A revision of the Ancient Woodland Inventory for Surrey

Report and Inventory Maps

June 2011

A revision of the Ancient Woodland Inventory for Surrey

Project carried out by Robert Davies,
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January 2009 to June 2011

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Natural England foreword

Natural England works for people, places and nature, to enhance biodiversity, landscapes and wildlife in rural, urban, coastal and marine areas; promoting access, recreation and public well-being, and contributing to the way natural resources are managed so that they can be enjoyed now and in the future.

Natural England considers that ancient woodlands are irreplaceable, and should therefore be protected and managed so as to maintain and enhance their special character. Knowing where ancient woods are is therefore a key nature conservation need. You've

The Ancient Woodland Inventory was originally compiled by the Nature Conservancy Council (a predecessor to Natural England) between 1981 and 1992, with the inventory for West Sussex being first produced in 1984. This inventory was further updated in 1989 and was digitized by the Forestry Commission in 2000 for use on Geographic Information Systems.

A new inventory revision began in Wealden District in East Sussex in 2004, consolidating the earlier work on the Ancient Woodland Inventory, and including woodlands below two hectares for the first time. The survey has continued to expand across the South East region, with similar revisions to the Ancient Woodland Inventory now being undertaken across Sussex, Surrey, Kent, Hampshire and the Chilterns.

This report outlines the work of the project in Surrey, taking in additional historical map evidence and site surveys to verify the status of sites. Natural England will add the information captured by this project to the national inventory. Natural England welcomes the work of this survey and the increased protection and understanding of ancient woodland that it brings.

Emma Goldberg
Forestry and Woodland Specialist
Natural England

Forestry Commission foreword

The Forestry Commission works to ensure the protection and sustainable management of our woodlands. Ancient woodlands in particular are exceptionally rich in wildlife, and often contain important archaeological and heritage features relating to their past management. The appropriate management and protection of these sites is a key concern for the Forestry Commission, particularly in heavily wooded counties such as Surrey which contain a significant proportion of England's ancient woodland resource.

The focus on ancient woodland received a new emphasis in 2005, with the launch by Defra and the Forestry Commission of 'Keepers of Time: A Statement of Policy for England's Ancient & Native Woodland.' [1] This sets out the vision that '*Ancient woodlands, veteran trees and other native woodlands are adequately protected, sustainably managed in a wider landscape context, and are providing a wide range of social, environmental and economic benefits to society.'*

Ancient woodlands are widely recognised as being irreplaceable habitats, but many are not protected through designation. Local authorities have a key role to play in the protection of this unique resource through the planning process. This role was strengthened by the publication of Planning Policy Statement 9,[2] which includes a requirement for local authorities to identify any areas of ancient woodland that do not have statutory protection. The Forestry Commission recognises that this is a complex and potentially time-consuming task and its support for this revision of the Ancient Woodland Inventory for Surrey is part of a wider initiative to help co-ordinate similar surveys.

This survey has resulted from a strong partnership between Surrey County Council, Natural England, the Surrey Hills AONB Unit, and the Forestry Commission. The Forestry Commission believes that such partnerships, working with local authorities, provide an important means for increasing the understanding, protection and sustainable management of our historic ancient woodlands.

Alan Betts
Regional Director
South East England Conservancy
Forestry Commission

[1] DEFRA and the Forestry Commission (2005)
[2] Office of the Deputy Prime Minister (2005)

Surrey Hills AONB Foreword

The Surrey Hills Area of Outstanding Natural Beauty stretches across the chalk ridge of the North Downs that run from Farnham in the west, above Guildford, Dorking and Reigate, to Oxted in the east. They contain a mosaic of woodland, scrub and open downland with combes, spring lines, chalk pits, quarries and striking cliffs. To the south are the Greensand Hills that include Black Down, the Devil's Punch Bowl and Leith Hill, with ancient sunken lanes and geometric fields that have been enclosed from heaths and wooded commons. In between are the valleys of the Wey, Tillingbourne and Mole rivers, and the heaths of Frensham, Thursley and Blackheath. The Low Weald forms the southern fringe of the Area of Outstanding Natural Beauty with its extensive woodlands and small irregular fields, hedgerows and wooded shaw's.

The Surrey Hills is now one of the most wooded AONB's, with almost 40% woodland cover, and woodland is perhaps now the defining feature of the Surrey Hills landscape. The woodland is diverse, including shaw's, old coppice, wooded ghyll's, parkland trees, small carr's and conifer plantations. Secondary woodland on former farmland and commons can preserve archaeological features such as burial mounds, ridge and furrow, and kiln sites that would otherwise be lost under cultivation or management.

Some woods have been managed since medieval times and many have distinctive boundaries such as earth banks with laid trees. Ancient woodland has particular significance in terms of historic and nature conservation importance. Yew and box woodlands on the North Downs are of international importance constituting a Special Area for Conservation. There are a variety of woodland types within the Surrey Hills determined in part by the superficial geology. Ash, hornbeam and oak tend to dominate on the clay; ash, beech and yew on the chalk; with oak, birch, Scots pine and beech on the freer draining sands. Together with aspect, drainage and topography, this variation in soil type has determined the species composition and evolution of woodlands.

It is essential to understand what we have if we are to value, protect and enhance our ancient woodland heritage. The revision of the Ancient Woodland Inventory for Surrey has provided an opportunity to identify these ancient woodlands including those sites under two hectares in size, which were largely absent from previous work.

The Surrey Hills AONB was able to support this important project in Surrey through its Sustainable Development Fund supporting the work of the survey team. Our thanks go to Robert Davies, Matthew Grose, Victoria Hume, Patrick McKernan, Alistair Kirk and Sarah Jane Chimbwandira who have worked diligently in the field and at the desk to pull this project together.

Rob Fairbanks
Director
Surrey Hills AONB

Surrey County Council and the revision of the Ancient woodland Inventory

The Surrey landscape is precious and woodland is an important component, covering some 23% of the land area of the county. Ancient semi-natural woods contain irreplaceable ecological and historical features and must be protected and managed so that their special character can be conserved for future generations.

Knowing where ancient woodlands are and understanding this resource is a fundamental requirement for securing their long term future and key to making the right policy decisions. This survey accurately identifies our ancient woodlands, including those under two hectares, providing a robust evidence base for planners and other decision makers, helping to identify threats to this vulnerable resource but also opportunities for good management.

Woodlands are valued for a number of reasons including recreation, timber, flood amelioration, soil conservation, carbon storage, wildlife and how our ancestors shaped and interacted with their landscape. This and previous surveys have given a fascinating insight into our cultural history and complement the County Council's strategic landscape character work over several years.

This survey is now part of similar work throughout the South East of England, highlighting the hugely important and precious ancient woodland resource that exists in this densely populated region.

Surrey County Council has supported the Surrey Ancient Woodland Revision since 2008 and this document is the culmination of the hard work, dedication and enthusiasm of the survey team. I would particularly like to thank Robert Davies, Matthew Grose, Victoria Hume, Patrick McKernan, Alistair Kirk and Sarah Jane Chimbwandira for making the project a reality. It could not have happened without the support and commitment of all the project partners: the Forestry Commission, Natural England, the Surrey Hills AONB Unit, Surrey Biodiversity Information Centre, the Surrey Wildlife Trust and 10 district and borough councils.

Dr Lynne Hack
Cabinet Member for Environment
Surrey County Council

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1. Summary

Ancient woodland is a nationally important and threatened habitat, and its existence over hundreds of years has preserved irreplaceable ecological and historical features. The south-east of has approximately 40% of the ancient woodland in England, but this valuable resource is increasingly under threat from development pressures in this densely populated region. The revision of the Surrey Ancient Woodland Inventory (AWI) was initiated in recognition of the increasingly important role of ancient woodlands and the deficiencies of the existing Ancient Woodland Inventory.

This report summarises the methodologies and findings of a two year project (running from January 2009 to May 2011) to revise the Ancient Woodland Inventory (AWI) for Surrey. The Surrey Ancient Woodland Survey has worked with Elmbridge Borough Council, Epsom & Ewell Borough Council, The Forestry Commission, Guildford Borough Council, Mole Valley District Council, Natural England, Reigate & Banstead Borough Council, Runnymede Borough Council, Surrey Heath Borough Council, Surrey County Council, the Surrey Hills Area of Outstanding Natural Beauty (AONB) Unit, Surrey Wildlife Trust, Tandridge District Council, Waverley Borough Council and Woking Borough Council to provide a robust evidence base upon which to assign ancient woodland status.

The whole of the counties ancient woodland resource has been re-examined. The area of ancient woodland since the original inventory was produced has risen from 9,944 Ha to 11,935 Ha, a net gain of 1991 Ha, or 20%, as a result of this revision. This represents a modest increase from 6% to 7.1% of the area in the county designated as ancient woodland. Conversely, the number of parcels of ancient woodland in the revised inventory is almost two and a half times that of the original inventory, with the gain mostly attributable to small parcels of woodland well distributed across the county.

Although the gain in number of woodland parcels identified by this revision is significant it would have been even greater had it not been for an unusual quirk in the methodology of the original 1988 AWI. The 1988 Inventory, in line with the other AWI surveys conducted throughout South-East England at that time, should only have included woodlands greater than two hectares. This was an external limitation imposed by the paper based nature of the work which meant that potentially ancient sites below two hectares in size could not be confidently identified from maps alone. However, through the utilization of site data and local knowledge, 310 of the 1252 sites included by Drucker *et al.* were below two hectares in size.[3]

This revision thus reflects the first systematic attempt to fully include all woodlands below two hectares. Whereas the 1988 AWI identified 310 sites below two hectares the total area of these additions was only 351.57 Ha. The improved methodology and technology used by this revision has resulted in the identification of 1964 sites less than two hectares in size with an area of 1483 Ha, more than four times that included by the 1988 inventory.

The revised inventory will assist planners in making decisions about development within Surrey, ensuring that the effects of any development proposals on ancient woodlands can be properly assessed and considered. It will also enable a better assessment of the extent and quality of Surrey's ancient woodland resource, as well as helping to identify threats to the resource, areas for improving habitat connectivity, and opportunities for the strategic management of key woodlands.

[3] Drucker *et al.* (1988)

2. Introduction

2.1 Background

Ancient woodland sites over two hectares in size are recorded in the county Ancient Woodland Inventories which were compiled in the 1980s and 1990s by the Nature Conservancy Council (NCC).[4] These inventories, now brought together as the National Ancient Woodland Inventory, have become an important tool for policy makers and planners, whilst also assisting land managers to identify key areas for the restoration and planting of native woodlands and increasing awareness of the importance of ancient woodland.

At the time, the compilation of the original inventories was an extremely valuable process, and a landmark achievement for the conservation of British woodland. However, new information and advances in technology mean that their inaccuracies and omissions can now be addressed. With the pressure on land increasing year on year, these errors can cause significant problems for planning authorities. In addition, the general exclusion of woodlands of less than two hectares has undermined the protection afforded to these sites through the planning process. This is particularly the case in heavily wooded counties such as Surrey, where small woodlands are a central part of the fabric of the countryside and make a significant contribution to the overall woodland resource. This inventory revision systematically includes these small woodlands for the first time.

The original AWI for Surrey was first produced in 1988 by the NCC and revised in 1997 by English Nature.[5] Originally, all of the county inventories were only available on printed maps, but between 1998 and 2000 they were digitally mapped (digitized) by the Forestry Commission. This first digitization is the electronic version that most resembles the original printed inventories, which have a published methodology; although it does include some changes made since the paper versions were produced. This digital dataset was subsequently updated on a case-by-case basis by English Nature (now Natural England), the successor to the NCC, and is now administered by Natural England. For the purposes of this report, a comparison has been made between the revised inventory and the digitized inventory which became available in 2000. The 2000 version is the nearest to the original inventory available to this survey in electronic format, and is referred to hereafter in the text and maps as the 'original AWI' or 'original inventory'.

2.1.1 The Weald and Downs Ancient Woodland Survey

The Surrey revision is part of a wider revision of the ancient woodland inventories in the South-East of England. With the exception of surveys in Surrey, Hampshire and the Chilterns AONB the wider revision is known as the Weald and Downs Ancient Woodland Survey. The survey has completed revisions of the old inventories for Wealden district (2006), Mid Sussex district (2007), Tunbridge Wells borough Kent (2007), Ashford borough, Kent (2009), West Sussex and Brighton and Hove Unitary Authority (2010), Rother district, Hastings borough & Tonbridge & Malling borough (2010), Lewes district (2010) and Eastbourne borough (2011).

Key partners in the Weald and Downs Ancient Woodland Survey include the High Weald AONB, Unit (which hosts the Kent and East Sussex surveys), Natural England, Forestry

[4] Spencer & Kirby (1992)
[5] Isaac & Reid (1997)

Commission, Wealden District Council, Mid Sussex District Council, Ashford Borough Council, Tunbridge Wells Borough Council, Tonbridge & Malling Borough Council, Rother District Council, The Woodland Trust, East Sussex County Council, West Sussex County Council, High Weald AONB Unit, Sussex Wildlife Trust and Sussex Biological Records Centre, INTERREG IIIb under the Lifescape Your Landscape Programme, and the relevant local authorities.

The aim of the survey is to revise and update the Ancient Woodland Inventory in these areas, and to include, for the first time, ancient woodlands less than two hectares in size. For East Sussex and Kent, the survey is based at the High Weald AONB Unit. For West Sussex, the survey was hosted by the Sussex Biodiversity Record Centre and Sussex Wildlife Trust. The Chilterns survey is hosted by the Chilterns AONB and the Surrey revision was hosted by Surrey Biodiversity Information Centre at the Surrey Wildlife Trust.

2.1.2 Surrey Ancient Woodland Inventory revision

This survey was hosted by the Surrey Wildlife Trust and the Surrey Biodiversity Information Centre. Relative to it size, Surrey is an exceptionally wooded county. In total, there are 37,700 Ha of woodlands that are greater than 0.1 Ha.[6] Proportionately, this habitat covers 22.5% of the county. Of the nine counties in the South-East region, Surrey has the highest density of woodland and ranks third in terms of total hectarage. Almost a third of its woodland is designated as ancient. These ancient woodlands represent a significant resource, covering 7.1% of the county, based on this revision.

A significant part of the county is covered by the Surrey Hills AONB Surrey together with a small area of the High Weald AONB to the south east corner. In addition, a large part of the county falls within the Low Weald, Wealden Greensand, North Downs and Thames Basin Heaths character areas (see Map 1). The highest density of woodland is in the south and west, where there are many shaws; belts of trees and woodlands that are often less than two hectares in size. In fact, the majority of ancient woodland within the county falls south of a straight line drawn between the towns of Farnham and Epsom. This distribution is further restricted to two landscape areas in particular, the Low Weald and Wealden Greensand. Together, they encompass roughly 47% of the county yet harbour almost 74% of all ancient woodland. This distribution is a result of historical patterns in land use combined with the geology and soils of these regions as is explained below in section 2.1.3.

The extent of woodland in the county and the general exclusion of small woodlands in the original AWI were important factors in deciding to undertake this revision of the inventory.

2.1.3 Historical and ecological overview of the woodland of Surrey

Surrey is rich in woodland, not just in the size of its resource but also in the great ecological and historical diversity of its woods. Some, such as Glovers Wood and Chiddingfold Forest, are well known for both their ecological diversity, being Sites of Special Scientific Interest (SSSIs), and their archaeological heritage. Further, the native box and yew woodland at Box Hill, a SSSI and Special Area of Conservation (SAC), is of international importance in terms of biodiversity and cultural heritage.

Yet beyond the best-known examples, more than two hundred and fifty other woods in the county are designated, or part designated, as SSSIs, and many more are Local Nature Reserves (LNRs) or Sites of Nature Conservation Importance (SNCIs). This still leaves a considerable

[6] Smith and Gilbert (2001)

number of small woods within the county that have to date received relatively little - and, in many cases, no - study.

The variety of woodland types found in Surrey is varied and includes beech hangers, wooded ghylls (wooded valleys or ravines), historical parklands, wet floodplain or riverside woods, conifer plantations, coppice woods, shaws and derelict nurseries.

The factors that interact to shape the character and distribution of this variety are the underlying geography, climate, geology and soils – the root environmental controls on the development and composition of vegetation – and the changing ways in which this vegetation has been used and controlled as a resource by people through history.

