NFI woodland ecological condition in Wales: classification results

National Forest Inventory

Issued by: National Forest Inventory, Forestry Commission,
231 Corstorphine Road, Edinburgh, EH12 7AT
Date: Feb 2020
Enquiries: Ben Ditchburn, 0300 067 5561
NFI@forestresearch.gov.uk
Statistician: David Ross
David.Ross@forestresearch.gov.uk
Website: www.forestresearch.gov.uk/inventory
www.forestresearch.gov.uk/forecast

Summary

The National Forest Inventory (NFI) for Great Britain provides information concerning the size, distribution and composition of forests and woodlands including woodland ecological condition. Data enabling the calculation of 15 ecological condition indicators were measured as part of the NFI survey cycle 2010-2015 and compared to a benchmark of a stand of ancient semi-natural woodland (ASNW) in good condition. This enabled woodland stands to be classified as favourable, intermediate or unfavourable in terms of their ecological condition. These results can be calculated by woodland type, habitat type, country and region.

This report contains the classification results for Wales broken down by woodland type (native, non-native and 'near-native and fragments'). A series of complementary reports has been produced to describe the methodology used, to set out the underpinning statistics on the condition indicators and classes, and to summarise the results. Figure 1.1 illustrates the report and data products available.

For a brief summary of the work or for full details of the methodology please refer to:

- *NFI Woodland ecological condition in Great Britain: Executive Summary*
- *NFI Woodland ecological condition in Great Britain: Methodology*

For the statistical results for other countries and Great Britain please refer to:

- *NFI Woodland ecological condition in [country[1]]: Statistics*

For the classification results for the individual British countries please refer to:

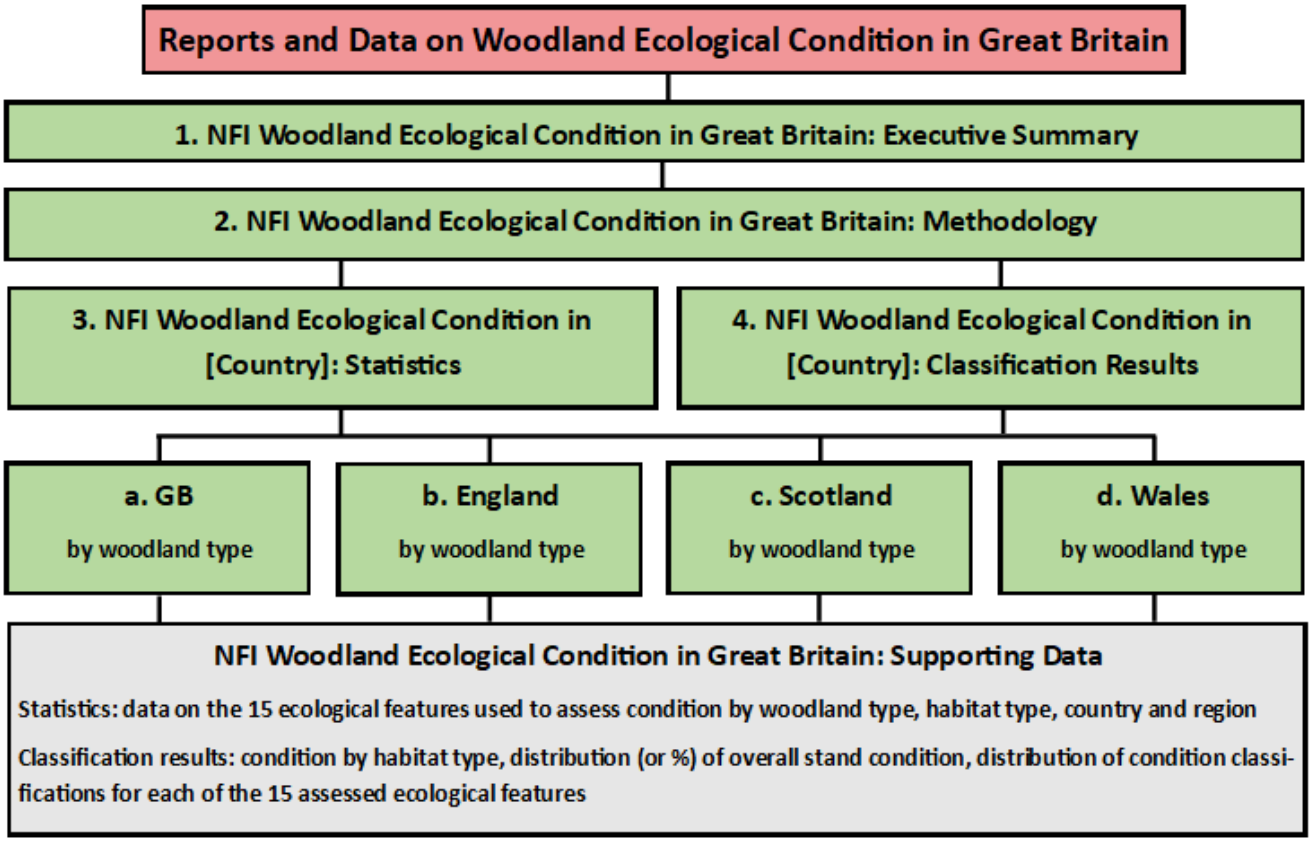
- *NFI Woodland ecological condition in [country[1]]: Classification Results*

Results for individual priority woodland habitat types can be found in the supporting data:

- *NFI Woodland Ecological Condition in [country]: Supporting Data[2]*

[1] There are four separate reports; Great Britain, England, Scotland and Wales
[2] Supporting/additional data is available as MS-Excel® spreadsheets

Figure 1.1 A schematic 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 statistical results, one for each of the three countries and Great Britain, broken by native woodland type[1] and;

4. The classification results describe woodland ecological condition (as calculated by the NFI Condition Calculator, see Methodology) one for each of the three countries and Great Britain by woodland type.

[1] The written reports cover native woodland type, the supplementary data includes regional breakdowns and statistics and classification by priority habitat types as well.

