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for Environment,
Food & Rural Affairs

Air Pollution Trends Report 2026

Critical Load and Critical Level exceedances in the UK

September 2026



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Executive summary

This contract provides key information to track the effects on ecosystems of policies aimed at meeting national and international air pollution targets, for example under the UK Government's National Emission Ceilings Regulations (NECR), the Clean Air Strategy 2019 (CAS), the Environmental Indicator Framework (indicators A6 and A7) and the United Nations-Economic Commission for Europe Convention on Long-range Transboundary Air Pollution (CLRTAP). The contract provides data underpinning indicators A6 and A7 of the Environmental Indicator Framework. It also provides the means to develop targeted action for emission reduction policies to get the maximum improvement in air quality.

Exceedance of critical level or critical load indicates that an ecosystem is at risk from potential harmful effects. When pollution subsequently decreases to below the critical level or load, there may be delays to recovery, but the risk of harm is reduced. Pollution control measures aimed at meeting CLRTAP targets have reduced the extent and magnitude of critical level and load exceedances across the UK. A target for the reactive nitrogen (N) deposition load in England (a percentage reduction compared to 2016) was included in the CAS to further reduce impacts on ecosystems in response to the UK's new emission reduction targets for ammonia and oxides of nitrogen.

This report presents data on exceedances of critical levels and critical loads for the period from 2003 to 2023, according to current estimates.

- UK habitats at risk of exceeding the critical levels for gaseous ammonia. In 2023, 1.9% (4,596 km²) of the UK land area was exposed to ammonia concentrations above the critical level set to protect vascular plants (3 µg m⁻³), and 58.3% (142,327 km²) exposed to ammonia at concentrations above the critical level set to protect lichens and mosses (1 µg m⁻³). The area where the critical level for vascular plants is exceeded has changed little since 2003 (this assessment suggests an increase by 0.1% of UK land area). The area where the critical level for lichens and mosses is exceeded has increased by 1.7% of UK land area since 2003.
- UK habitats at risk from acidification. The area of acid-sensitive habitats with exceedance of acidity critical loads has fallen from 65.6% in 2003, to 37.8% (34,253 km²) in 2023, due mainly to decreases in NO_x and sulphur deposition. Of the total acidifying pollution onto UK woodland in 2023, 70% was reduced N (ammonia and ammonium), 19% was NO_x, and 11% was sulphur.
- UK habitats at risk from excess N (eutrophication). The area of N-sensitive habitats with exceedance of nutrient N critical loads fell from 93.8% (87,954 km²) in 2003, to 77.8% (72,915 km²) in 2023. This decline was largely driven by changes in Scotland – in England, Wales and Northern Ireland there was relatively little change in area exceeded over this period. The amount of exceedance fell more substantially across the UK, from 10.6 kg N ha⁻¹ yr⁻¹ in 2003 to 5.9 kg N ha⁻¹ yr⁻¹ in 2023, with declines of 3.1 to 7.7 kg N ha⁻¹ yr⁻¹ in the different UK countries.

Technical summary

Critical levels are concentrations of pollutants (for example in micrograms per cubic metre, $\mu\text{g m}^{-3}$) in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge. Critical level exceedance is the amount by which the concentration exceeds the critical level.

Critical loads define the rates of acid or nitrogen (N) deposition (in kiloequivalents per hectare per year, $\text{keq ha}^{-1} \text{yr}^{-1}$, or in kilograms N per hectare per year, $\text{kg ha}^{-1} \text{yr}^{-1}$) below which significant harmful effects are not expected to occur in sensitive habitats. Critical load exceedance is the amount by which acid or N deposition exceeds the critical load.

In this report, critical load and critical level exceedances are calculated using rolling 3-year mean data sets for deposition rates and gaseous concentrations, which are updated annually. A three-year mean is used to smooth out inter-annual variability due to the influence of weather on atmospheric chemistry. This report describes critical loads and their exceedances, and critical levels and their exceedances, for the period from 2003 to 2023.

This report presents trends in: a) ammonia critical level exceedances across the UK; b) acidity critical load exceedances for UK habitats at risk from acidification by excess sulphur (S) and/or N; c) nutrient-nitrogen critical load exceedances for UK habitats at risk of eutrophication by excess N; and d) critical load exceedances for acid- and N-sensitive habitat features of UK designated sites (Special Areas of Conservation: SACs; Special Protected Areas: SPAs; Sites of Special Scientific Interest or Areas of Special Scientific Interest: SSSIs/ASSIs). Results for some early years have been excluded from some tables to keep them on a single page but can be supplied on request.

Summary statistics monitor progress in the area of habitats in the UK at risk from acidification and eutrophication from air pollution over time, and several statistics are reported in the annual “UK Biodiversity Indicators” summary produced by the Joint Nature Conservation Committee (<https://jncc.gov.uk/our-work/ukbi-b5a-air-pollution/>; indicator B5a for assessing the pressures from air pollution).

Between 2003 and 2023, UK NH_3 emissions fell by 8.15% from 295 kilotonnes N yr^{-1} to 271 kilotonnes N yr^{-1} in 2023, and there was a 22.9% decrease in UK grid-average NH_3 deposition from 182 kilotonnes N yr^{-1} to 140 kilotonnes N yr^{-1} . UK NO_x emissions fell by 64.0% from 1554 kilotonnes N yr^{-1} to 559 kilotonnes N yr^{-1} between 2003 and 2023, and there was a 52.5% decrease in UK grid-average NO_x deposition from 164 kilotonnes N yr^{-1} to 78 kilotonnes N yr^{-1} .

Exceedance of ammonia critical levels

Trends in ammonia critical levels exceedance are available for the period 2003 to 2023; there were only small changes in ammonia concentrations over this time period.

UK land area

- 58.6% of the UK was exposed to ammonia concentrations above the critical level set to protect lichens and bryophytes ($1 \mu\text{g m}^{-3}$) in 2023; this represents 85.1% of England, 48.3% of Wales, 10.5% of Scotland and 95.0% of Northern Ireland.
- There was an increase in the UK land area with ammonia concentrations above $1 \mu\text{g m}^{-3}$, from 56.9% in 2003 to 58.6% in 2023.
- About 1.9% of the UK was exposed to ammonia concentrations above the critical level set to protect vascular plants ($3 \mu\text{g m}^{-3}$) in 2023; Wales showed a small decrease in exceeded area by 0.1%, while there was an increase by 1.5% in Northern Ireland.
- The UK land area with ammonia concentrations above $3 \mu\text{g m}^{-3}$ increased, from 1.8% in 2003 to 1.9% in 2023.

Nitrogen-sensitive habitats

- 24.3% of the mapped area of N sensitive habitats in the UK was exposed to ammonia concentrations above the critical level of $1 \mu\text{g m}^{-3}$ in 2023; the percentage area exceeded ranged from 3% for Scotland to 85.1% for Northern Ireland.
- 73.1% of the area of calcareous grassland, and ~ 77% of the area of some woodland habitats (beech and broadleaved woodland) were in areas exposed to ammonia concentrations above the critical level of $1 \mu\text{g m}^{-3}$ in 2023. Only 8.9% of dwarf shrub heath was in areas exceeding this critical level, but this equates to $1,903 \text{ km}^2$.
- 0.3% of the area of N-sensitive habitats in the UK was exposed to ammonia concentrations above $3 \mu\text{g m}^{-3}$ in 2023; this ranged from 0.0% in Scotland and Wales to 4.0% in Northern Ireland.

Designated sites (SACs, SPAs and SSSIs or ASSIs)

- 40.6% (114) of SPAs, 53.9% (341) of SACs and 64.5% (4,527) of SSSIs (ASSIs in Northern Ireland) in the UK were exposed to ammonia concentrations above $1 \mu\text{g m}^{-3}$ on at least part of the site in 2023.
- 83.5-91.7% of the designated sites in England, 90.3-96.5% of sites in Northern Ireland, 38.9-55.2% of sites in Wales, and 7.5-12.4% of sites in Scotland, were exposed to ammonia concentrations above $1 \mu\text{g m}^{-3}$ in 2023.
- 2.1% (13) of SACs, 1.4% (4) of SPAs and 1.5% (105) of SSSIs/ASSIs in the UK were exposed to ammonia concentrations above $3 \mu\text{g m}^{-3}$ on at least part of the site in 2023. The percentage of designated sites with exceedance of this critical level increased since 2003 by 0.1% for SSSIs and decreased by 0.3% for SACs, while staying the same for SPAs.
- No SSSIs, SACs or SPAs in Scotland and Wales were exposed to ammonia concentrations above the critical level of $3 \mu\text{g m}^{-3}$, except for five SSSIs and two SAC sites on the England/Wales border. In comparison, in England and Northern Ireland 3.3% and 5.3% (respectively) of SACs, 3.6% and 6.2% of SPAs, and 1.7% and 8.7% of SSSIs/ASSIs exceeded the $3 \mu\text{g m}^{-3}$ ammonia critical level.

Exceedance of deposition critical loads

UK habitats at risk from acidification

- The area of acid-sensitive habitats in the UK with exceedance of acidity critical loads continued to decline due mainly to decreases in oxidised N (NO_x) and sulphur (S) deposition, having fallen from 65.6% (59,407 km²) in 2003 to 37.8% (34,253 km²) in 2023.
- Excess acidity (expressed as the Average Accumulated Exceedance) for all UK habitats combined fell between 2003 and 2023, from 0.58 to 0.17 keq ha⁻¹ year⁻¹.
- The largest reduction in the area of acid-sensitive habitats with exceedance of acidity critical loads was in Scotland, where it fell from 56.7% (30,896 km²) in 2003 to 23.0% (12,546 km²) in 2023.
- The smallest reduction in the area of acid-sensitive habitats with exceedance of acidity critical load was in Northern Ireland, falling from 79.3% (2,797km²) in 2003 to 65.9% (2,326 km²) in 2023.
- Of the terrestrial acid-sensitive habitats mapped, dwarf shrub heath occupies the largest area across the UK (24%); the area of this habitat with exceedance of acidity critical loads decreased, from 34.0% (7,435km²) in 2003 to 9.5% (2,075 km²) in 2023.

UK habitats at risk from eutrophication due to excessive nitrogen availability

- The area of N-sensitive habitats in the UK with exceedance of nutrient N critical loads decreased from 93.8% (87,954 km²) in 2003, to 77.8% (72,915 km²) in 2023, due mainly to a decrease in NO_x emissions.
- Excess Nitrogen (Average Accumulated Exceedance for nutrient N) for all UK habitats combined decreased from 10.6 kg N ha⁻¹ year⁻¹ in 2003 to 5.9 kg N ha⁻¹ year⁻¹ in 2023.
- The largest reduction in the area of N-sensitive habitats with critical load exceedance was in Scotland, falling from 89.3% (48,529km²) in 2003 to 62.2% (33,794 km²) in 2023.
- Reductions between 2003 and 2023 in the area of N-sensitive habitats with critical load exceedance in England, Wales and Northern Ireland were 0.9%, 0.4% and 0.8% accordingly.
- The nutrient N critical load was exceeded for more than 90% of the areas of seven N-sensitive habitats in all years: calcareous grassland, montane habitats, beech woodland, other broadleaved woodland, Scots pine woodland, and mixed woodland.
- Although the decline between 2003 and 2023 in area exceeded was small or zero for most habitats, the magnitude of exceedance (Excess Nitrogen) for beech woodland decreased more substantially from 20.9 kg N ha⁻¹ year⁻¹ in 2003 to 12.3 kg N ha⁻¹ year⁻¹ over the period.

Total N deposition onto protected sensitive habitats

- Since 2020, the Air Pollution Trends Report includes a metric against which progress towards the UK Government's Clean Air Strategy target (Defra, 2019) can be measured, i.e. "to reduce damaging deposition of reactive forms of nitrogen by 17% over England's protected priority sensitive habitats by 2030".
- The mean N deposition rate onto priority habitats in England was 24.4 kg N ha⁻¹ yr⁻¹ in 2016, and 19.9 kg N ha⁻¹ yr⁻¹ in 2023, representing an 18.4% decrease.

Designated sites with acid-sensitive feature habitats

- The percentage of SACs and SPAs in the UK with exceedance of acidity critical loads for one or more features decreased from 80% and 73.7% (SACs: 389 sites, SPAs: 129 sites) in 2003 to 61.6% (SACs: 300 sites) and 46.3% (SPAs: 81 sites) in 2023.
- The percentage of SSSIs/ASSIs with exceedance of at least one sensitive feature fell from 64.5% (3,021 sites) in 2003 to 42.2% (1,953 sites) in 2023.
- Scotland had the largest reductions in the percentage of designated sites with exceedance of acidity critical loads between 2003 and 2023, for example 30.0% fewer SSSIs.
- In England, 42.1% of SSSIs had exceedance of acidity critical loads in 2023, as did 53.3% of SSSIs in Wales, and 62.9% of ASSIs in Northern Ireland.

Designated sites with nitrogen-sensitive feature habitats

- There were small reductions in the percentage of designated sites in the UK with exceedance of nutrient N critical loads (for one or more features) between 2003 and 2023 (6.0% for SACs, 8.0% for SSSIs/ASSIs, 9.6% for SPAs). This reflects the downward trend in N deposition during this period, driven mainly by decreases in NOx emissions.
- Scotland had the largest reduction (14.8%) in the percentage of SPAs with exceedance of nutrient N critical loads between 2003 and 2023.
- Of nature conservation sites in England, Wales and Northern Ireland, 85.5–100% had exceedance of nutrient N critical loads for one or more features in 2023. Proportionally fewer sites in Scotland (70.6-80.4%, depending on designation) were exceeded in this way.

Table 0.1: Summary of statistics for exceedance of the nitrogen critical load in 2022-2024 for UK countries and UK

Country	SACs Exceeded (%)	SPAs Exceeded (%)	SSSIs/ASSIs Exceeded (%)	Area of Sensitive Habitats Exceeded (%)
England	98.0	94.6	96.3	99.1
Wales	100.0	100.0	93.7	99.4
Scotland	80.4	70.7	70.6	62.2
Northern Ireland	96.0	100.0	85.5	99.2
UK	91.4	81.9	90.2	77.8

Report structure

Section 1 of this report provides an overview of critical loads for acidity and for nutrient N, deposition data, and exceedance calculations and metrics for habitats across the whole area of the UK. Section 2 addresses critical levels for ammonia and their exceedances. Section 3 summarises the trends in exceedances of deposition critical loads for specific habitats and countries, i.e. England, Scotland, Wales, and Northern Ireland. Section 4 focuses on designated sites, the application of “site-relevant critical loads” (SRCL) to these sites, and trends in their exceedances. Section 5 focuses on N deposition onto sensitive habitats, which is the basis of a target in the UK Government’s Clean Air Strategy (CAS) (Defra, 2019). Finally, Section 6 describes method updates since the previous Air Pollution Trends Report (Rowe et al., 2024).

Notes on rounded numbers and percentages

Numbers in tables are shown to one decimal place. Differences were rounded after subtraction, so may not always equate precisely to the differences between the numbers in the table. For example, if there is a change of +0.08 units from 72.06 to 72.14, the real change is $72.14 - 72.06 = +0.08$, which rounds to +0.1, and the rounded numbers would show as $72.1 - 72.1 = 0.1$. This is not an error.

Changes in the area of habitat where critical loads or critical levels are exceeded are always expressed in terms of absolute percentage of the total habitat area, not as a relative percentage change from the previous value, nor as an absolute percentage of total land area for the country. For example, if a habitat occupies 10% of the UK, a change from 40% to 30% of the habitat area being exceeded would be expressed as a decrease of 10% (i.e. 40 minus 30), not as a decrease of 25% (i.e. $100 \times (40 - 30) / 40$), nor as a decrease of 1% (i.e. 4% of UK area minus 3% of UK area).

Section 1. Methods for calculating critical level and critical load exceedances

The pressure from air pollution on organisms and ecosystems can be expressed in two main ways, as pollutant concentrations or fluxes. In this report we assess the risk of harm from ammonia gas in terms of its concentration in air and exceedances of critical levels. The risk of harm from eutrophication is assessed in terms of the deposition flux of reactive N and exceedance of the critical load for nutrient-N, and the risk of harm from acidity is assessed in terms of the total deposition flux (i.e. load) of sulphur and reactive N, and exceedances of the critical loads for acidity.

1.1 Critical levels of ammonia

The critical levels considered here are annual mean concentrations of ammonia above which direct adverse effects on sensitive vegetation may occur according to present knowledge (CLRTAP, 2017). Critical levels have also been defined for other pollutants: sulphur dioxide, some N oxides, and ozone. Critical levels based on mean concentrations over shorter time periods have also been defined. These other pollutants and timescales are not considered here; further information can be found in (CLRTAP, 2017).

The critical levels for ammonia were reviewed and updated at an international workshop held in 2006 (UNECE, 2007) and approved by the Task Forces of the International Cooperative Programmes (ICPs) of the CLRTAP. Critical levels are only defined for two taxonomic groups (Table 1.1), in contrast to the range of habitats for which critical loads have been defined. This means that critical levels of ammonia have not here been applied to individual habitats or to habitat features of designated sites in the UK. Critical level exceedance metrics used are described in Section 1.4.

Table 1.1: Critical levels of ammonia (CLRTAP, 2014)

Vegetation type	Critical level NH ₃ [µg m ⁻³]	Time period
Lichens and bryophytes (including ecosystems where lichens and bryophytes are a key part of the ecosystem integrity)	1	Annual mean concentration
Vascular plants (including heathland, semi-natural grassland and forest ground flora)	3*	Annual mean concentration

*An explicit uncertainty range of 2-4 µg m⁻³ was set for vascular plants; this was intended to be used when applying the critical level in different assessment contexts.

