



▲ Coniferous woodland • © SNH

6. Woodlands: Broadleaved, Mixed and Yew Woodlands; and Coniferous Woodland

Summary

- The area of Broadleaved Woodland increased by 10% in Scotland between 1998 and 2007.
- The area of Coniferous Woodland decreased by 7.1% in Scotland between 1998 and 2007.
- The Species Richness Score decreased by five species in Broadleaved Woodland in Scotland between 1998 and 2007, but there was no longer-term decrease between 1990 and 2007.
- Competitive species increased in Broadleaved Woodland in Scotland between 1998 and 2007, whilst species of open ground decreased.
- Species richness decreased by 12% in Coniferous Woodland in Scotland between 1998 and 2007.
- No changes in soil (0-15cm) pH in either Coniferous or Broadleaved Woodland have been observed in Scotland since 1978.
- Soil (0-15cm) carbon concentration has remained stable in Coniferous Woodland in Scotland but increased in Broadleaved Woodland since 1978.



▲ Woodland planting • © SNH

Note on Chapter 6:

- **The sampling of woodland habitats in Countryside Survey (CS) is different to the approach taken by other agencies reporting on woodlands.**
- **In CS, woodland is defined as 'having over 25% canopy cover of trees and shrubs, over a metre high'. Other bodies include areas of felled and newly planted woodland in statistics for woodland cover, whilst in CS these areas fall into other Broad Habitats dependent on the dominant vegetation type.**

6.1 Introduction¹

In CS, the two woodland Broad Habitats include all broadleaved and coniferous woodlands as well as scrub. Lines of trees and hedges are covered separately as woody linear features, in the Boundary and Linear Features Broad Habitat (*Chapter 5*). Coniferous Woodland is the most extensive woodland type in Scotland making up 79% of the total woodland area, half of which is found in the True Uplands (EZ6). In contrast, the percentage of Scotland covered in Broadleaved Woodland is approximately half that of England and Wales, with the majority concentrated in the Lowlands (EZ4).

An area mapped as a woodland Broad Habitat may also encompass other small patches of vegetation without woodland cover that are a distinctive part of the woodland environment, but not big enough to have been mapped separately. These include grassland within the wood (rides, clearings etc); watercourses; glades opened up by coppicing or wind-throw that may support tall-herb vegetation such as bracken; and waterlogged areas supporting wetland plant communities. The use of the two plot types to assess condition, Main Plots and Targeted Plots, allows the differences between the large areas of habitat and the smaller patches within it to be sampled.

6.2 Description of Broad Habitats

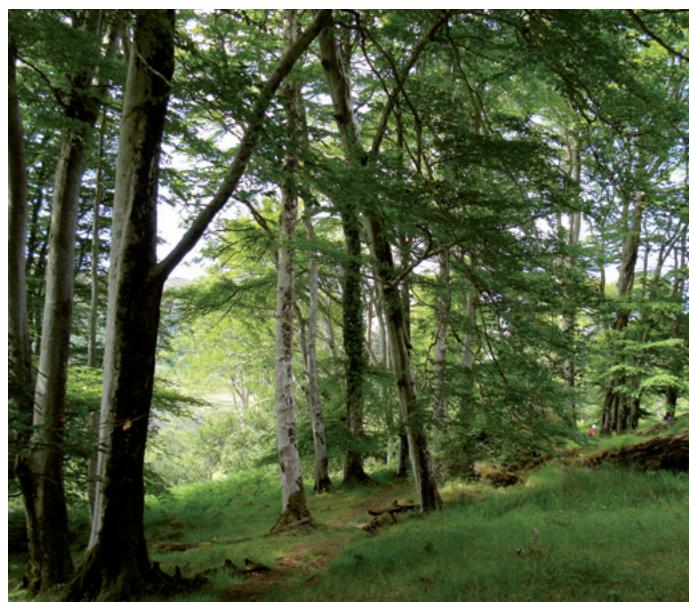
Two main Broad Habitat types distinguish woodland types in Scotland:

Broadleaved, Mixed and Yew Woodland (henceforth referred to as Broadleaved Woodland): Canopy of tree species including mixed broadleaved and yew species with less than 20% of conifers in the canopy. Also includes areas of *Ulex europaeus* scrub at greater than 25% cover.

The Broadleaved Woodland Broad Habitats also include a number of Priority Habitats, which are more restricted in their distribution, and only the more widespread are effectively sampled by CS. These Priority Habitats are defined by the species cover and composition of the woodland canopy (see *Chapter 1*). CS provides some limited information on Wet Woodland, Upland Mixed Ash Woodland, Upland Birchwoods and Upland Oak Woodland Priority Habitats. The ability to report on changes in extent of woodland Priority Habitats relies on consistent definitions between surveys which is not always possible since CS preceded the designation of Priority Habitats.

