Coppiced woodlands: their management for wildlife

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Second edition
1993

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Preface

Much of the research commissioned by the Joint Nature Conservation Committee is directed at the conservation requirements of wildlife or, if primarily designed for other purposes, attempts to make results available to provide guidelines for management purposes also. Several long-term monitoring studies, particularly on nature reserves where experimental manipulations are possible, have been designed to produce information over the time-scale necessary to examine the natural processes relevant to habitat management. This information can then be applied over much wider areas.

There is clearly a great demand for such information. In the case of woodlands, this is demonstrated by the enquiries, received by both the authors of this booklet and by the staff of JNCC and the country nature conservation agencies, from a range of people responsible for particular woodlands. This great demand was emphasised even more by the response to an advance presentation of these booklets to the British Ecological Society's 1989 Symposium on "The scientific management of temperate communities for conservation".

All these sources of enquiry make clear a need not just for a prescriptive guide or recipe book for management work, but for an explanation of studies on which guidance is based, so that reasons for the management options can be assessed. Although such studies may have been published previously in scientific journals, they may not be easily accessible in a form convenient for conservation managers. Accordingly, this booklet is based upon long-term studies commissioned by JNCC from the British Trust for Ornithology on birds, and from the Institute of Terrestrial Ecology and various ecological consultants for invertebrates, as well as in-house staff. To these has been added the expertise of colleagues in other subject areas, particularly of course woodland ecology.

This and its companion volume, *Woodland rides and glades: their management for wildlife,* are the first two of a series of booklets on aspects of management of various habitats for wildlife. I would welcome any comments or suggestions as to features which would further enhance their value to practitioners. I would also like to thank Rob Fuller and Martin Warren for the extra efforts necessary from authors when developing a new series and their aid in producing the second editions.

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Introduction

From the early Middle Ages until the late nineteen century most woods in lowland England were coppiced. In this traditional method of managing woodland the trees were cut at intervals, typically every 5-20 years, to produce a crop of poles for which there was a wide range of markets. By the late 1800s coppicing was on the wane and today only a small fraction of woodland remains actively coppiced. The long history of coppicing has profoundly influenced the plants and animals now found in many semi-natural woods. Coppicing creates conditions suitable for many plants, insects and birds but it is particularly important to those requiring very open woodland habitats. The decline in coppicing has resulted in serious losses of habitat for certain open-woodland species. The future survival of some butterflies, for example, may depend on the return to more traditional methods of managing woodland. Coppicing is being revived on many woodland nature reserves but it may also prove suitable for some woods which are not reserves. This booklet explains how traditional coppice systems worked, why they are important to woodland wildlife and how coppice can be managed to enhance its wildlife interest. It also discusses the pros and cons of reviving coppicing in neglected woodland.

What is coppicing?

The basic feature of a coppiced wood is that it is cut periodically and the trees are allowed to regrow from the cut stumps, which are termed *stools*. The word *coppice* is derived from the French 'couper', meaning to cut. A coppiced wood provides a self-renewing source of wood allowing an indefinite number of crops of stems to be taken. Coppiced trees can live to a great age. Some of the oldest trees in British woods are coppice stools which may be more than 1,000 years old. Traditionally a wood contains coppiced trees (*underwood*) and scattered timber trees (*standards*). In an actively coppiced wood an area of the underwood is cut each winter. The names given to such an area of felled coppice differ from one part of England to another but they include *panel*, *cant*, *fell*, *coupe*, *sale* and *burrow*, while in Scotland and northern England the term is *hagg*. Within a single wood, coppicing usually gives rise to an irregular patchwork of panels at different stages of growth. Panels typically range in size from a half to three hectares. Occasionally, coppicing is conducted in a more regular fashion, with an equal-sized area being cut each year, or even with the entire wood being coppiced at intervals.

Most coppice is grown as 'coppice-with-standards' but occasionally woods consist purely of underwood and these are termed 'simple coppice'. Standard trees are usually oak, but ash is also common. Production of both timber and underwood from the same wood requires a careful balance to ensure that there are not so many standards as to suppress the coppice. Although standards are sometimes planted, they are generally grown either from natural saplings (*maidens*) or by singling out a shoot from a coppice stool; these juvenile standards may be called *wavers* or *staddles*.

The regrowth from the cut stools, or *spring* as it is sometimes known, can be remarkably fast. It is quite normal for many species to reach two metres after their first year, with sallow attaining as much as four metres. Amongst the trees which coppice readily are alder, ash, birch, field maple, hazel, oak, sallow, small-leaved lime, sycamore, sweet chestnut and wych elm. Other species which are also coppiced but which can be slow to respond on some sites are beech and hornbeam. The interval between cuts (the rotation length) depends on the species and the intended produce. Hazel is usually cut every 7-10 years, sweet chestnut usually at about 15 years (except where it is cut as young as three years to make walking sticks), while ash and oak are generally cut at 25-35 years. In general, the shorter the rotation, the greater the density of coppice stools; hazel coppices may have ten times the density of stools found in an ash or oak coppice.

The products of a coppiced wood

Traditionally, coppiced woods provided two main crops - (a) poles, sometimes known as *slop*, cut from the underwood, and (b) timber obtained from the standard trees, usually used for building purposes. In addition, the field layer provided grazing for domestic animals. To avoid damaging the coppice regrowth, stock would only have been allowed into the wood after 4-7 years of growth, but nowadays active coppice is rarely grazed in this way although many woods do contain substantial numbers of deer. Much of the underwood was used as firewood, often being sold in bundles known as faggots, but across the centuries a wide variety of other products have come from coppiced wood. These include wattle and daub, basketry (mainly from osier or ‘withy’ beds), thatching spars, hurdles, tool handles, charcoal, oak bark for tanning, besom brooms and hop poles. Some of the old crafts have died out, but in their place have come new uses for coppice such as pulpwood and chestnut paling. There is still strong demand for firewood, and small markets remain for hazel coppice cut for such things as thatching spares, hurdles (used as fences), bean poles and hedging stakes.

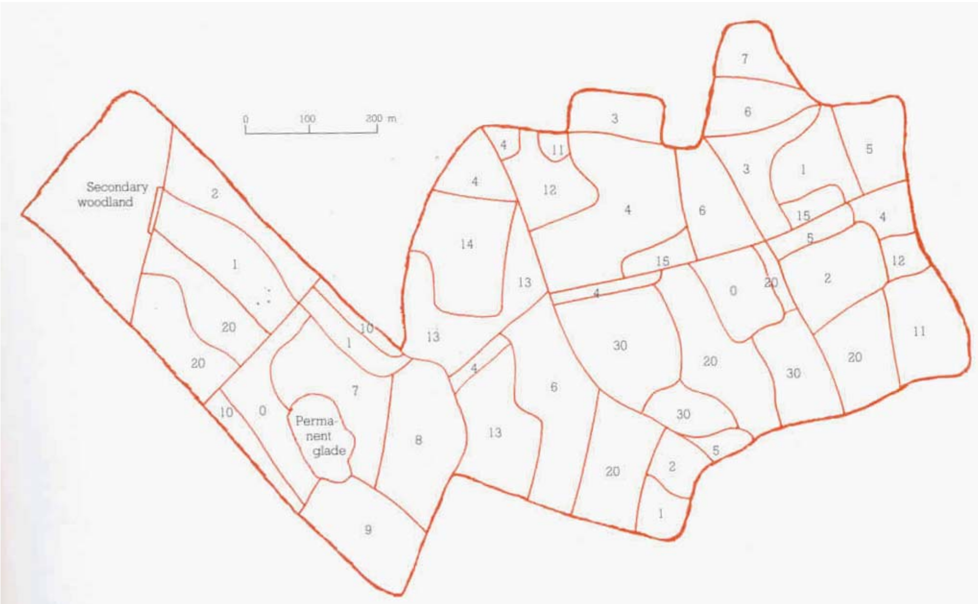

Figure 1 Growth of underwood in Bradfield Woods, Suffolk, 1987. Boundaries are shown between coppice of different ages with the number of full summers’ growth indicated. Areas of 20-29 years growth and of more than 30 years are shown as 20 and 30 respectively.

