Forestry Commission

National Inventory of Woodland and Trees 1995-1999

Analysis of Management and Biodiversity Data

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Executive Summary

This publication covers the management and biodiversity data collected during the first National Inventory of Woodland and Trees (NIWT1) that were not published with the main statistics on woodland area. Many of these data were collected for the first time during this National Inventory project.

The new types of data reflect the rapid expansion in the information needs of modern multi-objective forestry policy. For example the data includes aspects of ecology, biodiversity and thinning history, which contribute to the understanding of silvicultural potential as well as future harvests from the woodlands, not solely as timber. Some of the data are potentially more significant as baselines for monitoring than in their immediate uses, although they may also flag up issues for more detailed investigation locally.

The analyses reported on within this document are basic illustrations of possible results. Further, more detailed, analyses may be carried out in the future if required (e.g. Humphrey *et al.*, 2006).

Contents

1 Introduction

This report covers a range of data collected during the National Inventory of Woodland and Trees (National Inventory) survey that was not published with the main statistics on woodland area. Many of these attributes were collected for the first time in the National Inventory. These data are presented for GB and separately for England, Wales and Scotland. Some data are also available for the nine regions of England. Analysis of other land areas are possible, but are not included here.

The National Inventory consists of two separate surveys:

- The Main Woodland Survey covering woodlands of 2ha and over.
- The Survey of Small Woodland and Trees covering Small Woods, Groups of trees, Linear Features and Individual Trees.

Additional data presented in this report were collected during the course of the Main Woodland Survey only.

1.1 Survey methods (the Main Woodland Survey)

In England and Wales, a digital map of all woodland showing Interpreted Forest Types (IFT's - see Glossary) was derived from 1:25,000 scale aerial photography. In Scotland the main survey was based on the Land Cover of Scotland (LCS) 1988 project, which used 1:25,000 scale aerial photography to create a landcover map. The woodland components of this dataset were extracted to provide the basis for a digital woodland map showing IFT's. The digital map was then updated in Scotland (to 1995) to include new woodland established in the Private Sector, through Woodland Grant Schemes, and on the Forestry Commission's National Forest Estate. This map then provided the basis for sampling.

The digital map shows the extent of all woodland ≥ 2 hectares and this was updated as survey work progressed. The total area of woodland was obtained from the digital map with ground sampling undertaken to gather a wide range of woodland information such as species, age and stocking.

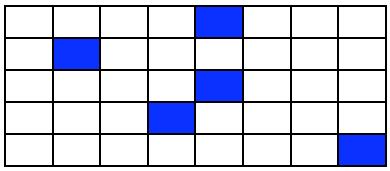
From the digital map the area of each woodland was recorded and this information was used to determine the intensity at which any selected woodland would be sampled. The woodland size classes and intensity of sampling were:

- 2.0ha - <100ha: every fifth wood
- 100ha - <500ha: two woods in five
- 500ha and larger: all woods

One hectare squares were used to sample the selected woodlands on the ground. This was a change of practice from all previous Census surveys where whole woods had been selected for survey. For each of the three woodland area size classes a different sampling grid was used with the density of the squares being reduced as the woodlands increase in size. The overall aim was to sample 1% of the woodland area in each size class.

The sample squares could have been spread randomly over the 1km Ordnance Survey grid or a thoroughly systematic approach could have been implemented. In fact an intermediate position was adopted whereby the OS grid was divided into rectangles of 800m (east – west) by 500m (north – south). These rectangles were called 'clusters', each of which was 40 hectares in area and could contain up to five sample squares as shown in Figure 1.

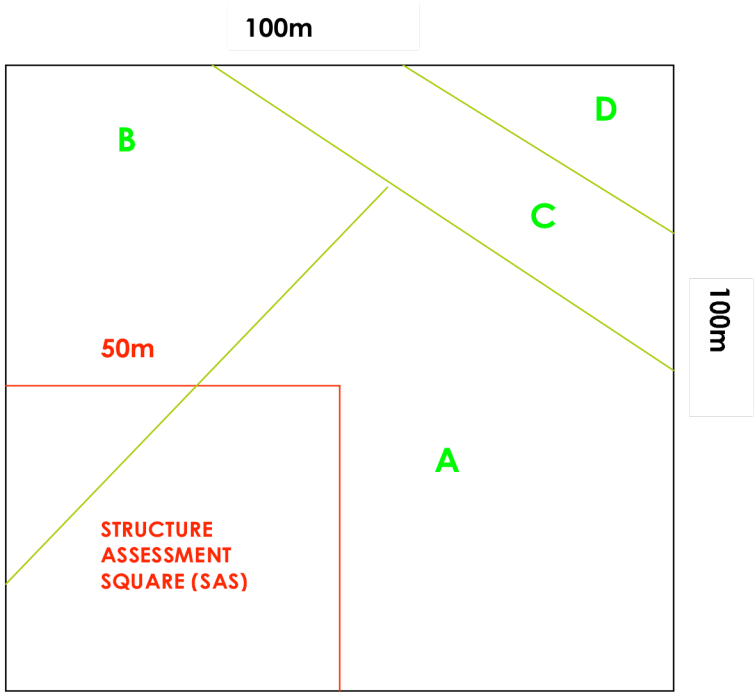
Figure 1: An example of the cluster grid showing five sample squares in one cluster.



This design gave some economies in travelling time, once a woodland was reached and the first square begun, the next and subsequent squares were closer than if a systematic sampling design had been selected.

The structure of the data within the National Inventory is hierarchical with a defined set of levels [wood, owner, cluster, square (and structure), section and element]. This data structure affects the relationships that can be drawn between this additional data and the data that has already been reported in the main series of reports.

Figure 2: Diagram of a 1 hectare sample square, showing the division into sections and the location of the structure assessment square (SAS).



The sections shown in Figure 2, defined by the green lines and labelled A, B, C and D, represent four stands which overlap the square boundary. They can also overlap the boundary of the structure assessment square (SAS); in other words the data for the SAS may represent more than one section but will be only one composite set of information. Where the sample square overlaps the woodland edge or is less than 1ha some adjustment of the SAS is permitted.

A section could be a stand of pure beech or it might be a mixture of Scots pine and European larch. In the first instance one line of information would describe the pure beech but the mixture would require two lines, one for each species. Within the National Inventory these lines of data are called elements. More elements can be created to handle more complex situations, for example variation in planting year.

1.2 The Management and Biodiversity Data

The new types of data reflect the rapid expansion in the information needs of modern multi-objective forestry policy. For example the data include aspects of ecology, biodiversity and thinning history, which contribute to an understanding of silvicultural potential as well as wood processing potential. It is not the aim to offer detailed interpretation of the results, which in most instances is best done by specialists in other disciplines but to present information as an illustration of what is available.

The Management and Biodiversity data are recorded at the following levels in the overall data structure:

Table 1: Principal data types within the data hierarchy.

	Size (ha)	Principal data type	See Section for detail
Wood	≥2.0	Area breakdown by IFT* per wood	
Owner		Ownership type Management type	
Cluster	≤40	*Management practices*	2.0
Sample Square	≤1.0	Predominant IFT	
Detail of data collection within Sample Square			
Structure Assessment Square (SAS)	0.25	*Vertical Structure* *Standing deadwood* *Abandoned timber* *Fallen trees*	5.0 6.1 6.2 6.3
Section	0.05–1.0	Forest type *Thinning history* *Horizontal Diversity* Extractability *Natural regeneration*	 3.0 4.0 7.0
Element	0.05–1.0	*(Horizontal Diversity – see Section above)* Species Planting year Mixture type Area Stocking Timber Potential *Bark* *Browsing damage* *Signs of disease, damage or poor condition*	4.0 8.0 9.0 10.0

Data types shown in *italics* are reported in this document.
* IFT = interpreted forest types (see Glossary for further information)

Note: The size of an owner's holding is not known within the National Inventory data, only which samples were on land under that ownership.

Data within the square at section and element level contribute to measures of horizontal diversity.

The sample statistics presented in the text of this report have very low standard errors; this is due to the very large sample size, with approximately 20,000 independent observations (clusters) containing over 35,000 squares contributing to the GB figures.

It should be noted that in Chapter 7 on bark damage and Chapter 8 on browsing damage it was the intention to ascertain the level of damage but not to attempt to determine the cause.

The overall results are published in the main series of reports for Great Britain and the three countries, the Regions and counties of England, the counties of Wales and the Regions of Scotland.

These are available from www.forestry.gov.uk/inventory. A full description of the methodology is to be published in Smith *et al.* (2008) and this should be consulted for more detailed explanations than are presented herein.

2 Management Practices

Management practices are recorded at the cluster level. If the surveyor found reasonable evidence for the presence of a management practice within the 40ha cluster then it was recorded. For details of the various management practices please refer to the Glossary. 'No obvious management' was used if in any part of the cluster there are areas where the surveyor had been unable to find any indication of active management; this would have included areas of non-intervention, and this could therefore lead to an underestimate of management.

Table 2: Management Practices in Great Britain by FC/Other as a percentage of woodland area.

Management Practice	FC	Other	Total	Standard error
Timber Production	99.0	74.2	**82.8**	0.3
Public Recreation	29.5	19.9	**23.2**	0.3
Good Forest Design	25.6	14.8	**18.5**	0.3
Wildlife/Conservation	13.7	20.7	**18.3**	0.3
Game Birds	2.2	19.8	**13.7**	0.2
Screening or Shelter	0.7	16.8	**11.2**	0.2
No Obvious Management	1.4	15.5	**10.6**	0.2
Grazing	1.9	7.7	**5.7**	0.2
Ornamental	0.2	3.9	**2.6**	0.1
Agroforestry	0.0	0.3	**0.2**	0.0

Within each cluster more than one management practice may be recorded and as a consequence the total of the percentage values may exceed 100%. A management practice recorded within a cluster does not necessarily represent the character of the whole cluster. The percentages given in Table 2 are based on the woodland area for whole clusters; it is not possible with the data available to adjust for management practices that apply over only a proportion of the cluster.

Timber production was the most frequently recorded management practice for both FC and other woodland. Other management practices show some differences between FC and other ownership. Tables 3–5 overleaf show the individual country results.

Table 3: Management Practices as percentages of Woodland area – England.

Management Practice	FC	Other	Total
Timber Production	98.9	70.7	**76.9**
Public Recreation	56.9	31.7	**37.2**
Good Forest Design	24.4	7.6	**11.3**
Wildlife/Conservation	17.0	25.8	**23.9**
Game Birds	8.4	33.6	**28.1**
Screening or Shelter	1.6	18.3	**14.6**
Unmanaged	1.7	20.1	**16.1**
Grazing	5.2	5.0	**5.1**

Table 4: Management Practices as percentages of Woodland area – Wales.

Management Practice	FC	Other	Total
Timber Production	98.9	57.2	**75.8**
Public Recreation	24.3	19.5	**21.6**
Good Forest Design	8.0	5.9	**6.8**
Wildlife/Conservation	6.4	17.1	**12.3**
Game Birds	0.1	7.8	**4.4**
Screening or Shelter	0.8	24.4	**14.0**
Unmanaged	2.0	23.4	**13.9**
Grazing	0.7	16.7	**9.6**

Table 5: Management Practices as percentages of Woodland area – Scotland.

Management Practice	FC	Other	Total
Timber Production	99.4	82.0	**89.5**
Public Recreation	19.4	6.9	**12.3**
Good Forest Design	30.2	24.7	**27.1**
Wildlife/Conservation	14.0	15.9	**15.1**
Game Birds	0.1	7.0	**4.0**
Screening or Shelter	0.2	13.7	**7.9**
Unmanaged	1.1	8.9	**5.5**
Grazing	0.8	8.9	**5.4**

Note:

- Management practice data is collected at the cluster level within the National Inventory.
- Clusters are 40 ha rectangles and form part of the sampling structure.
- Within each cluster more than one management practice may be recorded.
- A management practice recorded within a cluster does not necessarily represent the character of the whole Cluster.
- The cluster data is bulked up within the overall woodland area and consequently the areas above are only Indicative.

