National Inventory of Woodland and Trees

England

County Report for

Somerset

Forestry Commission

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Woodland Surveys Branch of Forest Research was responsible for carrying out the survey and analysing the data. A large number of Forestry Commission and contract staff were involved in the survey from its inception.

Preparation of the digital cartography for Somerset was carried out by Graham Bull, Woodland Survey Officer, and Woodland GIS Officers Chris Brown, Robert Beck and Esther Whitton. Data processing and analysis was carried out by Woodland Data Officers Justin Gilbert and Shona Cameron.

The authors of this Report are Steve Smith (Head of Woodland Surveys) and Justin Gilbert (Woodland Data Officer) of Forest Research.

INTRODUCTION

This report presents the results for Somerset from the Forestry Commission National Inventory of Woodland and Trees (NIWT).

The Inventory consists of two separate surveys -

- The Main Woodland Survey (MWS) covering woodlands of 2 hectares and over
- The Survey of Small Woodland and Trees (SSWT) covering Small Woods, Groups of Trees, Linear Features and Individual Trees.

BACKGROUND

Since 1924 the Forestry Commission has carried out a number of national woodland surveys at intervals of between 15 and 20 years. The previous survey was carried out between 1979 and 1982. With the statistics becoming increasingly out of date the Forestry Commission decided to undertake a new survey: the *National Inventory of Woodland and Trees*.

The survey fieldwork for Great Britain was completed in July 2000. Work began in Scotland in 1994, followed by Southern England, Wales and Northern England.

SURVEY METHODS

Main Woodland Survey

In England, Woodland Surveys derived a digital map of all woodland showing Interpreted Forest Types from 1:25 000 scale aerial photography. This provided the basis for the sampling.

The digital map gives the extent of all woodland over 2 hectares and this was updated as survey work progressed. The maps on pages 4-6 show: overall woodland cover; woodland by ownership; and woodland by Interpreted Forest Type, respectively. The total area of woodland was obtained from the digital map with ground sampling undertaken to evaluate 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 overall sampling scheme was as follows:

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

1 hectare square plots were used to sample the selected woodlands on the ground. This was a change of practice from all previous Census surveys, where whole woods have been selected for survey. For each of the three bands of woodland area 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 in each size class.

Survey of Small Woodland and Trees

The land area of England was stratified into coastal and inland 1 km x 1 km squares and a random sample of 1 km^2 plots were then selected, representing around 1% of the land area. 1:25 000 scale aerial photos were then used to identify features in each sample square. Each 1 km^2 was then divided into 16 parts, and two of these were selected at random for field data collection. Data was collected on Small Woodlands (0.10 - <2.00 ha), Linear Features, Groups and Individual Trees. The survey did not collect information from areas of developed land of 2 hectares or more.

MAIN POINTS FROM THE SURVEY RESULTS

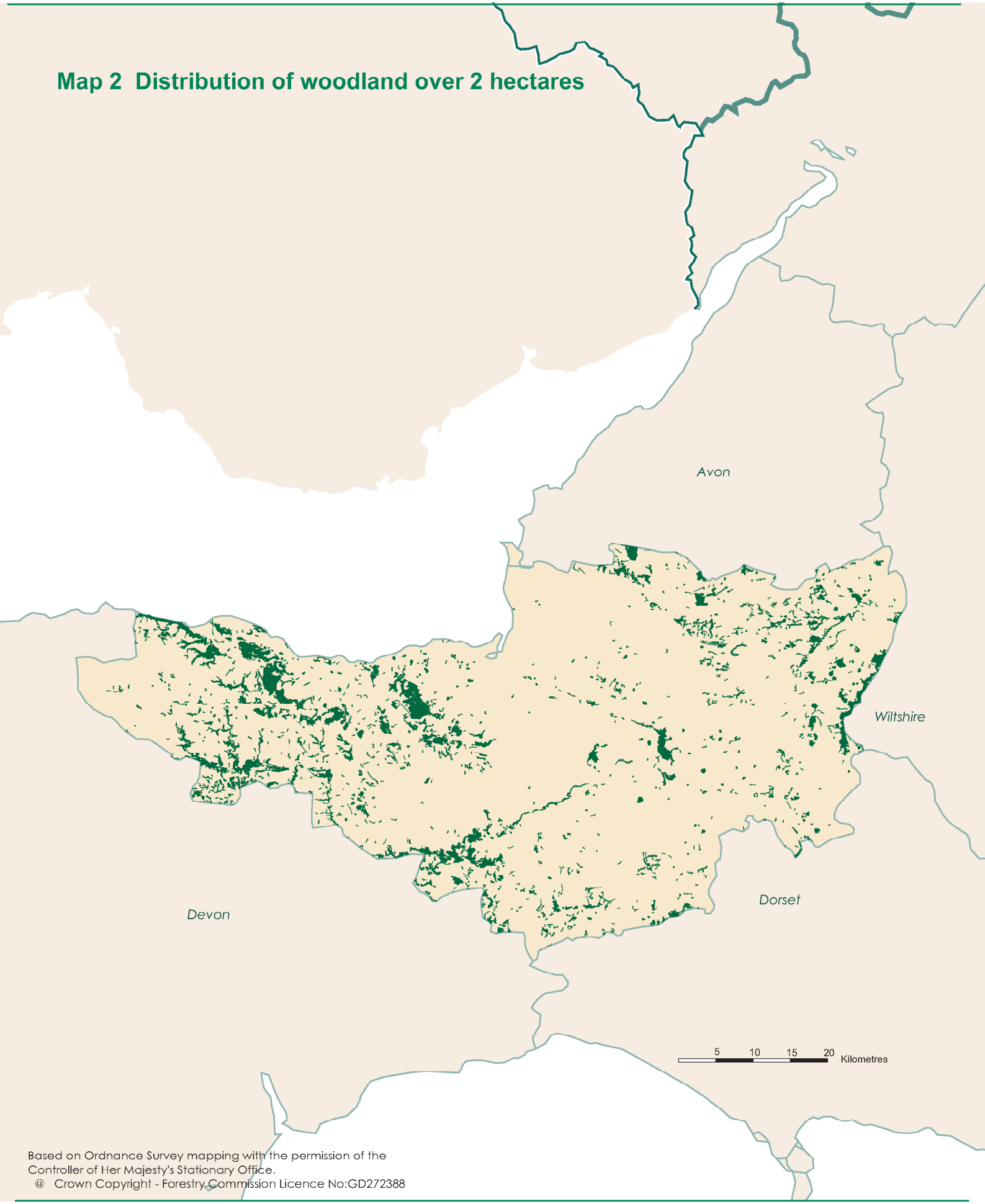
- The total area of woodland of 0.1 hectares and over in Somerset is 24,291 hectares. This represents 7.0 % of the land area. (Table 1)
- Broadleaved woodland is the dominant forest type representing 56.1 % of all woodland. Conifer woodland represents 27.6 %, Mixed woodland 12.6 % and Open Space within woodlands 2.5 %. (Table 2)
- The main conifer species is larch covering 1,345 hectares or 17.5 % of all conifer species. The main broadleaved species is oak covering 3,942 hectares or 25.1 % of all broadleaved species. (Table 3)
- 3,891 hectares or 17 % of woodland over 2 hectares is owned by or leased to the Forestry Commission, and 19,382 hectares or 83 % of woodland is in Other ownership. (Table 6)
- There are a total of 1,286 woods over 2 ha within Somerset with a mean wood area of 18.1 hectares. (Table 7a) There are a total of 2,479 woods from 0.1 - <2.0 hectares with a mean wood area of 0.41 hectares. (Table 14)
- There are 5.0 million live trees outside woodland in Somerset. (Table 15)
- Woodland land cover increased by over 4,900 hectares from 5.6 % to 7.0 % of the land area between 1980 and 1997. (Table 19)
- The area of broadleaves increased by 53 % between 1980 and 1997, with the relative proportion of broadleaves to conifers increasing from 56 % to 67 %. (Table 20)

INVENTORY REPORTS

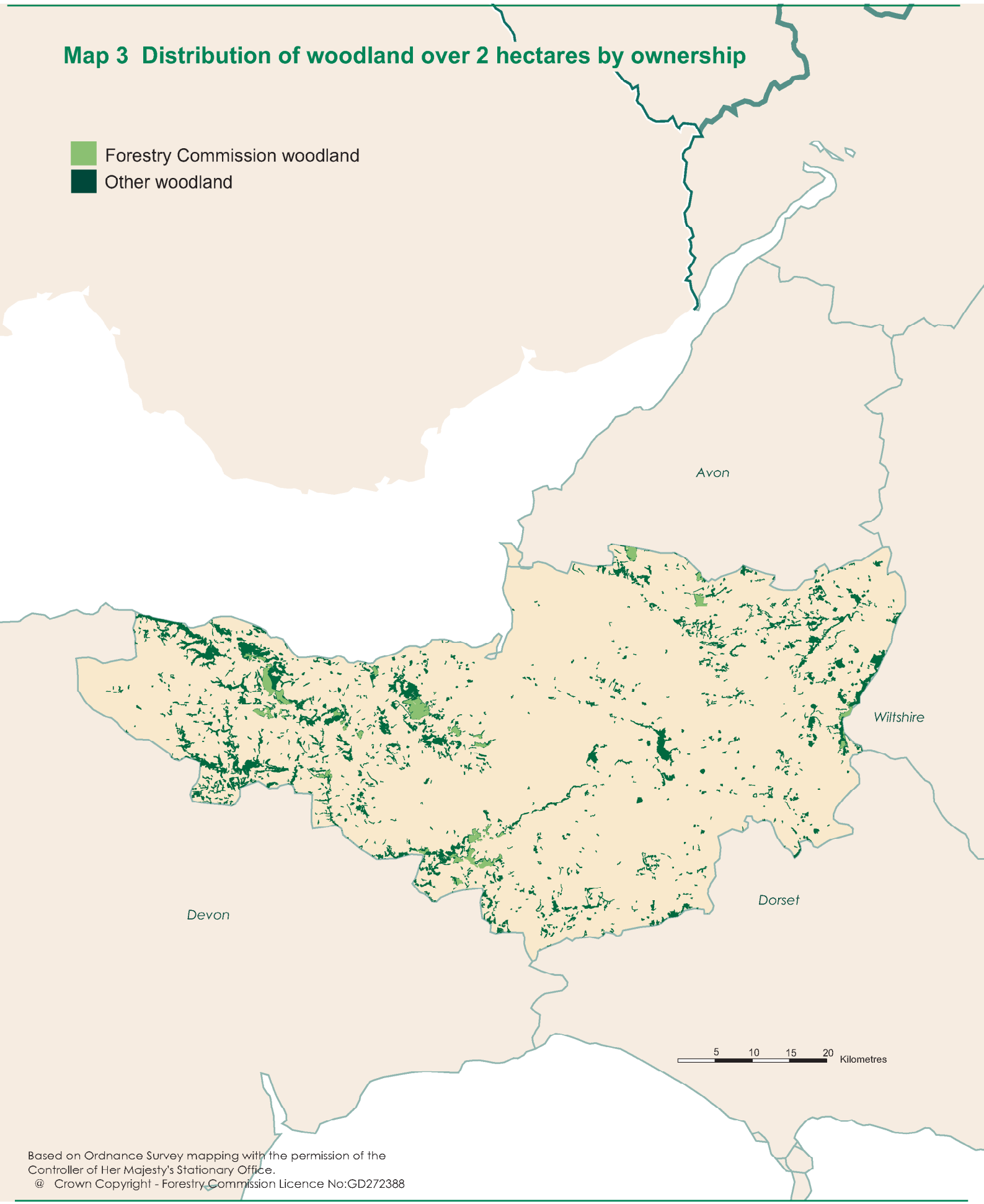
As well as this report for Somerset, reports are available for the other counties in the region as shown on the map opposite. Also available are region and county reports for England as well as a report for the country as a whole. Wales and Scotland are also covered by reports.