1.2 Concentrations of ammonia

The spatial distribution of ammonia is calculated using a process model, with results calibrated to observations. As a relatively short-lived primary pollutant, ammonia (NH_3) exhibits greater spatial variability than can reasonably be captured by national-scale networks, and a simple interpolation between existing monitoring sites would not give accurate concentration estimates. To account for this high spatial variability, we deploy an atmospheric chemistry and transport model (EMEP4UK) to simulate the spatial distribution of ammonia concentration, based on current understanding of emissions, chemical transformations and fate. EMEP4UK is a high-spatial-resolution UK implementation (EMEP4UK; Vieno et al., 2016) of the European Monitoring and Evaluation Programme (EMEP) model (EMEP MSC-W - <https://github.com/metno/emep-ctm>) (Simpson et al., 2012) with subsequent updates documented in the annual EMEP Status Reports published by MSC-W (https://www.emep.int/mscw/mscw_publications.html). The UK is modelled, using EMEP4UK, in a domain with a 3 km x 3 km horizontal resolution, nested into a bigger European domain with a horizontal resolution of 27 km x 27 km. Model versions and input data sources changed between the older runs for the years 2002-2021 and the newer runs for 2021-2024, as described below.

Process modelling has associated uncertainties and depends on the accuracy of the emission inventories, so EMEP4UK outputs are calibrated to measured concentrations from the UKEAP Acid Gas and Aerosol Network (AGANet) (Stephens et al., 2021b) and National Ammonia Monitoring Network (NAMN) (Stephens et al., 2021a), using a proportional relationship to scale the modelled concentrations according to the measurements. Data from all monitoring stations that have a temporal coverage of measurements data for at least 70% of the deposition data and trends year were used for calibration, except for a few stations where the measurements were not deemed representative of the surrounding area as modelled for the grid cell. The Northern Irish network expanded by 25 additional sites in 2018 which started reporting data to UKEAP/NAMN in 2022. These sites are characterised by higher-than-average NH_3 concentrations and there generally appears to be a closer agreement between measured and modelled concentrations for N Ireland than for the rest of the UK, for reasons that are yet to be fully understood. This change in sites has potentially resulted in a change in the calibration from 2022 onwards.

Variation in ammonia concentration can be considerable, due to variability in precipitation and temperature, and variability in air flows from more or less polluted areas. To smooth out inter-annual variation and get a clearer picture of trends, in this report the results for concentration and exceedances are presented as three-year mean values. For brevity, the three-year means are mainly referred to in this report using the middle year, for example “2003 to 2023” equates to “2002-2004 to 2022-2024”.

Whilst only the ammonia output is used in the calculation of ecosystem impacts, EMEP4UK requires annual total emissions for NO_x , SO_x , fine and coarse primary particulate matter ($\text{PM}_{2.5}$ and PM_{10}), CO, and non-methane volatile organic carbon, as well as NH_3 emissions. For the UK these are provided as both diffuse area emissions (on a 1

km x 1 km grid) and as point source emissions from the UK National Atmospheric Emissions Inventory (NAEI). For the larger European domain, emissions were downloaded from the EMEP emissions database¹. The EMEP4UK model uses meteorological data generated by the Weather Forecasting and Research (WRF) model (Skamarock, 2019), constrained with 6-hourly reanalysis data (<https://github.com/wrf-model/wrf>). Over time, the WRF model has been used with two different underlying meteorological reanalyses as boundary and initial conditions as well as for grid nudging of wind components and temperature (four-dimensional data assimilation every 6 hours).

(Dore et al., 2007) The old 2002-2021 EMEP output (Scheffler and Vieno, 2022) was generated with EMEP version 4.36 and WRF version 4.2.2, constrained with the meteorological fields from the National Centers for Environmental Prediction (NCEP) Global Forecast System (GFS) and of large-scale meteorological variables {Saha, 2011 #3089; NCEP, 2000 #102}. It uses the spatial emissions map of the NAEI 2019 scaled by the emissions for each particular year at sectoral level (i.e. SNAP² sector). Emissions for 2020 and 2021 were identical to 2019, the latest NAEI release available at the time. Open biomass burning emissions (wildfires; agricultural burn) were included in the simulation, taken from the satellite-derived FINNv1.5 dataset, except for 2021 for which fire data were not yet available.

By contrast, the newer 2021-2024 time-series (Table 1.2) was produced with WRF 4.4.2 constrained with meteorological fields from atmospheric reanalysis of the global climate (ERA5) by the fifth-generation European Centre for Medium-Range Weather Forecasts {Hersbach, 2023 #3090}. UK emissions use both the annual totals and spatial fields for the individual years. Emissions for the Republic of Ireland are based on the spatial field of the 2019 MapEire inventory, scaled with EMEP sectoral data for the individual years. In these runs open biomass emissions were not included, except those included in the NAEI.

The 2020 run (as used in mid-year 2021) was based on EMEP v4.45 and a bespoke seasonal cycle in emissions, whilst 2021 to 2024 were based on EMEP v5.0 with a modification to the wet deposition scheme (conditional on liquid water content, LWC) was implemented from 2022 (Table 1.2).

It should be noted that at the time of analysis, the spatial emissions field was not yet available for 2024, so for that particular year the EMEP model was run using the 2023 spatial emissions field, but in combination with 2024 total emissions and 2024 meteorological information. Meteorology has a large influence on atmospheric processes (Dore et al., 2007) so this allows estimation of ammonia concentrations for 2024. In

¹ <https://www.emep.int/>; <https://www.ceip.at/webdab-emission-database>

² SNAP: Selected Nomenclature for reporting of Air Pollutants. SNAP sectors include Road Transport; Agriculture, Forests and Land Use Change; and Waste Treatment and Disposal.

previous Trends Reports, emissions data for the last two years that were run had to be estimated in this way. Improvements in the data pipeline mean that estimated emissions now only have to be used for the final year that is run. Point-source emissions were obtained from the specific year's data and combined with re-scaled diffuse emissions, at the sectoral level.

Table 1.2: Overview of model versions and emissions data that were used in the runs that underpin mid-year 2021 to 2023. The emissions total column shows the year for which emissions were estimated and (in brackets) the NAEI release date for that estimate. Note that the emissions field is released later in the year than the annual emissions total. All these runs used WRF version 4.4.2 constrained with ERA5 meteorology

Year	EMEP version	Seasonal emission cycles	Emissions total	Emissions field
2020	4.45	Modified	2020 (NAEI2023)	2020 (NAEI2021)
2021	5.00	EMEP default	2021 (NAEI2024)	2021 (NAEI2024)
2022	5.0LWC	EMEP Default	2022 (NAEI2025)	2022 (NAEI2025)
2023	5.0LWC	EMEP Default	2023 (NAEI2025)	2023 (NAEI2025)
2024	5.0LWC	EMEP Default	2024 (NAEI2026)	2023 (NAEI2025)

1.3 Overview of receptors

Critical levels are defined for different types of organism (vascular plants; or bryophytes and lichens) whereas critical loads are defined for different habitats. Mapping the exceedances of critical levels and critical loads depends on maps of where sensitive organisms and habitats occur, known as receptor maps. Habitat maps were derived from Land Cover Map and other sources (see Section 1.5.1). Data on protected sites were derived from databases maintained by JNCC (for SACs and SPAs) or by the country statutory nature conservation agencies (for SSSIs and ASSIs).

1. Special Areas of Conservation (SACs) are protected sites designated using the criteria set out in Annex III of the EC Habitats Directive. Annexes I and II of the Directive identify the habitats and species (excluding birds) to be protected; 78 Annex I habitat types and 41 species are believed to occur in or be native to the UK.
2. Special Protected Areas (SPAs) are sites classified using the criteria set out in Article 4 of the EC Birds Directive to protect rare and vulnerable birds (as listed in an Annex to the Directive) and regularly occurring migratory species.

3. Sites of Special Scientific Interest (SSSIs in England, Wales and Scotland) and Areas of Special Scientific Interest (ASSIs in Northern Ireland) provide statutory protection to the UK's flora and fauna. There are additional SSSIs/ASSIs designated for geological or physiographic features, but these are not included in the SRCL assessments.

1.4 Calculation of critical levels exceedance

The critical level exceedance metrics calculated for this Trends Report are:

- The percentage land area in England, Wales, Scotland, Northern Ireland and UK where ammonia concentrations exceed the critical levels.
- The percentage area of N-sensitive habitats in England, Wales, Scotland, Northern Ireland and UK where ammonia concentrations exceed the critical levels. The habitat areas are based on the habitat distribution maps used for mapping nutrient N critical loads (Section 1.5.1).
- The percentage of designated sites (SAC, SPA, SSSI/ASSI) in England, Wales, Scotland, Northern Ireland and the UK, where ammonia concentrations exceed the critical levels anywhere across a site. Ammonia-sensitivity has not yet been determined for the current set of designated sites, so critical level exceedance was calculated for all sites.

1.5 Overview of deposition and critical loads

Pollutant deposition rates, expressed for example in $\text{kg ha}^{-1} \text{ yr}^{-1}$, are useful indicators of pressure on ecosystems (Rowe et al., 2017). However, ecosystems are considered able to withstand a certain amount of pollution deposition, and this amount is expressed as the critical load. Critical loads are thus thresholds for effects from atmospheric deposition and are defined as “a quantitative estimate of the exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge” (Nilsson and Grennfelt, 1988).

The methods used to calculate and map UK critical loads are described in detail in Hall et al. (2015). Critical loads are calculated and mapped for UK habitats sensitive to acidification and/or eutrophication (Table 1.3). In Section 3, results are presented for the entire mapped extent of habitats; results for designated sites are presented in Section 4. The critical load methods applied in the UK are based on methods approved at international workshops held under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and published in the “Mapping Manual” (CLRTAP, 2017).

A metric has been included to illustrate progress towards the aim of the UK Government's CAS (Defra, 2019), to develop a target to achieve a “reduction of damaging deposition of reactive forms of nitrogen by 17% over England's protected, priority, sensitive habitats by 2030”. The metric is here defined as “total deposition of reactive N onto nutrient-N sensitive priority habitat”, i.e. including priority habitat that is not within protected sites. Total N deposition does not take into account critical load but is a readily-understood indicator of overall pressure on sensitive ecosystems. The baseline year against which the

17% reduction will be assessed in 2016. The derivation of this metric is discussed further in section 1.8.

The Devolved Governments are considering whether to develop nitrogen deposition reduction targets for their own countries. Progress towards country-specific targets may be presented in future Trends Reports.

1.5.1 Habitat mapping

Habitat distribution maps for exceedance calculations were based principally on the UKCEH Land Cover Map 2019, with additional data sets such as species distribution data and altitude (Carnell et al. (2022)). Montane habitat was not mapped in LCM2019, so was distinguished based on altitude and latitude (Hall et al., 2015). A recent map of UK peat distribution (Evans et al., 2017) was used to apply distinct methods for woodland on peat and non-peat soils (see Section 1.5.2) and to refine the bog map. Areas mapped as bog but not occurring on peat were reassigned as wet heath.

Managed and unmanaged broadleaved woodland are no longer distinguished, because the National Forest Inventory (GB) and Agri-Food and Biosciences Institute woodland register (Northern Ireland) no longer map these separately. However, even commercial forestry in the UK is increasingly managed for multiple objectives. Exceedance of critical loads is likely to limit nature conservation value of any woodland, so it was considered appropriate to include all broadleaved woodland within the sensitive area.

Broadleaved woodland was mapped as priority habitat if it occurred within 10 km x 10 km grid cells that according to the National Vegetation Classification (NVC) dataset contain H9190 or H91A0 woodland types (i.e. acidophilous oak woodland); or W12, W14 or W15 woodland types (i.e. beech woodland). For NVC squares that contained both beech woodland and oak woodland, it was assumed that 50% of the Broadleaved woodland area was oak woodland and 50% was beech woodland.

Coniferous woodland in areas where Scots pine is native was considered to be unmanaged. All coniferous woodland within 10 km x 10 km grid cells in Scotland that according to the National Vegetation Classification (NVC) dataset contain W18 (*Pinus sylvestris*–*Hylocomium splendens* woodland) was mapped as unmanaged priority-habitat woodland, and assessed for exceedance of nutrient-N critical load separately from managed coniferous woodland. This approach presumably overestimates the area of Scots pine woodland, but coniferous woodland within the native range of Scots pine has the potential to become priority habitat and was treated as such. All coniferous woodland in grid cells where W18 does not occur was considered to be managed. Different critical loads for nutrient N were assigned to managed coniferous woodland and Scots pine woodland. The same approach to calculating acidity critical load was used for both types of coniferous woodland.

Wet and dry heath are not mapped separately, since they have the same critical loads for acidity and for nutrient-N.

The overall map of habitats sensitive to nutrient-N shows the wide distribution of these habitats in the UK (Figure 1.1). It should be noted that the habitat distribution maps and areas used to calculate exceedances: a) only include areas where data exist for the calculation or derivation of critical loads; and b) may differ from other national habitat distribution maps or estimates of habitat areas.



Figure 1.1. Areas of habitat sensitive to nutrient-nitrogen in the UK (green) and areas without sensitive habitat (white).

Figure 1.1 is a map of the UK showing the distribution of habitats sensitive to nitrogen pollution. Green areas indicate sensitive habitats, which are found across much of the UK, while white areas indicate locations without sensitive habitats.

Published correspondence tables³ were used to relate broad habitats to the European Nature Information System (EUNIS: Moss and Davies, 2002) hierarchical habitat classification scheme, developed for pan-European applications. The original EUNIS codes were revised recently⁴, and both old and updated codes are shown in Table 1.3.

³ <https://hub.jncc.gov.uk/assets/9e70531b-5467-4136-88f6-3b3dd905b56d>

⁴ <https://doi.org/10.2909/bfe4c237-e378-4a83-ab21-b3807f96c2e2>

Table 1.3: Habitats sensitive to acidity and/or nutrient nitrogen. Critical load for nutrient nitrogen (CLempN) mapping values are shown; note that these differ for wet and dry acid grassland. See section 1.8 for definition of N_{sens}.

Habitat	EUNIS habitat class(es) assigned ^a	Mapped for acidity	Mapped for nutrient N	CLempN (kg N ha ⁻¹ yr ⁻¹)	Included in N _{sens} calculation
Acid grassland	R372 & R1M (E1.7 & E3.52)	Yes	Yes	6 (dry AG); 10 (wet AG)	Yes
Calcareous grassland	R1A (E1.26)	Yes	Yes	10	Yes
Dwarf shrub heath	S411 & S42 (F4.11 & F4.2)	Yes	Yes	5	Yes
Montane	E4.2 ^b	Yes	Yes	5	Yes
Bog	Q1 (D1)	Yes	Yes	5	Yes
Scots pine woodland^c	T35 (G3.4)	Yes	Yes	5	Yes
Managed coniferous woodland^c	T31 (G3)	Yes	Yes	10	No
Beech woodland^c	T17 (G1.6)	Yes	Yes	10	Yes
Acidophilous oak woodland^c	T1B (G1.8)	Yes	Yes	10	Yes
Other broadleaved woodland^c	T1 (G1)	Yes	Yes	10	Yes
Mixed woodland^c	G4	Yes	Yes	10	Yes
Freshwaters^d	C1 & C2	Yes	No	-	No
Dune grassland	N15 (B1.4)	No	Yes	5	Yes

Habitat	EUNIS habitat class(es) assigned ^a	Mapped for acidity	Mapped for nutrient N	CLempN (kg N ha ⁻¹ yr ⁻¹)	Included in N _{sens} calculation
Saltmarsh	MA223/MA224 /MA225 (A2.53/54/55)	No	Yes	10	Yes

^a EUNIS class (2023 codes, with 2012 codes in brackets) closest to broad habitat and critical loads habitat; class used for assigning empirical nutrient nitrogen critical loads and for classifying UK critical loads data for submission to the CCE.

^b The 2023 revision of EUNIS codes does not include a class for montane habitats (formerly moss summits). The revision notes that the most similar new class is R42 (boreal and arctic acidophilous alpine grassland) but does not give a critical load for this class, hence the critical load for E4.2 has been retained.

^c For acidity critical load calculations, woodlands are grouped into two classes: Coniferous woodland and Broadleaved and mixed woodland.

^d Critical loads are calculated for 1752 freshwater sites across the UK; habitat areas are based on the catchment areas of these sites.

1.5.2 Acidity critical loads

Two methods are used in the UK for calculating acidity critical loads for terrestrial habitats: the empirical approach is used to provide estimates for non-woodland habitats on mineral and organomineral soils; and simple-mass-balance equations are used for woodland habitats and for habitats that occur on peat. The CL_{maxS}, CL_{maxN} and CL_{minN} values that define the critical load function (see Figure 1.3) are derived from the acidity critical load value, taking into account the deposition of anthropogenic base cations and chloride, and inputs and losses of nitrogen (Hall et al., 2015).

In the empirical approach used for non-woodland habitats on mineral and organo-mineral soils, critical loads for acidity are assigned to each 1 km x 1 km grid square of the UK based on the amount of acid deposition that could be neutralised by the base cations produced by mineral weathering of the dominant soil type in the grid square (Hornung et al., 1995).

For woodland habitats a simple mass balance (SMB) equation, based on balancing the acidic inputs to and outputs from the ecosystem, is used to derive a critical load that ensures that a specified critical chemical limit is not exceeded (Sverdrup and De Vries, 1994; Sverdrup et al., 1990). In the UK, the limit used is a calcium to aluminium molar ratio of 1.0 (Hall et al., 2015). Below this value, aluminium has significant toxic effects. Critical loads are calculated for both managed (productive) and unmanaged woodlands to protect

the long-term ecosystem function of these woodland habitats; this approach also aims to protect the land under managed coniferous forest for possible future non-forest use and reversion to semi-natural land uses.

A simpler mass balance approach is used for habitats on acid peat soils, because of the absence of inputs of alkalinity and of aluminium from mineral weathering (Gammack et al., 1995; Smith et al., 1992). Critical loads of acidity for peat soils are set to the value corresponding to the amount of acid deposition that would give rise to an effective rain pH value of 4.4 (Calver, 2003; Calver et al., 2004; Skiba and Cresser, 1989); the choice of threshold pH value reflects the buffering effects of organic acids on the pH of peat drainage water. This method may underestimate the critical load for acidity for fen peats that receive base cation inputs from groundwater, but fen peats were not distinguished in this report (Hall et al., 2015).

Acidity critical loads for freshwaters are calculated using the catchment-based First-Order Acidity Balance (FAB: Henriksen and Posch, 2001) model. FAB is currently applied to 1752 sites across the UK, comprising a mixture of mainly upland, lakes, reservoirs and first-order streams (i.e. streams that feed into other larger streams, but do not have any other streams draining into them). The critical load calculations are based on the water chemistry of samples collected in the 1990s to provide an estimate of the annual mean water chemistry. The FAB model generates the acidity critical load values CLmaxS, CLminN and CLmaxN (see Part 2).