Key findings:

- The total area of native woodland in Great Britain (GB) is estimated at around 1.51 million hectares, which is circa 500 thousand hectares or 50% higher than reported in previous estimates (see page 15, Table 3.2).
- The total area of native woodland in Wales is estimated at around 150 thousand hectares, which is circa 34 thousand hectares or 30% higher than reported in previous estimates.
- 13 thousand hectares or 9% of native woodland area in Wales is in favourable condition.[1]
- 135 thousand hectares or 91% of native woodland area in Wales is in intermediate condition[2].
- 0.2 thousand hectares or 0.1% of native woodland area in Wales is in unfavourable condition.
- 55% of native stands in Wales are in favourable condition for vertical canopy structure.
- 2% of non-native woodland area in Wales is in favourable condition, with 96% as intermediate, and 2% as unfavourable ecological condition.
- Volume of deadwood is unfavourable in 82% of native woodland area, 80% of near-native and 69% of non-native stands.
- 7% of native woodland area in Wales has unfavourable levels of invasive species, 13% of near-native and 5% of non-native woodlands.
- In native woodland in Wales, 98% area is in unfavourable condition for the presence of veteran trees, with 25% of native woodland being below 5 ha.
- 88% of stands score as intermediate for regeneration and 12% favourable for regeneration of young trees in native woods.
- 86% of native stands are in favourable condition for 'nativeness' of canopy.

[1] Section 11, Table 11.1 summarises the WEC indicators and thresholds used to classify stands as favourable, unfavourable and intermediate.
[2] With only one reference point of NFI woodland ecology measurements taken currently, no assessment of condition trends, whether declining or improving, can be made. Future reports utilising the second NFI cycle will address this.

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1 Introduction

Welsh woodlands are dynamic entities and their ecological condition changes in response to factors such as changing woodland management, general land use practices and climate change. There is a growing requirement across government, non-governmental organisations and the private sector for a better understanding of the ecological condition of Welsh woodlands, which can be used to inform the targeting of resources and woodland management in support of biodiversity and ecological resilience.

This is the largest and most in-depth direct field-based assessment of woodland ecological condition to have been carried out in Wales. 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 area and proportion of woodland in Wales, in three woodland ecological condition classes (favourable, intermediate, unfavourable) for native, non-native and 'near-native and fragments' woodland in Wales. Classification results by woodland habitat type are available in the supporting Excel tables.

1.2 The importance of understanding the ecological condition of Wales'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 United Kingdom's (UK) 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 to monitor 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). Article 17 of the directive 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) field survey assesses a large, stratified-random sample of woodlands across GB on a 5-year rolling cycle using a standardised protocol. Detailed data on various attributes are collected from approximately 15,100 one-hectare sample squares that are partially or entirely covered by forest, including clear-felled areas, according to the woodland map. The first cycle ran from 2010 to 2015 and the second cycle commenced in 2015 (to be completed in 2020). The survey provides an extensive, in-depth and spatially explicit record of our forests and woodlands.

This report provides a brief overview of the methodology used to assess woodland condition using the first cycle of NFI survey data, but full details are provided in the complementary report, '*NFI woodland ecological condition in Great Britain: Methodology*'.

To assess the ecological condition of the NFI survey woodlands, 15 woodland ecological condition (WEC) indicators were devised, reviewed and agreed by the NFI WEC working group, a group of specialists from Natural Wales, Forestry Commission, Forestry England, Scottish Forestry, Scottish Natural Heritage, Natural Resources Wales and the Welsh Government:

1. Age distribution of trees
2. Herbivore damage
3. Invasive plant species
4. Number of native trees
5. Occupancy of native trees
6. Open space
7. Proportion of favourable land cover
8. Woodland regeneration (stand-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. Total area of woodland

Alongside the WEC indicators listed above (i.e. stand-level indicators), total woodland area and woodland area loss were designated as population-level indicators (i.e.

[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'.

national-level indicators) and are reported upon and evaluated separately (see Forestry Statistics) to the condition classification results reported here. The national-level estimates were derived from the NFI woodland map, augmented by the NFI fieldwork. Both the national-level indicators and stand-level indicators are pertinent to the overall, national picture of habitat condition and should be considered together.

1.3.1 The NFI Map: an overview

Data on the location and extent of all forests and woodlands in the UK (≥0.5 hectares) is created, stored and maintained by the National Forest Inventory (NFI) as a digital woodland map. The map 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 and updated annually.

1.3.2 NFI woodland sample evaluation: an overview

NFI sample squares are located within the NFI mapped area using a stratified, random approach. Surveyors classify the area within each one hectare NFI sample square into forest and non-forest. The forested area(s) within the sample square are then further stratified into smaller units of homogenous canopy type based on differences in features such as woodland habitat and tree species, or more subtle factors such as condition and thinning history. Such contiguous 'units' of woodland are referred to as 'stands' for the purposes of these reports. Within each forest stand, information on species, age, management regime and other data is collected to enable assessment of each of the 15 ecological indicators described above.

Typically, there are multiple stands which may also be further divisible within each sample square. This means, from the circa 15,000 sample squares covered by the NFI, 33,000 forest stands in Great Britain have been assessed for ecological condition, of which circa 2,000 sample squares and circa 4,300 forest stands have been assessed in Wales. Within each stand two or three 100 m^2 (0.01 hectare) circular plots were randomly located. Within each of these circular plots, stocking was assessed and species, age, grid location and diameter at breast height (DBH) was recorded for all trees ≥4 cm DBH. A total of 650,000 trees were measured, of which circa 84,000 were in Wales. Transects were also conducted within each circular plot to assess the volume of lying deadwood, seedlings and saplings.

Each of the sample squares 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.

1.3.3 Ecological condition classification

The NFI WEC working group established a process for using the WEC indicator data to classify and score woodlands according to their expected condition. Briefly, the process developed involves the following steps:

1. Collect data on the WEC indicators as part of the NFI field survey.
2. Supply statistics on these indicators e.g. 'x % of woodland stands showed evidence of regeneration'.
3. Using ancient semi-natural woodland (ASNW) in good condition as a benchmark (see below), define thresholds for classifying woodland stands into 'favourable', 'intermediate' or 'unfavourable' status for each WEC indicator.
4. Assign numerical scores to these categories and combine these scores for all WEC indicators to provide an overall condition status score for each woodland stand.
5. Define thresholds to apply to the combined scores in order to classify woodland stands into overall 'favourable', 'intermediate' or 'unfavourable' status.
6. Supply information on the classification and scores of woodlands e.g. 'x % of woodland stands were classified as being in favourable condition status for the regeneration indicator'.
7. Use the results from the first survey cycle as a baseline against which changes in condition can be measured for monitoring purposes using data from future survey cycles.

The indicators and classification thresholds were selected with reference to other work (e.g. the Common Standards Monitoring approach for protected sites (JNCC, 2003)), the best available scientific evidence, expert opinion and each country's current policy needs and targets. For example, to determine a 'favourable' level of seedlings, saplings and small trees, a combination of published evidence and expert opinion was used. Details of thresholds used can be found in the methodology report.

