Office for National Statistics

Statistical bulletin

Woodland natural capital accounts, UK: 2024

Natural capital accounts containing information on the extent, condition and ecosystem services for woodlands in the UK.

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Table of contents

1. Main points

2. UK area covered by woodland

3. Woodland condition indicators

4. Ecosystem services

5. Woodland asset value

6. Woodland natural capital accounts data

7. Glossary

8. Measuring the data

9. Strengths and limitations

10. Related links

11. Cite this statistical bulletin

1 . Main points

- The UK land area covered by woodlands increased from 7% in 1965 to 13% in 2023.
- The asset value of UK woodlands was an estimated £382 billion in 2021; while timber and woodfuel is often seen as the main woodland asset, it accounted for 3.9% or £14.8 billion.
- Greenhouse gas regulating services, woodlands sequestering greenhouse gas emissions such as carbon dioxide, was 39% of the total asset value in 2021 (£150 billion).
- The total annual value of UK woodlands ecosystem services was an estimated £10 billion in 2021.
- The annual non-timber benefits of UK woodlands in 2021 were an estimated £10 billion, exceeding the market benefits of timber and woodfuel (£441 million) by approximately 23 times.
- An estimated 3.2 million people gained health benefits from recreation in UK woodlands in 2022, with an annual value of £1 billion.

As a result of changing methods and an expanding portfolio of natural services measured, this latest account cannot be directly compared with previous years' accounts. Our latest methods have been applied retrospectively, giving a consistent time series in these accounts.

2 . UK area covered by woodland

In the UK, woodlands are tree-covered landscapes, such as plantation forests, more natural forested areas, and lower density or smaller groups of trees.

The area of UK woodlands in 2023 was 3.3 million hectares, according to Forestry Statistics 2023 (Figure 1). The UK land area covered by woodlands increased from 7% in 1965 to 13% in 2023 (Table 1), with Scotland more than doubling its land area of woodland during this time.

Table 1: Woodland area in UK as a percentage of land area, 1965 to 2023 (selected years)

Year	England	Scotland	Wales	Northern Ireland	UK
1965	7	8	10	3	7
1980	7	12	12	5	9
1998	10	17	14	6	12
2019	10	18	15	8	13
2023	10	19	15	9	13

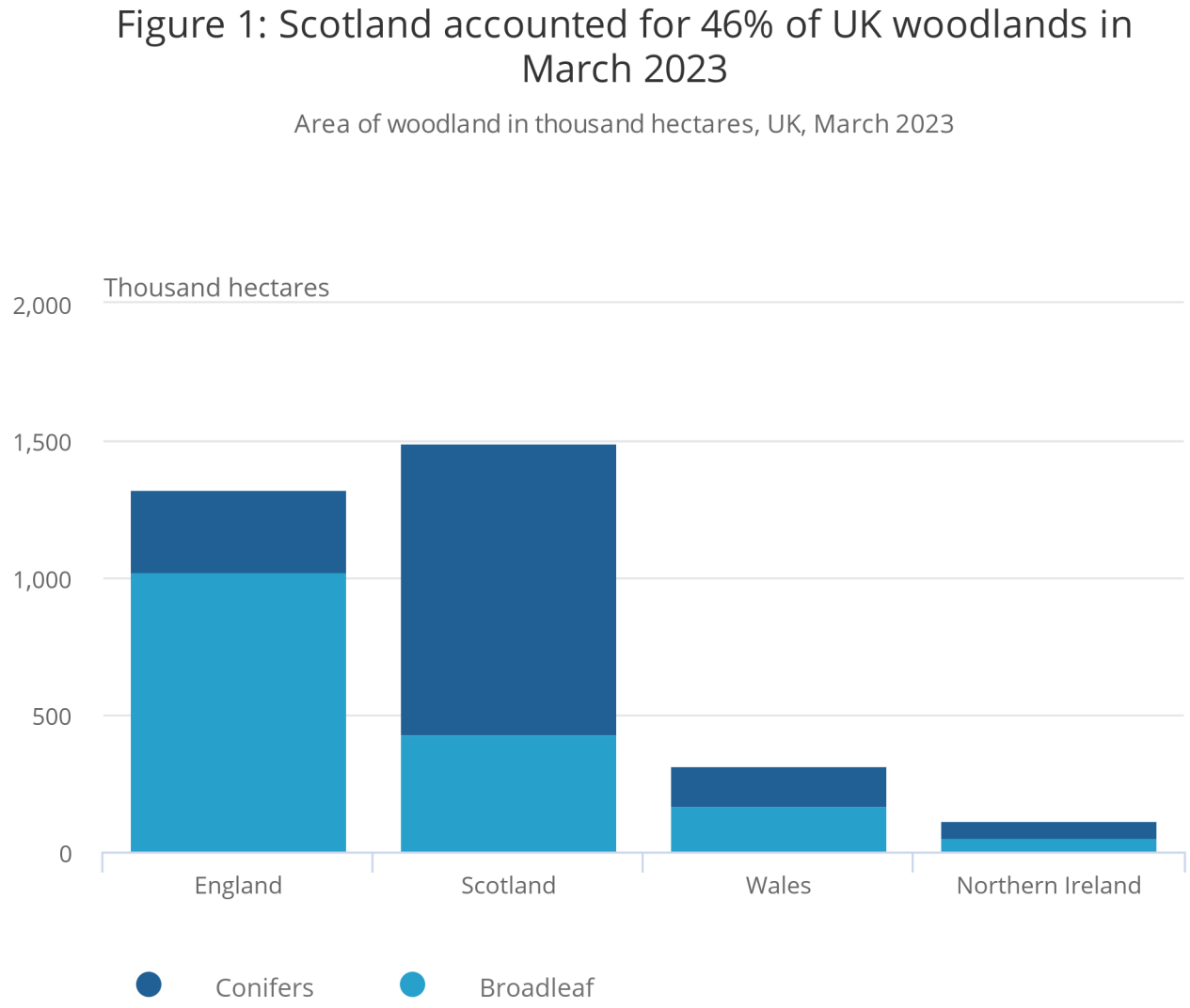
Source: Forest Research

Notes

1. Data for all years are not published in Forestry Statistics 2023.

Figure 1: Scotland accounted for 46% of UK woodlands in March 2023

Area of woodland in thousand hectares, UK, March 2023



Source: Forest Research

Notes:

1. Great Britain data are for woodland cover over 0.5 hectare, from the National Forest Inventory.
2. Northern Ireland data contain all woodland over 0.1 hectare, from the Woodland Register.

