National Inventory of Woodland and Trees

Wales

County Report for

Clwyd

Forestry Commission

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CONTENTS

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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 Clwyd 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 Clwyd 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 With the statistics becoming increasingly out of date the Forestry Commission decided to undertake a new survey: the *National Inventory of Woodland and Trees.*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 Wales, 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 Wales 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.

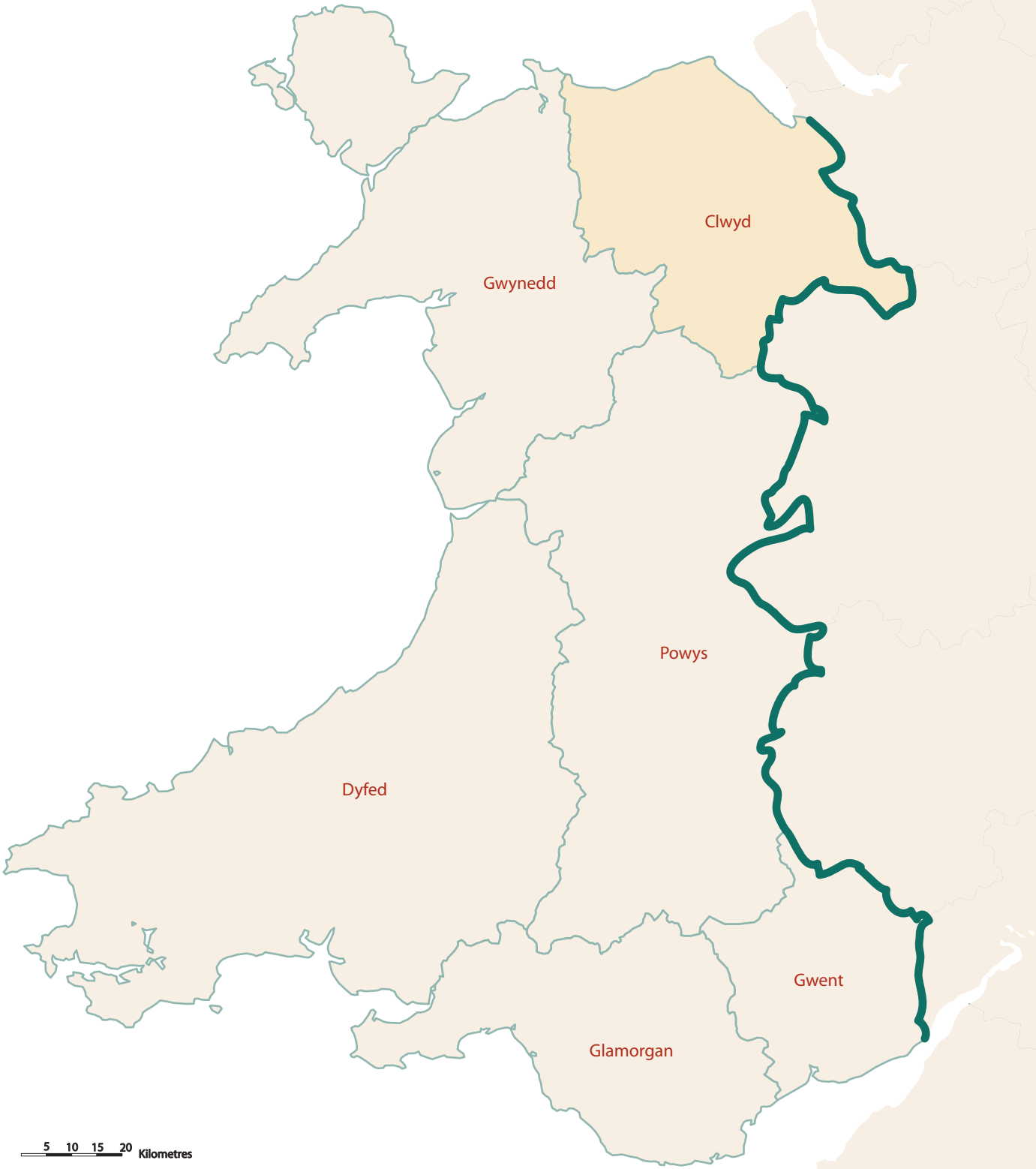
MAIN POINTS FROM THE SURVEY RESULTS

- The total area of woodland of 0.1 hectares and over in Clwyd is 24,271 hectares. This represents 10.0% of the land area. (Table 1)
- Conifer woodland is the dominant forest type representing 51.7 % of all woodland. Broadleaved woodland represents 35.2 %, Mixed woodland 8.7 % and Open Space within woodlands 2.8 %. (Table 2)
- The main conifer species is Sitka spruce covering 6,889 hectares or 51.9 % of all conifer species. The main broadleaved species is oak covering 3,292 hectares or 33.2 % of all broadleaved species. (Table 3)
- 8,404 hectares or 35 % of woodland over 2 hectares is owned by or leased to the Forestry Commission, and 15,442 hectares or 65 % of woodland is in Other ownership. (Table 6)
- There are a total of 1,202 woods over 2 ha within Clwyd with a mean wood area of 19.8 hectares. (Table 7a) There are a total of 1,215 woods from 0.1 - <2.0 hectares with a mean wood area of 0.35 hectares. (Table 14)
- There are 1.8 million live trees outside woodland in Clwyd. (Table 15)
- Woodland land cover increased by over 2,200 hectares from 9.1 % to 10.0 % of the land area between 1980 and 1998. (Table 19)
- The area of broadleaves increased by 45% between 1980 and 1998, with the relative proportion of broadleaves to conifers increasing from 32 % to 43 %. (Table 20)

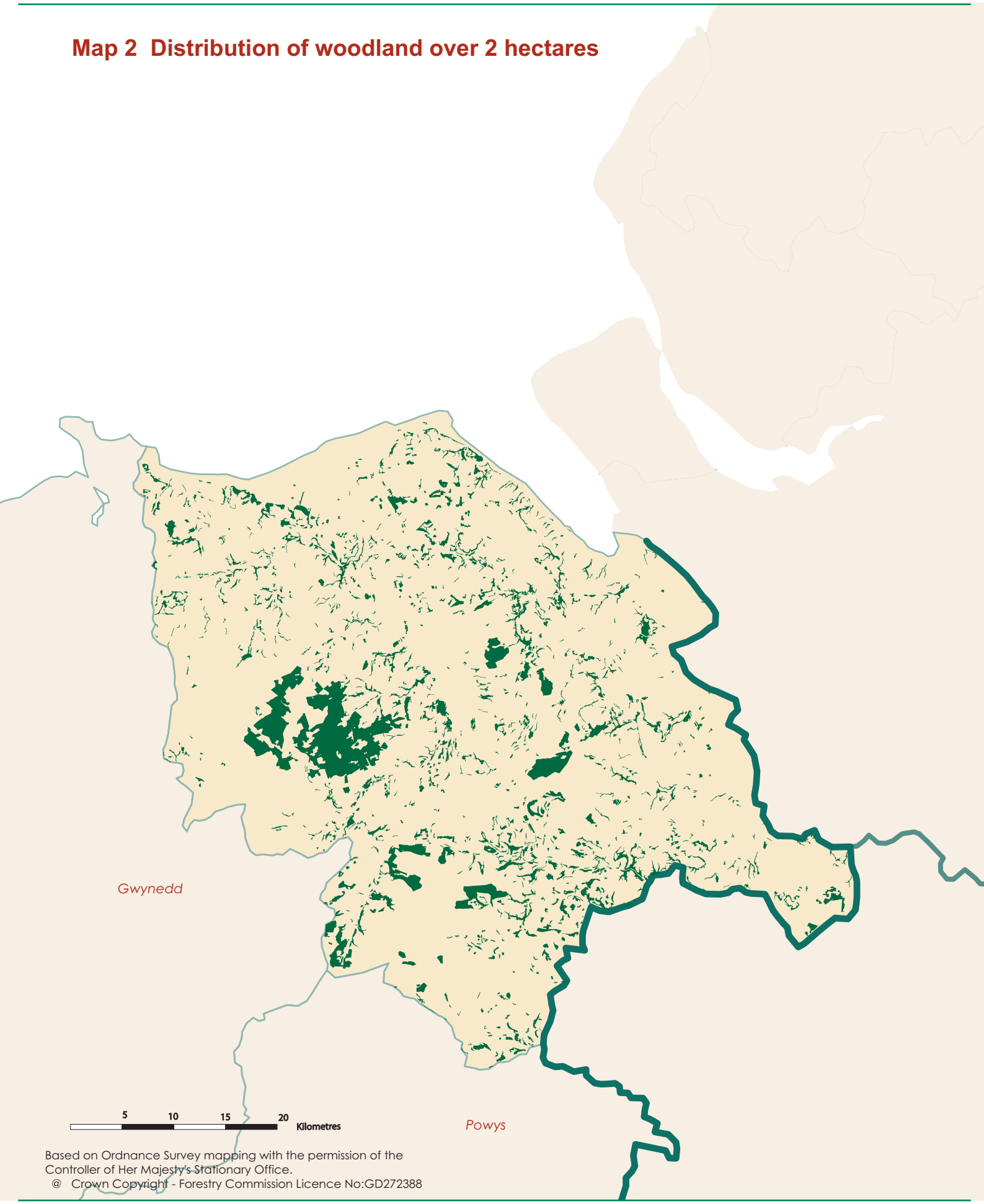
INVENTORY REPORTS

As well as this report for Clwyd, reports are available for the other counties in Wales as shown on the map opposite as well as a report for the country as a whole. England and Scotland are also covered by reports. Inventory reports can also be viewed or downloaded from the website at www.forestry.gov.uk/inventory.

