



**Species Action Plan**

**WOOD WHITE**  
*Leptidea sinapis*

**1998**

**Compiled by :**

**M. S. Warren and N. A. D. Bourn**

**Butterfly Conservation  
Manor Yard  
East Lulworth  
Wareham  
Dorset  
BH20 4QP**

**Tel: 01929 400209**

**email: [nbourn@butterfly-conservation.org](mailto:nbourn@butterfly-conservation.org)**

**THIS PROJECT IS SUPPORTED BY**



This species action plan is an unpublished working document produced by Butterfly Conservation to focus and co-ordinate the conservation of the Wood White in the UK over the next five to ten years. It has been prepared under the *Action for Butterflies* project which is funded by WWF-UK, English Nature, the Countryside Council for Wales and Scottish Natural Heritage. The Action Plan was prepared in consultation with the following organisations in the hope that they will participate in the actions outlined: Countryside Council for Wales, English Nature, Environment and Heritage Service (N. Ireland), The National Trust, MAFF/FRCA, WWF-UK, ITE, RSPB, the Forestry Authority, Forest Enterprise, Forest Service of DANI, the Woodland Trust and the Wildlife Trusts.

### **Acknowledgements**

We are grateful to the following for their comments on the first and subsequent drafts; Jeremy Thomas (ITE), David Sheppard (English Nature), Adrian Fowles (Countryside Council for Wales), Dave Phillips (Scottish Natural Heritage), Callum Rankine (WWF), Matthew Oates (National Trust), Dave Smallshire (FRCA), Fred Currie (FA), James Swabey & Andy Patmore (FE), Tony Whitbread (Wildlife Trusts), Richard Smithers (WT), Sue Clarke (Ecological Consultant), Paul Kirkland, Gail and Stephen Jeffcoate, Brian Nelson and Ken Willmott (Butterfly Conservation).

**Butterfly Conservation** (the British Butterfly Conservation Society) has an overriding objective to ensure a future for butterflies, moths and their habitats. In order to achieve this objective its aims are to:

- raise public awareness of the plight of our butterflies and moths and encourage public involvement in conservation.
- halt the decline of butterflies and moths and maintain or improve the present status of threatened species.
- improve the extent and suitability of key lepidoptera habitats and the environmental quality of the countryside as a whole for all lepidoptera species.
- work with and advise other conservation groups, local bodies and agencies on techniques of land management which favour butterflies and moths and related wildlife.
- acquire and manage habitats for butterflies and moths.
- encourage the research (both at amateur and professional levels) on butterflies and moths.
- support and encourage butterfly and moth conservation world-wide.

Registered Office of Butterfly Conservation: Manor Yard, East Lulworth, Wareham, Dorset, BH20 5QP. Registered in England No. 2206468 Registered Charity No. 254937.

## CONTENTS

	<b>Page</b>
<b>Summary</b>	4
<b>Part 1 Overview</b>	
1.1 Priority Statement	5
1.2 Broad Objectives	5
1.3 Legal Status	5
1.4 Status and Level of Biological Knowledge	6
<b>Part 2 Biological Assessment</b>	
2.1 Introduction	7
2.2 Ecology	7
2.3 Distribution and Population	10
2.4 Limiting Factors	12
2.5 Resume of Conservation to Date	13
<b>Part 3 Actions and Work Programme</b>	
3.1 Policy and Legislative	15
3.2 Site Safeguard and Acquisition	15
3.3 Land Management	16
3.4 Species Protection and Licensing	16
3.5 Advisory	16
3.6 International	17
3.7 Future Research, Survey and Monitoring	17
3.8 Communications and Publicity	18
3.9 Review	18
Abbreviations	
References	20
Appendix 1 The distribution of the Wood White	23
Appendix 2 The conservation requirements of the Wood White.	24

## Summary

- The Wood White is locally distributed in the UK, occurring quite widely in N. Ireland but within Britain is restricted to scattered colonies in the south of England. It has declined severely in many areas of Britain since 1950, most markedly in the northern and eastern counties of England where the species is now very close to extinct. It is also becoming far more restricted in its remaining southern strongholds. The Wood White is listed under Schedule 5 of the Wildlife and Countryside Act for sale only.
- The current rate of loss of colonies in southern England is estimated at 36% per decade (during the 1980s). The national distribution map is now very much out of date and identification of core areas in each of its habitat types is urgently required to ensure appropriate conservation action for the species. A **medium** priority is afforded to the conservation action in this plan to protect and increase the number of the butterflies colonies in the UK. We will be reviewing this priority when more accurate distribution data are available.
- In Britain, the Wood White breeds in a range of habitats, the most common being woodland rides and glades or disused railway lines. Other habitats are used occasionally, including mosaics of scrub and tall grassland, while in N. Ireland the butterfly breeds in a wide variety of habitats including hedgerows, rough grassland, dunes and disused railway lines and quarries.
- The main threats to the species are the lack of appropriate woodland management, the even-aged nature of many stands and increasing shade levels in woodland rides. Other limiting factors are the isolation of existing suitable woods, combined with the Wood White's limited colonising ability; the lack of knowledge of methods for managing woodland rides to maintain suitable breeding habitats in the long term; and the continuing loss of unimproved grassland through drainage and agricultural improvement.
- The immediate major objectives of the plan are to halt the rapid decline of the Wood White in the UK; to maintain viable networks of populations throughout its current range; and to conduct research on the distribution and ecology of the species to enable its effective conservation. A long term objective of the plan is to restore its 1950 range.
- The objectives of the plan will be achieved by maintaining the current distribution of the Wood White; determining current core areas of distribution of the species; and improving information on and dissemination of the habitat requirements of the species.
- The Action Plan covers the next ten years, will be monitored annually and reviewed as the situation demands. The reviewing procedure is particularly important for this species, as our current knowledge about its distribution requires updating. The priority and nature of any conservation action should be reviewed in the light of these results.

