Natural Capital Risk Register Appendix 1

Evidence and additional information for the Risk Register scoring

October 2024

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Table of Contents

1. Background

The natural capital risk method for the State of Natural Capital (SONC) Report (Lusardi and others, 2024) involved updating the UKNEA's 2011 assessment of the relative importance of, and trends in the impact of direct drivers on ecosystem asset extent and condition (Winn & Tierney, 2011). The assessment was updated using expert opinion, informed by the best available evidence, to indicate whether the ratings have changed since 2011. The evidence used to inform the expert opinion is outlined in sections 2-8.

Section 9 provides additional information on the importance ratings given to each driver-benefit relationship. For each driver-benefit relationship, it was assessed whether the driver of change has the potential to impact on the provision of the benefit. This was informed by UKNEA work which assessed the impact and trend of impact of drivers on the delivery of benefits.

1.1. Indicator evidence

A subset of our natural capital indicators (see Craven, Bell & Dobson, 2024 for more detail, including a breakdown of data sources) could be assessed against **existing policy targets,** and/or were linked to datasets allowing us to infer **trends over time.**

Targets that link to the metrics were taken from reports, strategies, and environmental agreements (e.g., UK Marine Strategy, Environmental Improvement Plan). Metrics were assessed against targets using the below criteria:

Performance category	Criteria for assignment
Met/Exceeded	Assigned if the metric value meets the target value exactly, or exceeds the target
Below	Misses the target by up to 50%
Substantially below	Misses the target by over 50%
N/A	No target available

Trends were assessed to understand changes to the extent and condition of ecosystems since the UKNEA was published in 2011. However, not all the indicator data identified went back this far. In other cases, due to the nature of the indicator (e.g., a long-term indicator) or the need to use more data points for a robust assessment of change, trends were assessed over longer periods of time. The date ranges over which trends were assessed are included in the Indicators and Data Appendix of the SONC Report (Craven, Bell & Dobson, 2024). The following criteria were used to assess trend:

Performance category	Criteria for assignment
Significantly positive	> 50% of the earliest recorded value
Positive	Up to 50% over the earliest recorded value
No change	The value for the metric is the same as previous recorded value
Negative	Up to 50% under the earliest recorded value
Significantly negative	> 50% under the earliest recorded value
No trend	No trend could be assessed because historical data are not available

1.2. D1

The 25 Year Environment Plan D1 Indicator of habitat quantity, quality and connectivity is continuing to be developed. A list of habitat quality attributes has been produced, along with benchmarks for defining poor, moderate and good status for each attribute in each habitat type. These have been applied to available datasets such as data collected for Countryside Survey, the Water Framework Directive and other independent studies to produce an assessment of overall habitat quality between 2007-2022 (Maskell and others, 2023, unpublished). Work is in development to bring in measurable elements of natural function for each habitat type, as well as determine how this indicator will utilise the England Ecosystem Survey when these data are available. The habitats used in the D1 report were matched to the ecosystem asset categories used in the SONC report. This, and the expert opinion of staff working on the development of the D1 indicator, contributed to the risk scoring. As the report is not yet published, it is not possible to include it in this appendix.

1.3. Sensitivity to climate change

A 2023 Natural England report evaluated the sensitivity of habitats (in good and degraded condition) to climate change (Staddon, Thompson & Short, 2023). Experts scored habitats on a scale of 1-5 (1 being low and 5 high) based on the habitat's sensitivity to climate change and commented on the main climate change risk factors for each habitat.

Good habitat contains all or most of key expected organisms and functions similarly to pristine habitat. **Degraded habitat** lacks key organisms but is still recognisable as that habitat type. Habitats ranked 4 and 5 were considered the most sensitive. A large difference between the degraded and good condition score suggests that degradation has a very important influence on sensitivity.

1.4. Additional evidence

During the review phase, specialists provided additional evidence to support their decision-making: these evidence sources are included in this annex for reference.

They are organised by driver of change, and then whether they were used to inform the impact or trend of impact rating (or both). For conciseness, throughout this report 'resource exploitation' is used to refer to the driver of change 'natural resource use and exploitation'.

1.5. Summary of ratings

Tables are provided which outline a summary of the impact and trend rating decisions for each ecosystem asset. They detail whether the impact or trend ratings from the UKNEA (2011) matrix were retained, or whether they were changed. If the ratings were changed, detail is provided on what the original rating was, and what it was changed to.

Uncertainty ratings are also provided for each impact and trend rating, based on the type of evidence that was used to inform the expert opinion. All the decisions used the UKNEA rating as a starting point; the uncertainty assessment considered the extent to which post-2011 evidence sources were available and supported the decision-making. The three categories used for the uncertainty assessment were:

A – based on UKNEA plus post-2011 evidence
B – based on UKNEA plus expert judgment
C – based on UKNEA only (decision to retain due to lack of post-2011 evidence)

1.6. Driver-Benefit Relationships

For each driver/benefit relationship, it was assessed whether the driver of change has the potential to impact on the benefit. This was informed by UKNEA work which assessed the impact and trend of impact of drivers on the delivery of benefits.

Section 2.3.1. of the Natural Capital Risk Register (Morgan & Lusardi, 2024) describes the logic flow used to produce the importance ratings. These were informed by the original UKNEA work, and then reviewed/updated using more recent evidence and expert opinion.

Importance was assigned through rating each driver/benefit relationship as one of:

a. **Major -** the driver of change has a major negative impact on the provision of the benefit and/or greatly increases the demand for the benefit,
b. **Minor -** the driver of change has a minor negative impact on the provision of the benefit and/or slightly increases the demand for the benefit,
c. **Unclear** - the driver of change can have both positive and negative impacts on the provision of/demand for the benefit, so the overall impact is less clear, or,
d. **Negligible -** the driver of change has a negligible impact on the provision of/demand for the benefit.

Additional detail is also provided on the driver-cultural benefit relationships. For each ecosystem asset, the impact of drivers of change on practices related to different uses of nature were considered.

Uncertainty ratings are also provided for each importance rating, using the same categories as detailed in section 1.5 to describe the type of evidence the decisions were based on. In this assessment, all importance ratings were given an uncertainty rating of ‘B’ as the UKNEA was used as a starting point, and experts were consulted to review and update the ratings.

