

# The Management of Semi-natural Woodlands

## 7. Native Pinewoods

PRACTICE GUIDE



Forestry Commission





**Forestry Commission**

**Practice Guide**

# **The Management of Semi-natural Woodlands**

## **7. Native Pinewoods**

© Crown Copyright 2003

First published in 1994 by the Forestry Commission  
231 Corstorphine Road, Edinburgh EH12 7AT.

Reprinted 2003

Applications for reproduction of any part of this  
Practice Guide should be addressed to:  
HMSO, Licensing Division, St Clements House,  
2–16 Colegate, Norwich NR3 1BQ.

ISBN 0 85538 586 3

FORESTRY COMMISSION (1994).  
*The management of semi-natural woodlands:*  
*7. Native pinewoods.*  
Forestry Commission Practice Guide.  
Forestry Commission, Edinburgh. i–iv + 1–32pp.

Keywords: ancient woodlands, biodiversity, native pinewoods,  
native woodlands, nature conservation, semi-natural  
woodlands, sustainable forest management.

Printed in the United Kingdom  
on Robert Horne Hello.

FCPG007/PPD(KMA)/LTHPT-4000/MAR03

Enquiries relating to this publication should be addressed to:

Policy & Practice Division  
Forestry Commission  
231 Corstorphine Road  
Edinburgh  
EH12 7AT

Tel: 0131 334 0303  
Fax: 0131 316 4344

---

## Acknowledgements

The compilation of this Guide was a team effort involving the following people. Dr George Peterken, acted as project adviser and drafted much of the text. Richard Britton and latterly Gordon Patterson were Project Leaders. John Clarke, Conservator Kent and East Sussex, and Graham Darrah undertook the initial research visits and prepared a report on which this Guide is based; they also commented on later drafts. Colin Tubbs, Barry Teasdale, Francis Rose and Tony Whitbread gave valuable comments and Alastair Rowan helped in various stages of the drafting. Alistair Scott and Graham Gill, provided additional editorial input. Many other organisations and individuals provided useful advice and comment at various stages.

# Contents

<b>Publishing update</b>	<b>iv</b>
<b>Introduction</b>	<b>1</b>
<b>Management principles for semi-natural and native woodlands</b>	<b>3</b>
<b>What are native pinewoods?</b>	<b>4</b>
<b>History and traditional management</b>	<b>6</b>
<b>Values</b>	<b>7</b>
Landscape	7
Historical and cultural	7
Wildlife conservation	7
Recreation	7
Game and livestock	8
Wood production	8
<b>Policy aims</b>	<b>9</b>
<b>Application of this guide</b>	<b>10</b>
<b>The management plan</b>	<b>11</b>
Description	11
Evaluation	11
Objects of management	11
Management proposals	11
Monitoring	12
<b>Operational guidelines</b>	<b>13</b>
General principles	13
The need for management	13
Silvicultural systems	14
Harvesting	15
Retained old trees and deadwood	15
Methods of regeneration	15
Weeding	16
Tending and thinning	16
Exotic species	17
Nutrition	17
Grazing and browsing	17
Open ground	17
Minimum intervention areas	18
<b>Expanding native pinewoods</b>	<b>19</b>
<b>References</b>	<b>20</b>
<b>Useful sources of information</b>	<b>20</b>
<b>Appendix: Definitions and classification of ancient and semi-natural woodlands</b>	<b>22</b>
<b>Appendix 2: Caledonian pinewoods inventory</b>	<b>29</b>

## 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 Appendix 1.

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.



*Scots pine*

## 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 native pinewoods?

This Guide deals with the management of the semi-natural pinewoods of the Scottish Highlands which are usually called native pinewoods or Caledonian pinewoods. Although they have been exploited and managed to a considerable extent, these woods are amongst the least modified in Britain. Those parts of them which have descended from one generation to another by natural means are an unbroken link with the natural forest which developed after the end of the last glaciation, some 8 000 years ago. They are an irreplaceable reservoir of adapted genetic stock of plants and animals. They have been shown to contain several sub-populations of Scots pine which collectively form a genetically and biologically distinct western outlier of the vast Eurasian distribution of this species.

The pine-dominated Caledonian forest may once have covered more than 1.5 million hectares of the Highlands, but the present area of native pinewood is now thought to be only 16 000 hectares of which more than half is scattered pine. Most of this is in private ownership and most larger woods are also Sites of Special Scientific Interest.

A typical example would be a mosaic of dense mature stands interspersed with tracts of moorland dotted with large-crowned 'granny' pines and hard knolls and mires without trees. Pockets of birch and other trees and shrubs such as juniper, rowan, alder, aspen and oak can be found often picking out small areas of more fertile or flushed soil. Most trees are mature and regeneration is often prevented by deer and sheep.

This guide deals with pine-dominated woods including small enclaves of other species. Other relevant guides should be consulted where more extensive areas of semi-natural broadleaves are interspersed with native pine.

The Forestry Commission introduced specific guidelines for native pinewoods within the Woodland Grant Scheme in 1989. This guide replaces the parts of these guidelines which were aimed at existing semi-natural pinewoods.

Guidance on the establishment of new native pinewoods is contained in the Woodland Grant Scheme Applicant's Pack<sup>1</sup>.

The largest areas of pinewood are Abernethy (private), Rothiemurchus (private), Glen Affric (FC), Glen Tanar (mainly private), Glen Strathfarrar (private) and Mar (private). Together these six areas contain over half the area of native pinewoods.

It has long been apparent that there are significant differences between the eastern pinewoods, mainly on Deeside and in Strathspey, and the smaller areas lying mainly south and west of the Great Glen. Recent advances in research, by examining one of the chemical constituents of pine trees (terpenes), have now made it possible to divide the Scottish population into seven regions. These are shown on the map on page 28.

Native pinewoods are included as a single type within the National Vegetation Classification (Rodwell, 1991<sup>2</sup>) namely **Scots pine – *Hylocomium splendens* Woodland (W18)**. There are five sub-divisions to recognise variation, which is mainly climatic.

