

NFI woodland ecological condition in Wales: Statistics

National Forest Inventory

issued by:	National Forest Inventory, Forest Research
	231 Corstorphine Road, Edinburgh, EH12 7AT
Date:	February 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) provides a record of the size, distribution and information on other key attributes of forests and woodlands¹ 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 [country²]: Statistics
- NFI woodland ecological condition in [country²]: Classification Results
- NFI woodland ecological condition in [country]: Supporting Data³

This report presents the statistical results of these NFI indicators of woodland ecological condition for Wales 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*.

 $^{^{\}rm 1}$ 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 as MS-Excel® spreadsheets

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 statistical results, one for each of the three countries and Great Britain, broken by native woodland type¹ 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 at 2013 in Britain is estimated to be around 1.51 million hectares, around 500,000 hectares or 50% higher than reported in previous estimates.
- The total area of native woodland in Wales is 150¹ thousand hectares, around 98 thosands hectares higher than reported in previous estimates. The increase in the NFI estimation of area of native woodland in Wales arises as a result of the application of improved earth observation techniques, which identified existing woodlands that previous assessments had missed. Those previously missed woodlands tended to be smaller woods found in lowland areas; for more details see NFI Report *Woodland Area in Britain 2010*.
- In Wales there are, 79 thousand hectares of lowland mixed deciduous woodland, 28 thousand hectares of wet woodland, 26 thousand hectares hectares of upland oakwood and an adittional 2,221 hectares of Upland Oakwood dominated by birch and 7144 hectares of upland mixed ashwoods, 6,424 hectares of lowland beech / yew woodland and 12 thousand hectares of broadleaved mixed yew woodlands which were not classifed into a priority habitat type.²
- 70% of native woodland stands have less than 5% non native species in the upper canopy.
- 64% of native stands have 5 or more native tree species per stand in Wales.
- 93% of native stands have some form of young tree regeneration within them.
- 82% of native stands have three or more layers of distinct canopy, providing better structural diversity and indicative of the woodland stands capacity to regenerate over time.
- 66% of native stands have no signs of herbivore browsing damage below 1.8 m in Wales.
- 45% of native woodland stands have no deadwood within them and 28% less than 10m³ of deadwood per hectare and 2 % have over 100m³.
- 49% of native woodland stands in Wales are found in woods smaller than or equal to 20 ha in size.
- 10% of native woodland stands in Wales have invasive species present.

¹ Direct comparisons between woodland area and area of native cannot be made as both hold slightly different definitions with woodland area allowing more open space.

² Estimates are rounded for brevity and do not add to other totals represented in the report

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1 Introduction

Welsh 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 <u>National Forest Inventory</u> (NFI) that records the size, distribution and composition of woodland in Great Britain.

1.1 The Aim

The purpose of this report is to present the statistical results of the woodland ecological condition assessment in Wales, broken down by woodland type at 2013. These data serve as evidence to support the scoring and classification of woodland ecological condition – see *NFI Woodland Ecological Condition in Wales: Classification results*. They also form an evidence base for further analytical work and added value.

For a brief summary of the study please refer to *NFI Woodland ecological condition in Great Britain: Executive Summary* report. For more information about the methodology used to conduct this study please refer to *NFI Woodland ecological condition in Great Britain: Methodology*. 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 *NFI Woodland ecological condition in Great Britain: Classification Results* (see Figure 1).

1.2 The importance of understanding the ecological condition of Welsh 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; <u>https://www.cbd.int</u>). Contracting parties are required to develop and enforce national strategies to identify, conserve and protect existing biodiversity. <u>Article 7</u> of the convention focuses on the requirement for identification and monitoring of biodiversity.
- The <u>EU Habitats Directive</u> (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, 2018¹). 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) ground surveys 1 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, around 2,000 of which were in Wales. 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

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

- 8. Woodland Regeneration: Stand or component group-level¹
- 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

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 <u>Common Standards Monitoring</u> 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 GB (≥ 0.5 hectares) is identified by the National Forest Inventory (NFI) and the resultant data is available in the form of a <u>digital woodland map</u>. 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 sample 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 1 hectare sample square into forest and nonforest. 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 (as described above) was collected (see complementary methodology report). Additionally, individual stands were vertically stratified into several layers, or storeys, if tree height widely differed and formed distinct bands of tree heights. See appendix for an illustrative diagram of a sample square.

Typically, there are multiple stands and / or parts of stands within each sample square. This means, from the circa 2,000 sample squares covered by the NFI in Wales, circa

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'.

4,300 forest stands have been assessed for ecological condition. Within each stand two or three 100 m² (0.01 hectare) circular plots were randomly located. Within each of these circular plots tree stocking was assessed and tree species, age, grid location and diameter breast height (DBH) was recorded for all trees \geq 4 cm DBH. A total of some 84,000 trees were measured in Wales. 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 were 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 Wales are presented in this report, broken down by different woodland types (native, near-native and fragments, non-native). Results specifically for England, Scotland and Great Britain 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 and 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 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 in order to report on woodland ecological change over time. For more detail on the methodology please refer to the complementary 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

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 statistical results of the woodland ecological condition assessment of woodland in Wales, broken down by native woodland type (native; near native and fragments; non-native and not determinable). 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 the estimates is 2013, reflecting the time period over which the field samples were taken - January 2010 to January 2016 and thus 2013 is the average age of the samples.

