum* and heather were assiduously harvested, again removing nutrients. These inherently infertile heaths would have only supported a marginal type of agriculture (Gimingham, 1972), from which people would have had to support themselves and their livestock by any means available. Burning would have prevented the growth of scrub and trees and encouraged the new growth of heather on which their animals depended. Even so, heathlands would have optimally supported only a low density of grazing animals and on many of the poorer soils, the productivity must have declined. As the human population increased, it is not hard to envisage overgrazing that in places would have resulted in an impoverished heathland landscape that at worst could truly be described as a waste. Not surprisingly, some heathland 'wastes' were described at the time as being vast, desolate areas that were open, almost treeless and with expanses of bare sand able to support only a few sheep (Symes and Day, 2003).

The area of lowland heathland began to decline with the industrialisation of Britain, as agricultural and silvicultural improvements meant that previously infertile land could be utilised. This conversion accelerated through the 19th and continued into the 20th century. The railway network developed and made timber and farm produce easier to transport. Coal was also more easily transported and began to replace turves and peat as fuel. At the same time, the clipper trade with Australia ended the premium value of wool (Symes and Day, 2003). Also since the start of the 19th century, the improvement, afforestation, and abandonment of common grazing grounds diminished and transformed the once extensive heathlands of southern and eastern England. The Forestry Commission was established in 1919, just after World War I, for the purpose of providing commercial timber as quickly as possible (Westoby, 1989). Pine plantations, such as Thetford Forest, together with other conifer plantations, were established on large areas of heathland.

During World War II the drive for self-sufficiency caused a large-scale conversion of heathland to farmland, although the poorest soils were

abandoned soon after, but it was the period between the end of this War and the 1980s that saw the most rapid losses of lowland heathland. This was caused by the expansion of urban areas together with an increasing demand for sands and gravels, further afforestation and technological advances and incentives to convert heathland to agricultural land (Symes and Day, 2003). Losses due to these reasons were largely halted by statutory designations aimed at protecting the dwindling remnant of lowland heathland. Now, one of the biggest threats to the remaining heaths is a lack of management.

2.1.2. Past management of woodlands.

Woodlands, ancient or otherwise, have also undergone massive change with the decline in demand for coppice and underwood products and oak and other timber for ship and house building. Thousands of hectares of woodland have been lost to development, cleared for agriculture, or replanted with conifers, and occasionally broadleaved trees. With the cessation of coppicing and other management operations, other woodlands have developed a dark, dense, closed canopy, producing a habitat of a type that is considered by some to be possibly rather rare either in nature as discussed in Kirby, 2003), or in the pre-18th century managed landscape.

Coppice today is often thought of as sweet chestnut *Castanea sativa* or hazel *Corylus avellana*, grown on rotations of 12 to 25 years to provide material for posts and fencing. In the past other species were also coppiced for specific uses, including oak, ash, hornbeam and alder. Oak was a popular coppice wood for charcoal, the tanning industry and innumerable other purposes and there was a demand for short-rotation material to make items such as barrel hoops (2-3 years) and hop poles (4-6 years). The harvest of coppice wood undoubtedly produced a much more varied and wildlife-friendly vegetation structure in the past than modern coppicing, where the demand for wood of some commercial value requires a longer rotation. This results in a far less open coppice wood structure than that resulting from short-rotation coppice. The width, frequency and floral composition of woodland rides has also changed considerably under modern silvicultural regimes, while in many places *Calluna* and other plants important in providing food for wildlife both from foliage and flowers have been deliberately weeded out as they were, and in many places still are, thought to inhibit the growth of the timber crop (Handley, 1963; Norberg *et al.,* 2001).

In addition to the agricultural systems of the wider countryside in the past, many places were enclosed as game reserves and parklands and some of these are now among the better-known areas of pasture woodland with its characteristic wildlife. Other woods had to be kept largely animal-free in order to allow the coppice to regenerate and the standards to grow for eventual timber use. In these situations deer, if present, would also have had to be controlled. These woods today are often among those classified as ‘ancient woodlands’.

2.1.3. Wooded heaths in historical context

Woodheaths would have been part of a more complex and finely tuned farming system than that of today and the surrounding habitats, whether

grassland or heath, were probably not seen as separate from the more wooded areas but as part of the available foraging area for farm livestock. Cattle grazing was still going on in some Wealden woodheaths until the mid 20th century. The kinds of meadow that were widespread on the acid soils of the High Weald can be illustrated by the plant list for Three Cups Corner Meadow on the ridge between Heathfield and Battle, and Hadlow Down Churchyard, set amid heathy woodlands with names like Wilderness Wood and Oxpasture Wood that indicate their past use as wood pasture (Appendix 1).

Any consideration of woodlands, heathlands and their past usage as a whole can only be a generalisation. In looking at any particular woodland, heath or other discrete area, it is important to try and establish its management history in order to get a better understanding of how it came to be the way it is and the various stages it passed through en route. Some woods were clear felled in the First and Second World Wars, others were not; grazing persisted in some places until relatively recently, in others it may never have occurred in historical times; in some coppices heather and other plants were regarded as weeds and removed, in others they were not, and so on.

To illustrate this point, three examples of heathy woodland are considered briefly below:

<u>Beckley and Flatropers Woods</u>

- Beckley and Flatropers Woods suffered exceptional destruction from iron and glassmakers during the 16th century (Pratt, 1999). Oak was replanted at Flatropers Wood during the 1910s and 1920s, then a great clearance took place during the winter of 1934/35 and much felling also took place in 1947. Broad-leaved trees were largely replaced with conifers. A large area of heather was cleared in 1948/49 and turned to arable. Since the storm of 1987, wild boar have become established and are increasingly common.

<u>Brede High Wood and the Great Sanders Estate</u>

- This was an important iron mining area from Roman times and had a large foundry from the Medieval period. Following the closure of this the woods were needed for many purposes by a powdermill (for the production of gunpowder) that was in operation until the early 19th century. In addition there was a glass-making industry and a brick kiln in the woods.

  In the later 19th century much of the area was preserved for game and there were several mixed farms with woods, fields, rough grazing, orchards and hop gardens. These were demolished in the early 1930s when the valley became the catchment area for the Powdermill Reservoir. The sides of the valley not already woodland were planted with conifers and a variety of broadleaved trees, though much of the original woodland was left. A few open, heathy areas escaped afforestation and were, for a while, remarkably rich in wildlife, especially after the 1987 storm. Their quality declined until recently but is now improving due to more ecologically sensitive management.

New Forest

- …. the impact of large herbivores [in the New Forest] was high before 1800, diminished to a low-point in mid-century, rose steeply to a high towards the end of the century, fell again, recovered somewhat during and after the First World War, fell to an all-time low in the 1930s, rose to another peak in the late 1970s, declined somewhat in the 1980s and has since risen steeply again (Tubbs, 2001).

2.2. Landscape and recreational value

The appeal of a landscape is, to a large extent, in the eye of the beholder but open woodland does provide an opportunity to see a reasonable distance and to enjoy the trees, the rich ground flora and the birds, animals, butterflies, bees and other creatures. The picturesque quality of such open woods was not lost on poets and authors such as Thomas Hardy and Thomas Love Peacock, who describe wooded heath landscapes with affection. Rudyard Kipling and William Cobbett also wrote of such areas in the High Weald. Cobbett (1830) is particularly interesting as he tended to heap invective on heathlands as unimproved wastes of little agricultural value. Of the countryside near Horsham, for example, he says:

> It was a bare heath with here and there, in the better parts of it, some scrubby birch. It has been, in the past, planted with fir-trees, which are as ugly as the heath was; and, in short, it is a most villainous tract.

Though he was familiar with heather, many of these places described by Cobbett had probably been severely overgrazed and overcropped and had few ericaceous plants remaining in flowering condition. Aubrey, writing of Wiltshire in the mid-17th century describes this exhausted landscape well:

> In Boudon-parke, fifteen foot deep under the barren sand, is a great plenty of blew marle, with which George Johnson, Esq., councellor-at-law, hath much improved his estate there. The soile of the parke was so exceedingly barren, that it did beare a gray mosse, like that of an old park pale, which skreeks as one walkes on it, and putts ones teeth on edge. Furzes did peep a little above the ground, but were dwarfes and did not thrive.

When Cobbett visited Eridge Park he seems, however, to have been pleasantly surprised:

> I saw here what I never saw before: the bloom of the common heath we wholly overlook; but, it is a very pretty thing; and here, when the plantations were made, and as they grew up, heath was left to grow on the sides of the roads and in the plantations. The heath is not so much a dwarf as we suppose. This is four feet high; and, being in full bloom, it makes the prettiest border that can be imagined.

It would appear that all the other heaths Cobbett had travelled through were those where over-grazing had driven the dwarf shrubs almost to extinction.

One of the difficulties of landscape management when the maintenance and enhancement of biodiversity is a high priority is that members of the general public often prefer the *status quo*. They like to see heathland remain as

heathland, and woodland as woodland. Thus, as heathland goes through its natural successional stages towards closed canopy forest, people are likely to protest at management operations that involve fencing and/or felling. The conflict over the future of Odiham Common in Hampshire is a good example of this. The wooded heath landscape, with all its habitat mosaics, may stand a better chance of being understood and appreciated. Judging by old postcards of the former open, worked woods of the Weald, this landscape was much appreciated by the postcard-sending people of the time.

Woodlands, heaths and wooded heaths all have considerable recreational value, perhaps even more so today than in the past. Many pursue activities such as rambling, family outings or horse-riding, all of which are compatible with a sensitive use of the landscape. Less suitable diversions such as off-road 4-wheel driving, and motorbike scrambling have a more negative impact on the environment but nevertheless are taking place.

2.3. Historical overview

It can thus be seen that historically, human usage created, shaped and maintained a range of biotopes from woodland, to wooded heaths, open heathland to almost barren stretches of overgrazed sandy ‘waste’. This review demonstrates that wooded heaths are an integral and inseparable part of both heathlands and woodlands on acid soils. They a part of our cultural history, yielding much information about how people in southeast England lived in a pre-industrialised world. They have a role to play in today’s culture, providing opportunities for recreation and a sense of place and local identity. They also have a considerable ecological importance, and it is this topic that is dealt with in the next chapter.

3. DESCRIPTION AND ECOLOGICAL IMPORTANCE OF WOODED HEATHS

3.1.Woods and Heaths in the High Weald

3.1.1.Woodlands in the High Weald

Few areas of true primary woodland remain in the High Weald. Notable exceptions include Marline Wood, parts of Dallington Forest and fragments in many of the small gill woodlands. Some areas of parkland, especially Eridge and Ashburnham, also appear to encompass relicts of the most ancient woodland wilderness (Rose *et al.,* 1991). Other, more extensive areas of woodland are likely to have developed since the middle ages when the landscape was probably much more open and grazing had much more of an impact on the countryside. The botanist Dr Francis Rose has proposed the use of lichens on ancient trees as indices of habitat continuity in various publications, but despite its ecological validity this has considerable practical difficulties due to the very few lichenologists available to undertake survey work.

The High Weald nevertheless has a long history of extensive woodland cover and much of it is classified as ancient semi-natural woodland in the Ancient Woodland Inventory (NCC 1989). However, the AWI excludes sites of less than 2ha and in the High Weald there are many small fragments of woodland of great antiquity and high biodiversity that form part of the characteristic landscape mosaic of the AONB and which encompass many woodheath sites.