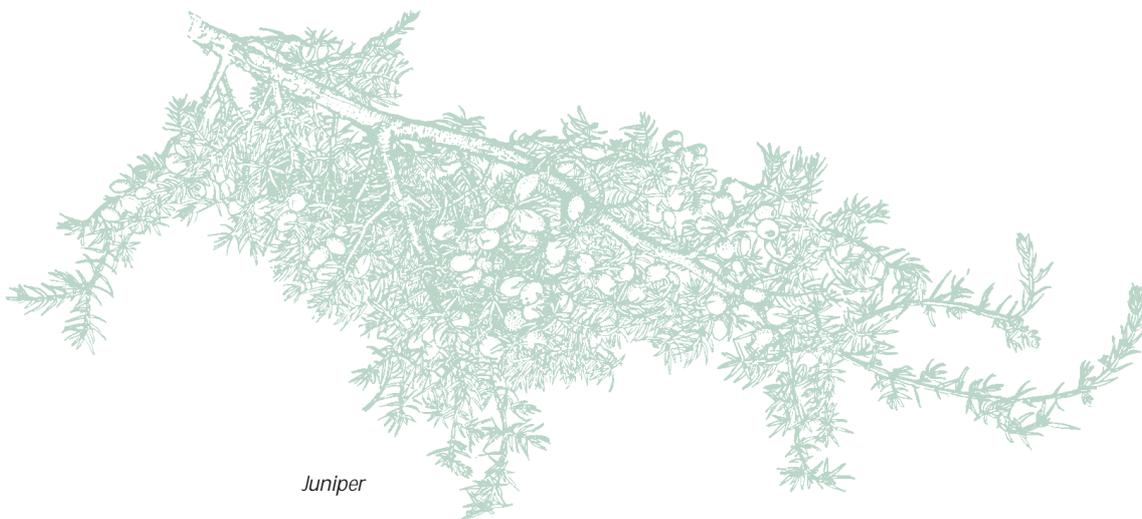
Pinewoods occur on strongly leached, podsollic soils in the cooler parts of the Highlands. Scots pine is the main tree but the canopy is often open, more especially in the west, and usually quite low (13–15 m, rarely 20 m). Birches are the commonest associates; Downy birch tending towards the west and Silver birch more to the east. Rowan may be locally common. Juniper is sporadic as an understorey and marginal shrub. Small clumps of other broadleaved trees and shrubs including alder, sallows, aspen, sessile oak, hazel, bird cherry and holly occur on pockets of richer soils where browsing pressure allows. Mosaics can occur and in time pine, birch, rowan and juniper can shift their location within a wood. There is a natural tendency for stands of mature pine to give way to more mixed young stands of birch, rowan and other broadleaves mingling with patches of regenerating pine which eventually would outgrow the broadleaves to dominate

again. In recent centuries however this pattern has been simplified by land-use and management so that pinewoods are less diverse.

The field layer is characterised by acid tolerant plants like wavy hairgrass, heather, blaeberry, cowberry and sometimes crowberry. These dwarf shrubs are more abundant to the east; in the western pinewoods on wetter ground mosses, notably *Sphagnum* species, and liverworts gain prominence together with sedges and purple moor-grass. There are a number of quite rare herbs including the *Pyrola* wintergreens and the twinflower associated with pinewoods, although some are also found in birchwoods and open moorland.

Bracken occurs only sparsely in pinewoods as do herbs such as cow-wheat, tormentil, heath bedstraw and wood sorrel which are more common in birchwoods and oakwoods.

Western woods are usually more open and patchy, with pine concentrated on gravelly ridges and knolls, sometimes spreading onto peatier ground, pockets of Downy birch and sallow and open bogs in the deeper peat hollows in between. Eastern woods have larger swathes of pine on more even terrain and a lower proportion of open ground and broadleaves. These characteristics are partly a reflection of climate and landform but have also been shaped by past management.



## History and traditional management

The reduction of pinewoods during historic times has been documented by Steven and Carlisle in their book *The Native Pinewoods of Scotland*<sup>3</sup>.

Man began to influence the pinewoods in Neolithic times and since then his influence increased steadily, but it was not until about 1600 that the pinewoods were exploited for use outwith the local area. The remote nature of the pinewoods and their inaccessibility delayed the exploitation, but when the technique of floating timber down the rivers was mastered then large-scale harvesting was possible. In the present century the demands of the two world wars caused further loss. Analysis of changes in the area of pinewoods has shown that their depletion has continued over the last 30 years<sup>4</sup>.

In places the original exploitation was followed by considerable regeneration, and in some cases there was active encouragement or planting of trees, notably in Deeside and Speyside. Often, however, the introduction of sheep and the increased population of red deer have prevented any regeneration from occurring for the last two hundred years, although sometimes their value as deer and stock shelter probably helped to prevent wholesale felling of pinewoods.

In the last century there was some planting of non-native species, or non-local origins of Scots pine, into pinewood areas but this reached a peak in the 1950s and 1960s. A growing awareness of the value of the pinewoods as more than a timber resource has developed in the last few decades.

Many areas of felled pinewoods have since become birchwoods or open moorland which has helped to create a greater separation of birch and pine today than in the original forest.

# Values

## Landscape

Few can fail to be moved by the grandeur of the larger pinewoods. They combine the texture and colour of rugged mature pines, bleached dead trees and scattered birch or rowans in the close view with the majestic sweep of forest, moor and bog in the wider mountain landscape. They convey a real feeling of wilderness, perhaps more than any other woodland type in Britain.

## Historical and cultural

Pinewoods, together with birchwoods, have a cultural and emotional importance in Scotland perhaps akin to that of oakwoods in lowland England or upland Wales. They have been used, albeit usually in an extractive way, for centuries and have left their mark in place names and folklore.

Archaeological relics such as old shielings and recent timber-extraction railways and saw pits still remain. The peat-filled hollows contain a wealth of untapped information, preserved as pollen or wood fossils, about the past composition and history of the forest.

## Wildlife conservation

Pinewoods are found on infertile soils which restricts their diversity of plants and animals. However many uncommon or rare species are found in native pinewoods, and some are specialists, not found elsewhere. The latter include insects, mainly beetles and hoverflies, which specialise on dead or dying wood. One such hoverfly, *Callicera rufa*, is confined to rot-holes in the fork of large limbs in old pine trees where the larvae may take years to develop. These deadwood specialists are thought to be less mobile than other wildlife groups and to need a continuity of supply of old trees to sustain them in the long-term.

A number of distinctive uncommon plants are characteristic of pinewood although often in

small quantities. These include creeping lady's tresses, several wintergreens, twinflower, lesser twayblade, St Olav's candlestick and coral-root orchid. Several of these are northern continental or montane plants whose climatic range coincides with that of native pinewoods. An uncommon and beautiful moss, *Ptilium crista-castrensis*, is most often found in pinewoods, and the western pinewoods support a wide range of other mosses and liverworts and lichens including some rare species.

Of the higher animals, red squirrel, pine marten, wildcat, capercaillie, Scottish crossbill and crested tit are amongst the most distinctive. These three birds seem strongly linked to pinewoods, especially the Scottish crossbill which is the only bird species confined to Britain. The survival of the whole suite of pinewood fauna depends on all the elements being present in the future; dead and dying trees, young and mature trees, dense thickets and open glades. The presence of even a small quantity of native broadleaves and juniper greatly contributes to maintaining the diversity of the pinewood and is probably important in maintaining soil fertility and the functioning of the whole ecosystem. Pure pine stands on podsollic soils cause a build-up of acid mor-type humus which may inhibit subsequent pine regeneration. Birch and other broadleaves in amongst pine clumps may reduce these effects.

## Recreation

Native pinewoods are popular with visitors who obtain a sense of naturalness and wilderness. The woods themselves are quite robust, if wet sites and damp flushes are avoided by paths, but careful control of visitor pressures is needed to maintain the qualities they seek and the wildlife.

Pinewoods present excellent opportunities for environmental education geared to history and wildlife.



