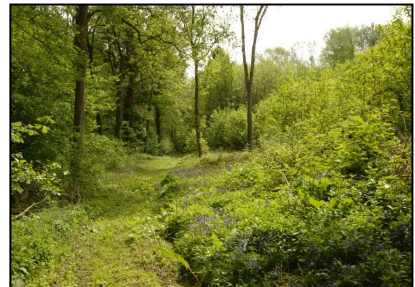


Butterfly Conservation

Saving butterflies, moths and their habitats



Lepidoptera on Forestry Commission Land in England; Conservation Strategy 2007 – 2017



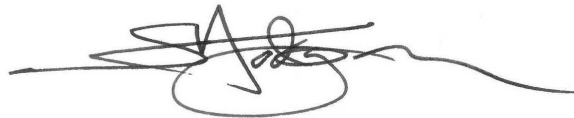
Forestry Commission
England

Lepidoptera on Forestry Commission Land in England Conservation Strategy 2007 – 2017

This Conservation Strategy is an agreement between Forestry Commission England and Butterfly Conservation. Forestry Commission England agree to manage their landholding to encourage and support Lepidoptera and in turn Butterfly Conservation will monitor species populations and provide encouragement, management advice and support as required.

Both organisations will strive towards achieving favourable conservation status for the butterflies and moths identified in this strategy across the priority woodlands.

Signed by:

A handwritten signature in black ink, appearing to read 'Simon Hodgson', with a large, stylized flourish extending to the right.

Simon Hodgson, Chief Executive,
Forestry Commission England

A handwritten signature in black ink, appearing to read 'Martin Warren', written in a cursive style.

Martin Warren, Chief Executive,
Butterfly Conservation

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Foreword

Butterflies and moths are known to be valuable indicators of the changes affecting the wider countryside and recent studies suggest that a large number of species are in rapid decline. Butterflies and moths are one of the most threatened wildlife groups that inhabit the Forestry Commission Estate and as active land managers; we are able to play an important role in their future.

The Priority Lepidoptera Sites identified in this strategy cover approximately 2000 – 8000ha of woodland and associated open habitats such as heathland and limestone pavement. These sites represent 3% of the total Forestry Commission England landholding and 50% of them have SSSI designation.

They support populations of some of the UK's most endangered woodland butterflies and moths including the Pearl-bordered Fritillary and Wood White, as well as the Argent & Sable. The reasons behind the decline of these Biodiversity Action Plan Priority Species are complex, however a lack of woodland management is often cited as an important cause and one that we can act on to support the conservation of these species.

Managing woodlands for Lepidoptera will make an important contribution to many other work programmes taking place across the Forestry Commission England Estate including work to enhance the condition of SSSI, Ancient Woodland restoration and Biodiversity Action Plan habitat restoration. With the potential demand for small diameter hardwoods on the increase through developments in the wood fuel industry, new opportunities for the sustainable management of key Lepidoptera habitats are being created.

Many Lepidoptera depend on a network of early succession habitats, such as young coppice as well as open, sunny rides for their long-term survival. If we are to prevent the loss of key woodland Lepidoptera from Forestry Commission woodlands, we need to target woodland management practices more directly and more urgently at the Priority Sites listed in this Conservation Strategy.

Much good work has already been achieved by Forestry Commission staff working closely with Butterfly Conservation colleagues. A key objective of this strategy is to further raise awareness of the important sites, to ensure that they feature as priorities in both the Design Planning process and the daily management of our woodlands. It also provides the opportunity to underpin a bid for funding to give the Forestry Commission the best chance of achieving the aims of the Strategy by 2017.

It is vital that the Forestry Commission's delivery of Priority Site conservation and management is viewed as part of a much wider programme of delivery to ensure that these diverse and beautiful insects are allowed to increase and thrive in our English woodlands.

Simon Hodgson
Chief Executive Forestry Commission England

1.0 Introduction

1.1 Summary

This strategy supports the agreement between Forestry Commission England (FC) and Butterfly Conservation to conserve and increase populations of butterflies and moths by increasing the level and urgency of woodland management across sites considered to be important for Lepidoptera.

It is aimed at the foresters, conservation managers and planners in each Forest District who are responsible for planning and implementing the management activities across our landholding. It provides details of each priority site as well as more generic information on the habitat requirements of each of our most threatened species.

With advice and input from Forest District staff and Butterfly Conservation 140 sites known to be important for butterfly and moth species have been identified and form the basis of this strategy.

- 77 sites have been graded A because they support species such as the Pearl-bordered Fritillary and Argent & Sable that depend specifically on woodland and require urgent targeted management.
- 33 sites are graded B. These sites support a lesser variety of priority species or species that are not so reliant on urgent woodland management such as the Grizzled Skipper.
- 30 sites are graded C. These sites support more generalist priority or species of conservation concern such as the White Admiral.

The objectives are to conserve populations of all priority Lepidoptera species on FC land through active woodland management. This can only be achieved through raising awareness of the urgency and necessity of each management activity on the ground. This strategy aims to do that through promoting a better understanding of the sites important for Lepidoptera and the species requirements across FC England.

It should become a key document used to inform all stages of the management process from Forest Design Planning through to operational planning and management activity in the woods.

The Conservation Strategy will be reviewed with each Forest District on a rolling programme to ensure that it is kept alive and relevant throughout its duration. The overall success will be determined by the status of priority Lepidoptera at priority sites at the mid-term review date of 2012 and again in 2017.

1.2 Purpose of the Report

None of the work needed to maintain priority Lepidoptera is new to the Forestry Commission – most Priority Sites simply need more action, and urgently. A significant proportion of Priority Sites are Ancient Woodland Sites or Plantation on Ancient Woodland Sites (PAWS), already managed for their biodiversity value or under a programme of restoration back to semi-natural woodland. In addition, a number of sites are designated as SSSI, many for their butterfly and moth interest and currently being targeted under the PSA agreement to achieve 95% target condition by 2010.

To put the conservation of Lepidoptera in context, 3% of the FC estate has been identified as a priority site. These sites form an integral part of sustainable woodland management and should be maintained with the same set of planning and operational tools that are used across the whole estate. Taking an integrated approach means that these sites are managed alongside the wider estate, supporting and contributing to other objectives such as Ancient Woodland restoration, SSSI management and Habitat Action Plan targets.

The Forestry Commission is currently facing many challenges. Woodland management for conservation depends on the availability of suitable markets for small diameter hardwoods such as coppice. The most important market for such products, the St. Regis paper mill closed in early 2006. Other challenges include the increasingly wide range of objectives that have to be reconciled whilst competing for the available resources. Securing additional resources will greatly reduce the challenge of improving woodland habitats for Lepidoptera.

Although they can be managed alongside other objectives, woodland Lepidoptera are dependent on *regular* habitat management for their survival. If forest management does not provide, for example, open habitat on a rotational basis, or rides become too shaded or connectivity between areas of suitable habitat is lost, populations can quickly become extinct. It is crucial that Priority Sites, known to be valuable due to their important Lepidoptera assemblages, feature highly in both the Forest Design Plans and the Operational Site Assessments that take place before operations commence, so that opportunities to enhance their habitats are not missed.

This strategy aims to reduce the chances of local extinction happening by raising awareness of these sites, of the Lepidoptera they support and of the general habitat requirements of each of the species across the FC Estate. It does *not* aim to provide detailed, site specific management prescriptions for each Priority Site, but encourages you to seek guidance from Butterfly Conservation staff if required.

Priority Site species information contained within this strategy was correct at the time of writing. It was collated using Butterfly Conservation monitoring data and information from the Forest District staff. This is a working document - use the Forest District tables to record new sightings or management activities that may have benefited Lepidoptera. In 2012 the information within this Strategy will be

reviewed and your knowledge of these sites will help us to re-assess Priority Site information.

The publication of this strategy coincides with the recent National Review of Biodiversity Action Plan (BAP) Priority Species by the Joint Nature Conservation Committee (JNCC). A significant number of butterfly and moth species have been added to the priority list, due to their increasing rarity within the British countryside. Many of these species occur on Forestry Commission land, again emphasising the ongoing commitment needed to ensure the objectives of this Conservation Strategy are achieved.

2.0 Aims of the Conservation Strategy

2.1 Overall Aim

- Through active forest management planned for butterflies and moths, FC aims to conserve populations of all BAP Lepidoptera species on the Forestry Commission England Estate.

The priorities are to:

- Prevent further extinctions
- Stabilise colonies and numbers
- Increase populations and range of the BAP Priority Species that require targeted woodland management

2.2 Specific Objectives

This Conservation Strategy will achieve the overall aim above through:

- Ensuring that more urgent action is carried out within the Priority Sites that are listed in this Strategy and that this management is integrated with other management activities such as PAWS restoration, timber harvesting (including wood-fuel initiatives), SSSI condition enhancement and Habitat Action Plan restoration targets.
- Raising awareness and promoting a better understanding of Priority Sites and species to inform and guide all stages of Priority Site management from Forest Design Planning through to Operational Site Assessment and activity in the woods.
- Increasing communication between FC staff and Butterfly Conservation staff and to ensure that expert advice is sought by both parties when appropriate.
- Encouraging further survey effort for Lepidoptera within FC woodlands, especially Grade A Priority Sites, and ensuring that records of scarce and threatened species are forwarded to Butterfly Conservation.
- Ensuring increased monitoring of Priority Sites results in more informed and responsive actions being taken in terms of planning and management activity.
- Achievement of the above objectives will be subject to available resources, and it will be vital to use this Conservation Strategy to underpin and secure additional funding from other parties to achieve the aims and objectives of this strategy.

2.3 Further objectives (subject to additional funding)

- FC will co-operate with partners over planned re-introductions, using Butterfly Conservation guidelines. It will be the responsibility of partners to assess feasibility and conduct actual re-introductions. FC will work with partners to create and maintain the desired habitat conditions.
- In co-operation with partners Butterfly Conservation will identify the key outstanding research issues for the conservation of Woodland Lepidoptera and will discuss with research providers.
- Butterfly Conservation will produce, in co-operation with partners, an advisory leaflet to provide the best current information on woodland management for Lepidoptera.

The success of this strategy will be determined by how fully the objectives of this Conservation Strategy have been implemented and met. This will be assessed by the number of sites in 2017 maintaining or improving their populations of Priority Lepidoptera and favourable habitat condition status.