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.

Standard errors (SE) attached to estimates are expressed in relative terms (%) to the right of the relevant estimate. The 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 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.

Charts show classes as a proportion of total woodland habitat area in Wales.

3 Woodland habitat area

Total woodland habitat area, separated into priority woodland habitats and native woodland types, is presented in this report (Table 3.1 and Table 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.

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)
	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
	54,482	/4/,508	U	U	11,220	31,907	44,027	//,/89	7,730	19,401	327,536	21,967	1,343,508
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	/3,895	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

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

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.

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	

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

Notes: 1. Woodland types are defined in section 1.4. 2. The above assessment is inclusive of clearfell and transition woodland areas. 3. Not determinable will relate to areas such as clear-fell and transition woodland area without sufficient tree canopy or plant material to determine native status with. 4. 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 <u>Native Woodland Survey of Scotland (NWSS</u>), 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.
- 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 JNCC NVC to describe native woodland extent should not be made because of differences in the methodologies.

4 Age distribution of trees in Wales

Table 4-1 Combinations of age bands of trees found within single woodland stands in Wales by area and woodland type

Woodland Type	Not app	olicable	Young) only	Youn interme	g & diate	Young intermediate old		
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	438	42	15,520	7	90,546	3	31,437	6	
Near native & fragments	78	36	1,739	19	3,643	17	1,028	33	
Non native	3,568	12	31,450	4	82,332	3	2,691	22	
Not determinable	718	26	0	-	0	-	0	-	
Total	4,802	10	48,709	3	176,520	2	35,156	5	

Woodland Type	Your ol	ng & Id	Intermediate only		Interme ol	diate & d	Old	only	Total	
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	350	37	8,881	12	3,186	22	40	89	150,399	2
Near native & fragments	0	-	328	51	188	103	0	-	7,004	12
Non native	0	-	33,949	6	798	39	33	82	154,822	2
Not determinable	0	-	0	-	0	-	0	-	718	
Total	350	37	43,159	5	4,173	19	73	61	312,943	2

- 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.

Figure 4-1 Proportion of age bands of trees found within single woodland stands in Wales by area and woodland type



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.

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5 Wild, domestic and feral herbivore browsing damage in Welsh woodland

Table 5-1 Areas of different levels of herbivore damage in Welsh woodland bywoodland type.

Woodland Type	No brow in squ	vsing are	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	99,612	3	36,189	5	715	34.6	13,883	8	150,399	2
Near native & fragments	5,228	13	1,262	29	82	40.4	433	50	7,004	12
Non native	127,008	2	17,493	8	720	35.5	9,600	9	154,822	2
Not determinable	469	32	0	-	0	-	249	45	718	
Total	232,317	2	54,944	4	1,517	23.6	24,165	6	312,943	1

Woodland Type	No squirrel damage in square		Squirrel damage in component group		Squirrel in secti	damage on only	Squirrel in squa	damage re only	Total		
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	128,325	2	14,131	9	201	50	7,741	10	150,399	2	
Near native & fragments	5,982	13	496	44	57	77	468	44	7,004	12	
Non native	145,264	1	5,223	15	383	51	3,952	15	154,822	1	
Not determinable	718	26	0	-	0	-	0	-	718		
Total	280,289	1	19,851	7	641		12,162	8	312,943	1	

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



Figure 5-1 Proportion of different levels of herbivore damage in Welsh woodland by woodland type

- (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 Wales

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

	None		≤ 10	0%	> 1	0%	Total		
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	135,478	2	9,607	11	5,314	15	150,399	2	
Near native & fragments	5,957	13	748	34	299	61	7,004	12	
Non native	144,378	1	8,810	11	1,635	25	154,822	1	
Not determinable	718	26	0	0	0	0	718		
Total	286,530	1	19,165	7	7,248	13	312,943	1	

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

	Pres	ent	Abse	ent	Tota	al
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	8,574	11	141,825	2	150,399	2
Near native & fragments	883	32	6,121	12	7,004	12
Non native	8,228	12	146,594	1	154,822	1
Not determinable	0	0	718	26	718	
Total	17,685	8	295,258	1	312,943	1

- 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 is inclusive of rhododendron and laurel

Figure 6-1 Proportion of woodland area in Wales 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.