3 Thinning History

The surveyors were asked to record the number of thinnings that a section (stand) had received. Sections with three or more thinnings were recorded as '3 or more', beyond 3 thinnings it is difficult to reliably distinguish the number of thinnings within a stand. High Forest excludes those areas under active coppice management. Also excluded is that part of High Forest recorded as 'felled'.

Table 6: Thinning History showing percentage of High Forest by number of thinnings and crop age within Great Britain.

Number of thinnings	Age of crop								
	Up to 25 years old			≥ 25 years old			All ages		
	FC	Other	Total	FC	Other	Total	FC	Other	Total
1	2.8	6.7	5.0	16.7	17.4	17.2	10.7	14.2	**13.0**
2	0.6	1.4	1.1	16.0	18.3	17.6	9.4	13.3	**11.9**
3 or more	0.3	1.0	0.7	11.7	16.8	15.3	6.8	12.0	**10.2**
Some thinning	3.7	9.2	6.8	44.4	52.6	50.1	26.9	39.5	**35.2**
No thinning	96.3	90.8	93.2	55.6	47.4	49.9	73.1	60.5	**64.8**

The data split at an age of 25 years separates, approximately, the pre-thinning crops from those where the expectation of thinning would have been realised if it was part of the management of that Section. It can be seen that almost 50% of all crops ≥25years old were unthinned at the time of the survey.

Table 7: Thinning History by percentage of High Forest Area by number of thinnings, England.

Number of thinnings	Age of crop								
	Up to 25 years old			≥ 25 years old			All ages		
	FC	Other	Total	FC	Other	Total	FC	Other	Total
1	6.4	11.9	10.0	19.6	16.5	17.1	15.2	15.7	**15.6**
2	1.9	4.1	3.3	26.1	22.3	22.9	18.0	19.1	**18.9**
3 or more	0.9	2.6	2.0	22.0	18.1	18.8	14.9	15.4	**15.3**
Some thinning	9.3	18.6	15.3	67.7	56.9	58.8	48.1	50.3	**49.8**
No thinning	90.7	81.4	84.7	32.3	43.1	41.2	51.9	49.7	**50.2**

Table 8: Thinning History by percentage of High Forest Area by number of thinnings, Wales.

Number of thinnings	Age of crop								
	Up to 25 years old			≥ 25 years old			All ages		
	FC	Other	Total	FC	Other	Total	FC	Other	Total
1	5.0	10.9	7.5	23.2	18.9	20.5	16.4	17.2	**16.9**
2	1.2	2.5	1.8	18.0	12.8	14.8	11.7	10.7	**11.1**
3 or more	0.5	1.5	0.9	17.1	30.9	25.8	10.9	24.8	**18.9**
Some thinning	6.7	14.9	10.2	58.4	62.7	61.1	39.0	52.8	**46.9**
No thinning	93.3	85.1	89.8	41.6	37.3	38.9	61.0	47.2	**53.1**

Table 9: Thinning History by percentage of High Forest Area by number of thinnings, Scotland.

Number of thinnings	Age of crop								
	Up to 25 years old			≥ 25 years old			All ages		
	FC	Other	Total	FC	Other	Total	FC	Other	Total
1	1.3	4.1	2.9	13.3	18.6	16.3	7.6	11.8	**10.0**
2	0.1	0.2	0.2	9.9	13.2	11.8	5.2	7.1	**6.3**
3 or more	0.0	0.3	0.2	4.7	9.6	7.5	2.5	5.2	**4.0**
Some thinning	1.5	4.6	3.3	28.0	41.3	35.7	15.3	24.1	**20.3**
No thinning	98.5	95.4	96.7	72.0	58.7	64.3	84.7	75.9	**79.7**

Note: Thinnings are recorded at the stand level; occasionally stands contain some trees that are substantially younger than most of the stand and as a result may appear to have been thinned more often than expected from their age.

Scotland had significantly more area allocated, c. 80% (Table 9), to no-thin than England (Table 7) or Wales (Table 8) both of which are approximately 50% no-thin.

The tables show that the level of unthinned stands in Scotland is far greater than either England or Wales.

In England, for broadleaves up to 25 years old, there was little difference in the proportion of crops unthinned between 'Forestry Commission' and 'Other' ownerships. 'Forestry Commission' broadleaves over 25 years old would appear to be more likely to be thinned than those in the 'Other' ownership category. Conifers were slightly more often (47%) left unthinned than broadleaves (43%) and conifers in 'Other' ownership were significantly more likely to be thinned (60%) than those in 'Forestry Commission' (43%) ownership.

Tables 10–12 show a detailed comparison for England of Category 1 High Forest with a conifer/broadleaf split.

Table 10: England – Thinning History of Category 1 High Forest Area by number of thinnings.

Number of thinnings	Up to 25 years old			> 25 years old			All Ages		
	FC	Other	Total	FC	Other	Total	FC	Other	Total
1	6.7	13.0	10.7	20.3	18.7	19.0	15.7	17.6	**17.2**
2	1.8	4.3	3.3	27.7	26.0	26.4	18.9	22.1	**21.4**
3 or more	0.9	2.3	1.8	22.5	20.5	20.9	15.2	17.2	**16.7**
Some thinning	9.4	19.5	15.8	70.5	65.2	66.2	49.8	56.9	**55.2**
No thinning	90.6	80.5	84.2	29.5	34.8	33.8	50.2	43.1	**44.8**

Table 11: England – Thinning History of Category 1 High Forest Conifers Area by number of thinnings.

Number of thinnings	Up to 25 years old			> 25 years old					All Ages
	FC	Other	Total	FC	Other	Total	FC	Other	Total
1	6.6	18.5	12.2	21.2	29.1	20.5	15.4	26.2	**21.4**
2	1.4	2.0	1.7	25.5	32.2	14.8	16.0	23.8	**20.3**
3 or more	0.4	0.6	0.5	19.0	14.4	25.8	11.6	10.6	**11.0**
Some thinning	8.4	21.1	14.4	65.8	75.7	61.1	43.1	60.5	**52.8**
No thinning	91.6	78.9	85.6	34.2	24.3	38.9	56.9	39.5	**47.2**

Table 12: England - Thinning History of Category 1 High Forest Broadleaves Area by number of thinnings.

Number of thinnings	Up to 25 years old			> 25 years old					All Ages
	FC	Other	Total	FC	Other	Total	FC	Other	Total
1	8.1	8.1	8.1	18.2	14.8	15.1	16.6	13.9	**14.2**
2	5.3	6.3	6.2	32.7	23.8	24.6	28.5	21.4	**22.1**
3 or more	4.9	3.8	3.9	30.6	22.7	23.4	26.6	20.1	**20.7**
Some thinning	18.2	18.1	18.1	81.4	61.3	63.2	71.7	55.4	**56.9**
No thinning	81.8	81.9	81.9	18.6	38.7	36.8	28.3	44.6	**43.1**

Note: Thinnings are recorded at the stand level; occasionally stands contain some trees that are substantially younger than most of the stand and as a result may appear to have been thinned more often than expected from their age.

Simpler tables (Tables 13–20) are presented below giving the overall thinning history for each country by timber potential and ownership. For conifers in timber potential class 1 the extent of thinning in FC Scotland is much lower (30%) than in either FC England (66%) or FC Wales (64%). The equivalent comparison for 'Other' ownerships whilst still showing Scotland at a lower level than the other two countries is much less marked.

Table 13: GB – Broadleaves by timber potential and thinning history.

Ownership		Timber potential			
		Class 1	Class 2	Class 3	Total
Other	No thinning	39.9	64.9	76.8	**52.5**
	1 thinning	15.3	12.7	5.7	**12.7**
	2 thinnings	22.1	9.9	3.7	**15.8**
	3 or more	22.7	12.5	13.8	**19.0**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
FC	No thinning	25.0	70.3	73.5	**42.8**
	1 thinning	16.8	14.7	6.1	**14.1**
	2 thinnings	30.4	6.0	3.7	**20.7**
	3 or more	27.8	8.9	16.6	**22.4**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
All	No thinning	38.4	65.4	76.5	**51.6**
	1 thinning	15.5	12.9	5.7	**12.8**
	2 thinnings	22.9	9.5	3.7	**16.3**
	3 or more	23.2	12.2	14.1	**19.3**
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 14: England – Broadleaves by timber potential and thinning history.

Ownership		Timber potential			
		Class 1	Class 2	Class 3	Total
Other	No thinning	38.7	70.8	85.5	**48.2**
	1 thinning	14.8	10.0	5.0	**13.0**
	2 thinnings	23.8	10.1	2.7	**19.6**
	3 or more	22.7	9.1	6.7	**19.2**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
FC	No thinning	18.6	59.9	61.8	**25.7**
	1 thinning	18.2	19.3	8.9	**17.4**
	2 thinnings	32.7	13.0	2.8	**28.4**
	3 or more	30.6	7.8	26.6	**28.5**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
All	No thinning	36.8	70.0	84.1	**46.2**
	1 thinning	15.1	10.6	5.3	**13.4**
	2 thinnings	24.6	10.3	2.7	**20.4**
	3 or more	23.4	9.1	8.0	**20.0**
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 15: Wales – Broadleaves by timber potential and thinning history.

Ownership		Timber potential			
		Class 1	Class 2	Class 3	Total
Other	No thinning	36.2	36.6	40.2	**38.1**
	1 thinning	22.0	19.1	10.7	**16.2**
	2 thinnings	9.1	14.1	8.2	**10.0**
	3 or more	32.7	30.3	40.9	**35.7**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
FC	No thinning	42.3	54.2	28.6	**42.0**
	1 thinning	13.0	20.4	9.2	**14.1**
	2 thinnings	26.8	7.4	3.1	**15.3**
	3 or more	17.9	18.0	59.1	**28.6**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
All	No thinning	37.2	38.5	39.4	**38.5**
	1 thinning	20.5	19.2	10.6	**15.9**
	2 thinnings	11.9	13.3	7.9	**10.6**
	3 or more	30.4	28.9	42.1	**35.0**
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 16: Scotland – Broadleaves by timber potential and thinning history.

Ownership		Timber potential			
		Class 1	Class 2	Class 3	Total
Other	No thinning	54.9	73.0	91.1	**76.2**
	1 thinning	15.8	12.4	3.2	**9.3**
	2 thinnings	13.8	7.4	1.8	**6.6**
	3 or more	15.5	7.1	3.9	**7.9**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
FC	No thinning	60.5	86.3	89.8	**82.2**
	1 thinning	9.4	8.5	4.2	**6.5**
	2 thinnings	15.0	0.5	4.3	**5.8**
	3 or more	15.1	4.6	1.7	**5.5**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
All	No thinning	55.5	74.4	90.9	**76.9**
	1 thinning	15.1	12.0	3.4	**9.0**
	2 thinnings	13.9	6.7	2.1	**6.5**
	3 or more	15.4	6.8	3.6	**7.6**
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 17: GB – Conifers by timber potential and thinning history.

Ownership		Timber potential			
		Class 1	Class 2	Class 3	Total
Other	No thinning	35.8	72.1	75.5	**37.9**
	1 thinning	27.4	10.6	7.0	**26.4**
	2 thinnings	24.0	9.2	5.6	**23.1**
	3 or more	12.8	8.2	12.0	**12.6**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
FC	No thinning	56.2	91.7	86.6	**58.2**
	1 thinning	18.1	3.5	2.7	**17.2**
	2 thinnings	15.8	3.5	0.7	**15.0**
	3 or more	10.0	1.4	10.1	**9.6**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
All	No thinning	46.1	83.3	80.0	**48.2**
	1 thinning	22.7	6.5	5.3	**21.8**
	2 thinnings	19.8	5.9	3.6	**19.0**
	3 or more	11.3	4.3	11.2	**11.1**
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 18: England – Conifers by timber potential and thinning history.

