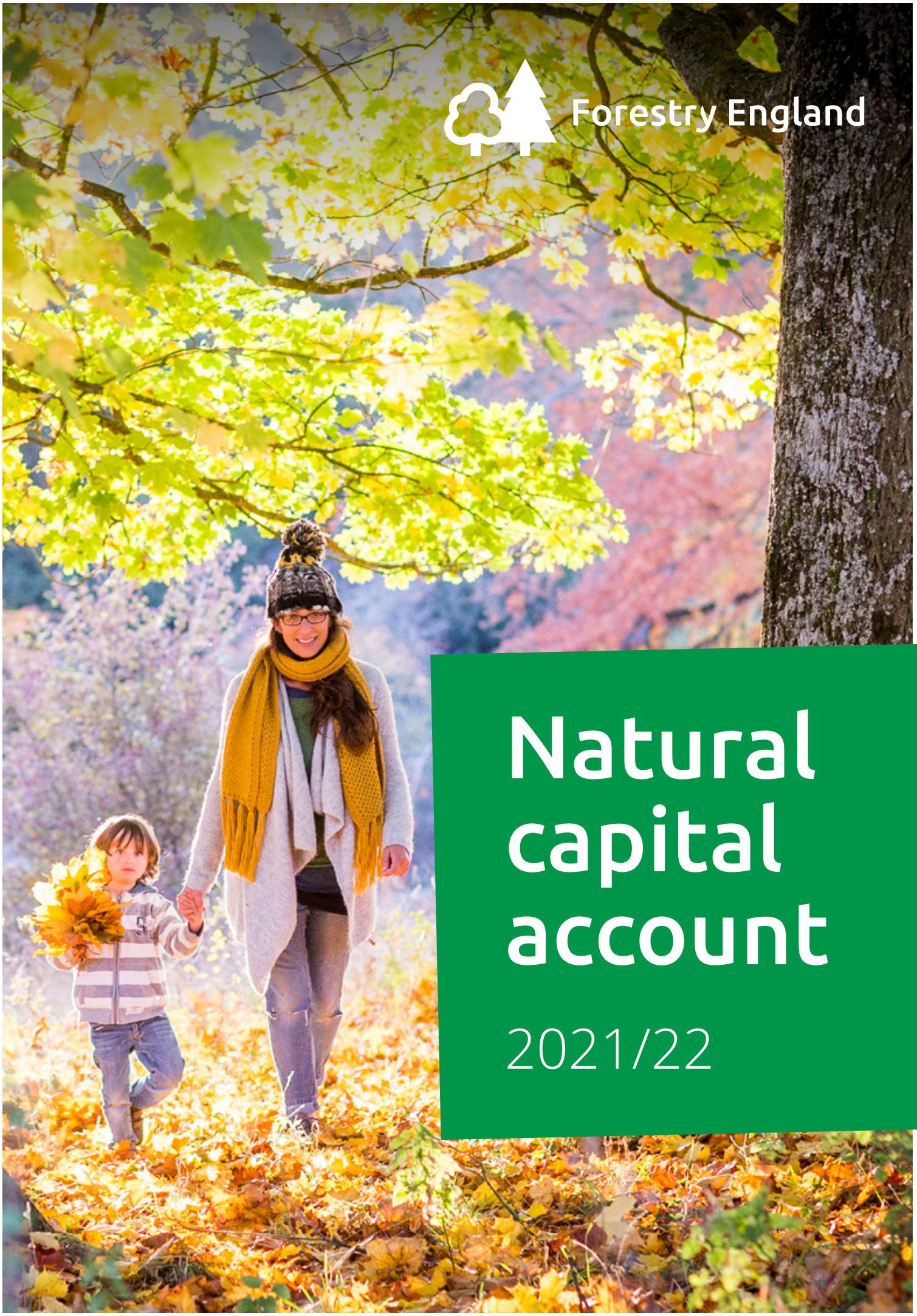

Natural capital account

2021/22

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'A river, with its waterfalls and meadows, a lake, a hill, a cliff or individual rocks, a forest, and ancient trees standing singly. Such things are beautiful; they have a high use which dollars and cents never [fully] represent.'