*St Olav's candlestick*  
(Single flowered wintergreen)

## Game and livestock

Native pinewoods are still used as deer-wintering and sheep range. These values can be maintained for the future provided the use is controlled so that it does not prevent woodland expansion and regeneration. Parts or whole woods will need to be excluded for 20–30 year periods to secure regeneration, and a permanent reduction in densities of sheep and deer is usually desirable to benefit wildlife habitats generally.

Capercaillie and black grouse can legally be shot but their numbers have declined and conservation of their habitat should take precedence at present.

## Wood production

Native pinewoods, especially on the more fertile soils have provided very fine quality sawn timber in the past. The best has usually been removed, but where an adequate genetic base is available, good timber can be obtained in the future. Where and whether this should be done is a matter for careful consideration of all factors in each case. In many woods the priority is to restore and expand the wood and timber production on any scale is a distant possibility.

## Policy aims

The aims of policy are to encourage appropriate management of native pinewoods 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 native pinewoods 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, including identifiable sub-populations of native pine.**

This aim is relevant for all native pinewoods 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 will 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.

Most native pinewoods 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 native pinewoods is very often desirable, especially for small woods, to secure their long-term future.

Each pinewood is unique in its characteristics and its relationship to the surrounding landscape. Although some native pinewoods are fairly uniform, partly through historical management, they all encompass significant small-scale variety of site conditions. Within practicable limits, the aim should be to reflect this inherent diversity in future management.

## Application of this guide

This guide should be applied to all native pinewoods included on the Caledonian Pinewood Inventory (see Appendix 2) which are managed under the Woodland Grant Scheme. It will also apply to Felling Licence applications, to management under other grant schemes and to woodlands managed by Forest Enterprise. The Inventory is compiled by the Forestry Authority.

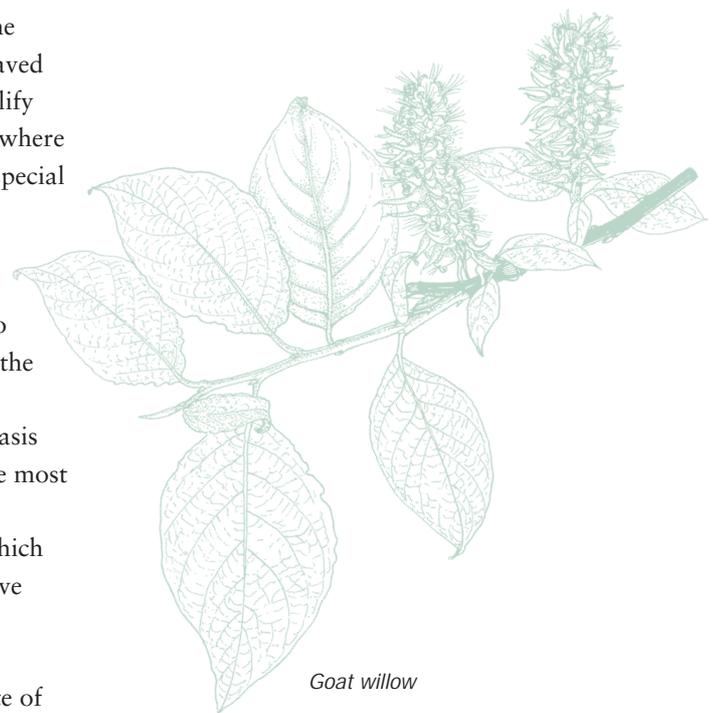
The area of each pinewood in the Inventory is not confined to the area covered by pines but, where appropriate, includes regeneration zones. Each entry in the register is supported by 1:25 000 scale. The appropriate entry is held by the relevant Conservancy office of the Forestry Authority. The Inventory contains the 35 localities identified by Steven and Carlisle and other pinewoods where the balance of probability lies in favour of the existing pines being the descendants of an unbroken line of self-sown trees. In each case the views of the owner will be sought as to the validity of a proposed entry, including the extent of the regeneration zone. There will be no lower limit of area for inclusion in the Inventory but pinewoods entered must be capable of regeneration.

These areas will be eligible for grants at the higher rate for pine as well as for broadleaved regeneration. They will also normally qualify for the special rate of management grant, where work is done to maintain or enhance the special value of the wood.

Pinewoods which are semi-natural in appearance but whose genetic origin is too much in doubt for them to be included in the Inventory can be managed along the lines suggested in this guide but with less emphasis required on genetic conservation. Likewise most of this guide can be applied to those old plantations of pine on appropriate sites which have acquired much of the wildlife of native pinewoods.

Where the woodland is designated as a Site of Special Scientific Interest (SSSI) guidance must be sought from Scottish Natural Heritage 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.



*Goat willow*

# 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.



*Aspen*

# Operational guidelines

## General principles

The policy aims for semi-natural pinewoods lead to general principles for management outlined below.

- **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.

- **Increase diversity of structure.**

A range of age classes within each site is preferable to the one or two ages which are usually encountered.

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

Some native pinewoods have very few trees or shrubs other than pine due to past management.

- **Maintain diversity of habitat.**

A diverse structure and a mixture of species improves habitat diversity, but open areas are also extremely important, including temporary open areas created by cutting.

- **Maintain a mature habitat.**

This can be achieved by retaining old, dead or dying trees, either standing or fallen, over part of the wood.

- **Moderate rates of change.**

Although pinewoods are adapted to quite large natural disturbances, 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.

Some pinewoods, 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 native pinewoods, whether or not wood production is an objective.

The basic requirement is to secure the long-term survival of the wood. 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 woods fail to regenerate and cutting gaps or ground disturbance, and perhaps planting, may be needed.

This low-intervention approach is particularly suitable for the smaller and more remote and inaccessible woods which do not have a long history of silvicultural 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 may be appropriate using some type of silvicultural system as described below. However many pinewoods are SSSIs where the appropriate management system would need to be agreed with Scottish Natural Heritage.



*Scottish crossbill*

Some management techniques can sometimes have adverse effects on the site or the wildlife of a wood, so careful thought needs to be given to operations such as cultivation to achieve benefits without adverse effects. Ways of achieving the right balance are suggested below.

## Silvicultural systems

Historically pinewoods have been managed, if at all, as high forest made up of relatively even-aged stands of fairly pure pine interspersed with open ground and pockets of birch and other broadleaves. The size of stands depended on landform and site: they tended to be larger in drier eastern sites with regular terrain. Clear felling and shelter-wood methods have been tried in a number of woods.

Before human influence grew strong the natural structure of pinewoods was probably more varied than it is today and was determined by the history of storms and fires at a particular site acting upon the local terrain and soils. These would have produced a great variety of sizes of gaps from a few trees up to extensive tracts containing scattered survivors. The resulting regeneration would therefore range from small clumps to large and fairly even-aged stands of many hectares. The latter were probably commoner in the east where the terrain was more even and fires more frequent.

Heavy grazing, regular muirburn and extensive felling has simplified the structure of pinewoods as well as their species composition in recent centuries.

Future management should attempt to encourage or actively mimic a more natural variety of structure in pinewoods.

In most pinewoods the first priority is to secure adequate regeneration. Often there will be ample space for regeneration without any need for felling. In these circumstances, felling should not be introduced until the regeneration process is well established.

