Species Action Plan

HEATH FRITILLARY
Mellicta athalia

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This species action plan is an unpublished working document produced to focus and co-ordinate the conservation of the Heath Fritillary butterfly in the UK over the next five to ten years.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: English Nature, National Trust, Forestry Authority, Forest Enterprise, Exmoor National Park, ITE, MAFF/ADAS, the RSPB and Kent Trust for Nature Conservation.

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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.

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Summary

• The Heath Fritillary, *Mellicta athalia* is listed in the UK Red Data Book as a vulnerable species. It is fully protected under schedule 5 of the Wildlife and Countryside Act 1981.

• Due to the Heath Fritillary's current rarity and dependence on conservation measures, the implementation of this plan is given **high priority**.

• The Heath Fritillary occurs in three types of habitat in the UK: 1) coppiced/newly felled woodland; 2) unimproved grassland and 3) sheltered heathland combes. The first two of these deteriorate rapidly without appropriate management and in woodland the habitat often remains suitable only for up to three years after felling (possibly 10 years in certain conifer habitats). Heathland habitats also require regular grazing and/or burning to prevent deterioration. The butterfly's reliance on ephemeral habitats means that the future maintenance of colonies depends on continued management of the habitats where the butterfly breeds.

• The conservation requirements of the Heath Fritillary are fairly well understood in woodland: The species requires the creation of new clearings on a regular basis which are located close to occupied habitat so that colonisation can occur rapidly after clearance. Grassland habitats have been successfully maintained by rotational cutting, every 2-5 years. The conservation requirements of the Heath Fritillary in heathland combes are comparatively poorly understood and require further study.

• The major threats to the butterfly are thus the lack of appropriate management in the habitats where colonies survive. Continuation of nature reserve management is important to the continual survival of several woodland and grassland colonies. There is a long term threat from isolation and fragmentation of habitats and viability of populations, and potentially a minor threat from collectors.

• The major objectives of the Plan are to restore the 1980 status of the Heath Fritillary in Kent; maintain its range in SW England and maintain the re-introduced populations in Essex and W Devon. In addition, restoration of suitable habitats in the butterfly's former range will be encouraged and opportunities examined for re-introducing the species.

• The objectives of the Plan will be achieved by encouraging the maintenance/restoration of coppice management in existing woodland habitats (mainly SE England), maintenance/ restoration of appropriate cutting regimes on existing grassland habitats (SW England) and identification and implementation of appropriate grazing and burning regimes on heathland habitats on Exmoor (SW England) helped by a variety of financial incentives. The Plan identifies the need for research into the species requirements on Exmoor and further research on the ecology of the hostplant Common Cow-wheat; survey and monitoring work on all populations and identifying potential habitat for extending/reinforcing the Heath Fritillary's range. The Plan will be publicised and funds sought to ensure that the proposed strategy can be accomplished.

• The Action Plan covers the next ten years, will be monitored annually and reviewed in the year 2000 or such earlier time as the situation demands.

Part 1 Overview

1.1 PRIORITY STATEMENT

The Heath Fritillary is now confined to southern England where it was formerly locally abundant in parts of south west and south east England (it has never been recorded from Wales, Scotland or Northern Ireland). It is included in the British Red Data Book of Insects (Shirt 1987) as a Vulnerable species. The Heath Fritillary has declined severely during the last 150 years although recent concerted conservation effort has prevented its decline in some areas since 1980 (Warren 1991). Due to the low number of existing colonies in the UK and dependence of the species on conservation measures, **high** priority should be afforded to the continual conservation of the Heath Fritillary in the UK.

1.2 BROAD OBJECTIVES

1. Restore 1980 status in Kent (i.e. c25 colonies in interconnected metapopulations including some large colonies).

2. Maintain range in SW England and maintain colonies in each county (2 in Cornwall, 2 in Devon, a minimum of 20 on Exmoor).

3. Maintain the two re-introduced populations in Essex and one in Devon.

4. Encourage restoration of suitable habitats in former range and examine opportunities for re-introducing species.

1.3 LEGAL STATUS

The Heath Fritillary is fully protected under Schedule 5 of the 1981 Wildlife and Countryside Act. Implications of this legislation in the UK are given in Appendix 3.

1.4. THE STATUS AND LEVEL OF BIOLOGICAL KNOWLEDGE

Population	**-size**	**A total of 43 colonies were known in 1989 including 21 large ones (i.e. >250 adults during the peak flight period) and two sites in Essex where it has been successfully re-introduced since 1984. It was re-introduced to a site in W Devon in 1993.**
	-trend, numbers	**Declined severely over the last century; with a decline of 50% over the last 25 years. Recent conservation effort has slowed and in some cases reversed this trend.**
	-trend, range	**82% decline over the last century and the species is now confined to southern England.**
Knowledge of	**-status**	**Good with regular monitoring of colonies and collation of results.**
	-trends	**Generally good, but not so on Exmoor.**
	-conservation requirements	**Good in woodland and grassland, poorly understood on Exmoor heathlands.**

Definition of a colony and colony size

A colony is defined as a group of individuals that occurs in a discrete area and is separated from other groups by at least 300m of apparently unsuitable habitat, which probably restricts the free interchange of individuals (after Warren *et al*., 1984). Colony sizes are: Large = > 200 adults during the peak flight period; medium = 20-200 adults at peak; small = <20 adults at peak (see methods of estimating population size in Warren *et al*, 1984).

