



**Species Action Plan**

**PURPLE EMPEROR**  
*Apatura iris*

**2000**

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This species action plan is an unpublished working document produced by Butterfly Conservation to focus and co-ordinate the conservation of the Purple Emperor in the UK over the next five to ten years.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, Countryside Council for Wales, The National Trust, MAFF/ADAS, WWF-UK, CEH, RSPB, the Forestry Commission, Forest Enterprise, the Woodland Trust and the Wildlife Trusts.

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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 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 Purple Emperor is a relatively widespread species in the southern English woodlands but declined severely (by over 50% in range) during the 20th century. This decline has been most marked in central and northern counties of England and Wales where the species is now absent. The Purple Emperor is listed under Schedule 5 of the Wildlife and Countryside Act for sale only.
- The rate of loss of 10km squares in southern England is estimated at 33% between the recording periods 1970-82 and 1995-99, although the species appears to have recovered in some areas during the last two decades. A **medium** priority is afforded to the conservation action in this plan to protect and increase the number the Purple Emperor colonies in the UK.
- The Purple Emperor is a canopy dwelling species that requires large blocks of broad-leaved woodland or clusters of smaller woods and/or dense scrub where the foodplants, willows, are moderately abundant.
- The decline of the Purple Emperor is largely attributable to the loss and fragmentation of ancient semi-natural woodland, although unsympathetic management practices and removal of willows have taken their toll. The isolated nature of remaining woodland habitat is a major factor limiting its recovery.
- The immediate major objectives of the plan are: to help to ensure that the partial recovery of the Purple Emperor continues 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.
- The objectives of the plan will be achieved by determining current core areas of distribution of the Purple Emperor; improving information on and dissemination of the habitat requirements of the species; and ensuring sites are managed with the long term maintenance of populations of the Purple Emperor as a key objective (i.e. the retaining and planting of willows and the encouragement of natural regeneration).
- The Action Plan covers the next ten years, will be monitored annually and reviewed as the situation demands.

## **Part 1 Overview**

### **1.1 PRIORITY STATEMENT**

The Purple Emperor has always been a species predominantly of the larger woodlands through much of south central England, with scattered records to the north and in Wales. It has declined severely in many areas since 1950 most noticeably in the northern counties of England, and in Wales where the species is now absent. It is listed as a Species of Conservation Concern 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 Purple Emperor colonies in the UK.

### **1.2 BROAD OBJECTIVES**

1. Maintain viable networks of populations throughout its current range.
2. To ensure that the partial recovery of the Purple Emperor in the UK continues.
3. Conduct research on the ecology and distribution of the species to enable its effective conservation.

### **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>Not known. Estimates of adult population size are very difficult for this elusive, canopy dwelling species.</b>
	<b>-trend, numbers</b>	<b>Nationally total number of colonies/sites is unknown.</b>
	<b>-trend, range</b>	<b>Formerly widespread in southern woodlands. Major decline in the north of England and Wales. Current stronghold in central southern England.</b>
<b>Knowledge of</b>	<b>-status</b>	<b>No up-to-date national data are available for this species. Location of large and medium colonies needs to be identified.</b>
	<b>-trends</b>	<b>Recent records indicate a slight re-expansion of range, particularly eastward into Surrey and Kent.</b>
	<b>-conservation requirements</b>	<b>Good ecological knowledge of its requirements in southern woodlands including practical management.</b>

## **Part 2 Biological Assessment**

### **2.1 INTRODUCTION**

This magnificent butterfly flies high in the tree-tops of well-wooded landscapes in central-southern England where it feeds on aphid honeydew and tree sap. The male is famous for the iridescent purple sheen on the upper wings, (the female lacks this colouration). Goat Willow (*Salix caprea*) is the most widely used foodplant although it also breeds on Grey Willow (*S. cinerea*) and more rarely, Crack Willow (*S. fragilis*). Eggs are laid on a wide range of tree sizes, ranging from medium-sized shrubs to tall, canopy trees.

The Purple Emperor declined steadily during the twentieth century and is now restricted to some of the larger woods in southern England. There has been a recent slight re-expansion in some areas.