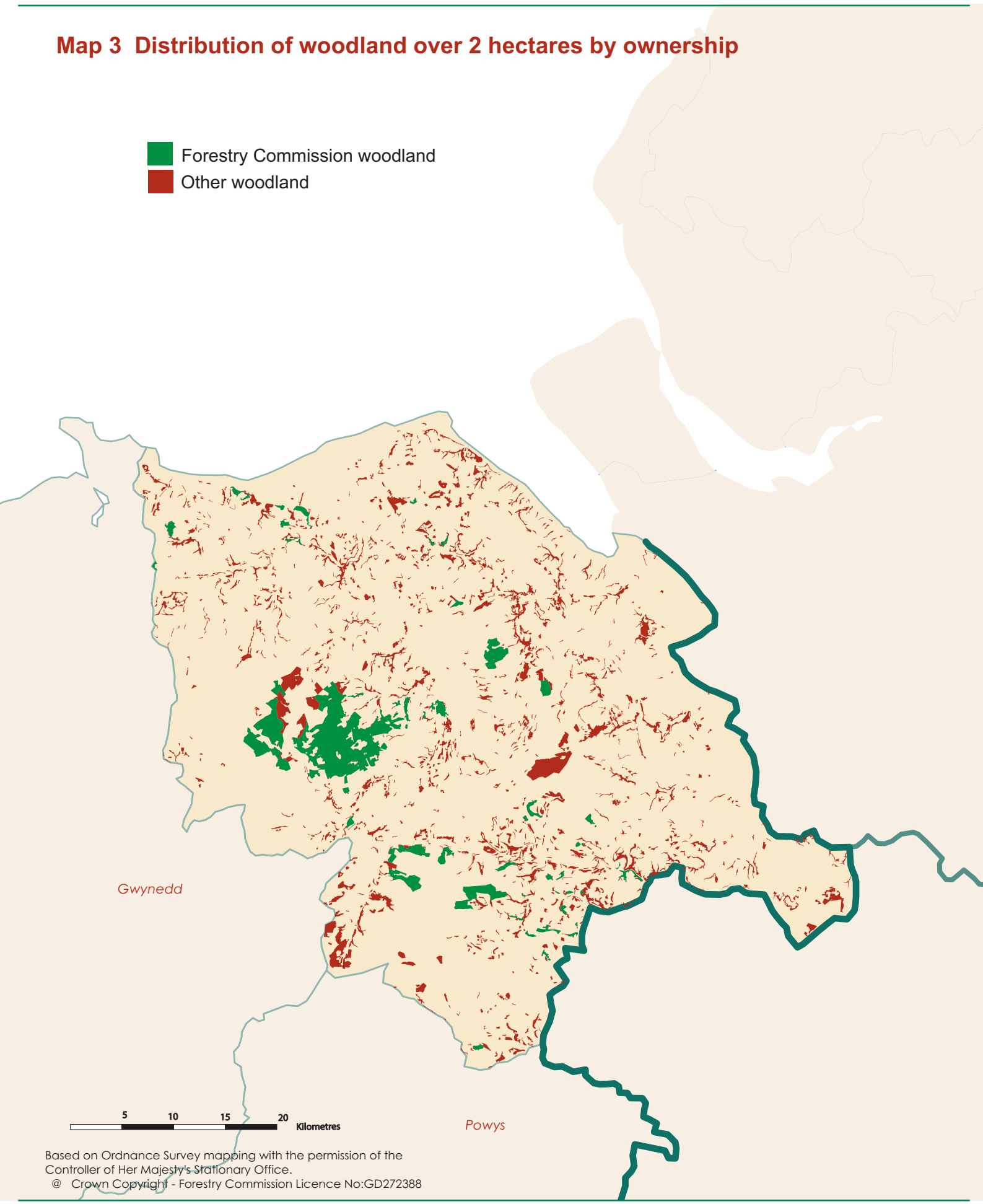
Map 1 County boundaries



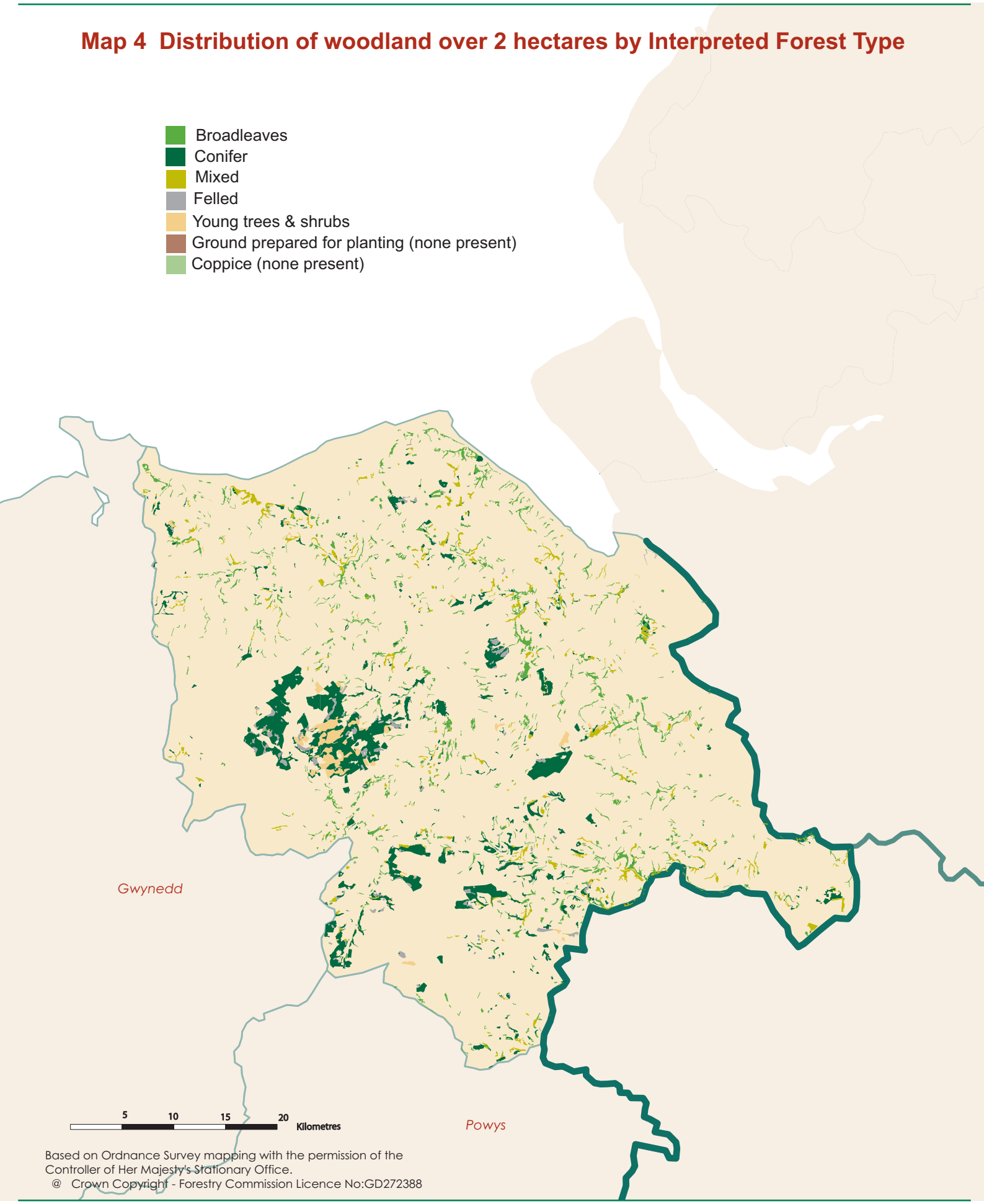
Map 2 Distribution of woodland over 2 hectares



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 Clwyd.

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	23,846	98.2
0.25 - < 2.00	425	1.8
0.10 - < 0.25	0	0.0
Total area of woodland	**24,271**	**100.0**
% Woodland land cover	**10.0**	

1. Area of Clwyd, including inland water, 243,015 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	12,551	0	12,551	51.7
Broadleaved	8,330	213	8,543	35.2
Mixed	1,920	182	2,102	8.7
Coppiced	0	0	0	0.0
Copp-w-standards	0	0	0	0.0
Windblow	0	0	0	0.0
Felled	401	0	401	1.7
Open Space	643	30	673	2.8
Total	**23,846**	**425**	**24,271**	**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	1,711	0	1,711	12.9	7.4
Sitka spruce	6,859	30	6,889	51.9	29.7
Larch	1,537	0	1,537	11.6	6.6
Other conifers	3,105	30	3,135	23.6	13.5
Mixed conifers	0	0	0	0.0	0.0
Total conifers	**13,212**	**60**	**13,272**	**100.0**	**57.2**
Oak	3,201	91	3,292	33.2	14.2
Beech	1,753	0	1,753	17.7	7.6
Sycamore	1,227	0	1,227	12.4	5.3
Ash	1,927	30	1,957	19.7	8.4
Birch	608	0	608	6.1	2.6
Elm	0	0	0	0.0	0.0
Other broadleaves	867	213	1,080	10.9	4.7
Mixed broadleaves	7	0	7	0.1	0.0
Total broadleaves	**9,590**	**334**	**9,924**	**100.0**	**42.8**
Total all species* **	**22,802**	**395**	**23,197**		**100.0**

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

***Excludes the 1074 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	4%
Broadleaves	4%
Sitka spruce	7%
Oak	9%
Ash	9%

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	33,200	193,600	6	80
Narrow Linear Features	13,100	1,523,300	116	627
Individual Trees	139,300	139,300	1	57
Total		**1,856,200**		**764**

1. Land area used to calculate tree density 243,015 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	48%
Narrow Linear Features	37%
Individual Trees	17%

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	0	0	0
Narrow Linear Features	13,100	2,319	954
Total		**2,319**	**954**

1. Land area used to calculate tree density 243,015 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	-
Narrow Linear Features	34%

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	8,404	35
Other	15,442	65
Total area of woodland	**23,846**	**100**

1. Woodland area from aerial photographic interpretation map updated to 31 March 1998

2. See Glossary for definitions of ownership types

Woodland area by ownership

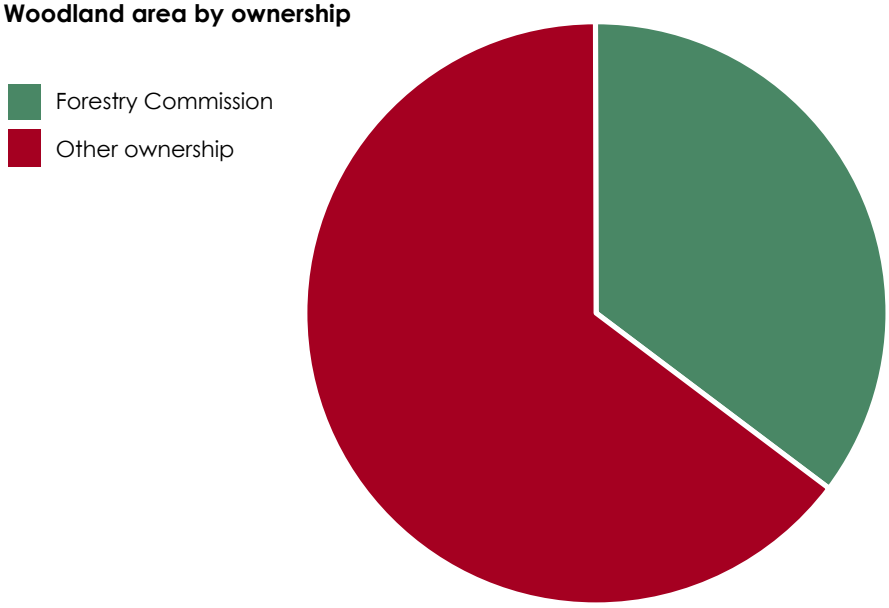


Table 7a Size class distribution of woodland

Size class (ha)	Number of woods	Total area (ha)	Percent of total area	Mean wood area (ha)
<10	852	3,749	16	4.4
10 - <20	163	2,276	10	14.0
20 - <50	118	3,502	15	29.7
50 - <100	44	2,967	12	67.4
<100	**1,177**	**12,494**	**52**	**10.6**
100 - <500	**19**	**3,324**	**14**	**174.9**
500 and >	**6**	**8,028**	**34**	**1,338.0**
All woods	**1,202**	**23,846**	**100**	**19.8**

