The Management of Semi-natural Woodlands

4. Upland Mixed Ashwoods

PRACTICE GUIDE

Forestry Commission

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Contents

Publishing update

This guide was first published in 1994. This edition is a reprint with a revised format and further reading section (page 20), otherwise the text has not been altered. The section on further reading has been updated to include relevant advice published since 1994. Please note that all references to *Forestry Authority* should be read as *Forestry Commission*.

Introduction

Ancient semi-natural woodlands are a vital part of our heritage. They provide a range of habitats which support a rich diversity of plants and animals. Many woodland species depend entirely for their survival on the continued existence of these habitats. Ancient semi-natural woodlands form prominent features in many landscapes and collectively constitute a significant economic resource. They are all that remain of the original forests which covered most of Britain and now occupy only 1% of land area. Concern about the continuing loss of area and character of ancient woods contributed to the Government's decision to introduce the Broadleaves Policy in 1985.

The Broadleaves Policy aims to maintain and increase the broadleaved woodland by encouraging good management for a wide range of objectives and giving special attention to ancient semi-natural woodlands to maintain their special features. It has generally been very successful in encouraging the expansion and better management of broadleaved woodland and in preventing further losses of ancient semi-natural broadleaved woodland. However, there is a need for policy guidance to take more account of local and regional factors, especially for semi-natural woodlands which vary greatly in character in response to differences in climate, soils and history.

The management guidelines for the native pinewoods of the Scottish Highlands published by the Forestry Commission in 1989 have proved a successful example of guidance for a specific type of semi-natural woodland. We have now extended this approach into a comprehensive set of advisory guides on the management of ancient semi-natural woods throughout Britain. For this purpose, we recognise eight broad woodland types as described in the Appendix.

The advice is intended to help owners and managers to achieve the best practice which will secure the woodland's future. The guides describe the management most appropriate for each type of woodland. Devised by Forestry Commission staff working closely with foresters and ecologists with special knowledge and experience of managing British semi-natural woodlands, they form a distillation of the best advice available.

Whilst these guides are aimed primarily at ancient semi-natural woodland, much of the advice in them will also be appropriate for other semi-natural woods which are of high conservation value, and for long-established planted woods which have developed some of the characteristics of ancient semi-natural woodland, notably where native trees were planted on ancient woodland sites.

The ecological value and character of ancient semi-natural woodland varies considerably. Some, notably in less accessible upland areas, owe much of their current value to a relatively low intensity of past management, although none have been totally unaffected by human influence. Others, especially in the lowlands, have developed a distinctively rich flora and fauna through a long history of consistent silvicultural management. Some have lost many of their special characteristics through various types of disturbance and many have been reduced in size so much that their survival is at risk. All are part of the nation's heritage, and deserve forms of management which recognise their different values. Some are designated as Sites of Special Scientific Interest. These may have specific management arrangements agreed with the conservation agencies, which are outside the scope of these booklets. The advice given here is aimed at encouraging forms of management which maintain and enhance the special characteristics of all ancient semi-natural woodland.

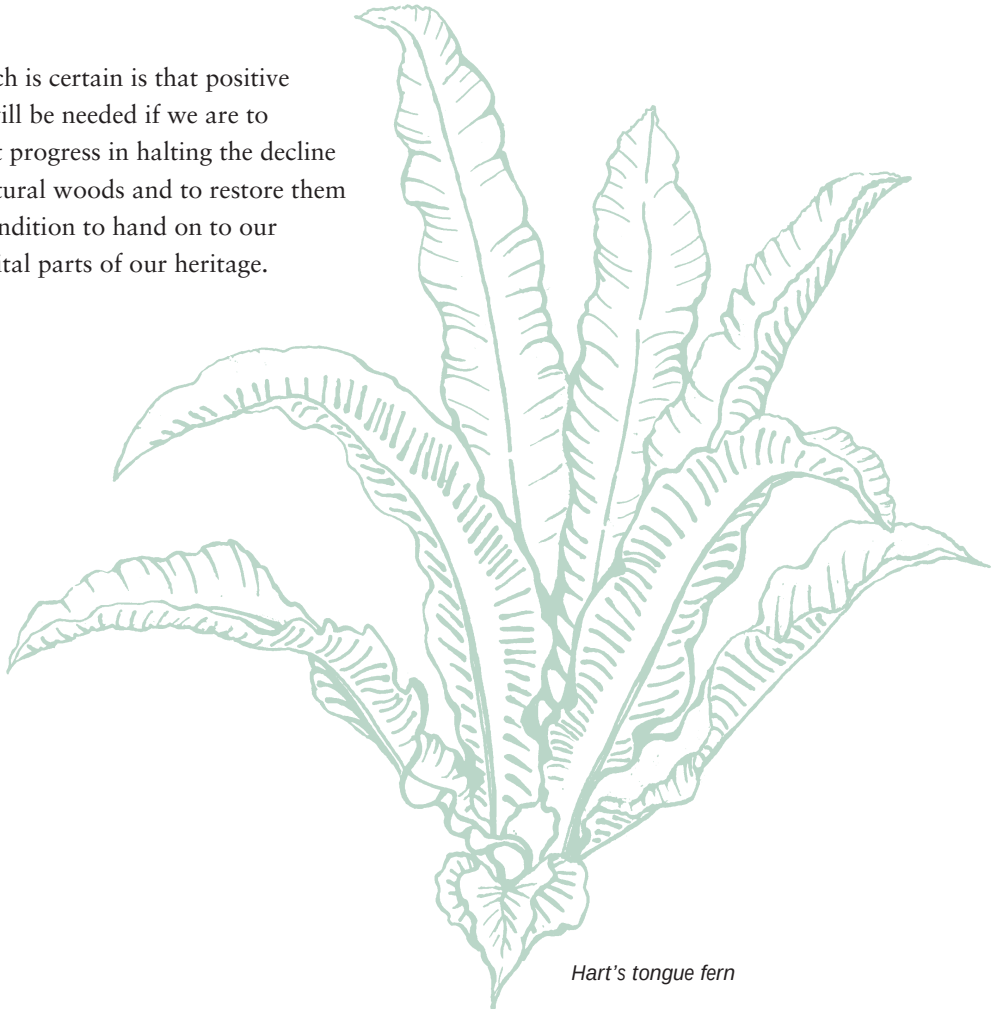
When grant aid is sought the Forestry Authority will compare management proposals with the advice contained in these booklets. Applicants are free to propose other forms of management for these woods, but must satisfy the Forestry Authority that their proposals will be effective in maintaining, and preferably enhancing, the special characteristics of the woodland. The advice given in these booklets is intended to create a flexible framework rather

than a straight-jacket, so that woods and their owners can develop their individuality as much as possible without reducing options for future generations.

Sensitive management which takes account of the individual character and circumstances of woods, and also the particular objectives of owners, is essential if their values are to be successfully maintained.

The appropriate form of management will vary considerably. In some cases, particularly some upland and many wet woodlands the most suitable management will be to reduce grazing and browsing pressures from deer or stock to levels which will allow natural regeneration or expansion of the wood to happen. More intensive forms of management may harm the unique wildlife interest of some of these woods. Elsewhere, especially in lowland woods with a long history of management systems such as coppice with standards, more active forms of silviculture will be appropriate and often necessary to conserve their character and wildlife as well as their value as an economic resource.

One thing which is certain is that positive management will be needed if we are to continue recent progress in halting the decline of our semi-natural woods and to restore them to a healthy condition to hand on to our successors as vital parts of our heritage.



Hart's tongue fern

Management principles for semi-natural and native woodlands

Semi-natural woods are composed of locally native trees and shrubs which derive from natural regeneration or coppicing rather than planting. Because of their natural features and appearance, semi-natural woods are valuable for nature conservation and in the landscape, and many are important for recreation and for historical and cultural interest.

Management should aim to maintain and enhance these values in harmony with securing other benefits, including wood products.

Ancient semi-natural woodlands are of special value because of their long, continuous history. They are the nearest we have to our original natural woodland and include remnants of the post-glacial forest which have never been cleared. They are irreplaceable assets which support many rare plants and animals and make a vital contribution to conserving biodiversity. They also contain a wealth of evidence of our past. Many have been greatly modified in structure and composition by centuries of management, whilst retaining many natural features. Some are threatened by neglect in the face of pressures such as fragmentation and overgrazing. The Forestry Authority encourages management which seeks to maintain or restore their special characteristics, including their natural diversity of species and habitats, aesthetic and cultural values and genetic integrity, whilst taking appropriate opportunities for wood production for a range of markets.

Management proposals should be geared to sensitive and low-key methods which are suited to the natural dynamics of these woodlands. Natural regeneration will be preferred to planting wherever practicable. More detailed guidance is given in the guide for each woodland type.

Other semi-natural woodlands, which have developed from natural colonisation of open ground sometime within the last few centuries, are also normally of high environmental value, particularly in the uplands, although they are not usually so valuable as ancient semi-natural woodlands because of their shorter history.

