Forestry Commission

The Native Woodland Resource of Scotland

A Review 1993-1998

Neil A.MacKenzie

Technical Paper 30

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Front cover: The Bucket Mill and part of the Glen Ferrick and Forest of Birse native pinewood, Deeside. This is Scotland's most easterly native pinewood and includes extensive areas of Scots pine, birch and other native tree species within a mosaic of moorland, fields and fringing settlement. *(Neil MacKenzie)*

Back cover: *top* Native scots pine spreading by natural regeneration over the Forest of Birse. *(Neil MacKenzie). bottom* The Bucket Mill is one of three 19th century water-powered wood-working mills still operating within the Glen Ferrick native pinewoods. At the Mill, which is owned by Birse Community Trust, wooden buckets are made using local native pine timber. *(Stan Moyes)*

CONTENTS

Summary

This report summarises the present extent of native woodlands in Scotland, reviews the planting and natural regeneration of new native woodlands over the past five years and considers the value of existing survey information in relation to the preparation of the UK Habitat Action Plans.

New survey information and an increase in the creation of new native woodlands have shown that the native woodland resource of Scotland is substantially greater than previously recognised. The current known area of native woodland is 320 938 hectares which consists of 47% natural origin and 53% planted origin native woodlands. This is a 34% increase in the area recorded in the previous review of five years ago and there are clear indications that the full extent of these native woodlands is still significantly under-recorded.

The planting and natural regeneration of native woodlands have increased considerably, adding 39 316 ha to the resource and accounting for over 53% of all planting, restocking and regeneration under Forestry Commission grant schemes in Scotland over the past five years. More native broadleaves were established than Scots pine and more broadleaves, on average, were established by natural regeneration rather than planting, particularly in the Highlands. However, the proportion of native woodland to total woodland has fallen during that period, principally due to recent accurate assessments of the afforestation schemes of the 1980s. Within the past two years, however, the proportion of regeneration schemes has declined slightly in favour of planting and, in contrast to the Highlands, the proportion of native broadleaves in schemes in the Lowlands is under 50% and has declined in the past five years.

In spite of the new information there is still no comprehensive account of the total area of native woodlands or the total area of each of the different sorts of native woodland in Scotland. An estimate of the proportion of the Habitat Action Plan classification types for semi-natural woods is given. A multi-purpose site-based database is suggested as a mechanism for the collection of national statistics on native woodlands in Scotland.

Neil MacKenzie is an independent land-use adviser working in Scotland on native woodlands, red deer and other related issues.

Chapter 1

Definition of the resource

Introduction

The increasing development of new policies for native woodlands as well as new targets and quotas for their restoration have maintained the growing importance of the native woodland resource. However, it has been five years since the data were compiled for the last review of native woodlands in Scotland and, throughout that time, new survey work has been completed, or is in progress, and substantial areas of new native woodlands have been planted or regenerated.

This report reviews all new surveys dealing with native woodlands in Scotland and updates and revises the native woodland statistics previously presented in Forestry Commission (FC) Technical Papers 12 and 17 (MacKenzie and Callander, 1995 and 1996). It also presents a detailed breakdown of new native woodland planting and regeneration statistics over the past five years and considers the implications of new woodland inventory data and the need to produce a comprehensive database for the UK Habitat Action Plans. This review has been commissioned to assist the work of the Forestry Commission's Advisory Panel on Native Woodlands in Scotland.

Native woodlands

The native woodlands of Scotland are largely made up of tree and shrub species which are the descendants of the original natural forest that colonised the country after the end of the last Ice Age (Table 1.1).

The total native woodland resource includes both the natural origin native woodlands and the planted origin native woodlands. The natural origin woodlands are also described as semi-natural because their character and composition have generally been modified by human activities. Most natural and planted origin native woodlands are relatively easily distinguished in the field, although there are a number of pine and oak sites where historical research is required to determine their origin. Recent new native woodland planting, however, has moderately accurate records of species and seed origin as required under the terms of the FC Woodland Grant Scheme.

Table 1.1 Trees and shrubs native to Scotland

Alder	*Alnus glutinosa*
Ash	*Fraxinus excelsior*
Aspen	*Betula pubescens*
Birch, silver	*Betula pendula*
Blackthorn	*Prunus spinosa*
Cherry, bird	*Prunus padus*
Cherry, wild (gean)	*Prunus avium*
Elder	*Sambucus nigra*
Elm, wych	*Ulmus glabra*
Hawthorn	*Crateagus monogyna*
Hazel	*Corylus avellana*
Holly	*Ilex aquifolium*
Juniper	*Juniperis communis*
Oak, pedunculate	*Quercus robur*
Oak, sessile	*Quercus petraea*
Pine, Scots	*Pinus sylvestris*
Rose, dog	*Rosa canina*
Rose, guelder	*Viburnum opulus*
Rowan	*Sorbus aucuparia*
Whitebeam	*Sorbus rupicola*
	Sorbus arranensis
	Sorbus pseudofennica
Willow, goat	*Salix caprea*
Willow, grey	*Salix cinerea*
Willow, eared	*Salix aurita*
Yew	*Taxus baccata*

Note
Some of these species are rare or have a restricted natural distribution in Scotland (e.g. yew, elder, guelder rose and the rock whitebeam, *Sorbus rupicola*) while *Sorbus arranensis* and *S. pseudofennica* are found only on Arran and Scots pine only occurs naturally in the Scottish Highlands. Other small shrubs like gorse, broom, dwarf birch and additional willow species and their hybrids could also have been included in this list. (See Rodwell (1991) or Peterken (1981) for further information on the distribution of native species.)

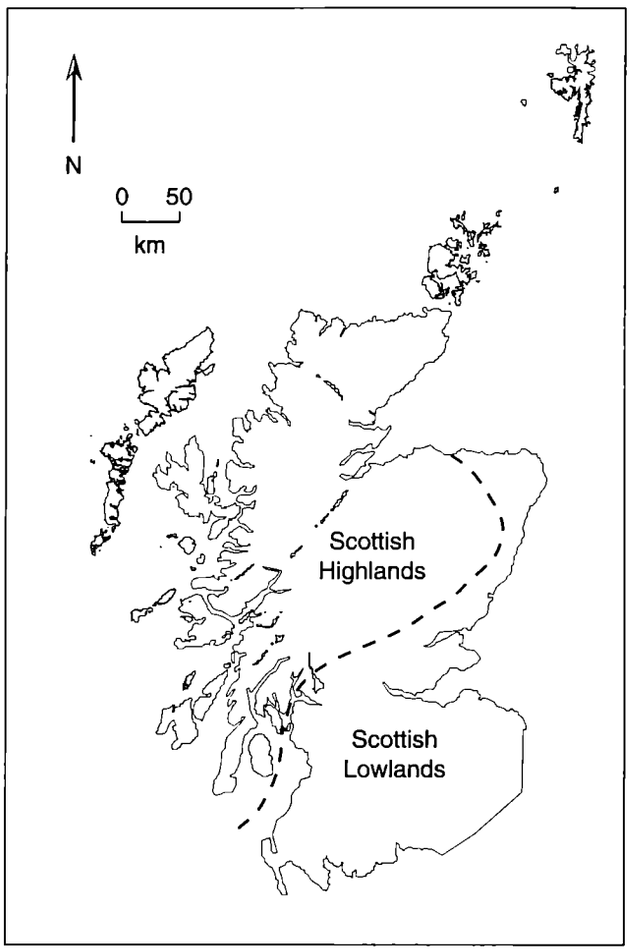


Figure 1.1 The gegraphical division of Scotland into two natural regions: the Highlands and the Lowlands

Highlands and Lowlands

Scotland is divided geographically into two natural regions: the Highlands and the Lowlands. The Highlands are located to the north of the Highland Boundary Fault and to the west of the eastern edge of the Grampian Mountains while the Lowlands are to the south of the Fault and to the east of the eastern edge of the Grampian Mountains (Figure 1.1). Survey data have been presented as all Scotland totals as well as separated into Highland and Lowland figures for comparison with the previous reports (MacKenzie and Callander, 1995 and 1996). Local authority districts are listed in Appendix 5.

Chapter 2

New sources of information 1993–1998

Boundary changes since 1993

A significant number of changes have occurred recently in relation to the administrative boundaries used by local authorities, Forest Enterprise (FE) and the Forestry Commission (FC). All these changes have impacted on the method of reporting for the various woodland surveys and data collection programmes. In addition, some woodland surveys have concentrated their efforts on particular geographical areas such as the Cairngorms, Central Lowlands or the lowland parts of various local authority regions.

Local authority boundaries changed in 1996 with the most significant difference being the new Highland Council area which is no longer split into any subdivisions. Surveys which began prior to the creation of the new unitary authorities are still using the old district boundaries. The current FC Inventory is using the former local authority Regions in order to ensure accurate comparison of statistics with the previous census of woodlands. Forest Enterprise hold data on the former districts as well as their own Forest Districts and Regions. Forestry Commission Woodland Grant Schemes (WGS), however, are collated according to the new council areas, although, if required, it should be possible to analyse the computerised data against different parameters.

The computerisation of data and the digitisation of maps within Geographical Information Systems (GIS) will permit much easier comparison in the future and boundary changes will have considerably less impact on survey results. In the meantime, the new unitary authority boundaries have been used to analyse the main results with data based on the old local authority districts being amalgamated as necessary (see Appendix 5). Semi-natural woodland area totals were, however, collated according to the former local authority districts.

