NFI woodland ecological condition in Great Britain: Statistics

National Forest Inventory

NFI woodland condition statistics

Summary

The National Forest Inventory (NFI) provides a record of the size, distribution and information on other key attributes of forests and woodlands[1] in Great Britain. The NFI is composed of two elements; an earth observation programme to identify the location and extent of woodlands and a fieldwork programme to assess woodland composition. To assess woodland ecological condition in Britain the NFI recorded ecological data as part of the fieldwork programme (NFI survey cycle 2010-2015) and that was used to assess 15 woodland ecological condition indicators (WEC indicators) at each woodland stand surveyed. In turn the data for the 15 WEC indicators were compared to a series of 15 benchmarks representative of a woodland stand of ancient semi-natural woodland (ASNW) in good condition, enabling a score of condition to be calculated. This score was used to classify stands according to their ecological condition; favourable, intermediate or unfavourable. These results can be collated and reported upon for any geographic area in Britain (minimum size 30,000 ha) and in this series of reports and supporting data statistics, scores and classes are presented by native woodland type and priority habitat type, broken down by country and region in Britain. A series of reports and supporting data have been produced to describe the methodology used, the statistical results and the classification results (see Figure 1):

- *NFI woodland ecological condition in Great Britain: Executive Summary*
- *NFI woodland ecological condition in Great Britain: Methodology*
- *NFI woodland ecological condition in [country[2]]: Statistics*
- *NFI woodland ecological condition in [country[2]]: Classification Results*
- *NFI woodland ecological condition in [country]: Supporting Data[3]*

This report presents the statistical results of these NFI indicators of woodland ecological condition for Great Britain by woodland type.

For a brief summary of the study please refer to the report *NFI woodland ecological condition in Great Britain: executive summary*. For more information about the methodology used to conduct this study please refer to *NFI woodland ecological condition in Great Britain: methodology* report. For more information about the statistical results for other countries please refer to *NFI woodland ecological condition in [country]: statistics*. For more information about the classification of woodland to describe ecological condition please refer to the report *NFI woodland ecological condition in Great Britain: classification results*.

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[1] The NFI defines woodland as areas of tree canopy over 0.5 hectare in extent and 20% canopy cover.
[2] There are four separate reports; Great Britain, England, Scotland and Wales.
[3] Supporting/additional data is available in Excel spreadsheets.

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Figure 1 A diagram to illustrate the link between all the reports published by the NFI on the study of woodland ecological condition in Great Britain
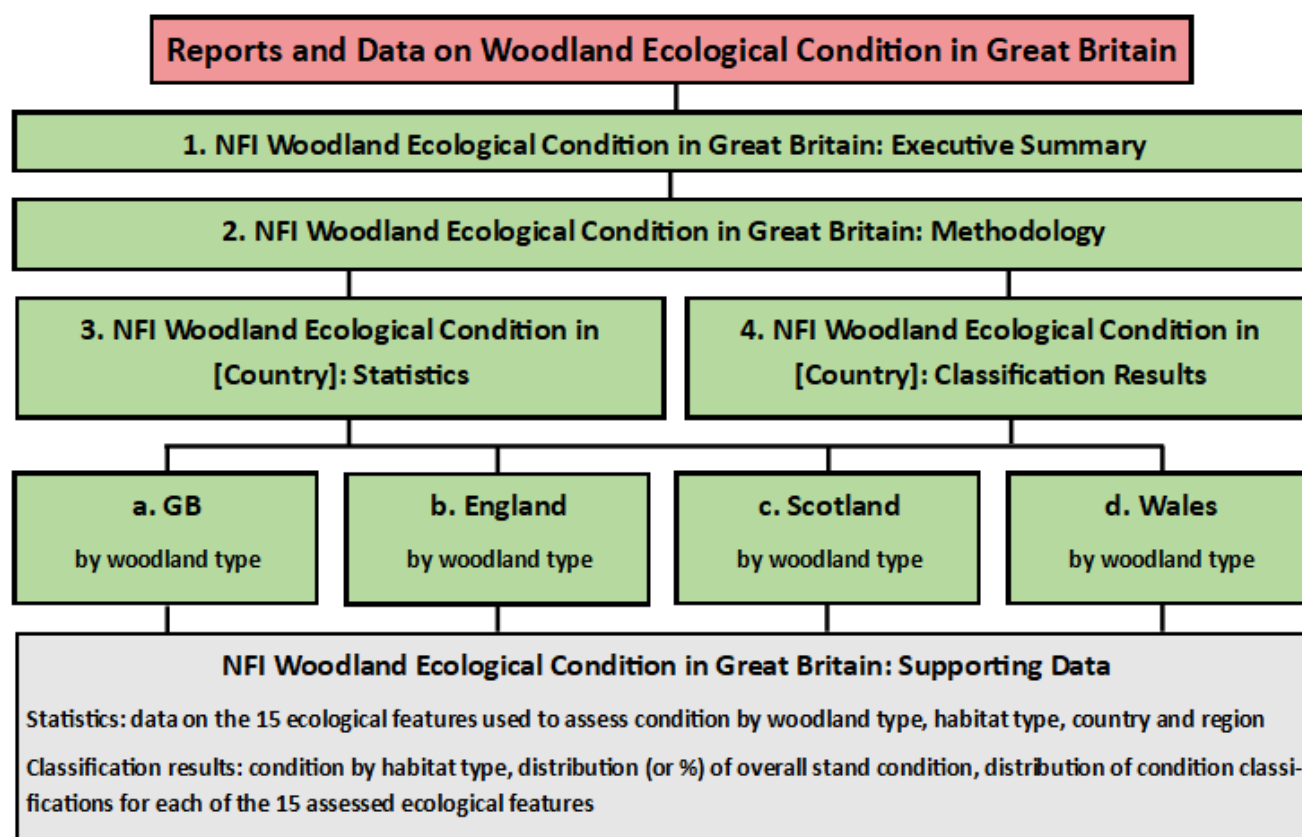
Notes: [green boxes] = published reports; [grey box] = detail available in supporting spreadsheets; [pink box] = over-arching theme. GB = Great Britain.

Ten reports have been published in relation to woodland ecological condition, namely: executive summary, methodology, statistics and classification results:

1. The Executive Summary spans all three topics presenting an overview of the methodology, key results and sign-posting to more detail;

2. The methodology describes the survey methodology and the calculation of the condition scores;

3. The statistics reports describe the key results, one for each of the three countries and Great Britain, and;

4. The classification results describe woodland condition (as calculated by the NFI Condition Calculator, see Methodology) by woodland type.

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Key Findings

- The total area of native woodland in GB is 1.51 million hectares, around 500,000 hectares or 50% higher than reported in previous estimates.
- In Britain there are 909 thousand hectares of lowland mixed deciduous woodland, 169 thousand hectares of wet woodland, 124 thousand hectares of native pinewood, 120 thousand hectares of upland birchwood, 103 thousand hectares hectares of upland oakwood, 13 thousand hectares of birch dominated upland oakwood, 62 thousand hectares of lowland beech / yew woodland, 54 thousand hectares of upland mixed ashwoods, and 53 thousand hectares of broadleaved mixed yew woodlands which were not classifed.
- 68% of native stands have 4 or more native tree species per stand in Britain.
- 80% of native stands have less than 5% non native species in the upper canopy.
- Regeneration of young trees occurs in some form in most native stands and only 9% of stands have neither seedlings, saplings or young trees.
- Circa 50% of woodland area has signs of herbivore browsing damage below 1.8 m in Britain; 47% in England, 26% in Wales and 59% in Scotland.
- 10% of native woodland stands have invasive species present.
- 46% of native woodland stands have no deadwood within them, 25% have less than 10m^3 per hectare, 26% of stands contain between 10m^3 and 100m^3 and 3% have over 100m^3 hectare.
- Upland woodland habitat types evidence less diversity in terms of the number of native trees found in individual stands and the number of vertical tree storeys.
- 80% of native stands in Britain have a resticted number of age classes with only 2 or less distinct age classes of trees.
- 71% of native stands have three or more distinct canopy stories.
- Circa 50% of native stands in Britain have less than 10% open space.
- 98% of native woodland stands have less than 0.05 veteran trees per hectare.
- 4% of native woodland stands woods have pest and diseases present.
- 27% of native woods have less than 10% woodland cover within 5.6km.
- 66% of native woodland stands are found in woods of < than 100 hectres in size

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1 Introduction

British woodlands are dynamic entities and ecological condition will change in response to several drivers including changing woodland management, general land use practices and impacts such as changes in climate. Through these and other factors there is a growing requirement across government, non-governmental organisations and the private sector to understand the ecological condition of British Woodlands.

This is the largest and most in-depth direct field-based assessment of woodland ecological condition to have been carried out in Britain to date. The study has been run in combination with the National Forest Inventory (NFI) that records the size, distribution and composition of woodland in Great Britain.

1.1   Aim

The purpose of this report is to present the statistical results of the woodland ecological condition assessment in Great Britain, broken down by woodland type. These data serve as evidence to support the scoring and classification of woodland ecological condition. They also form an evidence base for further analytical work and added value.

1.2 The importance of understanding the ecological condition of Britain's woodlands

There are several drivers for monitoring woodland ecological condition. The primary objective is to provide government with statistics that reflect woodland ecological condition and the main factors that impact condition, so that they can make informed decisions concerning the current state of woodland ecological condition and its management. Secondly, it is the UK's national and international requirement to monitor woodland condition. The UK government signed the following global and pan-European (EU) agreements in 1992 which led to commitments concerning the protection of biodiversity:

- The global Convention on Biological Diversity (CBD; https://www.cbd.int). Contracting parties are required to develop and enforce national strategies to identify, conserve and protect existing biodiversity. Article 7 of the convention focuses on the requirement for identification and monitoring of biodiversity.
- The EU Habitats Directive (Directive 92/43/EEC) aims to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on its Annexes to a favourable conservation status (JNCC, 2018[1]). Article 17 of the directive

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[1] JNCC, 2018. 2nd UK Report on Implementation of the Habitats Directive. Accessed online: http://jncc.defra.gov.uk/page-4060, November 2018.

specifically requires members to report an assessment of the conservation status of species and habitats listed on the Annexes of the Directive every 6 years.

1.3 Measuring ecological condition

The National Forest Inventory (NFI) ground surveys one hectare sample squares that partially or entirely contain woodlands (including clear felled areas). Over the course of the first cycle of the NFI (2010 to 2015), over 15,000 sample squares in Great Britain have been surveyed. The surveyed sample squares were selected as part of a stratified random sample, designed by the NFI to be representative of all woodland in Britain. The sample squares used for these reports were first surveyed during the first cycle of the National Forest Inventory fieldwork (completed in late 2015); a rolling programme designed to provide accurate information about the size, distribution, composition and condition of woodlands in Britain over time. To assess ecological condition; in each woodland stand assessed in each sample square, assessments were made for 15 different ecological features that are considered good indicators of ecological condition (woodland ecological condition indicators (WEC indicators)), the statistics for which are reported here. Full details of the methodology are provided in the complementary methodology report (see Figure 1).

The 15 WEC indicators assessed by the NFI are:

1. Age distribution of trees
2. Wild, domestic and feral herbivore damage
3. Invasive plant species
4. Number of native tree species
5. Occupancy of native trees
6. Open space within woodland
7. Proportion of favourable land cover around woodland; woodland cover and other favourable habitat
8. Woodland Regeneration: Stand or component group-level[1]
9. Woodland Regeneration: Square-level
10. Tree health
11. Vegetation and ground flora
12. Woodland vertical structure
13. Veteran trees
14. Volume of deadwood
15. Size of woodlands

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[1] Component group = Homogeneous areas that are too small (<0.05 ha) to practically map as a discrete section using Geographic Information System (GIS) software in the field, but with most of the same defining characteristics as a section. Section = within each sample square, the forest was stratified into different woodland stands or 'sections'.

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The WEC indicators were devised, reviewed and agreed in 2009 by specialists from Natural England, Forestry Commission, Forestry England, Scottish Forestry, Scottish Natural Heritage, Natural Resources Wales and the Welsh Government, under advice from RSPB and Woodland Trust. The WEC indicators and classification thresholds selected were based on other suggested and established woodland indicators (e.g. the Common Standards Monitoring approach for protected sites, JNCC), the best available scientific evidence, expert opinion and each country's reporting requirements.

1.3.1   The NFI map: an overview

The location and extent of all forests and woodlands in the UK (≥0.5 hectares) is identified by the National Forest Inventory (NFI) and the resultant data is available in the form of a digital woodland map. The map is updated annually and provides current and historical information on the distribution, type and size of forests and woodland in the UK. The digital woodland map is produced using aerial photography, satellite imagery and administrative records. NFI fieldwork samples squares are located within the bounds of the NFI woodland map.

1.3.2   Sample square evaluation: an overview

The NFI stratifies the area within each one hectare sample square into forest and non-forest and the forested area/s within the sample square are further stratified by the type of woodland present, into distinct woodland stands. Within each forest stand information on tree species, tree age, management regime and data to assess each of the 15 WEC indicators described above was collected (see complimentary methodology report). Additionally, if tree heights in individual stands widely differed and formed distinct bands of tree heights, these stands were vertically stratified into several layers or storeys.

Typically, there are multiple stands and / or parts of stands within each sample square. This means, from the circa 15,000 sample squares covered by the NFI in Great Britain, circa 33,000 forest stands have been assessed for ecological condition. Within each stand two or three 100 m^2 (0.01 hectare) circular plots were randomly located. Within each of these circular plots tree stocking was assessed and tree species, age, location and diameter at breast height (DBH) was recorded for all trees ≥4 cm DBH. A total of some 650,000 trees were measured in Great Britain. Transects were also conducted within one circular plot per stand to assess the volume of lying deadwood, and the presence and the number of seedlings and saplings.

Each of the sample squares and circular plots are marked on the ground with metal pegs and their exact location recorded by GPS to allow for quality assurance checks and future assessment. All field measurements and information are subject to quality assurance checks.

Woodland condition parameters were assessed post survey and then stands were scored as either favourable, intermediate or unfavourable, by comparing each of the 15

indicators to a benchmark, namely 'semi-natural woodland in favourable condition' (refer to the Methodology report for more information).

The data collected for each of the 15 WEC indicators within the survey sample squares was extrapolated, using standard statistical survey methodology, to the areas of woodland recorded on the NFI map, to produce the estimates presented in this report. Statistics for the 15 WEC indicators for Great Britain are presented in this report, broken down by different woodland types (native, near-native and fragments, non-native). Results specifically for England, Wales and Scotland are presented in companion statistics reports. For more detailed information on the methodology used to produce these statistics refer to the methodology report (see Figure 1).

1.3.3   The NFI condition calculator: an overview

An analytical tool, called the NFI Condition Calculator, was developed to use NFI data to report on woodland condition as set out above. The NFI Condition Calculator analyses data from the NFI sample squares, the NFI Map and other data sources to produce statistical results, scores and classes, that can be used as an indication of woodland condition. The 15 WEC indicators and the resultant data are compared to a benchmark of a woodland stand of ancient semi-natural woodland (ASNW) in good condition, enabling a score of condition to be calculated. This score was in turn used to classify stands according to their ecological condition; favourable, intermediate or unfavourable. The data collected within each survey sample square (used for the 15 WEC indicators), the derived scores and the classifications were extrapolated and aggregated to the areas of woodland recorded in the NFI map (e.g. woodland type) to produce the estimates presented in this and the other reports. The classifications of each stand can also be extrapolated up to any sub class of woodland area, such as woodland type or habitat type (minimum size 30, 000 ha) and in turn broken down by any geographic area, such as by country or NFI region, as in this report. The development of the NFI condition Calculator also means that the WEC analysis is repeatable and future cycles of the NFI can be compared to this assessment to report on woodland ecological change over time. For more detail on the methodology please refer to the complimentary report (see **Figure 1**).

1.4 Definition of woodland types

Woodland
An area of land over 0.5 hectares in extent, with 20 % or more tree canopy cover, or the potential to achieve that based upon established trees.

Native woodland

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Stands with 50% or more native tree species[1] occupancy in the upper canopy that either:

- Form a discrete woodland parcel with a minimum area of 0.5 ha.
- Form a woodland stand with a minimum area of 0.1 ha that is part of a woodland that is 0.5 ha or larger.

Non-native woodland

Stands with less than 40% native species occupancy sitting within a woodland of any size.

Near native and fragments

Stands that fail to meet the criteria for native or non-native woodland specified above are classified as 'near native and fragments'. Defining this category allows all woodland area to be assessed and reported on for its ecological condition status. Pinpointing these areas of woodland may help inform targeted restoration, as they may represent previously native woodland area that has been overplanted with non-natives.

The near native and fragments woodland type can be subdivided into two subclasses:

1. **Near native:** have a native canopy cover of somewhere between 40% to 49% and thus are 'nearly' native.
2. **Fragments:** have 50% or more native tree species occupancy in the upper canopy but fall under the minimum size threshold of 0.1 ha, falling in the size range 0.05 ha to 0.099 ha.

Not determinable

Areas classified as 'not determinable' apply to woodland areas that cannot be classified due to insufficient tree or other attribute information, such as areas without canopy cover and clear-fell sites with a weak vegetation layer. These form less than 0.5% of the whole woodland population.

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[1] For a list of native species refer to the methodology report.

2 Results

Presented here are the statistical results of the woodland ecological condition assessment of woodland in Great Britain, broken down by woodland type. Given the large volume of data gathered in this study it was decided that the statistical reports would focus on results by country and native woodland type. Results by habitat type and region are available in the supporting data excel spreadsheets.

The nominal baseline date for estimates is 2013 and the time period over which the field samples were taken was January 2010 to January 2016.

All values reported for area are rounded to the nearest 100 hectares. The values reported in the tables have been independently rounded, so may not add to any totals shown.

Sampling standard errors (SE) attached to estimates are expressed in relative terms (%) to the right of the relevant estimate. The sampling standard error will account for random variation arising from the selection of the sample and random measurement errors. However, standard errors will not account for any systematic biases in the field measurements, but it is unlikely that any substantial biases of this nature are present in the survey data because of NFI quality assurance processes. Also, the scale and duration of the survey help to mitigate this risk, as systematic errors are unlikely across all surveyors and equipment over the 5 years. Any standard error greater than 25% is reported in amber italics and represents a lower degree of assurance in the estimates.

3 Woodland habitat area

Total woodland habitat area for all woodland, separated into priority woodland habitats and native woodland types, is presented in this report (Table 3.1 and 3.2). Woodland loss in priority woodland habitats is a threat to the habitat because once lost it is very difficult or impossible to replace. The most recent data on total areas of woodland loss and estimates of annual new planting in Great Britain is available in the NFI report *Preliminary estimates of the changes in canopy cover in British woodlands between 2006 and 2015*, however this data cannot determine if this is native or not or if it falls into any priority habitat type.

