



Forestry England

Natural capital account

2022/23



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Foreword from the CEO

At Forestry England we grow forests, for all, for life, caring for over two hundred and fifty thousand hectares of land. Each year, we harvest millions of sustainably grown trees for use in everything from home building to furniture-making. Our nurseries produce millions of new trees for replanting and creating new areas of woodlands, ensuring that these valuable habitats and resources will last into the future. These same forests are close to communities and form iconic landscapes for people to enjoy and wildlife to flourish.

The nation's forests help clean our air and rivers of pollutants. They help people keep healthy by being open and accessible for all kinds of exercise – from walking and cycling on our well-kept paths, to more adventurous activities like camping and climbing. Our forests provide employment through businesses small and large, and they provide the material and context for the scientific research we all rely on to improve our understanding of these amazing places.

This is our eighth annual natural capital account, and the second made according to the new British Standards Institute Standard for Natural Capital Accounting. We work with a range of partners to generate this account, looking deeper into our forests and habitats to see how wildlife is fairing, how trees are growing and

to understand the ways that people are connecting with them. We can't always attach a monetary value to these benefits, but where we are able to, we can, over time, see clear trends which help to support our decision-making.

The biggest takeaway from these accounts are the clear strengths of our management of the nation's forests: the annual costs of managing and caring for these habitats are far outweighed by the benefits and only made possible by the expertise and hard work of our widely dispersed and diverse workforce, partners, and volunteers, who can be found in our forests no matter the weather.

The nation's forests continue to give to society, and this account shows how Forestry England is delivering on all its promises: to grow the natural capital value of these forests for wildlife to flourish, for people to enjoy, and for business to grow.



Mike Seddon,
Chief Executive

Asset register

The asset register is an inventory of the natural capital assets in the nation's forests, and their conditions - including evidence of their extent, condition, and spatial configuration. Some other forms of capital that may influence natural capital benefits are also included.

This asset register is important to read alongside the natural capital balance sheet and flow schedules, because an organisation may show increasing value of the flow of benefits from natural capital assets while also depleting the stock of its assets. By showing this asset register, we are able to show that our increasing natural capital value is not achieved at the expense of long term habitat management and delivery of ecosystem services.

Value change	Key	Impact of change	Key
Increase (>3%)	↑	Planned or positive	■
Minimal change	↔	Minimal impact	■
Decrease (>3%)	↓	Unplanned or negative	■
		No available data	■

Indicator		Baseline year (2013/14)	Reporting year (2022/23)	Trend	% change	Units	
Ecological communities and species							
Extent	Broad and priority habitat area		Full list of priority habitat areas given in S1.1				ha
	Broad habitat area	Woodland area	207,876	207,733	↔	-0.1%	
		Grassland area	12,748	16,895	↑	32.5%	
		Mountain, moors and heathlands area	28,564	29,518	↑	3.3%	
		Enclosed farmland	724	1,198	↑	65.5%	
		Freshwater	265	327	↑	23.6%	
		Urban area	742	840	↑	13.2%	
		Coastal margins area	17	23	↑	35.3%	
		Total area	250,936	256,535	↔	2.2%	
	Priority habitat within the nation's forests	Broadleaved, mixed and yew woodland	22,757	22,548	↔	-0.9%	
		Lowland dry acid grassland and lowland heath	14,628	14,807	↔	1.2%	
		Other priority grassland	522	877	↑	68.0%	
		Lowland raised bog	782	781	↔	-0.1%	
		Blanket bog	6,793	6,874	↔	1.2%	
		Upland heathland	6,881	7,122	↑	3.5%	
		Other	364	535	↑	47.1%	
		Total area	52,727	53,544	↔	1.5%	
	Woodland area	Plantation	164,199	158,313	↓	-3.6%	
		Native	38,890	42,179	↑	8.5%	
		Non-intervention	13,275	14,081	↑	6.1%	
		Wood pasture	735	736	↔	0.1%	
	Total land area holdings	Freehold	198,883	202,939	↔	2.0%	
		Leasehold	53,341	48,270	↓	-9.5%	
		Total area	252,223	251,209	↔	-0.4%	
	Total agricultural land use		3,284	6,899	↑	110.1%	
	Area land under statutory designations	Sites of Special Scientific Interest	68,192	68,261	↔	0.1%	
		Areas of Natural Beauty	29,832	29,728	↔	-0.3%	
Number of scheduled ancient monuments		969	937	↓	-3.3%		

Indicator		Baseline year (2013/14)	Reporting year (2022/23)	Trend	% change	Units
Ecological communities and species						
Extent	National Parks		85,230	85,179	↔	-0.1%
	Total area (designations overlap so not additive)		147,982	147,895	↔	-0.1%
	Area of open habitat		42,600	48,797	↑	14.5%
	Plantations on Ancient Woodland -area by semi-naturalness score	1 (over 80 % native)	9,066	11,550	↑	27.4%
		2 (between 50 to 80% native)	3,372	3,823	↑	13.4%
		3 (between 20 to 50% native)	5,336	5,890	↑	10.4%
		4 (under 20% native)	25,775	20,601	↓	-20.1%
		0 (no trees)	981	917	↓	-6.5%
		Total area	44,531	42,781	↓	-3.9%
		Ancient semi natural woodland and PAWS -area by semi-naturalness score	1 (over 80 % native)	21,840	23,670	↑
	2 (between 50 to 80% native)	4,077	5,392	↑	32.2%	
	3 (between 20 to 50% native)	5,910	6,709	↑	13.5%	
	4 (under 20% native)	27,272	21,632	↓	-20.7%	
	0 (no trees)	1,698	1,602	↓	-5.6%	
	Total area	60,797	59,005	↔	-2.9%	
	Condition of Sites of Special Scientific Interest	% in favourable condition	35.6	36.91	↑	3.7%
		% in unfavourable recovering condition	63.9	57.24	↓	-10.4%
		% in unfavourable no change or declining condition	0.5	5.85	↑	1070%
		% part destroyed or destroyed condition	-	0.0%	↔	0.0%
	Woodland Ecological Calculator Index	Deadwood volume (native woodland)	6.0%	-	-	-
		Vertical structure (native woodland)	42.0%	-	-	-
		Ground flora (native woodland)	9.0%	-	-	-
		Veteran trees (native woodland)	0.0%	-	-	-
		Nativeness of occupancy (native woodland)	89.0%	-	-	-
		Invasive species (native woodland)	95.0%	-	-	-
		Tree pests and diseases (native woodland)	89.0%	-	-	-
		Herbivores/grazing pressure (native woodland)	49.0%	-	-	-
Regeneration at component group level (native woodland)		20.0%	-	-	-	
Number of native tree/shrub species (native woodland)		46.0%	-	-	-	
Age distribution of tree species (native woodland)		18.0%	-	-	-	
Proportion of open space (native woodland)		5.0%	-	-	-	
Proportion of woodland/open habitat (native woodland)		76.0%	-	-	-	
Size of woodland parcel (native woodland)		97.0%	-	-	-	
Regeneration at population level (native woodland)		41.0%	-	-	-	
Overall ecological condition score (native woodland)		18.0%	-	-	-	
Overall ecological condition score (non-native woodland)	0.5%	-	-	-		