Appropriate management will vary according to the relative importance of these woodlands. For some, for example many long-established upland woods, management should be similar to that for ancient woods, whilst in woods of lower value a greater range of silvicultural options will be acceptable.

Planted woods of native species may often acquire some of the characteristics of semi-natural woodland, especially where they are on **ancient woodland sites**, where plants and animals have survived from the former semi-natural wood. The development of a varied structure and composition, including diverse native tree, shrub and field layer vegetation and the use of locally native species and genotypes for planted trees, can also increase the naturalness of native plantations.

Where planted native woods have developed a high conservation value in these ways management should be similar to that for semi-natural woods, but generally a wider range of silvicultural systems, including a greater emphasis on planting instead of natural regeneration, will be permitted under the grant aid and felling regulations.

New native woodlands, which are designed and managed from the start to develop a natural character, can help to offset some of the past losses of native woodland and will in time acquire a high environmental value, although they should not be seen as substitutes for any remaining semi-natural woodland.

The Forestry Authority will encourage by grant-aid the creation of new native woodlands on open land by natural colonisation or planting, where species composition and site are suitably matched, especially on areas close to existing semi-natural woods. Further guidance can be obtained in Bulletin 112, published by the Forestry Authority.

What are upland mixed ashwoods?

Ash

This guide deals mainly with management of the semi-natural ash-dominated woods of western and northern Britain, which grow mostly on neutral and alkaline, often moist soils in a cool, wet and windy climate, from Cornwall to north-west Scotland. They are particularly characteristic of limestone districts, such as the Mendips, Pennines and around Morecambe Bay, where they form the most abundant type of semi-natural woodland, but they are also frequent on Old Red Sandstone in south Wales, the Jurassic limestone of the North Yorkshire Moors and limestone outcrops in Skye and elsewhere in north-west Scotland. These last are the most northerly examples of this type in the world. Wherever they occur, they form the richest assemblages of flowering plants and often include rare and colourful species. There are estimated to be 40 000–50 000 ha of ancient semi-natural woodlands of this type.

A typical example on limestone would be a mature wood, growing on thin, dry soils, dominated by ash, but with some wych elm, oak, and perhaps gean and lime, growing over a patchy understorey of hazel. Equally typical, however, are strips of tall, ash-dominated woodland arranged along the lower edges of acid oakwoods, or on the steep, broken ground beside streams. The soils here are deeper, moister and more fertile than elsewhere in such woods. Wych elm, oak and hazel again accompany the ash, but alder may also be frequent. Such woods are usually as heavily grazed as the adjacent oakwoods.

The upland mixed ashwoods include the northern and western counterparts of the lowland mixed broadleaved woods (Guide 3) and the beech–ash woods (Guide 2), and ash-rich parts of western upland oakwoods (Guide 5) on base-rich soils. At the southern end of their range on the Carboniferous limestones of Devon, Somerset, Wales and the Welsh borders, they include a much greater variety of tree species, which often includes small-leaved lime, field maple, whitebeam, yew and holly. At the northern and oceanic end of their range, the ash is accompanied by rowan and birch. Some woods throughout their range have been invaded by sycamore or beech.

This variety is described in the National Vegetation Classification (Rodwell, 1991[1]) within 2 main woodland types. These are W8, which is the extension into the uplands of lowland mixed woodland, and W9, which includes the more northern and oceanic form of ashwood.

Ash–field maple–dog's mercury woodland (W8, e–g)

These are the woods of heavy, base-rich, poorly-drained, but fertile soils throughout lowland Britain, which intrude into the uplands in Wales, western England and the upland fringes of eastern Scotland. Ash is usually the commonest tree, usually with some wych elm and sycamore, with field maple in southern examples, and only limited amounts of both sessile and pedunculate oak. The underwood comprises hazel and hawthorn, with scattered elder, and often numerous saplings of sycamore and beech. Occasionally, southern shrubs, such as spindle and dogwood are found. The ground vegetation usually has a carpet of dog's mercury with an admixture of ivy, nettle, bramble, harts tongue fern and a scatter of other herbs, such as wood anemone, but it rarely includes bracken.

Three distinctive sub-types occur in the uplands. The herb robert sub-community (W8e) forms a herb-rich mixture on fertile sites with characteristic species, such as yellow deadnettle, enchanter's nightshade, wood sedge and wild arum. In well-irrigated sites, the highly distinctive wood garlic sub-community forms (W8f), which is often so dominated by the garlic that few other species occur, though cleavers, nettles and lesser celandine usually find a place. The wood sage sub-community (W8g) is characteristic of dry, rocky sites. Apart from wood sage, violets and grasses such as slender false brome, wood melick and oat grass are frequent.

Ash–rowan–dog's mercury woodland (W9)

These are the ashwoods of moist, brown soils derived from limestone and other calcareous bedrock in sub-montane and oceanic climates. Ash is characteristically dominant with an underwood of hazel, accompanied by Downy birch, rowan, wych elm, sycamore and hawthorn, but with few oaks. Growth is limited by the cool, windy climate. Most woods are heavily grazed with a ground vegetation containing sweet vernal-grass, but where grazing is less severe, dog's mercury, common violet, wood sorrel, wood avens, primrose and male fern are characteristic. Wetter ground supports a richer mixture with meadowsweet, water avens, marsh hawsbeard, wood cranesbill and various ferns. In the oceanic climate, bryophytes are often abundant.

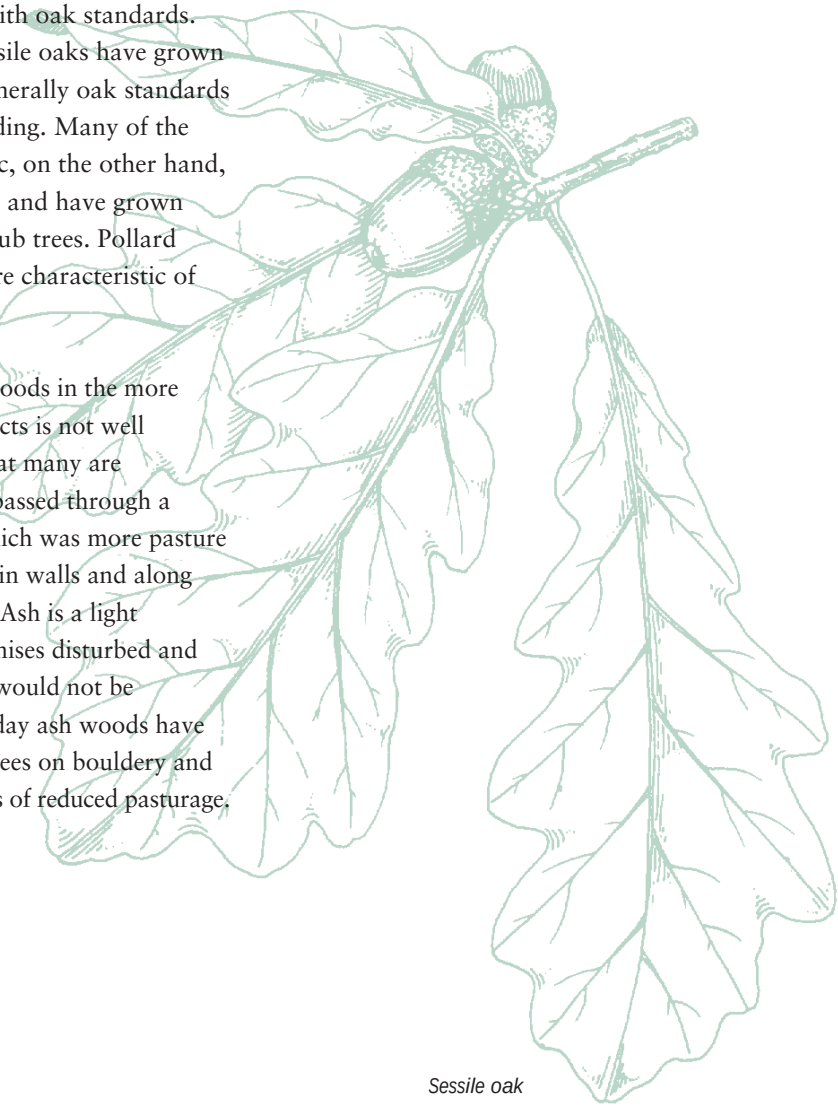
On the large limestone outcrops, mixed ash woodland may be the only woodland type within large woods, but often ashwoods are mixed with other types. The most widespread arrangement is for acid upland oak woodland to occur higher up slopes on less fertile soils, and for wet alder woodland to form on the wettest ground beside streams. In these circumstances the small area and inaccessibility of the ash woodland may preclude distinctive forms of management. An extreme form of ashwood grows on limestone pavements, where woodland is commonly mixed with open, bare rock, light scrub and limestone grassland.

History and traditional management

The upland ashwoods growing on the more fertile soils within oak woods have often developed only in recent decades after the oak was last managed. Although some trees have been coppiced, most are maiden stems which are younger than nearby oaks. In these situations it is possible that ash–wych elm woodland was originally more extensive, but was reduced to the moist fertile soils by management for oak and by soil degradation associated with timber cutting. These ashwoods are therefore recovering some of the ground lost over the last century or more. Typically, they take the form of groves of tall, slender stems.

