NFI 2011 woodland map GB

National Forest Inventory Report

NFI 2011 woodland map

Summary

The National Forest Inventory provides a record of the size and distribution of forests and woodlands in Great Britain and information on key forest attributes. This report summarises the results of the mapping of woodland area for GB that have arisen from the 2011 National Forest Inventory (NFI) woodland map update. It then looks at the changes between the initial 2010 NFI woodland map release and the 2011 woodland map. The report also analyses the differences between the National Inventory of Woodland and Trees (NIWT) woodland map published in 1998 and the NFI woodland map published in 2011.

- The total area of mapped woodland of 0.5 hectare and over on the 2011 NFI woodland map in GB is 2,979,354 hectares.
  This represents 13% of the total land area. A further 77,777 hectares of open space within woodland has been mapped as interpreted open areas. (See Appendix B for a summary of interpreted forest types (IFTs) and interpreted open areas (IOAs).) The total area of mapping including both IFTs and IOAs for GB is 3,057,131 hectares. (Table 1)
- A total of 807,288 hectares or 27% of the total mapped woodland in GB is owned by or leased to the Forestry Commission, with 2,172,066 hectares, or 73%, in other ownerships, based on the Forestry Commission legal boundary as at 31 March 2011. (Table 2)
- The largest interpreted forest type across GB is conifer, representing 42% of all mapped woodland. Broadleaved interpreted forest type represents 37%. (Table 3)
- NFI mapped a total of 2,767,116 hectares of woodland with an extent of 2 hectares and over in GB. 212,238 hectares of the woodland mapped in GB was less than 2 hectares in extent. (Table 4)
- 67% of Forestry Commission mapped woodland in GB is conifer interpreted forest type and 8% is broadleaved. 47% of woodland in other ownerships in GB is broadleaved and 33% is conifer. (Table 5)
- The area in woodlands of 500 hectares or more in extent in GB represents 32% of the total woodland area. (Table 7)
- There are 348,644 woods over 0.5 hectare in GB with a mean wood area of 9 hectares. There are 220,834 woods between 0.5 and 2 hectares in GB with a mean wood area of 1 hectare. (Table 7)
- 61% of open areas within woodland in GB were interpreted as grass. (Table 8)
- NFI has mapped 209,733 hectares more woodland of 2 hectares and over compared to NIWT, representing an overall increase of 8%. This represents 12% of the total land area as opposed to 11% represented by the NIWT estimate. (Table 14; based on 2 ha and over). Most of this increase is identified as being due to improved detection techniques (as explained under '2010 Woodland map revision method') rather than a genuine expansion of woodland since the NIWT mapping exercise.

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Introduction

The National Forest Inventory is composed of two elements: a woodland map and a field survey. The woodland map covers all forests and woodlands over 0.5 hectare with a minimum of 20% canopy cover (or the potential to achieve it), including new planting, clearfelled sites and restocked sites. It is based upon 25 cm resolution colour aerial photography for England and Scotland and 40 cm resolution colour aerial photography for Wales. Field survey work is used to refine the map-based estimates of woodland and clearfelled areas and to measure detailed aspects of the forest. Field surveys are being carried out between 2009 and 2014 to estimate standing volume, stocked areas, numbers of trees and other forest metrics. This involves the ground surveying of one-hectare sample squares that are partially or entirely covered by forest, including clearfelled areas and areas of assumed woodland, according to the 2010 NFI woodland map.

Further details of the mapping work and the derivation of forested areas can be found in the 2010 Woodland area reports at www.forestry.gov.uk/inventory.

2010 woodland map revision method

Since the published 2010 woodland area estimate (reference date 31 March 2010, published 26 May 2011) and 2010 woodland map launch, further work has been undertaken to improve that estimate. This has been achieved through incorporating further revisions arising from:
- a comparison exercise between the NIWT woodland map and the NFI woodland map;
- the addition of clearfell polygons identified from remote sensing analysis of 2006 and 2009 satellite imagery;
- a revision and update of the smaller assumed woodlands associated with recent woodland grant schemes.

The NIWT 1998 and NFI 2011 woodland maps were created using different methodologies and mapping standards (see appendix A for a summary of differences in mapping and methodology). The main objective of the comparison exercise is to define and explain any substantive differences in area estimates between NIWT and NFI. In order to identify those differences a symmetrical difference of the two sets of spatial data has been computed. The resultant potential woodland change areas have been categorised as 'Mapped in NIWT but not in NFI' (NFI unmapped) and 'Mapped in NFI but not included in NIWT' (NIWT unmapped). Analysis of the potential woodland change areas considers temporal, spatial, methodological and physical change, which account for many of the differences.

Temporal differences include:
- Time of year and time of day of photography. Angle of incidence of light can affect interpretation; shadows are more pronounced at different times of day and consequently may hide detail, and affect the tone of the image, which can make interpretation more difficult.
- Seasonal variation in the tree canopy can hinder interpretation.

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Spatial differences include:
- Scale of photography. The woodland map features for NIWT were derived from 1:25,000 scale photography. Stereo pairs of the photos were evaluated by stereoscopic photogrammetry. This introduced a third dimension of depth conception. Because the image scale was small, the stereo element helped larger trees to stand out from surrounding vegetation and improved the visible texture of the woodland type. However, the scale resulted in indistinct woodland boundaries and, for example, led to difficulties in defining boundaries along natural gradients in vegetation where broadleaved woodland became shrub.
- Digital orthorectified imagery does not have a set scale but has a set size of pixel, which determines the quality and legibility of the image at different zoom scales. For example, 25 cm resolution imagery has a pixel size that represents 25 cm on the ground. This allows the interpreter to zoom to 1:1,000 and beyond, but the image becomes less distinguishable at higher zoom rates.
- Digital orthorectified imagery also allows for 'heads up' digitising where the operator digitises the woodland boundaries directly into the GIS system.
- Geographic registration of the digital images will in places result in improved spatial accuracy and, as a result, some of the NIWT data may seem displaced against the latest images.

Methodological differences include:
- Changes in the definition of woodland such as change in the minimum width of woodland from 50 metres to 20 metres.
- Change in the minimum size of division between interpreted forest types.
- The use of OS MasterMap® in determining both external woodland boundaries and internal divisions between interpreted forest types.

Physical differences include:
- Land-use change, where irreversible change has occurred between the two surveys resulting in deforestation
- New planting which took place during or between the two surveys. Very young trees would have been difficult to interpret from the available imagery.

Data sources used in the update process

- The potential woodland change areas resulting from the comparison exercise. All potential woodland change areas greater than 5 hectares in extent have been analysed and input to the 2011 woodland map update, either as additions or deletions as explained in Tables 11 and 12
- NFI unmapped. Where further investigation of the latest images shows evidence of woodland or transition stage, such areas are mapped as additions. Where further analysis of the latest images verifies no woodland presence then the areas are attributed as NIWT error.
- NIWT unmapped. Where further investigation of the latest images shows no evidence of valid woodland, then such areas are attributed as NFI error and omitted from the woodland area calculation.

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- Assumed woodland. These are derived from areas of new planting or natural regeneration under grant schemes and areas of Forestry Commission first rotation planting. The assumed woodland areas are identified by a geoprocessing function that removes the areas of new planting already included in the NFI woodland map, resulting in an output of the balance of the unmapped features or parts of features. This process has resulted in some invalid features, which will be verified and cleaned as part of the 2012 woodland map update process.
- Assumed woodland derived from unmapped Forestry Commission new planting has been identified and added to the data. This source was not included in the 2010 woodland map.
- Some of the assumed woodland included in the 2010 woodland map has been validated, cleaned and mapped to the NFI mapping rules, around the areas where other update operations were being carried out. This has resulted in the reshape or deletion of several woodland areas.
- Remote sensing potential change areas. These are the result of a change detection analysis based on 2006 and 2009 satellite imagery. The analysis highlights areas of clearfell, extended felling, land-use change and sparse woodland which previously met the NFI woodland criteria.
    - The clearfell and extended felling areas are validated and used to update the base map features, originally mapped as mature trees.
    - The land-use change polygons are attributed as no longer woodland and are removed from the woodland area calculations.
    - The sparse areas are validated and changed from woodland to low density woodland.

In addition to the above, some corrections and improvements have been made around the areas where other update operations were being carried out, based on the latest available aerial photography. IOAs have been created or deleted based on the updates made, in accordance with the NFI mapping conventions.

There are three main woodland type attributes:
- Mapped woodland. These are the NFI base map features and have been attributed as woodland' or 'non woodland'. The woodland polygons represent the extent of woodlands equal to or greater than 0.5 hectare and are differentiated by interpreted forest type (IFT). The non woodland polygons represent open areas completely enclosed by woodland and are differentiated by interpreted open area (IOA).
- Assumed woodland. There are two types of assumed woodland polygons. Those with the Woodland_source attribute 'supplied grant schemes' are the balance of areas under woodland grant schemes that showed no evidence of trees or ground disturbance during the mapping aerial photography interpretation. Those with the Woodland_source attribute 'supplied FC new planting' are the balance of Forestry Commission new planting polygons extracted from the Forestry Commission's sub-compartment database that showed no evidence of trees or ground disturbance during the mapping aerial photography interpretation. Both types include areas of greater than 0.1 hectare which adjoin existing woodland. These areas have been included for future monitoring. Assumed woodland polygons have not been mapped according to the NFI mapping rules and are not differentiated by IFT.

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- Low density polygons were mapped as woodland by NIWT but were not originally mapped as NFI woodland. They were included after an investigation of the archive images proved that a higher density of woodland existed at the time of NIWT mapping than at present. This was done on the assumption that such sites may have included seed tree sites, or group felling, and that they may revert to the threshold canopy occupancy for woodland within a short period of time. If future monitoring proves this not to be the case they will be removed from the map.

Statistics derived from NFI may be used in the process of policy-making, and differences in woodland area between the two surveys therefore need to be clearly explained. Understanding and interpreting the differences between the two surveys is an important issue for future use of the data and will help to ensure that the data are not misinterpreted.

Summary of differences between NIWT (1995-1998) and NFI (2011) woodland maps for GB

An important aspect of the NFI woodland map is the ability to provide the basis of reporting on changes that have occurred in both the extent and distribution of GB woodlands in the intervening period between NIWT and NFI. The combination of the woodland map resource and the field survey results towards the end of the current NFI cycle will provide a more accurate view of those changes.

The NIWT 1998 and NFI 2011 woodland maps were created using different methodologies and mapping standards (see appendix A for a summary of differences in mapping and methodology). A consequence of these changes is the inclusion of woodland that existed at the time of NIWT mapping but was not mapped and the exclusion of area that was mapped by NIWT but not included in NFI due to:
- Methodology restricting minimum width of NIWT woodlands;
- larger minimum gap between woodlands which as a consequence included more non woodland area in NIWT
- resolution of the aerial imagery which resulted in less distinct woodland edge and misinterpretation of woodland;

NIWT mapped a total of 2,557 thousand hectares of woodlands with an extent of 2 hectares and over. The total mapped woodland with an extent of 2 hectares and over included in the NFI 2011 woodland map is 2,767 thousand hectares, a net difference in woodland area of 210 thousand hectares. This difference is the result of the inclusion of 526 thousand hectares of woodland not mapped by NIWT and the exclusion of 316 thousand hectares of NIWT mapped area. (Tables 16-18). These areas have been identified by computation of a symmetrical difference of the two datasets and further analysis of these potential woodland change areas, which is currently underway, will help to explain the substantive difference in woodland area between the two maps and should result in a more accurate estimate of actual increase in woodland area. Results of the comparison analysis completed to date for GB for the

additional area have estimated that 9% are due to methodology, 51% are due to afforestation and 40% are due to NIWT mapping errors. Similar results for the excluded areas have estimated 80% to be due to methodological differences, 2% due to land use change, 7% were mapped as young trees by NIWT but latest available imagery shows no sign of planting or other woodland transition stage and the remaining 11% were due to NIWT error or are not discernable from the current aerial photography. These estimates should be treated with caution until the conclusion of the comparison analysis exercise.

Understanding the differences between map-based and fieldwork estimates

Many of the reported areas presented in this report are based upon interpreted forest types. These are derived from desk-based interpretation of aerial photography. Mapped interpreted forest types (IFT) provide spatial information on the differentiation of total forested area into broad categories of woodland types that can be assessed from the interpretation of remote images and administrative information. As such, they provide a good indication of the spatial distribution of these different categories of mapped woodland. Summation of areas of IFT, as shown for example in Table 3, will give a broad indication of the absolute and relative extent of these categories across the country. However, they are of limited applicability with regard to the question of the breakdown of woodland areas into tree species, and in particular on the differentiation of total woodland area into that occupied by conifers or broadleaves. This is because the IFT categories used do not equate exactly with areas purely composed of either conifers or broadleaves.

Taking conifer area as an example:
• The 'conifer' IFT category represents areas of woodland assessed by photographic interpretation to be composed of at least 80% conifer species, and therefore includes woodland areas that are not pure conifer stands.
• Conifers, on the other hand, can occur in other IFT categories of high forest:
    • Between 50 and 80% within the 'mixed mainly conifer' IFT category.
    • Between 20 and 50% within the 'mixed mainly broadleaved' IFT category.
    • Between zero and 20% within the 'broadleaves' IFT category.
• A number of non-high forest IFT categories, such as the 'young trees' IFT, can also contain conifer species.
In addition to this indeterminacy of IFT categories with regard to the split into conifer or broadleaved species, the determination of IFT areas using mainly photographic interpretation will result in some degree of misclassification. Factors contributing to this relate to the quality of the images, which may be affected by the resolution of the photography, the time of year or time of day that the image was recorded, and obscuring of the image by cloud or shadow.

A more reliable estimation of the split of total forested area into that occupied by conifers or broadleaves is obtained with the use of information from the NFI field sample operation or, for Forestry Commission areas of woodland from the Forestry Commission's sub-compartment database (SCDB).

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Field survey will identify areas and woodland type more accurately than interpretation of aerial photography for a specific area. However, as field survey is expensive to perform, only a small sample of woodlands have been assessed in this manner. The NFI uses statistical techniques to integrate the results arising from mapping and fieldwork to derive improved final estimates of woodland composition. It is important to note the difference between these alternative assessments. For example, the conifer and broadleaved breakout reported in the main body of this report is map-based, and as such will differ from that of the combined estimate using field survey results. The combined estimates are published in other NFI reports such as the *Standing timber volume for coniferous trees in Britain* and *Preliminary estimates of quantities of broadleaved species in British woodlands, with special focus on ash* reports both of which are available for download from www.forestry.gov.uk/inventory. Section 4 explores such differences in more detail.

Results

Section 1 - Summary of woodland area from the NFI 2011 digital woodland map for GB

Tables 1 to 8, Figures 1 to 7, and Maps 1 to 3 summarise the sizes of woodland areas from the NFI 2011 digital woodland map for GB. Note that the figures in some tables may not add to the totals due to rounding.

A total of 2,835,170 hectares were mapped as base data and an additional 140,251 hectares of assumed woodland and 3,933 hectares of low density woodland have since been included.