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	14	62	0	4.4
	O	956	4,009	17	4.2
10 - <20	FC	14	217	1	15.5
	O	164	2,277	10	13.9
20 - <50	FC	17	532	2	31.3
	O	110	3,273	14	29.8
50 - <100	FC	8	627	3	78.4
	O	39	2,548	11	65.3
<100	FC	53	1,437	6	27.1
	O	1,269	12,107	51	9.5
100 - <500	FC	7	1,807	8	258.1
	O	15	2,728	11	181.9
500 and >	FC	3	5,160	22	1,719.9
	O	1	607	3	607.2
Total	**FC**	**63**	**8,404**	**35**	**133.4**
	O	**1,285**	**15,442**	**65**	**12.0**

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 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	6,790	80.8	5,762	37.3	12,551	52.6
Broadleaved	772	9.2	7,559	49.0	8,330	34.9
Mixed	176	2.1	1,745	11.3	1,920	8.1
Coppice	0	0.0	0	0.0	0	0.0
Copp-w-Stds	0	0.0	0	0.0	0	0.0
Windblow	0	0.0	0	0.0	0	0.0
Felled	213	2.5	188	1.2	401	1.7
Open Space	454	5.4	189	1.2	643	2.7
Total	**8,404**	**100.0**	**15,442**	**100.0**	**23,846**	**100.0**

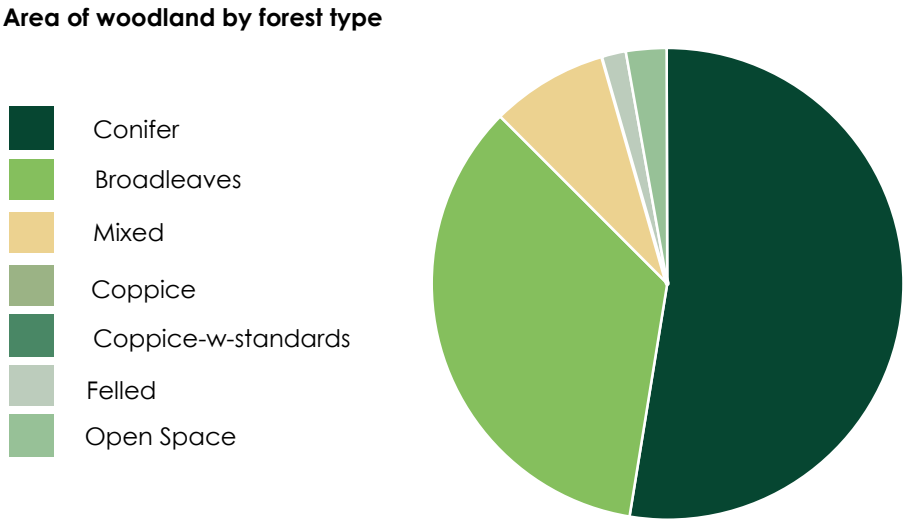


Table 9a Area of High Forest by principal species and ownership

Species	Forestry Commission			Other			All ownerships		
	area (ha)	cat* %	spp** %	area (ha)	cat* %	spp** %	area (ha)	cat* %	spp** %
Scots pine	126	2	2	467	7	3	593	4	3
Corsican pine	38	1	0	331	5	2	369	3	2
Lodgepole pine	413	6	5	336	5	2	749	6	3
Sitka spruce	4,468	67	58	2,391	37	16	6,859	52	30
Norway spruce	806	12	10	557	9	4	1,363	10	6
European larch	43	1	1	53	1	0	96	1	0
Jap/Hybrid larch	254	4	3	1,187	18	8	1,441	11	6
Douglas fir	164	2	2	910	14	6	1,073	8	5
Other conifers	404	6	5	264	4	2	669	5	3
Mixed conifers	0	0	0	0	0	0	0	0	0
Total conifers	**6,716**	**100**	**87**	**6,496**	**100**	**43**	**13,212**	**100**	**58**
Oak	166	16	2	3,035	35	20	3,201	33	14
Beech	454	44	6	1,299	15	9	1,753	18	8
Sycamore	0	0	0	1,227	14	8	1,227	13	5
Ash	58	6	1	1,869	22	12	1,927	20	8
Birch	224	22	3	384	4	3	608	6	3
Poplar	0	0	0	145	2	1	145	2	1
Sweet chestnut	0	0	0	45	1	0	45	0	0
Elm	0	0	0	0	0	0	0	0	0
Other broadleaves	116	11	1	562	7	4	677	7	3
Mixed broadleaves	4	0	0	4	0	0	7	0	0
Total broadleaves	**1,021**	**100**	**13**	**8,569**	**100**	**57**	**9,590**	**100**	**42**
Total - all species	**7,737**		**100**	**15,065**		**100**	**22,802**		**100**
Felled	**213**			**188**			**401**		
Total High Forest	**7,950**			**15,253**			**23,203**		

*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 643 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	4%
Broadleaves	4%
Sitka spruce	7%
Oak	9%
Ash	9%

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

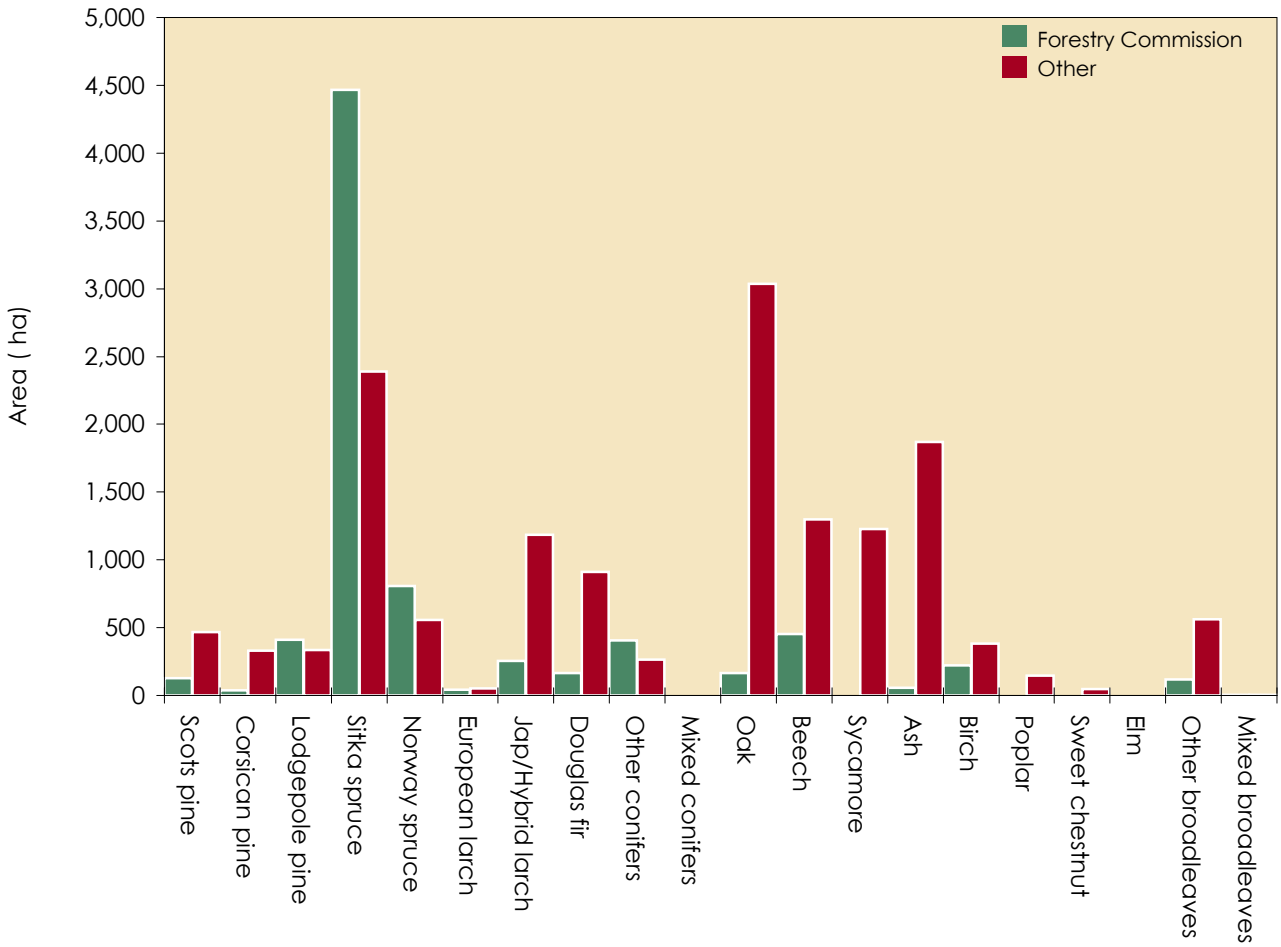


Table 9b Area of High Forest by principal species,ownership and category

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	126	0	126	467	0	467	593	0	593
Corsican pine	38	0	38	331	0	331	369	0	369
Lodgepole pine	372	41	413	336	0	336	708	41	749
Sitka spruce	4,149	319	4,468	2,385	6	2,391	6,534	325	6,859
Norway spruce	806	0	806	553	4	557	1,359	4	1,363
European larch	43	0	43	53	0	53	96	0	96
Jap/Hybrid larch	254	0	254	1,165	22	1,187	1,419	22	1,441
Douglas fir	164	0	164	910	0	910	1,073	0	1,073
Other conifers	404	0	404	252	13	264	656	13	669
Mixed conifers	0	0	0	0	0	0	0	0	0
Total conifers	**6,356**	**360**	**6,716**	**6,451**	**45**	**6,496**	**12,807**	**404**	**13,212**
Oak	0	166	166	503	2,531	3,035	503	2,697	3,201
Beech	408	46	454	419	880	1,299	827	926	1,753
Sycamore	0	0	0	70	1,157	1,227	70	1,157	1,227
Ash	0	58	58	184	1,685	1,869	184	1,744	1,927
Birch	5	220	224	4	381	384	8	600	608
Poplar	0	0	0	145	0	145	145	0	145
Sweet chestnut	0	0	0	0	45	45	0	45	45
Elm	0	0	0	0	0	0	0	0	0
Other broadleaves	0	116	116	135	426	562	135	542	677
Mixed broadleaves	0	4	4	0	4	4	0	7	7
Total broadleaves	**413**	**608**	**1,021**	**1,460**	**7,109**	**8,569**	**1,873**	**7,718**	**9,590**
Total - all species	**6,769**	**968**	**7,737**	**7,911**	**7,154**	**15,065**	**14,680**	**8,122**	**22,802**