In Wales and England a high proportion of the ashwoods on ancient woodland sites have been treated as coppice-with-standards for centuries. In the Mendips and Welsh borders, they have been treated as mixtures of hazel, ash, field maple and lime coppice, with oak standards. On the deeper soils the sessile oaks have grown to substantial trees, but generally oak standards have been short and spreading. Many of the coppiced ash, lime, oak, etc, on the other hand, have survived for centuries and have grown into immense stools and stub trees. Pollard limes, ash, elm and oaks are characteristic of these woods.

The history of upland ashwoods in the more northerly and oceanic districts is not well known, but it is possible that many are secondary woods, or have passed through a wood-pasture condition which was more pasture than wood. Ashes growing in walls and along streams were often lopped. Ash is a light demanding tree which colonises disturbed and open ground quickly, so it would not be surprising if many present-day ash woods have grown up from such seed trees on bouldery and rocky ground during periods of reduced pasturage.



Sessile oak

Values

Landscape

The grey bark, light foliage and pale winter crowns of ash diversify upland oakwoods and emphasise the natural lines in the land forms. The unbroken canopy of mature woodland forms an essential element of the semi-wild character of western and Highland scenery. Ashwoods on limestone often lie in bleak, spacious landscapes, to which they bring welcome shelter and a sense of scale. The rounded outlines of mature ash diversify the angular character of the rocky outcrops above and the geometry of the walled fields below, whilst blending with the predominantly pale tones of the limestone scenery.

Historical and cultural

Ash spread rapidly in the Post-glacial period and reached its current range at least 6,500 years ago. Those woods with a coppice history have been part of the local landscape for centuries. They and the woodbanks which define them will be amongst the oldest historical monuments in the parish. Many ashwoods contain small quarries, mine adits, remains of lime kilns and other relicts of an industrial past. Away from the lowland fringes, most woods are bounded – and many are sub-divided – by walls, which defined past property and grazing limits. Lower margins commonly incorporate the remains of small fields, which have been re-absorbed by the wood. Old pollard and stub trees still mark the boundaries.

Wildlife conservation

Mixed ashwoods are amongst the richest habitats for wildlife in the uplands. They diversify upland oakwoods to the extent that the length of the plant species list for an upland wood is usually determined by what is found in the small inclusions of ash, rather than the character of the main areas of oak. Well developed ash woods are notable for bright displays of flowers, such as bluebell, primrose, wood cranesbill, northern bellflower, lily of the valley and solomon's seal. Many extremely rare woodland flowers occur mainly in upland ashwoods, such as dark red helleborine, Jacob's ladder, autumn crocus, purple gromwell, bane-berry and whorled solomon's seal. Some rare native trees are found in these woods, notably large-leaved lime and various whitebeams.

In northern England ashwoods are commonly found growing on or near limestone pavements. These karst formations are usually recognised in their unwooded state, but some important pavements are and have long been well-wooded, and these preserve karst features in a near-natural state.

Mixed ashwoods also harbour a rich invertebrate fauna and the alkaline bark of ash supports an important lichen flora, particularly the Lobarion community. Amongst the breeding birds are redstart, wood warbler and, in north-west Scotland, redwing.

The significance of ashwoods for wildlife is far from confined to the tree-covered ground. The open spaces, particularly those containing exposed limestone pavement or tracts of limestone grassland, support many species which are not found under the trees. In those rare instances where small streams and seepages flow through limestone woods distinctive plants such as globe flower and bird's eye primrose may be found. In any particular wood, the open ground amongst the trees usually contributes as many species to the overall site list as the tree covered ground.

Recreation

Upland ashwoods occur in districts which the majority of the population associates with holidays and countryside recreation. They are prominent in the National Parks of the North Yorkshire Moors, Yorkshire Dales and the Lake District fringes. Many are permeated by trails which are well used by hill walkers. However, recreational usage requires careful attention to path location and design, for they

are particularly vulnerable to overuse, due to their thin friable soils.

Game and livestock

Some of the southern ashwoods on the lowland fringes are used as pheasant preserves, which can cause ecological damage in feeding and rearing areas, but the principal value of most upland ashwoods is as shelter and pasture for sheep due to their fertile soils. Many heavily grazed woods have lost much of their floristic interest as a short grassy sward has been created.

Wood production

Coppice forms of these woods on the lowland fringes have long yielded the traditional mixture of firewood, small wood and larger timber mainly for use in the local agricultural economy. Otherwise, upland ashwoods have not usually been important sources of timber. Poor growth on shallow soils and the stagnation often occurring in pure dense stands of ash produces stems which are hardly worth cutting. The high value of the surrounding grassland as pasture tends to preclude management as coppice. However, on deeper soils, which encourage faster growth, excellent ash timber can be grown. Sycamore and beech, where they have already been introduced, can also yield worthwhile timber.

Redwing

Policy Aims

The aims of policy are to encourage appropriate management of upland mixed ashwoods so as to:

- **Maintain and wherever suitable restore the natural ecological diversity;**

- **Maintain and where appropriate improve their aesthetic value.**

These two aims should be applied in every case. In the great majority of woods they should be compatible with each other but where conflicts do occur the first should tend to take priority over the second because of the national importance of ancient semi-natural woodland for nature conservation. However, each wood should be assessed according to its importance in the landscape and for nature conservation.

- **Maintain the genetic integrity of populations of native species, so far as is practicable;**

This aim is relevant for semi-natural woodlands where the genetic integrity of native tree and shrub populations has not been seriously compromised by past introductions of non-native stock within or close to the woodland.

- **Take appropriate opportunities to produce utilisable wood.**

The production of utilisable wood, including timber, is not an obligatory aim for every woodland. It is possible to achieve all the other policy aims without it, and indeed in those woods where minimal intervention is an appropriate philosophy, wood production may not be desirable. However, for many owners, securing an adequate income from their woodlands is essential in ensuring the continuity of management necessary to achieve these aims. Improving timber values, and hence the financial viability of the woodland, in ways compatible with other aims, is therefore a general strategy which the Forestry Authority encourages.

Many upland mixed ashwoods are capable of yielding significant quantities of utilisable wood products a proportion of which can be of relatively high quality. With good management as described in this guide these products can usually be harvested in ways which are compatible with achieving the policy aims.

- **Enlarge the woods where possible.**

Expansion of ancient semi-natural woodlands is very often desirable especially for small woods to secure their long-term future.

Each wood is unique in its characteristics and its relationship to the surrounding landscape. Many upland ashwoods pick out small areas of base-rich soil along flushed slopes and streamsides in semi-wild landscapes. Within practicable limits, the aim should be to maintain their small-scale diversity and character in future management.

Application of this guide

This guide should be applied to all ancient semi-natural woods of this type managed under the Woodland Grant Scheme. They will normally qualify for the special rate of management grant where work is done to maintain or improve the special environmental value of the wood. It will also apply to Felling Licence applications, to management under other grant schemes and to woodlands in the management of Forest Enterprise.

Semi-natural upland mixed ashwoods of recent origin can be almost as valuable as ancient semi-natural woods for nature conservation and scenic value, especially where they are growing next to an ancient semi-natural wood. Most semi-natural upland mixed ashwoods should therefore be treated in a similar way to ancient semi-natural woods.

Much of the advice in this guide can also be applied to ancient woodlands of this type which have been converted to broadleaved or mixed plantations. The nature conservation value of these woods is generally less than that of ancient semi-natural woods, so it is usually legitimate to place a greater emphasis on timber production. In ancient woods which have been converted to conifer plantations, but which have retained some nature conservation value, there may be opportunities to restore semi-natural upland mixed ashwoods, at least partially, by including appropriate native trees and shrubs in the next rotation.

Old planted woods of native species on sites which had not previously been wooded sometimes acquire a high conservation value. Again much of the advice is this guide can be applied in these cases.

Where the woodland is designated as a Site of Special Scientific Interest (SSSI) guidance must be sought from Scottish Natural Heritage, English Nature or the Countryside Council for Wales before carrying out any operation or change of management. Any other legal constraint on management, such as a Tree Preservation Order or a Scheduled Ancient Monument, must of course be respected.

The management plan

For any woodland to receive grant aid from the Forestry Authority, management objectives and a programme of work must be agreed for a five year period.

In the case of semi-natural woods, especially the larger and more complex ones, it will be helpful to prepare a separate management plan, which can be used for reference when the detailed proposals are revised every five years on grant applications. The management plan should contain an assessment of the woodland, including any special characteristics, a statement of objects of management and their priorities and a long-term strategy setting out the desired future condition of the wood and how it is proposed to achieve it. This will be of great value for semi-natural woods where management should be particularly sensitive to the individual values and character of each woodland. The management plan should be brief and succinct; long descriptive essays are not likely to be read.