New native woodland surveys 1993–1998

Although there is still no comprehensive survey listing the area and type of all the native woodlands in Scotland there have been a number of significant developments which continue to increase knowledge of the overall resource. Some of these have been completed while others are at an early stage or are part of an ongoing programme. Appendix 1 lists total areas of semi-natural woodland for each of the former local authority districts of Scotland. Most district totals are unchanged since 1993 but there are several key regions where new survey information has significantly increased the known area of native woodland. In the Highlands new surveys have increased the area of semi-natural woodland in Nairn, Moray, Gordon, Argyll, Perth & Kinross and Angus districts; and, in the Lowlands, NE Fife, Ettrick & Lauderdale, Roxburgh and Tweeddale districts. In addition, several important surveys have added more detail, such as National Vegetation Classification (NVC) or age structure information, to the existing material (details of these are given in Appendix 1). The main sources of data on native woodlands were available from the following surveys.

The Land Cover of Scotland project: LCS88

Since 1993 the Land Cover of Scotland (LCS88) project has been completed (Macaulay Land Use Research Institute, 1993). This was a desk study based on an analysis of the 1988 Scottish Office set of aerial photographs of Scotland and covered a wide range of habitats, including woodland. It did not specifically identify native woodlands but classified them under the headings of semi-natural conifers, mixed woodland and broadleaved woodland. The nature of these categories does not permit an accurate interpretation of the total area of native woodlands in Scotland although some of the regional statistics, such as Highland, may well reflect true semi-natural totals. The main difficulties relate to the likely inclusion of planted non-native broadleaves in total estimates and the impossibility of separating the planted Scots pine from the conifer plantation category.

This Technical Paper used the LCS88 figures for total woodland to help update the total woodland area data for Scotland, Highland and Lowland statistics.

The LIFE programme

The Caledonian Partnership's Scottish Woodland Inventory (the LIFE 94 survey) is currently using remote sources, including LCS88, the Ancient Woodland Inventory, aerial photographs and existing site surveys to compile a national database of semi-natural woodland in Scotland. Maps and the database will be available on a computerised GIS which is due to be completed by the year 2000. At present, hard copy maps have been completed for about two-thirds of Scotland but digital maps are only available for a few areas, such as the Cairngorms.

The Caledonian Partnership has developed a three-tiered woodland survey programme. The first is the initial basic, Level 1, information which will eventually provide total area data for semi-natural broadleaved and coniferous woodland but will be unable to provide estimates of area for the individual native woodland types. The second, or Level 2 survey, is designed to collect more detailed woodland data by means of field survey and the production of a series of record cards linked to the GIS. These will then provide the basis for management planning or suggest the need for more detailed or specialised Level 3 survey. Currently, Level 2 surveys have been completed for a sample of semi-natural woods in Argyll, Borders Region and the Central belt. The latter two surveys have been carried out by the Borders Forest Trust and the Central Scotland Countryside Trust respectively. Summary area data and National Vegetation Classification (NVC) woodland types are available for the Borders survey but no statistical information is available for the other areas until digitisation of the maps is completed. Only one Level 3 survey has been recently undertaken by the Caledonian Partnership. This is a timber mensuration assessment of a sample of semi-natural woods in Argyll and was completed in late 1998.

The use of remote sensing sources to compile native broadleaved woodland area data in the Lowlands is more complex and less reliable than in the Highlands. This is due to the larger number of planted, mixed and enclosed woods which require greater detail than is found in aerial photos and LCS88 to establish their correct classification. The value of such woods for amenity and landscape in the Lowlands often far outweighs their conservation attributes and they are often included as part of the LIFE survey programme because of the general scarcity of genuine native woodlands in the Lowlands and because they are sometimes candidates for restoration to a native woodland.

The National Countryside Monitoring Scheme

This survey was designed to assess habitat change between the 1940s and the 1970s and between the 1970s and 1980s. Using aerial photographs from these respective periods and sampling 10 km squares on the ground the results were able to quantify change in a range of habitats, including woodland. Native woodland was not specifically identified but the category of broadleaved woodland is likely to be largely native, at least in Highland districts. The final report has now been published (Mackey *et al.*, 1998).

Aerial photography

The last all Scotland air photo survey was completed in 1988 and the full set of black and white prints at a scale of 1:25 000 were used as the basis for the LCS88 project and are also helping to validate the inventory work of the Caledonian Partnership. More recently there have been several local and regional aerial surveys providing full colour prints at a scale of 1:10 000. The wider Cairngorms area was completed in 1995 and 1997 and there are a number of Special Area of Conservation (SAC) sites with colour aerial coverage. Colour prints are available for the Trossachs and a colour aerial survey of Dumfries and Galloway region was completed in 1997. The Dumfries and Galloway prints are to be used as the basis for a LIFE type Level 1 habitat survey of the region.

Scottish Natural Heritage surveys

Summary details of recent Scottish Natural Heritage (SNH) woodland surveys are listed in Appendix 1. Key areas with NVC surveys completed since 1993 include Stirling district, Loch Lomond Regional Park (completed in 1992 but reports only recently available), Kincardine and Deeside, Argyll and the Cairngorm Partnership area.

All native woodlands in the Cairngorms Partnership Area have now been surveyed and mapped and are in the process of being digitised. Recent projects to complete this exercise include surveys of Strathspey, Strathavon and upper Strathdon and the Cairngorms part of Tayside region. Site information includes dominant canopy type for all woodlands and NVC and age structure assessment for most woodlands. Scots pine woodlands, planted and self-sown, were also assessed for their genetic origin.

SNH have now completed NVC surveys of all the proposed woodland SAC sites with maps and area data available in digital form. Broad age structure data are also available for a few of the native pinewood sites.

Tayside Native Woodlands

This partnership initiative (formerly Tayside Native Woodlands Initiative) estimated the total area of all native woodlands in Tayside region and field surveyed a 10% sample to assess the extent, NVC type and condition of these woods. Detailed analysis was carried out and a database established which also includes ongoing input from surveys related to WGS schemes. Their report included a summary of the results of the survey (Tayside Native Woodlands Initiative, 1995).

Forest Enterprise surveys

Surveys of native Caledonian pine and upland oakwoods have been carried out by Forest Enterprise as part of their contribution to the UK Biodiversity Action Plan (Forest Enterprise, 1997 and 1998). Most of the surveys have focused on an assessment of the current condition of these native woodlands with a view to maintaining or restoring the ecological diversity of the habitat. Details of these and other native woodland surveys conducted as part of FE's general programme of environmental improvements are located in the local forest district offices. There is no central database at present which includes all FE survey details.

The Forestry Commission national inventory of woodland and trees

The FC are currently undertaking a national woodland survey to update their last census of 1979–82. The new survey is using the LCS88, updated to the time of survey, and involves ground sampling to evaluate species composition, age, stocking and other environmental data. The results are based on the former local authority regions in order to allow comparison with the previous census and presented in two reports, the main one covering woodlands of two or more hectares, and the other covering small woodlands and trees. The inventory does not have a native woodland category or distinguish between planted and self-sown woodlands but an indication of native woodland can be obtained by summing the native species areas. At present, six regions in Scotland have completed main reports with the remaining reports scheduled to become available by late 1999.

Surveys by other organisations

The RSPB, Woodland Trust, National Trust for Scotland (NTS), Scottish Wildlife Trust (SWT) and John Muir Trust have carried out various surveys, including Level 1, NVC and other specialist surveys, on their respective properties. The SWT also has an ongoing programme of Level 1 habitat surveys in various districts throughout Scotland. Currently, there are teams operating in Inverness-shire, Gordon, Clydesdale and South Ayrshire. Most survey work concentrates on lowland habitats only. Some statistics are available for broad habitat categories such as semi-natural broadleaved woodland but details of woodland types are only accessible from the survey target notes.

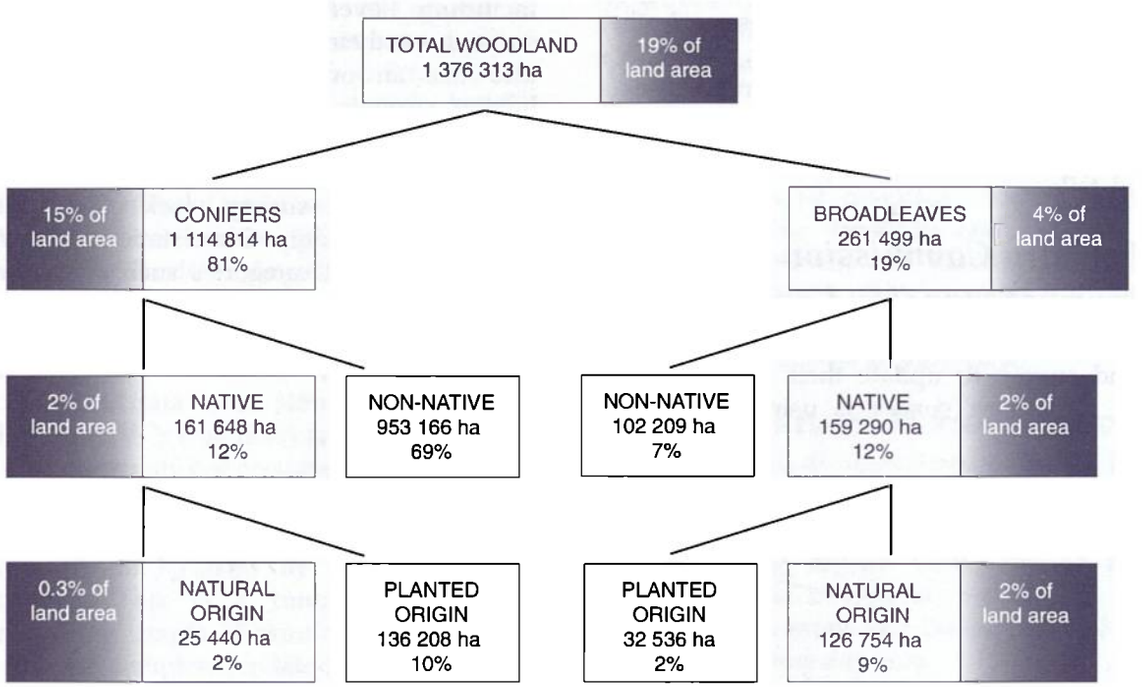
Chapter 3

The native woodland resource

Extent

New survey data, particularly the LCS88, have enabled a re-assessment of the total woodland cover of Scotland. Since the last FC census of 1979–82 the total woodland cover has increased in area by 52%. Almost 1.4 million ha, 19% of the land area of mainland Scotland and the Inner Hebrides, is currently covered by woodland.