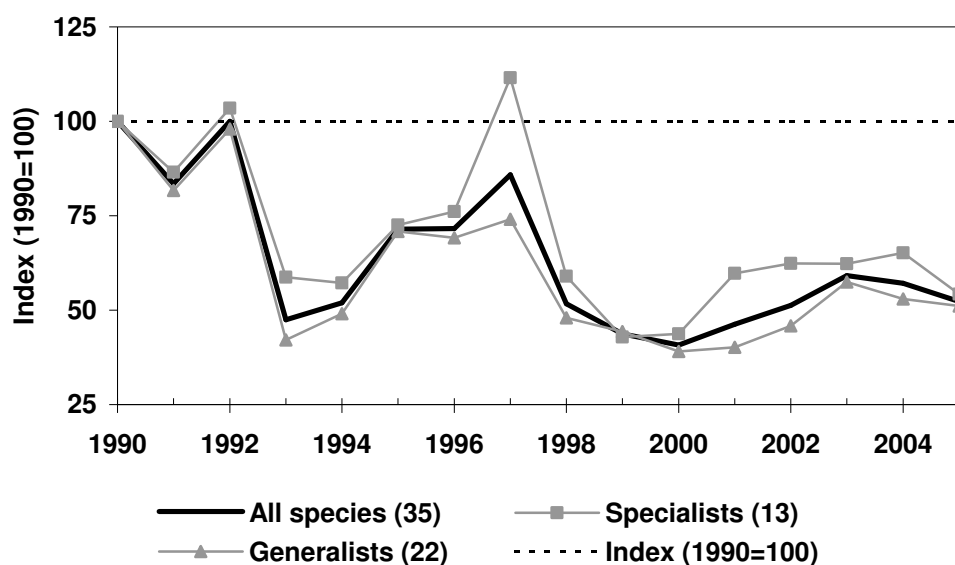
3.0 Conservation Strategy Context

3.1 Importance of woodlands for Lepidoptera

- Woodland is an extremely important habitat for British Lepidoptera. Seventeen species of butterfly (out of Britain's 59 resident species) rely on woodland in all or part of their range or have a large proportion of their population associated with woodlands (Liley *et al.* 2004).
- Nearly three-quarters of all British butterflies will use woodland as breeding habitat.
- There are around 2500 species of moths in Britain. Moths are found in almost all habitats and occupy a variety of niches but around 530 species of the larger British moths occur regularly in woodland habitat from open clearings to ancient woodland.
- Open space within woodland provides a refuge for species of open habitats. The FC Estate includes important non-woodland habitats, including unimproved grasslands, upland and lowland heath and mires.

3.2 Changing status of Butterflies & Moths in woodlands and on the FC estate

During the 20th Century there has been an increasingly rapid decline in woodland butterflies with many species disappearing from much of their former range. The abundance of butterflies in woodlands has dropped by 43% over the last 16 years. The decline has been similar for generalist species (45%) and specialist species (39%) (Graph 1) (Defra 2006). Some, such as the Pearl-bordered Fritillary and Heath Fritillary are now endangered nationally, while others, such as the Wood White are undergoing a rapid rate of colony extinction (Fox *et al.* 2006a). Moths have also seen a decline. The number of moths caught in Rothamsted light traps has decreased by nearly a third in 35 years and 71 so called "common and widespread" British moths now qualify as endangered or vulnerable under IUCN criteria (Fox *et al.* 2006b).



Graph 1. Indicator of butterfly populations in woodland 1990 – 2005 (Defra 2006).

Butterflies and moths are a well-studied group and the decline of so many woodland Lepidoptera may indicate a serious, yet less well-documented, threat to other woodland fauna and flora. A paper by Thomas *et al.* (2004) showed that butterflies have declined by 71% since the 1970s, substantially more than the decline recorded for British birds (54% over 20 years) and plants (28% over 40 years).

The overall decline in Lepidoptera has been strongly linked to changing management, structure and composition of woods, e.g. increasing shade, fewer open spaces and loss of plant diversity. Woodland management has altered rapidly, with a change from extensive coppicing in the late 19th Century in favour of high forest and the widespread introduction of conifers to previously broad-leaved woodland. Many of the woodlands that were not planted with conifers have undergone 100 years of neglect, especially those in private ownership.

The darker conditions that accompany maturing conifer plantations are unsuitable for most BAP Priority Lepidoptera. Few woodland butterflies can cope with well-shaded habitat and this has led to a decline in the majority of species that depend on early succession. Only the Speckled Wood, a species that can tolerate shaded conditions more than most other butterflies has increased in abundance. Conifer feeding moths, such as the Spruce Carpet, Pine Beauty and Satin Beauty have also done well (Fox *et al.* 2006b) although the Bordered White, another conifer specialist has declined (-33% in 35 years).

The impact of increasing deer numbers on ground flora has been identified as a further threat to Lepidoptera. In some circumstances they can prevent wood re-growth (thus affecting ground flora), the quality of coppice re-growth and, occasionally, may directly graze out food plants. The White Admiral has seen a 50% decline in numbers, thought to be due to Honeysuckle being browsed out by deer (Feber *et al.* 2001).

The intensification of agriculture and removal of hedgerow and woodland fragments have left much woodland isolated, reducing the chances of re-colonisation after local extinctions. The remaining woods are important as refuges for grassland as well as woodland species. This increases the need to maintain habitat variability within each individual woodland block, where habitat fragmentation in the surrounding countryside is high.

The Forestry Commission was set up in 1919 with the objective of planting enough forest to provide a strategic reserve of timber for future wars or national emergencies. Afforestation by the Forestry Commission took place at an unprecedented scale following the First World War, often with minimal regard for existing habitats such as native woodland. This undoubtedly had a negative impact on our woodland Lepidoptera.

However, many PAWS still retain some of the rich flora of their past and have very good potential to support sustainable populations of Priority Lepidoptera species. Over recent years, the widespread implementation of PAWS restoration through the gradual removal of conifer and the use of natural regeneration to create broad-leaved semi-natural woodland has given rise to more species rich woodlands.

However the move towards continuous cover forestry may have an adverse impact on Lepidoptera populations reliant on the early successional stages once provided through clearfelling. It is important that plentiful, well-connected open spaces such as rides are available within these woodlands to ensure that adequate habitat is available for Lepidoptera.

In addition FC are now taking a landscape-scale approach to habitat re-creation, and restoration projects are resulting in the creation of larger and more sustainable semi-natural habitat mosaics. FC woods are now representing a vital conservation resource for butterflies and moths in England.

3.3 Forestry Commission management for Butterflies & Moths to date

FC management for butterflies dates back to the 1970s, with practice evolving over the years. Management has developed from small-scale work in limited reserve areas to whole-wood management which provides greater, and more sustainable, conservation opportunities.

Small-scale management, using hand or mechanised hand tools in places like Bernwood proved unable to slow succession sufficiently to provide habitat for key early successional species. Larger-scale management plans developed in the late 1970s and early 1980s at places such as Bernwood and Haugh Wood created large open spaces, in particular 'box junctions' which could be managed by machine.

At the same time ride management suitable for broad, mechanised application was developed by Forest Research and widely applied. However, these practices did not live up to their initial promise because natural succession to grasses and other coarse vegetation meant that managed edges and glades lacked a bare ground/woodland herb component and became unsuitable for early succession species. Considerable effort has been made to overcome this problem, including the use of forage harvesters to remove cut vegetation and selective herbicide application. This has not produced habitat comparable to coppice or high forest felling, although has resulted in suitable habitat in some situations.

Clear fells and windblow particularly of conifer, have provided valuable early succession habitat, for example in South East England, and in the wildlife corridors developed largely by felling middle-aged conifer in Wyre Forest. The long-term suitability of these sites will depend on follow-up management, but initial progress has been made.

Butterfly management on a 'whole wood' basis is now being developed, linked to both SSSI and Forest Design Plans (FDPs). In places like Haugh Wood, Wyre Forest, Whitbarrow, Chiddingfold and Bernwood, management plans have incorporated the needs of key species of Lepidoptera and implemented actions to gain positive outcomes. FDPs and SSSI plans in the future must attempt to act on this landscape-scale to halt the loss of BAP Priority Lepidoptera Species. There is an important role for Butterfly Conservation in promoting work across land ownership boundaries to create and maintain linkages.

In February 2006 the St. Regis paper mill closed. This provided by far the most important market for small diameter hardwoods including coppice. Its closure makes the sourcing of new and reliable markets vital if affordable and sustainable management is to be achievable into the future.

3.4 Current information on the status of Butterflies and Moths on FC land

The Species Action Plan for Butterflies on Forestry Commission Land was published in 2000. The butterfly species information contained in that plan has been updated for this Conservation Strategy and information on moths has been included. The list for moths is not exhaustive, however, further survey effort for moths within FC woodlands is to be encouraged and records of scarce and threatened species should be forwarded to Butterfly Conservation.

4.0 Prioritising and Grading Priority Sites

4.1 Methodology

Site Grading

All Priority Sites identified within this strategy are important and collectively represent the best sites for Lepidoptera across the Forestry Commission England estate. However with a total of 140 sites, further grading is required to ensure that efforts are directed at those sites which support the most vulnerable species and which would be most affected through lack of management.

Sites have been graded A, B or C depending on:

- The status of the species (BAP or Species of Conservation Concern)
- The degree to which the individual species depend on suitably managed woodland habitats for their survival.
- The number of species present.
- The combined species score for an individual site*

Grade	Description	Species Score *
Grade A	Grade A sites are the highest priority sites. They support at least one woodland BAP Priority Species that depends on targeted and specific woodland management operations such as ride management or coppicing.	>15
Grade B	Grade B sites support more generalist priority or species of conservation concern that are not so dependent on woodland habitats or management to maintain early successional stages.	6-15
Grade C	Grade C sites also support more generalist priority or species of conservation concern that are not so dependent on woodland habitats or management to maintain early successional stages. However they are given lower priority because they support a less diverse group of species or information regarding species is lacking.	<6

* See Species Grading Appendix 1.

Species Grading

Appendix 1 details Priority BAP Species and Species of Conservation Concern recorded throughout the FC England Estate as well as associated species scores used to Grade sites A, B or C.

Habitat Condition Assessment

The habitat condition score describes how suitable the habitat is for the specific Lepidoptera present upon the site and how well the site is being managed for these species.

Forest District staff were responsible for providing the assessment based on advice from Butterfly Conservation as to the requirements of the species. The condition assessments used are as follows:

Habitat Condition	Description
Favourable Improving	The site is already in favourable condition and current ongoing management efforts could only work to improve the site further.
Favourable	The site is being managed appropriately for the Lepidoptera species present.
Unfavourable Recovering	Through appropriate management the site is beginning or is predicted to show a move towards favourable condition, however it has not yet reached favourable condition.
Unfavourable No Change	The site is in unfavourable condition but is neither declining nor recovering. Further management is required to achieve unfavourable recovering status.
Unfavourable Declining	The site has not been appropriately managed for Lepidoptera for sometime or has undergone a damaging activity. Recovery is possible and may occur if suitable management input is made.

4.2 *Distribution of sites by grading*

The map and tables in Appendix 4 list Priority Sites included in this Strategy together with the Grade and habitat condition of the Site. This information has been mapped on the GIS and is available on request. The data is held by the England Biodiversity Information Officer to whom any updated information should also be sent.

The list of sites is not exhaustive, if key species are found on FC land that are not listed here, Forest Districts are encouraged to consult with Butterfly Conservation over management issues if necessary.