Indicator		Baseline year (2013/14)	Reporting year (2022/23)	Trend	% change	Units
Condition	Trees of interest	Ancient	460	460	↔	0.0%
		Veteran	4,043	4,043	↔	0.0%
		Total	4,503	4,503	↔	0.0%
	Number of deer and boar killed	Fallow	3,347	4,511	↑	34.8%
		Muntjac	2,228	4,681	↑	110.1%
		Red	544	594	↔	9.2%
		Roe	4,967	5,788	↑	16.5%
		Sika	301	356	↑	18.3%
		Boar	196	215	↔	9.7%
		Chinese water deer	-	35	↑	n/a
		Total	11,583	16,180	↑	39.7%
	Carbon stock in...	...living biomass	11,377	12,743	↑	12.0%
		...deadwood and litter	3,336	-	-	-
		...soils	38,899	-	-	-
	CO ₂ e stock in...	...living biomass	41,717	46,723	↑	12.0%
		...deadwood and litter	12,232	-	-	-
		...soils	142,630	-	-	-
	Biomass stock...	...total above and below ground	22,755	25,485	↑	12.0%
		...above ground	17,809	19,952	↑	12.0%
		...below ground	4,946	5,534	↑	11.9%
Standing timber volume (overbark standing)	Coniferous	26,148	27,817	↑	6.4%	
	Broadleaved	8,147	10,166	↑	24.8%	
Location of the nation's forests by ONS land classification	Rural town and fringe	27,954	27,882	↔	-0.3%	
	Rural village and dispersed	206,223	206,268	↔	0.0%	
	Urban city and town	16,517	16,211	↔	-1.9%	
	Urban conurbation	2,201	1,997	↓	-9.3%	
	Total	252,895	252,358	↔	-0.2%	
Woodland accessibility						
Percentage of England's population within 6 miles of the nation's forests		49.1	48.9	↔	-0.4%	%
Percentage of England's population within 15min, 30min and 60min drive time to accessible sites within the nation's forests	15 minutes	40.3	41.2	↔	2.2%	
	30 minutes	85.8	86.6	↔	0.9%	
	60 minutes	99.9	99.9	↔	0.0%	

Indicator		Baseline year (2013/14)	Reporting year (2022/23)	Trend	% change	Units
Soil						
Area of woodland on deep peat soils	Yield class > 6	16,405	15,819	↓	-3.6%	ha
	Yield class ≤ 6	3,118	2,725	↓	-12.6%	
Area of woodland on shallow peat soils and peaty pockets	Yield class > 6	45,737	44,770	↔	-2.1%	ha
	Yield class ≤ 6	7,164	6,925	↓	-3.3%	
Air						
Area of woodland in areas of differing air quality	Urban	15,433	15,283	↔	-1.0%	ha
	Peri-urban	25,152	25,221	↔	0.2%	
	Rural	160,141	157,745	↔	-1.5%	
	Total	200,727	198,239	↔	-1.2%	
Other forms of capital						
Area of land by accessibility status	CRoW Access	150,430	150,212	↔	-0.1%	ha
	Other accessibility based on deeds	86,228	86,925	↔	-0.4%	
Km of published recreational routes across the estate	Walking	1,095	1,274	↑	16.4%	km
	Cycling	1,303	1,287	↔	-1.2%	
	Other (e.g equestrian, rally)	497	756	↑	52.1%	
	Total	2,895	3,318	↑	14.6%	
Active Forests programme						
Total visitors		865,618	1,256,739	↑	45.2%	No. of people
Gender of visitors	Female	479,892	691,206	↑	44.0%	
	Male	383,834	565,533	↑	47.3%	
	Other	1,892	1,257	↓	-33.6%	
Activities	Cycling	247,134	338,650	↑	37.0%	
	Running	174,181	387,483	↑	122.5%	
	Walking	207,719	313,237	↑	50.8%	
	Other	236,584	217,369	↓	-8.1%	

Notes:

a. The baseline data for these assets is from 2015-16.

b. The baseline data for the Woodland Ecological Index is taken from a report in 2019/20 and was based on data from the first cycle of the National Forest Inventory. There is not a confirmed date for the next update.

Risk register

The BSI standard requires inclusion of a risk register within the natural capital accounts. The risk register must identify material risks to the natural capital assets as well as our ability to deliver services from those assets. For the risks identified, in future accounts, we will be seeking to: estimate how benefits may be impacted by these risks (e.g. climate or pest risks to future timber yields and carbon sequestration); and assess whether this gives rise to future increases in maintenance activity to mitigate risks and preserve natural capital. This is something we will develop for future natural capital accounts.

The Forestry England natural capital account sits within our suite of corporate reports, alongside our annual report & accounts (ARA). The risk statement within the annual report & account provides the relevant information for the risk register for the natural capital accounts. In this section you will find a summary of the relevant risks, drawn from the ARA for the relevant financial year (2022/23).

