

Statistical bulletin

Woodland natural capital accounts: 2022

Natural capital accounts containing information on ecosystem services for woodlands in the UK.

Contact:
Hazel Trenbirth and Charlotte
Bradley
Natural.Capital.Team@ons.gov.
uk
+44 1633 580051

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1 . Main points

- The UK land area covered by woodland has increased from 9.0% in 1980 to 13.3% in 2022.
- The asset value of UK woodlands was estimated to be £337.3 billion in 2020; while timber and woodfuel is often seen as the main woodlands asset, it accounted for 3.7% or £12.6 billion.
- Health benefits of recreation, a newly estimated cultural service in the UK natural capital accounts, were 18.5% of the total asset value in 2020 (£62.4 billion).
- The total annual value of woodland in the UK in 2020 was an estimated £8.7 billion, of which timber and woodfuel accounted for £372.9 million.
- The non-market benefits of UK woodlands in 2020 were an estimated £8.3 billion, exceeding the market benefits of timber and woodfuel (£372.9 million) by approximately 22 times.
- There were an estimated 795.8 million recreation visits to UK woodlands in 2020.
- The estimated percentage of the UK population with a 20 hectare woodland area within four kilometres of their home in 2020 was 67%.

As a result of changing methods and an expanding portfolio of natural services measured, this latest account cannot be compared with previous years' accounts on a like-for-like basis. The latest methods developed have been applied retrospectively in the latest accounts, giving a consistent time series.

2 . Area covered by woodland

Woodlands in the UK are tree-covered areas, including plantation forests, more natural forested areas, and lower density or smaller stands, or uniform collections, of trees.

The land area of UK woodlands in 2022 is 3.24 million hectares according to [Forestry Statistics 2022 \(PDF, 369KB\)](#). Scotland has the largest share (46%), followed by England (41%), Wales (10%) and Northern Ireland (4%), see Table 2.

The UK land area covered by woodland has increased from 9% in 1980 to 13% in 2022 (Table 1). Conifers account for approximately half (51%) of the UK woodland area in 2022, with just over half (56%) of these conifers privately owned. In contrast, the majority (92%) of broadleaf woodland is privately owned.

Table 1: Woodland area in UK as a percentage of land area, UK, 1980 to 2022

Year	England	Wales	Scotland	Northern Ireland	UK
1980	7	12	12	5	9
1998	10	14	17	6	12
2019	10	15	18	8	13
2022	10	15	19	9	13

Source: Office for National Statistics – Woodland natural capital accounts, and Forest Research

Notes

1. Data for all years are not available.

Table 2: Area of woodland in thousand hectares, UK, March 2022

Forest type	England	Wales	Scotland	Northern Ireland	UK
Conifers	343	152	1,092	64	1,650
Broadleaves	980	159	395	54	1,587
Total	1,323	310	1,486	118	3,237
UK percentage	41	10	46	4	

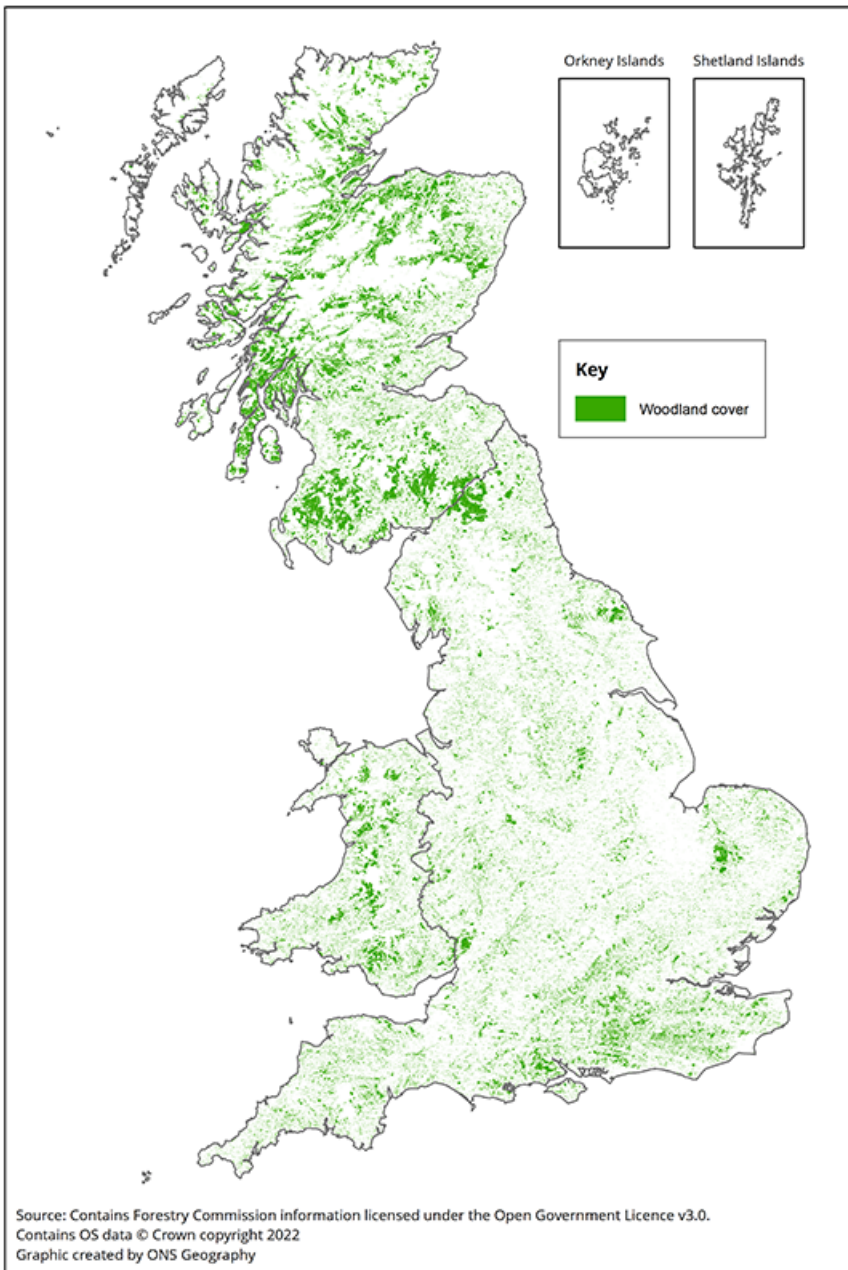
Source: Forest Research

Notes

1. Area data: country-level data do not add up to the overall UK total. This is because of rounding.
2. Great Britain data are for woodland cover over 0.5 hectare from National Forest Inventory
3. Northern Ireland data contain all woodland over 0.1 hectare from the Woodland Register.