Coniferous Woodland: Coniferous Woodland is woodland consisting of greater than 20% coniferous tree species and may be native, as in the Scots Pine forests of the Scottish Highlands or may be commercially planted native or non-native species in either large forests or smaller wood lots.

Commercial Coniferous Woodland also includes clear-felled areas awaiting replanting, areas where young trees are establishing and do not yet have 25% canopy cover and areas of natural regeneration, typically along the forest edges to encourage a more natural structure. CS records the vegetation present in these areas and assigns them to Broad Habitats on the basis of that vegetation rather than on the basis of their longer term land use.



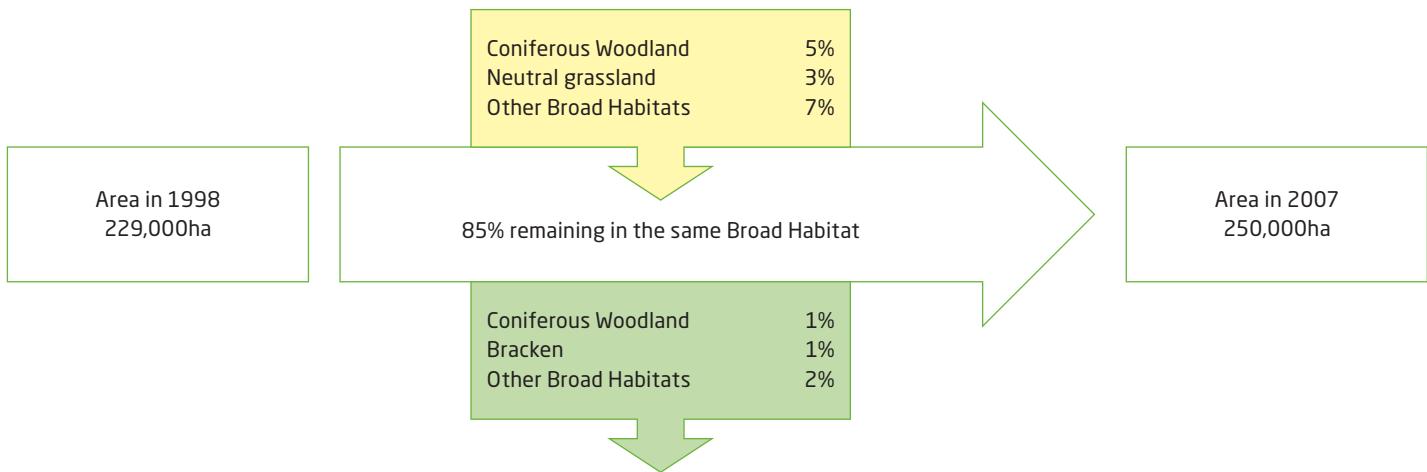
▲ Broadleaved woodland • © Lisa Norton

¹ Note: For further information on the Broad Habitat classification, Vegetation Aggregate Classes or ACs, sampling plots and other Countryside Survey terminology see *Chapter 1 (Introduction and methodologies)*.

▼ Table 6.1: Estimated area ('000s ha) and percentage of land area of the Broadleaved, Mixed and Yew Woodland Broad Habitat in each Environmental Zone and in Scotland from 1990 to 2007. Arrows denote significant change ($p<0.05$) in the direction shown. Note that because of changes in definitions that have been applied retrospectively, the estimates from 1990 are not in all cases directly comparable with later surveys.

	1990		1998		2007		Direction of significant changes 1998-2007
	Area ('000s ha)	%	Area ('000s ha)	%	Area ('000s ha)	%	
EZ4	105	4.7	118	5.2	131	5.8	↑
EZ5	75	2.9	52	2.0	63	2.5	↑
EZ6	104	3.2	59	1.8	57	1.8	
Scotland	284	3.5	229	2.9	251	3.1	↑

▼ Figure 6.1: Movements of land into and out of Broadleaved, Mixed and Yew Woodland between 1998 and 2007.



▼ Table 6.2: Estimated area ('000s ha) and percentage of land area of the Coniferous Woodland Broad Habitat in each Environmental Zone and in Scotland from 1990 to 2007. Arrows denote significant change ($p<0.05$) in the direction shown. Note that because of changes in definitions that have been applied retrospectively, the estimates from 1990 are not in all cases directly comparable with later surveys.

	1990		1998		2007		Direction of significant changes 1998-2007
	Area ('000s ha)	%	Area ('000s ha)	%	Area ('000s ha)	%	
EZ4	156	6.9	172	7.6	182	8.0	
EZ5	307	12.1	355	14.0	293	11.5	↓
EZ6	450	14.0	503	15.7	481	15.0	
Scotland	913	11.5	1030	13.0	956	12.0	↓

6.3 The Area of Woodlands

- The area of Broadleaved Woodland increased by 10% in Scotland between 1998 and 2007.
- The area of Coniferous Woodland decreased by 7.1% in Scotland between 1998 and 2007.