## **Part 1 Overview**

### **1.1 PRIORITY STATEMENT**

The Wood White was once widespread in woodlands throughout much of England and south-east Wales but has declined severely during the present century (range contraction of 62%). It is now extinct in Wales and many northern and eastern counties of England, and over the last 25 years its range is estimated to have declined by over 30%. In Ireland it is represented by a separate sub-species which has spread northwards in recent decades and is now quite widespread in Northern Ireland. The Wood White is listed as a species of conservation concern (long list) in Biodiversity: The UK Steering Group Report (DOE, 1995). Based on our current knowledge, **medium** priority should be afforded to conservation action to protect and increase the number of the butterflies colonies in the UK, especially in England where it is most threatened. A high priority may be given in those regions which have suffered a high rate of decline, or where it is reduced to a small number of populations.

### **1.2 BROAD OBJECTIVES**

1. Halt rapid decline in England and Wales.
2. Maintain viable networks of populations throughout its current range.
3. Long term objective to restore its 1950 range.

### **1.3 LEGAL STATUS**

The butterfly is listed on Schedule 5 of the 1981 Wildlife and Countryside Act (for sale only).

\*It is a criminal offence to sell, offer or expose for sale, or possess or transport for the purposes of sale, whether alive or dead, any wild specimen and parts or derivatives of them; or for anyone to publish or cause to be published any advertisement indicating or suggesting that they buy or sell such things.

## 1.4

## Status and Level of Biological Knowledge

<b>Population</b>	<b>-size</b>	<b>87 colonies estimated in England and Wales in 1977-80, current estimates are for approximately 70 colonies. In Northern Ireland it occurs quite widely (124 10km squares in 1995).</b>
	<b>-trend, numbers</b>	<b>Poorly known except for a few sites covered by butterfly monitoring transects. Major recent declines in both numbers and colonies in former stronghold of Surrey and Sussex where only one large and 3 or 4 satellite colonies now remain.</b>
	<b>-trend, range</b>	<b>Formerly widespread in England and the eastern edge of Wales, major decline in the north and east. Overall decline in range in Britain is 62%, the decline over the last 25 years is over 30%. In contrast it has spread in N. Ireland in recent decades and now occurs quite widely. Current strongholds in Devon, Somerset, Northants, Hereford and Worcs, and N. Ireland</b>
<b>Knowledge of</b>	<b>-status</b>	<b>Current distribution quite well known from local atlases but no up-to-date national data are available on colony size or conservation status.</b>
	<b>-trends</b>	<b>Recent reviews of important sites in central-southern Britain (Warren 1993) found the rate of extinction to be 19% during the decade 1980-1990. Local and regional studies have indicated serious declines (e.g. in Surrey and Sussex since 1982 Collins, 1995; Gay and Gay, 1996).</b>
	<b>-conservation requirements</b>	<b>Good ecological knowledge of its requirements in southern woodlands but further research required on practical management of woods and ride edges. Far less is known about its requirements in N. Ireland or the causes of its spread.</b>

## Part 2 Biological Assessment

### 2.1 INTRODUCTION

The Wood White *Leptidea sinapis* has undergone a severe decline in Britain during the last century and is now extinct over large parts of its former range. The butterfly breeds on various legumes and in Britain is largely restricted to woodland rides and glades, along disused railway lines and occasionally sheltered areas of scrub and tall grassland. In N. Ireland, the Wood White occurs as a distinct sub-species *juvernica* which has spread in recent decades and is now quite widely distributed. Here it breeds in more open situations such as road verges, rough grassland and scrub edges. The Wood White is widely distributed on the Continent where it breeds in a range of open grassy habitats as well as in woodland clearings.

### 2.2 ECOLOGY

#### Life Cycle

The Wood White is single brooded in the northern part of its range in Britain and N. Ireland, but in southern counties has a partial second generation in most years, the size of which depends on the weather in the early half of the year (Warren, 1984). The emergence dates vary considerably around the country: in southern England adults typically fly from early May until the end of June, with the second generation emerging in late July and August. Further north, adults are not usually seen until the end of May and have a prolonged emergence which lasts until the end of July. In N. Ireland the butterfly is always single brooded and normally flies from mid-May to mid-July. When the second brood does occur in Britain, the larvae may not always survive to pupation, especially if they are caught by the onset of cold autumn weather (Warren, 1984).

The Wood White breeds on a range of legumes, the most common being meadow vetchling *Lathyrus pratensis*, tufted vetch *Vicia cracca*, bitter vetch *Lathyrus montanus*, greater bird's foot trefoil *Lotus pedunculatus*, and bird's-foot trefoil *Lotus corniculatus*. However, a number of other common vetches do not seem to be used, notably bush vetch *Vicia sepium*, common vetch *Vicia sativa*, and smooth tare *Vicia tetraspermum*.

The adults have a slow ponderous flight with males spending most of their active lives patrolling up and down suitable rides or scrub edges searching for females. When they find a female, they alight opposite and begin a characteristic courtship ritual (Wiklund, 1977). The males wave their head from side to side with their proboscis fully extended almost touching the female who sits passively with antennae reclined. The males have a white patch on the inside of the antenna tip which may help distinguish them from other white butterflies as well as from female Wood Whites which have a brown tip. Unmated females respond within seconds by curving their abdomens round to mate, while mated females remain quite still and males court for several minutes before giving up. Both sexes feed frequently from flowers from a very wide variety of plants (Warren, 1984).

When egg-laying, females fly slowly over grassy or low scrubby vegetation landing on a variety of plants, testing their suitability using the chemoreceptors on their feet. Egg-laying

can thus be slow and laborious, and a large number of plants may be landed on before finding a potential food-plant. The rate of egg-laying is also highly dependent on weather, and there is a close relationship between ambient temperature and eggs laid (Warren, 1981). The eggs are laid singly, nearly always on the underside of leaves of the food-plant and on the newer growth, especially of plants that protrude above the surrounding vegetation.