Figure 1: Extent of woodland in Great Britain, 2020

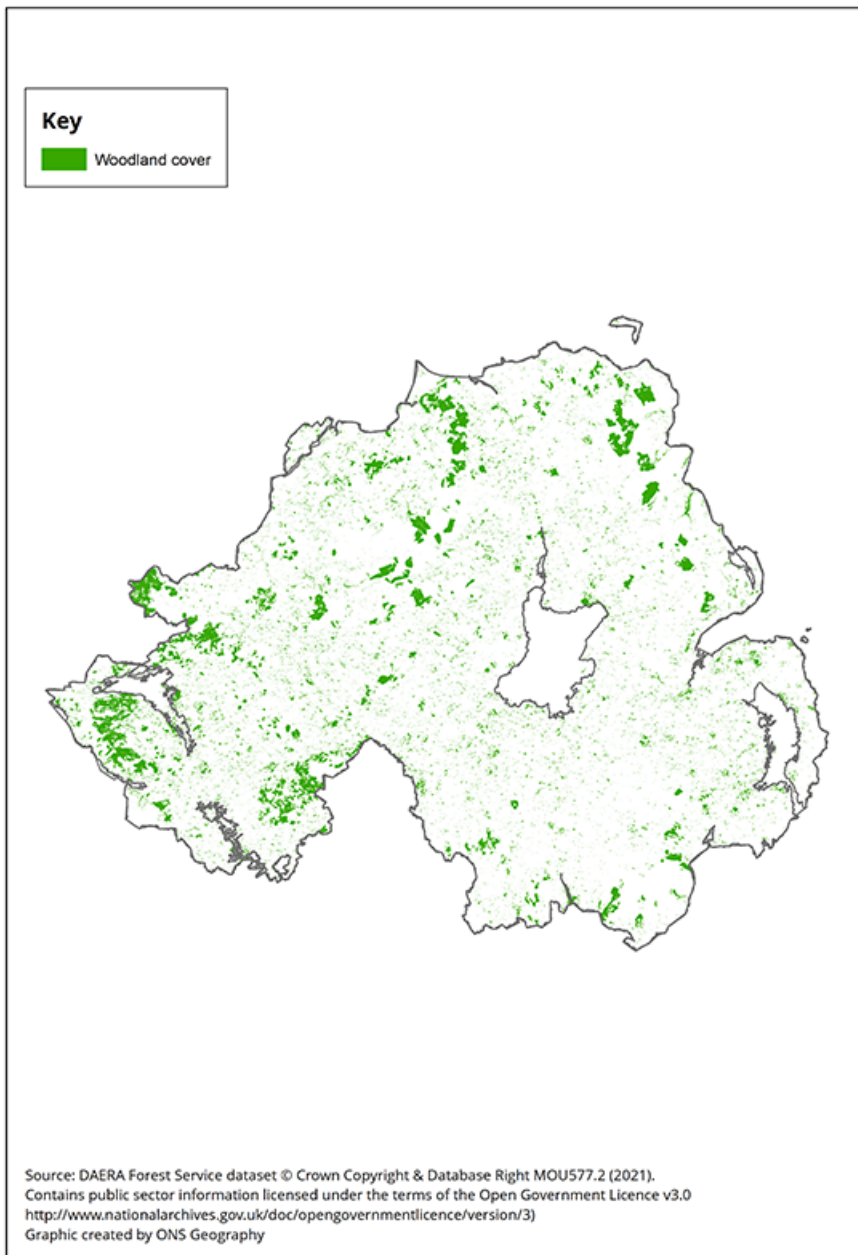
Map



Source: Forestry Commission – National Forest Inventory

Figure 2. Extent of woodland in Northern Ireland Woodland, 2019

Map



Source: Forestry Commission – National Forest Inventory

The proportion of all woodland that is publicly owned in the UK fell slightly from 28% (874,000 hectares) in 2012 to 27% (858,000 hectares) in 2022, with the proportion in private ownership rising from 72% (2,236,000 hectares) in 2012 to 73% (2,379,000 hectares) in 2022.

All of the extent statistics in this section are from the [Forestry Commission's National Forest Inventory \(NFI\)](#), the most current dataset for woodlands. Woodland that is over 0.5 hectares in extent and greater than 20 metres in width is included in these figures. This includes areas recently felled and expected to be replanted, and also open space within woodland.

In addition to the woodland areas in Table 1 and Table 2, the [Forestry Commission estimates](#) there are 390,000 hectares of small woods in Great Britain (non-NFI wooded areas of over 0.1 hectare in extent). There are also a further 255,000 hectares of groups of trees - clusters and linear tree features of less than 0.1 hectare in extent - as well as an estimated total canopy cover of 97,000 hectares of lone trees in Great Britain. Together, this gives a total woodland area in Great Britain of 3,719,000 hectares. Northern Ireland data come from the [Woodland Register](#) and are for all sites over 0.1 hectare, 117,671 hectares for 2022. Including small woodlands, giving a UK area of woodlands of 3.8 million hectares.

3 . Woodland condition indicators

The aim of condition indicators in the natural capital accounts is to help us to understand the relationship between ecosystem condition and the ecosystem services they deliver. The [System of Environmental Economic Accounting \(SEEA\) definition of ecosystem condition \(PDF, 605KB\)](#) is "the overall quality of an ecosystem asset in terms of its characteristics".

Figure 3 summarises the set of SEEA condition indicators and their long-term trends for a range of physical, chemical, compositional, structural and landscape condition indicators for woodlands from available data. A more detailed analysis for each condition indicator follows, including environmental pressure.

Figure 3: Summary of long-term trend for woodland condition indicators

Download the data

[.xlsx](#)

Physical state indicator: soil

Soil is important in woodlands for providing a fertile topsoil for trees and plants to grow their roots in according to the [Woodland Trust's Woodland Conservation News, Spring 2016 \(PDF, 1425KB\)](#). The [Countryside Survey for Great Britain \(PDF, 5001KB\)](#) showed a decrease in soil acidity (increase in pH value, Table 1 of broadleaf woodland between 1978 and 2007), this is consistent with the decrease of acidity of soils (higher pH) across Great Britain, a benefit from sulphur emissions reductions in the 1980s. Naturally more acidic coniferous woodland shows a much smaller decrease in acidity. Soil samples as part of the Countryside Survey were only taken across Great Britain up to 2007.

Table 3: Soil indicators for woodland, Great Britain, 1978, 1998 and 2007

Woodland	Indicator	1978	1998	2007
Broadleaf, mixed, and yew woodland	pH	5.1	5.5	5.8
Coniferous woodland		4.3	4.4	4.5
Broadleaf, mixed, and yew woodland	Carbon Concentrate (g C kg-1)	62.4	102.2	88.7
Coniferous woodland		203.7	222	197.8
Broadleaf, mixed, and yew woodland	Loss of ignition (%)	11.4	18.6	16.1
Coniferous woodland		37	40.4	36
Broadleaf, mixed, and yew woodland	Soil bulk density	0.8		
Coniferous woodland		0.5		

Source: UK Centre for Ecology and Hydrology and Countryside Survey

Compositional indicators

Species indicators are a useful gauge of wider habitat ecological health. The woodland bat index has shown an increase of 40% between 1999 and 2020. The population of the common pipistrelle, one of the three species in the bat index, in Great Britain is considered to have increased since 1999. For more information, see the [Bat Conservation Trust's National Bat Monitoring Programme, Annual Report 2020 \(PDF, 6954KB\)](#).

Species indicators in decline include those for butterflies, falling to their lowest since records began in 2012, and moths, in decline since 1996. Woodland birds saw their greatest decline from the early 1980s to the early 1990s, driven by a decline in woodland birds such as willow tits, tree pipits, spotted flycatchers and lesser redpolls. For more information, see the [Department for Environment Food & Rural Affairs' Biodiversity 2020 indicators \(PDF, 4854KB\)](#).

Figure 4: Compositional woodland species for bats, bees, birds, butterflies and moths, Great Britain or UK

Download the data

[.xlsx](#)

National Forest Inventory - compositional and structural indicators

The National Forest Inventory (NFI) samples ecological data from over 15,000 woodland sites in Great Britain. Table 4 shows that 92% of the sample sites showed favourable for invasive species, being favourable means no invasive species were found at the site.

Table 4: Summary of National Forest Inventory compositional and structural state condition indicators, Great Britain, 2010 to 2015 survey cycle

Condition indicator	Unfavourable		Intermediate		Favourable	
	Area (hectares)	Percentage	Area (hectares)	Percentage	Area (hectares)	Percentage
Compositional state						
Tree health - Pests and diseases	73,692	2	326,408	11	2,547,733	86
Invasive species	220,494	7	23,855	1	2,703,484	92
Regeneration at component group level	0	0	2,628,638	89	319,196	11
Structural state						
Number of native tree and or shrub species	1,402,259	48	585,098	20	960,477	33
Deadwood volume (m3 per ha)	2,250,883	76	515,164	17	181,787	6
Vertical structure	633,582	21	1,211,071	41	1,103,182	37
Veteran trees	2,928,501	99	5,645	0	13,688	0
Age distribution of tree species	1,189,376	40	1,421,369	48	337,089	11
Proportion of open space	2,419,080	82	525,399	18	3,354	0

Source: Forest Research – National Forest Inventory

Statutory Plant Health Notices compositional indicator

A [Statutory Plant Health Notice \(SPHN\)](#) is issued to fell trees to prevent the spread of diseases or pests. The latest [Forest Research data \(PDF 369.KB\)](#) includes some revisions, so we have revised our figures. These data are included as an indicator of tree health.