When the AWI was composed, the information available for individual sites varied considerably in quality and quantity. It included information sources such as historical maps, field survey data, and aerial photographs. There was not always a close tie-up between the quality of data available and the quality of the wood. A well-documented wood might in the end prove to be of recent origin (from the 18th century), while some 'classic' ancient sites are very poorly documented. The AWI is thus described as 'provisional'. It is EN's best estimate of the extent and distribution of ancient woodland at any one time, but any entry is open to revision in the light of new information about the origins of a wood, changes in its current state, or the identification of errors in the original compilation process. It is now considered by Dr Tony Whitbread (Sussex Wildlife Trust), Patrick McKernan (Woodlands Officer, South-East AONBs) and others that the definition of 'ancient woodland' used in the AWI should be revised. Redefining what constitutes an ancient woodland would more accurately reflect the dynamics of such woodlands over time. The proposed development of the definition of ancient semi-natural woodland used in the AWI is as follows:

An area of land thought to have had a continuity of woodland habitat since at least 1600 AD including:

- *Areas with continuous woodland cover*
- *Areas managed or periodically cleared for timber or underwood production*
- *Areas regenerating following woodland management*

- *Open grazed areas within the woodland site (at least 20% woodland over 80% of the site)*
- *Temporary or permanent open habitat within the woodland complex*
- *Temporary clearings that may have been created within the woodland complex but which have regenerated, or are regenerating, back to woodland*

(Whitbread, 2003).

Applied to the High Weald, this re-definition of "ancient woodland" will take account of the much more open character of woodland in the past and the greater frequency of pasture woodland within the dynamic mosaic of habitats.

3.1.2.Heathlands in the High Weald

The High Weald contains a significant amount of all lowland heathland remaining in the UK, including Ashdown Forest which at around 2,600ha is the largest area of heathland in southeast England (Sussex Biodiversity Partnership, 1998). Heathland also occurs in the western High Weald in the vicinity of St Leonard's, Tilgate and Worth Forests and further east at Broadwater Forest and The Warren on the East Sussex / Kent border (*ibid.*, 1998). Much of this surviving heathland is in small, scattered fragments and although several areas are now protected, the greatest threat to them is from encroaching scrub.

West Sussex also has a tract of heathland sites on the Wealden Greensand. The phytosociology of High Weald heathlands is different from the Greensand heaths, largely due to differences in soil properties. The wetter, more nutrient retentive Wealden sands tend to support greater areas of cross-leaved heath *Erica tetralix* and purple moor-grass *Molinia caerulea* and have subtly different wet heath and valley mire communities, although the component list of plant species between the two areas are similar there are differences in the proportions of each species present.

3.2. Ecological Description of Wooded Heaths

The wooded heaths of south east England consist of open, ungrazed, or lightly grazed, woodland on acid soil with sufficient insolation between the larger trees to allow *Calluna* and other characteristic heathland plants to flourish, often alongside a ground flora that is not specifically associated with heath. These wooded heaths are dynamic habitats that can either have arisen as a result of natural succession of open heath to W16 woodland (Rodwell, 1991) or that have a longer history of continuous management as acid pasture woodland. The location of tree cover and ratio of canopy to open space across any site is likely to be fluid, especially in former pasture woodland. Wooded heaths are different from simply woodlands on acid soils because their ground flora component is strongly linked to heathland rather than being specifically woodland communities that have a high proportion of vernal species and ferns. They also have a different structure from acid woodlands, which were often managed specifically for timber and underwood production. The more silty nature of the Wealden sands is likely to have promoted the development of woodheath rather than the more typical open heathland of the Greensand to the west because although the soils are free

draining they can also be prone to local waterlogging and are generally more nutrient retentive.

The importance of wooded heaths for particular species and groups is likely to be closely related to their structural diversity and their combination of characteristics of both woodland and heathland habitats. In effect they often tend to have a high proportion of “edge” habitat, which has intrinsically high biodiversity. This allows woodheaths to support plant and animal assemblages that combine species from both habitats, as well as a small suite of taxa that are most closely associated with woodheath, including some characteristic vascular plants, bryophytes and lichens, as well as some invertebrates and birds with quite narrow niche requirements. Some of these species are used as a preliminary set of indicator species and habitat associates in Section II, Survey and Assessment Protocol, Table 2).

Wooded heath habitats can be found across southeast England, including parts of the New Forest. There are many areas of habitats in the New Forest that are similar to those in the High Weald and much can be learnt from the way that these are managed, but there are also significant differences, particularly the much more fragmented nature of the High Weald woodheaths. The New Forest SAC Management Plan (Life Partnership Programme, 2001) contains definitions of the types of pasture woodland that occur there. These are based on extensive field data gathered by ecological consultant Neil Sanderson in recent years. There are similarities to the system we are developing to define types of woodheath in the Weald, but we do not yet have the field data to test our system.

Despite the points made above, generalising about woodheaths can be unhelpful because they are extremely heterogeneous habitats comprising very diverse mosaics that have arisen from a variety of different past treatments and highly localised edaphic and climatic conditions. Although they have basic elements in common, such as soil type and the kind of vegetation cover, their complexity of past treatment is probably the most important factor in their development so each site needs to be examined individually.

3.3. Identification and Definition of Types of Wooded Heath

A protocol for surveying and assessing woodland and heathland areas has been developed that will identify areas of existing woodheath and also those areas that are suitable for the creation of woodheath. This protocol is presented in Section II. It is initially a draft that is designed to be tested in the field at one or more sites and refined as necessary.

The assessment should be viewed as a multi-stage process intended to identify those wooded sites in the High Weald where management for “woodheath” is more appropriate than conventional woodland management. It is not the intention to advise the conversion of semi-natural ancient woodlands to either wooded heath or heathland. Rather, it is intended to raise the profile of wooded heaths as a component of the woodland / heathland matrix, and to advise where such areas, and areas of open heathland, might best be conserved or restored.

The proposal is that wooded heaths should be identified and defined primarily by the use of the survey protocol shown on the site survey and assessment forms. It is suggested that the analysis of the survey results could be via a points system relating to the site matrices (Section II, Tables 1 and 2) such that sites that score most points are closest to "wooded heath" as opposed to heathland or ancient woodland. Four broad, theoretical types of heathy woodland are described in Table 1 but these woodland types are only nodes on the habitat continuum from open heathland to ancient semi-natural (often coppiced) woodland with "woodheaths" being intermediate in nature between these two extremes. It is hoped that this protocol will prove rigorous but flexible enough to identify any existing or potential woodheaths in the High Weald or elsewhere in spite of their heterogeneity.

The assessment process is divided into six stages which are summarised as follows:-

- Identification of site boundaries
- Collation of existing information (maps, management plans. aerial photographs etc)
- Preliminary site mapping
- Division of site into more or less homogenous habitats / areas (subsites) if necessary
- Use of Table 1 (Section II) to assist definition of subsite habitats
- Use of Table 2 (Section II) to assess potential for heathland / woodheath management and restoration for the whole site or subsites.

At the end of the assessment process, an evaluation of the site should be made to direct management/restoration decisions. This evaluation is made via a scoring system for different attributes of a site or sub-site. High scoring sites are more suitable for heathland/woodheath management techniques than low scoring sites or sub-sites. Table 3 (Section II) is an example of the kind of summary table that is intended to be easy and convenient to use in the field.

3.4. Why Wooded Heaths are ecologically important

3.4.1. Biodiversity of Wooded Heaths

The biodiversity of the wooded heath biotope is inextricably linked to its past and present land use and management. In this aspect, it is comparable to other cultural landscapes such as the chalk grassland of the South Downs, where centuries of use by humans and their livestock created a fluctuating mosaic of habitats upon which many species came to depend. The larger, open-structured woods and wooded heaths of the High Weald and elsewhere in Kent and Sussex were undoubtedly rich wildlife habitats in the past and home to many species that are now national or local rarities, or extinct nationally or locally. Wooded heath still has the potential to support some of southern England's rarest flora and fauna (Briggs, 2001; Hall, 1980; Rose *et al*., 1991 and Stace, 1997).

3.4.2. Indicator species

The indicator species given in S.3.3 should act as a practical guide to identifying sites that are or were once wooded heath. Bilberry *Vaccinium myrtillus* is generally a good indicator of woodheath, though it can become more frequent on open heath at higher altitude in the High Weald (c.700-800ft), for example on Black Down and Brasted Chart. However, the heterogeneous nature of wooded heaths means that there are some difficulties in identifying definitive indicator species, and interpretation should take into account all of the categories in Tables 1 and 2, Section II. The reduced biodiversity of heathlands in the High Weald contributes to this, as a lack of or inappropriate management has caused distinctive species to become more rare.

Similarly the presence on a site of a number of ancient woodland indicator species (Appendix 2) will reduce the likelihood of a heath or wooded heath history. Such indicator species include wood anemone *Anemone nemorosa,* bluebell *Hyacinthoides non-scriptus,* thin-spiked wood sedge *Carex strigosa,* herb paris *Paris quadrifolia* and lily-of the valley *Convallaria majalis*, though there is an interesting discontinuity in some of these that occur in Hampshire and West Sussex then mostly disappear though East Sussex and reappear in Kent. Examples include herb paris, Solomon's seal and thin-spiked wood sedge. This could be attributable to an anthropogenic influence or more likely to a combination of factors (Francis Rose, *pers. comm.)*. It is considerably less difficult to identify species of fauna that are dependent on wooded heath habitats. Some of the best known, well-documented of these include butterflies, moths and other invertebrates and birds.

3.4.3. Importance of Wooded Heaths for Invertebrates

One of the glories of the larger, open woods in the Weald in the past was the diversity and abundance of butterflies and moths. In particular, localities such as Worth, St. Leonard's, Tilgate, Broadwater and Ashdown Forests, Chailey Common, Beckley and Flatropers Woods, Battle Great Wood, Guestling Wood, Ellenwhorne Wood, Ewhurst and the adjacent Brede High Wood, Vert Wood and Park Corner Heath, Rewell's Wood, Abbott's Wood and Plashett Wood supported butterflies including heath *Mellicta athalia* , marsh *Eurodryas aurinia*, pearl-bordered *Boloria euphrosyne*, small pearl-bordered *Boloria selene*, high brown *Argynnis adippe*, dark green *Argynnys aglaja* and silver-washed *Argynnis paphia* fritillaries. All of these species, except the latter, are now either extinct or in rapid decline in Kent and Sussex. The Duke of Burgundy *Hamearis lucina*, wood white *Leptidea sinapsis* and purple emperor *Apatura iris* were also frequently found in heathy woods in the area (Pratt, 1999). A few Weaver's fritillaries *Boloria dia* were caught around Tunbridge Wells in the 19th century and it is possible that this supposedly non-British species was once resident in the High Weald wooded heaths (Beavis, 1996). Noteworthy moths of wooded heaths included the Lewes wave *Scopula immorata*, whose only known British station was Park Corner Heath and the resident subspecies of the speckled footman *Coscinia cribraria bivittata*, now possibly extinct in its last British locations in Dorset and the New Forest, but once known from Tilgate Forest (Pratt, 1999). The birch-feeding Kentish glory

moth *Endromis versicolora*, was also common on heaths and wooded heaths in the Tilgate Forest area in the 19th century. The last record was 1892 and it was declared extinct in the area in 1905 (Pratt, 1999).