1.3.4 Extrapolating NFI field survey statistics to a reporting area

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) using standard statistical survey methodology. 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 approx. 30,000 ha, depending on variance within the population and what is being reported) and in turn broken down by any geographic area, such as by country or NFI region, as in this report. This report presents the results for different woodland types (native, near-native and fragments', non-native) for GB, results specifically for England, Scotland and Great Britain are presented in companion reports (Figure 1.1). Results for individual priority woodland habitats are available in the supplementary data.

1.3.5 The NFI Condition Calculator: an overview

To report on condition using the NFI data, an analytical tool was developed, referred to herein as the NFI 'Condition Calculator'. This tool allows the detailed data recorded in each NFI survey square to be analysed alongside the NFI woodland map and other data. It automatically produces the stand-level condition results per woodland type and aggregated statistics for the reporting area. The advantages of establishing an automated reporting tool are that results can be generated on demand using a consistent approach. The Condition Calculator will therefore allow the data from future cycles of the NFI to be analysed using the same procedures, enabling reliable comparisons for reporting on change.

1.3.6 Woodland and woodland type definitions

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
For Wales, native woodland is defined as Stands with 50% or more native tree species 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.

2 Results

Presented here are the scores of the woodland ecological condition assessment of woodland in Wales by woodland type. Given the large volume of data gathered in this study it was decided that the reports would focus on results by country and woodland type. Results by habitat type and region are available in the supporting data Excel spreadsheets.

The nominal baseline date for estimates is an average of 2013 (mid-point of the survey) and the time period over which the full series of field samples were collected was January 2010 to January 2016.

All areas in the tables are rounded to the nearest 100 hectares. In some breakdowns, the estimates in the body of the table may not sum to the quoted total because each individual value, including the total, has been independently generated by the estimation procedure used for results from the NFI sample survey.

2.1 Standard error

Along with these estimates, associated sampling standard errors have also been calculated and reported, giving a measure of accuracy, conditional upon the underlying assumptions. The sampling standard error will account for random variation arising from the selection of the sample and random measurement errors. However, standard error 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 the quality assurance processes account for this. Any standard error greater than 25% is reported in amber text and represents a lower degree of assurance in the estimates.

3 Woodland habitat type and woodland native type

This is the first assessment classifying woodland by habitat type for each country and by region.

Table 3.1 Area of woodland by habitat type for each country and region of GB

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, some definitions of wood pasture would include land that contains less than 20% canopy cover. 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).

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 1.3.6.
2. Not determinable relates to areas such as clearfell sites where there is not enough evidence in terms of trees species and NVC to determine a native type.
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).

This is the first assessment of the extent of native woodland and priority habitat type, across the whole of Wales, based on a balanced stratified random sample of woodlands. There have been one previous assessments of native woodland extent in Wales; an analysis carried out using National Vegetation Classification (NVC) survey information named the 2008 Hap assessment, by JNCC. In comparison, JNCC created estimates of the area of priority habitat types in 2008 using National Vegetation Classification (NVC) data and 2,648 samples taken in ancient and recent woods throughout Britain (Rodwell 1991). Differences between these and the NFI results largely arise from the lower sample size and non-random sampling associated with the NVC dataset. In general, due to the methodological differences, direct comparisons between the three datasets should not be made.

4 Stand-level condition classification results for native woodland area in Wales

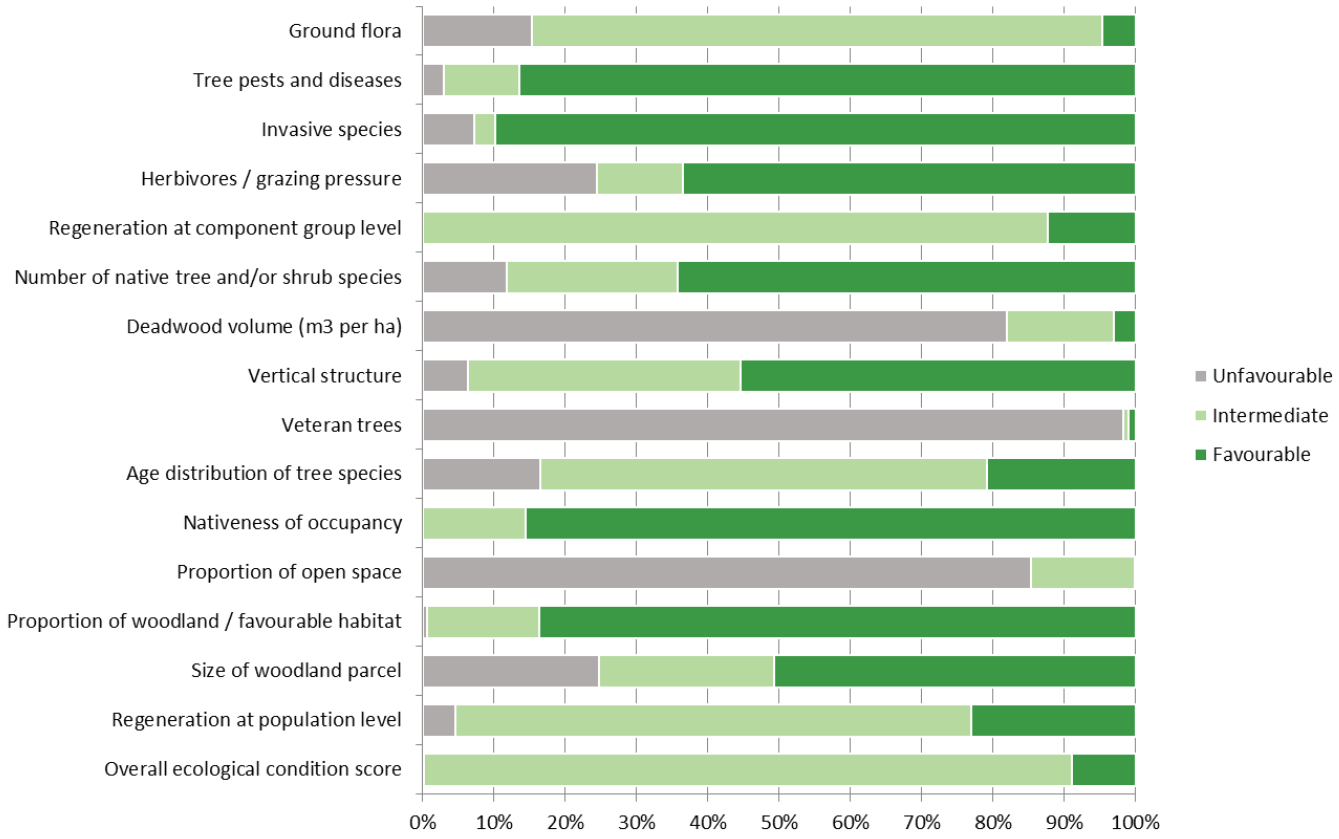
Table 4.1 Area of native woodland stands in Wales classified as favourable, intermediate or unfavourable for each of the 15 ecological indicators