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Table 3-1 Area of woodland by habitat type for each country and region of GB at 2013

Region	Lowland beech/yew woodland	Lowland mixed deciduous woodland	Native pine woodlands	Non-HAP native pinewood	Upland birchwoods (Scot); birch dominated upland oakwoods (Eng, Wal)	Upland mixed ashwoods	Upland oakwoods	Wet woodland	Wood pasture & parkland	Broadleaf habitat NOT classified as priority	Non-native coniferous woodland	Clearfelled and transition	TOTAL
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)
GB	**61,925**	**908,666**	**123,577**	**37,932**	**133,528**	**53,685**	**103,088**	**169,403**	**10,895**	**53,020**	**1,292,115**	**97,456**	**3,045,290**
ENGLAND	**54,482**	**747,508**	**0**	**0**	**11,220**	**31,907**	**44,027**	**77,789**	**7,730**	**19,401**	**327,536**	**21,967**	**1,343,568**
North West England	2,980	45,578	0	0	4,004	5,101	9,351	8,081	264	4,356	39,085	2,608	121,408
North East England	1,409	23,494	0	0	3,628	4,965	1,513	5,008	15	2,058	73,895	1,518	117,503
Yorkshire and the Humber	3,680	59,873	0	0	1,421	3,241	5,192	5,704	280	3,847	35,511	1,235	119,984
East Midlands	724	70,148	0	0	431	2,390	5,219	5,619	798	1,017	14,758	1,474	102,577
East England	3,739	94,807	0	0	0	309	840	13,497	1,178	1,101	34,368	4,468	154,305
South East England	24,700	245,410	0	0	0	1,758	323	9,761	4,946	2,740	49,670	5,582	344,890
South West England	15,133	138,219	0	0	1,336	8,337	15,586	23,212	154	2,459	54,579	3,021	262,036
West Midlands	2,116	69,980	0	0	401	5,805	6,004	6,906	95	1,824	25,671	2,060	120,863
SCOTLAND	**1,018**	**81,946**	**123,577**	**37,932**	**120,087**	**14,634**	**32,934**	**63,439**	**2,679**	**21,396**	**819,388**	**69,861**	**1,388,891**
North Scotland	0	4,034	31,642	16,626	25,848	1,269	4,764	9,243	0	2,007	106,962	21,110	223,503
North East Scotland	208	12,417	66,236	20,387	20,054	616	1,176	9,182	204	2,567	92,691	6,889	232,627
East Scotland	512	14,974	17,287	556	14,586	1,937	3,438	5,795	468	2,199	67,269	4,707	133,728
South Scotland	96	41,681	1,424	0	13,874	7,128	6,206	19,591	2,007	8,413	310,353	14,625	425,398
West Scotland	201	8,840	6,988	364	45,725	3,685	17,351	19,627	0	6,209	242,113	22,531	373,635
WALES	**6,424**	**79,211**	**0**	**0**	**2,221**	**7,144**	**26,126**	**28,175**	**486**	**12,224**	**145,192**	**5,628**	**312,831**

Note: 1. The wood pasture area in the above table only relates to wood pasture as defined by NFI as woodland; i.e. woodland must be over 0.5 hectares in extent, over 20% canopy cover and 20 m in width to qualify. Although there is no agreed British definition of wood pasture and this will be a reasonable proxy of wood pasture area, some definitions of wood pasture would include land that contains less than 20% canopy cover and this area is excluded from the estimates above. 2. Lowland beech / yew woodland outside the beech zone will be yew dominated. 3. Area includes a revision to underlying total woodland area (this will be revised in Forestry Facts and Figures Sept 2020). Comparisons with woodland area should not be made as woodland area is defined differently to woodland habitat (with woodland area being greater than habitat area due to the treatment of land uses like open space and clear-fell). 4. Upland oakwood dominated by birch in Wales has been classified as birch dominated upland oakwoods.

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Table 3-2 Area of woodland by woodland type for each country and region of GB.

Region	Native	Near native & fragments	Non native	Not determinable	Total
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)
GB	**1,507,105**	**56,776**	**1,461,267**	**19,629**	**3,044,777**
ENGLAND	**914,095**	**29,459**	**398,186**	**1,706**	**1,343,446**
North West England	73,932	2,329	45,152	421	**121,834**
North East England	36,201	3,005	77,982	149	**117,338**
Yorkshire and the Humber	68,954	3,783	46,837	271	**119,845**
East Midlands	73,964	2,305	26,272	37	**102,577**
East England	107,595	3,323	43,206	181	**154,306**
South East England	280,796	6,494	57,302	308	**344,901**
South West England	186,732	4,654	70,192	205	**261,782**
West Midlands	85,920	3,566	31,243	134	**120,863**
SCOTLAND	**442,611**	**20,313**	**908,259**	**17,205**	**1,388,388**
North Scotland	94,541	3,303	119,908	5,751	**223,503**
North East Scotland	111,260	3,781	115,197	2,248	**232,485**
East Scotland	48,860	2,647	80,049	2,171	**133,728**
South Scotland	78,739	7,026	336,526	2,709	**425,000**
West Scotland	109,211	3,556	256,579	4,327	**373,672**
WALES	**150,399**	**7,004**	**154,822**	**718**	**312,943**

Notes: 1. Woodland types are defined in Section 1.4. 2. Area includes a revision to underlying total woodland area (this will be revised in Forestry Facts and Figures Sept 2020). Comparisons with woodland area should not be made as woodland area is defined differently to woodland habitat (with woodland area being greater than habitat area due to the treatment of land uses like open space and clear-fell).

This is the first British assessment of the extent of native woodland and priority habitat type based on a balanced stratified random sample of woodlands. There have been two previous assessments of native woodland extent:

1. The Native Woodland Survey of Scotland (NWSS), a census of native woods in Scotland, dated 2012 (survey took place between 2006 and 2013). This identified, surveyed and mapped the location, extent, type and condition of all of Scotland's native and nearly native woods, as well plantations on ancient woodland sites (PAWS).
2. JNCC created estimates of the area of priority HAPs in 1998 using National Vegetation Classification (NVC) data, utilising 2,648 samples taken in ancient and recent woods throughout Britain (Rodwell 1991).

Direct comparisons between the estimates from NFI, NWSS and the 2008 JNCC NVC HAP estimates to describe native woodland extent should not be made because of differences in the methodologies.

4 Age distribution of trees in Britain

Table 4-1 Age bands of trees found within single woodland stands in Britain, by woodland type and area

Woodland Type	Not applicable		Young only		Young & intermediate		Young intermediate old	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	3,107	14	186,809	3	777,483	1	305,965	2
Near native & fragments	489	32	7,934	9	31,605	6	6,383	14
Non native	30,618	4	284,705	2	544,771	1	26,090	7
Not determinable	19,605	5	0	–	0	–	0	–
Total	**53,819**	**3**	**479,449**	**2**	**1,353,859**	**1**	**338,439**	**2**

Woodland Type	Young & old		Intermediate only		Intermediate & old		Old only		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	6,479	13	177,587	3	45,308	6	4,366	20	**1,507,105**	**1**
Near native & fragments	18	59	8,810	11	1,532	26	4	36	**56,776**	**4**
Non native	423	51	564,154	1	10,261	12	245	68	**1,461,267**	**1**
Not determinable	0	–	24	56	0	–	0	–	**19,629**	**5**
Total	**6,920**	**13**	**750,575**	**1**	**57,101**	**5**	**4,615**	**19**	**3,044,777**	**1**

Notes:

1. Tree Age: if Birch, cherry or sorbus species then; young = 0-20 years, intermediate = 21–60 years, old >60 years, all other species; young = 0-20 years, intermediate = 21-150 years, old >150 years.
2. SE = standard error. Amber text = values with SE >25%.
3. Woodland types are defined in Section 1.4.

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Figure 4-1 Age bands of trees found within single woodland stands in Britain, by woodland type, country and proportion
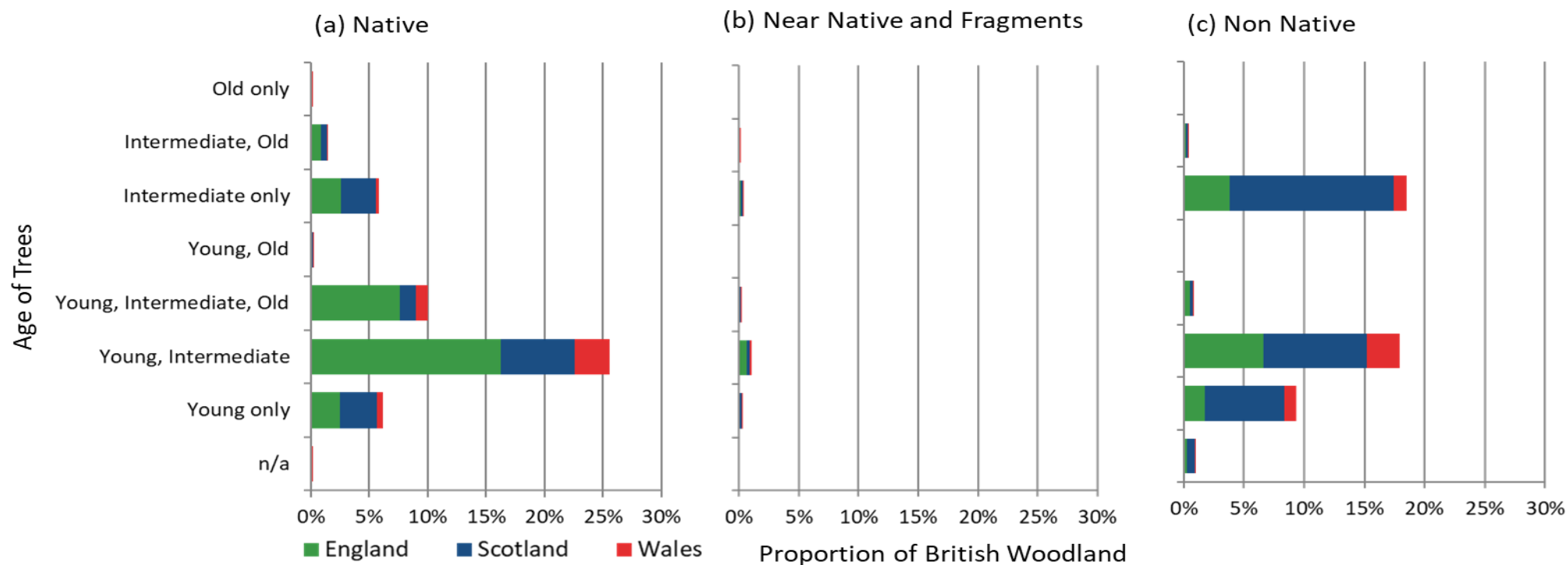
Notes:

1. (a) Native woodlands; (b) Near native woodlands and fragments; (c) Non-native woodland
2. Tree Age: if Birch, cherry or sorbus species then; young = 0-20 years, intermediate = 21–60 years, old >60 years, all other species; young = 0-20 years, intermediate = 21-150 years, old >150 years.
3. Woodland types are defined in section 1.4.

5 Wild, domestic and feral herbivore browsing damage in British Woodland

Table 5-1 Areas of different levels of herbivore damage in British woodland, by woodland type.

Woodland Type	No browsing in square		Browsing in component group		Browsing in section only		Browsing in square only		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	745,361	1	610,712	1	6,980	12	144,546	3	**1,507,598**	**1**
Near native & fragments	28,080	6	21,013	8	1,358	21	6,358	10	**56,809**	**4**
Non native	735,811	1	556,994	1	14,183	9	154,592	3	**1,461,581**	**1**
Not determinable	11,689	8	567	25	2,399	10	4,976	10	**19,632**	**5**
Total	**1,520,941**	**1**	**1,189,286**	**1**	**24,920**	**6**	**310,472**	**2**	**3,045,620**	**1**

Woodland Type	No squirrel damage in square		Squirrel damage in component group		Squirrel damage in section only		Squirrel damage in square only		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	1,334,981	1	112,811	3	1,383	27	58,423	5	**1,507,598**	**1**
Near native & fragments	49,237	5	5,088	15	237	51	2,247	19	**56,809**	**4**
Non native	1,395,754	1	38,342	5	2,643	16	24,842	6	**1,461,581**	**1**
Not determinable	19,623	5	0	–	8	96	0	–	**19,632**	**5**
Total	**2,799,595**	**0**	**156,241**	**3**	**4,272**	**14**	**85,511**	**4**	**3,045,620**	**0**

Notes:

1. Browsing damage: including damage to seedlings and saplings and fraying or stripping of bark less than 1.8m above ground level.
2. Squirrel damage: damage is assumed where bark stripping damage is observed greater than 1.8m above ground level.
3. The absence of herbivore damage means that no damage has been observed, as opposed to an absence of damage.
4. For definitions of Square, Section and Component group see glossary.
5. SE = standard error. Amber text = values with SE >25%.
6. Woodland types are defined in section 1.4.
7. Damage includes all domestic, wild and feral species that can browse a tree. Refer to the methodology report for more information.

Figure 5-1 Proportions of different levels of herbivore damage in British woodland, by woodland type
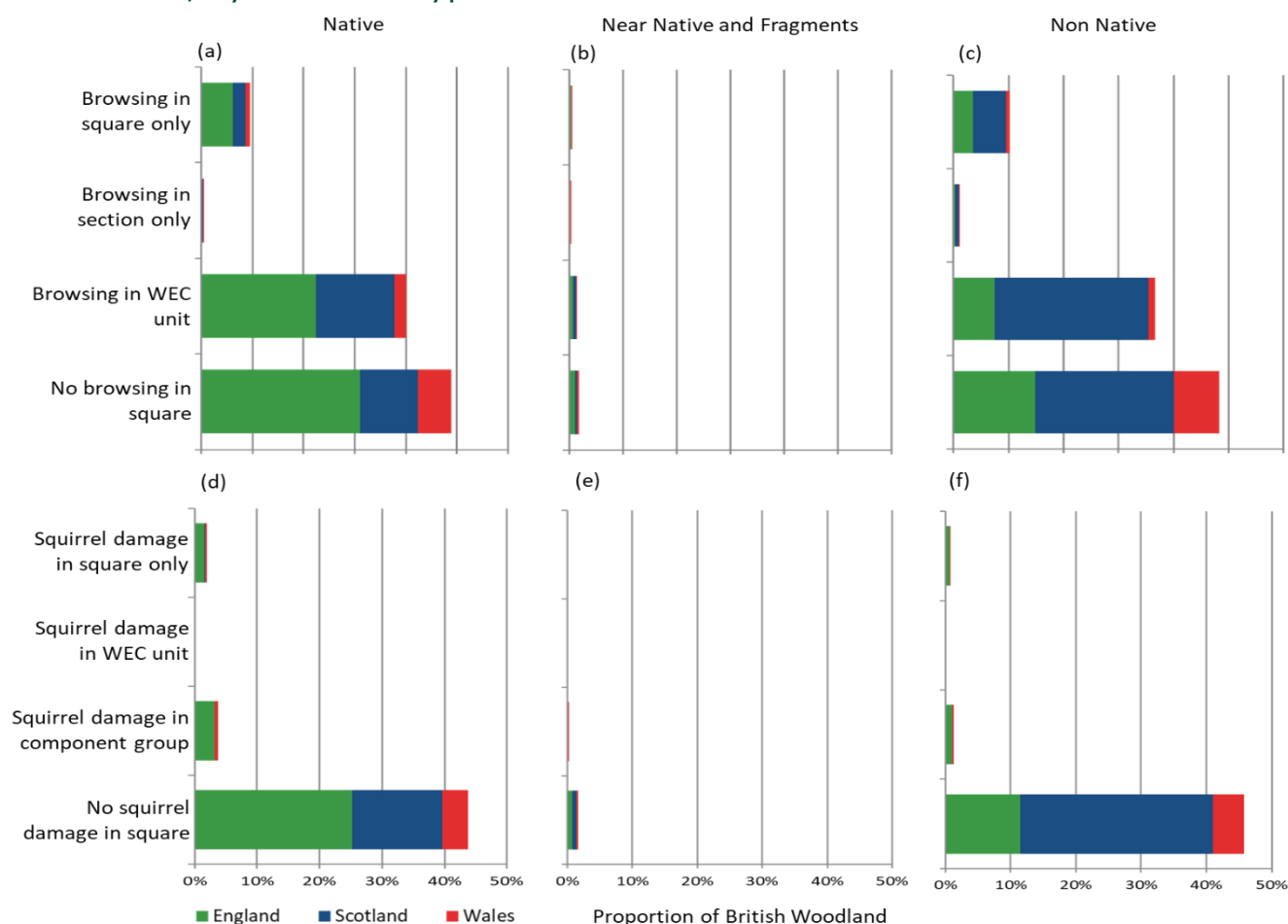
Notes:

1. (a) Browsing damage in native woodland; (b) Browsing damage in other types of woodland; (c) Browsing damage in non-native woodland; (d) Squirrel damage in native woodland; (e) Squirrel damage in other types of woodland; (f) Squirrel damage in non-native woodland.
2. For full definitions of square, section and woodland types see section 1.4 and method report.
3. Woodland ecological condition (or WEC) unit = a stand or group of stands that meet the woodland type criteria (e.g. native) and are the stand or a grouping of similar stands being evaluated.
4. Browsing and damage classes are structured based on 'closeness' of damage; browsing in WEC unit (the actual evaluation area is directly damaged), browsing in section only (the actual evaluation area is not directly damaged but damage is adjacent), browsing in square only (browsing further away).
5. Browsing damage: includes damage to seedlings and saplings and fraying or stripping of bark less than 1.8m above ground level.
6. Squirrel damage: where bark stripping damage is observed greater than 1.8m above ground level.
7. Damage includes all domestic, wild and feral species that can browse a tree.
8. The absence of herbivore damage means that no damage has been observed, as opposed to an absence of damage.