The proportion of this woodland which is actually native cannot be determined from the LCS88 and the current estimate relies on less comprehensive data from other sources (Figure 3.1). These confirm that there is a minimum native woodland resource of 320 938 ha which occupies 4% of the land area (5.6% of the land area in the Highlands; 1.7% of the land area in the Lowlands).



Notes

1. Woodland % expressed as % of total woodland.
2. The reference date for the FC Inventory is 31 March 1995 (except Grampian which is 31 March 1994). Area totals have thus been updated from WGS and FE planting/regeneration statistics.
3. Mixed and other broadleaves have not been included as the FC Inventory and WGS/FE planting data did not record the species composition. Since native broadleaves will form a component in this category the area data for native broadleaves and planted origin broadleaves will be an underestimate.
4. Open ground has been included in the woodland area totals for the FC Inventory and WGS/FE statistics. Felled woodland has not been included.
5. Woodland survey data are based mainly on surveys of woods 2 ha and over.

Figure 3.1 Extent of native woodlands in Scotland. Sources: FC Caledonian Pinewood Inventory; FC National Inventory of Woodland and Trees, Part 1 (in press); WGS and Forest Enterprise planting and regeneration statistics, 1993–98; Macaulay Land Use Research Institute (1993); MacKenzie and Callander (1995 and 1996); survey data listed in Appendix 1

Further analysis of the native woodland total reveals that there is a minimum of 152 194 ha of natural origin and 168 744 ha of planted origin native woodland, accounting for 47% and 53% respectively of the native woodland resource (Table 3.1). This is still an underestimate of natural origin native woodlands as most regional surveys of semi-natural woodland continue to be less than comprehensive in their coverage. It is also an underestimate of planted origin native woodlands since there is no information at present on the proportion of native species in the mixed and other broadleaves categories of the FC Inventory and current WGS/FE planting statistics. The majority of planted origin native woodland is Scots pine but native broadleaves are being planted in increasing numbers. Of the 21 567 ha of native species planted under WGS between 1993 and 1998, 61% of the area consisted of native broadleaves.

Table 3.1 also illustrates the disproportionate amount of Scotland's native woodland resource contained within the Highlands. In addition, although woodland area data for England and Wales have not recently been revised, the native woodland resource in the Highlands accounts for 36% and 21% respectively of Britain's woodland area composed of native species and of genuinely native woodland (Table 3.2). Scotland's proportion of the native woodland resource of Britain has increased. Natural origin woodland now accounts for a quarter of Britain's natural origin area (Table 3.2).

Significant changes have occurred in the available knowledge of the native woodland resource since the compilation of the two FC Technical Papers (MacKenzie and Callander, 1995 and 1996). The completion of new survey data has resulted in a 34% increase in the known area of native woodlands. Further new field work and WGS regeneration schemes have added considerably to the natural origin total (which has increased in area by 25%) while planted origin native woodlands have also increased (by 43%). The proportion of natural origin woodland is slightly smaller (47% of the total) than the area of planted origin woodland, which in 1993 was approximately equal in extent.

There has, however, been a reduction in the proportion of native woodland to total woodland. The percentage for Scotland has fallen from 27% (MacKenzie and Callander, 1995) to 23% (Table 3.1). This reduction clearly reflects the more accurate figures for total woodland cover which will include the substantial afforestation schemes of the 1980s. Further native woodland surveys and the completion of the FC's Inventory will probably restore the balance of information.

Current extent of survey coverage in Scotland

The total area of semi-natural woodland which has some degree of field survey information (Level 1 to NVC) amounts to 90% of the known area of semi-natural woods in the Highlands and 44% in the Lowlands. Considerably more effort is required, however, to increase the comprehensiveness of survey coverage and to provide greater detail of woodland types (beyond that of Level 1 or remotely sensed data). The following districts and regions (former local authorities) are priority areas with significant amounts of semi-natural woodland which do not have comprehensive NVC (or equivalent level) survey coverage:

Sutherland	Many of the woodlands have been surveyed in some detail (though most are not to NVC level) but the material has not been collated in a form that would provide an account of the different semi-natural types.
Wester Ross	This part of the district of Ross & Cromarty has not had a comprehensive NVC survey.
Lochaber	The NVC survey of the district omitted at least 30% of the semi-natural woods.
Tayside Region	The Tayside Native Woodlands survey was a sample NVC survey. Most semi-natural woods have not been field surveyed.
Stirling	The ancient semi-natural woods have NVC survey coverage but the rest of the native woods (about half) have not yet been field surveyed.
Arran (Cunninghame)	Some field survey coverage but none has been analysed.
Kyle & Carrick	No NVC surveys. Only part of the district with some survey coverage but no analysis.
Cumnock & Doon Valley	No NVC survey and no analysis of existing habitat survey.
Dumfries & Galloway Region	Some NVC survey coverage but 60% of the semi-natural woods remain to be surveyed.

Table 3.1 The native woodland resource in the Highlands and Lowlands of Scotland

	Lowlands	Highlands	Scotland
Total land area (ha)	5 081 700	2 239 800	7 321 500
% of Scotland's land area	69	31	100
Total woodland area (ha)	1 061 688	314 625	1 376 313
% of Scotland's woodland area	77	23	100
Total area of native species (ha)	283 944	36 994	320 938
Native species as % of total woodland	27	12	23
% of Scotland's native species area	88	12	100
Total area of natural origin woodland (ha)	134 713	17 481	152 194
Natural origin as % of total woodland	13	6	11
% of Scotland's natural origin area	88	11	100
Natural origin as % of total native species area	47	47	47
Planted origin as % of total native species area	53	53	53

Sources: As Figure 3.1.

Table 3.2 Scotland's native woodland resource in the Great Britain context

	England	Wales	Scotland	GB
Total land area (ha)	1 304 3927	2 076 402	7 321 500	22 441 829
% of GB land area	58	9	33	100
Total woodland area (ha)	929 027	237 432	1 376 313	2 542 772
% of GB woodland area	37	9	54	100
Total area of native species (ha)	415 679	60 808	320 938	797 425
% of total woodland area	45	26	23	31
% of GB native species area	52	8	40	100
Total area of natural origin woodland (ha)	415 679	60 808	152 194	62 8681
% of total woodland area	45	26	11	25
% of GB natural origin area	66	10	24	100

Notes
Land area and most area totals for Scotland exclude Western Isles, Orkney and Shetland which together contain a minimum 1527 ha of total woodland. The FC Inventory does not list any native species for these islands but there is likely to be at least 120 ha. There are only a few small areas of natural origin woodland (< 20 ha in total), for example at Berriedale on Hoy and Allt Volagir in the Western Isles.
LCS88, supplemented by new planting and regeneration data, provided the total woodland figure but the native woodland component could not be determined from this source. Area totals have thus been calculated from different data sources and the native species totals will be an underestimate. The total area of native species and natural origin woodland for England and Wales in Table 3.2 is the same because there are no recent data available on the amount of planted origin native woodland. The FC's National Inventory of Woodland and Trees should provide some of this data when it is completed within the next two years.

Table 3.3 Ownership and survey coverage of native woodlands by the main non-government conservation organisations in Scotland

	Area of woodland owned (ha)	Area surveyed (ha)	
		Level 1	NVC
RSPB (13 mainly woodland reserves)	4940	265	4675
Woodland Trust (75 sites)	2276		1169
John Muir Trust (on 3 properties)	*c.* 200		*c.* 200
SWT (39 woodland reserves)	4380	4380	

Several districts or parts of districts have habitat maps with target notes on woodland types. SNH area offices also contain survey material relating to woodland SSSIs and all the proposed Special Area of Conservation sites have NVC maps. Analysis of this material would provide additional woodland type and area statistics to supplement regional survey data.

Conservation agencies which own areas of native woodland undertake their own surveys. Table 3.3 shows the agencies which own and manage significant amounts of native woodland on some of their properties.

The National Trust for Scotland also own over 2000 ha of native woodland in their various properties but no area information is available on the extent of survey coverage.

Chapter 4

Recent trends in the resource

Woodland Grant Scheme statistics 1993–1998

MacKenzie and Callander (1995 and 1996) had previously reported on the increase in the planting and regenerating of native species between 1988 and 1993. The statistics from the FC's Woodland Grant Scheme analysed for this report continue that trend. From the year ending 31 March 1994 to the same period in 1998 the proportion of native broadleaves in the total broadleaved statistics for Scotland has risen steadily to almost 80% (Figure 4.1a). This figure would certainly be over 90% if mixed and other broadleaves had been used in the calculation. The mixed and other broadleaves categories were excluded from the native species totals as the species composition is not recorded in the WGS database. However, FC staff in Highland Conservancy have confirmed that in their area over 70% (almost 100% in the west) of 'other broadleaves' and 'mixed broadleaves' consist of native species.