The development of woodland in Surrey

Deciduous woodland first originated in South-East England, including Surrey, at around 7,500 BC during the rapid warming that followed the end of the last glacial period in 10,000 BC. The shift to a more settled economy based upon agriculture, in the Neolithic, at ca. 4000 BC would have been a gradual process during which societies were using a mix of hunter-gathering and farming. The slow development that occurred in agrarian technology would have meant clearance of high forest on easily worked sand or chalk soils, followed by secondary woodland succession on the nutrient-poor and exhausted soils. The large areas of downland plant communities historically associated with the North Downs are considered a direct result of the pasture created on these impoverished soils after woodland clearance.[7]

Settlement evidence of the first farmers in Surrey during the Neolithic period is scant; however, the decline in *Ulmus* (elm species) pollen evidence at approximately 4000 BC is considered an indication that woodland clearance was underway, at least on the Downs and heathland, by these early farmers.[8] It should be noted, however, that 4500 BC is the time at which coppice management of woodlands became a feature in the landscape. Thus, the type of woodland management at this time in unlikely to have been solely 'slash and burn'. Some woods would have been coppiced, either for animal fodder, firewood or for craft materials; though of course none of Surrey's present day coppice dates from this period.[9] This clearance, at least on the most easily worked soil, increased in intensity throughout the Bronze and Iron ages between ca. 2500 BC and 100 AD. During this time extensive areas of the Downs, close to settlements, were cleared for farming. In the High and Low Weald, the rate of woodland clearance was much slower as the soils there were less fertile and less suited for early agricultural management (see below).[10]

After the Roman invasion in 43 AD and subsequent conquest, clearance for agriculture is believed to have continued in the north and west. However, wood was increasingly utilised in the south of the county as a valuable resource to be managed for the manufacture of iron. The intensity of iron production increased during the Roman occupation, with the Wealden woods providing the necessary raw materials. The accompanying pottery, metal and glass industries of the Romano-British period required a ready supply of fuel which could not be supplied with sufficient regularity by primary woodland. Thus, centralized, active woodland management with the selection of different wood species for their durability and suitability for various uses is likely

[7] Bannister (2002)
[8] Bannister & Wills (2001)
[9] Rackham (1976)
[10] Rackham (2003)

to have occurred on a much greater scale than previously, giving rise to changes in species dominance of the wood.[11]

With the wane of Roman authority it is suggested that the resulting decline in industry meant many woodlands to the south previously managed as coppice would have been abandoned, developing into high forests. The subsequent consolidation of control by Anglo-Saxon invaders saw a return to full management: thus, the present landscape structure of southern and eastern Surrey is believed to be Saxon in origin. The distribution of ancient woodland, commons and farmsteads in the south and east of the county is likely to have been influenced by these Saxon management practices.[12]

By the time of the Domesday survey (1085-1086) much of the rural landscape of southern and eastern Surrey was in place, and remained little altered until the 19th and 20th centuries.[13] Examples of this medieval landscape survive and can be seen in the wooded areas surrounding East Horsley, north-east of Guildford or Dunsfold in the south of the county. Here a mosaic of small commons and assarted woodlands with numerous small shaws still remains. Many of the woods harboured glassworks, fish ponds, moated sites and iron workings of medieval origin. However, as outlined above, Saxon management did not greatly determine the landscape of the north-west of the county. Here the landscape has altered greatly as a result of parliamentary enclosure, changes in land management practices and later 19th century suburban development.

As the population in Surrey increased, so too did the demand for agricultural land and wood for fuel and timber. During the 16th century, new smelting practices enabled the production of cast iron but required a huge amount of fuel obtained largely from the overexploitation of underwood. This resulted in fewer trees growing to maturity with severe implication for the ship-building industry, to the extent that in 1581, in an attempt to regulate demand for this finite resource, a law was passed limiting the establishment of new iron works.[14] Even so, by the 1700s it is estimated that between 35-81% of the Surrey Weald wooded area was exploited by the iron industry.

However, in the north and west of the county between this period and the late 19th century a gradual change to coal as the fuel of choice in London, an increasing demand for food production, combined with untenable costs in transport and competition meant that many woods in this area fell into disuse and were subsequently grubbed up. This was further affected in the 17th century by the trend for planting exotic species, and large stands of trees became increasingly popular. The practice continued into the 18th and 19th centuries, with plantations established on areas that were previously more open heath and commons.

Further south, the demand for woodland produce continued to a later date, driven partly by the surging market for coppice produce in this area in the mid 19th century. However, a combination of factors, including the coming of railways and arrival of cheaper substitutes for many of the uses of wood (and for hops) meant a slump swiftly followed.

The widespread abandonment of traditional woodland management in the late Victorian period continued into the 20th century. Coppicing had reached an ebb by the end of World War II and the planting of non-native, usually coniferous, tree species grew significantly in the post-war period. Today many woods in Surrey are dominated by either a derelict broadleaved coppice or

[11] Bannister (2002)
[12] Bannister & Wills (2001)
[13] Drucker (Unpublished)

neglected conifer plantations. The closing of the broadleaved round-wood intake to the paper mill at Sittingbourne in Kent in 1991, and the recent closure of other mills throughout the country has significantly weakened the market for underwood in South-East England. Without new incentives to resume the coppice systems that have formed and defined these woods down the centuries, their ecological and cultural heritage is at threat. Some hope of revival has arrived in the form of renewed interest in the firewood market and the currently burgeoning interest in wood-fuel as a heat source.[15]

The development of Ancient Woodland in Surrey

As discussed above, the majority of Surrey's ancient woodland (almost 74% of sites) is found to the south of the county in just two landscape areas, the Wealden Greensand and Low Weald which run in roughly stacked, parallel bands, from east to west (see Map 1).

The Wealden Greensand has a particularly diverse geology consisting of bands of clay overlaid with varied surface deposits that include clay, sandstone and sandy limestone. This landscape was historically more suited to pasture than arable agriculture, which helps explain the current predominance of woodland. The central region of the Wealden Greensand is largely characterized by plantations of pine, sweet chestnut and other forestry species. The highest point in South-East England, Leith Hill, is also found here, straddling the border between the Wealden Greensand and Low Weald. Significant amounts of ancient woodland have survived on the valley floors, often as shaw woodlands, and on the sides of steep valleys.

The varied geology of these woods is reflected in their floristic diversity and richness. Acidic soils support woodland of oak, bracken, and bramble, with heathy oak and birch woodland on the lighter soils. The heavy clay supports especially varied woodland characterised by ash, field maple, and dog's mercury; the banks, ditches and large ash stools help to provide an indication of ancient status.[16]

The Low Weald is a low lying region below the Wealden Greensand and meets a small corner of the High Weald in the south-east. The soils in this area are generally heavy and clay-rich, with poor drainage, and are subsequently low in nutrients. Again, historically this geology meant the predominant cover was woodland, with an estimated 70% of the area wooded at the time of the Domesday survey in 1086. Indeed, the word *weald* comes from the Old English word for forest.[17]

The area is still heavily wooded today, with almost 42% of the county's ancient woodland found here. A large part of this is characterised by relatively large sites on the steep slopes around Haslemere, and in low-lying areas West of Chiddingfold, and around Leith Hill in the centre of the Low Weald. To the east, the Low Weald has always been more open as woodland was cleared to make way for pasture fields. This is particularly apparent in the district of Tandridge where clearance has resulted in a predominance of smaller, more irregular, woods often along the edges of fields. The species richness found in many of these shaws indicates that these are remnants of ancient woodland which survived the historical clearance.

Found to the south-east of the Low Weald only a relatively small area of the High Weald falls within Surrey but in its sandstone areas, streams and rivers may erode through the rocks to form a particularly interesting woodland type, steep ghyll woods. These are ecologically important as the localised high humidity, more typical today of the western Atlantic woodlands of the U.K,

[15] Bannister (2002)
[16] Margot *et al.* (1997)
[17] Rackham (1976)

supports communities of moisture-loving plants like ferns, lichens and bryophytes. They may, in fact, be relicts of the Atlantic period, 5-6000 years ago, when the climate was generally damper and milder than it is presently. Generally small in size and frequently isolated, the species they harbour are unlikely to be able to colonise recent woodland so their inclusion by this inventory revision is particularly important.

The North Downs is home to the majority of the remaining ancient woodland within the county, with 18% of sites found here. As outlined above in the general history of woodland within Surrey, this again is due largely to the interaction of geography, geology, soils and historical management. Ash, hornbeam and oak tend to dominate on the clay; ash, beech and yew on the chalk; with oak, birch, Scots pine and beech on the freer draining sands. However, the thin (superficial) uppermost deposits of clay with flints have the greatest variety of woodland stand types. Even on the chalky areas of the North Downs the ancient woods tend to occur on superficial deposits rather than directly on chalk soils. This is possibly a result of early cultivation of the area. Superficial clay and flint deposits may have been more widespread in the past but early cultivation is believed to have resulted in soil erosion, leaving more calcareous topsoil.[18] Thus, where woodland occurs today over clay-with-flints it is likely to indicate a long continuity of woodland cover.[19]

Beech hangers or ash woodlands tend to form on the more stable soils, with a mix of beech and yew on deeper soils and yew on the steeper, dryer slopes. Box Hill is a prime example of ancient yew woodland. Examination of historical maps shows shifting patterns of the grass/scrub and woodland matrix of the Downs. Over the years the wood on the Downs seems to have expanded and contracted as grazing intensity and agricultural practices changed.

The remainder of ancient woodland in Surrey is concentrated within the Thames Valley & Basin Lowlands and the Thames Basin Heath areas. It is primarily located in the Basin Lowlands, which cut across the county from east to west and which are generally low-lying and undulating over London clay. Here, the historical management pattern of small, mixed farms has been retained and with it has survived the ancient woodland - especially around East Horsley where, with the exception of recently afforested or regenerated woodland, most woodlands are surrounded by banks. On this clay the most common woodland type is oak in a classic National Vegetation Classification W10 composition of oak, bracken, and bramble. The more base-rich soils to the west support ash and oak woodland; and heathy, oak and birch woodland is found on the sand and gravel in the east. Wet alder woods are relatively common alongside rivers, and small pockets of ash-field maple woods occur in the area of the Lower Mole, many of which are species rich.

To the north of the county, in the Thames Valley region, very little woodland has survived (see Map 1). This is due, in part, to a combination of proximity to London and the predominance of superficial alluvial deposits over clay. Indeed, the relatively fertile nature of the soils and its geography mean that this was one of the first areas of historical settlement. The woodland that survived to be mapped onto the first edition of the Ordnance Survey, of 1872, was lost to the construction of a series of very large reservoirs and the more recent extensive extraction of sand and gravel for industry.

The last of the landscape character areas shown on Map 1 is the Thames Basin Heaths region. This is one the most heavily wooded parts of Surrey but the woodland cover is largely the result of recent land management. For example, Surrey Heath is the most densely wooded local

[18] Margot *et al.* (1997)
[19] Drucker *et al.* (1988)

authority in the county relative to size, with 32% cover, yet less than 1% of this is ancient. The vast majority of the cover is secondary, usually birch or oak and birch, on old heath and common land or coniferous forestry plantations. The sand and gravels that comprise the surface geology over most of the Thames Basin Heaths area are largely the reason for the paucity of ancient woodland. As outlined above, historically, the light sandy soils were easiest to cultivate and the original woodland cover was removed, probably in the Neolithic or late Mesolithic around 4000 to 5000 BC.[20] However, once the woodland was cleared the generally acidic, nutrient poor, soil was not suitable for sustained agricultural usage. The land was thus maintained as open heath or common by grazing, both by wild and domestic animals, well into the late 19th and early 20th centuries.

With the decline in this method of land management, and a trend towards intensive planting of conifers by the Forestry Commission after the First World War, large areas are now covered by secondary oak-birch woodland or vast tracts of conifer plantation. This afforestation of large areas of former heathland is slowly being reversed in some locations through the removal of woodland cover by various conservation bodies. Thus, the most important contribution of the ancient woodland revision in this area is arguably the confirmation that the majority of the woodland is of recent origin.

2.1.4 Project aims

The primary aim of the Surrey Ancient Woodland Survey is to re-examine all available information and to present a revised Ancient Woodland Inventory for the local authority area. This enables local authority planning officers to identify areas of ancient woodland and hence provide these woodlands with the appropriate recognition in accordance with planning guidance and policy.

Additional aims of the survey are:

- To develop a better understanding of the key issues and threats affecting ancient woodland.
- To document the location of ancient woodland sites within the local authority areas which will help to identify areas of opportunity for environmental enhancement, increase the understanding of habitat connectivity, and highlight woodland areas for targeting woodland management programmes and grant funding.

2.1.5 Project funding

The revision of the Ancient Woodland Inventory for the county of Surrey was funded by Elmbridge Borough Council, Epsom & Ewell Borough Council, The Forestry Commission, Guildford Borough Council, Mole Valley District Council, Natural England, Reigate & Banstead Borough Council, Runnymede Borough Council, Surrey Heath Borough Council, Surrey County Council, the Surrey Hills AONB Unit, Surrey Biodiversity Information Centre, Surrey Wildlife Trust, Tandridge District Council, Waverley Borough Council and Woking Borough Council.

[20] Bannister & Wills (2001)

2.2 Ancient woodland definitions

Woodlands in Britain are routinely grouped into the two categories of 'ancient woodland' and secondary or 'recent woodland' according to their history. This follows the pioneering research on the subject by George Peterken, Oliver Rackham and others in the 1970s.[21] The distinction is now well established as a useful one and the concept of 'ancient woodland' is embedded in national forestry and nature conservation policy.

2.2.1 Recent woodland

Secondary or recent woodland (less than 400 years old) is where a wood has either been planted on an area of land, or where trees have been allowed to grow naturally through regeneration, usually as the result of a cessation in land use management.[22] Recent woodland sites can show similarities to ancient woodland depending on their age, proximity to ancient sites and the diversity of microhabitats within the site. However, generally their biological diversity is not as great as that of ancient woodland. These woods are therefore excluded from the inventory.

2.2.2 Ancient woodland

The definition of ancient woodland used for this survey is that given by English Nature (now Natural England).[23] The relevant extract from this document is included below:

'Ancient woodland in England is defined as an area that has been wooded continuously since at least 1600 AD. Ancient woodland is divided into ancient semi-natural woodland and plantations on ancient woodland sites. Both types of stand are classed as ancient woods.'

The trees and shrubs in ancient woodlands may have been felled or cut for coppice at various times since 1600, but as long as the area has remained as woodland, *i.e.* the coppice stools have regrown or the stand has been replanted soon after felling, then it still counts as ancient woodland. Because it may have been cut over many times in the past, ancient woodland does not necessarily contain old trees.

The date used to define ancient woodland for England, 1600 AD, was chosen by Peterken,[24] because it reflected the point at which good maps started to become more common and was prior to the impetus for new woodland planting from the publication of John Evelyn's influential book *Sylva*.[25] Other dates could be argued for: 1650 was used by Peterken and Harding[26] to distinguish post-medieval woods in Rockingham Forest, as a detailed map for that area was produced at that time, while Rackham uses 1700.[27] In practice 1600 has been adopted for policy and practical purposes in England.

Ancient woodland is divided into ancient semi-natural woodland and plantations on ancient woodland sites. Both types of stand are classed as ancient woods.

[21] Peterken (1977), Rackham (2003)
[22] Bannister (2007)
[23] Kirby & Goldberg (2006)
[24] Peterken (1977)
[25] Evelyn (1664)
[26] Peterken & Harding (1974)
[27] Rackham (2003)

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

Plantation on Ancient Woodland Sites (PAWS)
Ancient replanted woodland sites (also called Plantations on Ancient Woodland Sites, or PAWS) are areas of ancient woodland where the original native tree cover has been felled and replaced by planted stock most commonly of a species not native to the site, for example conifers such as Norway spruce (*Picea abies*) or Corsican pine (*Pinus nigra var. maritima*), but also broadleaves such as sycamore (*Acer pseudoplatanus*) or sweet chestnut (*Castanea sativa*) (but see 3.2.5, below)

The division between semi-natural stands and plantations is not always easy to define, because there are intermediates, for example small clearings within woods, old plantations of native species, semi-natural structured stands of introduced species, planted conifer stands that now contain a proportion of self-sown native broadleaves, or semi-natural tree layers with no native understory or improved ground floras. Therefore, a judgement may be necessary as to the balance between the planted/introduced elements versus the native/naturally regenerating elements.

For the purposes of this survey, the following characteristics have also been used to help identify areas of ancient woodland:

- 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 (at least 20% canopy over 80% of the site).
- Temporary clearings that may have been created within the woodland complex but which have regenerated, or are regenerating, back to woodland.

2.2.3 Ancient wood pasture

Wood pasture describes woods derived from ancient pasture woodland managed for both trees and livestock or deer.[28] These woodlands are usually associated with ancient deer parks, Royal Forests or wooded common land. They frequently occur in a mosaic with other habitats and the boundaries are often poorly defined. Wood pasture was previously included on the original Inventories as ASNW where recognisable stands of trees evident on old maps remain unchanged. Parkland sites with wide-spaced trees were omitted.[29] However, the map sources used for the original Inventories were often inconsistent with only a partial coverage.