Map 1 Regional and county boundaries

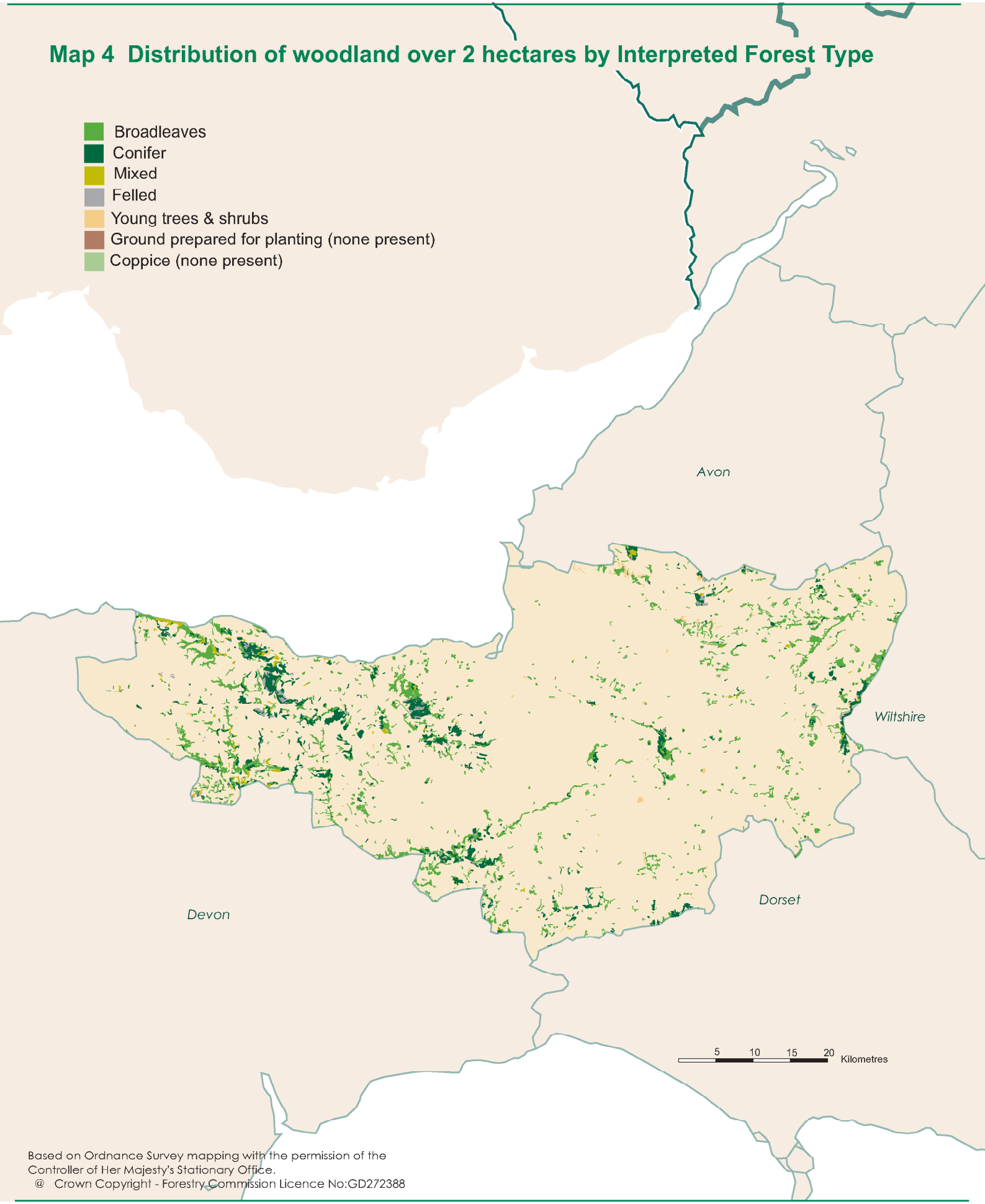
Map 2 Distribution of woodland over 2 hectares



Map 3 Distribution of woodland over 2 hectares by ownership



Map 4 Distribution of woodland over 2 hectares by Interpreted Forest Type



SUMMARY RESULTS FROM THE NATIONAL INVENTORY OF WOODLAND AND TREES (NIWT)

Both the Main Woodland Survey and the Survey of Small Woodland and Trees contributed to the estimate of woodland area for Somerset.

Tables 1-3 show the combined woodland area from the Main Woodland Survey and the Survey of Small Woodland and Trees.

Tables 4 and 5 summarise the numbers of live trees outside woodland, and the lengths of Linear Features from the Survey of Small Woodland and Trees.

Table 1:	Woodland area by woodland size class
Table 2:	Woodland area by forest type and woodland size
Table 3:	Woodland area by principal species and woodland size
Table 4:	Numbers of live trees outside woodland by feature type
Table 5:	Lengths of Linear Features

Note: *The figures in many of the tables may not add due to rounding*

Table 1 Woodland area by woodland size class

Woodland size (ha)	Woodland area (ha)	% of Woodland area
2.00 and over	23,273	95.8
0.25 - < 2.00	995	4.1
0.10 - < 0.25	23	0.1
Total area of woodland	**24,291**	**100.0**
% Woodland land cover	**7.0**	

1. Area of Somerset, including inland water, 345,207 ha based on digital boundaries used in the 1991 Census of Population

Table 2 Woodland area by forest type and woodland size

Forest type	Woodland size (ha)		Total area (ha)	Percentage of total area
	2.0 and over	0.1 - <2.0		
Conifer	6,711	4	6,715	27.6
Broadleaved	12,879	744	13,623	56.1
Mixed	2,802	266	3,068	12.6
Coppiced	25	0	25	0.1
Copp-w-standards	0	0	0	0.0
Windblow	0	0	0	0.0
Felled	242	0	242	1.0
Open Space	615	4	619	2.5
Total	**23,273**	**1,018**	**24,291**	**100**

1. See Glossary for definitions of forest types.

Table 3 Woodland area by principal species and woodland size

Species/Groups	Woodland size (ha)		Total area	Percentage of total area	
	2.0 and over	0.1 -<2.0	(ha)	Category*	Species**
Pine	774	48	822	10.7	3.5
Sitka spruce	1,186	0	1,186	15.4	5.1
Larch	1,307	38	1,345	17.5	5.7
Other conifers	4,106	19	4,125	53.7	17.6
Mixed conifers	208	0	208	2.7	0.9
Total conifers	**7,581**	**105**	**7,686**	**100.0**	**32.8**
Oak	3,869	73	3,942	25.1	16.8
Beech	1,290	172	1,462	9.3	6.2
Sycamore	374	89	463	2.9	2.0
Ash	3,329	138	3,467	22.1	14.8
Birch	870	0	870	5.5	3.7
Elm	70	108	178	1.1	0.8
Other broadleaves	1,615	295	1,910	12.2	8.2
Mixed broadleaves	3,393	32	3,425	21.8	14.6
Total broadleaves	**14,811**	**907**	**15,718**	**100.0**	**67.2**
Total all species* **	**22,392**	**1,014**	**23,406**		**100.0**

*Category - species/group percentage of conifer or broadleaved category
**Species/group percentage of all species

***Excludes the 886 ha of Coppice, Felled and Open space areas which were included in Table 2

1. The standard errors of the area estimates for woodland of 2 ha and over for the most common species or species groups are as follows

Conifers	6%
Broadleaves	4%
Larch	20%
Oak	11%
Ash	11%

2. Where the standard errors of these summary measures are 10% or less, the confidence intervals will be approximately symmetrical; the true value is expected to be within +/- one standard error for about 68% (or about two-thirds) of all cases, and within +/- two standard errors for about 95% of all cases. Where percentage standard errors are larger , e.g. for less common species or more variable species composition, the confidence intervals will be less symmetrical (and wider).

Table 4 Numbers of live trees outside woodland by feature type

Feature type	Total number of features	Total number of live trees	Mean number of trees per feature	Tree density (per sq km)
Groups	89,200	1,155,100	13	335
Narrow Linear Features	39,400	3,785,300	96	1,097
Individual Trees	110,500	110,500	1	32
Total		**5,050,900**		**1,463**

1. Land area used to calculate tree density 345,207 ha based on digital boundaries used in 1991 Census of Population

2. The standard errors of the live tree number estimates for these feature types are:

Groups	24%
Narrow Linear Features	25%
Individual Trees	15%

3. Where the standard errors of these summary measures are 10% or less, the confidence intervals will be approximately symmetrical; the true value is expected to be within +/- one standard error for about 68% (or about two-thirds) of all cases, and within +/- two standard errors for about 95% of all cases. Where percentage standard errors are larger , e.g. for less common species or more variable species composition, the confidence intervals will be less symmetrical (and wider).

4. See Glossary for definitions of feature types .

Table 5 Lengths of Linear Features

Feature type	Total number of features	Total length of features (km)	Density of features (m per sq km)
Wide Linear Features	1,715	282	82
Narrow Linear Features	39,400	3,008	871
Total		**3,290**	**953**

1. Land area used to calculate tree density 345,207 ha based on digital boundaries used in 1991 Census of Population

2. The standard errors of the length estimates for these feature types are:

Wide Linear Features	52%
Narrow Linear Features	20%

3. Where the standard errors of these summary measures are 10% or less, the confidence intervals will be approximately symmetrical; the true value is expected to be within +/- one standard error for about 68% (or about two-thirds) of all cases, and within +/- two standard errors for about 95% of all cases. Where percentage standard errors are larger , e.g. for less common species or more variable species composition, the confidence intervals will be less symmetrical (and wider).

4. See Glossary for definitions of feature type .

RESULTS FROM THE MAIN WOODLAND SURVEY (MWS)

Survey Method

Woods were selected from the digital map of woodland of 2 hectares and over, then sampled using a random grid of 1 hectare sample plots. The density of sample plots was reduced as the sampled woodland increase in size, the general aim being to sample 1% of the woodland area. The ground sampling evaluated a wide range of data such as species, age and stocking.

Note: The figures in many of the tables may not add due to rounding

Table 6 Summary of woodland area by ownership

Ownership	ha	% woodland
Forestry Commission	3,891	17
Other	19,382	83
Total area of woodland	**23,273**	**100**

1. Woodland area from aerial photographic interpretation map updated to 31 March 1997

2. See Glossary for definitions of ownership types

Woodland area by ownership

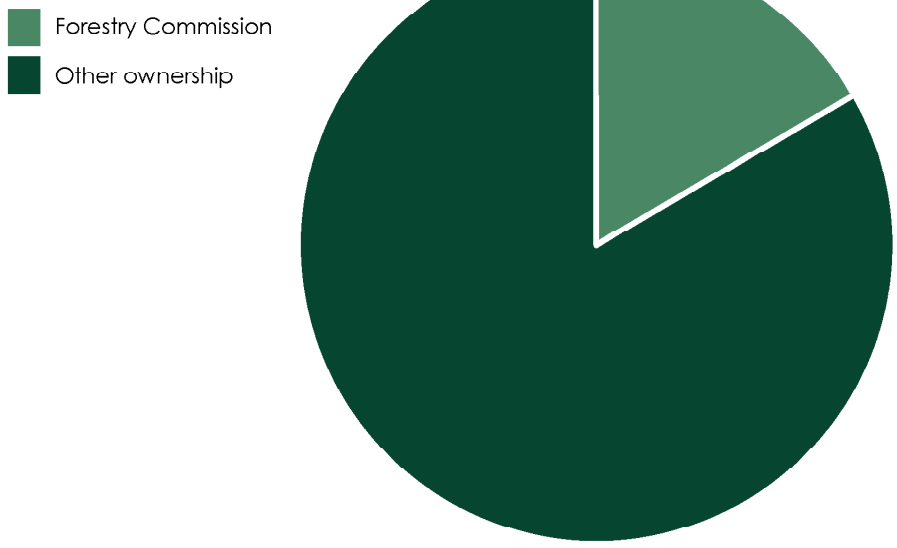


Table 7a Size class distribution of woodland

Size class (ha)	Number of woods	Total area (ha)	Percent of total area	Mean wood area (ha)
<10	949	3,971	17	4.2
10 - <20	150	2,080	9	13.9
20 - <50	118	3,787	16	32.1
50 - <100	34	2,498	11	73.5
<100	**1,251**	**12,336**	**53**	**9.9**
100 - <500	**30**	**6,875**	**29**	**229.2**
500 and >	**5**	**4,101**	**18**	**820.2**
All woods	**1,286**	**23,311**	**100**	**18.1**