### **2.2 ECOLOGY**

#### **Life Cycle**

The Purple Emperor is univoltine with adults flying from late June until mid-August. The adults are extremely elusive and occur at low densities over large areas. The males occasionally descend to the ground, usually in mid morning, where they probe for salts either from road surfaces or from animal dung.

Males set up territories on prominent master trees from mid day onwards and can occasionally be seen perching on outer, south-facing branches, or soaring gracefully between trees (Willmott, 1990b; 1994). Some of these trees are used in successive years but others are more temporary. Contrary to popular belief, such trees are not always oaks and alternatives are nearly always found if a 'master' tree is felled (though loss of such trees is still undesirable).

The bright green eggs are laid singly, during the middle part of the day, on the upper surface of a willow leaf, always on the shady side of the tree or within its crown. The butterfly appears to prefer a mix of age structures in the willows present on a site with some 15-20 year growth usually present. Studies also indicate that adult females show a preference for the old, tall sallow, often with and expansive crowns, but will also lay eggs on younger trees (5-10 years old) (Willmott, 1987; 1990b). Females do not lay eggs on the leaves of Aspen (*Populus tremula*) as has been stated in some early literature (Willmott, 1990b). The larvae rest along the mid-rib, facing the stalk and sitting on a silken pad with the front of the body raised from the leaf. Young larvae feed on the 'resting leaf' but larger larvae leave this intact and feed on nearby leaves. They hibernate as small larvae, typically pressed against a willow bud or in the crotch of a forked branch. They resume feeding when the buds burst in April and pupate in June, suspended from the underside of a leaf.

#### **Habitats**

The Purple Emperor requires large blocks of broad-leaved or mixed woodland or clusters of smaller woods and/or dense scrub where willows such as Goat Willow are abundant. The

Purple Emperor has always been associated with well-wooded districts, often on clays or in valleys where damp conditions promote abundant growth of suitable willows.

Although the butterfly is often associated with ancient woodland, it can spread to adjacent secondary woodland if suitable willows are abundant. Males set up territories on prominent master trees and although some of these trees are used in successive years many are more temporary.

## **2.3 DISTRIBUTION AND POPULATION**

### **Distribution**

The Purple Emperor has a Holarctic distribution, occurring in central Europe from north Spain to central Russia, but absent from Italy and the Mediterranean islands, and eastwards to China, Korea and Japan (Willmott, 1990a). It is declining in several western and central European countries but spreading at the north of its range in Scandinavia and Russia (van Swaay and Warren 1999).

The Purple Emperor is now well established only in the heavily wooded Weald of Surrey and Sussex, and in several large woods in Hampshire, south Wiltshire and on the border of Buckinghamshire and Oxfordshire. Outside these strongholds, its distribution is very patchy, but it is possible that small colonies may still be overlooked. The butterfly has undergone a modest re-expansion during the last two decades and has re-appeared (or has been re-discovered) in several counties after long absences: including east Devon, Kent, Nottinghamshire and Northamptonshire. In the latter it is reported to have expanded in the last five years. The overall number of occupied 10 km squares recorded in the BNM survey (1995-1999) is almost two-thirds greater than in 1970-82, although some of this may be due to increased recording effort as well as reflecting a genuine expansion. It is too early to say whether this is a temporary resurgence or part of a sustained recovery. However the situation in Britain may be mirroring the situation in northern Europe where the Purple Emperor has expanded northwards recently, possibly linked with climate change (Parmesan *et al.*, 1999). The last few decades have been warmer than average, which may have suited this species, but its potential for recovery may now be limited due to the fragmentation of its woodland habitats. Further monitoring is therefore needed to resolve these issues.

The Purple Emperor was once found throughout much of England, as far north as the Humber and in a few parts of central Wales. However, its elusive nature means that it has probably always been under-recorded. The butterfly declined throughout the early twentieth century and disappeared from many central and eastern areas by the 1940s. Major losses occurred in counties such as Lincolnshire and Northamptonshire where it was reported to be abundant in the early 1900s, as well as Norfolk, Suffolk and Essex, where it hung on until the 1950s. Its range has continued to contract and it has retreated to core areas of central-southern England. In Wales, only a few records are known and it died out during the 1930s.