Here is a checklist of some of the factors to be included where relevant:

Description

- Name, location.
- Areas, with sub-divisions if these clarify management proposals.
- Historical aspects, including past management.
- Tree and shrub species, notably dominant trees and abundant underwood shrubs.
- Age class distribution of trees; stocking; composition and condition of any natural regeneration.
- Ground flora; dominant species and any unusual species.
- Fauna, especially any rare, unusual, attractive or notable species.
- Conspicuousness in the landscape.
- Cultural features.
- Statutory designations.
- Constraints.
- Existing public access and planned future access.

The description should be a brief summary of the main features, ideally based upon survey information.

Local Forestry Authority officers may be able to advise on sources of specialist advice and survey information.

Evaluation

Itemise any special values, e.g. prominent in landscape, rare species, natural features, historical associations, quality timber potential. Careful assessment of the values of the wood will help to generate suitable management objectives.

Objects of management

All the policy aims must be respected, although as explained earlier not all are relevant to every wood. The owner may have additional objects of management for a wood. The owner should express the particular policy aims for the wood, giving details of management objectives and indicating priorities. Owners may find it helpful to discuss their objectives with local Forestry Authority staff.

Management proposals

A long-term strategy should be stated, which specifies any changes in composition envisaged, the overall woodland structure which is sought and any silvicultural systems to be used. It would be helpful to state the reasons for adopting this

strategy. The timescale may be many decades or more than a century. A five year summary work plan should be proposed, itemising the areas to be worked and the main operations to be carried out in the next five years.

Monitoring

A vital stage, often omitted, is the monitoring and review of management. Has it delivered the desired results? An ideal review point is the revision of a grant scheme or plan of operations every five years. Monitoring requires that some record be made of what the wood was like at the start of the period, the work done and how the wood responded. Experience demonstrates that, even in small and well-known areas, memory seldom provides the level of detail and accuracy required. Monitoring should be targeted to assessing how well the objectives of management are being achieved. This may mean, for example, assessing the success of natural regeneration or changes in woodland structure and species composition. Where rare habitats or species are present their progress may also be monitored in response to woodland management.

Simple techniques such as fixed-point photography can be used by non-specialists and provide valuable information over the years. Amateur naturalists as well as professional ecologists may be able to help with monitoring the wildlife of woods.

Some sources of advice on monitoring are listed in Further Reading and Forestry Authority staff may also be able to advise on what is needed for individual woods.

Dog's mercury

Operational guidelines

General principles

The policy aims for upland mixed ash woods lead to general principles for management.

- **Maintain semi-natural woodland types.**

Management should be based on growing species native to the site and appropriate to the pattern of soils within the site. Existing abundant species should remain a significant component.

- **Improve diversity of structure.**

A range of age classes within each site is preferred to the limited spread of ages often encountered.

- **Increase diversity of species, where appropriate.**

Many upland ashwoods of secondary origin have only a limited range of tree species.

- **Maintain diversity of habitat.**

A diverse structure and mixture of species improves habitat diversity, but open areas are also extremely important. They can be temporary (recently cut areas) or permanent (e.g. mires or limestone outcrops).

- **Maintain a mature habitat.**

This can be achieved by retaining old, dead or dying trees either standing or fallen, and by allowing some parts of the wood to grow to biological maturity.

- **Minimise rates of change.**

Wildlife takes time to adjust, so change should not be too drastic. This applies both to the scale and sequence of felling, and the layout of the wood.

- **Use low-key establishment techniques.**

Aggressive working methods should be avoided. The general rule should be to do the minimum necessary to ensure adequate establishment and growth.

The need for management

The type of management which is appropriate for individual woods needs to be carefully considered at the outset before any system is chosen.

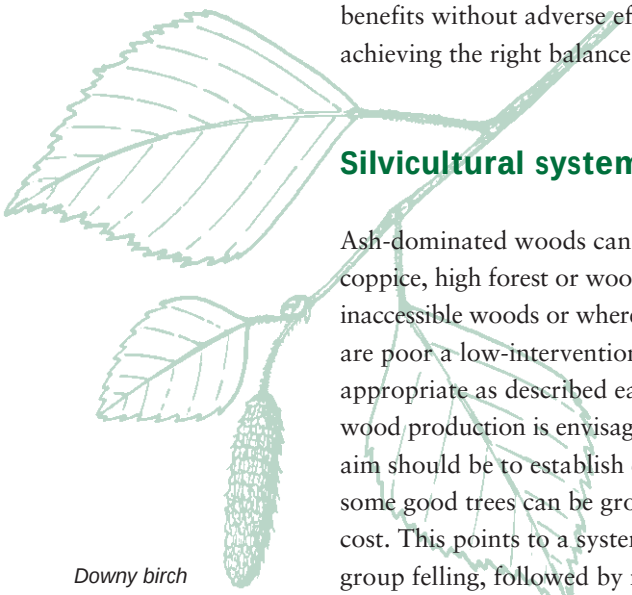
A few woods, usually in nature reserves, may be managed on a 'minimal intervention' basis to allow their natural development to be scientifically recorded. Elsewhere some active intervention will generally be needed to safeguard and restore upland ash woods woods whether or not wood production is an objective.

The basic requirement is to secure the long-term survival of the wood. In upland woods, the most important single measure to achieve this will often be the control of browsing and grazing by sheep and deer so that the wood can periodically regenerate or expand. Further intervention may often be unnecessary except, for example, where dense or even-aged woods fail to regenerate and cutting gaps and perhaps planting may be needed.

This low-intervention approach is particularly suitable for the more remote and inaccessible woods which do not have a long history of silvi-cultural management (although some trees may have been felled from time to time) and where the potential for substantial wood production without damage to the site may be low.

In these woods on more accessible sites and better soils where wood production would be more worthwhile and also in other woods which have been strongly influenced by silvicultural management in the past, a greater degree of intervention is usually appropriate using some type of silvicultural system as described below.

Some management techniques can sometimes have adverse effects on the site or the wildlife of a wood, so careful thought needs to be given



Downy birch

to operations such as cultivation to achieve benefits without adverse effects. Ways of achieving the right balance are suggested below.

Silvicultural systems

Ash-dominated woods can be treated as coppice, high forest or wood-pasture. In small or inaccessible woods or where prospects for timber are poor a low-intervention system is generally appropriate as described earlier. Where some wood production is envisaged in such woods the aim should be to establish conditions in which some good trees can be grown at minimum cost. This points to a system of occasional group felling, followed by natural regeneration in the gaps. Where the ash wood exists in a heavily grazed environment, fencing will be necessary during the period of regeneration.

However, in more southerly examples which have a long coppice history, the opportunities for coppicing are better and the benefits for wildlife more obvious.

High forest

Many upland ashwoods have not been managed for several decades, so they consist of dense groves of strongly drawn up stems, some of which usually have good form. Due to shade and grazing, most will have little ash regeneration, but may have an underwood of sycamore and wych elm. Stands in this condition are probably past the time when they can be beneficially thinned. Rather, where timber is an aim, the present stand is best partially felled with a view to better management of the regeneration.

Where the aim is to grow utilisable ash timber, 2 main options are available. A mature stand can be regenerated under a shelterwood of retained overstorey ash, which would act as a seed source. In this case, about 50 ash trees should be retained per hectare leaving at least 6 m between crowns of adjacent trees. Alternatively, groups of around 0.1–0.5 ha can be clear cut depending on the size of the wood, forming gaps for regeneration. The smaller groups may require enlargement after 4–5 years because ash seedlings bear heavy shade for a few years but then require almost full daylight to grow vigorously. Ash grows to 15–19 m high and in such stands any cutting to obtain regeneration must be at least 30 m (2 tree heights) across.

The aim should be to regenerate the wood in several episodes spaced over several decades. For timber purposes ash may mature at 60 years on better sites or 80 years in upland situations so that where timber is an objective, regeneration should ideally be spread over that period of time for much of the wood in order to provide for sustained yields and habitat continuity in future. However it is essential also to retain a proportion of trees and stands to develop into old age and provide old growth and dead wood habitat.

Coppice

Coppicing is recommended in the few woods where coppice has been cut within the last 50 years and where the woodland comprises a mixture of species, such as ash, hazel, lime, maple and others. Such woods are amongst the richest wildlife sites in Britain, and continuation of the traditional management is the most reliable means of perpetuating this richness. Coppice-with-standards will produce the greatest habitat diversity and on the deeper soils create an opportunity to grow large oak and ash. Groups of timber trees would produce a condition intermediate between high forest and coppice.

The success of coppicing will depend to a great extent on how well the coppice shoots are protected from browsing by deer and sheep.

No particular rotation is recommended. Rotations will be determined by opportunities for sale of the produce. The aim should be to cut some part of the wood once in every 5–7 years. Coupes of less than 1 ha provide adequate habitat diversity, but larger coupes may be more practical and reduce deer protection costs. Coupes of 2 ha and occasionally more may be suitable provided those of prominent sites are shaped to conform with the land form.