6 Invasive plant species in Britain

Table 6-1 Area of woodland in Britain with invasive plant species cover by woodland

Woodland Type	None		≤10%		> 10%		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	1,357,033	1	93,516	4	57,049	5	**1,507,598**	**1**
Near native & fragments	47,988	5	5,220	15	3,601	19	**56,809**	**4**
Non native	1,376,742	1	63,576	5	21,263	7	**1,461,581**	**1**
Not determinable	19,269	5	362	47	0	–	**19,632**	**5**
Total	**2,801,033**	**0**	**162,673**	**3**	**81,913**	**4**	**3,045,620**	**0**

Table 6-2 Area of woodland in Britain with presence or absence of Rhododendron or Laurel by woodland type

Woodland Type	Present		Absent		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	126,146	3	1,381,452	1	**1,507,598**	**1**
Near native & fragments	8,447	12	48,362	5	**56,809**	**4**
Non native	78,258	4	1,383,323	1	**1,461,581**	**1**
Not determinable	362	47	19,269	5	**19,632**	**5**
Total	**213,213**	**3**	**2,832,406**	**0**	**3,045,620**	**0**

Notes:
1. SE = standard error. Amber text = values with SE >25%.
2. Woodland types are defined in Section 1.4.
3. Refer to methods for a list of all species classified as invasive and further information.
4. Table 6.1 totals are inclusive of rhododendron and laurel.

NFI woodland condition statistics

Figure 6-1 Proportion of woodland area in Britain with invasive plant species cover and presence/absence of rhododendron or laurel by woodland type.
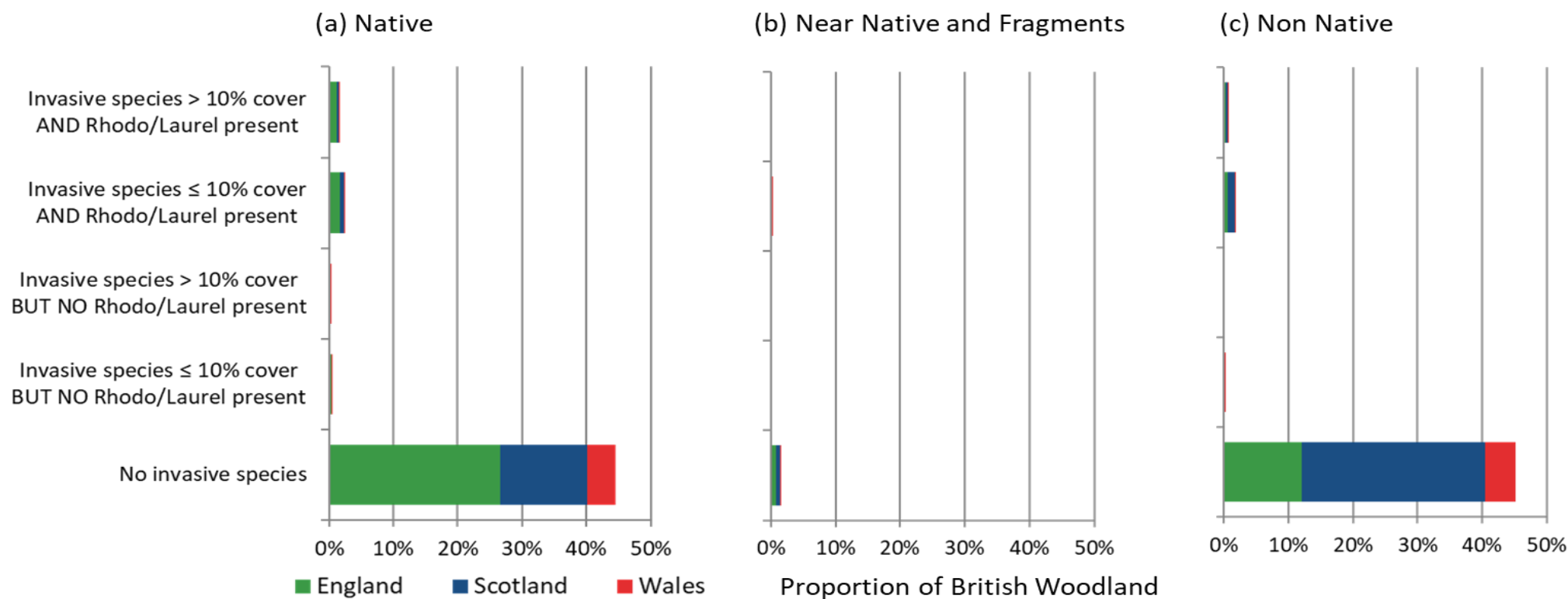
Notes: 1. (a) Native woodland (b) Near-native and fragments (c) Non-native woodland. 2. Rhodo = Rhododendron. 3. Woodland types are defined in section 1.4, refer to methods for a list of all species classified as invasive.

7 Number of native tree species in a stand

Table 7-1 The number of different native tree species present in British woodland stands by woodland type.

Woodland Type	0 native Area (ha)	SE%	1 native Area (ha)	SE%	2 native Area (ha)	SE%	3 native Area (ha)	SE%	4 native Area (ha)	SE%
Native	5,976	12	129,339	4	162,813	3	181,633	3	203,793	3
Near native & fragments	541	30	7,028	11	8,441	11	11,094	12	8,586	11
Non native	764,651	1	242,309	2	153,457	3	114,467	3	74,187	4
Not determinable	19,629	5	0	–	0	–	0	–	0	–
Total	**790,797**	**1**	**378,676**	**2**	**324,710**	**2**	**307,193**	**2**	**286,567**	**3**

Woodland Type	5 native Area (ha)	SE%	6 native Area (ha)	SE%	7 native Area (ha)	SE%	8 native Area (ha)	SE%	9 native Area (ha)	SE%
Native	184,896	3	173,115	3	145,624	3	114,315	3	85,845	4
Near native & fragments	6,466	12	5,928	14	3,709	19	2,317	24	1,402	31
Non native	47,830	5	30,134	6	16,316	9	10,093	11	3,929	18
Not determinable	0	–	0	–	0	–	0	–	0	–
Total	**239,193**	**2**	**209,177**	**2**	**165,649**	**3**	**126,724**	**3**	**91,176**	**4**

Woodland Type	10 native Area (ha)	SE%	11 native Area (ha)	SE%	12 or more native Area (ha)	SE%	Total Area (ha)	SE%
Native	53,846	5	31,879	7	34,032	7	**1,507,105**	**1**
Near native & fragments	888	43	0	–	377	65	**56,776**	**5**
Non native	2,466	22	849	32	578	47	**1,461,267**	**1**
Not determinable	0	–	0	–	0	–	**19,629**	**5**
Total	**57,200**	**5**	**32,728**	**7**	**34,987**	**7**	**3,044,777**	**1**

Notes:

1. Native tree species = trees that colonised Britain naturally after the last Ice Age.
2. SE = standard error. Amber text = values with SE >25%.
3. Woodland types are defined in Section 1.4.
4. Refer to methods for a list of all species classified as native.
5. 0 natives in native stands will in the main relate to clear-fell and transition areas.

NFI woodland condition statistics

Figure 7-1 The proportion of different native tree species present in British woodland stands by woodland type.
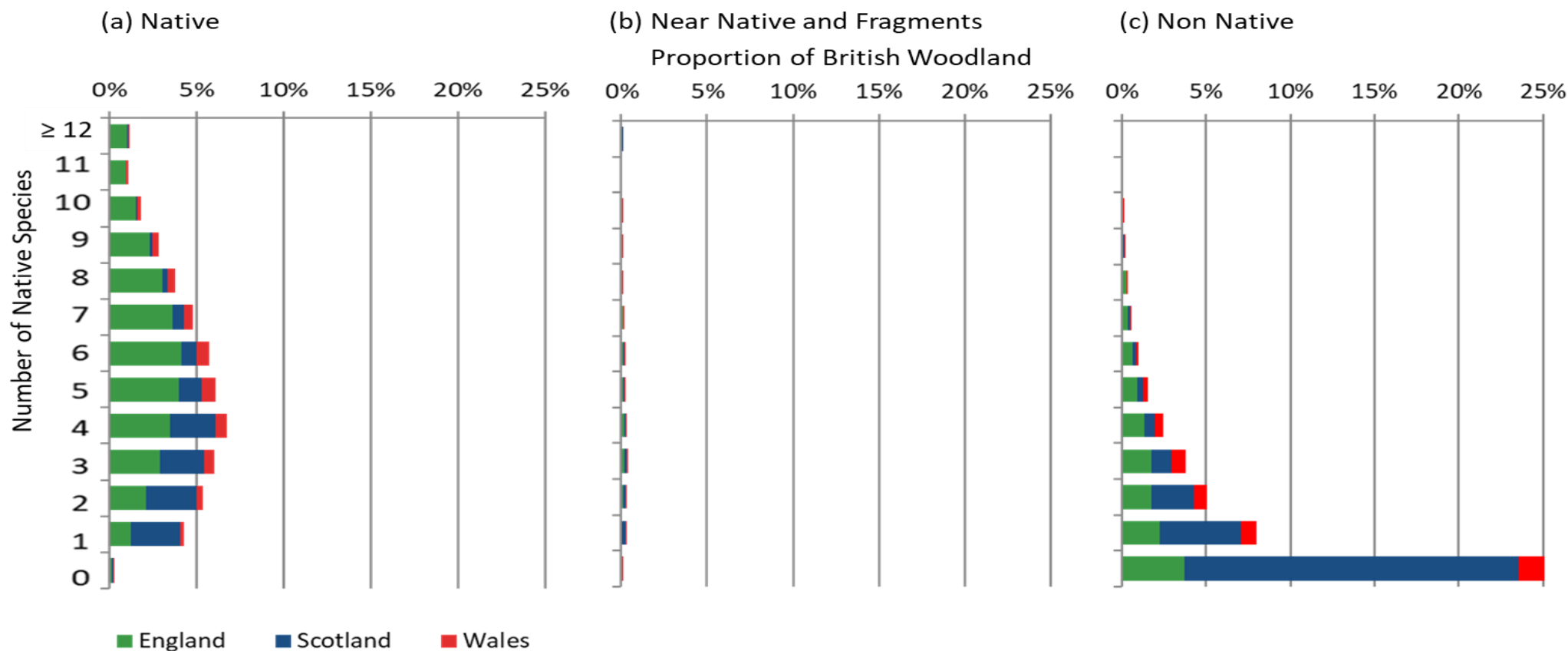
Notes: 1. (a) Native woodland (b) Near-native woodlands and fragments (c) Non-native woodland. 2. Native tree species = trees that colonised Scotland naturally after the last Ice Age. 3. Woodland types are defined in Section 1.4. 4. Refer to methods for a list of all species classified as native.

8 Occupancy of native trees

Table 8-1 The proportion of native trees occupying the canopy of single stands in different types of woodland in Britain

Woodland Type	0 to <5% Area (ha)	SE%	≥5 and <10% Area (ha)	SE%	≥10 and <15% Area (ha)	SE%	≥15 and <20% Area (ha)	SE%	≥20 and <25% Area (ha)	SE%
Native	0	–	0	–	0	–	0	–	0	–
Near native & fragmented	0	–	0	–	0	–	0	–	0	–
Non native	1,198,133	1	69,113	4	50,812	5	32,268	6	35,552	6
Not determinable	19,632	5	0	–	0	–	0	–	0	–
Total	**1,217,764**	**1**	**69,113**	**4**	**50,812**	**5**	**32,268**	**6**	**35,552**	**6**

Woodland Type	≥25 and <30% Area (ha)	SE%	≥30 and <35% Area (ha)	SE%	≥35 and <40% Area (ha)	SE%	≥40 and <45% Area (ha)	SE%	≥45 and <50% Area (ha)	SE%
Native	0	–	0	–	0	–	0	–	0	–
Near native & fragmented	0	–	0	–	0	–	26,171	7	21,803	7
Non native	24,129	7	28,204	6	21,541	7	1,828	25	0	–
Not determinable	0	–	0	–	0	–	0	–	0	–
Total	**24,129**	**7**	**28,204**	**6**	**21,541**	**7**	**27,998**	**6**	**21,803**	**7**

Woodland Type	≥50 and <55% Area (ha)	SE%	≥55 and <60% Area (ha)	SE%	≥60 and <65% Area (ha)	SE%	≥65 and <70% Area (ha)	SE%	≥70 and <75% Area (ha)	SE%
Native	38,600	6	24,696	7	32,992	6	35,968	6	35,122	6
Near native & fragmented	3,270	17	122	34	190	26	152	30	324	32
Non native	0	–	0	–	0	–	0	–	0	–
Not determinable	0	–	0	–	0	–	0	–	0	–
Total	**41,870**	**5**	**24,818**	**7**	**33,182**	**6**	**36,120**	**6**	**35,447**	**6**

Woodland Type	≥75 and <80% Area (ha)	SE%	≥80 and <85% Area (ha)	SE%	≥85 and <90% Area (ha)	SE%	≥90 and <95% Area (ha)	SE%	≥95 and <100% Area (ha)	SE%	Total Area (ha)	SE%
Native	38,086	6	57,923	5	53,677	5	85,491	4	1,105,043	1	**1,507,598**	**1**
Near native & fragmented	168	25	205	26	189	31	131	37	4,084	20	**56,809**	**4**
Non native	0	–	0	–	0	–	0	–	0	–	**1,461,581**	**1**
Not determinable	0	–	0	–	0	–	0	–	0	–	**19,632**	**5**
Total	**38,254**	**6**	**58,128**	**5**	**53,866**	**5**	**85,622**	**4**	**1,109,128**	**1**	**3,045,619**	**1**

Notes: 1. Native tree species = trees that colonised Scotland naturally after the last Ice Age. 2. SE = standard error. Amber text = values with SE >25%. 3. N. native & frag. = near native and fragments, woodland types are defined in Section 1.4. 4. >45 and ≤ 50% includes 50% which is defined as native. 5. Refer to methods for a list of all species classified as native. 6.   Area in cells that appear to contradict thresholds are due to rounding approaches at thresholds.

NFI woodland condition statistics

Figure 8-1 The proportion of native trees occupying the canopy of single stands in different types of woodland in Britain.
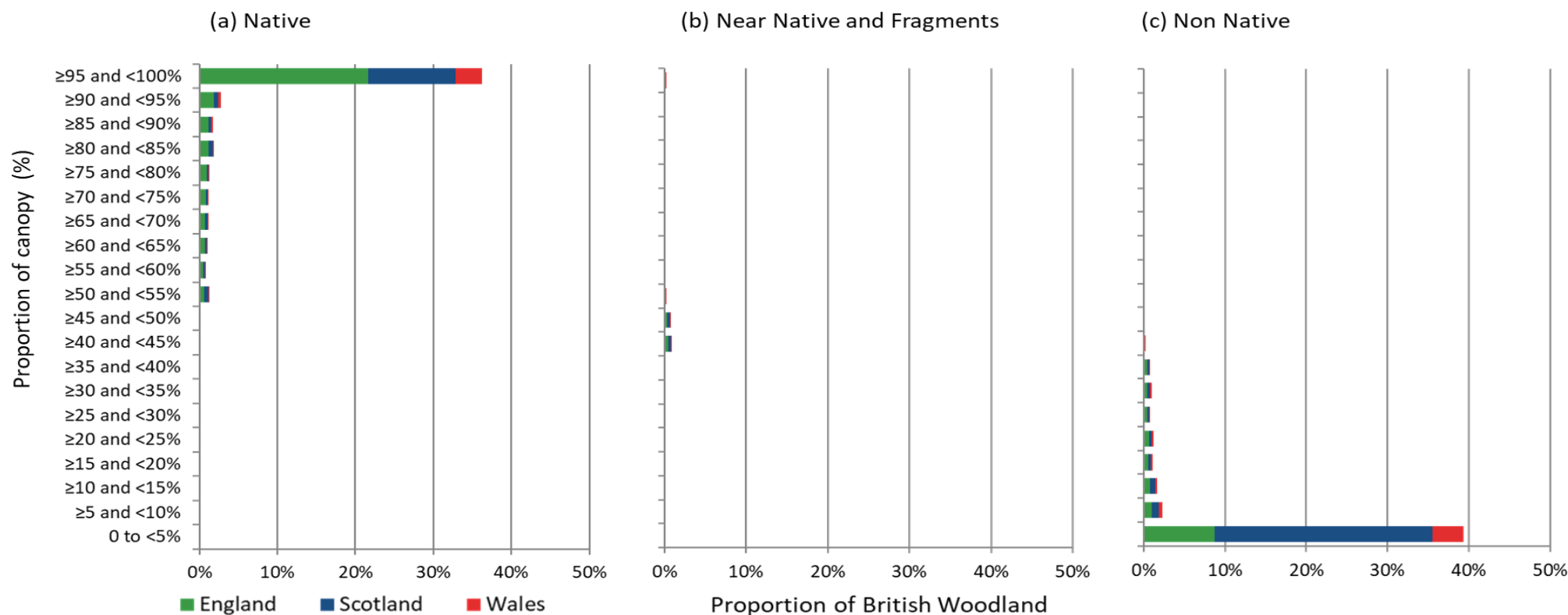
Notes: 1. (a) Native woodland (b) Near-native and fragments (c) Non-native woodland. 2. Native tree species = trees that colonised Scotland naturally after the last Ice Age. 3. Woodland types are defined in section 1.4. 4. Refer to methods for a list of all species classified as native.

9 Open space within woodland

Table 9-1 Different proportions of open space within British woodland by area (ha) and woodland type.

(a) Woodland Type	< 10%		≥ 10 and ≤ 25%		> 25 and < 50%		≥ 50%		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	445,792	2	170,784	3	193,900	2	240,970	2	1,051,446	1
Near native & fragments	17,543	8	6,117	12	8,337	11	9,375	11	41,372	5
Non native	698,352	1	247,866	2	166,462	3	219,972	2	1,332,651	1
Not determinable	132	33	116	35	113	56	18,758	5	19,119	5
Total	1,161,819	1	424,883	2	368,811	2	489,074	2	2,444,588	1

(b) Woodland Type	< 10%		≥ 10 and ≤ 25%		> 25 and < 50%		≥ 50%		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	55,485	5	51,482	6	111,469	4	237,716	3	456,152	2
Near native & fragments	2,115	20	1,211	29	3,196	19	8,914	14	15,437	10
Non native	19,135	8	14,941	9	29,465	7	65,389	5	128,930	3
Not determinable	3.7	96	0	–	0	–	509	41	513	41
Total	76,740	4	67,634	5	144,129	3	312,528	3	601,032	2

Notes:

1. (a) The proportion of open space within woodland greater than or equal to 10 hectares (b) The proportion of open space within woodland less than 10 hectares.
2. ha = hectares, SE = standard error. Amber text = values with SE >25%.
3. Woodland types are defined in Section 1.4.
4. The proportion of open space within woodland figures above should strictly be defined as the proportion of open space available in a woodland and will in some instances include open space immediately adjacent to woodland as well as open space entirely included within woodland. Refer to the methods report for more information.