Table 7b Size class distribution of woodland by ownership units

Size class (ha)	FC or Other	Number of woods	Total area (ha)	Percent of total area	Mean wood area (ha)
<10	FC	6	29	0	4.8
	O	1,023	4,202	18	4.1
10 - <20	FC	7	101	0	14.4
	O	158	2,203	9	13.9
20 - <50	FC	10	314	1	31.4
	O	116	3,687	16	31.8
50 - <100	FC	9	570	2	63.3
	O	32	2,311	10	72.2
<100	FC	32	1,014	4	31.7
	O	1,329	12,403	53	9.3
100 - <500	FC	11	1,683	7	153.0
	O	26	5,824	25	224.0
500 and >	FC	2	1,195	5	597.4
	O	2	1,192	5	596.1
Total	**FC**	**45**	**3,891**	**17**	**86.5**
	O	**1,357**	**19,420**	**83**	**14.3**

1. Table 7a and 7b are based solely on the digital woodland map. The other MWS tables are derived from the field sample data

2. The total area in Tables 7a and 7b is 38 hectares more than recorded in Table 6. This is mainly due to the field samples recording some land in other land uses not differentiated from woodland in the digital map

3. The data available from the digital map enable the identification of woodlands according to their ownerships, Forestry Commission or Other. The entries in table 7b cannot be added to derive table 7a as some woods may consist of both Forestry Commission and Other ownership(s)

   For example, the Forestry Commission may own most of a large wood with some parts in Other ownership(s). In Table 7a the whole area would be treated as one wood and the area allocated to one size category. In Table 7b each of the ownership units would be allocated to the size category for that unit. Dividing woods by ownership can occasionaly generate part woods of less than 2 hectares

Table 8 Area of woodland by forest type and ownership

Forest type	Forestry Commission		Other		All ownerships	
	ha	%	ha	%	ha	%
Conifer	2,209	56.8	4,502	23.2	6,711	28.8
Broadleaved	640	16.4	12,238	63.1	12,879	55.3
Mixed	600	15.4	2,201	11.4	2,802	12.0
Coppice	0	0.0	25	0.1	25	0.1
Copp-w-Stds	0	0.0	0	0.0	0	0.0
Windblow	0	0.0	0	0.0	0	0.0
Felled	228	5.9	14	0.1	242	1.0
Open Space	213	5.5	402	2.1	615	2.6
Total	**3,891**	**100.0**	**19,382**	**100.0**	**23,273**	**100.0**

Area of woodland by forest type

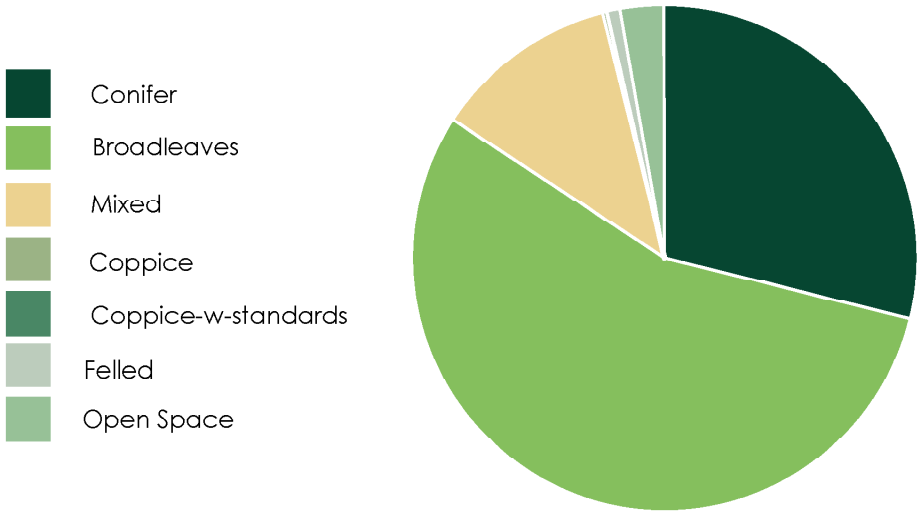


Table 9a Area of High Forest by principal species and ownership

Species	Forestry Commission			Other			All ownerships		
	area (ha)	cat* %	spp** %	area (ha)	cat* %	spp** %	area (ha)	cat* %	spp** %
Scots pine	216	9	6	408	8	2	624	8	3
Corsican pine	54	2	2	95	2	1	150	2	1
Lodgepole pine	0	0	0	0	0	0	0	0	0
Sitka spruce	871	36	25	315	6	2	1,186	16	5
Norway spruce	312	13	9	1,341	26	7	1,653	22	7
European larch	17	1	0	413	8	2	430	6	2
Jap/Hybrid larch	446	18	13	431	8	2	877	12	4
Douglas fir	439	18	13	1,691	33	9	2,129	28	10
Other conifers	8	0	0	316	6	2	324	4	1
Mixed conifers	74	3	2	134	3	1	208	3	1
Total conifers	**2,436**	**100**	**71**	**5,145**	**100**	**27**	**7,581**	**100**	**34**
Oak	71	7	2	3,799	28	20	3,869	26	17
Beech	381	38	11	909	7	5	1,290	9	6
Sycamore	47	5	1	327	2	2	374	3	2
Ash	137	14	4	3,192	23	17	3,329	22	15
Birch	17	2	0	854	6	5	870	6	4
Poplar	0	0	0	191	1	1	191	1	1
Sweet chestnut	42	4	1	114	1	1	156	1	1
Elm	8	1	0	62	0	0	70	0	0
Other broadleaves	188	19	5	1,079	8	6	1,268	9	6
Mixed broadleaves	123	12	4	3,270	24	17	3,393	23	15
Total broadleaves	**1,014**	**100**	**29**	**13,797**	**100**	**73**	**14,811**	**100**	**66**
Total - all species	**3,450**		**100**	**18,942**		**100**	**22,392**		**100**
Felled	**228**			**14**			**242**		
Total High Forest	**3,678**			**18,956**			**22,634**		

*cat : species percentage of Conifer or Broadleaved in the ownership category
**spp : percentage of all species in the ownership category

1. In addition to the areas shown there are 615 ha of other areas integral to the woodland not stocked with tree species.

2. The standard errors of the all ownerships area estimates for the most common species or species groups are as follows;

Conifers	6%
Broadleaves	4%
Douglas fir	17%
Oak	11%
Ash	11%

3. 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'.

4. Confidence Intervals: where the standard errors of these summary measures are 10% or less, the confidence Intervals will be approximately symmetrical; the true value is expected to be within +/- one standard error for about 68% (or about two-thirds) of all cases, and within +/- two standard errors for about 95% of all cases. Where percentage standard errors are larger , e.g. for less common species or more variable species composition, the confidence intervals will be less symmetrical (and wider).

Area of High Forest by principal species and ownership

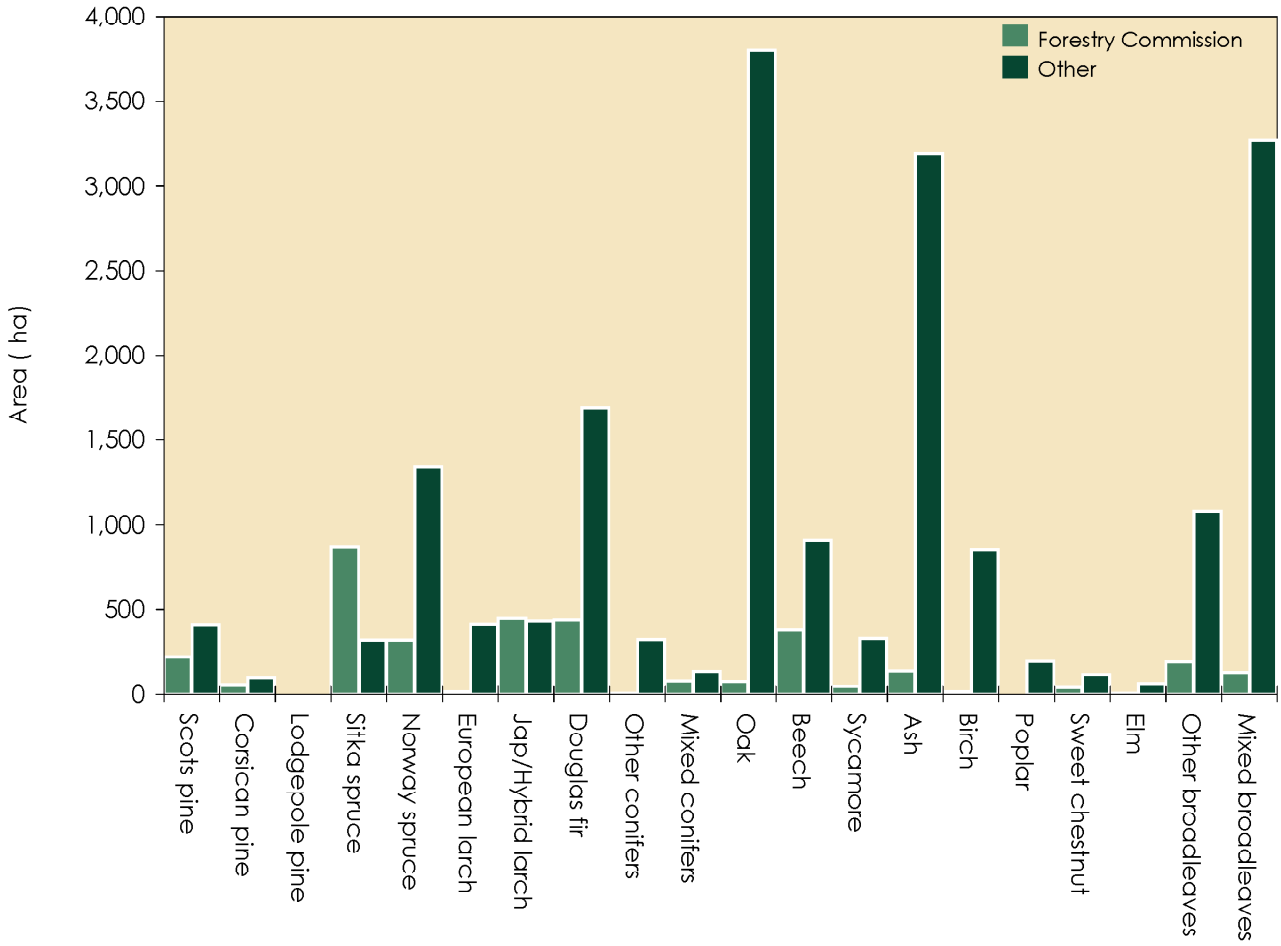


Table 9b Area of High Forest by principal species,ownership and category

Species	Forestry Commission			Other			All ownerships		
	cat. 1	cat. 2	Total (ha)	cat. 1	cat. 2	Total (ha)	cat. 1	cat. 2	Total (ha)
Scots pine	216	0	216	408	0	408	624	0	624
Corsican pine	54	0	54	95	0	95	150	0	150
Lodgepole pine	0	0	0	0	0	0	0	0	0
Sitka spruce	871	0	871	315	0	315	1,186	0	1,186
Norway spruce	312	0	312	1,341	0	1,341	1,653	0	1,653
European larch	17	0	17	413	0	413	430	0	430
Jap/Hybrid larch	446	0	446	431	0	431	877	0	877
Douglas fir	439	0	439	1,686	5	1,691	2,124	5	2,129
Other conifers	8	0	8	279	37	316	287	37	324
Mixed conifers	74	0	74	134	0	134	208	0	208
Total conifers	**2,436**	**0**	**2,436**	**5,103**	**42**	**5,145**	**7,539**	**42**	**7,581**
Oak	71	0	71	3,177	621	3,799	3,248	621	3,869
Beech	350	31	381	866	44	909	1,216	75	1,290
Sycamore	47	0	47	270	57	327	317	57	374
Ash	137	0	137	3,076	116	3,192	3,213	116	3,329
Birch	17	0	17	531	323	854	547	323	870
Poplar	0	0	0	191	0	191	191	0	191
Sweet chestnut	42	0	42	114	0	114	156	0	156
Elm	0	8	8	0	62	62	0	70	70
Other broadleaves	23	166	188	271	808	1,079	294	974	1,268
Mixed broadleaves	74	49	123	2,734	536	3,270	2,808	585	3,393
Total broadleaves	**760**	**254**	**1,014**	**11,231**	**2,566**	**13,797**	**11,990**	**2,820**	**14,811**
Total - all species	**3,196**	**254**	**3,450**	**16,334**	**2,608**	**18,942**	**19,530**	**2,862**	**22,392**