6.3.1 Broadleaved, Mixed and Yew Woodland

Broadleaved Woodland covered 251,000 ha and made up 3.1% by area of Scotland in 2007 (Table 6.1, Fig. 6.1).

The area of Broadleaved Woodland has increased by an estimated 22,000ha (10%) across Scotland since 1998 (Fig 6.1).

This contrasts with a much greater recorded decrease of 55,000 ha in the area of Broadleaved Woodland between 1990 and 1998

(Table 6.1). However, changes to the Broad Habitat reporting framework between 1990 and 1998 mean that comparisons between 1990 and 1998 are less robust.

The overall pattern of change for Scotland (decreases 1990-1998, followed by increases 1998-2007) masks different directions of change at the EZ level. Broadleaved Woodland in the Scottish Lowlands (EZ4) has increased in area since 1990, whilst decreasing in the True Uplands (EZ6) during this period. Only in the Intermediate Uplands and Islands (EZ5), which has the smallest amount of Broadleaved Woodland of all the EZ's, does the trend reflect that of Scotland as a whole.

Most of the Broadleaved Woodland (85%) recorded in 2007 was also recorded as this Broad Habitat type in 1998 (Figure 6.1).



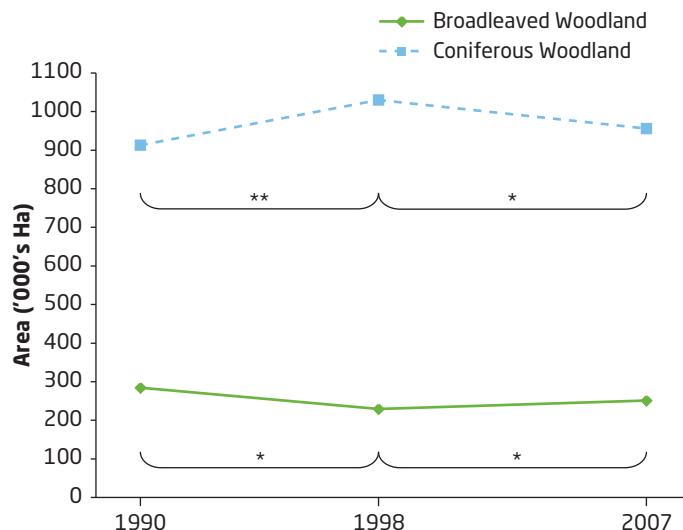
▲ Scots Pine forest • © SNH

There is necessarily a time-lag in detecting new woodland. The recorded shift to woodlands from other Broad Habitats may be because new woodlands planted in the early 1990s have only now (in 2007) reached the 25% canopy cover required to be recorded as woodland by CS.

6.3.2 Coniferous Woodland

In 2007, the estimated area of Coniferous Woodland in Scotland was 956,000ha covering 12% of Scotland (*Table 6.2*). Since 1998, it has decreased in area by 7.1%, which contrasts with a previous increase of 12.8% between 1990 and 1998 (*Figure 6.2*). As for Broadleaved Woodland, changes to the Broad Habitat reporting framework between 1990 and 1998 mean that comparisons between 1990 and 1998 are less robust than those between 1998 and 2007.

▼ **Figure 6.2:** Change in the area of Broadleaved, Mixed and Yew Woodland and Coniferous Woodland in Scotland between 1990 and 2007. Significant changes (** $p<0.05$, ** $p<0.01$) are shown between the dates bracketed. 95% Confidence Intervals are shown for each data point. Confidence Intervals on change are not shown.



The pattern of change for Scotland as a whole was consistent with that in both the Intermediate Uplands and Islands (EZ5) and the True Uplands (EZ6) but only the decrease in EZ5 between 1998 and 2007 was significant (*Table 6.2*). In the Lowlands (EZ4) the increase between 1990 and 1998 was significant.

Almost all of the Coniferous Woodland recorded in 2007 was also recorded as Coniferous Woodland in 1998 (97%) (*Figure 6.3*).

6.4 The condition of woodlands

- The Species Richness Score decreased by five species in Broadleaved Woodland in Scotland between 1998 and 2007, but there was no longer-term decrease between 1990 and 2007.**
- Competitive species increased in Broadleaved Woodland in Scotland between 1998 and 2007, whilst species of open ground decreased.**
- Species richness decreased by 12% in Coniferous Woodland in Scotland between 1998 and 2007.**