NFI woodland condition statistics

Figure 9-1 The proportion of open space within British woodland area by woodland type and woodland size.
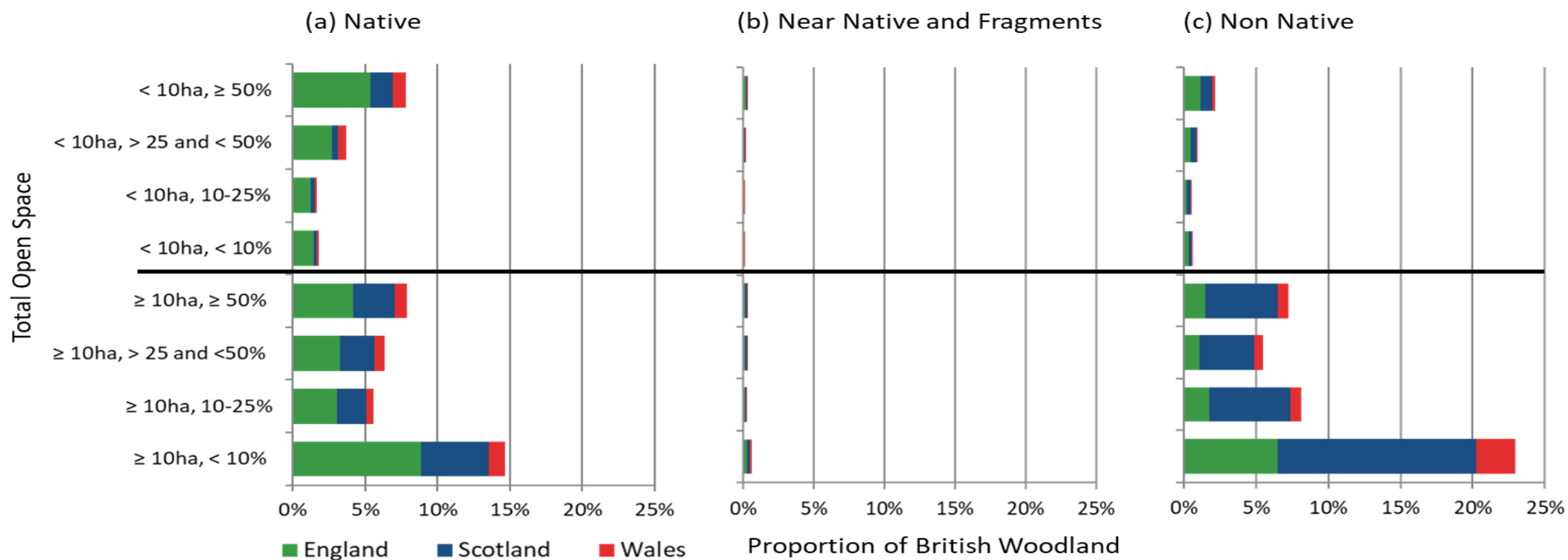
Notes:
1. (a) Native woodland (b) Near-native woodlands and fragments (c) Non-Native Woodland.
2. ha = hectare.
3. Woodland types are defined in section 1.4.
4. Refer to the methods report for more information.

NFI woodland condition statistics

Table 9-2 The proportion of surveyed area within British woodland by open space habitat type.

Habitat_name	Percentage of GB open space area	Quality
Improved grassland	20.1%	Low
Neutral grassland	13.9%	High
Arable/horticulture	11.2%	Low
Upland heathland	9.7%	High
Built up areas & gardens	7.6%	Low
Upland flushes, fens & swamps	7.4%	High
Boundary & linear features	5.2%	High
ACID GRASSLAND	4.4%	Low
Bracken	3.3%	High
Fen; marsh/swamp	2.9%	High
Other	14.4%	NA

Table 9-3 The proportion of surveyed area within British woodland by open space land use.

Land use	Percentage of GB open space area	Quality
Open OPN	35.5%	High
Agricultural land AGR	34.5%	Low
Felled PFE	8.9%	High
Plantable land LHP	4.5%	Low
Residential EMR	3.6%	Low
Perm. Open Space assoc. with Linear Feat. POS	3.5%	High
Open Water MOW	2.2%	High
Linear feature & open space assoc. linear feature LIF	1.9%	High
Other Recreation FRO	1.5%	Low
Other Built Facility EMO	1.1%	Low
Other	2.9%	NA

Note: High quality habitat and land-uses are those evaluated as highly beneficial to the woodlands ecology. Low quality habitat and land-uses are considered of low or moderate to negative benefit to woodland ecology.

10 Favourable land cover[*] types around woodlands in Britain

10.1 Woodland cover around woodlands

Table 10-1 Area of woodland within a 5.6 km radius (100 km^2) of surveyed woodlands in Britain by woodland type.

Woodland Type	< 10		≥ 10 and ≤ 20		> 20 and ≤ 30		> 30 and ≤ 40		> 40 and ≤ 50	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	417,220	2	524,059	2	250,246	2	157,897	3	97,119	4
Near native & fragments	15,597	9	19,642	7	9,204	10	5,668	12	3,907	24
Non native	141,991	3	337,885	2	262,824	2	252,228	2	213,767	3
Not determinable	829	25	3,089	12	5,537	12	3,162	15	4,013	10
Total	**575,637**	**2**	**884,676**	**1**	**527,812**	**2**	**418,954**	**2**	**318,807**	**2**

Woodland Type	> 50 and ≤ 60		> 60 and ≤ 70		> 70 and ≤ 80		> 80 and ≤ 90		> 90		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	46,621	6	10,866	9	2,817	12	259	43	0	–	**1,507,105**	1
Near native & fragments	1,704	25	581	49	450	32	22	59	0	–	**56,776**	5
Non native	135,394	3	72,655	5	36,760	6	7,123	13	640	39	**1,461,267**	1
Not determinable	2,413	12	541	39	46	6	0	–	0	–	**19,629**	5
Total	**186,131**	**3**	**84,643**	**4**	**40,073**	**6**	**7,405**	**13**	**640**	**39**	**3,044,777**	**1**

Notes:

1. SE = standard error. Amber text = values with SE >25%. 2. Woodland types are defined in Section 1.4. 3. Buffer zone = Land Cover within a 5.6 km radius (100 km^2) circle of the survey square centre point was assessed. 4. Sample location = 1hectare sample squares from which data are collected and are part of a stratified random sample designed by the NFI to be representative of all woodland in Britain. 5. Refer to the methods report for more detail.

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[*] 'Favourable land cover' are types of land cover that are considered favourable to biodiversity in the landscape, e.g. woodland. For more details refer to the methodology.

NFI woodland condition statistics

Figure 10-1 Proportional of woodland cover within a 5.6 km radius (100 km^2) of surveyed woodland in Britain by woodland type
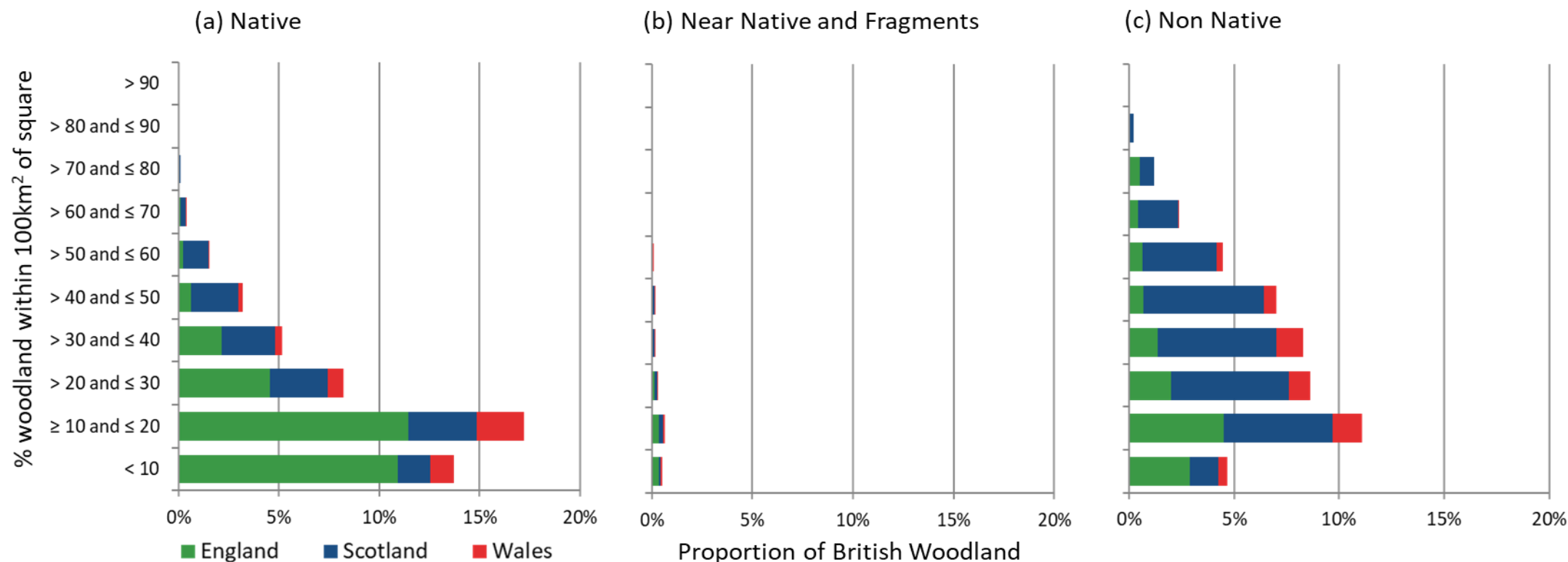
Notes: 1. (a) Native woodland (b) Near native woodland and fragments (c) Non-native. 2. Woodland types are defined in section 1.4.
3. Surveyed woodland refers to the 1 hectare sample squares from which data are collected and are part of a stratified random sample designed by the NFI to be representative of all woodland in Britain. 4. Refer to the methods report for more detail.

10.2 Other favourable habitat around woodlands

Table 10-2 Area of land cover composed of other favourable habitat within a 5.6 km radius (100 km^2) of the surveyed woodland in Britain by woodland type

Woodland Type	< 10%		≥ 10 and ≤ 20%		> 20 and ≤ 30%		> 30 and ≤ 40%		> 40 and ≤50%	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	983,409	1	205,917	3	92,716	4	60,512	5	53,906	6
Near native & fragments	33,150	6	9,878	12	5,305	12	3,460	17	1,227	22
Non native	561,570	1	198,707	3	176,980	3	173,017	3	133,948	3
Not determinable	9,497	8	1,699	22	2,053	15	1,472	15	1,731	13
Total	**1,587,626**	**1**	**416,200**	**2**	**277,055**	**2**	**238,461**	**2**	**190,812**	**3**

Woodland Type	> 50 and ≤ 60%		> 60 and ≤ 70%		> 70 and ≤ 80%		> 80 and ≤90%		> 90%		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	38,518	6	31,392	7	21,477	9	16,004	12	3,254	21	**1,507,105**	**1**
Near native & fragments	1,490	22	1,750	23	299	30	119	43	97	103	**56,776**	**5**
Non native	104,911	4	58,277	6	37,204	7	14,559	10	2,095	23	**1,461,267**	**1**
Not determinable	886	22	879	25	710	28	635	28	68	63	**19,629**	**5**
Total	**145,805**	**4**	**92,297**	**4**	**59,690**	**5**	**31,317**	**8**	**5,514**	**15**	**3,044,777**	**1**

Notes:
1. SE = standard error. Amber text = values with SE >25%.
2. Woodland types are defined in Section 1.4.
3. Surveyed woodland refers to the 1 hectare sample squares from which data are collected and are part of a stratified random sample designed by the NFI to be representative of all woodland in Britain.
4. 'Other favourable habitats' excludes urban and arable land, for a full definition and more information refer to the methods report.

NFI woodland condition statistics

Figure 10-2 Proportion of land cover that is 'other favourable habitat' within a 5.6 km radius (100 km^2) circle of the surveyed woodland in Britain by woodland type
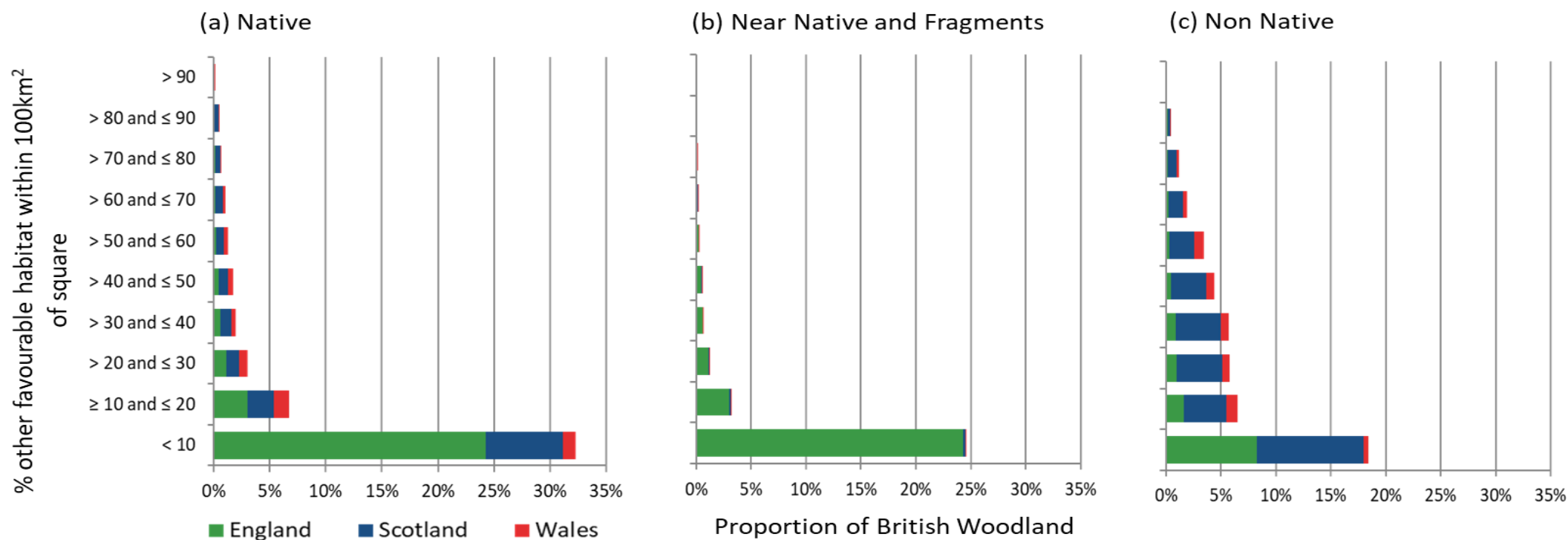
Notes: 1. (a) Native woodland (b) Near native woodland and fragments (c) Non-native woodland. 2. Woodland types are defined in Section 1.4. 4. Surveyed woodland refers to the 1 hectare sample squares from which data are collected and are part of a stratified random sample designed by the NFI to be representative of all woodland in Britain. 5. 'Other favourable habitats' exclude urban and arable land, for a full definition and more information refer to the methods report.

11 Woodland regeneration

11.1 Woodland regeneration within the individual stand

Table 11-1 Evidence of regeneration within individual woodland stands in Britain by woodland type and area

Woodland Type	None		Seedlings only		Seedlings & saplings only		Seedlings saplings < 7 cm trees	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	136,251	3	925	29	77,273	5	232,504	2
Near native & fragments	7,458	12	99	24	5,526	14	5,607	14
Non native	279,691	2	1,470	22	103,070	3	81,802	4
Not determinable	17,988	6	812	27	228	17	0	–
Total	**441,387**	**2**	**3,307**	**14**	**186,097**	**3**	**319,912**	**2**

Woodland Type	Saplings only		<7 cm trees & seedlings only		<7 cm trees & saplings only		< 7 cm trees only		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	317,526	2	228	93	601,144	1	141,256	3	**1,507,105**	**1**
Near native & fragments	14,663	8	0	–	18,984	9	4,440	15	**56,776**	**5**
Non native	280,508	2	399	60	361,470	2	352,857	2	**1,461,267**	**1**
Not determinable	601	29	0	–	0	–	0	–	**19,629**	**5**
Total	**613,298**	**2**	**627**	**51**	**981,598**	**1**	**498,552**	**2**	**3,044,777**	**1**

Notes: 1. Regeneration at the stand / component group level: each woodland component group is checked for the presence or absence of seedlings, saplings and 4-7 cm DBH trees, if present in at least one component of the group then this is counted as a presence (see glossary for definition of component group). (2). There is a strong correlation between nativeness and native tree species being present (see table on occupancy of natives) and it can be assumed that in the main any young trees present will be of the type of the stand they are within. 3. SE = standard error. Amber text = values with SE >25%. 3. Woodland types are defined in Section 1.4, refer to the methods report for more information.

NFI woodland condition statistics

Figure 11-1 Evidence of regeneration within woodland stands in Britain by woodland type
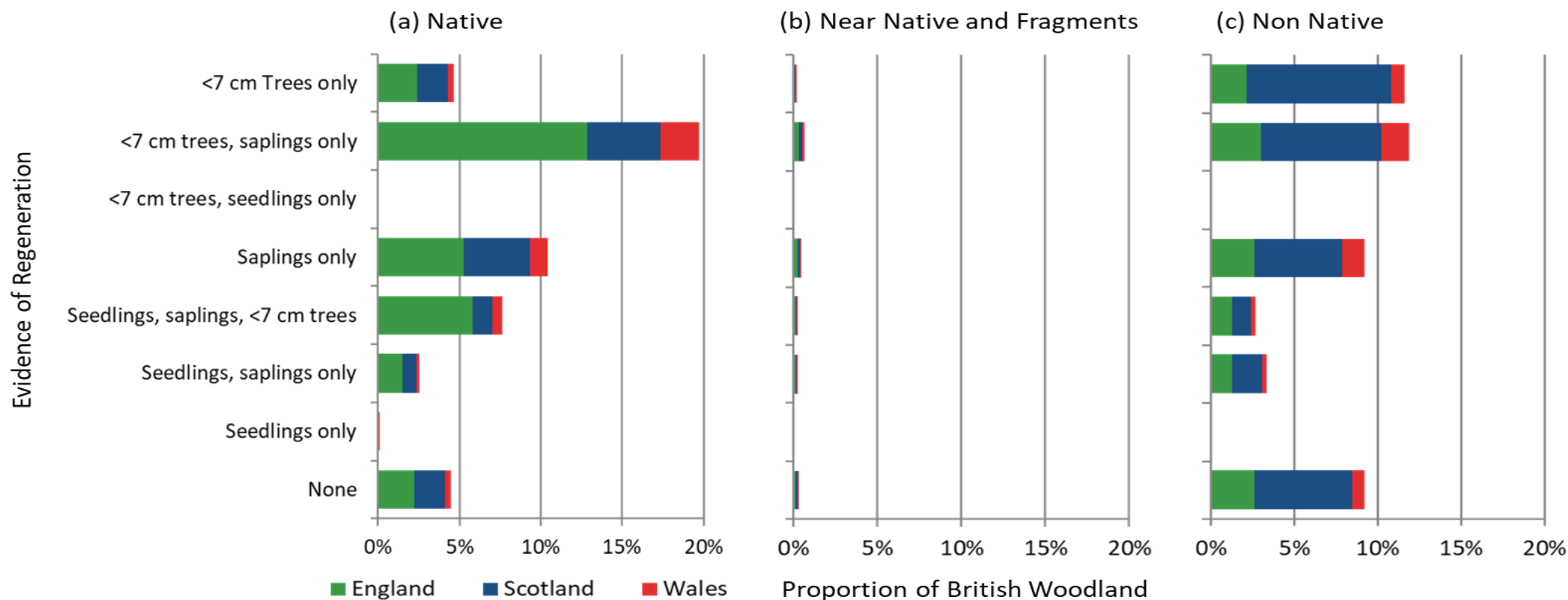
Notes: (a) Native woodland (b) Near native woodland and fragments (c) Non-native woodland. 1. Component Group: Homogeneous areas that are too small (<0.05 ha) to practically map as a discrete section /stand within GIS but with most of the same defining characteristics as a section. 2. Regeneration at the component group / stand level: each woodland component group is checked for the presence or absence of seedlings, saplings and 4-7 cm DBH trees, if present in at least one component of the group then this is counted as a presence. 3. Woodland types are defined in section 1.4. 4. Refer to the methods report for more information.