Table 5: Number of sites where a Statutory Plant Health Notice has been served, UK, 2012 to 2013, to 2021 to 2022

Year	England	Wales	Scotland	Northern Ireland	UK
2012 to 2013	161	89	43	15	308
2013 to 2014	227	272	55	28	582
2014 to 2015	144	71	17	17	249
2015 to 2016	75	57	32	3	167
2016 to 2017	103	53	67	0	223
2017 to 2018	82	153	70	14	319
2018 to 2019	128	215	284	0	627
2019 to 2020	48	205	198	0	451
2020 to 2021	203	177	283	2	665
2021 to 2022	269	148	304	0	721

Source: Forestry Commission, Scottish Forestry, Natural Resources Wales, and Forest Service

Table 6: Felling areas, thousand hectares, under Statutory Plant Health Notices, UK, 2012 to 2013, to 2021 to 2022

Year	England	Wales	Scotland	Northern Ireland	UK
2012 to 2013	0.5	1.5	0.3	0.2	2.5
2013 to 2014	0.9	4.6	0.2	0.5	6.2
2014 to 2015	0.3	0.4	0.1	0.0	0.9
2015 to 2016	0.2	1.5	0.1	0.0	1.8
2016 to 2017	0.3	0.2	0.2	0.0	0.7
2017 to 2018	0.2	1.3	0.3	0.1	1.8
2018 to 2019	0.6	1.9	1.4	0.0	3.9
2019 to 2020	0.3	1.5	1.0	0.0	2.8
2020 to 2021	1.3	1.3	1.8	0.0	4.5
2021 to 2022	1.5	1.2	1.3	0.0	4.0

Source: Forestry Commission, Scottish Forestry, Natural Resources Wales, and Forest Service

Notes

1. The area that is required to be felled within the Statutory Plant Health Notice.
2. Scotland areas to be felled relate to Larch only.

Landscape-level indicators - habitat connectivity

Habitat connectivity is a measure of how well different species can move between habitats in the landscape. The mean connectivity values for broadleaf, mixed and yew woodlands in England went from 0.0923 in 1990 to 0.0868 in 2007, having fallen to 0.0695 in 1998.

A different method is used in Scotland to calculate connectivity, providing statistics for river catchments. Connectivity varies considerably across Scotland and between each catchment area for semi-natural woodland (Table 7). A higher value for the Equivalent Connected Area (Probability of Connectivity) or ECA(PC), shows a greater connectivity, and is calculated as a percentage of total area of habitat in the region.

Table 7: Scottish Equivalent Connected Area (Probability of Connectivity) values for catchment areas for semi-natural woodland, Scotland, 2017

Catchment	Area of habitat (hectares)	Number of patches	Equivalent Connected Area (Probability of Connectivity) (hectares)	Percentage Equivalent Connected Area (Probability of Connectivity) of total habitat
Argyll	96,068	10,429	5,552	5.8
Clyde	91,665	16,356	3,421	3.7
Forth	50,498	10,887	2,259	4.5
Orkney and Shetland	255	67	110	43.1
North-East Scotland	71,851	13,475	2,455	3.4
North Highland	93,187	12,618	4,164	4.5
Solway	90,922	12,327	4,770	5.2
Tay	58,861	11,181	2,341	4.0
Tweed	33,450	6,393	2,836	8.5
West Highland	33,786	4,462	3,200	9.5

Source: NatureScot

Landscape-level indicators - woodland on farmland

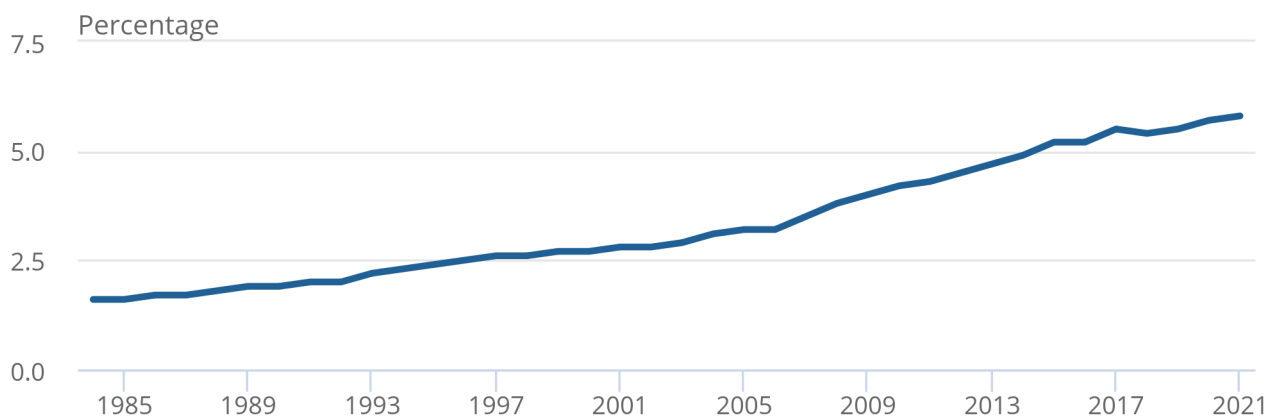
Woodland on farmland provides habitat connectivity for wildlife, natural flood protection and boosts biodiversity. The proportion of woodland area on total UK agricultural area increased from 1.6% in 1984 to 5.8% in 2021. For more information on the benefits of woodland on farmland, see the [Forestry Commission's It's time to branch out: How woodland creation benefits your farm report \(PDF, 1054KB\)](#).

Figure 5: Woodland on UK farmland increased to 5.8% in 2021

Proportion of woodland on farmland, UK, 1984 to 2021

Figure 5: Woodland on UK farmland increased to 5.8% in 2021

Proportion of woodland on farmland, UK, 1984 to 2021



Source: Department for Environment, Food and Rural Affairs

Environmental pressure indicators

Some environmental pressure indicators, for example, wildfires and access, provide a broad measure of potential effects on the condition of ecosystems. As they do not provide direct measures of condition, they are classed as ancillary or proxy indicators.

Herbivore damage

Damage caused by herbivores negatively impacts the ecological condition of woodland. The NFI for Great Britain shows that the percentage of woodland area condition for herbivore damage between 2010 and 2015 was:

- 40% unfavourable
- 11% intermediate
- 49% favourable

Woodland wildfires

Wildfires can be considered a pressure indicator, as most wildfires are caused by humans, intentionally or not. In Wales, it was identified between April 2018 and March 2019 that around 7 out of 10 fires on woodland, grassland and crops were started deliberately. For more information, see the [Welsh Government's Grassland fires, 2018-19 statistical bulletin \(PDF, 2545KB\)](#).

England

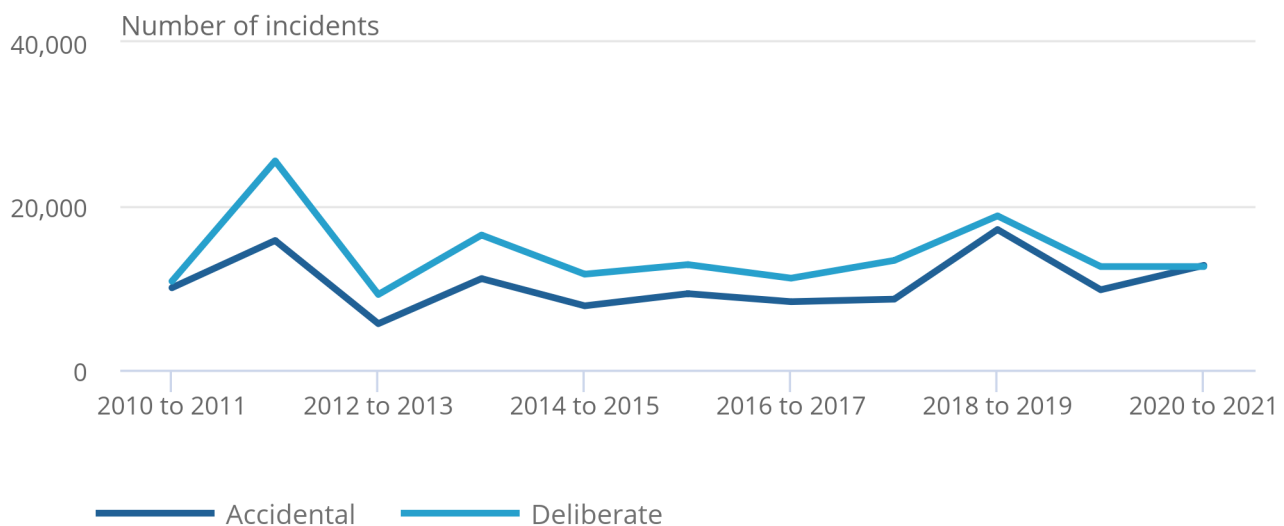
Since 2010 to 2011, the greatest number of grassland, woodland and crop wildfire incidents and area burnt occurring in woodlands in England (Figure 6) occurred between 2011 to 2012. There was a drought in the same period, with heatwave alerts in central, eastern, and southern England and in Wales. For more information, see the [Home Office's Fire statistics incident level datasets](#).