The revision of the Ancient Woodland Inventory in Wealden District, East Sussex highlighted the problems of classifying woodland sites in historically more open areas such as the Ashdown Forest and other former commons and hunting forests.[30] Some of these woodlands had been classified on the original inventory as ancient whilst others had been omitted. However, re-examination of the historic map and other evidence does not always appear to support these decisions. Study of the historical extent of these sites can reveal a complex management history

[28] Harding & Rose (1986)
[29] Spencer & Kirby (1992)
[30] Westaway (2005)

with a mixed pattern of woodland, grazing and shifting agricultural use.[31] This spatial complexity and 'historical dynamism' within the woodland vegetation is a feature of many North Downs woodlands.[32]

Within this revision of the Ancient Woodland Inventory for Surrey, some sites were classed as a subcategory of ancient woodland, wood pasture, whilst keeping the ASNW/ PAWS split.

The following criteria were used to define the subcategory:

- Wooded today (at least 20% tree cover over 80% of the site).
- Woodland shown on the Ordnance Survey First Edition County Series maps (produced for Surrey between 1868-75), with the cartography indicating at least 20% tree cover over 80% of the site.
- Former enclosed forest or common land as identified on the Ordnance Survey surveyors Drawings, OSD (1801-1812). *(see section 3.2.2 for a fuller description of these map sources).*

Pasture woodland was therefore defined as a semi-natural habitat that has retained a wooded nature throughout recent history as documented by the above map sources. The revised inventory includes these areas and they can be readily extracted from the dataset.

[31] Greenaway *et al* (2004)
[32] Bannister (2007), Land Use Consultants (2005)

3. Methodology and Sources

The guiding principles followed in this project are those used to compile the original inventory. The work, combining desk-based analysis, field surveys and archive research, utilised methods piloted in the Wealden district inventory revision[33] and developed in subsequent revisions to the inventory for Mid Sussex and Rother districts and Tunbridge Wells and Ashford boroughs.[34]

The revision represents a complete and systematic rebuilding of the AWI dataset for Surrey. It draws heavily on the established intelligence contained in the original inventory (and its subsequent amendments) but also reappraises this information in the light of a range of, often hitherto unavailable, evidence sources. The availability of high precision digital mapping tools and large-scale historical map sources in digital format meant that, for the first time, small ancient woods (less than two hectares in size) could routinely be included in the inventory revision for Surrey. Whilst the methodology aims to be systematic and robust, because of the regional scope of this research, the methods are, by necessity, relatively simple and quick, with more detailed historical and field surveys confined to a priority set of sites. The inventory is therefore inclusive, meaning that the default for borderline sites, or those for which data is lacking, is that they are retained on the inventory, thus ensuring they can be considered in future surveys.[35]

3.1 Software

The mapping of woodland in this project and much of the map research underpinning the final dataset was done in a Geographic Information System (GIS). This allows the relatively rapid comparison and combination of a variety of spatial data sources. Importantly, it also allows the editing of the dataset to a standard of spatial precision which would have been impossible to achieve within the space of time available without such technology. The GIS software used was *ESRI ArcMap 9.3.*[36] The resulting GIS database can be linked to external databases which hold more detailed site survey and archive data.

Data accrued from on-the-ground woodland survey in the project is held in a Recorder 6 database from which a report for each site outlining the main survey findings can be generated.[37] Recorder 6 is specifically designed for biological recording. It allows species observations and habitat data to be captured in an electronic format that is compatible with the National Biodiversity Network. This enables the methods of data storage to be easily reproduced and also allows easy exchange of data.

3.2 Inventory revision

The approach to mapping ancient woodland used in this project is deductive. A relatively large set of woods is first captured from highly accurate and reliable but relatively recent map evidence. This 'indicative ancient woodland dataset' is then sequentially refined and filtered by interpretation of further sources of evidence, historical, ecological and archaeological. The procedure for revising the AWI has three interlinked elements:

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[33] Westaway (2005)
[34] Westaway, *et al* (2007a); Westaway *et al* (2007b); Sansum *et al* (2009)
[35] Spencer & Kirby (1992)
[36] ESRI Inc (2008)
[37] JNCC (2007)

1. Desk-based mapping – capture of the dataset

2. Research on historical maps and documents – refinement of the dataset

3. Field survey work – refinement of the dataset

3.2.1 Desk-based mapping - capture of the dataset

The initial stage identified, with a high degree of spatial accuracy, that subset of the present-day woodland resource which could clearly be demonstrated to be long-established woodland. Woods of late 19th century and 20th century origin were thereby eliminated from the search.

This capture of potentially ancient woodland sites employed two key mapping elements:

- The current Ordnance Survey MasterMap® Topographic Layer displayed over recent high-resolution aerial photographs covering Surrey.
- Ordnance Survey First Edition County Series 25 inch to 1 mile map: Surrey 1868-1875 (also referred to in this report as Epoch 1).

The first of these is the modern vector dataset from which other current Ordnance Survey (OS) map products are derived. It is the 'industry standard' baseline for the creation of maps and geographic datasets in the UK. The second is the earliest very large scale mapping to give a complete and systematic national coverage. It is sufficiently accurate that, following its recent digitization and geo-rectification by a partnership between the Ordnance Survey and Landmark Solutions, it can be routinely used in a GIS environment alongside modern datasets (see Figure 1). Both maps were surveyed at comparable scales of 1:2500 or greater and are arguably the most detailed and precise maps ever produced as a national coverage. As such, the comparison and integration of these sources provides an ideal method for the accurate capture of historic woodland boundaries – including small woods – as a first stage in revising the AWI.

Working systematically through a grid of 500m x 500m cells covering the county, all MasterMap® polygons visibly containing woodland on the aerial photograph were compared with the Epoch 1 maps in order to identify those areas of woodland common to both. Each woodland MasterMap® polygon (or part of) was coded according to its presence or absence on the Epoch 1 map. This approach is flexible. If available for a given region, more layers of map evidence can be worked into the procedure. For the purposes of this mapping, woodland was defined as land with at least 20% canopy woodland over 80% of the site. Any continuous blocks of woodland were regarded as discrete sites with historical or ownership boundaries disregarded; ponds and other open areas within the wood less than one hectare in size were included. Man-made linear features, such as roads, passing through wooded areas have generally been edited out of the polygon whereas unsurfaced tracks and natural and semi-natural linear features, such as watercourses, less than 10m wide have been included as part of the woodland polygon.

Woods which were depicted on the Epoch 1 map but are no longer visible (lost woods) and woods which appear in MasterMap® and recent photographs but which are not shown on the Epoch 1 map (woods apparently of recent origin) are systematically identified in this way. The absence of a wood on the highly accurate Epoch 1 maps was generally considered sufficient evidence to eliminate it from the search for ancient woodland where it only appeared on later maps or aerial photographs. An important tenet of the methodological approach adopted was that no other elimination of woods depicted on the Epoch 1 maps was carried out based on

judgement or interpretation of the map at this capture stage. Many woods shown on these maps have a modern, planted or planned appearance but may prove upon further examination (see, 3.2.2) to have much older origins. Premature removal of sites from the dataset would prevent any such examination being carried out.

The resulting dataset comprises a map of a particular subset of the woodland resource – the surviving portion of the woods which appeared on the Victorian Epoch 1 maps – in which woodland boundaries are both historically accurate and conform wherever possible to OS MasterMap®. In theory, the woods included in this dataset contain all the ancient woods in the area of interest in addition to some woods with origins in the 17th, 18th & 19th centuries (see Ancient woodland definitions, 2.2).

This indicative ancient woodland dataset was then incorporated and compared with the digital version of the Natural England existing AWI within GIS. This allowed:

- Currently designated ancient woodland sites to be attributed to the corresponding polygons in the new Ordnance Survey MasterMap® derived dataset subject to further confirmation of status.
- Identification and enumeration of the sites identified by the process described above as potentially new (hitherto unrecorded) ancient woodland sites.
- Potential discrepancies between the two datasets to be marked for further investigation (for example where a piece of woodland recorded on the original inventory does not appear to be shown as woodland on either the Epoch 1 map or on current aerial photographs).

A general principle has been to retain areas of previously designated ancient woodland in the revised inventory where the evidence of Epoch 1 supports this (but with boundaries now mapped to MasterMap® standard where appropriate) and place the thrust of the research effort on assigning the correct status to the additional potential sites identified by the process described above. If incontrovertible evidence subsequently emerged in further archival and field research (see below) against an original ancient woodland designation then appropriate boundary revisions to those areas have been made.

3.2.2 Refining the dataset using historical maps

The capture stage described above yielded an indicative ancient woodland dataset comprising some 6,700 MasterMap® derived polygons. This consisted of:

- 9,044 Ha of previously designated ancient woodland in the county or 1,553 polygons (equivalent to 1,252 polygons on the original inventory which was digitized with lower precision).
- 4,443 polygons of potentially additional ancient woodland (wooded areas in existence since at least the 1870s) amounting to approximately 8,173 Ha.
- 704 previously designated ancient woodlands, which were not shown as wooded in the 1870s, this amounted to 593 Ha.

The next stage in the methodology consisted of checking this indicative dataset against the evidence of a range of historical map sources held both in traditional archives and in digital form which could be analysed in a GIS as an extension of the desk-based mapping stage (above). Not all the evidence sources consulted can be detailed in this report but the key ones are described below in reverse chronological order.

The Ordnance Survey (OS) First Edition County Series 25 inch to 1 mile maps (produced for Surrey 1868-75)[38]

These are the digital geo-referenced Epoch 1 images used in the capture process described above (see 3.2.1). These maps are superbly detailed and contain a wealth of information about the woods under review beyond that of simple presence or absence (Figure 1). The engravers used an extensive palette of symbols to depict different types of woodland and scrub vegetation including, simple coppice, coppice-with-standards, high forest, plantations - mixed and coniferous, osiers, pasture woodland, parkland, *et cetera*. It is also possible to discern from these maps which woods were enclosed and which were not, as well as to see features within woods such as buildings and enclosures. In fact, the attention to detail in the vegetation and the varying character within and among woods shown in these maps far surpasses that of modern maps and reflects the still central importance of woods and woodland produce to the rural and wider economy at the time of their production.

From the perspective of this research – the identification of woods which have been in existence since at least 1600 AD – the main disadvantage of Epoch 1 maps is their relatively recent date. Because of the high level of accuracy of this source, absence of a wood on these maps is considered highly significant. On the other hand, whilst more recent woods can sometimes be identified as regularly shaped enclosures or having map symbols that indicate a previous non-woodland use or recent planting, the map does not, of itself, necessarily give grounds for elimination of such sites.

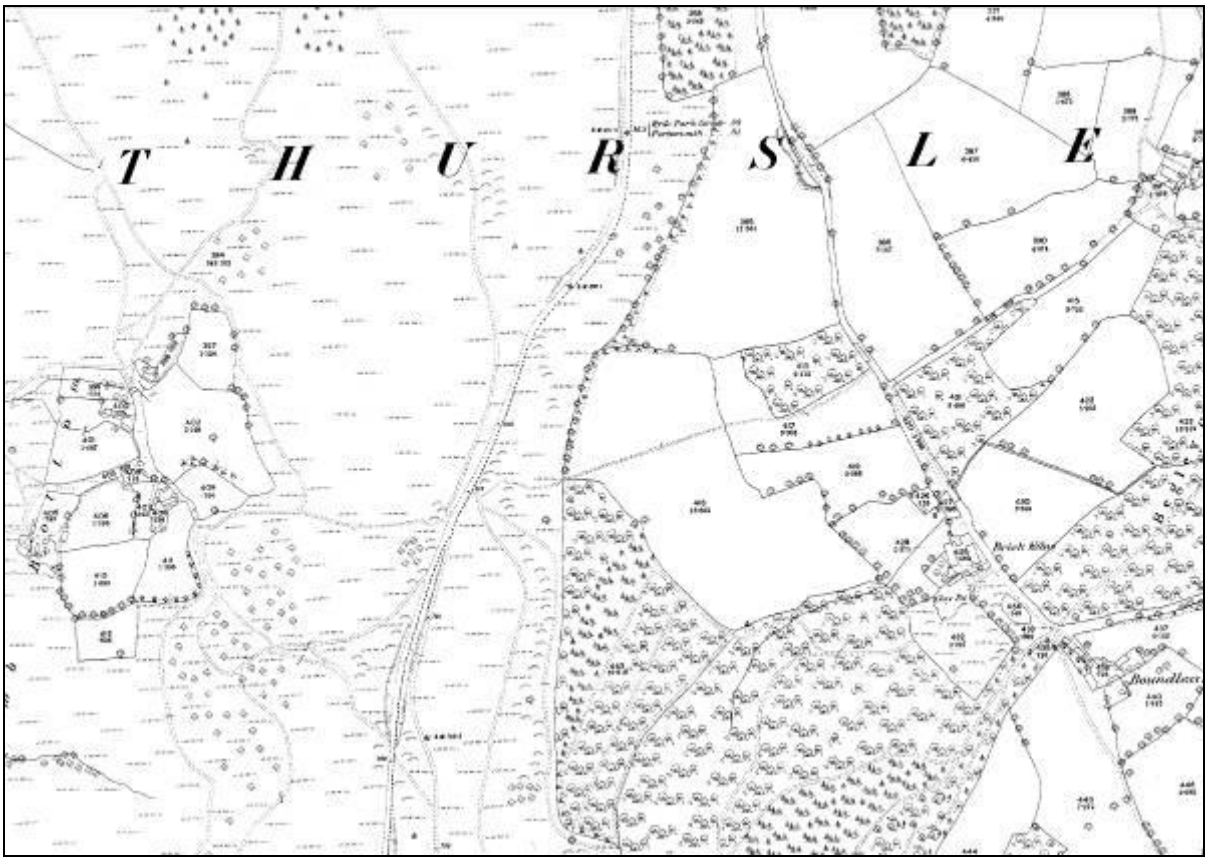

Figure 1. Example of the Ordnance Survey First Edition County Series 25 inches to 1 mile (1:2,500) map for Surrey (1868-75) showing the woods and shaws around Hindhead Common .

[38] Dates from the British Library: http://www.bl.uk/reshelp/findhelprestype/maps/index.html

The Tithe maps for Surrey (produced from 1837 to 1852)

Tithe Maps were produced under the direction of a parliamentary commission following the Tithe Commutation Act of 1836 when tithes in kind to the parish were replaced by payments in rental value. For this Act to be workable, a prerequisite was a consensus on ownership boundaries and the extents of properties. Furthermore, the state of cultivation of every parcel of land needed to be recorded as this determined the charges due. For example, land classed as 'wood' was exempt from tithe payment within the legal boundary of the Weald and sometimes also elsewhere. The maps provide an invaluable record of the land-use and economy of mid 19th century England at the local level in the way that the Domesday Book does for the 11th century but with the important advantage of spatial precision. [39]

The revision has made extensive use of the digitized maps and the transcribed apportionments to revise the AWI of Surrey. The importance of the tithes to the revision process cannot be overstated as they are the first accurate representation of land usage in England. Without this historical resource the decisions made regarding the ancient status of woods in Surrey would be reliant upon earlier, less accurate, historic maps and less robust than they are as a consequence of having the tithe maps in a digitized format

The maps relating to the parishes of Surrey (see Figure 2) were drawn up between 1837 and 1852. Chaldon and Coulsdon were the first parishes to be mapped with Woldingham the last to be published. The majority of the maps were created between 1838 and 1846. The maps for Surrey vary in scale from 1.5 chains to 1 inch (") (53.5" to 1 mile) to 12 chains to 1" (6.7" to 1 mile), with about 68% within the recommended scale range of between 3 to 4 chains to 1". Surrey is covered by 112 individual maps but some of the larger parishes may be split into between two and 19 additional maps.

Maps were usually created on a parish by parish basis. Four parishes in Surrey have no tithe coverage: Wanborough, Ewell, Waverley and Sunbury. Where tithes were all in the hands of one owner there was no need for maps and apportionments to be drawn up as was the case with Wanborough, owned by St Mary Bermondsey. Lands previously exonerated from tithe by enclosure usually were not surveyed which was the case with the remaining parishes lacking coverage. Non-titheable land deemed to be unproductive could be excluded; commons and roads were also excluded. For instance, although tithe maps were created for the parishes of Chobham and Chertsey they largely consist of small, isolated, congregations of fields and houses entirely encircled by vast areas of blank space (the common land).

The tithe maps show compartments of land together with a code, which is indexed and listed in a bound apportionment volume detailing the owner(s) and/or occupier(s), the name of each parcel of land, a description of its 'state of cultivation' and the associated rent charge calculation. The maps vary in quality and accuracy from parish to parish. The original intention of the commission was to produce all the maps to a uniformly high standard but the cost implications of this meant that there was much local variability in the results achieved and not all of the maps were ultimately given the commissioners' seal. Those which did became known as 'first class' maps and the rest as 'second class'. In Surrey 32% of tithe maps are sealed as first-class, and these seem to be concentrated in a west-east band along the North Downs. The tithe maps of Croydon, Dorking and Epsom are unusual in being first-class maps of urban areas.[40]

The Surrey Tithe Maps have been made available as digital images by the Surrey History Centre, along with transcribed copies of the apportionments. The authors are grateful to the transcribers

[39] Kain & Prince (1985)

[40] Surrey County Council (2011)

of these documents for their generosity in making the resulting information available for use. In order to correlate the tithe maps with the revised Ancient Woodland Inventory, the maps had to be geo-rectified. This was undertaken by volunteers recruited by the Surrey Biodiversity Information Centre and Surrey Archaeology Society.