A historical perspective

Coppicing has been carried out in Britain for thousands of years. The earliest evidence comes from the Neolithic wooden trackways built across the peat of the Somerset Levels. These tracks are constructed from small trees and poles which were apparently cut on both small and long rotations. The Romans probably coppiced large areas of the Wealden woodlands to fuel their iron works. By the time of the Domesday Book (1086), coppicing was widespread throughout lowland England. It seems likely that most medieval woods were coppice-with-standards, although there were also substantial areas of wood pasture where land was devoted both to grazing and to growing trees. A typical wood in East Anglia at this time would have contained a mixture of tree species cut on average every six years with a scatter of mainly young standard trees. The finest surviving example is Bradfield Woods in Suffolk, which has been managed in this way since at least the thirteenth century (Figure 1).

Coppicing spread to many of the northern and western parts of Britain relatively late. Large areas of oak in central and western Scotland, for example, were first coppiced in the early 1700s, mainly to satisfy the demands of tanneries for oak bark and of iron works for charcoal. Not only were natural oakwoods coppiced, but substantial tracts of hillside were planted with oak to meet the demand. At the same time as this northwards expansion of coppicing, English coppice systems started to change. New coppices were planted, often monocultures of hazel or sweet chestnut, while some of the old woods were rearranged with regular layouts of rides and panels. Rotations lengthened until, by the nineteen century, woods were being cut on average every 14 or 15 years. This may have been a consequence of a demand for larger logs, or perhaps growth rates were slowing owing to decreasing fertility after centuries of intensive felling.

In the late 1800s, coppicing went into the long decline which continued until the middle of the 20th century. Between 1900 and 1970 there was at least a tenfold reduction in the area of actively coppiced woodland in Britain (Figure 2). This was brought about by the collapse of its traditional markets. Demands for firewood diminished as coke and coal became alternative fuels, and this led indirectly to an increasing preoccupation with plantation forestry. Coppicing died out first in the north and steadily contracted towards the south-east until by the 1960s active coppice was heavily concentrated in Kent and Sussex (Figure 3). Much of the present-day active coppice is very different from the traditional mixed coppices of the English lowlands. Underwood was once rarely grown without standards, but now the area of simple coppice is more than double that of coppice-with-standards. In medieval coppices few standards were allowed to grow on for more than three coppice rotations. The number of standards in a wood varied enormously, with up to 40 per acre, usually of uneven age. Nowadays, standards are often allowed to grow much larger, up to 150 years. Another change is that approximately half the area of coppice is now of sweet chestnut, much of which was probably planted in the last 200 years. Even today some planting of chestnut coppice continues.

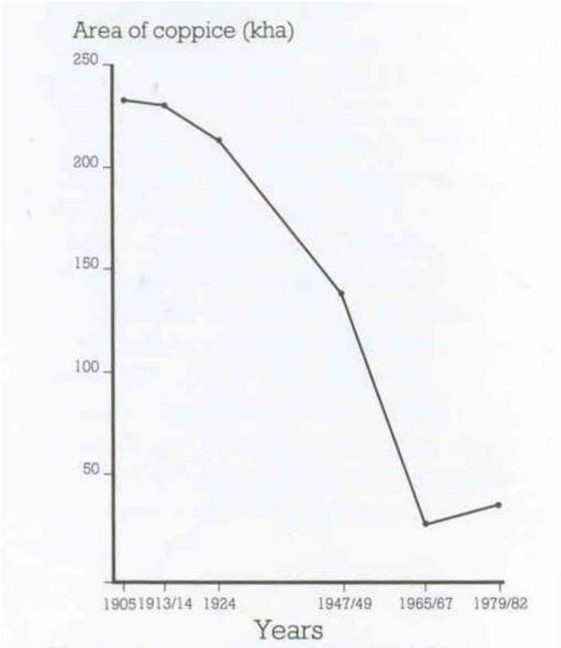

Figure 2 The decline in coppicing in Britain 1905 – 1982. Estimated areas were derived from Peterken (1981) and Forestry Commission censuses

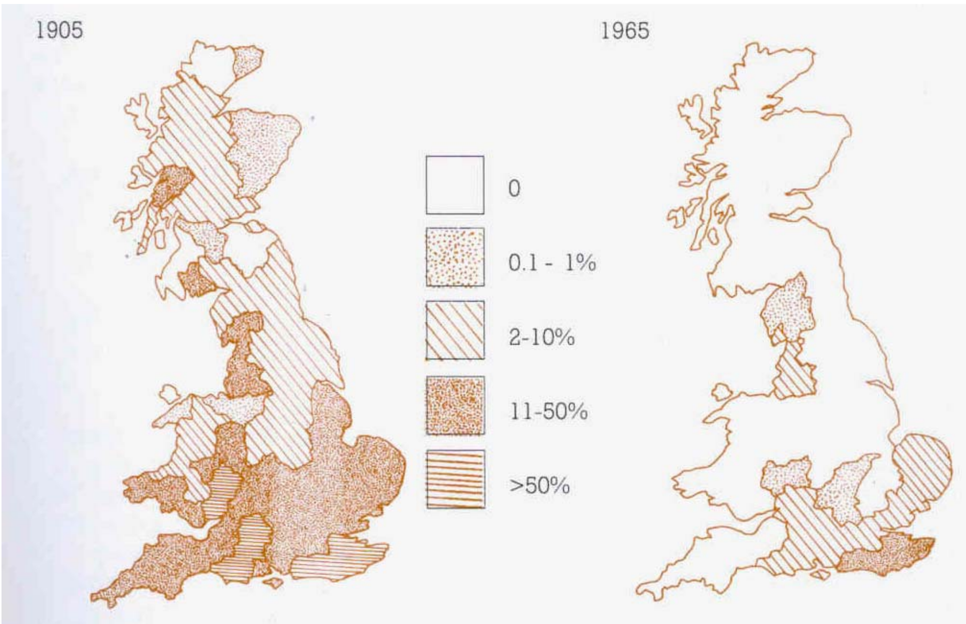

Figure 3 Distribution of actively coppiced woodland in Britain, showing the contraction of coppice towards the south-east during the 20th century. The area of coppice in each county is shown as the percentage of the total woodland area in 1905 (after Peterken 1981)

Many woods last coppiced between 1920 and 1950 have been grubbed out or converted to conifer plantations. Others have simply been neglected. Various terms can be used to distinguish these relic woods from actively coppiced woods where there is a continuing programme of cutting - derelict, neglected, abandoned, overstood, or stored coppice. Left alone, these woods will eventually return to some form of high forest dominated by mature trees. The total area of active coppice remains a small fraction of that 100 years ago. Nevertheless, since 1970 there has been something of a coppice revival centre on, but by no means confined to, derelict coppice in nature reserves.