From the Journal of Henry D Thoreau, by Henry David Thoreau

Introduction (2021/22)

This is our seventh annual natural capital account (NCA). This NCA illustrates the breadth and scale of the benefits provided to society by the nation's forests and Forestry England's management of them.

These accounts do not place a 'price tag' on these diverse landscapes, which are held in trust for everyone. Rather, they are a way of showing the extent of the positive impact they have on our lives, helping us to better understand and value these natural assets so that we can protect them. They are, then, an attempt at showing the value to society of natural habitats and processes that markets and traditional financial accounts ignore, or are unable to include.

In this reporting year - 2021/22 - we estimate that the habitats that make up the nation's forests have delivered almost £2 billion of value to society. This is a staggering increase of around £1 billion compared to 2020/21. Over the long-term, this translates to a natural capital value of nearly £62 billion! There are multiple reasons for this large increase this year: we are delivering greater quantity of benefits for some ecosystem services, and also including more ecosystem services in our calculations.

Once again, we are leading the world with our Natural Capital Accounts, at the forefront of aligning process to the new British Standards Institute (BSI) Standard for Natural Capital Accounting (BS:8632).

This has allowed us to be sure of the quality of our processes, strengthening the credibility of our accounts and the integrity of the decisions they lead to.

This natural capital account is split into six broad sections:

1) **Asset register:** this shows the quantity and quality of natural capital assets across all the land we manage.

2) **Risk register:** showing the risks that could affect our natural capital assets.

3) **Physical flow account:** this shows the in-year delivery of natural capital benefits in terms of quantity, volume or weight of benefits delivered.

4) **Monetary flow account:** this shows the in-year delivery of natural capital benefits in terms of monetary value.

5) **Natural capital balance sheet:** this shows the overall natural capital values, and cost of maintaining, our forests into perpetuity.

6) **Natural capital income statement:** this shows the impacts of our operations and of our value chain on the quality and quantity of natural capital assets.

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
Increase (>3%)	↑
Minimal change	↔
Decrease (>3%)	↓

Impact of change	Key
Planned or positive	
Minimal impact	
Unplannned or negative	
No available data	

Indicator			Baseline year (2013/14)	Reporting year (2021/22)	Trend	% change	Units
Ecological communities and species							
Extent	Broad habitat area	Woodland area	207,876	208,073	↔	0.1%	ha
		Grassland area	12,748	15,974	↑	25.3%	
		Mountain, moors and heathlands area	28,564	29,363	↔	2.8%	
		Enclosed farmland	724	1,171	↑	61.7%	
		Freshwater	265	323	↑	21.9%	
		Urban area	742	803	↑	8.2%	
		Coastal margins area	17	18	↑	5.9%	
		Total area	250,936	255,724	↔	1.9%	
	Priority habitat within the nation's forests[a]	Broadleaved, mixed and yew woodland	22,757	22,417	↔	-1.5%	
		Lowland dry acid grassland and lowland heath	14,628	14,820	↔	1.3%	
		Other priority grassland	522	845	↑	61.9%	
		Lowland raised bog	782	781	↔	-0.1%	
		Blanket bog	6,793	6,879	↔	1.3%	
		Upland heathland	6,881	7,048	↔	2.4%	
		Other	364	526	↑	44.5%	
		Total area	52,727	53,317	↔	1.1%	
	Woodland area	Plantation	164,199	159,464	↔	-2.9%	
		Native	38,890	41,563	↑	6.9%	
		Non-intervention	13,275	13,588	↔	2.4%	
		Wood pasture	735	736	↔	0.1%	
	Total land area holdings	Freehold	198,883	203,140	↔	2.1%	
		Leasehold	53,341	48,215	↓	-9.6%	
		Total area	252,223	251,335	↔	-0.3%	
	Total agricultural land use		3,284	6,909	↑	110.4%	
	Area land under statutory designations	Sites of Special Scientific Interest	68,192	68,261	↔	0.1%	
		Areas of Natural Beauty	29,832	29,729	↔	-0.3%	
		Number of scheduled ancient monuments	969	967	↔	-0.2%	Count