6.4.1 Changes in Broadleaved, Mixed and Yew Woodland

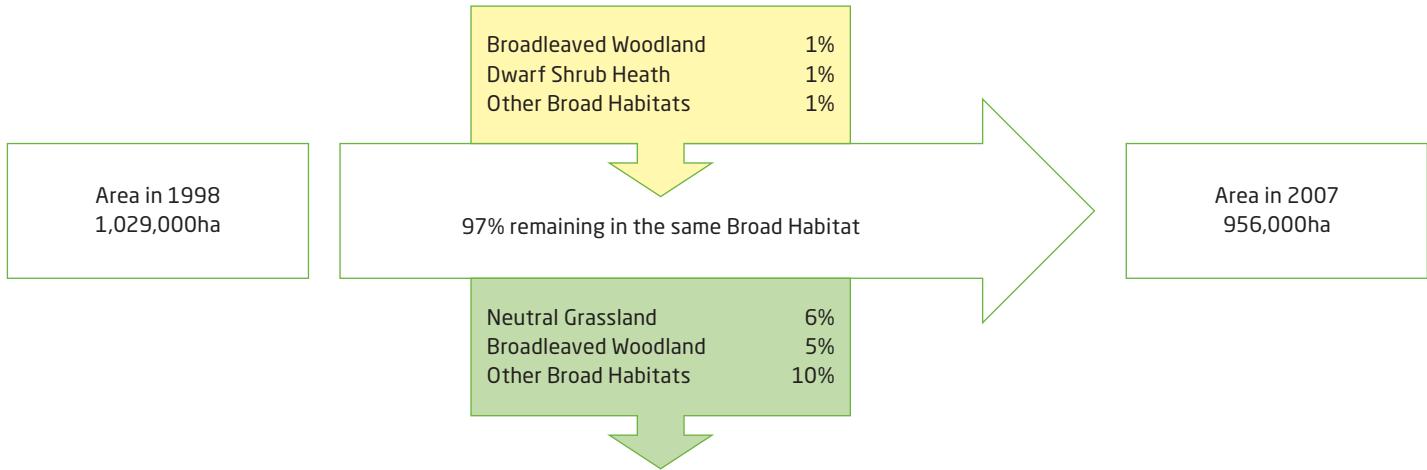
Main plots: The Species Richness Scores of Main Plots in Broadleaved Woodland indicate a decrease of approximately five species between 1998 and 2007 (*Fig. 6.4*). This decrease was significant in the Intermediate Uplands and Islands (EZ5) and the True Uplands (EZ6) but since 1990, a longer-term decline is only evident in the True Uplands (EZ6).

Other changes in the Main Plots since 1998 indicate an increase in competitive species both across Scotland and in the Intermediate Uplands and Islands (EZ5) and True Uplands (EZ6), and a decrease in species of open/disturbed ground across Scotland and in the Intermediate Uplands and Islands (EZ5). Results for the period 1990 to 2007 support the idea that the latter may be part of a longer-term trend potentially indicating an increase in canopy cover. Across this period there were also significant increases in species associated with less fertile, more acidic conditions (*Table 6.3*). The Change Index for species in Broadleaved Woodland Main Plots in Scotland was so small that changes in frequency of plant species can be considered negligible and results are not presented here.



▲ Song thrush • © SNH

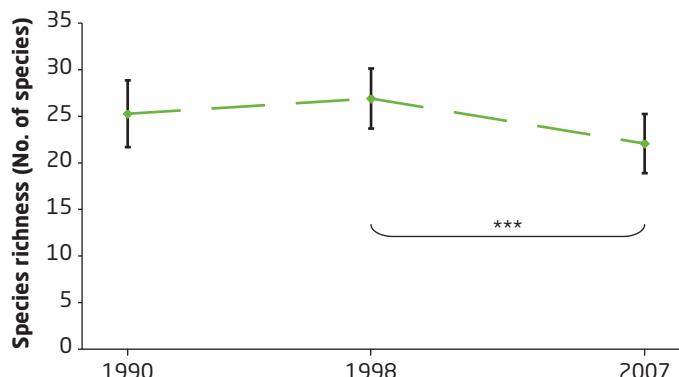
▼ **Figure 6.3:** Movements of land into and out of Coniferous Woodland between 1998 and 2007.



▼ **Table 6.3:** Change in the characteristics of vegetation in 200m² Main Plots in the Broadleaved, Mixed and Yew Woodland Broad Habitat across Scotland between 1990 and 2007. Mean values for condition measures in 1998 and 2007 are presented. Arrows denote significant change ($p<0.05$) in the direction shown. The condition measures are described in **Box 1.3, UK Report**.