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

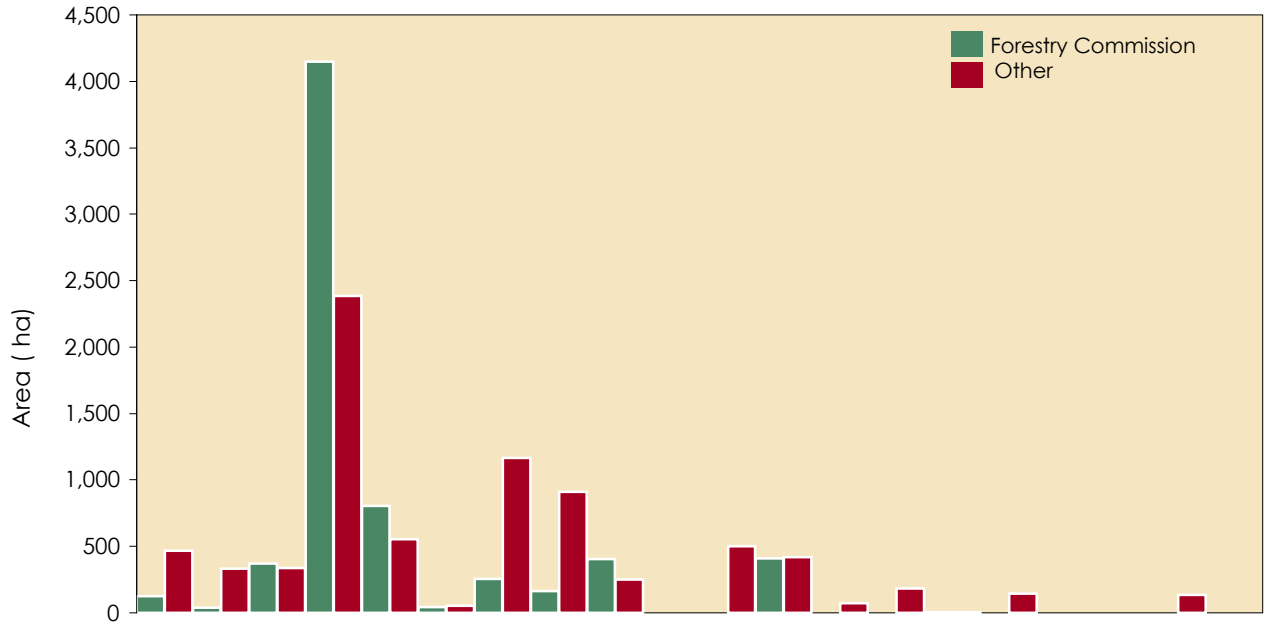
	Category 1*	Category 2*	Total High Forest
Conifers	3%	38%	4%
Broadleaves	15%	4%	4%
Sitka spruce	7%	47%	7%
Oak	22%	10%	9%
Ash	29%	10%	9%

*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

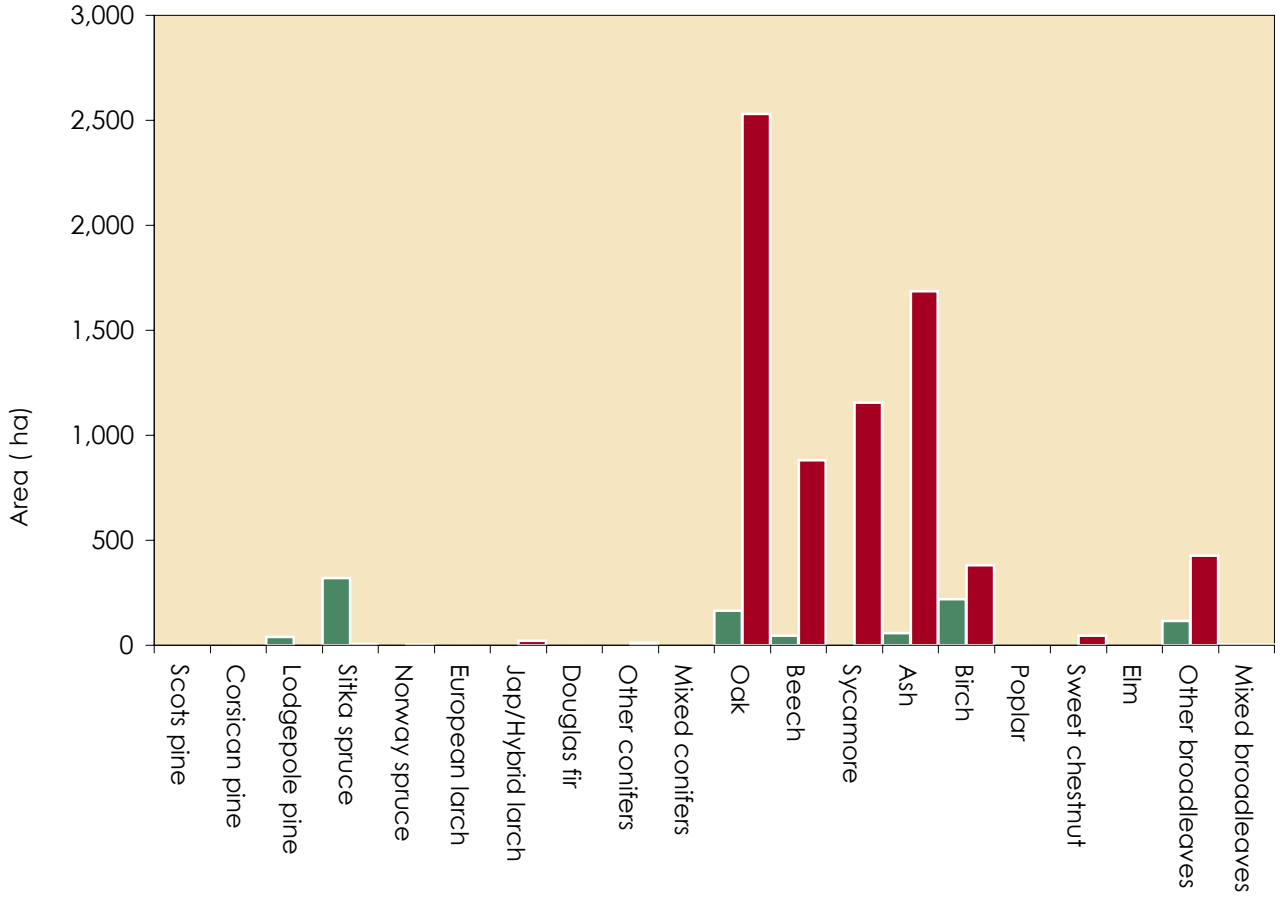
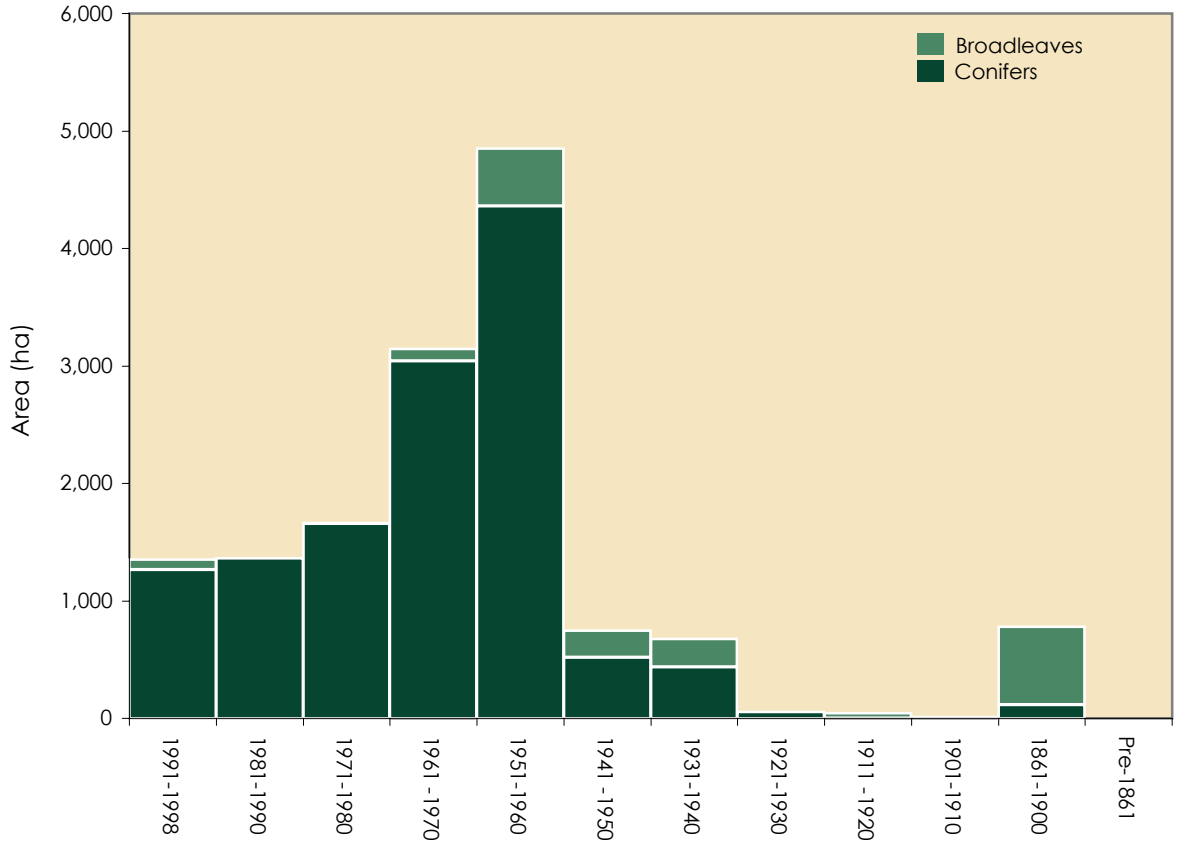