2. Marine and coastal margins

2.1. Indicator data

Summary of status and trend assessments for marine and coastal natural capital indicators

Metric	Target	Trend
Shellfish Water Protected Area condition assessment (% that pass, **2021**)	N/A	Positive
Harbour seal abundance (% change **2015-2020**)	Met/Exceeded	Positive
Harbour seal abundance (% change **1995-2020**)	Met/Exceeded	Positive
Atlantic grey seal pup production (% change **2013-2018**)	Met/Exceeded	Significantly positive
Atlantic grey seal pup production (% change **1991-2018**)	Met/Exceeded	Significantly positive
% change in proportion of breeding marine birds meeting population size targets for GES (1996-2016 **- GNS**, 1996-2019 **- CS**)	N/A	Negative
Breeding marine birds (% of species meeting population size target for Good Ecological Status)	Below	Negative
Non-breeding marine birds (% of species meeting population size target for Good Ecological Status)	Below	Negative
Marine Protected Areas coverage (% area)	Met/Exceeded	No trend
Marine feature condition (% good) (H1130, H1140, H1160)	Below	Negative
Marine feature condition (% good) (H1110, H1170, H8330)	Below	No change
Marine feature condition (% good) (H1150)	Below	No trend
Bathing Waters condition (% good/excellent, **2022**)	Below	Positive
Estuaries ecological status (% good, **2021**)	Substantially below	No change

Metric	Target	Trend
Coastal waters ecological status (% good, **2021**)	Below	No change
Invasive non-native species established along >10% of Great Britain's coastline (cumulative total of species **1969-2020**)	N/A	Negative
Changes in overall plankton communities in the Greater North Sea (GNS)[a]	GNS: N/A	GNS: No change
Changes in overall plankton communities in the Celtic Sea (CS)[a]	CS: N/A	CS: Negative
Changes in phytoplankton and zooplankton abundance[b]	N/A	Negative
Long term change in the mean maximum length of demersal fish communities (**1983-2020**)[c]	N/A	Mixed - positive (4 areas), no change (1 area), negative (2 areas
Long term change in the mean typical length of demersal fish communities (**1983-2020**)[d]	N/A	Mixed - positive (2 areas), no change (3 areas), negative (2 areas)
Fish stocks where biomass levels support sustainable reproductive capacity (%)	Below	Positive
Seabed habitat subject to high levels of disturbance by fishing (% area predicted, (**2018**)	Below/Substantially below	No trend
Coastal and estuarine waters chemical status (% good, **2019**)	Substantially below	No trend
Coastal waters chemical status (excluding uPBTs, % good (**2019**)	Met/Exceeded	Positive
Chemical status (excluding uPBTs) of estuarine waters - % at good status (**2019**)	Below	Positive

[a, b] Not listed in Craven, Bell & Dobson (2024). Data sources: Holland and others (2023); Louchart and others (2023)

[c, d] Not listed in Craven, Bell & Dobson (2024). Data source: Defra (2023a)

2.2. Sensitivity to climate change

Marine and Coastal habitat sensitivity to climate change scores (1 – lowest sensitivity, 5 – highest sensitivity)

Habitat	Rescaled expert weighted score		Main risk identified
	Good	Degraded	
Coastal Vegetated Shingle	3	4	Sea level rise, erosion, and storms
Machair	3	4	Sea level rise, storms, and coastal squeeze
Coastal sand dunes	3	5	Sea level rise, storms, and coastal squeeze
Coastal saltmarsh	4	5	Sea level rise, storms, and coastal squeeze
Intertidal mudflats	4	4	Sea level rise, storms, and coastal squeeze
Saline lagoons	4	4	Sea level rise, storms, warming, coastal

Source: Staddon, Thompson & Short, 2023

2.3. Additional evidence

Summary of additional evidence used to inform the impact and trend ratings for marine and coastal margins ecosystems.

Driver	Rating	Evidence
Land- and sea-use change	Trend	Natural England casework on marine development, particularly ongoing/expected future impacts of offshore wind developments.
Land- and sea-use change	Impact	Loss of coastal margin ecosystems “squeezed” between coastal defences and sea level rise, due to climate change.
Climate change	Impact	Recent high sea temperatures and documented cases of phenological mismatches, and shifts in ranges, distribution, and abundance (Edwards and others, 2020; Burton and others, 2023; Cornes and others, 2023; Fox and others, 2023; Martin, Banga & Taylor, 2023).
Pollution	Trend	UK Marine Strategy Indicator D8 Contaminants (Defra, 2019) – Good Environmental Status (GES) largely achieved as of 2019, with contaminants at levels that

Driver	Rating	Evidence
		should not cause harm to sea life. Unlikely for GES to be fully achieved soon due to highly persistent nature of PBT chemicals.
Pollution	Impact	Newer, stricter standards and the inclusion of uPBTs in assessments of chemical status mean that every water body fails to meet the criteria for good chemical status (Environment Agency & Natural England, 2023).
Resource exploitation	Trend	Outcome Indicator Framework, C10: Productive seas: fish and shellfish stocks fished sustainably (Defra). Marine fish (quota) stocks of UK interest harvested sustainably is showing improvement over both the short- and long-term.
Resource exploitation	Impact	UK Marine Strategy Indicator D3 Commercial Fish (Defra, 2019) – highlights pressure for intertidal shellfish gathering.
Invasive species	Trend	Great Britain Invasive Non-Native Species Strategy 2023-2030 (Defra, 2023b) suggests an increasing trend in marine invasive non-native species.
Invasive species	Impact	UK Marine Strategy Indicator D2 Non-Indigenous Species (Defra, 2019) – as of 2018, the UK had not achieved its aim of GES for non-indigenous species.

2.4. Summary of ratings

Summary of impact and trend decisions for marine

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
Land- and sea-use change	Changed impact rating from moderate to high	A – based on UKNEA plus post-2011 evidence	Changed trend rating from increasing impact to very rapid increase of the impact	B – based on UKNEA plus expert judgment
Pollution	Retained impact rating of moderate	A – based on UKNEA plus post-2011 evidence	Changed trend rating from decreasing impact to	A – based on UKNEA plus post-2011 evidence

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
			continuing impact	
Resource exploitation	Retained impact rating of very high	A – based on UKNEA plus post-2011 evidence	Retained trend rating of increasing impact	A – based on UKNEA plus post-2011 evidence
Climate change	Changed impact rating from moderate to very high	A – based on UKNEA plus post-2011 evidence	Retained trend rating of very rapid increase of the impact	B – based on UKNEA plus expert judgment
Invasive species	Retained impact rating of low	B – based on UKNEA plus expert judgment	Retained trend rating of very rapid increase of the impact	B – based on UKNEA plus expert judgment

Summary of impact and trend decisions for coastal margins

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
Land- and sea-use change	Changed impact rating from high to very high	B – based on UKNEA plus expert judgment	Retained trend rating of increasing impact	B – based on UKNEA plus expert judgment
Pollution	Retained impact rating of very high	A – based on UKNEA plus post-2011 evidence	Retained trend rating of continuing impact	B – based on UKNEA plus expert judgment
Resource exploitation	Retained impact rating of low	C – based on UKNEA only (decision to retain due to lack of post-2011 evidence)	Retained trend rating of decreasing impact	C – based on UKNEA only (decision to retain due to lack of post-2011 evidence)
Climate change	Changed impact rating from high to very high	B – based on UKNEA plus expert judgment	Retained trend rating of very rapid increase of the impact	B – based on UKNEA plus expert judgment
Invasive species	Retained impact rating of moderate	C – based on UKNEA only (decision to retain due to lack of post-2011 evidence)	Retained trend rating of increasing impact	C – based on UKNEA only (decision to retain due to lack of post-2011 evidence)

3. Freshwaters and wetlands

3.1. Indicator data

Summary of status and trend assessments for freshwaters and wetlands natural capital indicators