The whole of the indicative ancient woodland dataset, for which there was tithe coverage, was then compared to the tithe maps and apportionments. This provided a second filter to the potential revisions as well as further verification and evidence to support ancient woodland status. It was beyond the means of the project to cross-reference all woodland within Surrey against the tithes.

Figure 2. Example of a Tithe Map (1846). Drawn at a scale of 5 chains to 1" (20" to 1 mile). The detail in this figure shows the same area of the parish of Thursley as Figure 1. The quality of the tithe maps produced varies enormously; some were original surveys, others little more than topographical sketches or copies of slightly earlier maps. Some made elaborate use of colour to distinguish different properties, tithe free areas or land use, (see Figure 3); while others, like the one shown above, gave no such detail meaning the transcription of the associated apportionments was vital to their usefulness as a historical resource for the AWI revision.

Comparisons to the tithes could be made for 93% of the sites. The remainder fell in areas where parts of the map in question were unreadable, missing or damaged or the corresponding number in the apportionment volume was missing or illegible.

These maps possess certain advantages to the Epoch 1 maps – often a greater level of accuracy and high information content. However, they lack the antiquity needed to demonstrate that a wood is truly ancient. The tithe maps were largely produced only a few decades before Epoch 1. Nonetheless, they remain a useful evidence source. The Tithe Maps come at an opportune moment in the history of Surrey, being produced at the beginning of the Victorian period during which woodland produce would reach unprecedented heights in its economic value (prior to a decline of equal proportions at the end of the 19th century). Consequently, the first half of Queen

Victoria's reign was a time of considerable change for wood resources both, in the style and efficiency of management and the proportion of the land given over to managed woodland.

Many woods, or parts of them, appear to have their origins in this period or in the decades immediately before. Examination of the Epoch 1 and MasterMap® derived polygons in the light of tithe map evidence often resulted in further edits to the polygons being made, for example where part of a wood was shown to have been a field or plantation in the 1830s. Following a complete check of the polygons from the capture stage, 25% of sites were recorded as having a non-woodland land-use – generally pasture, arable or meadow but also downland, commons and gardens. Almost 59% of the sites were recorded as partially or wholly wooded, with roughly 3% of these woods shown as some form of plantation. Usually the apportionments do not refer to species in the plantation but there may be clues within the name, for example The Fir Tree Piece, Firs Plantation, Furze Field, Willow or Withey Bed. Seven sites were marked as New Plantation and were therefore treated with caution.

Analysis of the tithe layer, in collaboration with other sources, provided a means to eliminate secondary woodland and make many additional alterations. The Tithe Maps represent a very valuable tool for refining the inventory.

Figure 3. Example of a detailed tithe, Hambledon (1846). Drawn at a scale of 5 chains to 1" (20" to 1 mile). The attention to detail extends to accurate illustrations of wood type showing plantations as conifers and coppice woods as broadleaved trees. Areas of wooded common, to the west, are appropriately shown as open with scattered trees and ponds.

Ordnance Survey Drawings, 2 to 6 inches to 1 mile (produced for Surrey 1797-1809), prepared for the First Edition Ordnance Survey maps[41]

The Ordnance Survey Drawings and drafts (see Figure 4 for an example) are the manuscript maps upon which the first fully triangulated large scale published maps of South-East England were based. It was from these draught maps that the OS 1" first edition maps, referred to as the 'Old Series,' were published in 1816. This endeavour was a military response by the English government to the Napoleonic threat of invasion from across the English Channel. It was undertaken by the Corps of Royal Military Surveyors and Draftsmen (a body akin to the current Ministry of Defence) between 1797 and 1809 from which the Ordnance Survey takes its name. Depending on whom the draughtsmen were, each sheet differs in the detail shown. In some, the field patterns approximate to what was on the ground in the 1770's.

The most detailed drawings were made at a scale of six inches to the mile in areas of military importance. Particular attention was paid to rivers, roads, woods that could provide cover or obstruction and the contours of hills. Elsewhere, the maps were drawn at smaller scales - sometimes as low as two inches to the mile.

Figure 4. Example of an Ordnance Survey Drawing for Hindhead Common (produced in the field at 2 inches to 1 mile in 1810). This employs a more generalized set of symbols to indicate trees but the sophistication of the surveying is clear with careful attention to the depiction of relief through cross hatching and the inclusion of small wooded enclosures

The data from these drawings was reduced and standardised in order to produce the published 'Old Series' maps. These maps were drawn at a scale of one inch to the mile. The printed maps therefore had an attendant loss of information and simplification in the depiction of features, for instance, the straightening of woodland boundaries, the truncation of tapering ghylls and other linear woodland shapes and the removal of smaller woods.

[41] Dates sourced from the Bannister & Wills (2001)

The original drawings are held by the British Library, and geo-referenced scans of these data were used to supply coverage of Surrey. The images were examined along with the tithe and Epoch 1 data using GIS software. Most of the relevant information is contained on nine overlapping sheets of varying size. Where maps overlap, woods may be served by two or more drawings whilst some small areas have no surviving coverage. Individual sheets were often produced by different surveyors and map styles and dates vary accordingly. The level of accuracy also varies greatly, with the finest sheets depicting, very precisely, woods as small as an acre (or 0.4 Ha) in size but with the poorest sheets coarse and distorted with little information on small woods.

Absence of a wood from these maps cannot be taken as proof of woodland not existing at this time. Enclosed woods containing significant timber would generally be accurately depicted; simple coppices (without standards), brushwood, ghylls and shaws are often omitted. Similarly, where steep ground is occupied by woodland or scrub, such as the downland hangars, the surveyors have often placed priority on conveying the physical relief of the land above depiction of the vegetation cover. In other places the surveyors' preoccupation with the lie of the land and use of dense hachure marks to indicate steep topography obscures other coincident features.

The suggestion has also been made that woods which had recently been cut were simply overlooked by the surveyors or that they mistook recent woodland harvesting for conversion to agriculture (an error which sometimes occurs in modern map making). [42] Large woods managed in the traditional way by coppicing would tend to be divided into a series of compartments harvested on a cyclic rotation. Such woods would perpetually contain some conspicuous growth and be visible as woodland. Small woods, however, were sometimes harvested in their entirety, with a dispersed group of copses across a farm or larger estate each acting as a felling compartment within the coppice rotation. At the time of the first Ordnance Survey most, if not all, woods would have been actively managed. At any one time then, a relatively large proportion of small woods may have been at a low and inconspicuous state of growth.

We should not expect to see every small wood depicted on these maps. However, where woodland is recorded these maps are considered to be reliable and give a strong indication of possible ancient woodland status when this is supported by the context of the site and the evidence from other sources. Following the approach of the original AWI, which utilised the smaller scale printed version of this source (see below), a presumption in favour of retaining those woods shown on these maps (as provisionally ancient woodland sites) has been made. [43]

As with the tithe maps, the indicative ancient woodland dataset was systematically cross-referenced with the Ordnance Survey Drawings. Approximately 42% of polygons were shown wholly or partially wooded. In terms of total area, in hectares, a much larger proportion, 59% of the indicative layer, was shown as wholly or partially wooded. Over 50% of sites were not depicted as wooded at the time the maps were drawn. But in terms of area only 34% of the indicative layer showed no sign of being wooded. This illustrates the skew towards the depiction of larger woodlands in the drawings. For instance, the average parcel size for sites that were illustrated as wooded was 3.6 Ha, compared to 1.7 Ha for sites that were not depicted with trees. An additional 2% of polygons were shown as common or parkland. The remainder of sites could not be analysed due to map damage or lack of coverage.

[42] Hodson and Campbell (1989)
[43] Drucker *et al.* (1988)

Ordnance Survey First Edition, 1 inch to 1 mile, 1816[44]

The Surrey edition was published by Colonel Mudge, Director of the Trigonometrical Survey. In spite of the disadvantages of using this map to identify ancient woodland rather than the larger scale drafts produced in its development (discussed above), this was the primary source used in the creation of the original Surrey AWI. For this revision it has been referred to on an ad-hoc basis in paper format only. Although it represents a 'loss of information' relative to the drawings it also represents the definitive distillation of an immense body of work and the Ordnance Survey's final decision on what should and should not be mapped at the time.

John Rocque, 2 inches to 1 mile, 1768[45]

Upon Rocque's death in 1762 the maps were completed & engraved posthumously by Peter Andrews and published by his widow, Mary-Ann Rocque. Although not the first map to use triangulation this map was the first, large scale, detailed map of Surrey, with nine sheets covering the entire county.

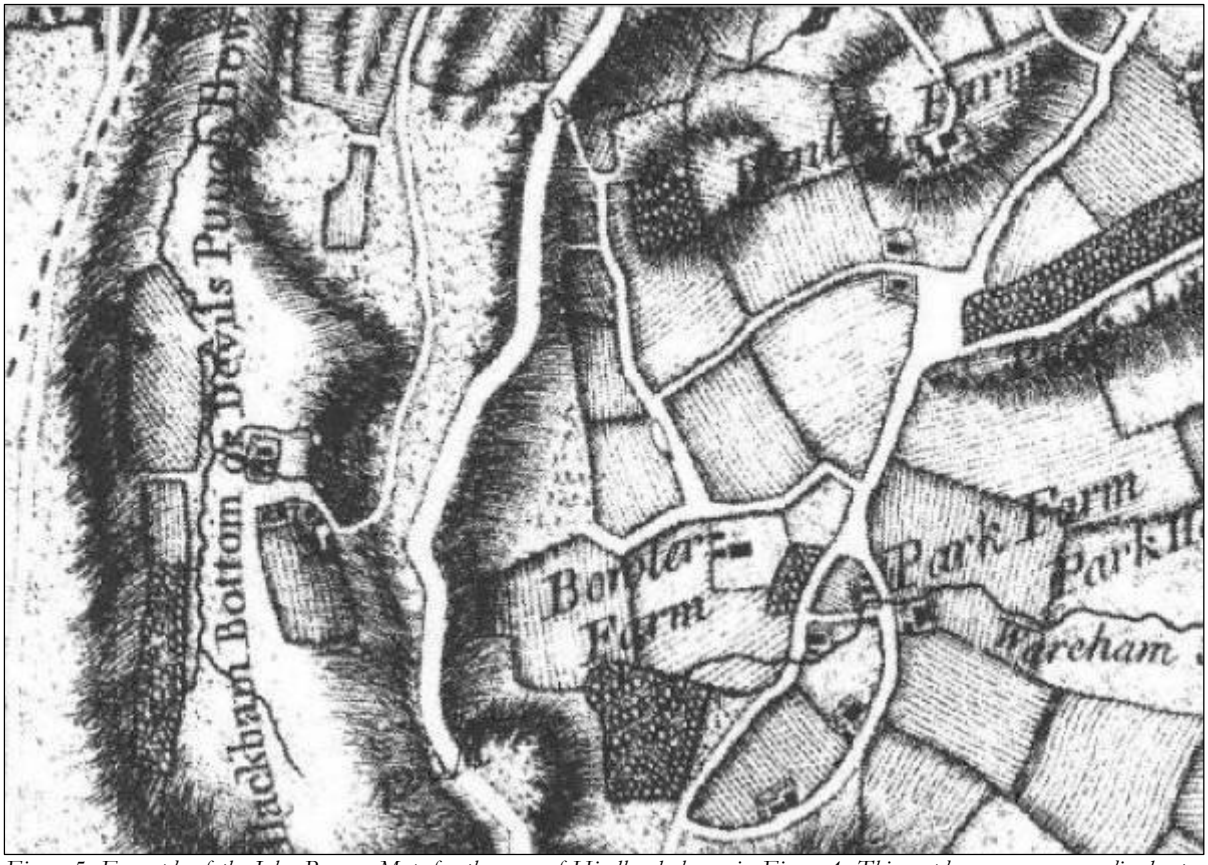

Figure 5. Example of the John Rocque Map for the area of Hindhead shown in Figure 4. This employs a more generalized set of symbols to indicate trees but the sophistication of the surveying is clear with careful attention to the depiction of relief through cross hatching and the inclusion of small wooded enclosures

As well as illustrating actual field boundaries, the map was the first to give a systematic indication of land use illustrating plough land and pasture. In addition, heaths, commons, marshes, wildernesses, woods, parks and gardens are shown in greater detail than previous maps. Although the accuracy of the field boundaries in some areas has been questioned they are not entirely diagrammatic, with woodlands shown on the map clearly aligning with ancient woodland

[44] David & Charles (1979)
[45] I Margary (1974)

polygons in this revision. The map generally excluded small woodlands or shaws whilst missing ghyll woodlands entirely. Thus, as with the Ordnance Survey Drawings, the presence of a wood on the Rocque map is considered to be a far more accurate indicator of its ancient status than its absence.

As it is so closely comparable in style and method to the later Ordnance Survey Drawings it thus proved a useful point of comparison, especially on heavily hachured areas along hillsides and slopes, where land use was difficult to interpret. The entire provisional ancient woodland resource was compared to this map.

It was possible to compare 96% of the indicative sites to the Rocque map. Of these sites, 11,202 Ha (5374 sites) or 76.5% were not illustrated as wooded and 3,822 Ha (1324 sites) or 33% were shown as wholly or partially wooded. Further, 366.5 Ha (133 sites) or 2% were illustrated as parkland or common. For the remainder of the sites the map covering the area was either damaged or could not be interpreted.

Estate and Enclosure Maps

The use of the theodolite for triangulation from 1570 onwards (rather than the less satisfactory trigonometry produced by the 'plane table') resulted in increasingly accurate maps. Mediaeval cartographers had often relied on tradition and local wisdom for their information. The introduction of a standard length chain in the early 17th century improved the quality and accuracy further.

Photograph 1. Extract showing allotments from the Chatley Heath & Martyrs Lane estate map produced at a scale of 1" to six chains in 1795. The deep folds and creases reflect the fact that such maps were often engraved on parchment, in this case made from sheep's skin. Note that, typically, the land use in neighbouring estates is not illustrated. The numbers in each land parcel correspond to an accompanying schedule which gives their extent and current usage. This information helped discern the pattern of ancient woodland around modern day pointers green (© Surrey History Centre).

Individual estate maps were usually drawn for a particular purpose, such as to show land boundaries, buildings, issues of ownership and land use. They can also include correspondence, accounts and surveys. However, they were also used as a status symbol and many were elaborately decorated. As a result, they may therefore emphasise or omit select features. They also vary significantly in their quality, accuracy and extent, and as such they do not give a complete coverage of the county.

The Surrey History Centre holds a large number of estate maps in paper or vellum format, meaning the study of estate maps can be time consuming and not always fruitful. Whether a map is relevant to woodland sites being targeted for research is often not evident until it has been examined, sometimes at length. Each map must be interpreted on its own merit and with an awareness of its possible original purpose.

In view of the limited time resources available to the project staff, very limited use was made of this rich resource. Effort was concentrated on areas lacking other historical sources such as the parish of Sunbury in Spelthorne which lacked tithe map coverage; or areas not adequately covered by the tithe maps, such as parts of Cobham parish.

It should be noted that there are likely to be other, significant historical documentary resources of relevance to the inventory of Surrey's ancient woodland. Within the time constraints of the project, it was not possible to examine a greater amount of the likely resource available.

3.2.3 Other evidence sources

This revision of the AWI was primarily a mapping exercise supported by research on historical maps and field survey (see below), and evidence from these sources was given the greatest weight. However, there are important additional factors which are brought into interpretations of woodland status during the decision-making process. These include:

Place names
The attraction of historic place names is the link they speak of to features in a past landscape for which we have no description. Unfortunately place-name scholars often disagree as to the precise meaning of a name, with some assigning quite different topographic associations to the same term. However, they can, with caution, be used as a guide to help reconstruct the landscape.[46] For example 'leah' or 'ley' refers to a woodland glade or clearing, 'den' to a woodland swine pasture and 'hyrst' or 'hurst' to a wood or a grove especially one on a hill. The disadvantage is that many topographic place names probably relate to features which were atypical, and therefore distinctive, rather than describing the general situation. Hence, when the term hurst, originally applied to a small and distinctive hilltop grove, is later transferred to the general area of the hill, it does not necessarily support ancient woodland status for sites in the vicinity.

Wood names can also help to identify non-ancient woods. 'The Plantation' or 'The Grove' for example, may indicate more recently planted woodland particularly where the site is associated with a large house and/or on cultivable land. However, a large degree of caution should be exercised because names change over time and 'The Plantation' might well occupy the site of a pre-existing wood.

[46] Gover *et al.* (1982)

Woodland shape and situation in the landscape
Larger ancient woodland sites often survive on parish boundaries or follow steep inaccessible topography such as the slopes down to a ghyll or the land surrounding old iron extraction pits. The boundaries of intact older woodlands are rarely straight and often follow natural features such as streams. Surviving fragments of historically larger woods, however, often do have straight margins where their modern boundaries have been chased back to the limits of viable cultivation by successive agricultural improvements.