11.2   Woodland Regeneration at the square level: within and surrounding the stand

Table 11-2 Evidence of regeneration around woodland stands in Britain by woodland type.

Woodland Type	None		Seedlings only		Seedlings, saplings only		Seedlings, saplings, <7 cm trees	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	83,750	5	0	–	55,695	7	397,999	2
Near native & fragments	3,985	19	0	–	3,629	19	12,477	8
Non native	153,036	3	186	103	88,989	4	211,834	2
Not determinable	8,576	9	0	–	1,467	17	986	18
Total	**249,347**	**3**	**186**	**103**	**149,782**	**3**	**623,296**	**1**

Woodland Type	Saplings only		<7 cm trees, seedlings only		<7 cm trees, saplings only		<7 cm trees only		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	208,789	3	0	–	641,928	1	118,944	4	**1,507,105**	**1**
Near native & fragments	9,211	12	0	–	24,124	7	3,349	17	**56,776**	**5**
Non native	195,360	3	402	60	501,085	2	310,374	2	**1,461,267**	**1**
Not determinable	3,088	12	0	–	3,234	10	2,278	15	**19,629**	**5**
Total	**416,448**	**2**	**402**	**60**	**1,170,372**	**1**	**434,945**	**2**	**3,044,777**	**1**

Notes:

1. Square: A one-hectare (100 m by 100 m) square, which may be entirely within woodland or may overlap the woodland edge.
2. Regeneration at the square level: once the stand / component group level assessment is complete within a square, results for all stands / component groups in the square are aggregated and if seedlings, saplings, 4-7 cm DBH trees are found in at least one stand / component group in the square then this is counted as a presence.
3. SE = standard error. Amber text = values with SE >25%.
4. Woodland types are defined in Section 1.4, refer to the methods report for more information.

NFI woodland condition statistics

Figure 11-2 Evidence of regeneration in and around woodland stands in Britain by woodland type
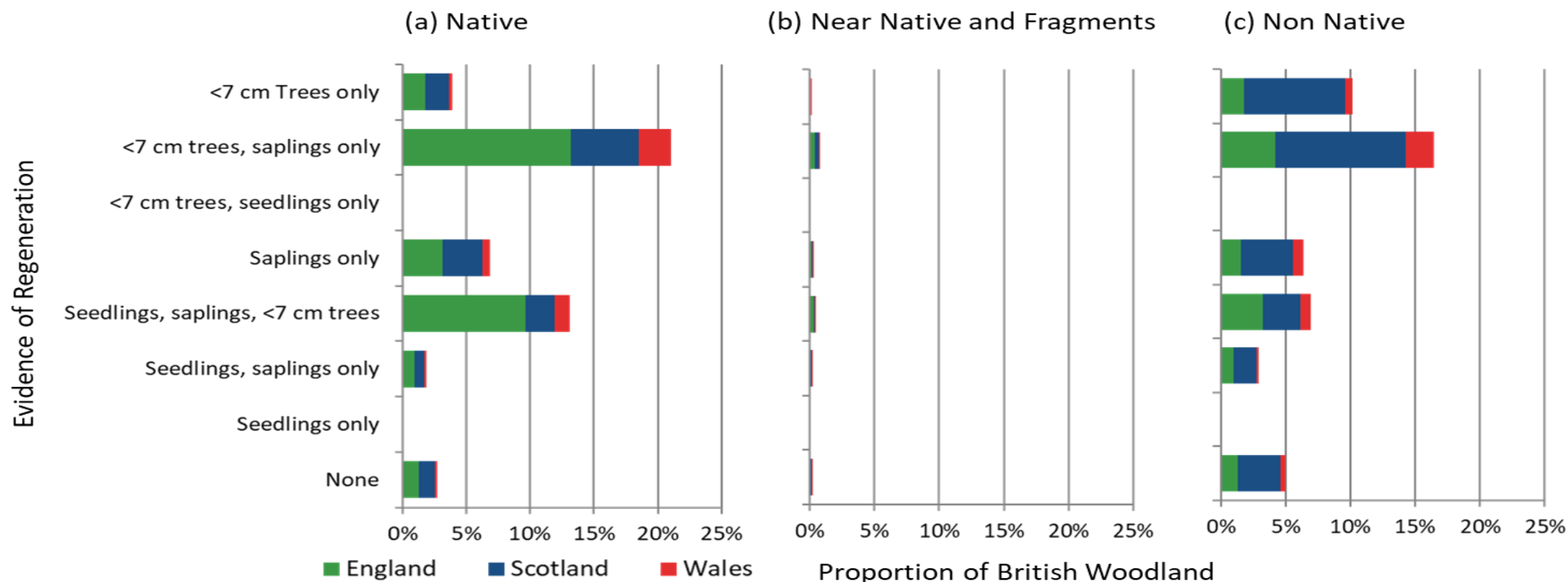
Notes: (a) Native woodland (b) Near native woodland and fragments (c) Non-native woodland. 1. Square: A one-hectare (100 m by 100 m) square, which may be entirely within woodland or may overlap the woodland edge. 2. Regeneration at the square level: once the stand / component group level assessment is complete within a square, results for all stands / component groups in the square are aggregated and if seedlings, saplings, 4-7 cm DBH trees are found in at least one stand / component group in the square then this is counted as a presence. 3. Woodland types are defined in Section 1.4. 4. Refer to the methods report for more information

12 Tree health

Table 12-1 Area of woodland in Britain without or with disease by woodland type

Woodland type	No pest & disease		Low impact pest & disease		High impact pest & disease		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	1,462,075	1	28,260	7	16,770	9	**1,507,105**	1
Near native & fragments	55,788	5	613	43	375	47	**56,776**	4
Non native	1,410,516	1	3,902	15	46,849	5	**1,461,267**	1
Not determinable	17,695	6	0	–	1,934	14	**19,629**	5
Total	**2,946,073**	1	**32,775**	6	**65,929**	4	**3,044,777**	1

Notes:

1. SE = standard error. Amber text = values with SE > 25%.
2. Woodland types are defined in section 1.4.
3. Low impact disease examples include Horse Chestnut Leaf Miner and Oak Processionary Moth; High impact disease examples include Ash Dieback and *Phytophthora ramorum*. For a full list of tree diseases with impact classification please refer to the methodology report.
4. This assessment will not be exhaustive as some tree diseases and pests are difficult to detect at low infection levels and positive detection for several pests and diseases requires destructive sampling, which was not undertaken during the NFI Surveys. However, high impact infections and high levels of mortality in trees are unlikely to be missed and moderate infections and infestations equally will be observed by surveyors. Time of year and leaf on or not will also impact upon the ability to observe/ identify some diseases and results were not normalised for season. Therefore, while positive results are a valuable indicator, negative results may not always be an indication of absence.

NFI woodland condition statistics

Figure 12-1 Proportion of woodland area in Britain without or with disease in by woodland type
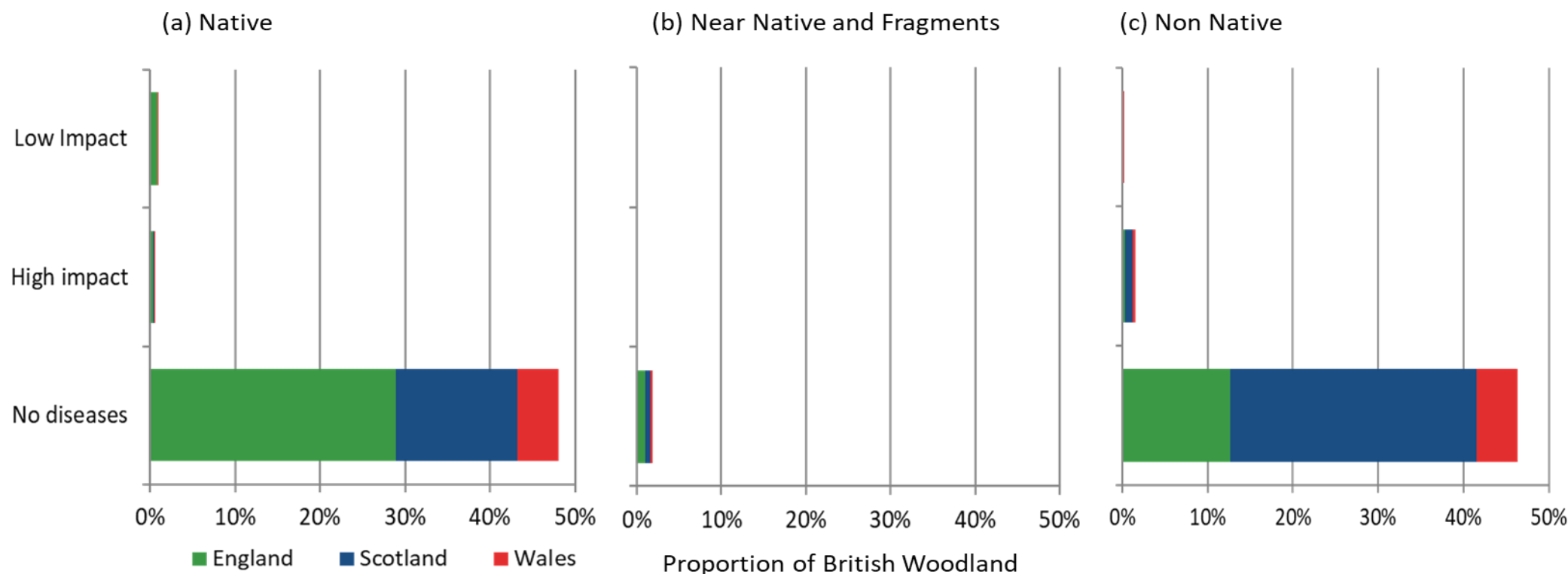
Notes: (a) Native woodlands (b) Near native woodland or fragments (c) Non-native woodland. 1. SE = standard error. Amber text = values with SE > 25%. 2. Woodland types are defined in section 1.4. 3. Low impact disease examples include Horse Chestnut Leaf Minor and Oak Processionary Moth; High impact disease examples include Ash Dieback and Phytophthora ramorum. For a full list of tree diseases with impact classification please refer to the methodology report. 4. Some of the diseases are difficult to detect at low infection levels and surveying for several of the insects requires destructive sampling, which was not undertaken during the NFI Surveys, but high impact infections and high levels of mortality in trees are unlikely to be missed. Time of year and leaf on or not will impact the ability to observe/ identify some diseases and results were not normalised for season Therefore, while positive results are a valuable indicator, negative results may not always be an indication of absence.

NFI woodland condition statistics

Table 12-2 Area of woodland in Britain, broken down by different levels of tree mortality by woodland type

Woodland type	≤ 11% mortality		> 11% and < 25% mortality		≥ 25% mortality		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	1,400,962	1	69,821	4	36,323	6	**1,507,105**	**1**
Near native & fragments	53,450	5	2,474	21	852	34	**56,776**	**4**
Non native	1,376,178	1	64,434	5	20,655	7	**1,461,267**	**1**
Not determinable	19,186	5	303	36	140	34	**19,629**	**5**
Total	**2,849,775**	**1**	**137,032**	**3**	**57,970**	**5**	**3,044,777**	**1**

Notes:

1. SE = standard error. Amber text = values with SE > 25%.
2. Woodland types are defined in section 1.4.
3. Dead trees associated with wind blow or failed planting are not included in this assessment. Refer to the methodology report for more information.

Table 12-3 Area of woodland without or with crown dieback in British woodlands by woodland type

Woodland type	No crown dieback		Some crown dieback		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	1,372,344	1	134,761	3	**1,507,105**	**1**
Near native & fragments	52,239	5	4,538	17	**56,776**	**4**
Non native	1,333,056	1	128,211	4	**1,461,267**	**1**
Not determinable	19,341	5	288	40	**19,629**	**5**
Total	**2,776,980**	**1**	**267,798**	**2**	**3,044,777**	**1**

Notes:

1. SE = standard error. Amber text = values with SE > 25%.
2. Woodland types are defined in section 1.4.
3. Crown dieback = the death of branches within a tree's crown. Crown dieback may be due to causes injurious and non-injurious to long term tree health, for example squirrels may cause temporary crown dieback while *H. fraxineus* may cause permanent mortality. Refer to the methods report for more information.

NFI woodland condition statistics

Figure 12-2 Proportion of tree mortality within woodland in Britain by woodland type
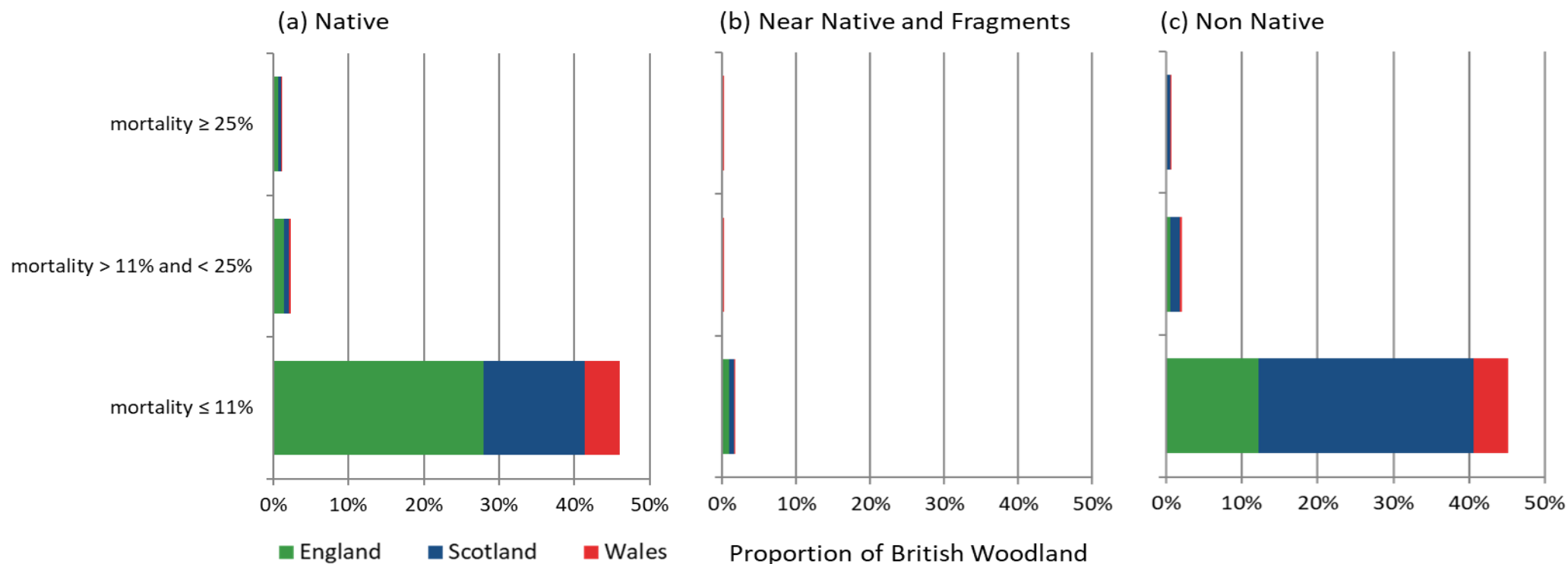
Notes:

(a) Native woodland (b) Near native and fragments (c) Non-native woodland. 1. Woodland types are defined in section 1.4. 2. Dead trees associated with wind blow or failed planting are not included in this assessment. 3. Refer to the methodology report for more information.

13 Vegetation: field and ground flora in British woodlands

The combined area for the field and ground layer vegetation must sum to 100% of the section area, with the assumption these layers are spatially discrete. However, it is acknowledged that there is likely to be some ground layer vegetation beneath the field layer, therefore to account for this likely overlap 25% of the field layer coverage is universally added to the ground layer coverage. Refer to the methodology report for more information.

13.1   Vegetation: ground layer

Table 13-1 Percentage cover of ground layer vegetation in woodland stands in Britain by woodland type and area

Woodland Type	No Ground layer		> 0 and ≤ 10 %		> 10 and ≤ 20 %		> 20 and ≤ 30 %		> 30 and ≤ 40 %		> 40 and ≤ 50 %	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	31,785	6	91,383	4	95,677	4	332,303	2	261,090	3	170,660	3
Near native & fragments	1,298	30	987	33	1,727	19	8,712	10	8,782	11	8,213	15
Non native	54,483	5	76,558	4	47,439	5	139,819	3	132,858	3	109,934	3
Not determinable	7,295	9	689	30	139	32	1,776	19	2,254	16	1,466	19
Total	**94,862**	**3**	**169,617**	**3**	**144,982**	**3**	**482,610**	**2**	**404,984**	**2**	**290,272**	**2**

Woodland Type	> 50 and ≤ 60 %		> 60 and ≤ 70 %		> 70 and ≤ 80 %		> 80 and ≤ 90 %		> 90 %		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	144,610	3	136,770	3	91,143	4	79,829	4	71,855	4	**1,507,105**	**1**
Near native & fragments	6,223	13	5,372	14	5,067	16	4,693	15	5,703	14	**56,776**	**5**
Non native	105,226	3	122,713	3	142,920	3	203,877	3	325,440	2	**1,461,267**	**1**
Not determinable	1,529	17	929	23	996	26	1,610	19	946	23	**19,629**	**5**
Total	**257,588**	**2**	**265,784**	**2**	**240,126**	**2**	**290,009**	**2**	**403,944**	**2**	**3,044,777**	**1**

Notes: 1. SE = standard error. Amber text = values with SE >25%. 2. Woodland types are defined in Section 1.4. 3. Ground layer = the lowest layer of a plant community, often comprising mosses, lichens, leaf litter and fungi. 4. What constitutes favourable vegetation cover differs depending on the NVC type present, with nutrient rich NVC types having a higher benchmark than nutrient poor NVC types. 5. Refer to methods for more information.