Indicator			Baseline year (2013/14)	Reporting year (2021/22)	Trend	% change	Units
Ecological communities and species							
Extent		National Parks	85,230	85,217	↔	0.0%	ha
		Total area (designations overlap so not additive)	147,982	147,933	↔	0.0%	
	Area of open habitat		42,600	47,651	↑	11.9%	
	Plantations on Ancient Woodland -area by semi-naturalness score	1 (over 80 % native)	9,066	11,358	↑	25.3%	
		2 (between 50 to 80% native)	3,372	3,675	↑	9.0%	
		3 (between 20 to 50% native)	5,336	5,856	↑	9.7%	
		4 (under 20% native)	25,775	20,991	↓	-18.6%	
		0 (no trees)	981	937	↓	-18.6%	
		Total area	44,531	42,818	↓	-3.8%	
	Ancient semi natural woodland and PAWS -area by semi-naturalness score	1 (over 80 % native)	21,840	23,465	↑	7.4%	
		2 (between 50 to 80% native)	4,077	5,210	↑	27.8%	
		3 (between 20 to 50% native)	5,910	6,672	↑	12.9%	
		4 (under 20% native)	27,272	22,082	↓	-19.0%	
		0 (no trees)	1,698	1,613	↓	-5.0%	
		Total area	60,797	59,043	↔	-2.9%	
Condition	Condition of Sites of Special Scientific Interest[a]	% in favourable condition	35.6	38.27	↑	7.5%	%
		% in unfavourable recovering condition	63.9	58.13	↓	9.0%	
		% in unfavourable no change or declining condition	0.5	3.57	↑	614.6%	
		% part destroyed or destroyed condition	-	0.0%	↔	0.0%	
	Woodland Ecological Calculator Index[b]	Deadwood volume (native woodland)	6.0%	-	-	-	% ha favour-able
		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 (2021/22)	Trend	% change	Units
Trees of interest		Notable	562	562	⟷	0.0%	-
		Ancient	1,271	1,271	⟷	0.0%	
		Veteran	5,089	5,089	⟷	0.0%	
		Total	6,922	6,922	⟷	0.0%	
Condition	Number of deer and boar killed	Fallow	3,347	4,336	↑	29.5%	-
		Muntjac	2,228	4,313	↑	93.6%	
		Red	544	669	↑	23.0%	
		Roe	4,967	5,446	↑	9.6%	
		Sika	301	355	↑	17.9%	
		Boar	196	803	↑	309.7%	
		Chinese water deer	-	26	↑	n/a	
		Total	11,583	15,948	↑	37.7%	
	Carbon stock in...	...living biomass	11,381	12,745	↑	11.8%	Thousand metric tonnes
		...deadwood and litter	3,336	-	-	-	
		...soils	38,899	-	-	-	
	CO_2e stock in...	...living biomass	41,729	46,732	↑	11.8%	
		...deadwood and litter	12,232	-	-	-	
		...soils	142,630	-	-	-	
	Biomass stock...	...total above and below ground	22,761	25,490	↑	11.8%	Thousand metric tonnes oven-dry weight
		...above ground	17,734	19,872	↑	11.9%	
		...below ground	5,027	5,618	↑	11.6%	
	Standing timber volume (overbark standing)	Coniferous	26,148	27,817	↑	5.5%	Thousand m^3
		Broadleaved	8,147	10,166	↑	26.3%	
Location of the nation's forests by ONS land classification	Rural town and fringe		27,954	27,882	⟷	-0.3%	ha
	Rural village and dispersed		206,223	206,305	⟷	0.0%	
	Urban city and town		16,517	16,217	⟷	-1.8%	
	Urban conurbation		2,201	1,997	↓	-9.3%	
	Total		252,895	252,401	⟷	-0.2%	
Woodland accessibility							
Percentage of people in 'Priority Places' close to accessible woodland in the nation's forests.[a]			9	9.2	⟷	2.2%	%
Percentage of England's population within 6 miles of the nation's forests.[a]			49.1	48.7	⟷	-0.8%	
Percentage of England's population within 15min, 30min and 60min drive to the nation's forests.[a]		15 minutes	40.3	47.0	↑	16.6%	
		30 minutes	85.8	88.2	⟷	2.8%	
		60 minutes	99.9	100	⟷	0.1%	