1.5.3 Nutrient nitrogen critical loads

Both empirical and mass-balance methods can be used for calculating critical loads for eutrophication (i.e. an excess of nutrients, in this case N). Empirical critical loads are based on experimental or field evidence of thresholds for changes in species composition, plant growth, plant tissue chemistry or soil processes. The empirical approach is suited to semi-natural communities for which the long-term protection of biodiversity and/or ecosystem function is the key concern. In the UK, the empirical approach is applied to natural and semi-natural habitats, based on critical load values agreed internationally (Bobbink and Hettelingh, 2011; Bobbink et al., 2022; Hall et al., 2015). Empirical critical loads for N (CLempN) are presented as a range for each habitat, to represent the variation in sensitivity within the habitat, and also uncertainty in both ecosystem response and N addition rate in the studies that were considered. Exceedances are calculated for this report in relation to a single value within each range, the “mapping value”. Since 2023, this mapping value has been set to the lower end of the range, as recommended by an expert group (Rowe and Hina, 2023).

Empirical critical loads were applied to all habitats apart from managed coniferous woodland, to which a mass-balance approach was applied. This approach accounts for the long-term inputs and outputs of N from the ecosystem, with the critical load being exceeded when a specified critical rate of N leaching is exceeded. This approach is suitable for managed ecosystems with relatively low biodiversity, in which the inputs and outputs can be quantified with some confidence and in which a key concern is nitrate

leaching. As with acidity, in the UK this approach is applied to managed coniferous woodlands to ensure that long-term ecosystem functions (for example of soils, soil biological resources, trees, or linked aquatic systems) are protected.

1.6 Deposition data and trends

The S, N and base cation deposition data used in the UK calculations of critical loads and their exceedances are based on the “Concentration Based Estimated Deposition” (CBED) methodology (RoTAP, 2012). For secondary compounds (HNO_3 , particulate NO_3^- , NH_4^+ and SO_4^{2-}) and base cations, site-based measurements of air concentrations of sulphur and nitrogen, as gases and particulates (Tang et al., 2018a; Tang et al., 2018b) from the Acid Gases and Aerosol Network (AGANet), are interpolated to generate 5 km x 5 km maps of concentrations for the UK. Ideally, data are filtered to only include sites that achieved a 70% data coverage for any given year. AGANet was set up to provide the minimum number of sites deemed necessary to derive defensible national maps. Due to reduced data capture for a number of reasons, especially since 2021, it was necessary to relax the 70% data coverage criterion. Expert judgement was used to tune the site acceptance to provide spatial maps that were realistic and consistent with previous years. In addition, in some interpolations the nearby sites of Auchencorth and Easter Bush created strong local gradients which were extrapolated to create artificial areas of very high or low concentrations. In these situations, the data for the two sites were averaged and treated as one site.

As with NH_3 , concentrations of the primary pollutants SO_2 and NO_2 show higher spatial variability than can be resolved by the networks, and for these components 1 km x 1 km resolution data were taken from Defra’s Modelling of Ambient Air Quality (MAAQ) contract, which has so far used the Pollution Climate Mapping (PCM) methodology (but is likely to move to the CMAQ Atmospheric Chemistry and Transport Model in the future). Ion concentrations in precipitation from the UK Eutrophying and Acidifying Pollutants (UKEAP) network (Braban et al., 2021; Conolly et al., 2018) are combined with the Met Office map of annual precipitation (Met Office et al., 2025), also at 5 km x 5 km resolution, to generate maps of wet deposition. These wet deposition estimates include direct deposition of cloud droplets to vegetation (known as “occult” deposition), and orographic enhancement to take account of the “seeder-feeder” effect in upland regions (Fowler et al., 1988). A map of gaseous ammonia concentration is combined with spatially distributed estimates of vegetation-specific deposition velocities (Smith et al., 2000) to generate dry deposition. The spatial distribution of gaseous ammonia was derived from the UK version of the European Monitoring and Evaluation Programme (EMEP4UK) model, driven by the most recent emissions and meteorology data available, as discussed in Section 4.2. Combining these data sets produces 5 km x 5 km maps of total (wet + cloud + dry) deposition of S (non-marine), oxidised N (NO_y) and reduced N (NH_x). These maps were then re-sampled at 1 km x 1 km by bilinear interpolation, for intersection with habitat data at that resolution. Two different sets of deposition values are calculated for critical load and exceedance applications: i) deposition onto “moorland”, i.e. unfertilised open (non-wooded) habitats;

and ii) deposition onto “woodland”, which has greater deposition velocities due to the greater roughness of the land surface.

As with ammonia concentration (Section 1.2.1), deposition can be subject to significant inter-annual variation due to the natural variability in annual precipitation (which influences wet deposition) as well as the general circulation of air which can increase or decrease the amount of polluted air imported from the European continent. The CBED deposition data used to calculate critical load exceedances are therefore averaged over a three-year period; this has been demonstrated to be a suitable time period to smooth out inter-annual variations in deposition. Figure 1.2 shows the CBED data for 2022-2024. For brevity, the three-year means are mainly referred to in this report using the middle year, for example “2003 to 2023” equates to “2002-2004 to 2022-2024”.

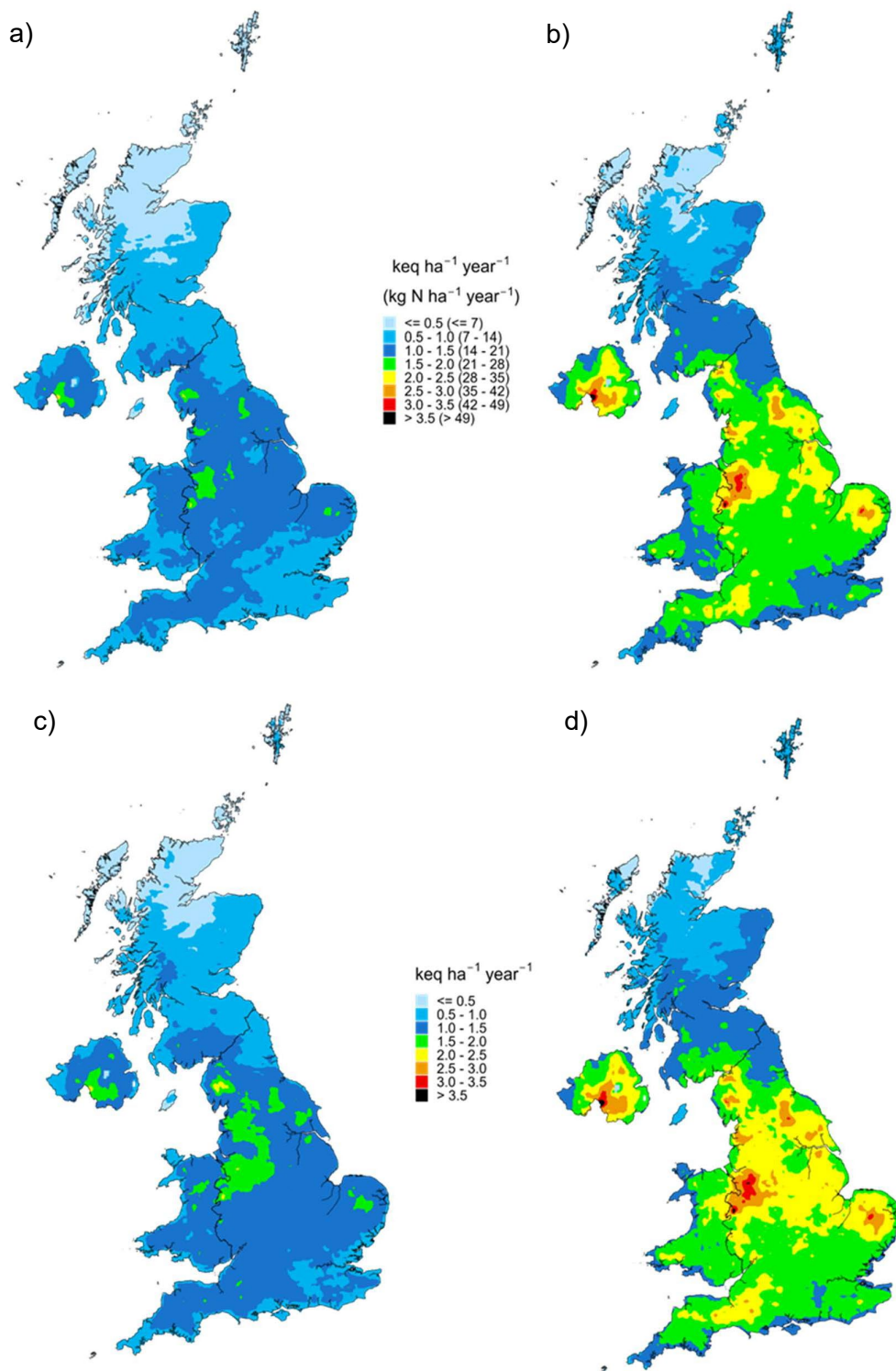


Figure 1.2: CBED deposition for 2022-2024:

- a) nitrogen (oxidised plus reduced) deposition to moorland;
- b) nitrogen (oxidised plus reduced) deposition to woodland
- c) acid (sulphur plus nitrogen) deposition to moorland
- d) acid (sulphur plus nitrogen) deposition to woodland

In Figure 1.2, deposition is mapped for N and acidity using the same units ($\text{keq ha}^{-1} \text{ yr}^{-1}$) and class intervals. For the N maps, deposition rates are also shown in $\text{kg N ha}^{-1} \text{ yr}^{-1}$. Four UK maps showing nitrogen and acid deposition to moorland and woodland habitats in 2022-2024. Deposition is generally highest in England, Wales and Northern Ireland, lower in much of Scotland, and consistently greater on woodland than on moorland.

To understand trends in critical load exceedances, it is useful to look at trends in deposition. Deposition estimates using CBED deposition data derived from the EMEP map for ammonia exist for all 3-year rolling intervals from 2003 to 2023 (reminder: the 3-year time periods are referred to in brief using the *middle year* of the period). The trends in CBED deposition to moorland and to woodland are summarised in Figure 1.3. Deposition onto woodland is higher than that onto moorland due to greater deposition velocities of gases (for example NH_3 and HNO_3), particulates and cloud droplets onto tall vegetation. Between 2003 and 2023, non-marine S deposition onto moorland in the UK decreased by 70%, NO_x deposition onto moorland decreased by 52% and NH_x deposition onto moorland decreased by 10%.

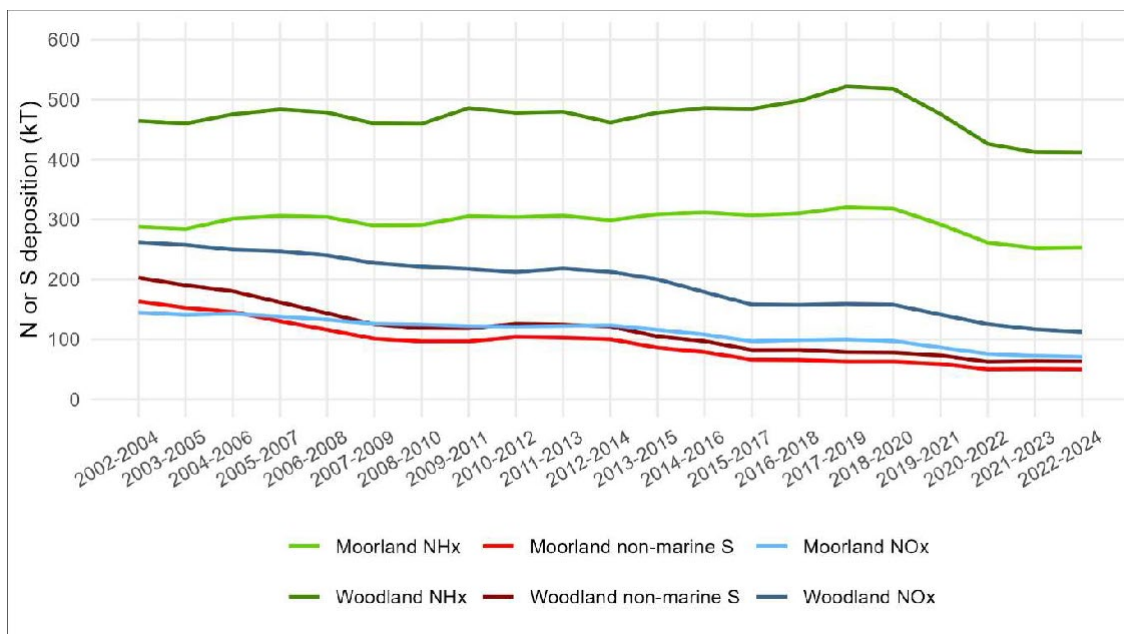


Figure 1.3: Deposition budgets (kilotonnes S or N per year) calculated by CBED using ammonia concentration maps from EMEP assuming UK area is a) woodland or b) moorland or other unfertilised open habitat.

Key:

- Non marine S: non-marine sulphur
- NO_x : oxidised nitrogen
- NH_x : reduced nitrogen

The results shown in Figure 1.3 are discussed in Section 1.6.

1.7 Overview of the calculation of critical load exceedances

Critical load exceedances are the amount of excess deposition above the critical load; for nutrient N the calculation is simply total N deposition (derived from N oxides and ammonia) minus the critical load. For acidification, deposition of both S and N compounds can contribute to the exceedance of critical loads. The Critical Load Function, developed under the UNECE CLRTAP (Hettelingh et al., 1995; Posch et al., 1999; Posch et al., 1995; Posch and Hettelingh, 1997), defines combinations of S and N deposition that will not cause harmful effects. In its simplest form, an acidity critical load can be defined graphically by a 45-degree diagonal line on a sulphur-nitrogen deposition plot (Figure 1.3a), where both types of deposition are expressed in chemical equivalents, i.e. moles of charge. The line intercepts the x-axis (representing N deposition) and y-axis (representing S deposition) at the same value in equivalents, each representing the N or S deposition equal to the critical load for acidity. Each point along the diagonal line represents the critical load in terms of some combination of S and N deposition.

To allow for the long-term N removal processes by the soil and through harvesting of vegetation, the simple diagonal line is shifted along the N axis to increase the N values across the entire Critical Load Function (Figure 1.3b). More N can then be deposited before the acidity critical load is exceeded. There are no similar removal processes that need to be considered for S.

The intercepts of the Critical Load Function on the S and N axes (Figure 1.3c) define the following terms:

1. The “maximum critical load of S” (CL_{maxS}): the critical load for acidity expressed in terms of S only, i.e. when N deposition is zero.
2. The “maximum critical load of N” (CL_{maxN}): the critical load for acidity expressed in terms of N only, i.e. when S deposition is zero.
3. The “minimum critical load of N” (CL_{minN}): represents long-term N removal processes in the soil (for example N uptake and immobilisation) and harvesting of vegetation.

These critical loads are calculated from the acidity critical loads described in Section 1.1 and additional soil-specific or habitat-specific data.

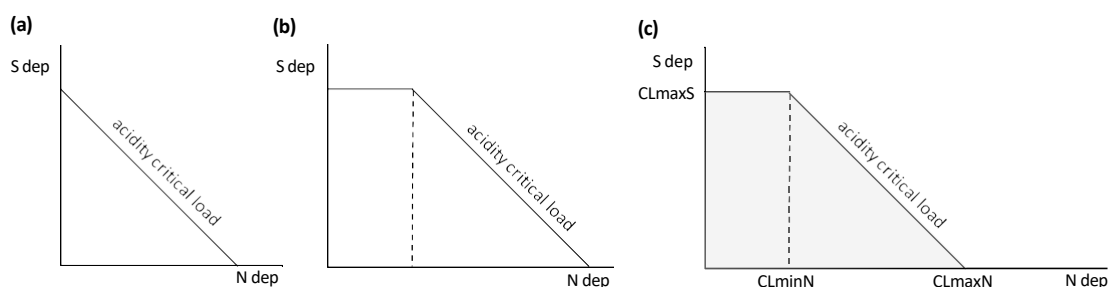


Figure 1.4: Development of the Critical Load Function:

- a) acidity critical load defined by equal amounts of sulphur and nitrogen deposition**
- b) shifting the acidity critical load diagonal line to allow for nitrogen removal processes**
- c) the 3 intercepts of the Critical Load Function: CLmaxS, CLminN and CLmaxN**

In Figure 1.4, the area shown in grey represents the combinations of sulphur and nitrogen deposition that are below the critical load (that is, critical load is not exceeded).

Exceedances are calculated by comparing the values of CLmaxS, CLminN and CLmaxN to the values of S and N (oxidised + reduced) deposition. The actual calculation depends on where the deposition falls in relation to these critical load values; the Critical Load Function is divided into five different regions for this purpose (Figure 1.4). The exceedance is defined by the sum of S and N deposition as shown by the red arrows in Figure 1.5 (i.e. not the length of the diagonal line); this is referred to as the “shortest distance” exceedance. Further details of the calculations are given in Hall et al. (2015).

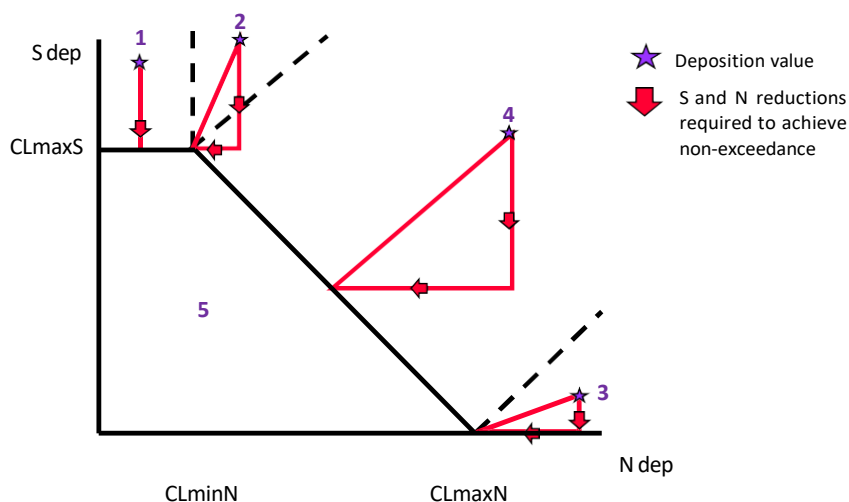


Figure 1.5: Example of S and N deposition reductions required depending on the region of the CLF. Deposition that falls in region 5 is below the critical load (that is, critical loads not exceeded)

1.7.1 Exceedance and damage

The critical loads data on which exceedance calculations are based are derived from empirical or steady-state mass balance methods, which are used to define critical loads for the long term. Exceedance of critical loads is an indication that an ecosystem is at risk from potential harmful effects in the long-term. Therefore, exceedance is not a quantitative estimate of damage to the environment; it does not necessarily mean that harmful or adverse effects have already occurred or may be observed, but that there is a risk of damage in the long-term. Reducing deposition to below the critical load does not mean that ecosystems immediately recover. There are time lags before chemical recovery takes place, and further delays before biological recovery. Timescales for both chemical and biological recovery could be very long, particularly for the most sensitive ecosystems.