Risk	Mitigations
Climate change emergency	<p>The changing climate poses a significant threat to the long term business of forestry, to land use, the health and wellbeing of our environment and society. Forestry England are integrating climate change harm mitigation measures into our national policies, strategies and forest plans and using our expertise in forestry to engage with and influence society and partners on what forestry can do to help combat the challenge of a changing climate.</p> <p>Climate change is predicted to have a broad range of impacts on our natural assets whilst also exacerbating the effects of other pressures and risks such as over-exploitation, invasive species, habitat fragmentation, degradation and loss.</p>
Pests and diseases	<p>Existing, emerging and potential pests and diseases as a result of changing climate represent significant risks in forests across Europe, including the nation's forests. The risks that result are the impact on Forestry England's ability to deliver its planned programmes and on timber prices.</p>
Supply Chain	<p>Availability of contractors and materials are outside of our control and the general economic situation, including further unexpected increases in inflation, and impact of the conflict in Ukraine could adversely impact delivery and costs. Areas of particular risk are supply of vehicles, particularly electric vehicles in line with government targets, IT and civil engineering work. The situation will be monitored and managed as part of the regular business monitoring reporting process.</p>



Physical flow account

This schedule reports the flow of natural capital benefits that are produced by the nation's forests in the baseline and reporting year. This includes production by Forestry England ourselves, our contractors and tenants. It is relevant to report all these aspects because total annual production relates to Forestry England management decisions.

We will continue to improve how we quantify additional or existing natural capital benefits in our physical flow account.

Spacial accounting by natural capital benefit	Indicator	Units	Baseline year		Reporting year	
			2013/14	2022/23	2013/14	2022/23
Timber provision						
Woodland	Timber production	m ³ /yr	1,520,129		1,735,356	
Climate regulation^a						
Woodland	Carbon sequestered/(emitted)	tCO ₂ /yr	1,645,657		1,623,612	
Bogs			(11,663)		(11,783)	
Grassland			-		-	
Heathland			-		-	
Woodland on deep peat soils			(88,569)		(84,128)	
Woodland	Carbon embodied in environmental goods (timber) ^b	tCO ₂ /yr	1,040,571		1,285,886	
Flood mitigation						
Woodland	Total volume of water stored	m ³ /yr	78,334,513		78,334,513	
Air quality						
Woodland	Volume of PM2.5 removed	kg	1,289,984		1,289,984	
Recreation						
Whole estate	Visits to the nation's forests ^c	visits/yr	BL 2016/17 165,000,000		296,000,000	
	Visitors to the nation's forests ^c	visitors/yr	BL 2016/17 21,000,000		22,900,000	
	Volunteers	hours/yr	201,337		176,504	
Plant and seed supply						
Whole estate	Plants production number	number/yr	14,961,000		5,096,830	
	Seed production weight	kg/yr	-		-	
Food provision						
Whole estate	Wild game carcass numbers	number/yr	11,586		16,180	
	Livestock production from tenant farmers	number/yr	7,309		6,283	
	Crop production from tenant farmers	tonnes/yr	3,419		3,953	
Minerals						
Whole estate	Mineral production volume	tonnes/yr	1,295,850		1,023,741	
	Coal production volume	tonnes/yr	200		255	
Physical health						
Whole estate	Active visits to nation's forests	visits/yr	84,975,000		152,440,000	

Notes:

- All green house gas (GHG) emissions are grossed out by expressing them all in terms of the same 'language': Carbon dioxide equivalents. Bogs in the nation's forests, for example, are net emitters of GHGs in the form of methane, nitrous oxide and carbon dioxide, depending on condition.
- Carbon embodied in environmental goods does not represent a release of carbon to the atmosphere. It represents carbon locked up in harvested timber, which leaves the estate for commercial uses in the reporting year. It does not include non-timber biomass (such as brash and roots), much of which is left on site after felling. This flow is of a slightly different nature to the other flows in the accounts, as it does not take into account what the subsequent timber use is, and in order to avoid double counting alongside the carbon sequestered figure, does not contribute to the monetary account or the balance sheet.
- Current reporting year figures for flood mitigation and air quality flows are the same as those for the baseline year (2021-22), as the model is not updated annually.