Map 1. Distribution of woodland by interpreted forest type

Legend:
- Assumed woodland
- Broadleaved
- Cloud or shadow
- Conifer
- Coppice
- Coppice with standards
- Felled
- Ground prep
- Low density
- Mixed mainly broadleaved
- Mixed mainly conifer
- Shrub
- Young trees

0 25 50 100 kilometres
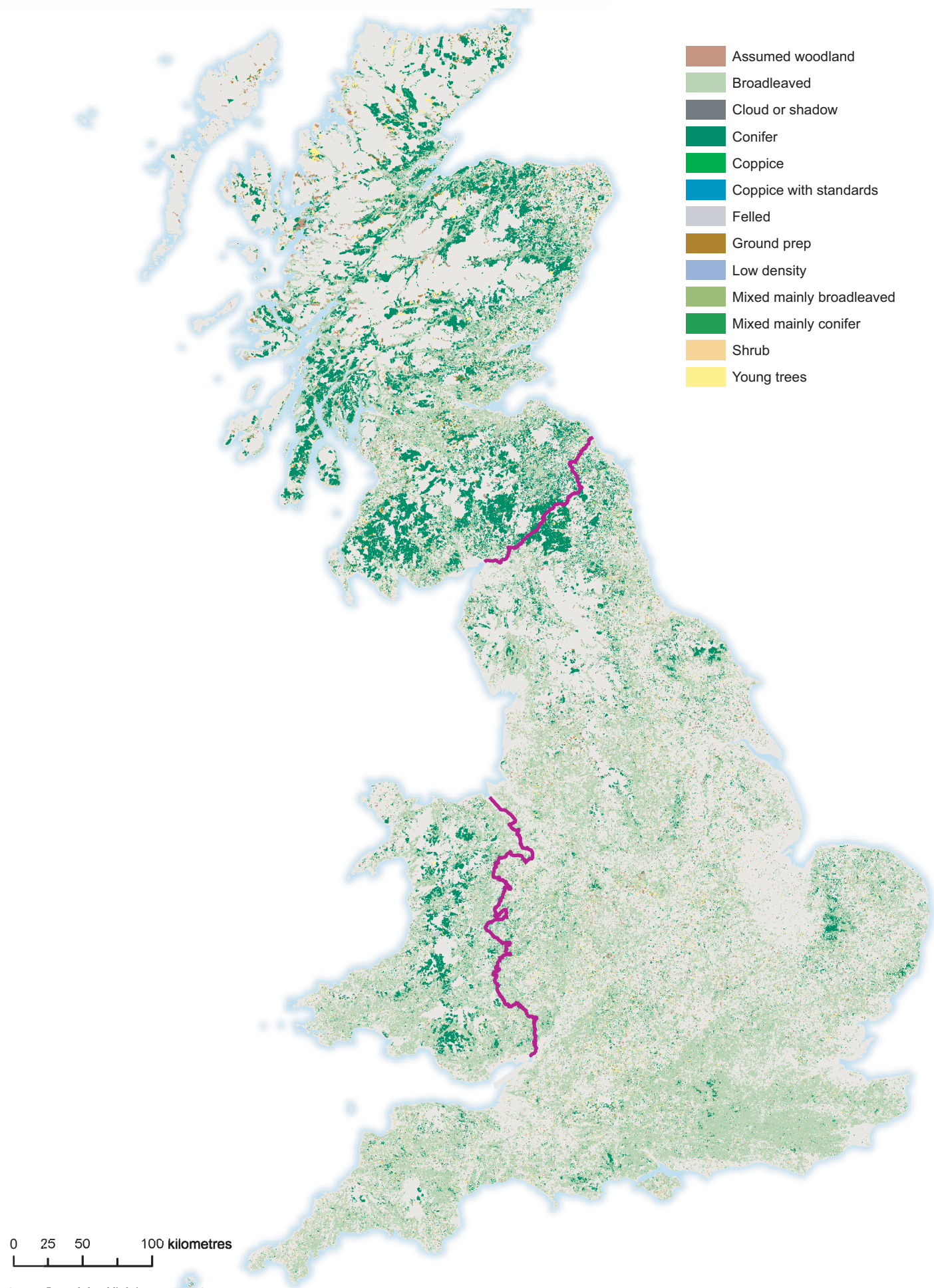
Map 2.   Distribution of woodland by ownership

■ Forestry Commission

■ Other

0   20 40   80 kilometres
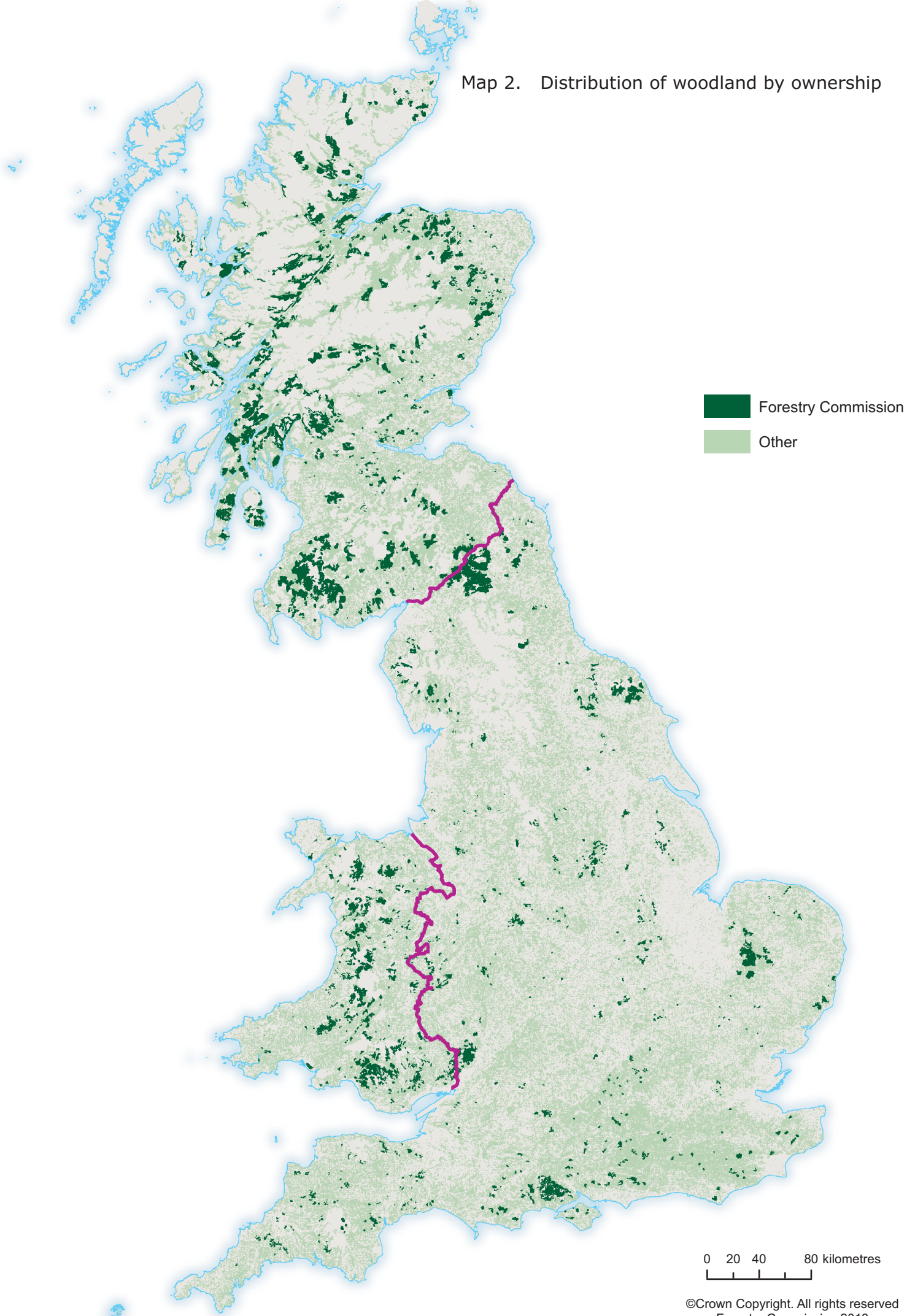
Map 3. Distribution of woodland by woodland size

Woodland by size class (ha)

- 0 - <2
- >=2 - <10
- >=10 -<50
- >=50 - <100
- >=100 - <500
- >=500 - <1000
- >=1000 - <2000
- >=2000 - <5000
- >=5000 - <10000
- >=10000 - <20000
- >=20000 - <30000
- >=30000

Terrain (height in meters)

- <50
- 50 - 100
- 100 -150
- 150 - 200
- 200 - 300
- 300 - 400
- 400 - 500
- 500 - 600
- 600 - 700
- 700 - 800
- 800 - 900
- 900 - 1000
- 1000 - 1200
- 1200 - 1300
- >1300

0   20   40   80 kilometres
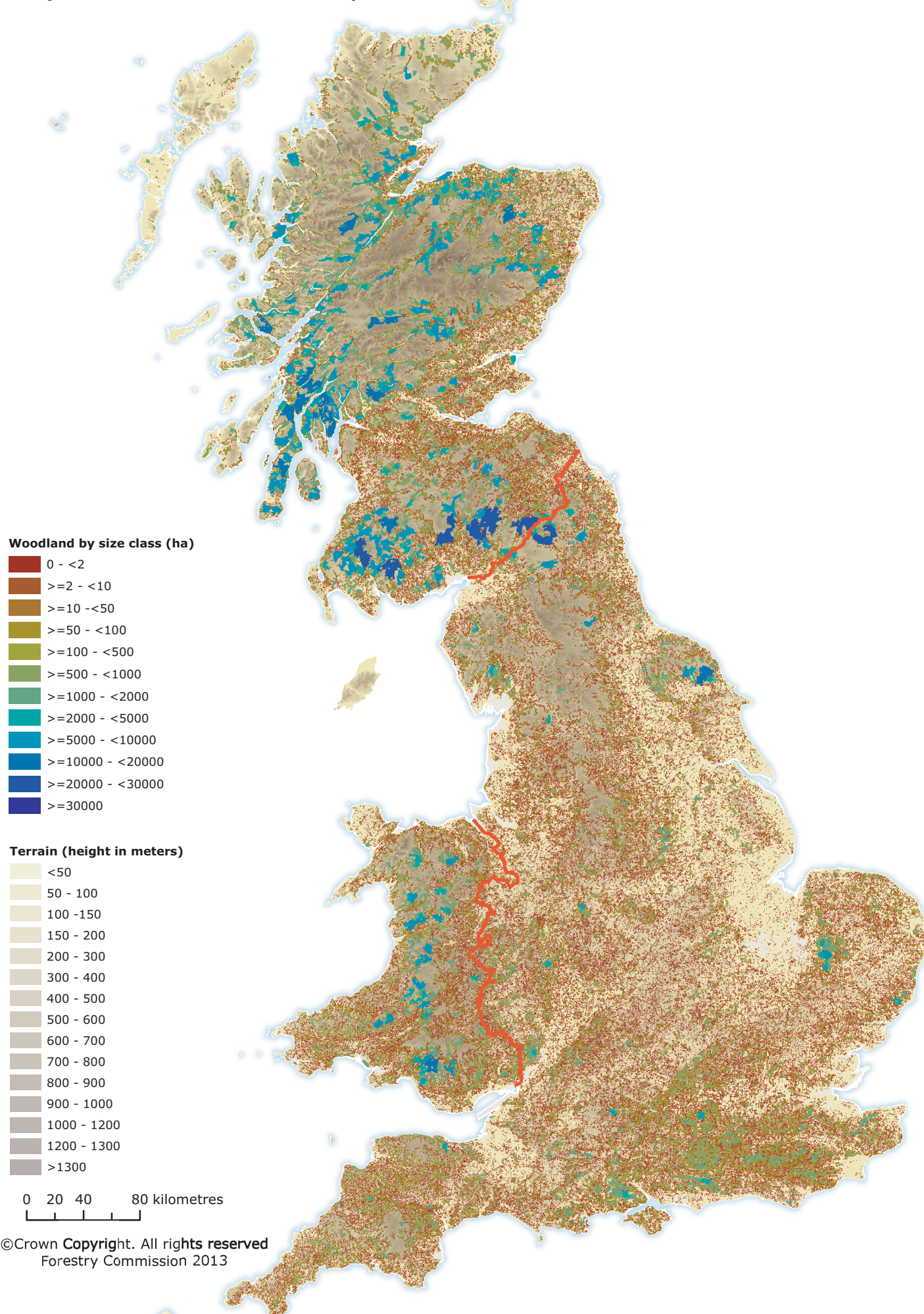
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Table 1. Mapped area by woodland type and non woodland

Mapped area	Area (ha)	%
England		
Woodland	1,255,654	97%
Assumed woodland	34,664	3%
Low density	2,053	0%
Total mapped woodland	**1,292,372**	**100%**
% woodland land cover		**10%**
Mapped non woodland	24,885	
Total mapped area	**1,317,256**	
Scotland		
Woodland	1,281,236	93%
Assumed woodland	100,863	7%
Low density	1,310	0%
Total mapped woodland	**1,383,410**	**100%**
% woodland land cover		**18%**
Mapped non woodland	47,570	
Total mapped area	**1,430,980**	
Wales		
Woodland	298,280	98%
Assumed woodland	4,723	2%
Low density	569	0%
Total mapped woodland	**303,572**	**100%**
% woodland land cover		**15%**
Mapped non woodland	5,322	
Total mapped area	**308,894**	
Great Britain		
Woodland	2,835,170	95%
Assumed woodland	140,251	5%
Low density	3,933	0%
Total mapped woodland	**2,979,354**	**100%**
% woodland land cover		**13%**
Mapped non woodland	77,777	
Total mapped area	**3,057,131**	

Figure 1. Summary of woodland area as part of total land area
(size relative to total area of GB)

- ■ Confirmed woodland
- ■ Assumed and low density woodland
- ■ Interpreted open area within woodland
- ■ Non woodland
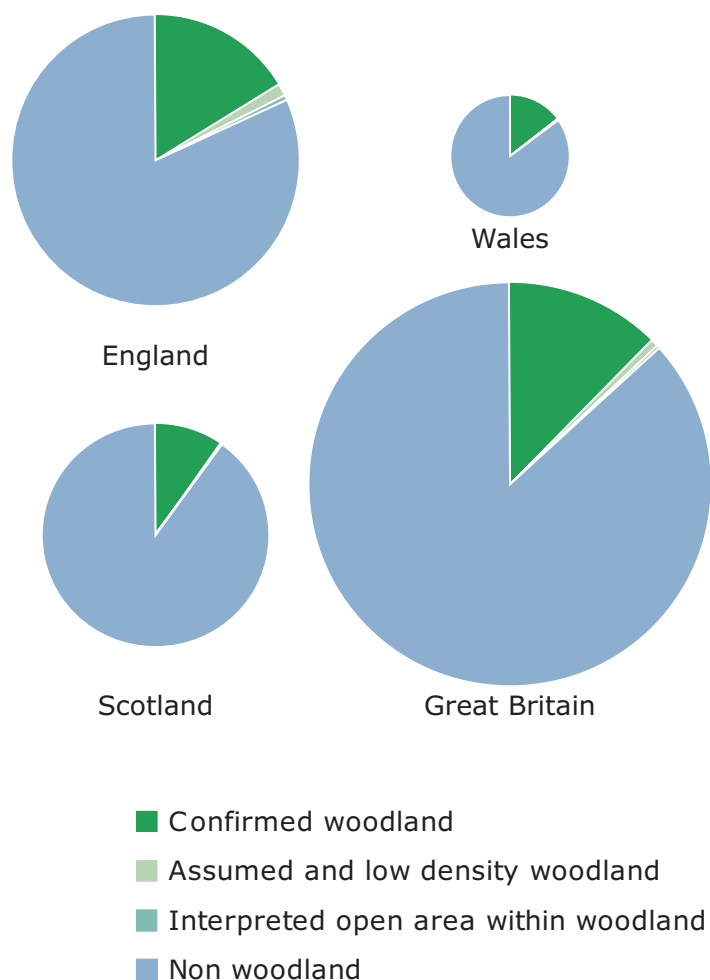
Note for table 1. The area of GB, excluding inland water, is 22,894,394 hectares. Source: UK Standard Area Measurements, Office for National Statistics. % woodland land cover is based on mapped woodland only. Mapped open areas are not included in the calculation.