1.7.2 Critical load exceedance metrics

Critical load exceedances are calculated for each 1km square of the distributions of each terrestrial habitat, and for each catchment for freshwaters. The results are then summarised by habitat and country using the following exceedance metrics:

(i) *Area of habitat exceeded*

For terrestrial habitats, the area values are based on habitat maps mainly derived from LCM2019 data; if the critical load for any individual habitat is exceeded, the exceeded area is set to the habitat area within the 1 km square for that particular habitat. For freshwater habitats, if the FAB acidity critical load is exceeded, the whole catchment is assumed to be exceeded and the exceeded area set to the catchment area. The total exceeded areas for individual habitats are summarised by country. Freshwater catchment areas are not included when calculating total area exceeded for acidity per country, to avoid double-counting of the areas of sensitive habitat within these catchments.

(ii) *Percentage area of habitat exceeded*

This is calculated from the exceeded areas derived in (i) and the total area of each habitat mapped in each country (Section 1.1). While this is a useful metric for expressing how much habitat is at risk, it does not clearly reflect decreases in the amount of exceedance. For example, when comparing exceedance results from one year to another (or one deposition scenario to another), there may be only small changes in the percentage area of habitat exceeded, particularly in regions with high deposition. This is because the magnitude of the exceedance may have reduced, but the area exceeding the critical load remains the same; the area exceeded will only reduce when the critical load is no longer exceeded. Even when the critical load is still exceeded, decreases in the amount of exceedance are likely to have some benefits (Rowe et al., 2017).

(iii) *Accumulated Exceedance (AE)*

AE takes account of both the magnitude of exceedance and the habitat area exceeded:

$$AE \text{ (keq year}^{-1}\text{)} = \text{exceedance (keq ha}^{-1} \text{ year}^{-1}\text{)} \times \text{exceeded area (ha)}$$

AE is calculated for each 1 km square for each habitat and then summarised by habitat and country. AE is set to zero where critical loads are not exceeded. This metric can be useful for comparing results for different years or scenarios, but because the results are expressed in as totals for the country (in keq year⁻¹) they are large numbers and not intuitive to understand. It should also be noted that the same AE can arise from a large exceedance and small exceeded area, or a small exceedance and a large area.

(iv) *Average Accumulated Exceedance (AAE)*

AAE averages the AE across the entire sensitive habitat area:

$$AAE \text{ (keq ha}^{-1} \text{ year}^{-1}\text{)} = AE \text{ (keq year}^{-1}\text{)} / \text{total sensitive habitat area (ha)}$$

This metric provides an exceedance value averaged across the whole habitat area. In this report we use the terms **Excess Nitrogen** as a synonym for the AAE of nutrient-N critical loads and **Excess Acidity** as a synonym for the AAE of acidity critical loads. In the summary statistics presented (Section 2) it is based on the AE for the habitat (by country) divided by the total sensitive habitat area (by country). AAE is set to zero where critical loads are not exceeded. This metric provides a more intuitive value for comparing the exceedance results for different years or scenarios, and gives an indication of the reduction in the magnitude of exceedance even if there is no change in the percentage area of habitat exceeded.

1.8 Calculation of N deposition onto protected sensitive habitats in England

The Defra Clean Air Strategy (Defra, 2019) includes an indicator for England, “total deposition of reactive N onto nutrient-N sensitive, protected, priority habitats” (N_{sens}). This metric is calculated as the area-weighted mean deposition of total N (oxidised and reduced N) in kg N ha⁻¹ yr⁻¹, that is, the sum over all sensitive habitats of habitat area times deposition, divided by the sum over all habitats of habitat area.

The priority habitats included in this calculation are a subset of the habitats listed in Table 1.3, as indicated in that table. Deciduous woodland and mixed woodland were included, but not managed coniferous woodland (see Section 1.5.1).

Section 2: Exceedances of critical levels

This section of the report focuses on the trends in exceedance of critical levels for ammonia, that are set to protect: a) lichens and bryophytes; or b) vascular plants. The trends are based on rolling 3-year mean ammonia gaseous concentrations. For brevity, the three-year means are mainly referred to in this report using the middle year, for example “2010 to 2015” equates to “2009-11 to 2014-16”.

2.1 Trends in ammonia critical levels exceedance

2.1.1 UK land area with exceedance of ammonia critical levels

Ammonia concentrations exceeded the critical level of $1 \mu\text{g m}^{-3}$ (set to protect sensitive bryophytes and lichens) across 58.6% of the UK land area in 2023, compared to 56.9% in 2003 (Figure 2.1a; Table 2.2a). Exceedance varies spatially, with minimum 10.5% of Scotland, but 85% of England and more 95% of Northern Ireland having ammonia concentrations above $1 \mu\text{g m}^{-3}$.

The ammonia critical level of $3 \mu\text{g m}^{-3}$, set to protect sensitive vascular plants, was not exceeded in 2023 in Scotland. Relatively small areas of the rest of the UK exceeded the $3 \mu\text{g m}^{-3}$ threshold: 0.2% of Wales and 2.2% of England, although a larger proportion of the area of Northern Ireland was exceeded, 12.6% (Figure 2.1b; Table 2.2).

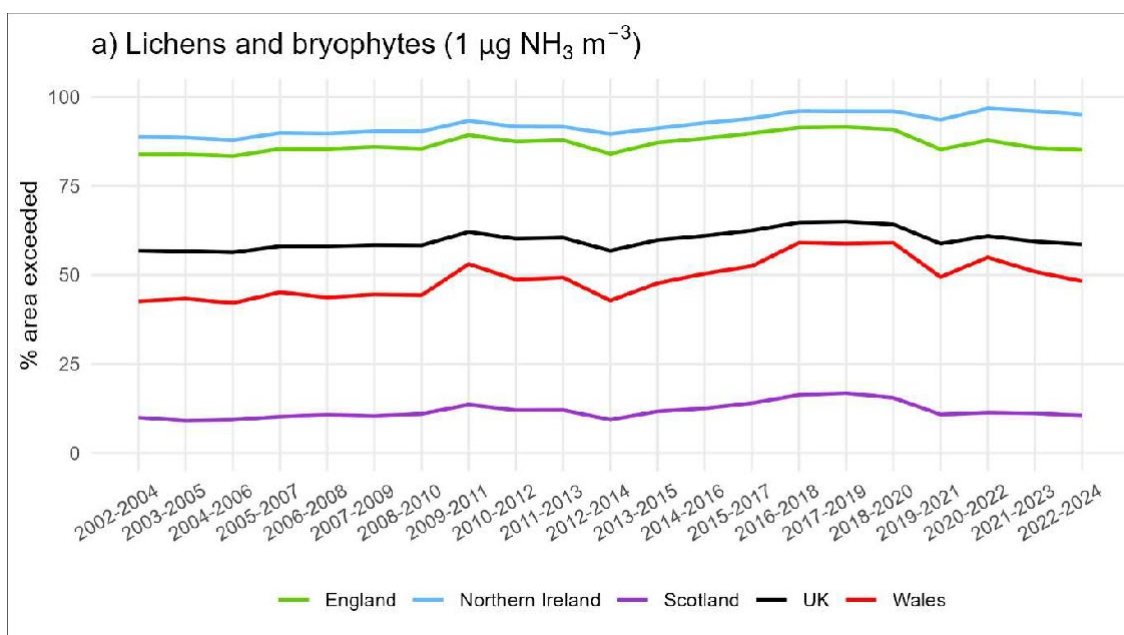


Figure 2.1A: Percentages of the UK land area where ammonia concentrations exceeded the critical level for lichens and bryophytes. The results shown are discussed in Section 2.1.1.

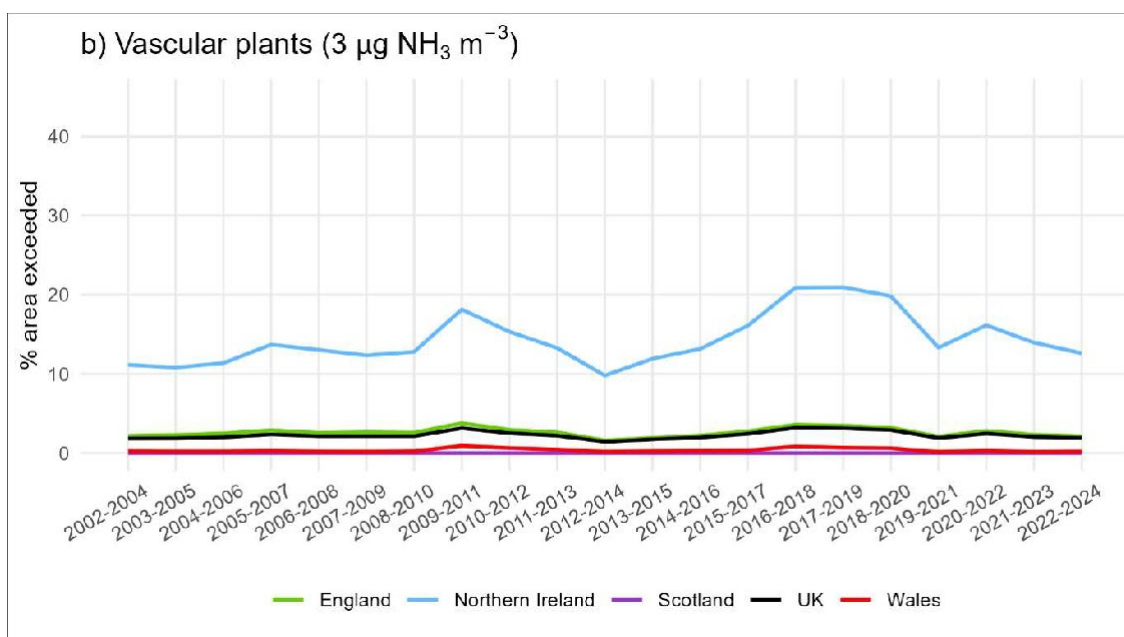


Figure 2.1B: Percentages of the UK land area where ammonia concentrations exceeded the critical level for vascular plants. The results shown are discussed in Section 2.1.1.

Table 2.2a: Percentages of the UK land area where ammonia concentrations exceed critical level of $1 \mu\text{g m}^{-3}$. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	UK
2002-2004	83.8	42.6	10.0	88.8	56.9
2007-2009	86.0	44.5	10.4	90.3	58.4
2012-2014	84.0	42.8	9.4	89.6	56.8
2013-2015	87.2	47.7	11.7	91.2	59.8
2014-2016	88.4	50.4	12.6	92.7	61.0
2015-2017	89.8	52.5	14.0	93.9	62.5
2016-2018	91.4	59.0	16.3	96.1	64.8
2017-2019	91.5	58.8	16.8	96.0	65.0
2018-2020	90.8	59.0	15.5	96.0	64.2
2019-2021	85.3	49.4	10.9	93.6	58.8
2020-2022	87.8	54.9	11.4	96.8	61.0
2021-2023	85.7	50.9	11.2	96.1	59.4
2022-2024	85.1	48.3	10.5	95.0	58.6
Change 2003-2023	1.3	5.6	0.5	6.2	1.7

Table 2.2b: Percentages of the UK land area where ammonia concentrations exceed critical level of $3 \mu\text{g m}^{-3}$. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	UK
2002-2004	2.2	0.3	0.0	11.2	1.8
2007-2009	2.6	0.2	0.0	12.3	2.1
2012-2014	1.6	0.2	0.0	9.8	1.4
2013-2015	1.9	0.2	0.0	11.9	1.7
2014-2016	2.2	0.3	0.0	13.2	2.0
2015-2017	2.8	0.3	0.0	16.1	2.4
2016-2018	3.6	0.8	0.0	20.9	3.2
2017-2019	3.5	0.7	0.0	21.0	3.1
2018-2020	3.2	0.6	0.0	19.8	2.9
2019-2021	2.1	0.1	0.0	13.3	1.9
2020-2022	2.8	0.3	0.0	16.2	2.5
2021-2023	2.3	0.1	0.0	14.0	2.1
2022-2024	2.2	0.2	0.0	12.6	1.9
Change 2003-2023	0	-0.1	0	1.5	0.1

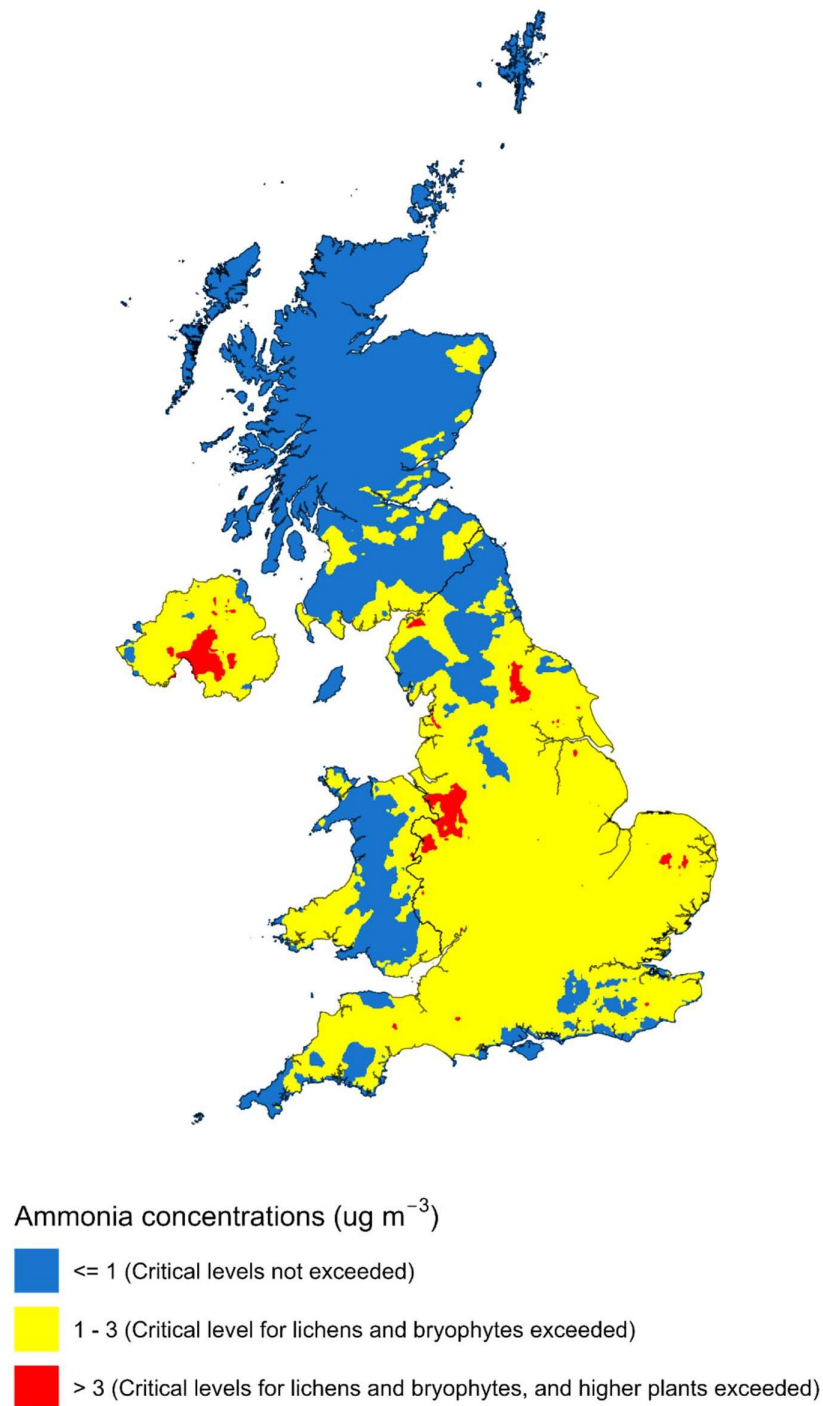


Figure 2.2: Distribution of mean ammonia concentrations across the UK in 2022-2024 according to the CBED model, in relation to critical levels set to protect sensitive lichens and bryophytes ($1 \mu\text{g NH}_3 \text{ m}^{-3}$) and to protect vascular plants ($3 \mu\text{g NH}_3 \text{ m}^{-3}$).

Figure 2.2 is a map of UK ammonia concentrations in 2022–2024, showing areas where levels exceed critical thresholds for sensitive plants, lichens and bryophytes. Exceedances are most widespread in England and Northern Ireland and least extensive in Scotland.

2.1.2 Nitrogen-sensitive habitats with exceedance of ammonia critical levels

In 2023, less than a quarter (24.3%) of the mapped area of N-sensitive habitats in the UK received ammonia concentrations above the critical level of $1 \mu\text{g m}^{-3}$ (Table 2.3a). This is an increase from 22.3% in 2003, but there is some evidence of a decrease from greater areas exceeded in the late 2010s. The results vary spatially across the UK depending on variation in ammonia concentrations (see Figure 3.1), and the distributions of the different N-sensitive habitats. Although 58% of the total UK area of N-sensitive habitats is found in Scotland, because the ammonia concentrations are generally low in this part of the UK (Figure 3.1) only 3.0% of the Scottish habitat area coincides with ammonia concentrations above $1 \mu\text{g m}^{-3}$. There were no areas in Scotland or Wales with concentrations above $3 \mu\text{g m}^{-3}$ in 2023 (Table 2.3b). The most widespread exceedances were seen in England and Northern Ireland, with ammonia concentrations above $1 \mu\text{g m}^{-3}$ exceeded over 59.1% and 85.1% of sensitive habitat, respectively. 0.6% and 4% of their N-sensitive habitat areas are above $3 \mu\text{g m}^{-3}$.