Figure 6: The greatest number of grassland, woodland and crop wildfire incidents occurred in 2011 to 2012

Secondary Fire - grassland, woodland and crops, England, 2010/11 to 2020/21

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Secondary Fire - grassland, woodland and crops, England, 2010/11 to 2020/21



Source: Home Office

Scotland

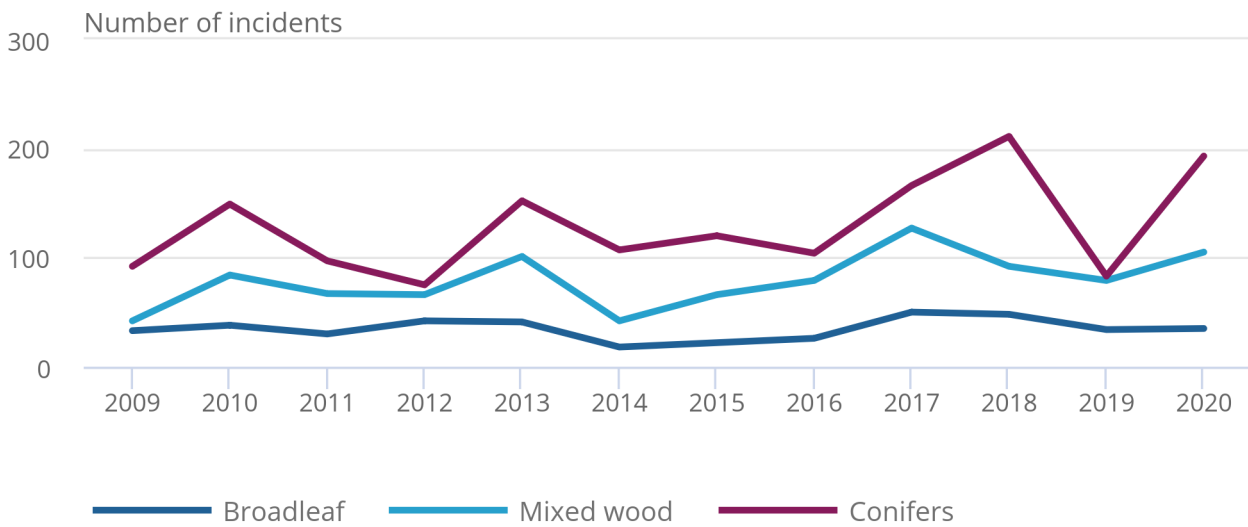
The peaks in woodland fires in Scottish conifer woodlands in 2010, 2013 and 2018 correspond to lower than average summer seasonal precipitation in those years. For more information, see [Scottish Fire and Rescue Services \(SFRS\) - wildfire: incident reporting system - data analyses](#).

Figure 7: Woodland fires in Scotland peaked in 2010, 2013 and 2018

Number of woodland fire incidents, Scotland, 2009 to 2020

Figure 7: Woodland fires in Scotland peaked in 2010, 2013 and 2018

Number of woodland fire incidents, Scotland, 2009 to 2020



Source: Scottish Fire and Rescue Service

Wales

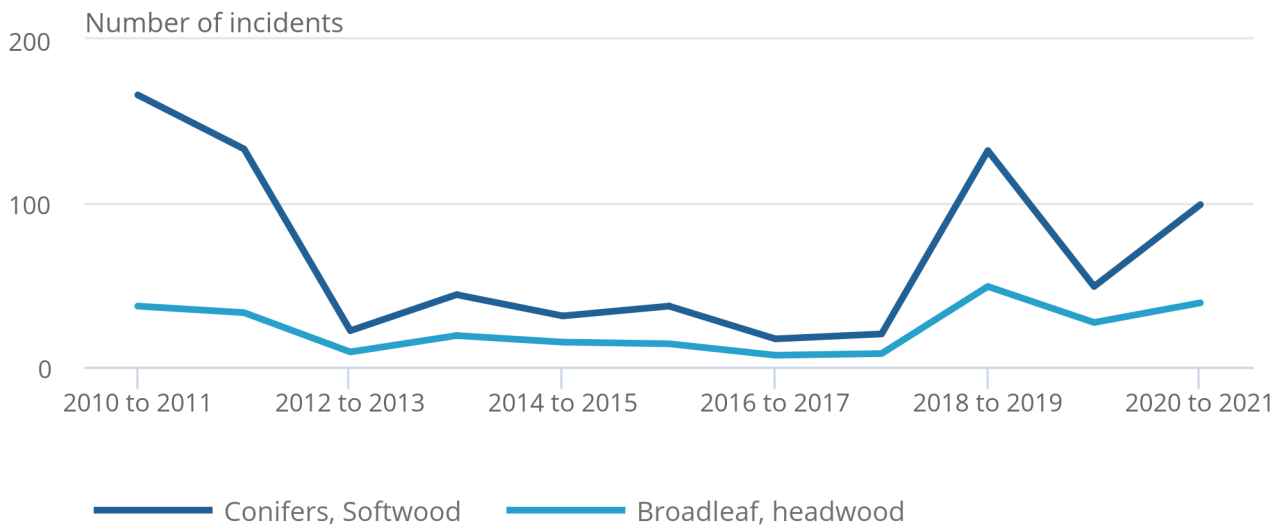
Woodland fires saw a spike in 2018 to 2019, with 132 in conifer and 49 broadleaf and hardwood woodland. In 2018, Wales saw the highest annual total duration of bright sunshine hours in the last two decades (1,543 hours), and the lowest total summer rainfall since 1995 (182.5 millimetres).

Figure 8: In Wales coniferous woodland fires saw a spike in 2018 to 2019

Number of incidents of woodland fires, Wales, 2010 to 2011, to 2020 to 2021

Figure 8: In Wales coniferous woodland fires saw a spike in 2018 to 2019

Number of incidents of woodland fires, Wales, 2010 to 2011, to 2020 to 2021



Source: Welsh Government

Protected sites

Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs) are two of the strictest [Protected Areas](#) designations in the UK. Ecologists measure the condition of these sites qualitatively as: favourable (best condition) through to destroyed (worst condition). We can identify SAC's and SSSI's containing woodland and report their current measured condition.

Table 8: Area of protected woodland sites in England by condition, 2018 and 2022

Habitat	Condition	2018	2018	2022	2022
		hectares	percentage	hectares	percentage
Broadleaf, mixed and yew woodland - Lowland	Favourable	38,190	49	38,749	49
	Recovering	36,849	47	35,211	45
	Unfavourable	3,658	5	5,077	6
	Destroyed	13	0	13	0
Broadleaf, mixed and yew woodland - Upland	Favourable	6,269	41	6,093	40
	Recovering	7,569	49	7,214	47
	Unfavourable	1,427	9	1,905	12
	Destroyed	37	0	37	0
Coniferous woodland	Favourable	2,500	10	2,500	11
	Recovering	21,785	90	21,052	89
	Unfavourable	40	0	40	0
	Destroyed	0	0	0	0

Source: Natural England

Table 9: Scotland's proportion of woodland protected sites in favourable condition, 2011 to 2022

Year	Number natural features	Percentage favourable
2011	481	67
2012	490	67
2013	494	66
2014	499	66
2015	500	68
2016	483	68
2017	483	68
2018	483	67
2019	485	65
2020	485	64
2021	484	64
2022	484	63

Source: NatureScot

In Wales, the number of protected woodland sites for broadleaf, mixed and yew woodland in 2020 by condition was:

- 30 sites favourable
- 112 sites unfavourable
- 169 sites unknown

Certified woodland

[Certified woodland](#) is independently audited against the UK Woodland Assurance Standard, which promotes good forest practice. The area of certified woodland in the UK increased from 1,160 thousand hectares in March 2004 (39% of total woodland) to 1,420 thousand hectares in March 2022 (44% of total woodland).