NFI woodland condition statistics

Figure 13-1 Percentage cover of ground layer vegetation in woodland stands in Britain by woodland type

(a) Native   (b) Near Native and Fragments   (c) Non Native

■ England ■ Scotland ■ Wales

Proportion of British Woodland

Notes:

(a) Native woodland (b) Near native woodlands and fragments (c) Non-native woodland. 1. Ground layer = the lowest layer of plant community, comprising of things like mosses, lichens and fungi. 2. Woodland types are defined in Section 1.4. 3. None = no data collected. 4. Refer to the method report for more information.

13.2 Vegetation: field layer

Table 13-2 Percentage cover of field layer vegetation in woodland stands in Britain by woodland type and area
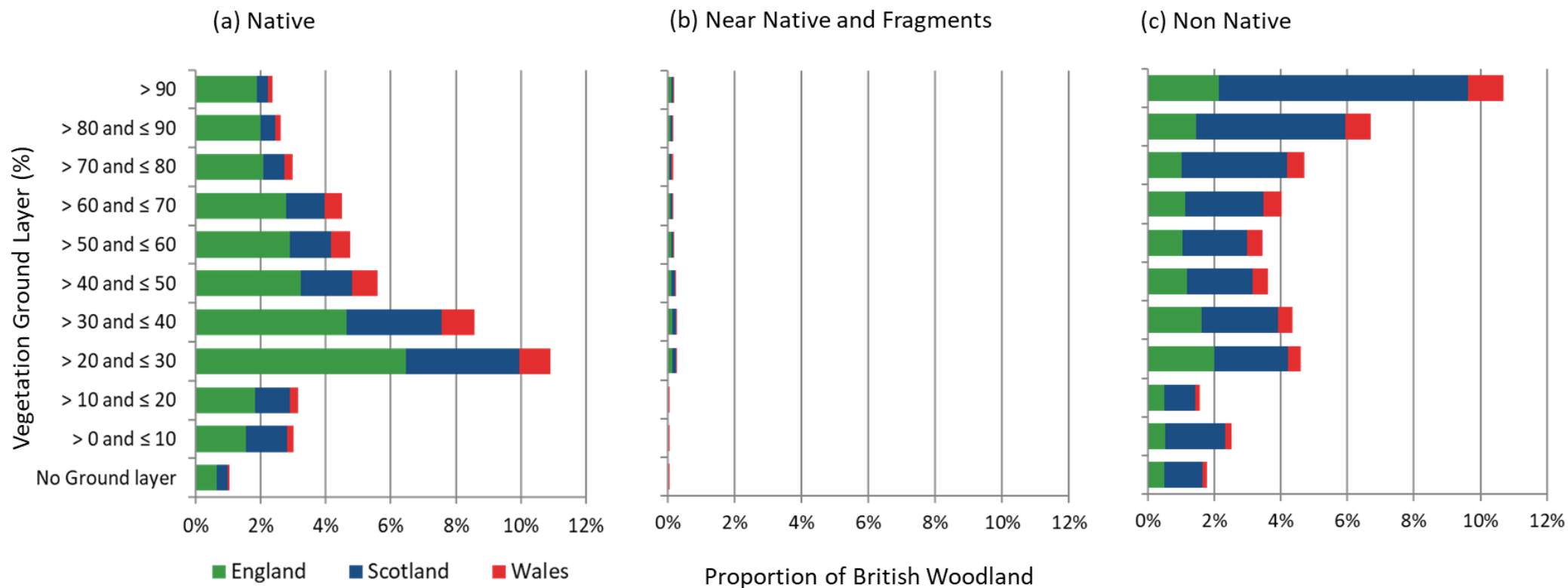
Woodland Type	No field layer		> 0 and ≤ 10%		> 10 and ≤ 20%		>20 and ≤ 30%		>30 and ≤ 40%		>40 and ≤ 50%	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	83,731	4	143,330	3	128,496	3	115,969	3	123,156	3	137,388	3
Near native & fragments	5,085	15	5,327	20	4,810	15	6,480	15	4,024	16	3,955	16
Non native	356,979	2	340,134	2	136,213	3	97,011	4	76,871	4	83,670	4
Not determinable	8,199	8	1,731	18	764	26	815	23	1,153	25	916	22
Total	**453,994**	**2**	**490,521**	**2**	**270,282**	**2**	**220,274**	**2**	**205,203**	**2**	**225,929**	**2**

Woodland Type	>50 and ≤ 60%		>60 and ≤ 70%		>70 and ≤ 80%		> 80 and ≤ 90%		> 90%		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	139,214	3	133,361	3	144,674	3	170,749	4	187,039	3	**1,507,105**	**1**
Near native & fragments	4,664	13	5,452	14	6,415	12	4,662	14	5,902	13	**56,776**	**5**
Non native	69,342	4	74,314	4	74,507	4	75,813	4	76,414	4	**1,461,267**	**1**
Not determinable	766	22	1,463	19	1,266	22	1,743	18	813	30	**19,629**	**5**
Total	**213,987**	**2**	**214,589**	**2**	**226,861**	**2**	**252,967**	**3**	**270,169**	**2**	**3,044,777**	**1**

Notes:
1. SE = standard error. Amber text = values with SE > 25%.
2. Woodland types are defined in section 1.4.
3. Field layer = the Field layer is made up of grasses, ferns and flowering plants.
4. Refer to methods for more information.

NFI woodland condition statistics

Figure 13-2 Proportion of field layer vegetation in woodland stands in Britain by woodland type
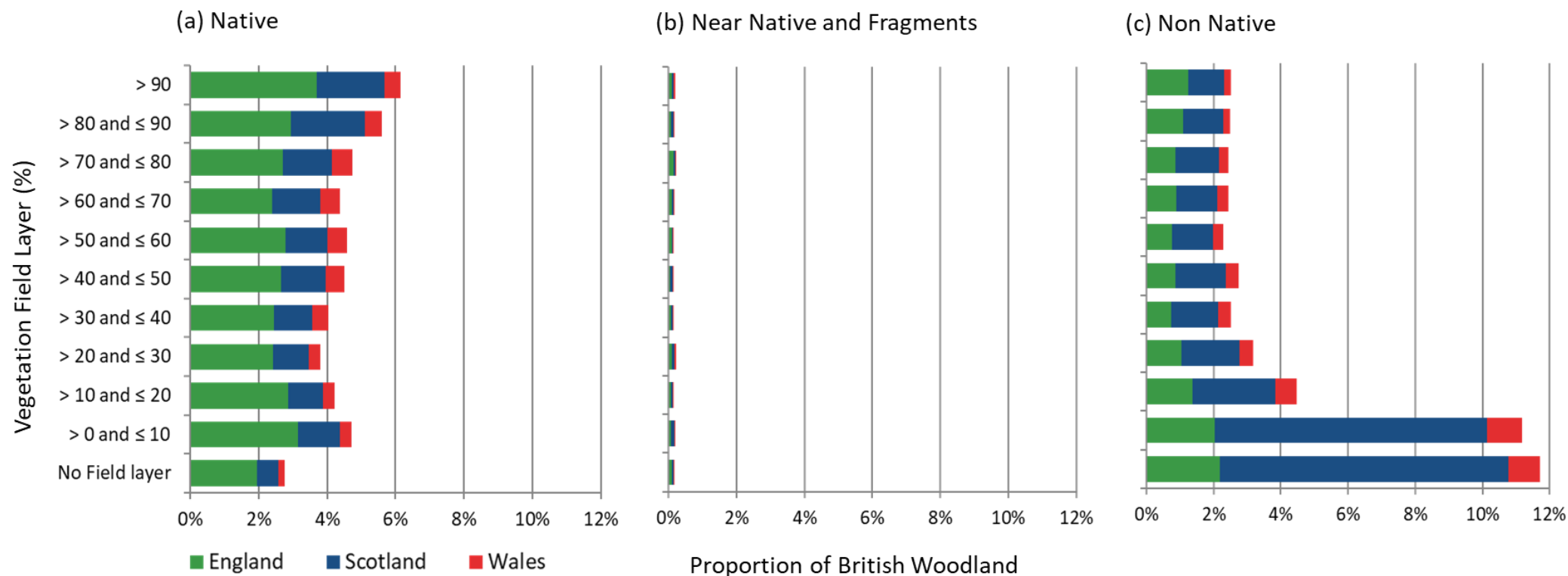
Notes:

(a) Native woodland (b) Near native woodlands and fragments (c) Non-native woodland. 1. Field layer = the field layer is made up of grasses, ferns and flowering plants. 2. Woodland types are defined in section 1.4. 3. None = no data collected. 4. Refer to the method report for more information

13.3 Vegetation: bare soil

Table 13-3 Percentage of bare soil in woodland stands in Britain by woodland type and area

Woodland Type	No bare soil Area (ha)	SE%	> 0 and ≤ 10% Area (ha)	SE%	> 10 and ≤ 20% Area (ha)	SE%	>20 and ≤ 30% Area (ha)	SE%	>30 and ≤ 40% Area (ha)	SE%	>40 and ≤ 50% Area (ha)	SE%
Native	1,140,606	1	286,686	2	44,097	5	16,846	9	6,876	14	4,444	17
Near native & fragments	43,088	5	10,296	11	2,312	22	841	42	32	66	61	69
Non native	1,221,128	1	195,480	3	22,851	7	7,902	11	5,611	12	3,648	18
Not determinable	15,007	6	3,444	13	719	22	176	50	283	40	0	–
Total	**2,419,828**	**1**	**495,906**	**2**	**69,979**	**4**	**25,766**	**7**	**12,801**	**9**	**8,152**	**13**

Woodland Type	>50 and ≤ 60% Area (ha)	SE%	>60 and ≤ 70% Area (ha)	SE%	>70 and ≤ 80% Area (ha)	SE%	> 80 and ≤ 90% Area (ha)	SE%	> 90% Area (ha)	SE%	Total Area (ha)	SE%
Native	3,534	21	1,078	33	1,242	29	1,320	38	376	62	**1,507,105**	**1**
Near native & fragments	0	–	100	51	43	97	0	–	4	108	**56,776**	**4**
Non native	1,732	20	879	29	655	36	777	33	605	35	**1,461,267**	**1**
Not determinable	0	–	0	–	0	–	0	–	0	–	**19,629**	**5**
Total	**5,266**	**15**	**2,057**	**21**	**1,940**	**22**	**2,096**	**27**	**985**	**32**	**3,044,777**	**1**

Notes:

1. SE = standard error. Amber text = values with SE >25%.
2. Woodland types are defined in Section 1.4.
3. Refer to the method report for more information.

NFI woodland condition statistics

Figure 13-3 Proportion of bare soil in woodland stands in Britain by woodland type
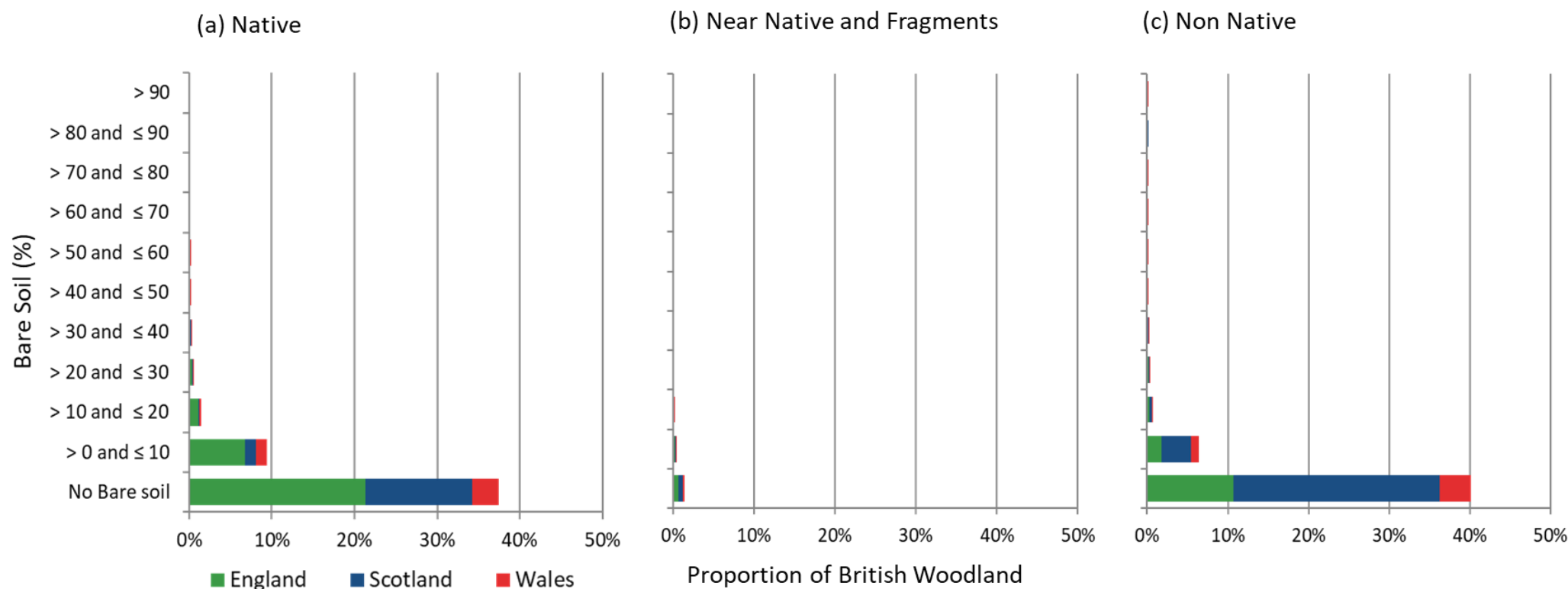
Notes:

(a) Native woodland (b) Near native woodlands and fragments (c) Non-native woodland. 1. Woodland types are defined in section 1.4.

2. None = no data collected. 3. Refer to the method report for more information.

14 Woodland vertical structure

Table 14-1 The vertical structure of woodland stands in Britain by area by woodland type.

Woodland Type	No storeys		1 storey		2 storeys		3 storeys	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	2,900	15	169,169	4	265,318	2	292,559	2
Near native & fragments	484	33	7,796	10	9,101	13	10,163	10
Non native	27,187	5	484,960	2	398,537	2	254,072	2
Not determinable	19,551	5	79	40	0	–	0	–
Total	**50,122**	**3**	**662,004**	**2**	**672,957**	**1**	**556,793**	**1**

Woodland Type	4 storeys		5 storeys		Complex		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	192,028	3	45,482	6	539,649	1	**1,507,105**	**1**
Near native & fragments	5,477	15	1,296	32	22,459	7	**56,776**	**5**
Non native	98,622	4	18,413	8	179,475	3	**1,461,267**	**1**
Not determinable	0	0	0	0	0	0	**19,629**	**5**
Total	**296,127**	**2**	**65,191**	**5**	**741,583**	**1**	**3,044,777**	**1**

Notes:

1. SE = standard error. Amber text = values with SE >25%.
2. Complex storey = stands that are composed of 5 or more storeys or multiple heights of trees without it being possible to stratify into broad height bands (such as upper, middle or lower).
3. No storeys = occur due to clear fell or areas of open space less than 0.5 hectares within a woodland. Refer to the methods report for more information.
4. Woodland types are defined in section 1.4.

NFI woodland condition statistics

Figure 14-1 The vertical structure of British woodland stands by woodland type.
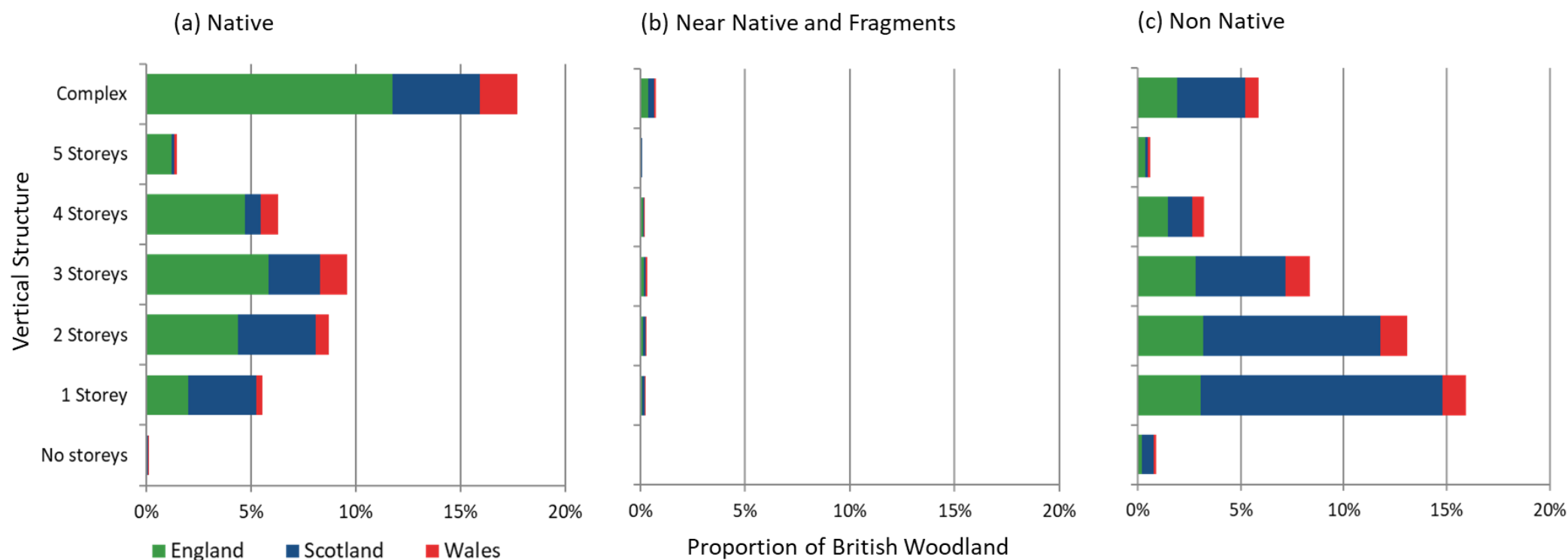
Notes:

(a) Native woodland (b) Near native woodlands and fragments (c) Non-native woodland. 1. Complex storey = stands that are composed of 5 or more storeys or multiple heights of trees without it being possible to stratify into broad height bands (such as upper, middle or lower); No storeys = occur due to clear fell or areas of open space less than 0.5 hectares within a woodland. 2. Refer to the methods report for more information. 3. Woodland types are defined in section 1.4.