Table 10a High Forest Category 1 - Area by principal species and planting year class

Species	Planting year class*												Total (ha)
	1991-1998	1981-1990	1971-1980	1961 - 1970	1951-1960	1941 - 1950	1931-1940	1921-1930	1911 - 1920	1901-1910	1861-1900	Pre-1861	
Scots pine	9	0	0	19	431	0	39	0	0	0	94	0	593
Corsican pine	0	0	258	43	38	0	17	0	0	0	13	0	369
Lodgepole pine	18	21	159	204	289	15	0	0	0	0	0	0	708
Sitka spruce	828	996	1,053	1,389	1,862	362	45	0	0	0	0	0	6,534
Norway spruce	332	87	0	154	440	54	237	55	0	0	0	0	1,359
European larch	0	0	0	0	0	48	43	0	0	0	5	0	96
Jap/Hybrid larch	78	161	141	447	542	37	13	0	0	0	0	0	1,419
Douglas fir	0	100	22	477	465	0	10	0	0	0	0	0	1,073
Other conifers	0	0	22	306	293	4	32	0	0	0	0	0	656
Mixed conifers	0	0	0	0	0	0	0	0	0	0	0	0	0
Total conifers	**1,266**	**1,365**	**1,655**	**3,041**	**4,360**	**520**	**435**	**55**	**0**	**0**	**112**	**0**	**12,807**
Oak	17	0	0	8	9	36	32	0	0	0	401	0	503
Beech	35	0	0	56	323	97	92	0	44	13	166	0	827
Sycamore	0	0	0	0	17	25	24	0	0	0	4	0	70
Ash	5	0	0	19	0	13	85	0	0	0	62	0	184
Birch	0	0	5	0	0	0	4	0	0	0	0	0	8
Poplar	0	0	0	6	139	0	0	0	0	0	0	0	145
Sweet chestnut	0	0	0	0	0	0	0	0	0	0	0	0	0
Elm	0	0	0	0	0	0	0	0	0	0	0	0	0
Other broadleaves	26	0	0	14	0	55	5	0	0	0	35	0	135
Mixed broadleaves	0	0	0	0	0	0	0	0	0	0	0	0	0
Total broadleaves	**84**	**0**	**5**	**104**	**489**	**226**	**242**	**0**	**44**	**13**	**668**	**0**	**1,873**
Total - all species	**1,350**	**1,365**	**1,659**	**3,144**	**4,849**	**746**	**677**	**55**	**44**	**13**	**780**	**0**	**14,680**

*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



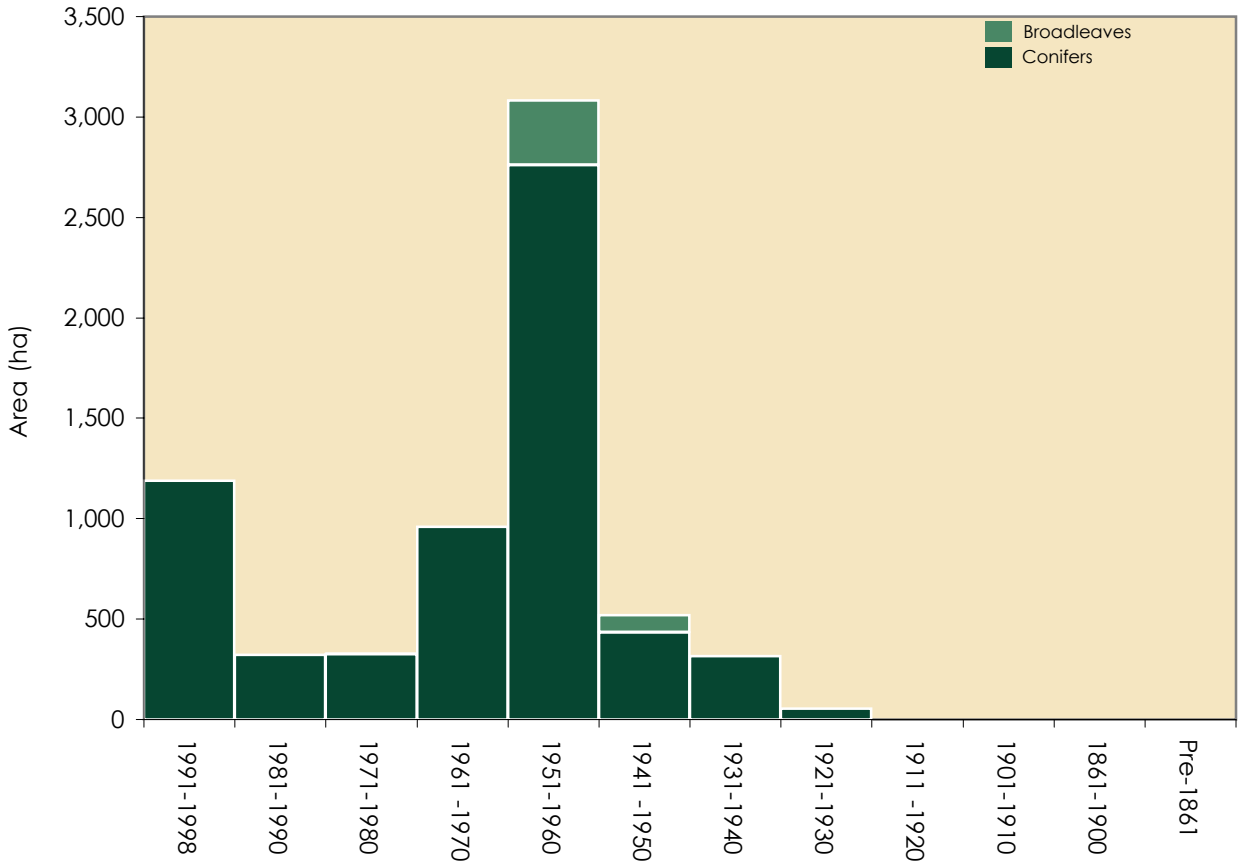
1. Most of the planting year classes cover 10 years, 1991-1998 is 8 years, and the classes prior to 1901 are 40 years or more.

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

Species	Planting year class*												Total (ha)
	1991-1998	1981-1990	1971-1980	1961 - 1970	1951-1960	1941 - 1950	1931-1940	1921-1930	1911 - 1920	1901-1910	1861-1900	Pre-1861	
Scots pine	9	0	0	0	81	0	36	0	0	0	0	0	126
Corsican pine	0	0	0	0	38	0	0	0	0	0	0	0	38
Lodgepole pine	18	9	133	0	202	9	0	0	0	0	0	0	372
Sitka spruce	828	313	169	761	1,723	355	0	0	0	0	0	0	4,149
Norway spruce	332	0	0	0	132	50	237	55	0	0	0	0	806
European larch	0	0	0	0	0	0	43	0	0	0	0	0	43
Jap/Hybrid larch	0	0	23	0	213	18	0	0	0	0	0	0	254
Douglas fir	0	0	0	23	141	0	0	0	0	0	0	0	164
Other conifers	0	0	0	176	229	0	0	0	0	0	0	0	404
Mixed conifers	0	0	0	0	0	0	0	0	0	0	0	0	0
Total conifers	**1,188**	**322**	**324**	**960**	**2,759**	**433**	**315**	**55**	**0**	**0**	**0**	**0**	**6,356**
Oak	0	0	0	0	0	0	0	0	0	0	0	0	0
Beech	0	0	0	0	323	85	0	0	0	0	0	0	408
Sycamore	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
Birch	0	0	5	0	0	0	0	0	0	0	0	0	5
Poplar	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweet chestnut	0	0	0	0	0	0	0	0	0	0	0	0	0
Elm	0	0	0	0	0	0	0	0	0	0	0	0	0
Other broadleaves	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed broadleaves	0	0	0	0	0	0	0	0	0	0	0	0	0
Total broadleaves	**0**	**0**	**5**	**0**	**323**	**85**	**0**	**0**	**0**	**0**	**0**	**0**	**413**
Total - all species	**1,188**	**322**	**329**	**960**	**3,082**	**517**	**315**	**55**	**0**	**0**	**0**	**0**	**6,769**

*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



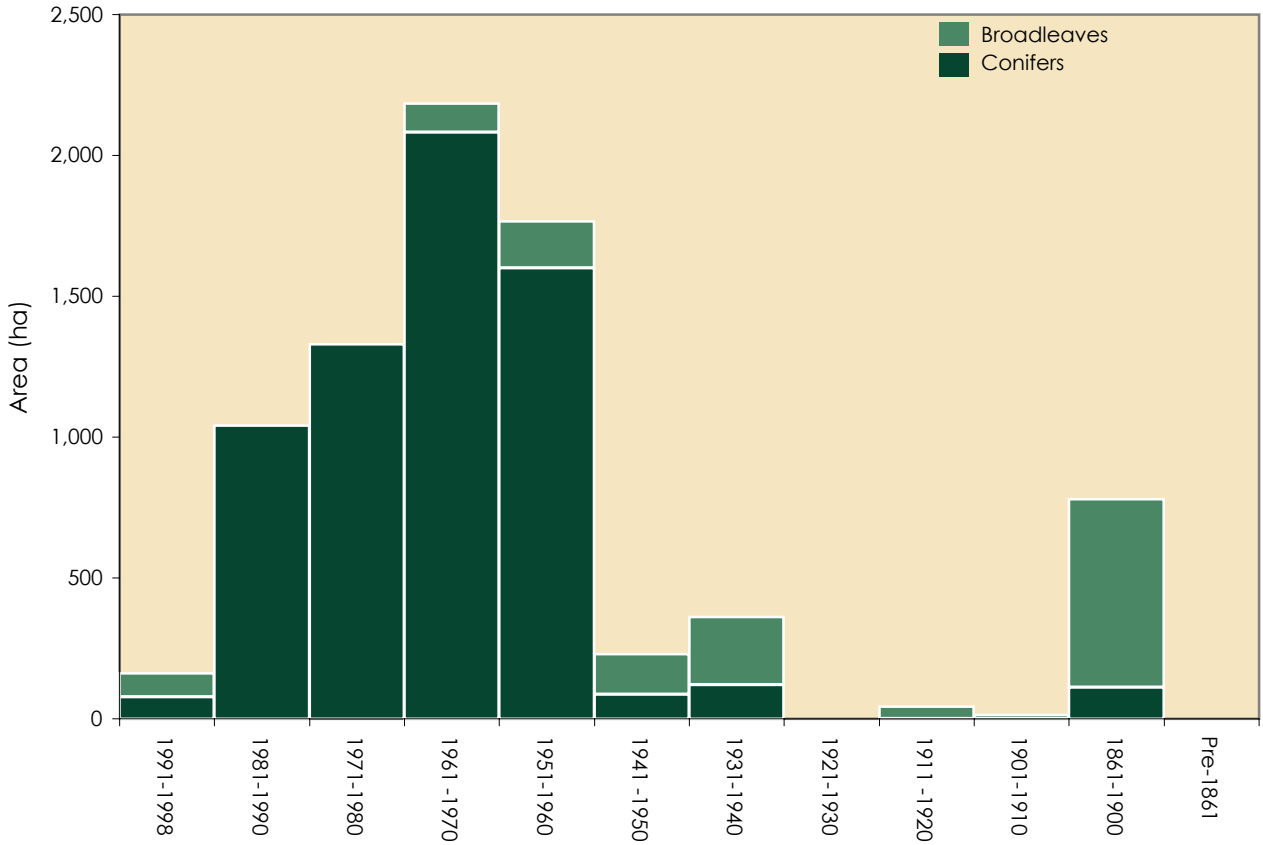
1. Most of the planting year classes cover 10 years, 1991-1998 is 8 years, and the classes prior to 1901 are 40 years or more.