Native	Unfavourable		Intermediate		Favourable	
	Area (000 ha)	*SE%*	Area (000 ha)	*SE%*	Area (000 ha)	*SE%*
Ground flora	23.1	*6.8*	120.4	*2.2*	6.9	*12.4*
Tree pests and diseases	4.5	*16.4*	16.0	*8.0*	130.0	*2.1*
Invasive species	10.9	*10.2*	4.4	*16.1*	135.1	*2.0*
Herbivores / grazing pressure	36.9	*5.2*	17.9	*7.3*	95.6	*2.9*
Regeneration at component group level	0.0	–	132.0	*2.0*	18.4	*7.6*
Number of native tree and/or shrub species	17.9	*7.6*	35.9	*5.4*	96.6	*2.6*
Deadwood volume (m3 per ha)	123.2	*2.2*	22.7	*6.7*	4.5	*15.8*
Vertical structure	9.7	*10.4*	57.4	*4.0*	83.3	*2.9*
Veteran trees	147.9	*1.7*	1.0	*37.9*	1.5	*26.9*
Age distribution of tree species	24.9	*6.1*	94.1	*2.8*	31.4	*5.7*
Nativeness of occupancy	0.0	–	21.7	*6.7*	128.7	*2.0*
Proportion of open space	126.9	*2.1*	21.5	*6.6*	0.2	*43.6*
Proportion of woodland / favourable habitat	0.9	*43.1*	23.7	*8.0*	125.8	*2.1*
Size of woodland parcel	37.3	*5.8*	36.9	*5.6*	76.2	*3.3*
Regeneration at population level	7.0	*14.6*	108.8	*2.6*	34.7	*5.6*
Overall ecological condition score	0.2	*83.0*	135.1	*2.0*	13.2	*9.0*

Notes:

1. SE = standard error. Amber text = values with SE >25%.
2. Native is defined in Section 1.3.6.
3. Woodland ecological condition classification categories and indicators are defined in the methodology report.
4. For more information refer to the methodology report.
5. Classification thresholds for ground flora; favourable, unfavourable and intermediate are adjusted for different woodland NVC types, with 'more' being expected of nutrient rich types than nutrient poor types.

Figure 4.1 The proportion of each woodland ecological condition class, for each WEC indicator type in native woodland stands in Wales



Notes:

1. Native is defined in Section 1.3.6.
2. Woodland ecological condition classification categories and indicators are defined in methodology report.
3. For more information refer to the methodology report.
4. Classification thresholds for ground flora; favourable, unfavourable and intermediate are adjusted for different woodland NVC types, with 'more' being expected of nutrient rich types than nutrient poor types.

5 Stand-level condition classification results for near-native woodland and fragments in Wales

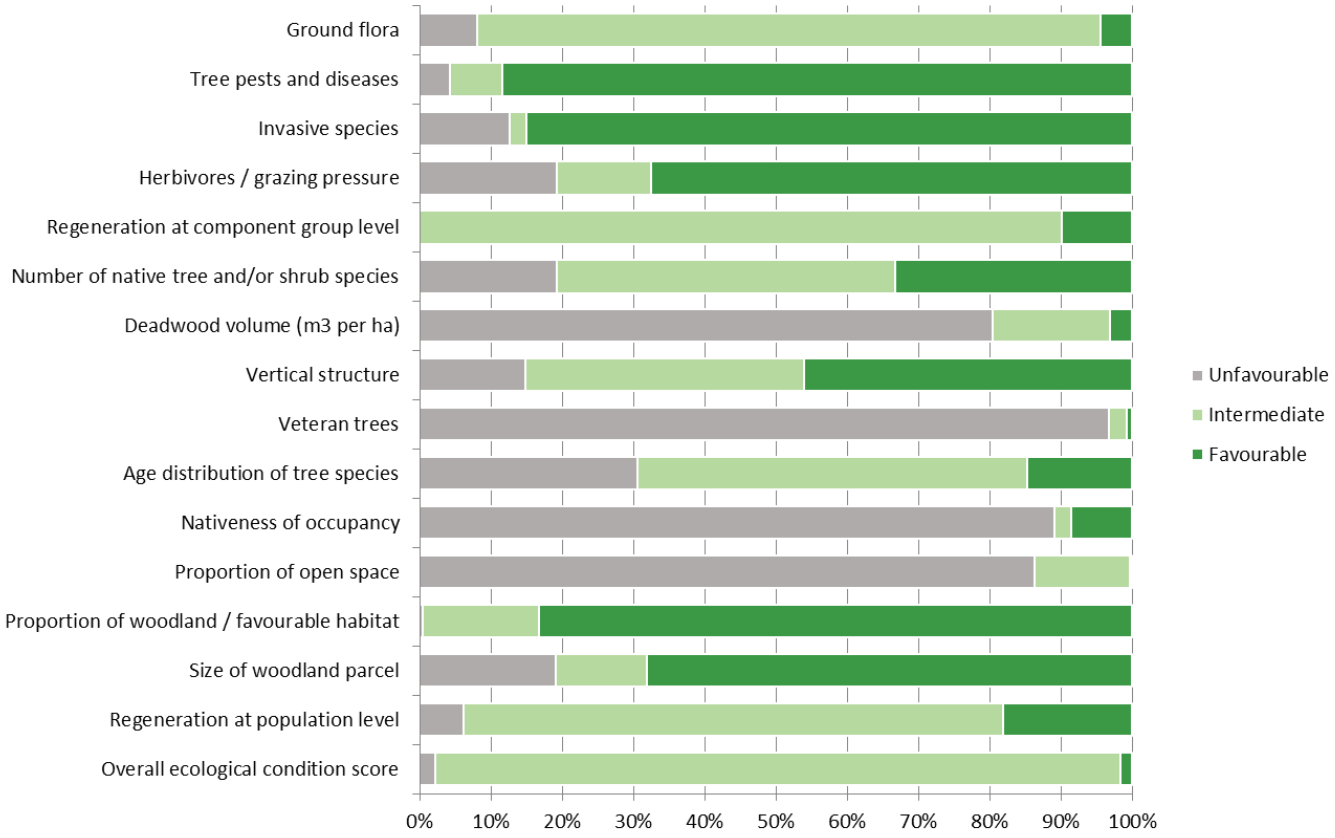
Table 5.1 Area of near native woodland and fragments in Wales classified by woodland ecological condition for each of the 15 WEC indicators