Woodland pasturage

Upland mixed ashwoods have rarely been treated as parkland, though many marginal hill farms with small, overgrown fields now take the form of ash–hazel wood pasture. These are

the product of a particular sequence of events which would be difficult to repeat, but in such places it would be desirable to keep the old trees as long as possible while allowing enough replacements to grow up in the vicinity to eventually replace them. In this instance, it would be more appropriate to allow a scatter of individual trees to grow up, rather than dense clumps of ash.

Harvesting

On some ash sites, extraction will be difficult due to poor access, steep or rough terrain and the need to avoid damage to sensitive sites. It is generally undesirable to construct roads through ash woods, especially if a necessary road can be routed through an oak wood. Sensitive small-scale extraction techniques are desirable for these woods such as horse extraction, if any harvesting is undertaken.

Upland mixed ashwoods are often rather susceptible to damage to soil and flora. Heavy machinery exerting high ground pressure, used during felling and extraction, can damage soil structure and archaeological features. On thin soils the risk of permanent damage to the site through erosion is considerable. Wherever possible, heavy machinery should be kept to tracks and rides, or to the dry soils of adjacent oak woods.

Retained old trees and deadwood

Many woodland and wildlife species depend on large, old trees, standing dead wood and large fallen trunks and limbs. Upland ashwoods often contain a few large, ancient specimens, but rarely possess large accumulations of dead wood. Where they exist, the trunks of large trees form rich habitats for lichens, and large fallen trunks or limbs provide habitats for fungi, insects and other woodland fauna.

Management should aim to maintain and increase the number of large, old trees and the quantity of dead wood. Large trees can be achieved by allowing some groups of trees to grow longer than might be commercially desirable, selecting those which occupy windfirm sites. All the trees and shrubs present in the wood should be represented. Marginal trees, and trees growing in difficult corners and along streamsides may already be important (e.g. as lichen trees) or associated with rich habitats, and these should be retained indefinitely. Eventual replacements of existing large trees should be developed by retaining and thinning around well-grown trees at the wood edge and within the body of the wood.

Large old coppice stools can be retained by cutting above the level of the last cut. Stub trees and pollards, which usually grow on marginal and internal banks, can be maintained by periodic cutting, but only if the nearby woodland is opened up at the same time.

Dead wood can be provided by leaving individual windblown trees where they lie, subject to access, safety and marketing objectives. This is especially appropriate for fallen trees in difficult corners, along streamsides and on margins.

Methods of regeneration

Natural regeneration

Natural regeneration is preferred. It maintains the natural distributions of tree species in relation to site conditions, allows a shrub component to grow with the trees, maintains local genotypes, and usually gives mixed stands of diverse structure. Ash and most of its associates usually regenerate well.

Ash fruits prolifically at intervals of 3–5 years and usually produces some seed every year. Most seed is shed in late autumn and winter and will normally lie dormant for 18 months before germination. Seedlings are shade tolerant, but saplings require full access to overhead light. Early growth can be rapid.

Natural regeneration will normally be promoted by group fellings creating gaps of up to 0.5 ha in size. Retention of side-shelter is important. In mature ashwoods regeneration is often already established, and can be released by removal of overhead cover and protection from grazing animals and weed competition.

Gaps full of ash saplings often exist where disease has killed elms.

Planting

It should only be used where adequate natural regeneration cannot be obtained. It may be necessary for timber production where the ground cover is dominated by a dense mat of grasses or dog's mercury, which sometimes inhibits regeneration and can develop after stock has been excluded from an ash wood, but only rarely where wood production is not an important objective. Plants should be set into canopy gaps and felling coupes; these can be larger than for natural regeneration but coupes of much over 1 hectare will often limit the diversity of the wood and be unacceptable in landscape terms especially in small woods. Retaining single trees and clumps within coupes may reduce these problems.

Where quality timber production is an objective groups of ash at 2.0 m spacing may be merited in parts of the wood. The aim overall should remain an irregular density throughout the wood, however. Where wood production is not important, restocking may be adequate if enough transplants and natural saplings survive to produce around 50 mature trees/ha. Natural regeneration will increase the density and diversity of any plantings. Small transplants should be protected by tree shelters. Larger transplants (25–50 cm) may require careful weeding for several years; stakes can be used to make them more conspicuous.

There is no reason why planting in ashwoods should be restricted to ash. Other species typical of these woods may be planted if they are unable to regenerate naturally or if a higher proportion is desired of, say, oak for timber production purposes. Care should be taken to plant the oak species already on the site; sessile oak is generally more appropriate for thin soils on limestone and in gulleys within upland oak woods.

Oak, but not ash, is covered by the Forest Reproductive Materials Regulations so that planting stock should originate from a registered seed source, but small amounts of seed can be sold (sufficient for a thousand plants or less) if it is to be used for conservation rather than forestry purposes.

Local sources are generally preferable and are particularly important where there is little evidence of past planting of the species concerned.

Where 'nurse' species are considered to improve the early growth and potential timber value broadleaved trees the nurses should themselves be broadleaved, and could take the form of coppice regrowth or natural seedlings.

Conifer nurses are neither necessary nor appropriate for this woodland type; ash is a light-demanding tree and planted conifers are likely to reduce the diversity of the rich ground flora and shrub layer of mixed ashwoods.

Coppicing

Coppice sprouts can reach 2 m in their second season in the absence of deer and sheep, but browsing can permanently check new growth and eventually kill the stool. Protection is crucial to success and a trial is recommended. If deer are prevalent, a minimum of 1 ha should be treated initially, as very small areas can provide a focus for deer browsing. Protection of the stools by piling of brash may assist initial growth but should not be relied upon as a sole means of protection.

Site preparation

Upland ashwoods often occupy well-drained, but damp areas. Drainage of these patches is highly undesirable; they are essential elements of habitat diversity on which many woodland species depend. Ash is well able to regenerate amongst the ground cover, so ground preparation is unlikely to be necessary. Ground disturbance from harvesting will provide sufficient regeneration sites.

Ash woods on thin soils over limestone also regenerate readily. Ground preparation is not required, and in any case could risk soil erosion.

Weeding

Ground vegetation consists of native plants and provides a substrate for woodland fauna, so weeding should be kept to the minimum necessary.

In fact, weeding is only likely to be necessary when planting into a dense grass sward or if dense bramble is present. Herbicides are usually cheaper and are more effective at reducing root competition from grasses. They should be applied to grasses in circles of one metre diameter around planted trees each year for about 3–4 years. Regular mechanical cutting often results in a loss of coppice and the impoverishment of the ground vegetation to a uniform grassy mat. At a later stage it is usually necessary to release individual stems by hand cutting. The best stems, whether planted, seedling or coppice shoots, should be favoured in weeding and cleaning.

Tending and thinning

Thinning is necessary to grow good timber and provides an opportunity to bring in some early income, but it can significantly influence the conservation value of a wood. All the species in a natural mixture should be retained as late into the rotation as possible, and preferably into the final crop. Heavy and early thinning will allow a shrub layer to persist or develop and retain a vigorous ground vegetation. Patches with different intensities of thinning will allow some structural diversity into a wood which might otherwise be uniform. Stems of ash showing ash-canker should be removed at an early stage.

Respacing of dense thickets is advisable in ash-dominated woods if the aim is to produce timber. It should start early if natural regeneration is present, and certainly by the time the saplings have reached 2 m. The better stems should be retained, and the spacing between trees increased to 1.5–2 m, in stages if very high densities of stems are present.

Exotic species

Any underplanted conifers should be removed before they do more damage to the ground flora; their removal may bring in a small surplus. The disturbance associated with removal can assist natural regeneration of native species.

Several non-native trees commonly colonise upland ashwoods, particularly sycamore, beech, pines, larch and Norway spruce. In the case of the conifers, eventual complete removal of trees and saplings is recommended, followed by periodic removal of later saplings.

Beech and sycamore are often well established and cast heavier shade than the native trees. If they occupy a small proportion, say under 10%, of the canopy they should be eradicated, but otherwise it is more practicable to accept them as part of the mixture and remove them progressively during thinning and cleaning operations. The aim should be to ensure that they form no more than a small proportion of the canopy trees, and never dominate the understorey.

Rhododendron, cherry laurel and Japanese knotweed can all be problems as they inhibit regeneration and extinguish ground vegetation. They should be removed.

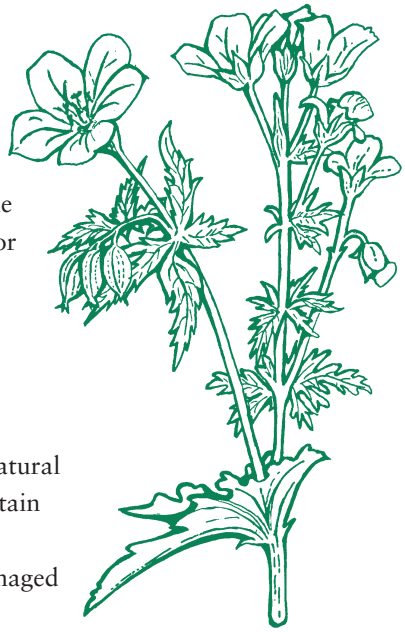
Nutrition

Ashwoods characteristically grow on fertile sites and there is usually no requirement for fertiliser application.