Some invertebrates occur, or occurred, in the heath or wooded heath habitat because their foodplant grows, or grew, there. Species such as the silver-studded blue *Plebejus argus* and the beautiful yellow underwing *Anarta myrtilli* have *Calluna* as their main foodplant while the autumnal moth *Epirrita autumnata* has bilberry-feeding larvae and was once locally common in Sussex. Other species have foodplants such as goldenrod *Solidago virgaurea* or devil's-bit *Succisa pratensis* that are characteristic of heathy woods but also grow elsewhere. The cudweed moth *Cucullia gnaphalii occidentalis*, last recorded in Britain in woods near Beckley in 1979, was once widespread in the wooded heath habitat where goldenrod grew. Many use very widespread foodplants but clearly prefer conditions in open, sunny woodland whether heathy or not, for example the *Melampyrum*-feeding heath fritillary (so-named because it was once thought its larvae ate *Calluna*), the Duke of Burgundy (primrose/cowslip-feeding), the pearl-bordered fritillary (violet-feeding) and the wood white (vetch-feeding).

The number of species of butterflies and moths and their abundance strongly implies that there was an equal richness of other invertebrates with a requirement for the open, wooded heath habitat. Among those which seem to have been associated with wooded heaths but which are now very rare or possibly extinct in Britain is the picture-winged fly *Campiglossa grandinata*, another goldenrod feeder, only known as a British species from three old Sussex records. Wooded heaths also have a rich dipterous fauna of Mycetophilidae (fungus gnats) and Empidoidea (dance flies) (Stubbs, 1978).

3.4.4. Decline of wooded heath invertebrates

The loss of wooded heaths has led to the reduction in invertebrates that depended on them partly because the characteristic structure of the ecotone between heathland and woodland has been lost - especially in areas of conifer plantation - and partly because encroaching scrub has shaded out the ground flora typical of heathy woods. An analysis of past woodland management regimes and the demand for many different types of timber and heathland products indicates that until at least the middle of the 19th century, open woodland would have been much more widespread. A reprieve was given to many woodland invertebrates that were declining due to canopy closure of the woodlands when clear-felling took place in World Wars I and II, when broad-leaved woodland was removed for conifer planting, or from catastrophic events such as the 1987 storm.

In some cases, the modern creation of what are thought to be ideal habitats for species such as woodland butterflies and moths has failed to conserve the target species in the long-term and they appear to have died out. Colonies also died out in the past due to parasitism, predation, disease and habitat change, but new colonies were more easily established. As Oates (2000) has pointed out in the case of the Duke of Burgundy *Hamearis lucina*, an open

woodland butterfly, its decline "*should be measured not so much by the loss of colonies but by the paucity of new colonisations*".

The pearl-bordered fritillary is a good example. This butterfly needs open, sunny woodland where its violet-feeding larvae can bask in the sunshine in the early months of the year and where the adults, flying from mid-April to early June, have ample nectar sources among the ground flora. After a long decline, a number of pearl-bordered fritillary colonies 'appeared' and grew in the High Weald following the 1987 storm when large numbers of trees were blown down and cleared away. By the mid-1990s most of these colonies had vanished and have not, to date, re-appeared either on the original sites or in places nearby, despite conditions apparently being ideal in some areas where they formerly flourished. While there must have been residual populations of butterflies to found the post-1987 colonies, the devastation caused by the storm and the subsequent regrowth of vegetation was perhaps too homogenous an event to secure long-term conservation. It seems to be increasingly evident that there needs to be a continual supply of newly suitable areas where fresh colonies can be established as the old ones decline.

In addition to the availability of fresh habitat, the land in between must be crossable by the insects capable of founding new colonies. In the past many woods were managed so that insects that tend to fly less powerfully and at lower levels could have made their way through the trees sustained, if necessary, by a nectar-bearing ground flora. In 1871 G. E. B. Eyre observed of the New Forest that

> Instead of the varied intermixture of moor and wood and groups of oak, beech and holly scattered over the open spaces between the pervious woods, monotonous plantations of Scotch Fir are gradually overspreading the soil and obliterating its undulations.

The word 'pervious' is very useful in describing the kind of woodland structure through which flying invertebrates can pass. Many conifer plantations, neglected coppices and unmanaged 'ancient woodlands' are 'impervious' in this sense and create barriers preventing re-colonisations of wooded heath species. The surrounding fields have also changed from the unimproved flowery meadows of the past to species-poor improved grasslands. In the past wandering woodland Lepidoptera may well have continued their flight path across these nectar-rich flowery meadows and were thus more easily able to colonise new blocks of woodland or wooded heath.

Many accounts of butterfly decline (Tubbs, 2001; Oates, 1996 & 2000; Pratt, 1981 & 1991 and Warren, 1983) indicate that the best woodlands were those that were ungrazed or lightly grazed and usually deer-free, but which remained open and sunny. The New Forest inclosures for example, had deer and other large herbivores strictly excluded, but silvicultural operations provided ample opportunities for the adult butterflies to nectar along the wide rides (Oates, 1996). It was of such inclosures that the often-repeated remarks were written in 1892:

> As I slowly walked along, butterflies alarmed by my approach arose in immense numbers to take refuge in the trees above. They were so thick that I could hardly see ahead and indeed resembled a fall of brown leaves. As soon as the sun came out again they descended from the trees and resumed feeding on the bramble blossom.

The butterflies, and presumably other wildlife with similar habitat requirement are now gone from the inclosures and this is generally ascribed to the woods being shadier and the disappearance of bramble and other nectar plants, as well as larval foodplants, due to the increasing volume of grazing that was allowed (Tubbs, 2001). Some important foodplants are vulnerable to grazing, for example common cow-wheat *Melampyrum pratense*, which is the main foodplant of the heath fritillary (Rich et al., 1996).

Among the wider patterns of abundance and decline of mobile invertebrates there are usually small fluctuations, colonisations, and local extinctions and it is often difficult to determine the combined effects of short- and long-term changes in population. In spite of this, it is important to keep as much habitat as possible to provide potential for re-colonisation, and that such 'islands' of habitat should be close enough together for re-colonising individuals to reach.

The butterflies that have been in increasing difficulty as the years have gone by are mainly the low-flying, shade-intolerant woodland species. Larger, stronger species like the silver-washed fritillary *Argynnis paphia*, the purple emperor *Apatura iris* and the white admiral *Ladoga camilla*, continue to establish new colonies, though they are not nearly as abundant as they used to be, while the shade-tolerant speckled wood *Pararge aegeria* is now common in woods and lanes everywhere in the south east, though it was a rare butterfly 100 years ago (Beavis, 1995; Pratt, 1999) despite having been abundant 50 years before that. The high brown fritillary *Argynnis adippe*, although large and a strong flyer, has not followed this pattern and continues to decline illustrating how difficult it is to be dogmatic about the causes of butterfly increase or decrease.

3.4.5. Importance for Birds

A number of birds considered to be characteristic of heathlands in fact require wooded heath rather than a treeless open heathland. The nightjar *Caprimulgus europaeus* needs dry heathland, clearings in heathy woodland or lightly wooded heath for breeding (Symes & Day, 2003), but as well as gaps, it needs trees or bushes as territorial perches and a wide range of habitats in which to forage. Studies of the nocturnal movements of nightjars in Dorset have demonstrated that "*birds fly nightly from their heathland breeding sites to nearby deciduous woodland, farmland and wetland to feed*" (Haskins, 2000). Birds such as stonechat *Saxicola torquata* and Dartford warbler *Sylvia undata* also occur on the edges of wooded heath.

Other birds of wooded heath in the High Weald include the yellowhammer *Emberiza citrinella* and linnet *Carduelis cannabina,* which both require scrub in which to breed; the tree pipit *Anthus trivialis* which requires wooded heaths and the woodlark *Lullula arborea*, which is virtually restricted to open heath or clearings in forestry plantations on former heathland (Symes & Day, 2003).

This species appears to be responding to the creation of new, or restored, heathland and has reappeared as a breeding species in the RSPB's Tudeley Wood reserve east of Tunbridge Wells (RSPB, 2001).

One of the most distinctive wooded heath birds died out in the mid-19th century. The black grouse *Tetrao tetrix* was once 'quite numerous' in Sussex in "*thinly treed, heathy bracken-grown parts of forest-land, as well as on our larger commons and, possibly, certain wooded stretches of the Downs*" (Walpole-Bond, 1938). Ashdown and St. Leonard's Forests appear to have supported most of the birds and Gilbert White (1789) mentions that they were well-known on the heaths of the West Sussex/Hampshire border until the early 18th century.

3.5. Current Status and Threats

Section III presents the existing areas of woodheath in the High Weald. Wooded heaths are becoming progressively more wooded and less open due to cessation of management, especially extensive grazing. Open heathland and acid pasture woodland also experience increased tree and shrub cover without grazing. As the canopy closes and a woodland understorey develops the field layer of characteristic dwarf ericaceous shrubs, dwarf gorse and other plants is shaded out, though they may survive in the seed bank. There is a change towards more shade tolerant species, the amount of edge habitat is reduced and the availability of special niches declines.

There has been a well-documented loss of biodiversity in woodland and heath and especially in the transitional ecotones between the two. Woodheaths were previously probably more species rich than they are today – for example juniper *Juniperus communis* appears in old records but is no longer a component of Wealden heaths, and greater broomrape is now locally extinct. Much of the fauna that has been lost from heathy woods, or is in very worrying decline, is dependent on warm, sheltered, sunny conditions rather than heathland as such. Many species that have disappeared or are now very scarce were equally at home in heathy or non-heathy woods provided their food was available within the required macro- and micro-climates. If the shade becomes too dense, the wooded heath ground flora will decline and disappear and, though it may return from a seed bank after coppicing or felling operations, many of the invertebrates and other fauna associated with it may have been lost forever. Long-term changes to soil fertility caused by scrub and woodland invasion, as well as the increasing nitrification of the soil from air pollution, are likely to affect wooded heaths (Chapman *et al.,*1989; Rich, 1996). The spread of bracken over large areas, both open and semi-shaded, in the absence of harvesting, grazing and trampling will also have an impact on wooded heath biodiversity.

Unlike woodlands, lowland heath and wood pasture, wooded heath has not been recognised as a habitat in its own right, and hence there has been no specific evaluation of its status and factors causing any decline. With no national HAP, there is correspondingly no local HAP with targets aimed at specifically conserving wooded heath sites. It is intended that this report will serve to raise the profile of wooded heaths, and by defining the matrix of

biotopes within the wooded heath general heading, will set them firmly in the context of the heathland / woodland habitat mosaic. Only by recognising their place within this continuum on acid soils will appropriate management objectives be set and the future of often rare or vulnerable species dependent on wooded heath biotopes be safeguarded.

4. MANAGEMENT

4.1. Owners and Managers

The High Weald Natural Area includes a total of some xxxha of woodland, heath and wooded heath. Much of this lies within the High Weald AONB. Although this report is primarily aimed at the WHI project partners, it is also hoped that it will be of use to other owners and managers of heathland,woodland or wooded heaths in the High Weald and elsewhere, including farmers. The ownership and management of the High Weald is varied. Some is privately owned, some is within reserves, some is owned or leased by Forest Enterprise and some is owned by local authorities. Of the land in private ownership, there will be some owners who have no wish to solicit advice or opinion regarding management, but also others who will wish to manage their land for the benefit of wildlife or for small-scale traditional occupations such as coppice products including charcoal manufacture. It is not unusual for staff of Sussex Wildlife Trust to be asked for management advice from people who have purchased land with areas of woodland or grassland and would like to conserve or enhance its wildlife interest (Janyis Hyatt, *pers. comm.*).

4.2. Forestry Commission Policy

In the first half of the 20th century, woodlands in the UK were depleted by the demands of two world wars, with the result that developing a strategic reserve of timber was considered to be of paramount importance. For the decades following the World War II, emphasis was put on timber production rather than the wider array of woodland products that was a feature of traditional woodland use and management (Spencer, 2002). Between the 1930s and 1960s, the Forestry Commission acquired most of its current estate and embarked upon a programme that essentially aimed to replace existing woodlands with plantations, many of which comprised exotic conifers (Spencer, 2002).