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7 Number of native tree species in a stand

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

	0 na	tive	1 na	tive	2 na	tive	3 native		4 native	
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	921	34	6,298	13	10,640	10	16,037	8	19,893	8
Near native & fragments	78	36	537	35	729	25	1,479	28	1,857	23
Non native	48,552	4	26,647	6	23,578	6	24,486	6	13,700	9
Not determinable	718	26	0	-	0	-	0	-	0	-
Total	50,269	4	33,482	6	34,946	5	42,003	5	35,450	6

	5 na	tive	6 na	tive	7 na	tive	8 native		9 native	
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	23,977	7	20,419	7	16,477	8	13,151	9	11,599	10
Near native & fragments	795	28	951	37	119	87	143	91	29	101
Non native	8,639	11	4,655	15	2,042	22	977	38	687	44
Not determinable	0	-	0	-	0	-	0	-	0	-
Total	33,411	6	26,025	6	18,638	7	14,271	9	12,315	10

	10 na	ative	11 na	ative	12 or mo	re native	Total		
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	5,422	14	3,048	19	2,515	22	150,399	3	
Near native & fragments	287	77	0	-	0	-	7,004	12	
Non native	725	42	35	99	100	77	154,822	3	
Not determinable	0	-	0	-	0	-	718	26	
Total	6,435	13	3,084	19	2,615	21	312,943	2	

- 1. Native tree species = trees that colonised Wales 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 clearfell and transition areas.

Figure 7-1 The proportion of different native tree species present in Welsh woodland stands by woodland type





8 Occupancy of native trees

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

	0 to <5%		≥5 and <10%		≥10 and	d <15%	≥15 and	d <20%	≥20 and <25%		
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	0	-	0	-	0	-	0	-	0	-	
Near native & fragmented	0	-	0	-	0	-	0	-	0	-	
Non native	116,460	2	12,426	9	7,095	12	4,591	15	4,643	14	
Not determinable	718	26	0	-	0	-	0	-	0	-	
Total	117,178	2	12,426	9	7,095	12	4,591	15	4,643	14	

	≥25 and	d <30%	≥30 and	d <35%	≥35 and	l <40%	≥40 and <45%		≥45 and <50%	
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	0	-	0	-	0	-	0	-	0	-
Near native & fragmented	0	-	0	-	0	-	3,291	17	2,712	21
Non native	3,328	17	4,261	15	1,970	19	49	108	0	-
Not determinable	0	-	0	-	0	-	0	-	0	-
Total	3,328	17	4,261	15	1,970	19	3,340	17	2,712	21

	≥50 and	≥50 and <55%		≥55 and <60%		d <65%	≥65 and	l <70%	≥70 and <75%	
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	3,721	16	3,823	18	3,417	16	3,499	18	3,446	18
Near native & fragmented	302	54	5	66	24	51	14	55	22	59
Non native	0	-	0	-	0	-	0	-	0	-
Not determinable	0	-	0	-	0	-	0	-	0	-
Total	4,023	15	3,828	18	3,441	15	3,513	18	3,469	18

	≥75 and <80%		≥80 and	d <85%	≥85 and	d <90%	≥90 and	d <95%	≥95 and •	<100%	Total	
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	3,065	18	6,798	12	6,130	12	10,921	9	105,579	3	150,399	2
Near native & fragmented	26	66	78	39	61	53	20	61	448	24	7,004	12
Non native	0	-	0	-	0		0	-	0	-	154,822	2
Not determinable	0	-	0	-	0		0	-	0	-	718	
Total	3,090	18	6,876	12	6,191	12	10,941	9	106,027	3	312,943	1

Notes: 1. Native tree species = trees that colonised Wales 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 \leq 50% includes 50% which is defined as native. 5. Refer to methods for a list of all species classified as native. 5. Areas in woodland type appearing to contradict classification definitions (see section 1.4) are a result of rounding approaches on values close to the threshold.

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Figure 8-1 The proportion of native trees occupying the canopy of different types of woodland in Wales

Notes: 1. (a) Native woodland (b) Near-native and fragments (c) Non-native woodland. 2. Native tree species = trees that colonised Wales 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 Welsh woodlands by area (ha) and woodland type

	< 10%		\geq 10 and \leq 25%		> 25 and	d < 50%	≥ 50%		Total	
(a) Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	33,698	5	15,213	8	22,909	7	25,592	6	97,412	3
Near native & fragments	3,035	18	436	29	1,129	26	792	28	5,392	13
Non native	80,994	3	22,727	7	17,768	7	22,468	6	143,957	2
Not determinable	3.8	59	0	-	8	61	706	27		
Total	117,731	2	38,377	5	41,815	5	49,558	4	247,480	2

	< 10	0%	\geq 10 and	≤ 25%	> 25 and	d < 50%	≥ 50%		Total	
(b) Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	4,686	15	5,701	14	15,616	9	26,983	7	52,986	5
Near native & fragments	148	99	69	83	170	72	1,224	34	1,612	29
Non native	1,675	26	1,067	32	2,260	23	5,864	15	10,865	11
Not determinable	0	-	0	-	0	-	0	-	0	-
Total	6,509	13	6,836	13	18,046	8	34,071	6	65,463	4

- 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.





- 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.