Table 2.3a: Percentages of the area of nitrogen sensitive habitats in the UK where ammonia concentrations exceed critical levels of $1 \mu\text{g m}^{-3}$ by country. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	UK
N sensitive habitat area (km²)	25813	9347	53530	3898	92588
2002-2004	55.9	19.3	2.7	74.8	22.3
2007-2009	60.4	20.2	2.9	78.8	23.9
2012-2014	56.8	19.3	2.6	76.6	22.5
2013-2015	62.1	23.0	3.3	80.9	24.9
2014-2016	64.6	25.2	3.6	85.1	26.2
2015-2017	67.7	27.0	4.2	88.6	27.8
2016-2018	71.5	33.3	5.2	94.6	30.3
2017-2019	71.9	33.3	5.2	94.6	30.3
2018-2020	70.2	33.4	4.8	94.5	29.7

Years	England	Wales	Scotland	NI	UK
N sensitive habitat area (km²)	25813	9347	53530	3898	92588
2019-2021	59.5	24.2	3.3	86.9	24.6
2020-2022	63.8	29.5	3.4	90.0	26.5
2021-2023	60.2	26.5	3.2	87.9	25.0
2022-2024	59.1	24.6	3.0	85.1	24.3
Change 2003-2023	3.2	5.3	0.2	10.4	2

Table 2.3b: Percentages of the area of nitrogen sensitive habitats in the UK where ammonia concentration exceeds the critical level of $3 \mu\text{g m}^{-3}$, by country. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	UK
N sensitive habitat area (km²)	25813	9347	53530	3898	92588
2002-2004	0.7	0.1	0.0	3.6	0.3
2007-2009	0.9	0.0	0.0	3.9	0.4
2012-2014	0.5	0.0	0.0	3.2	0.3
2013-2015	0.6	0.0	0.0	4.0	0.3
2014-2016	0.7	0.1	0.0	4.5	0.4
2015-2017	0.9	0.1	0.0	5.4	0.5
2016-2018	1.2	0.1	0.0	7.0	0.6
2017-2019	1.2	0.1	0.0	7.1	0.6
2018-2020	1.1	0.1	0.0	6.7	0.6
2019-2021	0.6	0.0	0.0	4.3	0.4
2020-2022	0.9	0.1	0.0	5.2	0.5
2021-2023	0.7	0.0	0.0	4.5	0.4
2022-2024	0.6	0.0	0.0	4.0	0.3
Change 2003-2023	0	0	0	0.4	0

The N-sensitive habitats (Table 2.4) with the highest percentage area of exceedance of the ammonia critical level of $1 \mu\text{g m}^{-3}$ in 2023 were beech woodland (76.6%), calcareous grassland (73.1%), broadleaved woodland (77.2%), and mixed woodland (69.1%). Other habitats had smaller percentage areas where ammonia concentrations were above $1 \mu\text{g m}^{-3}$.

m⁻³. However, although only 8.9% of Dwarf shrub heath is exceeded, this habitat occupies a large area across the UK so this equates to 1,903 km², which is more than the exceeded area of beech woodland (1,574 km²), even though beech woodland was 76.6% exceeded. The temporal trends in exceedance are similar to those for total habitat area (Table 2.3), with greater areas exceeded in 2023 compared to 2003, but evidence of a recent decrease from the high values of the 2010s.

Table 2.4a: Percentages of the area of nitrogen-sensitive habitats where the 1 µg m⁻³ ammonia critical level is exceeded, by habitat. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved woodland	Beech woodland	Acidophilous oak	Scots Pine	Mixed woodland	Dune grassland	Saltmarsh
Habitat area (km²)	20339	994	21385	9070	4915	14401	8616	2055	6851	1484	1409	426	642
2002-2004	8.1	72.1	7.0	8.1	0.0	20.9	77.7	74.7	48.4	0.9	65.7	27.1	66.9
2007-2009	9.2	76.3	8.5	9.5	0.0	22.4	78.6	81.0	51.8	1.1	68.1	30.8	70.5
2012-2014	8.5	72.4	7.5	8.9	0.0	21.1	77.4	74.1	47.8	0.9	66.0	29.4	67.9
2013-2015	10.6	78.2	9.0	10.0	0.0	23.5	80.0	83.2	53.8	1.3	70.3	35.8	73.6
2014-2016	12.0	80.7	10.0	11.1	0.0	24.9	81.1	86.9	56.3	1.2	72.5	40.5	75.7

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved woodland	Beech woodland	Acidophilous oak	Scots Pine	Mixed woodland	Dune grassland	Saltmarsh
2015-2017	13.5	82.2	11.5	12.3	0.1	26.5	82.8	90.1	58.6	1.3	74.6	41.8	76.9
2016-2018	16.7	84.8	13.2	15.0	0.2	29.3	85.2	94.0	62.4	1.4	78.6	46.0	80.3
2017-2019	17.0	85.4	13.3	15.2	0.2	29.6	85.4	93.9	62.7	1.5	78.8	45.5	79.9
2018-2020	16.2	83.2	12.7	13.8	0.1	28.9	84.3	93.2	61.9	1.4	78.2	43.3	78.9
2019-2021	11.4	71.7	9.3	10.3	0.0	23.8	78.7	75.1	50.8	1.2	70.1	33.7	69.3
2020-2022	13.4	76.1	10.3	10.8	0.0	25.7	80.1	84.6	55.9	1.2	73.0	41.2	75.4
2021-2023	12.1	72.7	9.4	10.1	0.0	24.2	78.4	78.0	51.6	1.2	70.8	39.2	71.9

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved woodland	Beech woodland	Acidophilous oak	Scots Pine	Mixed woodland	Dune grassland	Saltmarsh
2022-2024	11.3	73.1	8.9	9.6	0.0	23.5	77.2	76.6	50.3	1.2	69.1	37.3	70.3
Change 2003-2023	3.2	0.9	1.9	1.5	0	2.6	-0.5	1.9	1.9	0.2	3.4	10.3	3.4

Table 2.4b: Percentages of the area of nitrogen-sensitive habitats where the 3 µg m⁻³ ammonia critical level is exceeded, by habitat. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved woodland	Beech woodland	Acidophilous oak	Scots Pine	Mixed woodland	Dune grassland	Saltmarsh
Habitat area (km²)	20339	994	21385	9070	4915	14401	8616	2055	6851	1484	1409	426	642
2002-2004	0.0	0.0	0.0	0.2	0.0	0.2	2.1	0.1	0.6	0.0	2.7	0.0	1.6
2007-2009	0.0	0.1	0.0	0.2	0.0	0.3	2.5	0.6	0.7	0.0	3.0	0.0	1.4
2012-2014	0.0	0.1	0.0	0.1	0.0	0.2	1.7	0.3	0.4	.0	2.3	0.0	0.9
2013-2015	0.0	0.1	0.0	0.2	0.0	0.2	2.0	0.3	0.5	0.0	2.7	0.0	0.8
2014-2016	0.0	0.1	0.0	0.2	0.0	0.2	2.2	0.2	0.6	0.0	3.0	0.0	0.8

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved woodland	Beech woodland	Acidophilous oak	Scots Pine	Mixed woodland	Dune grassland	Saltmarsh
2015-2017	0.0	0.1	0.1	0.3	0.0	0.3	2.8	0.3	0.8	0.0	3.6	0.0	0.8
2016-2018	0.0	0.1	0.1	.4	0.0	0.4	3.6	0.6	1.1	0.0	4.5	0.0	1.2
2017-2019	0.0	0.1	0.1	0.4	0.0	0.4	3.6	0.6	1.1	0.0	4.5	0.0	1.2
2018-2020	0.0	0.1	0.1	0.4	0.0	0.4	3.4	0.5	1.0	0.0	4.4	0.0	1.1
2019-2021	0.0	0.1	0.0	0.2	0.0	0.2	2.2	0.2	0.6	0.0	2.8	0.0	0.8
2020-2022	0.0	0.1	0.1	0.2	0.0	0.3	3.0	0.2	0.7	0.0	3.4	0.0	0.5
2021-2023	0.0	0.0	0.0	0.2	0.0	0.2	2.4	0.1	0.6	0.0	2.9	0.0	0.1

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved woodland	Beech woodland	Acidophilous oak	Scots Pine	Mixed woodland	Dune grassland	Saltmarsh
2022-2024	0.0	0.0	0.0	0.2	0.0	0.2	2.2	0.2	0.5	0.0	2.6	0.0	0.2
Change 2003-2023	0.01	0.04	0.01	0.02	0	0	0.15	0.03	-0.04	0	-0.02	-0.04	-1.41

2.1.3 Designated sites with exceedance of ammonia critical levels

These results show the percentage of sites (SACs, SPAs, SSSIs/ASSIs) where ammonia critical levels are exceeded; a site is counted as exceeded if the ammonia concentration exceeds the respective critical level anywhere across a site. SACs may contain one or more SSSIs/ASSIs, and some SACs and SPAs may overlap one another, however in this analysis the sites are all assessed as if they were independent.

SACs

54.6% of SACs occur in areas of the UK where ammonia concentrations exceed $1 \mu\text{g m}^{-3}$ (Table 2.5a); the lowest number of sites with exceedance is in Scotland, where ammonia concentrations are greater than $1 \mu\text{g m}^{-3}$ at 9.2% of sites. The percentage of UK SACs with exceedance of the $1 \mu\text{g m}^{-3}$ critical level increased by 3.0% between 2003 and 2023, but this varies spatially across the UK with more increase seen in England, than in Wales and Scotland over this time period.

The percentage of SACs with ammonia concentrations above $3 \mu\text{g m}^{-3}$ is smaller, 2.1% in 2023 (Table 2.5b). Over the last three years in Northern Ireland there has been a steady decrease in the number of SACs where this higher critical level is exceeded, with ~5.3% of sites now exceeded.

Table 2.5a: Percentage of SACs where the $1 \mu\text{g m}^{-3}$ ammonia critical level is exceeded, by country. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	England/ Wales	England/ Scotland	UK
Number of sites	240	87	238	57	8	4	634
2002-2004	80.0	54.0	8.0	93.0	100.0	100.0	50.9
2007-2009	84.2	59.8	7.1	94.7	100.0	100.0	53.2
2012-2014	80.8	56.3	6.7	94.7	100.0	100.0	51.3
2013-2015	86.2	59.8	9.7	98.2	100.0	100.0	55.2
2014-2016	87.1	62.1	11.8	98.2	100.0	100.0	56.6
2015-2017	88.8	64.4	13.0	100.0	100.0	100.0	58.2
2016-2018	90.4	74.7	16.0	100.0	100.0	100.0	61.4
2017-2019	90.4	72.4	16.8	100.0	100.0	100.0	61.4
2018-2020	89.2	72.4	14.7	100.0	100.0	100.0	60.1
2019-2021	82.5	58.6	7.6	96.5	100.0	100.0	52.7
2020-2022	87.1	64.4	9.2	96.5	100.0	100.0	55.8
2021-2023	86.2	58.6	9.7	96.5	100.0	100.0	54.9
2022-2024	85.4	55.2	9.2	96.5	100.0	100.0	53.9
Change from 2003 – 2023	5.4	1.1	1.3	3.5	0	0	3

Table 2.5b: Percentage of SACs where the 3 µg m⁻³ ammonia critical level is exceeded, by country. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	England/ Wales	England/ Scotland	UK
Number of sites	240	87	238	57	8	4	634
2002-2004	3.3	0.0	0.0	8.8	25.0	0.0	2.4
2007-2009	3.8	0.0	0.0	10.5	25.0	0.0	2.7
2012-2014	2.5	0.0	0.0	5.3	25.0	0.0	1.7
2013-2015	2.9	0.0	0.0	10.5	25.0	0.0	2.4
2014-2016	2.9	0.0	0.0	12.3	25.0	0.0	2.5
2015-2017	3.3	0.0	0.0	14.0	25.0	0.0	2.8
2016-2018	4.2	1.1	0.0	14.0	25.0	25.0	3.5
2017-2019	3.8	0.0	0.0	14.0	25.0	25.0	3.2
2018-2020	3.8	0.0	0.0	14.0	25.0	25.0	3.2
2019-2021	2.1	0.0	0.0	7.0	25.0	0.0	1.7
2020-2022	3.3	0.0	0.0	10.5	25.0	0.0	2.5
2021-2023	3.3	0.0	0.0	8.8	25.0	0.0	2.4
2022-2024	3.3	0.0	0.0	5.3	25.0	0.0	2.1
Change from 2003 – 2023	0	0	0	-3.5	0	0	-0.3

SPAs

The results for SPAs show a 15.4% increase from 2003 to 2023 in the number of sites in Wales exceeding the critical level of 1 µg m⁻³, although it should be noted there are only 18 SPAs in Wales. There was a decrease of 1.2% of exceeded sites in England and 3.9% in Scotland. Northern Ireland did not observe any change (Table 2.6a). Over 90% of the SPAs in England and all 16 sites in Northern Ireland are exposed to ammonia concentrations above 1 µg m⁻³.

The critical level of 3 µg m⁻³ is not exceeded for any SPAs in Wales and Scotland; this is consistent with the fact that less than 1% of the land area has ammonia concentrations above 3 µg m⁻³ (Table 2.6b). Overall, the percentage of sites with ammonia concentrations above 3 µg m⁻³ is considerably smaller than the number exceeding the critical level of 1 µg m⁻³. In Northern Ireland, one SPAs showed exceedance of the ammonia critical level of 3 µg m⁻³, representing roughly a 6% increase since 2003 of the percentage of sites exceeded, from 0% to 6.2%.

Table 2.6a: Percentage of SPAs where the 1 µg m⁻³ ammonia critical level is exceeded, by country. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	England/ Wales	England/ Scotland	UK
Number of sites	84	18	161	16	3	1	238
2002-2004	92.9	23.5	11.3	93.8	100.0	-	42.5
2007-2009	92.9	29.4	11.9	93.8	100.0	-	43.2
2012-2014	90.5	29.4	10.7	93.8	100.0	-	41.8
2013-2015	92.9	35.3	11.9	100.0	100.0	-	43.9
2014-2016	92.9	35.3	12.6	100.0	100.0	-	44.3
2015-2017	92.9	35.3	13.2	100.0	100.0	-	44.6
2016-2018	92.9	58.8	15.7	100.0	100.0	-	47.5
2017-2019	94.0	52.9	15.7	100.0	100.0	-	47.5
2018-2020	92.9	52.9	14.5	100.00	100.0	-	46.4
2019-2021	90.5	35.3	8.8	93.8	100.0	-	41.1
2020-2022	92.9	50.0	7.5	93.8	100.0	100.0	41.7
2021-2023	92.9	38.9	7.5	93.8	100.0	100.0	41.0
2022-2024	91.7	38.9	7.5	93.8	100.0	100.0	40.6
Change from 2003 – 2023	-1.2	15.4	-3.9	0	0	-	-1.9

Table 2.6b: Percentage of SPAs where the 3 µg m⁻³ ammonia critical level is exceeded, by country. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	England/ Wales	England/ Scotland	UK
Number of sites	84	18	161	16	3	1	238
2002-2004	4.8	0.0	0.0	0.0	0.0	-	1.4
2007-2009	4.8	0.0	0.0	12.5	0.0	-	2.1
2012-2014	3.6	0.0	0.0	0.0	0.0	-	1.1
2013-2015	3.6	0.0	0.0	12.5	0.0	-	1.8
2014-2016	3.6	0.0	0.0	12.5	0.0	-	1.8
2015-2017	3.6	0.0	0.0	12.5	0.0	-	1.8
2016-2018	6.0	0.0	0.0	12.5	0.0	-	2.9
2017-2019	4.8	0.0	0.0	12.5	0.0	-	2.5
2018-2020	4.8	0.0	0.0	12.5	0.0	-	2.5
2019-2021	3.6	0.0	0.0	6.2	0.0	-	1.4
2020-2022	4.8	0.0	0.0	6.2	0.0	0.0	1.8
2021-2023	3.6	0.0	0.0	6.2	0.0	0.0	1.4
2022-2024	3.6	0.0	0.0	6.2	0.0	0.0	1.4
Change from 2003 – 2023	-1.2	0	0	6.2	0	-	0

SSSIs and ASSIs

The percentage of SSSIs/ASSIs in the UK in areas where ammonia concentrations exceed the critical level of 1 µg m⁻³ increased by 1.2% between 2003 and 2023, to 64.5% (Table 2.7a). Over 83% of the sites in England and over 90% sites in Northern Ireland are in locations where this critical level is currently exceeded, as well as almost 50% of sites in Wales and 12.4% of sites in Scotland.

There was a small increase (0.1%) in the number of UK SSSIs/ASSIs showing exceedance of the 3 µg m⁻³ critical level for ammonia, with the number of sites exceeded increasing in every country. In particular, it is worth noting that between 2003 and 2023 there has been an increase (0.5%) in the percentage of ASSIs in Northern Ireland that received ammonia concentrations above the critical level of 3 µg m⁻³. No sites in Wales or Scotland now exceed the 3 µg m⁻³ threshold.