The butterfly's decline coincided with a period of profound change in woodland. Although the species may have benefited from the abandonment of coppicing during the twentieth century, and the gradual change to high forest systems of management, this was more than

offset by the overall loss of ancient semi-natural woodland. Since the 1940s, the area of such woodland in England has been reduced by 30-50 %, but losses have been higher in the intensive arable region in central and eastern England. This process has left remaining fragments of ancient semi-natural woodland smaller and more isolated at the edge of its range where perhaps it was most vulnerable to change.

### **Population**

There is little detailed information on the structure of Purple Emperor populations, partly because adults are too difficult to study using traditional marking methods and because its presence or absence in a particular wood is difficult to determine. They appear to be highly mobile and have been seen dispersing along mature hedgerows as well as across open fields between nearby patches of woodland. Populations probably extend over quite large areas of land, spanning either single large woods or complexes of smaller woods. Adult density is also difficult to assess but is probably low, and it is rare to see more than one or two at a time. In its strongholds, the butterfly seems to occur in almost every wood where there are suitable willows, but it is rarely found in smaller, more isolated woods. More research is needed to determine the size of populations and how far the adults range. An interesting attempt to estimate the total Purple Emperor numbers in Britain was made by Robertson (1980), however the method involved several sweeping assumptions that may not be valid.

## **2.4 LIMITING FACTORS**

### **Historical**

Loss and fragmentation of ancient semi-natural woodland

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

The small size and isolation of its remaining woodland habitat

Continuity of suitable habitat within woodlands as the larval foodplants, willows, are fairly short-lived trees

The species' potential for recovery may now be limited due to the fragmentation of its woodland habitats

Unsympathetic forest management leading to reduction in numbers of willows growing in suitable situations

Possible threat from increased number of deer, which can prevent willow regeneration or regrowth.

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

### **Ecology and Conservation Requirements**

The conservation of the Purple Emperor depends on the protection and sympathetic management of woodland, especially the retention of numerous willows. It is also important to ensure continuity because these foodplants are comparatively short-lived trees. They can regenerate freely in damp conditions but, if natural regrowth is sparse, they can be readily propagated by pushing cuttings into the ground during the autumn. Unfortunately, low regrowth is threatened by deer browsing and trees may need to be protected. Willows growing at the edges of rides are often removed when mature as they increase the shade levels in the rides. Such ride management on a rotation and the addition provision of willow bushes and trees of different ages away from ride edges, in scallops, glades and at box junctions will help maintain populations.

The over-riding factor determining the butterfly's survival may be its need for large areas of habitat which requires conservation measures at the landscape scale as well as within individual woods. The outlook for the butterfly has improved since the introduction of the Broadleaves Policy by the Forestry Commission in the 1980s, which introduced stronger safeguards for ancient woodland and encouraged planting of broad-leaved trees. This has slowed the rate of woodland loss and the cover of broad-leaved woodland is now gradually increasing. However, there are still threats from unsympathetic forest practices that result in more uniform woods and the removal of willows from ride edges. Fortunately the butterfly is now being actively conserved in several key areas and has survived well in some commercially managed ancient woodland sites where willows have been retained. Forest Enterprise is also now incorporating the butterfly's requirements in its management of relevant woods, but effective conservation still requires a major shift in standard forestry practice.

### **Current Studies**

The ecology and behaviour of the Purple Emperor have been studied for many years by Ken Willmott, and have been summarised in a review article (Willmott, 1990a,) and a Butterfly Conservation booklet (Willmott, 1990b). However, it is an extremely difficult species to study and information is still patchy. Moreover, there is little current work examining practical methods of habitat management and only a few sites are being monitored by annual visits, for example though volunteers in Hampshire (Butterfly Conservation Hampshire and Isle of Wight Branch, 1987-1998).

### **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.*

For key to abbreviations see page 14.

#### **3.1 POLICY AND LEGISLATIVE**

**Lead  
organisation(s)  
concerned**

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

Improve financial incentives for sympathetic woodland management throughout range (especially measures that will encourage willows in woods).