Much has changed since then, and Forestry Commission policy has evolved to reflect changes in the forestry industry itself as well as the increasing emphasis attached to biodiversity conservation. UK commitments under the Biodiversity Convention, ratified in 1992, have had a particular impact on forestry policy and the management objectives that are now the aim of Forest Enterprise. Forestry policy now supports the maintenance, restoration and expansion of ancient and native woodlands and the management, protection and restoration of priority open-ground habitats such as heathland and peatland that occur within forests (England Forestry Strategy, undated; Forestry Commission, 2001; Thompson *et al.,* 2003).

Between 1999 and 2002, the Forest Enterprise Ancient Woodland Project carried out an overall assessment of the character and relative importance of different parts of the Forestry Commission estate for ancient woodlands at both Forest District and national level. It was established to collect information that would enable informed decisions to be taken about priorities for the restoration of Plantations on Ancient Woodland Sites to native woodland (Foreword, Spencer, 2002). Spencer reiterates that the mission of

Forest Enterprise is to promote and implement the maintenance, restoration and expansion of ancient and native woodlands through the Government's UK Forestry Standard, Habitat Action Plans (HAPs) and the UK Woodland Assurance Scheme (UKWAS). UKWAS also demands the full or partial restoration of Plantations on Ancient Woodland Sites (PAWS), or at the very least maintenance of their existing biodiversity.

It was also acknowledged that the ancient woodlands evaluated during the course of the Ancient Woodland Project had a high proportion of 'Woods of Base Poor Free Draining Soils (NVC Type W16 Rodwell, 1991)'. These are heathy woods on sands and gravels and other acidic soils, in their native state comprising oak, birch and rowan. Conifer plantations have replaced many such areas of woodland, in which when thinned or felled, native broadleaved regeneration readily occurs (Spencer, 2002)

The objectives of the Ancient Woodland Project were

- To catalogue the extent and condition of ancient woodland sites under FE management across England.
- To map the extent of different vegetation types, using NVC on ancient woodland sites.
- To identify priorities for PAWS restoration and conservation management
- To quantify the potential costs/benefits and timescale of restoring the various woodland types

The information gathered achieving these objectives contributed to the development of a strategy for FE-managed native woodland in England.

At about the same time as the publication of the details of the Ancient Woodland Project (Spencer, 2002), the English Forestry Forum Biodiversity Working Group was also developing proposals to progress recognition of the role of forestry in delivering other, non-woodland, elements of the UK BAP, and to provide guidance on best practice relating to forestry which could affect habitats beyond those addressed through the UK Native Woodland HAP (Clarke, 2002, Appendix 3).

These proposals included:

- Conservation of species linked with forest types not covered by the UK Native Woodland HAPs.
- Management of UK BAP priority open-ground habitats and species that occur within forests
- Protection of priority open-ground habitats and species from inappropriate afforestation
- Restoration of priority open-ground habitats (eg heathland and peatland) through forest restructuring or removal
- Potential for afforestation on arable or improved grassland to buffer priority open-ground habitats from more intensive land use and help create ecologically functional landscapes.

The Working Group considered that the restoration of priority open-ground habitats was one of five key topics. This is of particular relevance to the WHI project, and the full background to such restoration is given in Clarke 2002 (Appendix 3). In this document, the English Forestry Strategy acknowledges a number of issues. It recognises that forestry has a significant role to play in delivering the Government's policies for the implementation of the UK's international obligations for biodiversity and re-affirms the UK Forestry policy of maintaining existing woodland but at the same time achieving a reasonable balance between timber and wildlife objectives. It also recognises the currently unfavourable status of certain open ground habitats such as lowland heathland which have been caused by long-term land-use changes including the planting on them of conifers and other tree species.

UK BAP objectives for restoration of open-ground habitats are being delivered through a wide range of strategic partnerships. Opportunities exist on agricultural land and old mineral workings, as well as forestry. However, afforested areas frequently offer the best opportunities in terms of ecological achievability, linkage with existing habitats and relict populations, and best value for public monies.

The England Forestry Strategy acknowledges that tree removal is necessary to re-create important open habitats. The UK Woodland Assurance Scheme (UKWAS) supports deforestation as an important requirement in good forestry practice. The FC has recognised that biodiversity is a legitimate public benefit and, as a matter of policy, no longer requires compensatory planting where restoration of open ground achieved biodiversity objectives.

Although the restoration of priority open-ground habitats is agreed to be a key topic, it does raise certain issues – specifically that there is a need to address potentially conflicting UK BAP priorities, which may arise from restoration of open habitats from native woodland. Clarke (2002) recognised that good opportunities exist for restoring open-ground habitats through deforestation but progress has been limited due partly to a lack of integration between policies designed to protect forests and those encouraging restoration of open habitat. Open-habitat restoration has generally been at the level of small-scale restructuring of existing forests, largely through the Forest Design Plan process. The Woodland Grant Scheme has supported deforestation but grant conditions do not readily enable more extensive habitat restoration, with tree removal limited currently to 20 % of the woodland area. One important aspect of open-ground creation is the securing of its future maintenance and funding. The Forestry Commission and the High Weald Heathland Initiative arrived at deforestation procedures in October 2001 (Woodcock, 2002, Appendix 4).

Promoting the importance of wooded heaths may help to integrate policies designed to protect forests with those encouraging the restoration of open habitats such as heaths. As this report demonstrates, there is no clear dividing line between ancient woodland and open heathland. The wooded heath matrix is an integral part of both biotopes, with its own range of conservation interests and significance, and requiring appropriate management strategies. A definition of the wooded heath matrix is presented in Table 1, Section II.

Guidelines aimed at assessing sites for restoration or conservation are presented in Table 2, Section II. The next chapter outlines management options for wooded heath biotopes, and Ch.4.4. draws attention to likely ecological impacts, positive and negative, of these options. The options below should assist the implementation of management actions identified in this report.

4.3. Management options

Management guidelines for woodheaths need to address many issues, including the acceptable/desirable level of tree cover on sites, the size and number of glades/open spaces per unit area, connectivity of glades/open areas and any forestry management practices that could enhance the heathland element of acid woodlands and plantations.

There is a need to recognise former pasture woodland as distinct from ungrazed (or very lightly grazed) woodland. It is also important to understand that the outcome of management need not be either open heath or closed woodland but that a mosaic of linked open areas within a wooded framework or a grazed acid pasture woodland will probably be the optimum result.

The size of each site will be crucial in determining what kind of management is practical and sustainable. The availability of money, labour and local support at each site will have to be assessed to allow management decisions to be made. Large sites with greater levels of diversity will provide most scope for varied management treatments, including scope for some commercial forestry. Small, fragmented sites are unlikely to provide many opportunities for sustainable forestry at the same time as management purely for nature conservation. Following the procedure given in Section II, each site or sub-site should be identified and assessed for the most appropriate management options. Several of the management options are appropriate for all types of site, for example the removal and control of non-native species.

A primary aim of management on most woodheath sites will be to achieve and sustain low levels of canopy cover across most parts of the site to ensure that high levels of light reach the ground throughout the year. Canopy cover will not necessarily be spread evenly across a site, but light levels of 30-60% are appropriate targets. It will also be important to promote continuity of age classes of canopy trees by recruiting new standards of native species where appropriate.

4.3.1. Site or sub-site scores mostly ‘High restoration potential’ in site assessment

Priority should be given to management for nature conservation, particularly creating and maintaining heathland and woodheath habitats. Consideration should be given to whether grazing may be appropriate in some form.

Management options will include:

- Grazing
- Removal of plantation trees, especially non-native species

- Tree thinning to reduce canopy cover to about 30% over most of the site, though areas with up to 60% cover are acceptable.
- Selective felling to create glades
- Ride widening and linkage
- Mowing glades, rides, open areas (especially in the absence of grazing)
- Bracken control
- Retention of mature, native trees to develop to veteran status
- Scrub management
- Removal/control of non-native species
- Non-intervention where appropriate

4.3.2. Site or sub-site scores mostly 'Moderate restoration potential' in site assessment

Consideration could be given to native, continuous cover forestry but with low canopy cover and/or short rotation coppice. This will promote some nature conservation gains whilst having the potential to generate some income from forestry, although markets for small diameter coppice are very limited. It will still be necessary to ensure a high degree of light reaches ground level across most of the site. Mechanical cutting of rides and glades will be desirable to maintain and/or herbaceous and dwarf shrub community.

Management options will include:

- Broadleaved plantation of native species at very wide spacing with ideally no more than 50% cover across the site
- Traditional coppicing on a short rotation
- Mowing glades, rides, open areas
- Bracken control
- Thinning for either canopy reduction or commercial purposes
- Selective felling for commercial purposes and to create glades
- Removal/control of non-native species

4.3.3. Site or sub-site scores mostly 'Low restoration potential' in site assessment

There is still abundant scope to manage for nature conservation, but with the emphasis on woodland habitats and species rather than on heathland or woodheath assemblages. Management based on a traditional coppice with standards system is one option. It is possible that some areas should be left as non-intervention, depending on the results of bat, bryophyte and selected invertebrate surveys. Thinning or coppicing is not recommended unless such surveys have been conducted and interpreted.

Management options will include:

- Non-intervention
- Rotational coppicing
- Thinning and selectively felling standard trees
- Mowing rides and glades
- Removal of non-native species

4.4. Economic opportunities

Timber production remains the key function of the FC, now operated by the agency of Forest Enterprise. However, in today's economic climate, turnover from timber production has fallen. Other economic opportunities need to be explored, although realistically, there are limited options for making money in the long term out of woodheath sites.

Timber sales from Low-intensity production.

The maximum potential financial return on sites that have supported plantation forestry (either coniferous or broadleaved) is at clear felling when the trees are mature. However, thinning plantation trees is more economically viable for greater numbers of trees so although increased levels of thinning will reduce the potential for a high value product at clear felling, it can still generate some income on sites where reduction of tree cover as soon as possible is desirable for nature conservation purposes (Jonathan Harding, *pers. comm.*).

Low-intensity timber production would require a management strategy that would aim to thin plantation conifers and other species at stated intervals to combine the tall straight growth required by the market with the more open nature compatible with a wooded heath habitat. It seems unlikely that there would be a significant forestry income potential from thinnings of conifer crop or other timber trees, other than in the initial stages of restoration when most tree felling is likely to be needed. An assessment of each site under consideration will be needed and it is not possible to make general assumptions for all sites. The current depressed state of the timber market suggests that any revenue from timber sales is unlikely to make woodheath management profitable in the long term. There is the possibility that such management may be cost neutral if the trees that need to be removed are of high timber quality.

Bracken products. Another potential source of income from woodheath management is the sale of bracken compost/bracken scrapings, at least from heavily infested sites. The FC apparently carries out large scale, commercial bracken composting in the New Forest and the National Trust also undertake bracken composting.

Bracken can be baled and used as cattle bedding, where calves are not present. It can also be used as a protective mulch in winter to reduce nitrogen and potassium losses from bare soil, as a compost and as a biofuel. Its ash can be used as a potassium fertiliser and to improve soil structure. The timing of bracken harvest is very important in determining its uses, and the composting process is quite critical in determining the resultant quality of the compost (ADAS 2002; FA, 1998; University of Aberdeen website).