5.0 Summary Statistics

Forest District	Total	Grade A Woods	Grade B Woods	Grade C Woods	Total number of sites assessed as "Favourable" habitat condition	BAP Priority Species that are principally woodland species and require urgent targeted management:
East Anglia	12	6	2	4	6	Basil Thyme Case-bearer, Lunar Yellow Underwing
Forest of Dean	9	6	2	1	3	Argent & Sable, Drab Looper, Pearl-bordered Fritillary, Small Pearl-bordered Fritillary, Wood White
Kielder	5	2	0	3	2	Small Pearl-bordered Fritillary
National Arboreta	1	0	1	0	1	
New Forest	10	5	4	1	10	Argent & Sable, Drab Looper, Duke of Burgundy, Pearl-bordered Fritillary, Small Pearl-bordered Fritillary
North West	7	6	0	1	3	Duke of Burgundy, High Brown Fritillary, Pearl-bordered Fritillary, Small Pearl-bordered Fritillary
North York Moors	7	7	0	0	3	Argent & Sable, Small Pearl-bordered Fritillary, Duke of Burgundy
Northants	20	10	8	2	9	Wood White
Peninsula	9	7	0	2	5	Duke of Burgundy, Small Pearl-bordered Fritillary, Pearl-bordered Fritillary, Wood White
Sherwood	4	1	1	2	1	Wood White
South East	37	14	12	11	11	Argent & Sable, <i>Coleophora wockeela</i> , Drab Looper, Duke of Burgundy, Heath Fritillary, Pearl-bordered Fritillary, Small Pearl-bordered Fritillary, Wood White
West Midlands	19	13	3	3	8	Argent & Sable, Drab Looper, Pearl-bordered Fritillary, Small Pearl-bordered Fritillary, Wood White
Total	140	77	33	30	62	

6.0 References

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Feber, R.E., Brereton, T.M., Warren, M.S. & Oates, M. 2001. The impact of deer on woodland butterflies: the good, the bad and the complex. *Forestry*. **Vol 74**. No 3, pg 271 – 276.

Fox, R., Asher, J., Brereton, T., Roy, D. & Warren, M.S. 2006a. *The State of Butterflies in Britain and Ireland*, Pisces Publications, Oxford.

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Green, D.G. 2000. *The Status of Lepidoptera in the New Forest: A report for the Forestry Commission by Butterfly Conservation*. Butterfly Conservation, Wareham.

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Thomas, J. Telfer, M.G., Roy, D.R., Preston, C.D., Greenwood, J.J.D., Asher, J., Fox, R., Clarke, R.T. & Lawton, J.H. 2004. Comparative Losses of British Butterflies, Birds and Plants and the Global Extinction Crisis. *Science*. **Vol 303**. pp 1879-1881.

7.0 Useful reading

Specific species reports for certain areas are also available and can be requested from Butterfly Conservation please see examples from the list below:

Asher, J., Warren, M.S., Fox, R., Harding, P., Jeffcoate, G & Jeffcoate, S. 2001. *The Millennium Atlas of Butterflies in Britain and Ireland*, Oxford University Press, Oxford.

Bulman, C. 2007. Woodlands – a vital habitat for butterflies and moths. *Quarterly Journal of Forestry*. **Vol 101**. pp 29-39

Defra Factsheets are available for most BAP Priority Lepidoptera species with habitat management recommendations included. These are available from Butterfly Conservation or can be downloaded from the website www.butterfly-conservation.org

Ellis, S. 2005. *Conservation of the Duke of Burgundy (Hamearis lucina) butterfly on the North York Moors 2005*. Butterfly Conservation Report S05-37, Wareham.

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Ferris, R. & Carter, C. 2000. *Managing Rides, Roadsides and Edge Habitats in Lowland Forests Bulletin 123*. Forestry Commission, Edinburgh.

Haggett, G.M. 2006. *Basil Thyme Case-bearer moth (Coleophora tricolor Walsingham, 1899) in the Norfolk and Suffolk Breck. Research and survey 2005*. Butterfly Conservation Report S06-01, Wareham.

Joy, J. 2005 *Argent & Sable (Rheumaptera hastata) in Herefordshire. Update 2003-2004*. Butterfly Conservation S05-16, Wareham.

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Joy, J. 2006. *Small Pearl-bordered Fritillary (Boloria selene) in the Cannock Chase area 2006*. Butterfly Conservation Report S06-1, Wareham.

McCracken, M. & Bulman, C. 2006. *Pearl-bordered Fritillary Habitat management: An experiment into using Kerb[®] herbicide in North Wood, Devon to improve suitability for butterflies*. Butterfly Conservation Report S06 -21, Wareham.

Parsons, M.S., Hoare, D., Davis, T. & Green, D. 2005. *The distribution of the UK Biodiversity Action Plan Priority moth species, 1999-2004*. *Atropos*, No. 25: 5-20.

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Acknowledgements

Many thanks to all who have contributed to this report, particularly Butterfly Conservation Regional Officers and branch members who completed species forms and also all the Forestry Commission England staff who attended and contributed to Forest District meetings and completed questionnaires. Thanks also to all those who commented on the text and structure of the document. Forestry Commission England, David Green and David Grundy provided the photographs.

Appendix 1: Species Grading

Lepidoptera featuring in this Strategy have been given a score according to their conservation status and their dependence on the active management of woodland habitats.

The following table lists these species together with the score with which they have been attributed. This list is intended to be a base, on which Forestry Commission England and Butterfly Conservation can build throughout the Strategy period.

BAP Priority Species that require urgent targeted management:

			Species Score
Argent & Sable	<i>Rheumaptera hastata</i>	Moth	15
Basil Thyme Case-bearer	<i>Coleophora tricolor</i>	Moth	15
	<i>Coleophora wockeella</i>	Moth	15
Drab Looper	<i>Minoa murinata</i>	Moth	15
Duke of Burgundy	<i>Hamearis lucina</i>	Butterfly	15
Heath Fritillary	<i>Mellicta athalia</i>	Butterfly	15
High-Brown Fritillary	<i>Argynnis adippe</i>	Butterfly	15
Lunar Yellow Underwing	<i>Noctua orbona</i>	Moth	15
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>	Butterfly	15
Small Pearl-bordered Fritillary	<i>Boloria selene</i>	Butterfly	15
Wood White	<i>Leptidea sinapis</i>	Butterfly	15

BAP Priority Species where woodland is a secondary habitat but active management necessary:

			Species Score
Barred Tooth-striped	<i>Trichopteryx polycommata</i>	Moth	5
Brown Hairstreak	<i>Thecla betulae</i>	Butterfly	5
Buttoned Snout	<i>Hypena rostralis</i>	Moth	5
Clay Fan-foot	<i>Paracolax tristalis</i>	Moth	5
Common Fan-foot	<i>Pechipogo strigilata</i>	Moth	5
Dingy Mocha	<i>Cyclophora pendularia</i>	Moth	5
Dingy Skipper	<i>Erynnis tages</i>	Butterfly	5
False Mocha	<i>Cyclophora porata</i>	Moth	5
Grayling	<i>Hipparchia semele</i>	Butterfly	5
Grizzled Skipper	<i>Pyrgus malvae</i>	Butterfly	5
Large Heath	<i>Coenonympha tullia</i>	Butterfly	5
Marsh Fritillary	<i>Euphydryas aurinia</i>	Butterfly	5
Narrow-bordered Bee Hawk-moth	<i>Hemaris tityus</i>	Moth	5
Northern Brown Argus	<i>Aricia artaxerxe</i>	Butterfly	5
	<i>Phyllonorycter sagitella</i>	Moth	5
	<i>Sciota hostilis</i>	Moth	5
Silver-studded Blue	<i>Plebeius argus</i>	Butterfly	5
Square-spotted Clay	<i>Xestia rhomboidea</i>	Moth	5
Striped Lychnis	<i>Shargacucullia lychnitis</i>	Moth	5
Waved Carpet	<i>Hydrelia sylvata</i>	Moth	5

BAP Priority Species associated with mature trees:

			Species Score
Dark Crimson Underwing	<i>Catocala sponsa</i>	Moth	3
Heart Moth	<i>Dicycla oo</i>	Moth	3
Light Crimson Underwing	<i>Catocala promissa</i>	Moth	3
Scarce Merveille du Jour	<i>Moma alpium</i>	Moth	3
White Admiral	<i>Limenitis camilla</i>	Butterfly	3
White-letter Hairstreak	<i>Satyrium w-album</i>	Butterfly	3
White-line Snout	<i>Schrankia taenialis</i>	Moth	3
White-spotted Pinion	<i>Cosmia diffinis</i>	Moth	3

Other key species occurring in woodland:

			Species Score
Black Hairstreak	<i>Satyrium pruni</i>	Butterfly	1
Broad-bordered Bee Hawk-moth	<i>Hemaris fuciformis</i>	Moth	1
Dark Green Fritillary	<i>Argynnis aglaja</i>	Butterfly	1
	<i>Dictiomeris ustalella</i>	Moth	1
	<i>Elegia similella</i>	Moth	1
Fletcher's or Pauper Pug	<i>Eupithecia egenaria</i>	Moth	1
	<i>Oecophora bractella</i>	Moth	1
Purple Emperor	<i>Apatura iris</i>	Butterfly	1
Reed Leopard	<i>Phragmataecia castaneae</i>	Moth	1
	<i>Salebriopsis albicilla</i>	Moth	1
	<i>Schiffermuellerina grandis</i>	Moth	1
Silver-washed Fritillary	<i>Argynnis paphia</i>	Butterfly	1
Triangle	<i>Heterogenea asella</i>	Moth	1
Welsh Clearwing	<i>Synanthedon scoliaeformis</i>	Moth	1
White-banded Carpet	<i>Spargania luctuata</i>	Moth	1

Appendix 2. Lepidoptera found on Forestry Commission Land and their conservation requirements

BAP Priority Species that depend on woodland and require urgent targeted management

Species	Conservation Status	Habitat	Conservation Requirements
* Argent & Sable <i>Rheumaptera hastate</i>	BAP Priority	Open woodland with birch re-growth	Maintain a constant supply of small birches (<2m) in sunny situations. Short rotation coppice.
* Basil Thyme Case-bearer <i>Coleophora tricolor</i>	BAP Priority	Found on unimproved Breck grassland	Ensure a year on year supply of Basil Thyme. Ground disturbance may be needed.
<i>Coleophora wockeella</i>	Proposed BAP Priority	Woodland rides where Betony occurs	Ensure annual continuity of foodplant.
* Drab Looper <i>Minoa murinata</i>	BAP Priority	Ancient woodland in open, sunny situations and along ride edges.	Encourage larval foodplant. Rotational clearance of ride margins, creation of box junctions and the introduction of coppicing should occur where appropriate.
* Duke of Burgundy <i>Hamearis lucina</i>	Proposed BAP Priority	Woodland rides, glades and clearings or tall grassland and scrub	Maintain open sunny clearings or grassy glades with abundant Primroses or Cowslips growing as large plants in prominent situations. Rotational coppicing or ride cutting is ideal to link breeding sites.
* Heath Fritillary <i>Mellicta athalia</i>	BAP Priority	Newly cleared or coppiced woodland with abundant Cow-wheat	Regular coppicing essential, preferably with broad interlinking rides.
* High-Brown Fritillary <i>Argynnis adippe</i>	BAP Priority	Newly cleared woodland with sparse vegetation or bracken slopes	Regular coppicing or scrub clearance is essential on woodland sites. Bracken habitats should ideally be grazed with cattle or ponies or failing this cut periodically to prevent total bracken dominance.
* Lunar Yellow Underwing <i>Noctua orbona</i>	BAP Priority	Grassy heathland rides in sunny young woodland and regrowth in young conifer plantations	Woodland rides should be kept open and sunny. They should have a marginal strip of longer grassy vegetation and be cut on rotation, not all in one year.
* Pearl-bordered Fritillary <i>Boloria euphrosyne</i>	BAP Priority	Newly cleared woodlands or sunny rides with sparse vegetation and violets	Regular coppicing is ideal or regular clearing in deciduous woodlands with numerous broad, sunny rides. Maintenance of bracken cover may be essential.
* Small Pearl-bordered Fritillary <i>Boloria selene</i>	Proposed BAP Priority	Sunny clearings or grassy rides with damp, lush vegetation and violets	Maintenance of numerous open, sunny rides and glades, especially in damper areas. Regular woodland clearance or coppicing is highly beneficial. Keeping a light cover of bracken essential in some breeding habitats.