Indicator			Baseline year (2013/14)	Reporting year (2021/22)	Trend	% change	Units
Soil							
Area of woodland on deep peat soils	Yield class > 6		16,405	15,999	⟷	-2.5%	ha
	Yield class ≤ 6		3,118	2,707	↓	-13.2%	
Area of woodland on shallow peat soils and peaty pockets	Yield class > 6		45,737	45,111	⟷	-1.4%	
	Yield class ≤ 6		7,164	6,916	↓	-3.5%	
Air							
Area of woodland in areas of differing air quality broad category	Urban		15,433	15,266	⟷	-1.1%	ha
	Peri-urban		25,152	25,221	⟷	0.3%	
	Rural		160,141	158,292	⟷	-1.2%	
	Total		200,727	198,779	⟷	-1.0%	
Other forms of capital							
Area of land by accessibility status	CRoW Access		150,430	150,222	⟷	-0.1%	ha
	Other accessibility based on deeds		86,228	86,209	⟷	-0.0%	
Km of published recreational routes across the estate	Walking		1,095	1,095	⟷	0.0%	km
	Cycling		1,303	1,304	⟷	0.1%	
	Other (e.g equestrian, rally)		497	659	↑	32.6%	
	Total		2,895	3,058	↑	5.6%	
Active Forests programme							
Total visitors			865,618	1,317,925	↑	52.3%	No. of people
Gender of visitors	Female		479,892	759,041	↑	58.2%	
	Male		383,834	555,417	↑	44.7%	
	Other		1,892	3,467	↑	83.2%	
Activities	Cycling		247,134	307,629	↑	24.5%	
	Running		174,181	458,415	↑	163.2%	
	Walking		207,719	374,723	↑	80.4%	
	Other		236,584	177,158	↓	-25.1%	

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 including a risk register within the natural capital accounts. The risk register must identify material risks to the natural capital assets as well as to 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 (2021/22).

Risk	Mitigations
Climate change emergency	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. 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.
Pests and diseases	Existing, emerging and potential pests and diseases as a result of a changing climate present significant risks in forests across Europe, including the nation's forests. 2021/22 has seen a significant increase in the number of outbreaks that are needing management. The risks that result are the impact on Forestry England's ability to deliver our planned programmes, and on timber prices. Changing climate and globalised plant trade both pose significant risks around introducing new pathogens, the resilience of our forests and the economic impact on timber production and markets. Biosecurity procedures and controls are used to mitigate the environmental threats together with strong financial management controls to manage the economic impacts. Forestry England is also taking action to build resilience into the nation's forests to achieve their long term sustainability.
Supply Chain	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.

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. For the first time, in our 2021/22 natural capital accounts we have included metrics for flood mitigation, air quality and physical health benefits of the nation's forests.

Spacial accounting by natural capital benefit	Indicator	Units	Baseline year	Reporting year
			2013/14	2021/22
Timber provision				
Woodland	Timber production	m^3/yr	1,520,129	1,135,060
Climate regulation[a]				
Woodland	Carbon sequestered/(emitted)	tCO_2/yr	1,645,657	1,674,510
Bogs			(11,663)	(11,783)
Grassland			-	-
Heathland			-	-
Woodland on deep peat soils			(88,569)	(84,863)
Woodland	Carbon embodied in environmental goods (timber)[b]	tCO_2/yr	1,032,504	783,416
Flood mitigation[c]				
Woodland	Total volume of water stored	m^3/yr	BL 2021/22 78,334,513	78,334,513
Air quality[c]				
Woodland	Volume of PM2.5 removed	kg/yr	BL 2021/22 1,289,984	1,289,984
Recreation				
Whole estate	Visits to the nation's forests	visits/yr	BL 2016/17 165,000,000	363,000,000
	Visitors to the nation's forests	visitors/yr	BL 2016/17 21,000,000	23,600,000
	Volunteers	hours/yr	201,337	101,599
Plant and seed supply				
Whole estate	Plants produced	number/yr	14,961,000	10,878,000
	Seed production	kg/yr	-	-
Food provision				
Whole estate	Wild game carcass numbers	number/yr	11,586	15,948
	Livestock production from tenant farmers	number/yr	7,309	6,283
	Crop production from tenant farmers	tonnes/yr	381	597
Minerals				
Whole estate	Mineral production	tonnes/yr	1,295,850	1,023,741
Physical health[c]				
Whole estate	Number of visits involving physical activities	number/yr	BL 2021/22 186,945,000	186,945,000

Notes:

a. 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.

b. 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.

c. Baseline year for flood mitigation, air quality and physical activity flows is same as reporting year, as it is the first year including them in the accounts.