Part 2 Biological Assessment

2.1 INTRODUCTION

The Heath Fritillary, *Mellicta athalia* lives in discrete colonies in relatively warm and sunny habitats, with topological shelter or shelter provided by shrubs or trees, where the food plants grow in abundance among an otherwise sparse ground flora on poor, well drained soils.

2.2 ECOLOGY

Life Cycle

The Heath Fritillary is univoltine in the UK. It flies from the end of May until mid July tending to be slightly later in SE compared to SW England. The average life span of an adult is probably between five to ten days (Warren, 1985), and adults are active in shade temperatures above 17-18^{o}C when there is some sunshine. The females mate once soon after emergence and oviposit only during warm sunny weather. The adults are very sedentary and most remain within their breeding area, rarely moving more than about 150m. A few individuals have been recorded as emigrating from large colonies and moving up to two kilometres. Both sexes frequently take up nectar from a variety of flowers with exposed nectaries, notably Bramble species (*Rubus* sp.), Buttercup species (*Ranunculus* sp.), Oxeye Daisy *(Chrysanthemum leucanthemum*) and Tormentil (*Potentilla erecta*).

Eggs are usually laid in large batches of between 80 and 150, although occasionally smaller batches containing as few as 15 have been recorded in the field (Warren 1985, 1987a). A small proportion are laid directly on the larval food plant but most are deposited beneath a leaf of any adjacent plant. The ovum lasts from two to three weeks, and mortality is probably low.

The newly hatched larva is pale grey with a black head and covered with long, fine hairs. The mature larva has velvety black dorsal ground colour, freckled with numerous tiny white spots from which arise short black hairs. The larval stage lasts from June or July until May or June the following year.

After hatching the larvae eat their eggshells and feed gregariously in a small, inconspicuous web. They begin to disperse during the second instar and form smaller groups. By the third instar the larvae usually feed alone and rest beneath dead leaves both at night and during bad weather. In their third instar during September they form a hibernaculum by spinning together the edges of a dead, tightly rolled leaf, usually close to the ground in leaf-litter. Most larvae hibernate singly but sometimes two or three, and rarely as many as 15-20 larvae, may share the same hibernaculum.

The larvae emerge from hibernation during the first warm, sunny days of March or April and feed sporadically whenever the weather is warm. At this stage they spend most of their time basking, often on dead leaves or twigs, and only feed sporadically during the day. Predation and fungal diseases are thought to be major mortality factors, particularly in cold, damp

spring weather which slows larval development (Warren 1987a, 1987c). There are six larval instars.

The larvae feed on a range of plants which vary according to the habitat (for details see below). The pupal stage lasts 15-25 days from early May until late June. A high mortality of roughly 50% was recorded in a Cornish population, caused largely by small mammals. A few pupae were also predated by beetles, and a proportion were parasitised (Warren, 1987c).

Habitats

The Heath Fritillary is unusual in that it occurs in three types of habitat where it has highly specific requirements: 1) coppice/newly-felled woodland where it breeds solely on Common Cow-Wheat (*Melampyrum pratense);* 2) unimproved grassland with abundant food plants Ribwort Plantain (*Plantago lanceolata*) and Germander Speedwell (*Veronica chamaedrys)* and 3) sheltered heathland combes where its primary host is Common Cow-wheat and its occasional second host is Foxglove (*Digitalis purpurea*) (Warren *et al*., 1984; Warren 1987a).

1) Coppice/Newly-Felled Woodland

The Heath Fritillary's most characteristic habitat is newly-coppiced and nearby deciduous woodland (NVC community W10 - *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland) where it breeds solely on Common Cow-wheat. This annual plant is largely confined to acid soils and is semi-parasitic on the roots of certain deciduous trees and probably a few grasses (Cressey, 1987). It is usually rare or absent under dense woodland canopies but often becomes abundant in the year or two following clearance. Eggs are laid on plants growing in open sunny situations, typically surrounded by a high proportion of bare ground. Such conditions provide a particularly warm micro-climate but are short-lived as the vegetation regrows making the host plant too shaded for oviposition. The host plant also declines rapidly as succession proceeds. Individual patches often only remain suitable for up to 3 years, although some may remain suitable for longer (up to 10 years) in new clearings or conifer plantations (Warren, 1987c). All the surviving colonies of the Heath Fritillary in SE England occur in coppice or newly-felled woodland. The clearings are created either by coppicing Sweet Chestnut (*Castanea sativa*) or Hornbeam (*Carpinus betulus*), or during the 1980s, by conifer plantings on deciduous woodland sites (Warren, 1992).