Monetary flow account

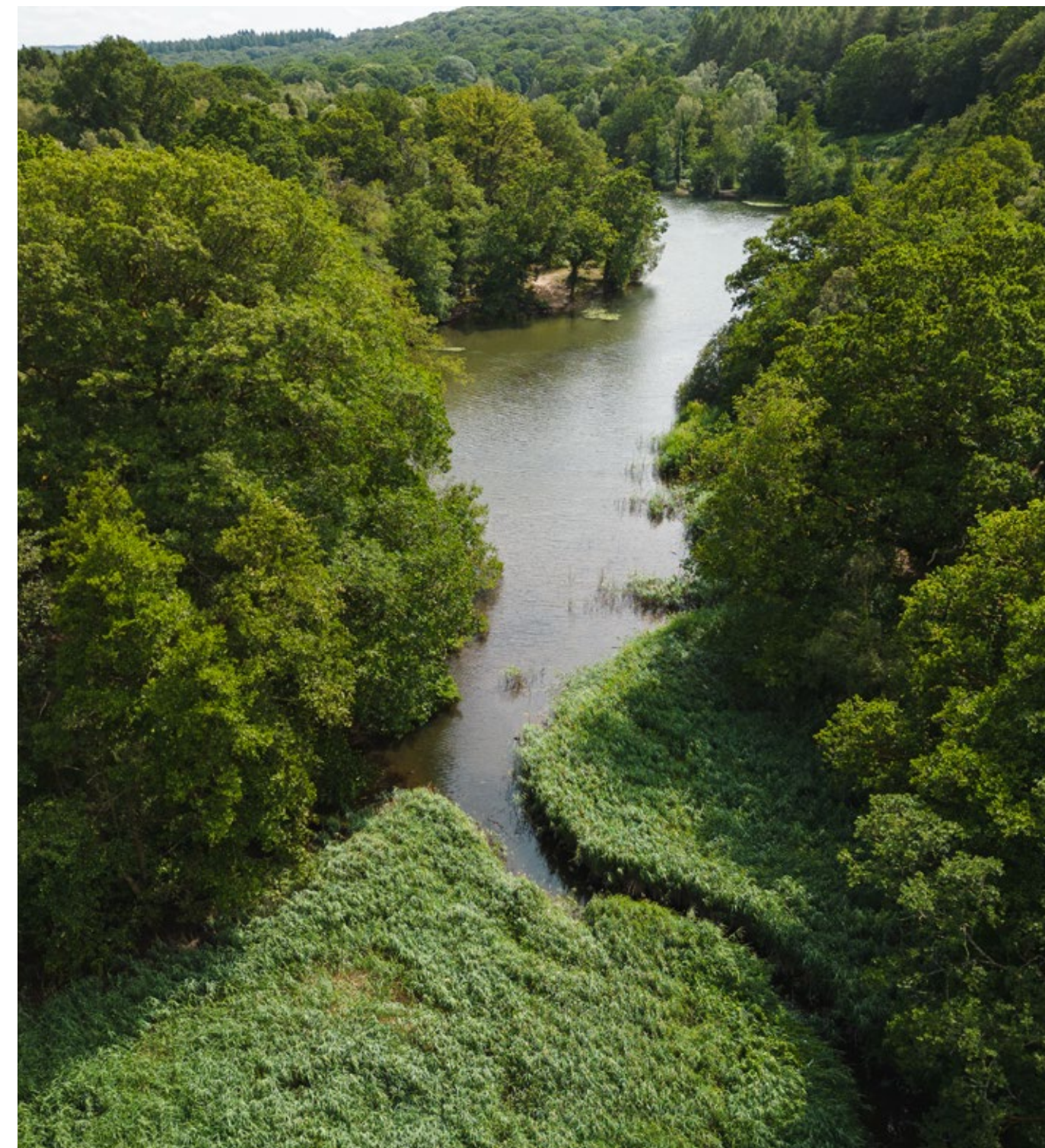
This schedule collates the estimated total annual monetary value of natural capital benefits that are produced from the nation's forests in both the baseline year and the reporting year. These values are calculated after deducting production costs (but not maintenance costs, which cannot be attributed to individual benefits but are netted off the gross value of assets in the balance sheet).

As current methodologies are developed, and more are included, we will add more ecosystem services to both flow accounts.

Special accounting by natural capital benefit	Indicator	Units	Baseline year	Reporting year
			2013/14	2022/23
Timber provision				
Woodland	Net asset value for timber produced	£/yr	£16,660,928	£(317,677)
Climate regulation				
Woodland	Carbon sequestration value	£/yr	£118,510,980	£423,762,657
Bogs			£(839,875)	£(3,075,240)
Grassland			-	-
Heathland			-	-
Woodland on deep peat soils			£(6,378,267)	£(21,957,321)
Flood mitigation				
Woodland	Flood mitigation value	£/yr	£39,228,896	£39,228,896
Air quality				
Woodland	Air quality regulation	£/ha	£44,111,894	£47,001,399
Recreation				
Whole estate	Net asset value for recreation	£/yr	£432,439,154	£781,487,875
	Value to FE	£/yr	£(6,236,714)	£(5,470,046)
	Public Value	£/yr	£438,675,868	£786,957,921
	Volunteers	£/yr	-	-
Plant and seed supply^b				
Whole estate	Plant and seed revenues	£/yr	£466,659	£(812,995)
Food provision				
Whole estate	Wild game carcass value ^c	£/yr	£12,677	£(821,729)
	Livestock production value	£/yr	-	-
	Crop production value	£/yr	-	-
Minerals				
Whole estate	Mineral sales value	£/yr	£925,504	£192,949
Physical health				
Whole estate	Avoided medical treatment costs	£/yr	£315,298,721	£565,626,796
Total annual value of ecosystem services delivered			£963,326,777	£1,830,315,610

Notes:

- The monetary flow account reports the value to the reporting entity (private value from rents) and to wider society (external value from the direct consumption of benefits only). It does not include the indirect or 'downstream' value to farmers and aggregates/timber contractors from the sale of their produce. This is because these sales are based on decisions outside of the control of Forestry England and exist further along the value chain. Values reported above are the sum of annual private and external value.
- Our plant and seed sales are counted as a benefit to society because the actual value of plants and seeds is much higher than their sale value.
- Although the number of wild carcasses has increased against baseline in the physical flow, the huge decline in wild boar value from £2.50 in October 2017 to £0.75 in November 2017, as well as changes in Forestry England venison contracts, has meant the revenues to Forestry have fallen sharply alongside an increase in the cost of production. Wild game income is a consequence of culling for forest management purposes, rather than being done to generate profit.



Abbreviated natural capital balance sheet

This Natural Capital Balance Sheet (NCBS) shows the total estimated natural capital value delivered into perpetuity in the baseline and reporting years for the range of ecosystem services we can currently measure and value. Some of these benefits overlap with financial accounts, notably the private values (for timber, minerals, food and recreation). All other benefits are non-market and hence not included in financial accounts (carbon sequestration, air quality, flood mitigation and benefits of public recreation and physical health).

Asset Values Baseline Year	Private value ^a					
	Baseline ^b	Cumulative gains/losses ^c	Additions ^d / disposals ^e	Revaluations/ adjustments ^f	Reporting year (2022/23)	
Present value £m						
Net Asset Values (Gross + Production Costs)						
Timber	2013/14	411	(92)	-	(326)	(6)
Food	2013/14	(1)	(20)	-	-	(21)
Plants and seeds	2013/14	-	-	-	-	-
Carbon sequestered	2013/14	-	-	-	-	-
Mitigation of floods	2021/22	-	-	-	-	-
Air quality regulation	2021/22	-	-	-	-	-
Recreation and public access ⁱ	2013/14	(194)	24	-	-	(170)
Minerals	2013/14	4	-	-	(1)	4
Physical health	2021/22	-	-	-	-	-
Total Net Asset Values		222	(88)	-	(327)	(193)
Natural capital maintenance costs						
Government payment for ecosystem services funding ^g		625	253	-	-	878
Maintenance costs ^h		(428)	(506)	-	-	(934)
Total natural capital maintenance costs		197	(253)	-	-	(56)
Total net natural capital assets value		419	(341)	-	(327)	(249)

Notes:

All values in 2022/23 prices £m (million) is present value terms, rounded to the nearest £1m.