In small or scattered woods and others managed with the 'low intervention' philosophy described earlier, the approach should be to

encourage regeneration in existing gaps and outside the wood in the short term. Felling to encourage regeneration may occasionally be acceptable where it is not possible to expand the wood and regeneration is prevented inside it by a canopy of old pine which has poor seed production and limited longevity.

In the longer term some felling for wood production could be introduced once small woods have expanded successfully enough to secure their survival.

In some of the larger woods, if stocking densities are high and if wood production is intended, felling for regeneration can be introduced from the start, using adapted shelterwood and clear felling systems which should mimic natural patterns and maintain or increase the diversity of structure. Scattered trees and clumps should be retained within coupes and the sizes of coupes should vary over a range which suits the local landform.

The long-term aim should be to have at least four age classes present in most woods spread over a period of between 80–200 years depending upon the growth rate and importance of timber production as an objective, and provision for a substantial proportion of stands to be kept until they die and decay which will often be at 250 years or more.

There are many considerations bearing on the size, shape and orientation of any felling coupes, not least the type of silvicultural system adopted. Appropriate silvicultural systems will recognise that normally seed dispersal is limited beyond a distance of one and a half tree heights. In larger woods it will often be appropriate to adopt a system which allows for the progressive expansion of regeneration nuclei or edges. Initial clear felling coupes should not normally be wider than about 60 m.

Shelterwood coupes, where around 50 trees per hectare are retained as seed trees, can be wider than this. The total area of initial coupes by either method should not normally exceed a quarter of the wood. The size of each initial coupe should normally be less than 3 hectares but some larger shelterwood coupes may be suitable where compatible with landform and

where the chances of successful regeneration are very good.

Small coupes will be most appropriate in small woods, in sensitive landscapes where harvesting is least difficult and where side shelter will be the most beneficial. In these circumstances initial coupes of less than one hectare should be the norm. Coupe size should be geared to the natural pattern of the site; western pinewoods with morainic hummock – and – hollow terrain are more suited to small coupes or group felling on knolls, whilst larger scale eastern landscapes suit larger coupes which are naturally more frequent after fire or storm.

## Harvesting

Harvesting is relatively easily carried out without site damage except perhaps on the more broken terrain. Light disturbance of the soil surface helps with regeneration on mineral soils and is usually not harmful to the wildlife. Peaty areas and other heavy soils should be avoided by extraction machinery as they are easily damaged and are important habitats.

Patches of uncommon pinewood plants should also be avoided by extraction machinery.

## Retained old trees and deadwood

Dead and dying trees of all species are valuable habitats for fungi, lichens insects and birds, but especially old pine trees.

In every pinewood at least a proportion of trees should be allowed to reach natural maturity, senescence and death for their wildlife and landscape value. Dead and windblown trees should normally be retained. Consideration should be given to identifying areas of the pinewood in which no future felling is planned.

Clumps and scattered trees retained in felling coupes, or as mother trees in shelter-wood fellings, will eventually provide a mixture of damp and dry, standing and fallen dead wood. Advantage should be taken of inaccessible areas to retain trees to biological maturity.

## Methods of regeneration

### Natural regeneration

Natural regeneration is strongly preferred to planting in native pinewoods. It conserves the local genotype, unless non-local stock is close by, favours the natural distribution of tree species in relation to site conditions and tends to create a more irregular structure and mixed species composition than planting.

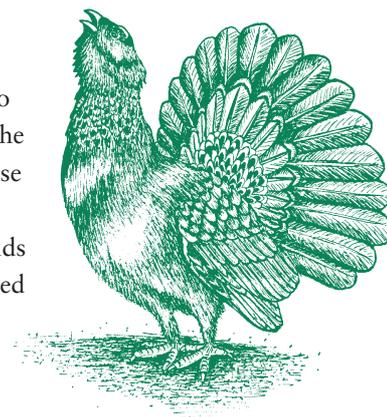
In many circumstances there will be ample space for regeneration without any need for felling. Within the range of a native pine seed source there will be a strong preference for regeneration by natural means. Being ready to take advantage of good seed years will often be the single most effective act of management. Opportunities should be sought to extend the woodland wherever possible.

Regeneration of species other than pine should be encouraged to maintain or increase the natural diversity of pinewoods. Birches, alder, sallows, rowan, holly and juniper, plus occasional oak, hazel and aspen, can all be encouraged. These trees are mostly more palatable to deer and sheep than pine and, especially where seed sources are scarce or absent, these animals may need to be controlled at very low levels for long periods to allow diverse regeneration.

### Planting

Unless there is not a suitable local seed source for natural regeneration, planting should be the last resort, and planting proposals should only be advanced if the effect of a good seed year, together with ground preparation if appropriate, and protection against browsing has been adequately tested and found wanting. On this basis planting of pine will not normally be an acceptable proposal during at least the first 5 year plan of operations for a pinewood in the WGS. If planting is proposed in this period, the Forestry Commission will seek advice from Scottish Natural Heritage. Planting should not be used to fill gaps in areas of successful natural regeneration.

Where planting is to be undertaken, it must be with stock which originates from the same locality (preferably the same wood) and reflects



*Capercaillie*

local genetic diversity. Trees must be planted in a way that reflects the natural habitat variation within the site and must not be evenly spaced. Planting of pine may sometimes be justified where the genetic integrity of natural regeneration may be seriously at risk from nearby non-native stands. Such cases must be carefully assessed to balance any advantages for genetic conservation with the disadvantages from planting.

It should be borne in mind that past management has often resulted in under-representation of broadleaves. Unless regeneration of other trees can be expected more readily than that of pine, a proportion, normally at least 15% of planted stock within the pinewood, should be of other native trees and woody shrubs. The appropriate level of other native species will vary between pinewoods. In pinewoods where there is already a significant presence and diversity of other native species, this percentage may be reduced.

Planting of species other than pine may also be considered when natural regeneration alone is being used for pine. Planting should be considered for species which are unlikely to appear naturally, e.g. slow colonisers like juniper or aspen with no nearby seed source and where there is good evidence for their presence in the wood in the recent past. Planting stock should be of Scottish origin, preferably from locally collected seed in the same zones as for pine.

### Site preparation

The aim should be to obtain adequate natural regeneration with minimum or, preferably, no cultivation. There may be a balance to be struck between undue disturbance of the soil profile and some ground preparation in order to create seed bed conditions. Ground preparation should only be attempted in circumstances where the chosen method of regeneration has been demonstrated to fail.

Where cultivation is proven to be necessary, scarifying, particularly patch scarifying, will be the strongly preferred method. It should be as light, irregular and intermittent as is practicable to provide a seedbed or planting position. In the wetter western pinewoods low mounds may be better than a scraped patch for pine

germination and growth. Wet and boggy areas are integral components of the pinewood ecosystem providing diverse habitat for wildlife and variety to the scene. They should not be drained.

Controlled burning to remove vegetation which will otherwise prevent seedling establishment and compete for light, water and nutrients, simulates the natural catastrophic disruption which is a feature of Scots pine regeneration throughout its range. Burning is an operation which should only be attempted with adequate experience and resources, however. Care should be taken not to burn areas where adequate regeneration is present amongst long heather.