NFI 2011 woodland map

Table 2. Woodland area by ownership

Ownership	Area (ha)	% woodland
England		
Forestry Commission	213,372	17%
Other ownership	1,079,000	83%
Total area of woodland	**1,292,372**	**100%**
Scotland		
Forestry Commission	479,087	35%
Other ownership	904,323	65%
Total area of woodland	**1,383,410**	**100%**
Wales		
Forestry Commission	114,828	38%
Other ownership	188,744	62%
Total area of woodland	**303,572**	**100%**
Great Britain		
Forestry Commission	807,288	27%
Other ownership	2,172,066	73%
Total area of woodland	**2,979,354**	**100%**

Figure 2a. Summary of woodland area by ownership (size relative to total woodland area of Great Britain)

Figure 2b. Summary of woodland area by ownership
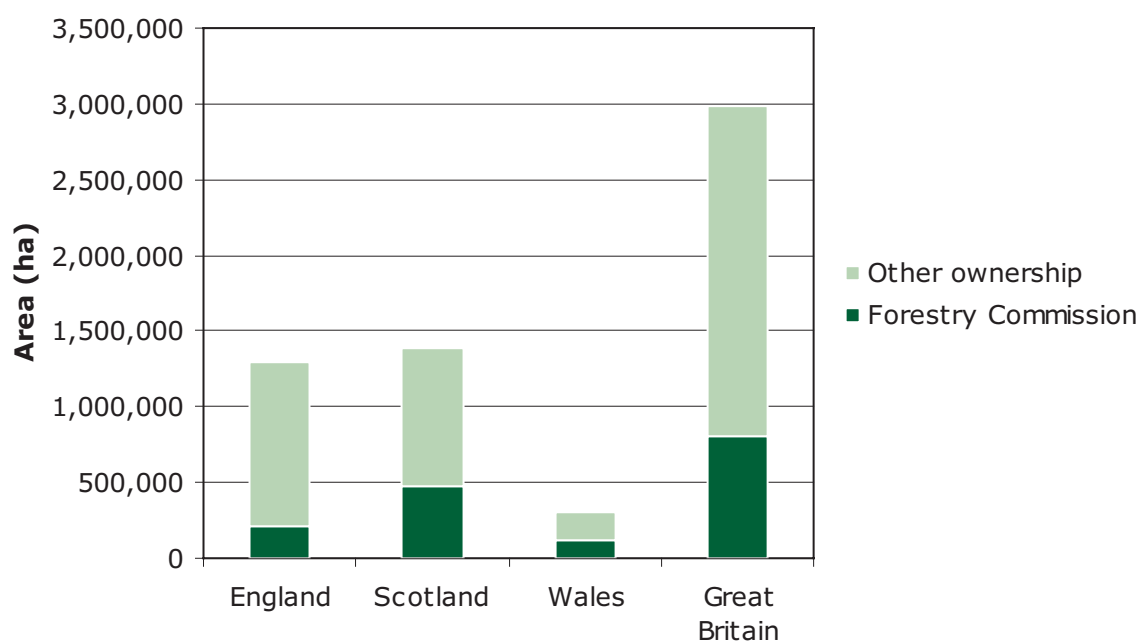
Note for Table 2. Based on Forestry Commission legal boundary dated 31 March 2011. Other ownership encompasses all woodland not owned by or leased to the Forestry Commission.

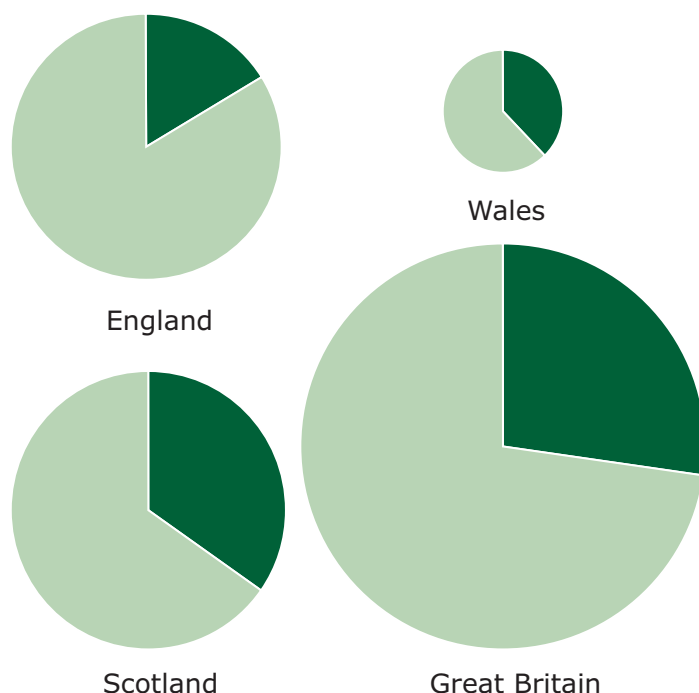**Table 3.** Woodland area by interpreted forest type

Forest type	Total area (ha)	Percentage of total
England		
Broadleaved	784,858	61%
Conifer	315,933	24%
Felled	19,987	2%
Ground prep	8,683	1%
Mixed mainly broadleaved	21,842	2%
Mixed mainly conifer	28,156	2%
Young trees	69,295	5%
Coppice	2,030	0%
Coppice with standards	125	0%
Shrub	4,732	0%
Assumed woodland	34,663	3%
Low density	2,053	0%
Cloud/shadow/uncertain	13	0%
TOTALS	**1,292,372**	**100%**
Scotland		
Broadleaved	190,844	14%
Conifer	814,864	59%
Felled	97,121	7%
Ground prep	32,343	2%
Mixed mainly broadleaved	17,219	1%
Mixed mainly conifer	14,551	1%
Young trees	110,403	8%
Coppice	4	0%
Coppice with standards	0	0%
Shrub	3,851	0%
Assumed woodland	100,863	7%
Low density	1,310	0%
Cloud/shadow/uncertain	37	0%
Totals	**1,383,410**	**100%**
Wales		
Broadleaved	115,075	38%
Conifer	123,143	41%
Felled	21,375	7%
Ground prep	3,195	1%
Mixed mainly broadleaved	6,108	2%
Mixed mainly conifer	6,052	2%
Young trees	22,340	7%
Coppice	12	0%
Coppice with standards	0	0%
Shrub	978	0%
Assumed Woodland	4,723	2%
Low Density	569	0%
Cloud/shadow/uncertain	1	0%
Totals	**303,572**	**100%**

Forest type	Total area (ha)	Percentage of total
Great Britain		
Broadleaved	1,090,777	37%
Conifer	1,253,940	42%
Felled	138,484	5%
Ground prep	44,222	1%
Mixed mainly broadleaved	45,169	2%
Mixed mainly conifer	48,759	2%
Young trees	202,037	7%
Coppice	2,046	0%
Coppice with standards	125	0%
Shrub	9,562	0%
Assumed woodland	140,250	5%
Low density	3,933	0%
Cloud/shadow/uncertain	51	0%
Totals	**2,979,354**	**100%**

Figure 3. Summary of woodland area by interpreted forest type (size relative to total woodland area of Great Britain)

- Broadleaved
- Conifer
- Felled
- Ground prep
- Mixed mainly broadleaved
- Mixed mainly conifer
- Young trees
- Coppice
- Coppice with standards
- Shrub
- Assumed woodland
- Low density
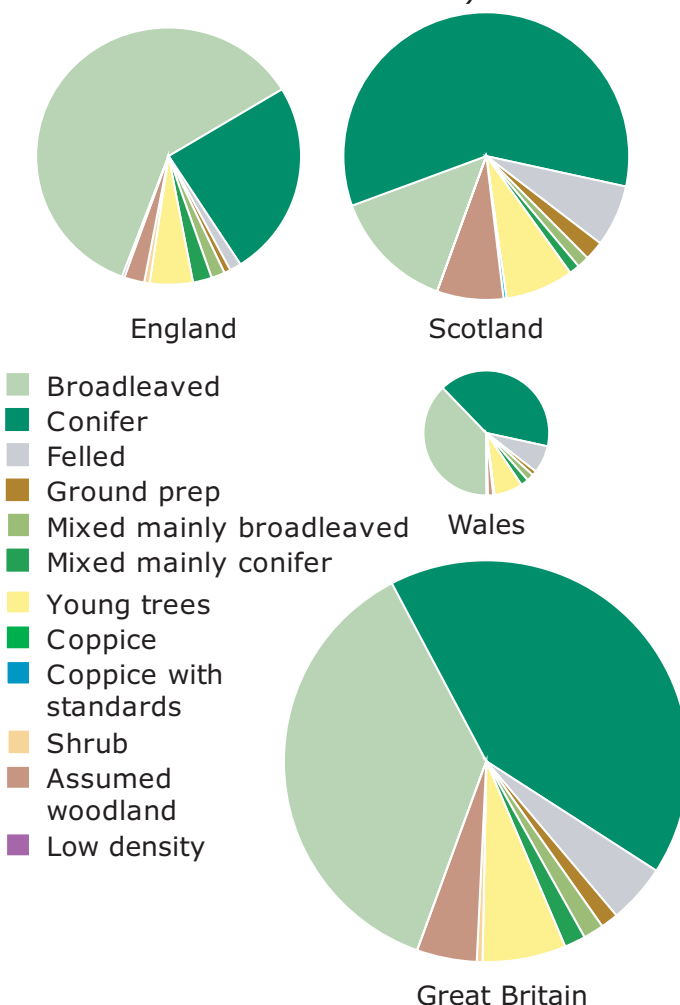
Table 4. Woodland area by interpreted forest type and woodland size

Forest type	Woodland size		Total area (ha)	Forest type	Woodland size		Total area (ha)
	2 ha and over	0.5 - < 2 ha			2 ha and over	0.5 - < 2 ha	
England				Great Britain			
Broadleaved	676,081	108,777	784,858	Broadleaved	944,850	145,927	1,090,777
Conifer	304,511	11,422	315,933	Conifer	1,230,526	23,415	1,253,941
Felled	19,775	212	19,987	Felled	137,875	609	138,484
Ground prep	8,335	348	8,683	Ground prep	43,556	665	44,222
Mixed mainly broadleaved	17,271	4,571	21,842	Mixed mainly broadleaved	37,470	7,700	45,169
Mixed mainly conifer	23,689	4,467	28,156	Mixed mainly conifer	41,708	7,050	48,759
Young trees	61,808	7,487	69,295	Young trees	191,759	10,278	202,037
Coppice	1,997	33	2,030	Coppice	2,013	33	2,046
Coppice with standards	120	4	125	Coppice with standards	120	4	125
Shrub	3,324	1,408	4,732	Shrub	6,875	2,687	9,562
Assumed woodland	26,788	7,876	34,663	Assumed woodland	126,451	13,799	140,250
Low density	2,004	49	2,053	Low density	3,862	71	3,933
Cloud/shadow/ uncertain	13	0	13	Cloud/shadow/ uncertain	49	2	51
Totals	**1,145,717**	**146,655**	**1,292,372**	**Totals**	**2,767,116**	**212,238**	**2,979,354**
Scotland				Wales			
Broadleaved	170,408	20,435	190,844	Broadleaved	98,361	16,714	115,075
Conifer	804,611	10,253	814,864	Conifer	121,404	1,740	123,143
Felled	96,785	337	97,122	Felled	21,315	60	21,375
Ground prep	32,049	294	32,343	Ground prep	3,173	23	3,195
Mixed mainly broadleaved	14,950	2,269	17,219	Mixed mainly broadleaved	5,249	859	6,108
Mixed mainly conifer	12,608	1,942	14,551	Mixed mainly conifer	5,411	641	6,052
Young trees	108,027	2,376	110,403	Young trees	21,924	416	22,340
Coppice	4	0	4	Coppice	12	0	12
Coppice with standards	0	0	0	Coppice with standards	0	0	0
Shrub	2,825	1,026	3,851	Shrub	726	252	978
Assumed woodland	95,722	5,142	100,863	Assumed woodland	3,942	782	4,724
Low density	1,296	14	1,310	Low density	561	8	569
Cloud/shadow/ uncertain	35	2	37	Cloud/shadow/ uncertain	1	0	1
Totals	**1,339,320**	**44,090**	**1,383,410**	**Totals**	**282,078**	**21,494**	**303,572**

NFI 2011 woodland map

Figure 4. Summary of woodland area by interpreted forest type and woodland size
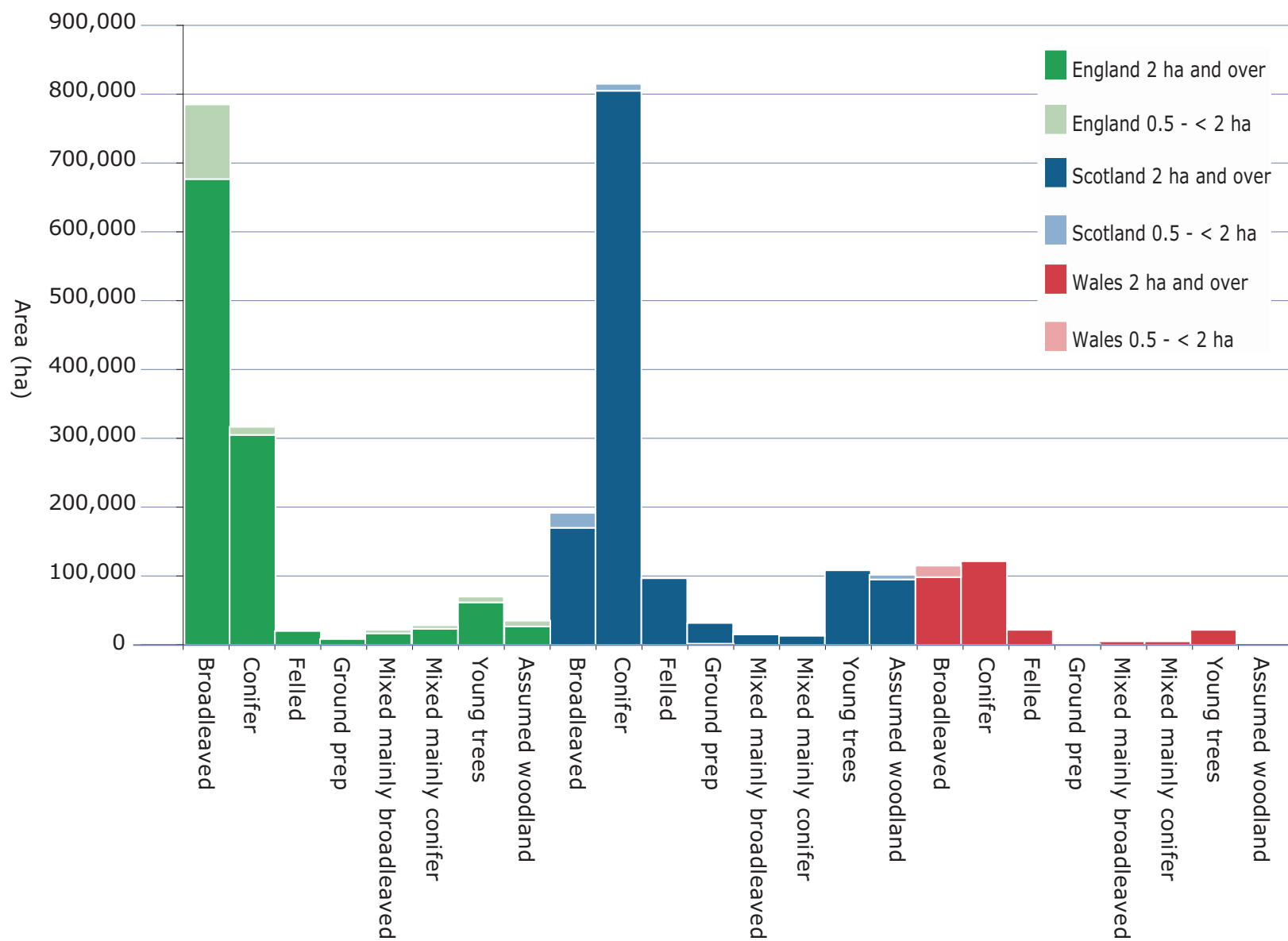
NFI 2011 woodland map

Table 5. Woodland area by interpreted forest type and ownership

Forest type	Forestry Commission		Other ownership	
	Area (ha)	% of total area	Area (ha)	% of total area
England				
Broadleaved	43,644	20%	741,214	69%
Conifer	126,489	59%	189,444	18%
Felled	10,987	5%	9,001	1%
Ground prep	3,760	2%	4,924	0%
Mixed mainly broadleaved	2,171	1%	19,671	2%
Mixed mainly conifer	2,758	1%	25,398	2%
Young trees	21,435	10%	47,860	4%
Coppice	159	0%	1,870	0%
Coppice with standards	6	0%	119	0%
Shrub	116	0%	4,616	0%
Assumed woodland	1,367	1%	33,297	3%
Low density	481	0%	1,572	0%
Cloud/shadow/uncertain	0	0%	13	0%
Totals	**213,372**	**100%**	**1,079,000**	**100%**
Scotland				
Broadleaved	13,678	3%	177,166	20%
Conifer	344,462	72%	470,402	52%
Felled	54,139	11%	42,982	5%
Ground prep	10,234	2%	22,109	2%
Mixed mainly broadleaved	2,283	0%	14,936	2%
Mixed mainly conifer	2,299	0%	12,252	1%
Young trees	41,444	9%	68,958	8%
Coppice	0	0%	4	0%
Coppice with standards	0	0%	0	0%
Shrub	300	0%	3,552	0%
Assumed woodland	10,079	2%	90,784	10%
Low density	166	0%	1,144	0%
Cloud/shadow/uncertain	4	0%	33	0%
Totals	**479,087**	**100%**	**904,323**	**100%**
Wales				
Broadleaved	6,623	6%	108,452	57%
Conifer	73,440	64%	49,703	26%
Felled	15,191	13%	6,184	3%
Ground prep	1,447	1%	1,748	1%
Mixed mainly broadleaved	1,472	1%	4,636	3%
Mixed mainly conifer	1,256	1%	4,796	3%
Young trees	14,237	12%	8,103	4%
Coppice	0	0%	12	0%
Coppice with standards	0	0%	0	0%
Shrub	133	0%	845	1%
Assumed woodland	712	1%	4,012	2%
Low density	319	0%	250	0%
Cloud/shadow/uncertain	0	0%	1	0%
Totals	**114,828**	**100%**	**188,744**	**100%**