Furthermore, a new sort of coppice has emerged in which fast-growing species such as poplars and willows are grown in dense plantations and harvested on a short rotation to provide fuel. This short-rotation coppice is of limited value for nature conservation compared with time-honoured coppice systems. However, it may prove attractive to some species by increasing habitat diversity in, for example, arable landscapes.

The conservation value of coppice

In the Middle Ages most underwood was composed of mixtures of trees and shrubs descended from those in our prehistoric forests. Invaluable relics of this special vegetation still survive in many ancient woods where coppicing was continued into the present century. It is important that the traditions of coppice management continue in appropriate lowland broadleaved woods for the following reasons.

1. Most woodland plants and animals are largely confined to ancient woods which have had a fairly stable history of coppice management over hundreds of years. These species have been suited by this management in the past and are likely, therefore, to benefit from it in the future.

2. Many woods have become much poorer in their ground vegetation and in insect species since the decline in coppicing. Some butterflies, in particular, require the open conditions of newly cleared woodland which was once provided by coppicing. Several of the woodland fritillary butterflies, for example, have become much rarer since the decline in coppicing (Figure 4).

3. Actively coppiced woodland is very diverse in its structure and is, therefore, attractive to many different plants and animals. Rich communities of birds, for example, can be found in coppiced woods with many stages of growth. Although no birds are confined to coppiced woods, some, such as nightingale and garden warbler, find ideal habitats in coppice. These species and other birds needing open and young woodland were probably far more widespread before the decline in coppicing.

4. Many people find that coppicing creates an aesthetically attractive woodland. Not everyone agrees, of course, but few can fail to appreciate the magnificent carpets of spring flowers that often appear in recently felled areas. The cultural value of coppicing should not be overlooked: it should remain as a link with our disappearing rural traditions.

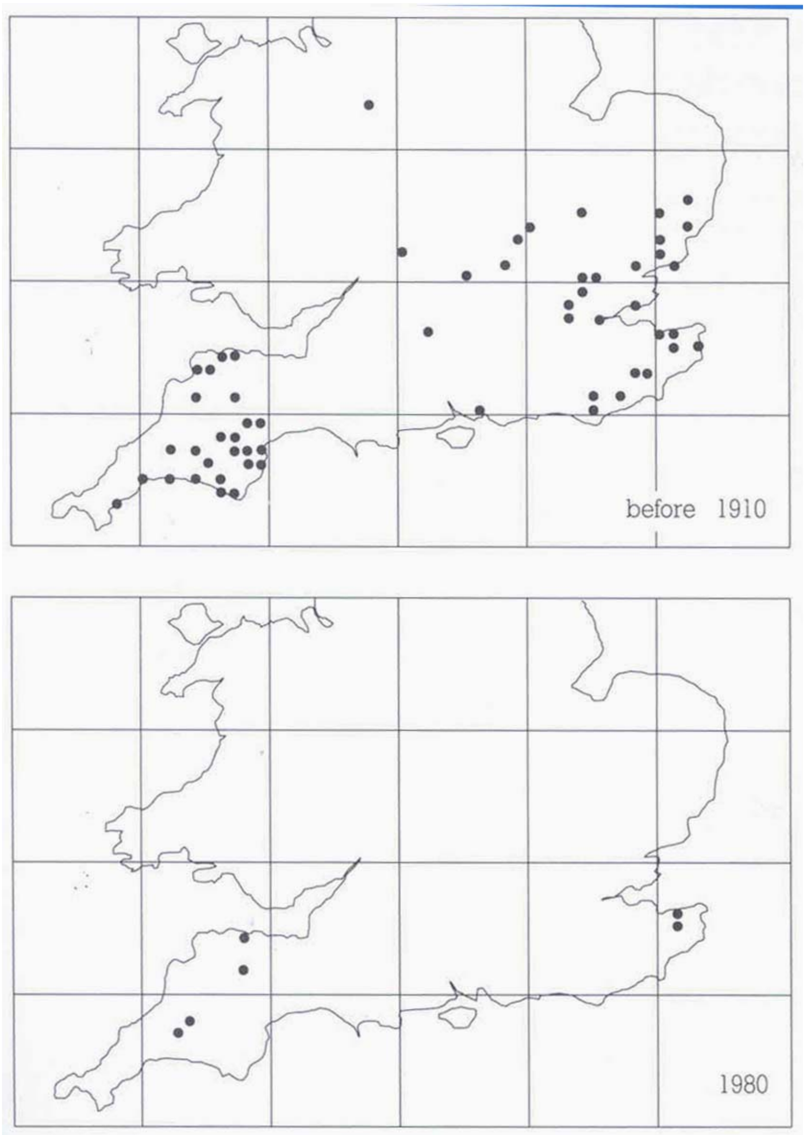

Figure 4 The decline of the heath fritillary butterfly. The distribution is shown before and after the decline in coppicing. Dots indicate presence in 10 km grid squares of the National Grid (after Warren *et al*. 1984).

How wildlife responds to the coppice cycle

A sequence of changes in the vegetation and its associated animals is set in motion each time a coppice panel is cut. A typical mixed coppice in south or east England might develop in the following way. In the first summer after cutting, the woodland floor usually has a rather sparse vegetation, but by the second summer the ground is carpeted with spring flowers and other plants. The coppice itself is very open in the first three or four years, and this allows species such as birch and bramble to establish themselves between the stools. The result can be an almost impenetrable tangle of low foliage, which persists until the coppice canopy closes, usually about five or eight years after cutting. The increasing shade rapidly eliminates most of the foliage beneath the canopy, which by this time may be over six metres above the ground. Until the next cutting there are no further changes to the structure of the vegetation other than continued growth of the coppice stems (Figures 5 and 6). However, if it is left long enough (that is, beyond the normal cutting age), the composition of the underwood may alter as species such as hazel are overgrown by more strongly growing trees like ash, alder and birch.