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

Habitat_name	Percentage of Wales open space area	Quality
Improved grassland	25.8%	Low
Neutral grassland	19.2%	High
Built up areas & gardens	8.4%	Low
Arable/horticulture	7.4%	Low
ACID GRASSLAND	7.0%	Low
Bracken	5.8%	High
Upland heathland	5.7%	High
Boundary & linear features	5.4%	High
Upland flushes, fens & swamps	2.8%	High
Purple moor grass/rush pastures	1.6%	High
Other	10.8%	NA

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

Land use	Percentage of Wales open space area	Quality
Agricultural land AGR	45.2%	Low
Open OPN	29.6%	High
Felled PFE	8.2%	High
Perm. Open Space assoc. with Linear Feat. POS	3.8%	High
Residential EMR	2.9%	Low
Linear feature & open space assoc. linear feature LIF	2.7%	High
Open Water MOW	1.9%	High
Plantable land LHP	1.6%	Low
Other Built Facility EMO	1.4%	Low
Unplanted streamsides FMW	0.8%	High
Other	1.9%	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 Wales

10.1 Woodland cover around woodlands

Table 10-1 Area of woodland within a 5.6 km radius (100 km²) of surveyed woodlands in Wales by woodland type

	< 10		\geq 10 and \leq 20		> 20 ar	nd ≤ 30	> 30 ai	nd ≤ 40	> 40 and \leq 50		
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	35,067	6	72,140	4	23,679	7	11,004	9	6,649	12	
Near native & fragments	1,918	27	2,196	21	1,331	25	1,024	25	244	31	
Non native	12,333	10	43,409	5	31,565	6	39,080	5	18,643	8	
Not determinable	0	-	278	42	81	48	60	73	8	61	
Total	49,318	5	118,023	3	56,655	4	51,168	4	25,545	6	

	> 50 ar	> 50 and ≤ 60		> 60 and ≤ 70		nd ≤ 80	> 80 aı	nd ≤ 90	> 90		Total	
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	1,459	25	401	60	0	-	0	-	0	-	150,399	3
Near native & fragments	186	65	105	72	0	-	0	-	0	-	7,004	12
Non native	7,885	12	1,907	26	0	-	0	-	0	-	154,822	3
Not determinable	290	47	1	116	0	-	0	-	0	-	718	26
Total	9,820	11	2,414	23	0	-	0	-	0	-	312,943	2

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 = 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. Refer to the methods report for more detail.

^{* &#}x27;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.

Figure 10-1 Proportional of woodland cover within a 5.6 km radius (100 km²) of surveyed woodland in Wales 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 km²) of the surveyed woodland in Wales by woodland type

	< 10%		\geq 10 and \leq 20%		> 20 and	d ≤ 30%	> 30 and	d ≤ 40%	> 40 and ≤50%		
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	35,582	6	43,074	5	22,699	7	12,946	9	14,306	10	
Near native & fragments	920	36	1,995	22	1,273	29	810	34	509	44	
Non native	14,031	10	31,860	6	21,823	7	20,325	8	22,260	7	
Not determinable	0	-	0	-	351	41	8	61	167	50	
Total	50,533	5	76,929	4	46,146	5	34,089	6	37,242	6	

	> 50 and	> 50 and \leq 60%		> 60 and ≤ 70%		d ≤ 80%	> 80 an	d ≤90%	> 9	0%	Total	
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	11,738	10	6,606	15	2,303	23	965	36	181	55	150,399	3
Near native & fragments	914	28	554	42	30	48	0	-	0	-	7,004	12
Non native	25,856	7	10,178	11	6,695	14	1,794	31	0	-	154,822	3
Not determinable	0	-	190	47	2	61	0	-	0	-	718	
Total	38,508	6	17,526	9	9,030	12	2,759	24	181	55	312,943	2

- 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.

Figure 10-2 Proportion of land cover that is 'other favourable habitat' within a 5.6 km radius (100 km²) of the surveyed woodland in Wales 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 stands

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

Woodland Type	None		Seedlings only		Seedli sapling	ngs & s only	Seedlings saplings < 7 cm trees		
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	10,507	11	195	79	5,555	14	18,417	8	
Near native & fragments	683	35	15	79	346	50	691	37	
Non native	22,037	7	4	79	8,940	10	9,089	11	
Not determinable	595	29	0	-	0	-	0	-	
Total	33,822	6			14,841	8	28,197	6	

Woodland Type	Saplings only		<7 cm trees & seedlings only		<7 cm t sapling	rees & s only	< 7 cm tr	rees only	Total		
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	33,167	6	0	-	72,884	3	9,675	12	150,399	3	
Near native & fragments	2,182	21	0	-	2,951	18	135	99	7,004	12	
Non native	40,744	4	0	-	50,708	4	23,300	7	154,822	2	
Not determinable	123	62	0	-	0	-	0	-	718	26	
Total	76,216	3	0	-	126,543	3	33,111	6	312,943	2	

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. 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.



Figure 11-1 Evidence of regeneration within individual woodland stands in Wales 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 Wales by woodland type

Woodland Type	No	ne	Seedlin	gs only	Seedlings or	, saplings Iy	Seedlings, saplings, <7 cm trees		
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	6,964	15	0	-	4,259	17	34,665	6	
Near native & fragments	431	53	0	-	348	51	1,267	24	
Non native	12,442	10	0	-	5,460	14	24,634	7	
Not determinable	19	54	0	-	111	50	259	45	
Total	19,857	8	0	-	10,179	11	60,826	4	

Woodland Type	Saplings only		<7 cm trees, seedlings only		<7 cm trees only	, saplings /	<7 cm tr	ees only	Total		
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	18,249	8	0	-	77,289	3	8,971	14	150,399	3	
Near native & fragments	1,399	27	0	-	3,402	17	156	86	7,004	12	
Non native	26,440	6	0	-	67,782	4	18,064	9	154,822	3	
Not determinable	193	57	0	-	136	61	0	0	718	26	
Total	46,281	5	0	-	148,609	2	27,191	7	312,943	2	

- 1. Square: A one-hectare (100 m by 100 m) square, which may be entirely within woodland or may overlap the woodland edge.
- 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.