3 . Woodland condition indicators

Condition indicators look at the relationship between ecosystem health and the delivery of ecosystem services. The United Nations System of Environmental-Economic Accounting (SEEA), which provides overall guidance for natural capital accounting, defines ecosystem condition as “the overall quality of an ecosystem asset in terms of its characteristics” in their Discussion paper (PDF, 605KB).

Condition indicators comprise physical, chemical, compositional, structural, and landscape conditions specific to woodlands. Figure 2 provides an overview of these indicators for UK woodlands, with long-term trends. Condition data from the National Forest Inventory for a further nine indicators are excluded because they have only one data point.

Figure 2: Summary of long-term trend for woodland condition indicators

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Physical state: soil

Soil is important in woodlands for providing a fertile topsoil for trees and plants to grow their roots, according to the Woodland Trust's Woodland Conservation News (PDF, 1,425KB).

Findings from the Countryside Survey reveal a decline in soil acidity, an increase in pH value, in broadleaf woodland in Great Britain between 1978 and 2007 (Table 2). This trend aligns with the reductions in industrial sulphur emissions during the 1980s, leading to a reduction of acid rain.

Table 2: Soil indicators for woodland, Great Britain, 1978, 1998 and 2007

Woodland	Indicator	1978	1998	2007
Broadleaf, mixed, and yew woodland	Soil acidity (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	222.0	197.8
Broadleaf, mixed, and yew woodland	Loss on ignition (%)	11.4	18.6	16.1
Coniferous woodland		37.0	40.4	36.0
Broadleaf, mixed, and yew woodland	Soil bulk density (g cm-3)	0.8	[z]	[z]
Coniferous woodland		0.5	[z]	[z]

Source: UK Centre for Ecology and Hydrology and Countryside Survey

Notes

1. [z] not applicable.
2. Carbon concentration is measured in grammes of carbon per kilogramme of soil.
3. Loss on ignition measures organic matter content in soils.
4. Bulk density shows how compacted a soil is.

Compositional indicators

Species indicators reflect habitat health. The National Bat Monitoring Programme's (NBMP) woodland bat index increased 40% between 1999 and 2020, while GOV.UK's butterfly index shows a long-term decline. The Joint Nature Conservation Committee's (JNCC) woodland bird index contains 37 species, with only one specialist increasing – the long-tailed tit, by 90% – over the time series. Four of the woodland specialist birds, willow tit, lesser spotted woodpecker, spotted flycatcher and capercaillie, declined 90% between 1970 and 2022.

Figure 3: Compositional woodland species for bats, bees, birds, butterflies and moths, Great Britain, or UK

Notes:

1. The gap in the time series for birds is because of the limited availability of 2020 data due to coronavirus (COVID-19) restrictions.

2. The arrow on each chart denotes the change over the time series, from the baseline year to the most recent year for which we have data. An upward pointing arrow indicates an increase and a downward pointing arrow shows a decrease.

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Statutory plant health notices

A statutory plant health notice (SPHN) is issued to allow trees to be felled to prevent the spread of diseases or pests. For the period 2021 to 2022, there were 720 statutory plant health notices issued across the UK, covering 4,000 hectares (see supplementary tables for detail).

National Forest Inventory – compositional and structural indicators

The National Forest Inventory (NFI) surveys more than 15,000 woodland sites in Great Britain, totalling an area of 2,947,834 hectares.

Table 3 shows 48% of the sample sites were unfavourable for the number of native trees and shrub species, where favourable means the presence of five or more native species. These trees and shrubs are considered good for supporting native woodland biodiversity because they tend to be more diverse communities, including habitat-specialist species. Non-native trees can cause or facilitate the introduction and spread of tree pests and, therefore, threaten native trees. For more information, see the Forestry Commission's NFI woodland ecological condition in Great Britain: methodology (PDF, 3.1MB).

Table 3: 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 of total survey area	Area (hectares)	Percentage of total survey area	Area (hectares)	Percentage of total survey area
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: National Forest Inventory from Forest Research