The larvae hatch after 10-20 days and, as with other butterfly larvae, their rate of development is very dependent on temperature. At a site in Northamptonshire larvae took 35-60 days to develop, with an average of 44 days (Warren, 1984). The number of larval instars has been quoted as either four or five, but at this site it was invariably four. The larvae rarely move far and most remain on the natal food-plant until pupation. In their third instar they often move to the top of the plant to feed on the young growth and gradually work their way downwards, leaving a trail of eaten leaflets behind them. When fully grown, the larvae enter a wandering phase lasting from 1-2 hours to several days and can travel several metres until they find a suitable pupation site. Pupae are very hard to find in the wild, but of the 20 found during a three year study in Northamptonshire, most used the firm stems of grasses and wild roses (*Rosa* sp.) selecting heights 10-70cm above ground (Warren, 1984). The pupae are cryptically coloured and can be of two colour forms, pale green or pale brown, the former being by far the commonest.

The survival rate of larvae in Britain has been studied in detail by Warren (1984) and Warren et al. (1986), using key factor analysis to identify the main factors determining annual fluctuations in population size over a period of 8 years. Overall mortality from egg to emergence varied from 90.1-98.3%, mostly caused by unknown predators. Parasites were a minor cause of mortality to eggs (a chalcid fly *Trichogramma evanescens*) and a larger cause of mortality to larvae (6-21% losses due to two species of ichneumon wasp, *Cotesia vitripennis* and *C. anchisiades*). Annual fluctuations were thought to be caused mainly by variation in egg numbers, which is related to temperature during the flight period, and by early larval survival. Wet and cold weather during these periods led to fewer adults the following year and good weather led to increases. However, these authors concluded that long-term population trends in this species are determined by the level of shade in the woodland rides where it breeds, which was constantly changing (see below under habitat).

## **Habitats**

In Britain, the Wood White breeds in a range of habitats, the most common being woodland rides and glades or disused railway lines. Other habitats are used occasionally, including mosaics of scrub and tall grassland while, in N. Ireland the butterfly breeds in a wide variety of habitats including hedgerows, rough grassland and disused quarries. These woodland and grass/scrub habitats are considered separately below.

### **1) Woodland glades and clearings**

These are by far the most widely used habitat in England and Wales, accounting for over three-quarters of the 87 colonies known in 1970-80 (Warren, 1984). The majority of these (49) occurred in ancient semi-natural woodlands, converted to varying degrees, to plantation forestry during the 1960s and 1970s. This forestry process included creation and maintenance of wide open sunny rides which because of the young trees growth remained unshaded for a decade or so. Such habitats continue to support some of the largest known colonies today.

The butterfly breeds in open sunny rides with tall grass or scrub margins that are lightly shaded by the surrounding trees. Measurements with a “fish-eye” camera have shown that the Wood White prefers shade levels of 20-50%, with smaller numbers occurring in more open rides (<20% shade) and virtually none in rides with more than 50% shade (Warren, 1985). In woods where the species survives, colonies therefore tend to be concentrated in rides running between young crops or young coppice where general canopy height is 2-5 metres tall, or in wider rides running through slightly older growth. The effect of ride width, ride orientation and tree height on habitat suitability is described in detail by Warren (1985).

The suitability of the ride habitat is also affected strongly by edge management, especially cutting. Most woodland rides were created to allow easy access within woodland, for timber extraction or sporting or amenity purposes (and over the last decade or so, the conservation value of rides has been increasingly recognised). They are typically maintained by regular mowing of the central ride and periodic cutting back of marginal woody growth. Wood Whites can thrive if the marginal vegetation is cut back relatively infrequently, for example with sections cut every 3-6 years, but cannot tolerate annual edge cutting as this removes all potential breeding habitat. Cutting ride edges in alternate years, often used on woodland nature reserves, is also unsuitable as eggs tend to be laid in the taller areas which are due to be cut. Further information on ride and glade management can be found in Warren & Fuller (1994).

In the past, it seems likely that the Wood White was associated with coppicing which naturally created a range of shade conditions and a continuity of suitable edge habitat. However, most woods where the butterfly survives are no longer coppiced and suitable habitat is only perpetuated in larger woods where there is a regular cycle of clear-felling and re-planting, or deliberate conservation management of wide rides.

## **2) Hedgerows and grass/scrub mosaics**

As in woodland rides, the essential requirement seems to be for open but sheltered habitat containing abundant vetches, typically scrambling through tall grassland or light scrub. If left unmanaged these habitats can soon become too overgrown or shady. In Britain, suitable grass/scrub mosaics occur on a few abandoned commons (e.g. in Herefordshire) or disused railway lines where scrub is encroaching in the absence of regular grazing or cutting. In N. Ireland this grass/scrub mosaic is found in several habitats including disused railway lines and quarries, hedgerows, limestone hills in Fermanagh, and on dunes. Other suitable habitats occur in areas of extensive scrub and tall grassland, most notably along the coastal undercliffs of south-east Devon and south-west Dorset. Here the butterfly breeds in the scrub/grass interface where vetches are abundant in a habitat perpetuated by continual cliff falls and soil slippage. The butterfly also occurs at low densities in the network of small unimproved fields and thick hedgerows of the Culm grassland region of north Devon and north-east Cornwall and in the west of Northern Ireland. Precise breeding areas within these habitats are not known, but it is likely that the butterfly breeds on vetches growing in hedgerows or rough field margins which are only lightly grazed by cattle.

In the late 1980s, 5 of the 87 known British colonies bred along disused railway lines and many more colonies use this habitat in N. Ireland (Warren, 1984). In fact it has been

suggested that the spread of the butterfly in Ireland is due to the creation of suitable habitats along railway lines (both used and disused) and that they act as linear corridors enabling the butterfly to colonise many kilometres in just a few decades (Heal, 1965). However, more recently it is believed that many of these railway lines have become less suitable (B. Nelson, pers. comm.).