Present values are calculated as discounted flow of annual value in perpetuity. A 3.5% discount rate is used for years 1-30, after which it changes to 3% - this follows HM Treasury advice. Annual values are forecasted over 50 years and from year 51 into perpetuity it is assumed that the annual value is constant (i.e. a constant flow assumption).

- a. Private value of assets is value to Forestry England, external value of assets is value to the rest of society.
- b. The baseline value represents the value of assets at the baseline date (31 March 2014 where possible, if otherwise the baseline year is noted in the asset register).
- c. Cumulative gains/losses show the net change in asset values (compared to the baseline date). The change is normally due to a change in the condition of the assets, either through natural improvement/deterioration or through management intervention.

- d. Additions show the increase in asset values associated with the acquisition, realisation or discovery of new assets since the baseline date.
- e. Disposals disclose the reduction in asset values associated with the disposal or extraction (for non-renewable resources of natural assets).
- f. Revaluations and adjustments calculate the asset value changes arising from changes in external factors and key assumptions (e.g. market prices), or through a significant change in valuation methodology.
- g. The net asset values are the gross present values plus the production cost present values of each natural capital benefit. The individual breakdown of liabilities can be seen in the detailed natural capital balance sheet (see Annex D).

Baseline ^b	External value ^a			
	Cumulative gains/losses ^c	Additions ^d / disposals ^e	Revaluations/ adjustments ^f	Reporting year (2022/23)
Present value £m				
-	-	-	-	-
-	-	-	-	-
18	2	-	-	20
8,208	112	-	9,128	17,449
-	-	-	1,219	1,219
-	-	-	1,264	1,264
13,630	10,821	-	-	24,451
-	-	-	-	-
-	-	8,946	11,267	20,213
21,856	10,935	8,946	22,878	64,616
(625)	(253)	-	-	(878)
(59)	22	-	-	(37)
(684)	(231)	-	-	(915)
21,172	10,704	8,946	22,878	63,701

Baseline ^b	Total value			
	Cumulative gains/losses ^c	Additions ^d / disposals ^e	Revaluations/ adjustments ^f	Reporting year (2022/23)
Present value £m				
411	(92)	-	(326)	(6)
(1)	(20)	-	-	(21)
18	2	-	-	20
8,208	112	-	9,128	17,449
-	-	-	1,219	1,219
-	-	-	1,264	1,264
13,436	10,845	-	-	24,281
4	-	-	(1)	4
-	-	8,946	11,267	20,213
22,076	10,847	8,946	22,551	64,423
-	-	-	-	-
(487)	(484)	-	-	(971)
(487)	(484)	-	-	(971)
21,591	10,363	8,946	22,551	63,452

The natural capital values of the nation's forests change – sometimes quite substantially – each year. This is partly due to fluctuations in benefits delivered, partly due to changes in valuation (for example, due to revised methodologies or inflation), and partly due to more ecosystem services being included in our accounts.

This is the second year where we have included:

- Physical health benefits, estimated at £20.2 billion.
- Air quality, estimated at £1.3 billion.
- Flood damage mitigation, estimated at £1.2 billion.

Future published accounts will see continued changes: for example, we know that we will review our carbon sequestration methods further in coming years, and are looking to better account for carbon embodied in timber exported from the nation's forests.

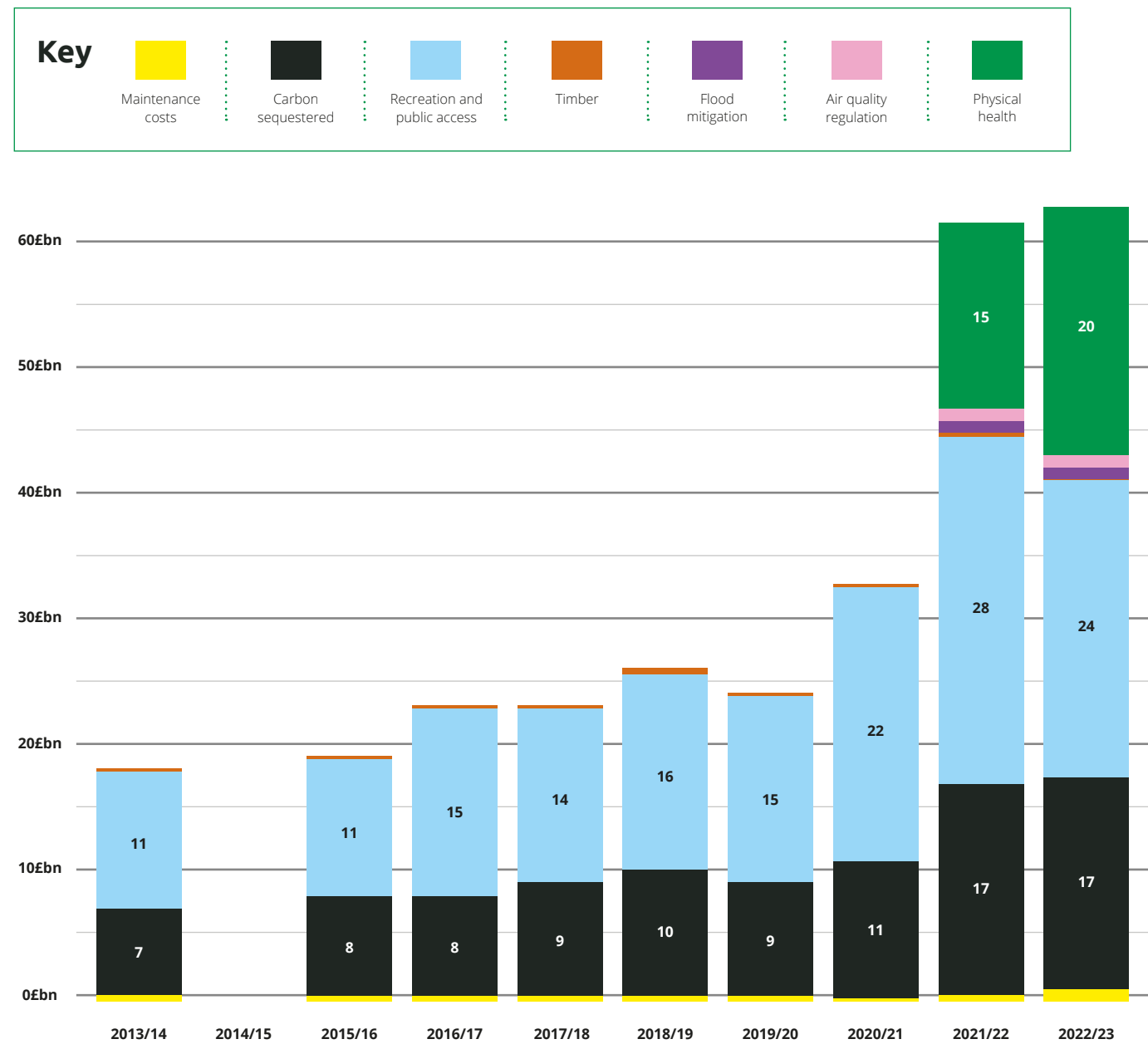
Maintenance costs are based on projecting our existing level of spend forward, but we have yet to evaluate whether the existing level of maintenance effort is sufficient to sustain the high and increasing benefits from the nation's forests. A key priority for Forestry England is to establish a forward plan of necessary natural capital maintenance activity required to sustain asset condition in the face of future risks (such as climate change and pests).