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. In this year's account, we have added values for flood mitigation, air quality regulation, and the physical health benefits that the nation's forests provide.

Spacial accounting by natural capital benefit	Indicator	Units	Baseline year	Reporting year
			2013/14	2021/22
Timber provision				
Woodland	Net asset value for timber produced	£/yr	£14,087,278	£14,124,612
Climate regulation				
Woodland	Carbon sequestration value	£/yr	£111,619,479	£407,692,468
Bogs			(£791,035)	(£2,868,689)
Grassland			-	-
Heathland			-	-
Woodland on deep peat soils			(£6,007,366)	(£20,661,542)
Flood mitigation				
Woodland	Flood mitigation value	£/yr	£36,817,221	£36,817,221
Air quality				
Woodland	Air quality regulation	£/ha	£44,111,894	£44,111,894
Recreation				
Whole estate	Net asset value for recreation	£/yr	£397,160,955	£855,847,097
	Volunteers	£/yr	-	-
Plant and seed supply[b]				
Whole estate	Plant and seed revenues	£/yr	£3,091,288	£2,226,808
Food provision				
Whole estate	Wild game carcass value[c]	£/yr	£12,677	(£629,920)
	Livestock production value	£/yr	-	-
	Crop production value	£/yr	-	-
Minerals				
Whole estate	Mineral sales value	£/yr	£925,504	£390,698
Physical health				
Whole estate	Avoided medical treatment costs	£/yr	£286,609,907	£630,541,796
Total annual value of ecosystem services delivered		**£/yr**	**£887,637,802**	**£1,997,592,442**

Notes:

a. 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.

b. 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.

c. 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).

	Private value[a]					External value[a]					Total value				
	Baseline (2013/14)[b]	Cumulative gains/losses[c]	Additions[d]/ disposals[e]	Revaluations/ adjustments[f]	Reporting year (2021/22)	Baseline (2013/14)[b]	Cumulative gains/ losses[c]	Additions[d]/ disposals[e]	Revaluations/ adjustments[f]	Reporting year (2021/22)	Baseline (2013/14)[b]	Cumulative gains/ losses[c]	Additions[d]/ disposals[e]	Revaluations/ adjustments[f]	Reporting year (2021/22)
	Present value £m					Present value £m					Present value £m				
Net Asset Values[g]															
Timber	347	24	-	(220)	153	-	-	-	-	-	347	24	-	(220)	153
Food	(2)	(13)	-	-	(15)	-	-	-	-	-	(2)	(13)	-	-	(15)
Plants and seeds	-	-	-	-	-	17	3	-	-	20	17	3	-	-	20
Carbon sequestered	-	-	-	-	-	7,731	452	-	8,743	16,926	7,731	452	-	8,743	16,926
Mitigation of floods[g]	-	-	-	-	-	-	-	-	1,144	1,144	-	-	-	1,144	1,144
Air quality regulation[g]	-	-	-	-	-	-	-	-	1,187	1,187	-	-	-	1,187	1,187
Recreation and public access	(192)	146	-	-	(46)	12,532	15,038	-	-	27,570	12,340	15,184	-	-	27,524
Minerals	4	-	-	-	4	-	-	-	-	-	4	-	-	-	4
Physical health[g]	-	-	-	-	-	-	-	-	15,445	15,445	-	-	-	15,445	15,445
Total Net Asset Values	**157**	**157**	**-**	**(220)**	**96**	**20,280**	**15,493**	**-**	**26,519**	**62,292**	**20,437**	**15,650**	**-**	**26,299**	**62,388**
Government payment for ecosystem services funding[h]	625	(61)	-	-	564	(625)	61	-	-	(564)	-	-	-	-	-
Maintenance costs[i]	(428)	(334)	-	-	(762)	(59)	22	-	-	(37)	(487)	(312)	-	-	(799)
Total net natural capital assets value	**354**	**(238)**	**-**	**(220)**	**(102)**	**19,596**	**15,576**	**-**	**26,519**	**61,691**	**19,950**	**15,338**	**-**	**26,299**	**61,589**

Notes:

All values in 2021/22 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 The mitigation of floods, air quality regulation and physical health elements of the balance sheet are new additions to the balance sheet.