	Mean values (Scotland)			Direction of significant changes 1998 - 2007				Direction of significant changes 1990 - 1998				Direction of significant changes 1990 - 2007			
	1990	1998	2007	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6
Vegetation Condition Measures															
Species Richness (No. of Species)	25.2	26.9	22.1	↓		↓	↓			↑					↓
No. of Bird Food Species	8.1	9.0	7.3	↓											
No. of Butterfly Food Species	8.8	9.7	8.6				↓								
Grass:Forb Ratio	-0.05	0.33	0.14												
Competitor Score	2.64	2.61	2.73	↑		↑	↑								
Stress Tolerator Score	2.83	2.90	2.86							↑					
Ruderal Score	2.13	2.13	1.99	↓		↓						↓	↓	↓	↓
Light Score	6.32	6.39	6.37												
Fertility Score	4.46	4.28	4.21					↓	↓	↓		↓	↓	↓	↓
Ellenberg pH Score	4.93	4.78	4.68						↓			↓	↓	↓	↓
Moisture Score	5.71	5.72	5.76												

▼ **Figure 6.4:** Changes in the mean Species Richness in 200m² Main Plots in the Broadleaved, Mixed and Yew Woodland Broad Habitat across Scotland between 1990 and 2007. Significant changes (** p<0.001) are shown between the dates bracketed. 95% Confidence Intervals are shown for each data point. Confidence Intervals on change are not shown.



Targeted Plots: The number of species recorded in Targeted Plots within Broadleaved Woodland decreased significantly in Scotland between 1998 and 2007. This contributed to a long-term decrease of 15% from a mean of 12.6 species to 10.7 species per plot between 1990 and 2007.

Other changes in Targeted Plots were similar to those in Main Plots, with increases in competitive species and decreases in species of open ground between 1998 and 2007, though not always in the same EZs (**Tables 6.3 and 6.5**). Increases in species associated with fertile conditions in Scotland and the Lowlands (EZ4) between 1998 and 2007 and across Scotland between 1990 and 2007 contrasted with trends in Main Plots.

▼ **Table 6.5:** Change in the characteristics of vegetation in 2m x2m Targeted Plots in the Broadleaved, Mixed and Yew Woodland Broad Habitat across Scotland between 1990 and 2007. Mean values for condition measures in 1998 and 2007 are presented. Arrows denote significant change ($p<0.05$) in the direction shown. The condition measures are described in **Box 1.3, UK Report**.

	Mean values (Scotland)			Direction of significant changes 1998 - 2007				Direction of significant changes 1990 - 1998				Direction of significant changes 1990 - 2007			
	1990	1998	2007	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6
Vegetation Condition Measures	1990	1998	2007	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6
Species Richness (No. of Species)	12.6	12.8	10.7	↓	↓							↓			
No. of Bird Food Species	4.4	4.6	3.9	↓	↓				↑						
No. of Butterfly Food Species	4.5	4.9	4.0	↓	↓					↑					
Grass:Forb Ratio	-0.27	0.15	-0.06								↑				↑
Competitor Score	2.76	2.80	2.99	↑	↑							↑	↑	↑	
Stress Tolerator Score	2.69	2.66	2.59		↓										
Ruderal Score	2.24	2.27	2.06	↓	↓	↓						↓	↓		
Light Score	6.35	6.44	6.38												
Fertility Score	4.57	4.55	4.75	↑	↑					↑		↑			
Ellenberg pH Score	5.04	5.04	5.15												
Moisture Score	6.05	6.01	6.01			↓									

▼ **Table 6.6:** Change in the characteristics of vegetation in 200m² Main Plots in the Coniferous Woodland Broad Habitat across Scotland between 1990 and 2007. Mean values for 1998 and 2007 are presented; those for 1990 are available in **Annex 7**. Arrows denote significant change ($p<0.05$) in the direction shown. The condition measures are described in **Box 1.3, UK Report**.

	Mean values (Scotland)			Direction of significant changes 1998 - 2007				Direction of significant changes 1990 - 1998				Direction of significant changes 1990 - 2007			
	1990	1998	2007	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6
Vegetation Condition Measures	1990	1998	2007	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6
Species Richness (No. of Species)	14.2	15.6	13.7	↓											
No. of Bird Food Species	3.6	3.9	3.4	↓			↓				↑				
No. of Butterfly Food Species	5.2	5.5	4.8	↓						↑			↓		
Grass:Forb Ratio	0.60	0.41	0.60							↓					
Competitor Score	2.55	2.58	2.57										↑		
Stress Tolerator Score	3.19	3.17	3.22												
Ruderal Score	1.79	1.72	1.70							↓		↓			
Light Score	6.36	6.38	6.38												
Fertility Score	3.35	3.39	3.32												
Ellenberg pH Score	3.62	3.68	3.58												
Moisture Score	6.21	6.18	6.23												

6.4.2 Changes in the condition of Coniferous Woodland 1990-2007

Main Plots: The Plant Species Richness Score has decreased by 12% since 1998 (**Table 6.6**). No changes were evident at EZ level since 1998, with the exception of the decrease in bird food plant species in the True Uplands (EZ6) which is unlikely to be of importance in this habitat.

Changes since 1990 include a decrease in species of open/disturbed ground across Scotland, increases in competitive species and decreases in Butterfly larvae Food Plant Species in the Lowlands (EZ4). The change index for species in Coniferous Woodland Main Plots was so small that changes in frequency of plant species can be considered negligible and results are not presented here.