Table 5. Continued

Forest type	Forestry Commission		Other ownership	
	Area (ha)	% of total area	Area (ha)	% of total area
Great Britain				
Broadleaved	63,945	8%	1,026,832	47%
Conifer	544,391	67%	709,550	33%
Felled	80,316	10%	58,168	3%
Ground prep	15,441	2%	28,781	1%
Mixed mainly broadleaved	5,927	1%	39,243	2%
Mixed mainly conifer	6,313	1%	42,446	2%
Young trees	77,116	10%	124,921	6%
Coppice	159	0%	1,886	0%
Coppice with standards	6	0%	119	0%
Shrub	548	0%	9,013	0%
Assumed woodland	12,157	2%	128,093	6%
Low density	966	0%	2,966	0%
Cloud/shadow/uncertain	4	0%	47	0%
Totals	**807,288**	**100%**	**2,172,066**	**100%**

Figure 5. Summary of woodland area by interpreted forest type and ownership (size relative to total woodland area GB)

England   Scotland   Wales   Great Britain

Broadleaved	Coppice with standards	Mixed mainly broadleaved
Conifer	Shrub	Mixed mainly conifer
Felled	Assumed woodland	
Young trees	Low density	
Coppice	Ground prep	
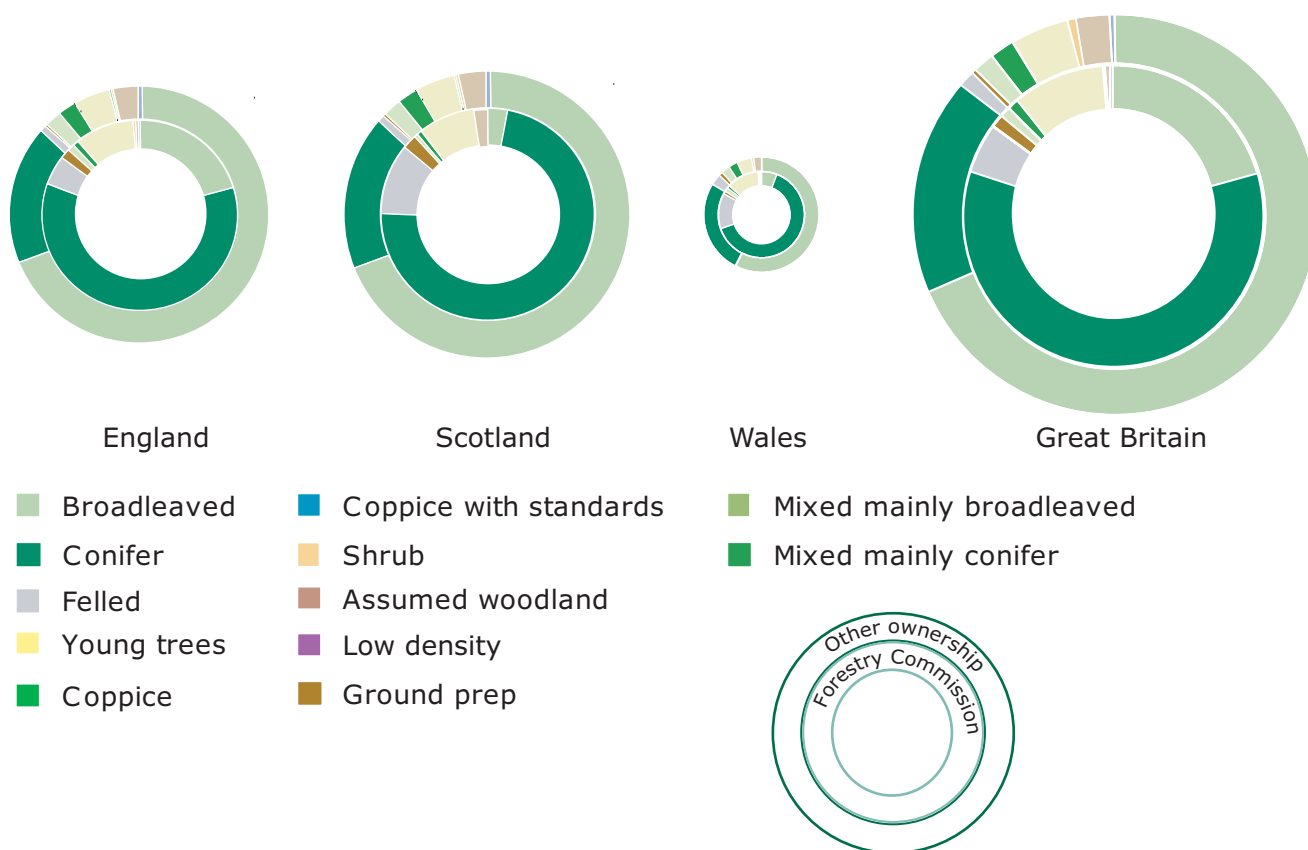
Other ownership
Forestry Commission

Table 6. Woodland area by ownership, interpreted forest type and size

Forest type	2 ha and over		0.5 - < 2 ha		Total area (ha)
	Forestry Commission	Other	Forestry Commission	Other	
England					
Broadleaved	43,433	632,648	211	108,566	784,858
Conifer	126,441	178,070	48	11,374	315,933
Felled	10,983	8,792	3	209	19,987
Ground prep	3,756	4,579	3	345	8,683
Mixed mainly broadleaved	2,163	15,108	8	4,563	21,842
Mixed mainly conifer	2,743	20,947	15	4,452	28,156
Young trees	21,388	40,420	47	7,440	69,294
Coppice	159	1,838	0	33	2,030
Coppice with standards	6	115	0	4	125
Shrub	108	3,215	7	1,401	4,732
Assumed woodland	1,275	25,512	91	7,785	34,664
Low Density	480	1,524	1	48	2,053
Cloud/shadow/uncertain	0	13	0	0	13
Totals	**212,937**	**932,780**	**435**	**146,219**	**1,292,372**
Scotland					
Broadleaved	13,388	157,020	290	20,146	190,844
Conifer	344,052	460,559	410	9,843	814,864
Felled	54,118	42,667	21	316	97,121
Ground prep	10,205	21,844	29	265	32,343
Mixed mainly broadleaved	2,263	12,686	20	2,249	17,219
Mixed mainly conifer	2,280	10,328	19	1,923	14,551
Young trees	41,389	66,638	55	2,321	110,403
Coppice	0	4	0	0	4
Coppice with standards	0	0	0	0	0
Shrub	291	2,535	9	1,017	3,851
Assumed woodland	9,694	86,028	385	4,757	100,863
Low Density	166	1,130	0	14	1,310
Cloud/shadow/uncertain	4	31	0	2	37
Totals	**477,850**	**861,469**	**1,237**	**42,853**	**1,383,410**
Wales					
Broadleaved	6,604	91,757	19	16,695	115,075
Conifer	73,399	48,005	41	1,698	123,143
Felled	15,186	6,129	5	55	21,375
Ground prep	1,447	1,725	0	23	3,195
Mixed mainly broadleaved	1,470	3,779	2	857	6,108
Mixed mainly conifer	1,250	4,160	5	636	6,052
Young trees	14,233	7,691	4	411	22,340
Coppice	0	12	0	0	12
Coppice with standards	0	0	0	0	0
Shrub	133	593	0	252	978
Assumed woodland	699	3,243	13	769	4,724
Low Density	319	242	0	8	569
Cloud/shadow/uncertain	0	1	0	0	1
Totals	**114,738**	**167,339**	**90**	**21,405**	**303,572**

Table 6. Continued

Forest type	2 ha and over		0.5 - < 2 ha		Total area (ha)
	Forestry Commission	Other	Forestry Commission	Other	
Great Britain					
Broadleaved	63,425	881,425	519	145,407	1,090,777
Conifer	543,892	686,634	499	22,915	1,253,941
Felled	80,287	57,588	29	580	138,484
Ground prep	15,408	28,148	33	633	44,222
Mixed mainly broadleaved	5,897	31,573	30	7,670	45,169
Mixed mainly conifer	6,273	35,435	39	7,011	48,759
Young trees	77,010	114,749	106	10,172	202,037
Coppice	159	1,853	0	33	2,046
Coppice with standards	6	115	0	4	125
Shrub	532	6,343	16	2,670	9,562
Assumed woodland	11,668	114,783	489	13,310	140,250
Low Density	966	2,896	1	70	3,933
Cloud/shadow/uncertain	4	45	0	2	51
Totals	**805,526**	**1,961,589**	**1,761**	**210,477**	**2,979,354**

Note for Table 6. Some woods may consist of both Forestry Commission and other ownership. Dividing woods by ownership can generate part woods of less than 2 hectares, where the whole wood without the division may be greater than 2 hectares in extent. Such part woods are classified in Table 6 according to the size of the entire woodland.

NFI 2011 woodland map

Size class (ha)	Total area (ha)	Total number of woods	% of total area	Mean wood area (ha)	Broadleaved woodland class	% Area	Number of woods	Conifer woodland class	% Area	Number of woods
England										
<2	146,655	151,717	11%	1	113,385	14%	116,681	15,889	5%	16,165
2 - <10	263,526	63,267	20%	4	199,567	25%	58,308	35,149	10%	15,834
10 - <20	131,162	9,410	10%	14	97,490	12%	12,325	20,870	6%	6,097
20 - <50	188,922	6,166	15%	31	132,843	16%	11,747	39,122	11%	8,367
50 - <100	149,188	2,157	12%	69	95,774	12%	7,227	41,229	12%	6,426
100 - <500	264,421	1,423	20%	186	137,881	17%	10,780	102,403	30%	9,925
500 and >	148,497	123	11%	1,207	31,914	4%	2,998	89,429	26%	2,627
All woods	**1,292,372**	**234,263**	**100%**	**6**	**808,855**	**100%**	**220,066**	**344,090**	**100%**	**65,441**
Scotland										
<2	44,090	47,373	3%	1	22,705	11%	24,212	12,195	1%	12,351
2 - <10	92,890	21,607	7%	4	41,284	20%	14,167	32,076	4%	11,444
10 - <20	56,403	4,041	4%	14	20,852	10%	3,933	22,300	3%	3,992
20 - <50	98,546	3,139	7%	31	30,102	14%	4,427	44,039	5%	4,838
50 - <100	95,051	1,357	7%	70	18,971	9%	2,857	50,924	6%	3,270
100 - <500	294,396	1,409	21%	209	36,734	18%	5,654	183,551	22%	6,159
500 and >	702,034	429	51%	1,636	37,419	18%	8,280	484,330	58%	8,060
All woods	**1,383,410**	**79,355**	**100%**	**17**	**208,067**	**100%**	**63,530**	**829,414**	**100%**	**50,114**
Wales										
<2	21,494	21,880	7%	1	17,573	15%	18,194	2,381	2%	2,570
2 - <10	41,185	9,751	14%	4	32,314	27%	9,457	5,715	4%	2,423
10 - <20	23,379	1,688	8%	14	16,200	13%	2,403	4,851	4%	1,214
20 - <50	35,859	1,168	12%	31	20,413	17%	2,524	10,845	8%	1,789
50 - <100	29,153	425	10%	69	13,563	11%	1,827	11,402	9%	1,405
100 - <500	61,245	315	20%	194	14,561	12%	2,556	33,708	26%	2,135
500 and >	91,257	74	30%	1,233	6,571	5%	1,889	60,293	47%	1,652
All woods	**303,572**	**35,301**	**100%**	**9**	**121,195**	**100%**	**38,850**	**129,195**	**100%**	**13,188**
Great Britain										
<2	212,238	220,834	7%	1	153,663	14%	159,087	30,465	2%	31,086
2 - <10	397,601	94,559	13%	4	273,166	24%	81,932	72,940	6%	29,701
10 - <20	210,943	15,114	7%	14	134,542	12%	18,661	48,020	4%	11,303
20 - <50	323,327	10,455	11%	31	183,358	16%	18,698	94,006	7%	14,994
50 - <100	273,393	3,927	9%	70	128,307	11%	11,911	103,555	8%	11,101
100 - <500	620,063	3,135	21%	198	189,176	17%	18,990	319,662	25%	18,219
500 and >	941,788	620	32%	1,519	75,905	7%	13,167	634,052	49%	12,339
All woods	**2,979,354**	**348,644**	**100%**	**9**	**1,138,117**	**100%**	**322,446**	**1,302,699**	**100%**	**128,743**

Table 7.
Woodland area by size class distribution

NFI 2011 woodland map

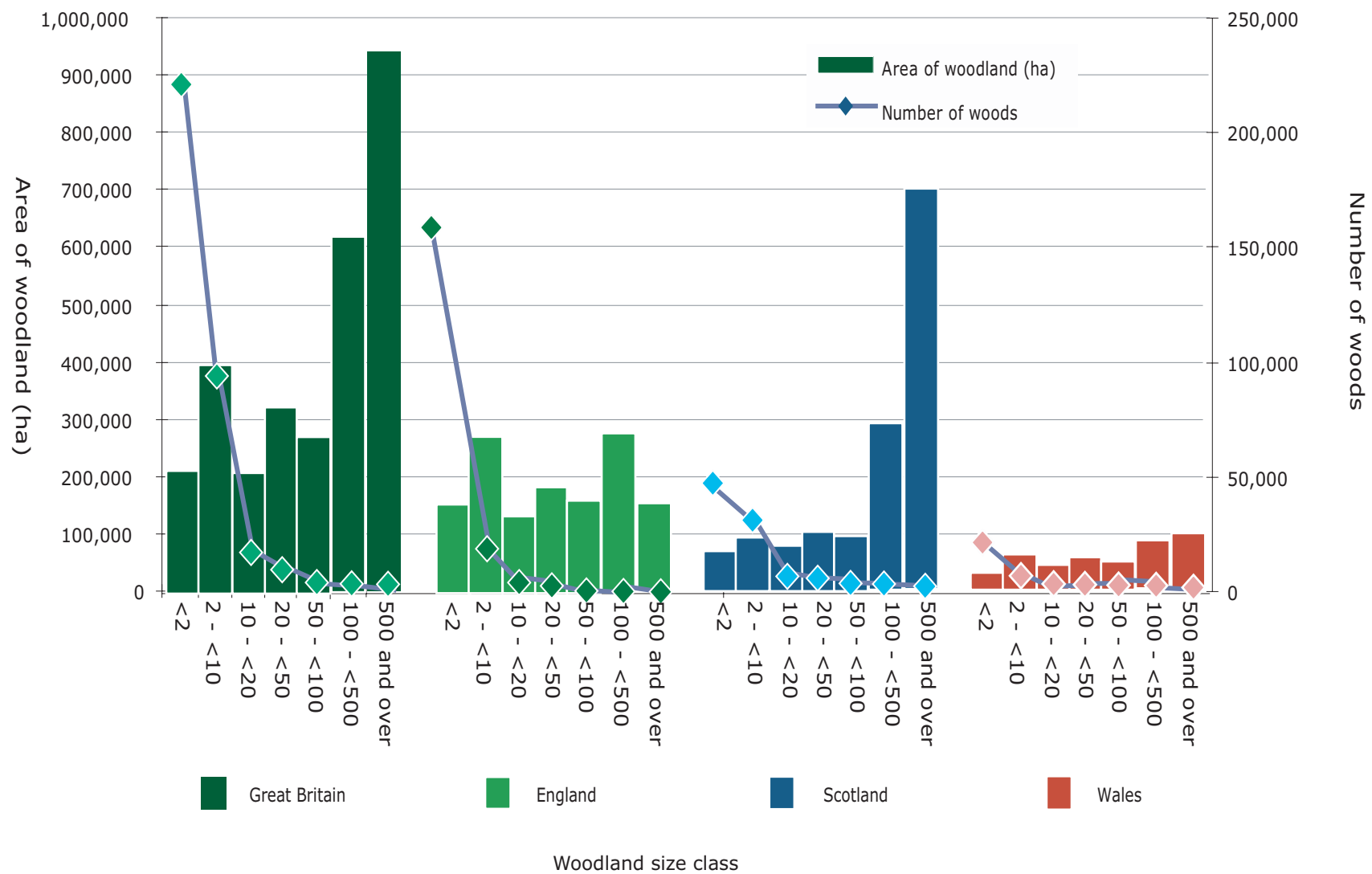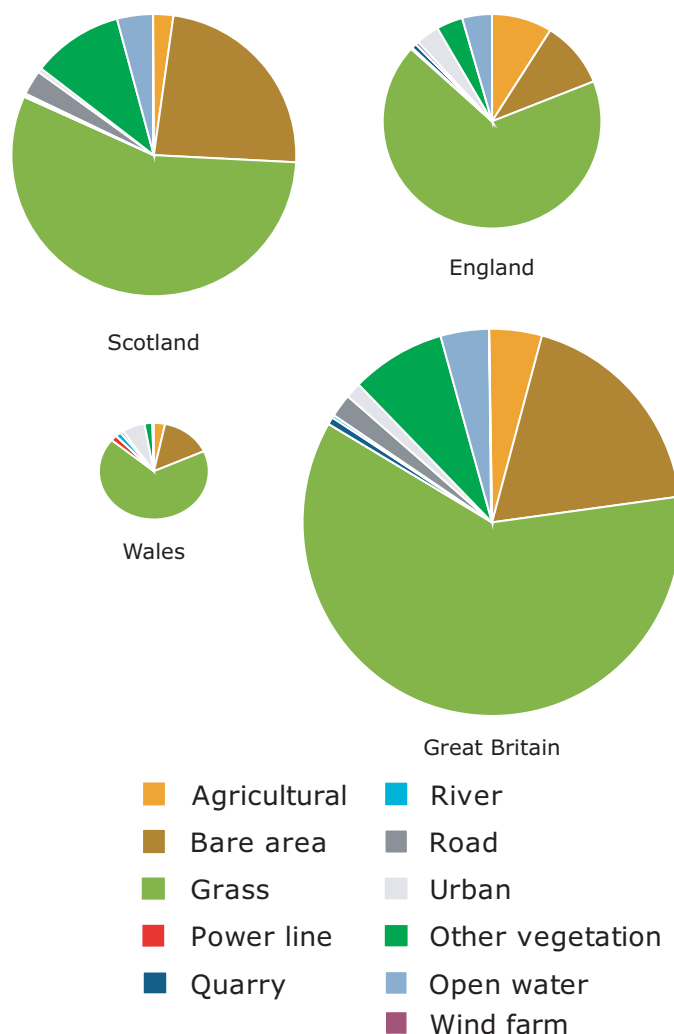**Figure 6.** Summary of woodland area by size class distribution