Natural capital through the years

Breakdown by year of ecosystem services delivered, monetary value (£ billions)

The benefits that the nation's forests provide fluctuate over time – for example, our forests will not sequester the same amount of carbon in each reporting year. We also want to develop our understanding of how the nation's forests impact people's lives: so we have expanded the benefits we measure and value since our first NCA in 2015/16, and look to do more of this. Because of these developments, there has been an increase in the total calculated natural capital value reported in recent years. The graph below shows the published net present values of each ecosystem service we measure from previous NCAs.

The data for the baseline year 2013/14 shows our current understanding of that year's natural capital value, rather than that originally published in our first NCA in 2015/16. It is also worth noting that the substantial increase in the overall value in the last two years, is driven not only by an increase in the estimated net present value of ecosystem services we have already measured in previous accounts (like recreation), but also by including three new ecosystem services: physical health, air quality regulation, and flood mitigation.



Natural capital income statement

This Natural Capital Income Statement (NCIS) shows the impact on the natural capital assets caused by our management directly (scope 1), and throughout our value chain (scope 2), where data is available, within the reporting year 2022/23. Although we intend to include scope 2 impacts in future accounts, none have been evaluated this year. Where production costs exceed private income within the reported year, private income will show as negative.

	2022/23		
	Private value £m/yr	External value £m/yr	Total value £m/yr
Scope 1			
Enhancements to natural capital			
Timber produced	0	-	(0)
Food produced	(1)	-	(1)
Carbon sequestration in all habitats	-	424	424
Air pollution removal by woodland	-	47	47
Recreation provision	(5)	787	781
Physical health benefits	-	566	566
Water storage	-	39	39
Plant and seed Supply	-	(1)	(1)
Total enhancements	(7)	1,862	1,855
Deteriorations to natural capital (own operations)			
GHG emissions from all habitats	-	(25)	(25)
GHG emissions from own energy use (whole enterprise)	-	(1)	(1)
Total deteriorations	-	(26)	(26)
Net contribution to natural capital (A+B)	(7)	1,836	1,829