Landscape-level indicators

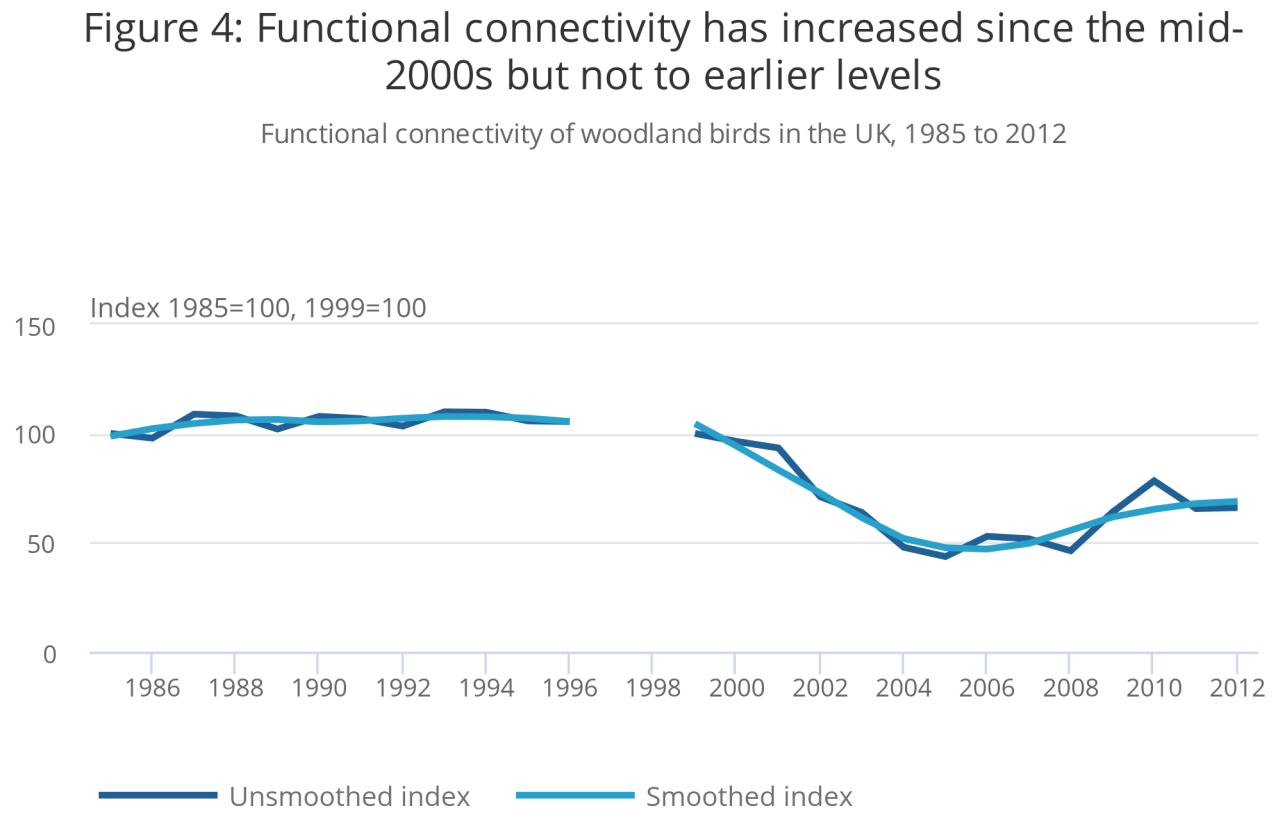
Habitat connectivity

Habitat connectivity is a measure of how well different species can move between habitats in the landscape.

The average functional connectivity for UK woodland birds was relatively stable between 1985 and 1996 (Figure 4). After a decline in the smoothed bird index between 1999 and 2006, there was some recovery from 2007, but most species in the index (57%) declined in connectivity between 1999 and 2012, shown in JNCC's Habitat connectivity report.

Figure 4: Functional connectivity has increased since the mid-2000s but not to earlier levels

Functional connectivity of woodland birds in the UK, 1985 to 2012



Source: Joint Nature Conservation Committee, British Trust for Ornithology and University of Reading

Notes:

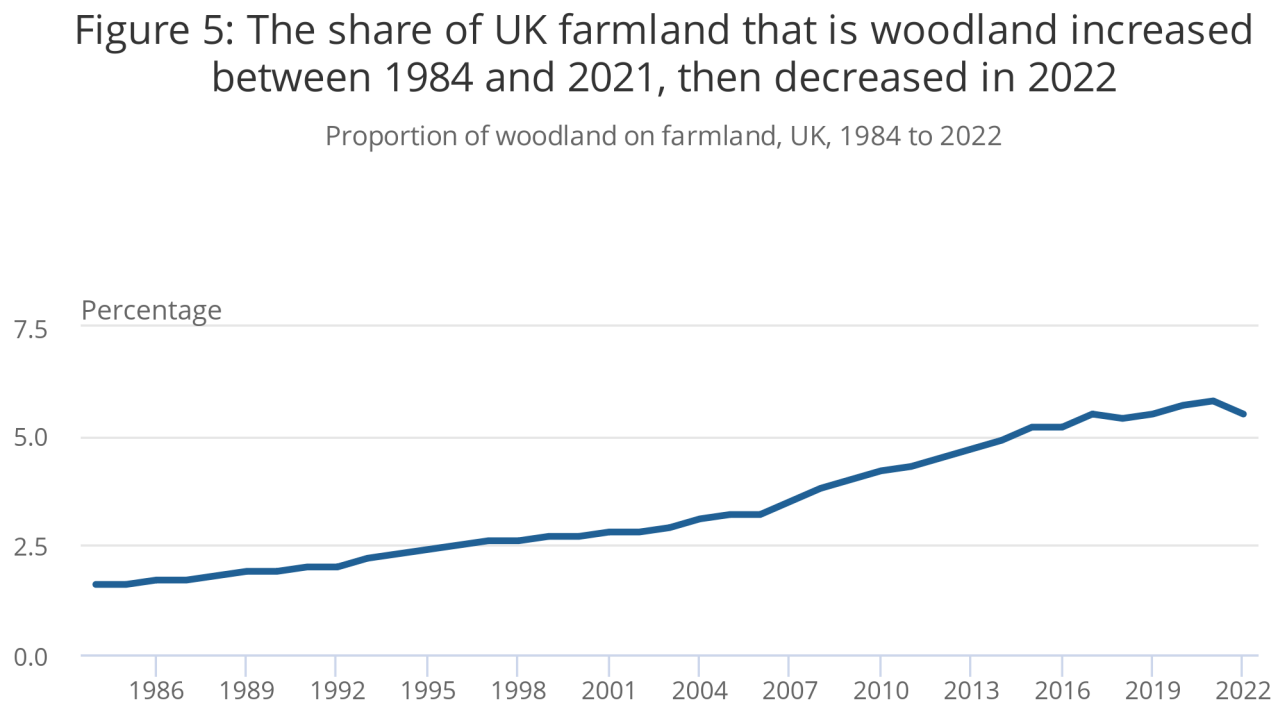
1. No data available for 1997 and 1998.
2. The number of individual species included varies with availability of data: there were 25 species between 1985 and 1996 and 23 species between 1999 to 2012.

Woodland on farmland

Woodland on farmland provides habitat connectivity for wildlife, natural flood protection and boosts biodiversity, according to the Forestry Commission's report on How woodland creation benefits your farm (PDF, 4.8MB). The proportion of woodland as a share of total UK farmland increased from 1.6% in 1984 to 5.8% in 2021, then decreased to 5.5% in 2022.

Figure 5: The share of UK farmland that is woodland increased between 1984 and 2021, then decreased in 2022

Proportion of woodland on farmland, UK, 1984 to 2022



Source: Department for Environment, Food and Rural Affairs

Environmental pressure indicators

Environmental pressure indicators can provide useful proxies for the condition of ecosystems. Detailed data for wildfires, herbivore damage, condition of protected sites, area of certified woodland and access to woodlands can be found in the supplementary tables.

4 . Ecosystem services

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

In 2021, the latest year with complete data, the total annual value for woodland ecosystem services was £10.4 billion (2022 prices). This is a partial valuation, excluding food from agroforestry and education, for example.