1. The standard errors of the all ownerships area estimates for the most common species or species groups (in all woodland types) are as follows

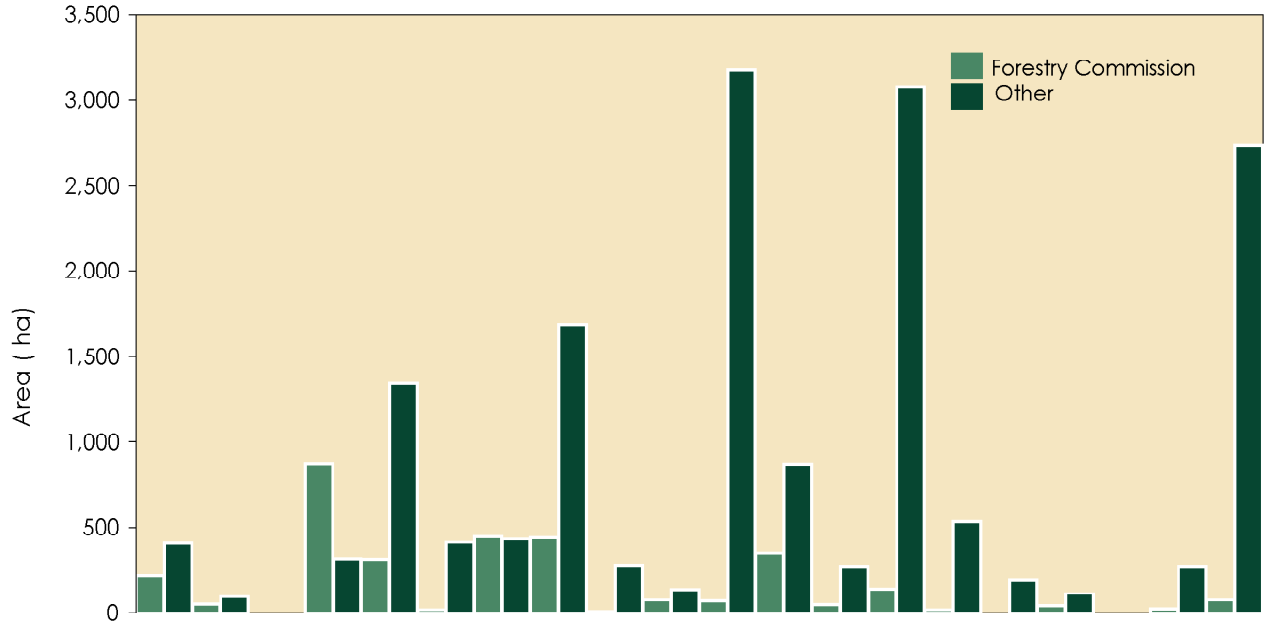
	Category 1*	Category 2*	Total High Forest
Conifers	6%	41%	6%
Broadleaves	4%	9%	4%
Douglas fir	17%	-	17%
Oak	12%	34%	11%
Ash	11%	47%	11%

*See Glossary for Category 1 and Category 2 descriptions

2. Where the standard errors of these summary measures are 10% or less, the confidence intervals will be approximately symmetrical; the the true value is expected to be within +/- one standard error for about 68% (or about two-thirds) of all cases, and within +/- two standard errors for about 95% of all cases. Where percentage standard errors are larger , e.g. for less common species or more variable species composition, the confidence intervals will be less symmetrical (and wider).

3. 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'.

High Forest Category 1 - Area by principal species and ownership



High Forest Category 2 - Area by principal species and ownership

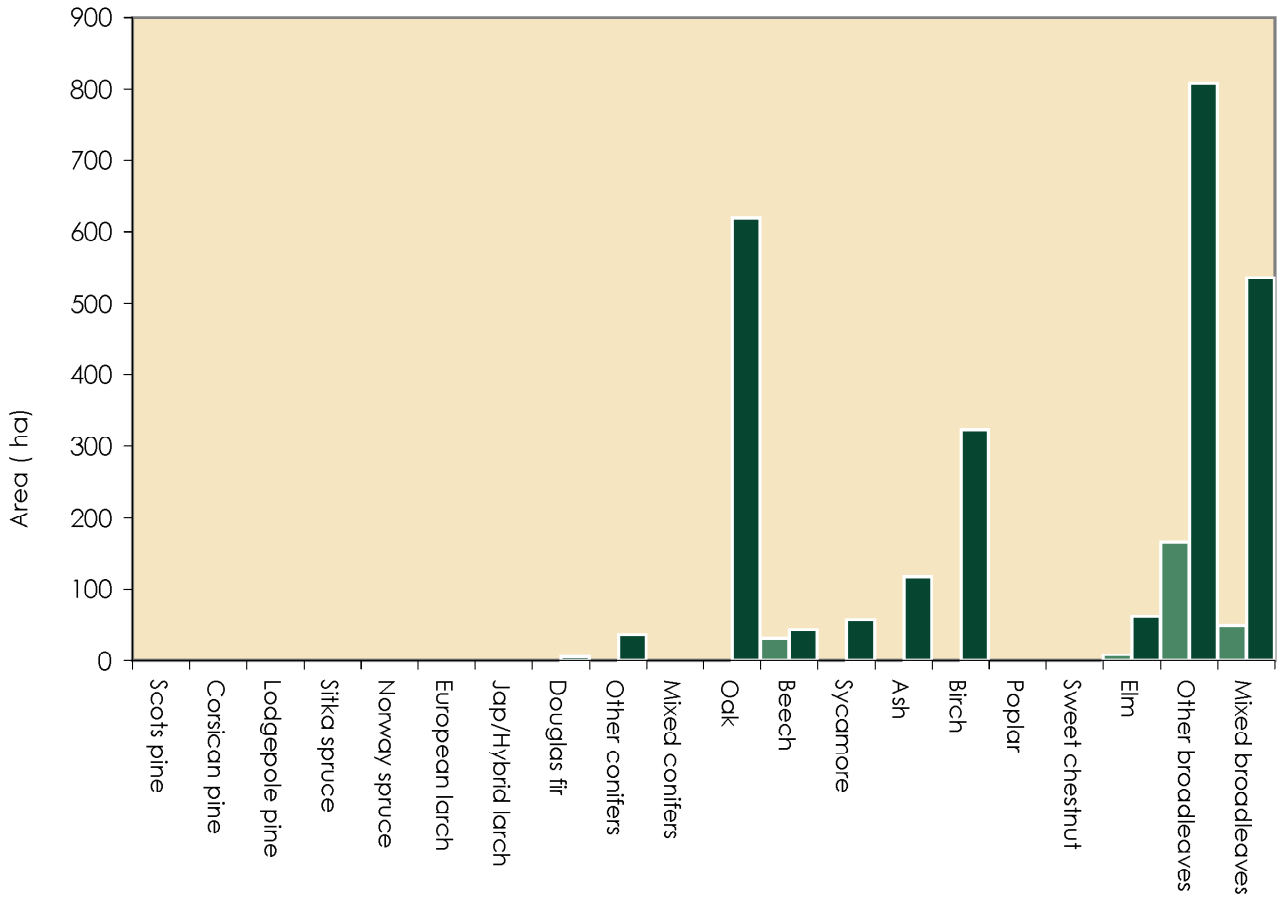
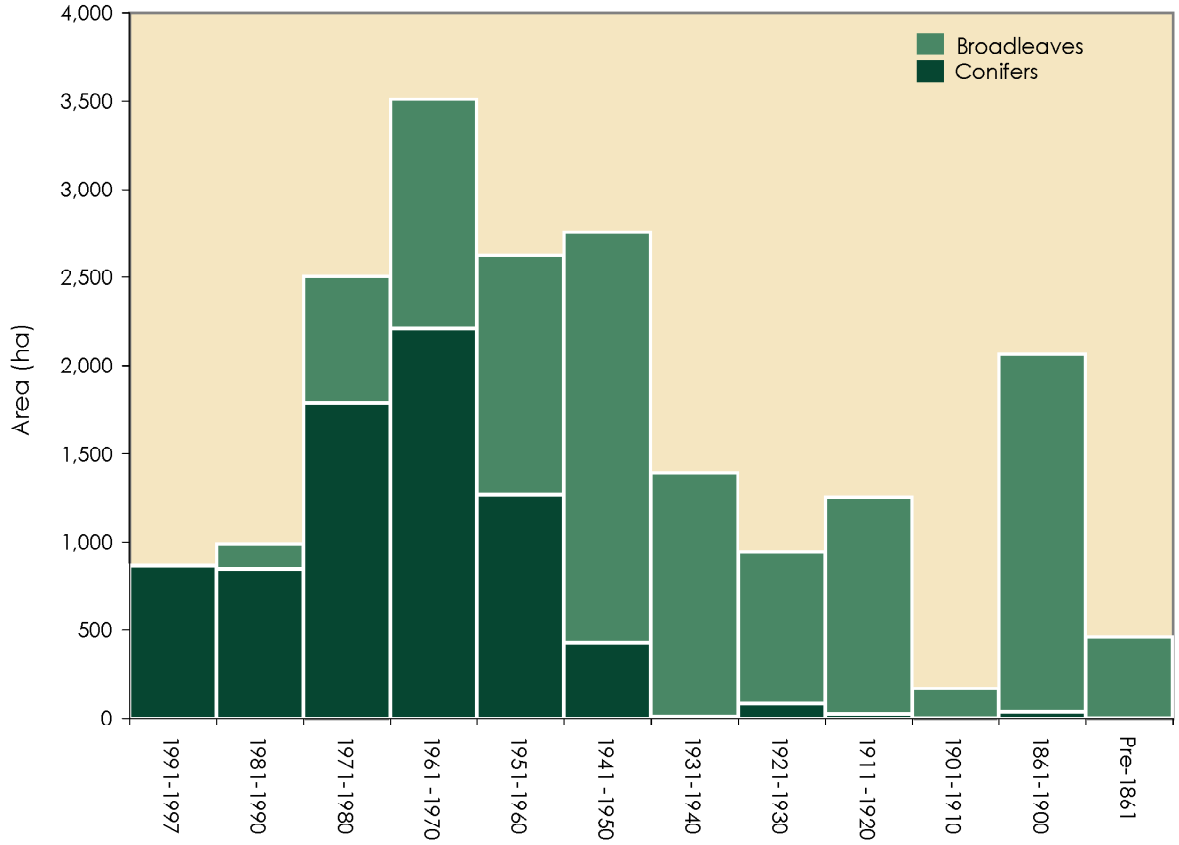


Table 10a High Forest Category 1 - Area by principal species and planting year class

Species	Planting year class*												Total (ha)
	1991-1997	1981-1990	1971-1980	1961 - 1970	1951-1960	1941 - 1950	1931-1940	1921-1930	1911 - 1920	1901-1910	1861-1900	Pre-1861	
Scots pine	25	35	242	67	175	20	4	21	20	0	17	0	624
Corsican pine	0	0	64	54	0	12	0	0	0	0	20	0	150
Lodgepole pine	0	0	0	0	0	0	0	0	0	0	0	0	0
Sitka spruce	159	210	197	250	231	140	0	0	0	0	0	0	1,186
Norway spruce	124	198	785	226	231	88	0	0	0	0	0	0	1,653
European larch	0	0	76	263	56	35	0	0	0	0	0	0	430
Jap/Hybrid larch	331	77	114	271	69	16	0	0	0	0	0	0	877
Douglas fir	219	180	302	927	437	59	0	0	0	0	0	0	2,124
Other conifers	0	141	6	62	60	15	5	0	0	0	0	0	287
Mixed conifers	0	0	0	94	5	45	0	65	0	0	0	0	208
Total conifers	**857**	**839**	**1,786**	**2,212**	**1,264**	**430**	**9**	**85**	**20**	**0**	**37**	**0**	**7,539**
Oak	4	17	11	69	250	381	292	184	72	10	1,565	393	3,248
Beech	0	0	88	163	136	45	128	163	183	16	260	35	1,216
Sycamore	0	7	0	16	75	140	15	10	10	0	45	0	317
Ash	0	58	402	501	589	762	419	122	88	141	131	0	3,213
Birch	0	14	17	309	34	130	24	20	0	0	0	0	547
Poplar	0	0	108	0	4	69	10	0	0	0	0	0	191
Sweet chestnut	0	7	0	5	0	10	68	42	10	0	15	0	156
Elm	0	0	0	0	0	0	0	0	0	0	0	0	0
Other broadleaves	0	39	35	48	40	79	19	36	0	0	0	0	294
Mixed broadleaves	8	8	58	189	232	710	406	283	869	0	10	35	2,808
Total broadleaves	**13**	**149**	**718**	**1,299**	**1,359**	**2,325**	**1,381**	**860**	**1,231**	**167**	**2,026**	**462**	**11,990**
Total - all species	**869**	**988**	**2,505**	**3,511**	**2,623**	**2,754**	**1,391**	**945**	**1,251**	**167**	**2,062**	**462**	**19,530**

*Age determined from records where these were available. Where records were not available or were clearly inaccurate age-class was assigned by reference to similar crops of known age in the locality.