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).

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.

The new benefits included for the first time this year are:

- Physical health, estimated at £15 billion.
- Air quality, estimated at £1.2 billion.
- Flood damage mitigation, estimated at £1.1 billion).

Other substantial changes worth noting this year are:

- The value of carbon sequestration has substantially increased by £8.7 billion due to the new non-traded carbon values issued by BEIS in 2021.
- Recreational value has increased by £15 billion due to the substantially higher number of estimated visits to the nation's forests.
- All other benefits have altered by relatively modest amounts.

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

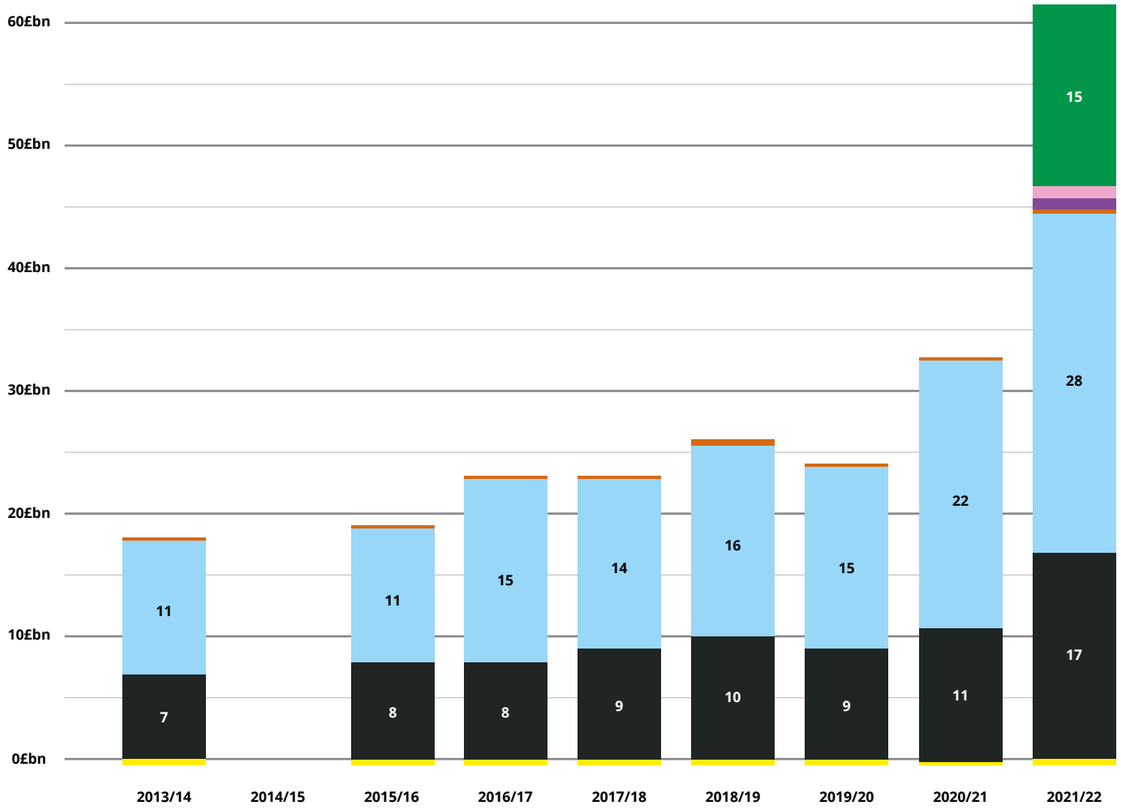
Breakdown by year of ecosystem services delivered, monetary value (£ billions)

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 this year's overall value 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.

Key

- Maintenance costs
- Carbon sequestered
- Recreation and public access
- Timber
- Flood mitigation
- Air quality regulation
- Physical health



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 2021/22.

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.