## 2.3 DISTRIBUTION AND POPULATION

### Distribution

The butterfly is widely distributed on the Continent occurring throughout Europe to Syria and the Caucasus mountains. There are four very similar species of Wood White on the continent, including one *Leptidea realli* that has only recently been recognised as distinct from *Leptidea sinapis*. It is assumed that the UK species is the latter, but this awaits confirmation from studies of museum specimens. The species is considered stable in Europe (Swaay et al., 1997) but has declined considerably (>75%) in Denmark.

In Britain, the Wood White was formerly widely distributed in England as far north as Cumbria and in parts of south-east and north-west Wales. However it has undergone a serious decline over the last 150 years and is now extinct in many northern and eastern counties. Its decline began earlier than many butterflies and by the early 1900s it was extinct in several counties where it was once abundant (Cumbria, Essex, Suffolk, Kent, and the Isle of Wight). It also died out in Yorkshire, Nottinghamshire and North Wales at this time, although only a few records are known for these areas (Warren, 1984).

The Wood White has continued to decline during the present century and has become extinct in Hampshire and Berkshire. In the period 1977-80, the number of colonies surviving in Britain was estimated to be around 87, with four strongholds remaining in Herefordshire and Worcestershire; Northamptonshire and Oxfordshire; the borders of Surrey and Sussex; and east Devon and south Somerset (Warren, 1984). A feature of Wood White records is that a large number relate to single individuals, usually males, well away from any known colony. For example, in Cambridgeshire, single adults were recorded in 1975 and 1976 at Monks Wood NNR, and in 1977 at Woodwalton Fen NNR which are over 30 miles from the nearest known colonies in Northamptonshire. The quantity of such records indicate that the male butterfly can occasionally disperse over wide distances, though the possibility of clandestine releases cannot be ruled out (see below). The colonial nature of the Wood White and its colonising ability are discussed below.

An analysis of national recording data shows that the range of the Wood White in Britain has declined by 36% in the 25 years preceding 1982 (Warren et al., 1997). However, no national distribution map has been published since and the map shown on Appendix 1 is now very out of date. The results of more recent local surveys indicate that declines are still continuing in some areas but new colonies have been located, bringing the total to approximately 70 colonies (Table 1). A major decline has been documented in the butterfly's stronghold on the Surrey/Sussex border the number of colonies has declined from 20 in 1970 to just one large and several (3 or 4) small 'satellite' colonies in 1997 (Warren, 1981; Hart, 1997).

In N. Ireland, the butterfly's distribution shows a reverse trend, having expanded considerably in recent decades. In the 1960s, it was found in just a few sites but spread rapidly and is now widely distributed, occupying 124 10km squares (Nelson, 1993). Its spread northwards through Ireland has been described by Heal (1965) and Hickin (1992) who believe that it may have spread along railway lines, both used and disused. There may have been climatic reasons for its spread but these have not been examined in detail and run against the trend in Britain.

**Table 1 Approximate status of Wood White in 1980-90s**

County	Number of colonies (estimated from various sources)	Source
<b>ENGLAND</b>		
<b>Bedfordshire</b>	1	G. Herbert, pers. comm.
<b>Buckinghamshire</b>	c.13	Asher, 1994
<b>Cornwall</b>	2	Smith, 1997
<b>Devon</b>	c.14	Bristow et al., 1993
<b>Dorset</b>	1	Thomas, in press.
<b>Gloucestershire</b>	3 (metapopulations)	Joy, 1997
<b>Hampshire</b>	extinct 1980s?	D Goddard, pers. comm.
<b>Herefordshire</b>	8	Joy, 1997
<b>Hertfordshire</b>	extinct 1976	Sawford, 1987
<b>Northamptonshire</b>	c.15	Goddard, pers. comm.
<b>Oxfordshire</b>	c.2	Asher, 1994
<b>Shropshire</b>	2	Joy, 1997
<b>Somerset</b>	c.3	Anon, 1992
<b>Surrey</b>	2	Collins, 1995; Jeffcoate, 1997
<b>Sussex</b>	2	Gay & Gay, 1996; Gay, 1997
<b>Warwickshire</b>	extinct 1986	Joy, 1997
<b>Wiltshire</b>	extinct 1987	Fuller, 1994
<b>Worcestershire</b>	2+	Joy, 1997
<b>WALES</b>	extinct (occasional vagrants)	Horton, 1994
<b>TOTAL</b>	c.70	

The Wood White has undergone periods of expansion and contraction in range; during such expansion singletons are occasionally seen and some new sites are colonised for a few years, for example in Devon and Warwickshire (Bristow et al., 1993; Smith and Brown, 1979). As a result of these sporadic records, distribution maps often give a misleading impression of the butterfly's true status, which is much more restricted than the maps indicate. These records have not been included in the estimate of colony number given in Table 1.

## **Introductions**

Over recent decades, attempts have been made to re-introduce the butterfly to numerous sites. Over 9 attempts are documented by Oates & Warren (1990), of which three still survive (Bedfordshire, Dorset and the Bucks/Oxon border). One of these, in the Bernwood Forest complex spanning the borders of Buckinghamshire and Oxfordshire, subsequently spread to become a large colony, but has recently declined and is now smaller, though still scattered over a wide area.

## **Population**

Mark-recapture experiments and other observations indicate that the butterfly forms discrete colonies in most sites, but these vary considerably in their size and density. In some cases, high densities occur in very discrete areas whilst in others the breeding habitat is more scattered and adults occur at low densities over wide areas. In the latter situation the species may exist as metapopulations\* which breed over a network of habitats, though this has yet to be confirmed. In other areas, the larger more stable colonies may have a mainland/ island metapopulation structure, with the larger colonies acting as 'mainland' populations from which individuals periodically disperse to found temporary 'island' colonies (see Harrison et al., 1988).