Table 8. Open areas in woodland by land-use type

Interpreted open area	Total area (ha)	% of total area
England		
Agricultural	2,191	9%
Bare area	2,533	10%
Grass	16,856	68%
Power line	25	0%
Quarry	219	1%
River	15	0%
Road	144	1%
Urban	818	3%
Other vegetation	955	4%
Open water	1,130	5%
Wind farm	0	0%
TOTALS	**24,885**	**100%**
Scotland		
Agricultural	1,013	2%
Bare area	11,249	24%
Grass	26,635	56%
Power line	19	0%
Quarry	113	0%
River	129	0%
Road	1,290	3%
Urban	253	1%
Other vegetation	4,887	10%
Open water	1,957	4%
Wind farm	25	0%
TOTALS	**47,571**	**100%**
Wales		
Agricultural	177	3%
Bare area	792	15%
Grass	3,619	68%
Power line	103	2%
Quarry	1	0%
River	87	2%
Road	40	1%
Urban	356	7%
Other vegetation	139	3%
Open water	8	0%
Wind farm	0	0%
TOTALS	**5,322**	**100%**

Interpreted open area	Total area (ha)	% of total area
Great Britain		
Agricultural	3,381	4%
Bare area	14,573	19%
Grass	47,110	61%
Power line	146	0%
Quarry	334	1%
River	232	0%
Road	1,474	2%
Urban	1,427	1%
Other vegetation	5,981	8%
Open water	3,095	4%
Wind farm	25	0%
TOTALS	**77,777**	**100%**

Figure 7. Summary of open areas in woodland by land-use type (size relative to total mapped open area of GB)

Scotland

England

Wales

Great Britain

- Agricultural
- Bare area
- Grass
- Power line
- Quarry
- River
- Road
- Urban
- Other vegetation
- Open water
- Wind farm

Section 2 - Summary of differences between NFI 2010 and NFI 2011 woodland areas for GB

The total woodland area on the 2011 NFI woodland map of GB is 2,979,354 hectares. The published NFI woodland area for GB for 2010 (National Forest Inventory Woodland Area Statistics: GB, NFI, 26 May 2011) was 2,982,300 hectares. After further correction and processing, the published 2010 woodland map contained a total woodland area of 2,970,475 hectares. The change in mapped woodland area from the 2010 to the 2011 woodland maps was 8,879 hectares. Some of this change is attributable to real change in the intervening period and other to corrections and improvements made to the map. Tables 9 and 10 provide an overall summary of these differences, and Tables 11, 12 and 13 provide more detail on the comparison of areas in the 2010 and 2011 versions of the NFI woodland maps.

Table 9. Comparison between 2010 and 2011 NFI woodland maps

Woodland type	2010 Area (ha)	%	2011 Area (ha)	%	Difference
England					
Woodland	1,257,245	95%	1,255,654	95%	-1,591
Assumed woodland	33,766	3%	34,664	3%	898
Low density	1,254	0%	2,053	0%	799
Mapped non woodland	24,599	2%	24,885	2%	286
Total mapped area	**1,316,864**	**100%**	**1,317,256**	**100%**	**392**
% woodland land cover		**10%**		**10%**	
Scotland					
Woodland	1,281,378	90%	1,281,236	90%	-141
Assumed woodland	92,983	7%	100,863	7%	7,880
Low density	727	0%	1,310	0%	584
Mapped non woodland	42,265	3%	47,570	3%	5,305
Total mapped area	**1,417,352**	**100%**	**1,430,980**	**100%**	**13,628**
% woodland land cover		**18%**		**18%**	
Wales					
Woodland	298,617	97%	298,280	97%	-337
Assumed woodland	4,108	1%	4,723	2%	615
Low density	397	0%	569	0%	172
Mapped non woodland	5,296	2%	5,322	2%	26
Total mapped area	**308,419**	**100%**	**308,894**	**100%**	**476**
% woodland land cover		**15%**		**15%**	
Great Britain					
Woodland	2,837,239	93%	2,835,170	93%	-2,069
Assumed woodland	130,858	4%	140,251	5%	9,393
Low density	2,378	0%	3,933	0%	1,555
Mapped non woodland	72,160	2%	77,777	3%	5,618
Total mapped area	**3,042,634**	**100%**	**3,057,131**	**100%**	**14,497**
% woodland land cover		**13%**		**13%**	

Note for Table 9. The net area of the woodland category removed from the 2010 map as part of the 2011 map update is 4,516 hectares. Of that area 410 hectares were due to land use change, 129 hectares was cleaned from the assumed woodland and the remaining 3,977 hectares were due to NFI error identified by the remote sensing and NIWT comparison analysis. The remaining balance of the difference in the woodland category is due to woodland being reclassified between the other categories based upon the remote sensing work, comparison analysis and the aerial photography update work. The net differences are summarised in tables 11 to 13.

NFI 2011 woodland map

Table 10. Differences in woodland area between NFI 2010 and NFI 2011 woodland map published areas

Type of change	2010 area (ha)	2011 area (ha)	Difference
Great Britain			
Published woodland area (26th May 2011)	2,982,300		
Removal of border polygons	-5,226		
Removal of duplicate polygons	-4,040		
Addition of missed base map polygons	1,940		
Deduction of assumed woodland area from non spatial records	-4,500		
Mapped woodland	2,970,474	2,979,354	8,879
Mapped non woodland (IOAs)	72,160	77,777	5,618
Total mapped area	**3,042,634**	**3,057,131**	**14,497**

Note for table 10. 4,500 hectares have been deducted to take account of the non-spatial element of paid grant schemes included in the published woodland area. This element is now available as spatial data and has been included in the 2011 update of the woodland map.

Table 11. Summary of area removed from the 2010 woodland map for GB

Woodland source	Source area (ha)	Woodland type	Type area (ha)
Great Britain			
Base map corrections	2,944	Non woodland	61
		Woodland	2,883
NIWT comparison validation	1,504	Low density	965
		Woodland	539
Validated grant schemes	129	Assumed woodland	129
Total	**4,577**		**4,577**

Table 12. Summary of area added to the 2010 woodland map for GB

	Source area (ha)	Woodland type	Type area (ha)
Great Britain			
Remote sensing	61	Woodland	58
		Low density	2
Aerial photography update	3,112	woodland	705
		Low density	156
		Non woodland	2,251
NIWT comparison validation	3,493	woodland	2,057
		Low density	1,007
		Non woodland	429
Validated grant schemes	11,632		
		Assumed woodland	11,632
Additional mapping	776	woodland	12
		Low density	2
		Non woodland	762
Total	**19,074**		**19,074**

Table 13. Summary of changes between NFI 2010 and NFI 2011

	NFI 2010 Area (ha)	NFI 2011 Area (ha)
Great Britain		
Total mapped area 2010	3,042,634	
Deducted from NFI 2010	4,577	
Added to NFI 2010	19,074	
Total mapped area 2011		3,057,131

Section 3 - Summary of differences between NIWT (1995-1998) and NFI (2011) woodland maps for GB

NIWT did not differentiate between 'mixed mainly conifer' and 'mixed mainly broadleaved' forest types and therefore in the following tables both NFI forest types have been included as 'mixed'. NFI 'assumed woodland' has been included with NFI 'young trees' and NFI 'low density' has been included with NFI 'shrub'. Tables 14 to 18 and Figures 8 and 9 summarise the differences in area based on interpreted forest type. Tables 16 to 18 provide an overall summary of the changes in area between the two maps.

Tables 14 and 15 compare the woodland area breakdown derived from the NIWT woodland map of 2 hectares and over, and the 2 hectares and over element of the NFI woodland map. The woodland maps, which are based upon interpreted forest type, are derived from interpretation of aerial photography. Mapped interpreted forest types provide the location, scale and distribution of woodland types; however, this process results in a different distribution of woodland types and open areas to that derived from the ground assessments. The more precise ground survey identifies areas, woodland type and species more accurately than interpretation of aerial photography for a specific area. Statistical techniques are used to integrate the results arising from mapping and fieldwork to derive improved final estimates of woodland composition. This results in a more accurate quantification of woodland area and composition across large areas.

Note for Tables 14 to 18 and Figures 8 to 9. The reference dates for NIWT at country level are; 1995 for Scotland, 1997 for Wales and 1998 for England. The range of dates of photography used for mapping are explained in Appendix A and illustrated in Appendix C.

Table 14. Differences in woodland area by interpreted forest type between NIWT (1995-1998) release and NFI (2011) (based on woodlands 2 hectares and over)

Forest Type	NIWT - 1998 Inventory		NFI - 2011 Inventory		Difference NFI-NIWT
	Area (ha)	%	Area (ha)	%	
England					
Broadleaved	481,680	47%	676,081	59%	194,401
Conifer	301,049	29%	304,511	27%	3,462
Felled	37,700	4%	19,775	2%	-17,925
Ground prep	4,055	0%	8,335	1%	4,280
Mixed	139,417	14%	40,960	4%	-98,456
Young trees	38,452	4%	88,595	8%	50,143
Coppice	10,656	1%	1,997	0%	-8,659
Coppice with standards	2,305	0%	120	0%	-2,185
Shrub	14,816	1%	5,328	0%	-9,488
Cloud/shadow/uncertain	0	0%	13	0%	13
Total	**1,030,130**	**100%**	**1,145,717**	**100%**	**115,587**
% of land area	**8%**		**9%**		

Table 14. Continued

Forest Type	NIWT - 1998 Inventory		NFI - 2011 Inventory		Difference NFI-NIWT
	Area (ha)	%	Area (ha)	%	
Scotland					
Broadleaved	103,868	8%	170,408	13%	66,540
Conifer	627,815	50%	804,611	60%	176,796
Felled	31,090	2%	96,785	7%	65,694
Ground prep	153,958	12%	32,049	2%	-121,909
Mixed	88,313	7%	27,558	2%	-60,755
Young trees	242,915	19%	203,748	15%	-39,166
Coppice	0	0%	4	0%	4
Coppice with standards	0	0%	0	0%	0
Shrub	7,831	1%	4,122	0%	-3,710
Cloud/shadow/uncertain	0	0%	35	0%	35
Total	**1,255,791**	**100%**	**1,339,320**	**100%**	**83,529**
% of land area	**16%**		**17%**		
Wales					
Broadleaved	79,138	29%	98,361	35%	19,222
Conifer	138,835	51%	121,404	43%	-17,431
Felled	15,391	6%	21,315	8%	5,924
Ground prep	334	0%	3,172	1%	2,838
Mixed	16,364	6%	10,659	4%	-5,705
Young trees	17,166	6%	25,866	9%	8,700
Coppice	0	0%	12	0%	12
Coppice with standards	0	0%	0	0%	0
Shrub	4,233	2%	1,287	0%	-2,945
Cloud/shadow/uncertain	0	0%	1	0%	1
Total	**271,461**	**100%**	**282,079**	**100%**	**10,616**
% of land area	**13%**		**14%**		
Great Britain					
Broadleaved	664,686	26%	944,850	34%	280,164
Conifer	1,067,700	42%	1,230,526	44%	162,826
Felled	84,181	3%	137,875	5%	53,694
Ground prep	158,347	6%	43,556	2%	-114,790
Mixed	244,093	10%	79,178	3%	-164,915
Young trees	298,533	12%	318,210	11%	19,676
Coppice	10,656	0%	2,013	0%	-8,643
Coppice with standards	2,305	0%	120	0%	-2,185
Shrub	26,881	1%	10,737	0%	-16,143
Cloud/shadow/uncertain	0	0%	49	0%	49
Total	**2,557,383**	**100%**	**2,767,116**	**100%**	**209,733**
% of land area	**11%**		**12%**		