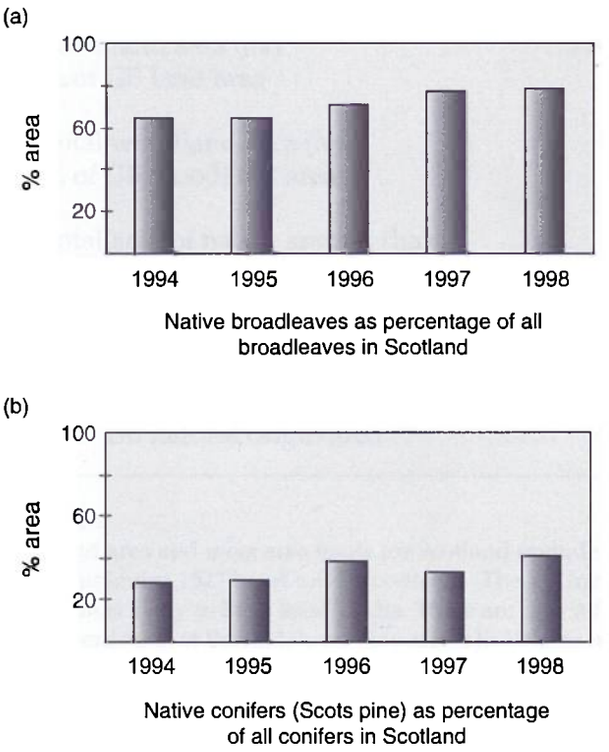


Figure 4.1 WGS statistics (grant paid) for native species in Scotland from year ending 31 March 1994 to year ending 31 March 1998. (Data includes new planting, restocking and natural regeneration)

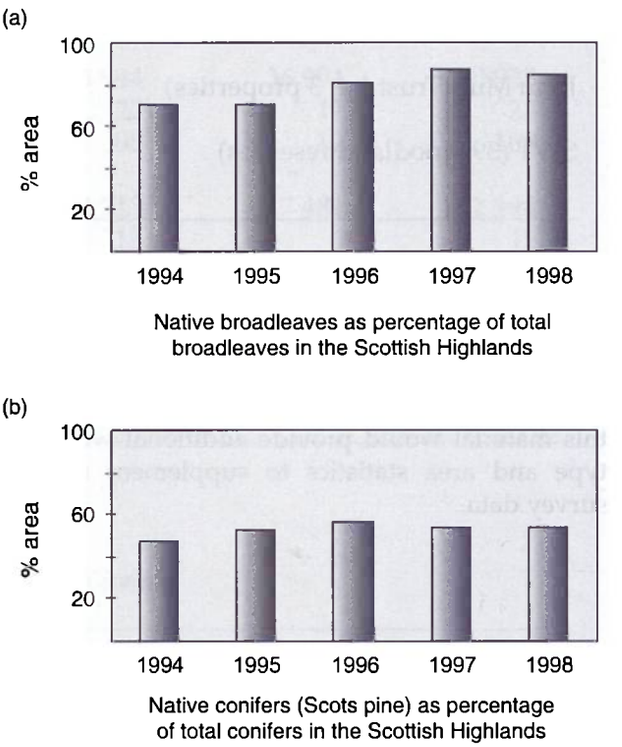


Figure 4.2 WGS statistics (grant paid) for native species in the Scottish Highlands from year ending 31 March 1994 to year ending 31 March 1998. (Data includes new planting, restocking and natural regeneration)

The proportion of native Scots pine in WGS schemes has also risen and has accounted for over a third of all conifers established since 1993 (Figure 4.1b). Almost all of this has been under the Native Pinewood Scheme which has shown a dramatic rise in take-up since 1990 and looks set to continue the trend with a significant area of schemes gaining approval during the last five years (Appendix 3).

Most of the planting and regenerating of native species in Scotland has been in the Highlands. Almost 90% of all broadleaves consist of native species (Figure 4.2a), while Scots pine, which is only native to the Highlands, has accounted for over 50% of all conifers for the past five years (Figure 4.2b). In contrast to the dominance of native species in schemes in the Highlands the proportion of native broadleaves in the Lowlands is under 50% (Figure 4.3).

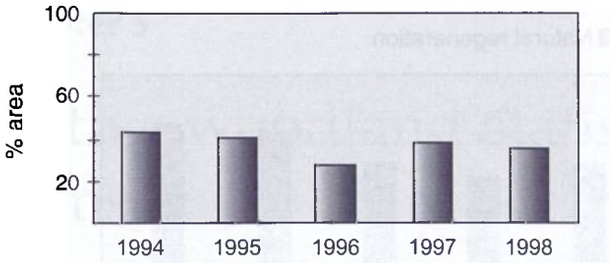


Figure 4.3 WGS statistics (grant paid) for native species in the Scottish Lowlands from year ending 31 March 1994 to year ending 31 March 1998. (Data includes new planting, restocking and natural regeneration)

WGS planting and natural regeneration statistics 1994–1998

Between 1994 and 1996 the amount of new native broadleaved woodland schemes established by natural regeneration exceeded that of planting. In 1997 and 1998, however, although the total amount of native broadleaved schemes had increased, the proportion established by regeneration had become reduced (Figure 4.4).

In the Highlands the proportion of native broadleaved regeneration schemes remained above 50% of the total until 1998 when it declined slightly in favour of planting (Figure 4.5a). With Scots pine, regeneration exceeded planting in 1994 but has shown a gradual decline since then (Figure 4.5b). In 1998 the proportion of regenerating pine was down to 13% despite a consistently high level of Scots pine in Woodland Grant Schemes (Appendices 2 and 3).

In the Scottish Lowlands the amount of regeneration in new schemes remains at a low level, averaging 10% of all the established native broadleaves over the past five years (Figure 4.6). This probably reflects the much smaller area of existing native woodland and the limited scope for expansion in this part of Scotland.

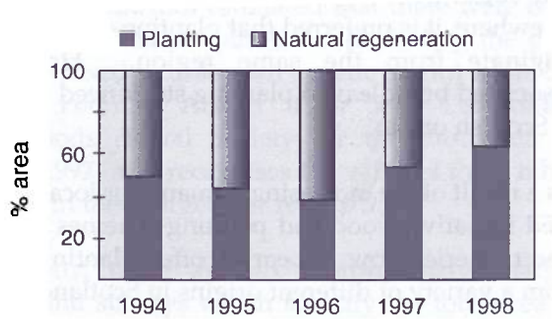


Figure 4.4 Planting and regeneration of native broadleaves within Woodland Grant Schemes (grant paid) in Scotland, 1994–1998. (Planting includes new planting and restock; natural regeneration includes new planting and restock by regeneration)

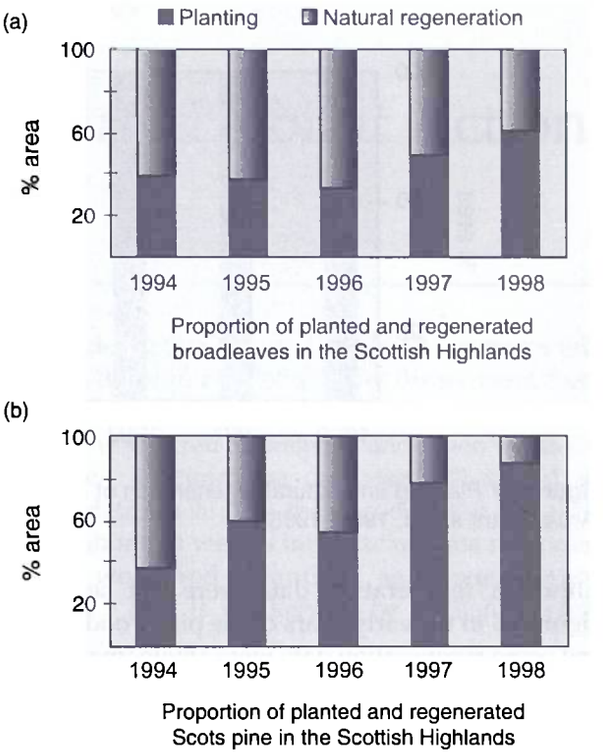


Figure 4.5 Planting and regeneration of native species within Woodland Grant Schemes (grant paid) in the Scottish Highlands, 1994–1998. (Planting includes new planting and restock; natural regeneration includes new planting and restock by regeneration)

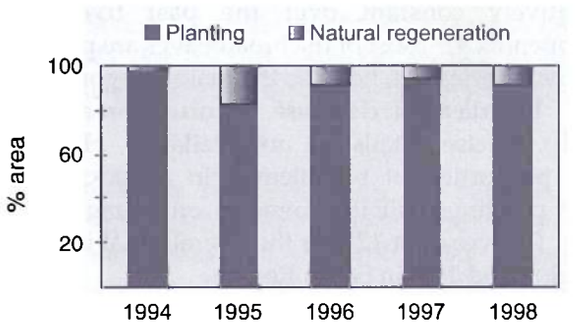


Figure 4.6 Planting and regeneration of native species within Woodland Grant Schemes (grant paid) in the Scottish Lowlands, 1994–1998. (Planting includes new planting and restock; natural regeneration includes new planting and restock by regeneration)

Native pinewoods in Woodland Grant Schemes 1990–1998

The majority of Scots pine and a significant amount of native broadleaves are planted or regenerated under the Native Pinewood Scheme (Appendix 3). The scheme only applies to the Caledonian Forest zone of the Scottish Highlands, although there are a few applications approved for areas outwith this boundary. Over the past six years the total areas established have gradually risen, including the proportion of native broadleaves.