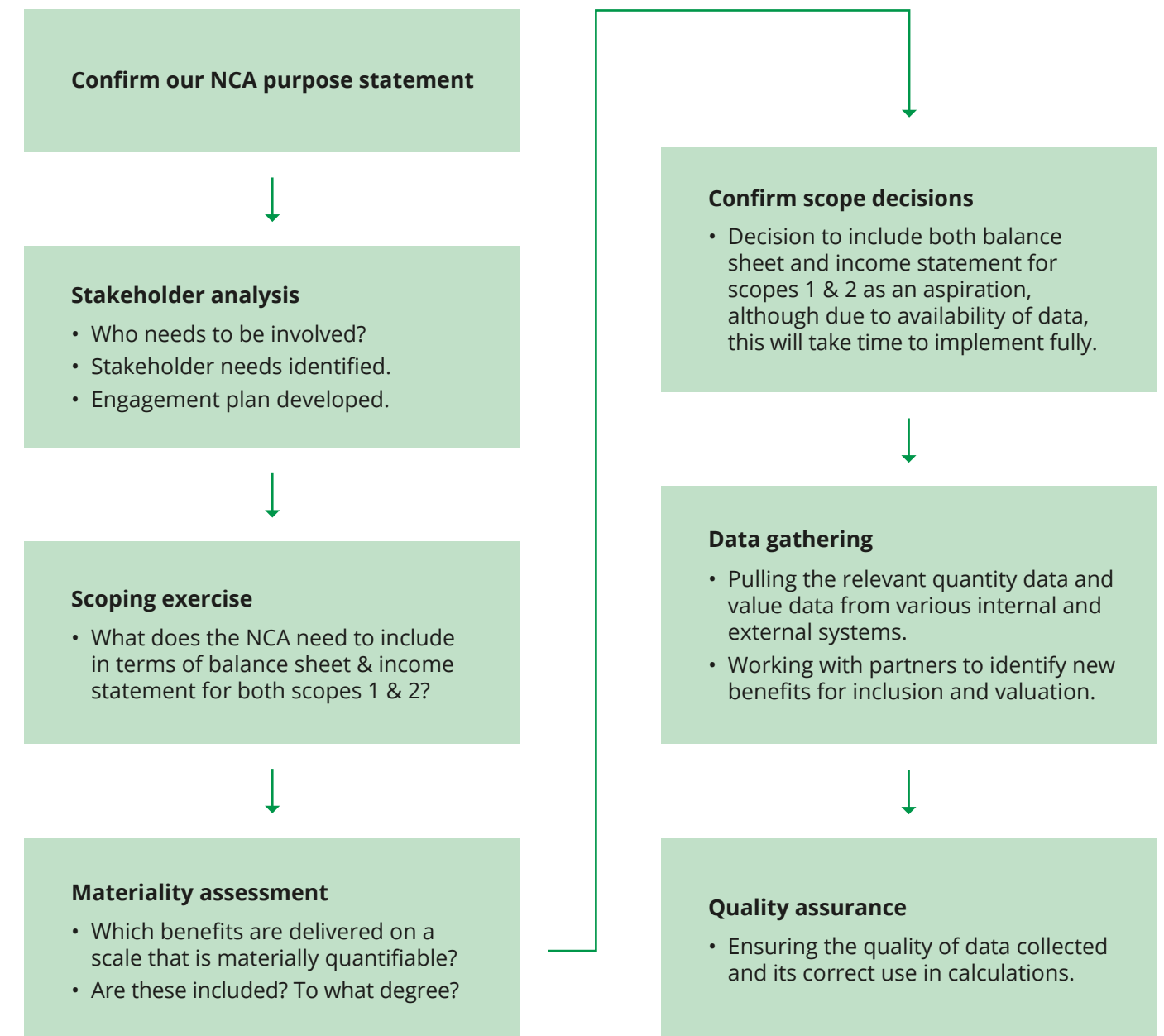


Annex A: natural capital accounting

For the second time, this account has been produced following the brand new British Standards Institute Standard for Natural Capital Accounting, 2021 BS 8632:2021.

Working with Economics for the Environment Consultancy (eftec) last reporting year, we followed a step-by-step process as described in the flow chart below. Key decisions were made by John Stride (Strategy, Performance & Insight Lead), Dr Eleanor Tew (Natural Capital & Resilience Programme Manager), Hannah Griffiths and Jacob Waller (Natural Capital Insights Officers). At critical points we consulted with members of the Forestry England Executive Team, who were kept informed of progress, decisions and timings throughout.

This year has followed the same overall process, but with less involvement from eftec, who have acted as auditors for this annual account.



See pages 14-27 of BS 8632:2021, 'Natural Capital Accounting for Organizations — Specification' for a detailed breakdown of this process, with each step explained in detail. Page 14 of the Specification in particular lays out each of these individual elements in broad outline.

Annex B: materiality statement

This table is a summary of which ecosystem services should be included in our NCA, based on materiality to Forestry England, and to wider society; the potential impact of that service; and whether we are able to quantify it now or if we need to prioritise including it.

Clause 3.16 of BS 8632:2021 says: “impact or dependency on natural capital is material if consideration of its value, as part of the set of information used for decision making, has the potential to alter that decision”. We have undertaken a materiality assessment to understand which assets actually or potentially provide which benefits, and which ones can or cannot be included in the accounts.

Value change	Key
Not included	0
Partially included	1
Included	2
Data unavailable or no method – out of scope	-

Ecosystem service	Private & public benefits	Natural capital assets			
		Freshwater	Grassland	Mountain, moorland and heath	Woodland
Provisioning	Food provision	-	2	2	2
Provisioning	Timber (fibre and materials)	-	-	-	2
Provisioning	Water supply	-	-	-	-
Provisioning	Renewable energy	0	-	-	0
Provisioning	Minerals	-	-	-	2
Regulating	Carbon sequestration	0	0	1	2
Regulating	Air quality	-	-	-	2
Regulating	Flood risk mitigation	-	-	0	2
Cultural	Recreation	1	1	1	1
Cultural	Education	0	0	0	0
Cultural	Volunteering	1	1	1	1
Bundled	Water quality	0	0	0	0
Bundled	Property value	0	0	0	0
Bundled	Biodiversity	1	1	1	1
Cultural	Mental health	0	0	0	0
Cultural	Physical health	2	2	2	2



Annex C: maintenance cost schedule

This table is a summary of the costs associated with maintaining and improving the quality of the natural capital assets of the nation’s forests. Here we have categorised the costs of natural capital benefits delivery into five main areas to show the proportional difference between groups of costs.

We review our decision making at all levels of our business to ensure costs are effectively focused on investment into maintaining and improving the natural capital assets themselves and their capacity to provide increasing value to society.

	2013/14	2022/23
Forest Regeneration and Maintenance	£11,160,569.67	£6,110,52.73
Habitat and Species Management	£3,821,704.34	£7,879,702.64
Infrastructure	£2,841,512.36	£12,426,002.90
Community and Learning	£1,772,842.31	£3,658,653.45
Volunteering	£2,011,356.63	£1,254,543.96
Total	£21,607,985.31	£31,329,475.68



Annex D: detailed natural capital balance sheet

This balance sheet broadly shows the same information as the balance sheet above with the additional detail of individual production costs for each ecosystem service valued rather than the net value shown in the abbreviated version above.