NFI 2011 woodland map

Figure 8. Summary of differences in woodland area by interpreted forest type between NIWT 1995-1998 and NFI 2011 (based on woodlands 2 hectares and over)
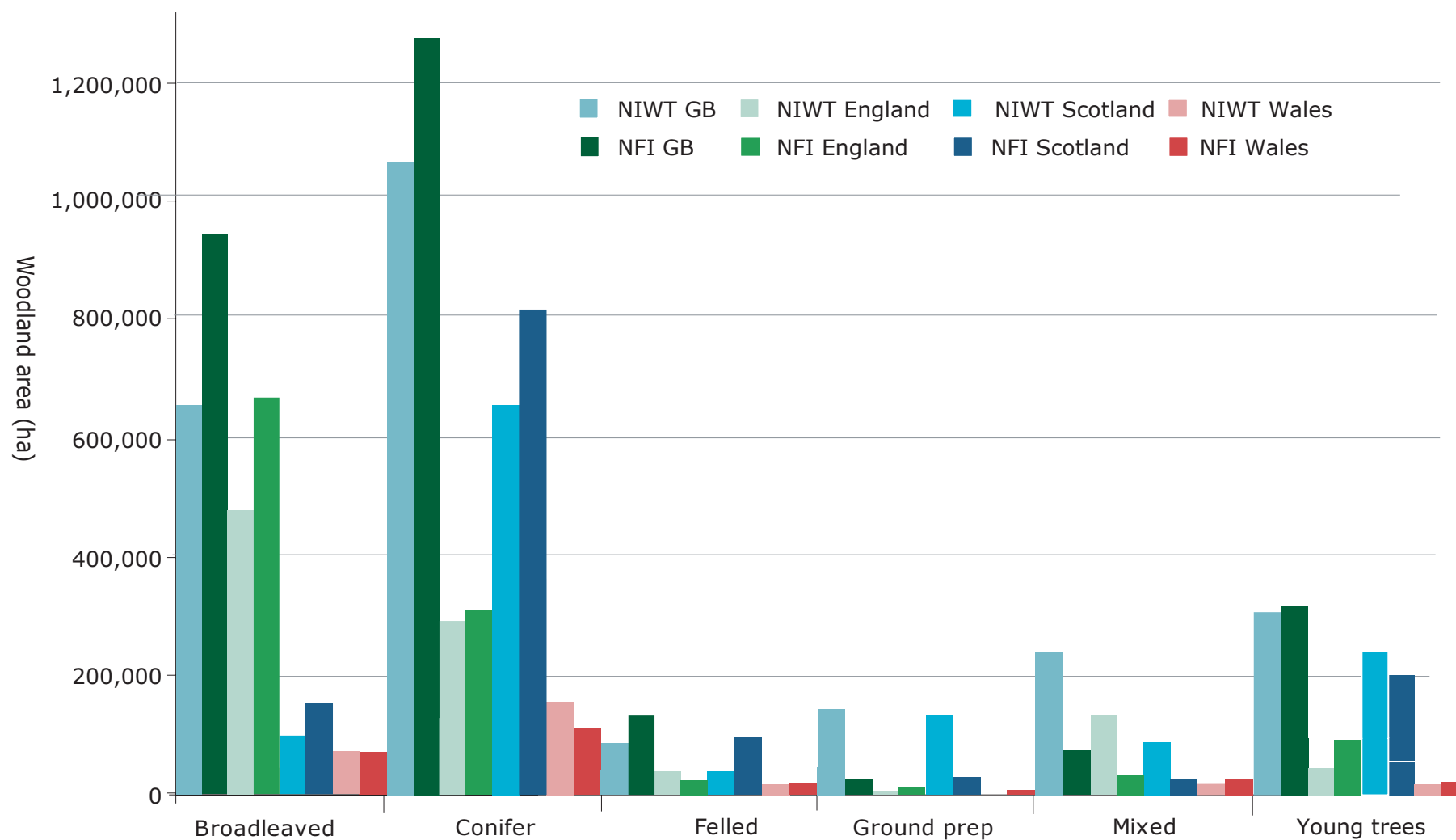
NFI 2011 woodland map

Table 15. Differences in woodland area by interpreted forest type and ownership between NIWT (1995-1998) release and NFI 2011 (based on woodlands 2 hectares and over)

Forest type	NIWT - 1995 to 1998 Inventory		NFI - 2011 Inventory		Difference from NIWT to NFI	
Area (ha)	Forestry Commission	Other ownership	Forestry Commission	Other ownership	Forestry Commission	Other ownership
England						
Broadleaved	28,910	452,770	43,433	632,648	14,524	179,878
Conifer	143,798	157,252	126,441	178,070	-17,356	20,818
Felled	12,203	25,497	10,983	8,792	-1,220	-16,704
Ground prep	3,550	504	3,756	4,579	206	4,074
Mixed	17,004	122,413	4,906	36,054	-12,098	-86,358
Young trees	16,377	22,075	22,663	65,932	6,286	43,858
Coppice	871	9,786	159	1,838	-711	-7,948
Coppice with standards	37	2,268	6	115	-32	-2,153
Shrub	483	14,333	589	4,739	106	-9,594
Cloud/shadow/uncertain	0	0	0	13	0	13
Total	**223,233**	**806,898**	**212,937**	**932,780**	**-10,296**	**125,883**
% of land cover	**2%**	**6%**	**2%**	**7%**		
Scotland						
Broadleaved	5,790	98,078	13,388	157,020	7,598	58,942
Conifer	346,423	281,392	344,052	460,559	-2,371	179,167
Felled	19,063	12,027	54,118	42,667	35,055	30,639
Ground prep	44,042	109,916	10,205	21,844	-33,837	-88,072
Mixed	11,403	76,910	4,544	23,015	-6,859	-53,896
Young trees	111,373	131,542	51,083	152,665	-60,290	21,123
Coppice	0	0	0	4	0	4
Coppice with standards	0	0	0	0	0	0
Shrub	187	7,644	457	3,665	270	-3,979
Cloud/shadow/uncertain	0	0	4	31	4	31
Total	**538,281**	**717,510**	**477,850**	**861,469**	**-60,431**	**143,960**
% of land cover	**7%**	**9%**	**6%**	**11%**		

NFI 2011 woodland map

Table 15. Continued

Forest type	NIWT - 1995 to 1998 Inventory		NFI - 2011 Inventory		Difference from NIWT to NFI	
Area (ha)	Forestry Commission	Other ownership	Forestry Commission	Other ownership	Forestry Commission	Other ownership
wales						
Broadleaved	3745	75394	6604	91757	2,859	16,364
Conifer	90985	47850	73399	48005	-17,586	155
Felled	10320	5071	15186	6129	4,866	1,058
Ground prep	237	98	1447	1725	1,210	1,628
Mixed	3528	12836	2720	7939	-808	-4,897
Young trees	10773	6394	14931	10935	4,159	4,541
Coppice	0	0	0	12	0	12
Coppice with standards	0	0	0	0	0	0
Shrub	441	3792	452	835	11	-2,957
Cloud/shadow/uncertain	0	0	0	1	0	1
Total	**120026**	**151435**	**114738**	**167339**	**-5,288**	**15,904**
% of land cover	**6%**	**7%**	**6%**	**8%**		
Great Britain						
Broadleaved	38,445	626,242	63,425	881,425	24,980	255,184
Conifer	581,205	486,494	543,892	686,634	-37,313	200,140
Felled	41,586	42,595	80,287	57,588	38,702	14,993
Ground prep	47,829	110,517	15,408	28,148	-32,421	-82,369
Mixed	31,934	212,159	12,170	67,008	-19,764	-145,151
Young trees	138,523	160,010	88,678	229,532	-49,845	69,522
Coppice	871	9,786	159	1,853	-711	-7,932
Coppice with standards	37	2,268	6	115	-32	-2,153
Shrub	1,111	25,770	1,498	9,239	387	-16,531
Cloud/shadow/uncertain	0	0	4	45	4	45
Total	**881,540**	**1,675,842**	**805,526**	**1,961,589**	**-76,014**	**285,747**
% of land cover	**4%**	**7%**	**4%**	**9%**		

Table 16. Additions: Post NIWT afforestation and existing woodland not identified in NIWT (based on woodlands 2 hectares and over)

Type of update	Update area (ha)	Woodland type	Type area (ha)	IFT/IOA	IFT/IOA area (ha)
Great Britain					
Remote sensing	1,191	Woodland	1,030	Broadleaved	15
				Conifer	2
				Felled	971
				Mixed mainly broadleaved	0
				Mixed mainly conifer	1
				Young trees	40
		Low density	160	Low density	160
Aerial photography update	746	Woodland	537	Broadleaved	226
				Conifer	21
				Felled	15
				Ground prep	7
				Mixed mainly broadleaved	18
				Mixed mainly conifer	9
				Young trees	213
				Shrub	30
		Low density	209	Low density	209
Validated potential change polygons	1,283	Woodland	617	Broadleaved	120
				Conifer	13
				Felled	374
				Ground prep	4
				Mixed mainly broadleaved	3
				Mixed mainly conifer	1
				Young trees	76
				Shrub	25
		Low density	666	Low Density	666
Assumed woodland	111,732	Assumed woodland	111,732	Assumed woodland	111,732
Additional woodland mapped as NFI but not identified in NIWT	411,031	Woodland	411,031	Broadleaved	219,283
				Conifer	82,979
				Felled	3,287
				Ground prep	14,344
				Mixed mainly broadleaved	8,358
				Mixed mainly conifer	8,504
				Young trees	69,777
				Coppice	307
				Coppice with standards	17
				Shrub	4,150
				Cloud/shadow/uncertain	24
	525,982		**525,982**		**525,982**

NFI 2011 woodland map

Table 17. Deletions: Areas mapped as woodland in NIWT but not identified as woodland by NFI
(based on woodlands 2 hectares and over)

NIWT IFT	Area (ha)
Great Britain	
Broadleaved	119,845
Conifer	65,911
Coppice	625
Coppice with standards	105
Felled	11,531
Ground prep	24,990
Mixed	35,096
Shrub	12,253
Young trees	45,894
Total	**316,250**

Table 18. Summary of change between NIWT 1995-1998 and NFI 2011

	NIWT 1998	NFI 2011
Great Britain		
Total woodland area	2,557,383	
Deducted from NIWT 1998	316,249	
Added post NIWT		525,982
Total		**2,767,116**

Figure 9. Summary of net changes from NIWT to NFI
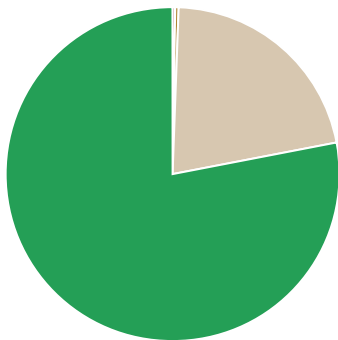
Table 16 (additions)
categorised by source of update

- Remote sensing
- Aerial photography update
- Validate potential change polygons
- Assumed woodland
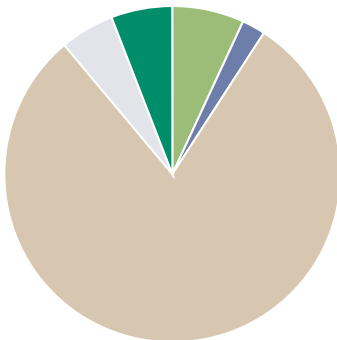- Additional woodland mapped as NFI but not identified in NIWT

Table 17 (deletions)
categorised by type of change

- Grant schemes (no visible trees)
- Land-use change
- Methodology differences
- Not yet categorised
- NIWT error

Section 4 - Interpreted forest types and stocked areas

The recently published *Standing timber volume for coniferous trees in Britain* report includes estimates of stocked areas of principal conifer species and of all conifers in GB in Table 1 of the document. This is reproduced here in Table 19 and summarised in Figure 10. The Forestry Commission stocked areas have been derived from information in the sub-compartment database, while those for other woodlands have been determined from results of the NFI field sample to date combined with information from the 2011 NFI woodland map. In the latter case, since they are based on a sample of woodland, the estimates are shown with associated sampling standard errors. The *Standing timber volume for coniferous trees in Britain* report also provides details of the methods used in the derivation of these estimates, which, in the case of 'other' woodland, has used the combined information within the NFI field sample and the NFI map, as described in that document.

More information on the details of the NFI field sample operation and the use of the data from this in the derivation of country or regional estimates can be found at www.forestry.gov.uk/inventory.
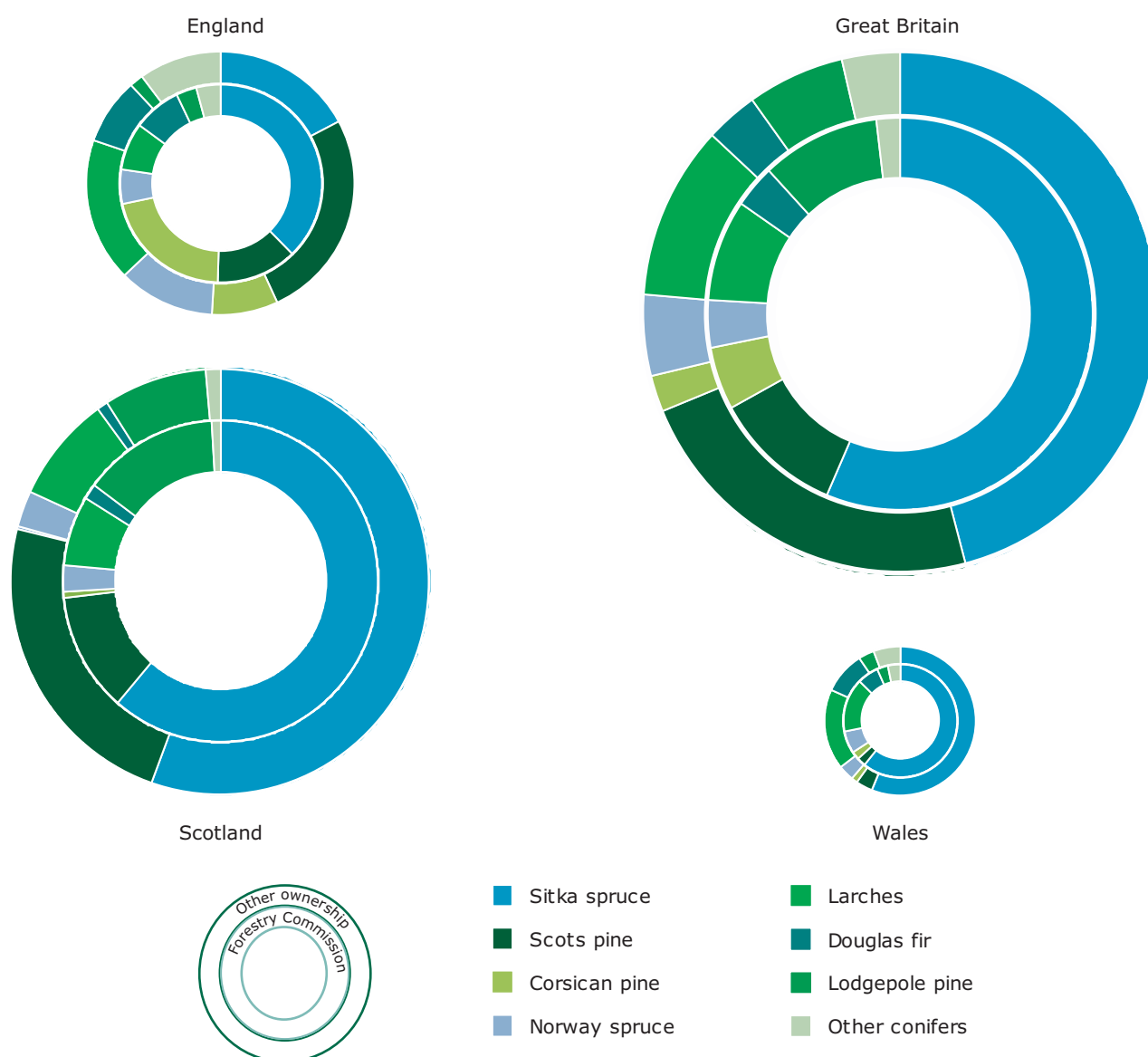
Table 19. Stocked area by principal conifer species for GB

Principal species	FC Area (000 ha)	Other Area (000 ha)	SE%	Total Area (000 ha)	Principal species	FC Area (000 ha)	Other Area (000 ha)	SE%	Total Area (000 ha)
England					**Wales**				
All conifers	**127.5**	**192.6**	*2*	**320.1**	**All conifers**	**81.4**	**49.7**	*4*	**131.1**
Sitka spruce	47.8	33.5	*8*	**81.3**	Sitka spruce	49.5	28.0	*8*	**77.5**
Scots pine	16.6	49.9	*6*	**66.5**	Scots pine	2.0	1.7	*48*	**3.7**
Corsican pine	27.1	15.8	*11*	**42.9**	Corsican pine	1.9	0.8	*41*	**2.7**
Norway spruce	6.9	22.1	*8*	**29.0**	Norway spruce	5.2	1.6	*35*	**6.8**
Larches	10.1	33.9	*6*	**44.0**	Larches	12.3	8.6	*16*	**21.0**
Douglas fir	9.8	15.6	*10*	**25.4**	Douglas fir	5.0	4.6	*23*	**9.5**
Lodgepole pine	4.5	3.6	*20*	**8.1**	Lodgepole pine	2.6	1.6	*30*	**4.2**
Other conifers	4.8	19.2	*9*	**23.9**	Other conifers	2.9	2.9	*26*	**5.7**
Scotland					**Great Britain**				
All conifers	**374.1**	**532.1**	*1*	**906.2**	**All conifers**	**583.0**	**774.4**	*1*	**1,357.4**
Sitka spruce	229.3	294.0	*2*	**523.3**	Sitka spruce	326.6	355.5	*2*	**682.1**
Scots pine	45.1	126.0	*4*	**171.1**	Scots pine	63.7	177.5	*3*	**241.3**
Corsican pine	1.6	1.4	*41*	**3.0**	Corsican pine	30.6	18.0	*10*	**48.6**
Norway spruce	10.9	15.0	*12*	**25.9**	Norway spruce	23.0	38.6	*7*	**61.6**
Larches	26.4	42.0	*7*	**68.4**	Larches	48.8	84.5	*4*	**133.3**
Douglas fir	5.4	5.1	*19*	**10.5**	Douglas fir	20.1	25.3	*8*	**45.4**
Lodgepole pine	52.1	42.0	*7*	**94.1**	Lodgepole pine	59.1	47.2	*7*	**106.4**
Other conifers	3.3	6.4	*19*	**9.8**	Other conifers	11.0	28.4	*8*	**39.4**

NFI 2011 woodland map

The total stocked area of conifer in Great Britain, according to Table 19 is 1,357,400 hectares. This compares to the total area of conifer IFT on the 2011 NFI map of 1,253,940 hectares. The two estimates are reasonably close because the incidence of conifer species is predominantly to be found within the areas identified as conifer woodland in the aerial photography interpretation used for the construction of the NFI IFT map. However, it is not expected that these areas would be identical since there are important differences in what these estimates represent. In the case of the area of conifer IFT, the differences from the area occupied by conifer species alone are noted in the introduction section 'Understanding the differences between map-based and fieldwork estimates'. In the case of stocked areas, the estimate represents the area occupied by conifer species whether in pure stands of conifer or in stands mixed with broadleaves at the time of the NFI field survey, excluding from the total forest area that occupied by broadleaved species and that which is currently felled with no evidence of a newly planted crop.