2) Unimproved Grassland

The second biotope used by the Heath Fritillary occurs on a small number of sites in SW England. It consists of unimproved grassland where a different host plant, Ribwort Plantain is abundant (5-20% ground cover). Several other plants are also eaten, including Germander Speedwell and a secondary host plant the Foxglove, which is sometimes used by post-diapause larvae. Suitable conditions occur only in fairly short (less than 20cm tall), herb-rich vegetation that is not dominated by rank grasses. Such habitats have been provided for a few years by the abandonment of flower-rich hay-meadows usually prior to afforestation. In contrast to parts of Continental Europe, the Heath Fritillary does not seem capable of surviving in British hay-meadows that are cut during the summer (Warren, 1985). Suitable *Plantago*-rich biotopes have occasionally developed on disturbed ground such as disused railway lines or even abandoned market garden allotments on steep slopes. All these biotopes

soon become too overgrown for breeding if left unmanaged and few remain suitable for more than 10-15 years (Warren, 1992).

3) Heathland Combes

The third biotope which is used on the majority of localities in SW England (on Exmoor) is sheltered heathland with scattered Common Cow-wheat (NVC community H12, Upland Heath). All these colonies occur on freely-drained, mineral soils where the vegetation is dominated by Heather (*Calluna vulgaris*), Bilberry (*Vaccinium myrtillus*) and Bracken (*Pteridium aquilinum*). They occur at 200-400m above sea level, much higher than the other biotopes which lie between 30-100m. Heath Fritillary habitat exists in the transition zone between upland and lowland heathland which has been produced by grazing and/or burning, though the role and level of these activities is not well known (Warren, 1987a, c). The main breeding areas are in sheltered valleys (combes) where the soil is thin and the vegetation contains a large proportion of *Vaccinium*. The primary host plant Common Cow-wheat, is a parasite solely of *Vaccinium* in this habitat (Cressey, 1987) and occurs at low densities (e.g. less than 1% ground cover) in comparison to most woodland biotopes where Common Cow-wheat covers 5-20% of the ground. Foxglove is also used by the post-diapause larvae as a secondary hostplant in some of these heathland habitats. In contrast to the other habitat types, the heathland habitat sites appear to be far more stable, though the main food-plant (Cow-wheat) can change in abundance from year to year in response to management, and probably other environmental factors.

The Heath Fritillary is one of several species of butterfly in the UK that have depended wholly on man to create its habitat since recording began, c200 years ago and probably for many centuries (Thomas, 1993). All three habitats deteriorate without management, and in woodland the habitat remains suitable for only 3-10 years after felling, depending on conditions within the woodland (Warren, 1987c). The butterfly's reliance on ephemeral habitats, and the need for management make effective conservation difficult, even though sizeable populations can breed on small habitat patches (e.g. over 1000 adults in less than 1 ha). Colonies are unable to move far, and the lack of a continuous supply of new habitats near to existing sites, as formerly occurred when woods were coppiced, has resulted in numerous extinctions. The successful conservation of this butterfly in ephemeral habitats is thus dependent on new habitat being created on a regular basis, near to existing colonies (see Appendix 1).

2.3 DISTRIBUTION AND POPULATION

Distribution

The Heath Fritillary occurs from Western Europe through Russia and Asia to Japan. In southern France it is extremely widespread and breeds in unimproved hay meadows and pastures (Warren, 1985c). It is endangered in the Netherlands (Geraedts, 1986; Verspui and Visser, 1992) and has declined severely in many countries in N Europe, including Belgium (Verstraeten, 1985), N France and parts of W Germany (Warren, 1992). It is unlikely that it exists in Portugal or in Spain much south of the Pyrenees, except as the unusual subspecies *nevadensis* in the highest parts of the Sierra Nevada (Bretherton, 1966).

It once occurred in numerous sites scattered across southern Britain. Before 1910, it was recorded from at least 58 ten-km grid squares, but its known distribution declined to 25 grid squares during 1910-60 and to 17 from 1960-79 (Warren *et al*., 1984). It was probably always very localised, and most colonies occurred in acid woodland which was maintained by regular coppicing. This traditional form of management continually created the new, sunny clearings that the butterfly needs in order to thrive. (Warren, 1985a, b). However during the late 19th and 20th centuries the practice steadily declined and today only a small proportion of Britain's woodlands are coppiced. Most of the remaining coppices occur in Kent, and it is here that the butterfly has its stronghold in the Blean Woods complex (comprising several large blocks of woodland north of Canterbury). Elsewhere in the country, coppicing has virtually ceased and the woods have become too shady to support viable populations. It has managed to survive in only a few other counties where it uses two alternative types of habitat. In Devon and Cornwall a few colonies have persisted in predominately grassland habitats, and on Exmoor a number occur in heathland habitats.