**FA**

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

Include habitat requirements of the Purple Emperor when drawing up or revising management prescriptions in Forest Design Plans.

**FE**

#### **3.2 SITE SAFEGUARD AND ACQUISITION**

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

Designate as SSSI three large woods with 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 woods or woodland complexes with colonies through management agreements and/or reserve acquisition.

**All**

### **3.3 LAND MANAGEMENT**

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

Incorporate needs of the Purple Emperor in all management plans, site management statements and agreements covering SSSIs with colonies. **EN**

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

Encourage suitable habitat management in all regions where the Purple Emperor survives. **All**

#### **Action 7 PRIORITY: MEDIUM**

Encourage restoration of suitable breeding habitat within current range in Britain where there is potential for re-establishing extensive habitats or viable networks of populations. **EN, CCW, FA, FE, LAs, BC, WT, WT's**

#### **Action 8 PRIORITY: LOW**

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

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

No action proposed

### **3.5 ADVISORY**

#### **Action 9 PRIORITY: HIGH**

Advise land management agencies and site owners/managers on practical habitat management for the Purple Emperor and how to incorporate this with other management priorities and interests. **BC, WTs, EN,**

#### **Action 10 PRIORITY: MEDIUM**

Produce a brief guide on habitat management for the Purple Emperor, incorporating this with management for other wildlife that shares its habitat. **BC, EN, FA**

### **Action 11 PRIORITY: HIGH**

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

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

### **3.6 INTERNATIONAL**

No actions proposed.

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

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

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

**BC, CEH**

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

Identify location of all sizeable colonies and produce site dossier to inform all relevant bodies of the location and status of these and other potential sites in Britain.

**BC, EN**

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

Conduct further research on habitat requirements, dispersal and colonisation and management techniques.

**BC, EN, FA,  
FE**

#### **Action 15 PRIORITY: MEDIUM**

Investigate techniques for monitoring and establish a monitoring programme.

**BC, EN, CEH**

### **3.8 COMMUNICATIONS AND PUBLICITY**

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

Publicise this Action Plan, the decline of the Purple Emperor and measures needed to conserve it.

**All**

### **3.9 REVIEW**

#### **Action 17 PRIORITY: HIGH**

Review/monitor this Action Plan annually and update in five to ten years as necessary.

**BC, EN,  
CCW**

#### **Key to abbreviations**

All = All organisations listed  
BC = Butterfly Conservation  
CCW = Countryside Council for Wales  
EN = English Nature  
FA = Forestry Authority  
FE = Forestry Enterprise  
CEH = Centre for Ecology and Hydrology (formerly Institute of Terrestrial Ecology)  
JNCC = Joint Nature Conservation Committee  
LAs = Local Authorities  
Us = Universities  
WT = Woodland Trust  
WTs = Wildlife Trusts