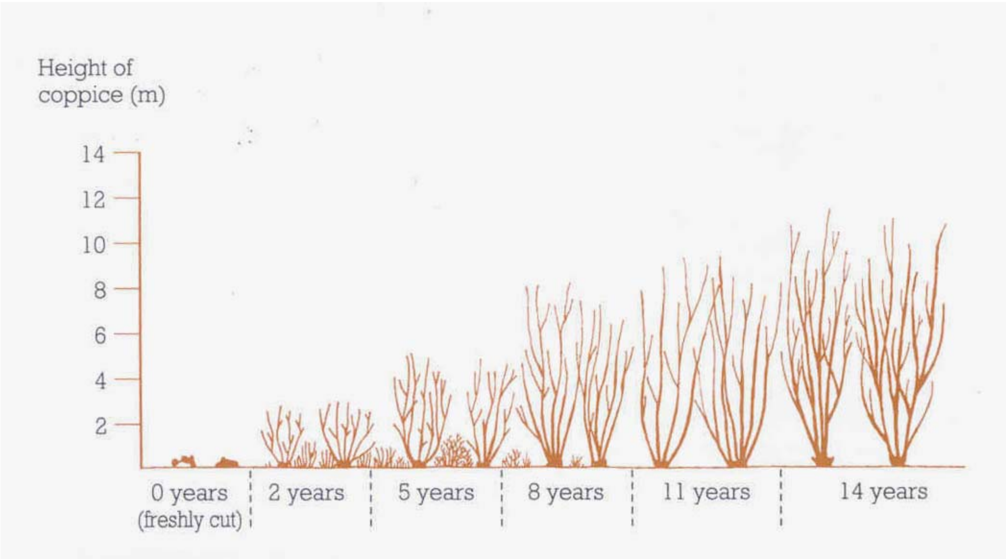

Figure 5 Changes in vegetation structure in simple coppice as the vegetation grows. Note the well developed low vegetation in the early years of growth.

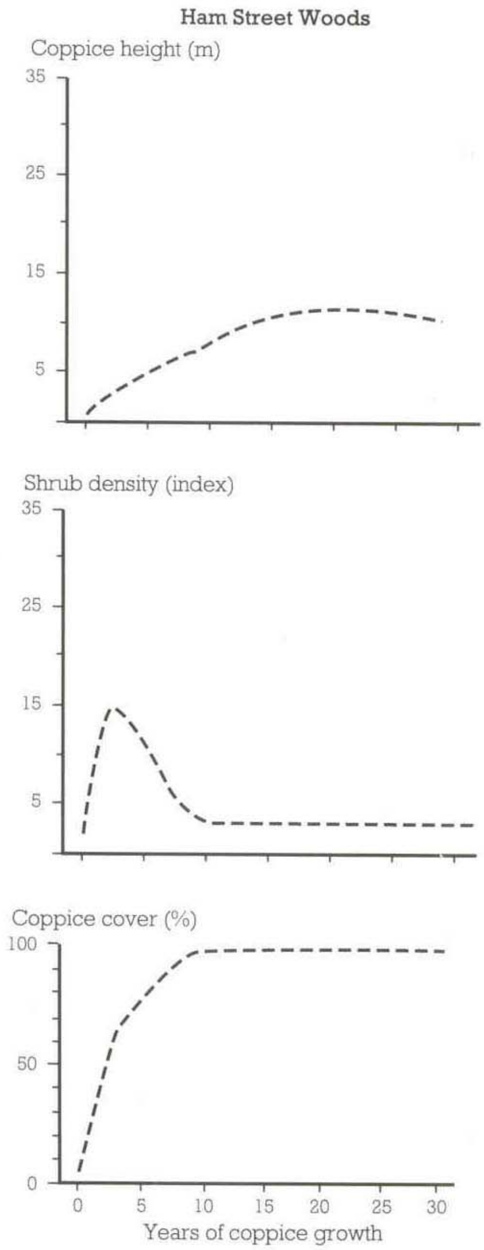

Figure 6 Changes in the structure of coppiced woodland at Ham Street Woods NNR in Kent (after Fuller, Struttard & Ray 1989)

The ground vegetation

The response of the ground vegetation when the underwood is felled is often spectacular. Under the shade of a mature coppice canopy the field layer is usually very sparse. However, midsummer light increases about 20-fold and spring light fourfold after coppicing, and this triggers a rapid change in the appearance of the woodland floor. The most dramatic response is often seen in the second, or occasionally the third, year after cutting, when the flowering and vigour of many plants are at a peak. At this time spring flowers - anemones, bluebells, ground-ivy, yellow archangel, water avens - can carpet the ground. Many of these plants which suddenly appear in freshly coppiced panels have survived in the shaded coppice by growing vegetatively (without flowering). Others, like centaury, wood spurge, rushes, foxglove and St John’s-wort germinate from buried seed. But not all the light-demanding plants that thrive in the open panels manage to survive as seeds under old shaded coppice. Thistles and willowherbs, for example, may spread into young coppice from other open areas within the wood or even from outside the wood.

Many woodland plants, especially spring-flowering ones, benefit from coppicing. Alternating periods of light and dark ensure that they are able to flower periodically without becoming overwhelmed by more competitive species. The amount of mature coppice depends very much on the tree species. Pure hazel or hornbeam casts a very heavy shade compared with mixed coppice or ash, under which some of the light-demanding plants may be able to continue flowering. Only a handful of plants, such as dog’s mercury and herb-paris, prefer the shady conditions under older coppice and tend to decline after cutting.

Invertebrates - general

Many invertebrates have two characteristics which set them apart from most other wildlife groups. First, they often have completely different habitat requirements in each developmental stage. Secondly, the survival of many invertebrates population depends on suitable conditions being available every year, often within rather small areas. This is because they have annual life-cycles and many species lack the ability to disperse, sometimes even small distances, to new areas of suitable habitat.

Apart from the butterflies and moths which are considered separately below, the response of invertebrates to coppicing is poorly known. In general, the first year after cutting is characterised by very large numbers of a few species, notably ground-dwelling species such as ground beetles and wolf spiders. The highest densities of most groups occurs in years 2 to 5 after cutting, with numbers gradually falling off after canopy closure. Many invertebrates undoubtedly thrive in young coppice because it provides open ground with a particularly warm microclimate for adults feeding at flowers or hunting for prey and because the highly diverse ground flora provides opportunities for numerous specialist herbivores.

Invertebrates typical of young coppice include certain bees, wasps, leaf beetles, weevils, bugs, wolf spiders and jumping spiders. Nests of the wood ant *Formica rufa* reach highest densities in the first few years after cutting, with very few remaining after canopy closure. Its national decline may be partly due to the widespread cessation of coppicing. Another declining species associated with young growth is the leaf-mining hoverfly *Cheilosia semifasciata*, recently seen in only one site in England but which formerly bred more widely on orpine in young coppiced woodland. In contrast, some invertebrates become most abundant in the later stages of the coppice cycle, or in neglected coppice, and tend to be less numerous in newly cut areas. These include certain leaf-mining moths and spiders.

Taken as a group, invertebrates need a wide range of woodland habitats, many of which can be provided by coppicing. However, short rotation coppice will not cater for all woodland invertebrates, especially those adapted to breed in mature forest habitats, in particular in dead wood or fungi. Nonetheless, it may be possible to cater for some of the dead-wood specialists in a coppiced woodland by retaining large old standard trees or scattered boundary pollards. For long-term survival, though, they will need a continuous supply of such features through the establishment of new generations of standards or pollards. In addition, large coppice stools (especially of ash, oak, lime or beech) may contain microhabitats such as rot-holes which are invaluable to dead-wood invertebrates.

Butterflies and moths

Woodland supports more species of butterflies than any other British habitat. As with plants, many of these insects have long benefited from coppicing, and several species have decreased alarmingly in woods where regular cutting has ceased. Most butterflies have just one or a very small number of plants upon which the larvae will feed. In the absence of the correct larval food-plant the butterfly cannot breed and, for most species, the plants must be growing in exactly the right conditions of shade. The majority of woodland butterfly larvae feed on herbs which occur along rides and in open sunny areas such as those created by coppicing. Adult butterflies do not generally have such particular food requirements as the larvae, but instead taken nectar from a range of the commonest flowers present.