Table 1. The distribution of Heath Fritillary colonies by habitat and county (from Warren, 1991).

	Herb-rich grassland	**Sheltered heathland**	**Woodland**	**TOTAL**
Cornwall	1.5		0.5	2
Devon (excluding Exmoor)	2**			2
Exmoor (Devon & Somerset)		23		23
Kent			14	14
Essex			2*	2
TOTAL	3.5	23	16.5	43

* Both re-introduced colonies

** These colonies comprise a mix of herb-rich grassland and woodland. The last known colony as at 1995 occurs mainly on the recently coppiced woodland edge with a small amount of adults discovered in the adjacent grassland meadow for the first time for several years (D. Land, pers. comm.).

In 1980 when the first national survey was conducted the species could be found in only six grid squares (Warren *et al.*, 1984). Just eight localities were identified, containing 31 colonies of which 25 were in SE England (Kent) and six were in SW England (Cornwall - 3; Devon -
2; and Somerset - 1). The survey revealed two more disturbing facts; three quarters of the colonies were estimated to be small (less than 200 adults at the peak flight period) and many breeding areas were deteriorating rapidly following the planting of conifers. Furthermore, the two nature reserves that had been established to conserve once large populations of the Heath Fritillary had suffered a major decline, containing just a few individual adults (which are thought to have been mainly strays from others sites), with negligible, if any, breeding.

A further survey in 1989 however showed that the total number of colonies known in Britain had risen to 43, and the number of large colonies (with over 250 adults during the peak period) had risen from 5 to 21. The butterfly's improvement in status was mainly due to the discovery of 22 new colonies on Exmoor (Jarman, 1985-88). An important contribution has also been made by the conservation measures which have successfully maintained a substantial proportion of the colonies identified in 1980, or discovered since, while those on unmanaged sites have nearly all become extinct. There are a few previous records for the Heath Fritillary on Exmoor and present colonies may partly be the result of a recent expansion, although some may have been overlooked in the past. It is possible that a few as yet undiscovered colonies may exist in remote areas. Exmoor contains several large colonies and although they fluctuate the region must now be regarded as the British stronghold for the species.

In Devon and Cornwall during the 1980s, the overall number of occupied sites decreased slightly from 5 to 4. However there has been a major loss of individual colonies; a total of 11 sites have been occupied at some time between 1980 and 1989, but 7 (64%) are now extinct (1 in Cornwall, 6 in Devon). One of these sites was destroyed as a result of agricultural improvement, but the other sites have lost their colonies due to a lack of management and subsequent successional changes. These losses have been offset slightly by the establishment of one small colony in a newly created woodland clearing, probably as a result of natural colonisation from a large colony less than 2km away. Two of the other sites have held substantial colonies throughout the last decade and are now nature reserves and the fourth remaining site is on privately owned land (Warren, 1991).

In Kent, the turnover of colonies has been even more pronounced due to the highly ephemeral nature of their woodland habitat (Warren, 1987c). The colonies occur in three large woodland blocks, totalling 2200 ha in the Blean Woods, where they breed predominantly in coppiced Sweet Chestnut, with some colonies occurring in coppiced Hornbeam. Here the Heath Fritillary has had mixed fortunes. It was drastically affected by the demise of the Sittingbourne Pulp Mill in the late 1980's which has led to the collapse of the Blean Sweet Chestnut coppice industry. A total of 42 separate sites have held colonies from 1980 to 1989, but 28 (67%) have become extinct owing to woodland regrowth following clearance (Warren, 1991).

A large turnover is inevitable in coppiced woodland as the habitat is ephemeral, but over the last decade the number of extant colonies in this region has fallen substantially from 25 to 14. This decline has been due entirely to losses in privately owned woodland, where the number

of colonies has dropped from 20 to 9, all but one of which are now small. Moreover, two of them owe their existence to the gale which caused extensive windblow damage to woods in SE England during October 1987. The other five Kent colonies occur in areas that are now nature reserves, and where the number of colonies has remained stable over the last decade. After a decade of steady decline, the number of colonies is now expanding slowly following new management agreements.

Since 1980, the number of British Heath Fritillary colonies has also been increased by re-introductions onto former sites as part of the overall conservation strategy (Warren, 1985 & 1991). In Essex, two new colonies have been established successfully, since 1984 and 1987, following the reinstatement of coppice management on nature reserves. The third attempt in Essex during 1983 failed because the habitat was only marginally suitable, and recommendations to improve it were not implemented. In 1993 the butterfly was re-introduced on to a site in W. Devon.