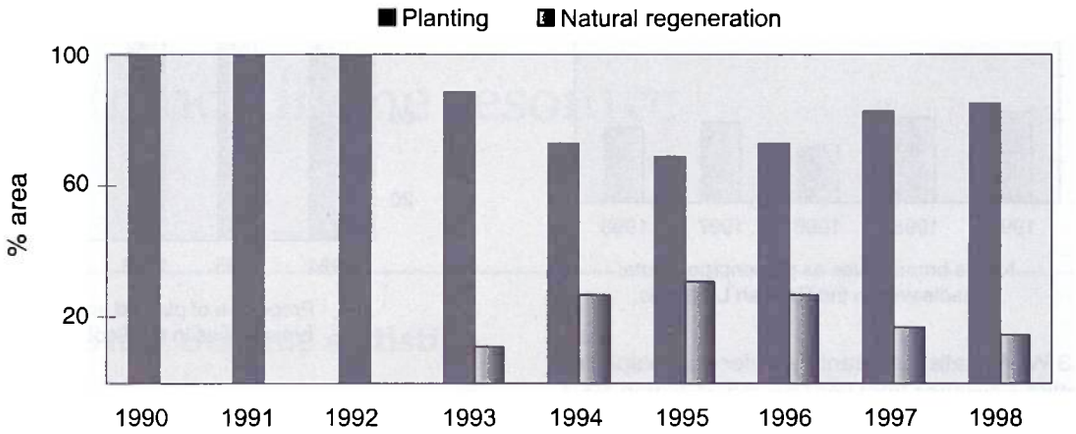


Figure 4.7 Planting and natural regeneration of Scots pine and native broadleaves under the Native Pinewood Scheme. (Areas grant aided, 1990–1998)

Although regeneration data were not separately identified in the early years of the pinewood scheme and some regeneration data were amalgamated with restocking figures prior to 1996, there is an evident decline in the proportion of regeneration to planting from 1996 to 1998 (Figure 4.7).

Native woodland statistics on Forest Enterprise land

New planting, restocking and natural regeneration of native broadleaves and Scots pine have remained relatively constant over the past five years (Appendix 4). Most of the broadleaves are probably native species but, because the main category in the FE broadleaved database is mixed broadleaves (MB), precise details are not available. However, the proportion of broadleaves in restocking and new planting on FE land remains, on average for the past five years, at 12% of the overall total in North Region and 14% in South Region.

The proportion of Scots pine used by FE in North Region plantations also remains relatively constant, albeit with a slight decline in 1997 and 1998. However, the proportion of Scots pine has remained well below 20% of the total area of new conifer planting and restocking over the past five years (Figure 4.8).

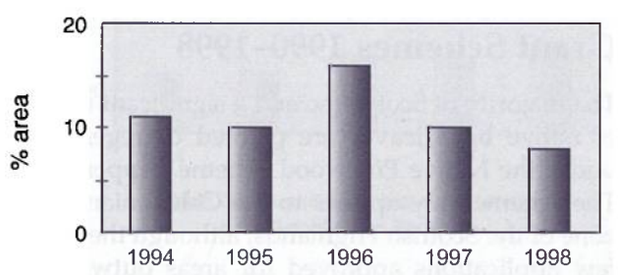


Figure 4.8 Proportion of native conifer (Scots pine) new planting, restocking and natural regeneration on Forest Enterprise land in North Region, 1994–1998

Scots pine planted on FE land in the Lowlands has not been included as a native species but the amount of Scots pine used by FE in South Region is very small (e.g. 27 ha in 1998).

Seed origin for native woodland planting schemes

The last review (MacKenzie and Callander, 1995) commented on the dominance of non-Scottish origin stock in tree nurseries in Scotland. Since then the Forestry Commission's Forestry Practice Guides for the management of semi-natural woodland have been published and these recommend, but do not insist, that, on ancient woodland sites, seed is of Scottish, or preferably local, origin. In Highland Conservancy, the Forestry Commission expect a letter of confirmation or invoice from the nursery as evidence of the origin of the seed source in native woodland planting schemes. However, this is not a formal requirement by the FC (personal communication, FC, Dingwall).

Conditions for native pinewoods are considerably more stringent. Seed for pine planting stock must originate from the same region in the north-west and south-west regions of biochemical similarity. Elsewhere, it is preferred that planting stock should originate from the same region. However, associated broadleaved planting stock need only be of Scottish origin.

As a result of the increasing demand for local origin seed in native woodland planting schemes several tree nurseries now appear to offer planting stock from a variety of different origins in Scotland.

Chapter 5

Native woodland statistics and Habitat Action Plans

As part of Scotland's commitment to the UK Biodiversity Action Plan the Scottish Biodiversity Group (1997) is coordinating the development of costed action plans to cover the range of native woodland types in Scotland. The Forestry Commission will be the lead partner in all the main woodland habitat action plans, while English Nature will lead on lowland wood pasture and parkland. Costed action plans have so far been published for Caledonian Pinewood and Upland Oakwoods (Anon., 1995). Plans for Upland Ashwoods, Wet Woodlands and Lowland Wood Pasture (and beech and yew) were published in 1998 (UK Biodiversity Group, 1998).

The Habitat Action Plan strategy requires that targets for the restoration and expansion of a certain area of each woodland type be set for the next 10 or 20 years. Currently these targets relate to percentage areas for each woodland type and this is then translated to actual areas. For example, targets for upland oakwoods include a 10% expansion of the total area by 2005. However, as there are no precise area estimates for the total amount of upland oakwood it is not possible to accurately predict what area of oakwood represents 10% of the resource in Scotland. The pinewood targets for 2005 require that the current known area of native pinewoods (17 882 ha) (Forestry Commission, 1998) be expanded by 35%. However, there are a significant number of other self-sown pinewoods of unknown genetic origin, which may yet be recognised as genuinely native, and which possess high conservation value. This review of native woodland statistics estimated that there were over 20 000 ha of native pinewood (including the pine sites of mixed or unknown genetic origin) while the RSPB Habitat Action Plan for Caledonian Pinewoods (Royal Society for the Protection of Birds, 1997) also recognises the value of these other woods in their targets for restoration.

Currently, there are no comprehensive native woodland surveys which identify the total area of each Habitat Action Plan (HAP) or FC semi-natural woodland type in Scotland. The remote surveys of the LIFE level 1 programme will provide total estimates of semi-natural broadleaves and semi-natural conifers by the year 2000 but will not be able to provide further detail. LIFE level 2 surveys will produce the required detail but at the moment these are only being carried out on either a sample basis or in a few selected districts, as and when funds are available. In time, the database will record all survey data, including those conducted by other organisations as well as introducing data from new native woodland planting and regeneration schemes. This is unlikely to be available before 2000.

The FC National Inventory of Woodlands and Trees (NIWT), due to be completed for Scotland later this year, will also not provide an accurate assessment of all semi-natural stands. Matching it with the Ancient Woodland Inventory could identify a large proportion but the AWI significantly under-represents the total area of semi-natural woodland. Matching the FC's Inventory with the LIFE level 1 survey will provide more accurate data on semi-natural status, but only in the FC's sample plots. The NIWT does not, in any case, readily compare with the list of HAP/FC semi-natural woodland types.

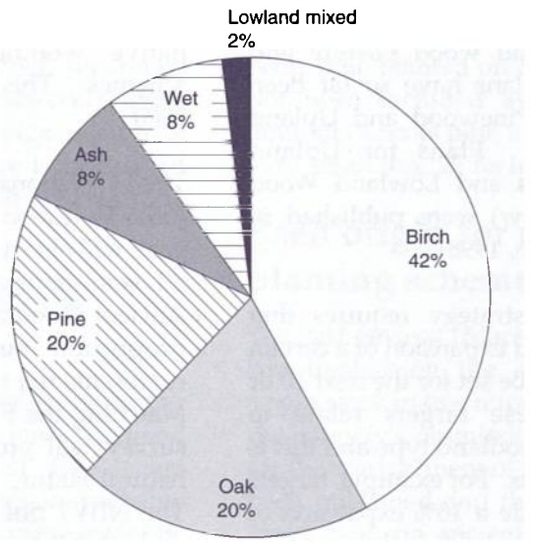
At the moment, therefore, there is a problem in identifying accurate percentages which can be readily monitored and this will affect proposed HAP targets for all of the native woodland types in Scotland. Future monitoring of these percentage targets, for example by the National Inventory of Woodlands and Trees, may produce inaccurate results if the Inventory subsequently identifies additional woodlands which were not previously recorded.

The only way to quickly obtain some idea of the extent of HAP categories in Scotland is to assess the relative percentages of the different FC classification types for semi-natural woodland. This would involve collating information from existing field survey material. Final figures would still be an underestimate of area but might be closer to the true proportion of native woodland types. A proper assessment would require access to woodland record cards and maps as summary area data in reports cannot always be matched with the FC classification. NVC communities such as W11 (*Quercus petraea–Betula pubescens–Oxalis acetosella*

woodland) and W17 (*Quercus petraea–Betula pubescens–Dicranum majus* woodland) could be either oak or birch while Peterken Stand Types do not identify a wet birchwood category (Peterken, 1981; Rodwell, 1991).

Detailed woodland classification schemes such as the NVC are probably not the most appropriate mechanism for obtaining the relevant woodland statistics required for policy and management decisions. FE, for example, calculated the area of upland oakwoods for the HAP on their own estates by utilising existing survey material supplemented by rapid field and vantage point surveys to complete the assessment. Each method will have its pros and cons. The vantage point survey may omit small areas of other woodland types, ash or alder for instance, contained within the oakwood while the NVC would include such sub-dominant habitats. Rapid surveys do produce early results however, while NVC or other Level 2 survey coverage of Scotland's native woodlands will take several years to complete at the present rate of progress.

A preliminary assessment of the proportion of HAP classification types is given in Figure 5.1. This is a very tentative assessment as it did not involve



HAP classification of semi-natural woodlands in Scotland	% area	Approximate area (000s ha)
Upland birchwoods	42	64
Upland oakwoods	20	30
Native pinewoods	20	30
Upland mixed ashwoods	8	12
Wet woodlands	8	12
Lowland mixed broadleaved woods	2	3
	100	152

Notes

1. All figures based on an estimated approximate total area of semi-natural woodland of 152 000 ha. Areas of individual woodland types are a guide to the relative proportions and do not reflect accurate amounts. Figures may not sum due to rounding.
2. Wet woodlands include alder, willow and sphagnum birchwoods (NVC type W4c).
3. Habitat Action Plan woodland types in Scotland are more or less equivalent to the FC classification (in the current Forestry Practice Guides 1-8) except that two of the W4 *Betula–Molinia* sub-communities (W4a and W4b) have been transferred from wet woodlands to the upland birchwood HAP. These W4 birchwoods account for approximately 6% of the semi-natural woodland total and in the figure are included with the other W11 and W17 birchwoods.