Species	Conservation Status	Habitat	Conservation Requirements
* Wood White <i>Leptidea sinapis</i>	Proposed BAP Priority	Woodland rides, edges and light scrub	Maintenance of numerous open rides and careful management of ride edges and scrub. Piecemeal cutting of ride edges on a 1-6 year rotation.

BAP Priority Species where active management less critical or woodland is a secondary habitat

Species	Conservation Status	Habitat	Conservation Requirements
* Barred Tooth-striped <i>Trichopteryx polyommata</i>	BAP Priority	Wild Privet in open woodland and ride edges on chalk or limestone	Widening of narrow, neglected rides. Cut Privet on rotation; do not cut all in one year. Maintain stands of Privet where possible.
Brown Hairstreak <i>Thecla betulae</i>	Proposed BAP Priority	Wood edges and hedgerows with abundant young growth of Blackthorn	Retain all hedges, especially those with blackthorn. Cut hedges on rotations not shorter than 2 or 3 years. Avoid annual flailing at all costs.
* Buttoned Snout <i>Hypena rostralis</i>	BAP Priority	Hedgerows and along footpaths, hollow trees and Ivy clad trees	Where the species occur plants should not be disturbed and continuity of good stands of Hop promoted.
Clay Fan-foot <i>Paracolax tristalis</i>	BAP Priority	Sunny but sheltered felled or coppiced areas in broadleaved woodland	Poorly understood requirements.
* Common Fan-foot <i>Pechipogo strigilata</i>	BAP Priority	Open woodland and recently abandoned coppice	Regular woodland management such as long-term coppice rotation is desirable. Fallen trees or branches, such as oak with leaves on should be left in situ.
* Dingy Mocha <i>Cyclophora pendularia</i>	BAP Priority	Heathland and damp grassland where willow bushes occur	Provide continual supply of small isolated small-leaved willow bushes that are not heavily shaded.
* Dingy Skipper <i>Erynnis tages</i>	Proposed BAP Priority	Woodland rides and clearings	Maintain open rides and carefully manage ride edges and scrub.
False Mocha <i>Cyclophora porata</i>	Proposed BAP Priority	Scrubby oak and oak coppice in woodlands. Long established areas of habitat	Ensure continuity of scrubby oak and oak coppice regrowth in warm sheltered situations.
Grayling <i>Hipparchia semele</i>	Proposed BAP Priority	Inland colonies found on dry heathland and in open woodland on stony ground	Maintain open woodland with bare ground in open positions.
* Grizzled Skipper <i>Pyrgus malvae</i>	Proposed BAP Priority	Woodland rides and clearings	Maintenance of numerous open rides and careful management of ride edges and scrub.
* Large Heath <i>Coenonympha tullia</i>	Proposed BAP Priority	Open, wet areas. Lowland raised bogs, upland blanket bogs and damp acidic moorland	Maintain high water table. No grazing where possible otherwise a light and extensive grazing regime.

Species	Conservation Status	Habitat	Conservation Requirements
* Marsh Fritillary <i>Euphydryas aurinia</i>	BAP Priority Species	Open grassland adjacent to woodland	Maintain open, sunny areas of shorter vegetation with Devil's-bit Scabious
* Narrow-bordered Bee Hawk-moth <i>Hemaris tityus</i>	BAP Priority Species	Open grassland adjacent to woodland	Maintain open, sunny areas of shorter vegetation with Devil's-bit Scabious
Northern Brown Argus <i>Aricia artaxerxes</i>	BAP Priority	Sheltered, well-drained, unimproved grassland.	Maintain uneven sward and light winter grazing
<i>Phyllonorycter sagitella</i>	Proposed BAP Priority	Associated with aspen, possibly with a preference for saplings	Maintain a continuity of aspen, including young trees.
<i>Sciota hostilis</i>	Proposed BAP Priority	Woodland supporting aspen	Ensure supply of aspen.
Silver-studded Blue <i>Plebejus argus</i>	BAP Priority	Lowland heathland, calcareous grassland and sand dunes	Maintain short or sparse vegetation.
* Square-spotted Clay <i>Xestia rhomboidea</i>	BAP Priority	Ancient woodland with a dense coppice understory, scattered open woodland	Maintain existing open areas with Common Nettle, Oxslip and Dog's Mercury.
* Striped Lychnis <i>Shargacucullia lychnitis</i>	BAP Priority	Open calcareous grassland, road & field verges	Do not cut when foodplant is in flower. Some ground disturbance may be needed to retain foodplant.
* Waved Carpet <i>Hydrelia sylvata</i>	BAP Priority	Actively managed damp woodland or scrub	Maintain or establish a coppice cycle in woodland or scrub where the moth is found.

BAP Priority Species associated with mature trees:

Species	Conservation Status	Habitat	Conservation Requirements
* Dark Crimson Underwing <i>Catocala sponsa</i>	BAP Priority	Large tracts of mature oak, generally in open woodland situations	Retain mature oak stands. Ensure a continuity of mature oak trees in open situations.
* Heart Moth <i>Dicycla oo</i>	BAP Priority	Parkland, and openly spaced trees on woodland rides or edges	Retain mature oak stands and ensure a continuity of mature oak trees in open situations.
* Light Crimson Underwing <i>Catocala promissa</i>	BAP Priority	Large tracts of mature oak, generally in open woodland situations	Retain mature oak stands. Ensure a continuity of mature oak trees in open situations.
Scarce Merveille du Jour <i>Moma alpium</i>	BAP Priority	Mature oak	Retain stands of mature oak and ensure a continuity of supply of such situations.

Species	Conservation Status	Habitat	Conservation Requirements
White Admiral <i>Limenitis camilla</i>	Proposed BAP Priority	Shady woodland and ride edges	Retain areas of deciduous woodland with Honeysuckle in shady positions
White-letter Hairstreak <i>Satyrion w-album</i>	Proposed BAP Priority	Sheltered rides, glades and unkempt hedges with elms	Retain and extend area of suckering elms.
White-line Snout <i>Schrankia taenialis</i>	BAP Priority	Damp broad-leaved woodland, coppiced woodland and conifer plantations	Precise habitat requirements are not fully understood, likely to prefer shady, sheltered situations.
* White-spotted Pinion <i>Cosmia diffinis</i>	BAP Priority	English Elm in parks, woodlands and hedgerows	Retain healthy elm trees. Where possible allow re-growth from tree stumps if infected trees have been cut.

Other key species occurring in woodland

Species	Conservation Status	Habitat	Conservation Requirements
Black Hairstreak <i>Satyrion pruni</i>	BAP Species of conservation concern	Dense, tall stands of Blackthorn, either within woods or in thick hedgerows	Maintain patches of dense Blackthorn. Cut extensive patches of Blackthorn on long rotations to prevent from becoming moribund.
Broad-bordered Bee Hawk-moth <i>Hemaris fuciformis</i>	Nationally Scarce	Rides and clearings in open woodland	Maintain rides and clearings where Honeysuckle grows.
Dark Green Fritillary <i>Argynnis aglaja</i>	Key Species	Woodland glades and open habitat	Maintain open sunny rides and glades.
<i>Dictiomeris ustalella</i>	Provisional Red data book	Small-leaved Lime coppice	Coppice small-leaved lime.
<i>Elegia similella</i>	Nationally Scarce	Mature oak woods and parkland with large oaks	Maintain supply of large oak, possibly has a preference for oaks in open situations.
Fletcher's or Pauper Pug <i>Eupithecia egenaria</i>	Red data book species	Ancient lime wood and avenues of lime	Ensure continuity of flowering limes.
<i>Oecophora bractella</i>	Provisional Red data book	Larva feed in dead bark of decaying wood	Retain dead wood.
Purple Emperor <i>Apatura iris</i>	BAP conservation concern	Mature deciduous woodland with abundant oaks and sallows	Maintain extensive areas of broad-leaved woodland with a scatter of large oak trees and abundant sallows, both along ride margins and within woodland blocks.
Reed Leopard <i>Phragmatacia castaneae</i>	Red data book species	Fens, marshes and margins of ponds	Avoid disturbance of habitat. Maintain constant and annual supply of Common Reed. Maintain existing water levels.
<i>Salebriopsis albicilla</i>	Provisional Red data book	Ancient lime woodland	Retain a continuity of supply of Small-leaved Lime.
<i>Schiffermuellerina grandis</i>	Proposed BAP Priority	Deciduous ancient woodland and hedgerows	Retain dead wood. Found especially on dry, dead standing branches of oak, elm, Ivy and gorse.

Species	Conservation Status	Habitat	Conservation Requirements
Silver-washed Fritillary <i>Argynnis paphia</i>	BAP Species of conservation concern	Well thinned deciduous woodland with sunny rides and glades	Regular thinning of deciduous high forest to create dappled shade conditions, combined with maintenance of sunny rides. Rotational coppicing also suitable.
Triangle <i>Heterogenea asella</i>	Red data book species	oak and beech woodland	Maintain a continuity of supply of large oak and/or beeches.
Welsh Clearwing <i>Synanthedon scoliaeformis</i>	Red data book species	Open birch woodland and scrub on hillsides of wet, acidic pasture and moorland	Ensure supply of mature birches in open sunny situations.
White-banded carpet <i>Spargania luctuata</i>	Nationally Scarce	Woodland rides and clearings	Maintain annual supply of foodplant in open situations. Some ground disturbance may be required.

*Species Factsheets containing further details on the conservation requirements of these species are available from Butterfly Conservation or are available to download from: <http://www.butterfly-conservation.org/conbio/defrafactsheets/index.html>

Species in bold type are Priority Species identified by Defra as headline Biodiversity Action Plan status indicators. The purpose of these indicators is to help assess outcomes of the England Biodiversity Strategy (Defra 2006).

Appendix 3. National Summary of Forest District Priority Sites by Designation

Category			
<i>Total area of FC England landholding</i>		260143ha	100%
Estimated area of Priority Butterfly Sites		1610 – 8050ha*	0.6 – 3%
Number of Priority Lepidoptera sites		140	100%
	Priority Lepidoptera Sites with SSSI designation**	60	49%
	Priority Lepidoptera Sites with designation SPA**	24	17%
	Priority Lepidoptera Sites with SAC designation**	8	6%
	Priority Lepidoptera Sites with Ancient Woodland**	103	75%

* Sites have been named according to Forestry Commission England woodland blocks or areas, not all land within blocks will be suitable for Lepidoptera. An estimate of the potential area that may be occupied by Lepidoptera is given.

** The SSSI, SPA, SAC or Ancient Woodland designation may not cover all of a Priority Lepidoptera Site and in some cases the actual location of Priority Species may fall outwith the boundary of the designated sites.