Historic Environment Record (HER)
Maintained by Surrey County Council's Heritage Conservation Team, this resource is the most complete record of archaeological sites, finds and historic monuments within the current administrative county. It was incorporated in the revision process in the form of a GIS layer stripped down to only show post-medieval (in this case post 1600 AD) sites and features. Data was available for 606 woods and once overlaid with the ancient woodland polygons it was used to add an extra layer of information to inform the decision making process. For example, the wood SRY_1637 near Pirbright was marked as potentially ancient due to presence on the 1872 OS map. Examination, however, of the HER for the wood revealed most of the higher parts of the hill is littered with twentieth century military earthworks, indicating the site was likely to have been open heath historically.

3.2.4. Refining the dataset through field survey

On completion of the capture stage (see 3.2.1) and in tandem with historical research (see 3.2.2), a priority set of woodlands was identified for ground survey. The survey methodology sought to establish a woodland plant list for each site, along with a record of a series of features that helped decide on the status of a site. These included site damage, management, habitat features, and archaeological and boundary features. The summary statistics for these features are given in Appendix 2.

The survey sites were selected in consultation with the relevant local authorities and were generally situated in areas of potential growth and development or where other activities potentially impinged on woodland. Survey site selection was further informed by the emerging historical evidence for woodland status and sites were prioritised where this evidence was weak or ambiguous.

The field surveys were carried out from May to October in 2009 and April to September 2010. Some species, such as wild daffodil (*Narcissus pseudonarcissus*) or pignut (*Conopodium majus*), could not be identified later in the season, as once they have flowered they are either absent or easily overlooked. The survey aim was to make a quick assessment of each site recording the key information needed to aid in the identification of ancient woodland. The methodology was broadly in keeping with the 'walk-about' survey recommended by the Nature Conservancy Council for the original inventory work.[47] Where possible, site boundaries were walked and the interior of the wood was traversed. Potential sources of variation were investigated. Emphasis was placed on recording the following:

- A list of vascular plant species.
- Living evidence relating to the past management of a wood, for example, coppice structure, aged coppice stools, veteran trees or pollards.

[47] Kirby (1988)

- Archaeological evidence relating to the past management of the site such as saw pits, charcoal hearths, drainage systems, old banks, mineral diggings, *et cetera*.
- Physical features indicating a previous agricultural land use, such as ridge and furrow plough markings and lynchets.
- Historical boundary features, such as wood banks, stubbed trees or outgrown laid hedges, delineating the wood.
- Current uses or factors causing disturbance or damage to the wood.
- Structural and habitat diversity, presence of dead wood and the presence of streams and ponds following natural courses and depressions.

These features can all provide evidence of past land use and so help determine ancient woodland status. For example:

Wood banks
Distinct wood banks are characteristic indicator features of lowland ancient woodlands (though far from all ancient woods are enclosed by such banks). A wood bank consists of an earth bank, often though not always with an associated ditch, constructed at the boundary of the wood or demarcating compartments within it. Very ancient wood banks tend to be massive and asymmetric in form, and follow sinuous lines around obstacles at the wood's edge. Post-medieval and modern wood banks are often straighter and lower. These banks, which were made to keep out both grazing animals and human intruders and possibly served as conspicuous displays of control and ownership, would in most cases have been topped by a hedge or fence.[48]

Ancient woodland indicator species
The presence of vascular plant indicator species can aid in the identification of ancient woodland, and ancient woodland sites tend to be richer in terms of their species composition. However, care is required as other factors affect the presence and abundance of these species. These factors include the area of the wood, the time of year of the survey, the diversity of habitats within the wood, soil type, and the position of the woodland relative to other wooded areas. Current uses, including disturbance, damage or invasive species may also influence species diversity and the time spent surveying will affect the number and abundance of species recorded as well as the likelihood of other features being recorded.

Lists of vascular plant species strongly associated with ancient woodland sites, known as 'indicators', have been compiled for different geographical areas of the British Isles. These lists are based on the occurrence of species in known ancient woodland sites.[49] The South-East list used in this revision is shown in Appendix 1a.

3.2.5 Deciding on ancient semi-natural or replanted ancient woodland status

The Forestry Commission's National Forest Inventory (NFI), Interpreted Forestry Type, was used as the core dataset to redefine the boundaries of PAWS and ASNW. [50] This dataset classifies woodlands into categories such as broadleaved, coniferous, mixed, and coppice.[51] For ancient woodland less than two hectares, a judgement on ASNW or ancient replanted status was based on an interpretation of aerial photographs. Boundaries were then further refined using

[48] Hornby & Rose (1986), Rose (1999) and Rackham (2006)
[49] Kirby & Goldberg (2006)
[50] Smith & Gilbert (2001)
[51] ibid

aerial photography, the existing AWI boundaries, Ordnance Survey MasterMap® boundaries and the results from field survey work.

The reliance on aerial photography for identifying PAWS means that there were inevitably some inaccuracies in the classification, for example, in distinguishing between mature broadleaved plantations and stands of semi-natural woodland. ASNW was used as the default classification where it was not possible to determine the woodland type.

It should also be noted that there has been a considerable amount of PAWS restoration since the NFI was published in 2002, not least as a result of the Defra/ Forestry Commission 'Keepers of Time' policy in 2005.[52] This encouraged the re-establishment of broadleaved tree cover on ancient woodland sites, particularly on the Forestry Commission estate. It has not been possible, within the resource constraints of this survey, to identify all areas of PAWS restoration that have occurred since the last inventory of the county was published in 1988. The area of PAWS shown in the results of this survey may therefore be an overestimate of the actual remaining resource.

Sweet chestnut

Sweet chestnut (*Castanea sativa*) is a non-native species, but is a very long established introduction, and widely planted, in the woods of Kent, Sussex and Surrey.[53] This species may occur as a naturalised element within a diversity of other woodland species in woodland, but also occurs as densely planted coppice (particularly in Kent), often established in the 19th century.[54] There is therefore a case for accepting sweet chestnut as a semi-natural element in some ancient woodlands in Surrey, as well as recording it as ancient replanted woodland, or PAWS, where the species is dominant to the exclusion of other components of semi-natural underwood. Hutton, considering this issue in the 1990 report on the provisional AWI for Kent, provided the following comments.[55]

> It is thought that sweet chestnut was introduced to Britain in Roman times (Rackham, 1980). Evidence that it persisted through the Dark Ages comes from the Anglo-Saxon's knowledge of the tree and from the nature and distribution of mediaeval records. By the 13th century many records specifically mention chestnut in woods which were well away from habitation. Records from the Forest of Dean and from Sittingbourne state that it was accompanied by oak and beech with which it can still be found in the same stand today, e.g. in Ellenden Wood near Canterbury. This association of chestnut with what were then the typical trees of very acid soils shows that it did not depend totally on where growers had put it.
>
> On the basis of this historical 'naturalisation' of sweet chestnut in the woods of the county, and of the present character of known ancient woods in which sweet chestnut comprises a major component of the woodland community, some sweet chestnut coppices have been included in the semi-natural category of the inventory.
>
> Many formerly mixed coppice stands have been inter-planted with sweet chestnut, and the stumps of existing native trees and shrubs treated and killed. This type of management results in a dense monoculture of sweet chestnut coppice which, in many cases, has the effect of suppressing the semi-natural flora. Where the later planting of sweet chestnut in ancient woods is known to have resulted in a marked suppression of the semi-natural underwood and ground flora, such woods have been recorded as replanted.

[52] Defra and the Forestry Commission (2005).
[53] Drucker *et al.* (1988)
[54] Bannister (2002).
[55] Hutton (1990)

> The information so far gathered in this inventory is insufficient to identify all sweet chestnut coppices where the semi-natural vegetation has been suppressed and the extent of ancient woodland in the county which should be recorded as replanted may, consequently, have been considerably underestimated.

It has not been possible to identify all sweet chestnut coppices; nevertheless, sweet chestnut is not as widespread a species in Surrey as it is in Kent. Its under-recording is therefore unlikely to represent a significant addition to the area of PAWS in the county.

3.2.6 Minimum size of a wood to be included in the inventory revision

Generally, 0.25 Ha was the lowest size of woodland polygon considered for inclusion in the revised inventory, making it directly comparable with the Forestry Commission's NFI. However, each wood is considered separately and factors such as the location and historical extent of the woodland mean that some woods under 0.25 Ha may be included. This allows these woods to be considered when looking at the whole habitat matrix. Querying the GIS dataset's attribute table will allow a size restriction to be imposed if required.

3.2.7 Ancient woodland status

Due to time and financial constraints it was only possible to ground survey a proportion of the woodlands, so the decisions for the majority of the sites were based on map and archive research data alone. Whilst these sources are highly accurate, and every effort has been made to make this revision as robust as possible, the inventory is still regarded as provisional, as new evidence may come to light for a particular site in the future that challenges its ancient woodland status.

Such information, when provided to Natural England, will be considered and a decision taken on whether a site should be removed or added to the inventory. Nevertheless, although the revised inventory is described as provisional, the survey's thorough methodology, with the use of both desk-based and field work, and the use of digital mapping technology, mean that the project represents the most complete and detailed update of the inventory yet undertaken.

4. Results

The results of the Ancient Woodland Inventory revision are primarily stored in digital format. Natural England will incorporate the final dataset for Surrey into the national AWI. It will also be available to download from www.magic.gov.uk in due course. The revised map boundaries are shown at the end of this report. Survey data will be held by Natural England and the Surrey Biodiversity Information Centre and will be incorporated into the Surrey county dataset of biological records.

4.1 The ancient woodland resource

The total amount of all woodland (ancient and recent) within Surrey, as recorded in the Forestry Commission's National Inventory of Woodland-Interpreted Forest Type (2002), is 37,700 Ha (Table 1). This amounts to 22.6% of the county's area, and as such is well above the England average of 8.4%.[56] In terms of percentage cover relative to county area, Surrey is the most wooded county in the South East region.

4.1.1 Extent of ancient woodland

The original inventory recorded 9944 Ha of ancient woodland in Surrey, covering 6% of the county's area.[57] This revised inventory contains 11,935 Ha of ancient woodland and now covers 7.1% of the county's area, an increase of 1.1%. The net gain in provisional ancient woodland area across the county, compared to the original inventory, is 1,991 Ha, a 20% increase (see Table 1).

Table 1: Summary of woodland area and number of separate woodland parcels from the National Forest Inventory, Interpreted Forest Type (NFI), Forestry Commission, 2002), the original AWI for Surrey (2000) and the revised AWI (2011). All areas in hectares.

	Area (Ha)	% of the County	Number of woodland parcels	Average area of woodland parcel
Surrey	167,004			
All woodlands (NIWT) >2 Ha	37,700	22.6%	5,330	7.1
Original AWI (including woods <2 Ha)	9,944	6.0%	1,252	7.9
Revised AWI (including woods <2 Ha)	11,935	7.1	2,827	4.2
Overall ancient woodland gain – compared to original AWI (2000)	1,991	1.1%	1,575	

The woodland area removed from the first digitised AWI amounts to 1,252 Ha. This loss was due to a combination of inaccuracies in the initial mapping process, misattribution of some woods or parts of woods in the original inventory, and conversion of ancient woodland to other land-uses since the original inventory was compiled. These areas were removed following re-alignment of boundaries with OS MasterMap® and Epoch 1 maps and re-examination of the historic map evidence.

[56] Smith & Gilbert National Inventory of Woodland-Interpreted Forest Type (2001)
[57] Isaac & Reid (1997)

The additions to the area of ancient woodland were greater in aggregate than the areas removed. In Table 1, comparisons have been made to the 'original', first digitized version, available in 2000. This version has been used, rather than the paper-based 1988 inventory, as it is a digital dataset and can be analysed to produce a range of woodland statistics not possible with the 1988 inventory. Appendix 3 shows similar results for each of the local authorities of Surrey.

The revised ancient woodland area includes 3,027 Ha of woodland not previously illustrated on the inventory. The average size of the additional parcels of woodland was 1.84 Ha. The average size of woodland parcels in the revised inventory is 4.2 Ha. As would be expected, the majority of the additions to the inventory fall into the sub-2 Ha size classes (Figure 6). There are also far more woods in the sub-5 Ha size range. Some of these are genuine additions, but many have been formed by the breaking up of larger woods into smaller units, as a result of the more precise mapping of neighbouring but non-contiguous woodland parcels that use of MasterMap® has brought to the inventory.

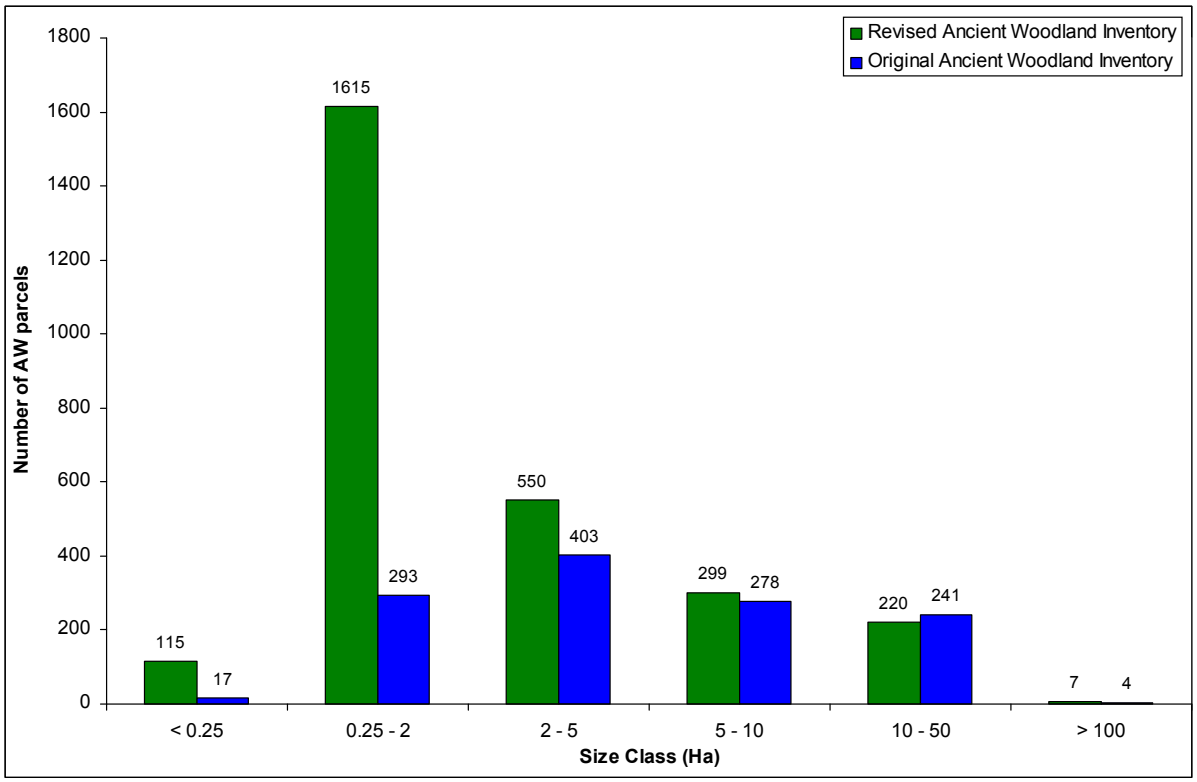

Figure 6. Histogram of the size class distribution for the original and the revised Ancient Woodland Inventories.

4.1.2 Plantations on Ancient Woodland Sites

In the revised inventory, 73.5% of the ancient woodland area is recorded as ancient semi-natural (ASNW), with an area of 8,778 Ha (Table 2). However, as discussed in section 3.2.5, the area of replanted ancient woodland, or PAWS, may be an overestimate, given the difficulty of identifying all ancient woodland sites which may have been restored to native broadleaved cover in recent years and the difficulty of identifying broadleaved plantations from aerial photographs.

Table 2: Revised Inventory – Ancient woodland types (areas in hectares).

Ancient woodland type	Area (hectares)	% of ancient woodland area
Ancient Semi-Natural Woodland	8,778	73.5%
Plantations on Ancient Woodland Sites	3,157	26.5%
Total:	11,935	100%

4.2 Results from the woodland survey

Field surveys were a central part of the project. They allowed the investigation of potentially contentious additions to the inventory, confirmation of ancient status for pre-established sites and the elimination of those with recent origins. It must be stressed that the woods surveyed do not constitute an unbiased sample of Surrey woodland, primarily because the survey effort was focused within areas of priority, usually urban fringe, identified by the local authorities, and therefore are not necessarily representative of the wider resource.