Ownership		Timber potential			
		Class 1	Class 2	Class 3	Total
Other	No thinning	24.3	60.3	74.7	**25.9**
	1 thinning	29.1	19.1	6.9	**28.5**
	2 thinnings	32.2	10.7	6.4	**31.3**
	3 or more	14.4	9.8	11.9	**14.3**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
FC	No thinning	34.2	95.3	81.3	**35.7**
	1 thinning	21.2	1.7	2.6	**20.7**
	2 thinnings	25.5	2.7	0.4	**24.9**
	3 or more	19.0	0.4	15.8	**18.7**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
All	No thinning	28.2	73.6	76.4	**29.8**
	1 thinning	26.0	12.5	5.8	**25.4**
	2 thinnings	29.5	7.7	4.8	**28.8**
	3 or more	16.2	6.2	13.0	**16.0**
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 19: Wales – Conifers by timber potential and thinning history.

Ownership		Timber potential			
		Class 1	Class 2	Class 3	Total
Other	No thinning	33.1	71.3	34.7	**35.3**
	1 thinning	27.7	9.6	26.3	**26.6**
	2 thinnings	21.3	16.2	3.5	**20.8**
	3 or more	17.9	2.9	35.8	**17.3**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
FC	No thinning	36.5	86.4	85.1	**41.5**
	1 thinning	27.1	4.8	11.2	**24.9**
	2 thinnings	19.9	6.3	0.0	**18.5**
	3 or more	16.6	2.4	3.7	**15.1**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
All	No thinning	35.3	82.9	57.9	**39.4**
	1 thinning	27.3	6.0	19.4	**25.5**
	2 thinnings	20.4	8.6	1.9	**19.3**
	3 or more	17.0	2.5	21.1	**15.9**
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 20: Scotland – Conifers by timber potential and thinning history.

Ownership		Timber potential			
		Class 1	Class 2	Class 3	Total
Other	No thinning	44.4	75.2	78.4	**46.5**
	1 thinning	26.2	8.6	5.9	**25.0**
	2 thinnings	18.5	7.4	5.2	**17.7**
	3 or more	10.8	8.8	10.5	**10.7**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
FC	No thinning	69.8	94.3	88.1	**71.1**
	1 thinning	14.6	2.9	2.2	**13.9**
	2 thinnings	10.9	1.9	0.8	**10.3**
	3 or more	4.7	0.9	9.0	**4.6**
	Total	**100.0**	**100.0**	**100.0**	**100.0**
All	No thinning	58.1	85.3	82.9	**59.7**
	1 thinning	20.0	5.6	4.2	**19.1**
	2 thinnings	14.4	4.5	3.1	**13.8**
	3 or more	7.5	4.6	9.8	**7.5**
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Notes for tables 13-20:

- The information given in the above tables is for High Forest as a percentage of area in a timber potential class.
- The data given is for stands over 25 years old where there is some expectation of projected thinning having taken place.

4 Horizontal Diversity

Three measures are available:

1. Number of sections per square
2. Number of elements per square
3. Number of elements per section

Each sample square is divided into sections and then sub-divided into elements, the elements describing the section. Sections differentiate the stands that occur within the one hectare sample square identifying them in terms of change of Forest type, species, mixture or planting year. An element defines the composition of the section; for a section with two species then each would be represented as an element. Both the sections and elements that occur within the square can be used as measures of diversity. The more sections or elements that are distinguished within the sample square then the more diverse the woodland that is recorded within the sample. The minimum size of a section or an element is 0.05ha and this is the resolution of the diversity measures described below.

If a section is composed of a number of elements then it is more diverse than if it were composed of only one element, for example, a mixed stand of sycamore, ash and birch viewed against a stand of pure beech. If a woodland is made up of a checkerboard of different stands it is more likely that the square will contain more than one section. In contrast a plantation with large plantings of Sitka spruce might have only one section and one element in a square. The number of elements per square gives an overall assessment combining the other two measures.

Figure 3: Diagram showing increasing horizontal diversity.

Fig. 3a

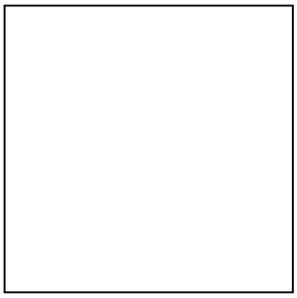


Fig. 3b

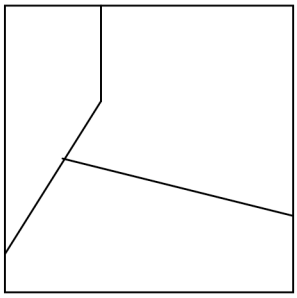
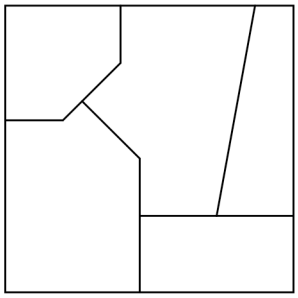


Fig. 3c



In the above diagram Fig. 3a shows a square with only one section, Fig. 3b has three and Fig. 3c shows five; the maximum number of sections allowed in the methodology. Similarly the number of elements within each section can vary from one to nine in England and Wales, subject to a maximum of 20 within a square, with up to three and a maximum of ten in Scotland. As the number of sections and / or elements increases then the diversity of the woodland increases.

Scotland was the first country to be surveyed in the National Inventory; at that time a limit of three elements per section was included in the data structure. After the completion of Scotland this limit was felt to be artificial and restrictive and was amended to allow a maximum of 9 elements per section, within an overall limit of 20 elements per square.

Extra fields can be added to the dataset to hold the numbers of sections and elements that occur within each sample square. These frequency data can be used as the basis for analysis. The number of squares may be tabled against the number of sections. A disadvantage is that this approach does

not take into account the sampling structure, and assumes each square is equal to any other square, which is not valid. It is better to present the data by area, with a given number of sections (or elements) in a square. This is a weighted measure taking into account the structure of the sample, and it can be reconciled within the framework laid down by other statistics from the Inventory. The results show a small difference of a few percent between the different (counts versus area) analyses.

With this form of analysis the way in which different surveyors approach the division of the square into sections and elements is key to the production of consistent data. Some surveyors are meticulous and others are more 'broad-brush'. However the criteria used to define the division of the square and section were consistent throughout the survey and the training received by the surveyors will have mitigated any personality-related affects that there may have been on the data.

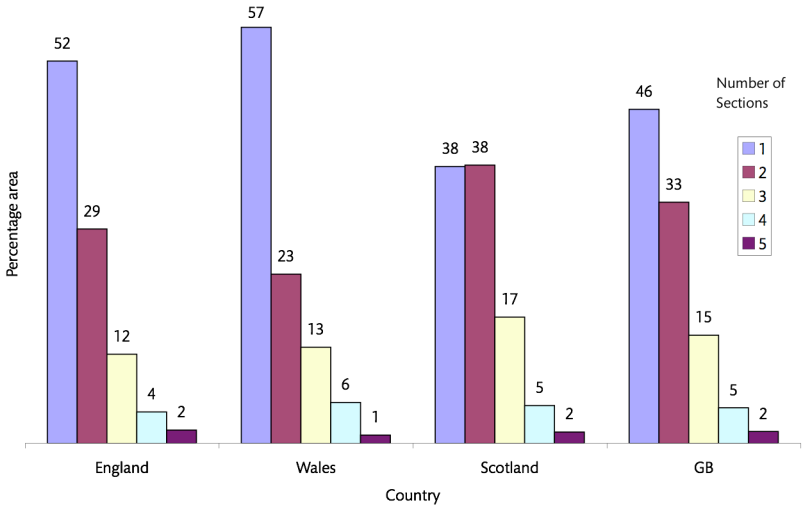
4.1 Number of Sections per Square

Table 21: Percentage Woodland Area by Number of Sections per Square.

Number of sections	GB		England		Wales		Scotland	
	%	Standard error	%	Standard error	%	Standard error	%	Standard error
1	**45.7**	0.3	**52.4**	0.5	**57.0**	1.0	**37.9**	0.5
2	**33.0**	0.3	**29.3**	0.4	**23.2**	0.8	**38.1**	0.5
3	**14.8**	0.2	**12.2**	0.3	**13.2**	0.6	**17.3**	0.4
4	**4.8**	0.1	**4.3**	0.2	**5.6**	0.4	**5.2**	0.2
5	**1.6**	0.1	**1.8**	0.1	**1.1**	0.2	**1.5**	0.1
Total	**100.0**		**100.0**		**100.0**		**100.0**	

The contents of Table 21 are slightly unexpected when compared to the table of elements per square (Table 22) that follows. This second table indicates that of the three countries England was the most diverse, however here we can see that over half the area for England is accounted for by squares that have only one section. In Scotland only 38% of the area is represented by squares with one section. When squares with sections with up to three elements are considered, all three countries are very close in terms of the proportion of the area that has been allocated (just short of 94%).

Figure 4: Percentage area by number of sections per square.



4.2 Number of Elements per Square

Table 22: Percentage Area by Number of Elements per Square.

No of Elements	GB	England	Wales	Scotland
1	22.9	18.1	30.9	25.2
2	28.5	22.8	25.3	33.8
3	22.0	21.5	19.7	22.8
4	12.8	16.0	12.8	10.2
5	7.0	10.0	6.5	4.7
6	3.5	5.7	2.9	1.8
7	1.7	2.9	1.2	0.9
8	0.9	1.6	0.5	0.3
9	0.5	0.9	0.2	0.2
10	0.2	0.3	0.1	0.1
11	0.1	0.1	0.0	0.0
12	0.0	0.0	0.0	0.0

The number of elements per square gives us information on what is nearly a per hectare basis. 'Nearly' because not all of the squares occupy a full hectare due to overlaps with the edges of the woodland. Also because the actual area of elements is not known this data cannot be used to estimate the number of elements in a wood of a given area nor can it be used to derive the number of elements per hectare.

Table 23: Mean number of elements per square by country.

Great Britain	**2.8**
England	3.2
Wales	2.6
Scotland	2.5

Figure 5: Count of Elements – %Cumulative Area by Country.

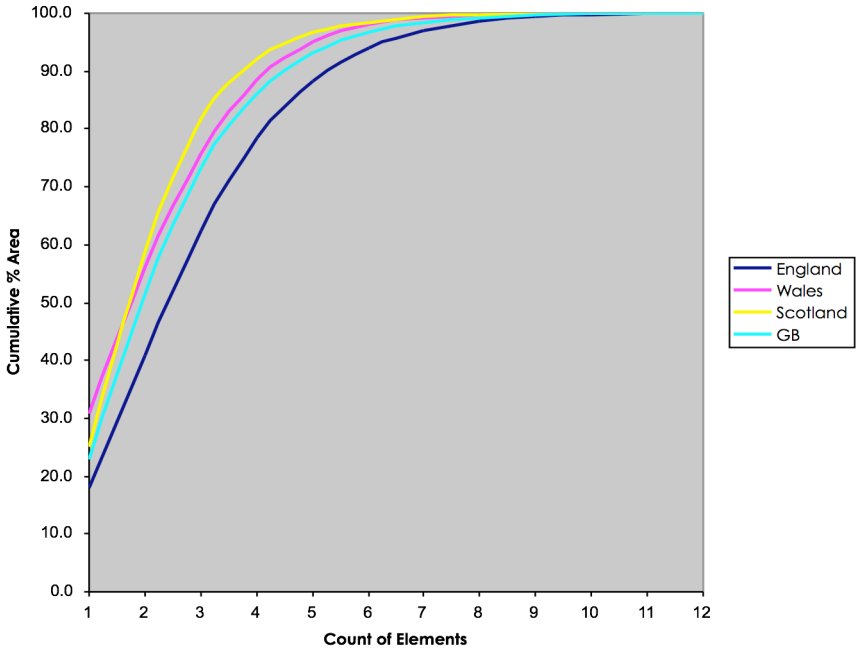


Figure 5 shows that over 90% of the cumulative area was accounted for with squares of up to 6 elements; squares occur with up to 18 elements but were extremely infrequent. England was more diverse with only 18% of the area with one element whilst in Wales the matching figure was over 30%. It is worth comparing the data to see the contrasts between the three countries. At 9 or 10 elements per square the differences were reduced to just a few points of a percent, as most of the area was accounted for by those squares with lower numbers of elements.