Near native & fragments	Unfavourable		Intermediate		Favourable	
	Area (000 ha)	*SE%*	Area (000 ha)	*SE%*	Area (000 ha)	*SE%*
Ground flora	0.6	*33.2*	6.1	*12.7*	0.3	*50.1*
Tree pests and diseases	0.3	*71.1*	0.5	*28.4*	6.2	*12.5*
Invasive species	0.9	*33.4*	0.2	*76.1*	6.0	*12.6*
Herbivores / grazing pressure	1.3	*26.9*	0.9	*36.1*	4.7	*13.9*
Regeneration at component group level	0.0	–	6.3	*12.3*	0.7	*37.5*
Number of native tree and/or shrub species	1.3	*19.5*	3.3	*17.7*	2.3	*21.9*
Deadwood volume (m3 per ha)	5.6	*13.1*	1.2	*27.9*	0.2	*51.5*
Vertical structure	1.0	*24.0*	2.7	*18.2*	3.2	*18.6*
Veteran trees	6.8	*11.8*	0.2	*98.8*	< 0.1	*50.5*
Age distribution of tree species	2.1	*17.2*	3.8	*16.5*	1.0	*33.5*
Nativeness of occupancy	6.2	*13.0*	0.2	*21.1*	0.6	*19.3*
Proportion of open space	6.0	*12.9*	0.9	*24.4*	< 0.1	*88.9*
Proportion of woodland / favourable habitat	< 0.1	*77.2*	1.1	*35.4*	5.8	*12.2*
Size of woodland parcel	1.3	*33.3*	0.9	*33.0*	4.8	*13.1*
Regeneration at population level	0.4	*53.5*	5.3	*13.6*	1.3	*24.4*
Overall ecological condition score	0.1	*89.4*	6.7	*11.9*	0.1	*60.5*

Notes:

1. SE = standard error. Amber text = values with SE >25%.
2. Woodland type is defined in Section 1.3.6.
3. Woodland ecological condition classification categories and indicators are defined in methodology report.
4. For more information refer to the methodology report.
5. Classification thresholds for ground flora; favourable, unfavourable and intermediate are adjusted for different woodland NVC types, with 'more' being expected of nutrient rich types than nutrient poor types.

Figure 5.1 The proportion of each woodland ecological condition class, for each WEC indicator type in near native woodland and fragments in Wales



Notes:

1. Woodland type is defined in Section 1.3.6
2. Woodland ecological condition classification categories and indicators are defined in methodology report.
3. For more information refer to the methodology report.
4. Classification thresholds for ground flora; favourable, unfavourable and intermediate are adjusted for different woodland NVC types, with 'more' being expected of nutrient rich types than nutrient poor types.

6 Stand-level condition classification results for non-native woodland stands in Wales

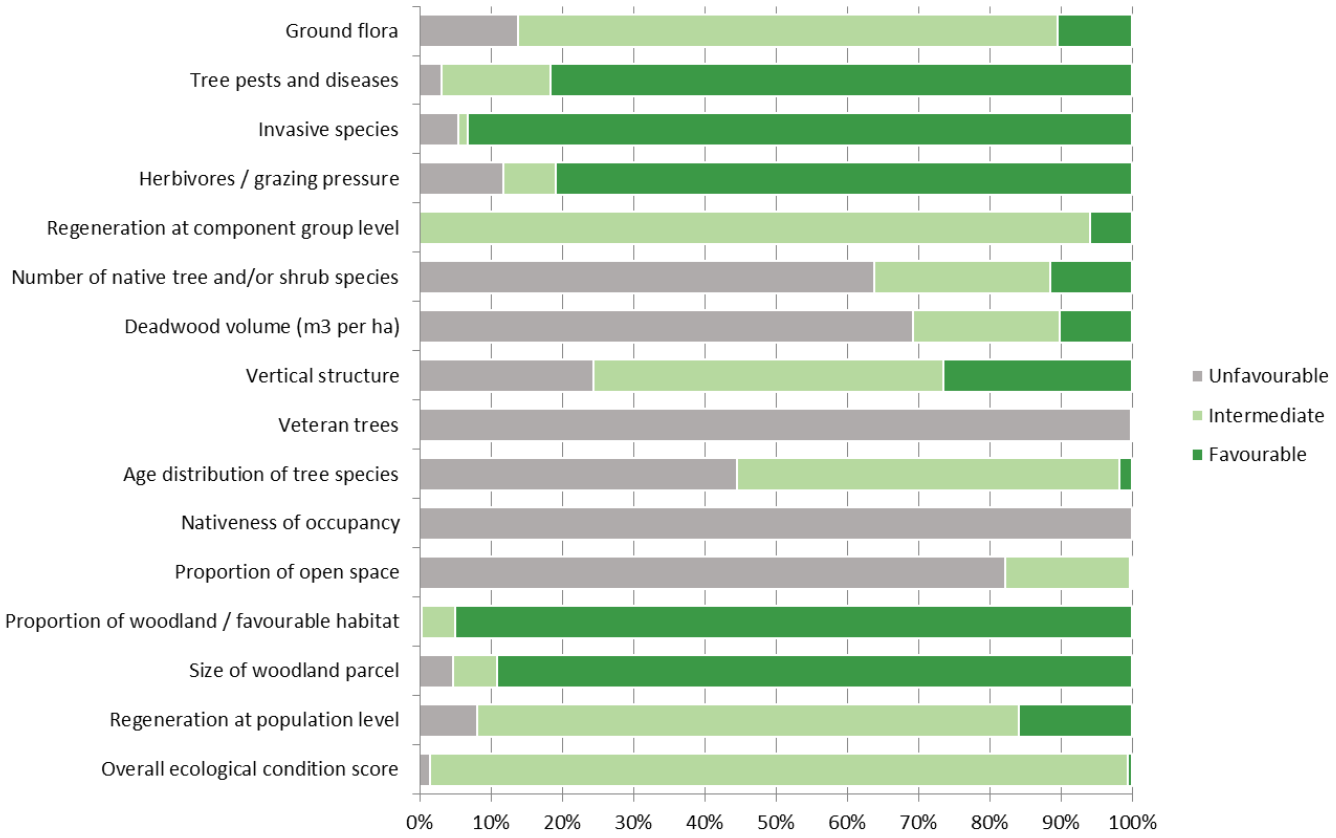
Table 6.1 Area of non-native woodland stands in Wales classified by woodland ecological condition classification for each of the 15 ecological indicators