Grazing and browsing

Low intensity grazing and browsing is a natural feature of woodlands which helps to maintain diversity in composition and structure. However, in the small, isolated and unmanaged woodland we have now, even very low numbers of deer and sheep will selectively browse young growth. Fencing is thus normally necessary, either of the whole wood, or of that part which is currently being regenerated.

When whole woods and large parts are fenced against deer, further control may be necessary. Fences must be well designed and maintained. Sheep often penetrate poor fences or enter over snow in winter, devastating young broadleaves. Shelters may be cheaper, depending on the amount and distribution of young growth, and they will also allow some grazing to continue. Deer control policy needs to be co-ordinated



Wood cranesbill

between neighbours who own small woods. This is essential if protection against browsing damage is to be effective.

Grey squirrel control

Grey squirrels can cause serious bark-stripping damage to many trees between about 10 and 40 years of age, particularly to beech, sycamore and to a lesser extent oak.

Control methods are described in FC Research Information Notes 180[2], 191[3] and 232[4]. The most effective method is the use of Warfarin bait in hoppers which are designed to prevent non-target animals from entering and being poisoned.

Poison cannot legally be used for grey squirrel control in Scotland or in some counties of England and Wales where red squirrels are present. In these areas cage-trapping and spring-trapping are the only suitable methods.

Open ground

Open areas in semi-natural woodlands provide exceptionally important habitats. Upland ashwoods frequently contain glades with bracken and herb-rich grassland, which diversify the wood by creating warm, sheltered openings. Ashwood margins are often irregular, forming a complex transition of habitats, with exposed peninsulas of woodland and sheltered coves.

Ashwoods would be impoverished if all openings filled with trees, either naturally or by planting. Enough open spaces will remain open if light grazing is continued in most of a wood while part is fenced for regeneration. Discrete fellings will renew the open spaces at intervals.

Minimum intervention areas

Awkward or remote corners, steep-sided streamsides, rock outcrops and sites on steep slopes with very shallow and drought-prone soils may be particularly important for diversity of wildlife as well as being difficult to access and should be left completely unmanaged to grow large trees and build up accumulations of dead wood, which will provide habitats for specialised and now often rare species.

Expanding upland mixed ashwoods

In limestone country, upland ashwood margins have often shifted to and fro over the centuries. New ash woods are generally not as rich as long-established woods, but those developing on suitable soils around the margins of existing woods quickly acquire species from the adjacent woodland.

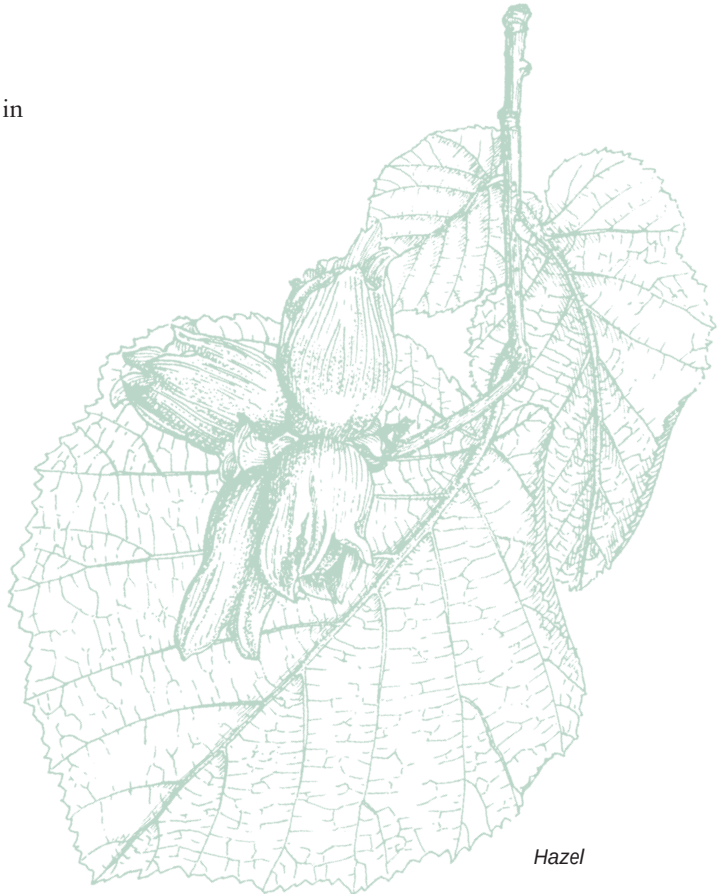
Instead of felling and restocking, younger age classes can be introduced to a mature ash wood by allowing the wood to expand onto adjacent ground, preferably by natural colonisation.

Expansion of woodland onto grassland which is already of high conservation value as such should be avoided.

Ash seed spreads readily up to about 150 m, and ashwoods should expand fairly rapidly given protection from grazing.

Opportunities may also arise for some expansion when conifer plantations are felled on ancient woodland sites formerly occupied by ashwoods.

More advice on expansion of semi-natural woods onto unwooded ground can be found in Forestry Commission Bulletin 112[5].



Hazel

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The UK Forestry Standard (1998).

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4 Controlling grey squirrel damage to woodlands (2003).
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8 Using local stock for planting native trees and shrubs (1999).

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62 Silviculture of broadleaved woodland (1984).
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15 Creating new native woodlands: turning ideas into reality (1999).
23 Using natural colonisation to create or expand new woodlands (1999).
28 Domestic stock grazing to enhance woodland biodiversity (1999).
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For further information and details of new Forestry Commission publications visit:
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Appendix

Definitions and classification of ancient and semi-natural woodlands

Definitions

Ancient woods

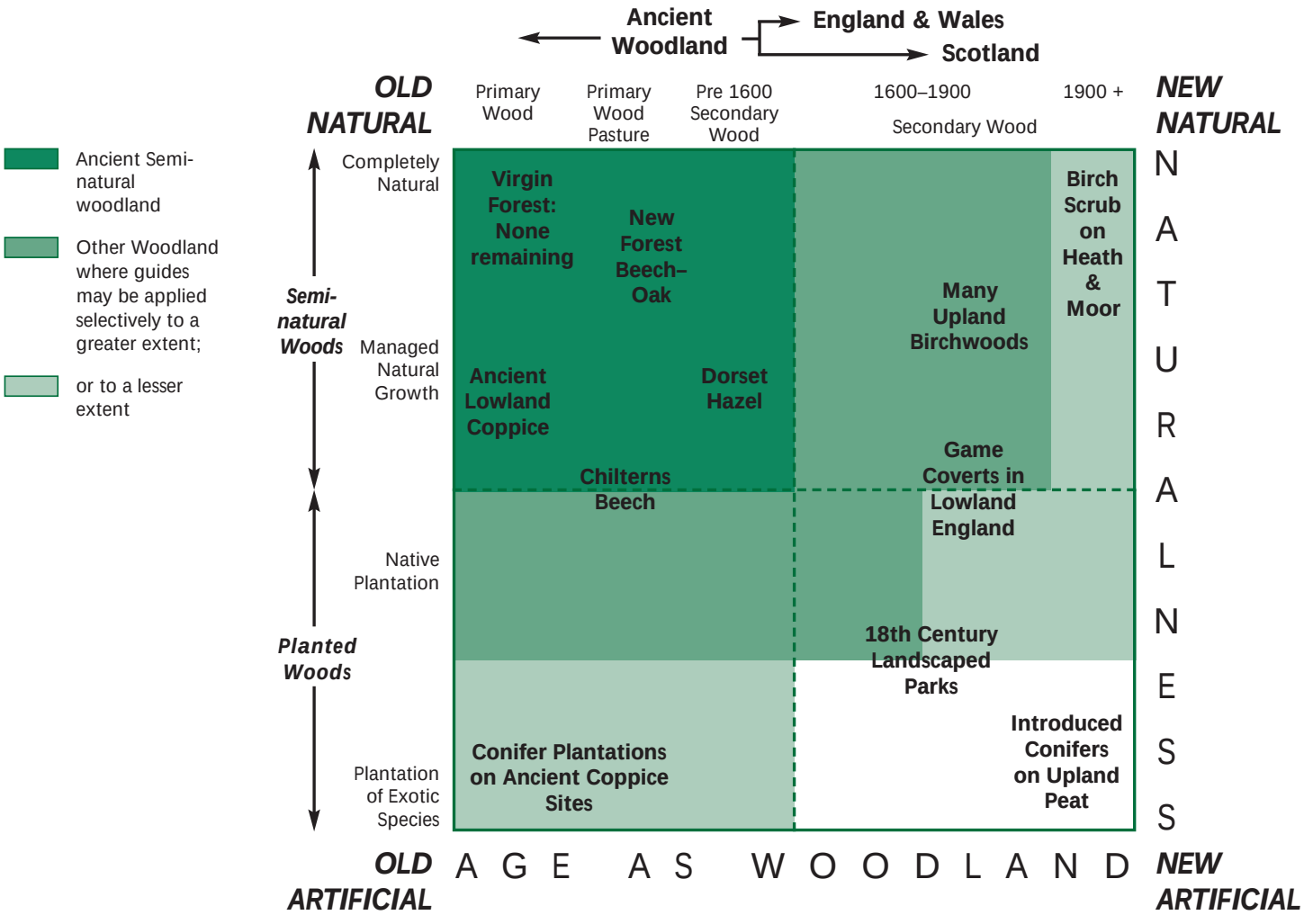
Ancient woods are those occupying sites which have been wooded continuously for several hundred years at least since the time when the first reliable maps were made. In England and Wales ancient woods are those known to have been present by around 1600 AD. In Scotland ancient woods are those which were present before 1750 when the first national survey was made by General Roy.