Perhaps only the speckled wood and white admiral, which prefer rather shaded woods, have benefited from the coppice decline. On the other hand, the Duke of Burgundy, chequered skipper, pearl-bordered and small pearl-bordered fritillaries, high brown fritillary, heath fritillary and silver-washed fritillary are all butterflies which were formerly more widespread in woodlands. Each needs a food-plant growing in open sunny places or on the edges of clearings. The increasing shade of neglected woodland has undoubtedly contributed to their decline. Many of the fritillaries, for example, feed on violets, which flourish in young coppice. In its woodland habitats the heath fritillary is virtually confined to young coppice in Kent, where it feeds on common cow-wheat. In vigorous coppice, numbers of this butterfly peak two or three years after cutting, but it has disappeared by six years (Figure 7). Ideal conditions have been specifically created for this butterfly at Blean Woods National Nature Reserve, Kent, by linking actively coppiced panels with systems of carefully managed rides and glades. The heath fritillary has such poor powers of dispersal that it is unlikely to colonise a new site more than one kilometre from its nearest breeding colony. This explains why it has been so vulnerable to the decline of coppicing in British woods. Several moths also rely on plants which flourish in recently cut coppice. Examples include the drab looper, which breeds on wood spurge growing in open, sunny conditions, and the starwort and, a great rarity, the cudweed moth, both of which feed on goldenrod. Numerous less specialised moths move in to exploit the grasses and herbs that are present: one study found a marked increase after coppicing in the small dotted buff, lunar underwing and brown rustic. However, unlike the butterflies, a large proportion of the moths feed on the foliage of particular trees and shrubs and are more abundant in the middle to late stages of the coppice cycle, or even in neglected coppice. An important feature for moths is, therefore, the presence of a good range of tree species in both the coppice and the standards.

In general, the number of moths and the range of species increase through the early years of coppice growth. The woodland moths associated with trees and shrubs move onto the coppice regrowth from one year onwards. Larvae of moths such as the winter moth, mottled umber and dotted border feed on a wide range of tree species and will drop from standards in the spring and continue their development on the young coppice. Others, such as the more local brindled white-spot, can become common two or three years after coppicing. By this time, when there are patches of various herbs and grasses as well as the coppice regrowth itself, the number of larger moths alone can easily exceed three hundred species. Mature hazel coppice continues to support the commoner moths, which tend to be those that establish themselves in young coppice, but it also contains a range of less common species. Examples are the barred umber and the small white wave. However, if the coppice becomes over-mature and neglected, the variety of moths will probably decrease, although some of the rare woodland species, such as the misnamed common fan-foot, are often found in such conditions. Old coppice is also important as a shady daytime roost for many moths such as the mottled beauty, pale oak beauty and light emerald. It also provides shelter for the weaker-flying geometrid moths (for example the Devon carpet), although the larval food-plants usually occur on open ground. Recent work has also shown that some species of leaf-mining moths are most abundant in old or derelict coppice.

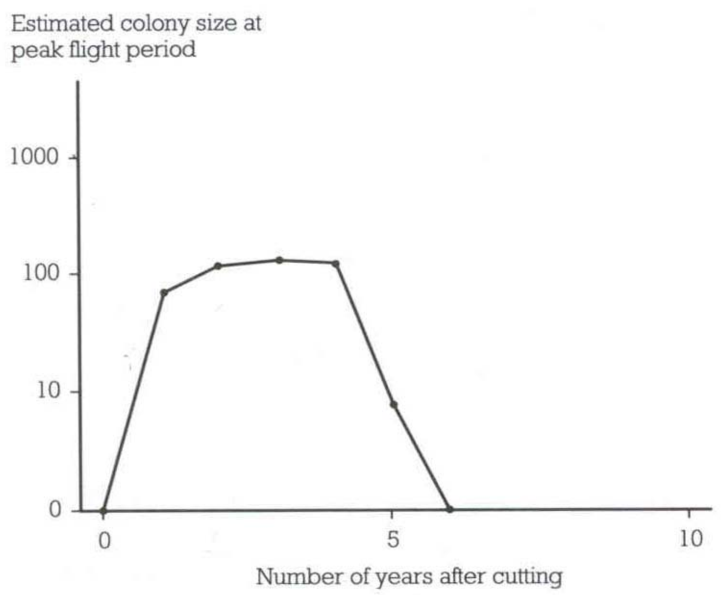

Figure 7 Changes in colony size of the heath fritillary in relation to the growth of vigorous chestnut coppice in a Kentish woodland. Colonies survive for slightly longer in less vigorous or poorly stocked coppice (after Warren 1987).

Birds

As with the butterflies, there are many birds which are strongly dependent on highly ephemeral habitats. Unlike butterflies, however, most birds are not closely tied to a small number of plant species but respond to the overall structure of the habitat. A substantial number of the bird species which nest in British woods require areas of low open vegetation or scrub. These conditions can be provided by coppicing. In a large actively coppiced wood the breeding bird populations are highly dependent on the age of the coppice.

Within an actively coppiced wood, three broad groups of species can be recognised -

1. Species associated with the very open coppice. In sweet chestnut, tree pipits can be the first birds to colonise newly-cut coppice, followed by yellowhammers, linnets and whitethroats. Occasionally, nightjars breed in very young coppice in dry woods. Typically, these species reach peak numbers in the first three or four years of growth.

2. Species associated with the canopy-closure period. By the third or fourth year, when the low vegetation (within two metres of the ground) is becoming very dense, this group of species starts to colonise the coppice. These are mainly summer visitors, including garden warbler, willow warbler, nightingale, blackcap and chiffchaff. The one resident in this group is the dunnock. Although each of these species prefers a slightly different stage of coppice growth, all are strongly associated with coppice which has grown for 4-10 years and they rapidly decrease thereafter (Figure 8).

3. Species preferring old coppice. Robin avoids young coppice and is generally the most numerous bird in neglected coppice. Blackbird, chaffinch, great tit and blue tit follow a similar pattern in many woods. The density and numbers of breeding bird species is generally lower after canopy-closure than before.

Not all species fit readily into these three groups. Wren, for example, may peak in the canopy-closure phase but can remain common in older coppice. There can also be larger differences from one coppiced wood to another. This is perhaps clearest in comparing pure sweet chestnut with mixed coppice in Kent. Tree pipits, yellowhammers and linnets are typical of much chestnut coppice but less so of many mixed coppices. Conversely, large populations of nightingales and warblers are more or less absent from chestnut of the ‘correct’ age but are typical of mixed coppice. Chestnut may be different from other coppices because it has a relatively impoverished insect fauna and therefore presumably offers poor feeding conditions for birds.

The density and size of standards have an important bearing on the bird life of coppiced woodland. Woodpeckers, nuthatches, treecreepers, great tits, blue tits and chaffinches are scarcer in woods with very few large standards. On the other hand, too high a density of standards will suppress coppice regrowth beneath, thus making the coppice less suitable for nightingales and warblers.