Appendix 4. Priority Forestry Commission Lepidoptera sites in England

East Anglia

Cranwich Camp
Dunwich Forest
Frosts Common
Hills and Holes
Horsford Wood
Hurst Fen (Mildenhall)
Kings Forest
Marsham Wood
Rendlesham Forest
Tunstall Forest
West Harling Woods
West Toffs Pit

Forest of Dean

Dymock Woods
Forest of Dean
Forest of Dean (Highmeadow)
Haugh Wood
Nether Wood
Red Lodge Wood
Savernake Forest
Somerset Common
Tidenham Chase Woods

Kielder

Chopwell Woods
Fourlaws (Aid Moss)
Hamsterley Forest
Harbottle and Holystone Burn
Kielder Forest

National Arboreta

Westonbirt National Arboretum

New Forest

Ashmore (formerly Stubhampton
Bottom and Washer's Pit)
Grovely Wood
Hethfelton Wood
Moreton
New Forest
Park & Queen Copse
Rempstone
Stonedown
Vernditch
Wareham Forest

North West

Barrowfield & Honeybee Wood
Dalton Craggs
Grizedale Forest
Hampfield Fell
High Stand
Underlaid
Whitbarrow

North York Moors

Bishop Wood
Bumble Wood
Cropton Forest & Newtondale
Dalby Forest
Harwood Dale Forest
Langdale Forest
Sneaton Forest

Northants

Bedford Purlieus
Chicksands Woods
College and Home Wood
Fermyn Woods and Titchmarsh Woods
Fineshade Wood
Hardwick & Sywell Wood
Harry's Park
Hazleborough Main block
Maulden Wood
Plumpton
Potton Wood
Salcey Forest
Wakerley Great Wood
Washers & Dainty
West Wood
Whistley Wood
Whitfield
Wicken Wood & Park Copse
Wilstead Wood
Yardley Chase

Peninsula

Blackdown Forest
Cann Wood, Plym Forest
Cookworthy
Dunmere
Great Plantation
Haldon Forest
Herrods Foot Woods
Lydford
North Wood

Sherwood

Bardney Limewoods
Hugsett Wood
Wellow Park
Whitwell Wood

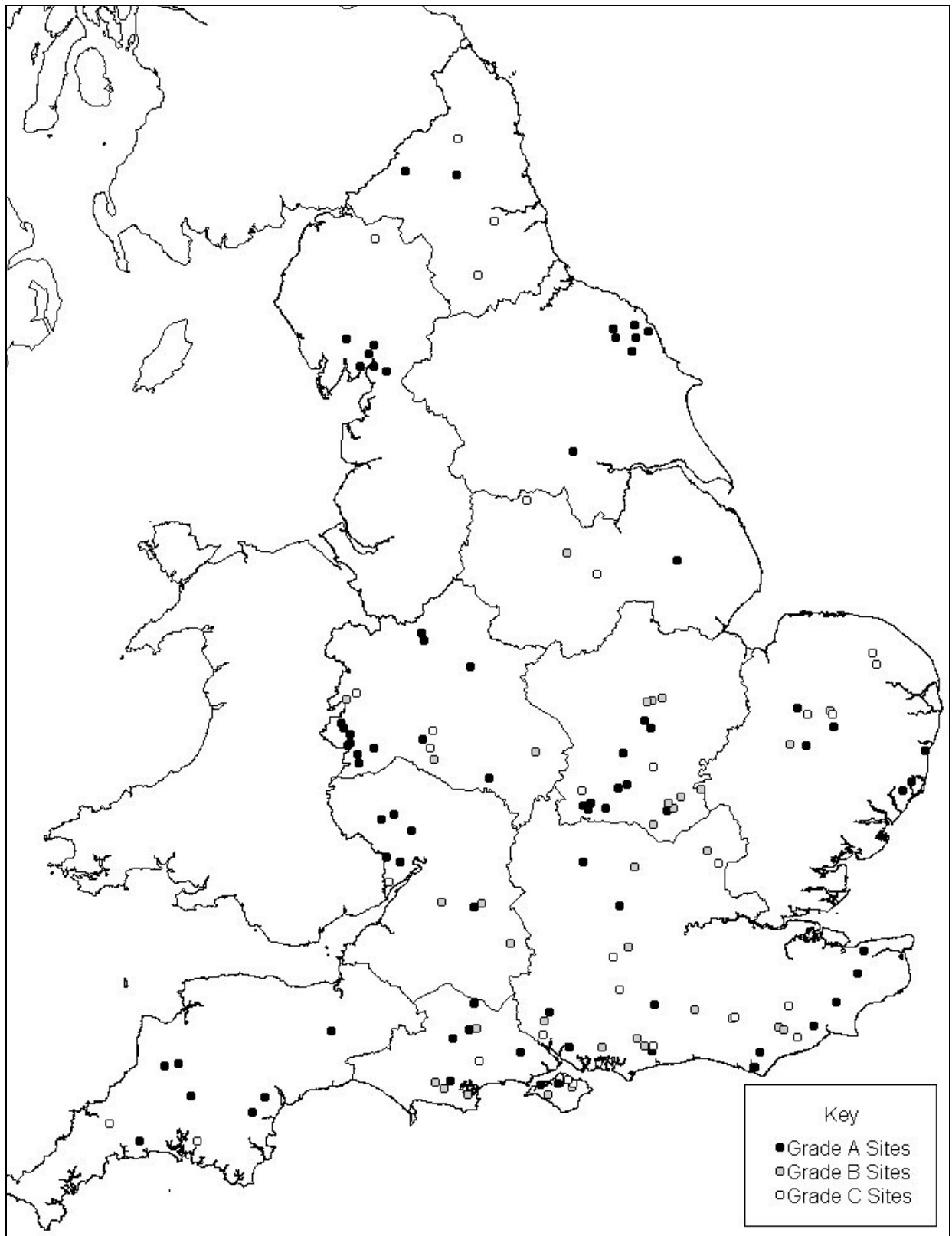
South East

Abbots Wood
Alice Holt Forest
Ampfield Wood
Balls Wood
Battle Great Wood
Beckley Wood
Bedgebury
Bernwood Forest
Bouldnor Copse
Bramfield Woods
Bramshill
Brighstone Forest
Burwash
Charlton
Chiddingfold
Clowes Wood
Combley Great Wood (Bridlesford Copses)
Crowthorne Woods/Swinley Park
Darwell Wood
Denge Wood
Eartham Woods
Firestone Copse
Forest of Bere
Friston Forest
Homefield
Houghton wood
Lord's Wood
Maresfield (High and Park Wood)
Orlestone Forest
Parkhurst Forest
Rewell Wood
Sheffield Forest
St Leonards
Wendover
West Wood
Whiteley Pastures (formally Botley Wood)
Woodhouse

West Midlands

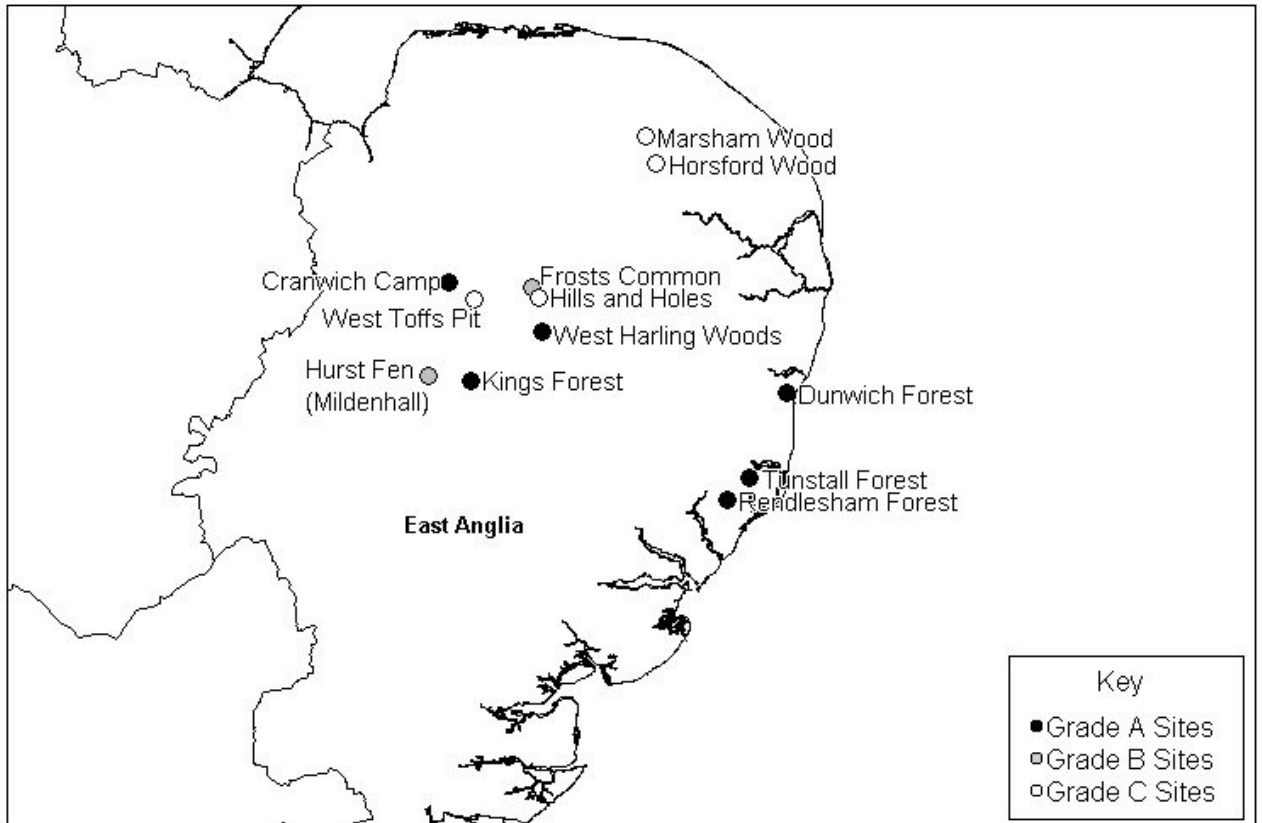
Arley Wood
Bishop's Wood
Blakeridge Wood
Bucknell Wood
Burnt Wood
Cannock Chase
Eastridge Wood
Hopton Wood
Mortimer Forest
Oversley Wood
Purslow Wood
Radnor and Bury Ditches
Ribbesford Wood
Shelve Woodland
Shobdon (inc. Mere Hill and Sned)
Shrawley Wood
Waverley Wood & Weston Wood
Wigmore Rolls
Wyre Forest

Distribution map of the Priority Forestry Commission Lepidoptera sites in England