Figure 5.1 Estimated proportions of the area of each native woodland Habitat Action Plan (HAP) type in Scotland

consultation with record cards or some recent survey data. Guesstimates were applied in the calculation of wet birchwoods, to separate W11 and W17 birch from oak and to assess regions where survey data were not available.

In view of the lack of comprehensive native woodland area data and the difficulty of monitoring an unknown population, HAP targets should not be based on a percentage of the estimated areas. Instead, targets should be fixed area totals for each HAP type. Monitoring the whole population, when the whole is unknown, is unlikely to provide the required accuracy as sampling can produce a margin of error in excess of 10% (compare the error estimates for common species in the NIWT (Forestry Authority, 1997) where standard errors can be as high as ± 15%). If HAP targets are set at 10%, as in the costed action plan for oakwoods, then monitoring could produce erroneous figures.

Monitoring of the HAP targets should therefore involve an assessment of the actual area totals of new regeneration, planting and restoration achieved during the course of the plan rather than assess the total woodland in a before and after situation, although the latter would be useful in indicating trends.

Chapter 6

Conclusions and recommendations

This is the third occasion in 10 years (1987, 1993 and 1998) that an assessment of the native woodland resource of Scotland has been attempted. Each review has had to utilise a wide range of different survey sources in order to compile a summary account of the native woodland resource. This and the previous assessment have revealed the considerable amount of new survey data which had become available during each five-year interval. In addition, new information provided by the computerisation of WGS data highlights the expansion of native woodlands, particularly during the last five years.

Once again, the analysis of the available data has shown that the native woodland resource of Scotland is substantially greater than previously recognised. The results in this report increase the estimated minimum area of genuinely native woodlands in Scotland to 152 194 ha – a 25% increase on the 1993 total of 121 557 ha which in turn was a 44% increase on the 1987 total of 84 300 ha (MacKenzie, 1987). Also there are indications that these natural origin woodlands are still under-recorded in Scotland. The Highlands remain the most important area for native woodlands of all types but several major restoration schemes are being developed in the Lowlands, for example, by the Borders Forest Trust. The planting and regeneration of native woodlands under the FC grant schemes have achieved considerable advances in the last five years, adding 39 316 ha to the resource. More native broadleaves were established under WGS than Scots pine and more broadleaves, on average, were established by natural regeneration. Native species accounted for over 53% of all planting and natural regeneration, including restocking, under FC grant schemes in Scotland over the past five years.

However, in spite of the new information there is still neither a comprehensive account of the total area of native woodland nor an accurate assessment of the extent of the different types of native woodland in Scotland. The LIFE level 1 survey will not provide this kind of detail and, although the new FC Inventory will provide more information on area and broad composition, it will not provide accurate data on the extent of natural origin woods. Surveys such as the LIFE, LCS88 and the FC Inventory are using aerial photographs which are now 10 years old and before too long another set of aerials will be required, rendering the 1988 ones obsolete. It is inevitable that there will be a time lag between data collection and final output but, when the gap becomes significant, a database with a continuous update facility becomes an essential requirement. LIFE and the FC Inventory are involved in such a programme but neither can provide the necessary native woodland resource statistics because the baseline data are either incomplete or the collection of such data is not part of their objectives. The Forestry Commission's WGS database provides useful statistics on the extent and composition of recent planting and regeneration. Native species area totals can be readily extracted but the mixed and other broadleaves categories (MB and XB), which can include significant amounts of native species, cannot be used in the analysis as their species composition is not recorded on the database. If the WGS and FE database are to provide accurate and comprehensive native woodland statistics the species composition of the MB and XB categories should be included.

There is now an opportunity for a more co-ordinated approach to the collection of native woodland statistics and the establishment of a dedicated dataset. There is already an urgent requirement for comprehensive information on the area, location type and condition of Scotland's native woodland resource as part of the UK Biodiversity Action Plan and its Strategy for Sustainable Development. While they have signed an agreement on this, the Forestry Commission, SNH and the LIFE programme need to develop a combined dataset which will produce appropriate information and updates on all the different types of semi-natural woods and plantations in Scotland. This should move away from a sample based system to a site related one and incorporate the essential components required for analysis. Details of semi-natural woods must include date of survey, area of wood, map, dominant tree species and a classification based on the NVC or the FC system. The dataset need not contain the full content of

the LIFE Level 1/2 record cards as a scaled down version would satisfy the requirements for national or regional statistics. As all surveys, maps and WGS data are gradually being converted into a GIS system the opportunities for minimising duplication and ensuring compatibility are technologically feasible. Any problems associated with local authority boundary changes will be obviated by the ability of the GIS to customise boundaries as the need arises. It will also become easier to monitor trends in woodland change, avoiding the need to set up specific projects such as the National Countryside Monitoring Scheme.

As many other organisations are also involved in, sometimes overlapping, survey work the collection of native woodland statistics has become a complicated operation. The value of a genuinely compatible register of native woodlands with an ongoing mechanism for updating will enable more accurate and reliable statistical analysis, allow regular monitoring, provide the basis for further survey work and guide policy. As the total woodland cover of Scotland has increased significantly in recent years an early conversion to a multi-purpose site-based database will reduce the long-term costs of future inventory and sampling work

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Appendix 1
Main areas of semi-natural woodland in former local authority districts with notes on new field surveys since 1993

District	Total semi-natural area (ha)	Area with field survey (ha)	Notes
Highland districts			
Caithness	302	302	No new data.
Sutherland	4 164	4 016	No new data.
Ross & Cromarty	6 421	5 062	No new data.
Skye & Lochalsh	2 747	2 582	NVC surveys of John Muir Trust woodlands at Torrin and Strathaird (Averis,1995, 1997); Clan Donald Estate (Averis, 1992); FE woodlands at Kinloch & Kylerhea (Averis, 1991, 1993).
Inverness	9 911	8 695	Native woodland on the upper Findhorn mapped and assessed for condition (MacKenzie, 1997c).
Nairn	2 636	2 636	SWT Phase 1 habitat survey was completed in 1993 (Gallagher, personal correspondence, 1993). Maps and target notes only. Includes 1977 ha broadleaves, 332 ha mixed birch with Scots pine plus 327 ha of semi-natural pine of plantation origin. Earlier broadleaved survey of district now in report form (Tidswell, 1995b).
Lochaber	13 373	9 391	No new data.
Badenoch & Strathspey	11 362	10 512	Survey of pinewoods (genetic origin of planted and self-sown) and birchwoods by Dunlop (1994); age structure assessment of self-sown woods in west Cairngorms (Ross and Dunlop, 1998).
Moray	4 046	4 046	Survey of all native woodlands in Strathavon; includes NVC, age structure and genetic origin of planted Scots pine and self-sown woods (MacKenzie, 1997a). Earlier broadleaved survey of district now in report form (Tidswell, 1995b).
Gordon	2 715	2 715	Survey of all native woodlands in upper Strathdon; includes NVC, age structure and genetic origin of planted Scots pine and self-sown woods (MacKenzie, 1997a). Earlier broadleaved survey of district now in report form (Tidswell, 1995a).

Appendix 1 continued

District	Total semi-natural area (ha)	Area with field survey (ha)	Notes
Kincardine & Deeside (including Aberdeen)	11 263	11 263	Callander and MacKenzie (1994) completed survey report on genetic origins of planted and self-sown Scots pine in Highland Deeside; MacKenzie (1997b) produced additional report on age structure of all pinewoods and some birchwoods in Highland Deeside; Tidswell (1997) carried out an NVC survey of 45 broadleaved woods (2033 ha) and Honour (1996) carried out an NVC survey of a further 146 broadleaved woods (no area data) in the district.
Angus (including Dundee)	3 789	3 789	Tayside Native Woodlands Initiative (1995) carried out an NVC survey and condition assessment of 344 ha of native woodland (about 20% of district total) plus an estimate of the area of NVC communities in the rest of the district.
Perth & Kinross	14 965	14 965	Tayside Native Woodlands Initiative (1995) completed an NVC and condition assessment of 1367 ha of native woodland and estimated the area of NVC communities in the whole district. Using the TNWI methods, McInroy (1996) surveyed 893 ha in the southern Cairngorms. TNWI have set up a database to introduce details of all WGS schemes involving native woodlands.
Stirling	5 160	2 943	Booth (1994) completed an NVC survey of 1762 ha of ancient semi-natural woodland which complemented the Loch Lomond NVC survey (Dargie and Simpson, 1992) of 1155 ha.
Argyll & Bute	19 450	19 450	New survey work undertaken in 1995 (Rae) involved additional NVC mapping and a revised estimate of the total native woodland area of the district. Included previously unsurveyed woods under 5 ha and unmapped woods identified from aerial photographs.
Dumbarton	2 257	1 171	The Loch Lomond survey by Dargie and Simpson (1992) surveyed (using NVC) 1171 ha of native woodland in the district.
Arran (Cunninghame)	536	-	No new data.
Lowland districts			
Banff & Buchan	844	398	No new data. A report on previous surveys has been produced (Tidswell, 1995a)

Appendix 1 continued

District	Total semi-natural area (ha)	Area with field survey (ha)	Notes
Dunfermline	805	257	No new data.
Kirkcaldy	463	49	No new data.
NE Fife	849	849	SWT Level 1 habitat survey has mapped 849 ha of semi-natural broadleaved woodlands.
Clackmannan	391	73	No new data.
Falkirk	494	41	No new data.
East Lothian	746	610	Level 1 survey maps and target notes for 610 ha of semi-natural broadleaved woodland were compiled by Hutcheon *et al.* (1998).
Edinburgh	144	10	No new data.
Midlothian	725	480	Level 1 survey maps and target notes for 480 ha of semi-natural broadleaved woodland were compiled by Bates *et al.* (1996).
West Lothian	290	272	Level 1 survey maps and target notes for 272 ha of semi-natural broadleaved woodland were compiled by SWT (1994).
Berwickshire	298	266	All Borders region woodland has been mapped by Borders Forest Trust in 1997 using LIFE Level 1 methodology. 110 sample woods (613 ha) were surveyed to NVC. A further 510 ha or so of woodland SSSIs have Phase 1 maps and target notes. 110 woods due to be surveyed.
Ettrick & Lauderdale	238	238	As Berwickshire.
Roxburgh	239	239	As Berwickshire.
Tweeddale	382	382	As Berwickshire. In addition, SWT Level 1 habitat survey have mapped 382 ha of semi-natural broadleaved woodland.