4.3 Count of Elements per Section

It was not possible to produce data for this measure that can be compared between all three countries.

Although there are limitations to the comparison of the areas that can be made, Scotland had the greatest proportion of area with sections of just one element.

Table 24: Number of Elements per Section (% area).

Number of Elements	England	Wales
1	42.5	60.5
2	25.7	20.7
3	16.1	11.8
4	9.2	5.2
5	4.0	1.8
6	1.5	0.3
7	0.5	0.0
8	0.2	0.0
9	0.2	0.0
Total	**100.0**	**100.0**

Table 25: Number of Elements per Section (% area).

Number of Elements	Scotland
1	70.4
2	23.6
3	6.0

5 Vertical Structure

The vertical structure assessment was devised to describe the canopy variation and the complexity and density of different vertical strata. Vertical structure is important in determining wildlife diversity and abundance. The data allow a description of the variety of habitat niches within a stand.

The vertical structure of the sample squares was visually assessed within the quarter-hectare structure assessment square (SAS) in terms of the vegetation cover in the SAS and the species that contribute to those layers. The analysis for the species in the layers is still under development but some preliminary information for the vegetation cover is given below.

Five canopy layers are used to describe the vertical structure for vegetation percentage as follows:

Upper Canopy	above 15m
Lower Canopy	5m–15m
Shrub Layer	2m–5m
Field Layer	10cm–2m
Ground Layer	below 10cm

These are shown schematically in Figure 6 below.

Vegetation cover assessments did not include dead or non-living components such as leaf litter, bare soil or rock.

Figure 6: Diagram of Vegetation Percentage in fixed height bands (from the surveyors' manual – unpublished).

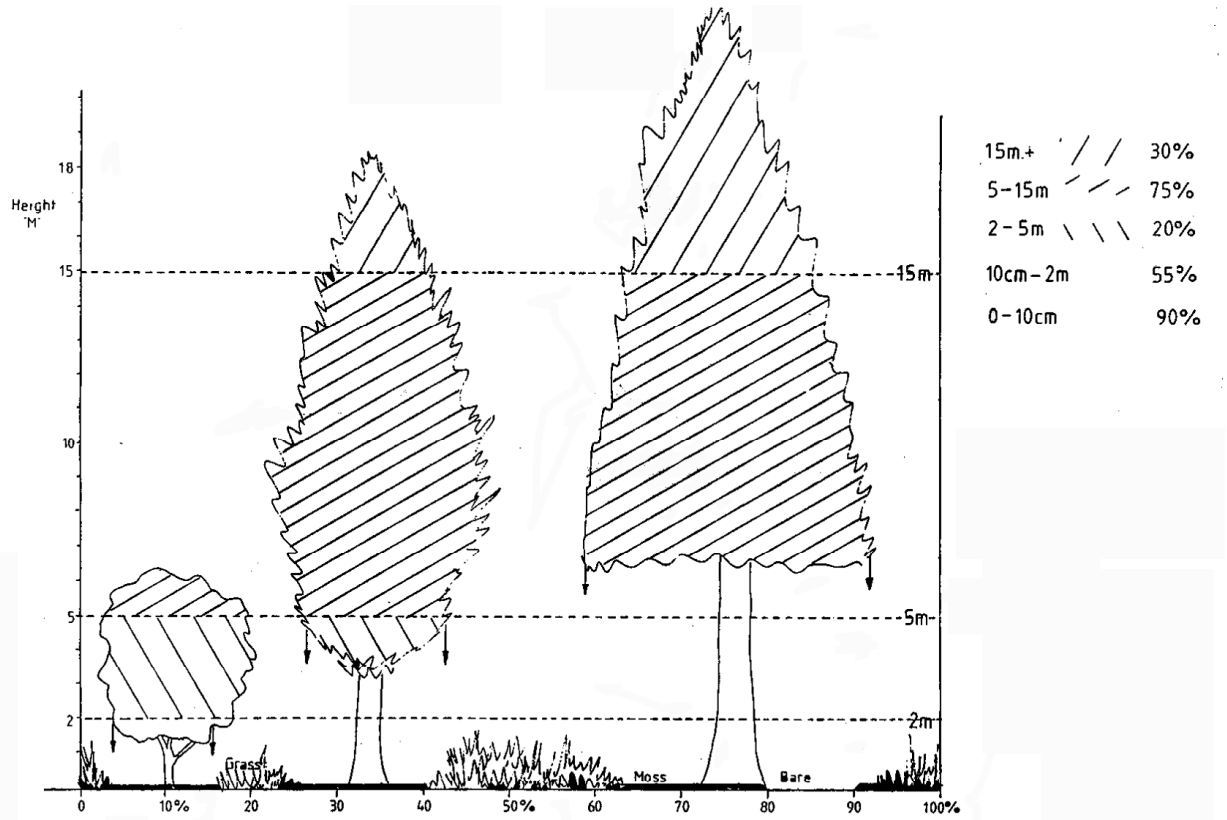
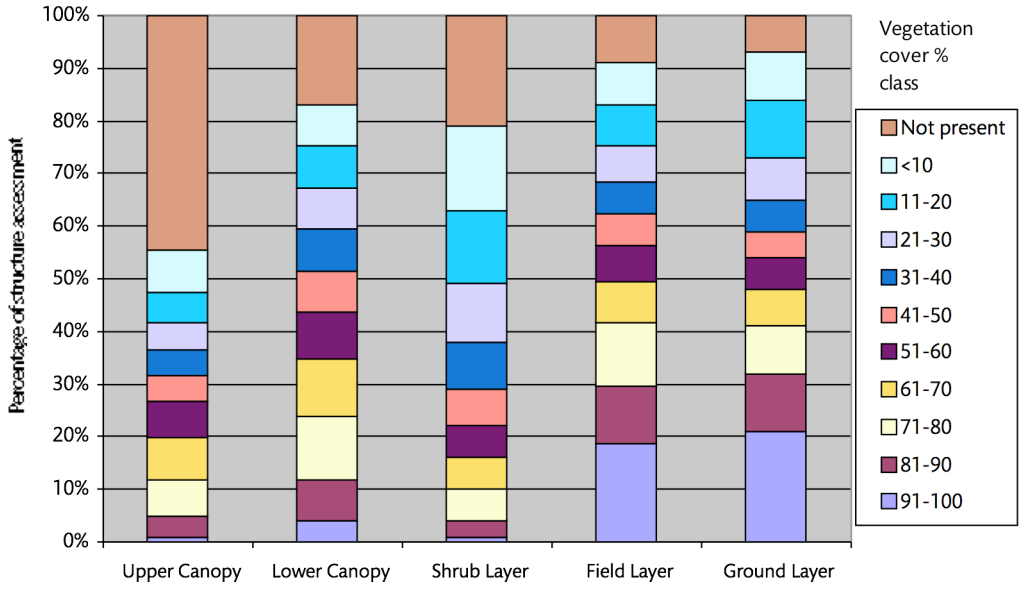

Height M
18
15
10
5
2
15m
5m
2m
Grass
Moss
Bare
0
10%
20
30
40
50%
60
70
80
90
100%
15m.+ 30%
5-15m 75%
2-5m 20%
10cm-2m 55%
0-10cm 90%

Table 26: GB – Mean Vegetation Cover by Layer.

Layer	Cover (%)
Upper Canopy	27%
Lower Canopy	44%
Shrub Layer	30%
Field Layer	57%
Ground Layer	56%

Figure 7: GB - Vegetation Cover % Class by % of structure assessments and layer.



There are some differences between the table and the chart, the table shows the average vegetation cover in a layer. The chart shows the proportion of structure assessments for a given layer which have vegetation cover that falls into a vegetation canopy class. It also indicates the proportion where no vegetation was recorded in a particular layer. For instance, 21% of structure assessments have a ground layer of between 91 and 100% cover. Over 90% of woodland has a field layer present.

6 Deadwood

Deadwood is recorded within the structure assessment square (SAS). Three types of deadwood were recorded within the SAS:

- standing deadwood;
- abandoned timber;
- fallen trees.

Note: For the purposes of the National Inventory some fallen trees may have been still living but were considered as potential deadwood.

All this information was recorded as counts of items (i.e. trees, limbs or pieces of timber) within the 0.25ha SAS; per hectare figures are therefore four times the recorded values, and are presented below by classes which align with Indicator B6 'Diversity of woodland within a stand' in 'UK Indicators of Sustainable Forestry' (FC, 2002):

Table 27: Deadwood class definitions.

Class	Number of items per SAS	Number of Items per hectare
Class 0	0	0
Class 1	1 or 2	4 or 8
Class 2	3 or 4	12 or 16
Class 3	5	20
Class 4	6	24
Class 5	more than 6	>24

6.1 Standing Deadwood (dead trees or major limbs over 15cm diameter)

Table 28: GB – Number of items of standing deadwood per hectare class as a percentage of Structure Assessment Squares.

% Area	Class							
	0	1	2	3	4	5	Total	%SAS with standing deadwood
FC	90.6	3.9	2.1	0.7	0.4	2.3	**100.0**	9.4
Other	86.2	7.8	3.3	0.9	0.4	1.5	**100.0**	13.8
All	87.4	6.7	2.9	0.8	0.4	1.7	**100.0**	12.6

Approximately 87.4% of the SASs have no standing deadwood.

Table 29: England – Number of items of standing deadwood per hectare class as a percentage of Structure Assessment Squares.

% Area	Class							
	0	1	2	3	4	5	Total	%SAS with standing deadwood
FC	88.0	6.3	2.2	0.5	0.4	2.6	**100**	12.0
Other	84.2	9.2	3.6	0.9	0.5	1.6	**100**	15.8
All	84.8	8.7	3.3	0.8	0.5	1.8	**100**	15.2

Table 30: Wales – Number of items of standing deadwood per hectare class as a percentage of Structure Assessment Squares.

% Area	Class						Total	%SAS with standing deadwood
	0	1	2	3	4	5		
FC	97.9	0.4	0.3	0.1	0.1	1.3	**100**	2.1
Other	98.6	1.0	0.2	0.0	0.0	0.3	**100**	1.4
All	98.3	0.8	0.2	0.0	0.0	0.7	**100**	1.7

Table 31: Scotland – Number of items of standing deadwood per hectare class as a percentage of Structure Assessment Squares.

% Area	Class						Total	%SAS with standing deadwood
	0	1	2	3	4	5		
FC	89.9	3.8	2.5	1.0	0.5	2.4	**100**	10.1
Other	85.5	7.7	3.8	1.1	0.4	1.5	**100**	14.5
All	87.2	6.1	3.3	1.0	0.4	1.9	**100**	12.8

6.2 Abandoned Timber

Abandoned timber consists of material that has been worked, but not been extracted, and then left to decay. The minimum dimensions used for inclusion were 15cm diameter and 2m in length.

Table 32: GB – Number of Pieces of Abandoned Timber per hectare class by ownership as a percentage of Structure Assessment Squares.

% Area	Class						Total	%SAS with abandoned timber
	0	1	2	3	4	5		
FC	95.2	1.4	0.9	0.5	0.3	1.6	**100.0**	4.8
Other	96.5	1.3	0.8	0.3	0.2	0.9	**100.0**	3.5
All	96.1	1.3	0.8	0.3	0.2	1.1	**100.0**	3.9

Some 96.1% of the SASs had no abandoned timber recorded. Other analyses of Category 1 High Forest give a similar picture of the efficiency of extraction.

Table 33: England – Number of Pieces of Abandoned Timber per hectare class by ownership as a percentage of Structure Assessment Squares.

% Area	Class						Total	%SAS with abandoned timber
	0	1	2	3	4	5		
FC	92.5	2.9	1.6	0.7	0.5	1.7	**100.0**	7.5
Other	95.7	1.6	1.0	0.3	0.2	1.1	**100.0**	4.3
All	95.2	1.8	1.1	0.4	0.3	1.2	**100.0**	4.8

Table 34: Wales – Number of Pieces of Abandoned Timber per hectare class by ownership as a percentage of Structure Assessment Squares.