Non native	Unfavourable		Intermediate		Favourable	
	Area (000 ha)	*SE%*	Area (000 ha)	*SE%*	Area (000 ha)	*SE%*
Ground flora	21.3	*6.9*	117.3	*1.9*	16.2	*8.2*
Tree pests and diseases	4.7	*15.8*	23.6	*6.9*	126.5	*1.8*
Invasive species	8.3	*11.7*	2.2	*20.3*	144.3	*1.4*
Herbivores / grazing pressure	18.2	*7.5*	11.3	*8.9*	125.3	*1.9*
Regeneration at component group level	0.0	–	145.7	*1.4*	9.1	*10.7*
Number of native tree and/or shrub species	98.8	*2.4*	38.2	*4.9*	17.9	*7.8*
Deadwood volume (m3 per ha)	107.1	*2.2*	32.0	*5.5*	15.7	*8.4*
Vertical structure	37.7	*4.9*	76.2	*3.0*	40.9	*4.9*
Veteran trees	154.7	*1.2*	0.1	*102.2*	< 0.1	*92.5*
Age distribution of tree species	69.0	*3.1*	83.1	*2.7*	2.7	*21.5*
Nativeness of occupancy	154.8	*1.2*	0.0	–	0.0	–
Proportion of open space	128.7	*1.7*	27.6	*5.9*	0.4	*52.8*
Proportion of woodland / favourable habitat	0.3	*79.1*	7.4	*13.0*	147.1	*1.3*
Size of woodland parcel	7.4	*13.7*	9.5	*11.8*	137.9	*1.4*
Regeneration at population level	12.4	*10.4*	117.7	*2.0*	24.6	*6.6*
Overall ecological condition score	2.3	*22.6*	153.4	*1.2*	1.0	*33.4*

Notes:

1. SE = standard error. Amber text = values with SE >25%.
2. Non-native is defined in Section 1.3.6.
3. Woodland ecological condition classification categories and indicators are defined in methodology report.
4. For more information refer to the methodology report.
5. Size of woodland parcel: Fragments tend to occur in larger woods, therefore the results may reflect the overplanting of native woodland with large non-native plantation woods. NFI reports on woodland area (2012) evidence that non-native woods are larger on average than native woods.
6. Classification thresholds for ground flora; favourable, unfavourable and intermediate are adjusted for different woodland NVC types, with 'more' being expected of nutrient rich types than nutrient poor types.

Figure 6.1 The proportion of each woodland ecological condition class, for each WEC indicator type in non-native woodland stands in Wales

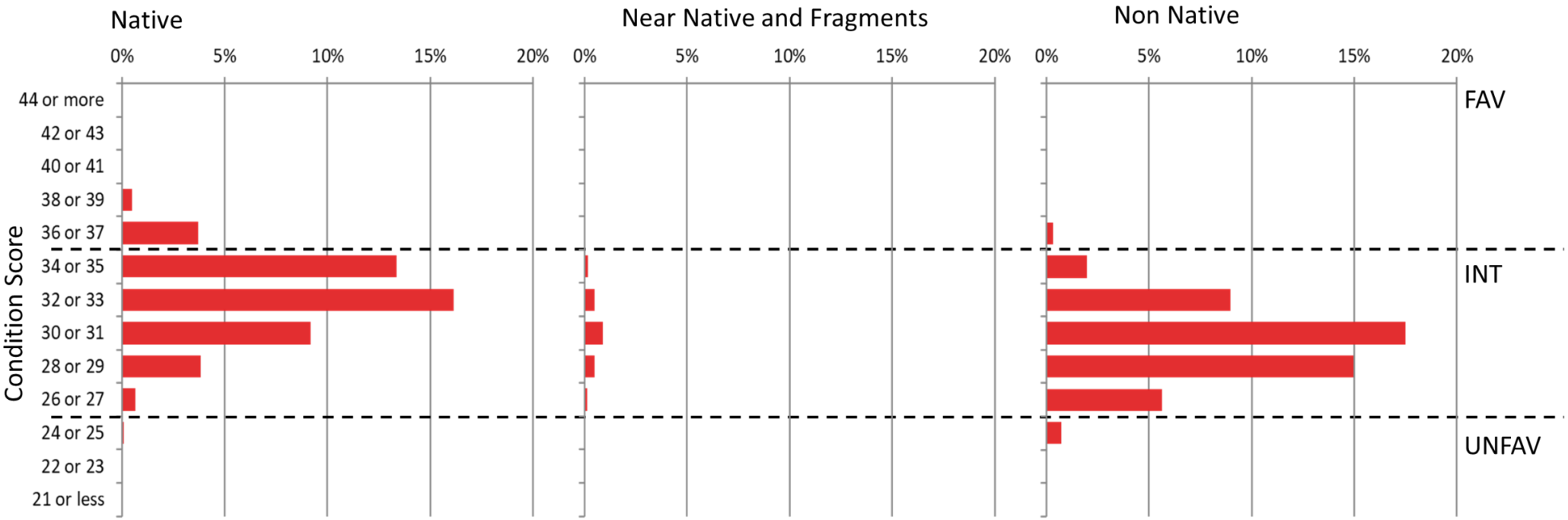


Notes:

1. 'Non-native' is defined in Section 1.3.6.
2. Woodland ecological condition classification categories and indicators are defined in methodology report.
3. For more information refer to the methodology report.
4. Size of woodland parcel: Fragments tend to occur in larger woods, therefore the results may reflect the overplanting of native woodland with large non-native plantation woods. NFI reports on woodland area (2012) evidence that non-native woods are larger on average than native woods.
5. Classification thresholds for ground flora; favourable, unfavourable and intermediate are adjusted for different woodland NVC types, with 'more' being expected of nutrient rich types than nutrient poor types.

7 Condition scoring distribution

Figure 7.1 The overall distribution of ecological condition class by woodland type in Wales



Notes: 1. Native = native woodland area, Near native and fragments = Near native woodland area and fragments, non-native = non-native woodland area. 2. The NFI calculator is used to score each of the 15 WEC indicators that can then be combined and used to give an over-all score, and classification as favourable (fav) score 36-45, intermediate (int) score 26-35 or unfavourable (unfav) score 16-25 by woodland type. 3. Dashed line = threshold of each condition classification. To inform where to set the thresholds for each of the three classification categories published evidence was used. 4. Woodland types are defined in Section 1.3.6. 5. Refer to the methodology report for more information.