	2022/23		
	Private value PV £m	External value PV £m	Total value PV £m
Asset values (monetised)			
Timber	972	-	972
Food	12	-	12
Plant and seeds	-	20	20
Carbon Sequestered	-	17,449	17,449
Food Risk Mitigated	-	1,219	1,219
Air Quality Regulated	-	1,264	1,264
Recreation and Public Access	928	24,451	25,379
Minerals	4	-	4
Physical Health	-	20,213	20,213
Total gross asset value	1,916	64,616	66,532
Asset values (non-monetised)			
Other material unquantified benefits	-	-	-
Liabilities			
Production costs			
Timber	(978)	-	(978)
Food	(33)	-	(33)
Plants and Seeds	-	-	-
Carbon Sequestered	-	-	-
Mitigation of floods	-	-	-
Air Quality Regulation	-	-	-
Recreation and Public Access	(1,098)	-	(1,098)
Minerals	-	-	-
Physical Health	-	-	-
Natural capital maintenance costs	-	-	-
Government Payment for Ecosystem Services Funding	878	(878)	-
Maintenance Costs	(934)	(37)	(971)
Total gross liabilities	(2,165)	(915)	(3,080)
Net natural capital asset value (monetised)	(249)	63,701	63,452

	2022/23		
	Private value PV £m	External value PV £m	Total value PV £m
Net benefits			
Timber	(6)	-	(6)
Food	(21)	-	(21)
Plant & Seeds	-	20	20
Carbon Sequestered	-	17,449	17,449
Food Risk Mitigated	-	1,219	1,219
Air Quality Regulated	-	1,264	1,264
Recreation and Public Access	(170)	24,451	24,281
Minerals	4	-	4
Physical Health	-	20,213	20,213
Net asset value (monetised)	(193)	64,616	64,423
Maintenance Liabilities	(934)	(37)	(971)
Net natural capital asset value (monetised)	(1,127)	64,579	63,452

Audit trail and references

Below is a breakdown of the ecosystem services included within this natural capital account, alongside a brief explanation of where the data and values come from. NCA information, values and quantities are drawn from a wide range of internal and external sources. All of these methods are under review and will be refined/revised as needed in future.

Timber

Our timber data is based on production forecasts developed by Forest Research's Inventory, Forecasting and Operational Support (IFOS) team. Ultimately, the raw inventory data is sourced from the Forestry England Geographic Information System database, 'ForesterWeb' which is used to estimate timber production (thinning and felling) in m³ overbark standing, within the reporting period. Monetary values are taken from direct production and standing sales figures that also feed into Forestry England's Annual Report and Accounts.

Food

The quantity of food produced and its monetary value and costs are recorded in our internal Wildlife Management System. These accounts show both the overall quantity of food produced (based on number of carcasses sold) and the net financial income of our wildlife management programme. Carcasses are sold and valued at market price, and so this benefit is subject to potentially quite large variations in per kilo prices of boar and venison.

Plant & seeds

Forestry England's Plant and Seed Supply (PSS) team provide the NCA with an estimate of what quantity and weight of seeds and plants are produced by our nurseries. Monetary values within the NCA are calculated based on revenues from the sale of our seeds and plants, which are then subject to an assumed margin of external value (14.46% for the reporting year) based on PSS analysis.

Carbon sequestered

Like the timber data, our carbon sequestration figures come from Forest Research's Inventory, Forecasting and Operational Support (IFOS) team. This time they use Forestry England's forest plans to forecast 'net volume increments' (the volume of tree growth in m³). This is then converted into tonnes of CO₂ in the accounts, based on sequestration models developed by Forest Research. The value per tonne of sequestered CO₂ is updated each year for inflation and forecast into future flows. This value is taken directly from government guidance on the non-trade value of carbon, the Department for Business, Energy & Industrial Strategy's (BEIS) 'Valuation of energy use and greenhouse gas'.

Mitigation of floods

The valuation for flood mitigation draws on the Forest Research report, 'Revised valuation of flood regulation services of existing forest cover to inform natural capital accounts.' (2023). Using the values within this report, we applied the same discount rate as to the other services to estimate the value over 50 years based on 2022 prices.

Air quality regulation

Air quality benefit arises from the ability of different types of vegetation to remove pollutants from the air. This benefit is estimated for the amount of PM2.5 removed by woodland. Jones et al. (2017) modelled this benefit for the UK national accounts reflecting the variety of different levels of PM2.5 concentration, types and extent of vegetation and density of human population across the country. An update to this study has produced estimates of PM2.5 removal per hectare of woodland by local authority. The economic value of this service is estimated through the resulting avoided healthcare cost at local authority level (eftec and CEH, 2019).

Recreation and public access

Forestry England's NCA recreation figures are sourced from quarterly surveys conducted with Kantar (previously Kantar TNS) – a demographically representative sample of the English population fills in a series of questions asking them to estimate how many woodland visits they have made to the nation's forests over the previous three months. This data is then input into statistical models (also developed by Kantar), which give us annual estimates for how many recreational visits we have.

We then apply a per recreational visit value – £2.66 this year – which is updated annually for inflation. The original value is taken from 'The Social and Environmental Benefits of Forests in Great Britain' (2003).

Minerals

Mineral production information is sourced directly from internal Forestry England databases – our Civil Engineering function collate estimates for mineral and aggregate volumes extracted within each calendar year. Monetary values are also collated by the same team, based primarily on rents from mineral and aggregate extraction.

Physical health

In addition to improving the general welfare of visitors, if people are active during their visits, recreation can also have measurable physical health benefits. White

et al. (2016) estimate that 1.5% of recreation visits are 'active', where an 'active visit' is defined as those who met recommended daily physical activity guidelines either fully, or partially, during visits.

The benefit is valued as the health benefits of active recreation (in terms of improvements in Quality Adjusted Life years – QALYs) and the economic value of health improvement (in terms of the avoided health cost due to improvement in QALY). Beale et al. (2007) analysed Health Survey for England data, estimating that 30 minutes a week of moderate-intense physical exercise, if undertaken 52 weeks a year, would be

associated with 0.0106768 QALYs per individual per year. Beale et al. (2007) assume this relationship between physical activity and QALYs is both cumulative and linear.

Claxton et al. (2015) estimate a cost effectiveness threshold of a QALY to be roughly £12,900/QALY in 2008 prices. This figure is used as a proxy for health costs, reflecting the avoided health costs when QALY is improved by one unit. Based on this information, the avoided health cost is estimated as £3.71 in 2022 prices. The monetary unit value is assumed to remain constant over time.

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Butterfly Conservation

British Trust for Ornithology

Find out more

For more information about Forestry England's natural capital account contact:

Forestry England
620 Bristol Business Park
Coldharbour Lane
Bristol
BS16 1EJ

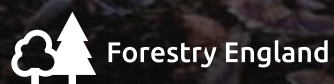
0300 067 4000
info@forestryengland.uk





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