A problem encountered at Chailey Common is the high handling costs of turning harvested bracken to make well-rotted compost. It is now mown with a Rytec mower that cuts the fronds into roughly 5cm pieces which are then dumped in piles on site. The central parts of the heap are then bagged up

when they are composted on an ad hoc basis. Scraped litter is collected directly by Wakehurst Place and used as compost – this is a cost neutral exercise for ESCC, so no profit is made. A quote of £25 per hour from a contractor was obtained for removing cut bracken with a tractor and trailer to make compost off site – this was prohibitively expensive when the market and return from compost sales was uncertain (Jessie Leamy ESCC Ranger, *pers.comm*.)

Woodland products from coppice. Markets for coppice products are also restricted and while sweet chestnut can be sold at 20-30 years old for post and rail fencing, younger material is of very little financial value. The shorter rotation desirable for nature conservation ends is thus unlikely to generate much income other than for small, specialised markets such as charcoal and walking sticks.

Tourism. The High Weald has a wealth of natural and cultural attractions, many of which already attract local and more distant visitors. There are bound to be additional opportunities, although whether FE would find them attractive would need to be evaluated. Building on the tourist potential of the cultural history of the High Weald may have possibilities. For example, it could be worthwhile to replicate a Wealden farm as it might have been around, say, 1800. There would be a small amount of arable, unimproved grassland for hay and better quality grazing, worked woodland and coppice for timber requirements and 'waste' for winter grazing. The farm buildings could illustrate domestic life and other aspects of the period. This would be an open-air museum and visitor centre with an important educational and research dimension and such a facility, from which lessons might be learnt, already exists in a heathland area of Denmark.

There are, of course, many problems in creating new visitor attractions, not the least of which is whether there is an adequate and accessible market likely to make it cost-effective in what are undoubtedly competitive modern circumstances. Rather than attempting to start something from scratch, the concept might appeal to an existing visitor attraction such as Wilderness Wood at Hadlow Down.

4.5. Management techniques for conservation

Working to keep habitats open and diverse as well as controlling invasive and competitive species will be the primary aims of management for woodheaths. To achieve this, the reintroduction of some form of grazing is likely to be the most important factor in allowing sustainable long-term management of woodheaths. At most sites this would require fencing, water supply, stock management and so on. A minimum of 25% open space is likely to be needed to allow grazing to be restored in woodheaths and the lack of open space is probably going to be a significant limiting factor in the restoration of grazing to many sites. Stockmen should be willing to enter into an agreement that any stock grazed on sites managed for conservation should not be dosed with antihelminthetics such as Ivermectin, which have adverse impacts on coprophagous insects such as dung beetles and a wide range of flies, which

in turn reduces the amount of food available to insectivorous mammals and birds.

Thinning trees to restore coppicing, reduce shading, promote ground level vegetation for grazing and allow the development of a smaller number of timber trees to grow on to maturity and veteran status is likely to be an appropriate and realistic option for conservation management at woodheath sites. Where there is past evidence of coppice on woodheath sites then cutting on an uneconomically short rotation is likely to be the optimum management choice to promote biodiversity. As previously noted (S.4.3.3), thinning should not be carried out prior to an appropriate site evaluation. A degree of humidity and shade would be required to conserve species such as lemon-scented fern *Oreopteris limbosperma* or if there are important bryophyte communities. Woodlands assumed to have low ecological interest due to an excessively closed canopy, for example 500 acre Wood on Ashdown Forest, might prove to have considerable ecological interest as a result of further survey. It is important to note here that very few woodlands if any in the High Weald have, to date, been surveyed for bats using acceptably rigorous techniques involving trapping and radio-tracking that permit the identification of nursery roost areas within woodlands. Other management activities will include more typical woodland management tasks such as scrub management, bracken control, mowing (in the absence of grazing), ride and glade creation/maintenance, felling, plantation removal, rhododendron control/elimination etc., but again, a site assessment should be carried out before any management action is implemented.

There is a need to distinguish between conventional, intervention conservation management and the promotion of habitat development by natural processes, as is being attempted in the New Forest SAC and at Oostvaardersplassen in the Netherlands (Life Partnership Programme, 2001; Siebel and Piek, 2002; Vera, 2002). To be viable the natural processes approach needs to encompass a significant area of contiguous habitat within which natural processes can occur. Managing individual High Weald sites in isolation will inevitably require some degree of intervention management, even where grazing is involved, because the sites are likely to be too small and fragmented to support an extensive grazing system without a fairly high level of animal husbandry, tree management and other management actions.

One observation in the New Forest has been that locally lower grazing pressure has allowed tree cover to increase from historic levels and there are fewer open areas. There is an ongoing debate over whether there should be intervention to open glades using mechanical means. The appropriate response to the increase in levels of birch in former wood pasture is also under discussion since birch colonisation and decay is a natural component of the dynamic vegetation system in the New Forest (Clive Chatters, Hampshire Wildlife Trust, *pers. comm.*).

Soil stripping is often carried out on heathland restoration sites that have been under plantation or are heavily bracken infested, but needs to be approached with care since it runs the risk of removal of seed bank and without follow up

grazing may be a wasted expense. If there is going to be grazing then soil stripping is probably unnecessary. Harrowing may be a better option to break up litter and expose the seed bank.

Whatever the management decisions made for a site, it is crucial that a long term commitment is made to sustaining that management. The ecological benefits of management can take many years to develop and, like most semi-natural habitats, woodheath needs continuity of management for its full biodiversity potential to be realised.

4.6. Case studies of two examples of heath/woodheath management

4.6.1.Church Wood and Blean Woods

Church Wood is part of the Blean Woods complex in north Kent to the north of Canterbury and the North Downs. Although largely acid soil, its origin is different from that of the High Weald as it derives from sands and gravels overlying clay. The climate is also significantly different from that of the Weald. The woods are managed by a partnership of RSPB, English Nature and the Woodland Trust.

A conversation was had with the RSPB warden, Michael Walter, in January 2004. He explained that much of the area was now coppiced on ten to twelve year rotation and that this benefits birds like nightjar and nightingale.

Some areas have been cleared so that heathland, dotted with coppice islands, can be recreated. *Calluna* often appears in these of its own accord, and the woods were clearly of very heathy character in the past. *Calluna* still grows extensively in the chestnut coppice.

The initial 2.5 ha of re-created heathland with scattered trees is being expanded with new areas of 7 ha, 3 ha and 12-13 ha all either being, or planned to be, cleared. The aim seems to be to create heath within wood rather than wooded heath per se.

Bracken is controlled with Asulox.

One of the important species in Blean Woods is the heath fritillary, *Mellicta athalia*, lost from the Weald many years ago. In Blean populations of this fluctuate and the butterfly demands open, sunny coppice where common cow-wheat, *Melampyrum pratense*, its main foodplant, flourishes. This butterfly requires a very open woodland or woodland edge and populations die out two or three years after the coppice has been cut. Short-rotation management may have been more frequent here in the past and have contributed to the survival of the butterfly.

Today new colonies are established, but these are always quite close to existing colonies. The warden has also noticed that *Melampyrum*, an annual plant, does not reappear after a 10-12 year coppice cycle. Short-rotation

coppice, however, reduces the amount of bramble, something which may have both good and bad consequences.

In contrast to the heath fritillary, the pearl-bordered fritillary, *Boloria euphrosyne*, has not been seen since 1995 although it used to be common in Blean Woods and conditions would appear to be ideal and improving.

There are no deer in the woods and currently no grazing by domestic animals, though grazing may be introduced in the next few years. This could benefit *Melampyrum* and therefore the heath fritillary.

A new management plan is currently in production for all the reserve areas in the Blean complex.

4.6.2.Tudeley Woods

Details of the RSPB's Tudeley Woods reserve are very fully covered in two draft documents, the *Tudeley Woods Management Plan* and the *Pembury Heathland Restoration Project* (Appendix 5) both of which have been supplied to this project by Martin Allison, the RSPB Manager at Tudeley.

One of the authors of this report toured much of the Tudeley Woods reserve with Martin Allison in winter 2002/3 and was able to see and discuss the work that is going on there. Much of the focus is on heathland restoration as will be seen from the attached documents and, while *Calluna* and other ericaceous plants have undoubtedly always been plentiful on the site, much of it may have been wooded heath and other biotopes rather than open heath, the kind of habitat mosaic of ancient woods (coppiced or otherwise), heaths, unimproved fields and so on that has been much discussed elsewhere in this study.

One interesting discovery at Tudeley has been that *Calluna* has regenerated in grass fields, until recently farmed in a conventional late 20th century way, where the topsoil has been removed, possibly exposing a still viable seed-bank from the past:

> Interestingly, strong *Calluna* plants were found in flower on the scrapes in Sandhill Field (field C), away from the study plots and in an area where no seed had been introduced. These plants either had appeared from seed in the original field soil, or seed had inadvertently blown from the study plots at the time of addition. The latter is unlikely as the rogue plants were more robust, and in a later stage of development, than those established on the study plots.

This could be a factor that would help to confirm the hypothesis that many fields and grazed areas in the past contained much *Calluna* and other acid soil plant species, but would not today be categorised as heaths. They would, however, have been an important part of the habitat mosaic at landscape scale. There are other examples of places in the High Weald where a predominantly grass topsoil has been removed and ericaceous plants have regenerated from what would appear to have been a long-buried seed bank.

Buried *Calluna* seed has been estimated as remaining viable for up to 70 years and this idea may be worth revisiting.

Contact with Martin Allison has been maintained and Tudeley Woods is a useful study area for assessing options for management on the whole of the Tunbridge Wells heaths that run east to west across this area and, in the past, clearly represented an important block of habitat with much open heath and heathy woodland and which was home to many characteristic species not found in similar habitats elsewhere in the Weald. This is undoubtedly partly due to climatic differences between this relatively elevated area which lies further from the sea that other parts of the High Weald.

5. MAPPING THE RESOURCES

5.1. Wooded heath in the High Weald

The High Weald area is fortunate in the diversity and quality of map coverage that is in existence in a digital format. These range from the early Ordnance Survey series (1820's) to modern aerial photography (2001). These maps and associated digital habitat boundary data can generally be linked together and conveniently viewed using a Geographical Information System (GIS). Other maps, not yet in a digital and geo-rectified format, exist from early estate maps (1600's onwards) and Tythe maps (1800's) and are available through County Record Offices.

For this contract the High Weald AONB provided the Record Centre Survey Unit the data needed to take a preliminary look at the use of GIS in the identification of wooded heath or potential wooded heath within the High Weald AONB. This data in combination with digital data from the Sussex Biodiversity Record Centre and advice from Dr Patrick Roper regarding historical place names was used to assess the following:

1. Known areas of wooded heath in the High Weald AONB.

2. Areas within the High Weald AONB where wooded heath is not anticipated (based on geology, topography and current land use). The mirror of this therefore demonstrates sites for potential recreation of Wooded Heath.

3. Areas that indicated a previous heath nature from the first series Ordnance Survey maps, that may now be associated with woodland.

4. Areas with place names that indicate a previous heath or wooded heath nature in the first series Ordnance Survey maps.

5. Use of indicator species from Section II to locate wooded heath sites that are currently unidentified (Sussex only).

Section 3 of this report gives the full methodology for the mapping undertaken for this contract and provides images to demonstrate how the data available was used to investigate the above points. The resulting maps are presented in Section III. These are followed by a discussion that outlines the limitations of the data available, the potential use of maps for looking at individual known or potential wooded heath sites and a basic methodology that can be followed in the future by those investigating wooded heath potential through GIS.

6. DISCUSSION

6.1. Restoring wooded heaths to the High Weald

The research carried out under this contract demonstrates that in the High Weald, open heaths, wooded heaths and woodlands are all part of the same landscape and are the result of the same tradition of rural land use. According wooded heaths a greater importance will help to bridge the gap between heathland managers and foresters. It is hoped that the strict boundaries between what is heathland and what is ancient woodland can be removed and replaced with areas of woodheath to the benefit of biodiversity and landscape, with no detriment to economic interests.