Table 10: Area of certified woodland as a percentage of total woodland, UK, 2004 to 2022

Date	England (thousand hectares)	Wales (thousand hectares)	Scotland (thousand hectares)	Northern Ireland (thousand hectares)	UK (thousand hectares)	Percentage total woodland that certified
2004	298	127	670	65	1,160	39
2006	354	131	724	63	1,273	42
2008	345	130	770	64	1,310	43
2010	357	133	792	64	1,347	44
2012	355	138	808	65	1,366	44
2014	349	141	822	65	1,377	44
2016	337	141	806	65	1,350	43
2018	332	145	833	65	1,375	43
2020	323	146	862	66	1,397	43
2022 [e]	315	145	895	65	1,420	44

Source: Forest Research

Notes

1. "e" equals estimated.
2. All data as of 31 March in each year

Access to woodlands

[Accessible woodland](#) is an indicator of its ability to supply recreational services to the population. It is defined by Woodland Trust as "any site that is permissively accessible to the general public for recreational purposes" and includes sites with unrestricted access and restricted but permissive access, such as charging a fee or fixed hours.

The estimated percentage of the population with a 20 hectare woodland area within four kilometres of their home in 2020 in the UK was 67%, with the highest among the 4 nations in Scotland at 76% (Table 11). For more information, see the [Woodland Trust's State of the UK's Woods and Trees 2021 report \(PDF, 28682KB\)](#).

Table 11: Percentage of population with access to accessible woodlands, UK, 2020

Country	Percentage of population with access to a 2ha+ wood within 500m	Percentage of population with access to a 20ha+ wood within 4km
England	16	66
Wales	18	74
Scotland	19	76
Northern Ireland	10	59

Source: Woodland Trust

Notes

1. The data for 2020 represents the best data available to the Woodland Trust at that point in time.

4 . Ecosystem services

Ecosystem services estimate the contribution of woodlands to the economy and society.

In 2020, the total annual value for ecosystem services we are currently able to measure was £8.7 billion (in 2021 prices). This is a partial valuation with potentially significant exclusions, such as Christmas trees, food from agroforestry and education.

We continue to improve our estimates of the economic value of the natural world. This year we have included health benefits from recreation in woodlands for the first time, with the annual valuation estimated to be £1.1 billion in 2020 (in 2021 prices).

Table 12: Woodland annual physical flow by service, UK, 2010 to 2020

Service type	Provisioning		Regulating		Cultural	
	Timber, total fellings (Thousand cubic metres of overbark standing)	Woodfuel, total fellings (Thousand cubic metres of overbark standing)	Carbon Sequestration, removal (Thousand tonnes)	Pollution removal (Thousand tonnes)	Tourism and recreation (Million visits)	Health benefits (People benefitting, millions)
2010	10,362.4	1,544.2	18,100	316.2	[x]	[x]
2011	11,343.1	1,544.2	17,800	319.4	331.9	1.4
2012	11,260.7	1,666.4	16,600	310.7	324.4	1.4
2013	11,980.7	1,971.9	16,600	316.0	346.8	1.5
2014	12,403.0	2,277.4	16,800	315.7	386.6	1.6
2015	11,252.3	2,399.6	16,700	315.6	399.2	1.7
2016	11,452.9	2,338.5	16,900	308.3	420.5	1.9
2017	11,437.5	2,621.8	16,900	309.6	414.3	1.9
2018	11,695.6	3,099.5	16,600	317.6	404.4	2.0
2019	9,867.3	3,099.5	16,300	304.3	458.6	2.1
2020	10,167.4	3,038.4	16,300	310.4	795.8	3.3

Source: Office for National Statistics, Forest Research, Department for Business, Energy and Industrial Strategy, Monitor of Engagement with the Natural Environment (MENE) Survey – Great Britain Day Visits Survey and Great Britain Tourism Survey

Notes

1. [x] data not available

Table 13: UK nations breakdown of woodland annual physical flow by service, 2020

Service type	Provisioning		Regulating		Cultural	
	Timber, total fellings (thousand cubic metres of overbark standing)	Woodfuel, total fellings (thousand cubic metres of overbark standing)	Carbon Sequestration, removal (Million tonnes)	Pollution removal (Thousand tonnes)	Tourism and recreation (Million visits)	Health benefits (People benefitting, millions)
England	2,488.7	743.7	8.3	130.6	611.2	2.6
Scotland	6,089.3	1,819.7	6.3	131.1	81.9	0.3
Wales	1,131.5	338.1	1.3	35.4	82.5	0.3
Northern Ireland	457.0	136.6	0.5	13.4	19.6	0.1
UK	10,167.4	3,038.4	16.3	310.4	795.8	3.3

Source: Office for National Statistics, Forest Research, Department for Business, Energy and Industrial Strategy, Monitor of Engagement with the Natural Environment (MENE) Survey – Great Britain Day Visits Survey and Great Britain Tourism Survey

Notes

1. For tourism data country-level data may not add up to the overall UK total. This is because of the data being collected separately by each nation with their own habitat breakdowns.

Figure 9: Annual value for woodland ecosystem services for the UK was estimated to be £8,666 million in 2020

Ecosystem services for the UK, £ million (2021 prices), 2020

Download the data

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Figure 10: The annual value of woodland ecosystem services in England was estimated to be £5,217.8 million in 2020

Ecosystem services for England, Scotland, Wales and Northern Ireland, £ million (2021 prices), 2020

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Figure 11: The total annual value of woodland in the UK in 2020 was an estimated £8.7 billion, of which timber and woodfuel accounted for £372.9 million

Value of UK woodland ecosystem services, £ million (2021 prices), 2010 to 2021

Download the data

[.xlsx](#)

Figure 12: Health benefits of recreation in woodlands was estimated to be £892.6 million for England for 2020

Value of woodland ecosystem services, England, Scotland, Wales and Northern Ireland, £ million (2021 prices), 2010 to 2021

[Download the data](#)

[.xlsx](#)

Provisioning services

Provisioning services are products from nature such as food, energy, and materials.

Timber fellings (excluding woodfuel)

Between 2010 and 2021, there was a 16% increase in UK timber production (Figure 11), with 13.6 million cubic metres overbark standing timber fellings in 2021 (including woodfuel). Timber excluding woodfuel was 10,910 thousand cubic metres overbark standing in 2021.

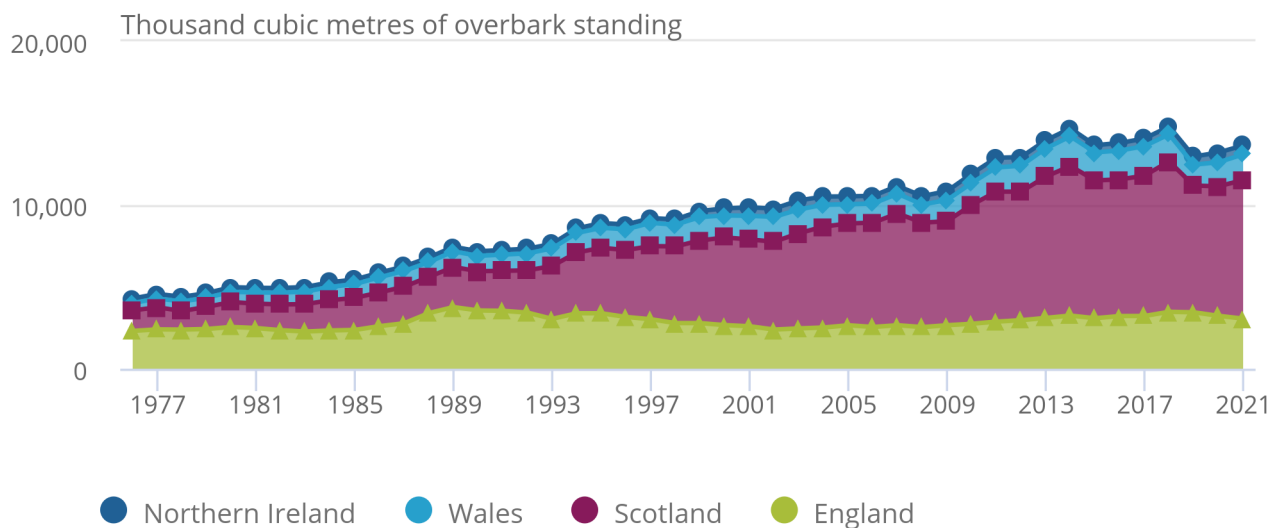
In 2021, 62% of timber was sourced from Scotland, 22% from England, 12% from Wales and 4% from Northern Ireland. Timber production in Scotland has driven the UK trend, with production increasing by 14% between 2010 and 2021 (Figure 11).