8 Discussion

The EC Habitats Directive requires Member States to report on the conservation status of habitats and species. This report presents the first evaluation of the condition of woodland in Wales and represents a decade of work for the NFI team and its partners. The methodology used to assess and classify woodland area is evidence based, systematic, and objective. Most of the scores presented are based on statistics derived from simple, objective measures of woodland such as tree counts, deadwood diameters and species identification and as such the statistical estimates and their classification scores have a great degree of certainty associated with them. Other indicators use more complex measures, such as the level of herbivore browsing damage or squirrel stripping high in the canopy. These can be harder to assess in the forest. For example, herbivore impacts may be seasonal, and it is difficult to evaluate bark stripping from squirrels many metres above the ground. Such factors have a greater degree of uncertainty in the estimates and may be somewhat under-reported, but overall the broad trends identified are thought to be accurate and have stood up to validation against comparable data sources (where they exist*) and expert opinion. With these caveats in mind, these results are Wale's first systematic and repeatable assessment of woodland ecological condition.

8.1 Woodland habitat area

One of the most notable results from this study was that the total area of native woodland in Great Britain is estimated to be 1.51 million hectares, about 50% more than the previous estimate (986 thousand hectares, estimated in the 2008 priority habitat assessment). The majority of the newly recorded native woodland is in the lowlands and most woods are smaller than 2 ha in extent. Similarly, the native woodland area estimate in Wales has also risen. In Wales 150 thousand hectares is now classified as native woodland, an increase of 34 thousand hectares on the previous estimate reported in the 2008 HAP assessment. Recent advances in earth observation technology have enabled the identification of such smaller areas of woodland than was previously possible. Furthermore, the NFI has used smaller minimum area thresholds than previous assessments (≥0.1 hectares within larger woods, and >0.5 hectares as discrete stands), so small areas of native woodland within other woodland habitat types have been identified for the first time.

In addition to the increase in the estimate of native woodland area in Wales, estimations of the area of other woodland habitats have also generally increased pro rata. However, increases in estimated areas are higher for some habitats compared to others. For example, the area classified as lowland mixed deciduous woodland has increased to 79

* Independent surveys of deer presence, squirrel presence, invasive and disease presence and levels of deadwood and veteran trees were available for comparison- see methodology paper.

thousand hectares in Wales as compared to the estimate in the 2008 NVC assessment. This is most likely a result of the fact that this habitat tends to dominate patches of smaller, lowland woods that are harder to identify and thus weren't incorporated into previous assessments.

Another factor that resulted in a disproportionate (but correct) increase in the estimated relative area of one habitat type, was that the NFI reduced the minimum area of a 'qualifying stand' of a woodland habitat within a woodland from ≥0.1 ha to ≥0.01 ha. Therefore, woodland types such as wet woodland, which naturally occur in smaller localised patches (of wetter land), have been recorded and included in estimates for the first time, where previously they will have been included in the counts of other woodland types. This has resulted in an estimated wet woodland cover of 28 thousand hectares compared with what was recorded in the 2008 HAP assessment in Wales.

8.2 Classification of woodland condition

The WEC covers all of Wales's woodlands, native and non-native, semi natural and plantation alike. The results present a robust evidence base, comparing all woods to a single benchmark, and providing the first systematic measure of woodland ecological condition. Each woodland stand was scored for each of the 15 woodland ecological condition indicators, and the scores combined to give an overall score of favourable, intermediate or unfavourable. The scoring method was to take each woodland stand and compare each of the 15 indicators to the characteristics of a benchmark, namely 'semi-natural woodland in favourable condition' (refer to the Methodology report for more information). Scoring thresholds were set using published evidence where possible and, where this was unavailable, expert opinion. For example, to determine a 'favourable' number of seedlings, saplings and small trees in a woodland, a combination of published evidence and expert opinion was used.

The indicators each measure different aspects of woodland condition and can be used to indicate the likely health of specific elements of biodiversity. For example, volume of deadwood can be used as an indicator of the potential presence of associated taxa, such as saproxylic fungi or invertebrates. Limiting the list of woodland ecological condition indicators to 15 measures is a simplification of an exceptionally complex ecosystem, however, it is a compromise between the resources necessary to carry out the survey work and the data required to describe condition comprehensively. The WEC provides a good indication of where potential issues may lie or where potential positive trends may occur, but the results are not an absolute measure of ecological condition status.

The results suggest that the indicators which score poorly in the greatest number of native woodlands (i.e. they scored as unfavourable in >20% of native woodlands) are:

1. Size of woodland parcel
2. Veteran trees and deadwood volume
3. Herbivores/grazing pressure
4. Proportion of open space

The principle reason for many native woodlands falling into unfavourable or intermediate condition is the deeper historic management of woodlands. This has led to fragmentation of woods, low levels of older trees and of veteran trees. For example in native woodland stands, 98% unfavourable condition for the presence of veteran trees, with 25% of native woodlands being below 5 ha. Volume of deadwood is unfavourable in 82% of native stands, 80% of near-native and 69% of non-native stands.

It is also worth noting that herbivore damage is recorded only where it has been observed, with lack of observation not necessarily an absence. Squirrel damage is not always readily observable from the ground where the NFI assessments were taken. Hence 25% of native woodland are in unfavourable condition for herbivore damage levels, but may be under-reported.

Other indicators of particular importance in native woodlands, including invasive species and pests and diseases, affect a smaller total area of stands across the country. Presence of invasive species including Rhododendron and Laurel are surprisingly low for Wales across all woodland types, but do occur in high concentrations in some areas. Just 7% of native woodland has unfavourable levels of invasive species, 13% of near-native and 5% of non-native woodlands. However, they have a major impact on ecological condition where present. Unfavourable levels of pests and diseases may appear low across the woodland types, including high impact tree disease such as *P.ramorum* in non-native woodland. These statistics relate to 2013 (samples taken 2010-2016), and it is possible that infection may have occurred after an area was surveyed. Additionally, sites may have been felled before survey for sanitation purposes (and would not display symptoms). Time of year and leaf presence or absence will also impact upon the ability to observe / identify some diseases and these results are not normalised for season. Future iterations of the NFI will be important to monitor trends and changes in these indicators.

The study has also highlighted some positive results for woodland ecology in Wales:

1. There is now evidence to classify more woodland in Wales as native than previously evidenced.
2. Some habitats that were previously thought to be rare, such as wet woodland, are in fact more extensive than previously evidenced.