The creation or managment of wooded heath on areas that were once open heath but on which woodland has developed during a long interval with no heathland management could be more successful than attempts to re-establish open heathland on such sites. Some of the potential sites for restoration may be overlain by forestry treatments, particularly plantations. This can modify the appearance and long-term recoverability of semi-natural habitat on both open heath and wooded heath. Removal of coniferous plantations may be more successful in allowing the restoration of heathland than removal of long established broadleaved plantation because the cumulative effect of broadleaf leaf litter on soil nutrient levels is likely to be more pronounced. There is the possibility of long-term irreversibility of some changes, such as soil fertility, after long periods of neglect. Wealden soils are more silty and prone to nutrient retention than the Greensand heaths, so less easily reverted to open heathland habitats after woodland succession has progressed for many years. The decrease of ling as woodland canopy closes may itself contribute to changes in soil fertility. Ling produces phenolic substances in its litter that actively promote podsol formation by making colloidal humus soluble so that it leaches to lower soil levels. Birch, and to a lesser extent holly, invasion is a significant factor due to the impact of roots and leaf litter on soil structure and fertility (Rich *et al.,*1996). The potential to revert to previous habitats is changed by succession of this kind, but wooded heath may stand more chance of success than any attempt to restore open heathland. Bracken invasion is also likely to be a significant threat to restoration of both heath and wooded heath. Priority should be given to sites where bracken is not already well established.

The creation of woodheath will enable both foresters (FC/FE) and heathland project partners to achieve economic, woodland and heathland targets to mutual satisfaction. Including areas of open heath as a stage in plantation operations does not help long-term heathland objectives and has its opponents. Quoting Neil Sanderson, an ecological consultant with a long experience of New Forest habitats, who was consulted during this contract -

> As a botanist I am not impressed by “rotational heathland” in plantations, these [areas] can only be of any use for extremely mobile [plant] species but presumably may be of interest to faunal people. I would be very worried if the early stages of heath regeneration started in felled plantations, but then stopped dead by growing crops, were counted as “heathland”. To me heathland is an entire cultural landscape with heath i.e. heather dominated plant communities, as an important component. As

much of heathland biodiversity is found in associated communities within the heath dominated landscape, the partial regeneration of heath between crops is hardly much of a contribution to heathland conservation.

6.2. Management appraisal

For all those sites identified as actual or candidate wooded heaths, management will be essential in order to create or maintain the wooded heath habitat. Management options are proposed in Ch.4.3. Before implementing any management strategy, each site will need to be assessed, and management options appraised in relation to this assessment. Studying management plans of similar areas will help to evaluate whether a particular management action achieves the desired objective. Two such examples, the management of Church Wood and Tudeley Wood, are summarised in Ch.4.6. and the Tudeley Wood Manage,ment Plan is enclosed in full in Appendix 5. The New Forest is also often used as an example of a range of management practices, some of which are of relevance to heathlands and wooded heath of the HighWeald. The current Forest Design Plan for the New Forest Inclosures contains provision for the restoration of woodland and open forest habitats including pasture woodland and heaths. Much of this new and restored habitat will be derived from existing conifer and other mixed plantations, though substantial areas of pasture woodland is to come from established oak and beech plantations (Spencer, 2002).

The digitised maps will identify areas for any potential habitat restoration or creation, but before any changes can be made each potential site will have to be visited and evaluated. Any area may have developed an importance, including biological and cultural significance, that may have to be taken into consideration, and part of this evaluation will be to assess the likely response of local people to any changes that may affect their landscape. It is envisaged that site assessment could be carried out either as a second phase of the current survey, or by the individual agencies responsible for woodheath sites identified by the survey protocol detailed in Section II and as a result of the mapping exercise.

Before implementing management actions to restore or create wooded heaths, a consensus of ecologists as well as local opinion will need to be sought. Grazing may be the preferred option of many, but fencing sites is frequently unpopular. Radically altering the appearance of a site by tree-felling may also meet with disapproval, although this may be minimal if the trees involved are plantation conifers. Any management changes will benefit some species and impact negatively on others and the ecological value of the new habitats needs to be assessed before an assumption is made about their removal. Developing birch woodland can be of importance to birds, invertebrates and small mammals so a presumption that it should always be removed from former open areas within woodheath should not be made. The age of birch stands, any known species of importance present and the long-term sustainability of birch removal must all be considered. Equally it must be remembered that to date the High Weald woodlands and wooded heaths have not been surveyed for bats – a group of mammals with varying ecological requirements, although all UK species need woodlands for either roosting or foraging or both. The woods, wooded heaths and plantations present in the

High Weald will not necessarily be suited to bat usage especially as breeding sites. However, as these woods have not been surveyed effectively, a presumption of absence by agencies such as FE, EN and the High Weald AONB Unit would be unadvisable. Species known to occur in the High Weald include:- pipistrelle *Pipistrellus pipistrellus*, brown long-eared bat *Plecotus auritus*, Natterer's bat *Myotis nattererii*, Daubenton's bat *M.daubentoni* and noctule *Nyctalus noctula*. Others might well be identified if sufficiently sensitive surveying methods were used. Appendix 6 summarises the legal protection afforded to bats and dormice, and gives a protocol for tree-felling.

For all sites identified as potential woodheaths, an audit should be prepared. Apart from the undesirable possibility of adversely affecting a rare, notable or protected species, time and money can be wasted on a management plan that has objectives prematurely superceded by the subsequent discovery of such species. Ideally a monitoring programme should also be in place before management changes are implemented on a site. Appropriate preparatory work will help to prevent conflicts between managers, local people and other stakeholders. Such an audit should encompass the following:-

- Vascular plants plus significant bryophytes and lichens
- Breeding birds
- Bats and dormice
- Invertebrates
- Herptiles, especially near watercourses, ponds etc
- Watercourses, ponds
- Cultural / archaeological / past use survey
- Local opinion, local identity & landscape

6.2.1. Pros and cons of Grazing

Grazing is considered to be instrumental in creating and maintaining the 'pasture woodland' phase in woodland succession (Vera 2000). Partly because of this, and partly because it is viewed as a more sustainable 'natural' process, grazing is increasingly being viewed as a preferred management option for a range of habitats. It would clearly be of benefit in a wooded heath environment, again integrating open heath and woodland on acid soils, as well as reflecting the cultural practices of pre-industrial southern England.

The often remarkable and unique biodiversity of wood pasture, including grazed woodheaths, has been increasingly recognised over the last 50 years or so. It is a biodiversity largely associated with ancient trees growing in open, sunny conditions, which can provide an internationally important habitat for lichens, beetles and many other organisms that are seldom, if ever, found elsewhere. A characteristic of these species is that they are often relatively sedentary. The lichens take many years to establish and are slow-growing and long-lived, some of the beetles are flightless and confined to one or two aged trees.

Pasture woodland is maintained by the constant grazing of domestic and wild animals. There is no formula or prescription for the best grazing regime. It depends on a knowledge of the area to be grazed, on the existing biotic agents such as deer or rabbits, on the proclivities and preferences of the domestic stock to be used at different times of the year and the flora and fauna found in, or likely to colonise, the area and its requirements. Any regime necessarily needs constant appraisal and adjustment as knowledge grows and the effects of the work become apparent. The high level of deer grazing is a relatively new but important factor in the management and maintenance of wooded heath habitat and the grazing/browsing pressure exerted by deer in each site needs to be assessed. The aim should be a careful balance of grazing by wild or domestic herbivores. No grazing in heathy woods where conservation was a priority would probably demand an unacceptably high input of labour to keep the woods open, but over-grazing for a long period would have damaging consequences, producing an impoverished field layer of short grass.

The position of grazed woodlands in forest dynamics is important. Abandoned pasture woodland enters a phase of open, sunny woodland, with large, widely spaced trees and a rich field layer flora. This ungrazed ground flora can now produce flowers and seed heads that attract butterflies, moths and other invertebrates. The classic examples are the inclosures of the New Forest during the period when grazing was prevented and the rides were wide, open and flowery. Many accounts from the past have confirmed areas like this as the richest habitats for butterflies and moths and, by inference, many other groups too. If grazing is re-introduced to these areas, butterflies and other wildlife requiring such a habitat disappear as nectar plants and larval foodplants once more become scarce.

If grazing is not re-introduced, understorey eventually regenerates in abandoned pasture woodland, but although the loss of high levels of sunlight reduces their suitability for flowers and butterflies, these woodlands too may develop significant wildlife interest. A woodland with large standard trees and dense understorey increases humidity and reduces wind speed as well as temperature. Many or the rarer woodland Diptera are dependent on such moist shady conditions (Stewart, 2001) which in turn makes them good foraging habitats for woodland bats. The large old trees are utilised by invertebrates, woodpeckers and other birds, and frequently develop valuable fungal communities. Patches of loose bark, wind-damaged boughs and woodpecker holes, in sites sheltered and kept humid by understorey, also provide the range of roosts needed by various bat species throughout the year

Pasture woodland itself is therefore just one phase in woodland dynamics, and it is not in the interests of biodiversity as a whole to open up all areas of woodland to grazing. What is important is to recognise the successional changes following cessation of grazing as well as the biodiversity and cultural interest of grazed woodlands. Establishing new areas of grazed wooded heaths will be as important in the long-term as selectively restoring abandoned areas.

No grazing regime likely to be initiated in the High Weald of the 21st century will reproduce the complex, labour-intensive methods of livestock rearing of centuries past. Cobbett (1830) illustrates this well in his description of agricultural operations in part of the Weald:

> How curious is the natural economy of a country! The forests of Sussex; those miserable tracts of heath and fern and bushes and sand, called Ashdown Forest and Saint Leonard's Forest, to which the latter Lord Erskine's estate belongs; these wretched tracts and the not much less wretched farms in their neighbourhood, breed the cattle which we see fatting in the Romney Marsh! They are calved in the spring; they are weaned in a little bit of grassland; they are put into stubbles and about in the fallows for the first summer; they are brought into the yard to winter on rough hay, peas-haulm, or barley-straw; the next two summers they spend in the rough woods or in the forest; the two winters they live on straw; then they pass another summer in the forest or at work; then they come here [Romney Marsh] or go elsewhere to be fatted.

6.2.2.Pros and cons of Coppicing

The biodiversity of coppiced woodland is also well-documented. Some of the richest habitats in the Weald in the past were widely spaced, large trees growing in coppice that was constantly worked, resulting in a succession of open areas that were rich in wildlife. In acid soil areas much of this woodland would have had a heathy character, with heather, bilberry, dwarf gorse *Ulex minor*, bracken etc. present in the shrub and field layers.

To re-establish coppice woodlands with the species richness that prevailed until the 1950s, management should ideally involve both short- and long-rotation coppice cycles beneath widely spaced standard broadleaves, using native species such as oak and hazel. Although this is not an option thought viable by the FC, it would have a place in sites managed for nature conservation, if such sites had not developed any significant biological interest since coppicing was abandoned. It does require a long-term commitment to maintain, especially for the 2-3 year short-rotation necessary to provide the open sunny woodheath required by some butterflies and other invertebrates. Coppicing as a management option is likely to be site-specific, rather than a landscape scale venture.

6.3. Recommendations to further the understanding of the ecology, management and conservation of High Weald woodheaths

Having considered the issues involved, practical steps to achieve the desired aims of understanding, managing and conserving wooded heaths in the High Weald can be summarised as follows:-

- Test the prototype woodheath survey and assessment methodology in the field and refine it in the light of results to enable a valid assessment to be made of the different types of woodheath habitat and their restoration and management potential.