Figure 13: Timber production in the UK is over three times larger in 2021 than in 1976

Total timber fellings, UK, 1976 to 2021

Figure 13: Timber production in the UK is over three times larger in 2021 than in 1976

Total timber fellings, UK, 1976 to 2021



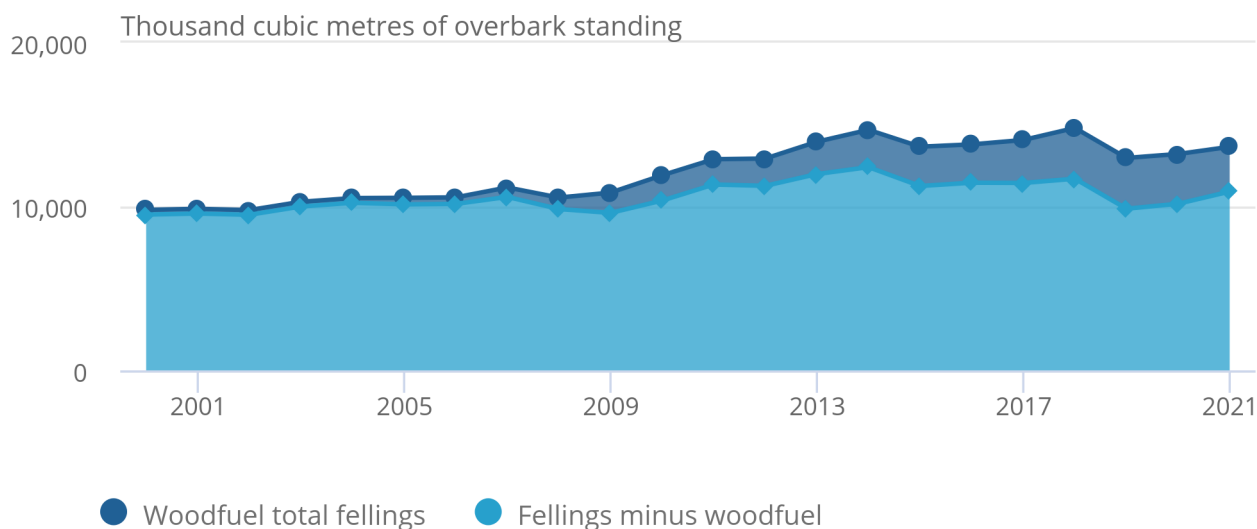
Source: Forest Research and The Office for National Statistics

Figure 14: Woodfuel represented 20% of total timber in 2021

Total fellings as a proportion of woodfuel, UK, 2000 to 2021

Figure 14: Woodfuel represented 20% of total timber in 2021

Total fellings as a proportion of woodfuel, UK, 2000 to 2021



Source: Forest Research and The Office for National Statistics

In 2021, the annual value of timber (excluding woodfuel) in the UK reached the series high of £338.5 million.

Energy: woodfuel

Energy from fuels created directly from plant matter or waste food are referred to as biofuels and are part of the renewable energy ecosystem service. Wood makes up a significant part of the market in biofuels in the UK, being used in domestic fires, modern pellet-burning boilers and even large electricity-generating power stations. In 2021, the generation of electricity from bioenergy, including woodfuel, accounted for 40% of renewable electricity generation. For more information, see our [UK natural capital accounts: 2022 bulletin](#).

Since the mid-2000s, there has been an increase in the amount of timber used for woodfuel (Figure 12). Deliveries of UK-grown softwood and hardwood timber for woodfuels rose from 289 thousand cubic metres (3% of total timber) in 2000 to 2.7 million cubic metres (20% of total timber) in 2021, which represents a slight decline from the 2019 series high of 3.1 million cubic metres, or 24%.

Regulating services

Regulating services help to maintain the quality of the environment we rely upon, from the regulation of natural processes such as air quality regulation, climate regulation, and natural hazard regulation such as flood mitigation.

Carbon sequestration

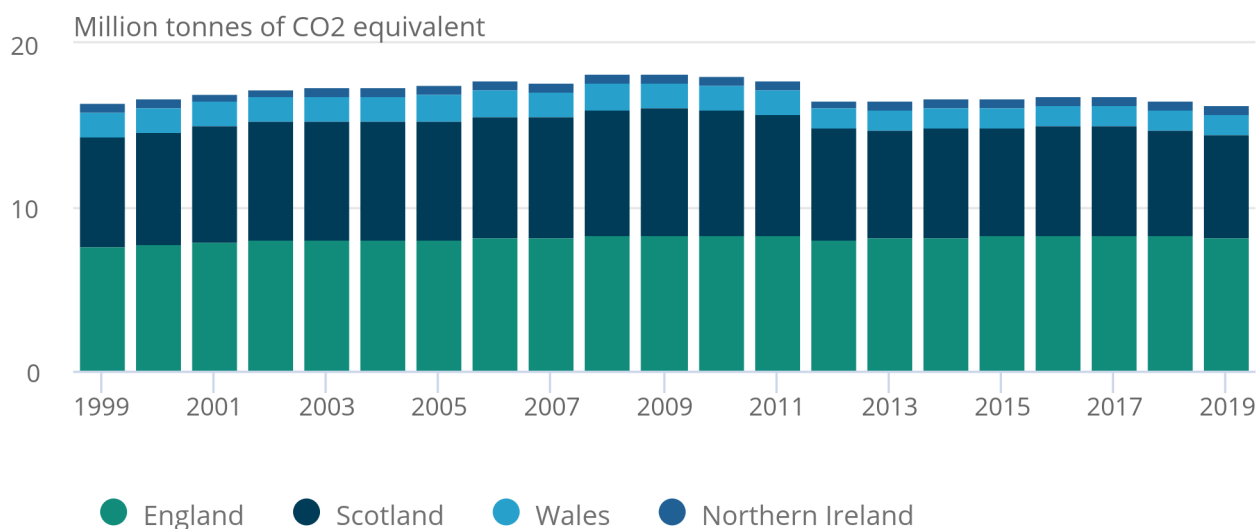
Sequestering and emissions of greenhouse gases (GHGs): the removal of GHGs, mostly carbon dioxide, from the atmosphere is provided by woodlands. It was greatest between 1998 to 2010 but fell back in 2011 and 2012 and returned to a similar level in 2019.

Figure 15: UK woodland sequestered around 16.3 million tonnes of carbon in 2019

Carbon sequestration by woodland, UK, 1999 to 2019

Figure 15: UK woodland sequestered around 16.3 million tonnes of carbon in 2019

Carbon sequestration by woodland, UK, 1999 to 2019



Source: National Atmospheric Emissions Inventory

Despite levels of greenhouse gases sequestered being lower than in some previous years, the annual valuation of this service provided by woodlands increased year-on-year between 1999, when it was £3.3 billion, and 2017 when it reached £4.4 billion (Figure 13).

This is because of increases in the non-traded carbon prices, for example emissions that are not covered by the [UK Emissions Trading Scheme](#) (ETS), which are estimated to keep increasing until 2080. Consequently, the asset value of carbon sequestration by UK woodland was estimated to increase year-on-year, reaching £54.6 billion in 2017.

The annual valuation includes the value of both forest land and the value attributed to harvested wood products. Harvested wood products also represent a net carbon sink; there is a transfer of carbon from woodland through timber removal as carbon is stored within the end product (though potentially for varying lengths of time depending on the product made). Harvested wood products accounted for 12% of the annual value of woodland in 2019 (£0.52 billion) and sequestered 2.2 million tonnes of carbon. For more information, see the [Forest Research's Harvested Wood Products and Carbon Substitution: approaches to incorporating them in market standards report \(PDF, 759KB\)](#).

Since the previous woodland account there have been changes in how the Department for Business, Energy and Industrial Strategy (BEIS) models carbon sequestration by nature, see [BEIS's Mapping Carbon Emissions & Removals for the Land Use, Land-Use Change & Forestry Sector report \(PDF, 4360KB\)](#). Primarily the changes have been in capturing the emissions from degraded habitats, indicating that the UK emits more greenhouse gases than it removes from land use, land-use change and forestry (LULUCF). The net carbon sequestration values presented align with the UK 2019 Greenhouse Gas Inventory figures for the LULUCF sector, and our UK natural capital accounts: 2022 show a negative value for all habitats for carbon sequestration.