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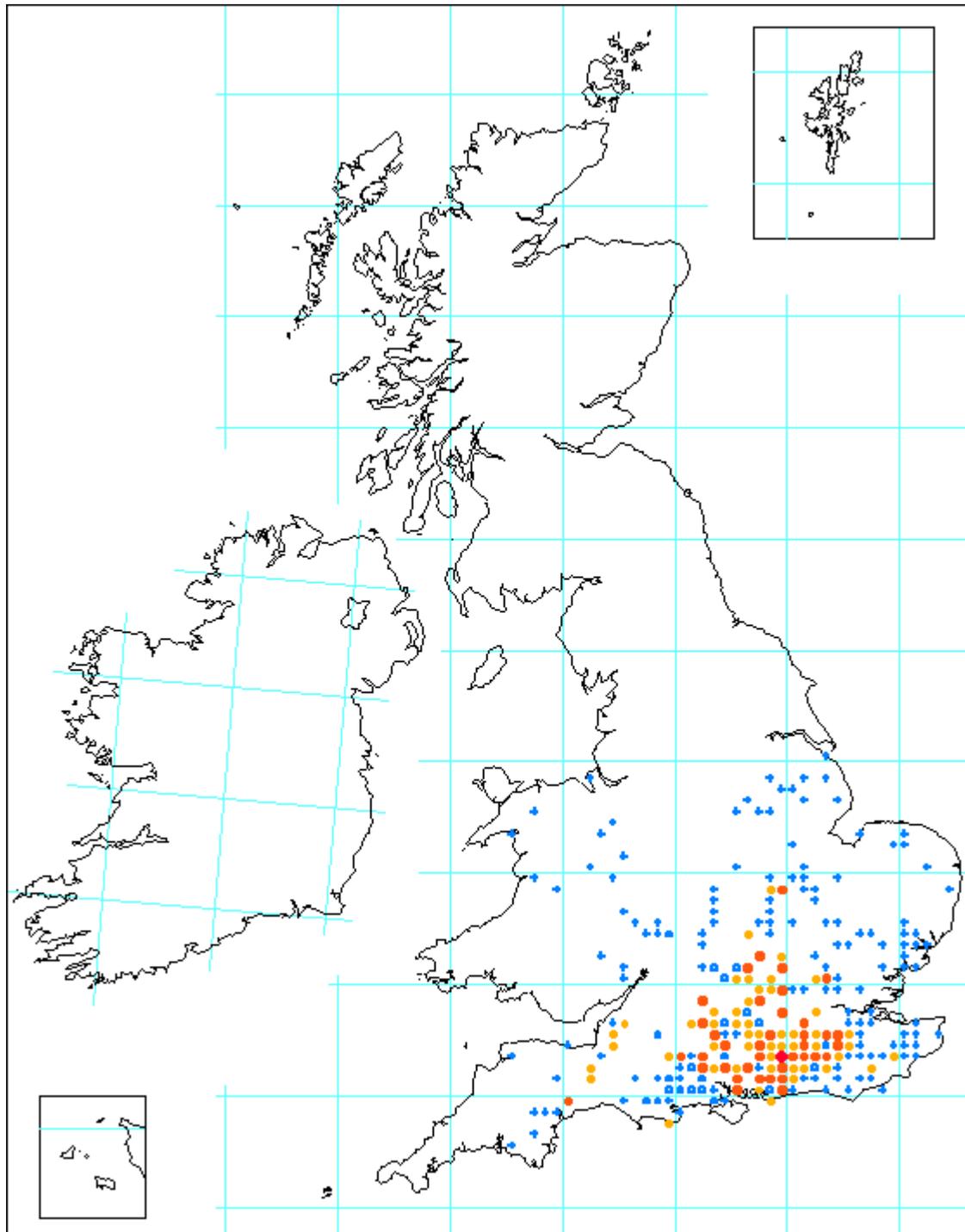
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**Appendix 1 The approximate distribution of the Purple Emperor Butterflies for the New Millennium project (2001).**  
Copyright of Butterfly Conservation/Biological Records Centre.  
(Dark full spot all records from 1995-1999; open circles all records between 1970-1982; cross all pre 1970 records).



## **Appendix 2 Conservation requirements of the Purple Emperor**

### **General requirements**

The conservation of the Purple Emperor depends on the protection and sympathetic management of large ancient and secondary woodland, especially where willows such as Goat Willow are relatively abundant. Although the butterfly is often associated with ancient woodland, it can spread to adjacent secondary woodland if suitable willows are abundant. Males set up territories on prominent master trees while some of these trees are used in successive years many are more temporary. Such trees are not always oaks and alternatives are nearly always found if a 'master' tree is felled (though loss of such trees is still undesirable).

The preferred foodplant trees have large crowns or grow at ride edges with the eggs being laid in the shady part of the willow canopy.

### **Management**

Retain numerous willows wherever possible, especially along ride edges, in damp areas and in new woodland planting.

In addition to rotational ride management, the provision of willow bushes and trees of different ages away from ride edges, in scallops, glades and at box junctions will help maintain populations.

It is also important to ensure continuity because the foodplants are comparatively short-lived trees.

They can regenerate freely in damp conditions but, if natural regrowth is sparse, they can be readily propagated by pushing cuttings into the ground during the autumn.

Unfortunately, low re-growth is often threatened by deer browsing and trees may need to be protected.