Appendix 1 continued

District	Total semi-natural area (ha)	Area with field survey (ha)	Notes
Clydebank	503	92	No new data. (Includes Inverclyde and Renfrew districts.)
Clydesdale	1874	1736	Recent NVC surveys include 436 ha of native woodlands in the Clyde Valley (Hawker, 1998; 1996 raw data held by SNH). (Includes Cumbernauld & Kilsyth, East Kilbride, Hamilton, Monklands, Motherwell and Strathkelvin districts.)
Cumnock & Doon Valley	690	50	No new data.
Cunninghame (excluding Arran)	237	55	No new data.
Glasgow	211	146	No new data. (Includes Bearsden & Milngavie and Eastwood districts.)
Kilmarnock & Loudoun	187	–	No new data.
Kyle & Carrick	1606	314	No new data.
Annandale & Eskdale	668	221	No new data. A Level 1 survey of Dumfries & Galloway by Solway Heritage is in progress.
Nithsdale	1947	427	No new data.
Stewartry	1348	643	No new data.
Wigtown	964	662	No new data.

Appendix 2
Woodland Grant Scheme statistics (grant paid)

For Scotland 1993-1998

	Areas in hectares				
	1993/94	**1994/95**	**1995/96**	**1996/97**	**1997/98**
Total BL	6125.66	8902.29	7927.40	7082.01	7273.01
Total CON	4838.76	8305.59	8236.86	8109.82	7264.33
Native BL	3967.92	5677.98	5637.53	5482.72	5754.06
% native BL	65	64	71	77	79
Native CON	1338.29	2529.45	3211.31	2701.17	3014.61
% native CON	28	30	39	33	41

For the Scottish Highlands 1993-1998

	Areas in hectares				
	1993/94	**1994/95**	**1995/96**	**1996/97**	**1997/98**
Total BL	4679.77	6915.85	6512.11	5751.50	6416.91
Total CON	2806.88	4758.58	5706.36	5029.02	5608.32
Native BL	3336.57	4866.15	5244.38	4979.48	5458.12
% native BL	71	70	81	87	85
Native CON	1338.29	2529.45	3211.31	2701.17	3014.61
% native CON	48	53	56	54	54

For the Scottish Lowlands 1993-1998

	Areas in hectares				
	1993/94	**1994/95**	**1995/96**	**1996/97**	**1997/98**
Total BL	1445.89	1986.44	1415.29	1330.51	856.10
Total CON	2031.88	3547.01	2530.50	3080.80	1656.01
Native BL	631.35	811.83	393.15	503.24	295.94
% native BL	44	41	28	38	35

Appendix 2 continued

For Scotland 1993-1998: planting and regeneration data

	Areas in hectares									
	1993/94		1994/95		1995/96		1996/97		1997/98	
	P	Reg	P	Reg	P	Reg	P	Reg	P	Reg
Native BL	1934	2034	2473	3205	2149	3489	2969	2513	3611	2143
% native BL	49	51	44	56	38	62	54	46	63	37
Native CON	491	847	1507	1023	1726	1486	2079	622	2628	386
% native CON	37	63	60	40	54	46	77	23	87	13

For the Scottish Highlands 1993-1998: planting and regeneration data

	Areas in hectares									
	1993/94		1994/95		1995/96		1996/97		1997/98	
	P	Reg	P	Reg	P	Reg	P	Reg	P	Reg
Native BL	1316	2020	1806	3060	1785	3459	2494	2486	3340	2119
% native BL	39	61	37	63	34	66	50	50	61	39
Native CON	491	847	1507	1023	1726	1486	2079	622	2628	386
% native CON	37	63	60	40	54	46	77	23	87	13

For the Scottish Lowlands 1993-1998: planting and regeneration data

	Areas in hectares									
	1993/94		1994/95		1995/96		1996/97		1997/98	
	P	Reg	P	Reg	P	Reg	P	Reg	P	Reg
Native BL	617	14	667	145	364	30	476	28	271	24
% native BL	98	2	82	18	92	8	94	6	92	8

Notes

1. BL = broadleaves; CON = conifers; P = new planting and restock by planting; Reg = natural regeneration.
2. Totals include new planting, restocking and natural regeneration.
3. Area totals exclude open ground.
4. 'Mixed' and 'Other Broadleaves' categories are excluded from the native species totals as the species composition is not recorded in the database.
5. Scots pine is not included as a native species in the Lowlands.
6. Statistics as at 31 March 1998.

Appendix 3

Native pinewood statistics for Scotland 1990-1998

Areas (ha) grant aided to 31 March 1998

	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98
Planting SP	23	528	957	1277	1189	1730	2885	2380	2636
Nat. reg. SP	-	-	-	84	219	560	385	295	435
Planting BL	-	-	-	1499	1145	1281	1080	1822	1653
Nat. reg. BL	-	-	-	276	456	781	1075	566	322
TOTAL	23	528	957	3136	3009	4352	5425	5063	5046

Areas (ha) grant approved to 31 March 1998

	92/93	93/94	94/95	95/96	96/97	97/98
Planting SP	579	1760	2164	2363	2586	1495
Nat. reg. SP	126	1367	1430	1493	299	183
Planting BL	339	1623	1151	1748	1402	1911
Nat. reg. BL	240	1467	1648	903	283	190
TOTAL	1284	6217	6393	6507	4570	4214

Data were unavailable for years 1990-92.

Notes

1. Planting = new planting and restock by planting; Nat. reg. = natural regeneration.
2. SP = Scots pine; BL = native broadleaves.
3. New planting and regeneration totals include restocking; but note that regeneration of Scots pine and broadleaves under restock for years 1992/93 – 1995/96 was recorded under restock by planting. Thus, the regeneration totals are under-recorded for these years.

Appendix 4

New planting, restocking and natural regeneration on Forest Enterprise land in Scotland 1994-1998

North Region

	Areas in hectares				
	93/94	**94/95**	**95/96**	**96/97**	**97/98**
Total BL	309	254	328	161	116
Native BL	309	252	328	161	116
% native BL	100	99	99	100	100
Total CON	2033	2056	1623	1172	1351
Native CON	227	199	258	121	102
% native CON	11	10	16	10	8

South Region

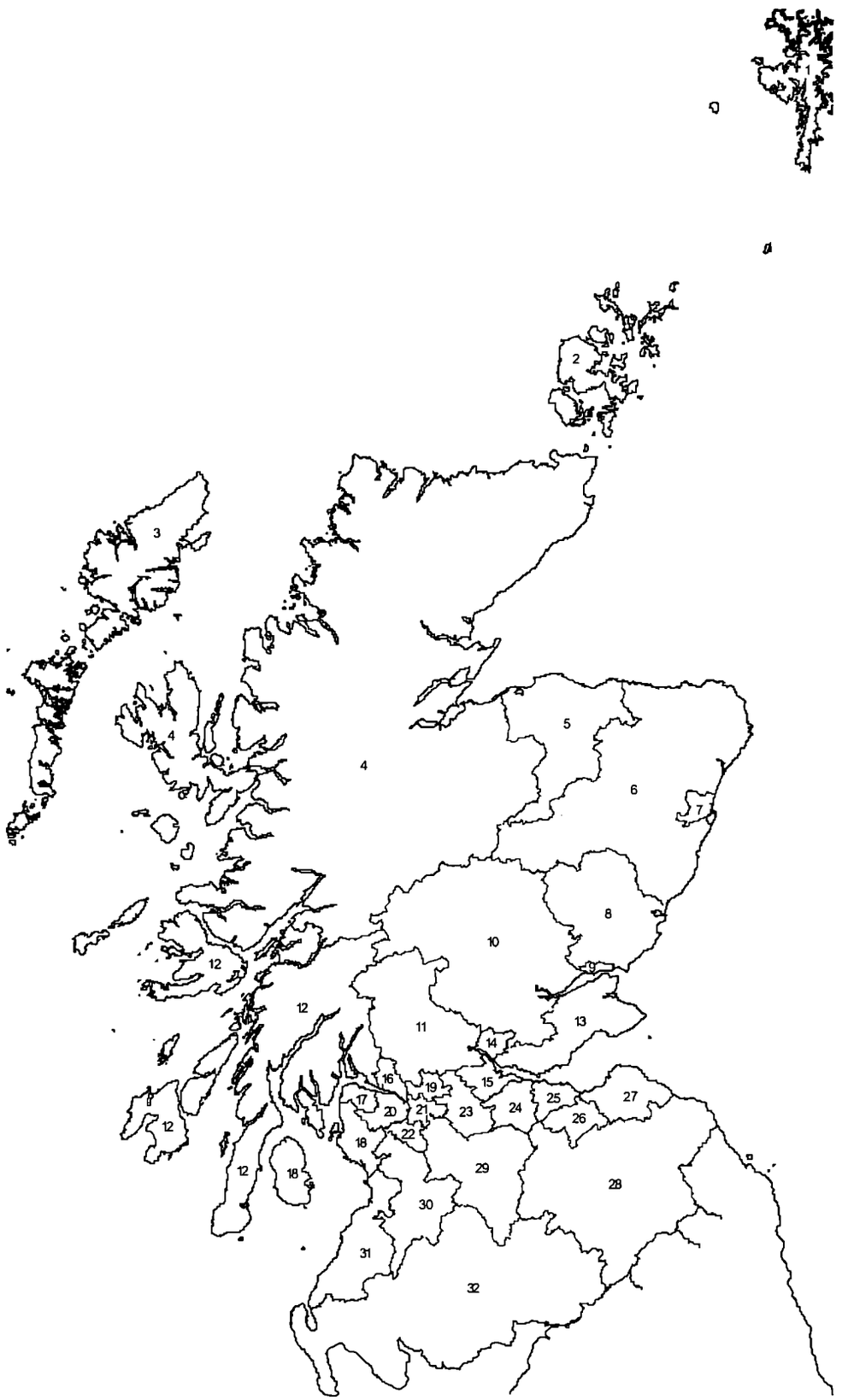
	Areas in hectares				
	93/94	**94/95**	**95/96**	**96/97**	**97/98**
Total BL	277	307	317	282	148
Native BL	277	307	314	282	148
% native BL	100	99	99	100	100
Total CON	1421	1647	2015	1792	1287