Figure 10. Summary of stocked area by principal conifer species for GB (size relative to total stocked area of conifer)

England

Great Britain

Scotland

Wales

Other ownership
Forestry Commission

- Sitka spruce
- Larches
- Scots pine
- Douglas fir
- Corsican pine
- Lodgepole pine
- Norway spruce
- Other conifers

NFI 2011 woodland map

The recently published *Preliminary estimates of quantities of broadleaved species in British woodlands, with special focus on ash* report includes estimates of stocked areas of principal broadleaved species and of all broadleaves in GB in Table 4 of the document. This is reproduced here in Table 20 and summarised in Figure 11.

Table 20. Stocked area by principal broadleaved species for GB

Principal species	FC Area (000 ha)	Other Area (000 ha)	SE%	Total Area (000 ha)	Principal species	FC Area (000 ha)	Other Area (000 ha)	SE%	Total Area (000 ha)
England					**Wales**				
All broadleaves	**50.0**	**835.8**	*1*	**885.8**	**All broadleaves**	**13.6**	**112.6**	*3*	**126.2**
Oak	15.5	163.0	*3*	**178.5**	Oak	2.4	22.5	*10*	**24.9**
Beech	12.7	68.0	*5*	**80.7**	Beech	1.7	6.1	*20*	**7.8**
Sycamore	1.1	80.8	*5*	**81.8**	Sycamore	0.1	9.9	*16*	**9.9**
Ash	2.7	107.7	*4*	**110.4**	Ash	0.4	17.2	*11*	**17.6**
Birch	4.5	93.7	*4*	**98.1**	Birch	1.1	10.3	*13*	**11.4**
Sweet chestnut	0.8	27.0	*9*	**27.8**	Sweet chestnut	0.0	0.4	*77*	**0.5**
Hazel	0.3	68.8	*5*	**69.1**	Hazel	0.0	12.8	*13*	**12.8**
Hawthorn	0.0	49.4	*6*	**49.4**	Hawthorn	0.0	5.4	*20*	**5.4**
Alder	0.5	29.2	*8*	**29.7**	Alder	0.1	9.0	*15*	**9.1**
Willow	0.0	33.0	*8*	**33.0**	Willow	0.0	8.9	*17*	**8.9**
Other broadleaves	12.0	115.2	*4*	**127.2**	Other broadleaves	7.8	10.4	*13*	**18.2**
Scotland					**Great Britain**				
All broadleaves	**27.3**	**237.5**	*2*	**264.9**	**All broadleaves**	**91.0**	**1,185.9**	*1*	**1,276.9**
Oak	2.5	24.1	*11*	**26.6**	Oak	20.4	209.6	*3*	**230.0**
Beech	0.6	13.7	*13*	**14.3**	Beech	14.9	87.8	*5*	**102.7**
Sycamore	0.3	17.6	*15*	**17.9**	Sycamore	1.5	108.2	*4*	**109.6**
Ash	0.4	13.1	*12*	**13.5**	Ash	3.5	138.1	*3*	**141.6**
Birch	9.2	108.5	*4*	**117.8**	Birch	14.8	212.5	*3*	**227.3**
Sweet chestnut	0.0	0.0	*0*	**0.0**	Sweet chestnut	0.8	27.4	*9*	**28.2**
Hazel	0.2	5.7	*20*	**6.0**	Hazel	0.6	87.3	*5*	**87.9**
Hawthorn	0.0	6.0	*21*	**6.0**	Hawthorn	0.0	60.8	*6*	**60.8**
Alder	0.6	13.7	*13*	**14.2**	Alder	1.1	51.9	*6*	**53.1**
Willow	0.0	8.6	*11*	**8.6**	Willow	0.0	50.5	*6*	**50.5**
Other broadleaves	13.5	26.0	*8*	**39.5**	Other broadleaves	33.3	151.6	*3*	**184.9**

The total stocked area of broadleaves in Great Britain according to Table 20 is 1,276,900 hectares. This compares to the total area of broadleaved IFT on the 2011 NFI map of 1,090,777 hectares. The two estimates are reasonably close because the incidence of broadleaved species is predominantly to be found within the areas identified as broadleaved woodland in the aerial photography interpretation used for the construction of the NFI IFT map. However, it is not expected that these areas would be identical since there are important differences in what these estimates represent (as explained above for conifers). In the case of stocked areas, the estimate represents the area occupied by broadleaved species at the time of the NFI field survey, excluding from the total forest area that occupied by conifer species and that which is currently felled with no evidence of a newly planted crop. Figure 12 summarises the differences between the two estimates for conifer and broadeaved woodland types.

Figure 11. Summary of stocked area by principal broadleaved species for GB (size relative to total woodland area)
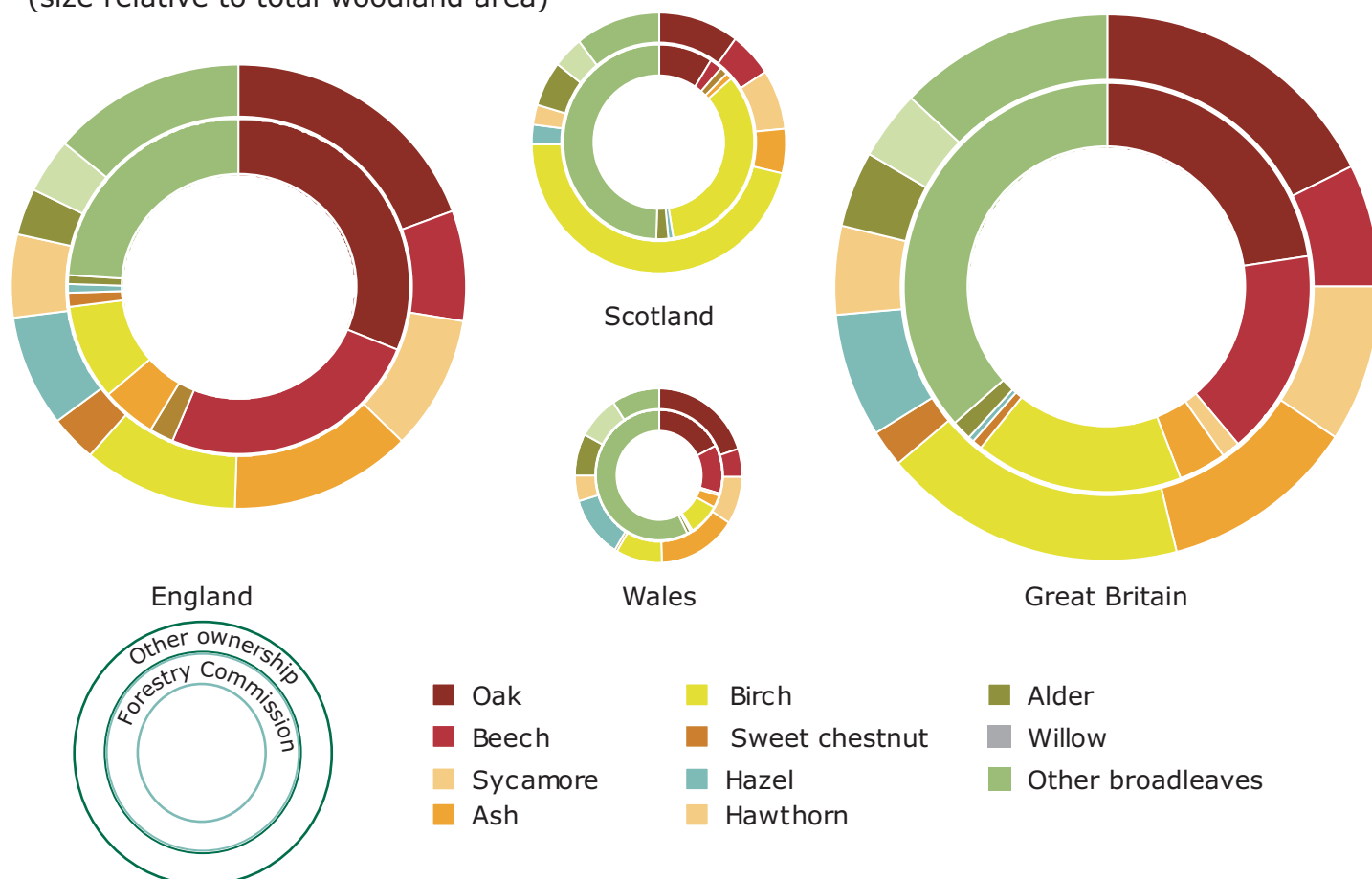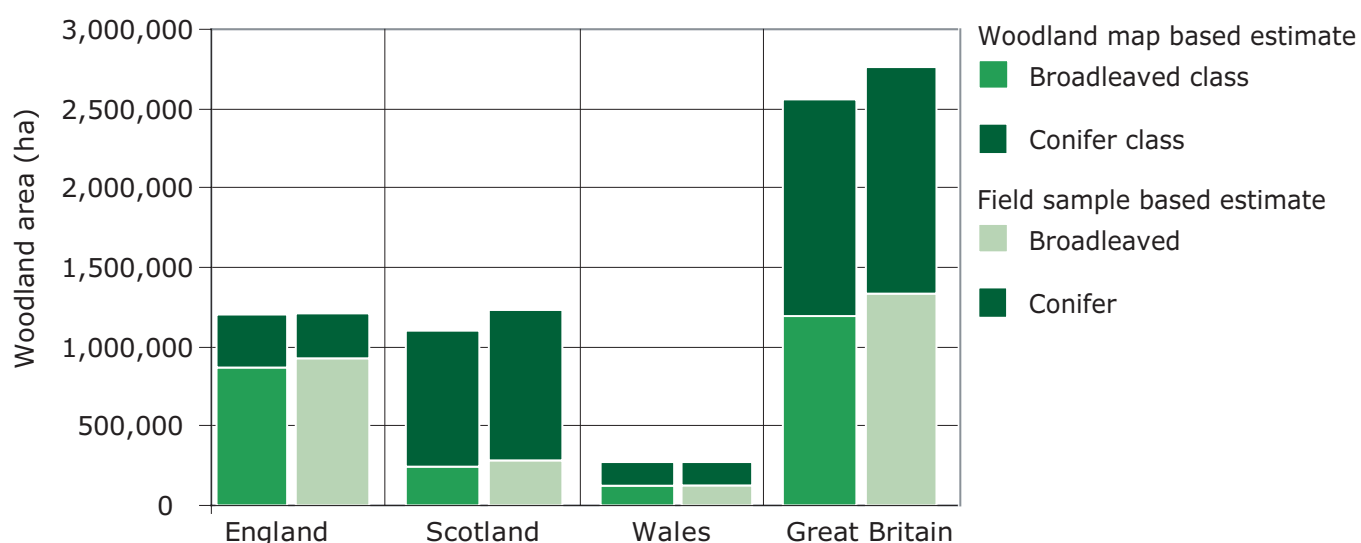

Scotland

England

Wales

Great Britain

Other ownership

Forestry Commission

■ Oak	■ Birch	■ Alder
■ Beech	■ Sweet chestnut	■ Willow
■ Sycamore	■ Hazel	■ Other broadleaves
■ Ash	■ Hawthorn	

Figure 12. Comparison of mapped area estimates and stocked area estimates for GB

Woodland map based estimate
■ Broadleaved class
■ Conifer class

Field sample based estimate
■ Broadleaved
■ Conifer

Note for Figure 12. Mapped IFT classes in the woodland map based estimates;
• Broadleaved class includes broadleaved, mixed mainly broadleaved, coppice & coppice with standards.
• Conifer class includes conifer & mixed mainly conifer.
The transition class (not included in this table), includes young trees which have been included in the field based estimate, as conifer or broadleaved but cannot yet be differentiated by aerial photography interpretation due to their immaturity.

Conclusion

The previous woodland map of Great Britain (National Inventory of Woodland and Trees - NIWT) was derived from 1:25,000 scale aerial photography dating between 1988 and 2000. This was updated to 2002 with new planting based on paid grant schemes and Forestry Commission first rotation planting. Like previous inventories these data were periodic and became increasingly out of date; even the new planting data that were added were accepted without visual verification of successful planting. While this approach was reasonable based on the available technology at that time, it quickly lacked current information on the nature and rate of change to the woodland resource.

The advancement of GIS technology coupled with the availability of up to date orthorectified aerial imagery meant that a new more accurate digital map could be developed to form the basis of a continuous rolling woodland inventory programme for sample plot measurement and an annual cycle for woodland map updating. This approach will enable us to create a more timely and accurate picture of the extent, nature and sustainability of GB woodland and its change over time and provide up to date woodland analysis data as and when required, without the inhibiting cost of a complete remapping project.

The change in mapping methodology to exclude all public roads and the reduction of the minimum gap between woodlands to 20 metres has highlighted the degree and distribution of woodland fragmentation throughout GB. This is summarised in Table 7.

Of the total number of discrete woodlands in GB, 63% are less than 2 hectares in extent, although this represents only 7% of the total woodland area. Only 1% of the total number of discrete woodlands are greater or equal to 100 hectares in extent, although these woods represent 53% of the total woodland area.

Of the conifer woodland class 19% fall into the category of greater than or equal to 100 hectares in extent, representing 73% by area of all conifer woodland in GB. In the case of broadleaves, just 7% of the this woodland class falls into this category, representing 23% by area of the total broadleaved woodland in GB.
In comparison, 28% of the conifer woodland class falls within the category of less than 2 hectares, representing just 2% of the total conifer woodland area while 53% of the broadleaved woodland class falls within this category, representing 14% of the total broadleaved woodland area for GB. The conifer and broadleaved woodland size distribution is also summarised in Table 7.

NFI 2011 woodland map

Glossary

Area (forest/woodland)	Forest and woodland area is divided into net forest area - the land area actually covered by trees (in the National Forest Inventory defined to the drip line of the canopy), and gross forest area - which includes both the area covered by trees and small open spaces of less than 0.5 hectare within the forest boundary (e.g. rides, glades, ponds).
Broadleaves	Trees and shrubs that belong to the angiosperm division of the plant kingdom (as distinct from the gymnosperm division, which includes conifers). Most broadleaves in the UK have laminar leaves and are deciduous. They are sometimes referred to as 'hardwoods' but not all produce hardwood timber.
Canopy	The mass of foliage and branches formed collectively by the crowns of trees.
Clearfelling	Cutting down of an area of woodland (if it is within a larger area of woodland it is typically a felling greater than 0.25 hectare). Sometimes a scatter or small clumps of trees may be left standing within the felled area.
Conifers	Trees and shrubs that belong to the gymnosperm division of the plant kingdom (as distinct from the angiosperm division, which includes broadleaves). Conifers mostly have needles or scale-like leaves and, with the exception of larch, all are evergreen. Sometimes referred to as 'softwoods', they produce softwood timber.
Forest (and woodland)	For the National Forest Inventory woodland is defined as land with a minimum area of 0.5 hectare under stands of trees, and tree crown cover of at least 20%, or the potential to achieve this. Areas of open space completely enclosed by woodland have been mapped as interpreted open areas. The minimum width for woodland is 20 metres, although where a woodland includes a narrow neck of woodland less than 20 metres wide, then the neck may be included if there is less than 20 metres in distance between woodlands. Tarmac roads and normal gauge railways have been excluded from the data regardless of width. Rivers, rides and power lines have been excluded when the feature (e.g. river) is visibly 20 metres wide and greater than 0.5 hectares in area. Parts of river features could be excluded, while other parts of the same feature are included.
Forestry Commission	The government department responsible for the regulation of forestry, implementing forestry policy and management of state forests in Great Britain. Forestry policy is devolved, with the exception of common issues addressed on a GB or UK basis, such as international forestry, plant health and forestry standards.