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

Species	Planting year class*												Total (ha)
	1991-1998	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	0	0	19	350	0	4	0	0	0	94	0	467
Corsican pine	0	0	258	43	0	0	17	0	0	0	13	0	331
Lodgepole pine	0	12	26	204	87	6	0	0	0	0	0	0	336
Sitka spruce	0	682	884	629	139	6	45	0	0	0	0	0	2,385
Norway spruce	0	87	0	154	308	4	0	0	0	0	0	0	553
European larch	0	0	0	0	0	48	0	0	0	0	5	0	53
Jap/Hybrid larch	78	161	118	447	329	19	13	0	0	0	0	0	1,165
Douglas fir	0	100	22	454	323	0	10	0	0	0	0	0	910
Other conifers	0	0	22	130	65	4	32	0	0	0	0	0	252
Mixed conifers	0	0	0	0	0	0	0	0	0	0	0	0	0
Total conifers	**78**	**1,042**	**1,330**	**2,081**	**1,601**	**87**	**120**	**0**	**0**	**0**	**112**	**0**	**6,451**
Oak	17	0	0	8	9	36	32	0	0	0	401	0	503
Beech	35	0	0	56	0	13	92	0	44	13	166	0	419
Sycamore	0	0	0	0	17	25	24	0	0	0	4	0	70
Ash	5	0	0	19	0	13	85	0	0	0	62	0	184
Birch	0	0	0	0	0	0	4	0	0	0	0	0	4
Poplar	0	0	0	6	139	0	0	0	0	0	0	0	145
Sweet chestnut	0	0	0	0	0	0	0	0	0	0	0	0	0
Elm	0	0	0	0	0	0	0	0	0	0	0	0	0
Other broadleaves	26	0	0	14	0	55	5	0	0	0	35	0	135
Mixed broadleaves	0	0	0	0	0	0	0	0	0	0	0	0	0
Total broadleaves	**84**	**0**	**0**	**104**	**165**	**142**	**242**	**0**	**44**	**13**	**668**	**0**	**1,460**
Total - all species	**162**	**1,042**	**1,330**	**2,184**	**1,766**	**229**	**362**	**0**	**44**	**13**	**780**	**0**	**7,911**

*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, 1991-1998 is 8 years, and the classes prior to 1901 are 40 years or more.

Table 11 High Forest : principal species by planting year class

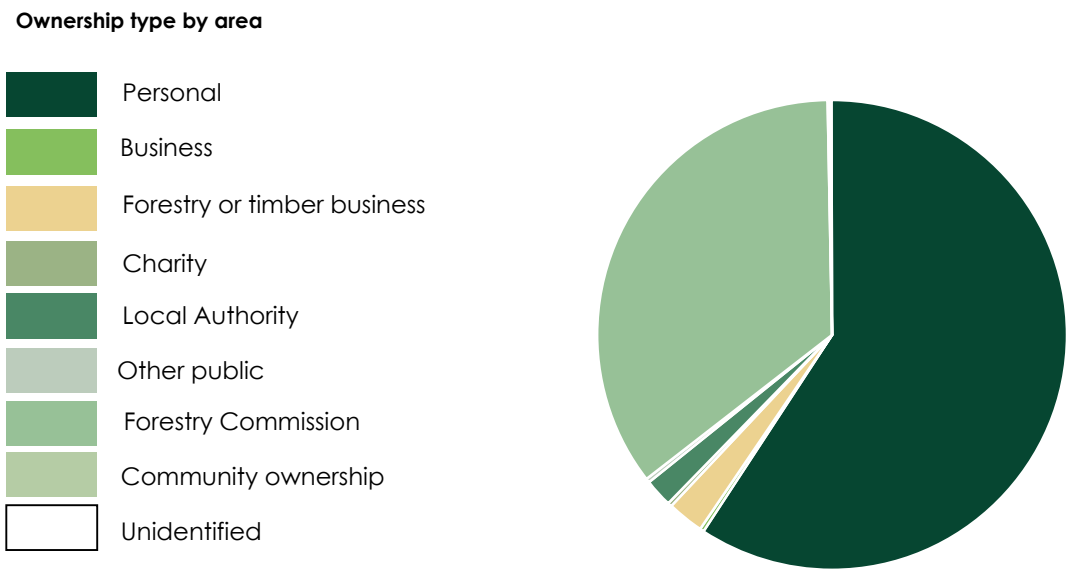
Planting year class	First	%	Second	%	Third	%
1991-98	Sitka spruce	52	Norway spruce	21	Birch	7
1981-90	Sitka spruce	66	Jap / Hybrid larch	10	Birch	8
1971-80	Sitka spruce	62	Corsican pine	12	Lodgepole pine	7
1961-70	Sitka spruce	35	Beech	15	Douglas fir	12
1951-60	Sitka spruce	34	Jap / Hybrid larch	10	Beech	10
1941-50	Oak	27	Sitka spruce	24	Sycamore	12
1931-40	Ash	27	Sycamore	22	Norway spruce	13
1921-30	Norway spruce	44	SY / Other BL's	18	Oak	11
1911-20	Sycamore	63	Beech	32	Ash	5
1901-10	Beech	100	-		-	
1861-1900	Oak	54	Ash	22	Sycamore	9
Pre 1861	OK / Other BL's	50	-		-	
All years	**Sitka spruce**	**30**	**Oak**	**14**	**Ash**	**8**

1. Principal species as a percentage of area in the planting year class.
2. SY - Sycamore, Other BL's - Other broadleaves, OK - Oak

Table 12 Ownership type* by area and percentage

Ownership type	Area (ha)	%
Personal	14,132	59.3
Business	44	0.2
Forestry or timber business	583	2.4
Charity	104	0.4
Local Authority	407	1.7
Other public (not FC)	81	0.3
Forestry Commission	8,404	35.2
Community ownership or common land	0	0.0
Unidentified	91	0.4
Total	**23,846**	**100.0**

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



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

Survey Method

The land area of Wales 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	1,215	425	Area (ha)
Wide Linear Features	0	0	Area (ha)
Wide Linear Features	0	0	Length (Km)
Narrow Linear Features	13,100	2,319	Length (Km)
Narrow Linear Features	13,100	1,523,300	Number of live trees
Groups	33,200	193,600	Number of live trees
Individual Trees	139,300	139,300	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	0	425	425	1,215	0.35
Wide Linear Features	0	0	0	0	0.00
Total	**0**	**425**	**425**	**1,215**	**0.35**

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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spruce	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Larch	0.8	0.0	0.0	3.6	4.4	55.0	0.2
Cypress	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other conifers	0.0	0.0	0.0	3.6	3.6	45.0	0.2
Total conifers	**0.8**	**0.0**	**0.0**	**7.3**	**8.0**	**100.0**	**0.4**
Oak	45.4	12.2	19.4	66.2	143.2	7.7	7.7
Beech	2.4	0.0	8.9	95.3	106.6	5.8	5.7
Sycamore	8.9	0.0	0.0	128.0	136.9	7.4	7.4
Ash	19.2	5.1	6.5	87.3	118.1	6.4	6.4
Birch	2.4	2.4	8.1	61.8	74.7	4.0	4.0
Poplar	4.1	0.0	0.0	0.0	4.1	0.2	0.2
Sweet chestnut	1.6	1.6	0.8	0.0	4.0	0.2	0.2
Horse chestnut	3.2	0.0	0.0	0.0	3.2	0.2	0.2
Alder	3.2	0.0	0.0	12.4	15.6	0.8	0.8
Lime	0.0	0.0	0.0	4.4	4.4	0.2	0.2
Elm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Willow	0.0	0.0	0.8	5.8	6.6	0.4	0.4
Other broadleaves	17.8	8.9	149.0	1,054.8	1,230.5	66.6	66.3
Total broadleaves	**108.2**	**30.2**	**193.6**	**1,516.0**	**1,847.9**	**100.0**	**99.6**
Total - all species	**109.0**	**30.2**	**193.6**	**1523.3**	**1,856.2**		**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	17%
Groups	48%
Narrow Linear Features	37%

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	0.0	0.0	0.0	0.0
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**	**0.0**	**0.0**	**0.0**	**0.0**
Oak	1.6	0.0	0.0	0.0	1.6	69.6	69.6
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	0.7	0.7	30.4	30.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Willow	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other broadleaves	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total broadleaves	**1.6**	**0.0**	**0.0**	**0.7**	**2.3**	**100.0**	**100.0**
Total - all species	**1.6**	**0.0**	**0.0**	**0.7**	**2.3**		**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	0.0	0.0	0.0	0.0
Spruce	0.0	0.0	0.0	0.0	0.0
Larch	0.0	4.4	0.0	0.0	4.4
Cypress	0.0	0.0	0.0	0.0	0.0
Other conifers	3.6	0.0	0.0	0.0	3.6
Total conifers	**3.6**	**4.4**	**0.0**	**0.0**	**8.0**
Oak	17.3	63.8	54.7	7.3	143.1
Beech	48.5	49.1	9.1	0.0	106.7
Sycamore	65.3	59.2	12.4	0.0	136.9
Ash	27.8	64.1	26.1	0.0	118.0
Birch	14.8	60.0	0.0	0.0	74.8
Poplar	2.4	1.6	0.0	0.0	4.0
Sweet chestnut	1.6	0.8	1.6	0.0	4.0
Horse chestnut	2.4	0.0	0.8	0.0	3.2
Alder	4.4	11.2	0.0	0.0	15.6
Lime	4.4	0.0	0.0	0.0	4.4
Elm	0.0	0.0	0.0	0.0	0.0
Willow	6.6	0.0	0.0	0.0	6.6
Other broadleaves	981.2	228.0	18.9	2.4	1,230.5
Total broadleaves	**1,176.7**	**537.8**	**123.7**	**9.7**	**1,847.8**
Total - all species	**1,180.4**	**542.2**	**123.7**	**9.7**	**1,856.2**