Table 4: UK nations breakdown of woodland annual physical flow by service, 2021

Service type	Provisioning		Regulating		Cultural	
Country	Timber provisioning total fellings (thousand cubic metres of overbark standing)	Woodfuel provisioning (thousand cubic metres of overbark standing)	Greenhouse gas regulating (thousand tonnes CO2 equivalent)	Air pollution regulating (thousand tonnes of pollutants)	Recreation and tourism (expenditure) (visits, million)	Recreation (health benefits) (people benefitting, million)
England	2,029.8	1,031.0	8,521.1	131.6	546.9	2.4
Scotland	7,101.0	1,365.2	8,955.4	128.8	133.2	0.5
Wales	1,170.2	248.2	1,594.5	35.0	77.3	0.3
Northern Ireland	461.0	88.5	531.3	12.7	20.7	0.1
UK	10,761.9	2,732.9	19,602.4	308.1	770.1	3.2

Source: Office for National Statistics, Forest Research, Department for Energy Security and Net Zero, 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.

2. Overbark standing is the volume of wood including the bark.

Figure 6: The annual value for greenhouse gas regulating in UK woodland increased by 10% between 2010 and 2021

Ecosystem services for the UK, £ million (2022 prices), 2010 to 2022

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Figure 7: In Scotland, the annual value of timber (excluding woodfuel) trebled between 2010 (£81 million) and 2022 (£251 million)

Ecosystem services for England, Scotland, Wales, and Northern Ireland, £ million (2022 prices), 2010 to 2022

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Provisioning services

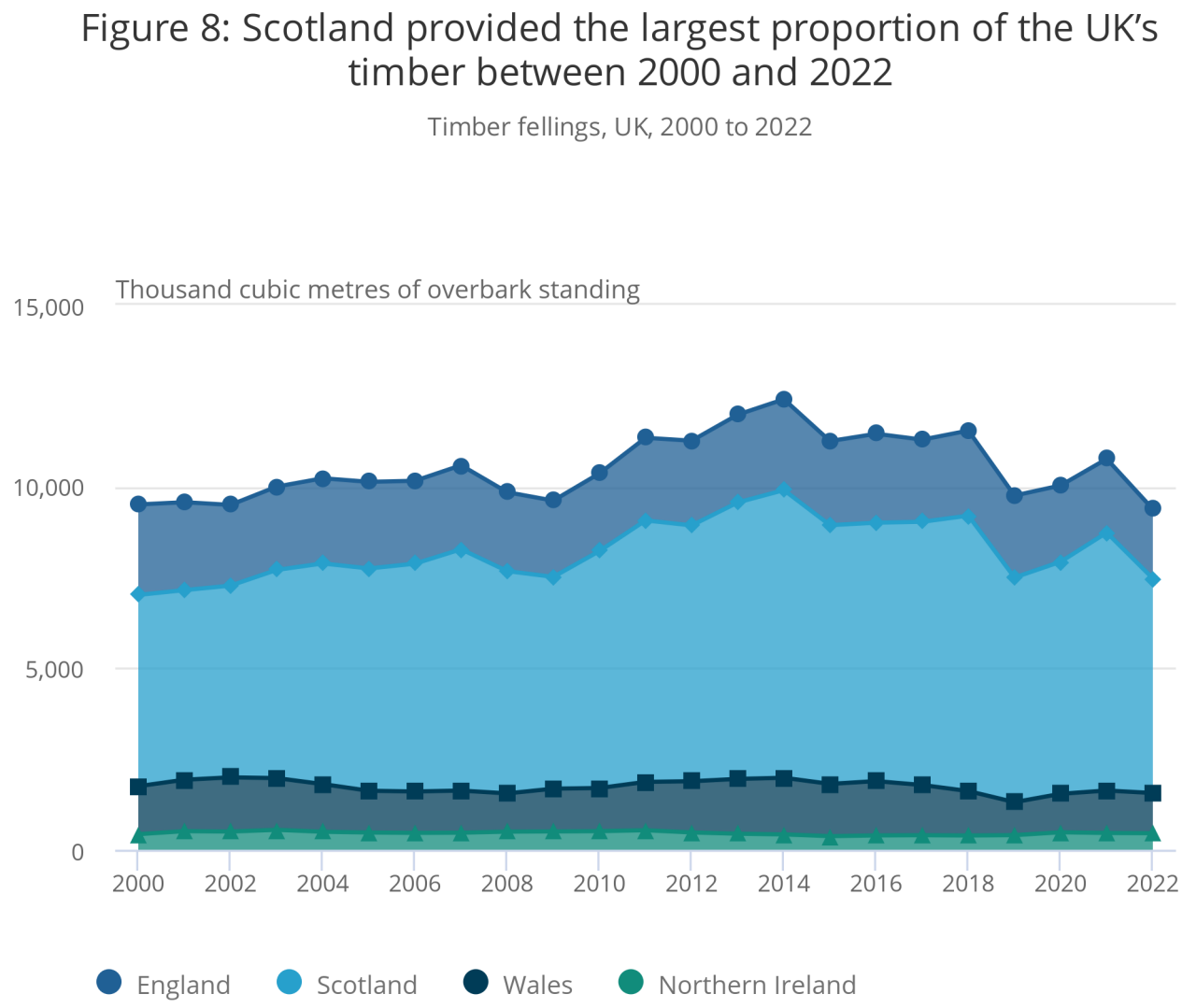
Provisioning services are products from nature, such as food, energy, and materials.

Timber provisioning (excluding woodfuel)

In 2022, 63% of UK-harvested timber was sourced from Scotland, 20% from England, 12% from Wales and 5% from Northern Ireland (Figure 8). For 2022, 92% of all timber harvested (including woodfuel) in the UK was softwood (coniferous), with 64% of this softwood harvested in Scotland, 19% in England, 12% in Wales and 5% in Northern Ireland. The UK annual value of all timber (excluding woodfuel) was £399 million in 2022. More information can be found in the Forestry Commission's UK-grown timber report.