▲ Speckled wood butterfly • © SNH

Targeted Plots: Across Scotland there were few changes in Targeted Plots between 1998 and 2007. A decrease in the Bird Food Species Score from 3.4 to 1.9 is probably aligned to a decrease in species associated with open/disturbed ground, which was significant in the Lowlands (EZ4), as was a decrease from 10.7 to 6.3 in the Species Richness Score.

Changes in this plot type across the period 1990 to 2007 included decreases in Species Richness Score (Scotland and the Lowlands (EZ4)) and the numbers of bird (Scotland and the Lowlands (EZ4)) and Butterfly (Scotland) larvae Food Plant Species. There was also a decrease in species associated with open/disturbed ground in the Lowlands (EZ4).



▲ Coniferous woodland • © Crown copyright Scottish Government

6.5 Woodland Priority Habitats

6.5.1 The area of Priority Habitat woodlands

Wet Woodland: The area of Wet Woodland was estimated to be approximately 16,000 ha in Scotland in 2007 (*Table 6.7*), which represents an increase of 25% since 1998. There are two possible reasons for this: a) An increase in willow saplings that have invaded boggy ground and now have a canopy cover of 50%, or b) An increase in the dry woodland around the edges of mapped wet woodland, that was not large enough to be mapped separately; it was joined (following written protocols) to the wet woodland correctly by surveyors, and therefore classified overall as Wet Woodland.

▼ **Table 6.7:** The area ('000s ha) of Wet Woodland in Scotland from 1998 to 2007. Arrows denote significant change ($p<0.05$) in the direction shown

	1998 Area ('000s ha)	2007 Area ('000s ha)	Direction of significant changes 1998-2007
EZ4	14	16	
EZ5	2	3	
EZ6	0.2	1.2	↑
Scotland	16	20	↑

Upland Mixed Ashwood: The area of Upland Mixed Ashwood Priority Habitat was estimated to be 13,000 ha in Scotland in 2007 (*Table 6.8*).

▼ **Table 6.8:** The area ('000s ha) of Upland Mixed Ashwood in Scotland in 2007.

	Area ('000s ha)
EZ4	0
EZ5	5
EZ6	8
Scotland	13

Upland Oakwood: The area of Upland Oakwood in 2007 was estimated to be 32,000 ha in Scotland which alongside Wales is where most of this Priority Habitat is found in Great Britain (*Table 6.9*).

▼ **Table 6.9:** The area ('000s ha) of Upland Oakwood in Scotland from 1998 to 2007.

	Area ('000s ha)
EZ4	8.4
EZ5	15
EZ6	8.1
Scotland	32

Upland Birchwood: Upland Birchwood is restricted to Scotland where it covered an estimated area of 32,000 ha in 2007 (*Table 6.10*).

▼ **Table 6.10:** The area ('000s ha) of Upland Birchwood in Scotland in 2007.

	Area ('000s ha)
EZ4	4.6
EZ5	4.3
EZ6	22.9
Scotland	32



▲ Oak woodland • © SNH



▲ Woodland at Loch Lowes • © SNH

6.6 Changes in woodland soils (0-15cm)

- No changes in soil (0-15cm) pH in either Coniferous or Broadleaved Woodland were observed in Scotland from 1978 to 2007.
- Soil (0-15cm) carbon concentration remained stable in Coniferous Woodland in Scotland but increased in Broadleaved Woodland between 1978 and 2007.

6.6.1 Broadleaved, Mixed and Yew Woodland

Soil (0-15cm) pH: There were no significant changes in the mean pH of soil (0-15cm) samples in Broadleaved Woodland in Scotland between 1998 and 2007 (4.84, 5.26).

In contrast, there were significant decreases in the mean Ellenberg pH score in vegetation sampling plots between 1990 and 2007 indicating an increase in species associated with more acidic conditions.

Soil (0-15cm) carbon concentration: There was no significant change in the mean carbon concentration of soil (0-15cm) in Main Plots within Broadleaved Woodland in Scotland between 1998 and 2007 (155.1, 132.0). Over the longer-term, 1978 to 2007, there was a significant increase in soil (0-15cm) carbon concentration. Changes in woodland structure and management and other potential drivers of change in soil (0-15cm) carbon concentration are being investigated as part of the additional analyses of soils in CS, due to be reported in November 2009.

Bulk density and soil (0-15cm) carbon content: The mean bulk density of soils (0-15cm) in Broadleaved Woodland in Scotland was 0.58 g/cm³. Combined with mean soil (0-15cm) carbon concentration, the estimated soil (0-15cm) carbon content is 70.6 t/ha.

6.6.2 Coniferous Woodland

Soil (0-15cm) pH: No change in the mean pH of soils (0-15cm) in Coniferous Woodlands was detected in Scotland between 1998 and 2007 (4.54, 4.63).