Figure 11-2 Evidence of regeneration around woodland stands in Wales 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 Wales without or with pest and disease by woodland type

Woodland type	No pest &	No pest & disease		mpact disease	High iı pest &	mpact disease	Total		
	Area SE% (ha)		Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	146,203	2	2,446	20	1,750	26	150,399	2	
Near native & fragments	6,775	12	0	-	229	72	7,004	12	
Non native	146,274	2	200	52	8,348	11	154,822	2	
Not determinable	718	26	0	-	0	-	718	26	
Total	299,971	1	2,646	19	10,326	10	312,943	1	

- 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.
- Rapidly spreading infestations may have occurred since the day of survey (samples taken 2010 to 2016), with a mean date of 2013. Equally infested sites that have been clear-felled for sanitation purposes may not show signs of infestation at point of survey.



Figure 12-1 Proportion of woodland area in Wales without or with disease in by woodland type

Notes: 1. (a) Native woodlands (b) Near native woodland or fragments (c) Non-native woodland. 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.

39 NFI Condition Statistics

Table 12-2 Area of woodland in Wales by different levels of tree mortality andwoodland type

Woodland type	≤ 11% mortality		> 11% < 2 mort	% and 5% ality	≥ 2 mort	5% ality	Total		
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	
Native	141,012	2	5,322	15	4,065	17	150,399	2	
Near native & fragments	6,660	12	209	40	135	99	7,004	12	
Non native	142,698	2	9,740	12	2,384	23	154,822	2	
Not determinable	710	26	0	-	8	61	718	26	
Total	291,079	1	15,272	9	6,592	14	312,943	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 Proportion of woodland without or with crown dieback in Welsh woodlands by woodland type

Woodland type	No crown	dieback	So crown o	me dieback	Tot	al
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	139,279	2	11,120	10	150,399	2
Near native & fragments	6,682	12	322	38	7,004	12
Non native	137,266	2	17,556	9	154,822	2
Not determinable	666		52	52 66		26
Total	283,893		29,050	6	312,943	1

- 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.





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 Welsh 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

wales by v	woodla	and ty	pe and	a area								
	No Grou	nd layer	> 0 and	≤ 10 %	> 10 an	d ≤ 20 %	> 20 an	d ≤ 30 %	> 30 and	d ≤ 40 %	> 40 and	≤ 50 %
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	1,493	23	5,312	16	7,215	13	29,738	6	30,606	6	23,909	6
Near native & fragments	101	36	30	58	204	46	1,249	30	883	26	841	35
Non native	4,039	14	5,559	15	3,831	15	11,533	9	13,867	9	14,146	8
Not determinable	302	45	0	-	0	-	319	39	0	-	0	-
Total	5,934	12	10,901	11	11,251	10	42,839	5	45,356	5	38,895	5
	> 50 and	≤ 60 %	> 60 and	≤ 70 %	> 70 and	≤ 80 %	> 80 and	≤ 90 %	> 90	1%	Tot	al
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	18,151	8	15,791	8	8,231	12	5,641	14	4,311	16	150,399	3
Near native & fragments	893	29	634	39	1,231	34	476	40	461	43	7,004	12
Non native	14,027	8	17,227	8	15,661	8	22,968	7	31,965	6	154,822	3
Not determinable	97	41	0	-	0	-	0	-	0	-	718	26

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

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, and fungi. (3) 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. 4. Refer to methods for more information.



Figure 13-1 Proportion of ground layer vegetation in woodland stands in Wales by woodland type

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, leaf litter and fungi. 2. Woodland types are defined in section 1.4. 3. No ground layer = 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 Wales by woodland type and area

	No field	d layer	> 0 and	≤ 10%	> 10 and	l ≤ 20%	>20 and	≤ 30%	>30 and	≤ 40%	>40 and	≤ 50%
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	5,112	14	10,292	11	10,098	11	10,606	10	14,830	9	17,045	8
Near native & fragments	251	36	443	43	951	35	864	37	670	42	556	38
Non native	29,017	6	31,564	6	19,307	7	12,598	9	11,965	9	11,330	9
Not determinable	302	45	0	-	0	-	0	-	0	-	0	-
Total	34,682	6	42,300	5	30,357	6	24,068	7	27,465	6	28,930	6

	>50 and	l ≤ 60%	>60 and	d ≤ 70%	>70 and	d ≤ 80%	> 80 and	d ≤ 90%	> 9	0%	Tota	al
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	16,874	8	17,443	7	18,259	8	15,479	8	14,360	9	150,399	3
Near native & fragments	644	29	622	43	497	32	406	42	1,100	32	7,004	12
Non native	8,712	10	9,853	10	8,298	11	5,999	13	6,179	12	154,822	3
Not determinable	29	66	68	52	0	-	174	50	144	61	718	
Total	26,259	6	27,986	6	27,055	6	22,058	7	21,783	7	312,943	2

- 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.