In both cases the dates correspond roughly with the time when new woodland planting first became commonplace so that ancient woods are unlikely to have been planted originally. Some may be remnants of our prehistoric woodland (primary woods) whilst others arose as secondary woodland on ground cleared at some time in the past.

An ancient woodland may be over 400 years old but this does not mean that the present trees are as old as that, although in some woods this is the case; rather that woodland has been present on the site continuously without intervening periods under other land-uses.

In fact many ancient woods have been cut down and regrown (or been replanted) several times in recent centuries, and during this century many have been converted from native species to plantations of introduced trees.

Figure 1 **Classification of woodlands according to age and naturalness**



Semi-natural woods

Semi-natural woods are stands which are composed predominantly of native trees and shrub species which have not been planted. By 'native' we mean locally native, e.g. beech is not native in Scotland and Scots pine is not native in England. Many woods are semi-natural even though they contain a few planted trees, for the latter do not change the character of the wood. The problem lies with woods dominated by native trees which were planted long ago on sites where they grew naturally, such as the many beech woods on the southern chalklands. Another ambiguous type is the chestnut coppice, dominated by an introduced species, often planted about 1800, but containing an admixture of native broadleaves and managed by the traditional coppice system. Both these 'intermediate' types are usually classified as 'semi-natural' by ecologists.

'Ancient' and 'semi-natural' have sometimes been used as synonyms, but this is quite wrong. Ancientness refers to the site as woodland, whereas naturalness refers to what is growing on that site.

Combining ancient with semi-natural

The age of the site as woodland and the naturalness of the stand on a site are independent of each other. This is illustrated in Figure 1. The vertical axis of the diagram shows a range of naturalness from completely natural at the top (i.e. people have had no influence on its composition) to completely artificial at the bottom. The horizontal axis shows a range of age-as-woodland, from primary woods on the left (i.e. surviving remnants of prehistoric woodland which have never been completely cleared) to woods of very recent origin on the right.

Ancient woods are simply those in the left-hand half of the diagram: those in the right-hand half are recent woods (except in Scotland where ancient woods extend further to the right). Recent woods are often called secondary woods, but this is slightly inaccurate, for there are secondary woods originating in the Middle Ages or earlier, which are included with the ancient woods. Semi-natural woods are those in the upper half of the diagram. Those in the lower half are planted woods. Ancient, semi-natural woods are those in the top-left quarter.

Within the diagram various examples of woodland types are placed according to their degrees of ancientness and naturalness. Top left would be virgin forest, if it still existed in Britain. At the other extreme, bottom right, is the most artificial form of recent woodland, a conifer plantation on drained peat in the uplands. Such forest comprises an introduced species, planted in regular formation on sites modified by management, where trees may not have grown naturally for several millennia. In the other corners are two kinds of intermediate condition. In the top right corner, newly and naturally-regenerated birch scrub on heaths or moors exemplifies woods which are relatively natural, but which are extremely recent in origin. In the bottom left corner is a conifer plantation, often for Norway spruce or Corsican pine, growing in a wood which had been treated as coppice continuously for several centuries. This is a common condition in lowland England: the site has been woodland continuously for a millennium or more, but the stand is almost wholly artificial. The diagram also shows roughly where several other woodland types fit.

Ancient semi-natural woods

Figure 1 makes clear that ASNW as a class contains many types of woodland. Some are very ancient, but others originated in historic times. Some are much more natural than others. Borderline types exist, and for different reasons.

Ancient semi-natural woods, because of their combination of naturalness and a long continuous history, are generally richer for wildlife and support more rare habitats and species than more recent or less natural woods.

However, all these divisions are somewhat arbitrary points on a spectrum and mature 'recent' semi-natural woods and old plantations of native species can also develop a high ecological value and of course landscape value, which may justify similar management to that of ancient semi-natural woods as Figure 1 indicates. This is particularly the case in the uplands where in general the ecological differences between ancient and younger woods are less marked than in lowland areas.

Inventories of ancient and semi-natural woodland were prepared by the former Nature

Conservancy Council (NCC) from map and historical records and some survey information.

Owners can refer to these to check the status of their woods either by consulting the NCC's successor bodies (English Nature, Scottish Natural Heritage and Countryside Council for Wales) or local Forestry Authority offices each of which holds copies of the inventory.

Classification of ancient semi-natural woodlands

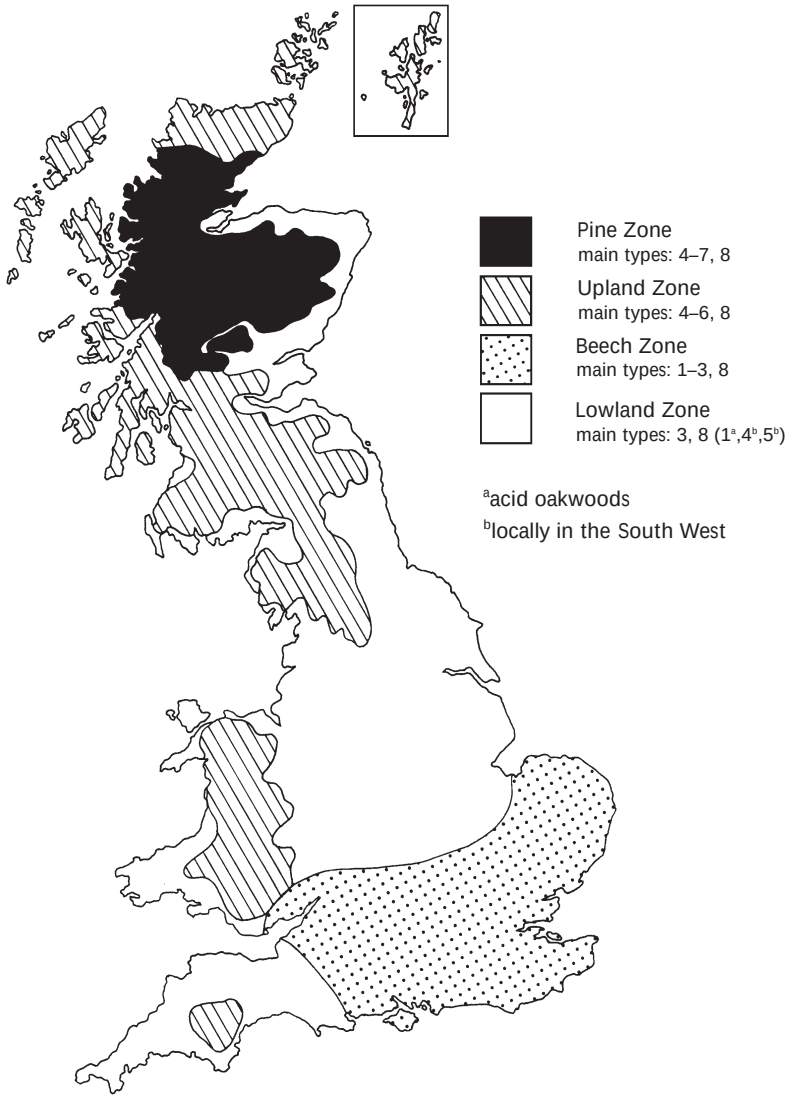
Outline

For the purposes of these management guides, Britain's ancient semi-natural woodlands have been divided into 8 types. This gives the best balance between straight-forward, practical guidance and the specific needs of the various types of native woodland. Many more types are recognisable, but fine distinctions would over-complicate the advice. With fewer types important ecological and silvicultural distinctions would be lost.

The 8 woodland types are based on 4 major regional divisions of Britain shown approximately in Figure 2:

- **The uplands of the north and west (Upland zone);**
- **The 'boreal' region of the Scottish Highlands within the Upland zone, in which pine is native (Pine zone);**
- **The lowlands of the south and east (Lowland zone);**
- **The southern districts of the lowlands within the natural range of beech (Beech zone).**

Figure 2 **The main semi-natural woodland zones**



These geographical divisions are further divided to recognise the ecological differences between acid and base-poor soils on the one hand and alkaline and base-rich soils on the other. Wetland woods constitute an additional type found in all regions.