### Weeding

There should rarely be a need to weed trees in pinewoods because of their infertile soils, provided any planted trees are well located.

Ground vegetation consists of native plants, which provide a habitat for woodland fauna, so weeding should be kept to the minimum necessary for tree growth.

Although hand cutting generally does less damage to the wildlife of a wood especially if it can be delayed until July, herbicides are usually cheaper and more effective in reducing root competition especially where grasses are dominant. Any herbicides should be confined to spot applications of 1 metre diameter around young trees. They should not be needed for more than one or two years. Natural regeneration is unlikely to require weeding, except where weeds are stimulated by cultivation or fertilisers.

### Tending and thinning

Although pine is capable of natural self-thinning, respacing and repeated thinnings are desirable where it is intended to produce good quality timber from dense clumps of regeneration, or planting. These operations can affect the conservation value of a pinewood. All the species in mixed stands should be maintained for as long as possible somewhere



*Sessile oak*

in the stand, preferably into the mature stage. The intensity of thinning should be varied to produce a variety of spacings, including unthinned clumps. Some areas should be thinned heavily to develop a vigorous shrub and field layer and large flat crowns favoured by capercaillie. Occasional high stumps can provide deadwood and nest sites for Crested tits.

## Exotic species and non-native origins of Scots pine

Exotic conifers, sometimes underplanted or planted within the regeneration zone in the past, should be removed as soon as is practical. If they have already closed-canopy and shaded out the pinewood flora it may be best to await until a suitable stage for marketing them, unless they threaten the pine trees immediately. Removal will often be associated with attempts to regenerate pine in their place. Broadleaves which are not site-native are only occasional in native pinewoods; small amounts of beech may occur in the lower woods. They can be removed when thinning or felling operations permit. Scots pine of non-native origin is a bigger problem because it is often hard to detect where they are and to what degree they have already affected the indigenous gene pool. The aim should be to avoid significant alteration of the native gene pool, where this is practical, by removal of non-native stock before it has interbred widely with local stock. Removal of non-native Scots pine should be given a high priority within sites on the Pinewood Inventory. There may be cases, however, where the practical benefits are outweighed by costs and other drawbacks; if a whole generation of possible 'hybrid' saplings would have to be removed, for example.

## Nutrition

Where fertiliser appears to be needed to obtain successful establishment of young trees, or to stimulate seed production by mature trees, it should be applied around the individual trees only, to avoid artificially enriching the site and damaging species adapted to less fertile soils.

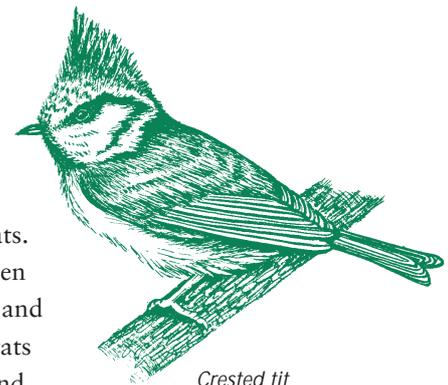
## Grazing and browsing

The adequate reduction or complete removal of grazing animals whether deer or domestic stock, is essential for successful regeneration. The normal method of reducing numbers will be by fencing. External fencing should be at a distance sufficient to allow for expansion and for an edge of natural appearance to develop in the landscape. This will vary but should usually be at least 100 m from the edge of the wood. In large areas internal fencing may also be necessary. Where it is proposed that deer numbers can be sufficiently reduced over a long enough period by a stalking programme alone without fencing, the views of the Red Deer Commission will be sought about the practicality of the proposal. Evidence that a sufficient reduction has been achieved will be required before the first installment of grant for natural regeneration can be paid.

Although current animal densities are generally too high, low intensity grazing and browsing is a natural feature of woodlands which helps to maintain diversity of composition and structure. Consideration should therefore be given to maintaining light grazing regimes in areas of pinewoods which are not actively being regenerated.

## Open ground

Open areas in semi-natural woodlands provide exceptionally important habitats. Native pinewoods typically have an open canopy and many areas of mire, heath and sedge-rich flush. This complex of habitats greatly enriches the whole woodland and naturally open areas, such as wet hollows, hard knolls and scree slopes, should not be filled in, although fluctuation in the current boundaries of stands and open areas should be allowed to occur and sparsely stocked woods should be encouraged to thicken up overall. Light grazing as described earlier can help to maintain a proportion of open habitats.



*Crested tit*

## 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 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 would provide habitats for specialised and now often rare species.

## Expanding native pinewoods

Mention has been made several times of the desirability of expanding most pinewoods outside their present boundaries, both because of their fragmented state and because they naturally tend to regenerate onto open moorland, so that over a period of centuries the woods alter their shape as their margins shift to and fro across hillsides. This expansion should be achieved wherever possible by natural colonisation following the principles outlined earlier. Expansion onto heather moorland soon after burning or removal of grazing can be quite rapid. Semi-natural moorland or grassland of high existing conservation value should normally be avoided although sometimes their value may be maintained or even enhanced with a small proportion of naturally regenerated native pine. Each case needs to be judged on its merits. Further guidance is available in the WGS Applicant's Pack in the section called New Native Pinewoods, and in Forestry Commission Bulletin 112<sup>5</sup>.

## References

1. RODWELL, J. S. (Ed) (1991). British plant communities. Volume 1, *Woodlands and scrub*. Cambridge University Press.
2. FORESTRY COMMISSION (1990). *Grey squirrel damage control with Warfarin*. Forestry Commission Research Information Note 180. Forestry Commission, Edinburgh.
3. FORESTRY COMMISSION (1990). *Grey squirrels and the law*. Forestry Commission Research Information Note 191. Forestry Commission, Edinburgh.
4. FORESTRY COMMISSION (1993). Grey squirrel control using modified hoppers. Forestry Commission Research Information Note 232. Forestry Commission, Edinburgh.
5. FORESTRY COMMISSION (1994). *Creating new native woodlands*. Forestry Commission Bulletin 112. HMSO, London.
6. PETERKEN, G. F. (1993). *Woodland conservation and management* (2nd edition). Chapman and Hall, London.

## Useful sources of information

### Forestry Commission publications

The UK Forestry Standard (1998).

#### Guidelines

Forest nature conservation (1990).  
Forest recreation (1992).  
Lowland landscape design (1992).  
Community woodland design (1992).  
Forest landscape design (2nd edition) (1994).  
Forests and archaeology (1995).  
Forests and soil conservation (1998).  
Forests and water (3rd edition + amendments) (2000).

#### Guideline Note

1 Forests and peatland habitats (2000).

#### Practice Guide

Restoration of native woodland on ancient woodland sites (2003).

#### Practice Notes

4 Controlling grey squirrel damage to woodlands (2003).  
6 Managing deer in the countryside (1999).  
8 Using local stock for planting native trees and shrubs (1999).