Figure 8: Scotland provided the largest proportion of the UK's timber between 2000 and 2022

Timber fellings, UK, 2000 to 2022



Source: Forest Research

Notes:

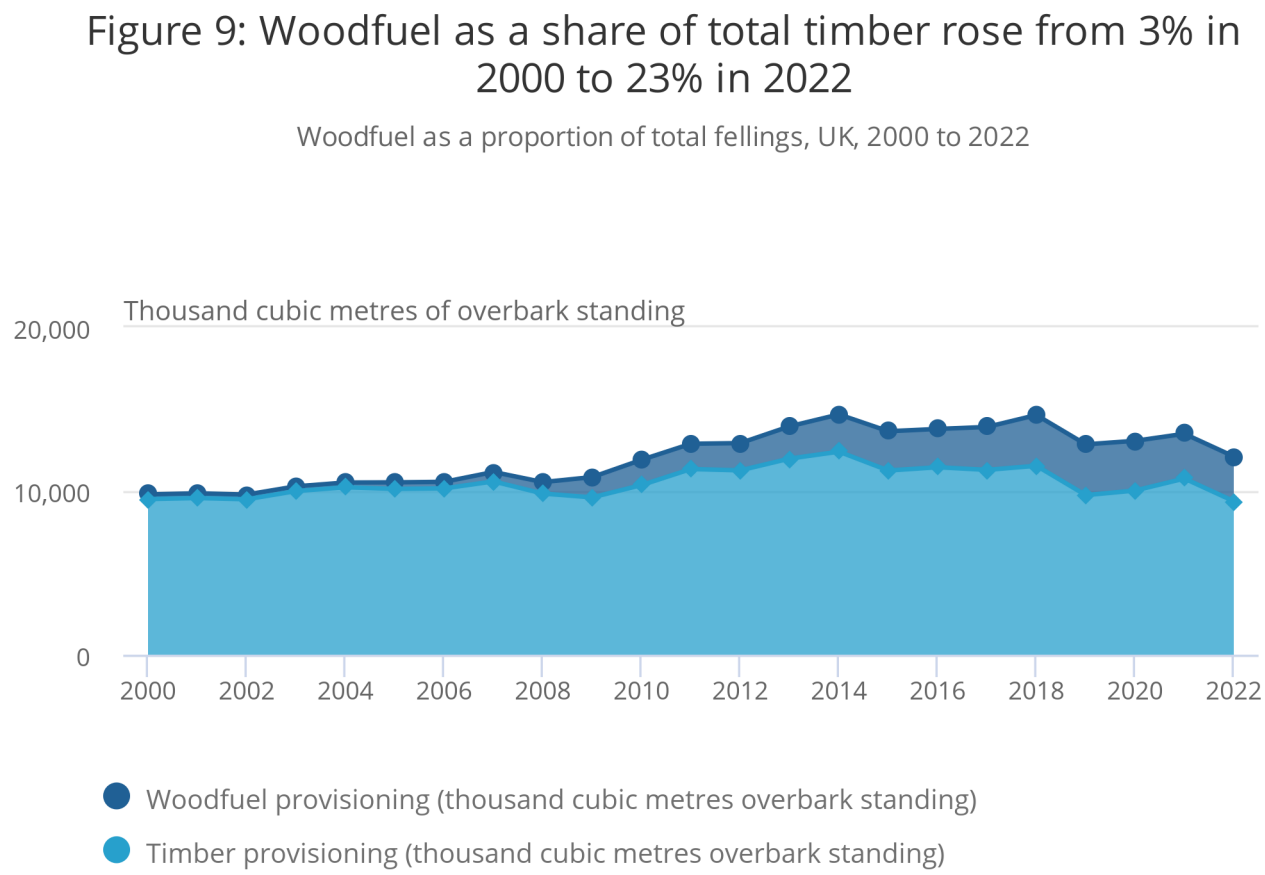
1. Total timber fellings excludes woodfuel.
2. Overbark standing is the volume of wood including the bark.

Woodfuel provisioning

Woodfuel – a form of fuel such as firewood, charcoal, chips, sheets, pellets, and sawdust – represented 23% of total timber fellings in 2022. The annual value of UK woodfuel in 2022 was £116 million.

Figure 9: Woodfuel as a share of total timber rose from 3% in 2000 to 23% in 2022

Woodfuel as a proportion of total fellings, UK, 2000 to 2022



Source: Forest Research

Regulating services

Regulating services help to maintain the quality of the environment we depend upon. They include natural processes, such as air quality, greenhouse gas and flood regulating services.