Survey effort was split between the different districts. In the first year, a surveying target of 200 Ha per district was set on areas of potential development around towns such as Farnham, Cranleigh, Guildford, Reigate & Redhill, Dorking, Oxted, Leatherhead, Epsom and Egham. In total, 371 sites were visited, which amounted to 974 Ha of woodland (about 2.6% of the county's total woodland resource). Of this area, about 60% were accepted as provisional ancient woodland on the basis of the field survey data interpreted alongside the other historical information available. The remaining 387 Ha were judged to be of recent secondary origin or else too degraded to be defined as ancient woodland and thus eliminated from the inventory.

As stated above, the survey methodology sought to establish a vascular plant list for each site, along with a record of a series of features that helped decide on the status of a site. These included site damage, management, habitat features, and archaeological and boundary features. The findings for these features are outlined below and summary are given in Appendix 2.

4.2.1 Site damage

Site damage was taken to mean both direct physical damage, such as fly-tipping or loss of woodland through garden extension, and biological factors including invasive species and over-grazing. Of the surveyed woodlands, 72% showed some sign of damage, with invasive species (24% of sites), rubbish dumping (20% of sites), heavy, non-domestic, animal browsing (19% of sites) and dumping of garden waste (17% of sites) being by far the most frequently encountered.

Overgrazing
Of the woods surveyed, 26% were judged to be damaged. Overgrazing is taken to mean action either through lack of sufficient livestock control or through the action of wildlife such as rabbit or deer. Many of the small shaws and ghylls of Surrey are open to livestock for drinking and shelter. This can cause poaching of the ground and trampling of the flora. High rabbit densities were often associated with localised soil erosion and poor ground flora.

Waste dumping

A high proportion of the surveys were located in or close to urban centres. In some of the larger towns, such as Guildford, small woodlands were completely surrounded by houses and roads. In many cases these small woodlands would serve as dumping grounds for a variety of rubbish including cars, sofas and fridges. In more rural environments rubbish ranged from dumped tractors and rubble to kitchen sinks. In total 25% of sites showed some form of dumping varying from casual rubbish to the use of woods as regular waste disposal sites.

Garden encroachment

Of the sites surveyed, 8% had lost some of their area to the expansion of gardens. These effects were mainly seen in sites where woodland and gardens graded into one another, often without defined boundary features. In these cases garden planting and garden escapes were common. Grass clippings, compost and other garden waste would often be disposed of in woodland at the back of gardens, thus dispersing garden escapes further and causing localised nutrient enrichment. This type of activity was recorded in 17% of sites.

Photograph 2. Damage to an ancient oak coppice near Effingham, Guildford. The Site is heavily used for paintball games which has had a severe effect on the ground flora. Indicator species are still present, for now, in very low abundance in small pockets.

Invasive species

Of the woods surveyed, 24% had non-native species recorded in them. This ranged from the almost complete dominance of the vegetation by rhododendron (*Rhododendron ponticum*) or cherry laurel (*Prunus laurocerasus*), to localised patches of Himalayan balsam (*Impatiens glandulifera*).

Sycamore (*Acer pseudoplatanus*) was the most frequently recorded non-native species, occurring on 52% of sites. Sweet chestnut (*Castanea sativa*) was recorded on 35% of sites largely as a result of plantation. The highly invasive cherry laurel (*Prunus laurocerasus*) and rhododendron (*Rhododendron spp.*) were found on 30% and 28% of sites respectively.

Recreational activities
Recreational damage to the survey sites was recorded at 4% of the sites. This could range from low-level erosion and expansion of path networks to the trampling of extensive areas and high levels of dog fouling. In several sites, severe damage had been caused by the construction of bike ramps (for both mountain and motor bikes). One site had been completely destroyed and turned into a race track, presumably for quad or motor bikes. Paintballing and associated forts and ditches were seen at two sites causing significant damage to the field layer (see Photograph 2).

4.2.2 Woodland management

Coppice-with-standards (42% of sites) or coppice (40% of sites) was the most commonly recorded management types. Oak-hazel and ash-hazel coppice-with-standards were the most widespread woodland type, but stands of hornbeam or sweet chestnut coppice were also frequent.

Most of the coppice was outgrown with no evidence of recent management. Only 3.2% of sites showed recent coppicing, but 16% of sites had some degree of felling - this ranged from the felling of individual trees to large scale clearance. Many of the smaller woods had poor access and evidently a history of neglect.

Photograph 3. Greater Butterfly Orchid (Platanthera chlorantha), a rare plant in Surrey, was recorded at just four sites. Three of these sites were within 500 meters of each other suggesting they may once have formed a single large woodland.

4.2.3 Ancient woodland indicator species

For the revision, 371 sites were ground surveyed totalling 974 Ha, with an average size of 2.4 ha. Of these, 60% had at least 10 ancient woodland indicator species recorded, with 19% of sites having 20 or more. 17.5% of sites had five or less indicator species recorded, with the average number of indicators per site overall being 12.6 (minimum 1, maximum 39).

Holly (*Ilex aquifolium*), bluebell (*Hyacinthoides non-scripta)*, field maple (*Acer campestre*), wood sedge (*Carex sylvatica*), wood speedwell (*Veronica montana*), wild cherry (*Prunus avium*), field rose, (*Rosa arvensis*), black bryony (*Tamus communis*), primrose (*Primula vulgaris*) and remote sedge (*Carex remota*) were the most frequent indicators, with all being present in 40% or more of the sites. Wood anemone (*Anemone nemorosa)* was recorded in 17.3% of sites. Wood anemone is known to be an ancient woodland specialist. It is very slow to colonise new areas, making it a good indicator of the antiquity of a wood, especially where it occurs in abundance.[58] In total, 84 out of the 100 vascular plant indicator species thought to be indicative of ancient woodland in the South-East were recorded at least once. See Appendix 1a for the list of ancient woodland indicator species along with an indication of the proportion of woods surveyed in which each species was recorded.

[58] Rackham (2003)

Herb paris (*Paris quadrifolia*) is mainly found on calcareous sites in the North Downs and has previously been recorded at just 23 sites. During the survey, this species was found in an additional 2 sites. Another scarce plant in Surrey, greater butterfly orchid (*Platanthera chlorantha*), was recorded at 2 new locations taking the total number of sites it has occurred at in Surrey to 82 (see Photograph 3). Taking into account all native plant species, not only ancient woodland indicators, the survey recorded roughly 30% of all species known in England and added over 16,000 species records to the Biodiversity Information Centres database.

4.2.4 Archaeological and boundary features

The woods of Surrey are a repository of cultural heritage in the form of archaeological features. These are associated not only with the former management of the woods themselves but also with preceding historic and prehistoric land-uses.[59] This woodland archaeology is an under-recorded resource. The survey did not have the time or resources to record the features present in great detail. However, where possible, features were roughly mapped and measurements were estimated.

Photograph 4. Earthworks dividing an area of ancient woodland. The immensity of these structures and the labour involved in their construction shows the value of the renewable resources they enclosed.

By far the most common features recorded were banks and ditches on the boundaries of sites (see Photograph 4). These were recorded in 63% of all sites. Older trees, stubs and outgrown hedges were sometimes found associated with these features. Simple ditches were found along at least parts of the boundaries of 4% of the sites surveyed and simple low banks along 12%. Other linear features such as streams and walls were found in 7% of the sites.

[59] Bannister (2007)

Whilst 9% of sites had internal ditches, only a few showed widespread, complex drainage patterns across the whole site. Internal banks or banks and ditches together were found in 8% and 19% of sites respectively. These features could be indicative of administrative boundaries, ownership or management areas or they may have been associated with sunken tracks.

Photograph 5. Veteran Hazel coppice stool within Park Row Copse, East Horsley. Although it can be difficult to accurately age such living features the A4 clipboard gives an idea of scale. At more than 3 feet in diameter this suggests and age in excess of 300 years. This site was absent from the original inventory despite harbouring 28 indicator species including native daffodil (Narcissus pseudonarcissus subsp. pseudonarcissus). The presence of these indicators, in combination with hazel coppice stools of this size, builds a strong case for inclusion on the revised ancient woodland inventory.

Old mineral or stone extraction pits, ponds and water-filled hollows and depressions were found in 9% of the sites. This does not detract from their ecological value as ancient semi-natural woodland and often the form of the pit enhances biodiversity by providing a range of environmental conditions within a relatively small area. Archaeological features contribute to the wealth and diversity of woodland vegetation, and small pits, ponds, streams and ditches created variation in topography and environmental conditions. Ancient land use techniques provided pockets of diversity in what might otherwise be species-poor sites. Other notable archaeological features recorded during the survey were moats and castle mounds, pond bays and various diggings (some known to be medieval iron workings), mounds and excavations of unidentified purpose.

In addition to built structures, pollards, stubbs and veteran coppice stools too can be considered as archaeological features. Created by people, these natural features are a living evidence of the past management on a site and can often be very impressive in size (see Photograph 5). Veteran coppice stools were found in 31% of sites surveyed and veteran or notable trees of various species in 11% of sites. Although veteran trees are not a prerequisite for ancient woodland, their

survival within woodland can provide firm evidence for the historical continuation for woodland. Old pollard trees were found in 9% of sites, often at the boundaries whilst boundary and internal stubs were both found in 5% of the survey sites (see Appendix 2).

5. Outputs

Maps 5 to 12 at the end of this report show the revised AWI on an Ordnance Survey 1:50,000 scale base map. Due to the map scale and the volume of small woods added to the inventory this map should be treated as indicative only. These maps represent a snapshot in time and will not show any subsequent revisions. Digital boundaries will be held by the Surrey Biodiversity Information Centre and available to download online (www.magic.gov.uk) as part of the national AWI dataset administered by Natural England. Any changes to the inventory made on a case-by-case in the future by Natural England will be incorporated into the national dataset over time.

By its nature, the revised inventory is still provisional, but represents an important advance in establishing ancient woodland status using a wide range of evidence and making full use of advances in modern technology. There may however be facts that come to light in the future that could alter or reinforce the decisions taken in this survey. The database is set up in such a way as to incorporate any future modifications or additional information.

Planning Policy Statement 9 (PPS9)[60] has strengthened the protection granted to areas of ancient woodland. PPS9 states that local authorities should identify any areas of ancient woodland in their areas that do not have statutory protection. As well as fulfilling this requirement, this inventory revision also provides an important information base for informing local authorities' planning policies, and will enable planning decisions relating to wooded areas in Surrey to be made in the light of a greatly improved evidence base. The net gain of 1,575 new ancient woodland parcels in Surrey not only affords these woodlands a higher degree of protection, but also emphasises the need for a review of the inventory in other well wooded areas.

The revised inventory provides a more complete picture of the location of the county's ancient woods within a habitat network and will help to identify areas of opportunity for environmental enhancement. It also has the potential to inform the more strategic distribution of funding for woodland management programmes, such as the English Woodland Grant Scheme. The survey data and revised inventory will also be useful to inform the Surrey woodland and Wood Pasture Habitat Action Plans.

6. Discussion

The majority of sites identified were small in size, with 1.84 Ha being the average size of additional parcels. Figure 6 illustrates the contrast between the sizes of parcels in the original inventory compared to the revised inventory. Overall, the average woodland size has decreased from 7.9 Ha to 4.2 Ha. The AWI now contains more than two and a half times the number of sites than its predecessor, a large proportion of which are under 2 Ha in size.

As stated in the summary, the original ancient woodland inventory for Surrey was unusual in that it did include a significant number of small woods. Indeed, 24% of the 1252 sites were below 2 Ha but this only amounted to 351.6 Ha. In contrast, this revision of the inventory has added over 1400 new parcels below 2 Ha totalling 1395.2 Ha, 0.8% of the county area. This equates to more than four times as many sites below 2 Ha than identified by the original inventory.

These results imply that, in terms of numbers, many ancient woodland sites were not identified in the original surveys. The majority were small sites, under 2 Ha, which we have been able to include on the revised inventory. Most of these are located to the south, where woodland density

[60] Office of the Deputy Prime Minister (2005)

is generally higher due to historic land use patterns. Districts in the north of the county showed a lower degree of woodland gain.

An important consequence of the revision to the AWI is the geo-rectification of the Tithe maps for Surrey. The tithe maps are now in a format that can be easily compared to modern maps. Almost 60% of woodlands in the indicative layer were shown as either wholly or partially wooded. The tithe maps added a further layer of verification onto the decision making process and helped to build a clearer picture of management history. This excellent resource should prove invaluable for future projects seeking to investigate land-use history in Surrey.

The boundaries to the original inventory were significantly refined. A total of 1,252 Ha were removed from the first digitised version of the AWI. The changes to the AWI were due to a combination of three factors: lack of (or contradictory) historical evidence, improved mapping techniques and focused surveying effort. In some cases, changes in land use have necessitated revisions to the original inventory.

A ground survey of 371 sites or 974 hectares of woodland was undertaken. The majority of these sites were around areas of potential growth and development. As well as improving the evidence base for the revised inventory this provided an opportunity to increase our knowledge and understanding of Surrey's current woodland resource, its ecology, history and management. Not only did the surveys contribute valuable biological data concerning the distribution and abundance of species throughout Surrey, but they also provided a snapshot of those woodlands and their archaeology.

The predominantly semi-natural condition of Surrey's small ancient woodland resource coupled with its widespread distribution of sites has many positive implications for nature conservation in the county. The accurate mapping of this resource provides important opportunities for understanding and improving connectivity of semi-natural habitats and biodiversity at the landscape scale. The standards of mapping used in this project mean that the revised AWI dataset will be readily synthesised with a range of other compatible spatial datasets and inventories by researchers, conservationists, planners and policy makers to address the complex landscape scale issues of the 21st century.

The importance of ancient woodland is widely acknowledged.[61] This resource is increasingly threatened by development pressures and lack of appropriate management. It is hoped that the work outlined here will make a useful contribution towards the long-term protection and appropriate management of this irreplaceable resource.

6.1 Limitations of the survey

The Surrey project built on the methods trialled in Wealden, Mid and West Sussex, and in the subsequent revisions to Tunbridge Wells, Ashford and Rother.[62] The solutions to problems encountered in these previous revisions have been fed into the procedure for mapping and identifying ancient woodland used in the Surrey project. There will, however, always be limitations with the types of evidence used in assessing ancient woodland status and these need to be considered by all users of the dataset:

- The limitations and inaccuracies associated with early map sources were discussed in the relevant section of this document. No decision based on historical map evidence relating

[61] English Nature (2002), Defra and the Forestry Commission (2005), Ellis (2004)
[62] Westaway (2005), Westaway, *et al* (2007a); Westaway *et al* (2007b); Sansum *et al* (2009), Sansum *et al.* (2010)

to woodland can be completely infallible and a project such as this must inevitably make many such qualitative decisions. This is especially true where woods of diverse historical character, which have been little studied in this way before, are concerned.

- Botanical evidence varies in its value as a guide to the antiquity of a wood. The use of such data is more problematic in heavily disturbed woods and PAWS sites where vascular plant floras are often poor. Similarly, ancient semi-natural woods managed traditionally as coppice over centuries can become less conspicuously diverse when the coppice structure becomes derelict and the ground flora enters a prolonged shade phase with suppression of some of the diagnostic elements of an ancient semi-natural ground flora. Sudden changes in management or disturbances can bring strong secondary elements to ancient woodland vegetation locally which can mask the presence of diagnostic specialist species. In large woods such an effect is more easily identified and understood but in small woods with high ratios of edge to area the effect of disturbance, where the whole site may be affected, can be to confuse the decision-making process significantly.

- Woodland archaeological features, of considerable diagnostic value in interpreting the history of a site, are most conspicuous in the winter and early spring, but ground flora recording dictates that the bulk of field surveying is done in spring or early summer. Rarely are sufficient resources available to visit a site twice in order to form a more complete picture.

6.2 The future of the inventory

It is hoped to that this project will encourage a wider take-up of the survey with other local authorities in the South East. The Weald and Downs Ancient Woodland Survey is working in partnership with local authorities in East Sussex and Kent to revise the inventory, and other partner surveys are being undertaken in Hampshire and the Chilterns.