- Adopt a revised definition of "ancient woodland" in the High Weald, using the Whitbread definition as a model, that encompasses the complex mosaic of habitats found within ancient wooded sites.

- Although each site is different and will need individual assessment, look beyond individual sites for management prescriptions. A landscape scale strategy is needed to maximise biodiversity in the High Weald and tailor made schemes for Woodland Grant Scheme and Countryside Stewardship, soon to be replaced by the new Environment Stewardship Scheme, are appropriate.

- Include woodheath sites in an extensive grazing scheme across the whole AONB in association with the High Weald Heathland Project using experience gained on open heathland and unimproved grassland habitats, based on the Local Grazing Schemes (LGS) promoted by the Grazing Animals Project (GAP).

- Organise a meeting of managers of similar/equivalent habitats on site in a woodheath and encourage brainstorming sessions.

- Investigate the possibility of setting up a large demonstration site, perhaps building on an existing operation such as Wilderness Wood, as an educational resource and a visitor attraction.

6.4. In conclusion

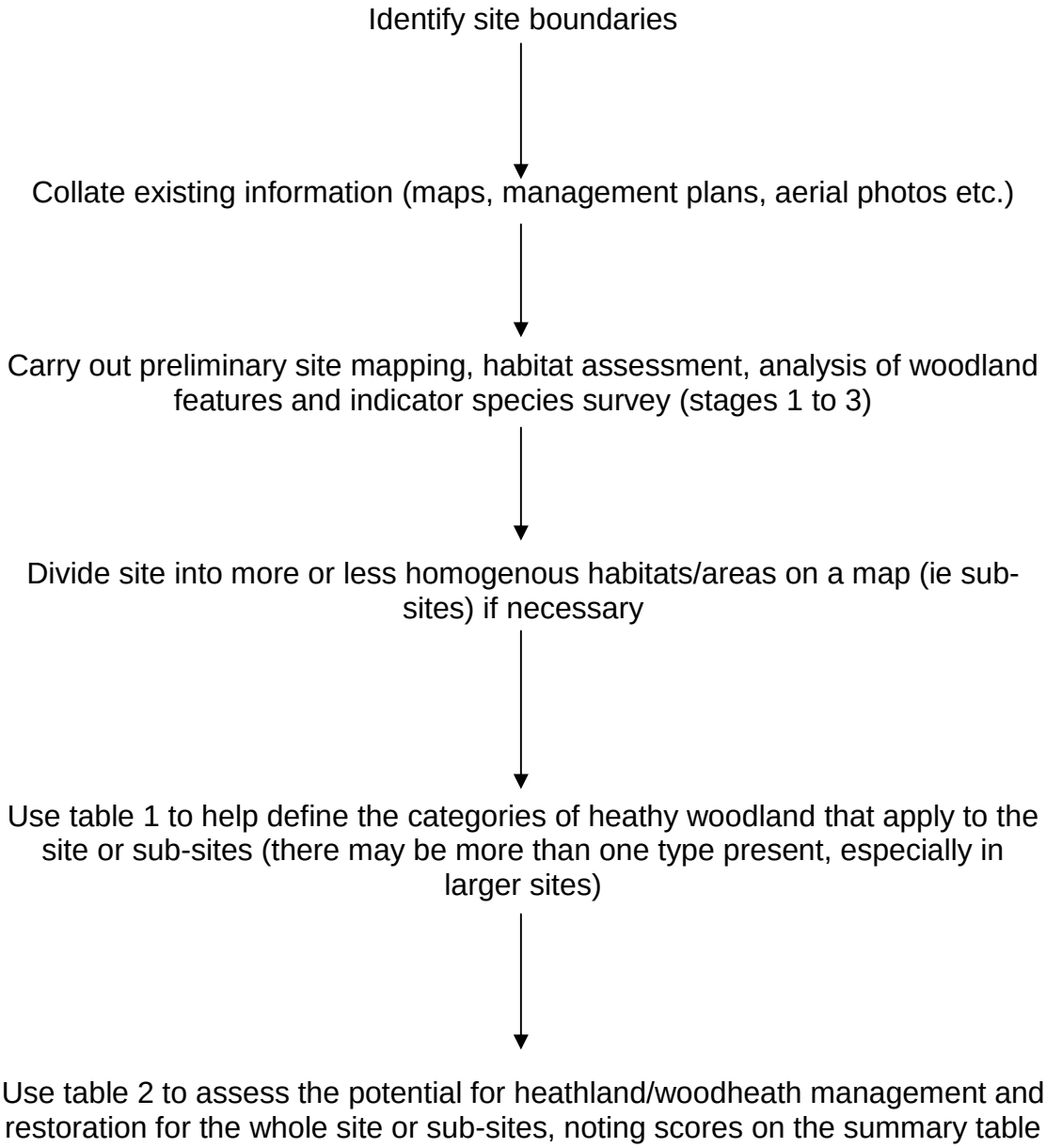
There is a wealth of literature pertaining to heathlands and wooded heathlands, much of which has been consulted in the preparation of this survey. Interpreting the past, analysing the present and informing the future, although ideally conducted from an objective standpoint, is never going to be definitive. A complete replication of the factors that created the habitats of the past is unattainable. The increased and increasing human population, together with its concomitant infrastructures, have considerably reduced the amount of land available for the entire wood – heath continuum since lowland heath was at its zenith in the 18th century, and it is simply not possible to reinstate the rural lifestyles of pre-industrial southern England. In a landscape with a low human population, the heath / wooded heath / woodland continuum would be in a state of dynamic flux, driven by natural succession, grazing pressure of large herbivores and catastrophic events such as storms and heath fires. The ideal would be to achieve this state once more, but with the level of human population in the southeast, this is not even a remote possibility on a large scale. At best, it may be feasible to designate specific sites as ‘woodland’, ‘wooded heath’ and ‘open heath’, and permit as much small-scale dynamic movement as possible within each of these. The fight to conserve all components of the wood/heathland mosaic, from open heath to closed canopy woodland, together with all the dependent biota, is a long-term commitment. It is the maintenance of this dynamic heterogeneity that will be one of the biggest challenges to those involved with managing heaths and woodlands in the High Weald.

This contract had a number of aims (Ch.1.3). It is hoped that all of these will be considered to have been achieved. The information that has been collated, the guidelines that have been developed, the maps that have been

digitised, the management options that have been identified and the economic opportunities that have been explored have all been undertaken with the ultimate goal – that wooded heath should acquire a status equal to that of open heath and ancient woodland, and that the conservation of the entire heath / wooded heath / woodland continuum is the responsibility of heathland and woodland managers, and the management strategy of both should reflect this. It is hoped that this will reconcile perceived conflicts of interests, and facilitate the conservation of as much of these habitats as possible in the High Weald area.

SECTION II WOODED HEATH SURVEY AND ASSESSMENT PROTOCOL

SUMMARY



WOODHEATH SURVEY AND ASSESSMENT FORM DRAFT

The draft woodheath survey is a multi-stage process intended to identify those wooded sites in the High Weald where management for “woodheath” is more appropriate than conventional woodland management.

At the end of the survey an assessment of the site should be made to direct management/restoration decisions. The assessment is made via a scoring system for different attributes of a site or sub-site. High scoring sites are more suitable for heathland/woodheath management techniques than low scoring sites or sub-sites.

Stage 1 – SITE MAPPING

Prepare a site sketch map with target notes – pay particular attention to the following features:

- Open glades and rides
- Areas with sparse tree cover
- Young tree/scrub growth including dense stands that indicate recent invasion of open ground
- Areas with intact/balanced canopy and shrub layers
- Old/veteran trees
- Wet flushes
- Driest/sandy areas
- Bracken dominated areas
- Rhododendron dominated areas
- Areas of conifer plantation

Stage 2 – HABITAT ASSESSMENT AND WOODLAND FEATURES

Woodland type(s) – tick boxes in the first row to indicate type(s) of woodland present on the site. There can be more than one type present.

* tick if all or part of the site appears on the ancient woodland inventory

	Conifer plantation	Broadleaf plantation	Secondary semi-natural	Ancient semi-natural*
Dominant canopy species				
Dominant shrub layer species				

Woodland features - note features that are present and attributes that apply to the site and if possible indicate where they occur on the site via map target notes

Feature or attribute	**Present Y/N?**	**Where? (eg whole site or target note number for sub-sites)**
Shrub layer		
Evidence of coppicing		
Shrub layer dense		
Mature or veteran trees. (Which species?)		
>50% tree cover over whole site		
Open areas/glades		
Ride and path network		
Age structure of wood uniform		
Wet flushes		
Bracken dominated areas		
Rhododendron dominated areas		

Stage 3 - INDICATOR SPECIES SURVEY

Records can be from field survey or anecdotal or historical records.

Tick the appropriate column where 1 = field survey record and 2 = anecdotal or historical record. Column 3 can be used to relate species location to target note on field map. Measures of abundance on the DAFOR scale can be added in column 1 if appropriate.

VASCULAR PLANTS

Species	**1 (field record)**	**2 (old record)**	**3 (target note number)**
Alder buckthorn			
Allseed			
Bell heather			
Bilberry			
Bracken			
Broom			
Climbing corydalis			
Common bent			
Common cow-wheat			
Devil's-bit scabious			
Goldenrod			
Gorse			
Great woodrush			
Hairy woodrush			
Hard fern			
Heath bedstraw			
Heath milkwort			
Ivy-leaved bellflower			
Lily-of-the-valley			
Ling			
Lousewort			
Purple moor-grass			
Sheeps sorrel			
Tormentil			
Wavy hair-grass			
Wood sage			
These rare/locally extinct spp should also be noted			
Dodder			
Greater broomrape			
Heath violet			
Heath lobelia			
Pale dog-violet			
Bog myrtle			
Cranberry			
Yellow centaury			

BRYOPHYTES

Species	1 (field record)	2 (old record)	3 (target note number)
Campylopus paradoxus			
Dicranella heteromalla			
Dicranum majus			
Hookeria lucens			
Isopterygium elegans			
Leucobryum glaucum			
Leucobryum juniperoideum			
Lophocolea bidentata			
Plagiothecium undulatum			
Pleurozium schreberi			
Pohlia nutans			
Polytrichum formosum			
Sphagnum fimbriatum			
Sphagnum squarrosum			
Zygodon baumgartneri			

FAUNA

Species	1 (field record)	2 (old record)	3 (target note number)
Heath fritillary			
Green hairstreak			
Dingy skipper			
Grizzled skipper			
Grayling			
Pearl-bordered fritillary			
Small pearl-bordered fritillary			
Tiger beetles			
Nightjar			
Meadow pipit			
Stonechat			
Tree pipit			
Woodlark			
Hobby			
Adder			
Common lizard			

SUMMARY OF ASSESSMENT OF SITES/SUB-SITES

Using stages 1 to 3 of the survey and assessment form it should be possible to map where there are concentrations of features that suggest woodheath/heathland management for nature conservation is most appropriate. This may apply to either all or part of a site.

Features Indicative of High Woodheath Potential	Features Indicative of Low Woodheath Potential
Open glades/rides	Evidence of coppicing
Sparse tree canopy cover	Dense/older shrub layer
Sparse/young shrub layer	Abundant “ancient woodland indicator” ground flora species including many vernal species
Well-spaced mature/veteran trees	Few “woodheath indicator species” recorded
Grassy ground flora	
At least some “woodheath indicator species” recorded	

Table 1: Broad categories of "heathy" woodland

This should be used as a basis for making a preliminary decision on what broad type of habitat a site or sub-site comprises, and is a first step in the decision making process on whether heathland habitat creation or woodheath management is a valid option. The categories form a continuum and there are not necessarily distinct boundaries between them i.e. many sites will be mosaics of different types of woodland or contain areas that are transitional in nature.