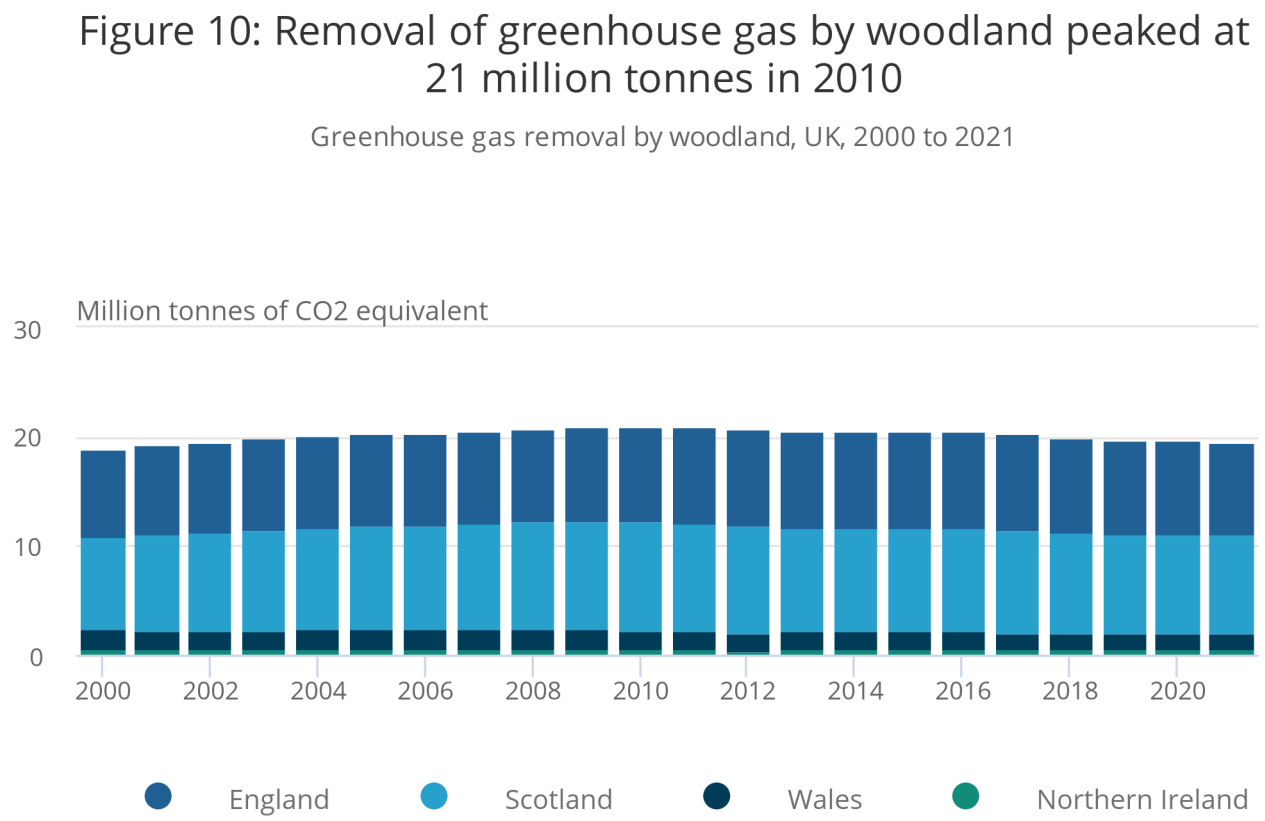
Greenhouse gas regulating

Woodlands remove greenhouse gas emissions, including carbon dioxide, from the atmosphere. In 2021, UK woodlands sequestered 19.6 million tonnes of greenhouse gases, valued at £5.1 billion.

While the amount of greenhouse gases removed fell year-on-year between 2014 and 2021, the annual value increased by 6% over the same period. This is caused by rising non-traded carbon UK Emissions Trading Scheme (ETS) prices, shown in GOV.UK's Participating in the UK ETS guidance.

Figure 10: Removal of greenhouse gas by woodland peaked at 21 million tonnes in 2010

Greenhouse gas removal by woodland, UK, 2000 to 2021



Source: National Atmospheric Emissions Inventory, Department for Energy Security and Net Zero

Air pollution regulating

The World Health Organisation (WHO) estimates that outdoor air pollution contributed to 4.2 million premature deaths worldwide in 2019.

UK woodlands, including broadleaf, coniferous and urban trees, can remove airborne pollutants from the environment, therefore reducing harmful human health effects. Air pollutants measured are:

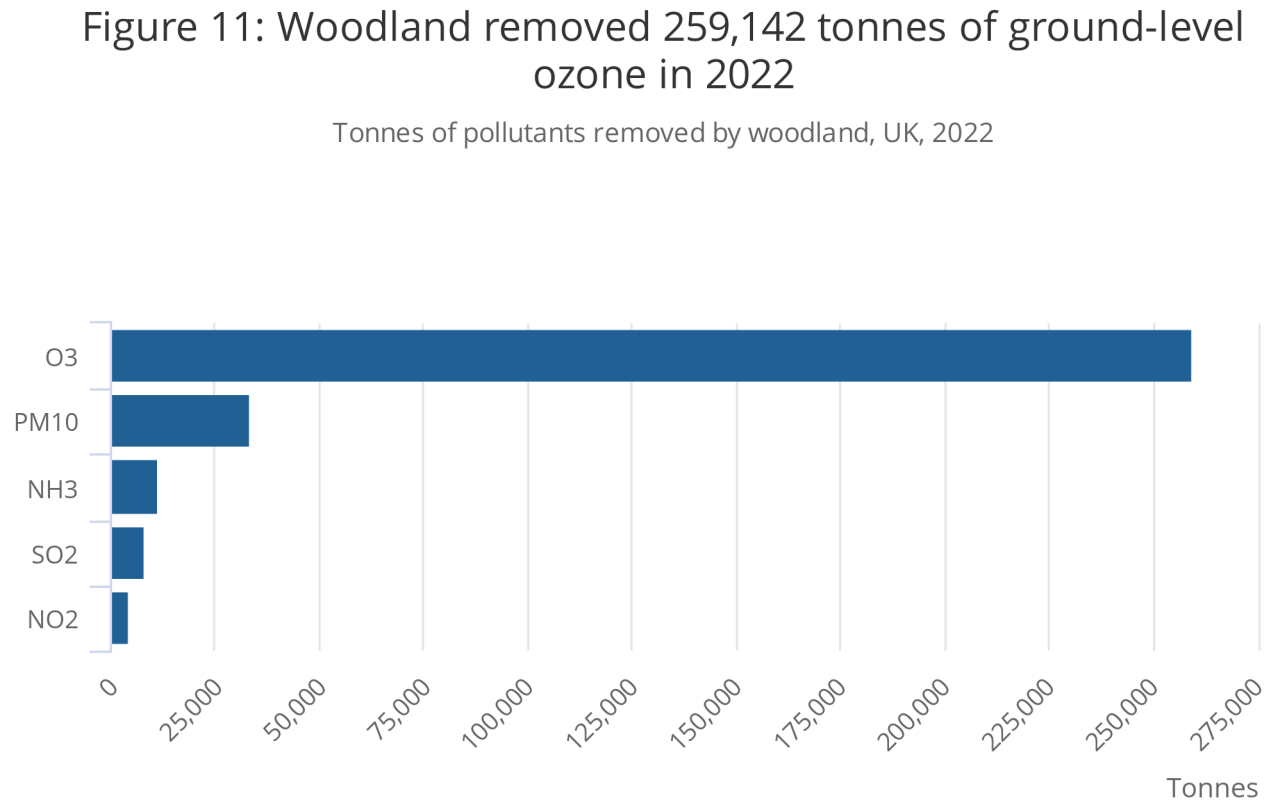
- NH3
- NO2
- O3
- PM10 (fine particulate matter with a diameter of less than 10 micrometres, with PM2.5 as a subset)
- SO2

See the supplementary tables for full details.

In 2022, UK woodlands removed 316,454 tonnes of these pollutants from the atmosphere (Figure 11), providing an estimated £1,785 million in avoided negative health impacts, with 56% contributed by broadleaf trees.