Metric	Target	Trend
Groundwater quantity status (% of waterbodies at good, **2019**)	Below	Positive
Pond density (number of ponds/km^2) (**1998-2007**)[a]	N/A	Positive
River chemical status (% good, **2019**)	Substantially below	No trend
River chemical status (excluding uPBTs, % good, **2019**)	Below	Positive
Lake chemical status (% good, **2019**)	Substantially below	No trend
Lake chemical status (excluding uPBTs, % good, **2019**)	Met/Exceeded	Positive
River phosphorus status (% good, **2019**)	Substantially below	Positive
Lake phosphorus status (% good, **2019**)	Substantially below	Positive
River ecological status (% good, **2019**)	Substantially below	Negative
Lake ecological status (% good, **2019**)	Substantially below	Negative
Groundwater quality (% good, **2019**)	Substantially below	Negative
Water and Wetland Bird Index (% change **2017-2022**)	Below	Negative
Water and Wetland Bird Index (% change **1975-2022**)	Below	Negative
Water and Wetland Bird Index, changes in individual species **2016-2021** (% of species)	Below	Mixed – no clear trend
Water and Wetland Bird Index, changes in individual species **1975-2021** (% of species)	Below	Mixed – no clear trend
River fish status (% good, **2019**)	Substantially below	No change

Metric	Target	Trend
River invertebrate status (% good, **2019**)	Below	Positive
River macrophytes and phytobenthos status (% good, **2019**)	Substantially below	Positive
Lake phytoplankton status (% good, **2019**)	Below	Negative
Lake macrophytes and phytobenthos status (% good, **2019**)	Substantially below	Positive
% of surface water achieving sustainable extraction criteria **(2017-2022[b])**	Below	Positive

[a] Not listed in Craven, Bell & Dobson (2024). Data source: Williams and others (2010)
[b] Not listed in Craven, Bell & Dobson (2024). Data source: Defra B5

3.2. Sensitivity to climate change

Freshwater habitat sensitivity to climate change scores (1 – lowest sensitivity, 5 – highest sensitivity)

Habitat	Rescaled expert weighted score		Main risk identified
	Good	Degraded	
Base-poor spring and spring brook	4	5	Change in flows, droughts, degraded riparian zone, and rising temperature
Calcareous spring and spring brook	4	5	Change in flows, drought, eutrophication, and rising temperature
Permanent non-tidal, fast, turbulent watercourse of montane to alpine regions with mosses	4	5	Change in flows, rising temperature, degraded riparian zone, and drought
Permanent non-tidal, fast, turbulent watercourse of plains and montane regions with Ranunculus spp.	3	5	Change in flows, rising temperature, water flows, and drought
Permanent non-tidal, smooth-flowing watercourse	3	5	Change in flows, rising temperature, eutrophication, and drought
Tidal river, upstream from the estuary	3	5	Change in flows, rising temperature, saline intrusion, and drought
Temperate temporary running watercourse	4	5	Drought, eutrophication, and rising temperature

Habitat	Rescaled expert weighted score		Main risk identified
	Good	Degraded	
Oligotrophic and dystrophic lakes	4	5	Drought, eutrophication, and rising temperature
Ponds	4	5	Drought, eutrophication, and rising temperature
Mesotrophic lakes	3	5	Drought, eutrophication, and rising temperature
Eutrophic standing waters	3	5	Drought, eutrophication, and rising temperature
Aquifer fed naturally fluctuating water bodies	3	4	Drought /drying out
Upland flushes, fens and swamps	4	5	Drought /drying out, and invasives
Purple moor grass and rush pastures	3	4	Drought
Lowland fens	4	4	Drought, but also flooding
Reedbeds	2	3	Habitat has good resilience, drought the main risk, with some risk from hydrological changes and saline intrusion

Source: Staddon, Thompson & Short, 2023

3.3. Additional evidence

Summary of additional evidence used to inform the impact and trend ratings for freshwaters and wetlands.

Driver	Rating	Evidence
Resource exploitation	Trend	The Plan for Water shows that there is increasing water demand expected with climate change (Defra, 2023c): “around 4 billion litres of additional water a day will be needed in England by 2050”. Climate change is already impacting water resources through more severe and frequent drought and flooding.
Climate change	Impact	The Third Climate Change Risk Assessment for the UK (UK Climate Risk, 2021) reports risks to freshwater species and habitats from changing climatic conditions, extreme events, and pests, pathogens, and invasive

Driver	Rating	Evidence
		species. These risks have been assessed as having the highest urgency score of 'more action needed' in England.
Invasive species	Impact	Great Britain Invasive Non-Native Species Strategy 2023-2030 reports that "as a proportion of all known established non-native species in GB, approximately 3% of the risk assessed species have been terrestrial, 24% marine and 58% freshwater" (Defra, 2023b).

3.4. Summary of ratings

Summary of impact and trend decisions for freshwaters and wetlands

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
Land-use change	Retained impact rating of very high	A – based on UKNEA plus post-2011 evidence	Retained trend rating of continuing impact	A – based on UKNEA plus post-2011 evidence
Pollution	Changed impact rating from high to very high	A – based on UKNEA plus post-2011 evidence	Changed trend rating from decreasing impact to continuing impact	A – based on UKNEA plus post-2011 evidence
Resource exploitation	Retained impact rating of high	A – based on UKNEA plus post-2011 evidence	Retained trend rating of increasing impact	B – based on UKNEA plus expert judgment
Climate change	Changed impact rating changed from low to very high	A – based on UKNEA plus post-2011 evidence	Changed trend rating from increasing impact to very rapid increase of the impact	A – based on UKNEA plus post-2011 evidence
Invasive species	Changed impact rating changed from moderate to high	A – based on UKNEA plus post-2011 evidence	Retained trend rating of increasing impact	A – based on UKNEA plus post-2011 evidence

4. Woodlands

4.1. Indicator data

Summary of status and trend assessments for woodlands natural capital indicators

Metric	Target	Trend
Tree pests and diseases becoming established in England	N/A	Negative
Nutrient-sensitive habitat where nitrogen critical load is exceeded (%)[a]	N/A	No change
Woodland bird index (% change **2013-2018**)	Below	Negative
Woodland bird index (% change **1970-2018**)	Below	Negative
Woodland Bird Index, changes in individual species **2016-2021** (% of species)	Below	Mixed – no clear trend
Woodland Bird Index, changes in individual species **1970-2021** (% of species)	Below	Mixed – no clear trend
Butterflies of the wider countryside in woodland index (% change **2016-2021**)	Met/Exceeded	Positive
Butterflies of the wider countryside in woodland index (% change **1990-2021**)	Below	Negative
Butterflies of the Wider Countryside in Woodland Index, changes in individual species **2017-2022** (% of species)	Met/Exceeded	No change
Butterflies of the Wider Countryside in Woodland Index, changes in individual species **1990-2021** (% of species)	Below	Mixed – no clear trend

[a]All (100%) of nutrient-sensitive woodland habitat is subject to exceedance of its nitrogen critical load.