3. Circa 13,000 hectares or 9% of native woodland area is in favourable ecological status overall.
4. Circa 135,000 hectares or 91% of native woodland area is in intermediate condition*.
5. Circa 200 hectares or 0.1% of native woodland area is in unfavourable condition.
6. 1% of non-native woodlands are in favourable condition, with 98% as intermediate, and 1.5% as unfavourable ecological condition.
7. 86% of native woodland area achieve favourable status for native canopy occupancy.
8. The regeneration of native and non-native young trees in native woodland is positive with 88% of stands as intermediate for regeneration and 12% favourable for regeneration.
9. 55% of native stands in Wales are in favourable condition for vertical canopy structure.

As might be expected, non-native woods do not score as highly as native woods. In particular, they scored lower on parameters such as natural regeneration (of natives and non-natives). Whilst ecological condition is not the primary objective of management for productive woodlands, the application of a consistent benchmark to all woodland types provides a transparent and consistent measure, allowing all woodland types to be compared equally, as well as highlighting where non-native woodland scores well. This consistent application of a single benchmark of condition has reflected positively on non-native plantations in Wales, as 2% of non-native woodland were classified as 'unfavourable' overall, compared to just under 0.1% of native woodlands. Non-native stands also scored equally to or better than some native woods for some of the indicators; for example, a higher proportion of non-native stands were 'favourable' for deadwood and invasive species.

8.3 Conclusion

This is the largest and most in-depth study of ecological condition of any habitat in Wales to date. The results present a valuable insight into the current ecological condition of woodland habitat in Wales and provide a foundation and reference data set for future work and added value. The reader is pointed towards the companion reports for additional information on the methodology and statistics.

8.4 Future work

Some of the results suggest further analysis of the data is required. For example, the evidence concerning open space in woods is notable where it was found that a relatively

* With only one reference point of NFI woodland ecology measurements taken currently, no assessment of if their condition is declining or improving has been made. Future reports utilising the second NFI cycle will address this.

large proportion (85%) of native woodland stands in Britain have been classified as unfavourable for open space due to the low proportion of open space within them (being less than 10% to 25%). This result raises the question as to why current policy is to encourage 10% to 25% open space, when the native population evidences that 90% of stands contain less than 10% open area. Future work is needed in this area.

NFI plan to repeat this exercise for data collected in the NFI second cycle of survey 2015 to 2020. This and these estimates will provide two data points of woodland condition from which trends and change in woodland condition can be assessed.

9 References

See methodology report.

10 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).

NFI woodland condition classifications

Word/phrase	Definition
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.
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.

NFI woodland condition classifications

Word/phrase	Definition
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.
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.

NFI woodland condition classifications

Word/phrase	Definition
Naturalised species	A species that, once it is introduced outside its native distributional range, establishes self-sustaining populations.
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.

NFI woodland condition classifications

Word/phrase	Definition
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.
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.

NFI woodland condition classifications

Word/phrase	Definition
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).
(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)

11 Annex

Table 11.1 Classification threshold summary

Woodland Ecological Condition Indicator		Classification thresholds (abbreviated)	
	Favourable condition	**Intermediate condition**	**Unfavourable condition**
Age distribution of trees	Three age classes present	Two age classes present	One age class present
Wild, domestic and feral herbivore damage	No herbivore or squirrel damage	Herbivore damage near to stand	Herbivore damage in stand
		Squirrel damage only	
Invasive plant species	No invasive species in stand	Rhododendron and laurel not present, other invasive species < 10% cover	Rhododendron and laurel present, or other invasive species > 10% cover
Number of native tree species	Five or more native tree or shrub species in a stand	Three to four native tree of shrub species in a stand	None to two native tree or shrub species in a stand
Occupancy of native trees (in a stand)			
England and Wales	> 80%	50-80%	< 50%
Scotland	>90%	80-90%	<50%
Open space within woodland			
Woods greater than 10 hectares	10-25% open & ≥ 50% of open high quality	<10% open space, yet over 50% of open high quality	≥ 50% open space, irrespective of quality of open
		>25 and <50% open space & > 50% high quality open space	<10% open space and over 50% of open space low quality
		10-25% open space and over 50% of open space low quality	
Woods less than 10 hectares	0-10% & > 50% of open high quality	10-25% open space with over 50% high quality open	>25% open space
		0-10% open space and less than 50% of open space high quality	10-25% open space and over 50% low quality open
Proportion of favourable land cover around woodland	>20%	10-20%	<10%
Woodland Regeneration: Stand	All three classes present in stand; Trees 4-7cm dbh, saplings and seedlings	One or two classes only present in stand	Not applicable
Woodland Regeneration: Square-level	All three classes present nearby; Trees 4-7cm dbh, saplings and seedlings	One or two classes only present nearby	No classes present nearby
Tree health	Tree mortality less than 10%, no pests or diseases and no crown dieback	11% to 25% mortality	Greater than 25% tree mortality
		0-11% mortality and crown dieback or low risk pest or disease present	Any high risk pest or disease
Vegetation and ground flora	Strong plant community	Average plant community	Weak plant community
Woodland vertical structure	Four or more storeys in a stand or a complex stand	2 or 3 storeys in a stand	One or less storey in a stand
Veteran trees	Greater than 40 veteran trees per 20 hectares	Between one and 40 veteran trees per 20 hectares	Less than 1 veteran tree per 20 hectares
Volume of deadwood	Greater than 80 cubic metres per hectare	Between 20 and 80 cubic metres per hectare	Less than 20 cubic metres per hectare
Size of woodlands	Greater than 20 hectares	between 5 and 20 hectares	less than 5 hectares
Score per WEC indicator	3	2	1
Total score	Greater than 35	26 to 35	Less than 25

NFI woodland condition classifications

12 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 not an Official Statistics publication, but it does include two tables of official statistics (Tables 3.1 and 3.2). More information about Official Statistics and the UK Statistics Authority is available at www.statisticsauthority.gov.uk

National Forest Inventory Statistician: David Ross.

Survey design

B. Ditchburn and A. Brewer.

Authors

B. Ditchburn, T. Wilson, L. Henderson, K. Kirby and P. Steel.

Publication support

V. Correia, D. Ross, L. Halsall, W. Peden, H. Stephenson and C. Bellamy

Reviewers and steer

For a list of those who assisted in the quality assurance of these statistics, please see the Forest Research statistics webpages.

Lead Reviewers: Colin Edwards, Emma Goldberg, Jeanette Hall, Rebecca Isted, Fiona Macfarlane, Neil Riddle and Chris Tucker

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