Figure 13-2 Proportion of field layer vegetation in woodland stands in Wales 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 cover of bare soil in woodland stands in Wales by woodland type and area

	No bare	e soil	> 0 and	≤ 10%	> 10 and	d ≤ 20%	>20 and	≤ 30%	>30 and	i ≤ 40%	>40 and	≤ 50%
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	98,060	3	40,040	5	6,204	14	3,468	19	1,127	29	710	44
Near native & fragments	5,761	13	1,146	32	67	50	31	66	0	-	0	-
Non native	118,884	2	28,829	6	3,707	17	834	34	1,488	30	254	75
Not determinable	543	31	174	50	0	-	0	-	0	-	0	-
Total	223,248	2	70,189	4	9,978	11	4,333	17	2,616	21	964	

	>50 and	l ≤ 60%	>60 and	≤ 70%	>70 and	i ≤ 80%	> 80 and	d ≤ 90%	> 9	0%	Tota	I
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	501	53	193	91	53	70	0	-	42	99	150,399	2
Near native & fragments	0	-	0	-	0	-	0	-	0	-	7,004	12
Non native	468	34	48	88	111	96	0	-	198	55	154,822	2
Not determinable	0	-	0	-	0	-	0	-	0	-	718	
Total	969	32	241	75	165	69	0	-	240	48	312,943	2

- 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.



Figure 13-3 Proportion of bare soil in woodland stands in Wales 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 number of storeys in woodland stands in Wales by area and woodland type

	No st	oreys	1 st	orey	2 sto	oreys	3 sto	oreys
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	438	42	9,223	11	18,164	8	39,260	5
Near native & fragments	72	39	967	26	818	30	1,917	22
Non native	3,320	12	34,369	5	40,296	5	35,915	5
Not determinable	718	26	0	-	0	-	0	-
Total	4,548	11	44,559	5	59,278	4	77,092	4

	4 sto	oreys	5 sto	oreys	Com	plex	Tot	al
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	24,996	7	4,337	17	53,981	4	150,399	3
Near native & fragments	399	43	0	-	2,830	20	7,004	12
Non native	17,425	8	3,065	20	20,432	7	154,822	3
Not determinable	0	-	0	-	0	-	718	
Total	42,820	5	7,402	13	77,243	3	312,943	2

- 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.



Figure 14-1 The number of storeys in Welsh 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 Welsh woodlandsby woodland type

Woodland Type	0 trees p	er ha	0 - 1 tre	e per ha	> 1 and : per	≤ 2 trees ha	> 2 and : per	≤ 5 trees `ha
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	146,073	2	0	-	1,118	35	613	40.6
Near native & fragments	6,698	12	0	-	179	98.8	0	-
Non native	156,568	1	0	-	116	100	3	7,5.7
Not determinable	718	26	0	-	0	-	0	-
Total	310,057	1	0	-	1,413			

Woodland Type	> 5 and ≤ per	10 trees ha	> 10 and : per	≤ 20 trees ˈha	> 20 tree	es per ha	Tot	al
	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	428	52	302	55	56	99	148,590	2
Near native & fragments	49	50	0	-	0	-	6,926	12
Non native	22	116	0	-	0	-	156,709	1
Not determinable	0	-	0	-	0	-		26
Total	499	45	302	55	56	99	312,943	1

- 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 Welsh 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 Wales by woodland type and area

	None	9	>0 and	l ≤ 10	>10 and	d ≤ 20	>20 and	d ≤ 30	>30 and	d ≤ 40
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	68,307	4	42,743	5	12,134	10	7,853	12	4,695	16
Near native & fragments	3,254	17	1,718	23	665	43	470	50	57	47
Non native	57,660	4	35,410	5	14,037	9	10,016	11	6,904	12
Not determinable	288	41	0	-	69	63	52	66	17	61
Total	129,509	3	79,872	3	26,905	6	18,391	8	11,673	10

	>40 an	d ≤ 50	>50 an	d ≤ 60	>60 and	d ≤ 70	>70 an	d ≤ 80	>80 and	$0 \text{ and } \leq 90$	
Woodland Type	Area (ha)	SE%									
Native	2,951	19	2,679	20	2,543	21	1,996	25	802	34	
Near native & fragments	195	74	224	63	80	69	128	52	26	70	
Non native	4,514	17	3,872	17	3,675	18	3,053	20	2,764	20	
Not determinable	128	65	0	-	0	-	164	66	0	-	
Total	7,789	12	6,775	13	6,297	14	5,341	15	3,592	17	

	>90 and	l ≤ 100	>100 an	d ≤ 150	>150 an	d ≤ 200	>200 an	d ≤ 500	>50	00	Tot	al
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	542	45	1,425	29	491	48	1,077	31	159	90	150,399	3
Near native & fragments	19	96	2	100	12	116	49	50	104	99	7,004	12
Non native	1,828	24	5,512	15	2,716	22	2,778	20	85	66	154,822	3
Not determinable	0	-	0	-	0	-	0	-	0	-	718	
Total	2,388	21	6,940	13	3,219	20	3,904	17	347	53	312,943	2

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.