% Area	Class						Total	%SAS with abandoned timber
	0	1	2	3	4	5		
FC	99.9	0.0	0.0	0.0	0.0	0.1	**100**	0.1
Other	99.7	0.0	0.1	0.0	0.1	0.2	**100**	0.3
All	99.8	0.0	0.0	0.0	0.0	0.1	**100**	0.2

Table 35: Scotland – Number of Pieces of Abandoned Timber per hectare class by ownership as a percentage of Structure Assessment Squares.

% Area	Class						Total	%SAS with abandoned timber
	0	1	2	3	4	5		
FC	95.0	1.0	0.9	0.6	0.4	2.1	**100**	5.0
Other	96.9	1.0	0.6	0.3	0.3	0.9	**100**	3.1
All	96.1	1.0	0.7	0.4	0.3	1.4	**100**	3.9

6.3 Fallen Trees

Within each SAS the number of fallen trees was recorded within three size classes, defined by diameter at breast height (1.3m):

Table 36: Diameter Ranges for Fallen Trees.

Range	Diameter at breast height (dbh)
1	7-20cm
2	20-50cm
3	>50cm

A structure assessment square could contribute to more than one diameter range and so the area with fallen trees in class 1 could also have fallen trees in class 2; the proportions of area in each class cannot therefore be used to compile the overall proportion with fallen trees. The total number of trees in a square could also generate more entries in the higher frequency classes.

The data on fallen trees within the structure assessment square is a 'snapshot' of the situation prevailing at the time of the assessment; future National Inventory surveys could provide an indication of change allowing monitoring to be carried out against suggestions of increasing windiness, reflecting an aspect of climate change or changes in management practice to incorporate a greater volume of deadwood into stands for biodiversity.

Table 37: GB – Number of Fallen Trees per hectare class, by Fallen tree size class and ownership as percentages of Structure Assessment Squares.

		Class							%SAS with fallen trees
		0	1	2	3	4	5	Total	
FC	7-20cm	84.6	5.9	3.3	1.3	0.7	4.2	**100.0**	15.4
	20-50cm	91.5	4.6	1.5	0.7	0.4	1.3	**100.0**	8.5
	>50cm	99.3	0.6	0.0	0.0	0.0	0.0	**100.0**	0.7
	Total	81.6	5.9	3.9	1.7	0.9	6.0	**100.0**	18.4
Other	7-20cm	80.5	9.5	5.5	1.2	0.9	2.4	**100.0**	19.5
	20-50cm	86.3	9.4	2.3	0.7	0.3	0.9	**100.0**	13.7
	>50cm	98.2	1.6	0.2	0.0	0.0	0.0	**100.0**	1.8
	Total	74.6	11.1	6.4	2.0	1.4	4.6	**100.0**	25.4
All	7-20cm	81.6	8.5	4.8	1.3	0.8	3.0	**100.0**	18.4
	20-50cm	87.8	8.0	2.1	0.7	0.3	1.0	**100.0**	12.2
	>50cm	98.5	1.3	0.1	0.0	0.0	0.0	**100.0**	1.5
	Total	76.6	9.6	5.7	1.9	1.2	5.0	**100.0**	23.4

Note: The SAS could contain fallen trees in more than one diameter range and therefore the percentages across the classes will not necessarily add.

Table 38: England – Number of Fallen Trees per hectare class, by Fallen tree size class and ownership as percentages of Structure Assessment Squares.

		Class							%SAS with fallen trees
		0	1	2	3	4	5	Total	
FC	7-20cm	77.9	9.7	5.5	1.5	1.2	4.1	**100.0**	22.1
	20-50cm	88.4	7.8	1.9	0.3	0.4	1.2	**100.0**	11.6
	>50cm	98.8	1.2	0.1	0.0	0.0	0.0	**100.0**	1.2
	Total	73.5	10.5	6.7	2.0	1.6	5.5	**100.0**	26.5
Other	7-20cm	73.9	12.6	8.0	1.5	1.3	2.7	**100.0**	26.1
	20-50cm	81.7	13.1	2.9	0.8	0.4	1.1	**100.0**	18.3
	>50cm	97.5	2.2	0.2	0.0	0.0	0.0	**100.0**	2.5
	Total	66.6	14.5	8.8	2.6	1.9	5.6	**100.0**	33.4
All	7-20cm	74.6	12.1	7.6	1.5	1.3	2.9	**100.0**	25.4
	20-50cm	82.8	12.2	2.7	0.7	0.4	1.2	**100.0**	17.2
	>50cm	97.7	2.0	0.2	0.0	0.0	0.0	**100.0**	2.3
	Total	67.7	13.9	8.5	2.5	1.8	5.6	**100.0**	32.3

Table 39: Wales – Number of Fallen Trees per hectare class, by Fallen tree size class and ownership as percentages of Structure Assessment Squares.

		Class							%SAS with fallen trees
		0	1	2	3	4	5	Total	
FC	7-20cm	95.9	1.3	1.1	0.3	0.3	1.1	**100.0**	4.1
	20-50cm	96.6	1.5	1.1	0.0	0.1	0.7	**100.0**	3.4
	>50cm	99.9	0.1	0.0	0.0	0.0	0.0	**100.0**	0.1
	Total	94.2	1.3	1.9	0.5	0.3	1.9	**100.0**	5.8
Other	7-20cm	94.4	3.1	1.2	0.3	0.2	0.8	**100.0**	5.6
	20-50cm	96.1	2.5	0.8	0.2	0.2	0.2	**100.0**	3.9
	>50cm	99.4	0.5	0.0	0.0	0.0	0.0	**100.0**	0.6
	Total	92.0	4.3	1.9	0.2	0.2	1.4	**100.0**	8.0
All	7-20cm	94.9	2.4	1.2	0.3	0.2	0.9	**100.0**	5.1
	20-50cm	96.3	2.1	0.9	0.1	0.1	0.4	**100.0**	3.7
	>50cm	99.6	0.4	0.0	0.0	0.0	0.0	**100.0**	0.4
	Total	92.8	3.2	2.1	0.3	0.2	1.3	**100.0**	7.2

Table 40: Scotland – Number of Fallen Trees per hectare class, by Fallen tree size class and ownership as percentages of Structure Assessment Squares.

		Class							%SAS with fallen trees
		0	1	2	3	4	5	Total	
FC	7-20cm	84.7	5.4	2.8	1.5	0.5	5.0	**100.0**	15.3
	20-50cm	91.6	4.0	1.5	1.0	0.5	1.5	**100.0**	8.4
	>50cm	99.5	0.5	0.1	0.0	0.0	0.0	**100.0**	0.5
	Total	82.1	4.9	3.2	1.9	0.8	7.2	**100.0**	17.9
Other	7-20cm	86.3	6.7	2.9	1.0	0.6	2.5	**100.0**	13.7
	20-50cm	90.6	5.8	1.8	0.8	0.3	0.8	**100.0**	9.4
	>50cm	98.8	1.0	0.1	0.0	0.0	0.0	**100.0**	1.2
	Total	81.6	7.8	4.1	1.5	0.9	4.0	**100.0**	18.4
All	7-20cm	85.7	6.2	2.8	1.2	0.6	3.5	**100.0**	14.3
	20-50cm	91.0	5.1	1.7	0.9	0.3	1.0	**100.0**	9.0
	>50cm	99.1	0.8	0.1	0.0	0.0	0.0	**100.0**	0.9
	Total	81.8	6.6	3.7	1.7	0.9	5.3	**100.0**	18.2

Note: The data for fallen trees in Scotland is largely complete except for Grampian Region, the pilot area, where further work on the information is still required. In the above table Grampian area is included as having no fallen trees.

6.4 Deadwood Volume

The current practice for reporting deadwood is to report volumes rather than counts. It is possible to convert the various deadwood frequencies per hectare within the National Inventory to a volume per hectare by making some assumptions based on an estimate of the volume of each item counted, guided by the minimum dimensions for each category and/or an average dimension. The results are sensitive to the volumes selected for each category.

The estimated volumes used in the following section of the report are as follows, guided by the average dimensions:

Standing deadwood		0.250m^3/tree or limb
Abandoned timber		0.035m^3/piece
Fallen trees	7–20cm dbh	0.080m^3/tree
	20–50cm dbh	0.500m^3/tree
	>50cm dbh	2.000m^3/tree

Converting the counts to volumes also means that it is possible to add the three categories of deadwood together and look at the overall picture of the occurrence of deadwood.

Figure 8: GB – Total deadwood volume per hectare class by percentage of High Forest area (note: 70% of the area had no recorded deadwood).

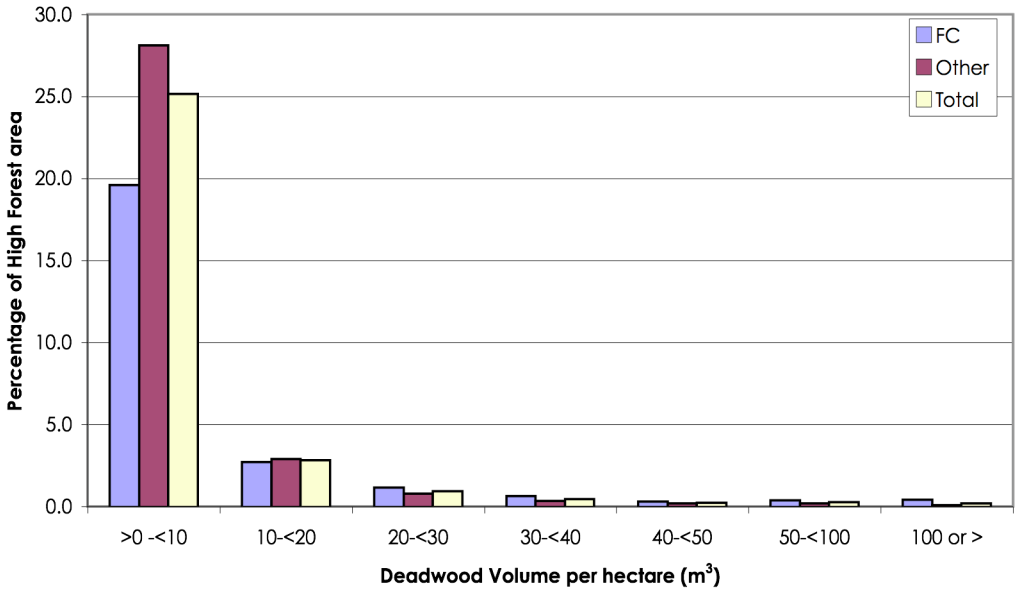


Figure 8 could have included the 0m^3 category, but as 70% of the area had no recorded deadwood and the differences in the other categories would have been much less distinct.

The estimates of volume per piece of abandoned timber or fallen tree have a considerable effect on the estimates of total deadwood volume (Table 21). The data does not record the species of deadwood nor of fallen trees; with this data it might have been possible to produce a more accurate estimate of volume. By using the threshold limits one could estimate the minimum volume of deadwood represented by the counts.

From the data it is also possible to estimate the average volume per hectare of deadwood in High Forest (Table 41).

Table 41: Deadwood volume by country.

Country	Deadwood Volume per ha	Total Deadwood	Standard Error of Total	Comments
	m^3ha^{-1}	millions m^3	millions m^3 (%)	
England	4.0	4.1	0.29 (7.1)	
Wales	1.0	0.3	0.04 (15.1)	
Scotland	4.4	4.9	1.29 (26.6)	Excludes Grampian Region
GB	**3.9**	**9.2**	**1.32 (14.4)**	

Table 42: England - Deadwood Volume per hectare (m^3ha^{-1}) by percentage of High Forest Area.