High Forest Category 1 - Area by planting year class



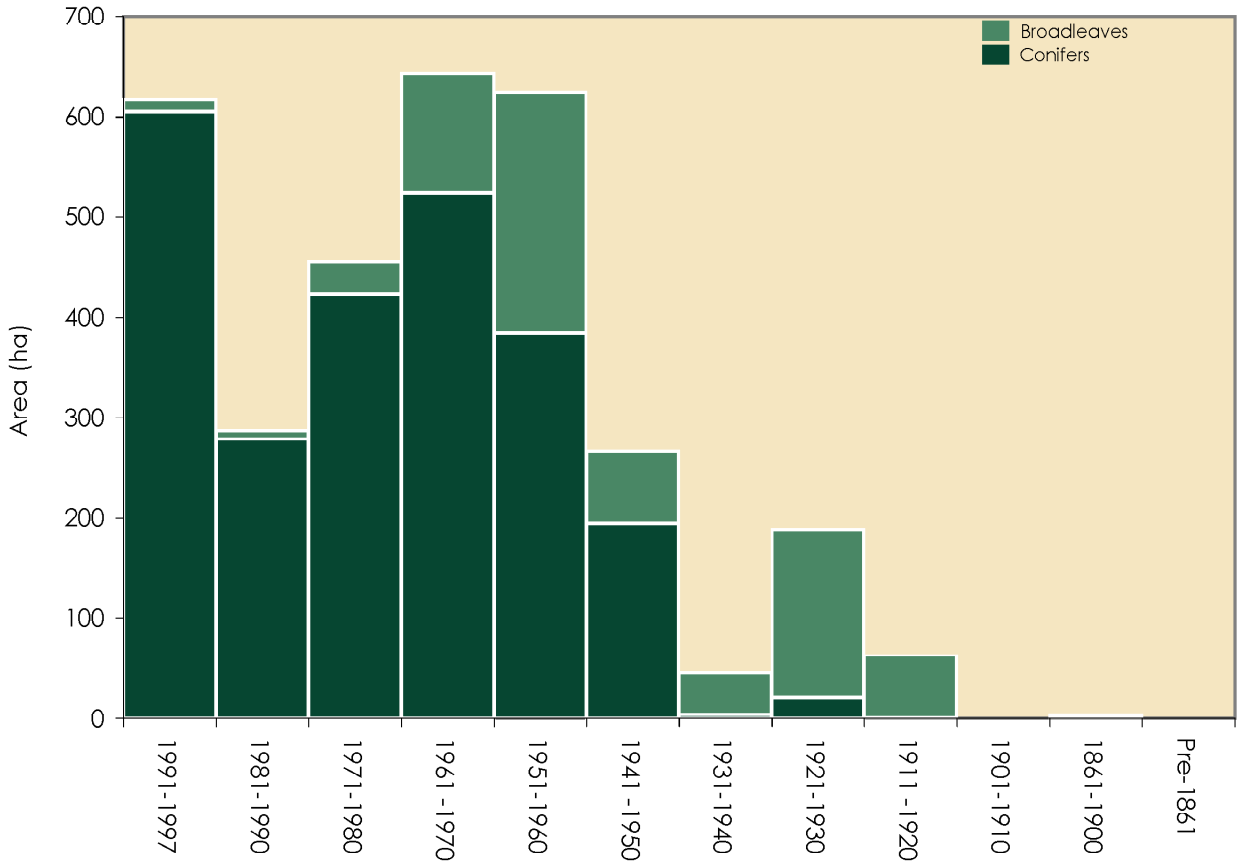
1. Most of the planting year classes cover 10 years, 1991-1997 is 7 years, and the classes prior to 1901 are 40 years or more.

Table 10b High Forest Category 1 - Forestry Commission : area by principal species and planting year classes

Species	Planting year class*												Total (ha)
	1991-1997	1981-1990	1971-1980	1961 - 1970	1951-1960	1941 - 1950	1931-1940	1921-1930	1911 - 1920	1901-1910	1861-1900	Pre-1861	
Scots pine	25	0	103	42	21	0	4	21	0	0	0	0	216
Corsican pine	0	0	54	0	0	0	0	0	0	0	0	0	54
Lodgepole pine	0	0	0	0	0	0	0	0	0	0	0	0	0
Sitka spruce	116	167	94	163	231	99	0	0	0	0	0	0	871
Norway spruce	50	0	71	29	83	78	0	0	0	0	0	0	312
European larch	0	0	17	0	0	0	0	0	0	0	0	0	17
Jap/Hybrid larch	331	0	0	65	50	0	0	0	0	0	0	0	446
Douglas fir	83	113	83	143	0	17	0	0	0	0	0	0	439
Other conifers	0	0	0	8	0	0	0	0	0	0	0	0	8
Mixed conifers	0	0	0	74	0	0	0	0	0	0	0	0	74
Total conifers	**605**	**279**	**423**	**524**	**385**	**194**	**4**	**21**	**0**	**0**	**0**	**0**	**0**
Oak	4	0	0	33	0	8	17	8	0	0	0	0	71
Beech	0	0	0	63	117	0	25	79	63	0	4	0	350
Sycamore	0	0	0	16	0	31	0	0	0	0	0	0	47
Ash	0	0	0	0	66	33	0	38	0	0	0	0	137
Birch	0	0	17	0	0	0	0	0	0	0	0	0	17
Poplar	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweet chestnut	0	0	0	0	0	0	0	42	0	0	0	0	42
Elm	0	0	0	0	0	0	0	0	0	0	0	0	0
Other broadleaves	0	0	15	8	0	0	0	0	0	0	0	0	23
Mixed broadleaves	8	8	0	0	58	0	0	0	0	0	0	0	74
Total broadleaves	**13**	**8**	**32**	**119**	**240**	**73**	**42**	**167**	**63**	**0**	**4**	**0**	**760**
Total - all species	**618**	**288**	**454**	**643**	**625**	**267**	**46**	**188**	**63**	**0**	**4**	**0**	**3,196**

*Age determined from records where these were available. Where records were not available or were clearly inaccurate age-class was assigned by reference to similar crops of known age in the locality.

High Forest Category 1 - Forestry Commission: area by planting year class



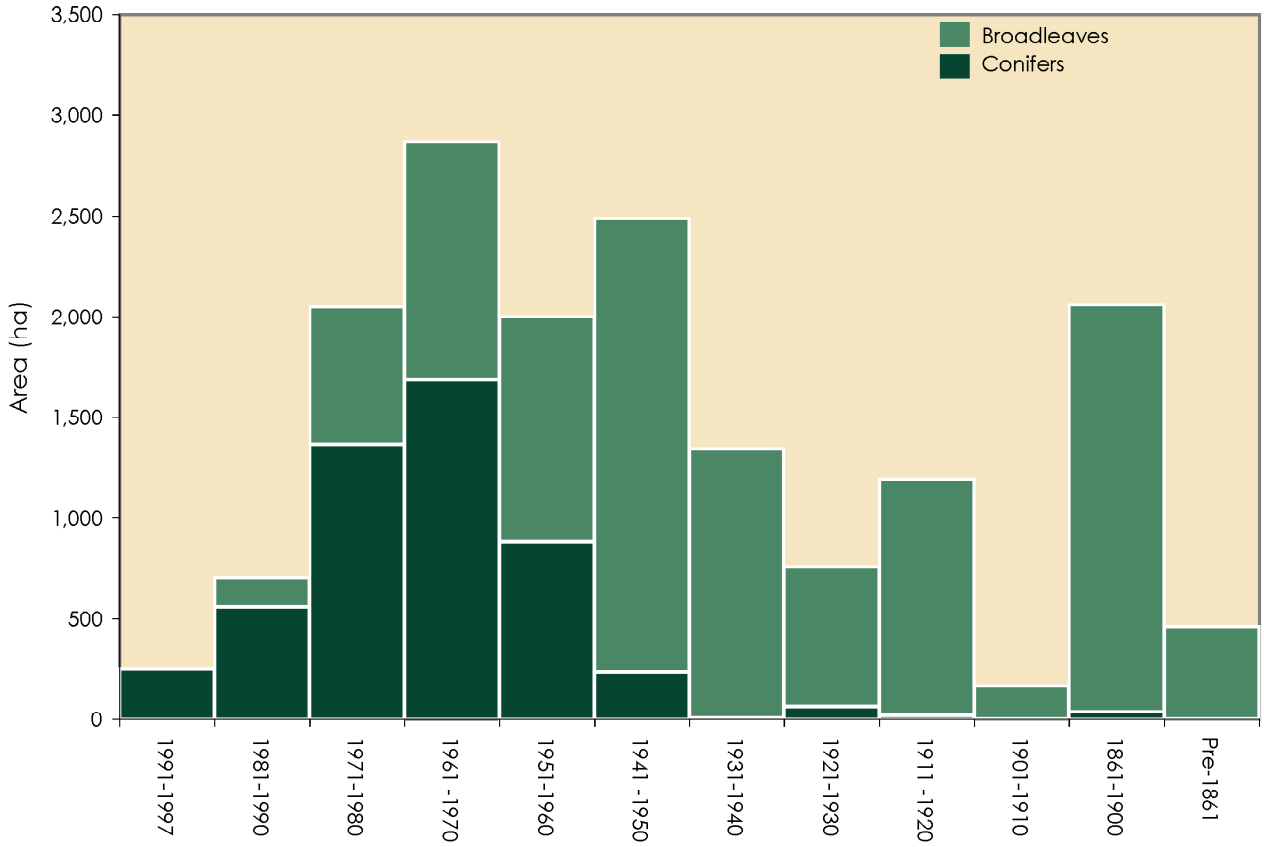
1. Most of the planting year classes cover 10 years, 1991-1997 is 7 years, and the classes prior to 1901 are 40 years or more.

Table 10c High Forest Category 1 - Other ownership: area by principal species and planting year classes

Species	Planting year class*												Total (ha)
	1991-1997	1981-1990	1971-1980	1961 - 1970	1951-1960	1941 - 1950	1931-1940	1921-1930	1911 - 1920	1901-1910	1861-1900	Pre-1861	
Scots pine	0	35	138	25	154	20	0	0	20	0	17	0	408
Corsican pine	0	0	10	54	0	12	0	0	0	0	20	0	95
Lodgepole pine	0	0	0	0	0	0	0	0	0	0	0	0	0
Sitka spruce	43	43	102	86	0	41	0	0	0	0	0	0	315
Norway spruce	74	198	715	197	148	10	0	0	0	0	0	0	1,341
European larch	0	0	60	263	56	35	0	0	0	0	0	0	413
Jap/Hybrid larch	0	77	114	206	19	16	0	0	0	0	0	0	431
Douglas fir	135	68	219	784	437	43	0	0	0	0	0	0	1,686
Other conifers	0	141	6	54	60	15	5	0	0	0	0	0	279
Mixed conifers	0	0	0	20	5	45	0	65	0	0	0	0	134
Total conifers	**251**	**560**	**1,364**	**1,689**	**879**	**236**	**5**	**65**	**20**	**0**	**37**	**0**	**5,103**
Oak	0	17	11	36	250	373	275	176	72	10	1,565	393	3,177
Beech	0	0	88	100	19	45	103	83	120	16	255	35	866
Sycamore	0	7	0	0	75	109	15	10	10	0	45	0	270
Ash	0	58	402	501	523	728	419	84	88	141	131	0	3,076
Birch	0	14	0	309	34	130	24	20	0	0	0	0	531
Poplar	0	0	108	0	4	69	10	0	0	0	0	0	191
Sweet chestnut	0	7	0	5	0	10	68	0	10	0	15	0	114
Elm	0	0	0	0	0	0	0	0	0	0	0	0	0
Other broadleaves	0	39	20	40	40	79	19	36	0	0	0	0	271
Mixed broadleaves	0	0	58	189	175	710	406	283	869	0	10	35	2,734
Total broadleaves	**0**	**141**	**687**	**1,180**	**1,119**	**2,252**	**1,340**	**693**	**1,169**	**167**	**2,022**	**462**	**11,231**
Total - all species	**251**	**701**	**2,050**	**2,868**	**1,998**	**2,488**	**1,345**	**757**	**1,189**	**167**	**2,058**	**462**	**16,334**

*Age determined from records where these were available. Where records were not available or were clearly inaccurate age-class was assigned by reference to similar crops of known age in the locality.