Glossary (continued)

Forestry Commission estate	Forests, woodlands, open land and other property managed by the Forestry Commission.
Great Britain (GB)	England, Scotland and Wales.
Interpreted forest type	The woodland map is differentiated into interpreted forest types (IFTs) as outlined in Appendix B1.
Interpreted open area	Open areas completely surrounded by woodland are differentiated into interpreted open areas (IOAs) as outlined in Appendix B2.
Other ownership	Land not owned or leased to the Forestry Commission. This could include private individuals, private forestry or timber businesses, other private businesses, local authorities, charitable organisations and community ownership or common land. It also includes government departments other than the Forestry Commission, such as the Ministry of Defence.

Appendix A: Summary of methodology differences between the NIWT woodland map and the NFI woodland map

	National Inventory of Woodland and Trees (NIWT)	National Forest Inventory (NFI)
Minimum extent of woodland, and also minimum extent of interpreted forest type (IFT) and interpreted open area (IOA)	2 hectares	0.5 hectare
Minimum width of gaps between woodlands and minimum width of IOA	50 metres	20 metres
Derived from	In England 1:25,000 fixed scale photography flown between 1991 and1999. In Wales 1:25,000 fixed scale photography flown between 1991 and1997. In Scotland, based on Land Cover of Scotland (LCS) 1988 project - which also used 1:25,000 fixed scale photography flown between 1987 and 1989	25 cm resolution orthorectified imagery for Scotland and England (Ordnance Survey). 40 cm resolution orthorectified imagery for Wales (Welsh Assembly)
Interpreted forest types (IFTs)	Broadleaved Conifer Felled Ground prepared for planting Mixed Young trees Coppice Coppice with standards Shrub	Broadleaved Conifer Felled Ground prepared for planting Mixed mainly broadleaved Mixed mainly conifer Young trees Coppice Coppice with standards Shrub Assumed woodland Low density

Appendix A: Continued

	National Inventory of Woodland and Trees (NIWT)	National Forest Inventory (NFI)
Interpreted open areas (IOAs)	N/A	Agricultural Bare area Grass Power line Quarry River Road Urban Other vegetation Open water Wind farm
Requirements	All woodland, both urban and rural, is mapped and included in the survey	All woodland, both urban and rural, is mapped and included in the survey OS MasterMap® features are used as boundaries where they fall within 10 metres of the percieved woodland edge
	Rivers visibly less than 50 metres wide are included in the woodland area	Rivers visibly less than 20 metres wide are included in the woodland area
	Roads less than 50 metres are included in the woodland area	All public roads are excluded from the woodland area regardless of width
	Power lines less than 50 metres wide are included in the woodland area	Power lines less than 20 metres wide are included in the woodland area
	Railways less than 50 metres wide are included in the woodland area	All railways are exluded from the woodland area
Updates	Updated to 31 March 2002 with new planting information from Forestry Commission sub-compartment database (SCDB) and country based grant scheme data	Annual updates based on: • polygons identified from comparison with other sources; • felling/restocking polygons from SCDB; • availability of new photography; • object based classification of remote sensing data

Appendix B1: Descriptions of interpreted forest types

| Abbreviation code	Description text	Comments
B	Broadleaved	The canopy of broadleaved woodland is generally more uneven than that of coniferous woodland, being made up of rounded crowns but with variations according to species, age, height and season. Boundaries with adjacent internal polygons are generally less clearly defined than with conifers and naturally occurring stands. Some conifer trees may also be present but greater than 80% of the area will consist of broadleaved trees.
C	Conifer	Coniferous woodland often occurs as large plantations with trees in regular rows and the stand edges may be regular and sharply defined. Some broadleaved trees may also be present but greater than 80% of the area will consist of conifer trees.
F	Felled	Areas of woodland where the trees have been harvested or felled. Stumps or felled trees may be visible and there may be long heaps of felling debris ('windrows'). Some standing trees within this limit may also be present but should be disregarded. This category should not be confused with coppice. The areas concerned may also have been restocked but the new trees are not yet visible.
G	Ground prepared for planting	Very difficult to differentiate from agricultural, but may show plough furrows, spaced earth mounds or weed killed patches or strips as part of a new woodland regime. Likely to be part of an approved grant scheme held on Grants & Licences databases.
Mc	Mixed mainly conifer	Mixed woodland exhibits intermediate characteristics between conifer and broadleaved woodland. There can be several types of mixed woodland. A plantation of alternate rows of conifers and broadleaves may produce a 'striped' appearance. Conifers and broadleaves may be planted in blocks, or there may be general interspersed woodland. The proportion of the conifers will be more than 50% of the area and less than 80%.
Mb	Mixed mainly broadleaved	Mixed woodland exhibits intermediate characteristics between conifer and broadleaved woodland. There can be several types of mixed woodland. A plantation of alternate rows of conifers and broadleaves may produce a 'striped' appearance. Conifers and broadleaves may be planted in blocks, or there may be general interspersed woodland. The proportion of the broadleaves will be more than 50% of the area and less than 80%.

Appendix B1: Continued

Abbreviation code	Description text	Comments
N	Young trees	Areas where planting is clearly visible but the trees cannot yet be differentiated between conifer and broadleaved due to their immaturity. Such areas can be either on land new to woodland or where a felled crop has been replaced.
O	Coppice	The most important characteristic of coppice areas on aerial photographs is their very even, smooth appearance. The coppice area may be made up of a patchwork of different ages (heights) but all exhibit this very even texture. Areas recently cut may appear to have a very clear floor with little felling debris. Coppice is always of broadleaved trees.
P	Coppice with standards	Some areas of coppice may also include larger broadleaved trees set into the coppice matrix. Such broadleaved trees, often oak, are known as standards and show very clearly over the even coppice as large, rounded crowns. The distribution of the standards may also be fairly scattered with approximately 25 stems per hectare.
S	Shrub	This category is intended to include areas that may possibly be woodland, where the growth is close to the ground and shows a rough character but no clear differentiation between conifer and broadleaved can yet be made. Areas being colonised by woody species may fall into this category. The cover will be at least 20%.
Aw	Assumed woodland	Areas of woodland identified as having been planted through woodland planting grant aid, which are not currently visible in aerial photography, but are assumed to exist.
Ld	Low density	The 'low density' polygons are areas that were mapped by NIWT but not mapped by NFI where investigation of the archive images shows a higher density than at present. These have been included for future monitoring.
CS	Cloud/ shadow	If cloud or shadow areas obscure woodland detail and it is difficult to allocate one of the above IFTs, then a feature is digitised around the uncertain area.
X	Uncertain	Where the interpreter is uncertain of the IFT/IOA to be used, X will be designated. The rate of use of this category should decline over time, as operators become more proficient and better at recognising IFTs/IOAs. As part of the quality control and update procedures Xs will be checked against the latest imagery

Appendix B2: Descriptions of interpreted open areas

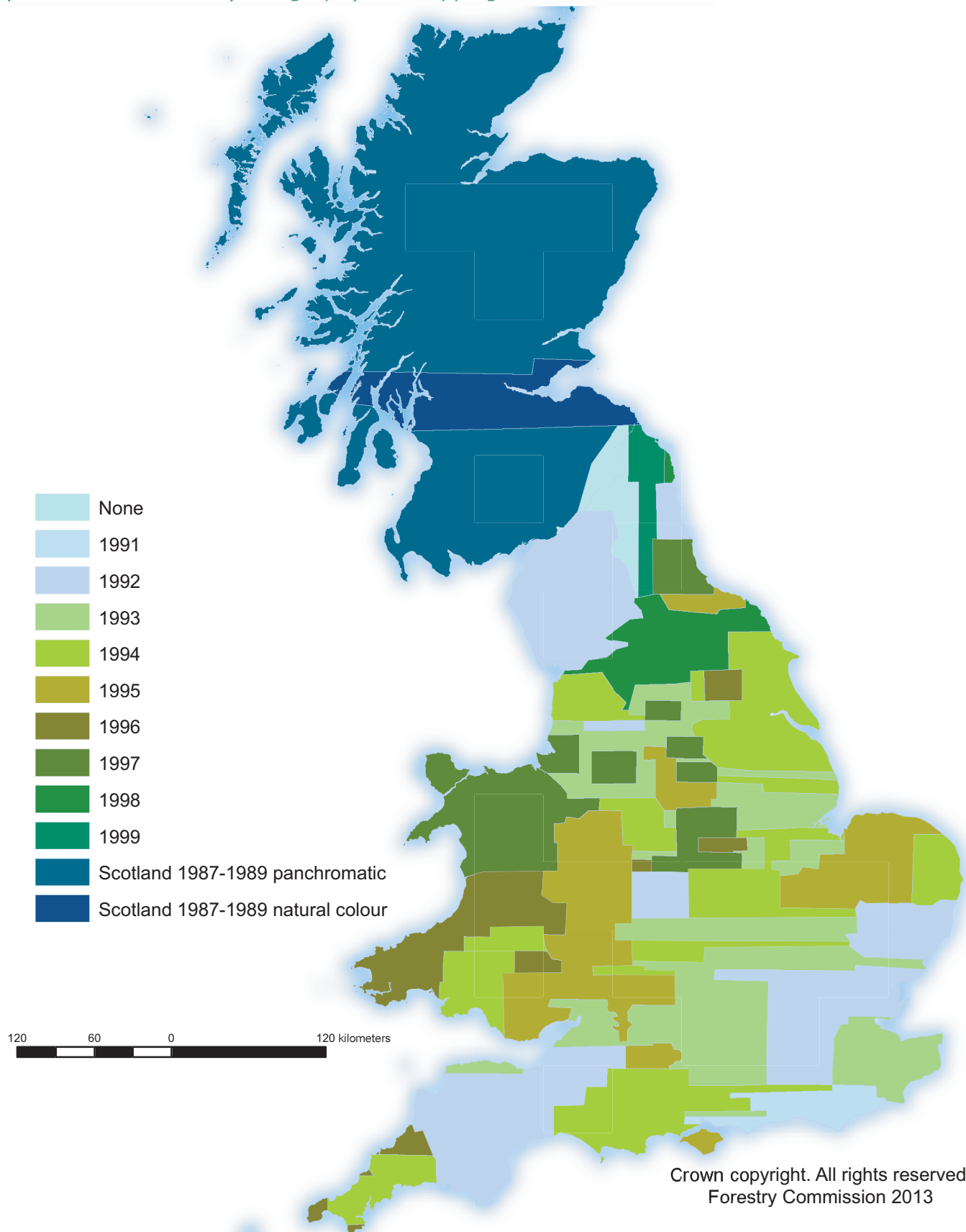| Abbreviation code	Description text	Comments
A	Agricultural	May contain a cereal crop or pasture.
Ba	Bare area	Bare ground or rock.
Gs	Grass	A predominantly grassy area - may or may not be agricultural.
L	Power line	Linear feature, possibly shadow evidence of poles, pylons or even the cables/lines.
Q	Quarry	Evidence of change from vegetation to geology; sand, slate, rock etc. Active quarries could have buildings, and heavy plant tracks leading into the quarry.
Ri	River	Linear feature; depending on location can be fairly straight or meander through woodland.
Ro	Road	Linear feature; often fairly straight with gentle bends or turning circles.
U	Urban	Buildings within woodland areas; may include gardens surrounding the buildings.
V	Other vegetation	Not covered by the above (e.g. gorse, rhododendron, bracken, heather etc).
W	Open water	Normally labelled within OS MasterMap ®, areas of even colour.
Wf	Wind farm	Possible shadow evidence of turbines, normally in groups.

Appendix C: Aerial photography years of flying
Map C1: NFI dates of photography for mapping

	1999
	2000
	2001
	2002
	2003
	2004
	2005
	2006
	2007
	2008
	2009

120   60   0   120 kilometers
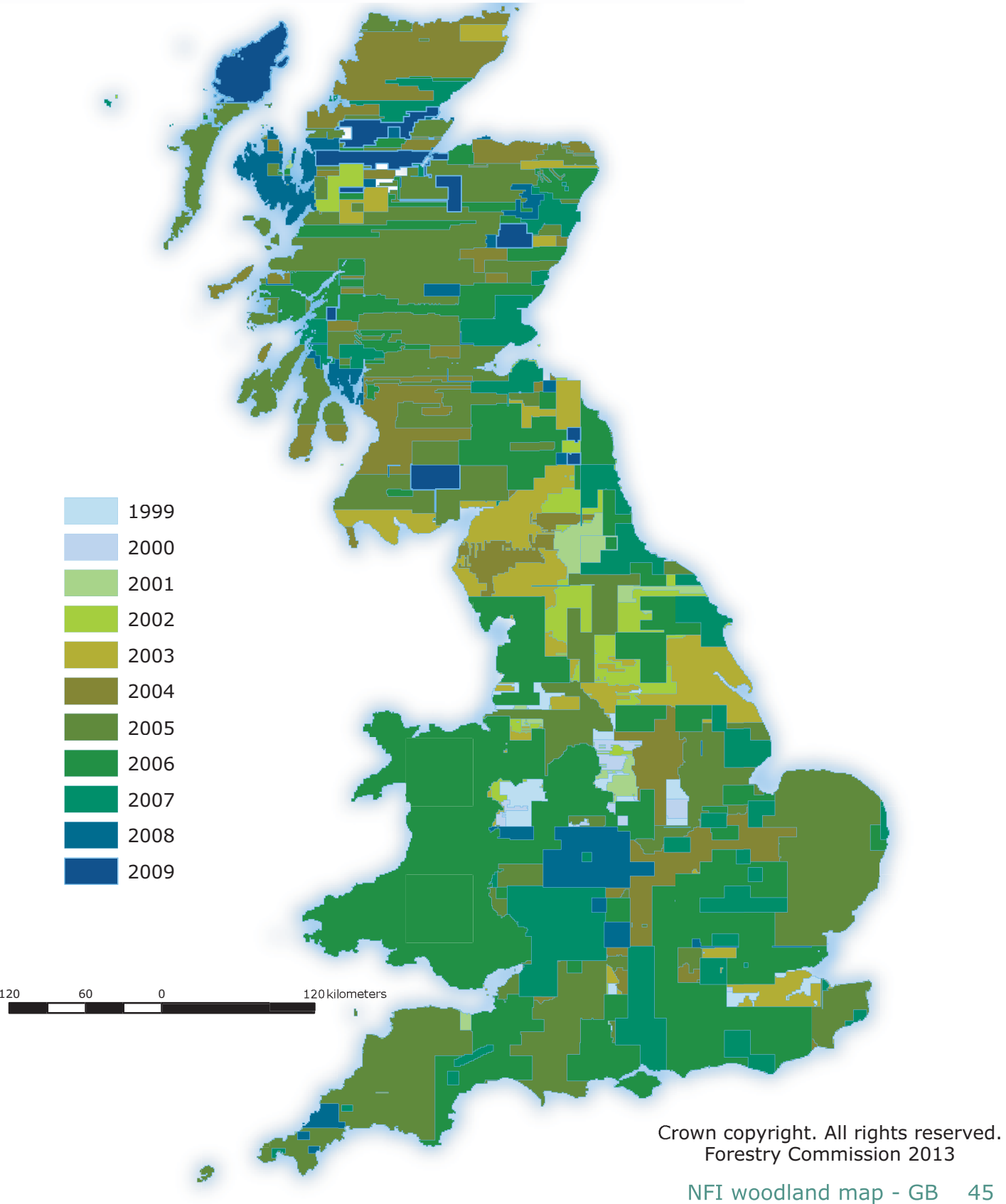
Appendix C: Aerial photography years of flying
Map C2. NIWT dates of photography for mapping

⬜	None
⬜	1991
⬜	1992
⬜	1993
⬜	1994
⬜	1995
⬜	1996
⬜	1997
⬜	1998
⬜	1999
⬜	Scotland 1987-1989 panchromatic
⬜	Scotland 1987-1989 natural colour

120   60   0   120 kilometers

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