Marking experiments in a large woodland complex in Northamptonshire showed that discrete colonies occurred in two areas and that the mean distance moved between captures was around 300m for both males and females (Warren, 1981). The fact that this distance did not increase with time between captures indicates that the population was fairly closed with comparatively little immigration and emigration. However adults were found to move very occasionally between sites over a linear distance of 4km, indicating that dispersal can occur over quite large distances. Despite occasional dispersal, the Wood White has a fairly poor colonising ability, confirmed by the success of several re-introductions, sometimes to sites that despite being only 10km from known colonies, had not been colonised naturally by the butterfly. However, the species is clearly capable of natural colonisation given a fairly continuous network of suitable habitat, as has been the case in Ireland where it has spread considerably over recent decades (see above). This is supported by the records of single individuals a long way from known colonies (see above). Population sizes in these colonies varied between 1,300 and 2,900 in two years, with slightly more males present than females. Adult residence rate (probably roughly equivalent to survival rates) were similar for males and females at 8-10 days (Warren et al., 1986).

## **2.4 LIMITING FACTORS**

### **Historical**

Decline of traditional coppicing in woodlands leading to increased shade levels following neglect or conversion to high forest systems.

---

\* A metapopulation is a collection of local populations, connected by occasional dispersal, in which there are local extinctions and colonisations (Gilpin & Hanski, 1991).

Loss of ancient woodland and re-planting of ancient woodland with conifers

Increased shading of disused railway lines following a temporary period of suitability following abandonment in the 1960s.

Agricultural improvement and loss of unimproved grassland and grass/scrub mosaics in the south-west.

### **Current and Future Limiting Factors**

The even-aged nature of many existing woodland sites, the majority of which were extensively re-planted in the 1950s and 1960s, and increasing shade levels in woodland rides.

Isolation of existing suitable woods, combined with the Wood White's limited colonising ability.

Continuing decline in the market for coppice produce (although this may have recently been reversed in some areas).

Continuing loss of unimproved grassland through drainage and agricultural improvement.

Lack of knowledge of methods of managing woodland rides to maintain suitable breeding habitats in the long term.

## **2.5 RESUME OF CONSERVATION TO DATE**

### **Ecology and Conservation Requirements**

The autecology of the Wood White was intensively studied in one forest complex at Yardley Chase in Northamptonshire during the late 1970s and early 1980s by Martin Warren and colleagues at the Institute of Terrestrial Ecology (Warren, 1981, 1984, 1985; Warren et al., 1986). The study site comprised both coniferous and deciduous plantations with an extensive ride network, managed by the Forestry Commission (now Forest Enterprise). The results showed that Wood White occurs mainly in lightly shaded woodland rides, and that its distribution changes as plantations grow and mature. The maintenance of populations thus relies on having a continuity of suitable shade levels in rides, which can only be provided in woods with plantations of uneven ages. The management of ride edges themselves was recognised also as being crucial but was not studied in detail.

General studies on ride edge management have recently been published by Buckley et al. (1997) and management options are given by Warren & Fuller (1991). However, several crucial aspects of ride management are still very poorly known and require further study to enable effective long term conservation of the species. The butterfly's conservation requirements in hedges and grass/scrub mosaics have also not been studied in any detail.

### **Current Studies**

Little current work is being done on the Wood White, except for the population monitoring on several reserves including 5 sites in the National Butterfly Monitoring Scheme (of which only one has a significantly high population, Pollard and Greatorex-Davies, 1996) and regular surveys of certain regions, notably the Surrey/Sussex border (Clarke, 1995; Willmott, 1996). Positive habitat management for the butterfly is being conducted on several nature reserves, for example the Butterfly Conservation reserve at Monk Wood in Worcestershire, where numbers have increased substantially as a result. Here, the rides managed for the Wood White have a three tier structure consisting of a central pathway, and inner margin (flailed every 4 years on rotation) and an outer coppice margin (managed on a 7 year rotation). Additionally, new areas of coppice with standards are created and cut on varying rotations between 7-20 years (Joy, 1997). A similar management regime has also been initiated at the Butterfly Conservation Oaken Wood reserve in Surrey. Other specific ride management for this species include work carried out by Forest Enterprise at several woods and on Wildlife Trust reserves.

Butterfly Conservation (Sussex Branch) have recently undertaken a Wood White Recovery programme supported by English Nature, West Sussex County Council, and Forest Enterprise (Clarke, 1995).

The Wood White is present, but in small numbers, on 5 NNRs (3 of them in N. Ireland) (McLean et al, 1995) and is also found on 3 RSPB reserves (Cadbury, 1990).

### Part 3 Actions and Work Programme

*This section has been divided into the standard headings Policy and Legislative; Site Safeguard and Acquisition; Land Management; Species Protection and Licensing; Advisory; International; Future Research and Monitoring; Communications and Publicity; Review. Actions are given a low, medium or high priority. The lead organisation(s) concerned for each action is/are named.*

Definition of Colony Size: Large = >1,000 adults; medium = 100-1,000 adults; small <100 adults.

Area of search is defined in NCC (1989, figure 2, page 18).

For key to abbreviations see page 19.

#### 3.1 POLICY AND LEGISLATIVE

**Lead  
organisation(s)  
concerned**

##### **Action 1 PRIORITY: HIGH**

Improve financial incentives for coppice restoration and sympathetic woodland management throughout range (especially measures that will encourage suitable ride and glade management in woods).

**FA**

##### **Action 2 PRIORITY: HIGH**

Include habitat requirements of the Wood White when drawing up or revising management prescriptions in land enhancement schemes, especially the Countryside Stewardship and Wildlife Enhancement Scheme in south-west England and ESAs in N. Ireland.

**MAFF, EN,  
DANI**

#### 3.2 SITE SAFEGUARD AND ACQUISITION

##### **Action 3 PRIORITY: HIGH**

Designate as SSSI three large or medium colonies per area of search (or as many as exist if less than three) in Britain if this will help ensure favourable management.