Notes

1. Native species listed in the FE database include ash, birch, alder, hazel, mixed broadleaves, oak, Scots pine, wych elm and other broadleaves.
2. Scots pine has not been included as a native species in South Region, which approximately equates with the Scottish Lowlands.
3. The actual species composition of 'mixed broadleaves' is not recorded in the FE database but is presumed to consist largely of native species. It is included here because it comprises over three-quarters of all new planting and restock.
4. The majority of the data refer to restock and new planting by planting; natural regeneration averages about 11% of the native totals in North Region and about 5% in South Region.

Appendix 5
Local authorities in Scotland

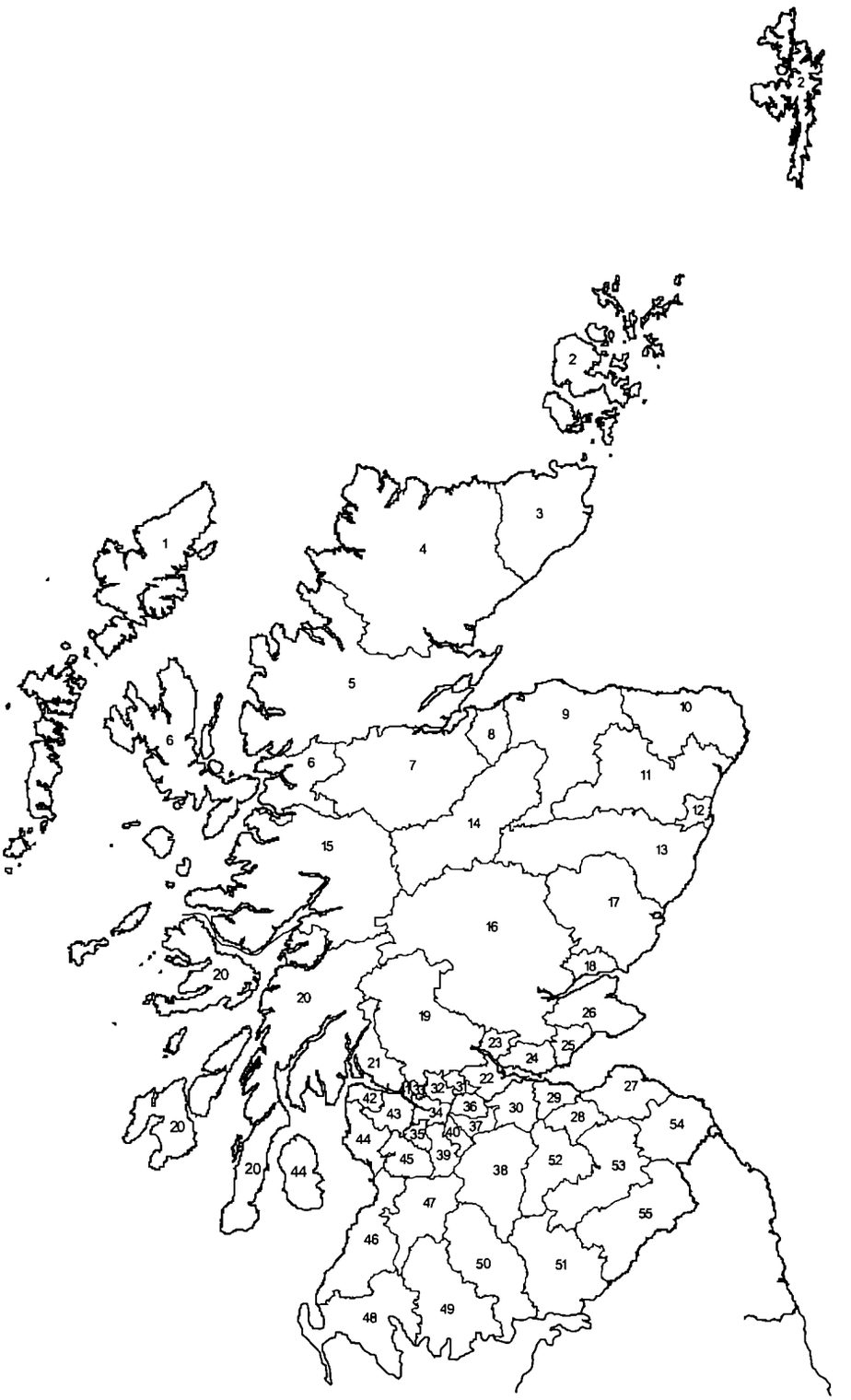
New unitary authority boundaries



1 Shetland Isles
2 Orkney Isles
3 Western Isles
4 Highland
5 Moray
6 Aberdeenshire
7 City of Aberdeen
8 Angus
9 City of Dundee
10 Perthshire & Kinross
11 Stirling
12 Argyll & Bute
13 Fife
14 Clackmannan
15 Falkirk
16 West Dunbartonshire
17 Inverclyde
18 North Ayrshire
19 East Dunbartonshire
20 Renfrewshire
21 City of Glasgow
22 East Renfrewshire
23 North Lanarkshire
24 West Lothian
25 City of Edinburgh
26 Midlothian
27 East Lothian
28 Scottish Borders
29 South Lanarkshire
30 East Ayrshire
31 South Ayrshire
32 Dumfries & Galloway

Former local authority district boundaries

1 Western Isles
2 Shetland and Orkney Isles
3 Caithness
4 Sutherland
5 Ross & Cromarty
6 Skye & Lochalsh
7 Inverness
8 Nairn
9 Moray
10 Banff & Buchan
11 Gordon
12 Aberdeen City
13 Kincardine & Deeside
14 Badenoch & Strathspey
15 Lochaber
16 Perth & Kinross
17 Angus
18 Dundee
19 Stirling
20 Argyll & Bute
21 Dumbarton
22 Falkirk
23 Clackmannan
24 Dunfermline
25 Kirkcaldy
26 North East Fife
27 East Lothian
28 Midlothian
29 Edinburgh
30 West Lothian
31 Cumbernauld & Kilsyth
32 Strathkelvin
33 Bearsden & Milngavie
34 Glasgow
35 Eastwood
36 Monklands
37 Motherwell
38 Clydesdale
39 East Kilbride
40 Hamilton
41 Clydebank
42 Inverclyde
43 Renfrew
44 Cunninghame
45 Kilmarnock & Loudon
46 Kyle & Carrick
47 Cumnock & Doon Valley
48 Wigtown
49 Stewartry
50 Nithsdale
51 Annandale & Eskdale
52 Tweeddale
53 Ettrick & Lauderdale
54 Berwickshire
55 Roxburgh

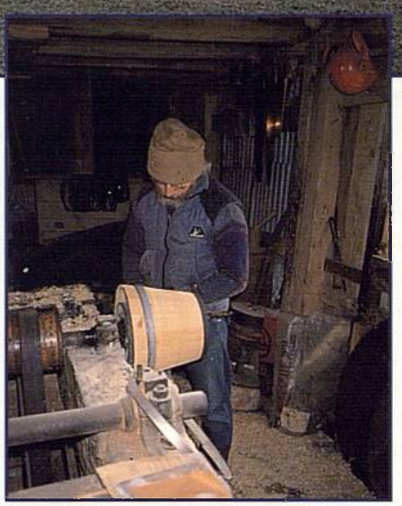


Abbreviations used in the text

AWI	Ancient Woodland Inventory
FA	Forest Authority
FC	Forestry Commission
FE	Forest Enterprise
GIS	Geographical Information System
HAP	Habitat Action Plan
LCS88	Land Cover of Scotland 1988
MB	Mixed Broadleaves
NTS	National Trust for Scotland
NIWT	National Inventory of Woodlands and Trees
NVC	National Vegetation Classification
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SNH	Scottish National Heritage
SSSI	Site of Special Scientific Interest
SWT	Scottish Wildlife Trust
TNWI	Tayside Native Woodlands Initiative
WGS	Woodland Grant Scheme
XB	Other Broadleaves

Scotland's existing native woodlands are important as a unique natural habitat and for the many other environmental, economic and social benefits they provide.

New survey information and an increase in the creation of new native woodlands have shown that the native woodland resource of Scotland is substantially greater than previously recognised.



This Technical Paper summarises the present extent of native woodlands in Scotland, reviews the planting and natural regeneration of new native woodlands over the past five years and considers the value of existing survey information in relation to the preparation of the UK Habitat Action Plans.

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