Table 2.7a: Percentage of SSSIs/ASSIs where the 1 µg m⁻³ ammonia critical level is exceeded, by country. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	England/ Wales	England/ Scotland	UK
Number of sites	4106	1063	1413	393	31	13	7019
2002-2004	82.6	45.6	12.7	86.0	-	-	63.2
2007-2009	85.1	48.8	12.9	89.1	-	-	65.3
2012-2014	82.8	45.2	12.0	88.8	-	-	63.2
2013-2015	86.2	51.3	14.4	91.6	-	-	66.8
2014-2016	87.1	53.9	15.3	94.1	-	-	68.1
2015-2017	88.2	56.0	17.2	96.2	-	-	69.6
2016-2018	90.1	62.2	21.4	98.2	-	-	72.6
2017-2019	90.2	61.1	21.7	98.0	-	-	72.5
2018-2020	89.3	62.7	19.2	98.7	-	-	71.8
2019-2021	93.4	52.3	12.8	94.4	-	-	65.2
2020-2022	86.1	58.8	13.4	95.4	100.0	84.6	67.9
2021-2023	83.9	53.2	13.4	93.9	100.0	69.2	65.7
2022-2024	83.5	49.9	12.4	90.3	96.8	69.2	64.5
Change from 2003 – 2023	0.9	4.3	-0.3	4.3	-	-	1.3

Table 2.7b: Percentage of SSSIs/ASSIs where the 3 µg m⁻³ ammonia critical level is exceeded, by country. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	England/ Wales	England/ Scotland	UK
Number of sites	4106	1063	1413	393	31	13	7019
2002-2004	1.5	0.2	0.0	8.1	-	-	1.5
2007-2009	1.9	0.2	0.0	8.9	-	-	1.7
2012-2014	1.2	0.2	0.0	6.6	-	-	1.2
2013-2015	1.4	0.2	0.0	8.9	-	-	1.4
2014-2016	1.6	0.2	0.0	10.2	-	-	1.6
2015-2017	2.0	0.3	0.0	11.5	-	-	2.0
2016-2018	2.6	0.9	0.0	14.2	-	-	2.5
2017-2019	2.5	0.8	0.0	13.5	-	-	2.4
2018-2020	2.3	0.4	0.0	13.7	-	-	2.3
2019-2021	1.4	0.0	0.0	9.2	-	-	1.4
2020-2022	2.1	0.2	0.0	10.9	16.1	0.0	2.0
2021-2023	1.8	0.0	0.0	9.2	16.1	0.0	1.6
2022-2024	1.7	0.0	0.0	8.7	16.1	0.0	1.5
Change from 2003 – 2023	0.1	-0.2	0	0.5	-	-	0.1

Section 3: Exceedance of critical loads by habitat and country

The data used for the trends analysis are described in Section 1. Acidity and nutrient N exceedances by habitat and country are updated annually using the latest three-year rolling mean deposition data. For brevity, the three-year means are mainly referred to in this report using the middle year, for example “2003 to 2023” equates to “2002-2004 to 2022-2024”. The summary statistics as described in Section 1.7.2 are made available to Defra and the Devolved Governments and JNCC. Trends in the percentage area of habitats exceeded are also included in the [annual summary of UK Biodiversity Indicators](#).

The trends results are shown as both tables and simple plots. It is worth noting that the percentage area exceeded for some habitats changes only gradually from one year to another, whereas AAE values (Excess Nitrogen and Excess Acidity) are more responsive to changes in deposition.

3.1 Trends by country

Table 3.1 shows the total land area by country and the area of habitats sensitive to acidification and eutrophication to which critical loads have been applied; 36% of the UK land area has habitats mapped for acidity critical loads, and 38% for nutrient N. Freshwater habitats are also mapped for acidity, but statistics are reported separately.

Table 3.1: Total land area and terrestrial habitat areas mapped for critical loads by country.

Country	Land area (km ²) [#]	Terrestrial habitat areas mapped for acidity (km ²)	Area mapped for acidity (per cent of country)	Terrestrial habitat areas mapped for nutrient nitrogen (km ²)	Area mapped for nutrient nitrogen (per cent of country)
England	132,938	23,429	18	26,038	20
Wales	21,225	9,075	43	9,412	44
Scotland	80,239	54,512	68	54,333	68
NI	14,130	3,527	25	3,990	28
UK	284,532	90,543	36	93,774	38

[#] The UK and its countries: facts and figures. Office for National Statistics.

3.1.1 Acidity results

The results for exceedance of acidity critical load (Table 3.2, Table 3.3, Figure 3.1 and Figure 3.2) show a decline in the percentage area of habitats exceeded in the UK, from 65.6% in 2003 to 37.8% in 2023. Between 57.5% and 65.9% of acid-sensitive areas of England, Wales and Northern Ireland were exceeded in 2023, whereas 23.0% of acid-sensitive areas in Scotland were exceeded (Table 3.2, Figure 3.4).

The magnitude of the acidity exceedance (expressed as Excess Acidity or AAE) across the UK has decreased, from 0.50 keq ha⁻¹ year⁻¹ in 2003 to 0.17 keq ha⁻¹ year⁻¹ in 2023 (Table 3.5, Figure 3.3). Excess Acidity varied among regions, with lowest values in Scotland and highest in Northern Ireland (Table 3.3, Figure 3.2).

Table 3.2: Acid-sensitive terrestrial habitat area and percentage and [total] area of habitats where acidity critical loads are exceeded, by country and deposition dataset year. Areas include freshwater catchments, which are likely to include overlaps with terrestrial acid-sensitive habitats. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	UK
Total area (km²) acid sensitive habitats	23429	9075	54512	3527	90543
2002-2004	77.3 [18,112]	83.8 [7,601]	56.7 [30,896]	79.3 [2,797]	65.6 [59,407]
2007-2009	73.2 [17,148]	79.5 [7,215]	47.0 [25,609]	78.5 [2,768]	58.2 [52,740]
2012-2014	72.7 [17,023]	77.2 [7,002]	50.3 [27,422]	80.5 [2,840]	60.0 [54,287]
2013-2015	72.1 [16,901]	77.5 [7,031]	53.3 [29,080]	79.1 [2,789]	61.6 [55,801]
2014-2016	71.0 [16,631]	77.3 [7,013]	50.3 [27,395]	77.1 [2,718]	59.4 [53,758]
2015-2017	68.8 [16,109]	75.1 [6,819]	42.8 [23,338]	74.6 [2,633]	54.0 [48,897]
2016-2018	69.3 [16,225]	74.4 [6,755]	35.6 [19,380]	77.1 [2,719]	49.8 [45,079]
2017-2019	69.6 [16,302]	74.1 [6,723]	34.6 [18,876]	78.1 [2,753]	49.3 [44,653]
2018-2020	69.9 [16,378]	73.6 [6,681]	33.7 [18,351]	77.5 [2,732]	48.8 [44,142]
2019-2021	66.5 [15,569]	70.1 [6,364]	28.9 [15,753]	72.8 [2,566]	44.5 [40,253]
2020-2022	60.4 [14,156]	69.7 [6,324]	25.2 [13,711]	64.1 [2,260]	40.3 [36,451]
2021-2023	58.2 [13,630]	67.7 [6,144]	22.8 [12,452]	63.6 [2,245]	38.1 [34,471]
2022-2024	57.5 [13,473]	65.1 [5,908]	23.0 [12,546]	65.9 [2,326]	37.8 [34,253]
Change from 2003 – 2023	-19.8 [-4,639]	-18.7 [-1,693]	-33.7 [-18,350]	-13.4 [-472]	-27.8 [-25,153]

Table 3.3: Excess Acidity (Average Accumulated Exceedance in $\text{keq ha}^{-1} \text{ year}^{-1}$) by country and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	UK
2002-2004	1.04	0.82	0.34	0.69	0.50
2007-2009	0.78	0.65	0.22	0.65	0.42
2012-2014	0.76	0.65	0.27	0.71	0.45
2013-2015	0.75	0.67	0.30	0.65	0.47
2014-2016	0.70	0.68	0.26	0.59	0.43
2015-2017	0.61	0.58	0.19	0.53	0.35
2016-2018	0.61	0.51	0.15	0.61	0.32
2017-2019	0.62	0.46	0.14	0.68	0.32
2018-2020	0.62	0.47	0.13	0.68	0.31
2019-2021	0.50	0.38	0.10	0.55	0.25
2020-2022	0.37	0.34	0.07	0.38	0.19
2021-2023	0.33	0.31	0.06	0.38	0.17
2022-2024	0.34	0.29	0.07	0.39	0.17
Reduction from 2003 – 2023	-0.70	-0.53	-0.27	-0.30	-0.41

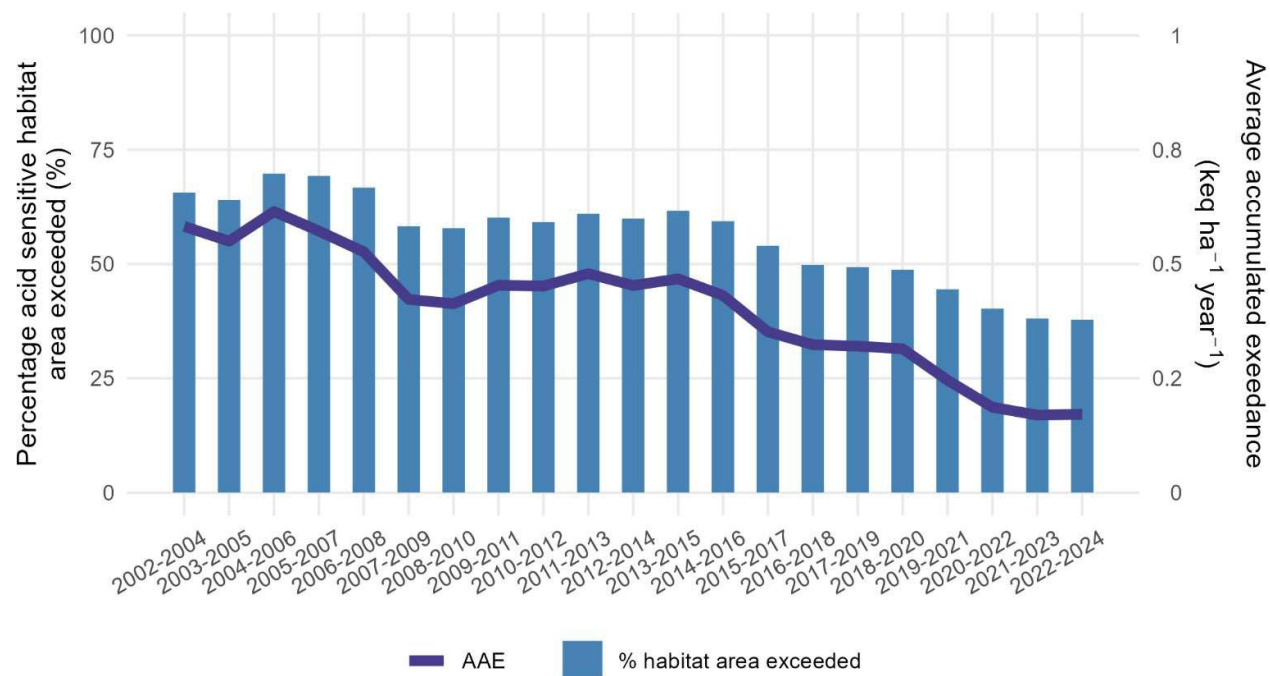


Figure 3.1: Acidity: Percentage area of acid-sensitive habitats with exceedance of acidity critical loads in the UK by year, and Average Accumulated Exceedance in keq ha⁻¹ year⁻¹. The results shown are discussed in Section 3.1.1.

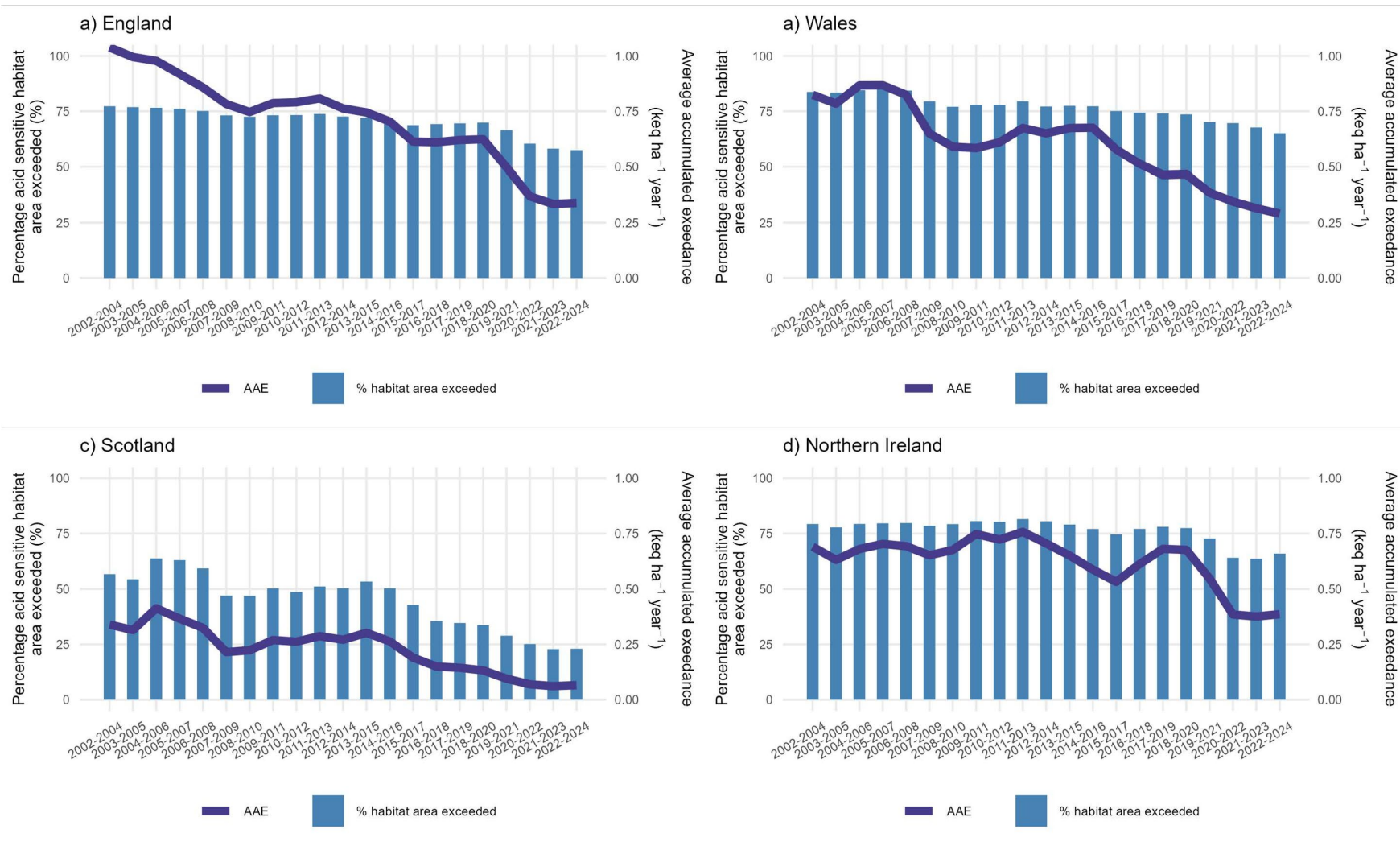


Figure 3.2: Acidity: Percentage area of acid-sensitive habitats with exceedance of acidity critical loads, by country and year, and Excess Acidity (Average Accumulated Exceedance in keq ha⁻¹ year⁻¹). The results shown are discussed in Section 3.1.1.

3.1.2 Nutrient nitrogen results

The results for nutrient N (Table 3.4, Table 3.5, Figure 3.3 and Figure 3.4) show a decline in the percentage area of habitats exceeded in the UK, from 93.8% in 2003 to 77.8% in 2023. Nitrogen-sensitive areas of England, Wales and Northern Ireland remain close to 100% exceeded over the same time period (Table 3.4, Figure 3.4). Scotland shows the smallest percentage habitat area exceeded of all countries (62.2%).

The magnitude of the nutrient-nitrogen exceedance (expressed as Excess Nitrogen or AAE) across the UK has decreased, from 10.6 kg N ha⁻¹ year⁻¹ in 2003 to 5.9 kg N ha⁻¹ year⁻¹ in 2023 (Table 3.5, Figure 3.3). Excess Nitrogen varies among regions, with lowest values in Scotland and highest in England (Table 3.5, Figure 3.4).

Table 3.4: Nitrogen-sensitive habitat area and percentage and [total] area of habitats where nutrient nitrogen critical loads are exceeded, by country and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	UK
Total area (km²)	26038	9412	54333	3990	93774
nutrient N sensitive habitats					
2002-2004	100.0 [26,034]	99.9 [9,401]	89.3 [48,529]	100.0 [3,990]	93.8 [87,954]
2007-2009	99.9 [26,022]	99.9 [9,403]	89.9 [48,843]	100.0 [3,990]	94.1 [88,259]
2012-2014	100.0 [26,030]	99.9 [9,406]	89.3 [48,506]	100.0 [3,990]	93.8 [87,932]
2013-2015	100.0 [26,030]	99.9 [9,406]	91.6 [49,763]	100.0 [3,990]	95.1 [89,188]
2014-2016	100.0 [26,027]	100.0 [9,408]	88.8 [48,268]	100.0 [3,990]	93.5 [87,693]
2015-2017	99.9 [26,024]	99.9 [9,403]	86.0 [46,726]	100.0 [3,990]	91.9 [86,144]
2016-2018	100.0 [26,028]	99.8 [9,396]	81.2 [44,140]	100.0 [3,990]	89.1 [83,554]
2017-2019	100.0 [26,029]	99.6 [9,378]	80.8 [43,898]	100.0 [3,990]	88.8 [83,295]
2018-2020	100.0 [26,032]	99.3 [9,348]	80.0 [43,488]	100.0 [3,990]	88.4 [82,858]
2019-2021	99.9 [26,011]	99.1 [9,327]	75.8 [41,200]	100.0 [3,990]	85.9 [80,528]
2020-2022	99.4 [25,893]	99.6 [9,371]	71.1 [38,652]	99.1 [3,955]	83.0 [77,872]
2021-2023	99.4 [25,876]	99.5 [9,367]	68.0 [36,920]	99.2 [3,958]	81.2 [76,121]
2022-2024	99.1 [25,802]	99.4 [9,359]	62.2 [33,794]	99.2 [3,959]	77.8 [72,915]
Change from 2003 – 2023	-0.9 [-232]	-0.4 [-42]	-27.1 [-14,735]	-0.8 [-31]	-16.0 [-15,040]

Table 3.5: Nutrient nitrogen: Excess Nitrogen (Average Accumulated Exceedance in kg N ha⁻¹ year⁻¹) by country and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	UK
2002-2004	19.2	14.2	5.7	14.0	10.6
2007-2009	17.4	13.6	5.1	14.8	9.8
2012-2014	17.1	13.5	5.8	15.6	10.1
2013-2015	17.3	14.3	6.5	15.0	10.7
2014-2016	17.0	14.6	6.0	14.0	10.3
2015-2017	16.0	13.4	5.1	13.4	9.3
2016-2018	16.4	12.5	4.3	14.9	8.9
2017-2019	16.9	12.0	4.3	16.2	9.1
2018-2020	16.8	12.1	4.2	16.1	9.0
2019-2021	14.5	10.7	3.3	13.8	7.6
2020-2022	12.4	10.4	2.7	11.1	6.5
2021-2023	11.5	9.6	2.4	10.8	6.0
2022-2024	11.5	9.1	2.3	10.9	5.9
Change 2003-2023	-7.7	-5.1	-3.3	-3.1	-4.7

3.1.3 Maps of Excess Acidity and Excess Nitrogen

The latest Excess Nitrogen and Excess Acidity maps (Figure 3.5) show lower exceedances in Scotland. The greatest Excess Acidity values are seen in upland areas of central and NW England, and smaller areas in E and SW England, parts of Wales, southern Scotland, and Northern Ireland. Exceedances of nutrient N critical loads are seen across most of England, Wales and Northern Ireland, with many areas having exceedances above 14 kg N ha⁻¹ year⁻¹.