#### Bulletins

62 Silviculture of broadleaved woodland (1984).

73 Rhododendron ponticum as a forest weed (1987).  
78 Natural regeneration of broadleaves (1988).  
91 The timbers of farm woodland trees (1990).  
105 Roe deer biology and management (1992).  
106 Woodland management for pheasants (1992).  
108 Monitoring vegetation changes in the conservation management of forests (1992).  
112 Creating new native woodlands (1994).  
123 Managing rides, roadsides and edge habitats in lowland forests (2001).  
124 An Ecological Site Classification for forestry in Great Britain (2001).  
125 Climate change: impacts on UK forests (2002).

#### Information Notes

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).  
32 Plant communities and soil seedbanks in broadleaved–conifer mixtures on ancient woodland sites in lowland Britain (2000).  
35 Natural regeneration in broadleaved woodlands: deer browsing and the establishment of advance regeneration (2000).

36 The impact of deer on woodland biodiversity (2000).

#### Handbooks

Lichens in southern woodlands (1989).  
Forestry practice (1991).  
Tree shelters (1991).  
Growing broadleaves for timber (1993).

#### Field Book

The use of herbicides in the forest (3rd edition) (1994).

#### Woodland Grant Scheme

Applicants' pack (2002).  
([www.forestry.gov.uk](http://www.forestry.gov.uk))

#### Scottish Forestry Grants Scheme

Applicants' Booklet (2003).  
([www.forestry.gov.uk/scotland](http://www.forestry.gov.uk/scotland))

For further information and details of new Forestry Commission publications visit:  
[www.forestry.gov.uk/publications](http://www.forestry.gov.uk/publications)  
Electronic (pdf) versions of many titles are available to download.

### Other publications

ANDERSON, M.L. (1967). *A history of Scottish forestry*. Nelson, London.  
ANON. (1995). Biodiversity: the UK Steering Group report. Volume 2: *Action Plans*. HMSO, London.  
BUCKLEY, G.P. (Ed) (1992). *Ecology and management of coppice woodlands*. Chapman and Hall, London.  
ENGLISH NATURE (1998). UK Biodiversity Group Tranche 2 Action Plans. Volume II: *terrestrial and freshwater habitats*. English Nature, Peterborough.  
HALL, J.E. and KIRBY, K.J. (1998). *The relationship between biodiversity action plan priority and broad woodland habitat types, and other woodland classifications*. JNCC Report No. 288. Joint Nature Conservation Committee, Peterborough.  
HARDING, P.T. and ROSE, F. (1986). *Pasture woodlands in lowland Britain*. Institute of Terrestrial Ecology, Monk's Wood, Huntingdon.  
KIRBY, K.J. (1988). *A woodland survey*

*handbook*. Research and Survey in Nature Conservation No 11. Nature Conservancy Council/Joint Nature Conservation Consultative Committee, Peterborough.  
KIRBY, K.J., PETERKEN, G.F., SPENCER, J.W. and WALKER, G.J. (1989) (2nd edition). *Inventories of ancient semi-natural woodland* (Focus on Nature Conservation No 6). Nature Conservancy Council/Joint Nature Conservation Consultative Committee, Peterborough.  
KIRBY, K.J. and SPENCER, J.W. (1992). An inventory of ancient woodland for England and Wales. In: *Biological Conservation* 62, 77–93.  
LINNARD, W. (1982). *Welsh woods and forests: history and utilisation*. National Museum of Wales.  
MARREN, P. (1992). *The wild woods*. A regional guide to Britain's ancient woodland. David and Charles, London.  
PRESTON, C.D., PEARMAN, D.A. and DINES, T.D. (2002). *New atlas of the British and Irish flora*. Oxford University Press, Oxford.  
RACKHAM, O. (1980). *Ancient woodland: its history, vegetation and uses in England*. Edward and Arnold, London.  
ROBERTS, A.J., RUSSELL, C., WALKER, G.J. and KIRBY, K.J. (1992). Regional variation in the origin, extent and composition of Scottish woodland. In: *Botanical Journal of Scotland* 46 (2), 167–189.  
THE WOODLAND LEAD COORDINATION NETWORK FOR THE JOINT NATURE CONSERVATION COMMITTEE (2002). *Objective setting and condition monitoring within woodland Sites of Special Scientific Interest*. English Nature Research Report 472. English Nature, Peterborough.  
VERA, F.W.M. (2000). *Grazing ecology and forest history*. CABI Publishing, Oxon.  
WALKER, G.J. and KIRBY, K.J. (1989). *Inventories of ancient long-established and semi-natural woodland for Scotland*. Nature Conservancy Council.  
WATKINS, C. (1990). *Britain's ancient woodland. Woodland management and conservation*. David and Charles, London.  
WHITBREAD, A. M. and KIRBY K. J. (1992). *Summary of National Vegetation Classification woodland descriptions*. UK Nature Conservation No. 4. Joint Nature Conservation Committee, Peterborough.

# Appendix 1

## 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.

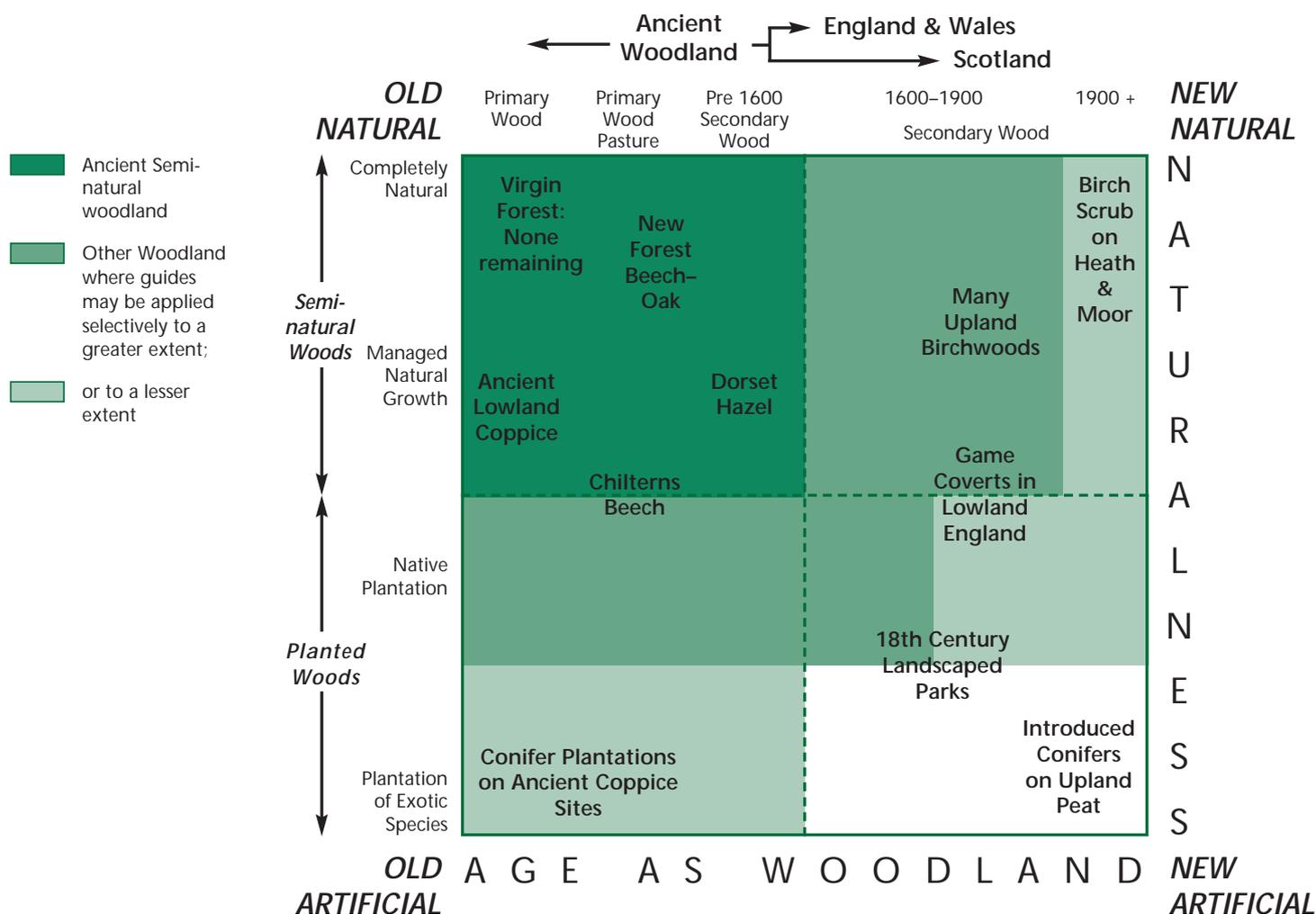
In both cases the dates correspond roughly with the time when new woodland planting first became commonplace so that ancient woods are unlikely to have been planted originally.