High Forest Category 1 - Other Ownership: area by planting year class



1. Most of the planting year classes cover 10 years, 1991-1997 is 7 years, and the classes prior to 1901 are 40 years or more.

Table 11 High Forest : principal species by planting year class

Planting year class	First	%	Second	%	Third	%
1991-97	Jap/Hybrid larch	36	Douglas fir	24	Sitka spruce	17
1981-90	Sitka spruce	18	Norway spruce	17	Douglas fir	15
1971-80	Norway spruce	27	Ash	15	Douglas fir	10
1961-70	Douglas fir	22	Ash	14	Other broadleaves	10
1951-60	Ash	21	Douglas fir	16	Mixed broadleaves	9
1941-50	Mixed broadleaves	24	Ash	23	Other broadleaves	12
1931-40	Oak	35	Ash	25	Mixed broadleaves	24
1921-30	Mixed broadleaves	29	Oak	20	Beech	15
1911-20	Mixed broadleaves	68	Beech	14	Ash	7
1901-10	Ash	71	Sycamore	16	Beech	8
1861-1900	Oak	78	Beech	11	Ash	6
Pre 1861	Oak	78	Mixed broadleaves	15	Beech	7
All years	**Oak**	**17**	**Mixed broadleaves**	**15**	**Ash**	**15**

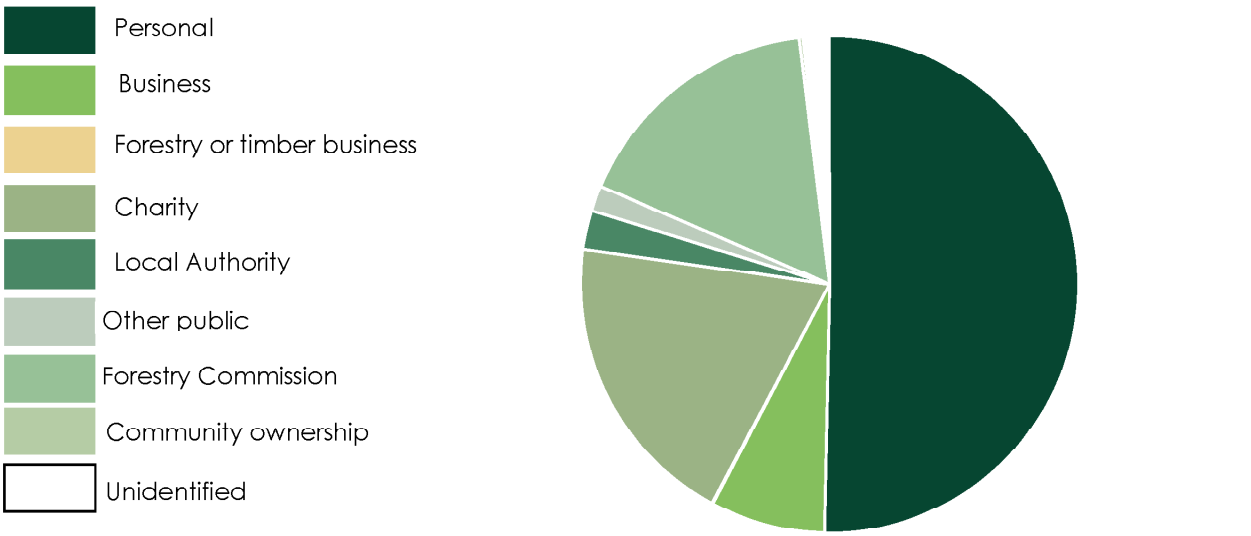
1. Principal species as a percentage of area in the planting year class.

Table 12 Ownership type* by area and percentage

Ownership type	Area (ha)	%
Personal	11,689	50.2
Business	1,788	7.7
Forestry or timber business	0	0.0
Charity	4,465	19.2
Local Authority	604	2.6
Other public (not FC)	407	1.7
Forestry Commission	3,891	16.7
Community ownership or common land	50	0.2
Unidentified	379	1.6
Total	**23,273**	**100.0**

* This table is produced from data contributed on a voluntary basis by owners or their representatives.

Ownership type by area



RESULTS FROM THE SURVEY OF SMALL WOODLAND AND TREES (SSWT)

Survey Method

The land area of England was stratified into coastal and inland 1 km x 1 km squares and a random sample of 1 km^2 plots were then selected, representing around 1% of the land area. 1:25 000 scale aerial photos were then used to identify features in each sample square. Each 1 km^2 was then divided into 16 parts, and two of these were selected at random for field data collection. Data was collected on Small Woodlands (0.10 - <2.00 ha), Linear Features, Groups and Individual Trees. The survey did not collect information from areas of developed land of 2 hectares or more.

Note: The figures in many of the tables may not add due to rounding

Table 13 Summary of information from the Survey of Small Woodlands and Trees

Feature type	Number of features	Total	Unit
Small Woods	764	458	Area (ha)
Wide Linear Features	1,715	559	Area (ha)
Wide Linear Features	1,715	282	Length (Km)
Narrow Linear Features	39,400	3,008	Length (Km)
Narrow Linear Features	39,400	3,785,300	Number of live trees
Groups	89,200	1,155,100	Number of live trees
Individual Trees	110,500	110,500	Number of live trees

1. See Glossary for definitions of feature types.

Table 14 Woodland area by feature type and woodland size

Feature type	Woodland size (ha)		Total area (ha)	Number of features	Mean size (ha)
	0.1 - <0.25	0.25 - <2.0			
Small Woods	23	436	458	764	0.60
Wide Linear Features	0	559	559	1,715	0.33
Total	**23**	**995**	**1,018**	**2,479**	**0.41**

1. See Glossary for definitions of feature types.

Table 15 Numbers of live trees outside woodland by species and feature type (000's trees)

Species	Feature type				Total live trees	Percent of total trees	
	Boundary Trees	Middle Trees	Groups	Narrow Linear Features		Category	Species
Pine	0.8	0.8	1.6	1.4	4.6	13.6	0.1
Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Larch	0.0	0.0	0.8	0.3	1.1	3.2	0.0
Cypress	0.0	0.0	6.3	3.4	9.7	28.6	0.2
Other conifers	0.8	1.6	7.9	8.2	18.5	54.6	0.4
Total conifers	**1.6**	**2.4**	**16.6**	**13.4**	**33.9**	**100.0**	**0.7**
Oak	17.4	3.9	17.4	63.8	102.5	2.0	2.0
Beech	2.4	0.0	9.5	157.1	169.0	3.4	3.3
Sycamore	2.4	0.0	18.2	23.7	44.3	0.9	0.9
Ash	20.5	4.7	99.5	222.3	347.0	6.9	6.9
Birch	0.8	1.6	19.7	213.0	235.1	4.7	4.7
Poplar	0.8	0.8	11.1	6.9	19.6	0.4	0.4
Sweet chestnut	0.8	0.8	0.0	0.0	1.6	0.0	0.0
Horse chestnut	1.6	0.0	0.0	1.0	2.6	0.1	0.1
Alder	0.8	0.0	16.6	297.7	315.1	6.3	6.2
Lime	2.4	0.0	0.8	0.3	3.5	0.1	0.1
Elm	9.5	0.0	180.0	629.4	818.9	16.3	16.2
Willow	5.5	7.1	265.3	325.8	603.7	12.0	12.0
Other broadleaves	14.2	8.7	500.6	1830.9	2354.4	46.9	46.6
Total broadleaves	**79.0**	**27.6**	**1138.6**	**3771.9**	**5017.3**	**100.0**	**99.3**
Total - all species	**80.6**	**30.0**	**1155.2**	**3785.3**	**5050.9**		**100.0**

1. Percentages

   Category : species percentage of conifer or broadleaved.
   Species : percentage of all species.

2. The standard errors of the total tree number estimates for these feature types are:

Individual Trees	15%
Groups	24%
Narrow Linear Features	25%

3. See Glossary for definitions of feature types.

Table 16 Numbers of dead trees outside woodland by species and feature type (000's trees)

Species	Feature type				Total dead trees	Percent of total trees	
	Boundary Trees	Middle Trees	Groups	Narrow Linear Features		Category	Species
Pine	0.0	0.0	0.0	0.7	0.7	100.0	0.4
Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Larch	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cypress	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other conifers	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total conifers	**0.0**	**0.0**	**0.0**	**0.7**	**0.7**	**100.0**	**0.4**
Oak	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Beech	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sycamore	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ash	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Birch	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poplar	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweet chestnut	0.8	0.0	0.0	0.0	0.8	0.5	0.5
Horse chestnut	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alder	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lime	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Elm	3.9	0.0	69.5	85.4	158.8	99.0	98.6
Willow	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other broadleaves	0.0	0.8	0.0	0.0	0.8	0.5	0.5
Total broadleaves	**4.7**	**0.8**	**69.5**	**85.4**	**160.4**	**100.0**	**99.6**
Total - all species	**4.7**	**0.8**	**69.5**	**86.1**	**161.1**		**100.0**

1. See Glossary for definitions of feature types.

Table 17 Numbers of live trees outside woodland by species and height band (000's trees)

Species	Height band (m)				Total live trees
	2-5	5-15	15-20	>20	
Pine	0.0	3.8	0.7	0.0	4.5
Spruce	0.0	0.0	0.0	0.0	0.0
Larch	0.8	0.0	0.3	0.0	1.1
Cypress	0.0	7.4	2.4	0.0	9.8
Other conifers	0.0	10.6	4.7	3.2	18.5
Total conifers	**0.8**	**21.8**	**8.1**	**3.2**	**33.9**
Oak	11.3	57.1	29.3	4.7	102.4
Beech	6.0	117.0	37.7	8.1	168.8
Sycamore	3.9	37.9	2.4	0.0	44.2
Ash	57.3	222.9	64.1	2.7	347.0
Birch	3.2	231.9	0.0	0.0	235.1
Poplar	11.1	7.6	0.0	0.8	19.5
Sweet chestnut	0.8	0.0	0.8	0.0	1.6
Horse chestnut	1.6	0.3	0.7	0.0	2.6
Alder	3.2	298.6	13.4	0.0	315.2
Lime	1.6	0.8	0.8	0.3	3.5
Elm	104.6	713.5	0.8	0.0	818.9
Willow	107.4	469.4	27.0	0.0	603.8
Other broadleaves	1,687.8	665.7	0.8	0.0	2,354.3
Total broadleaves	**1,999.8**	**2,822.7**	**177.8**	**16.6**	**5,016.9**
Total - all species	**2,000.5**	**2,844.6**	**186.0**	**19.9**	**5,050.9**

Table 18 Number of Groups by group size

Number of trees per Group*	Number of Groups (000's)
2	4
3-5	20
6-10	16
11-20	26
21-50	15
51-100	8
>100	1
Total	**89**

*The size of the group is determined by the total number of trees, live plus dead.

COMPARISON OF RESULTS WITH THE 1980 CENSUS AND PREVIOUS SURVEYS

Survey Method

The 1980 Census and 1997 Inventory were undertaken using very different sampling methods.