Soil (0-15cm) carbon concentration: The carbon concentration of soil (0-15cm) in the Coniferous Woodland Broad Habitat for Scotland did not change between 1978, 1998 and 2007 (222.6, 207.6).

Bulk density and soil (0-15cm) carbon content: The mean bulk density of soils (0-15cm) in Coniferous Woodland in Scotland was 0.46 g/cm³, which when combined with mean soil (0-15cm) carbon concentration, indicated a soil (0-15cm) carbon content of 73.2 t/ha.

6.7 Summary and Discussion

6.7.1 Changes in Woodlands

The extents of the two different woodland types in Scotland changed in different directions between 1998 and 2007 with decreases in Coniferous Woodland and increases in Broadleaved Woodland. These shifts in woodland type are at least to some extent a direct replacement of one woodland type with another as indicated by the analysis on conversion between Broad Habitat types. There was also recruitment of additional woodland from grassland Broad Habitats. The directions of change between 1998 and 2007 completely reversed those between 1990 and 1998. The introduction of Broad Habitats shortly before 1998 resulted in definitional changes which are likely to have affected woodland estimates and the comparability of 1990 estimates with those for 1998 and 2007. Further analyses of the nature of changes in woodland, in discussion with other bodies, will help to clarify the changes presented here.

Between 1998 and 2007 plant species richness decreased in both woodland types. The Species Richness Score in both plot types in Broadleaved Woodland decreased markedly. Decreases in Coniferous Woodland were less marked (with species richness already considerably lower in this woodland type) but were still significant across Scotland in Main Plots. Aligned with the decreases in Broadleaved Woodland were changes in the types of species recorded with increases in competitive species at the expense of those of more open habitats. Species of open habitats also decreased in Coniferous Woodland. It is possible that decreases in species in both woodland types may be due to canopy closure or to particular weather patterns in the survey year resulting in dominance by particular species. Further analysis is required to understand the reasons for species loss, but the results for Scotland are consistent with previous results indicating species loss in Scottish woodlands (Kirby et al. 2005).

Soils under woodland appear to be fairly stable although carbon concentration is increasing in Broadleaved Woodland. Further analysis of soils is ongoing to enable estimation of nutrient status, contaminant levels, soil biotic diversity and soil function and will be reported in November 2009.

6.7.2 Discussion

Since the creation of the Forestry Commission in 1919, there have been several national strategies for woodlands in the UK. During the 1980s, there was a major shift in emphasis in forestry



▲ Timber production • © Crown copyright Scottish Government

policy towards balancing timber production with natural heritage considerations. This resulted in marked changes in the composition and structure of forests and woodlands becoming apparent in the 1990s, as mature conifer plantations were restructured and more planting of broadleaved species took place to improve habitat diversity, naturalness and connectivity.

The most recent strategy published for Scotland, the Scottish Government's *Scottish Forestry Strategy* (2006) sets out a framework for an integrated, cross-sectoral approach to the use and enjoyment of woodlands and forests into the future. Objectives include the conservation of semi-natural woodland and enhancing the biodiversity of other woodlands and forest.

The last two decades have seen an increase in incentives and policy actions relating to planting of new broadleaved woodlands on farmland and in old industrial areas, and replacing felled conifers with broadleaved native trees. Annual Agricultural Census data show that the area of farm woodland in Scotland has continued to increase steadily, following a doubling in area between 1991 and 2000.

A large part of the increase in broadleaved woodland seen in the 2007 results can therefore be attributed to these policy changes, but natural processes will also have contributed, such as where reductions in grazing or intervention have allowed vegetation to develop into woodland by natural succession.

The CS definition of woodland as having over 25% crown cover at least a metre high means that survey results for woodland extent are not comparable with other woodland statistics (see **section 6.1**). The reduction in extent recorded for Coniferous Woodland is likely to be a reflection of felling and replanting cycles. Most newly planted woodland areas will not be allocated to a woodland Broad Habitat category for an estimated 10-15 years after planting, and most areas of plantations will be allocated to a different Broad Habitat (based on vegetation cover) between harvesting and the restocked area achieving 25% crown cover.

The reduction in species richness in woodland (including woodland patches) is consistent with surveys² specifically designed to track long-term changes in British deciduous woodlands and it is likely that areas of Coniferous Woodland are undergoing similar processes.

Longer-term decreases (1990 to 2007) in species associated with fertile conditions and increases in species of acid soils in Broadleaved Woodland may indicate maturing of woodland.

Broadleaved woodland communities have been shifting towards higher forest types, associated with the decrease of shade sensitive species, plant species used by butterfly caterpillars as food and increases in tree and competitive species. The factors which could contribute to these changes include the gradual ageing of trees and reduced thinning and coppicing of woods. Similar processes may be operating in maturing stands of coniferous woodland.