Records per hectare

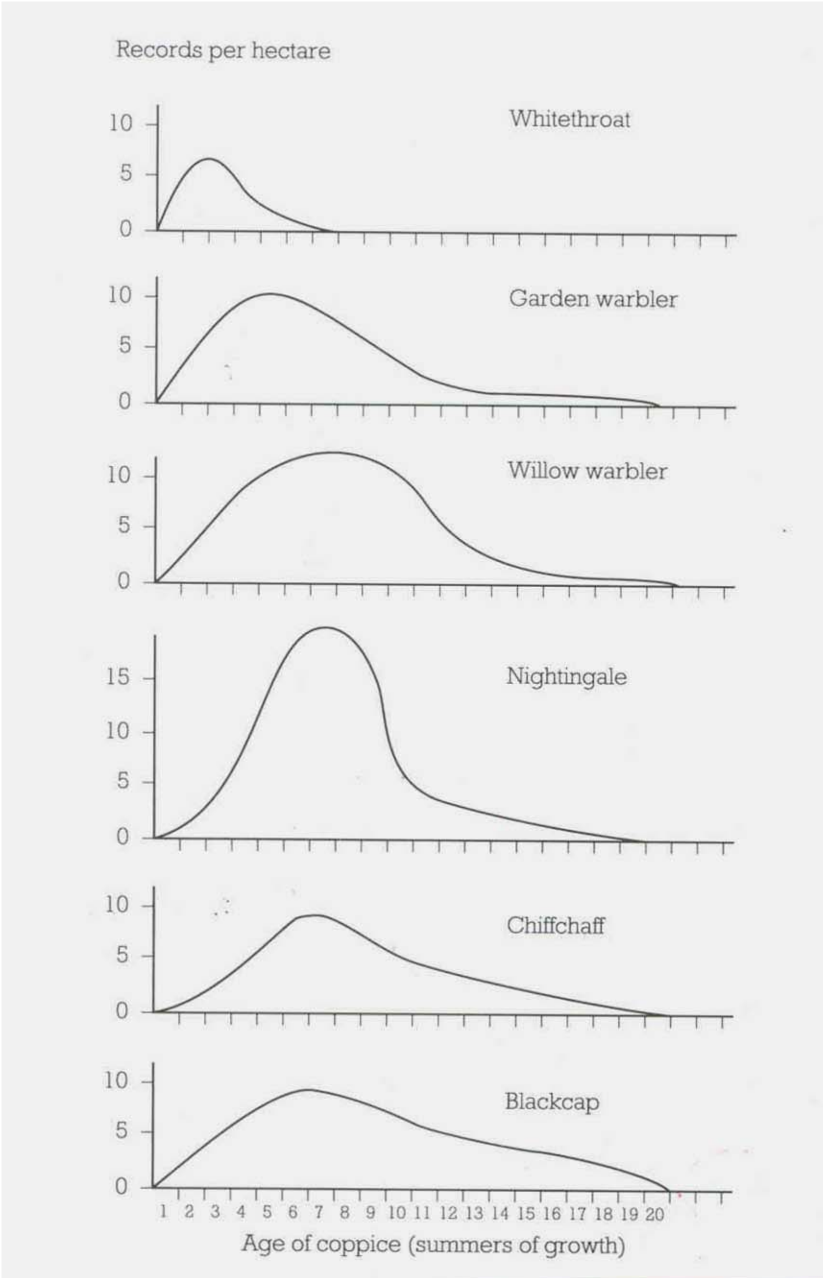

Figure 8 Abundance of breeding migrant birds in a Kentish woodland in relation to the age of coppice (after Fuller, Struttard & Ray 1989)

Small mammals

From studies in Bradfield Woods, Suffolk, it is clear that small mammals are strongly influenced by the cycle of coppicing. Freshly cut coppice is used only by wood mice, which are the commonest small mammals in the wood, occurring at all stages of growth. In the second year common shrews and bank voles appear, and their numbers dramatically increase in the third year, which supports double the density of small mammals as at any other stage of coppice growth. Numbers then decrease but remain fairly stable until the next felling, when the cycle is repeated. Of the scarcer species in Bradfield Woods, yellow-necked mice are present in all but the youngest coppice, while harvest mice, short-tailed voles, water and pygmy shrews are associated with young coppice.

Coppiced woodland in south and west England is one of the most important habitats of the common dormouse in Britain. Although hazel nuts are an important food for the dormouse, it seems that it needs a high diversity of trees and shrubs in its habitat to provide a year-round food supply. Coppice cut on a very short rotation is poor dormouse habitat because hazel will not produce nuts until it is five or six years old. On the other hand, very old coppice or areas heavily shaded by standards are equally poor. Dormice spend most of their lives amongst the foliage and branches of the coppice canopy and the standards. Therefore, without a continuous coppice canopy the animal is severely restricted in its ability to move about the wood. Where dormice are known to be present, special consideration should be given to their requirements before planning any new coppice management.

Coppice and game

Many woodland owners coppice woods because of the benefits this can bring for game, especially pheasants. The canopy-closure phase, when the low foliage is very dense, is favoured by pheasants. The females prefer to overwinter in very shrubby habitats, and the availability of such woodland can be an important influence on overwinter survival and hence the size of the breeding and autumn populations. This habitat preference of the pheasant broadly coincides with that of native birds such as nightingale and several warblers. Therefore, it is sometimes possible to manage coppiced woods in such a way as to benefit both game and some wildlife species.

Managing coppice for wildlife

The numbers and kinds of plants and animals found in an actively coppiced wood are strongly influenced by both past and present management. Much can be done to enhance a coppiced wood for wildlife through careful planning of the management. It is essential, however, to decide the objectives of the management before planning the programme of coppicing in detail, because some groups of plants and animals have conflicting requirements. Where a scarce or vulnerable species, such as the heath fritillary or common dormouse, is known to be present, then clearly the management plan should take special account of its needs. In other woods an appropriate objective may be to encourage as high a diversity of species as possible. The main issues in drawing up a coppice management plan to benefit wildlife are considered below.

Rotation length

Many of the specially interesting flowers, butterflies and birds of coppice depend on the early stages, before the canopy has closed. Indeed, the survival of some of these species within individual woods hinges on the constant creation of new areas of young growth. Species differ in their exact requirements. The first three years are particularly important to many plants, but migrant birds mainly depend on years 4-10. It is highly desirable, therefore, that substantial areas of young coppice of all ages up to 10 years are always present (Figure 9.1). Although this can be achieved by cutting on short rotations of, say, 12 years (though even this would be long for commercial hazel), this approach can be extremely labour-intensive in a large wood and the cycle is too short for the underwood to be valuable for pulpwood or firewood. Furthermore, longer rotations create a wide range of habitats. Old coppice does have its own wildlife interest, which should not be overlooked: it can be rich in fungi, mosses and small animals such as slugs and moths. Suitable tree holes for nesting dormice are often confined to older coppice. Indeed, for dormice rotations of less than 12 years seem undesirable. One solution can be to operate both short (less than 15 year) and long (25-35 year) rotations within the one wood (Figure 9.3). Such a split rotation can tilt the balance in favour of a predominance of young coppice but also ensures that a certain amount of old coppice is always present. Ideally, at least one panel should be cut every year. However, in some woods it may be more realistic financially, or where labour is short, to cut a larger area every few years. In such cases an acceptable interval between cuts would be two or three years (Figure 9.2).