Inventory practice and technology have moved on since the 1980 Census; this has led to changes in sampling methodology, scope and woodland definitions. For example, the Main Woodland Survey used the digital woodland map, created from aerial photos as a basis for sampling whereas the 1980 Census relied only on the woodland shown on the 1:50,000 Ordnance Survey map. Also in contrast to the 1980 Census, the Survey of Small Woodland and Trees did not record information within developed land e.g. residential or industrial areas of 2 or more hectares.

Where possible adjustments have been made to both the 1980 Census and the Inventory to achieve the nearest available comparison. The apparent changes indicated in the following tables and charts should therefore be treated with caution, particularly where areas are small.

Table 19:	Comparison of woodland area between 1980 Census and 1997 Inventory
Table 20:	Comparison of High Forest area by species between 1980 Census and 1997 Inventory
Chart:	Comparison of High Forest area by species between 1980 Census and 1997 Inventory
Table 21:	Comparison of High Forest Category 1 area by planting year class between 1980 Census and 1997 Inventory
Chart:	Comparison of High Forest Category 1 area by planting year class between 1980 Census and 1997 Inventory
Table 22:	Comparison of numbers of live trees outside woodland between 1980 Census and 1997 Inventory
Table 23:	Comparison of density of non-woodland features between 1980 Census and 1997 Inventory

Woodland cover

Chart	Change in woodland cover through time (1890 – 2000)
Maps:	Woodland by county through time (1895 – 1998)

Note: The figures in many of the tables may not add due to rounding

Table 19 Comparison of woodland area between 1980 Census and 1997 Inventory

Woodland size (ha)	1980 Census woodland area		1997 Inventory woodland area		Change (%)
	(ha)	(%)	(ha)	(%)	(%)
2.0 or more	17,846	92.5	23,273	95.9	30
0.25 - <2.0	1,454	7.5	995	4.1	-32
Total	**19,300**		**24,268**		**26**
% Woodland land cover	**5.6**		**7.0**		

1. Differences in sampling methodology may account for some of the apparent differences.

2. The above figures from the 1997 Inventory exclude woodland between 0.1 and <0.25 ha, thereby matching the scope of the 1980 Census. The 1997 figures above will therefore not match those in the previous sections of the report.

3. Land area used to calculate woodland cover percent (1997), 345,207 ha, was based on the 1991 Census of Population digital boundaries.

4. Land area used to calculate woodland cover percent (1980), 345,043 ha, (Ordnance Survey data)

Table 20 Comparison of High Forest area by species between 1980 Census and 1997 Inventory

Species	1980 Census woodland area (ha)	1997 Inventory woodland area (ha)	Change (%)
Scots pine	627	672	7
Corsican pine	335	150	-55
Lodgepole pine	165	0	-100
Sitka spruce	1,816	1,186	-35
Norway spuce	1,321	1,653	25
European larch	328	430	31
Jap/Hybrid larch	1,044	915	-12
Douglas fir	1,426	2,129	49
Other conifers	625	343	-45
Mixed conifers	277	208	-25
Total conifers	**7,963**	**7,686**	**-3**
Oak	3,317	3,942	19
Beech	972	1,462	50
Sycamore	457	459	0
Ash	2,124	3,452	62
Birch	1,214	870	-28
Poplar	134	191	43
Sweet chestnut	60	173	186
Elm	16	178	1042
Other broadleaves	1,114	1,543	39
Mixed broadleaves	831	3,425	312
Total broadleaves	**10,239**	**15,695**	**53**
Total all species	**18,202**	**23,381**	**28**
Felled	**564**	**242**	**-57**
Total High Forest	**18,766**	**23,623**	**26**

1. Differences in sampling methodology may account for some of the apparent differences.

2. In the 1980 Census the areas assigned to species included any associated open space such as roads and rides. In the Inventory open spaces are separately identified and the overall proportion is 2.5% (Table 2). To obtain meaningful comparisons between the two datasets the 1980 Census data have therefore been reduced by 2.5%.

3. The above figures from the 1997 Inventory exclude woodland between 0.1 and <0.25 ha, thereby matching the scope of the 1980 Census.
The 1997 figures above will therefore not match those in the previous sections of the report.

4. The 1980 figures include scrub to enable comparison

Comparison of High Forest area by species between 1980 Census and 1997 Inventory

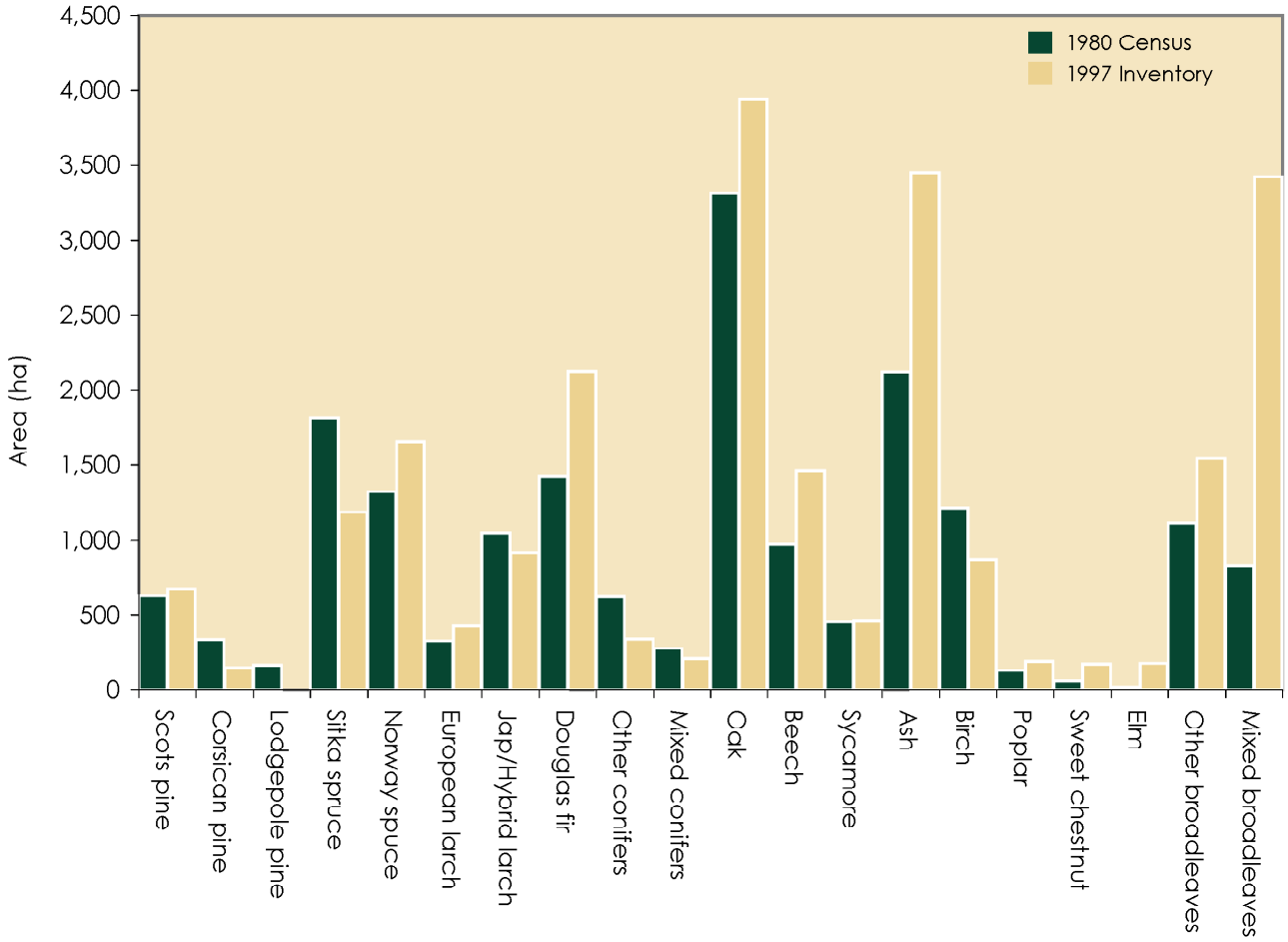


Table 21 Comparison of High Forest Category 1 area by planting year class between 1980 Census and 1997 Inventory

Planting year class	1980 Census woodland area (ha)	1997 Inventory woodland area (ha)	Change (%)
1991-1997	0	1,046	see note
1981-1990	0	988	see note
1971-1980	1,691	2,540	50
1961-1970	3,331	3,521	6
1951-1960	2,610	2,828	8
1941-1950	1,624	2,772	71
1931-1940	846	1,455	72
1921-1930	2,036	945	-54
1911-1920	216	1,266	485
1901-1910	294	177	-40
1861-1900	1,906	2,116	11
Pre 1861	432	462	7
Total all years	**14,985**	**20,116**	**34**

1. The first two classes, 1991-1997 and 1981-1990, cover the period since the 1980 Census and no comparison is therefore available.

2. The definition of High Forest Category 1 in the Inventory does not fully coincide with High Forest as defined in the 1980 Census.

Comparison of High Forest Category 1 area by planting year class between 1980 Census and 1997 Inventory

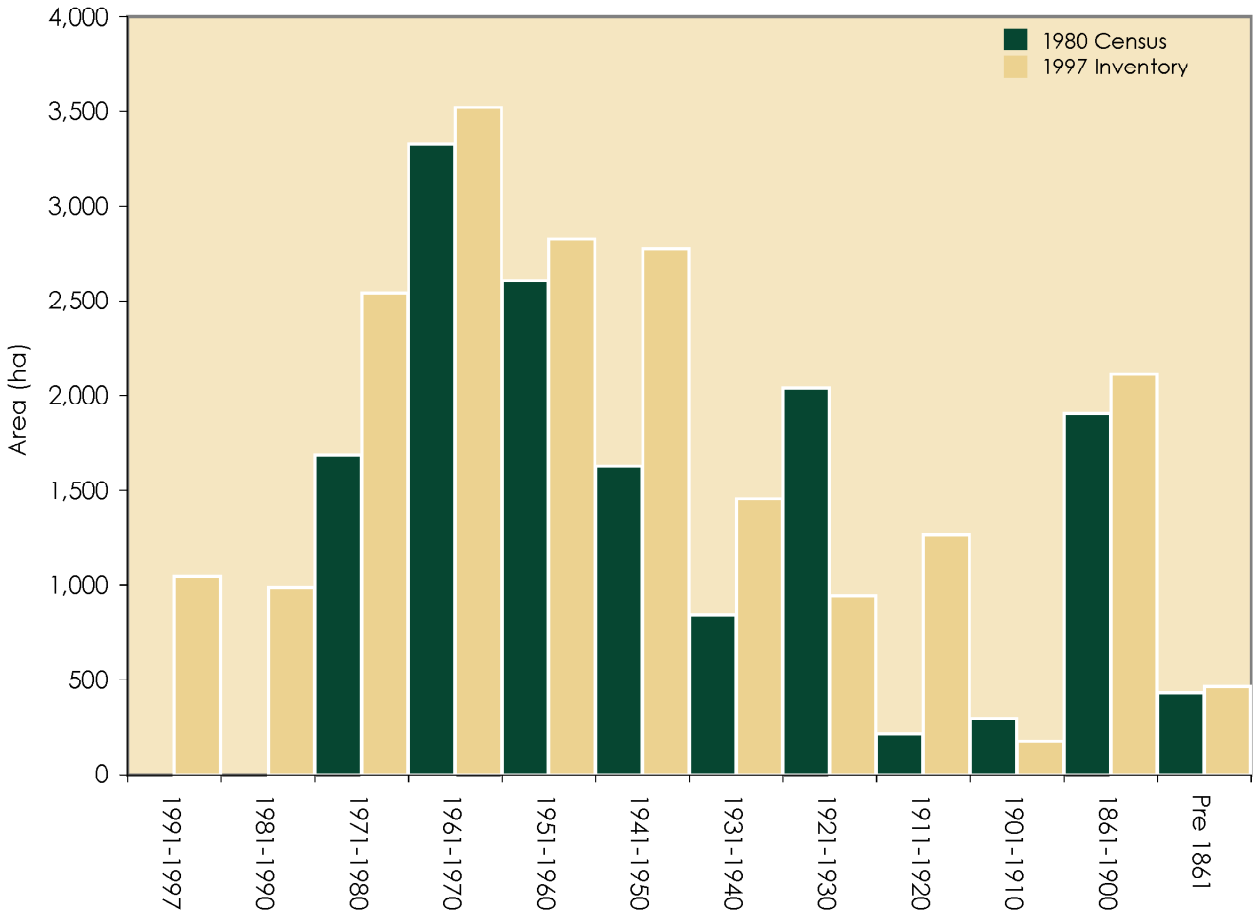


Table 22 Comparison of numbers of live trees outside woodland between 1980 Census and 1997 Inventory (000's)

Feature type	1980 Census	1997 Inventory	Change (%)
Boundary Tree	227	79	-65
Middle Tree	69	28	-59
Total Individual Trees	296	107	-64
Groups	1,183	828	-30
Linear Features	1,009	2,290	127
Total	**2,488**	**3,226**	**30**

1. The Survey of Small Woodland and Trees did not record information referring to tree features (I.e. Individual trees, Groups and Narrow Linear Features) within developed land.
2. In the 1980 Census hazel, hawthorn, blackthorn and goat willow were excluded, the 1997 Inventory figures have been adjusted accordingly. The 1997 figures above will therefore not match those in the previous sections of the report.
3. Changes stated in this table are indicative only. Even with adjustments to the 1997 Inventory, the two surveys are not directly comparable - 1980 used 7cm diameter at breast height, and 1997 used 2m height, as minimum criteria for inclusion.
4. See Glossary for definitions of feature type.