Table 18 Number of Groups by group size

Number of trees per Group*	Number of Groups (000's)
2	7
3-5	11
6-10	6
11-20	5
21-50	3
51-100	0
>100	0
Total	**33**

*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 1998 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 1998 Inventory
Table 20:	Comparison of High Forest area by species between 1980 Census and 1998 Inventory
Chart:	Comparison of High Forest area by species between 1980 Census and 1998 Inventory
Table 21:	Comparison of High Forest Category 1 area by planting year class between 1980 Census and 1998 Inventory
Chart:	Comparison of High Forest Category 1 area by planting year class between 1980 Census and 1998 Inventory
Table 22:	Comparison of numbers of live trees outside woodland between 1980 Census and 1998 Inventory
Table 23:	Comparison of density of non-woodland features between 1980 Census and 1998 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 1998 Inventory

Woodland size (ha)	1980 Census woodland area		1998 Inventory woodland area		Change (%)
	(ha)	(%)	(ha)	(%)	(%)
2.0 or more	20,279	92.2	23,846	98.2	18
0.25 - <2.0	1,715	7.8	425	1.8	-75
Total	**21,994**		**24,271**		**10**
% Woodland land cover	**9.1**		**10.0**		

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

2. The above figures from the 1998 Inventory exclude woodland between 0.1 and <0.25 ha, thereby matching the scope of the 1980 Census. The 1998 figures above will therefore not match those in the previous sections of the report.

3. Land area used to calculate woodland cover percent (1998), 243,015 ha, was based on the 1991 Census of Population digital boundaries.

4. Land area used to calculate woodland cover percent (1980), 242,645 ha, (Ordnance Survey data)

Table 20 Comparison of High Forest area by species between 1980 Census and 1998 Inventory

Species	1980 Census woodland area (ha)	1998 Inventory woodland area (ha)	Change (%)
Scots pine	863	593	-31
Corsican pine	271	369	36
Lodgepole pine	585	749	28
Sitka spruce	6,714	6,889	3
Norway spuce	1,743	1,363	-22
European larch	420	96	-77
Jap/Hybrid larch	1,585	1,441	-9
Douglas fir	834	1,073	29
Other conifers	897	699	-22
Mixed conifers	273	0	-100
Total conifers	**14,186**	**13,272**	**-6**
Oak	1,789	3,292	84
Beech	569	1,753	208
Sycamore	1,040	1,227	18
Ash	934	1,957	109
Birch	738	608	-18
Poplar	201	145	-28
Sweet chestnut	63	45	-29
Elm	78	0	-100
Other broadleaves	768	890	16
Mixed broadleaves	666	7	-99
Total broadleaves	**6,847**	**9,924**	**45**
Total all species	**21,033**	**23,196**	**10**
Felled	**240**	**401**	**67**
Total High Forest	**21,273**	**23,597**	**11**

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 2.8 % (Table 2). To obtain meaningful comparisons between the two datasets the 1980 Census data have therefore been reduced by 2.8 %.

3. The above figures from the 1998 Inventory exclude woodland between 0.1 and <0.25 ha, thereby matching the scope of the 1980 Census.
The 1998 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 1998 Inventory

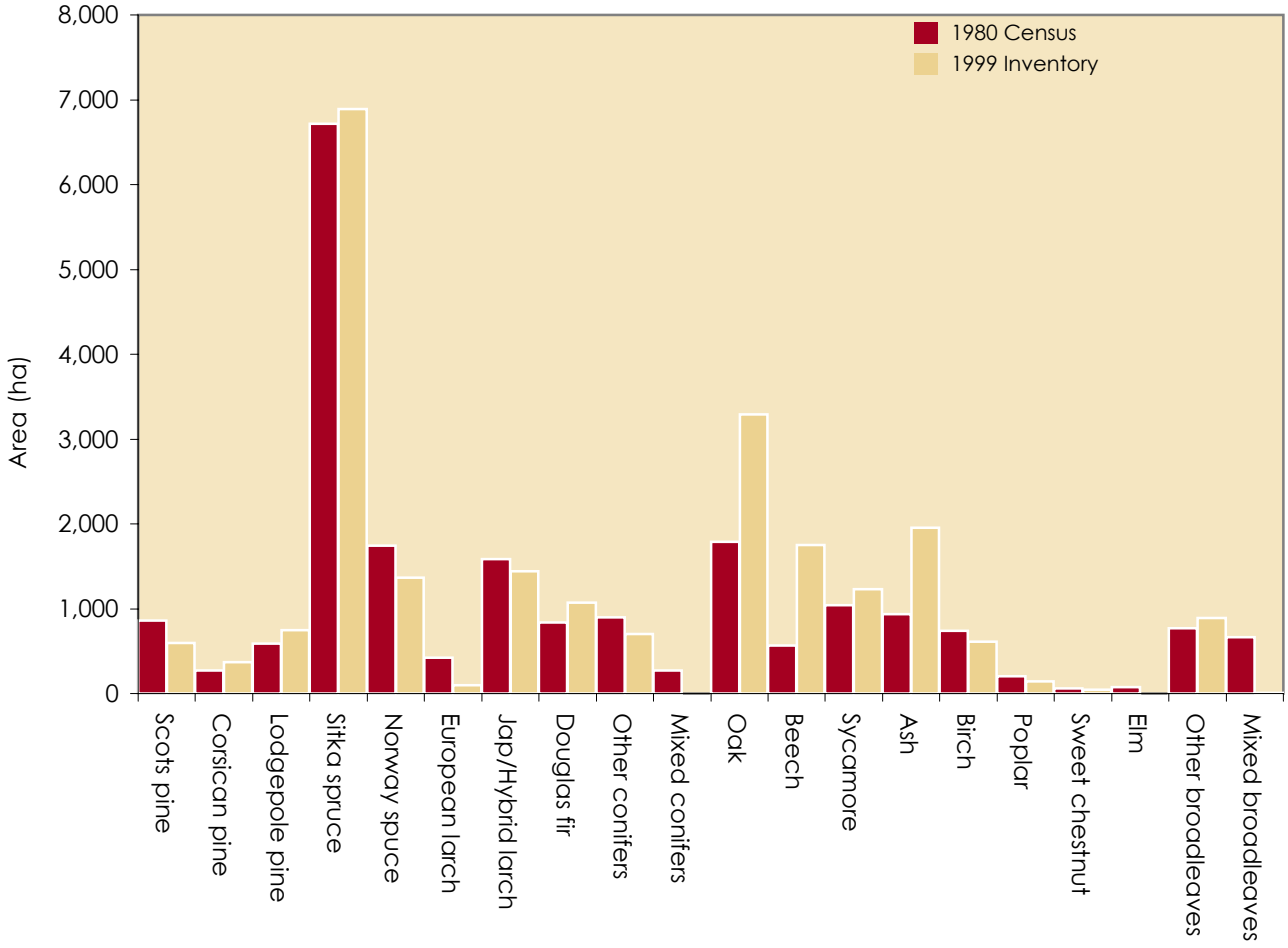


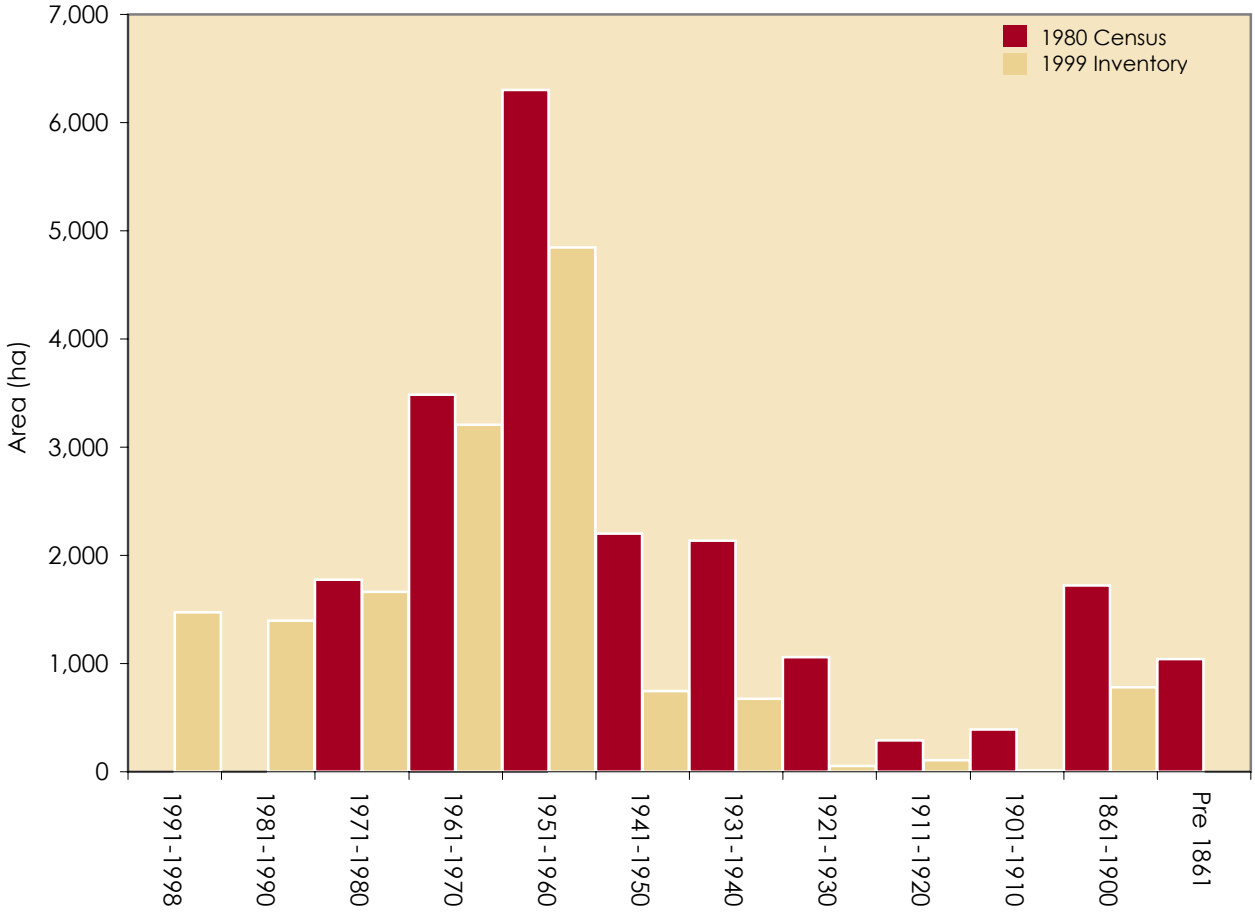
Table 21 Comparison of High Forest Category 1 area by planting year class between 1980 Census and 1998 Inventory

Planting year class	1980 Census woodland area (ha)	1998 Inventory woodland area (ha)	Change (%)
1991-1998	0	1,472	see note
1981-1990	0	1,395	see note
1971-1980	1,776	1,660	-7
1961-1970	3,483	3,206	-8
1951-1960	6,299	4,849	-23
1941-1950	2,198	746	-66
1931-1940	2,136	677	-68
1921-1930	1,060	55	-95
1911-1920	288	105	-64
1901-1910	390	13	-97
1861-1900	1,723	780	-55
Pre 1861	1,040	0	-100
Total all years	**20,393**	**14,958**	**-27**

1. The first two classes, 1991-1998 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 1998 Inventory



1. Most of the planting year classes cover 10 years, 1991-1998 is 8 years, and the classes prior to 1901 are 40 years or more.