4.2. D1

Woodlands were not included in the summary of habitat condition trends in the D1 habitat quality report.

4.3. Sensitivity to climate change

Woodland habitat sensitivity to climate change scores (1 – lowest sensitivity, 5 – highest sensitivity)

Habitat	Rescaled expert weighted score		Main risk identified
	Good	Degraded	
Traditional orchards	1	2	Pests and diseases
Wood-pasture and parkland	2	2	Storms, pests, and diseases
Upland oakwood	3	3	Drought, pests, diseases, and wildfires
Lowland beech and yew woodland	3	4	Drought, pests, diseases, and wildfires
Upland mixed ashwoods	3	3	Storms, drought, pests, and diseases
Wet woodland	3	3	Drought, pests, diseases, and wildfires
Lowland mixed deciduous woodland	1	2	Good resilience, but at risk from drought, pests, diseases, and wildfires
Upland birchwoods	3	4	Warming, pests, diseases, and drought
Native pine woodlands	3	3	Drought, pests, diseases, wildfires, and storms

Source: Staddon, Thompson & Short, 2023

4.4. Additional evidence

Summary of additional evidence used to inform the impact and trend ratings for woodlands.

Driver	Rating	Evidence
Land-use change	Impact	The Outcome Indicator Framework (OIF) woodland indicator D3 (Area of woodland in England, 1980-2022) shows that extent has shown little or no change (Defra).

Driver	Rating	Evidence
Climate change	Impact	The Third Climate Change Risk Assessment for the UK (UK Climate Risk, 2021) reports risks to forestry from changing climatic conditions, extreme events, and pests, pathogens, and invasive species. These risks have been assessed as having the highest urgency score of 'more action needed' in England.
Invasive species	Trend	Ash trees make up 12% of broadleaf woodland in Great Britain but are under threat from ash dieback (Defra, Forest Research & Forestry Commission, 2019). The disease is present in most parts of the UK and is causing widespread decline of ash trees in some areas (Forestry Commission, 2021).
Invasive species	Impact	Forest Research report how the changing climate of the UK is predicted to increase the growth or spore release of many common root pathogens (e.g., Honey fungus disease, root rot, oak decline); increased droughts may also increase infection incidence (Frederickson-Matika & Riddell, 2021).

4.5. Summary of ratings

Summary of impact and trend decisions for woodlands

Driver	Impact	Impact (Trend)	Trend	Uncertainty (Trend)
Land-use change	Retained impact rating of moderate	A – based on UKNEA plus post-2011 evidence	Changed trend rating from continuing impact to increasing impact	A – based on UKNEA plus post-2011 evidence
Pollution	Changed impact rating from low to moderate	A – based on UKNEA plus post-2011 evidence	Changed trend rating from continuing impact to increasing impact	A – based on UKNEA plus post-2011 evidence
Resource exploitation	Retained impact rating of very high	B – based on UKNEA plus expert judgment	Retained trend rating of decreasing impact	C – based on UKNEA only (decision to retain due to lack

Driver	Impact	Impact (Trend)	Trend	Uncertainty (Trend)
				of post-2011 evidence)
Climate change	Changed impact rating from low to moderate	A – based on UKNEA plus post-2011 evidence	Retained trend rating of increasing impact	A – based on UKNEA plus post-2011 evidence
Invasive species	Changed impact rating from moderate to high	A – based on UKNEA plus post-2011 evidence	Changed trend rating from increasing impact to very rapid increase of the impact	A – based on UKNEA plus post-2011 evidence

5. Mountains, Moorlands and Heaths (MMH)

5.1. Indicator data

Summary of status and trend assessments for mountains, moorlands and heaths natural capital indicators

Metric	Target	Trend
Nutrient-sensitive habitat where nitrogen critical load is exceeded (%)[a]	N/A	No change
Upland Bird Index (% change **2017-2022**)	Below	Negative
Upland Bird Index (% change **1994-2022**)	Below	Negative
Upland Bird Index, changes in individual species **2016-2021** (% of species)	Substantially below	Mixed – no clear trend
Upland Bird Index, changes in individual species **1994-2021** (% of species)	Below	Mixed – no clear trend

[a]100% of bog and montane and 99% of dry shrub heath nutrient-sensitive habitats are subject to exceedance of their nitrogen critical load.

5.2. Sensitivity to climate change

MMH habitat sensitivity to climate change scores (1 – lowest sensitivity, 5 – highest sensitivity)

Habitat	Rescaled expert weighted score		Main risk identified
	Good	Degraded	
Wet lowland heath	**4**	**4**	Drought and wildfire, risk of invasives
Dry lowland heath	**3**	**4**	drought and wildfire, risk of invasives
Wet upland heath	**3**	**4**	Drought and wildfire, risk of invasives
Dry upland heath	**2**	**3**	Relatively resilient, risks from wildfire, but also drought
Raised bog (PHI Lowland raised bog)	**3**	**5**	Drying out would allow invasive
Blanket Bog	**3**	**5**	Drying out would allow invasive

Habitat	Rescaled expert weighted score		Main risk identified
	Good	Degraded	
Mountain Heaths and Willow Scrub	4	5	Rising temperature, invasive species
Inland Rock Outcrop and Scree Habitats	1	2	Relatively resilient, some climate risk
Calaminarian Grasslands	1	2	Relatively resilient, high metals keep out competitors
Limestone Pavements	2	3	Invasives, drought
Maritime Cliff and Slopes	2	3	Sea level rise, storms

Source: Staddon, Thompson & Short, 2023

5.3. Additional evidence

Summary of additional evidence used to inform the impact and trend ratings for mountains, moorlands and heaths.

Driver	Rating	Evidence
Pollution	Impact	Lots of sites in unfavourable condition – Favourable Conservation Status (for UK level data) in 2019 reports that 5/5 bog habitat types and 5/6 heath habitat types were unfavourable. Pollution is ranked as a high pressure or threat for many of the bog and heath habitat types (JNCC, 2019).
Resource exploitation	Trend	70% of the UK's water supply comes from upland catchments (RSPB, 2014). The Plan for Water reports that we currently use "about 14 billion litres of water per day and will need 4 billion more by 2050" (Defra, 2023c).
Climate change	Trend	Wildfire statistics for England show an unclear trend to date; there is considerable variability in area affected and number of occurrences within a year (Forestry Commission, 2023). However, 2018-2020 saw the largest number of fires and the largest burned area of the period between 2010-2020. Future projections show that under 2C and 4C climate scenarios, the % of days of 'very high' fire weather index may rise to 27% and 55% respectively (Belcher and others, 2021).