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Photograph credits
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Appendix 1a: Ancient woodland vascular plant 'indicator species' in the South-East

The 100 species in Nature Conservancy Council's South-East Region that are most strongly associated with ancient woodland and are typical components of botanically rich ancient woodland communities.[63]

Grasses, Sedges, Rushes and Ferns	Black bryony	Stinking iris
Bearded couch	Bluebell	Three-nerved sandwort
Common polypody	Broad-leaved helleborine	Toothwort
Creeping soft-grass	Bush vetch	Tutsan
Giant fescue	Chaffweed	Violet helleborine
Great wood-rush	Columbine*	Wild daffodil*
Hairy brome	Common Solomon's-seal	Wood vetch
Hairy wood-rush	Common cow-wheat	Wood spurge
Hard shield fern	Early dog-violet	Wood speedwell
Hard fern	Early-purple orchid	Wood anemone
Hart's-tongue fern*	Goldenrod	Wood-sorrel
Hay-scented buckler fern	Goldilocks buttercup	Woodruff
Lemon-scented fern	Greater butterfly orchid	Yellow archangel
Narrow buckler fern	Greater burnet-saxifrage	Yellow pimpernel
Pale sedge	Green hellebore	**Trees and Shrubs**
Pendulous sedge*	Herb-paris	Alder buckthorn
Remote sedge	Ivy-leaved bellflower	Aspen
Scaly male fern	Lady orchid	Bilberry
Smooth-stalked sedge	Large bitter-cress	Black currant*
Soft shield fern	Lesser skullcap	Butcher's-broom
Southern wood-rush	Lily-of-the-valley*	Crab apple*
Thin-spiked wood sedge	Marsh violet	Field maple*
Wood melick	Moschatel	Field rose
Wood meadow-grass	Narrow-leaved everlasting-pea	Guelder-rose
Wood small-reed	Nettle-leaved bellflower	Holly
Wood sedge	Opposite-leaved golden saxifrage	Hornbeam*
Wood millet	Orpine	Midland hawthorn
Wood club-rush	Pignut	Red currant*
Wood horsetail	Primrose*	Sessile oak*
Wild flowers	Ramsons	Small-leaved lime*
Allseed	Sanicle	Wild cherry
Barren strawberry	Saw-wort	Wild service tree
Betony	Slender St John's-wort	Wych elm
Bird's-nest orchid	Small teasel	
Bitter vetch	Spurge-laurel	

* Only where these species occur well within a wood and do not appear to have been planted.

[63] NCC's South East region comprised Kent, Surrey, Sussex, London and Hertfordshire. See Hornby & Rose (1986)

Appendix 1b: Percentage occurrence in the Surrey sites surveyed of ancient woodland vascular plant 'indicator species' of the South-East (based on 371 site species lists)

Common Name	Latin Name	No. sites	% of sites
Holly	*Ilex aquifolium*	316	85.18%
Bluebell	*Hyacinthoides non-scripta*	241	64.96%
Field Maple	*Acer campestre*	206	55.53%
Wood-sedge	*Carex sylvatica*	198	53.37%
Wood Speedwell	*Veronica montana*	191	51.48%
Wild Cherry	*Prunus avium*	167	45.01%
Field-rose	*Rosa arvensis*	163	43.94%
Black Bryony	*Tamus communis*	161	43.40%
Primrose	*Primula vulgaris*	160	43.13%
Remote Sedge	*Carex remota*	150	40.43%
Wood Melick	*Melica uniflora*	138	37.20%
Three-nerved Sandwort	*Moehringia trinervia*	134	36.12%
Pendulous Sedge	*Carex pendula*	128	34.50%
Red Currant	*Ribes rubrum*	127	34.23%
Crab Apple	*Malus sylvestris*	117	31.54%
Yellow Archangel	*Lamiastrum galeobdolon*	100	26.95%
Scaly Male-fern	*Dryopteris affinis*	98	26.42%
Hornbeam	*Carpinus betulus*	97	26.15%
Barren Strawberry	*Potentilla sterilis*	94	25.34%
Hairy-brome	*Bromopsis ramosa*	90	24.26%
Giant Fescue	*Festuca gigantea*	85	22.91%
Wood Meadow-grass	*Poa nemoralis*	83	22.37%
Wood-sorrel	*Oxalis acetosella*	81	21.83%
Early Dog-violet	*Viola reichenbachiana*	76	20.49%
Hybrid Bluebell[64]	*Hyacinthoides x massartiana*	76	20.49%
Sanicle	*Sanicula europaea*	67	18.06%
Aspen	*Populus tremula*	66	17.79%
Guelder-rose	*Viburnum opulus*	65	17.52%
Wood Anemone	*Anemone nemorosa*	64	17.25%
Creeping Soft-grass	*Holcus mollis*	60	16.17%
Bush Vetch	*Vicia sepium*	54	14.56%
Hart's-tongue	*Phyllitis scolopendrium*	53	14.29%
Yellow Pimpernel	*Lysimachia nemorum*	52	14.02%
Soft Shield-fern	*Polystichum setiferum*	48	12.94%
Midland Hawthorn	*Crataegus laevigata*	46	12.40%
Pignut	*Conopodium majus*	41	11.05%

[64] Although not an indicator species it is included in this list to illustrate the extent to which the native bluebell (*Hyacinthoides non-scripta*) on ancient sites has been affected by hybridization.

Bearded Couch	*Elymus caninus*	35	9.43%
Hairy Wood-rush	*Luzula pilosa*	35	9.43%
Stinking Iris	*Iris foetidissima*	34	9.16%
Wood Millet	*Milium effusum*	34	9.16%
Tutsan	*Hypericum androsaemum*	32	8.63%
Black Currant	*Ribes nigrum*	28	7.55%
Moschatel	*Adoxa moschatellina*	28	7.55%
Wild Service-tree	*Sorbus torminalis*	27	7.28%
Wood Spurge	*Euphorbia amygdaloides*	23	6.20%
Slender St John's-wort	*Hypericum pulchrum*	21	5.66%
Early-purple Orchid	*Orchis mascula*	20	5.39%
Opposite-leaved Golden-saxifrage	*Chrysosplenium oppositifolium*	19	5.12%
Hard-fern	*Blechnum spicant*	18	4.85%
Sessile Oak	*Quercus petraea*	18	4.85%
Butcher's-broom	*Ruscus aculeatus*	16	4.31%
Alder Buckthorn	*Frangula alnus*	13	3.50%
Bilberry	*Vaccinium myrtillus*	13	3.50%
Woodruff	*Galium odoratum*	13	3.50%
Narrow Buckler-fern	*Dryopteris carthusiana*	12	3.23%
Betony	*Stachys officinalis*	10	2.70%
Broad-leaved Helleborine	*Epipactis helleborine*	10	2.70%
Polypody	*Polypodium vulgare*	10	2.70%
Hard Shield-fern	*Polystichum aculeatum*	9	2.43%
Ramsons	*Allium ursinum*	9	2.43%
Goldilocks Buttercup	*Ranunculus auricomus*	8	2.16%
Violet Helleborine	*Epipactis purpurata*	8	2.16%
Wood Club-rush	*Scirpus sylvaticus*	7	1.89%
Herb-paris	*Paris quadrifolia*	6	1.62%
Lily-of-the-valley	*Convallaria majalis*	6	1.62%
Nettle-leaved Bellflower	*Campanula trachelium*	6	1.62%
Smooth-stalked Sedge	*Carex laevigata*	5	1.35%
Solomon's-seal	*Polygonatum multiflorum*	5	1.35%
Thin-spiked Wood-sedge	*Carex strigosa*	5	1.35%
Columbine	*Aquilegia vulgaris*	4	1.08%
Greater Butterfly-orchid	*Platanthera chlorantha*	4	1.08%
Small-leaved Lime	*Tilia cordata*	4	1.08%
Southern Wood-rush	*Luzula forsteri*	4	1.08%
Great Wood-rush	*Luzula sylvatica*	3	0.81%
Hay-scented Buckler-fern	*Dryopteris aemula*	2	0.54%
Large Bitter-cress	*Cardamine amara*	2	0.54%
Orpine	*Sedum telephium*	2	0.54%
Pale Sedge	*Carex pallescens*	2	0.54%

Chaffweed	*Anagallis minima*	1	0.27%
Common Cow-wheat	*Melampyrum pratense*	1	0.27%
Wild Daffodil	*Narcissus pseudonarcissus subsp. pseudonarcissus*	1	0.27%
Saw-wort	*Serratula tinctoria*	1	0.27%
Spurge-laurel	*Daphne laureola*	1	0.27%
Toothwort	*Lathraea squamaria*	1	0.27%

Appendix 2: Summary of findings from the woodland survey work

Feature Type	% of sites
Damage	
Invasive Species	24%
Rubbish	20%
Heavy Browsing	19%
Garden Waste	17%
Human Disturbance	12%
Gardenization	8%
Grazing	7%
Rubble	5%
Heavy Recreation	4%
Other Damage	4%
Encroachment	2%
Physical Boundary Features	
Boundary Bank & Ditch	63%
Boundary Bank	12%
Boundary Fence	8%
Boundary Track	7%
Boundary Ditch	4%
Boundary Stream	3%
Other Feature at Boundary (hedge, wall, house, stream, fence *etc.*)	2%
Physical Internal Features	
Internal Bank & Ditch	19%
Internal Track	15%
Internal Ditch	9%
Pits	9%
Internal Bank	8%
Built Structures	6%
Internal Stream	4%
Internal Fence	3%
Mounds	1%
Charcoal Hearths	1%
Saw Pits	1%
Ridge and Farrow	< 1%
Living Features (qualifying age)	
Veteran Coppice Stools	31%
Notable Trees	11%
Pollards	9%
Internal Stubs	5%
Boundary Stubs	5%
Old Outgrown Hedge	1%
Current Management	
Felling	19%
Planting	10%
Other Management	8%
Recent Coppicing	5%
Charcoal Production	1%
Biodiversity enhancement (e.g. bird nesting boxes)	1%

Woodland Structure	
Coppice With Standards	42%
Coppice	40%
Broadleaf Plantation	10%
Conifer Plantation	7%
Wood Pasture Parkland	3%
High Forest	2%
Immature, scrub or no clear structure	1%

Appendix 3: Summary of findings for the districts and boroughs of Surrey

	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Elmbridge	9,634			
All woodlands (NIWT)	1,416.7	14.7	174	8.1
First digitized AWI (including woods <2 Ha)	205.5	2.1	15	13.7
Revised AWI (including woods <2 Ha)	265.3	2.8	46	5.4
Overall ancient woodland gain – compared to first digitized AWI (2000)	59.8	0.6	31	

	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Epsom & Ewell	3,407			
All woodlands (NIWT)	274.4	8.1	59	4.7
First digitized AWI (including woods <2 Ha)	5.8	0.2	3	1.9
Revised AWI (including woods <2 Ha)	23	0.7	16	1.4
Overall ancient woodland gain – compared to first digitized AWI (2000)	17.2	0.5	13	

	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Guildford	27,094			
All woodlands (NIWT)	7,522.9	27.8	967	7.8
First digitized AWI (including woods <2 Ha)	1,261	4.7	167	7.6
Revised AWI (including woods <2 Ha)	1,650	6.1	416	4
Overall ancient woodland gain – compared to first digitized AWI (2000)	389.5	1.4	249	

	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Mole Valley	25,832			
All woodlands (NIWT)	6,880.8	26.6	925	7.4
First digitized AWI (including woods <2 Ha)	2,696.8	10.4	280	9.6
Revised AWI (including woods <2 a)	3,237.3	12.5	621	5.2
Overall ancient woodland gain – compared to first digitized AWI (2000)	540.4	2.1	341	

	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Reigate & Banstead	12,913			
All woodlands (NIWT)	1,508.9	11.7	288	5.2
First digitized AWI (including woods <2 Ha)	491.1	3.8	87	5.6
Revised AWI (including woods <2 Ha)	580.7	4.5	201	2.9
Overall ancient woodland gain – compared to first digitized AWI (2000)	89.6	0.7	114	

	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Runnymede	7,804			
All woodlands (NIWT)	1,625.4	20.8	243	6.7
First digitized AWI (including woods <2 Ha)	302.3	3.9	28	10.8
Revised AWI (including woods <2 Ha)	314.9	4.0	86	3.8
Overall ancient woodland gain – compared to first digitized AWI (2000)	12.6	0.2	58	

	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Surrey Heath	9,509			
All woodlands (NIWT)	3,051	32.1	385	7.9
First digitized AWI (including woods <2 Ha)	190.9	2.0	18	10.6
Revised AWI (including woods <2 Ha)	95.5	1.0	25	3.8
Overall ancient woodland gain – compared to first digitized AWI (2000)	-95.5	-1.0	7	

	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Spelthorne	5,116			
All woodlands (NIWT)	55.9	1.1	20	2.8
First digitized AWI (including woods <2 Ha)	0	0	0	0
Revised AWI (including woods <2 Ha)	1.7	0.03	1	1.7
Overall ancient woodland gain – compared to first digitized AWI (2000)	1.7	0.03	1	

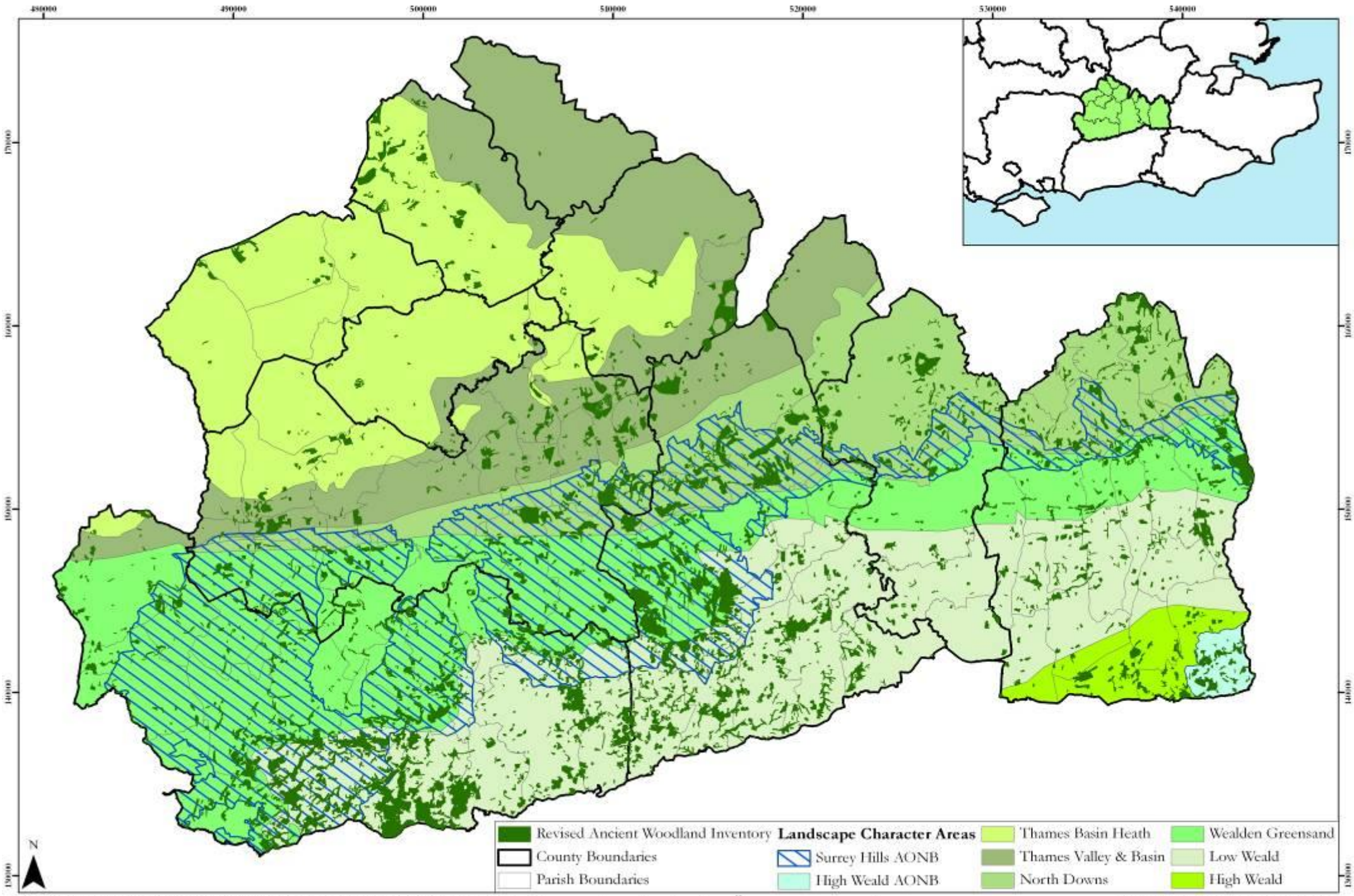
	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Tandridge	24,819			
All woodlands (NIWT)	3,096.7	12.5	624	5.0
First digitized AWI (including woods <2 Ha)	1,482.4	6	241	6.2
Revised AWI (including woods <2 Ha)	1,762.5	7.1	591	3.0
Overall ancient woodland gain – compared to first digitized AWI (2000)	280.1	1.1	350	

	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Waverley	34,517			
All woodlands (NIWT)	10,874.1	31.5	1,644	6.6
First digitized AWI (including woods <2 Ha)	3,295.7	9.5	416	7.9
Revised AWI (including woods <2 Ha)	3,952.8	11.5	835	4.7
Overall ancient woodland gain – compared to first digitized AWI (2000)	657.1	1.9	419	