Whilst deer or livestock grazing can prevent tree regeneration, if appropriately managed, it can also produce conditions that allow woodland flora and fauna to thrive. The relationship between densities of large herbivores and damage to young trees and ground flora is important for informing future management of commercial and non-commercial woodlands. Semi-natural woodlands, particularly broadleaved woodlands, may also be threatened by development pressure, inappropriate management and invasive species, all of which can contribute to species loss and fragmentation.

The Scottish Biodiversity Strategy (www.biodiversityscotland.gov.uk/) provides a plan for the conservation and restoration of Broadleaved Woodlands. Within this framework, Local Biodiversity Action Plans include actions to meet the specific targets for woodland Priority Habitats such as Upland Oakwoods and Upland Ashwoods, and many areas where these occur are also protected by designation as Sites of Special Scientific Interest (SSSIs). Woodlands of high biodiversity value may also be protected as Special Areas of Conservation under Natura 2000. The Scottish Forestry Strategy also places importance on reversing the effects of fragmentation on woodland biodiversity via the creation of forest habitat networks, through restoration and improvement of existing woodland and targeted planting.

The role of forestry is vital in adapting to climate change, such as contributing to sustainable flood management, capturing carbon and providing fuel resources and sustainable construction material. Analysis of forest habitat networks, which aim to support fully functioning and adaptable ecosystems, can help in planning adaptation to climate change.



▲ Scots pine, Loch Maree • © SNH

² Kirby et al (2005) *Long-term ecological change in British woodland (1971-2001)*. English Nature Research report 653. Peterborough, UK.

Further information

More details of the methodology, analyses and results from Countryside Survey can be found in other companion reports and data resources available for the Countryside Survey website [www.countrysidesurvey.org.uk] including:

Reports:

- UK Headline Messages – *published November 2008*
- UK Results from 2007 – *published November 2008*
- Detailed Northern Ireland Countryside Survey results – *published April 2009*
- England Results from 2007 – *due to be published August 2009*
- Scotland Results from 2007 – *due to be published June 2009*
- Wales Results from 2007 – *due to be published July 2009*
- Ponds – *due to be published July 2009*
- Streams – *October 2009*
- Soils – *November 2009*
- Integrated Assessment – *2010*

Data resources:

- Web access to **summary data** – a systematic summary of the results used to inform the UK and country level reports – launched in November 2008 and updated in January 2009
- Web access to the **actual data** – data from individual survey squares used to generate all the results presented in Countryside Survey reports from the 2007 survey – licensed access available from June 2009
- The UK Land Cover Map for 2007 – September 2009

The data generated by Countryside Survey will continue to be investigated in conjunction with other information such as climate, pollution and agricultural statistics. It is anticipated that future analysis of Countryside Survey data will lead to many scientific journal articles over the coming years. These investigations will improve understanding about the possible causes of the changes detected in the countryside and, for example, provide an opportunity to explore the results for Priority Habitats in more detail.

Contacts

For further information on Countryside Survey see

www.countrysidesurvey.org.uk or contact:

Countryside Survey Project Office,
Centre for Ecology and Hydrology,
Lancaster Environment Centre, Library Avenue,
Bailrigg, Lancaster LA1 4AP

Telephone: **01524 595811**

Email: **enquiries@ceh.ac.uk**

COPYRIGHT: This publication is the Copyright of the Natural Environment Research Council, June 2008

Copyright: of all graphs, diagrams and charts is owned by the Natural Environment Research Council

Copyright of photographs: Copyright of photographs is as acknowledged in individual captions

Copyright enquiries should be addressed to:

Knowledge Transfer Team, Centre for Ecology and Hydrology,
Maclean Building, Benson Lane, Wallingford OX10 8BB

This publication, excluding logos, may be reproduced free of charge in any format or medium for research, private study or the purposes of internal use within an organisation. This is subject to it being reproduced accurately and not being subject to any treatment that could be considered derogatory. The reproduced material must be acknowledged as NERC Copyright (except where otherwise stated) and the publication named in full.

Disclaimer

Any decisions or actions informed by these results are taken entirely at your own risk. In no event shall NERC be liable for any damages, including loss of business, loss of opportunity, loss of data, loss of profits or for any other indirect or consequential loss or damage whatsoever arising out of the use of or inability to use the results presented in this report.

The Countryside Survey partnership has endeavoured to ensure that the results presented in this report are quality assured and accurate. Data has been collected to estimate the stock, change, extent and/or quality of the reported parameters. However, the complex nature of the experimental design means that results can not necessarily be extrapolated and/or interpolated beyond their intended use without reference to the original data.



This document has been designed and optimised to be printed as portrait A4 double-sided pages. When printing from the software application Adobe® Reader®, please use the 'Fit to paper' or 'Shrink to Printable Area' options found in the 'Page Scaling' drop down menu of the 'Print' dialogue box.

Designed by Countryside Survey.