5.4. Summary of ratings

Summary of impact and trend decisions for mountains, moorlands and heaths

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
Land-use change	Retained impact rating of very high	A – based on UKNEA plus post-2011 evidence	Retained trend rating of increasing impact	A – based on UKNEA plus post-2011 evidence
Pollution	Retained impact rating of very high	A – based on UKNEA plus post-2011 evidence	Retained trend rating of continuing impact	A – based on UKNEA plus post-2011 evidence
Resource exploitation	Retained impact rating of moderate	B – based on UKNEA plus expert judgment	Retained trend rating of increasing impact	A – based on UKNEA plus post-2011 evidence
Climate change	Changed impact rating from moderate to very high	A – based on UKNEA plus post-2011 evidence	Changed trend rating from increasing impact to very rapid increase of the impact	A – based on UKNEA plus post-2011 evidence
Invasive species	Retained impact rating of low	A – based on UKNEA plus post-2011 evidence	Retained trend rating of continuing impact	A – based on UKNEA plus post-2011 evidence

6. Semi-natural grasslands

6.1. Indicator data

Summary of status and trend assessments for semi-natural grasslands natural capital indicators

Metric	Target	Trend
Nutrient-sensitive habitat where nitrogen critical load is exceeded (%)[a]	N/A	No change

[a]99% of acid and 87% of calcareous nutrient-sensitive grassland habitat are subject to exceedance of their nitrogen critical load.

6.2. Sensitivity to climate change

Semi-natural grasslands habitat sensitivity to climate change scores (1 – lowest sensitivity, 5 – highest sensitivity)

Habitat	Rescaled expert weighted score		Main risk identified
	Good	Degraded	
Lowland dry acid grassland	**2**	**3**	Drought
Upland acid grassland	**2**	**3**	Drought
Lowland calcareous grassland	**2**	**2**	Drought and wildfires
Upland calcareous grassland	**2**	**3**	Drought and wildfires
Dry lowland meadows	**2**	**3**	Drought and temperature
Wet lowland meadows	**3**	**4**	Sensitivity to drought and drying out
Upland hay meadows	**3**	**4**	Drought, rising temperatures, and invasives

Source: Staddon, Thompson & Short, 2023

6.3. Additional evidence

Summary of additional evidence used to inform the impact and trend ratings for semi-natural grasslands.

Driver	Rating	Evidence
Land-use change	Trend	Based on Natural England casework for Environmental Impact Assessment (EIA) and planning.
Pollution	Trend & Impact	Based on impacts for floodplain meadows and upland hay meadows.
Resource exploitation	Trend & Impact	Based on reported under-grazing of lowland semi-natural grassland sites, deterioration of the habitat, and scrub encroachment.
Climate change	Trend & Impact	The Climate Change Adaptation Manual (NE751) reported that floodplain grazing marsh, upland hay meadows, purple moor grass/rush pasture are assessed as medium sensitivity, but other grassland priority habitat is assessed as low sensitivity (Natural England & RSPB, 2019).

6.4. Summary of ratings

Summary of impact and trend decisions for semi-natural grasslands

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
Land-use change	Retained impact rating of very high	B – based on UKNEA plus expert judgment	Changed trend rating from decreasing impact to increasing impact	B – based on UKNEA plus expert judgment
Pollution	Retained impact rating of very high	A – based on UKNEA plus post-2011 evidence	Changed trend rating from continuing impact to increasing impact	A – based on UKNEA plus post-2011 evidence
Resource exploitation	Retained impact rating of high	B – based on UKNEA plus expert judgment	Changed trend rating from increasing	B – based on UKNEA plus expert judgment

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
			impact to continuing impact	
Climate change	Changed impact rating from low to moderate	A – based on UKNEA plus post-2011 evidence	Changed trend rating from very rapid increase of the impact to increasing impact	A – based on UKNEA plus post-2011 evidence
Invasive species	Retained impact rating of moderate	C – based on UKNEA only (decision to retain due to lack of post-2011 evidence)	Retained trend rating of continuing impact	A – based on UKNEA plus post-2011 evidence

7. Enclosed farmlands

7.1. Indicator data

Summary of status and trend assessments for enclosed farmlands natural capital indicators

Metric	Target	Trend
Butterflies of the Wider Countryside in Farmland Index (% change **2016-2021**)	Met/Exceeded	Positive
Butterflies of the Wider Countryside in Farmland Index (% change **1990-2021**)	Below	Negative
Butterflies of the Wider Countryside in Farmland Index, changes in individual species **2017-2022** (% of species)	Met/Exceeded	Mixed - no clear trend
Butterflies of the Wider Countryside in Farmland Index, changes in individual species **1990-2022** (% of species)	Below	Mixed - no clear trend
Farmland Bird Index (% change **2013-2018**)	Below	Negative
Farmland Bird Index (% change **1970-2018**)	Below	Negative
Farmland Bird Index, changes in individual species **2016-2021** (% of species)	Below	Mixed – no clear trend
Farmland Bird Index, changes in individual species **1970-2021** (% of species)	Below	Mixed – no clear trend

7.2. Sensitivity to climate change

Enclosed Farmland habitat sensitivity to climate change scores (1 – lowest sensitivity, 5 – highest sensitivity)

Habitat	Rescaled expert weighted score		Main risk identified
	Good	Degraded	
Arable field margins	1	1	High resilience habitat, ruderal species
Hedgerows	1	2	High resilience habitat, deep-rooted species
Coastal grazing marsh	3	4	Sea level rise, coastal erosion, and drought
Floodplain grazing marsh	3	3	Drying out and sea level rise

Source: Staddon, Thompson & Short, 2023

7.3. Additional evidence

Summary of additional evidence used to inform the impact and trend ratings for enclosed farmlands.

Driver	Rating	Evidence
Pollution	Trend	The Catchment Sensitive Farming Evaluation Report suggests that "there are indications that CSF is reducing the occurrence of water pollution incidents, relating to agriculture, where advice delivery has been most focused, but incidents are increasing in areas where there are agricultural pressures and less focused CSF delivery" (Environment Agency, 2019).

7.4. Summary of ratings

Summary of impact and trend decisions for enclosed farmlands.

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
Land-use change	Retained impact rating of very high	A – based on UKNEA plus post-2011 evidence	Changed trend rating from continuing impact to increasing impact	A – based on UKNEA plus post-2011 evidence
Pollution	Retained impact rating of very high	C – based on UKNEA only (decision to retain	Changed trend rating from decreasing	A – based on UKNEA plus

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
		due to lack of post-2011 evidence)	impact to continuing impact	post-2011 evidence
Resource exploitation	Retained impact rating of low	C – based on UKNEA only (decision to retain due to lack of post-2011 evidence)	Retained trend rating of continuing impact	C – based on UKNEA only (decision to retain due to lack of post-2011 evidence)
Climate change	Retained impact rating of low	B – based on UKNEA plus expert judgment	Retained trend rating of increasing impact	A – based on UKNEA plus post-2011 evidence
Invasive species	Retained impact rating of moderate	A – based on UKNEA plus post-2011 evidence	Retained trend rating of increasing impact	A – based on UKNEA plus post-2011 evidence

8. Urban

8.1. Indicator data

Summary of status and trend assessments for urban natural capital indicators

Metric	Target	Trend
% of population which meet doorstep standard: a greenspace of at least 0.5ha within 200m (**2019**)	Substantially below	No trend
% of population which meet the local natural greenspace standard: an accessible greenspace of at least 2ha within 300m (**2019**)	Substantially below	No trend
% of population which meet the wider neighbourhood standard: an accessible greenspace of at least 10ha within 1km (**2019**)	Substantially below	No trend
% of population which meet the combined accessible greenspace standard (access to one or more of the above metrics) (**2019**)	Below	No trend

8.2. D1

Urban ecosystems were not included in the summary of habitat condition trends in the D1 habitat quality report.