The size of panels

Some huge butterfly colonies are supported by very small areas of suitable coppice (for example half to one hectare). On the other hand, the same areas may form just a part of the territory of one pair of whitethroats. Very small panels may suffer shading from adjacent taller coppice and excessive browsing by deer, which tend not to venture far from the cover of more mature coppice. To encourage large breeding populations of migrant birds it is best to create extensive areas of young and middle-aged coppice extending continuously over at least four or five hectares. This can be achieved by cutting adjacent blocks of at least half a hectare. In general, panels of less than a third of a hectare (approximately 60 x 60 m) are undesirable, while panels of between a half (70 x 70 m) and one hectare (100 x 100 m) are probably best. Where it is not possible to cut such large areas each year, make successive cuts in one area so that panels of similar age are adjacent. It should be recognised, however, that large panels may be inappropriate in a wood being managed for common dormice because this may create large areas from which the animals are excluded. Where a wood is known to hold an important population of dormice, it is best to cut panels no larger than 0.5 hectares, preferably about 0.3 hectares. In such woods extensive areas of very young coppice should not be created because these will be devoid of food for dormice.

The layout of a coppiced wood

Cutting in slightly irregular shapes can increase the length of edge between panels of different age. This may be beneficial to some species, although rather little is known about the importance of these edges to wildlife. A wood laid out in a symmetrical grid certainly offers less variety and surprise to the human observer. Aim to create a wood composed of irregular blocks of underwood, but avoid too many small narrow strips, except perhaps along selected rides where the edges could be treated as a form of linear coppice cut on short (5-10 year) rotations. Special attention should always be given to rides, for these can be important habitats in their own right. They can also be used to link areas of young coppice: some butterflies, for example, may colonise new areas of suitable habitat by moving along the rides. Where only a part of a wood is to be managed as underwood, it is best to coppice those parts closest to the rides. Information on ride management is given in another booklet in this series - *Woodland rides and glades: their management for wildlife*. When starting to coppice a neglected wood, concentrate on one part, so that after several years a cluster of young panels will be created. This facilitates the movement of animals from one suitable area to another.

How many standards?

Woods with standard trees are generally richer in wildlife than those without. Standard trees create an additional stratum of vegetation which is important for many insects and birds. They provide holes for nesting birds and they can introduce dead wood, which is usually scarce in coppice. If the aim is to create open sunny panels, good for flowers and butterflies, and to grow vigorous underwood which benefits breeding birds, then the number of standards must not be too great. The typical range is about 30-80 per hectare, but the optimum number depends on the size of the trees. The more large trees, the lower is the overall number of standards that is compatible with good underwood. As a general rule, no more than 15 large standards should be left per hectare. If the standards have to be thinned, try to leave a variety of tree species wherever possible. Particularly at the extreme edge of the wood, some large trees could be left to stand indefinitely as a source of very old timber which might be beneficial to wood-boring insects. The boundaries of many ancient woods were marked by pollarded trees, whose branches were cut periodically at some height above the ground.

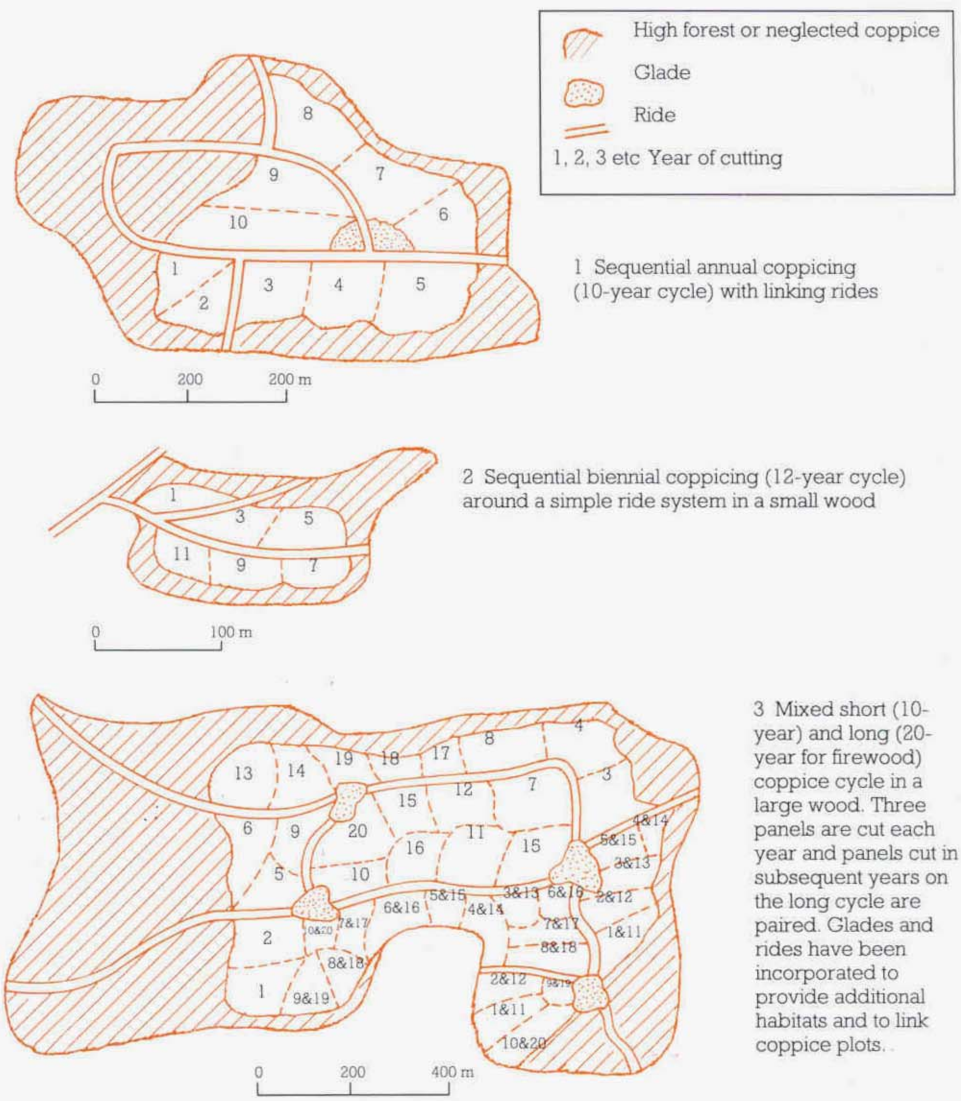

Figure 9 Examples of panel layout in woods to be partially coppiced

Problems with regrowth and stocking

When a wood is recoppiced, there can be problems with obtaining good regrowth, particularly if it has been neglected for some while. The main problems with neglected coppice are either that stool density is too low or that regrowth is sparse and patchy. This can lead to problems with invasive plants like bramble and coarse grasses, which can rapidly smother the ground flora. Poor regrowth is commonly caused by the density of standard trees being too high, resulting in overshadowing of the coppice, or by poor cutting procedure. Coppice stems should be cut cleanly, as close to the base as possible. The cut should be angled, to allow the rain to run off away from the stool.