Figure 16-1 Ranges of the volume of deadwood (m³ per hectare) in woodland stands in Wales 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 UK Forestry Standard threshold.

53 NFI Condition Statistics

17 Size of woodland parcels in Wales

Table 17-1 The size of woodland parcels that stands are found within, by woodland type and area in Wales

	<5 ha		≥5 and <10 ha		≥10 and <15 ha		≥15 and <20 ha		≥20 and <25 ha		≥25 and <30 ha	
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	37,288	6	15,698	9	11,510	11	9,710	12	4,595	18	4,451	18
Near native & fragments	1,338	33	274	47	598	44	24	117	300	64	47	65
Non native	7,376	14	3,489	20	3,303	20	2,707	24	2,318	23	2,384	23
Not determinable	0	-	0	-	0	-	0	-	0	-	0	-
Total	46,002	5	19,461	8	15,411	9	12,440	11	7,213	14	6,882	14
	≥30 and	<35 ha	≥35 and	<40 ha	≥40 and	<45 ha	≥45 and	<50 ha	≥50 and	<60 ha	≥60 and	<70 ha
Woodland Type	≥30 and Area (ha)	<35 ha <i>SE</i> %	≥35 and Area (ha)	<40 ha <i>SE</i> %	≥40 and Area (ha)	<45 ha <i>SE</i> %	≥45 and Area (ha)	<50 ha <i>SE%</i>	≥50 and Area (ha)	<60 ha <i>SE</i> %	≥60 and Area (ha)	<70 ha SE%
Woodland Type Native	≥30 and Area (ha) 4,409	<35 ha SE% 17	≥35 and Area (ha) 2,310	<40 ha SE% 23	≥40 and Area (ha) 2,999	<45 ha SE% 22	≥45 and Area (ha) 2,208	<50 ha SE% 27	≥50 and Area (ha) 6,045	<60 ha SE% 15	≥60 and Area (ha) 3,126	<70 ha SE% 20
Woodland Type Native Near native & fragments	≥30 and Area (ha) 4,409 430	<35 ha SE% 17 50	≥35 and Area (ha) 2,310 72	<40 ha SE% 23 95	≥40 and Area (ha) 2,999	<45 ha SE% 22 96	≥45 and Area (ha) 2,208 103	<50 ha SE% 27 99	≥50 and Area (ha) 6,045 57	<60 ha SE% 15 109	≥60 and Area (ha) 3,126 123	<70 ha SE% 20 61
Woodland Type Native Near native & fragments Non native	≥30 and Area (ha) 4,409 430 1,543	<35 ha SE% 17 50 29	≥35 and Area (ha) 2,310 72 1,936	<40 ha SE% 23 95 27	≥40 and Area (ha) 2,999 15 1,280	<45 ha SE% 222 96 33	≥45 and Area (ha) 2,208 103 948	<50 ha SE% 27 99 35	≥50 and Area (ha) 6,045 57 2,945	<60 ha SE% 109 22	≥60 and Area (ha) 3,126 123 1,306	<70 ha SE% 20 61 28
Woodland Type Native Near native & fragments Non native Not determinable	≥30 and Area (ha) 4,409 430 1,543 0	<35 ha SE% 17 50 29 -	≥35 and Area (ha) 2,310 72 1,936 0	<40 ha SE% 23 95 27 -	≥40 and Area (ha) 2,999 15 1,280 0	<45 ha SE% 22 96 33 -	≥45 and Area (ha) 2,208 103 948 0	<50 ha SE% 27 99 35 -	≥50 and Area (ha) 6,045 57 2,945 0	<60 ha SE% 15 109 22 -	≥60 and Area (ha) 3,126 123 1,306 0	<70 ha SE% 20 61 28 -

	≥70 and <80 ha		≥80 and <90 ha		≥90 and <100 ha		≥100 and <150 ha		≥150 and <200 ha		≥200 ha		Total	
Woodland Type	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%	Area (ha)	SE%
Native	1,206	32	2,590	22	3,170	21	8,802	12	3,475	18	26,806	5	150,399	3
Near native & fragments	93	92	91	48	0	-	442	54	293	63	2,703	16	7,004	12
Non native	2,455	23	2,744	21	2,327	25	8,903	12	5,715	16	101,143	2	154,822	2
Not determinable	0	-	0	-	0	-	144	61	0	-	574	29	718	
Total	3,754	18	5,425	15	5,498	16	18,292	8	9,483	12	131,226	2	312,943	2

Notes: 1. SE = standard error. Amber text = values with SE > 25%. 2. Woodland types are defined in section 1.4. 3. Woodland parcel equals a discrete woodland block. 4. Refer to methods report for more information.