Table 22 Comparison of numbers of live trees outside woodland between 1980 Census and 1998 Inventory (000's)

Feature type	1980 Census	1998 Inventory	Change (%)
Boundary Tree	148	97	-34
Middle Tree	137	22	-84
Total Individual Trees	284	119	-58
Groups	620	47	-92
Linear Features	538	668	24
Total	**1,442**	**834**	**-42**

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 1998 Inventory figures have been adjusted accordingly. The 1998 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 1998 Inventory, the two surveys are not directly comparable - 1980 used 7cm diameter at breast height, and 1998 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 1998 Inventory

Feature type	1980 Census	1998 Inventory	Change (%)
Individual Trees (per sq km)	117.2	49.0	-58
Groups (per sq km)	46.9	6.3	-86
Linear Features (m per sq km)	783.0	954.3	22

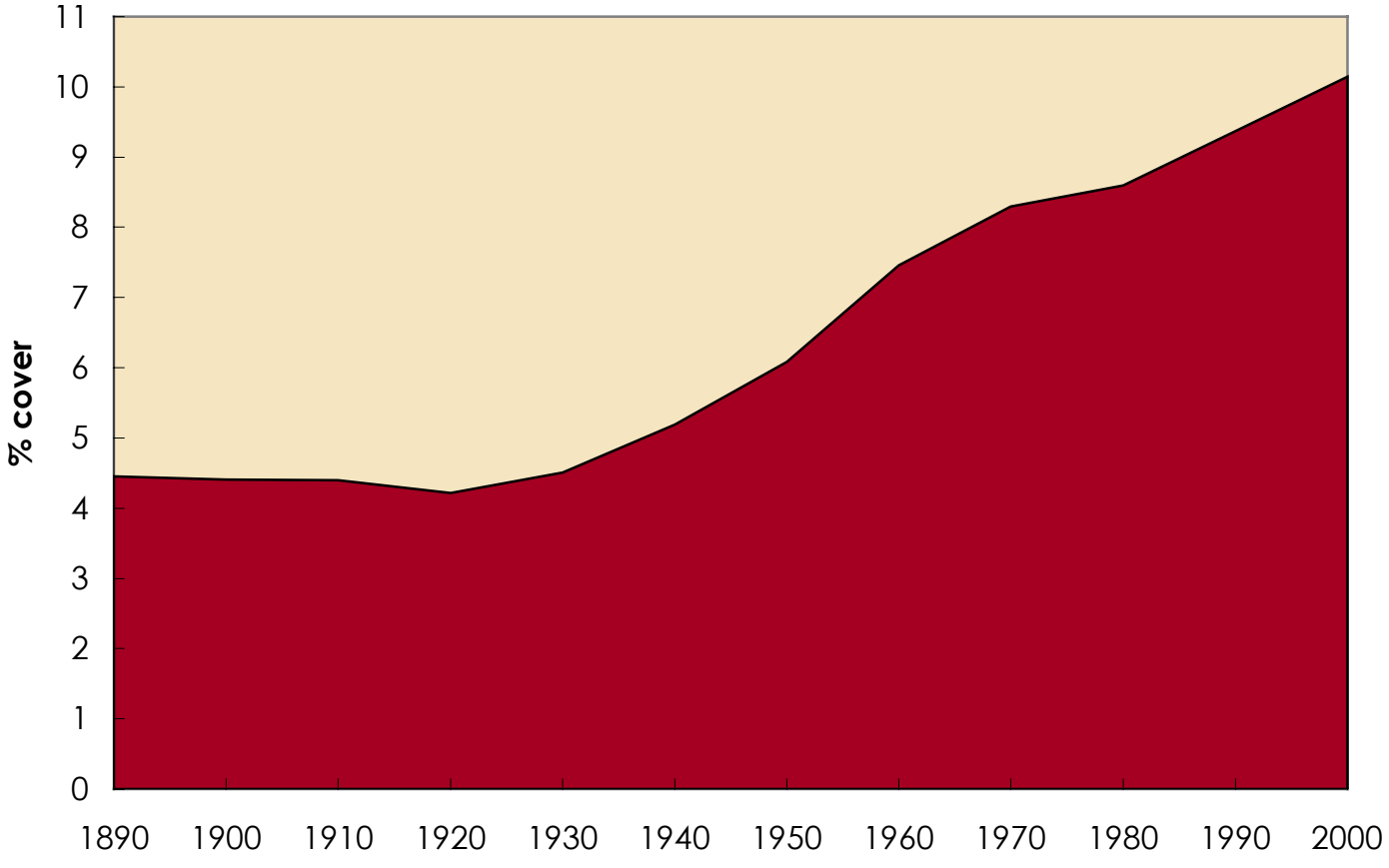
1. The Survey of Small Woodland and Trees did not record information referring to tree features (I.e. Individual trees, Groups and Narrow Linear Features) within developed land.
2. In the 1980 Census hazel, hawthorn, blackthorn and goat willow were excluded, the 1998 Inventory figures have been adjusted accordingly. The 1998 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 1998 Inventory, the two surveys are not directly comparable - 1980 used 7cm diameter at breast height, and 1998 used 2m height, as minimum criteria for inclusion.
4. See Glossary for definitions of feature type.

WOODLAND COVER

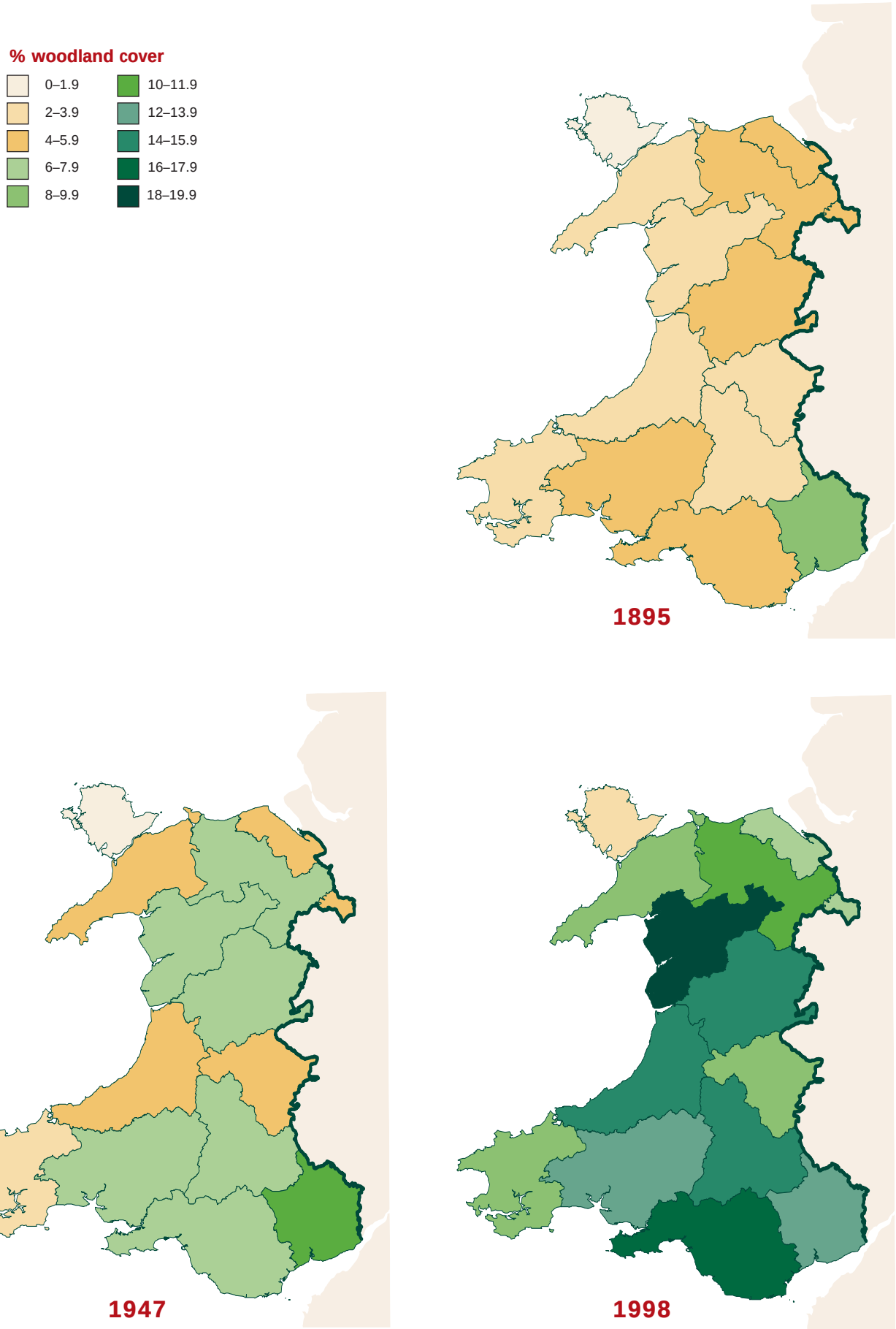
Woodland area data is available from Ministry of Agriculture surveys since 1871, and from Forestry Commission national woodland inventories since 1924. The following chart and maps show the changes in woodland area through time.

The maps use the old County structure data of Wales, 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)



Map 5 Woodland cover 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