The result is 8 types whose main characteristics are summarised below and in Table 1. They can be related to existing classifications, particularly the National Vegetation Classification (Rodwell 1991[1]) and the stand types described by Peterken (1981[6]). Insofar as the complexities of native woodlands can be reflected in a simple scheme, each type has a distinctive ecological and regional character, different history of management and exploitation, and different management requirements in the future. The guides have been drawn up for typical examples of each type.

The classification helps to relate British woodlands to those of continental Europe. The boreal pine and birch woods form an outlier of the sub-arctic coniferous forests. The beechwoods are the extremity of the central European broadleaved woods. Upland broadleaved woods have their counterpart in the oceanic woods of Ireland, Brittany and Galicia. The lowland mixed broadleaved woods form an outlier of a zone of mixed woodland lacking beech which extends throughout central Europe and deep into Asia.

Descriptions of each type

Lowland acid beech and oak woods

NVC types W15, W16
Stand types 6C, 6D, 8A, 8B

Beech and oak woods on acid, generally light soils. South-eastern, mainly in Weald, London and Hampshire basins. Mostly treated as high forest or wood-pasture in the immediate past. Many had a more distant history of coppicing, and in the Chilterns and the south-east some still have this character. Many were planted with chestnut around 1800 and are still worked as coppice. Includes a scatter of strongly acid

Table 1 **Summary of the main ecological and silvicultural characteristics of the eight semi-natural woodland types**

Semi-natural woodland type	Ecological characteristics		Silvicultural characteristics	
	NVC communities	Peterken stand types	Main historic management	Emphasis in future management
South and East Britain				
1. Lowland acid beech and oak woods*	W15, W16	6C, 6D, 8A, 8B	C or WP	HF
2. Lowland beech–ash woods*	W12, W13, W14	[1A], [3C], 8C, 8D, 8E	C or HF	HF
3. Lowland mixed broadleaved woods	W8 (A–D), W10	1B, 2A, 2B, 2C, 3A, 3B, 4A, 4B, 4C, 5A, 5B, 7C, 9A, 9B, 10A, 10B	C	C or HF
North and West Britain				
4. Upland mixed ashwoods	W8 (E–G), W9	1A, 1C, 1D, 3C, 3D, 7D, [8A–E]	C or HF	HF(C)
5. Upland oakwoods	W11, W17 (Oak dominant)	6A, 6B, [8A–B]	C or HF grazed	HF(grazed)
6. Upland birchwoods	W11, W17 (Birch dominant)	12A–B	HF grazed	HF(grazed)
7. Native pinewoods**	W18, W19	11A–C	HF grazed	HF(grazed)
All regions				
8. Wet woodlands	W1, W2, W3, W4, W5, W6, W7	7A–B, 7E	C neglect	Minimum intervention

NVC: National Vegetation Classification C: Coppice WP: Wood Pasture HF: High Forest
*Restricted to zone where beech is native (SE Wales and S England) **Restricted to zone of native pine (Scottish Highlands)

oak-dominated coppices found throughout the English lowlands. Also includes associated birch woods, self-sown Scots pine woods, holly scrub. Enclaves of hornbeam on acid soils best regarded as part of this type.

Lowland beech–ash woods

NVC types W12, W13, W14
Stand types 8C, 8D, 8E and parts of 1C, 3C

Beech woods on heavy and/or alkaline soils and associated ash woods. Southern distribution, grouped in South Downs, North Downs, Chilterns, Cotswold scarp, Lower Wye Valley and south Wales limestones, but sparingly elsewhere. Most had a medieval history of coppicing with limited wood-pasture, but most have long since been converted to high forest, often with extreme dominance of beech. Coppice survives in western districts. Woods often on steep slopes, but they extend on to Chiltern and Downland plateaux. Associated ash woods usually mark sites of past disturbance or formerly unwooded ground. Yew common in the driest beech woods and as distinct yew woods on open downland.

Lowland mixed broadleaved woods

NVC types W8(a–d), W10
Stand types 1B, 2A, 2B, 2C, 3A, 3B, 4A, 4B, 4C, 5A, 7C, 9A, 10A and 10B

Often known as 'oak–ash woods' by past ecologists, these are largely dominated by mixtures of oak, ash and hazel, but other trees may be dominant, notably lime (4A, 4B, 5A and 5B), hornbeam (9A and 9B), suckering elms (10A), wych elm (1B), field maple (2A, 2B and 2C) and alder (7C). Occur throughout the lowlands and upland margins, with enclaves on fertile soils in SW Wales, NE Wales and E Scotland. Most treated as coppice until 20th century, some still worked. Many still have a stock of oak standards growing with a mixture of other species grown from coppice and seedling regeneration. The various stand types occur as intricate mosaics which present silvicultural problems. Many have been invaded by sycamore or chestnut. Disturbed ground often marked by abundant ash, hawthorn or birch.

Upland mixed ashwoods

NVC types W8(e–g), W9
Stand types 1A, 1C, 1D, 3C, 3D, 7D with 8A–E where beech has been introduced.

Dominated by ash, wych elm and/or oak, usually with hazel underwood, sometimes with scattered gean. Found throughout the uplands on limestone and other base-rich sites. Also characteristic of lower slopes and flushed sites within upland oak woods. In the very oceanic climate of the north and west, increasingly take the form of ash–hazel woods with birch and rowan containing lower slopes dominated by alder. Lime is regular and sometimes common north to the Lake District. Like other upland woods, many have a history of coppicing which was displaced by grazing. Sycamore is a common colonist and in many woods is a naturalised part of the mixture.

Upland oakwoods

NVC types W11, W17 (oak-dominated woods)
Stand types 6A, 6B with 8A, 8B where beech has been introduced.

Woods dominated by sessile oak and, less often, pedunculate oak, growing on base-poor, often thin soils in upland districts from Sutherland to Cornwall. Sometimes absolutely dominated by oak, but more often oak forms mixtures with birch and rowan on very acid soils and hazel on the more fertile sites. Oak was planted in many woods, even those which now seem remote. Coppicing was characteristic, but not prevalent in N Wales and NW Scotland. Most now neglected and heavily grazed by sheep and deer. Includes small enclaves of birch, ash, holly, hawthorn and rowan-dominated woodland.

Upland birchwoods

NVC types W11, W17(birch-dominated woods)
Stand types 12A, 12B

Woods dominated by birch, but sometimes containing many hazel, sallow, rowan and holly. Birchwoods occur throughout Britain. Some are secondary woods which can sometimes develop naturally into native pinewoods or upland oakwoods. This type covers 'Highland Birchwoods' together with the extensive birchwoods of upland England and

Wales. Most are now heavily grazed by sheep and deer. Lowland birch stands are usually temporary phases or small enclaves and are included in Types 1 and 3.

Native pinewoods

NVC types W18, W19
Stand types 11A, 11B, 11C

Scots pine-dominated woods and the associated enclaves of birch and other broadleaves in the Highlands. Tend to be composed mainly of older trees, with natural regeneration often scarce. Most subjected to exploitive fellings during the last 400 years and heavy deer grazing during the last century.

Wet woodlands

NVC types W1, W2, W3, W4, W5, W6 and W7
Stand types 7A, 7B and 7E

Woodland and scrub on wet soils and flood plains. Usually dominated by alder, willow or birch. Generally take the form of scrub or coppice. Fragments of the prehistoric flood plain woods of black poplar, pedunculate oak, ash, elm, alder tree willows, and occasional black poplar survive in some southern districts.

Problems in using the classification

Semi-natural woodlands are complex systems which throw up many problems in the construction and use of classifications. These may seem unwelcome to managers used to managing plantations of one or two species, with clearly defined stand boundaries, but management of complexity is unavoidable if the small-scale diversity of semi-natural woodlands is to be successfully conserved. The commonest problems and their solutions are:

Intermediates

Stands falling between two or more types. Examples include;

- **a sessile oakwood on the Welsh borderland (between types 1 and 5);**
- **a mixed woodland with a limited amount of beech (between types 1 or 2 and 3–5);**
- **a birch-rich pinewood (between types 6–7);**
- **Managers should use the Guides appropriate to both types.**

Mosaics

Woodlands may include more than one of the 8 types within their border. Example: lowland acid beech woods and upland oak woods commonly include patches of birch-wood.

Ideally, each patch should be treated separately, though this is impractical with small inclusions of less than 0.5 ha.

Outliers

Good examples of each type can occur outwith their region. Examples: good lowland mixed broadleaved woods occasionally occur in N Wales and SW Wales; birchwoods occur throughout the lowlands.

Management of outlying examples should be based on the guidance for their core regions, but some adaptation may be required for local circumstances.

Introductions

Semi-natural woods often contain trees growing beyond their native range. Common examples are beech in northern England, north Wales and Scotland, and Scots pine south of the Highlands.

Unless the introduced species is dominant, such woods should be treated in the same way as the original type, using the guidance given on introduced species within that type. Thus, for example, a beech wood on acid soils in the Lake District should be treated as an acid beech wood (type 1) if beech is dominant, but otherwise should be treated as an upland oakwood (type 5).

Notes

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