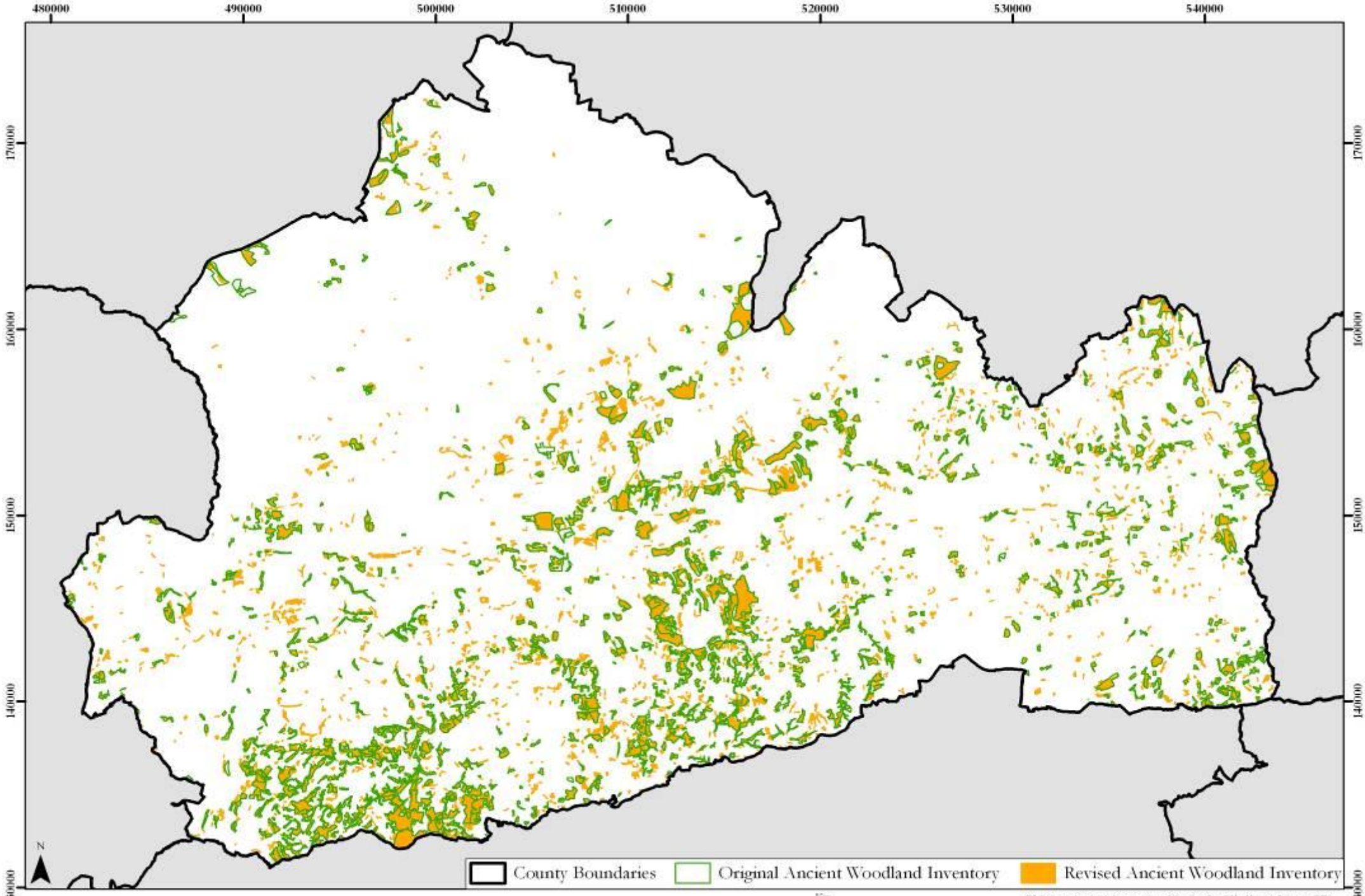
	Area in hectares	% of the District	Number of woodland parcels	Average area of woodland parcel
Woking	6,359			
All woodlands (NIWT)	1,393.2	21.9	217	6.4
First digitized AWI (including woods <2 Ha)	26.9	0.4	6	4.5
Revised AWI (including woods <2 Ha)	50.6	0.8	32	1.6
Overall ancient woodland gain – compared to first digitized AWI (2000)	23.7	0.4	26	

Maps[65]

[65] The scale used in all the maps is 1:50,000



Map 1: The location of Surrey in the South East showing Landscape Character Areas



Map 2: Comparison of the Ancient Woodland Inventories for Surrey

Map Produced 18/05/2011 by Robert Davies at the SBIC

480000 490000 500000 510000 520000 530000 540000

170000 160000 150000 140000 130000

N

County Boundary

Surrey_district_borough_unitary_region

Revised Ancient Woodland Inventory

Ancient Semi-Natural Woodland

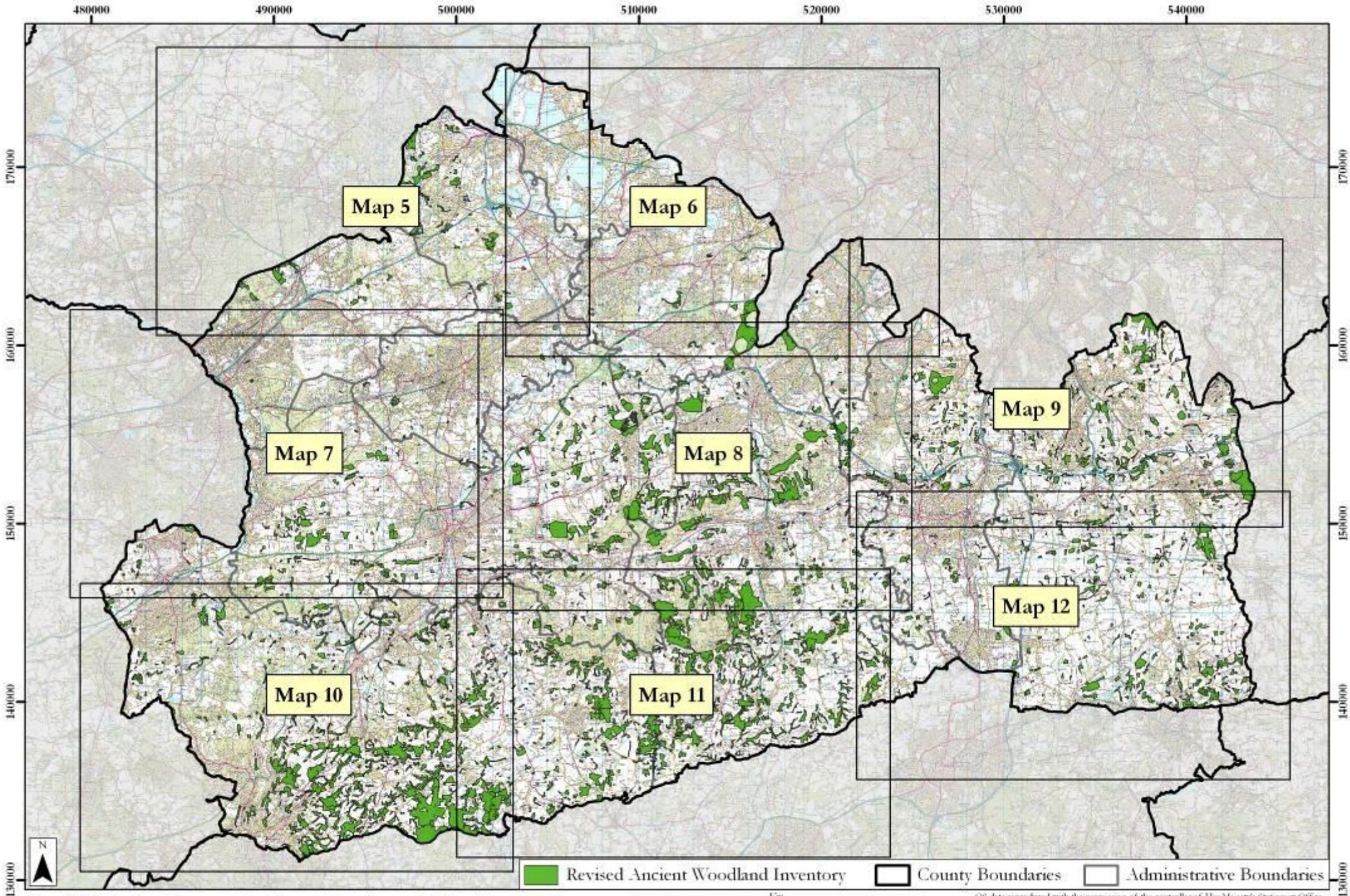
Plantation on Ancient Woodland Sites

Map 3: Comparison of planted and semi-natural ancient woodland

Km

0 2.5 5 10

Map Produced 18/05/2011 by Robert Davies at the SBIC



Map 4: The Revised Inventory for Surrey: Overview and Index Sheet

490000

500000

170000

170000

Legend

- County Boundaries
- Administrative Boundaries
- Revised Ancient Woodland Inventory

N

WINDSOR

WINDSOR FOREST

GREAT PARK

EGHAM

STAINES

ASHFORD

BRACKNELL

BRACKNELL FOREST

CHERTSEY

RUNNYMEDE

ADDLESTONE

COBHAM COMMON

Km

0 1.5 3 6

Map 5: The Revised Ancient Woodland Inventory - North West

Map Produced 18/05/2011 by Robert Davies at the SBIC

510000

520000

170000

160000

Legend

N

County Boundaries

Administrative Boundaries

Revised Ancient Woodland Inventory

HOUNSLOW
ISLEWORTH
RICHMOND
TWICKENHAM
FELTHAM
TEDDINGTON
WIMBLEDON
KINGSTON UPON THAMES
MERTON
NEW MALDEN
SURBITON
SUTTON
STAINES
ASHFORD
SUNBURY
WALTON-ON-THAMES
CHERTSEY
ADDLESTONE
WEYBRIDGE
ESHER
ELMBRIDGE DISTRICT
Claygate
EWELL
EPSOM AND EWELL DISTRICT
EPSOM
Byfleet
Cobham
Oxshott

Km

0 1.25 2.5 5

Map 6: The Revised Ancient Woodland Inventory - North East

Map Produced 18/05/2011 by Robert Davies at the SBIC

480000 490000 500000

160000

150000

Legend

- County Boundaries
- Administrative Boundaries
- Revised Ancient Woodland Inventory

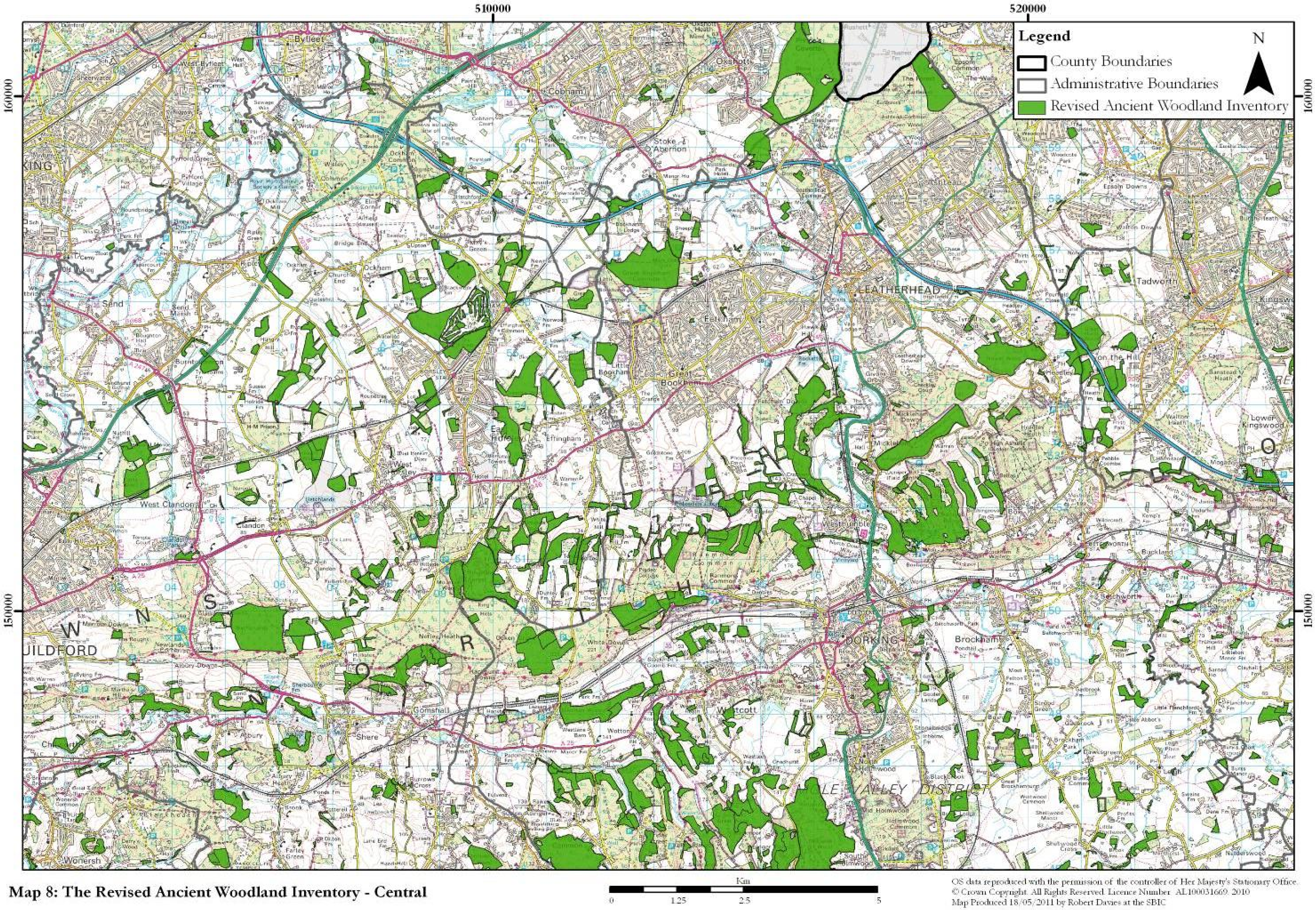
N

CAMBERLEY
FRIMLEY
FARNBOROUGH
FLEET
ALDERSHOT
FARNHAM
SURREY HEATH DISTRICT
DANGER AREA
WOKING
GUILDFORD
NORTH
Chobham
West End
Bisley
Pirbright
Mytchett
Frimley Green
Deepcut
Normandy
Wood Street Village
Tongham
Puttenham
Shalford
Hale
Badshot Lea

Km
0 1.25 2.5 5

Map Produced 18/05/2011 by Robert Davies at the SBIC

Map 7: The Revised Ancient Woodland Inventory - Mid West



Map 8: The Revised Ancient Woodland Inventory - Central

530000

540000

160000

150000

Legend

- County Boundaries
- Administrative Boundaries
- Revised Ancient Woodland Inventory

N

CROYDON
SUTTON
CARSHALTON
WALLINGTON
PURLEY
COULSDON
WARLINGHAM
CATERHAM
Woldingham
Tatsfield
Westerham
Oxted
Limpsfield
Godstone
Tandridge
WELL
DISTRICT
BANSTEAD
Banstead Downs
Woodmansterne
Chipstead
Tadworth
Kingswood
Lower Kingswood
Buckland
REDHILL
Merstham
South Merstham
Nutfield
Smallfield
REIGATE AND BANSTEAD BOROUGH COUNCIL

Map 9: The Revised Ancient Woodland Inventory - Mid East

Km
0 1.25 2.5 5

Map Produced 18/05/2011 by Robert Davies at the SBIC

480000

490000

500000

140000

Legend

N

County Boundaries

Administrative Boundaries

Revised Ancient Woodland Inventory

Map 10: The Revised Ancient Woodland Inventory - South West

Km

0 1.25 2.5 5

Map Produced 18/05/2011 by Robert Davies at the SBIC

510000

520000

140000

140000

Wonersh

Bramley

Shamley Green

Winterfold Wood

Holmbury St Mary

Beare Green

Newdigate

Capel

Ockley

Ewhurst

Cranleigh

Dunsfold

Alfold Crossways

Alfold

Pollingfold

Rudgwick

Warnham

Broadbridge Heath

Loxwood

Legend

County Boundaries

Administrative Boundaries

Revised Ancient Woodland Inventory

N

Map 11: The Revised Ancient Woodland Inventory - South

Km

0 1.25 2.5 5

Map Produced 18/05/2011 by Robert Davies at the SBIC

530000

540000

150000

140000

REIGATE

REDHILL

TANDRIDGE DISTRICT

South Nutfield

Salfords

Outwood

Blindley Heath

South Godstone

Edenbridge

Lingfield

HORLEY

Smallfield

Copthorne

CRAWLEY

Crawley Down

EAST GRINSTEAD

Legend

N

County Boundaries

Administrative Boundaries

Revised Ancient Woodland Inventory

Map 12: The Revised Ancient Woodland Inventory - South East

Km

0 1.25 2.5 5

Map Produced 18/05/2011 by Robert Davies at the SBIC

S U R R E Y
ANCIENT WOODLAND SURVEY

Project carried out by Robert Davies,
Victoria Benstead-Hume, and Matthew Grose
January 2009 to June 2011

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