Population

Structure and Mobility

The Heath Fritillary forms more or less closed populations within discrete areas of suitable breeding habitat that are often less than 0.5ha in size. Adults are extremely sedentary and even small strips of unsuitable vegetation represent major barriers to dispersal. This suggests that where several discrete colonies occur within the same block of woodland, as in SE England, they can be regarded, at least from a genetic viewpoint, as sub-populations within a larger population which covers the whole wood. The sub-populations fluctuate independently of each other in response to local changes in their habitat (see below). The amount of movement between colonies is highly variable but an important factor is clearly the nature of the intervening vegetation. Movement is greatly encouraged by the presence of open, sunny woodland paths (rides) running between the sites. Despite the detection of occasional migration within large woodland complexes, there is little evidence of movement between adjacent woods. The furthest distance at which a new site has been colonised over the last ten years is 2km away from the nearest colony (in this case a very large colony). On this basis, the natural colonisation of a site more than 10 km from the nearest colony could take tens if not hundreds of years. This has considerable implications for the conservation of the species in the modern fragmented landscapes of the UK and indeed Europe as a whole.

It is possible that on Exmoor, the species may be more mobile. Here, marginal ephemeral sites are observed at greater distance from established colonies than those described in woodland habitats. Further research is needed in this area.

Population Dynamics

Heath Fritillary populations are characterised by huge fluctuations in abundance from year to year. These fluctuations are most pronounced in woodland biotopes and reflect the rapid change that occurs in the suitability of the habitat for breeding following a clearance (Warren 1987b). Populations increase rapidly once an area has been colonised with numbers reaching a peak 2-3 years after cutting. Thereafter they decline rapidly, the exact rate dependent on the rate of regrowth in each type of vegetation. In vigorous chestnut coppice, colonies become extinct after about 5 years, by which time the regrowth has completely closed over ground vegetation. In less vigorous coppice and in conifer plantations on former deciduous sites, colonies usually become extinct 7-10 years after cutting. Changes in habitat suitability are

usually less sudden in grassland and heathland biotopes, and fluctuations are also thought to be related to the weather during April and May, when the post-diapause larvae are developing. Warm dry springs generally result in an early emergence and an increase in adult numbers, provided the habitat remains unchanged (Warren, 1992).

Mobility and Colonisation

Fluctuations in the Blean Woods complex are also linked to another factor - the rate of colonisation. In one example, new clearings were colonised rapidly if they occurred within 300m of an existing population, but colonisation was delayed, or failed to occur, on suitable sites that were further than about 600m away (Warren, 1987b; Thomas *et al*., 1992). Indeed it is extremely unlikely that any new clearing that is created more than 1 km from a population would ever be colonised, as the butterfly is unlikely to arrive during the short period that conditions remain suitable for breeding. Therefore in order to survive in a wood, the species requires the regular creation of clearings which are rich in Common Cow-wheat reasonably close together, and interconnected by a network of wide rides and glades so that colonisation can occur rapidly after clearance. The species will become locally extinct if there is any break in the supply of new clearings, or if the distance between clearings is increased beyond a critical point (c.300m).

2.4 LIMITING FACTORS

Historical

Changes in woodland management (especially the decline in coppicing) leading to fewer open habitats within woods and to the increasing distance of new clearings from occupied ones (thus reducing the rate of colonisation of new clearings).

Loss of herb-rich grasslands in SW England (e.g. by afforestation and abandonment).

Possible Current and Future Limiting Factors

Continuation of nature reserve management is important to the survival of several woodland and grassland colonies.

Continuing changes in woodland management, together with the limited extent of coppice area and increased isolation of new clearings in Kent.

Continuing decline in market for coppice produce.

Abandonment or inappropriate management of herb-rich grasslands in SW England.

Potential threat from changing management (e.g. burning and grazing regimes) on Exmoor.

Long term threat from isolation and fragmentation of habitats and viability of populations.

Potentially a minor threat from collectors.

2.5 RESUME OF CONSERVATION TO DATE

The first national survey of the Heath Fritillary was conducted in 1980 and confirmed that the species was close to extinction (Warren *et al.,* 1984). It was consequently considered to be the most endangered British butterfly and was scheduled as a protected species under the Wildlife and Countryside Act 1981.

Since 1980, a concerted effort has been made to conserve the remaining colonies and, by 1985, the majority were either included within nature reserves or covered by management agreements between the site owners and the former Nature Conservancy Council, now known as English Nature (Warren, 1985). The early results of conservation management in the coppice/newly felled woodland habitat have been extremely encouraging and most protected colonies continue to thrive. A spectacular increase has occurred as a result of improved management in the Blean Woods National Nature Reserve and numbers have risen from only a few adults to a population of over 1000 in 1985. This contrasts to its fortunes elsewhere in the Blean Woods complex where numbers dwindled during the 1980s (Warren, 1991). In addition during this time the Heath Fritillary has also received a great deal of attention including a three year autecological study (Warren, 1987a, b, c) and the production of a comprehensive conservation plan (Warren, 1985).