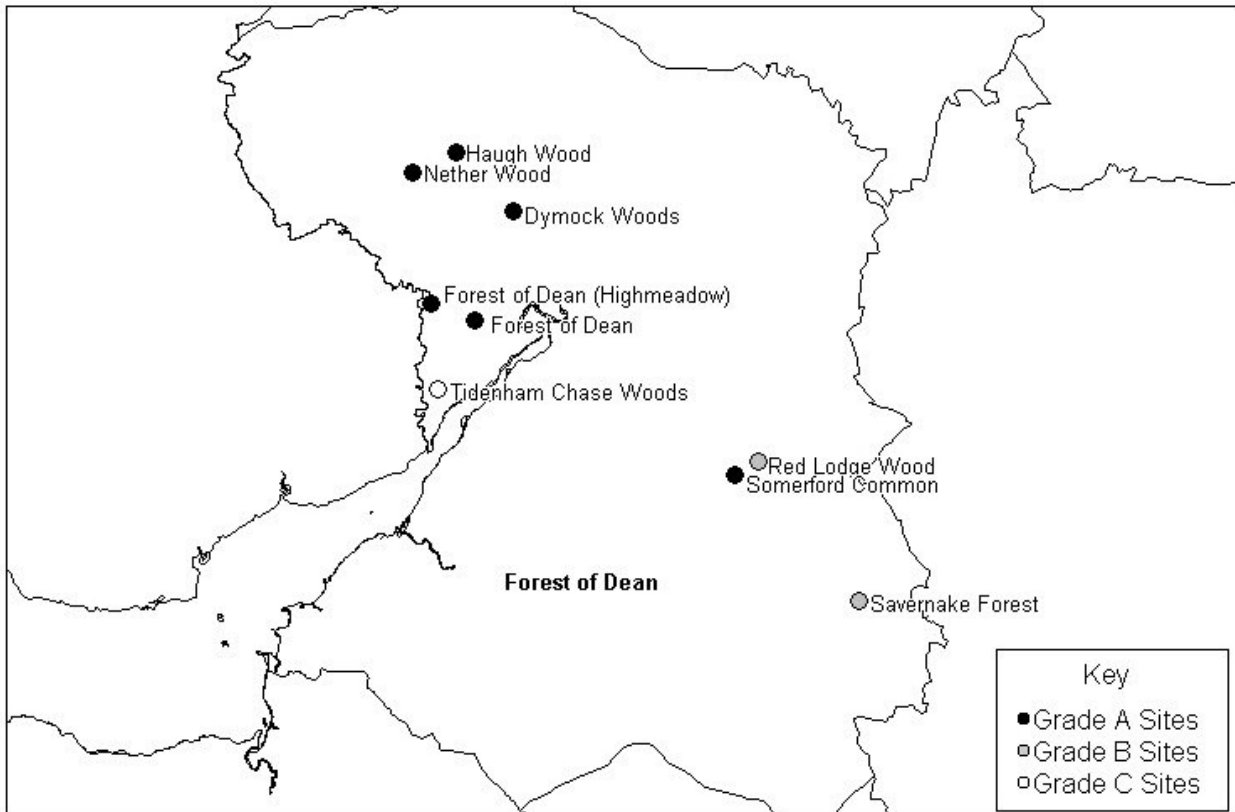
East Anglia Forest District

Santon Downham
Brandon
Suffolk
IP27 0TJ



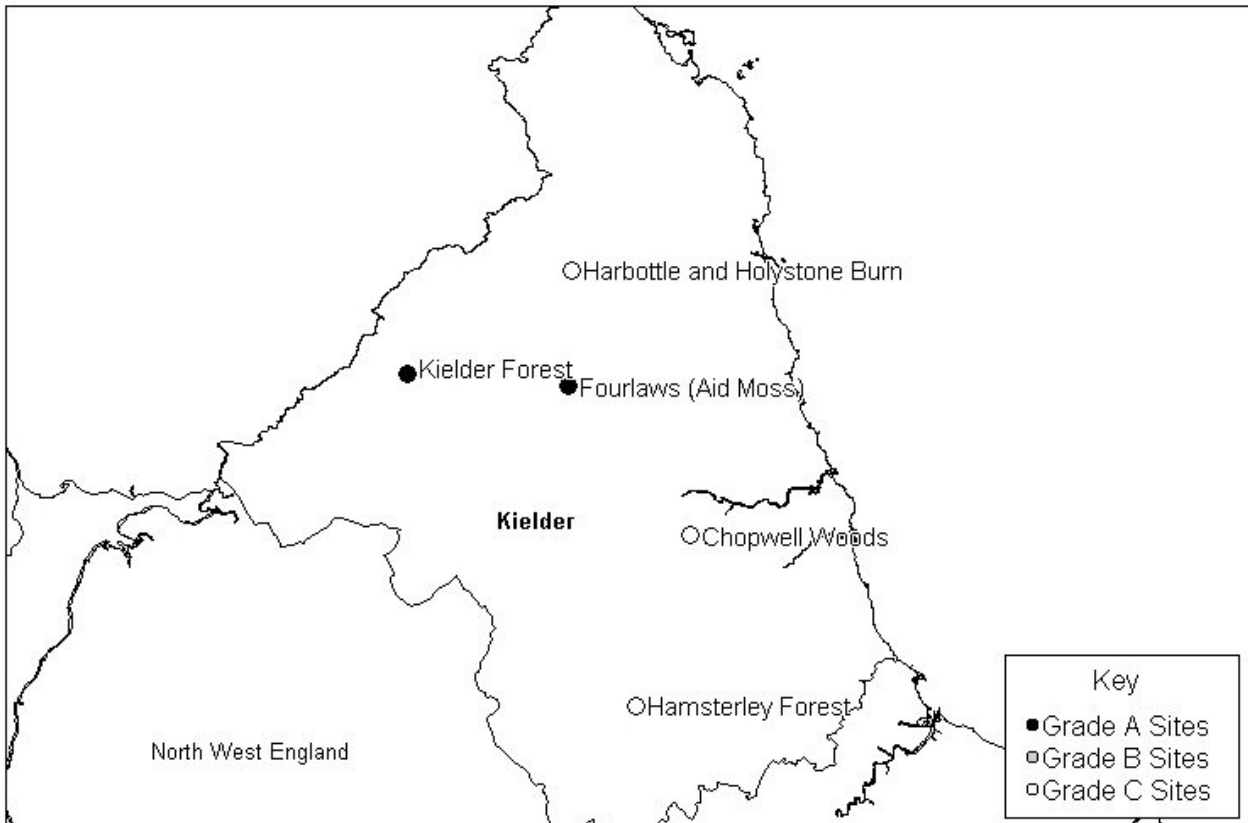
Forest of Dean

Bank House
Bank Street
Coleford
Gloucestershire
GL16 8BA



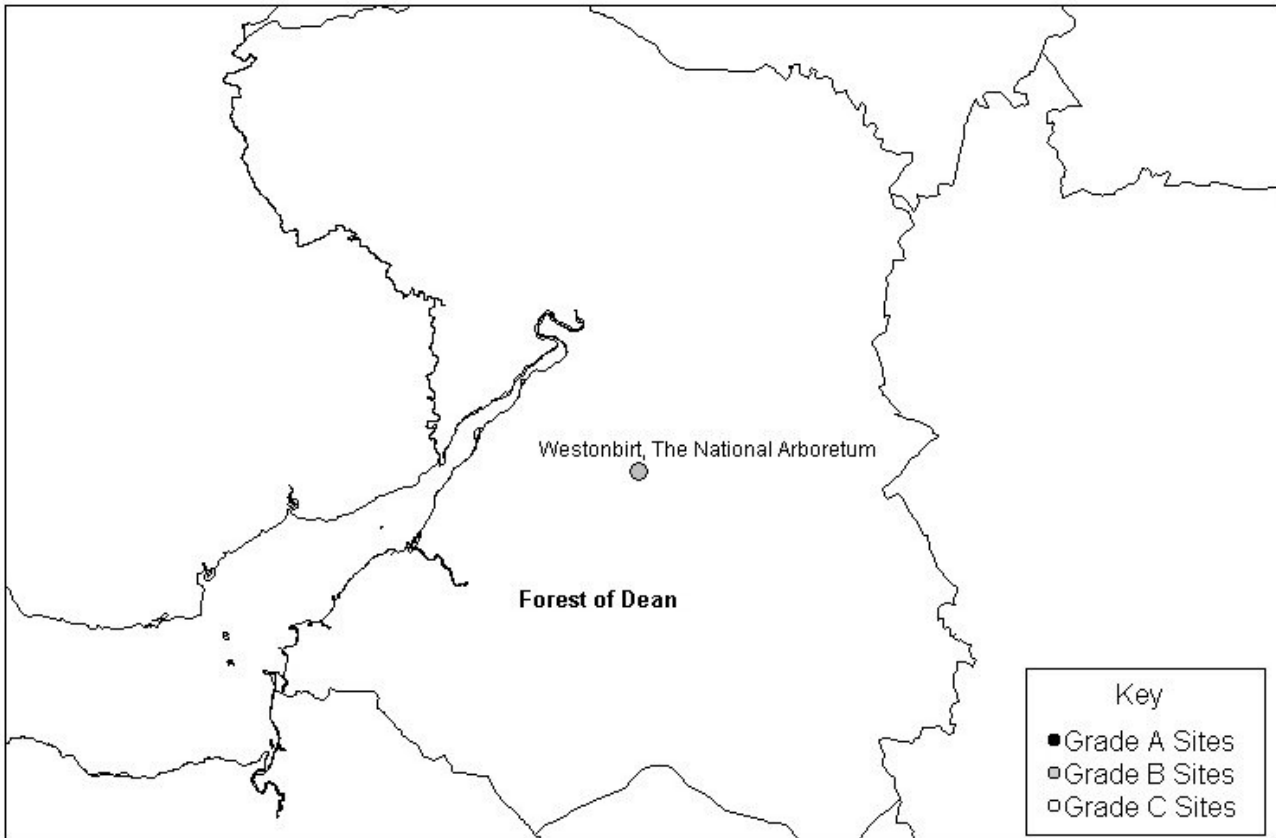
Kielder Forest District

Eals Burn
Bellingham
Hexham
Northumberland
NE48 2AJ



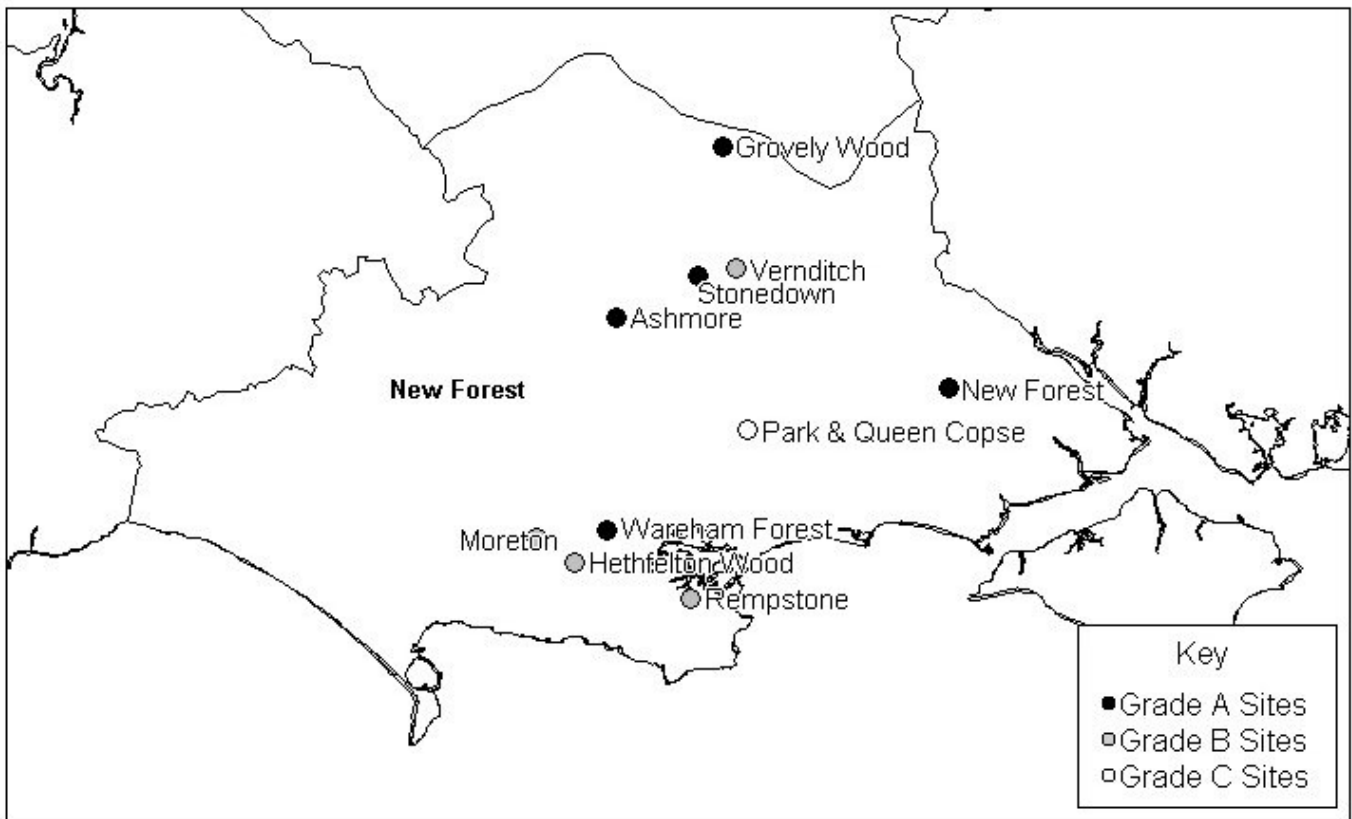
The National Arboretum Westonbirt

Tetbury
Gloucestershire