Figure 11: Woodland removed 259,142 tonnes of ground-level ozone in 2022

Tonnes of pollutants removed by woodland, UK, 2022



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

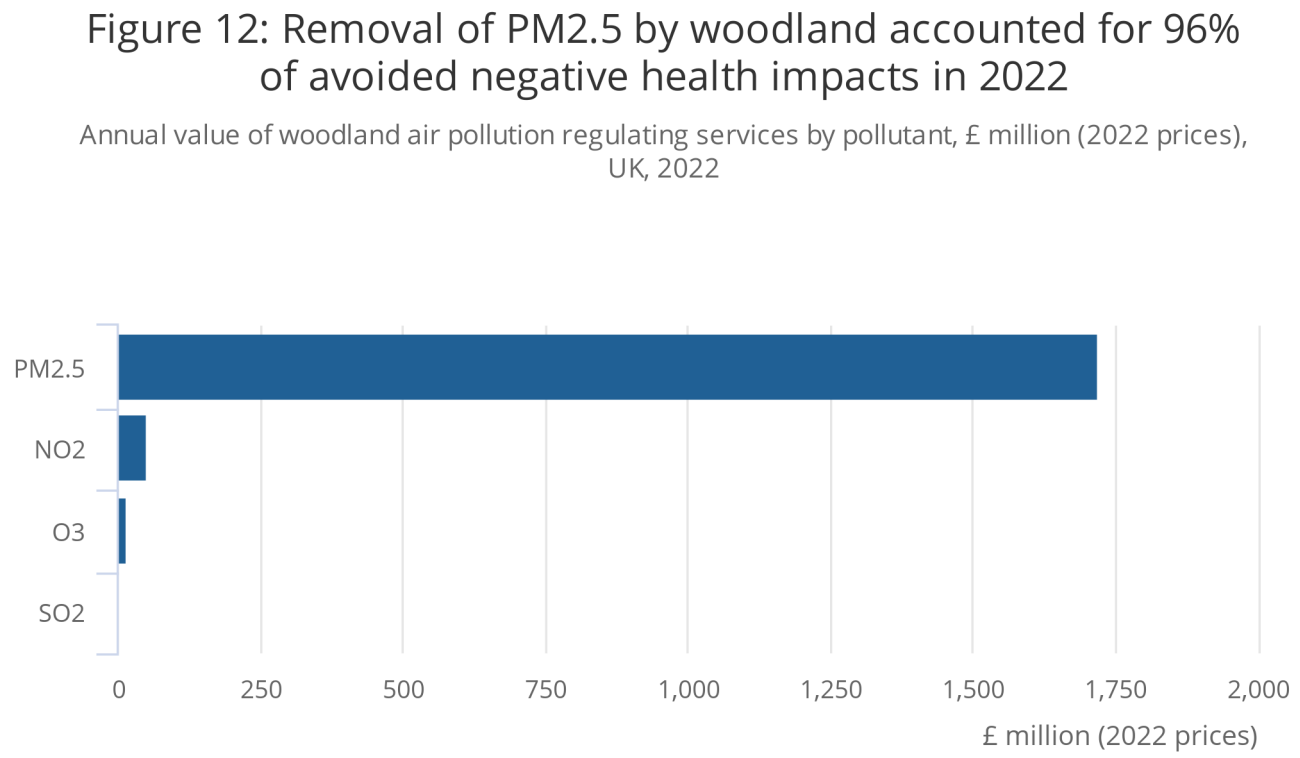
Notes:

1. PM10 data include PM2.5 as a subset.

Air pollution regulating service valuations are determined by risk to health. Ground-level ozone (O3) represented 82% of all pollutants removed in 2022, though only accounted for 1% of the annual value. PM2.5 poses the greatest risk, so accounted for most of the annual value (96%), but only 5% of the total amount of pollutants.

Figure 12: Removal of PM2.5 by woodland accounted for 96% of avoided negative health impacts in 2022

Annual value of woodland air pollution regulating services by pollutant, £ million (2022 prices), UK, 2022



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

Flood regulating

Woodlands can reduce downstream flooding. To capture the flood regulating service for woodland in Great Britain, Forest Research examined how much it would cost to have flood water storage (reservoirs) in non-woodland areas; they looked at the substitution costs of having no woodland.

In 2022, the UK annual value of flood regulating services was estimated at £911 million, while the total asset value stood at £27 billion.

Urban heat regulating

Woodlands also provide cooling benefits to urban areas, reducing labour productivity losses and reliance on artificial cooling like air conditioning.

In 2022, the UK annual value for this service was £753 million, an increase of 243% from 2021. See our detailed data tables.

Noise regulating

Green spaces, including woodlands, mitigate urban noise pollution.

In 2022, 167,000 UK urban buildings benefitted from noise reduction by urban trees, with an annual value of £17 million.

Cultural services

Cultural services are the non-material benefits we obtain from ecosystems, such as tourism and recreation in woodlands, and their associated health benefits.

Recreation and tourism (expenditure)

There were an estimated 748 million recreation and tourism visits to UK woodlands in 2022.

The number of visits to UK woodlands increased by 93% between 2019 (436 million) and 2020 (843 million), partly because of the effect of the coronavirus (COVID-19) pandemic and lockdown restrictions, which changed how people interacted with nature.

In 2022, the annual value of recreation and tourism in woodlands stood at £907 million. For more detail, including time series and four-nation breakdowns, see our supplementary data tables.