15 Veteran trees

Table 15-1 Number of veteran trees per hectare per stand of British woodlands by woodland type

Woodland Type	0 trees per ha		0 - 1 tree per ha		> 1 and ≤ 2 trees per ha		> 2 and ≤ 5 trees per ha	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	1,469,692	1	1,207	40	4,050	19	6,373	15
Near native & fragments	59,283	4	0	–	179	99	1,253	52
Non native	1,478,036	1	219	101	342	68	579	37
Not determinable	19,629	5	0	–	0	–	0	–
Total	**3,026,639**	**0**	**1,426**	**37**	**4,571**	**18**	**8,205**	**14**

Woodland Type	> 5 and ≤ 10 trees per ha		> 10 and ≤ 20 trees per ha		> 20 trees per ha		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	2,241	20	1,148	31	166	51	1,484,878	1
Near native & fragments	383	51	0	–	78	91	61,176	4
Non native	1,018	34	89	58	23	80	1,480,306	1
Not determinable	0	–	0	–	0	–	19,629	5
Total	**3,642**	**17**	**1,237**	**29**	**268**	**42**	**3,045,989**	**0**

Notes:
1. SE = standard error. Amber text = values with SE >25%.
2. Woodland types are defined in Section 1.4.
3. A veteran tree is defined as a tree that is of interest biologically, culturally or aesthetically because of its age, size or condition. It is important to note that veteran trees are also found in found outside of woodland, in wood pasture, parkland and hedgerows on agricultural land and other areas not covered by this study. Refer to the methods report for more information.

NFI woodland condition statistics

Figure 15-1 The number of veteran trees per hectare in British woodlands by woodland type and area
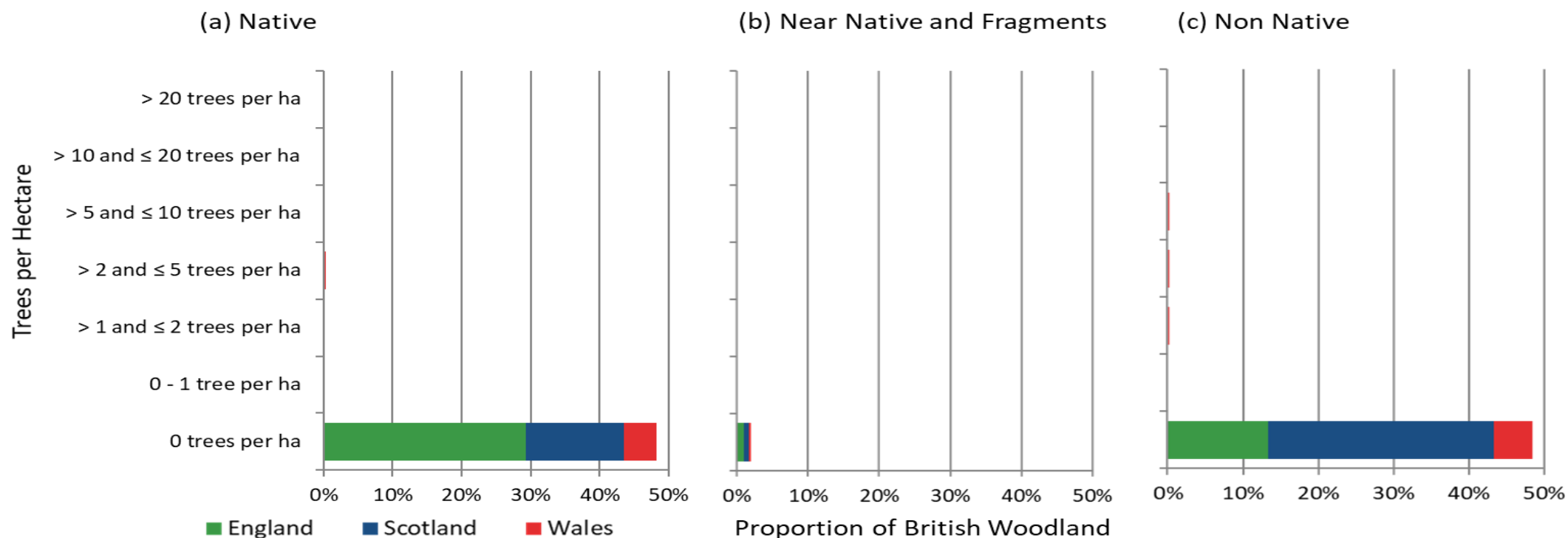
Notes:

(a) Native woodland (b) Near native woodlands and fragments (c) Non-native woodland. 1. Woodland types are defined in section 1.4. 2. A veteran tree is defined as a tree that is of interest biologically, culturally or aesthetically because of its age, size or condition It is important to note that veteran trees are also found in found outside of woodland in wood pasture, parkland and hedgerows on agricultural land and other areas not covered by this study. Refer to the methods report for more information.

16 Volume of deadwood

Table 16-1 Ranges of the volume of deadwood (m³ per hectare) in woodland stands in Britain by woodland type and area

Woodland Type	None		>0 and ≤ 10		>10 and ≤ 20		>20 and ≤ 30		>30 and ≤ 40	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	695,855	1	379,154	2	133,550	3	76,815	4	48,933	5
Near native & fragments	26,096	7	13,361	9	5,385	14	2,319	21	1,909	26
Non native	569,283	1	352,813	2	141,038	3	92,313	4	61,997	5
Not determinable	6,887	10	3,599	12	2,376	16	1,564	15	1,801	17
Total	**1,298,121**	**1**	**748,927**	**1**	**282,349**	**2**	**173,011**	**3**	**114,640**	**3**

Woodland Type	>40 and ≤ 50		>50 and ≤ 60		>60 and ≤ 70		>70 and ≤ 80		>80 and ≤ 90	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	34,543	6	28,729	7	20,381	8	16,634	9	11,033	11
Near native & fragments	1,323	27	1,225	31	1,072	30	327	39	958	41
Non native	42,657	5	37,119	6	31,185	7	23,496	8	18,533	8
Not determinable	774	27	556	33	355	32	685	36	163	18
Total	**79,297**	**4**	**67,629**	**5**	**52,993**	**5**	**41,141**	**6**	**30,687**	**6**

Woodland Type	>90 and ≤ 100		>100 and ≤ 150		>150 and ≤ 200		>200 and ≤ 500		>500		Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	9,992	12	26,953	7	11,403	11	11,738	10	1,390	30	**1,507,105**	**1**
Near native & fragments	482	53	1,666	24	381	59	169	25	104	99	**56,776**	**5**
Non native	16,261	9	41,270	6	16,683	9	15,702	8	918	32	**1,461,267**	**1**
Not determinable	48	21	742	22	80	30	0	–	0	–	**19,629**	**5**
Total	**26,783**	**7**	**70,630**	**4**	**28,547**	**7**	**27,610**	**6**	**2,412**	**22**	**3,044,777**	**1**

Notes: 1. The NFI records three types of deadwood: Standing dead trees, Lying deadwood and Stumps. The NFI Deadwood Calculator derives a standing deadwood volume per hectare, a lying deadwood volume per hectare and a stump volume per hectare (the methodology is set out in a document available on request from the NFI). 2. The NFI Condition Calculator uses the deadwood volume from standing dead trees and lying deadwood only, to match the UK Forestry Standard (Forestry Commission, 2017). 3. The deadwood volume calculations are at a section-level, so if multiple woodland component groups exist within a section, each will have the same per hectare values for lying and standing deadwood. 4. Estimations presented here exclude stumps. 5. SE = standard error. Amber text = values with SE >25%. 6. N. native & frags. =near native and fragments, woodland types are defined in section 1.4. 7. Refer to the methods report for more information.

NFI woodland condition statistics

Figure 16-1 Ranges of the volume of deadwood (m³ per hectare) in woodland stands in Britain by woodland type
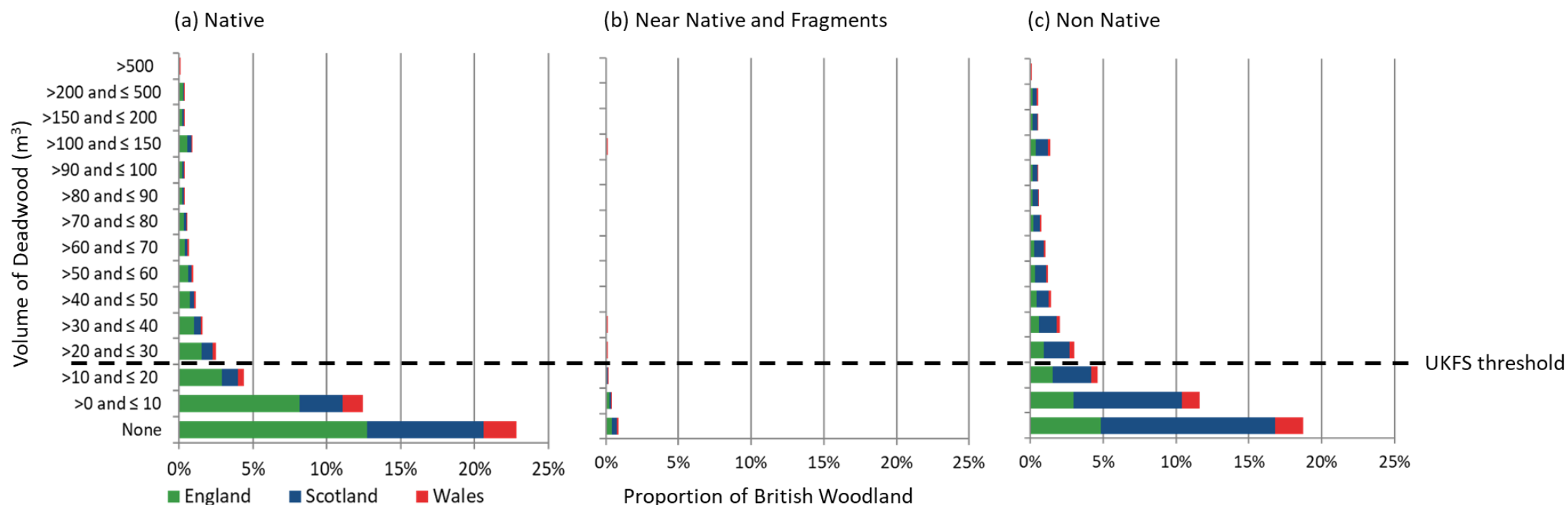
Notes: (a) Native woodland (b) Near native woodlands and fragments (c) Non-native woodland. 1. The NFI records three types of deadwood: Standing dead trees, Lying deadwood, Stumps. 2. The NFI Deadwood Calculator derives a standing deadwood volume per hectare, a lying deadwood volume per hectare and a stump volume per hectare (the methodology is set out in a document available on request from the NFI). 3. The NFI Condition Calculator uses the deadwood volume from standing dead trees and lying deadwood only, to match the UK Forestry Standard (Forestry Commission, 2017). 4. The deadwood volume calculations are at a section-level, so if multiple woodland component groups exist within a section, each will have the same per hectare values for lying and standing deadwood. 5. Estimations presented here excludes stumps. 6. Woodland types are defined in Section 1.4. 7. Refer to the methods report for more information. 8. Dashed black line represents the UK Forestry Standards threshold.

17 Size of woodlands that native types are found within in Britain

Table 17-1 The size of woodlands that native types are found within in Britain by woodland type and area

Woodland Type	<5 ha Area (ha)	SE%	≥5 and <10 ha Area (ha)	SE%	≥10 and <15 ha Area (ha)	SE%	≥15 and <20 ha Area (ha)	SE%	≥20 and <25 ha Area (ha)	SE%	≥25 and <30 ha Area (ha)	SE%
Native	315,098	3	140,853	4	90,047	4	61,494	5	52,893	6	44,316	6
Near native & fragments	11,877	12	3,544	16	3,194	19	1,589	24	961	34	1,714	28
Non native	88,148	4	40,676	6	32,505	7	27,235	8	21,289	10	21,227	8
Not determinable	454	45	59	74	260	74	105	49	287	54	294	35
Total	**415,577**	**2**	**185,132**	**3**	**126,005**	**4**	**90,423**	**4**	**75,430**	**5**	**67,550**	**5**

Woodland Type	≥30 and <35 ha Area (ha)	SE%	≥35 and <40 ha Area (ha)	SE%	≥40 and <45 ha Area (ha)	SE%	≥45 and <50 ha Area (ha)	SE%	≥50 and <60 ha Area (ha)	SE%	≥60 and <70 ha Area (ha)	SE%
Native	43,306	6	26,873	8	26,460	8	23,634	9	48,843	6	36,636	6
Near native & fragments	1,974	22	1,389	32	512	25	630	40	1,906	26	1,796	26
Non native	15,825	10	15,134	10	13,472	11	12,704	11	30,152	7	25,404	8
Not determinable	511	31	119	39	0	–	236	62	289	49	140	62
Total	**61,616**	**5**	**43,516**	**6**	**40,444**	**6**	**37,204**	**7**	**81,191**	**4**	**63,975**	**5**

Woodland Type	≥70 and <80 ha Area (ha)	SE%	≥80 and <90 ha Area (ha)	SE%	≥90 and <100 ha Area (ha)	SE%	≥100 and <150 ha Area (ha)	SE%	≥150 and <200 ha Area (ha)	SE%	≥200 ha Area (ha)	SE%	Total Area (ha)	SE%
Native	33,559	8	26,880	8	28,188	8	86,702	4	58,069	5	363,255	2	**1,507,105**	**1**
Near native & fragments	1,412	27	1,287	30	863	31	3,168	17	2,554	22	16,407	8	**56,776**	**5**
Non native	20,161	9	18,217	9	19,757	9	70,394	5	55,148	5	933,818	1	**1,461,267**	**1**
Not determinable	226	46	647	32	320	39	825	23	692	28	14,166	6	**19,629**	**5**
Total	**55,359**	**6**	**47,031**	**6**	**49,128**	**6**	**161,089**	**3**	**116,463**	**4**	**1,327,645**	**1**	**3,044,777**	**1**

Notes: 1. SE = standard error. Amber text = values with SE >25%. 2. Woodland types are defined in Section 1.4. 3. Refer to methods report for more information.

NFI woodland condition statistics

Figure 17-1 Proportion of size of woodlands that native types are found within in Britain
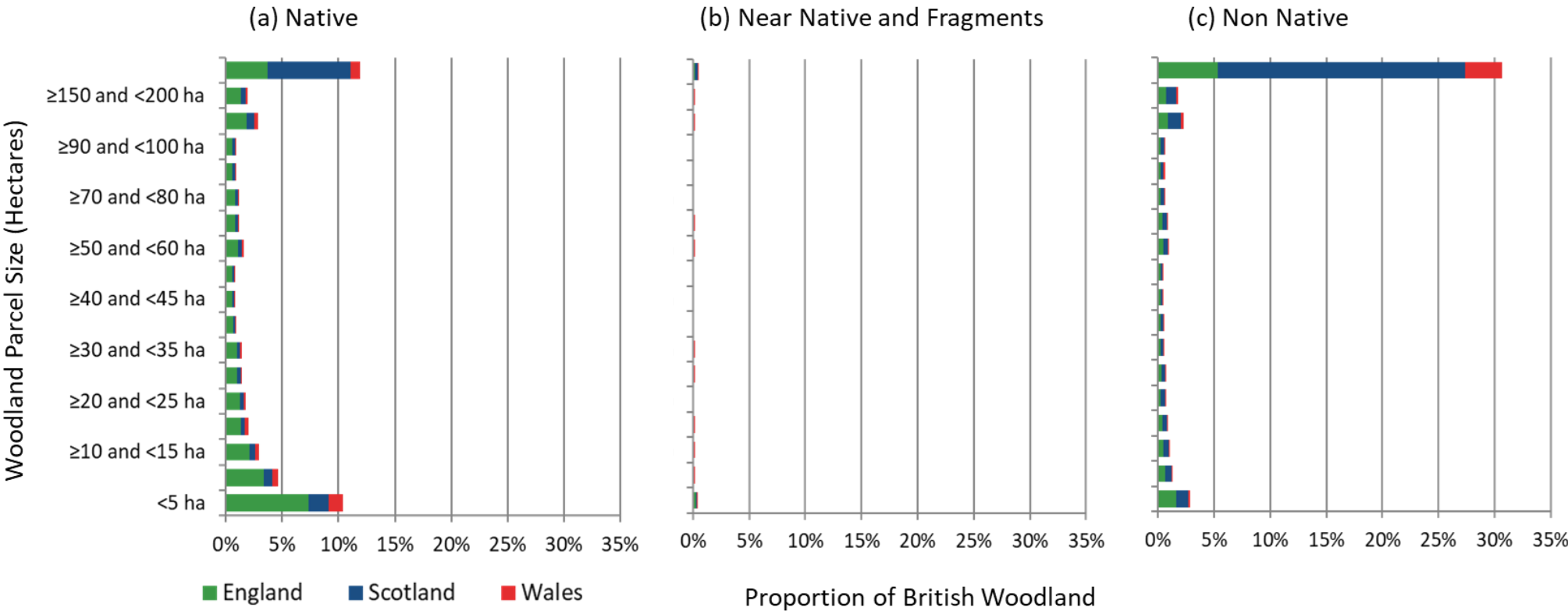
Notes:

(a) Native woodlands (b) Near native woodlands and fragments (c) Non-native woodland. 1. Woodland types are defined in Section 1.4.

2. Refer to methods for more information.

18 Discussion

The EC [Habitats Directive](#) signed in 1992 requires Member States to report on the conservation status of habitats and species. Nearly 20 years have elapsed since this was proposed and the publication of this set of NFI Woodland Ecological Condition reports. This period of time reflects the complex design and planning required for the implementation of the project. Time was first required to determine a set of woodland ecological indicators that would provide a reliable indication of woodland ecological condition and then to collect the field data that evidenced this. In turn a process to convert this data to a classification of condition status had to be established. The data collection was coordinated by the National Forest Inventory (NFI) team. The study is the largest and most in-depth assessment of the ecological condition of any woodland habitat in Great Britain.