New coppice stools can be established either by *layering* or by planting out new stools. Layering, or *plashing,* is achieved by cutting about three-quarters of the way through a stem (leaving the bark and outer layer attached) and pegging it along the ground, sometimes in a shallow trench. The stem can be detached from its original stood when it has rooted and begun to put up new shoots. New stools can also be obtained either by transplanting young stools cultivated in a nursery, or by *stooling* - which is achieved by mounting earth over existing stools and then splitting them after they have formed new roots. Practical details of these and other operations are given in the BTCV (1980) woodlands hardbook.

Deer browsing is an increasingly severe obstacle to successful woodland management. Intense browsing by fallow and roe deer can completely suppress regeneration and kill coppice stools, but large populations of the smaller species of deer can substantially reduce regrowth. The long-term solution is to reduce the size of deer populations but this requires co-ordinated efforts of many landowners over large areas. There are various approaches to reducing deer damage but none are entirely satisfactory in the absence of deer control. A fundamental difficulty is that by excluding deer from one area, the problem may simply be shifted to another. For example, if deer are excluded from some coppice panels within a wood, this can lead to increased grazing and browsing in rides and other open spaces which may themselves be areas of high conservation interest.

Several approaches are available for reducing browsing of coppice regrowth, though none are entirely satisfactory. The simplest is to cut the coppice in larger panels. If the intensity of deer browsing is not great this may help to restrict severe damage to the edges of panels, though in most coppice woods even the largest feasible size of panel may be too small to show any appreciable benefit. The second approach is to protect individual stools. This can be done by piling brash over them which may reduce damage by the larger deer, but may lead to increased damage from rabbits and possibly from smaller deer by providing more cover. A more effective method can be to enclose stools within rough brash fences though this is labour demanding.

The third approach is to protect individual panels with a temporary barrier during the early years of regrowth. It must be recognised, however, that there are several potential problems with fences which are discussed below. Traditional two-metre-high deer fencing may be effective but is too unsightly and costly in most coppice situations. There are two alternative methods of fencing which have been used in woodland nature reserves in eastern England. First, electric fencing can be an effective and safe deterrent for muntjac and Chinese water deer. An approach that has worked well is five strands of wire, with the highest 1.4 metres above ground. Flexi-netting should not be used because it is difficult to manipulate and can be a hazard to some mammals. Electric fences probably have rather limited application because they should not be used where the larger species of deer are present. Furthermore, it is essential that electric fences are checked regularly, so their use is limited to woods with full-time wardens. Second, fences of dense brushwood can be constructed around freshly cut panels. These fences certainly deter roe deer and may work against the larger species too. Their main drawback is that their construction requires much labour, though this is an ideal task for volunteer workforce.

Response of wildlife after the reinstatement of coppicing

Many woodland plants can survive for decades as buried seed and are likely to respond well when neglected woods are recoppiced. However, some may take several cycles for their propagules to become properly established, while those plants with poor dispersal ability which have become extinct in the site may be unable to recolonise. Birds are likely to respond well, as they are highly mobile and can quickly take advantage of any suitable new habitats that become available. The response of invertebrates will probably be much more variable, particularly the specialised species which may have become locally extinct after the cessation of coppicing. The more mobile species may colonise newly coppiced areas fairly readily, but many rare invertebrates are very sedentary and are unlikely to recolonise naturally. Several butterflies fall into this category, notably the smaller fritillaries. If a coppice-dwelling species is in danger of becoming extinct in Britain, artificial re-establishment could be considered. For example, a large population of the heath fritillary butterfly has been successfully re-established since the reinstatement of coppicing on a nature reserve in Essex, a county where the species had been extinct for over 20 years. However, re-establishment is only worth considering if the ecology of the species is accurately known and there is a long-term commitment to continue the coppicing in a suitable manner. All such re-establishment programmes should be planned carefully, with full consultation with the statutory nature conservation agency and site owners. The code of the practice produced by the Joint Committee for the Conservation of British Insects (1986) should always be followed.

What are the alternatives to coppicing?

Wherever mixed underwood has a long history of being coppiced and is still being treated as active coppice, every effort should be made to continue the traditional management. Actively coppiced woodland, with its associated wildlife, is a rare resource. The choice is not necessarily so straightforward where coppicing was abandoned long ago. Coppicing is labour-intensive and careful consideration should be given as to whether it can be maintained in the long term. Although some derelict coppices can be restored, even after as much as 100 years of neglect, there may be problems in establishing good-quality regrowth and in realising the desired responses of wildlife (see above). Nevertheless, the potential benefits of revitalising coppicing in much mixed underwood can outweigh the difficulties and there are many successful examples. The case for traditional coppicing is not so strong where the coppice is dominated by one species, as in the northern and western oakwoods. Some derelict coppice may have developed its own special fauna and flora, which might be damaged if coppicing is restarted. In this case, the best option may be to leave the wood untouched or to revive coppicing in one part of the wood. From a conservation viewpoint, coppicing is not always the best policy in very small woods of less than about five hectares because rather small panels have to be cut to obtain a range of ages. This problem can be overcome by not cutting every year. Alternatively, it is sometimes possible to manage a group of adjacent woods as one unit.

There are several possible alternative ways of treating neglected coppice. One is to do nothing. If left alone, old coppice may eventually, perhaps only after more than 200 years, take on some of the characteristics of a natural forest. This is worth attempting on some nature reserves. However, in many cases some financial return will be expected and promotion to managed high forest is the logical answer. In high forest woodland the primary produce is timber rather than underwood. Many derelict coppices can be thinned by singling (leaving the best stem to grow on from each stool) to create stands which will eventually produce good-quality timber. Another option is to clear-fell the coppice and to replant with native broadleaved trees at a fairly broad spacing, allowing the underwood to regrow as a shrub layer.

The conservation value of coppicing is unquestionable on sites with a long and continuing history of active management. In some regions there are now reasonable underwood markets available, and on shooting estates an added bonus is that it can provide valuable game cover. It should be recognised that high forest also has considerable conservation value, albeit of a different kind. Many animals need mature trees or dead wood and so prefer the habitats created by high forest management. Amongst birds, for example, hole-nesting species such as woodpeckers, nuthatches and tits reach higher numbers in mature woods, but generally these are not so rich in summer visitors as coppice. With careful management the semi-natural communities of trees and shrubs found in ancient underwood can still be preserved after promotion to high forest. From a conservation viewpoint, active coppice and high forest complement one another and our woodlands would be all the poorer if one were to dominate.

Acknowledgements

This booklet resulted from research programmes now commissioned by the JNCC, both in-house and from the British Trust for Ornithology, the Institute for Terrestrial Ecology and other ecological consultants. The following people have kindly supplied information for this booklet or commented on drafts - John Bratton, Paul Bright, Fred Currie, Steven Falk, Andrew Henderson, Dick Hornby, Paul Hyman, Roger Key, Keith Kirby, Peter Kirby, David Massen, Ian McLean, Pat Morris, George Peterken, Mike Pienkowski, Roland Snazell, David Steel, Alan Stubbs, Mark Tasker and Paul Waring. Stefa Birkenhead and Philip Oswald edited the text for publication.

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