Criterion/feature	**Plantation on formerly open heathland**	**Acid pasture-woodland (including abandoned pasture-woodland)**	**Woodland with heathland flora dominant in field layer (secondary woodland, often on formerly open heathland)**	**Woodland with an element of heathland flora in field layer (ancient semi-natural woodland)**
		"woodheath habitats"		
1.1 Tree type, % cover, structure etc.	• Can be dominated by pine and/or other conifers with little or no oak, or can be oak plantation. Birch may or may not be present. More rarely sweet chestnut plantation, usually as coppice. • Tree cover can be in excess of 75% and up to nearly 100%. • Comprise uniform, even-aged blocks of trees.	• Oak generally mature/veteran and well spaced. Few other canopy trees apart from occasionally beech • Reduced/no shrub layer or progressively more dense holly and rowan where grazing/browsing is removed • Hazel is typically absent • % tree cover can be low where grazing persists – in the region of 30%	• Oak, birch, rowan and holly in varying proportions • Hazel is typically absent • Cover of oak is lower in young stands • Variable % tree cover depending on stand age • Often has a patchy structure with distinct areas of even aged birch and varied aged oaks • Older stands may have oak coppice	• Canopy and shrub layers comprise a mixture of broadleaved species, of which oak is an important component • Hazel often present and can be frequent in the shrub layer • Hawthorn often present • Tree cover variable, from at least 60% upwards • Has a typical woodland structure with well defined canopy, shrub and field layers, usually a coppice with standards structure, though can be high forest
1.2 Indicator species	• Either monospecific canopy or just a few species, usually conifers eg Scots pine, but can be broadleaves such as sweet chestnut or oak • Ericaceous shrubs persist in rides and felled areas • Can be subject to invasion by rhododendron especially where the heather is in the degenerate phase and plantation trees are young	• Mature/veteran oaks, sometimes pollarded • Grassy field layer that can include wavy hair-grass, creeping soft-grass, common bent, devil's-bit scabious, tormentil, sweet vernal-grass, tufted hair-grass and purple moor-grass • Bracken • Ling • Wavy hair-grass is promoted by grazing so is most prominent where grazing persists	• Wavy hair-grass, bracken, tormentil, heath bedstraw, common cow-wheat, bilberry, ling, bell heather, great wood-rush, hairy wood-rush, lily-of-the-valley, wood sage, climbing corydalis, goldenrod, sheeps sorrel, hard fern, ivy-leaved bellflower, lousewort, heath milkwort, broom, alder buckthorn, allseed, gorse and purple moor-grass • Bryophytes including *Polytrichum formosum, Dicranum majus, Pleurozium schreberi, Dicranella heteromalla, Isopterygium elegans, Campylopus paradoxus, Lophocolea bidentata, Pohlia nutans, Sphagnum fimbriatum,*	• Bluebell and other spring flowering species are frequent • Bramble • A mixture of broadleaved trees and shrubs including hazel and hawthorn • Frequent wood anemone

Criterion/feature	Plantation on formerly open heathland	Acid pasture-woodland (including abandoned pasture-woodland)	Woodland with heathland flora dominant in field layer (secondary woodland, often on formerly open heathland)	Woodland with an element of heathland flora in field layer (ancient semi-natural woodland)
		"woodheath habitats"		
			S.squarrosum, Plagiothecium undulatum, Hookeria lucens, Zygodon baumgartneri and *Leucobryum glaucum, Leucobryum juniperoideum.* • Oak, birch, holly, rowan and sometimes beech woodland • Bilberry is more prominent in ungrazed woods • Great wood-rush is grazing sensitive • Ancient woodland species such as wood sage, wood sorrel and pignut can be present but will not be a major component of the field layer	
1.3 History of use/management including map evidence eg woodbanks	• Former open heathland that has been grazed/burnt/harvested but latterly planted with a tree crop	• Grazed pasture-woodland combined with harvesting other products eg. Bracken, gorse, timber	• Former heathland where grazing/burning/harvesting stops and natural succession progresses to allow birch scrub then woodland to become established	• Long continuity of dense woodland cover and management, usually coppice with standards
1.4 Possible NVC community(ies) – mosaics and transitional communities are to be expected	• H1 *Calluna vulgaris – Festuca ovina* heath • H2 *Calluna vulgaris – Ulex minor* heath (especially H2b) • M16 *Erica tetralix – Sphagnum compactum* wet heath • W16 *Quercus spp. – Betula spp. – Deschampsia flexuosa* woodland	• W16 *Quercus spp. – Betula spp. – Deschampsia flexuosa* woodland • U1 *Festuca ovina – Agrostis capillaris – Rumex acetosella* grassland • U2 *Deschampsia flexuosa* grassland • U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland • U20 *Pteridium aquilinum – Galium saxatile* community • M16 *Erica tetralix – Sphagnum compactum* wet heath (in flushes) • W4 *Betula pubescens – Molinia caerulea* woodland (in flushes)	• W16 *Quercus spp. – Betula spp. – Deschampsia flexuosa* woodland • W4 *Betula pubescens – Molinia caerulea* woodland (in flushes) • U20 *Pteridium aquilinum – Galium saxatile* community	• W10 *Quercus robur – Pteridium aquilinum – Rubus fruticosus* woodland

Table 2: Assessing heathland restoration/woodheath management potential within acid woodlands or woodheaths

This is the second, but parallel, step in assessing the site. A cumulative rating for each site or sub-site should be compiled to assist with decisions on appropriate management. It is probable that not all criteria can be answered for all sites. Criteria 2.1 to 2.4 inclusive apply to the whole site but the remaining criteria can be applied to either the whole site if it is small and/or uniform or to sub-sites defined in the mapping phase if the site is large and/or diverse

Criterion	Potential of wooded sites to support heathland communities within the woodheath mosaic		
	High	**Medium**	**Low**
2.1 Size of site	• Large >10ha	• Medium 1 – 10ha	• Small <1ha
2.2 Location within the defined/mapped area of appropriate soils on ridges in the High Weald	• Site falls entirely within the area	• Site falls partly within the area or next to its boundary	• Site falls on other soil type that is less acidic, more fertile etc.
2.3 Proximity to existing areas of heathland or woodland with a significant heathy component (ie potential to contribute to a habitat network)	• Site adjoins existing heath or woodheath and can form part of a network of such sites	• Site lies near existing heath or woodheath and links could potentially be created to such sites or species could be expected to colonise naturally	• Site does not lie near existing heath or woodheath and the potential to link with such habitats is limited. • Site is isolated from any semi-natural habitats
2.4 Diversity of habitats and features within the site	• A range of habitats and features exist on site	• Some variability in habitat and feature diversity	• Uniform site with little habitat diversity
2.5 Type of woodland/tree cover – number, condition, age of trees/shrubs, % tree cover, presence of open areas	• Coniferous or broadleaved plantation. • Predominantly old standards, including veterans and a sparse shrub layer indicating a recent history as wood-pasture. • Areas of young, even aged birch and few oaks. • Existing open areas with a heathy flora • Bracken only infrequent and not dominant in field layer	• Holly shrub layer developing below old oak standards • Young/maiden oaks. • Some heathland species in open areas. • Bracken frequent	• Mixed aged, broadleaved trees and shrubs. • Coppice with standards structure that includes hazel. • *>75% tree cover with few open areas.* • Canopy not oak or beech dominated with frequent birch

Criterion	Potential of wooded sites to support heathland communities within the woodheath mosaic		
	High	**Medium**	**Low**
2.6 Indicator species present – flora and fauna	*Calluna, Deschampsia flexuosa, Vaccinium myrtillus, Erica cinerea, Potentilla erecta, Galium saxatile, Melampyrum pratense, Luzula pilosa, Luzula sylvatica, Teucrium scorodonia, Ceratocapnos claviculata, Solidago virgaurea, Rumex acetosella, Blechnum spicant, Molinia, Ulex spp., Succisa pratensis, Radiola linoides, Wahlenbergia hederacea, Polygala serpyllifolia, Pedicularis sylvatica, Cytisus scoparius.* Heath fritillary, green hairstreak, dingy skipper, grizzled skipper, grayling, pearl-bordered fritillary, small pearl-bordered fritillary, tiger beetles, nightjar, Dartford warbler, meadow pipit, stonechat, tree pipit, woodlark, hobby, adder, common lizard	Intermediate numbers of indicator species from each extreme	*Hyacinthoides non-scripta, Corylus avellana, Crataegus monogyna, Anemone nemorosa, Primula vulgaris, Ranunculus ficaria* and other spring flowering field layer species Dormouse Bats, or high bat roosting potential
2.7 Potential to contribute to conservation and enhancement of populations of SAP, RDB or other protected or notable species present on site	• An increased area of heathland habitat will secure or benefit populations of rare, scarce or threatened species	• Species present is of local importance. • Species has extensive existing habitat. • A viable population can be maintained by existing woodland management	• No scarce or threatened species are likely to benefit from heathland habitats. • Nationally important species could suffer from a change of management
2.8 Extent of existing biological, geological, archaeological information and constraints/opportunities presented by the data	• Good data that indicates no/few constraints to management. • Records of heathland species present or formerly present.	• Limited data on past and present habitats and species • Limited geological and/or archaeological information	• Biological data suggests retention of woodland habitats. • Existing interest likely to be adversely affected by heathland restoration management. • Other constraints to management
2.9 Information on previous recent or historic site management and habitats present, including whether site appears on the ancient woodland inventory	• Site has recent history of heathland habitats and management. • Site does not appear on asnw inventory • Site is clearly young and/or secondary woodland	• Site appears as replanted ancient woodland on the inventory • Limited information on site management history	• Site appears as ancient semi-natural woodland on the inventory • Site has a long history of woodland management and supports well established coppice with standards, woodbanks etc.

Criterion	Potential of wooded sites to support heathland communities within the woodheath mosaic		
	High	**Medium**	**Low**
2.10 Management practicalities including access, invasive species present and resources available for management	• Good access • No/few invasive species • Low levels/density of bracken • Resources available for future management (including labour, equipment, money, livestock etc.)	• Moderate access • Moderate levels of invasive species • At least some resources available for future management	• Poor access • High density of invasive species, especially rhododendron • Few/no resources available for future management

Table 3 - Summary Table for Assessment of Site and Sub-site Woodheath/Heathland Restoration Potential (from table 2)

Site or sub-site	2.1 Size of site (whole site)			2.2 Location of site (whole site)			2.3 Proximity to heathland (whole site)			2.4 Diversity of site (whole site)			2.5 Type of wood/tree cover		
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
Site or sub-site	**2.6 Indicator species**			**2.7 Potential contribution**			**2.8 Existing information**			**2.9 Site management**			**2.10 Management practicalities**		
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L

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Appendices*

Appendix 1. Plant lists for Three Cups Corner Meadow and Hadlow Down Churchyard.

Appendix 2. Ancient Woodland Indicator Species.

Appendix 3. England Forestry Forum 22nd October 2002: Biodiversity Working Group Progress Report.

Appendix 4. Forestry Commission – South East England Conservancy: Deforestation procedures October 2001.

Appendix 5. Tudeley Woods Management Plan (*on attached CD only*)

Appendix 6. Bats, Dormice and the Law; Tree Work and Bats Information Sheet 1.

* *Appendices 1,2,3,4 & 6 on printed version only.*