	Volume class								
Ownership	**0**	**>0 -<10**	**10-<20**	**20-<30**	**30-<40**	**40-<50**	**50-<100**	**100 or >**	**Total**
FC	65.4	29.5	2.5	0.9	0.4	0.3	0.4	0.6	**100.0**
Other	54.3	40.0	3.6	1.1	0.4	0.2	0.2	0.1	**100.0**
Total	56.8	37.6	3.4	1.0	0.4	0.2	0.3	0.2	**100.0**

Table 43: Wales Deadwood Volume per hectare (m^3ha^{-1}) by percentage of High Forest Area.

	Volume class								
Ownership	**0**	**>0 -<10**	**10-<20**	**20-<30**	**30-<40**	**40-<50**	**50-<100**	**100 or >**	**Total**
FC	93.2	4.5	0.6	0.3	0.5	0.4	0.4	0.1	**100.0**
Other	91.0	7.7	0.8	0.1	0.3	0.0	0.0	0.1	**100.0**
Total	92.0	6.3	0.7	0.2	0.4	0.2	0.2	0.1	**100.0**

Table 44: Scotland – Deadwood Volume per hectare (m^3ha^{-1}) by percentage of High Forest Area.

	Volume class								
Ownership	**0**	**>0 -<10**	**10-<20**	**20-<30**	**30-<40**	**40-<50**	**50-<100**	**100 or >**	**Total**
FC	74.6	18.9	3.3	1.5	0.8	0.3	0.3	0.4	**100.0**
Other	76.9	19.3	2.5	0.6	0.2	0.2	0.2	0.1	**100.0**
Total	75.9	19.1	2.8	1.0	0.4	0.2	0.2	0.2	**100.0**

Note: The data for fallen trees in Scotland is largely complete except for Grampian Region, the pilot area, where further work on the information is still required. In the above table Grampian area is included as having no fallen trees.

7 Natural Regeneration

Natural regeneration consists of any tree species between 1 and 2m tall other than those described as elements. If the natural regeneration occupied a significant area (i.e. >0.05ha) then it would be described as an element.

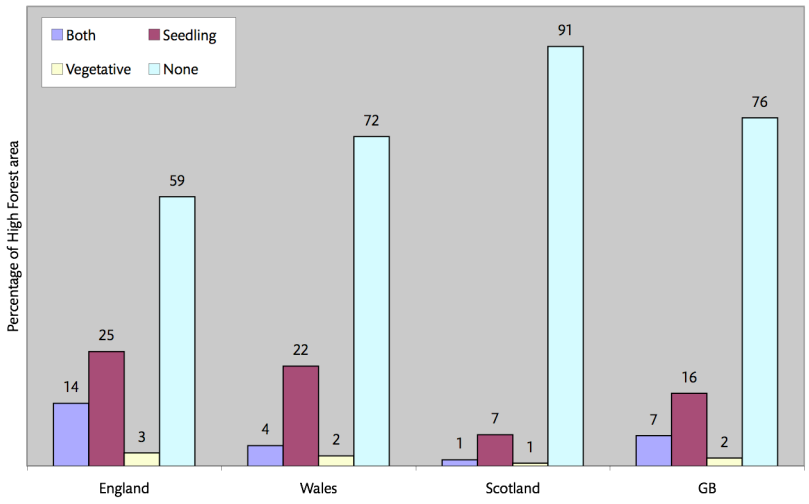
Data for natural regeneration is collected at the Section level* and consists of two items of data; the regeneration type and regeneration frequency.

Regeneration Type

Vegetative (V)
Seedling (S)
Both (B)

'Vegetative' regeneration would be in the form of suckers from existing trees.
*Information for Natural Regeneration was collected at Element level in Scotland but this was amended to the Section when the survey began in England and Wales as this was deemed to be more appropriate.

Figure 9: Percentage of High Forest Area by Natural Regeneration type and Country.



Regeneration Frequency classes (measured as stems per hectare)

<10
10–100
101–1000
>1000.

Figure 10: Percentage of High Forest area by Natural Regeneration frequency and Country.

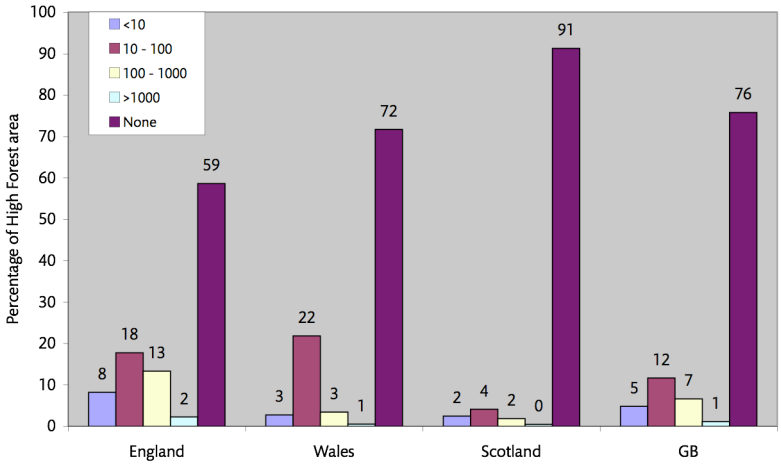


Table 45 presents information for regeneration type and regeneration frequency. The first block shows the simple breakdown by regeneration type, the second block breaks down each regeneration type by regeneration frequency and should be read in columns and not across the rows. Tables 46-49 show the full breakdown for each country including tables for each forest type in High Forest.

Table 45: GB – Percentage of High Forest area by Natural Regeneration (NR) type and frequency by All High Forest and Forest types Conifer, Broadleaved, Mixed and Windblow.

All High Forest		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	75.8	6.7	15.8	1.7	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR present
	<10	7.1	24.7	23.8	19.8
	10–100	41.3	49.7	59.9	48.1
	100–1000	46.6	20.7	13.6	27.4
	>1000	5.0	4.8	2.7	4.7
		100.0	100.0	100.0	100.0

Broadleaved		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	54.4	14.8	26.9	3.9	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR present
	<10	7.2	25.5	23.4	19.4
	10–100	41.0	49.8	60.8	47.9
	100–1000	47.6	20.6	12.8	28.7
	>1000	4.2	4.1	2.9	4.0
		100.0	100.0	100.0	100.0

Conifer		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	91.0	1.0	7.7	0.3	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR present
	<10	9.2	24.8	26.2	23.0
	10–100	45.7	49.3	56.8	49.1
	100–1000	34.4	19.8	16.8	21.4
	>1000	10.7	6.1	0.1	6.5
		100.0	100.0	100.0	100.0

Mixed		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	59.5	12.1	26.2	2.2	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR present
	<10	5.4	21.7	25.3	17.0
	10–100	40.3	50.4	55.5	47.7
	100–1000	48.5	22.8	16.7	30.2
	>1000	5.8	5.2	2.6	5.2
		100.0	100.0	100.0	100.0

Windblow		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	90.7	1.8	4.8	2.7	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR present
	<10	0.0	13.3	0.0	6.9
	10–100	0.0	53.5	53.9	43.2
	100–1000	100.0	12.1	19.1	31.2
	>1000	0.0	21.1	27.0	18.7
		100.0	100.0	100.0	100.0

Tables 46–49 show the breakdown within each country.

Table 46: England – Percentage of High Forest area by Natural Regeneration (NR) type and frequency by All High Forest and Forest types Conifer, Broadleaved, Mixed and Windblow.

All High Forest		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	58.6	13.6	24.9	2.8	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR present
	<10	7.1	25.8	28.2	19.8
	10–100	37.5	44.2	56.9	42.8
	100–1000	50.3	24.4	11.9	32.1
	>1000	5.2	5.6	3.0	5.3
		100.0	100.0	100.0	100.0

Broadleaved

	Natural Regeneration Type			
None	**Both**	**Seedling**	**Vegetative**	
49.3	18.1	28.7	4.0	
Frequency per hectare	**Natural Regeneration Type**			
	Both	**Seedling**	**Vegetative**	**NR present**
<10	7.2	28.4	28.0	20.8
10–100	36.4	43.3	58.1	42.0
100–1000	51.8	23.7	11.0	32.7
>1000	4.6	4.6	2.9	4.5
	100.0	100.0	100.0	100.0

Conifer

	Natural Regeneration Type			
None	**Both**	**Seedling**	**Vegetative**	
79.3	3.7	16.3	0.7	
Frequency per hectare	**Natural Regeneration Type**			
	Both	**Seedling**	**Vegetative**	**NR present**
<10	11.4	19.9	32.9	18.8
10–100	42.4	45.5	52.9	45.2
100–1000	35.3	25.6	13.9	26.9
>1000	10.9	8.9	0.2	9.0
	100.0	100.0	100.0	100.0

Mixed

	Natural Regeneration Type			
None	**Both**	**Seedling**	**Vegetative**	
52.1	16.8	28.2	2.9	
Frequency per hectare	**Natural Regeneration Type**			
	Both	**Seedling**	**Vegetative**	**NR Present**
<10	4.7	22.5	27.9	16.6
10–100	40.0	46.0	52.9	44.3
100–1000	50.2	26.2	15.5	34.0
>1000	5.1	5.3	3.7	5.2
	100.0	100.0	100.0	100.0

Windblow

	Natural Regeneration Type			
None	**Both**	**Seedling**	**Vegetative**	
68.2	8.4	14.2	9.1	
Frequency per hectare	**Natural Regeneration Type**			
	Both	**Seedling**	**Vegetative**	**NR Present**
<10	0.0	0.0	0.0	0.0
10–100	0.0	48.1	42.3	33.7
100–1000	100.0	18.5	22.1	41.2
>1000	0.0	33.3	36.5	25.4
	100.0	100.0	100.0	100.0

Table 47: Wales – Percentage of High Forest area by Natural Regeneration (NR) type and frequency by All High Forest and Forest types Conifer, Broadleaved, Mixed and Windblow.

All High Forest		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	71.7	4.4	21.7	2.2	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR Present
	<10	1.4	11.1	10.7	9.6
	10–100	70.6	78.4	74.9	76.9
	100–1000	26.4	8.7	13.3	11.8
	>1000	1.5	1.8	1.1	1.7
		100.0	100.0	100.0	100.0

Broadleaved		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	52.9	10.1	31.4	5.6	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR Present
	<10	0.7	9.6	9.7	7.7
	10–100	72.6	82.0	76.8	79.3
	100–1000	25.6	7.4	13.0	12.0
	>1000	1.1	1.0	0.6	1.0
		100.0	100.0	100.0	100.0

Conifer		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	85.9	0.6	13.4	0.1	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR Present
	<10	1.5	13.4	50.9	13.2
	10–100	69.8	72.3	18.6	71.7
	100–1000	28.8	11.5	30.5	12.5
	>1000	0.0	2.7	0.0	2.6
		100.0	100.0	100.0	100.0

Mixed		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	65.4	3.2	30.8	0.5	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR Present
	<10	11.3	11.7	0.0	11.5
	10–100	44.6	79.1	71.9	75.8
	100–1000	35.2	6.9	0.0	9.5
	>1000	8.9	2.3	28.1	3.3
		100.0	100.0	100.0	100.0

Windblow	Natural Regeneration Type			
	None	Both	Seedling	Vegetative
	100.0	0.0	0.0	0.0

Table 48: Scotland - Percentage of High Forest area by Natural Regeneration (NR) type and frequency by All High Forest and Forest types Conifer, Broadleaved, Mixed and Windblow.