Table 23 Comparison of density of non-woodland features between 1980 Census and 1997 Inventory

Feature type	1980 Census	1997 Inventory	Change (%)
Individual Trees (per sq km)	85.7	31.1	-64
Groups (per sq km)	54.6	21.7	-60
Linear Features (m per sq km)	449.2	834.1	86

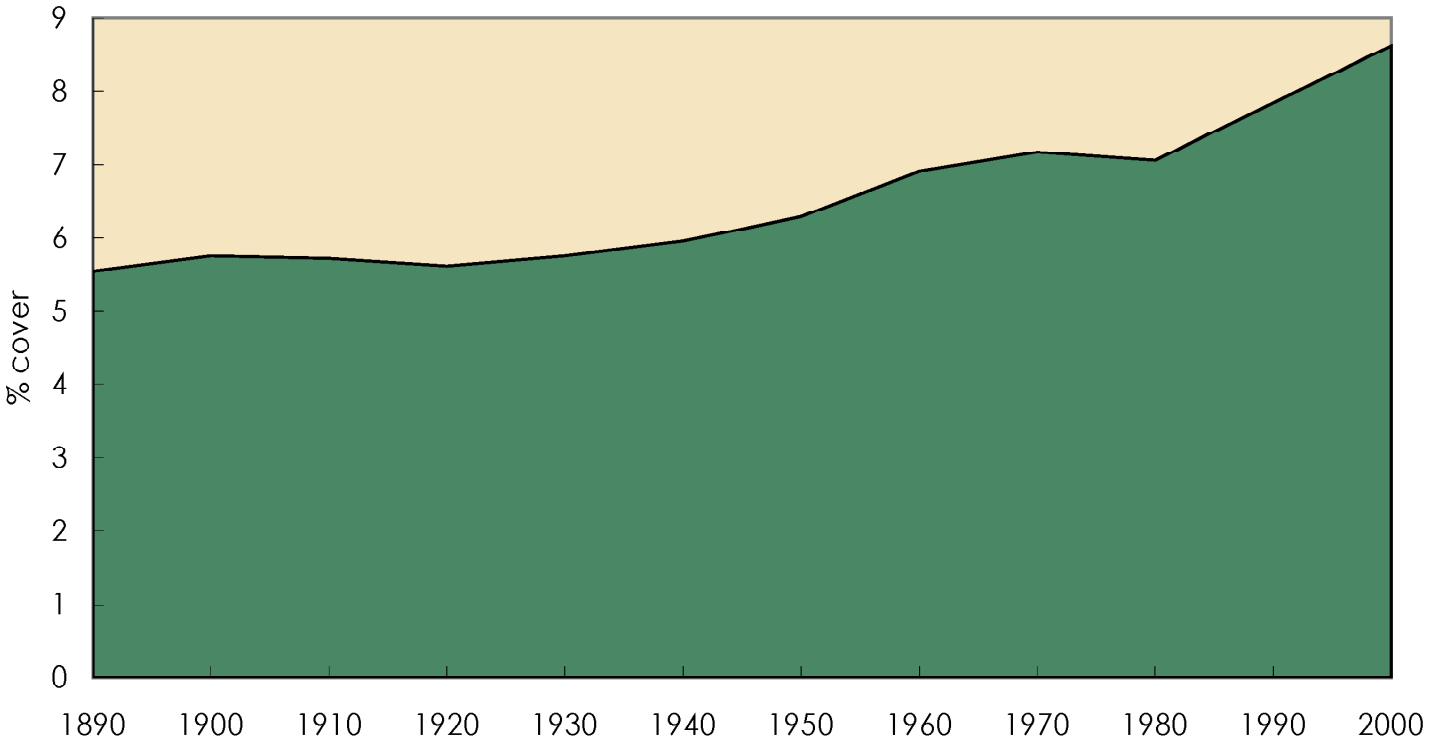
1. The Survey of Small Woodland and Trees did not record information referring to tree features (I.e. Individual trees, Groups and Narrow Linear Features) within developed land.
2. In the 1980 Census hazel, hawthorn, blackthorn and goat willow were excluded, the 1997 Inventory figures have been adjusted accordingly. The 1997 figures above will therefore not match those in the previous sections of the report.
3. Changes stated in this table are indicative only. Even with adjustments to the 1997 Inventory, the two surveys are not directly comparable - 1980 used 7cm diameter at breast height, and 1997 used 2m height, as minimum criteria for inclusion.
4. See Glossary for definitions of feature type.

WOODLAND COVER

Woodland area data is available from Ministry of Agriculture surveys since 1871, and from Forestry Commission national woodland inventories since 1924. The following chart and maps show the changes in woodland area through time.

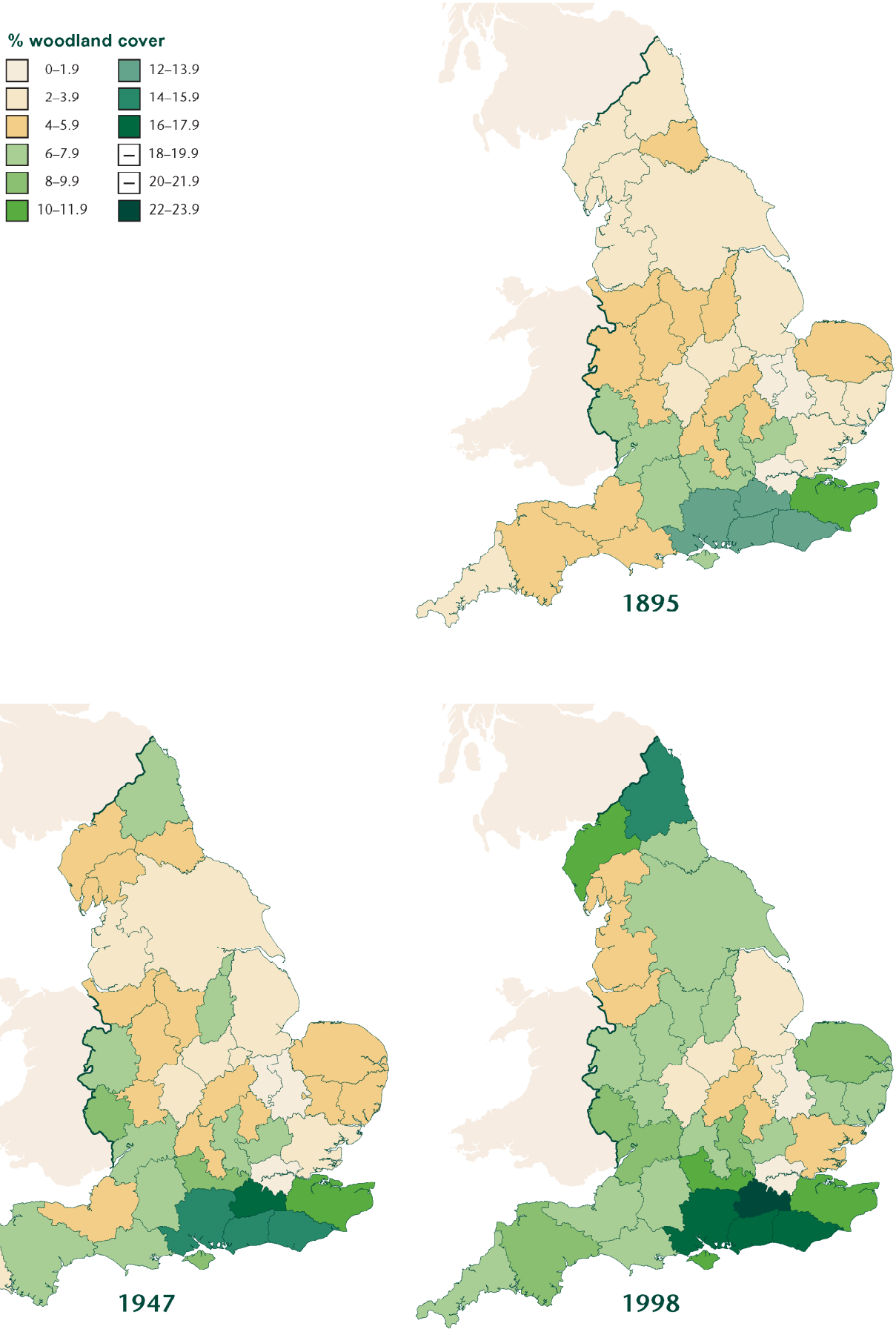
The maps use the old County structure data of England, as reported on in 1895 and 1947. The data from these counties could not be re-worked for different geographic areas. In contrast, the digital woodland map, which forms the basis of the current inventory, can be analysed for any geographic area.

Change in county woodland cover through time (1890 – 2000)



1. Following local government reorganisation the boundaries of the county of the report have changed significantly since 1890 and therefore data from a wider geographic area have been used.

Map 5 Woodland Cover in England by County through time (1895–1998)



GLOSSARY

Woodland

In the United Kingdom 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. There is additional information on the quality of woodland within the inventory database.

Woodland of 2 ha 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.

Interpreted Forest Types

The woodland map derived from aerial photographs is differentiated into Interpreted Forest Types (IFTs) 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.

High Forest

All woodland except stands managed as Coppice or Coppice-with-Standards with, or with the potential to achieve a tree cover of more than 20%. Two categories of High Forest are recognised:

- **High Forest Category 1**
  Stands which 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.

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'.

Forest Types

- **Conifer**

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

- **Broadleaved**

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

- **Mixed**

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

- **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.

- **Windblow**

  Areas of blown woodland which remain uncleared and not regenerated.

- **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.

Ownership types

- **Other Ownership**

  Woodland other than that owned by, or leased to, the Forestry Commission

  - Personal

  types of private occupation, e.g. individuals, private family trusts and family partnerships.

  - Private forestry or timber business

  owned by wood processing industry. This category does not include forest management companies.

  - Other private business

  occupiers, e.g. companies, partnerships, syndicates and pension funds.

  - Local Authority

  Region, County, District or other Council

  - **Other public bodies (not FC)**

  Government department/agency, nationalised industry, etc.

  - Charitable organisations

  organisations funded by voluntary public subscription, e.g. National Trust, churches and colleges.

- Community ownership or common land

the common property of all members of the community.

- **Forestry Commission**

Land owned by or land leased to the Forestry Commission

Feature types

- **Small Wood**

A woodland with an area of 0.1 ha or over but less than 2 ha.

- **Group**

A group containing two or more trees with an area less than 0.1ha.

- **Individual Tree**

A tree the crown of which has no contact with any other tree crown and which is at least 2m tall. Two types of individual tree are recognised:

- Boundary Tree (an Individual Tree on any boundary)

- Middle Tree (an Individual Tree not on a boundary)

- **Linear Feature**

A feature with a length of 25 m or more, and one which is at least four times as long as it is broad. It can be up to 50m wide or as narrow as a single line of trees. Two types of Linear Features are recognised:

- Narrow Linear Features (with a width of 16 m or less)
- Wide Linear Features (with a width greater than 16 m)

NOTES

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