8.3. Sensitivity to climate change

Urban ecosystems were not scored by the experts in the 'Re-evaluating the sensitivity of habitats to climate change' report.

8.4. Additional evidence

Summary of additional evidence used to inform the impact and trend ratings for urban ecosystems.

Driver	Rating	Evidence
Land-use change	Trend	Based on the focus of commercial and residential development on brownfield sites (Ministry of Housing Communities and Local Government, 2024). A proportion of Biodiversity Net Gain for urban developments is also likely to be delivered off-site (Defra, 2024).

8.5. Summary of ratings

Summary of impact and trend decisions for urban

Driver	Impact	Uncertainty (Impact)	Trend	Uncertainty (Trend)
Land-use change	Retained impact rating of very high	B – based on UKNEA plus expert judgment	Changed trend rating from continuing impact to increasing impact	A – based on UKNEA plus post-2011 evidence
Pollution	Retained impact rating of very high	B – based on UKNEA plus expert judgment	Retained trend rating of continuing impact	B – based on UKNEA plus expert judgment
Resource exploitation	Retained impact rating of low	B – based on UKNEA plus expert judgment	Retained trend rating of increasing impact	B – based on UKNEA plus expert judgment
Climate change	Retained impact rating of low	B – based on UKNEA plus expert judgment	Retained trend rating of increasing impact	B – based on UKNEA plus expert judgment
Invasive species	Retained impact rating of moderate	B – based on UKNEA plus expert judgment	Retained trend rating of increasing impact	B – based on UKNEA plus expert judgment

9. Driver-Benefit Relationships

9.1. Updated driver-benefit ratings

This section outlines cases where the initial ratings informed by the UKNEA were changed from major to negligible (or vice versa) following expert input, and the rationale behind these decisions.

Justifications for updated ratings for the impact of drivers on benefit provision, after expert input. Initial ratings were informed by the UKNEA (2011). Final ratings were informed using more recent evidence and expert input.

Relationship	Initial Rating	Final Rating	Justification
Pollution-plentiful water	Major	Negligible for all terrestrial ecosystems.	SONC report separates out “clean” and “plentiful” water.
Land-use change-plentiful water	Negligible	Major across all terrestrial ecosystems, except for woodland (minor).	Link between development and increased water demand.
Resource exploitation-clean water	Major	Negligible for marine, coastal, urban (minor for woodlands, semi-natural grasslands (SNG)).	Negligible potential impact of water and fish extraction on clean water due to large dilution effect in the sea. Minor impact of grazing and timber extraction.
Resource exploitation-flood protection	Major	Negligible for coastal, freshwater, urban (minor for SNG, mountains moorlands and heaths (MMH)).	Water, fish and timber extractions from sea, freshwater and urban areas not increasing flooding. Minor impact of peat extraction and grazing.
Pollution-reared animals and outputs	Major	Minor for MMH, SNG, enclosed farmland (EF).	Minor impact of pollution on outdoor animals drinking from freshwaters.

Relationship	Initial Rating	Final Rating	Justification
Pollution-produce from the sea	Negligible	Major for marine, coastal.	Potential for impact.
Pollution-aquaculture	Negligible	Major for marine, coastal.	Potential for impact.
Resource exploitation-erosion control	Major	Negligible for coastal, freshwater.	Water abstraction has negligible potential impact on erosion control.
Land-use change-reared animals and outputs	Major	Negligible for MMH, SNG (unclear for EF).	Land-use change includes agricultural improvement which is beneficial for reared animals. Unclear (mixed) for EF due to loss of farmland to development.
Resource exploitation-pollination	Negligible	Major for SNG, EF.	Overgrazing and water abstraction (in drought conditions) have potential for major impact on pollination.
Sea-use change-aquaculture	Major	Unclear for marine, coastal.	Aquaculture potentially part of sea-use change.
Resource exploitation-timber and other wood products	Major	Negligible	Extraction of timber not a negative impact on itself.
Invasive species-climate regulation	Negligible	Major for MMH, minor/negligible for all other assets.	Major impact of e.g., Rhododendron on drying of peat.
Resource exploitation-clean air	Major	Negligible for urban, minor for woodlands.	Management of woodlands for timber has minor potential impact on air quality regulation.

Relationship	Initial Rating	Final Rating	Justification
Pollution-cultivated crops	Major	Negligible	Nutrient enrichment from air and agricultural applications can be beneficial for crops.
Pollution-pest & disease control	Negligible	Major	Diffuse pollution from agriculture can impact on pest and disease controlling species; nutrient enrichment means that species diversity declines.

9.2. Driver-benefit ratings for each ecosystem

Summary of driver-benefit ratings for marine

	Land- and sea-use change	Pollution	Resource exploitation	Climate change	Invasive species
Produce from the sea	Major	Major	Major	Major	Minor
Aquaculture	Unclear	Major	Negligible	Minor	Minor
Clean water	Minor	Major	Negligible	Minor	Negligible
Thriving plants and wildlife	Major	Major	Major	Major	Major
Climate regulation	Major	Major	Major	Major	Negligible
Cultural benefits	Major	Major	Major	Major	Minor

All ratings have an uncertainty score of **B – based on the UKNEA plus expert judgment.**

Summary of driver impacts on marine uses of nature contributing to cultural benefits.

Driver	Uses of nature
Land- and sea-use change	**Experiential**: development/construction of offshore wind farms impacting on marine wildlife, which affects wildlife watching experiences. **Aesthetic, spiritual**: value affected by development of offshore wind farms; provides inspiration/existence value even to those who do not regularly interact with the open sea; development can impact on scheduled monuments, which can be sacred and contribute to cultural identity/sense of place**.** **Scientific, educational**: value affected by damaged seabeds; damage to scheduled monuments can affect research opportunities.
Pollution	**Experiential**, **aesthetic**: affected by plastic pollution (whether viewed in person or experienced through TV/film).
Resource exploitation	**Experiential**: fishing affects bird populations (less available prey), impacting bird watching.
Climate change	**Experiential**: climate change leads to phenological mismatches causing species declines/losses, which affects for example wildlife watching experiences; can affect ancient and scheduled monuments. **Aesthetic, spiritual**: impact on scheduled monuments, which can be sacred and contribute to cultural identity/sense of place. **Educational, scientific**: impact on scheduled monuments, which can provide opportunity for research and learning.
Invasive species	Minor impact on experiential/spiritual (outcompeting native, potentially emblematic species).