Air pollution removal

The [World Health Organization \(WHO\)](#) estimated that air pollution contributed to 7.6% of worldwide deaths in 2016. Vegetation can play a useful role in lessening this danger by removing air pollution. Polluting gases are absorbed by leaves' stomata, and particulate matter, suspended in polluted air, settles onto leaves.

In 2020, the removal of harmful pollutants by woodland in the UK led to an estimated £995 million in avoided healthcare costs. These include avoided deaths, avoided life years lost, fewer respiratory hospital admissions and fewer cardiovascular hospital admissions.

UK woodland removed 32,800 tonnes of PM10 in 2020, including PM2.5 as a subset, 15.2 in 2020 (Figure 15). While PM2.5 removal is only 4.8% of the total mass of air pollutants removed, this leads to the majority (95.2%) of the avoided health impacts. This is because PM2.5 (fine particulate matter with a diameter of less than 2.5 micrometres, or 3% of the diameter of a human hair) is the most harmful pollutant by mass. PM2.5 can bypass the nose and throat to penetrate deep into the lungs, leading to potentially serious health effects and related healthcare costs. The majority of total pollution removal by mass was ground-level ozone (O3), accounting for 82% in 2020.

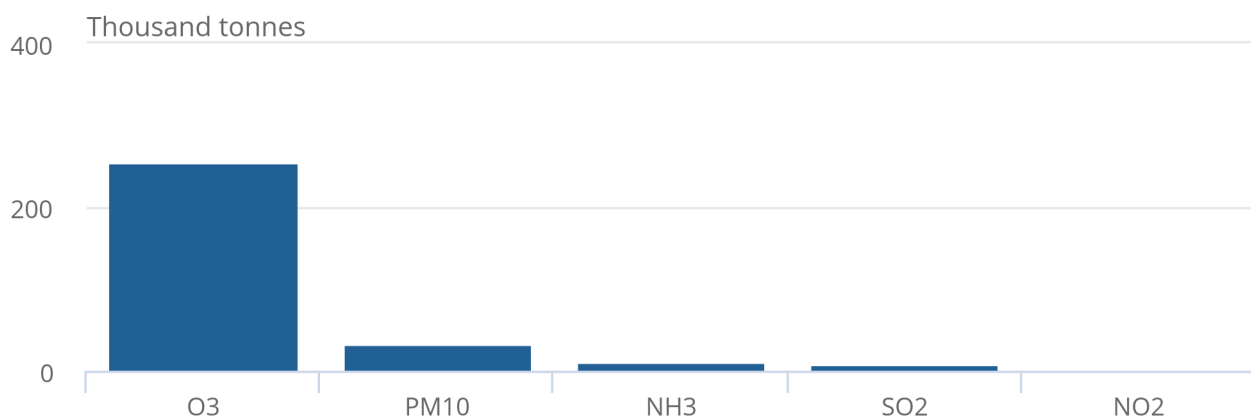
The asset value of air pollution removal services was an estimated £51 billion in 2020.

Figure 16: Woodland in the UK removed 310.4 thousand tonnes of PM10 in 2020

Thousand tonnes of pollutants removed by woodland, UK, 2020

Figure 16: Woodland in the UK removed 310.4 thousand tonnes of PM10 in 2020

Thousand tonnes of pollutants removed by woodland, UK, 2020



Source: UK Centre for Ecology and Hydrology and the Office for National Statistics

Flood mitigation

Forests are known to play a role in reducing flood flows, according to a [review of 71 studies by the UK Centre for Ecology and Hydrology](#). To capture the flood regulating service for woodland in Great Britain, Forest Research examined how much it would cost to have flood water storage (that is, reservoirs) in an area where there was no woodland; they looked at the substitution costs of having no woodland. For more information on the method, see the [Forest Research's Valuing flood regulation services of existing forest cover to inform natural capital accounts methodology, 2018 \(PDF, 923KB\)](#), which is due to be updated in 2023.

An annual average was estimated at £235.2 million for 2020 (2021 prices) for Great Britain, and the asset valuation of this service over 100 years equated to £7,013 million. However, there are a number of caveats with this calculation.

Temperature regulation

Woodlands can also cool urban environments, avoiding labour productivity losses so benefitting the economy, and reducing the use of artificial cooling, such as air conditioning.

In 2018, Economics for the Environment Consultancy (EFTEC) and others estimated the cooling effect provided by woodlands for 11 city regions across Great Britain in [Scoping UK Urban Natural Capital Accounts: Extension to develop temperature regulation estimates \(PDF, 834KB\)](#).

We value the cooling effect through estimating the benefit from improved labour productivity and cost savings from air conditioning. The benefit from improved labour productivity makes up most of the value, with avoided air conditioning energy costs only accounting for a small fraction.

In 2021, the West Midlands had the greatest number of hot days; with 8.1 recorded out of a total of 42.1 experienced across the country. In the last five years, 2021 was the only year that London did not have the greatest number of hot days. "Hot days" throughout this section refers to any days equal to or between 28 degrees Celsius and 35 degrees Celsius.

Table 14: Annual hot days recorded in each city region, number of days above 28 degrees Celsius, 2016 to 2021

City Region	2016	2017	2018	2019	2020	2021
Cardiff City Region	1.26	3.05	4.95	2.32	4.89	5.95
Edinburgh City Region	0.16	0.00	0.43	0.80	0.14	0.08
Glasgow City Region	0.18	0.00	1.00	1.00	0.09	0.05
Greater Manchester City Region	0.90	0.80	4.20	3.00	3.80	2.50
Liverpool City Region	1.00	1.75	6.25	2.75	3.00	3.75
London City Region	7.83	7.33	23.17	7.83	13.83	7.50
North East City Region	0.33	0.00	0.05	0.80	0.45	0.13
Sheffield City Region	2.00	1.60	5.20	5.50	5.00	4.40
West Midlands City Region	3.14	4.57	10.29	5.57	8.00	8.14
West of England City Region	2.25	4.63	8.38	3.63	7.13	6.38
West Yorkshire City Region	1.14	1.07	3.00	3.57	3.21	3.21
Total	20.20	24.80	66.91	36.77	49.55	42.08
Average per City Region	1.84	2.25	6.08	3.34	4.50	3.83

Source: Economics for the Environment Consultancy (Eftec) and others – Scoping UK Urban Natural Capital Account; Met Office

Table 15 shows that the highest recently recorded avoided costs were associated with 2018, when the country also saw a notable spike in number of hot days - particularly in London.

Table 15: Total annual value of cooling from urban woodland space in city regions or combined authorities in Great Britain, (£ thousand, 2021 prices), 2016 to 2021

City region	2016	2017	2018	2019	2020	2021
Cardiff	3,809	5,835	4,820	5,476	10,738	10,543
Edinburgh	160	0	383	1,402	182	93
Glasgow	2,474	0	3,267	2,387	144	88
Greater Manchester	6,635	1,383	8,918	10,728	16,907	5,909
Liverpool	4,560	796	4,243	6,157	9,838	5,338
London	259,327	210,484	657,256	357,579	309,808	161,313
North East	283	25	66	2,391	716	128
Sheffield	3,427	3,087	8,053	7,861	7,842	3,409
West Midlands	14,601	16,211	28,462	35,783	38,963	33,198
West of England	5,859	12,225	10,541	13,334	21,212	8,680
West Yorkshire	4,965	1,985	8,488	6,611	13,891	4,439
Total	303,878	252,034	734,501	449,714	430,245	233,143

Source: Economics for the Environment Consultancy (Eftec) and others – Scoping UK Urban Natural Capital Account; Met Office

The five-year average asset value of urban cooling provided by vegetation, which takes into consideration future projections, is £27.4 billion in 2021.

Noise reduction

Trees can also act as a buffer against noise pollution, in particular road traffic noise. Noise pollution causes adverse health outcomes through annoyance and lack of sleep. Initial estimates of the benefits of noise reduction from vegetation, which just includes woodland, was reported by EFTEC and other in 2018 (PDF, 834KB). Urban vegetation includes both large woodlands (greater than 3,000 square metres) and smaller woodlands (less than 3,000 square metres), but not very small woodlands (less than 200 square metres).