Between 1982 and 1984 about 18 new colonies were discovered in a small part of Exmoor where only one small colony had been recorded previously (Jarman, 1985-1988). These sites are mainly owned and managed by the National Trust. The discoveries were made in a habitat previously thought to be of little potential for butterflies. A further national survey of the butterfly in 1989 showed that the number of known colonies had increased from 31 to 43, part of which was due to an increase in the number of Exmoor colonies from 18 to 22.

Two new colonies have also been re-introduced successfully since 1984, under joint projects between English Nature and Butterfly Conservation. One is on an Essex Wildlife Trust Local Nature Reserve which has been managed specifically to conserve this rare butterfly (Ulrich, 1985) and the other in a “public access” wood owned and managed by Rochford District Council (Essex). The butterfly was also introduced to a site in west Devon in 1993 by the Devon Branch of Butterfly Conservation.

About 80% of the colonies known in 1989 were protected in some way, either on nature reserves or by agreements with the former Nature Conservancy Council, now English Nature. This contrasts with just 21% in 1980. Nearly all the protected colonies are now included within Sites of Special Scientific Interest (SSSI) notified under the Wildlife and Countryside Act 1981. The most significant aspect of this legislation to the conservation of the Heath Fritillary is that it allows for agreements with the owners to manage the habitat in a positive way. Such agreements now cover 10 colonies, and most involve the payment of large amounts of money to compensate for profits forgone and the extra expense of special management. Eight are on land managed by a private forest company, and two are on land owned by the Duchy of Cornwall, where conservation management was initiated at the express wish of HRH Prince Charles. On Exmoor, eight out of the eleven privately owned colonies have agreements for land management; 2 have Exmoor National Park agreements, 2 have EN agreements, three have ESA agreements and one has a Countryside Stewardship agreement. Three colonies have no agreements, and two of these are not SSSIs.

The largest single owner of Heath Fritillary sites is the National Trust, with 12 colonies, all on Exmoor and all covered by ESA agreements (Oates, 1995). Nine of the colonies are within the newly created Dunkery and Horner Wood NNR. The National Trust is becoming increasingly competent as a nature conservation organisation. The conservation of colonies on its land has therefore been given a high priority. A further five colonies are protected on nature reserves which are either owned or managed by voluntary organisations and one is a National Nature Reserve owned by English Nature.

A total of 23.5 colonies occur on privately owned land, and 15 of these are now protected by some form of legal statute. The remaining 8.5 are completely unprotected, including one formerly large colony in Devon and another on Exmoor (Warren, 1991).

Conservation management is being implemented on two sites in Cornwall and on several nature reserves in Kent, with good monitoring procedures. English Nature has recently negotiated a management agreement with the private owner of a large block of woodland in Kent containing several colonies. Trial habitat management is also being conducted by the National Trust on heathland habitat on Exmoor.

The initial success of conservation is attributed to the identification of its precise habitat requirements following a detailed study, and the implementation of a conservation plan based on sound scientific knowledge. As the majority of colonies are now protected, the survival of the Heath Fritillary no longer depends on preventing the factor that initially caused its decline, namely the decline of coppicing. Instead, its immediate future is now in the hands of conservationists and will depend on how well they manage the protected areas, and the incentives available (e.g. from English Nature and the Forestry Authority) to carry out appropriate management work. In some areas such as the Blean Woods, the extent to which different landowners and reserve managers are able to integrate their activities will also be important e.g. by creating clearings close to each other and by increasing the connectivity between such clearings.

Although a considerable amount of information is already available on the basic management requirements of the Heath Fritillary in woodland and grassland, most of it has been tested for just a few years and continual monitoring is vital to ensure its success in the long term. There is also considerable scope for further research, particularly on the dynamics of the larval food plants, and the long-term response of colonies to management of each type of habitat (notably grazing/burning on Exmoor). Nevertheless the results of recent conservation measures have been very promising and can be considered highly successful in the short term. (For a summary of the basic management and habitat requirements of the Heath Fritillary see Appendix 1).

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.

Notes
Definition of colony size: Large = > 200 adults at peak; Medium = 50-200 adults at peak.
For key to abbreviations see page 20.

3.1 POLICY AND LEGISLATIVE

	Lead organisation(s) concerned
Action 1 PRIORITY: HIGH	
Improve financial incentives to continue and extend coppice management in the butterfly's former range, and encourage market for coppice produce.	**FA, FE, LA, EN**
Action 2 PRIORITY: MEDIUM	
Include habitat requirements of the Heath Fritillary when drawing up or revising management prescriptions in ESAs and other agri-environment schemes. (e.g. Countryside Stewardship).	**MAFF/ ADAS, CoCo, EN *etc.***
Action 3 PRIORITY: HIGH	
Refuse planting grants on any definite or possible grassland /heathland sites.	**FA, EN**

3.2 SITE SAFEGUARD AND ACQUISITION

Action 4 PRIORITY: MEDIUM	
Designate as SSSIs all breeding habitats with large or medium colonies.	**EN**
Action 5 PRIORITY: HIGH	
Protect all sites with large or medium colonies through reserve acquisition where management agreements cannot be obtained.	**BC, WTs *etc.***