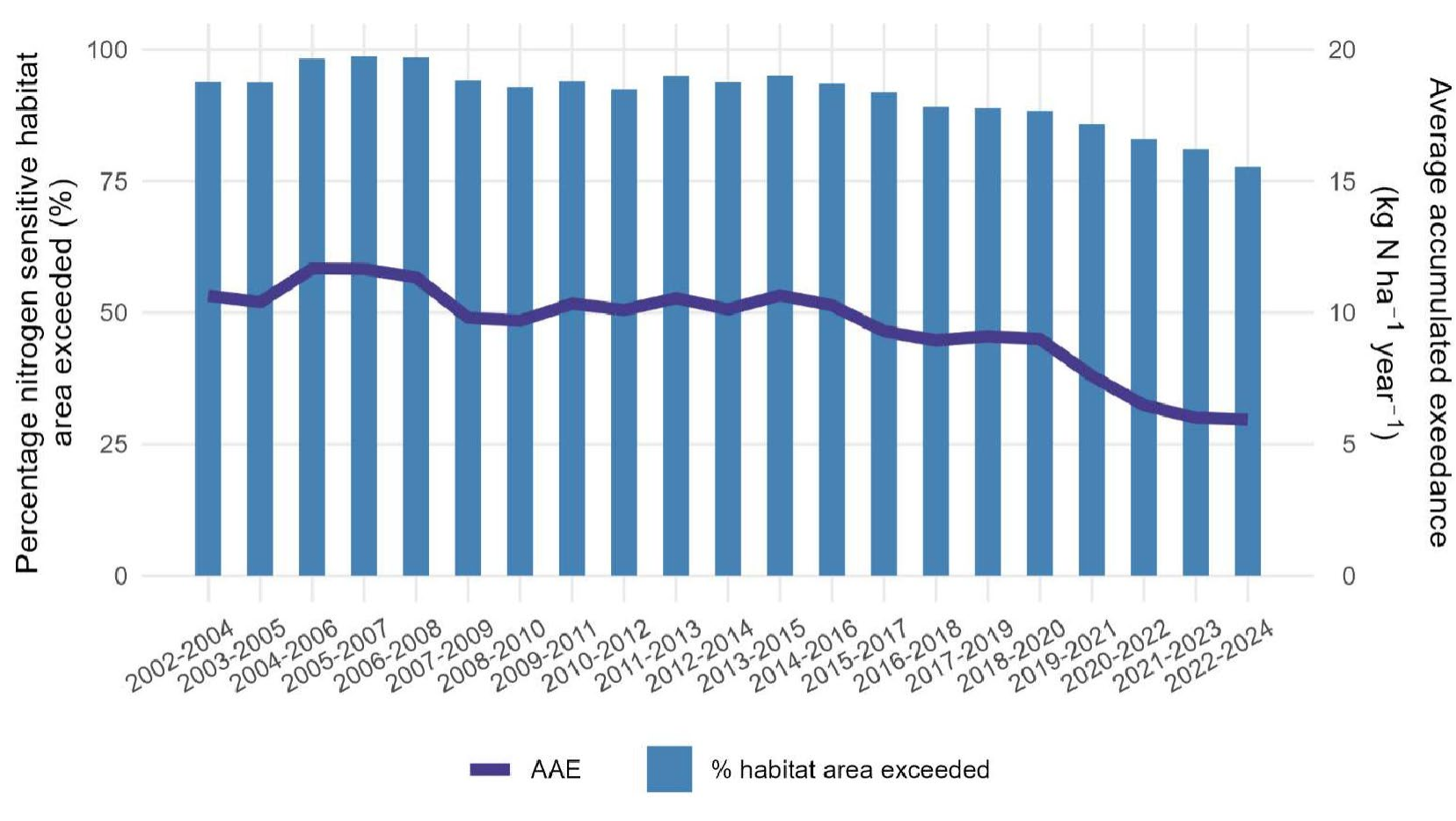


Figure 3.3: Nutrient nitrogen: Percentage area of nitrogen-sensitive habitats with exceedance of nitrogen critical loads in the UK by year, and Excess Nitrogen (Average Accumulated Exceedance in kg N ha⁻¹ year⁻¹). The results shown are discussed in Section 3.1.2.

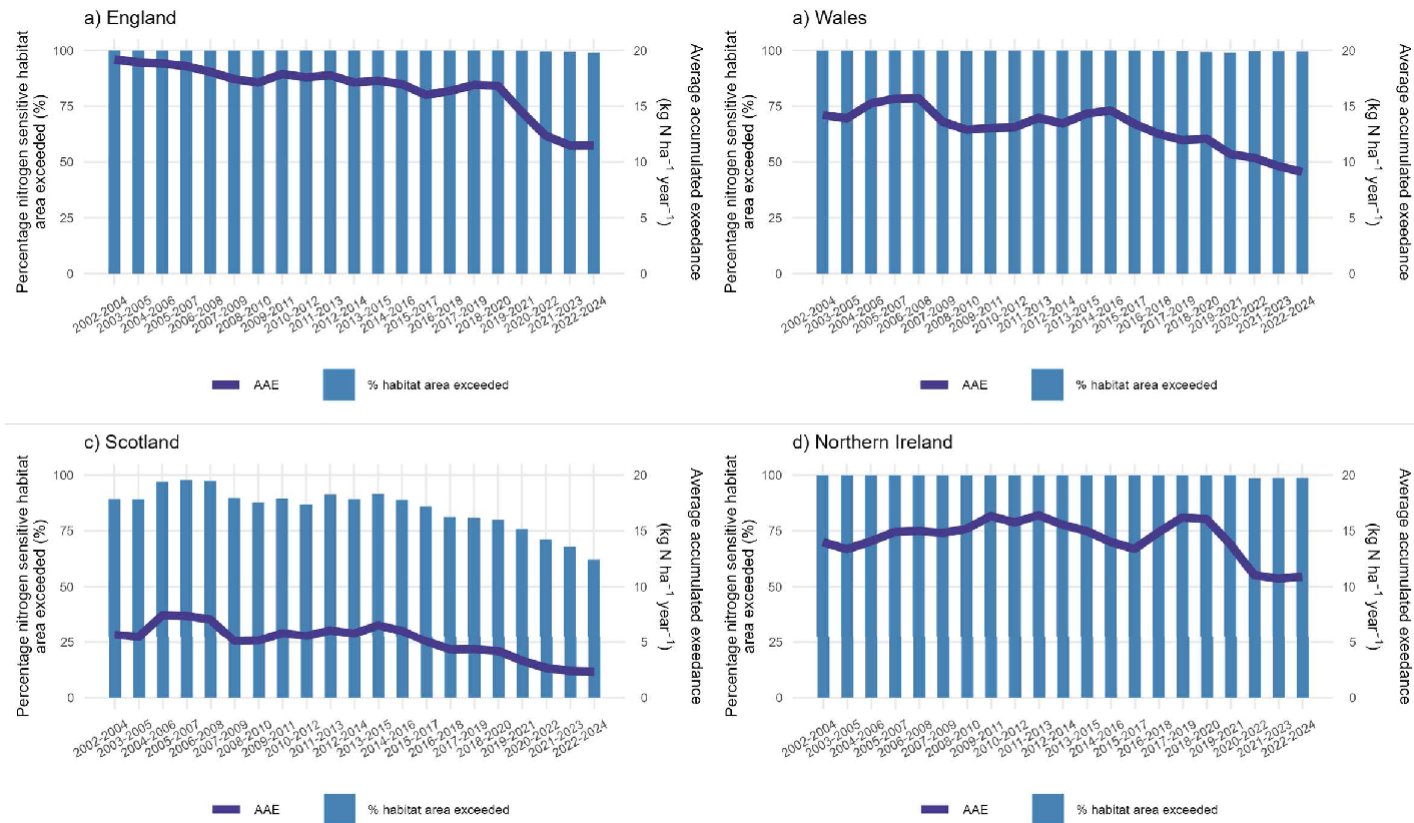


Figure 3.4: Nutrient nitrogen: Percentage area of nitrogen-sensitive habitats with exceedance of nitrogen critical loads, by country and year, and Excess Nitrogen (Average Accumulated Exceedance in kg N ha⁻¹ year⁻¹). The results shown are discussed in Section 3.1.2.

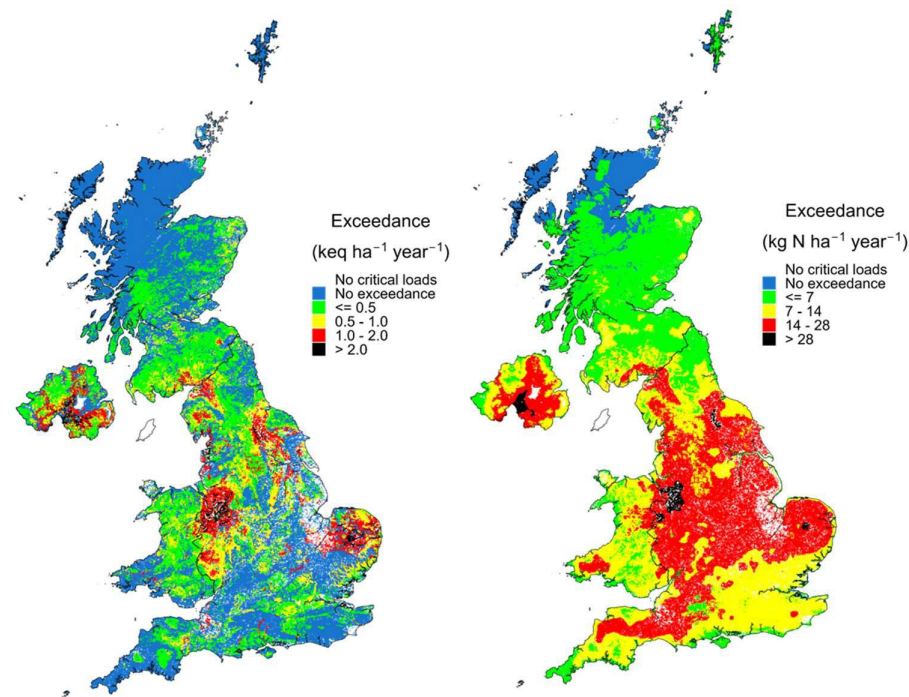


Figure 3.5: a) Excess Acidity (Average Accumulated Exceedance of acidity critical load) and b) Excess Nitrogen (Average Accumulated Exceedance of nutrient-nitrogen critical load) in 2023. Although the legends for the two maps are given in different units, the class intervals are the same (for example 7 kg N ha⁻¹ year⁻¹ is equal to 0.5 keq ha⁻¹ year⁻¹).

Figure 3.5 shows maps of excess acidity and excess nitrogen on UK habitats in 2023. Excess acidity is concentrated in specific upland and western areas and in East Anglia, while excess nitrogen is widespread across much of the UK, particularly England, Wales and Northern Ireland. Scotland generally has lower values.

3.2 Trends by habitat

This section focuses on the results by habitat for the UK. Habitat results for individual countries are also calculated and tabulated in the Annexe to this report.

3.2.1 Acidity results

The habitats with the highest percentage area where acidity critical load was exceeded are acid grassland and coniferous woodlands (Table 3.6, Figure 3.6); these habitats also have some of the highest Excess Acidity values (Table 3.7, Figure 3.5). Acidity critical load was exceeded over relatively small areas of calcareous grassland, declining from 14.9% in 2003 to 0.6% in 2023 (Table 3.6), with 0.0 keq ha⁻¹ year⁻¹ Excess Acidity value (Table 3.7). Montane habitat shows the largest decrease in the area exceeded, from 92.5% (4,547 km²) in 2003 to 38.1% (1,872 km²) in 2023. The largest reductions in Excess Acidity over the same timescale are for coniferous woodlands and montane habitats (Table 3.7).

3.2.2 Nutrient nitrogen results

With exception of bog and dwarf shrub heath, all habitats had more than 70% of their area exceeded for nutrient N in all years from 2003 to 2023 (Table 3.8, Figure 3.7). The largest reduction in the percentage area exceeded is for bog from 93.1% in 2003 to 53.4% in 2023 and dwarf shrub heath from 92.7% in 2003 to 64.5% in 2023. Excess Nitrogen is generally highest for the woodland habitats (Table 3.9, Figure 3.7), apart from Scots pine woodland which is only found natively in Scotland where deposition is generally lower.

Table 3.6: Acid-sensitive habitat areas in the UK and percentage area of habitats where acidity critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid Grassland	Calcareous Grassland	Dwarf Shrub Heath	Bog	Montane	Coniferous Woodland	Broadleaved and Mixed Woodland (unmanaged)	Fresh waters	All Habitats
Habitat area (km2)	20365	1012	21846	9118	4915	15935	17354	7857	90543
2002-2004	85.6	14.9	34.0	54.9	92.5	83.9	66.0	24.6	65.6
2007-2009	77.9	11.9	23.1	55.7	79.4	78.4	59.0	23.0	58.2
2012-2014	81.5	11.3	27.1	51.0	85.2	79.8	58.2	23.3	60.0
2013-2015	83.8	11.3	28.6	51.9	92.3	81.3	58.4	23.9	61.6
2014-2016	82.6	10.0	26.5	48.7	89.5	78.0	56.3	23.6	59.4
2015-2017	77.9	7.1	19.9	44.6	80.5	72.0	52.5	21.5	54.0
2016-2018	72.1	5.5	18.5	43.1	56.7	67.0	51.3	16.9	49.8
2017-2019	70.5	6.1	18.3	42.9	51.3	67.4	52.1	16.4	49.3
2018-2020	70.5	4.6	17.7	40.9	48.9	67.3	52.0	16.0	48.8
2019-2021	66.0	2.1	13.9	35.7	45.8	62.3	47.9	15.2	44.5
2020-2022	61.5	0.6	10.0	33.9	48.1	55.6	42.9	14.5	40.3
2021-2023	58.8	0.3	9.2	33.0	41.9	53.5	39.6	14.3	38.1
2022-2024	58.4	0.6	9.5	33.7	38.1	54.2	38.6	14.3	37.8
Change 2003-2023	-27.2	-14.3	-24.5	-21.2	-54.4	-29.7	-27.5	-10.3	-27.8

Table 3.7: Excess Acidity (Average Accumulated Exceedance in $\text{keq ha}^{-1} \text{ year}^{-1}$) by country and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid Grassland	Calcareous Grassland	Dwarf Shrub Heath	Bog	Montane	Coniferous Woodland	Broadleaved and Mixed Woodland (unmanaged)	Fresh waters	All Habitats
2002- 2004	0.73	0.09	0.18	0.45	0.69	0.87	0.73	0.25	0.58
2007-2009	0.52	0.04	0.11	0.36	0.40	0.67	0.53	0.20	0.42
2012-2014	0.60	0.04	0.13	0.38	0.50	0.72	0.50	0.21	0.45
2013-2015	0.65	0.04	0.12	0.38	0.60	0.73	0.48	0.21	0.47
2014-2016	0.61	0.04	0.11	0.35	0.55	0.66	0.45	0.20	0.43
2015-2017	0.48	0.02	0.08	0.28	0.37	0.55	0.40	0.17	0.35
2016-2018	0.40	0.01	0.08	0.26	0.23	0.53	0.43	0.14	0.32
2017-2019	0.37	0.01	0.08	0.26	0.20	0.54	0.46	0.13	0.32
2018-2020	0.36	0.01	0.07	0.24	0.18	0.54	0.45	0.12	0.31
2019-2021	0.28	0.00	0.05	0.18	0.14	0.43	0.36	0.09	0.25
2020-2022	0.22	0.00	0.02	0.13	0.13	0.32	0.29	0.07	0.19
2021-2023	0.20	0.00	0.02	0.12	0.11	0.30	0.26	0.07	0.17
2022-2024	0.20	0.00	0.02	0.12	0.11	0.30	0.26	0.07	0.17
Change 2003-2023	-0.53	-0.09	-0.15	-0.32	-0.58	-0.57	-0.47	-0.18	-0.41

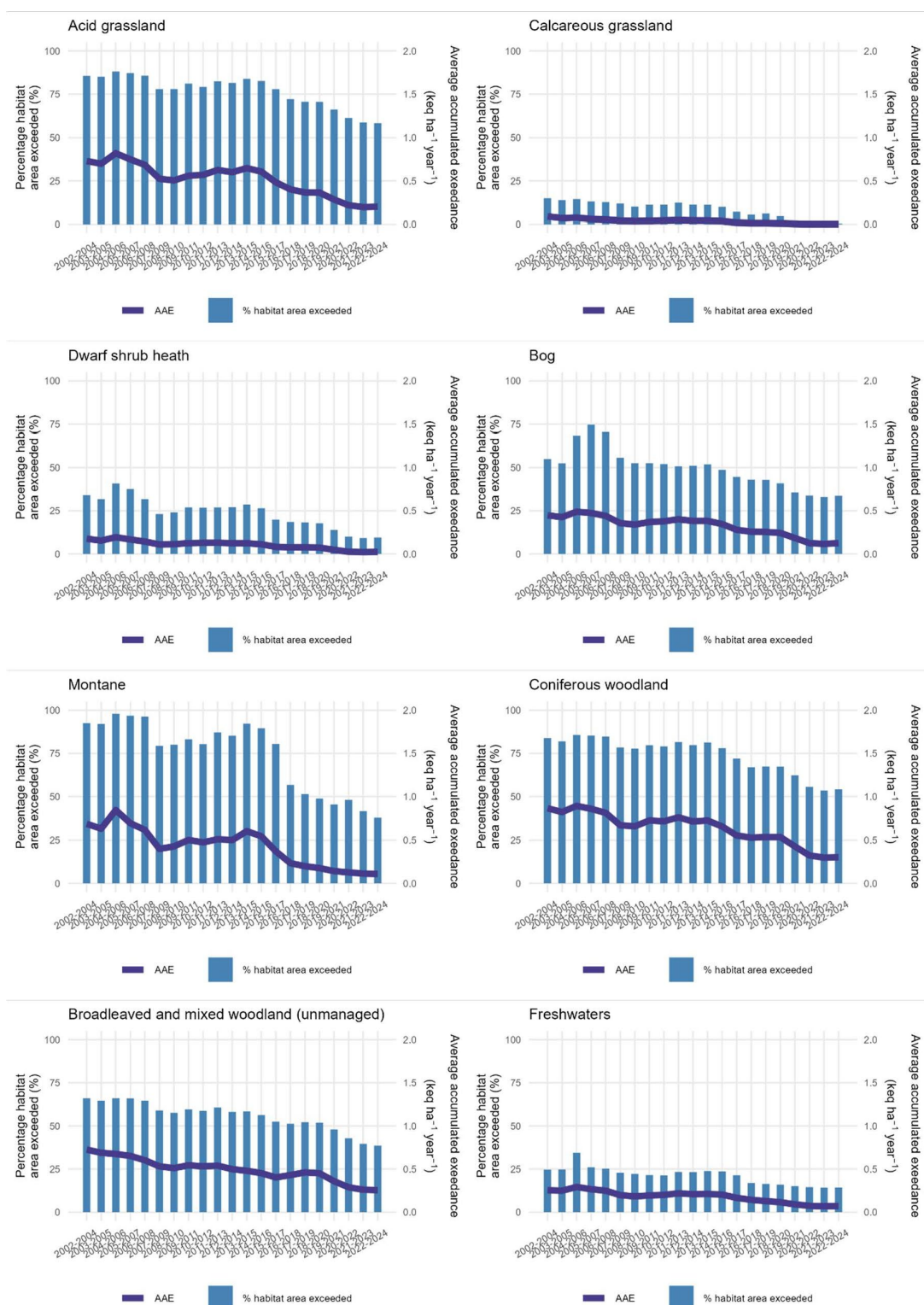


Figure 3.6: Acidity: Percentage area of habitats where acidity critical loads are exceeded, and Excess Acidity (AAE in keq ha⁻¹ year⁻¹) for the UK by deposition dataset year. The results shown are discussed in Section 3.2.1.