**EN**

##### **Action 4 PRIORITY: HIGH**

Encourage protection of all large and medium colonies in Britain through management agreements and/or reserve acquisition.

**All**

### **3.3 LAND MANAGEMENT**

#### **Action 5 PRIORITY: HIGH**

Incorporate needs of the Wood White in all management plans, site management statements and agreements covering SSSI's and ASSI's with colonies.

**EN, EHS**

#### **Action 6 PRIORITY: HIGH**

Encourage suitable habitat management in all regions where the Wood White survives, including woodland or grass/scrub habitat mosaics as appropriate.

**All**

#### **Action 7 PRIORITY: HIGH**

Ensure appropriate habitat management of all sites with colonies in Britain.

**All**

#### **Action 8 PRIORITY: MEDIUM**

Encourage restoration of suitable breeding habitat within former range in Britain where there is potential for re-establishing extensive habitats or viable networks of populations, concentrating on regions where it still exists.

**EN, FA, FE,  
LAs, BC, WT,  
WT's,**

### **3.4 SPECIES PROTECTION AND LICENSING**

#### **Action 9 PRIORITY: LOW**

Conduct strategic re-introductions of the Wood White into suitably restored large areas or networks of habitat patches, where natural colonisation is unlikely.

**BC, EN**

### **3.5 ADVISORY**

#### **Action 10 PRIORITY: HIGH**

Advise land management agencies and site owners/managers on practical habitat management for the Wood White and how to incorporate this with other management priorities and interests.

**BC, EN,  
EHS**

### **Action 11 PRIORITY: MEDIUM**

Produce a brief guide on habitat management for the Wood White, incorporating this with management for other wildlife that shares its habitat.

**BC, EN**

### **Action 12 PRIORITY: HIGH**

Ensure the conservation importance and management requirements of the Wood White are incorporated into any relevant national and Local Biodiversity Action Plans.

**BC, WTs,  
LAs, EN.**

## **3.6 INTERNATIONAL**

No actions proposed, (but see Action 18).

## **3.7 FUTURE RESEARCH, SURVEY AND MONITORING**

### **Action 13 PRIORITY: HIGH**

Collate all recent records, update national distribution map and determine core regions of distribution.

**BC, ITE**

### **Action 14 PRIORITY: HIGH**

Identify location of all large and medium sized colonies and produce site dossier to inform all relevant bodies of the location and status of these and other potential sites (see action 17) in Britain.

**BC, EN, ITE**

### **Action 15 PRIORITY: HIGH**

Conduct further research on habitat requirements and management techniques, especially methods of managing ride edges to maintain suitable habitat in the long term and in grass/scrub mosaics.

**BC, EN,  
EHS, FA, FE**

### **Action 16 PRIORITY: HIGH**

Establish a monitoring programme covering all core regions in Britain and regular surveillance of populations in N. Ireland.

**BC, EN, EHS,  
ITE**

**Action 17 PRIORITY: HIGH**

Collate transect data annually and calculate index to compare trends on individual sites. **BC, ITE**

**Action 18 PRIORITY: MEDIUM**

Identify potentially suitable, unoccupied habitats within 10-20km of existing populations in Britain **BC, EN**

**Action 19 PRIORITY: MEDIUM**

Determine taxonomic status of Wood White in relation to the very similar species *Leptidea realli*, recently discovered in Europe. **Us, BC**

**3.8 COMMUNICATIONS AND PUBLICITY**

**Action 20 PRIORITY: HIGH**

Publicise this Action Plan, the decline of the Wood White and measures needed to conserve it. **All**

**3.9 REVIEW**

**Action 21 PRIORITY: HIGH**

Review/monitor this Action Plan annually and update in five to ten years as necessary. **BC, EN, CCW, EHS**

## **Key to abbreviations**

All = All organisations listed

BC = Butterfly Conservation

CCW = Countryside Council for Wales

DANI = Department of Agriculture, Northern Ireland

EHS= Environment and Heritage Service, Northern Ireland

EN = English Nature

FA = Forestry Authority

FE = Forestry Enterprise

ITE= Institute of Terrestrial Ecology

JNCC = Joint Nature Conservation Committee

LAs = Local Authorities

MAFF = Ministry of Food and Fisheries

Us = Universities

WT = Woodland Trust

WTs = Wildlife Trusts

## References

- Anon.** (1992). Butterflies of Somerset: A provisional atlas. Unpublished, Somerset Butterfly Group.
- Asher, J.** (1994). The butterflies of Berkshire, Buckinghamshire and Oxfordshire. Pisces Publications, Newbury, Berkshire, UK.
- Bristow C, R. Mitchell S, H. and Bolton D, E.** (1993). Devon butterflies. Devon Books, Tiverton, Devon.
- Buckley, G. P., Howell, H., Watt, T. A., Ferris-Kaan, R, and Anderson, M. A.** (1997). Vegetation succession following ride edge management in lowland plantations and woods 1: The influence of site factors and management practices. *Biological Conservation*, **82**, 289-304.
- Clarke, S. A.** (1995). West Sussex Wood White Recovery Project: Survey report. Unpublished report to West Sussex County Council and Butterfly Conservation.
- Cadbury J.** (1990). The status and management of butterflies on RSPB reserves. *RSPB Conservation review*, **4**, 40-46.
- Collins, G. A.** (1995). Butterflies of Surrey. Surrey Wildlife Trust, Woking, Surrey, UK.
- D.O.E.** (1995). Biodiversity: The UK Steering group report. HMSO, London.
- Fuller, M.** (1995). The butterflies of Wiltshire: Their history, status and distribution. Pisces Publications, Newbury, Berkshire.
- Gay, J. and Gay, P.** (1996). Atlas of Sussex butterflies. Butterfly Conservation Sussex Branch, Henfield, Sussex.
- Gay, P.** (1997). Draft South East Regional Action Plan (Sussex). Unpublished, Butterfly Conservation.
- Jeffcoate, S.** (1997). Regional Action Plan - Surrey and S. W. London. (1<sup>st</sup> draft). Unpublished report to Butterfly Conservation.
- Joy, J.** (1997). The West Midlands Regional Action Plan. Unpublished report to Butterfly Conservation.
- Harrison, S., Murphy, D. D. and Ehrlich, P.R.** (1988). Distribution of the Bay checkerspot butterfly, *Euphydryas editha bayensis*: evidence for a metapopulation model. *American Naturalist*, **132**, 360-382.
- Hart, G.** (1997). Comments on Regional Action Plan (Sussex). Unpublished, Butterfly Conservation.