All High Forest		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	91.3	1.3	6.8	0.6	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR Present
	<10	11.7	31.6	18.1	27.6
	10–100	51.8	45.6	57.1	47.3
	100–1000	30.8	18.1	20.7	20.2
	>1000	5.7	4.7	4.0	4.8
		100.0	100.0	100.0	100.0

Broadleaved		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	71.9	7.0	18.3	2.8	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR Present
	<10	13.0	26.8	20.8	22.7
	10–100	53.0	49.7	53.3	50.9
	100–1000	30.8	18.9	20.3	22.0
	>1000	3.2	4.6	5.6	4.4
		100.0	100.0	100.0	100.0

Conifer		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	95.5	0.2	4.1	0.2	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR Present
	<10	1.0	36.7	13.2	34.2
	10 – 100	53.2	42.2	67.3	43.6
	100 – 1000	31.5	16.6	19.5	17.5
	>1000	14.2	4.4	0.0	4.8
		100.0	100.0	100.0	100.0

Mixed		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	77.7	2.9	18.5	1.0	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR Present
	<10	16.3	26.4	7.4	24.3
	10–100	39.2	45.7	63.8	45.6
	100–1000	29.2	21.4	29.0	22.8
	>1000	15.4	6.5	0.0	7.4
		100.0	100.0	100.2	100.0

Windblow		Natural Regeneration Type			
	None	Both	Seedling	Vegetative	
	96.7	0.0	2.4	0.9	
	Frequency per hectare	Natural Regeneration Type			
		Both	Seedling	Vegetative	NR Present
	<10	0.0	34.3	0.0	25.0
	10–100	0.0	65.7	86.5	71.3
	100–1000	0.0	0.0	13.5	3.7
	>1000	0.0	0.0	0.0	0.0
		0.0	100.0	100.0	100.0

8 Bark Damage

Table 49 shows the overall levels of bark damage with details of the classes used in describing each aspect of damage.

Table 49: Percentage[1] of High Forest area by bark damage, ownership and conifer or broadleaf.

Frequency of damage[2]	Ownership					
	FC	Other	Total	Conifers	Broadleaves	GB Total
<20% damaged	4.1	3.6	3.8	4.1	3.2	3.8
20–50% damaged	1.3	1.5	1.4	1.0	2.1	1.4
>50% damaged	0.5	0.5	0.5	0.4	0.7	0.5
Some damage	5.9	5.6	5.7	5.5	6.1	5.7
All High Forest	**100**	**100**	**100**			
	FC	**Other**	**Total**	**Conifers**	**Broadleaves**	**Total**
Ground or buttress	1.0	1.5	1.3	0.8	1.8	1.2
Main stem <1.8m	4.5	2.6	3.3	4.3	1.6	3.3
Main stem >1.8m	0.8	2.9	2.2	0.3	2.6	1.2
Some damage	5.9	5.6	5.7	5.5	6.1	5.7
All High Forest	**100**	**100**	**100**			
	FC	**Other**	**Total**	**Conifers**	**Broadleaves**	**Total**
<10cm high and <50% girdled	3.7	2.9	3.1	3.7	2.2	3.1
<30cm high and <50% girdled	1.7	2.1	1.9	1.3	2.9	1.9
>30cm high or >50% girdled	0.6	0.6	0.6	0.4	0.9	0.6
Some damage	5.9	5.6	5.7	5.5	6.1	5.7
All High Forest	**100**	**100**	**100**			

[1] The percentages are proportions of areas of High Forest.
[2] Frequency - percentage of trees damaged in the element.
[3] Location of main damage on trees in the element.
[4] Severity describes the wounds on the trees in the element.

Only approximately 6% of the trees exhibited some level of bark damage. The location of damage data indicates that over half of the damage occurs on the stem below 1.8m. The data is recorded for trees where damage occurs and is not restricted by age, size or species.

Tables 50–52 show the country results in more detail.

Table 50: England – Percentage of High Forest area by bark damage and ownership and conifer or broadleaf.

Frequency of damage	Ownership					
	FC	Other	Total	Conifers	Broadleaves	Total
<20% damaged	1.2	2.9	2.5	0.3	3.8	**2.5**
20–50% damaged	1.8	2.1	2.1	1.2	2.5	**2.1**
>50% damaged	0.8	0.6	0.6	0.2	0.9	**0.6**
Some damage	3.8	5.6	5.2	1.7	7.2	**5.2**
Location of Damage	**Ownership**					
	FC	**Other**	**Total**	**Conifers**	**Broadleaves**	**Total**
Ground or buttress	1.5	1.6	1.5	0.3	2.3	**1.5**
Main stem <1.8m	0.9	1.1	1.1	0.4	1.4	**1.1**
Main stem >1.8m	1.4	3.0	2.6	1.1	3.5	**2.6**
Some damage	3.8	5.6	5.2	1.7	7.2	**5.2**
Severity of Damage	**Ownership**					
	FC	**Other**	**Total**	**Conifers**	**Broadleaves**	**Total**
<10cm high and <50% girdled	1.3	2.0	1.8	0.5	2.6	**1.8**
<30cm high and <50% girdled	1.9	3.0	2.8	1.1	3.7	**2.8**
>30cm high or >50% girdled	0.5	0.7	0.6	0.1	0.9	**0.6**
Some damage	3.8	5.6	5.2	1.7	7.2	**5.2**

Table 51: Wales - Percentage of High Forest area by bark damage and ownership and conifer or broadleaf.

Frequency of damage	Ownership					
	FC	Other	Total	Conifers	Broadleaves	Total
<20% damaged	0.0	0.3	0.2	0.1	0.3	0.2
20–50% damaged	0.1	0.8	0.5	0.0	1.2	0.5
>50% damaged	0.1	0.2	0.2	0.0	0.4	0.2
Some damage	0.2	1.3	0.9	0.1	1.9	0.9
Location of Damage	**Ownership**					
	FC	**Other**	**Total**	**Conifers**	**Broadleaves**	**Total**
Ground or buttress	0.2	1.2	0.8	0.0	0.1	0.1
Main stem <1.8m	0.0	0.0	0.0	0.0	0.0	0.0
Main stem >1.8m	2.6	14.9	9.7	0.1	1.8	0.8
Some damage	0.2	1.3	0.9	0.1	1.9	0.9
Severity of Damage	**Ownership**					
	FC	**Other**	**Total**	**Conifers**	**Broadleaves**	**Total**
<10cm high and <50% girdled	0.1	0.1	0.1	0.0	0.2	0.1
<30cm high and <50% girdled	0.1	0.7	0.4	0.1	1.0	0.4
>30cm high or >50% girdled	0.0	0.5	0.3	0.0	0.8	0.3
Some damage	0.2	1.3	0.9	0.1	1.9	0.9

Table 52: Scotland – Percentage of High Forest area by bark damage and ownership and conifer or broadleaf.

Frequency of damage	Ownership					
	FC	Other	Total	Conifers	Broadleaves	Total
<20% damaged	6.3	5.1	5.6	6.1	3.1	5.6
20–50% damaged	1.3	1.0	1.1	1.1	1.2	1.1
>50% damaged	0.6	0.4	0.5	0.5	0.5	0.5
Some damage	8.1	6.5	7.2	7.7	4.8	7.2
	Ownership					
Location of Damage	FC	Other	Total	Conifers	Broadleaves	Total
Ground or buttress	0.9	1.4	1.2	1.1	1.4	1.2
Main stem <1.8m	7.0	5.0	5.8	6.4	3.1	5.8
Main stem >1.8m	0.2	0.1	0.2	0.1	0.3	0.2
Some damage	8.1	6.5	7.2	7.7	4.8	7.2
	Ownership					
Severity of Damage	FC	Other	Total	Conifers	Broadleaves	Total
<10cm high and <50% girdled	5.4	4.5	4.9	5.5	2.2	4.9
<30cm high and <50% girdled	1.9	1.4	1.6	1.6	1.7	1.6
>30cm high or >50% girdled	0.7	0.6	0.6	0.6	0.9	0.6
Some damage	8.1	6.5	7.2	7.7	4.8	7.2

9 Browsing Damage

The assessment of browsing damage was in two parts:

a) the frequency of damage to trees in the element
b) the severity of damage to these trees.

The data for severity of browsing is not available for Scotland due to a software fault. The incidence of browsing in Wales amounted to only 0.1% of the High Forest area and the data are not reported further here.

Table 53: Percentage of High Forest area by browsing damage and ownership and conifer or broadleaf.

Frequency of damage	FC	Other	Total	Conifers	Broadleaves	GB Total
<20% damaged	4.7	2.7	3.4	5.0	0.9	**3.4**
20–50% damaged	1.6	1.1	1.3	1.8	0.4	**1.3**
>50% damaged	1.3	0.9	1.1	1.6	0.2	**1.1**
Some damage	7.7	4.7	5.7	8.4	1.5	**5.7**

The full descriptions of the browsing severity classes are as follows:

Severity to trees which are affected by browsing damage.

1) < 20% of shoots browsed, with leader intact.
2) 20–0% of shoots browsed OR light browse line on taller trees and shrubs.
3) > 80% of shoots browsed, trees hedged, deformed or killed OR majority of trees have damaged leading shoot or very distinct browse line on taller trees and shrubs.

Very low levels of browsing damage were recorded in England and Wales, and with so little data, any attempt to draw conclusions would be unreliable. In Scotland browsing damage was recorded in 11% of the High Forest area, including 12.4% of the area of conifers, over half of which shows damage in the <20% class.

Table 54: England – Percentage of High Forest area by browsing damage, severity and ownership and conifer or broadleaf.

	Ownership						
Frequency of damage	**FC**	**Other**	**Total**		**Conifers**	**Broadleaves**	**Total**
<20% damaged	0.9	0.4	0.5		0.6	0.4	**0.5**
20–50% damaged	0.2	0.4	0.3		0.3	0.3	**0.3**
>50% damaged	0.2	0.1	0.1		0.1	0.1	**0.1**
Some damage	1.4	0.8	0.9		1.0	0.9	**0.9**

	Ownership						
Severity of Damage	**FC**	**Other**	**Total**		**Conifers**	**Broadleaves**	**Total**
<20% of shoots browsed	1.1	0.4	0.5		0.7	0.4	**0.5**
20-80% of shoots browsed	0.2	0.4	0.3		0.2	0.4	**0.3**
>80% of shoots browsed	0.1	0.0	0.1		0.1	0.0	**0.1**
Some damage	1.4	0.8	0.9		1.0	0.9	**0.9**

Table 55: Wales – Percentage of High Forest area by browsing damage and ownership and conifer or broadleaf.

	Ownership						
Frequency of damage	**FC**	**Other**	**Total**		**Conifers**	**Broadleaves**	**Total**
<20% damaged	0.0	0.0	0.0		0.0	0.0	**0.0**
20–50% damaged	0.1	0.0	0.1		0.1	0.0	**0.1**
>50% damaged	0.0	0.0	0.0		0.0	0.1	**0.0**
	Ownership						
Severity of Damage	**FC**	**Other**	**Total**		**Conifers**	**Broadleaves**	**Total**
<20% of shoots browsed	0.1	0.0	0.0		0.1	0.0	**0.0**
20-80% of shoots browsed	0.0	0.1	0.0		0.0	0.1	**0.0**
>80% of shoots browsed	0.0	0.0	0.0		0.0	0.0	**0.0**
Some damage	0.1	0.1	0.1		0.1	0.1	**0.1**

Table 56: Scotland – Percentage of High Forest area by browsing damage and ownership and conifer or broadleaf.

	Ownership						
Frequency of damage	**FC**	**Other**	**Total**		**Conifers**	**Broadleaves**	**Total**
<20% damaged	7.3	6.0	6.6		7.4	2.9	**6.6**
20 - 50% damaged	2.6	2.2	2.3		2.7	0.7	**2.3**
>50% damaged	2.1	2.1	2.1		2.4	0.7	**2.1**
Some damage	12.0	10.3	11.0		12.4	4.4	**11.0**

Notes:

- The percentages are proportions of areas of High Forest
- Frequency - percentage of trees damaged in the element
- Severity describes the damage on the trees in the element
- The severity data for Scotland was lost following a software fault

10 Trees Showing Signs of Disease, Damage or Poor Condition

The surveyors assessed up to six types of problem within the samples. It was not the intention to assign specific causes to poor condition, leaving this to other staff with relevant expert skills should this have been indicated as being appropriate during the course of the National Inventory. The range of types of problem was extended after the completion of fieldwork in Scotland with the addition of 'animal damage' and 'squirrel damage'. The data for 'crown dieback', 'stem decay' and 'windblow' are common to all three countries. 'General poor health' in Scotland may have included incidences of 'animal damage' and 'squirrel damage'

Areas may have been recorded as having more than one health problem. The percentages therefore may well add to more than the proportion of 'Any health problem'. The percentages represent proportions of the areas of High Forest.