Summary of driver-benefit ratings for coastal margins

	Land- and sea-use change	Pollution	Resource exploitation	Climate change	Invasive species
Produce from the sea	Major	Major	Major	Major	Minor
Aquaculture	Unclear	Major	Negligible	Minor	Minor
Clean water	Major	Major	Negligible	Major	Negligible
Erosion control	Major	Negligible	Negligible	Major	Negligible
Flood protection	Major	Negligible	Negligible	Major	Negligible
Thriving plants and wildlife	Major	Major	Major	Major	Major
Climate regulation	Major	Major	Major	Major	Negligible
Cultural benefits	Major	Major	Minor	Major	Minor

All ratings have an uncertainty score of **B – based on the UKNEA plus expert judgment.**

Summary of driver impacts on coastal margin uses of nature contributing to cultural benefits.

Driver	Uses of nature
Land- and sea-use change	**Experiential:** developments can affect ancient and scheduled monuments, impacting tourism. **Physical:** developments near the coastline (e.g., power stations/industry) can reduce coastal access. **Aesthetic and spiritual:** affected by coastal developments; especially if scheduled monuments are impacted as these can be sacred and contribute to cultural identity/sense of place. **Educational, scientific:** impact on scheduled monuments, which can provide opportunity for research and learning.
Pollution	**Experiential, physical:** poor water quality affects all water-based recreation. **Experiential, aesthetic:** experiences and sense of place affected by plastic pollution.
Resource exploitation	Minor – unsustainable exploitation can disrupt ecological processes and food chains, impacting wildlife and wildlife watching (experiential).
Climate change	**Physical:** walking affected by coast path erosion/more frequent storms. **Aesthetic, spiritual:** affected by increased need for coastal flood defences, ruining more natural coastlines; impact on scheduled monuments, which can be sacred and contribute to cultural identity/sense of place. **Educational, scientific:** impact on scheduled monuments, which can provide opportunity for research and learning.
Invasive species	Minor impact on experiential/spiritual (outcompeting native, potentially emblematic species).

Summary of driver-benefit ratings for freshwaters and wetlands

	Land-use change	Pollution	Resource exploitation	Climate change	Invasive species
Plentiful water	Major	Negligible	Major	Major	Negligible
Clean water	Major	Major	Major	Major	Minor
Erosion control	Major	Negligible	Negligible	Major	Minor
Flood protection	Major	Negligible	Negligible	Major	Minor
Thriving plants and wildlife	Major	Major	Major	Major	Major
Climate regulation	Major	Major	Major	Major	Negligible
Cultural benefits	Major	Major	Major	Major	Unclear

All ratings have an uncertainty score of **B – based on the UKNEA plus expert judgment.**

Summary of driver impacts on freshwater and wetland uses of nature contributing to cultural benefits.

Driver	Uses of nature
Land-use change	**Experiential**: historic culverting of urban rivers and draining/dredging of wetlands reduces habitat available for freshwater/wetland species, affecting wildlife watching; developments can affect ancient and scheduled monuments, impacting tourism. **Physical, aesthetic**: new housing developments affect runoff regimes and increase pollution load, which can affect water-based recreation. **Aesthetic, spiritual**: affected by coastal developments; especially if scheduled monuments are impacted as these can be sacred and contribute to cultural identity. **Educational, scientific**: impact on scheduled monuments, which can provide opportunity for research and learning.
Pollution	**Physical, aesthetic:** poor water quality (e.g., from sewage overflows) or algal blooms can affect swimming experience, aesthetic appearance, and smell.
Resource exploitation	**Experiential, aesthetic**: water abstraction can affect the 'quality' of cultural benefit, and changes in abstraction can alter recreational use/aesthetic benefits.
Climate change	**Experiential**: climate change means conditions are less hospitable for species intolerant to drought/waterlogging/hot temperatures; affects wildlife watching. **Aesthetic, spiritual**: impact on scheduled monuments, which can be sacred and contribute to cultural identity. **Educational, scientific**: impact on scheduled monuments, which can provide opportunity for research and learning.
Invasive species	Unclear - impact on experiential/spiritual (outcompeting native, potentially emblematic species), impact on physical (e.g., Japanese knotweed restricting riverbank access, floating pennywort preventing river access), but some invasives have cultural value themselves.

Summary of driver-benefit ratings for woodlands

	Land-use change	Pollution	Resource exploitation	Climate change	Invasive species
Timber and wood products	Unclear	Minor	Negligible	Major	Major
Plant-based energy	Negligible	Negligible	Negligible	Minor	Minor
Plentiful water	Minor	Negligible	Minor	Major	Negligible
Clean water	Minor	Major	Minor	Minor	Negligible
Clean air	Major	Major	Minor	Major	Negligible
Erosion control	Major	Negligible	Major	Major	Negligible
Flood protection	Major	Negligible	Major	Major	Negligible
Thriving plants and wildlife	Major	Major	Major	Major	Major
Climate regulation	Major	Major	Major	Minor	Minor
Cultural benefits	Major	Negligible	Major	Major	Unclear

All ratings have an uncertainty score of **B – based on the UKNEA plus expert judgment.**

Summary of driver impacts on woodland uses of nature contributing to cultural benefits.

Driver	Uses of nature
Land-use change	**Experiential, aesthetic, spiritual:** impacted by development/loss of ancient woodland; can have high biodiversity and cultural value and be a symbolic resource – especially if ancient or scheduled monument. **Educational, scientific:** impact on scheduled monuments, which can provide opportunity for research and learning.
Pollution	Negligible
Resource exploitation	**Experiential:** unsustainable timber production can lead to habitat and species losses, impacting wildlife watching. **Spiritual, aesthetic:** timber plantations can negatively affect landscape character; some trees have sacred/emblematic value.
Climate change	**Physical:** more frequent storms causing trees to fall, blocking paths used for walking and hiking. **Aesthetic, spiritual:** extremes in weather can cause changes to landscape character; impact on scheduled monuments, which can be sacred and contribute to cultural identity/sense of place. **Educational, scientific:** impact on scheduled monuments, which can provide opportunity for research and learning.
Invasive species	Unclear - impact on experiential/spiritual (outcompeting native, potentially emblematic species), but some invasives have cultural value themselves.

Summary of driver-benefit ratings for mountains, moorlands and heaths (MMH)

	Land-use change	Pollution	Resource exploitation	Climate change	Invasive species
Plentiful water	Major	Negligible	Major	Major	Negligible
Reared animals and outputs	Negligible	Minor	Negligible	Major	Negligible
Clean water	Major	Major	Major	Major	Minor
Erosion control	Major	Negligible	Major	Major	Minor
Flood protection	Major	Negligible	Minor	Major	Negligible
Thriving plants and wildlife	Major	Major	Major	Major	Major
Climate regulation	Major	Major	Major	Major	Major
Cultural benefits	Major	Unclear	Negligible	Major	Unclear

All ratings have an uncertainty score of **B – based on the UKNEA plus expert judgment.**

Summary of driver impacts on MMH uses of nature contributing to cultural benefits.