- Heal, H. G.** (1965). The Wood White, *Leptidea sinapis* L. and the Railways. *Irish Naturalist's Journal*, **15**, 8-73.
- Hickin, N.** (1992). The butterflies of Ireland. Roberts Rinehart Publishers, Schull, West Cork, Ireland.
- Horton, G. A. N.** (1994). The butterflies and moths of Gwent. Comma International Biological Systems, Bath, UK.
- McLean I. F. G., Fowles A. P., Kerr A. J., Young M. R. and Yates T. J.** (1995). Butterflies on nature reserves in Britain. In: Ecology and Conservation of Butterflies. Ed by Pullin, A. S. Chapman and Hall, London.
- Nelson, B.** (Ed.) (1993). A provisional atlas of the butterflies of Northern Ireland. Unpublished report, Butterfly Conservation - Northern Ireland Branch.
- Oates, M. and Warren, M. S.** (1990). A review of butterfly introductions in Britain and Ireland. WWF-UK, Godalming, Surrey.
- Pollard, E. and Greatorex-Davies, J. N.** (1997). Butterfly Monitoring Scheme: Review and suggestions for the future. Unpublished contract report to JNCC/NERC.
- Sawford, B.** (1987). The butterflies of Hertfordshire. Castlemead Publications, Ware, Hertfordshire.
- Smith, F. H. N.** (1997). The moths and butterflies of Cornwall and the Isles of Scilly. Gem Publishing, Wallingford, Oxfordshire, UK.
- Smith, R. and Brown, D.** (1979). The lepidoptera of Warwickshire a provisional list. Warwickshire Biological Recording Centre, Warwick.
- Swaay, C. A. M. van, Warren, M. S. and Grill, A.** (1997). Threatened butterflies in Europe - provisional report. Unpublished report, DeVlinderstichting and Butterfly Conservation.
- Thomas, J. A.** (in press). Butterflies of Dorset.
- Warren, M. S.** (1981). The ecology and conservation of the Wood White *Leptidea sinapis*. Ph.D. thesis, University of Cambridge.
- Warren, M. S.** (1984). The biology and status of the Wood White butterfly *Leptidea sinapis* (Lepidoptera: Pieridae) in the British Isles. *Entomologist's Gazette*, **35**, 207-223.
- Warren, M. S.** (1985). The influence of shade on butterfly numbers in woodland rides, with special reference to the Wood White *Leptidea sinapis*. *Biological Conservation*, **33**, 147-164.

**Warren, M. S.** (1993). A review of butterfly conservation in central southern Britain. I. Protection, evaluation and extinction in prime sites. *Biological Conservation*, **64**, 25-35.

**Warren, M. S. & Fuller, R. J.** (1994). Woodland rides and glades: their management for wildlife (2nd edition). Joint Nature Conservation Committee, Peterborough.

**Warren, M. S., Pollard, E. & Bibby, T. J.** (1986). Annual and long-term changes in a population of the Wood White butterfly *Leptidea sinapis*. *Journal of Animal Ecology*, **55**, 707-719.

**Warren, M. S., Barnett, L. K. Gibbons, D. W. and Avery, M. I.** (1997). Assessing national conservation priorities: an improved red list of British butterflies. *Biological Conservation*, **82**, 317-328.