Broadleaves suffer from crown dieback and stem decay more than conifers. The opposite is true for the other damage categories. In conifers 8% of crops show signs of windblow which is nearly double the next most frequent symptom, stem decay, shown in broadleaves. The FC's higher rate of overall problems in Scotland and Wales may be related to a higher incidence of conifers.

Table 57: Percentage of High Forest area by country, problem and ownership and conifer or broadleaf.

ENGLAND	FC	Other	Total	Standard error	Conifers	Broadleaves	Total
Crown dieback	2.1	3.4	**3.1**	0.1	1.4	4.1	**3.1**
Stem decay	1.3	2.9	**2.5**	0.1	0.6	3.6	**2.5**
Windblow	3.7	2.0	**2.4**	0.1	4.2	1.3	**2.4**
General poor health	2.3	3.6	**3.4**	0.2	2.9	3.6	**3.4**
Animal damage	2.8	2.0	**2.2**	0.1	1.0	2.8	**2.2**
Squirrel damage	1.5	2.7	**2.5**	0.1	1.0	3.3	**2.5**
Any problem	11.2	13.5	**13.0**		9.3	15.1	**13.0**
WALES	**FC**	**Other**	**Total**	**Standard error**	**Conifers**	**Broadleaves**	**Total**
Crown dieback	0.4	0.7	**0.5**	0.1	0.3	0.9	**0.5**
Stem decay	0.1	0.6	**0.4**	0.1	0.2	0.6	**0.4**
Windblow	4.1	1.2	**2.4**	0.3	3.9	0.3	**2.4**
General poor health	3.0	2.2	**2.6**	0.3	2.7	2.5	**2.6**
Animal damage	0.1	0.1	**0.1**	0.0	0.0	0.2	**0.1**
Squirrel damage	0.2	1.2	**0.8**	0.1	0.1	1.8	**0.8**
Any problem	7.4	5.2	**6.2**		6.6	5.5	**6.2**
SCOTLAND	**FC**	**Other**	**Total**	**Standard error**	**Conifers**	**Broadleaves**	**Total**
Crown dieback	0.2	1.7	**1.1**	0.1	0.4	4.4	**1.1**
Stem decay	0.8	2.6	**1.8**	0.1	0.6	7.5	**1.8**
Windblow	12.8	7.3	**9.7**	0.3	10.0	8.1	**9.7**
General poor health	9.9	8.2	**8.9**	0.3	10.0	3.6	**8.9**
Any problem	22.4	16.7	**19.2**		19.6	16.9	**19.2**

Notes:

- Areas may have been recorded as having more than one problem. The percentages therefore may well add to more than the proportion of 'Any problem'.
- The percentages are proportions of areas of High Forest.
- 'Animal damage' and 'Squirrel damage' were added to the National Inventory after the completion of Scotland.
- Standard errors refer only to the total percentage and are therefore the same for both the ownership and conifer / broadleaves breakdowns.

11 Conclusions

Some of the Management and Biodiversity data are potentially more significant as baselines for monitoring than in their immediate uses; they may also flag up issues for more detailed investigation locally. Within woodland in Great Britain, Timber production was the most important management practice with over 80% of woodland area reported within this category (Section 2).

More complex analyses than are presented in this report could add considerable informational value; for instance linking the information on Mammal Damage with the data on Condition, or linking this data with other datasets such as climate or soil type.

With new types of data it is likely that some will be more useful than others and decisions will be made after detailed discussion as to whether we continue to collect the same or similar information in future National Inventory surveys. The next National Inventory is currently in the planning stage and will answer questions and information needs posed by current policies as well as adopting new and recent technologies in data acquisition.

12 References and suggestions for further reading

THE MACAULAY LAND USE RESEARCH INSTITUTE, ABERDEEN 1993.
The Land Cover of Scotland 1988 (LCS88) Final Report.

SMITH, S. AND GILBERT, J. (2001).
Forestry Commission: National Inventory of Woodland and Trees. Country report for England.
Forestry Commission: Edinburgh.

SMITH, S. and GILBERT, J. (2002).
Forestry Commission: National Inventory of Woodland and Trees. Country report for Scotland.
Forestry Commission: Edinburgh.

SMITH, S. and GILBERT, J. (2002).
Forestry Commission: National Inventory of Woodland and Trees. Country report for Wales.
Forestry Commission: Edinburgh.

SMITH, S. and GILBERT, J. (2003*).*
Forestry Commission: National Inventory of Woodland and Trees. Country report for Great Britain.
Forestry Commission: Edinburgh.

In addition to the reports listed above, results are available by Region in Scotland and England and also for the counties of England and Wales. All National Inventory reports can be read or downloaded from the web at www.forestry.gov.uk\inventory.

HUMPHREY, J.W., GILBERT, J. and PEACE, A., (2006).
Development of the Scottish Biodiversity Strategy Woodland Diversity Indicator: analysis of stand structure and composition data from the National Inventory of Woodlands and Trees. Unpublished contract report to Forestry Commission Scotland. Forest Research, Roslin.

SMITH, S., GILBERT, J., BULL, G., GILLAM, S. and WHITTON, E. (2008).
The Great Britain National Inventory of Woodland and Trees 1995-1999 - Methodology of the survey. Forestry Commission: Edinburgh.

13 Glossary

Abandoned Timber

The wording "Abandoned Timber" has been selected to represent logs which have been worked by man to some extent, and left to rot or degrade. The size requirement is for 15 cm diameter (6 inches), and at least 2 m in length and includes whole trees felled but does not include unprocessed windblow. Current felling areas are not included.

High Forest

All woodland except stands managed as Coppice or Coppice-with-Standards with, or with the potential to achieve, a tree canopy cover of ≥ 20%. Two categories of High Forest are recognised (see also Timber Potential classes):

High Forest Category 1
Stands that are, or could become, capable of producing wood of a size and quality suitable for sawlogs.

High Forest Category 2
Stands of lower quality than High Forest Category 1.

Interpreted Forest Types

The woodland map, derived from aerial photographs, is differentiated into Interpreted Forest Types (IFT's) which are: Conifer, Broadleaved, Mixed, Coppice, Coppice-with-Standards, Shrubs, Young Trees, Ground Prepared for Planting and Felled. Note that forest types (see below) based on ground survey data are used for reporting purposes because they are more reliable.

Forest Types (recorded during ground survey for each Section)

Broadleaved
Woodland containing more than 80% by area of broadleaved species.

Conifer
Woodland containing more than 80% by area of coniferous species.

Coppice
Crops of marketable broadleaved species that have at least 2 stems per stool and are either being worked, or are capable of being worked, on rotation. With the exception of hazel coppice more than half the stems should be capable of producing 1m-timber lengths of good form.

Coppice with Standards
Two-storey stands where the overstorey consists of at least 25 stems per ha that are older than the understorey of worked coppice by at least one coppice rotation.

Felled
Woodland areas that have been felled or stands where the stocking has been reduced to less than 20% and where it is expected that these areas will be replanted or regenerated naturally.

Mixed
A combination of broadleaved and coniferous species where each category occupies at least 20% of the canopy (see note on mixtures below).

Open Space
Areas within a woodland that are not covered by trees but are integral to the woodland such as open areas, streamsides, deer glades, rides and forest roads.

Windblow
Areas of blown woodland that were uncleared at the time of the survey and were not regenerated.

Management Practice Descriptions

Agroforestry System
Agroforestry is an intimate mixture of trees with farm crops and/or animals on the same piece of land. In the UK this usually consists of widely spaced individual trees, groups or lines in grazed or arable fields, e.g. Poplar and Walnut.

Conservation
Active encouragement for wildlife. This may include permitting natural regeneration, scrub regeneration, opening up of streamsides and the general encouragement of diversity in storeys and species as well as obvious signs, such as the provision of bird boxes and ride management for butterflies. The encouragement of deer into woodland will also be included.

Forest Design
A surveyor's decision regarding the cluster; usually based on diversity, ride layout, streamside management, use of open spaces, landscaping and forest block shape. Any evidence that deficient design is currently being rectified is also included.

Game Birds
The presence of feeders, pens and game birds within the cluster. Active deliberate management as opposed to the occurrence of an occasional escapee.

Grazing by Domestic Animals
Actively permitting and encouraging grazing within the wood by domesticated animals and fowl. This does not necessarily include the presence of sheep or cattle where they have breached the fence, unless the fence has been deliberately allowed to decay without maintenance so as to permit animal access for shelter.

This classification will also include the permitting of pigs to forage the forest floor and the rearing of "free range" turkeys within woodland enclosures.

No Obvious Management
This implies no obvious management practice in all or part of a cluster and usually relates to patches of scrub adjacent to roads or buildings, bearing in mind that screening may be a better categorisation. Using this management practice does not preclude the use of other practices noted in the cluster.

Ornamental
This management practice includes arboreta and woody gardens often found around estate mansions and not accurately covered by the other options.

Public recreation
Deliberate management for the Public. Signs include resting benches, footpaths, picnic facilities, way marker posts, stiles, hoof prints, bicycle tracks, and car parks.

Screening or Shelter
A wood which appears to have been planted for the shelter or screening of buildings, factories, stock or wildlife. Any comments made by the owner may assist in deciding the correct allocation of this management practice. This classification may be linked with "Agroforestry" and "Grazing by domestic animals".

Timber products
The deliberate management within the cluster for timber products, including coppice.

Mixtures

Where possible the species in mixtures have been separately recorded. Where this has not been possible they were described as 'Mixed conifers' or 'Mixed broadleaves'.

Natural Regeneration

Type of regeneration
V Vegetative
S Seedling
B Both

Vegetative regeneration takes the form of shoots from an existing tree; seedling regeneration is from a seed source.

Frequency classes of Natural Regeneration
1. <10 per hectare
2. 10-100 per hectare
3. 100-1000 per hectare
4. >1000 per hectare

The quantity of regeneration estimated to be present between 1-2 m high as a "per-hectare" figure.

Timber potential classes used in this report

Class 1
Stands, which are, or could become, capable of producing wood of a size and quality suitable for sawlogs.

Class 2
Stands of lower quality than Class 1 but capable, at best, of producing small roundwood to a minimum length of 1m.

Class 3
Stands made up of material of lower quality than either Classes 1 or 2 including firewood.

Woodland

In Great Britain woodland is defined as land with a minimum area of 0.1 ha under stands of trees with, or the potential to achieve, tree crown cover of more than 20%. Areas of open space integral to the woodland are also included. Orchards and urban woodland between 0.1 and 2 ha are excluded. Intervening land-classes such as roads, rivers or pipelines are disregarded if less than 50m in extent. 'Scrubby' vegetation is not included as a separate category but as Conifer, Broadleaved or Mixed tree types in Timber potential Class 3. There is additional information on the quality of woodland within the inventory database.

Woodland of 2 hectares and over, and with a minimum width of 50m, is included in the Main Woodland Survey; other woodland and trees are assessed in the Survey of Small Woodland and Trees.

Appendix 1

Previous Forestry Commission Woodland and Tree Surveys

Date	Scope	Minimum size of woodland	Method
1924	FC and private woodlands	0.8ha	Questionnaires to owners
1938	FC and private woodlands	2.0ha	Initially complete inventory, subsequently by sampling only
1947	FC and private woodlands	2.0ha	Complete inventory
1951	Small Woods (<2.0ha) hedgerows and park trees	0.4ha	Sampling by strips
1965	Private Woodlands	0.4ha	Sampling by kilometre OS grid squares where woodland depicted on the map
1965	Hedgerows, Parks etc. (south of Humber/Mersey only)		Sample of one-third of the 1951 survey strips plus random selection of new strips to reach 1965 intensity
1980	Private Woodlands (except Dedicated and Approved)	0.25ha	Area – from 1:50,000 maps adjusted by sample check on aerial photography Crop – by sub-sample of the area sample
1980	Non-woodland trees		Sample strips interpreted from aerial photographs with ground checking. Additional parameters assessed on a sub-sample within each strip.

Note: Prior to 1980 all areas were assessed in acres.