The total number of buildings in UK urban areas that benefitted from a reduction in noise from urban trees in 2021 was 167,000.

The total annual value of noise reduction in the UK was £16.6 million in 2021, avoided loss of quality adjusted life years (QALY) using the [Department for Environment, Food and Rural Affairs' \(Defra's\) marginal noise damage cost values](#). Valuations based on QALY are economic welfare values, which look at how noise reduction affects people's social welfare.

The total UK asset value for noise reduction based on estimated future benefits over 100 years was £902 million.

Cultural

Cultural ecosystem services provide non-material benefits, such as enjoyment of the landscape, recreation in woodlands, education and cultural heritage.

Tourism, recreation and wellbeing

In 2020, there were an estimated 795.8 million recreation and tourism visits to UK woodlands. In 2019, the annual value of tourism and recreation in woodlands stood at £1.2 billion.

Recreational visits in nature are valued based on expenditure per trip, including fuel, public transport costs, admission costs and/or parking fees. For more information on these calculations, see our updated [Woodland habitat, natural capital accounts, UK: 2022 methodology](#).

Visits to UK woodlands have generally gradually increased over the time series, with a particularly large increase of 73% between 2019 and 2020 (Table 12), driven by increases in recorded woodland visits in England (105%) and Wales (63%).

This increase is, in part, attributable to a methodological change involving a new survey for England with the data used in calculations. However, there are complementary sources showing increased numbers of people visiting woodlands and forests during the coronavirus (COVID-19) pandemic. Forestry England reported that there was a 35% increase in visitors to Forestry England-managed forests in 2020 to 2021 compared with the previous year, mainly driven by repeat visits. For more information, see [Forestry Commission's Key Performance Indicators report for 2020-21 \(PDF, 3819KB\)](#).

Following the UK natural capital accounts earlier this year, we now include health benefits gained by the population by spending recreational time outdoors in the Woodlands accounts. Some 3.3 million people in the UK benefitted from spending time in woodland in 2020, estimated to be worth £1.1 billion in 2020. For methodological details please see our [Health benefits from recreation, natural capital, UK: 2022 bulletin](#).

The [Public Opinion of Forestry 2021: UK and England survey \(PDF, 1093KB\)](#) found that 69% of respondents had visited forests or woodlands in the last few years (Table 16).

Table 16: Percentage of people who visited woodlands last few years, UK, 2003 to 2021

Year	UK percentage
2003	67
2005	65
2007	77
2009	77
2011	67
2013	66
2015	56
2017	61
2019	63
2021	69

Source: Forest Research – UK Public Opinion of Forestry Surveys

Notes

1. Figures are based on all respondents who had visited woodland in the last few years. Weighted totals equal 2009 (1,549), 2011 (1,393), 2013 (1,272), 2015 (1,015), 2017 (1,296), 2019 (1,360), 2021 (3,557).

5 . Woodland asset value

The UK asset value of selected woodland ecosystem services was estimated to be £337 billion in 2020 (Table 17).

Table 17: Asset values woodland ecosystem services UK, 2020, £ million (2021 prices)

	England	Wales	Scotland	Northern Ireland	UK
Carbon sequestration	58,826	15,649	52,219	4,775	131,469
Health benefits	46,736	5,367	8,356	1,972	62,432
Air pollution removal	43,511	3,820	3,075	690	51,096
Tourism and recreation	35,479	3,052	3,303	2,133	46,084
Urban cooling (GB only)	25,960	450	201	[x]	26,611
Timber	2,488	979	6,140	102	9,709
Flood mitigation (GB only)	4,697	734	1,582	[x]	7,013
Wood fuel	743	292	1,835	31	2,901
Total	218,440	30,343	76,711	9,703	337,315

Source: Office for National Statistics – Woodland natural capital accounts

Notes

1. Tourism: country-level data do not add up to the overall UK total. This is because the data are collected separately by each nation that make use of their own habitat breakdowns.
2. [x] data not available

6 . Woodland natural capital accounts, UK ecosystem services data

[Woodland natural capital accounts, UK: supplementary information](#)

Dataset | Released 15 December 2022

A detailed data breakdown of financial and societal value of woodland natural resources in the UK.

7 . Glossary

Asset

Asset valuation is an estimate of the stream of services that are expected to be generated over the life of the asset. It looks at the pattern of expected future flows and the time period that the flows of values are expected to be generated.

Broadleaves

Trees that do not have needles or cones, such as oak, birch and beech. A few, such as alder, have cone-like structures for their seeds that are not true cones.

Conifers

Trees with needles and cones, such as spruce, pine and larch.

Ecosystem services

Ecosystem services are the flows of benefits that people gain from natural ecosystems. This includes provisioning services such as food and water, regulating services such as flood protection and pollution removal, and cultural services such as recreational and heritage.

Natural capital

Natural capital is a way of measuring and valuing the benefits that the natural world provides society. These benefits from natural resources include food, cleaning the air of pollution, sequestering carbon and cleaning fresh water.

Overbark

The volume of wood including the bark. Can be either standing volume or felled volume.

Woodlands

Woodlands in the UK are tree-covered areas that include plantation forests, more natural forested areas, and lower density or smaller stands of trees.

8 . Measuring the data

In this bulletin, the woodland habitat accounts are presented in four sections, which are:

- size of the area covered by woodland (extent account)
- indicators of the quality of the woodland ecosystem and ability to continue supplying services (condition account)
- quantity and value of services supplied by the woodland ecosystem (physical and monetary ecosystem service flow accounts)
- value of woodland as an asset, which represents the stream of services expected to be provided over the lifetime of the asset (monetary asset account)

The data underpinning woodlands natural capital come from a range of sources with different timeliness and coverage. This release is based on the most recent data as of November 2022.

The data sources used in this article include:

- Bat Conservation Trust
- British Trust for Ornithology (BTO)
- Butterfly Conservation (BC)
- Department for Business, Energy and Industrial Strategy
- Department for Environment, Food and Rural Affairs (Defra)
- Economics for the Environment Consultancy (EFTEC)
- Forest Research
- Forestry Commission
- Forestry England
- Joint Nature Conservation Committee (JNCC)
- Met Office
- Natural England
- Natural Resources Wales
- NatureScot
- Royal Society for the Protection of Birds (RSPB)
- UK Centre for Ecology and Hydrology
- UK National Atmospheric Emissions Inventory (NAEI)
- Woodland Trust

Detailed methodology on the calculations of ecosystem services can be found in our Woodland natural capital accounts methodology guide, UK: 2022.

The Office for National Statistics' (ONS') natural capital accounts are produced in partnership with Defra.



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9 . Strengths and limitations

Data quality

The ecosystems services are [experimental statistics](#). There is no single data source for the UK for the individual ecosystem services. They are calculated from data from the four UK nations with different availability and production periods.

Ecosystems provide a diverse range of services and not all are included in this bulletin, either owing to unavailability of data or the need for new valuation methods. We will continue to expand our reporting on such services.

10 . Methodology

Details of our methodologies for the woodlands accounts can be found in Woodland natural capital accounts methodology guide, UK: 2022. Further details on the concepts and methodologies underlying the UK natural capital accounts can be found in our [Principles of Natural Capital Accounting methodology](#).

11 . Related links

[UK natural capital accounts: 2022 Bulletin](#)

Released 10 November 2022

Estimates of the financial and societal value of natural resources to people in the UK.

[UK natural capital roadmap: 2022](#)

Article | Released 31 August 2022

This article assesses achievements since the publication of the natural capital roadmap, outlines various challenges, and sets out priorities for the next phase.

[Habitat extent and condition, natural capital, UK: 2022](#)

Bulletin | Released 3 May 2022

The size of area and condition indicators for eight natural UK habitats, including woodland, enclosed farmland, semi-natural grasslands and coastal margins. Uses the System of Environmental-Economic Accounting framework for Ecosystem Accounting. Experimental estimates.

[Health benefits from recreation, natural capital, UK: 2022](#)

Bulletin | Released 27 May 2022

Further development of the UK recreation natural capital ecosystem service accounts, including specific methods used to estimate the health benefits gained from nature-based recreational activities.

12 . Cite this bulletin

Office for National Statistics (ONS), released 15 December 2022, ONS website, bulletin, [Woodland natural capital accounts, UK: 2022](#)