GL8 8QS



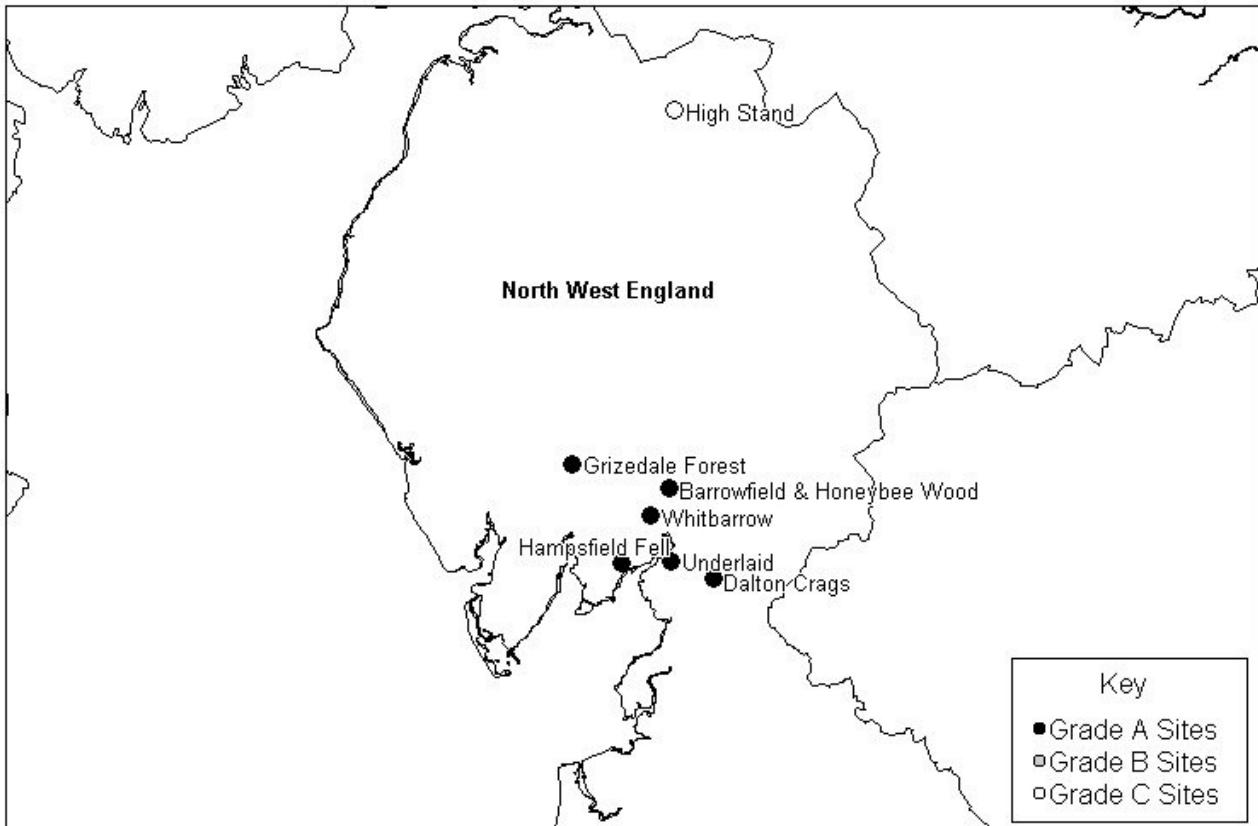
New Forest

The Queen's House
Lyndhurst
Hants
SO43 7NH



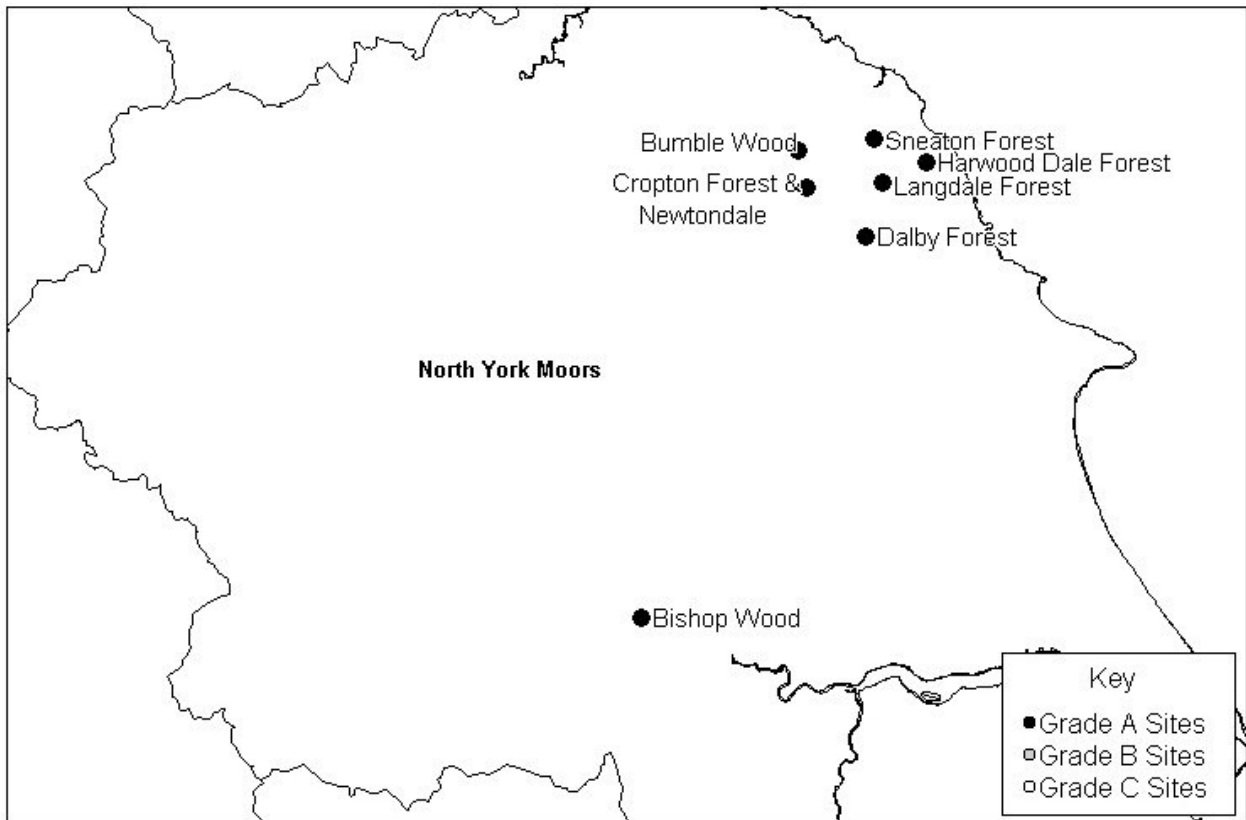
North West Forest District

Hawkshead
Grizedale
Ambleside
Cumbria
LA22 0Q1



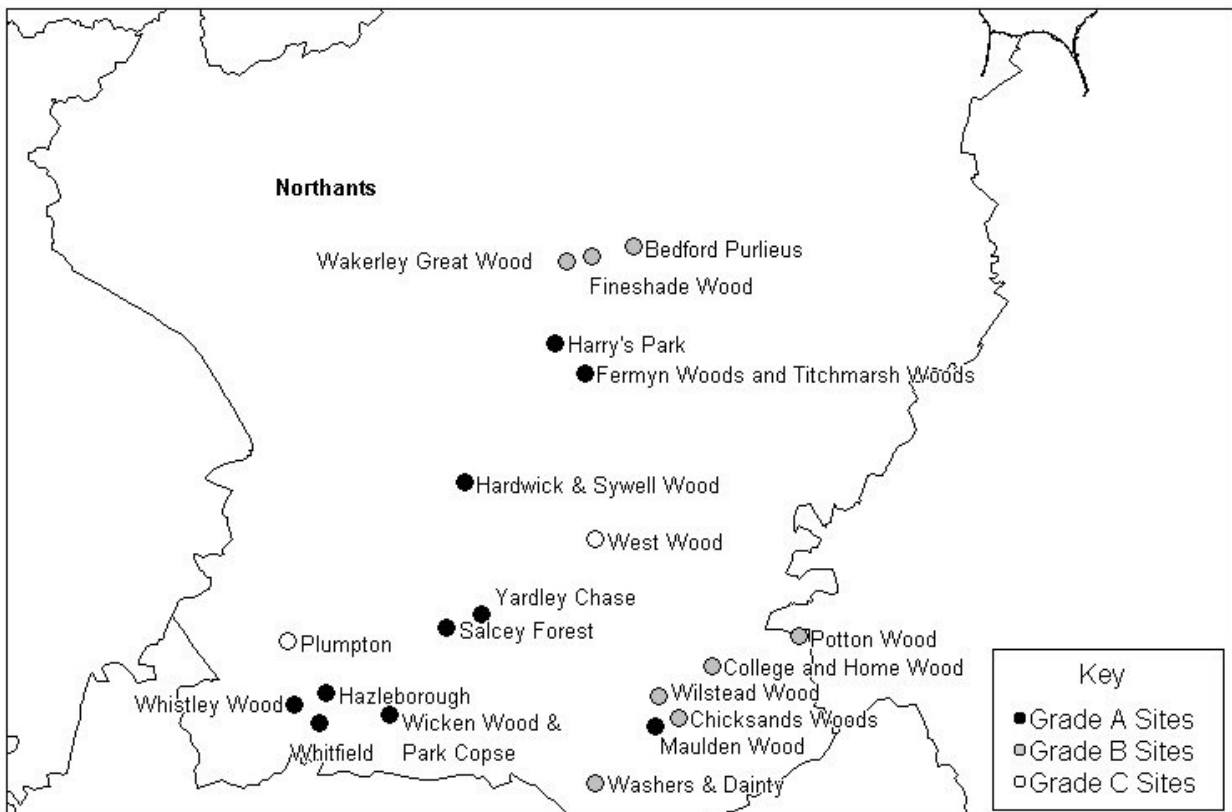
North York Moors Forest District

Outgang Road
Pickering
North Yorkshire
YO18 7EL



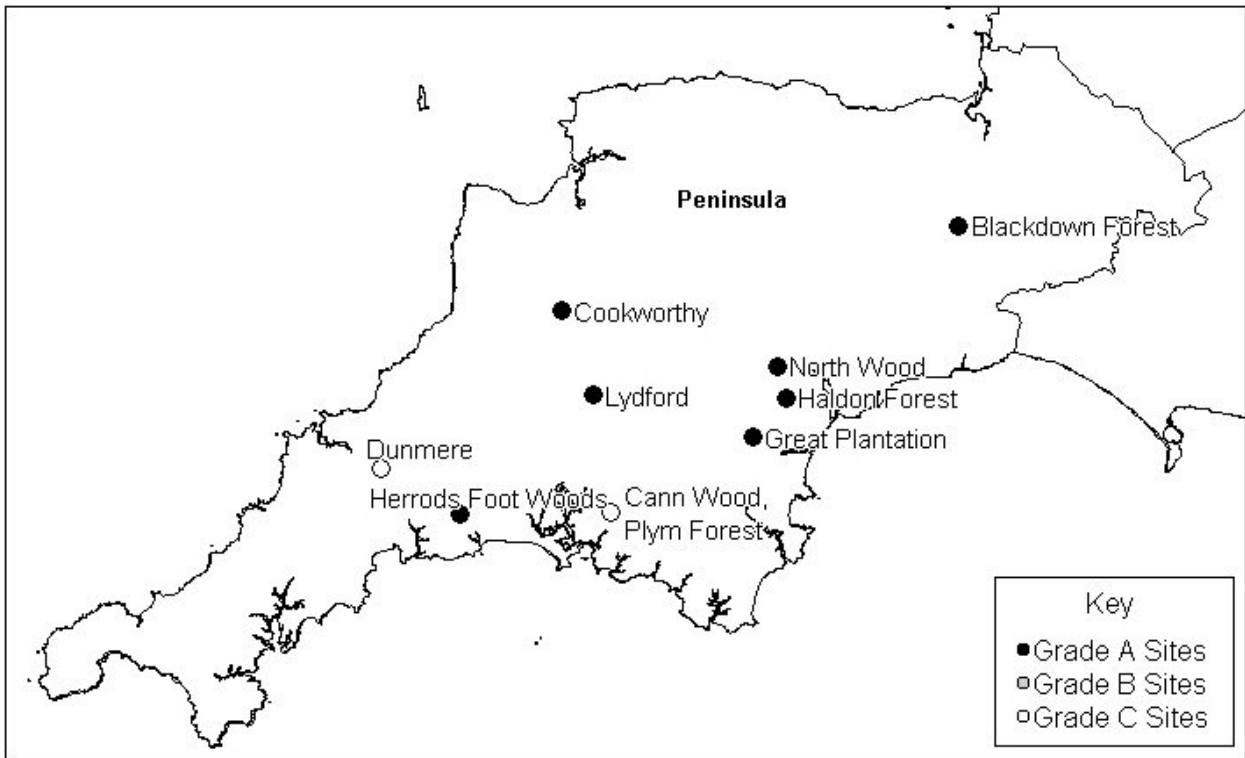
Northants Forest District

Top Lodge
Fineshade