3.3 LAND MANAGEMENT

Action 6 PRIORITY: HIGH

Manage all Heath Fritillary sites positively to maintain and enhance populations (i.e. through management agreements *etc.*).	**All**

Action 7 PRIORITY: HIGH

Maintain and encourage large populations in each centre of distribution through targeting resources on appropriate sites.	**All reserve owners and managers**

Action 8 PRIORITY: HIGH

Implement suitable management near to existing sites if there is the possibility of recreating suitable habitat.	**EN, WTs, BC, NT *etc.***

Action 9 PRIORITY: MEDIUM

Implement suitable management on new sites in former range if there is the possibility of recreating suitable breeding habitat.	**EN, WTs, BC, NT *etc.***

3.4 SPECIES MANAGEMENT AND PROTECTION

Action 10 PRIORITY: LOW

Enforce legislation to prevent collection of this species.	**EN**

Action 11 PRIORITY: MEDIUM

Conduct strategic re-introductions into suitably restored habitats, with appropriate licenses having been obtained.	**BC, EN**

3.5 ADVISORY

Action 12 PRIORITY: HIGH

Advise land management agencies and site owners/managers on practical habitat management for the Heath Fritillary, and keep updated with results from research.	**BC *etc.***

3.6 INTERNATIONAL

Action 13 PRIORITY: LOW

Disseminate and promote exchange of information on conservation requirements of the Heath Fritillary in the UK to other European countries especially those where the species is declining.	**BC**

3.6 FUTURE RESEARCH, SURVEY AND MONITORING

Action 14 PRIORITY: HIGH

Conduct further research into species requirement in heathland habitats on Exmoor.	**MAFF/ ADAS, EN, BC, NT and others**

Action 15 PRIORITY: MEDIUM

Continue research into habitat requirements in woodland habitats, particularly on a long term basis and on the ecology of the host plant Common Cow-wheat.	**BC, EN, RSPB *etc.***

Action 16 PRIORITY: HIGH

Continue existing butterfly monitoring transects on Heath Fritillary sites and ensure annual monitoring of all large/medium colonies (and occasional monitoring of small colonies every 2-5 years).	**EN, BC, NT, WT, RSPB**

Action 17 PRIORITY: HIGH

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

Action 18 PRIORITY: HIGH

Review and assess effects of habitat management in light of the above at least every 5 years.	**EN, BC, NT**

Action 19 PRIORITY: LOW

Investigate the effects of habitat loss and isolation of colonies on colonies on genetic variation and population viability.	**BC, EN , Universities**

Action 20 PRIORITY: MEDIUM

Survey potential habitat in regional strongholds and produce habitat suitability maps.	**BC, EN *etc.***

Action 21 PRIORITY: HIGH

Continue research on habitat management techniques (especially in heathland habitats), with appropriate monitoring of habitat and butterflies.	**BC, EN, ENP**

3.7 COMMUNICATIONS AND PUBLICITY

Action 22 PRIORITY: MEDIUM

Publicise this Action Plan, the decline of the Heath Fritillary and measures needed to conserve it.	**BC and All**

3.8 REVIEW

Action 23 PRIORITY: MEDIUM

Monitor the progress of the Action Plan annually and review in five years time.	**EN, BC**

Key to Abbreviations

All - All organisations listed
BC - Butterfly Conservation
CoCo - Countryside Commission
EN - English Nature
ENP - Exmoor National Park
ESA - Environmentally Sensitive Area
FA - Forestry Authority
FE - Forest Enterprise
LA - Local Authority
MAFF - Ministry of Agriculture, Food and Fisheries
NT - National Trust
RSPB - Royal Society For The Protection Of Birds
WT - Wildlife Trusts