The statistics in this report were collected as part of a scientific survey, the NFI. Most of the statistics presented are based on simple identification of tree and vegetation species, or quantitative measures such as tree counts and deadwood volume. Other more qualitative or complex measures, such as % levels of herbivore browsing damage, or % of squirrel stripping high in the canopy, may under report to some extent, but overall the broad trends identified hold and have stood up to testing against comparable data sources and expert opinion.

18.1   Woodland area

One of the most notable results from this study was the total area of native woodland in Great Britain is now estimated to be 1.51 million hectares. This is circa 500 thousand hectares greater than previously reported in the 2008 HAP assessment

The increase in the NFI estimation of area of native woodland in Britain comes as a result of the application of improved earth observation techniques, which identified existing woodlands that previous assessments missed. Those previously missed tended to be smaller woods located in the lowlands, see NFI Report *Woodland Area in Britain 2010*.

The NFI estimates of the total areas and relative proportions of the different native woodland habitat types in Wales has also changed as a result of the data collected in this study. Estimates now suggest that some habitats that were previously thought to be rare are much more prevalent. This increase arises as the overall area of native woodland has increased and because in this study the NFI reduced the minimum area of a 'qualifying stand' of a woodland habitat within a woodland from ≥0.5 ha to ≥0.01 ha and these smaller patches of habitat have been included in the totals.

NFI woodland condition statistics

Additionally, woodland types such as wet woodland, which naturally tend to occur in smaller localised patches (of wetter land), are now, as compared to before, recorded and included in their own class more often, where previously they will have been included in the counts of other woodland habitat types due to their smaller size.

The changes in the area classified for each priority woodland type as compared with previous estimates, includes NFI estimating:

- 909 thousand hectares of lowland mixed deciduous woodland in Britain

- 124 thousand hectares of native pine wood in Scotland.

- 103 thousand hectares of upland oakwood in Britain, plus 13 thousand hectares of birch dominated upland oakwood. 121 thousand hectares of upland birchwood in Britain and 169 thousand hectares of wet woodland in Britain.

- 54 thousand hectares of upland ashwood in Britain.

The estimate of upland ashwood is lower than the 2008 hap estimate. The difference is thought to have arisen through over sampling of the W9 NVC class (that represents upland ashwood) in the original 2008 Hap estimates. It could also be that the NFI has allocated more of this habitat into the lowland mixed deciduous category through methodological differences.

This study also suggests that there is a shift in the relative proportions between upland oakwood and upland birchwood when compared to previous estimates.   This study estimates 126 thousand hectares of upland oakwood in Britain and estimates 121 thousand hectares of upland birchwood in Britain. This marks a reduction in upland oakwood area and an increase in upland birchwood area as compared to the 2008 Hap assessment. The root of this difference is thought to lie in how these two habitats frequently exist in situations where the two habitats exist intertwined in mosaics. As the combined area of the two classes is similar between the two assessments, the relative changes in the estimates has likely arisen as a result of methodological differences in how these two habitats are methodologically separated in mosaics.

The NFI estimates also include a new class of 'border-line' native woodland area that include the two subclasses of near native woodlands and fragments (of native woodland). These include stands with only 40 to 50% native canopy and native woodland patches of <0.1 hectares and >0.05 hectares respectively.

The present study estimates that there is 57 thousand hectares of near native woodland and fragments in Britain

18.2   Ecological condition

Many woodland variables can be used as indicators of ecological condition, including age class structure, capacity to support invertebrate and vertebrate life, threats to health and regenerative status. The statistics reported here have been used in a qualitative scoring system to calculate the condition status for each stand as either 'favourable', 'intermediate' or 'unfavourable' as compared to an agreed threshold for each indicator. A benchmark of expected condition that would be found in an ancient semi-natural woodland (ASNW) in good condition was used as that threshold and has been reported in the *NFI Woodland Ecological Condition of Great Britain: Methodology* and the condition status classification of each woodland type in Britain is reported in *NFI Woodland Ecological Condition in Great Britain: Classification Report*. Reports for other GB countries are also available.

All types of woodlands in Britain, including native and non-native to semi natural and plantation have been measured using the same protocol using a statistically robust stratified random sample design. This represents the first single systematic measure of woodland ecological condition for British woodlands.

The results point to the main physical and observable drivers behind our woodland ecological health in Britain today. The findings show that the main issues for consideration are:

1. Low presence of older tree age classes
2. Herbivore pressure and its impact on vegetation and regeneration
3. Low amounts of veteran trees
4. Low amounts of deadwood

There are also positive findings for woodland ecology:

1. We now classify more woodland as native than previously estimated
2. 1.2 million hectares or 88% of native woods have over 90% native species in their upper canopy
3. 681 thousand hectares or 55% of native woodland stands have 5 or more native tree and shrub species in their canopy
4. 71% of native stands have three or more layers of distinct canopy
5. 90% of native stands have some form of regeneration

Other finds such as the small proportion of open space within stands are notable –with 33% of native stands having less than 10% open space.

18.3 Conclusion

This study is a foundation and a reference data source that can be used to build a fuller picture of woodland ecological condition in Great Britain. Broad comparisons can be made, in terms of woodland area figures, against previous surveys such as the NWSS and the 2008 HAP assessment.

19 Glossary

Word/phrase	Definition
Age class	A grouping of trees into specific age ranges for classification purposes. For the purposes of the "age distribution of trees" NFI WEC indicator, trees are grouped into three age classes: 0 – 20 years (Young); 21 - 150 years (Intermediate); >150 years (Old). For birch, cherry or Sorbus species: 0 - 20 years (Young); 21 - 60 years (Intermediate) >60 years (Old). Not applicable is used for stands without trees.
Ancient semi-natural woodland (ASNW)	Woodland which has been in continuous existence since 1600 (1750 in Scotland).
Area (forest/woodland)	Forest and woodland area can be defined in net or gross terms. Net area is the land actually covered by trees (in the National Forest Inventory that is to the drip line of the canopy). Gross area includes both the area covered by trees and the open spaces (<0.5 hectare) within (e.g. rides, glades, ponds).
Bark stripping	The removal of bark from trees by herbivores.
Biodiversity	Biodiversity represents 'all heritability-based variation at all levels of organisation, from the genes within a single local population, to the species composing all or part of a local community, and finally to the communities themselves that compose the living parts of the multifarious ecosystems of the world' (Wilson, 1997, p.1)
Broadleaves	Trees and shrubs that belong to the angiosperms (flowering plants) (as distinct from the gymnosperms that includes conifers). Most in the UK are deciduous and have laminar leaves (they do not have needles or cones) and a few, such as alder, have cone-like structures for their seeds which are not true cones. Sometimes referred to as 'hardwoods'.
Browsing	Herbivores feeding on tree buds, shoots and foliage.
Canopy	The mass of foliage and branches formed collectively by the crowns of trees.
Canopy cover	The percentage cover of the canopy across a defined area (e.g. NFI survey section or square).
Clear-felling	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.
Common Standards Monitoring (CSM)	The CSM approach was established during the 1990s by UK conservation agencies to describe the condition of protected sites, such as Sites of Special Scientific Interest (SSSI), in order to assess the effectiveness of conservation policies and practice.
Component (or sub-component)	Individual elements of the NFI survey component group. For example, each tree species will be recorded under a separate component, as will each habitat type if two habitats are intimately mixed (such as upland birchwood and wet woodland).
Component group	Homogeneous areas of the NFI survey that are too small (<0.05 ha) to practically map using Geographic Information System (GIS) software in the field, but with most of the same defining characteristics as a section. Component groups can be subdivided into components.
Condition	Shorthand for Woodland Ecological Condition.

NFI woodland condition statistics

Word/phrase	Definition
Conifers	Trees and shrubs that belong to the gymnosperms, as distinct from the angiosperms that include broadleaves). Conifers mostly have needles or scale-like leaves and are usually evergreen. Sometimes referred to as 'softwoods'.
Convention on Biological Diversity (CBD)	A multilateral treaty to develop national strategies for the conservation and sustainable use of biological diversity.
Crown dieback	The death of branches within a tree's crown.
Deadwood	Non-living woody biomass not contained in the litter, either standing or lying on the ground (the NFI 'volume of deadwood' indicator does not include data on stumps).
Diameter at breast height (DBH)	The diameter on the stem of a tree at 'breast height', defined as 1.3 m from ground level.
Drip line	The drip line is the furthest tip of the widest branch in the crown; the last point from which the tree can drip if wet. If two treed sections have drip lines that cross over each other use the centre line of the cross over.
Earth observation	The collection of information about the physical, chemical, and biological systems of the planet via remote-sensing technologies.
Ecology	The relations of organisms to one another and to their physical surroundings.
Establishment	The formative period that ends once young trees are of sufficient size that, given adequate protection, they are likely to survive at the required stocking. This varies for species and according to environmental condition, but is typically from around five to twenty years.
EU Habitats Directive	The EU Habitats Directive (Directive 92/43/EEC) aims to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on its Annexes to a favourable conservation status (JNCC, 2018).
(Vegetation) field layer	Vegetation 10 cm to 2 m tall measured as part of the NFI vegetation assessment.
Flora	The plants of a particular region, habitat, or geological period.
Forest (or woodland)	See woodland
Forestry Commission (FC)	The government department responsible for regulating forestry, implementing forestry policy and managing state forests in England. It was formerly also responsible for Forestry in Wales and Scotland, however on 1 April 2013 the Forestry Commission's functions in Wales transferred to a new organisation, Natural Resources Wales. From 1 April 2019, forestry was fully devolved, except for common issues addressed on a GB or UK basis, such as international forestry, plant health and forestry standards. Following devolution, two new Scottish Government agencies were created, Scottish Forestry and Forest & Land Scotland.
Forestry and Land Scotland (FLS)	The Scottish Government agency responsible for managing Scotland's national forests and land.
Fragments	Small areas of woodland with 50% or more native tree species occupancy in the upper canopy, but that fall in the size range 0.05 ha to 0.099 ha.

NFI woodland condition statistics

Word/phrase	Definition
Geographic Information System (GIS)	A system designed to capture, store, manipulate, analyse, manage, and present spatial or geographic data.
Global Positioning System (GPS)	A satellite-based global navigation satellite system that provides geolocation and time information to a GPS receiver.
Great Britain (GB)	England, Scotland and Wales.
(Vegetation) ground layer	Vegetation 0 – 10 cm tall measured as part of the NFI vegetation assessment.
Habitat Action Plan (HAP)	For all UK BAP priority habitats classified between 1995 and 1999, a Habitat Action Plan (HAP) was created (45 in total). For the habitats added to the priority habitats list in 2007, no UK action plans have been, or will be, produced, as conservation action is now primarily carried out at a country-level, rather than a UK-level, in response to the generation of country-level biodiversity strategies and aims (JNCC, 2019a).
Herbivore	An animal that is adapted to eating plant material for the main component of its diet.
Hectare (ha)	Unit of area defined as 10,000 square metres (100 m by 100 m), approximately equivalent to 2.47 acres.
Indicator	A quantitative or qualitative parameter that synthesises complex information and can be periodically measured to assess trends over time. 15 stand level indicators were selected to assess the condition of woodlands as part of the NFI WEC approach.
Invasive species	A species that is not native to a location, where it is likely to cause ecological or economic harm.
Invertebrate	A cold-blooded animal that does not have a backbone.
Lichen	A composite organism that arises from algae or cyanobacteria living among filaments of multiple fungi species in a mutualistic relationship.
National Forest Inventory (NFI)	National forest inventories are carried out in GB by the FC to provide accurate, up-to-date information about the size, distribution, composition and condition of the forests and woodlands. The current NFI, which began in 2009, is a multi-purpose operation that has involved the production of a forest and woodland map for GB and a continuing programme of field surveys of the mapped forest and woodland areas.
National Forest Inventory map	An earth observation-based programme that monitors and maps the extent and location of woodlands across GB on an annual basis.
National Forest Inventory field survey	A field survey of a large, stratified-random sample (15,100 sites) of woodlands across GB on a 5-year rolling cycle using a standardised protocol.
Native species	Species that have arrived and inhabited an area naturally, without deliberate assistance by man. For trees and shrubs in the United Kingdom usually taken to mean those present after post-glacial re-colonisation (around 11,000 years ago) and before historic times. Some species are only native in particular regions - hence locally native.
Natural England (NE)	The government's adviser for the natural environment in England. Natural England is an executive non-departmental public body, sponsored by Defra.
Naturalised species	A species that, once it is introduced outside its native distributional range, establishes self-sustaining populations.

NFI woodland condition statistics

Word/phrase	Definition
Natural Resources Wales (NRW)	The organisation responsible for advising the Welsh Government on the environment, created on 1 April 2013. NRW is responsible for the functions previously carried out by the Environment Agency in Wales, the Countryside Council for Wales and Forestry Commission Wales.
National Vegetation Classification (NVC)	Vegetation classification system commonly used in Great Britain.
Native woodland	Woodland with 50% or more native tree species occupancy in the upper canopy that either: - Forms a discrete woodland parcel with a minimum area of 0.5 ha. - Forms a woodland stand with a minimum area of 0.1 ha that is part of a woodland that is 0.5 ha or larger.
Native Woodland Survey of Scotland (NWSS)	A survey of all native woodlands, nearly native woodlands and non-native plantations on ancient woodland sites in Scotland.
Near native woodland	'Nearly' native woodland with 40% to 49% native species canopy cover.
NFI Condition Calculator	An analytical GIS tool developed to automatically produces the component group-level NFI WEC indicator results per woodland type and aggregated statistics for the reporting area.
NFI WEC working group	The expert committee that was established to develop the NFI WEC indicator approach. This group consists of representatives from (former) FC England and Scotland, Scottish Natural Heritage, Natural England, Natural Resources Wales and the Welsh Government.
Non-native woodland	Woodland with less than 40% native species occupancy.
(Woodland) parcel	Discrete blocks of woodland that are separated from other woodland parcels by gaps of at least 20 m in length.
Private sector estate	Forests and woodlands in the UK not managed by the Forestry Commission, Natural Resources Wales or Forest Service. In the context of the National Forest Inventory, 'Private sector' is used for convenience although it includes land owned or managed by bodies such as local authorities and charities.
(Natural) Regeneration	The regeneration of existing woodland by natural means, i.e. without sowing or planting.
(Ecological) resilience	The ecological resilience of woodland ecosystems refers to their ability to absorb disturbance while maintaining the major habitat-forming species that define their structure and ecosystem functioning. Resilience incorporates both the woodland ecosystem's ability to resist changes in response to disturbance or, failing this, its capacity to recover functioning via adaptation.
(NFI) sample square	The one-hectare (100 m by 100 m) square plots, which may be entirely within woodland or may overlap the woodland edge, used for the NFI field survey.
Sapling	Young tree ≥50 cm tall and <4 cm in diameter.
Saproxylic	Dependent on deadwood.
(NFI WEC) score	An ordinal score is assigned to the individual indicator classes of 'unfavourable' (1), 'intermediate' (2) and 'favourable' (3). The scores are summed for all 15 indicators to provide each stand's overall ecological condition score, which has a maximum value of 45.
Scottish Natural Heritage (SNH)	The public body responsible for protecting and promoting Scotland's natural heritage, especially its natural, genetic and scenic diversity. To be renamed 'NatureScot' from May 2020.

NFI woodland condition statistics

Word/phrase	Definition
Section	Within each NFI sample square, the forest was stratified into different woodland 'sections'. Sections are defined by individual strata at least 0.05 ha in size that are differentiated on basis of forest type, habitat, land use, silviculture system, tree and shrub composition, age and structure.
Seedling	Young tree <50 cm tall.
Shrub	Woody plants often (but not always) branching abundantly from the base that are between 2-5 m tall.
(Vegetation) shrub layer	Vegetation 2-5 m tall measured as part of the NFI vegetation assessment.
Site of Special Scientific Interest (SSSI)	A formal conservation designation that is applied to areas of particular interest to science because of the geology/geomorphology features or species it contains or supports.
(Woodland) Stand	A distinct area of woodland (from either planting or natural regeneration), generally composed of a uniform group of trees in terms of species composition and spatial distribution, and age and size class distribution.
Standard error (SE)	The measure of the margin of error associated with an estimate as a result of sampling from a population with statistical variability. Larger standard errors indicate less precision in the estimate. Standard errors in this report are quoted in relative terms (i.e. as percentages of the value of the estimate). In this report, any standard error greater than 25% is reported in amber italics and represents a lower degree of assurance in the estimates.
Stocking	The density of trees within a woodland.
Stump	The above-ground base part of a tree that would usually remain after felling.
Transect	A path along which a survey is carried out.
Transition woodland	Land classified as woodland area that is in transition between no tree cover and tree cover. Examples include clear-fell sites, restock sites, new planting sites and land with natural regeneration.
UK Biodiversity Action Plan (UK BAP)	The UK government's national biodiversity action plan that was developed in response to the Convention on Biological Diversity and replaced by the 'UK Post-2010 Biodiversity Framework' in 2012 following new international targets. It described the biological resources of the UK and provided detailed plans for conservation of these resources (JNCC, 2019a). The UK BAP priority habitats were identified as the most threatened habitats requiring conservation action under the UK BAP.
UK Forestry Standard (UKFS)	The reference standard for sustainable forest management across the UK that applies to all woodland to ensure that international agreements and conventions on areas such as sustainable forest management, climate change, biodiversity and the protection of water resources are applied in the UK.
United Kingdom (UK)	Great Britain and Northern Ireland.
Woodland (or forest)	Land predominately covered in trees (defined as land under stands of trees with a canopy cover of at least 20%, or the ability to achieve this, and with a minimum area of 0.5 hectare and minimum width of 20 m), whether in large tracts (generally called forests) or smaller areas known by a variety of terms (including woods, copses, spinneys or shelterbelts).

Word/phrase	Definition
(NFI) Woodland Ecological Condition (WEC)	The approach used by the NFI to assess the ecological condition of woodlands in GB in terms of their likely biodiversity value.
(Woodland) storey	A woodland's trees and shrubs can often be stratified into distinct layers, or storeys, according to their height.
Vertical (woodland) structure	The number of canopy storeys present.
Veteran trees	A tree that is of interest biologically, culturally or aesthetically because of its age, size or condition (Read, 2000)

20 NFI national reports

This inventory report is one of a series of publications reporting the outputs of the Forestry Commission National Forest Inventory. These and NFI data can be found on the NFI website: www.forestresearch.gov.uk/inventory

Official Statistics

This is an Official Statistics publication. More information about Official Statistics and the UK Statistics Authority is available at www.statisticsauthority.gov.uk

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