Driver	Uses of nature
Land-use change	**Experiential, aesthetic, spiritual:** agricultural improvement impacts on extent, competing with pressures for housing developments and demand for access to nature where people live; impact on wildlife watching; scheduled monuments and grouse shooting can contribute to sense of place and community in uplands. **Physical:** increased mountain hiking pressures, without proper management, can erode footpaths and affect future access. **Educational, scientific:** impact on scheduled monuments, which can provide opportunity for research and learning; impact of erosion and restoration on geological and pollen record.
Pollution	Minor/unclear - nitrogen deposition leads to changes in vegetation structure, but change =/= bad change. Depends on what people value in terms of experience.
Resource exploitation	Negligible
Climate change	**Experiential:** wildlife watching; montane species running out of space/no longer in climatic limits). **Aesthetic, spiritual:** impact of wildfires on sense of place perception; impact on scheduled monuments, which can be sacred and contribute to cultural identity/sense of place. **Physical:** extreme weather events such as heavy rainfall lead to soil and path erosion. **Educational, scientific:** impact on scheduled monuments, which can provide opportunity for research and learning.
Invasive species	Unclear - impact on experiential/spiritual (outcompeting native, potentially emblematic species), but some invasives have cultural value themselves.

Summary of driver-benefit ratings for semi-natural grasslands

	Land-use change	Pollution	Resource exploitation	Climate change	Invasive species
Plentiful water	Major	Negligible	Major	Major	Negligible
Reared animals and outputs	Negligible	Minor	Negligible	Major	Negligible
Clean water	Major	Major	Minor	Major	Negligible
Flood protection	Major	Negligible	Minor	Major	Negligible
Pollination	Major	Major	Major	Major	Major
Thriving plants and wildlife	Major	Major	Major	Major	Major
Climate regulation	Major	Major	Major	Unclear	Negligible
Cultural benefits	Major	Unclear	Unclear	Major	Negligible

All ratings have an uncertainty score of **B – based on the UKNEA plus expert judgment.**

Summary of driver impacts on semi-natural grassland uses of nature contributing to cultural benefits.

Driver	Uses of nature
Land-use change	**Aesthetic, spiritual:** wilder/more biodiverse types of grassland are seen as more 'interesting' and inspiring, contributing to sense of place/history/calm; scheduled monuments can be sacred. **Educational, scientific:** impact on scheduled monuments, which can provide opportunity for research and learning. **Experiential, physical:** affected by agricultural improvement, plus loss to development and infrastructure – wet grasslands and upland hay meadows most sensitive.
Pollution	Unclear - nitrogen deposition can affect species richness but also favour the growth of some grasses. Depends on what people value in terms of experience.
Resource exploitation	Unclear – high-intensity grazing can result in loss of species-rich meadows – land still grassland but meadows more uniform (experiential) - BUT under-grazing also an issue. Some meadows rely on seasonal grazing and without it revert to species-poor swards.
Climate change	**Experiential:** loss of species that are less tolerant to drought/waterlogging/hot temperatures, impacting wildlife watching. **Aesthetic, spiritual:** impact on scheduled monuments, which can be sacred and contribute to cultural identity/sense of place. **Educational, scientific:** impact on scheduled monuments, which can provide opportunity for research and learning.
Invasive species	Negligible.

Summary of driver-benefit ratings for enclosed farmlands.

	Land-use change	Pollution	Resource exploitation	Climate change	Invasive species
Cultivated crops	Major	Negligible	Negligible	Major	Minor
Plentiful water	Major	Negligible	Major	Major	Negligible
Reared animals and outputs	Unclear	Minor	Negligible	Major	Negligible
Clean water	Major	Major	Major	Major	Negligible
Erosion control	Major	Negligible	Major	Major	Negligible
Flood protection	Major	Negligible	Major	Major	Negligible
Pollination	Major	Major	Major	Major	Major
Thriving plants and wildlife	Major	Major	Major	Major	Major
Pest and disease control	Major	Major	Major	Major	Major
Climate regulation	Major	Major	Major	Major	Negligible
Cultural benefits	Major	Minor	Unclear	Major	Unclear

All ratings have an uncertainty score of **B – based on the UKNEA plus expert judgment.**

Summary of driver impacts on enclosed farmland uses of nature contributing to cultural benefits.

Driver	Uses of nature
Land-use change	**Aesthetic, spiritual:** productive mosaic agricultural landscapes are cherished and contribute to a sense of place; hedgerows and field boundaries like dry stone walls can reflect cultural history and conserve outlines of past land-use = contributing to cultural history; scheduled monuments can have sacred value. **Experiential, scientific, educational:** farmland management affects wild species diversity, impacting wildlife watching; more biodiverse farmland encourages citizen science and volunteer surveying like the Breeding Bird Survey, Butterfly Monitoring Scheme etc.
Pollution	Minor – eutrophication might indirectly impact experiential value.
Resource exploitation	Unclear – overexploitation can affect wild species diversity, but farming provides employment opportunities important to rural communities (experiential).
Climate change	**Experiential:** loss of species that are less tolerant to drought/waterlogging/hot temperatures, impacting wildlife watching. **Aesthetic, spiritual:** impact on scheduled monuments, which can be sacred and contribute to cultural identity/sense of place. **Educational, scientific:** impact on scheduled monuments, which can provide opportunity for research and learning.
Invasive species	Unclear - impact on experiential/spiritual (outcompeting native, potentially emblematic species), but some invasives have cultural value themselves.

Summary of driver-benefit ratings for urban

	Land-use change	Pollution	Resource exploitation	Climate change	Invasive species
Plentiful water	Major	Negligible	Major	Major	Negligible
Clean water	Major	Major	Negligible	Major	Negligible
Clean air	Major	Major	Negligible	Major	Negligible
Noise regulation	Major	Negligible	Negligible	Negligible	Negligible
Urban cooling	Major	Minor	Minor	Major	Negligible
Flood protection	Major	Negligible	Negligible	Major	Negligible
Thriving plants and wildlife	Major	Major	Major	Major	Major
Climate regulation	Major	Major	Major	Major	Minor
Cultural benefits	Major	Major	Minor	Unclear	Minor

All ratings have an uncertainty score of **B – based on the UKNEA plus expert judgment.**

Summary of driver impacts on urban uses of nature contributing to cultural benefits.

Driver	Uses of nature
Land-use change	**Experiential, physical:** urban blue and green spaces provide volunteering opportunities/stewardship, green walking or cycle paths, dog walking etc.; habitat losses to urban developments can reduce accessible nature available. **Aesthetic:** strong sense of place associated with urban green/blue spaces. **Educational:** urban green/blue spaces often used for outdoor learning.
Pollution	**Experiential, physical:** poor water quality impacts use of urban wetlands/blue spaces. **Aesthetic:** clean urban blue spaces have more aesthetic value.
Resource exploitation	Minor – over-abstraction can affect urban water flow/levels, affecting experience and aesthetic value.
Climate change	Unclear – climate change may negatively impact urban biodiversity and ecosystem condition, but high temperatures also drive increased use of urban green space.
Invasive species	Minor – can cause structural weaknesses and damage buildings or housing; reduce amenity value; threaten native plant community diversity; invasives can reduce access to green spaces.

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