Nr Corby
Northants
NN17 3BB



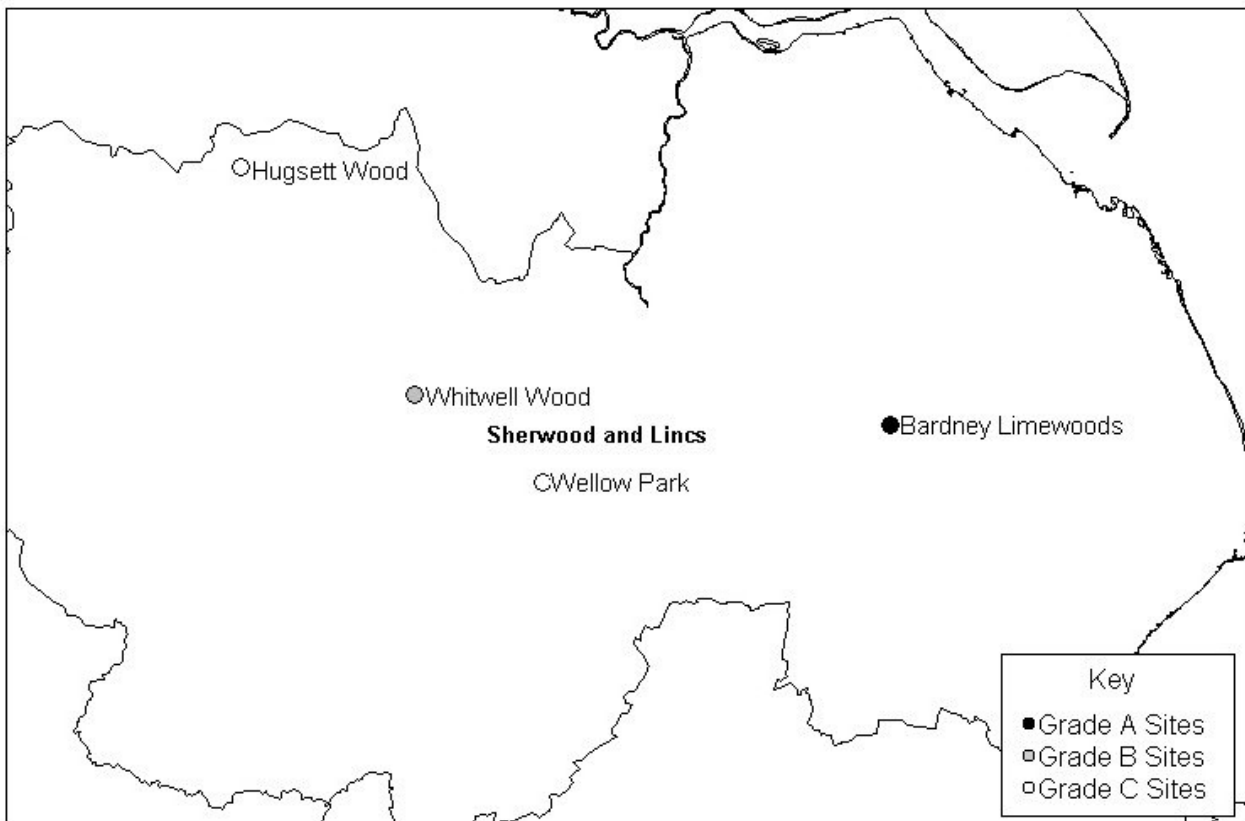
Peninsula Forest District

**Bullers Hill
Kennford
Exeter
Devon
EX6 7XR**



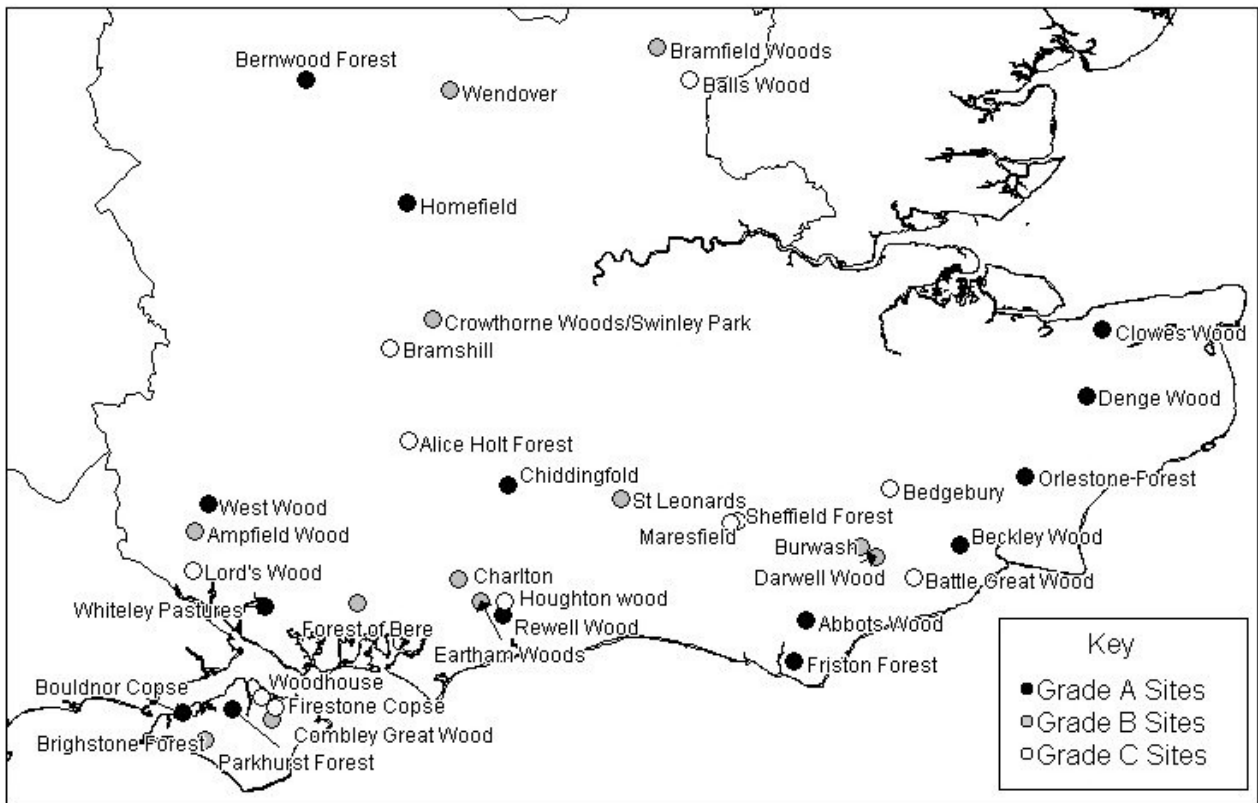
Sherwood & Lincs Forest District

Sherwood Pines Forest Park
Edwinstowe
Mansfield
Notts
NG21 9JL



South East England Forest District

**Bucks Horn Oak
Farnham
Surrey
GU10 4LS**



West Midlands Forest District

Lady Hill
Birches Valley
Rugeley
Staffs
WS15 2UQ