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

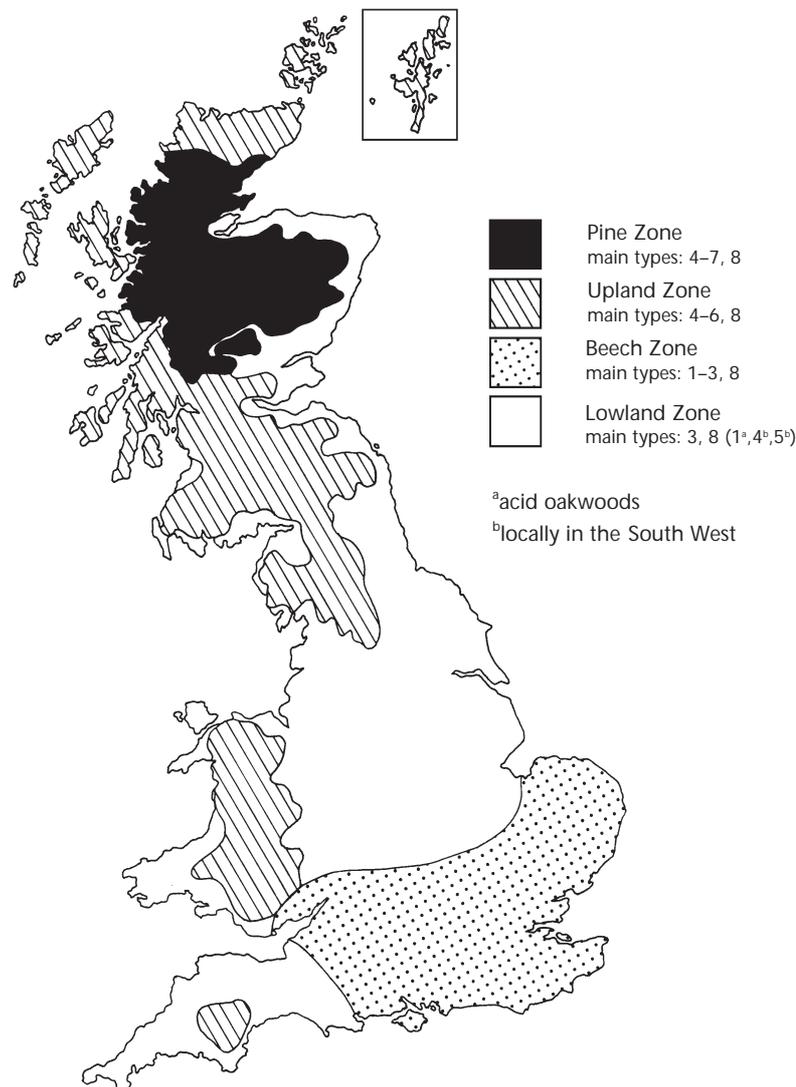
For the purposes of these management guides, Britain's ancient semi-natural woodlands have been divided into 8 types. This gives the best balance between straight-forward, practical guidance and the specific needs of the various types of native woodland. Many more types are

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<sup>1</sup>) and the stand types described by Peterken (1981<sup>6</sup>). 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
<b>South and East Britain</b>				
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
<b>North and West Britain</b>				
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)
<b>All regions</b>				
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.

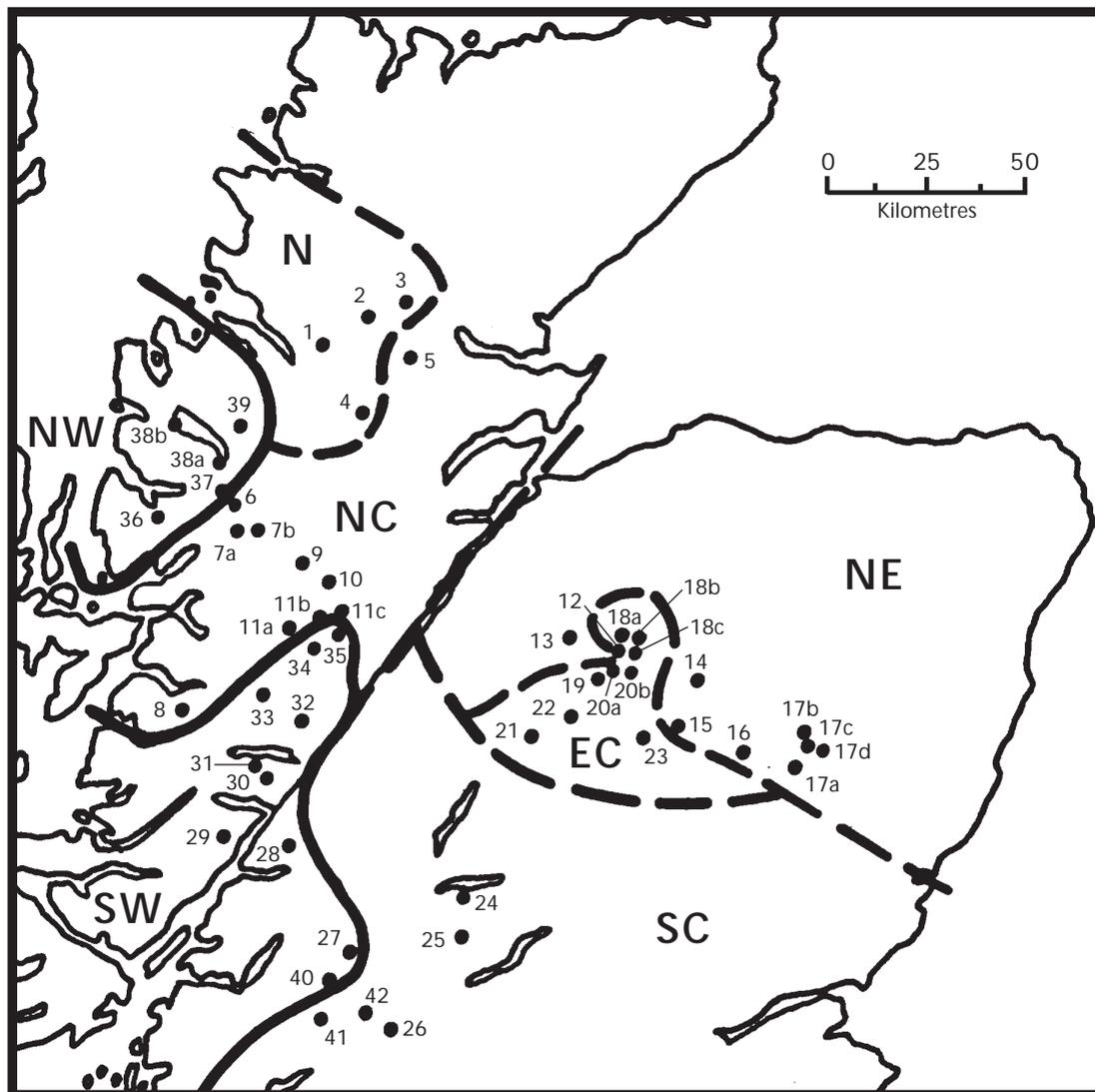
Management of outlying examples should be based on the guidance for their core regions, but some adaptation may be required for local circumstances.