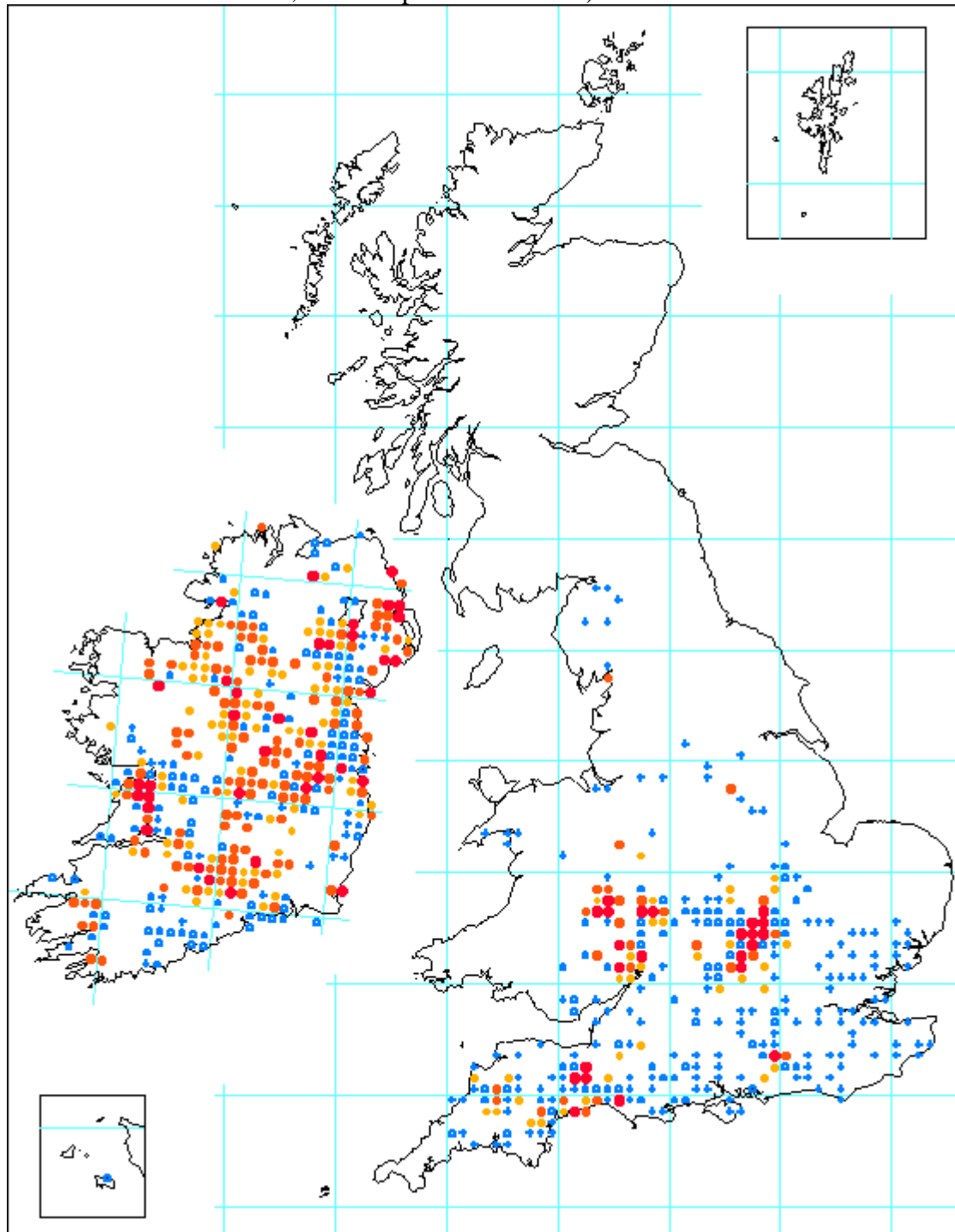
**Wikland, C.** (1977). Oviposition, feeding and spatial separation of breeding and foraging habitats in a population of *Leptidea sinapis* (Lepidoptera). *Oikos* **28**, 56-58.

**Willmott, K.J.** (1996) Surveys for the Wood White in the Surrey/Sussex border. Unpublished report, Butterfly Conservation.

## Appendix 1 The distribution of the Wood White

Butterflies for the New Millennium project (2001). Copyright of Butterfly Conservation/Biological Records Centre.

(Dark full spot all records from 1995-1999; open circles all records between 1970-1982; cross all pre 1970 records).



## **Appendix 2 Conservation requirements of the Wood White**

### **Habitats and food-plants**

In Britain, the Wood White breeds in a range of habitats the most common being woodland rides and glades or disused railwaylines. Other habitats used occasionally are mosaics of scrub and tall grassland while in N. Ireland the butterfly breeds in a wide variety of habitats including hedgerows, rough grassland and disused quarries.

The Wood White breeds on a variety of legumes, the most common being Meadow Vetchling *Lathyrus pratensis*, Tufted Vetch *Vicia cracca*, Bitter Vetch *Lathyrus montanus*, Greater Bird's-foot Trefoil *Lotus pendunculatus*, and Bird's-foot Trefoil *Lotus corniculatus*. However, a number of other common vetches do not seem to be used, notably Bush Vetch *Vicia sepium*, Common Vetch *Vicia sativa*, and Smooth Tare *Vicia tetraspermum*. The butterfly breeds in rough marginal vegetation, usually in tall grass or light scrub edges and typically lays its eggs where vetches scramble up and protrude slightly above the surrounding vegetation.

### **1) Woodland glades and clearings**

The butterfly requires open sunny rides with tall grass or scrub margins that are lightly shaded by the surrounding trees (giving levels of 20-50% shade). Very open, unshaded areas are used less frequently and more shady rides are avoided completely. In most modern plantations, colonies therefore tend to be concentrated in rides running between young plantations where trees are 2-5 metres tall, or in wider rides running through slightly older plantations.

The survival of Wood White populations is highly dependent on the management of ride edge vegetation. Ideally this should be cut back relatively infrequently, for example with sections cut every 3-6 years. The butterfly cannot tolerate annual edge cutting as this removes all potential breeding habitat, and cutting in alternate years (often used on woodland nature reserves) is also unsuitable as eggs tend to be laid in the taller areas which are due to be cut! Further information on ride and glade management can be found in Warren & Fuller (1991).

The butterfly can thrive in certain types of actively coppiced woodland, which provides a continuity of suitable, semi-shaded habitats. However, within its present range, coppicing has largely ceased and suitable habitat is perpetuated only in larger woods where there is a regular cycle of clear-felling and re-planting, or deliberate conservation management of wide rides.

### **2) Hedgerows and grass/scrub mosaics**

As in woodland rides, the essential requirement seems to be for open but sheltered habitat containing abundant vetches, typically scrambling through tall grassland or light scrub. If left unmanaged these habitats can soon become too overgrown or shady. In Britain, suitable grass/scrub mosaics occur on a few abandoned commons (e.g. in Herefordshire) or disused railway lines where scrub is encroaching in the absence of regular grazing or cutting. In N. Ireland this grass/scrub mosaic is found in several habitats including disused railway lines and quarries, hedgerows, limestone hills in Fermanagh, and on dunes. Other suitable habitats occur in areas of extensive scrub and tall grassland, most notably along the coastal undercliffs of south-east Devon and south-west Dorset. Here the butterfly breeds in the scrub/grass interface where vetches are abundant in a habitat perpetuated by continual cliff falls and soil slippage. The butterfly also occurs at low densities in the network of small unimproved fields and thick hedgerows of the Culm grassland region of north Devon and north-east Cornwall and in the west of Northern Ireland. Precise breeding areas within these habitats are not known, but it is likely that the butterfly breeds on vetches growing in hedgerows or rough field margins which are only lightly grazed by cattle.