	2021/22		
	Private value £m/yr	**External value £m/yr**	**Total value £m/yr**
Scope 1			
Enhancements to natural capital			
Timber produced	14	-	14
Food produced	(1)	-	(1)
Carbon sequestration in all habitats	-	408	408
Air pollution removal by woodland	-	44	44
Recreation provision	(1)	887	886
Physical health benefits	-	631	631
Water storage	-	37	37
Plant and seed Supply	-	2	2
Total enhancements	**12**	**2,009**	**2,021**
Deteriorations to natural capital (own operations)			
GHG emissions from all habitats	-	(24)	(24)
GHG emissions from own energy use (whole enterprise)	-	(1)	(1)
Total deteriorations	**-**	(24)	(24)
Net contribution to natural capital	**12**	**1,984**	**1,996**

Annex A: natural capital accounting

For the first 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), 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.

The final accounts have been proofread by several Forestry England colleagues.

Confirm our NCA purpose statement

↓

Stakeholder analysis

- Who needs to be involved?
- Stakeholder needs identified.
- Engagement plan developed.

↓

Scoping exercise

- What does the NCA need to include in terms of balance sheet & income statement for both scopes 1 & 2?

↓

Materiality assessment

- Which benefits are delivered on a scale that is materially quantifiable?
- Are these included? To what degree?

Confirm scope decisions

- Decision to include both balance sheet and income statement for scopes 1 & 2 as an aspiration, although due to availability of data, this will take time to implement fully.

↓

Data gathering

- Pulling the relevant quantity data and value data from various internal and external systems.
- Working with partners to identify new benefits for inclusion and valuation.

↓

Quality assurance

- Ensuring the quality of data collected and its correct use in calculations.

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	-

		Natural capital assets			
Ecosystem service	**Private & public benefits**	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.

	2021/22
Forest regeneration and maintenance	£4,749,053
Habitat and Species Management	£6,410,038
Infrastructure	£10,827,713
Community and Learning	£2,535,562
Volunteering	£1,254,543
Total	£25,776,912

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.

	2021/22		
	Private value PV £m	**External value PV £m**	**Total value PV £m**
Asset values (monetised)			
Timber	1,597	-	1,597
Food	12	-	12
Plant and seeds	-	20	20
Carbon Sequestered	-	16,926	16,926
Food Risk Mitigated	-	1,144	1,144
Air Quality Regulated	-	1,187	1,187
Recreation and Public Access	799	27,570	28,369
Minerals	4	-	4
Physical Health	-	15,445	15,445
Total gross asset value	**2,412**	**62,292**	**64,704**
Asset values (non-monetised)			
Other material unquantified benefits	-	-	-
Liabilities			
Production costs			
Timber	(1,444)	-	(1,444)
Food	(27)	-	(27)
Plants & Seeds	-	-	-
Carbon Sequestered	-	-	-
Mitigation of floods	-	-	-
Air quality regulation	-	-	-
Recreation and Public Access	(845)	-	(845)
Minerals	-	-	-
Physical Health	-	-	-
Natural capital maintenance costs	-	-	
Government Payment for Ecosystem Services Funding	564	(564)	-
Maintenance Costs	(762)	(37)	(799)
Total gross liabilities	**(2,514)**	**(601)**	**(3,115)**
Net natural capital asset value (monetised)	**(102)**	**61,691**	**61,589**

	2021/22		
	Private value PV £m	**External value PV £m**	**Total value PV £m**
Net benefits			
Timber	153	-	153
Food	(15)	-	(15)
Plant & Seeds	-	20	20
Carbon Sequestered	-	16,926	16,926
Food Risk Mitigated	-	1,144	1,144
Air Quality Regulated	-	1,187	1,187
Recreation and Public Access	(46)	27,570	27,524
Minerals	4	-	4
Physical Health	-	15,445	15,445
Net asset value (monetised)	**96**	**62,292**	**62,388**

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 Informations System database, 'ForesterWeb' which is used to estimate timber production (thinning and felling) in m^3 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 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 National Forest Inventory team. This time they use Forestry England's forest plans to forecast 'net volume increments' (the volume of tree growth in m^3). This is then converted into tonnes of CO_2 in the accounts, based on sequestration models developed by Forest Research.

The value per tonne of sequestered CO_2 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 2021 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 – £2.46 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 £3.37 in 2021 prices. The monetary unit value is assumed to remain constant over time.

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Butterfly Conservation

British Trust for Ornithology

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