### 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).

Figure 3 Native scots pine woodlands regions of biochemical similarity/seed collection zones



Note: a. The list of woodlands is not exhaustive.  
 b. Several woodlands contain more than one sampling point.

**North (N)**

1. Rhiddorroch
2. Glen Einig
3. Strath Oykeell
4. Strath Vaich

**North West (NW)**

- EXCLUSION ZONE
36. Shieldaig
  37. Coulin – Loch Clair
  - 38a. Loch Maree
  - 38b. Loch Maree Island
  39. Coir A'Ghamhna

**South Central (SC)**

24. Rannoch
25. Meggernie
26. Glen Falloch
41. Glen Orchy (South)
42. Coille Coire Chuilc

**North Central (NC)**

5. Amat
6. Coulin – Easan Dorcha
- 7a. Achnashellach – Golden Valley
- 7b. Achnashellach – Glen Carron
8. Barisdale
9. Glen Strathfarrar
10. Glen Cannich
- 11a. Glen Affric – west
- 11b. Glen Affric – central
- 11c. Glen Affric – east

**East Central (EC)**

- 18a. Abernethy – Loch Garten
- 18b. Abernethy – Fairy Tree
- 18c. Abernethy – Cuchanlupe
19. Rothiemurchus
- 20a. Glenmore – Loch Morlich
- 20b. Glenmore – Lodge
21. Glen Tromie
22. Glen Feshie
23. Glen Derry

**North East (NE)**

12. Abernethy – Torehill
13. Dalnahaitnach
14. Glen Avon
15. Glen Quoich
16. Ballochbuie
- 17a. Glen Tanar – Fir Hillock
- 17b. Glen Tanar – Tanar
- 17c. Glen Tanar – Gairney
- 17d. Glen Tanar – Allachy

**South West (SW)**

- EXCLUSION ZONE
27. Black Mount
  28. Glen Nevis
  29. Ardgour
  30. Glen Loy
  31. Glen Mallie
  32. Glengarry
  33. Glen Loyne
  34. Cougie
  35. Guisachan
  40. Glen Orchy (North)

## Appendix 2

# Caledonian pinewoods inventory and register of native Scots pine seed collection areas

The Forestry Authority maintains a CALEDONIAN PINEWOODS INVENTORY of genetically viable native pinewoods. The Inventory contains all pinewoods with more than 30 individual trees where the balance of probability is that they are genuinely native (semi-natural), that is, descended from one generation to another by natural seeding. The Inventory and the criteria for inclusion are amended from time to time as additional evidence becomes available.

Areas included in the Inventory will normally have:

- **not less than 4 pine per hectare excluding trees less than 2 m in height;**
- **vegetation which is characteristic of a native pinewood, although possibly of a depleted diversity;**
- **a semi-natural soil profile. A site will normally be included if the disturbance is limited to widely spaced drains or superficial cultivation, such as scarification or irregular shallow spaced ploughing.**

Sites which have been extensively underplanted will only be included if the density of native pine is over 50 stems per hectare.

Most seed falls within 30 m or about twice tree height. Consequently boundaries will be drawn initially to encompass trees and groups spaced at less than 50 m from their neighbours. The result will be examined to ensure that site integrity is not lost by the needless fragmentation of accepted sites.

A regeneration zone around each pinewood will be drawn by extending the boundaries by about 100 m. This distance will be extended when wind direction and topography indicate that regeneration is likely to occur, often by the presence of some existing regeneration. The distance will be reduced where there is a

natural barrier to regeneration or for some other practical reason. Regeneration zones may cross ownership boundaries where it makes sense to do so but should avoid minor incursions into other ownerships.

This guide will apply to the combined area of the pinewood and regeneration zone.

A buffer zone will be defined around the pinewood regeneration zone approximately 500 m in width. Within this buffer zone it will be a requirement of any grant scheme that any Scots pine planting is of native origin.

Pinewoods with less than 30 individuals and of historical, aesthetic or biological significance may be included in the Inventory, with regeneration and buffer zones appropriate to their regenerative capacity.

The boundaries of pinewood, regeneration zone and buffer zone, will be drawn on maps to the scale of 1:25 000. In each case the views of the owner will be sought as to the validity of the proposed entry and the extent of the zones. Advice will be sought from Scottish Natural Heritage and others with knowledge of the site.

As well as the Caledonian Pinewood Inventory the Forestry Authority also maintains a REGISTER OF NATIVE SCOTS PINE SEED COLLECTION AREAS which includes those sites with Scots pine of native origin which are considered suitable for collection of seed. Seven Collection Zones are recognised (see Figure 3), based on population differences identified by biochemical research, so that the resulting seed or young trees can be sown or planted in the appropriate zones.

Criteria for inclusion on the REGISTER include:

- **genuinely native origin;**
- **adequate isolation from non-local origins of**

Scots pine, normally at least 400 m;

- an adequate number of trees to conserve genetic diversity, normally at least 200 trees capable of producing seed.

Information on both the Inventory and the Register can be obtained from the local Conservancy offices of the Forestry Authority.

## Notes

## Notes





**Forestry Commission**

231 Corstorphine Road  
Edinburgh  
EH12 7AT

[www.forestry.gov.uk](http://www.forestry.gov.uk)