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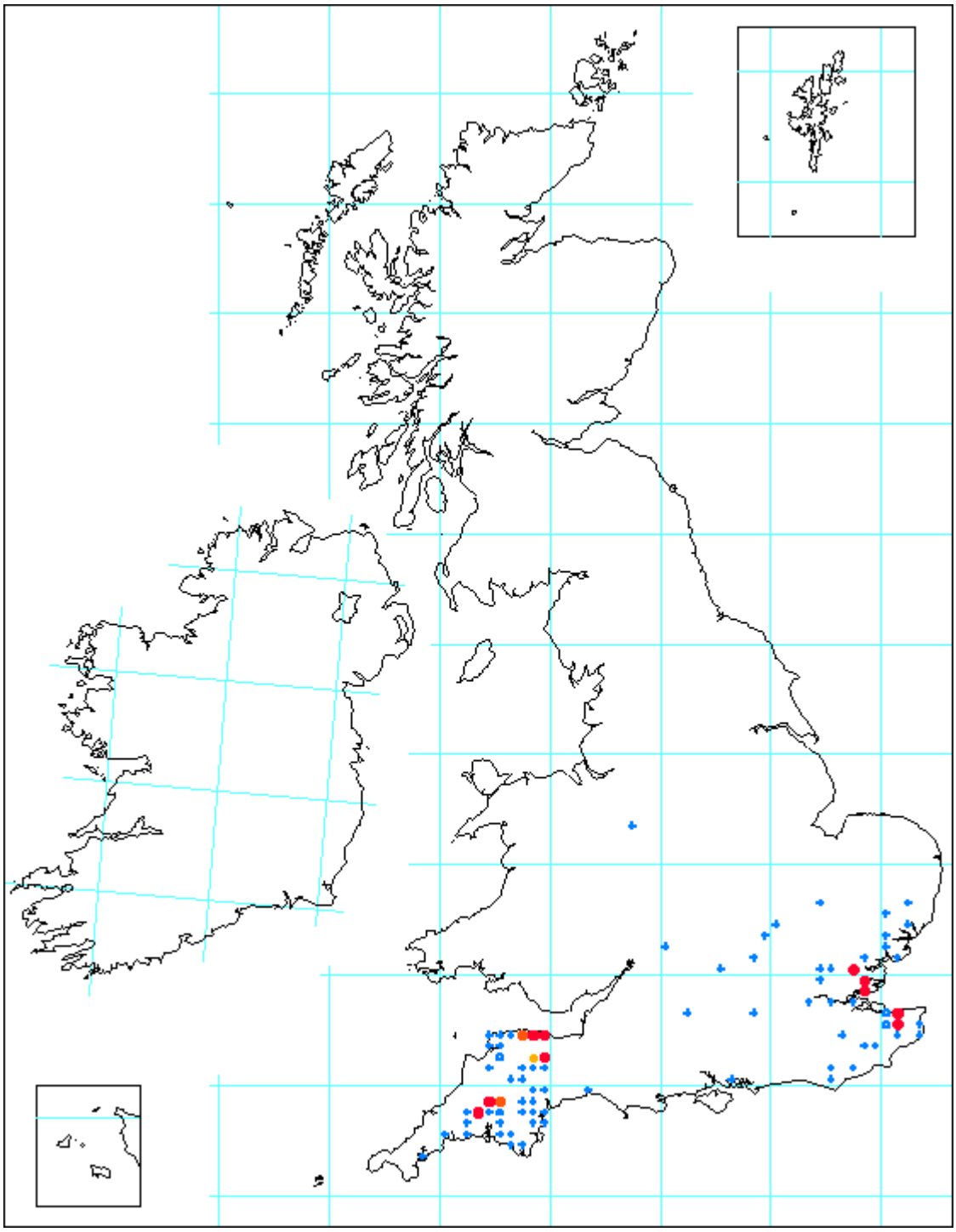
Appendix 1 Habitat requirements of the Heath Fritillary

Habitat	General Habitat Requirements	Known Specific Requirements
Woodland	Requires freshly cut woodland with abundant Common Cow-wheat, in otherwise sparse vegetation.	Coppice cut in small plots (0.4 - 2ha) on a rotation of 10-20 years, with plots adjacent to each other within maximum 3 year interval or within 300m of an existing colony and connected by a network of wide rides / glades to encourage rapid colonisation of new plots.
Sheltered Heathland Combes	Requirements in this habitat are still poorly known, but it comprises short heathy vegetation with scattered Common Cow-wheat growing amongst Bilberry.	Suitable habitat on Exmoor is maintained by grazing through the year by sheep, ponies, cattle and deer. Some areas are also burnt on rotation during winter and the butterfly is known to thrive in immediate post-burn vegetation if colonies survive nearby to re-colonise.
Grasslands	Herb-rich grassland with abundant Ribwort Plantain growing in short/medium (but not heavily grazed) vegetation (i.e. 5 - 15cm).	Suitable habitat has been maintained for 10+ years by 1) Biennial winter cutting with brush cutters so that half the habitat is cut each year, and raking cut material. 2) Annual mowing in autumn with tractor drawn 'bush-hog' cutter. An alternative, and possibly better regime of hay cutting of once every 4 - 5 years on rotation is being experimented with at present.

Appendix 2 The current distribution of the Heath Fritillary in the UK

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 3 Implications of the Wildlife and Countryside Act 1981 in Britain.

The Wildlife and Countryside Act 1981 gives limited protection to the Heath Fritillary butterfly in Britain.
Under this Act it is a criminal offence if any person:

- intentionally kills, injures or takes a specimen from the wild (this, in effect prohibits collecting for any purpose).
- has in their possession or control any live or dead wild specimen or any part of or anything derived from such specimen.
- sells, offers or exposes for sale, or has their possession or transports for the purpose of sale, any live or dead specimen (the object is to prevent trading).

Ova, larva and pupa as well as mature insects are covered by the Act. It is presumed in law that the specimen in question comes from the wild, unless the contrary is shown.