Figure 17-1 Proportion of Welsh woodland stands by the size of the woodland they are found within by woodland type



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 <u>Habitats Directive</u> 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 National Forest Inventory (NFI) Woodland Ecological Condition reports. This period of time reflects the complex design and planning required for the implementation of such a large-scale 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 NFI team and this study is the largest and most in-depth assessment of the ecological condition of any habitat in Great Britain.

The statistics in this report were collected as part of a scientific survey, the NFI, which has proven itself dependable in the domains of timber stock and carbon stock estimation. 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 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 that 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. Similarly, the native woodland area estimate in Wales has also risen. In Wales the NFI estimates that there is circa 150 thousand hectares of native woodland, an increase of 98 thousand hectares on the previous estimate reported in the 2008 Hap assessment, mirroring the wider British findings of increased woodland area. Most of this increase in native woodland resource is in the lowland areas of Wales.

The increase in the NFI estimation of area of native woodland in Wales arises as a result of the application of improved earth observation techniques, which identified existing woodlands that previous assessments had missed. Those previously missed woodlands tended to be smaller woods found in lowland areas, 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 is 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. Therefore, woodland types such as wet woodland, which naturally occur in smaller localised patches (of wetter land), are now recorded and included, where previously they may have been 'lost' in the counts of other woodland types.

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

- 79 thousand hectares of lowland mixed deciduous woodland in Wales as compared to the 26,581 hectares estimated in (2008).
- 26 thousand hectares of Upland Oakwood in Wales compared to previously reported estimates of 22,187 (2008 Hap).
- 28 thousand hectares of wet woodland in Wales as compared to the previous estimate of 10,174 thousand hectares.
- Circa 7,000 hectares of Upland Ashwood in Wales as compared to the previous estimate of 12,253 hectares.
- Circa 6000 hectares of Lowland beech / yew woodland in Wales compared to the 2008 Hap estimate of 2,221 hectares.
- Upland Oakwood dominated by birch has been identified separately from Upland Oakwood and accounts for around 2,200 hectares
- There are 12,200 hectares of broadleaved mixed yew habitat not classified as a priority woodland type.

The decrease in the estimate of Upland Ashwood in Wales, and across Britain compared to previous estimates, is likely due to 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.

The NFI estimates in the present study 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 7 thousand hectares of near native woodland and fragments in Wales.

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 Wales is reported in *NFI Woodland Ecological Condition Report*. Reports for other GB countries are also available.

Providing the statistics in this report enables a more detailed view of the different woodland variables, allowing a better understanding of what drives the classification results. The results point to the main physical and observable drivers behind our woodland ecological health in Wales today. The findings show some notable issues:

- 1. A lack of older age classes expected in regularly harvested non-native woodland, but notably found in native woodlands. This is also reflected in the low amounts of veteran trees found in all woodland types.
- 2. Herbivore pressure and its impact on vegetation and regeneration. 66% of native stands have no signs of herbivore browsing damage in Wales. Damage is recorded only when observed, so lack of observation is not necessarily an absence. Squirrel damage appears low, but damage is not always readily observable from the ground where the NFI survey was taken from. This will have led to a degree of underreporting.
- Low amounts of open space within stands with circa 25% of all woodland stands having less than the 10% minimum open space threshold advocated by the UK forest standard – the governments standard for sustainable woodland management
- 4. 45% of native woodland stands have no deadwood within them and 28% have less than 10 cubic metres of deadwood per hectare and 2% have over 100 cubic metres per hectare. These are relatively low amounts of deadwood when higher amounts are important for biodiversity.

- 5. 10% of native woodlands stands in Wales have an invasive species present. Rhododendron and laurel presence are lower than maybe expected for Wales, given the high concentrations that can be found in areas of Wales, which indicates localisation of presence.
- 6. Levels of high impact tree diseases such as P. Ramorum in conifer appears lower than currently reported elsewhere. These statistics relate to 2010-2016 and infection will have occurred post survey in some instances. Also, some sites clear-felled for sanitation may not have shown symptoms to surveyors. Sites surveyed for Ramorum in winter may not have shown symptoms. Thus, not observed may not always be a symptom of past or present absence.
- 7. 49 % of native woodland stands in Wales are found in woods smaller than or equal to 20 ha in size.

There are also positive findings for woodland ecology:

- 1. We can now classify more woodland as native than previously estimated.
- 2. Circa 106 thousand hectares or 70% of native woods have over 95% native species in their upper canopy
- Circa 97 thousand hectares or 64% of native woodland stands have 5 or more native tree and shrub species in their canopy, reflecting good diversity. Equally 12% of non-native woodland stands have over 5 native tree species within them.
- 4. 82% of native stands have three or more layers of distinct canopy, providing better structural diversity and indicative of the woodland stands capacity to regenerate over time.
- 5. 93 % of native stands have some form of young tree regeneration within them.

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 Wales. Broad comparisons can be made, in terms of woodland area figures, against previous surveys such as 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.

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 laver	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.

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.

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 \geq 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.

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)

NFI woodland condition statistics

20 Appendix

Figure 20-1 Illustration of an NFI woodland sample square



21 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 <u>www.forestresearch.gov.uk/inventory</u>.

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

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 <u>statistics webpages</u>.

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

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