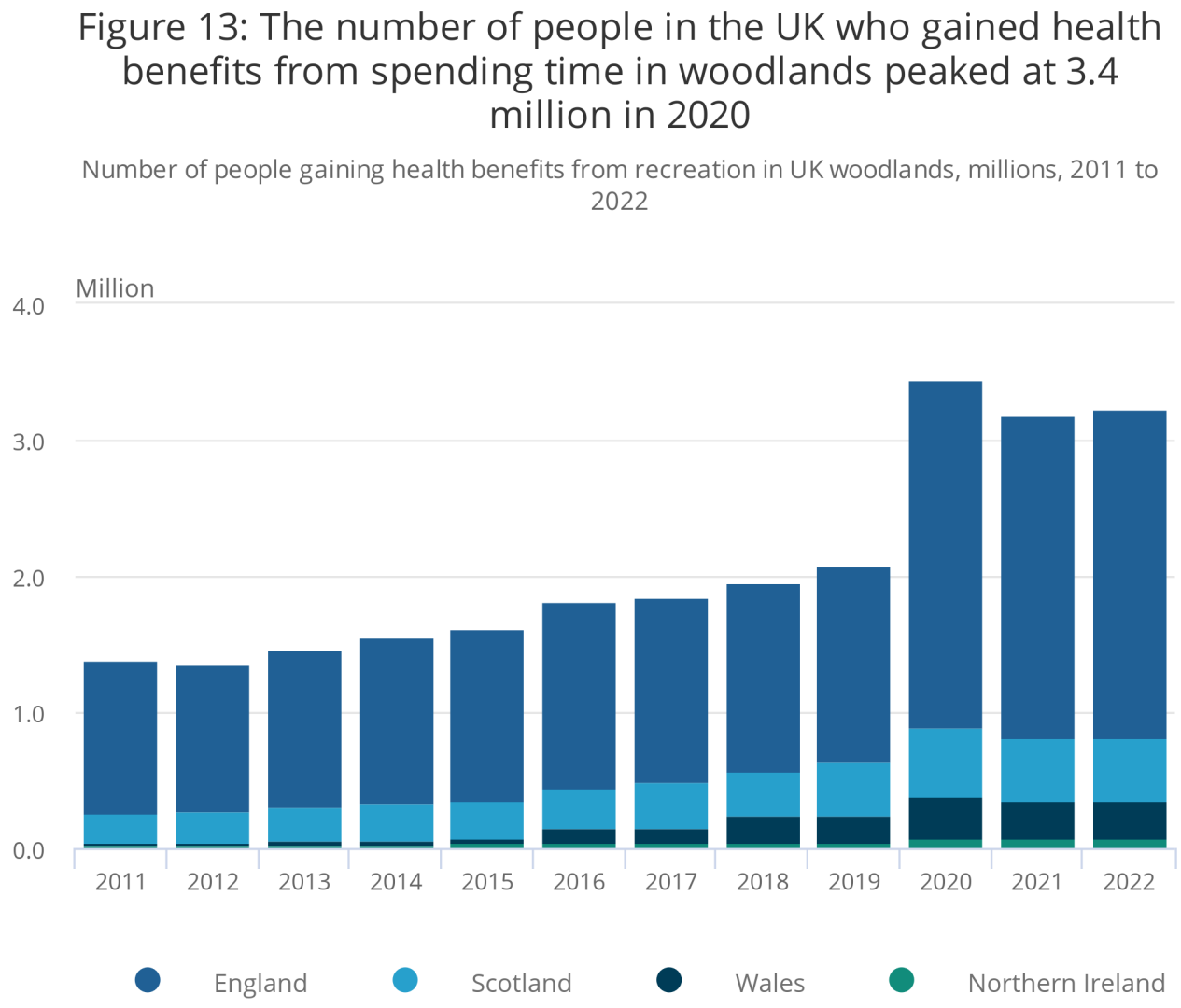
Recreation (health benefits)

Research from scientific reports shows that spending at least 120 minutes a week in nature is associated with health and well-being benefits.

The number of people gaining health benefits from recreation in woodlands declined 6% from 2020 (3.4 million) to 2022 (3.2 million). This is because visits to woodlands declined between 2020 and 2022, with shorter visits which were not long enough to gain health benefits. The annual value for this service was £1,149 million in 2022.

Figure 13: The number of people in the UK who gained health benefits from spending time in woodlands peaked at 3.4 million in 2020

Number of people gaining health benefits from recreation in UK woodlands, millions, 2011 to 2022



Source: Office for National Statistics, Monitor of Engagement with the Natural Environment Survey, The Welsh Outdoor Recreation Survey, Scottish Recreation Survey, Scotland's People and Nature Survey

5 . Woodland asset value

The total UK asset value of woodland ecosystem services we are currently able to value was an estimated £382 billion in 2021 (Table 5).

Table 5: Asset values woodland ecosystem services UK, 2021, £ million (2022 prices)

	England	Scotland	Wales	Northern Ireland	UK
Timber provisioning	2,512	7,815	1,202	446	11,767
Woodfuel provisioning	1,276	1,503	255	86	2,988
Air pollution regulating	78,451	3,526	4,090	462	86,529
Greenhouse gas regulating	71,052	56,596	16,721	5,204	149,574
Noise regulating	807	38	68	32	944
Urban heat regulating	17,392	168	488	[x]	18,048
Flood regulating	18,193	5,682	2,590	674	27,138
Recreation (health benefits)	39,077	7,593	4,701	1,110	52,481
Recreation and tourism (expenditure)	24,351	1,892	3,427	1,197	32,190
Total	253,111	84,813	33,541	9,211	381,659

Source: Office for National Statistics

Notes

1. Country-level data may not add up to the overall UK total because of rounding and other data limitations.

6 . Woodland natural capital accounts data

Woodland natural capital accounts, UK: summary tables
Dataset | Released 15 May 2024
A detailed data breakdown of financial and societal value of woodland natural resources in the UK.

Woodland natural capital accounts, UK: detailed summary tables
Dataset | Released 15 May 2024
A detailed data breakdown of financial and societal value of woodland natural resources in the UK.

7 . Glossary

Asset

A natural asset is a resource that can generate goods or services to humans into the future.

Asset valuation estimates the stream of services that are expected to be produced by the natural resource over a reasonably predictable time horizon.

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 estimate the contribution of natural assets in the UK to the economy and society.

This includes provisioning services such as food and water, regulating services such as flood protection and pollution removal, and cultural services such as recreation.

Non-market benefits

Non-market benefits are goods and services that are not traded in markets, such as air pollution removal.

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:

- the UK 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 January 2024.

These accounts have been compiled in line with the United Nations (UN) System of Environmental-Economic Accounting Ecosystem Accounting (SEEA EA) and the UN System of Environmental-Economic Accounting Central Framework. These are extended accounts complementing the UN System of National Accounts (SNA). We have also published the principles we follow when interpreting UN guidance to produce natural capital accounts in our Principles of UK natural capital accounting methodology.

Detailed methodology on the calculations of ecosystem services can be found in our Woodland natural capital accounts methodology guide, UK: 2024.

9 . Strengths and limitations

Data quality

The ecosystems services are classed as official statistics in development. 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 data 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 additional valuation methods. We intend to expand our reporting on such services.

10 . Related links

UK natural capital accounts: 2023
Bulletin | Released 27 November 2023
Estimates of the financial and societal value of natural resources to people in the UK.

A million fewer people are gaining health benefits from nature since 2020
Article | Released 27 November 2023
People in the UK are spending less time in natural environments since the coronavirus (COVID-19) pandemic.

Urban natural capital accounts, UK: 2023
Bulletin | Released 7 September 2023
Natural capital accounts estimate habitat extend, condition indicators, ecosystem services and asset value of urban areas in the UK.

Scotland natural capital accounts: 2023
Bulletin | Released 15 June 2023
Estimates the value of Scottish natural capital and its beneficial effects for the population.

England natural capital accounts: 2023
Bulletin | Released 25 January 2023
Estimates the value of English natural capital and its beneficial effects for the population.

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.

11 . Cite this statistical bulletin

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