Table 3.8: Nutrient-sensitive habitat area in the UK and percentage area of habitats where nutrient-nitrogen critical load is exceeded. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh
Habitat area (km²)	20365	1012	21846	9118	4915	14450	8706	2059	6958	1485	1422	631	808
2002- 2004	91.7	99.9	92.7	93.1	100.0	91.4	97.4	100.0	96.3	100.0	97.9	91.8	90.5
2007-2009	89.2	99.6	93.9	93.2	100.0	94.9	97.7	100.0	96.4	100.0	98.2	91.6	87.9
2012-2014	90.1	99.9	92.7	93.0	100.0	93.1	97.7	100.0	96.8	100.0	98.3	92.7	90.0
2013-2015	93.6	99.9	93.6	92.1	100.0	94.7	98.3	100.0	98.2	100.0	98.9	92.9	90.8
2014-2016	93.1	99.7	91.1	89.8	100.0	91.8	97.5	100.0	96.4	100.0	97.9	91.6	90.6
2015-2017	91.1	99.7	89.9	84.5	100.0	90.4	97.1	100.0	94.9	100.0	96.9	89.4	88.9
2016-2018	86.3	99.7	86.6	80.7	98.9	88.4	96.6	100.0	92.8	100.0	95.0	91.6	88.2
2017-2019	84.8	99.8	86.4	81.4	96.6	89.0	96.8	100.0	93.2	100.0	95.1	93.5	87.1
2018-2020	85.4	99.9	86.4	75.9	96.1	88.9	96.9	100.0	93.1	100.0	95.0	93.4	86.4
2019-2021	81.4	99.3	83.7	67.8	97.8	88.0	96.7	100.0	92.0	100.0	94.5	89.8	82.8
2020-2022	81.7	99.2	76.2	64.1	99.9	84.9	96.0	100.0	89.4	99.9	94.2	71.3	78.2
2021-2023	79.2	98.7	73.7	61.5	99.8	83.1	95.7	100.0	88.2	99.9	93.4	71.3	74.2
2022-2024	78.5	98.6	64.5	53.4	95.9	82.7	95.6	100.0	87.9	99.9	93.0	71.0	69.7

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh
Change 2003-2023	-13.2	-1.4	-28.2	-39.6	-4	-8.7	-1.8	0	-8.4	-0.1	-4.9	-20.8	-20.8

Table 3.9: Nutrient nitrogen: Excess Nitrogen (AAE in kg N ha⁻¹ year⁻¹) by country and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh
2002- 2004	8.3	10.7	6.1	7.3	9.3	13.5	20.1	20.9	16.4	9.4	17.6	5.5	4.9
2007-2009	7.5	9.5	5.7	7.5	7.9	12.5	18.1	18.8	14.8	9.0	16.7	5.4	4.2
2012-2014	8.6	9.9	6.0	7.5	8.9	13.0	17.4	17.8	14.4	9.6	16.6	5.5	4.4
2013-2015	9.5	10.0	6.5	7.9	10.5	13.5	17.2	17.7	14.8	10.5	16.6	5.5	4.3
2014-2016	9.3	9.9	6.2	7.4	10.0	12.8	16.9	17.5	14.4	9.5	16.0	5.4	4.4
2015-2017	8.0	9.2	5.5	6.6	8.2	11.6	16.3	16.8	13.5	8.2	15.2	5.2	4.1
2016-2018	7.0	9.4	5.1	6.2	6.1	11.4	17.4	17.8	13.6	6.7	16.1	5.4	4.4

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh
2017-2019	6.7	10.0	5.2	6.3	5.4	11.6	18.7	18.4	14.1	6.8	17.3	5.8	4.8
2018-2020	6.7	9.4	5.2	6.1	5.1	11.6	18.5	18.2	13.9	6.5	17.2	5.7	4.6
2019-2021	5.5	7.6	4.3	5.1	4.6	9.7	15.9	15.6	12.0	6.0	14.9	4.8	3.6
2020-2022	4.6	6.2	3.4	4.2	4.9	8.1	14.0	14.1	10.7	5.8	12.8	3.7	2.8
2021-2023	4.2	5.6	3.2	4.0	4.5	7.5	13.0	12.7	9.8	5.3	12.0	3.5	2.5
2022-2024	4.3	5.9	3.1	4.1	4.0	7.5	12.8	12.3	9.5	4.9	11.9	3.4	2.4
Change 2003-2023	-4.1	-4.8	-3	-3.2	-5.3	-6	-7.3	-8.7	-6.9	-4.5	-5.8	-2.1	-2.5

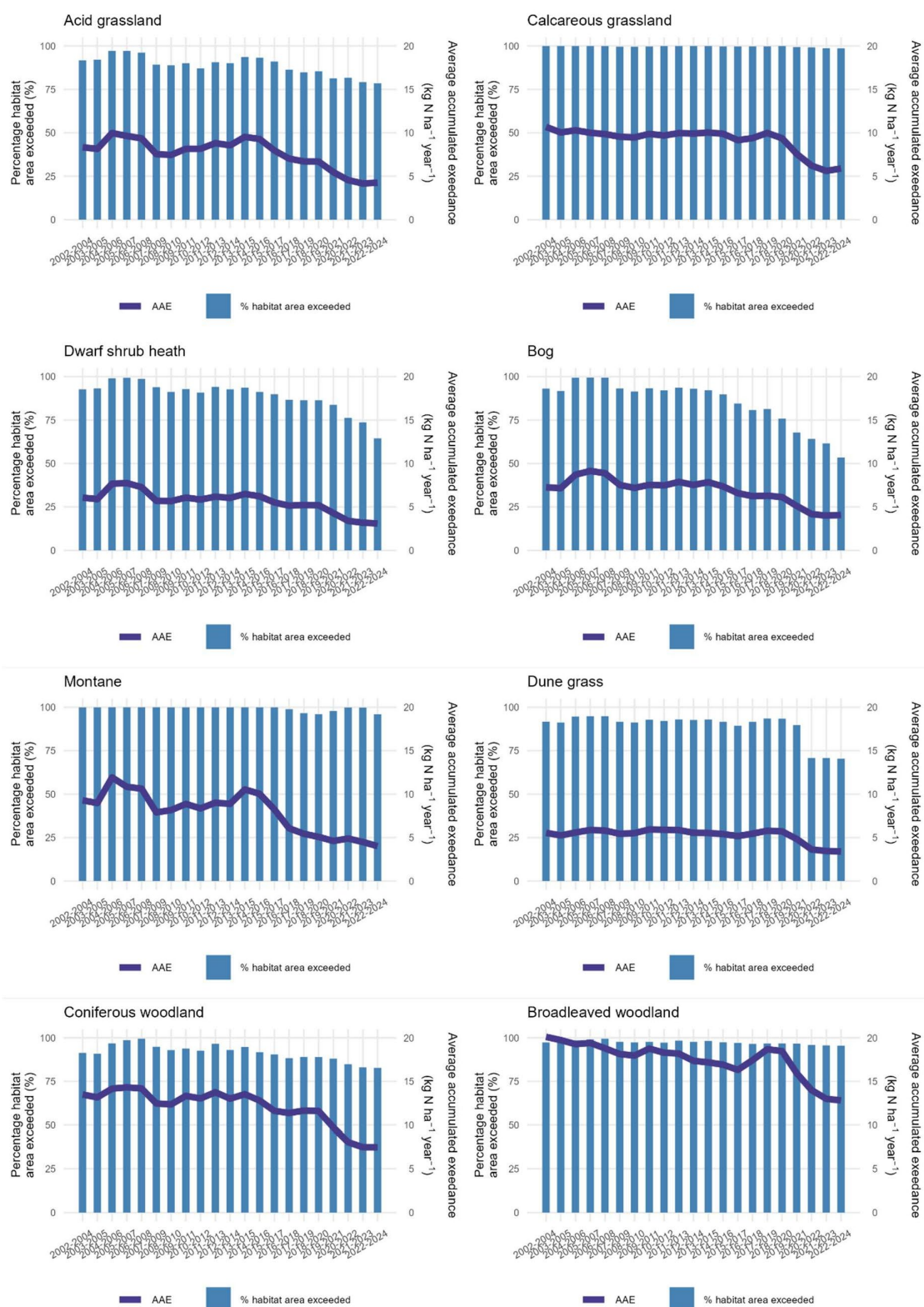


Figure 3.7 Nutrient nitrogen: Percentage area of habitats where nutrient nitrogen critical load is exceeded, and Excess Nitrogen (Average Accumulated Exceedance in kg N ha⁻¹ year⁻¹) in the UK by deposition dataset year.

The results shown in Figure 3.7 are discussed in Section 3.2.2.

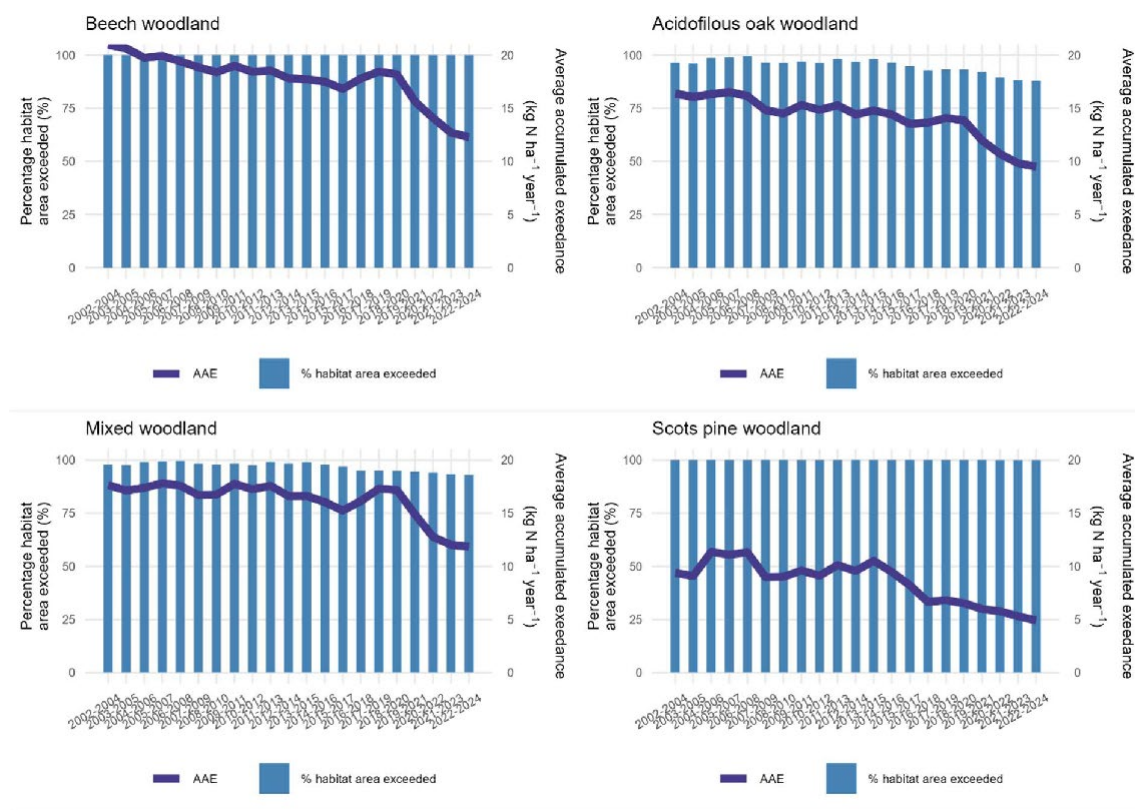


Figure 3.7 (continued): Nutrient nitrogen: Percentage area of habitats where nutrient nitrogen critical load is exceeded, and Excess Nitrogen (Average Accumulated Exceedance in kg N ha⁻¹ year⁻¹) in the UK by deposition dataset year.

The results shown in Figure 3.7 are discussed in Section 3.2.2.

Section 4: Site-relevant critical loads and their exceedances

This section of the report focuses on the application of critical loads to sites designated for their nature conservation importance, hereafter referred to as site-relevant critical loads (SRCL), and their exceedances. The critical loads are based on the same methods applied to UK acid- and N-sensitive habitats described in Section 1 of this report, and are applied to acid- and N-sensitive features within the designated sites. Exceedances of critical loads are also calculated in the same way as the habitats (Section 1) and also based on UK 5 km x 5 km CBED deposition, however, some different metrics are used to describe the exceedance results for SRCL and are explained below.

4.1 Overview of site-relevant critical loads

Site relevant critical loads (SRCL) have been applied to three types of statutory protected sites: SACs, SPAs and SSSIs (ASSIs in Northern Ireland), as described in Section 1.3.

Digital boundaries for all sites in the UK have been collated by each of the country conservation agencies, together with tables identifying the designated feature habitats and species associated with each site, but no digital information is currently available on the spatial area of each feature within each site. Therefore, it is assumed that all features recorded for a site occur across the entire site area. To avoid double counting the area exceeding critical loads for sites with more than one designated feature, the maximum area exceeded for any feature is used when summarising results to the site and country levels. The areas of sites reported include only terrestrial areas, not areas beyond the mean high-water mark.

To assign SRCLs, the first step is to consider whether the interest feature is potentially sensitive to acidification and/or eutrophication. Specialists within Natural England, NatureScot and CEH used expert judgement to determine this (SNIFFER, 2007). For SPAs where the features are bird species, the broad habitats that the birds depend upon for feeding, breeding and roosting are considered.

To assign critical loads to the habitat features of designated sites, it is necessary to cross-match the different habitat classifications used. Acidity critical loads are mapped by broad habitat, and empirical critical loads for nutrient-nitrogen are assigned based on the European Nature Information System (EUNIS) habitat classification. Look-up tables developed by Moss & Davies (2002) and available from the JNCC website (<https://hub.jncc.gov.uk/assets/9e70531b-5467-4136-88f6-3b3dd905b56d>) enable linkages to be made between:

- Annex I habitats and EUNIS classes
- Annex I habitats and broad habitats

- EUNIS habitats and broad habitats

Using the look-up tables the most appropriate EUNIS class and broad habitat class were assigned to each interest feature. However, some sites contain features that may be sensitive to acidification and/or eutrophication, but for which no appropriate critical loads are available. Note that the codes used for EUNIS classes changed recently (Table 1.3).

The critical loads assigned to protected sites are based on designated features. However, the national critical load maps are based on national-scale datasets, which may not include small areas of sensitive habitats or some coastal habitats. Some sites are designated for habitat areas that are not included in the national-scale habitat mapping for critical loads. To overcome this, for SRCLs a separate database of national critical loads for terrestrial habitats was created, that provides critical loads for every 1 km x 1 km square in the UK, whether the habitat is known to exist there or not. The appropriate SRCL can then be extracted for terrestrial habitat features of each designated site. The SRCLs assigned do not take into account acidity critical loads for freshwater habitats. For further information refer to the “Methods Report” (Hall et al., 2015).

For nutrient N, the empirical critical loads approach is applied to designated feature habitats sensitive to N. The critical load values applied to each habitat are the “mapping” values agreed by habitat specialists (See Section 1.5.3).

The tables later in this section give percentages of the number of **sensitive** sites (those with a SRCL for acidity or for nutrient-N) where the critical load is exceeded for at least one feature. Percentages of the total number of protected sites where a critical load is exceeded can be obtained using the formula below and the numbers in Table 4.1.

$$\text{per cent sites exceeded} = \frac{\text{per cent sensitive sites exceeded} \times \text{number of sensitive sites}}{\text{total number of sites}}$$

4.2 Metrics of exceedance of Site-Relevant Critical Loads

Exceedances are calculated separately for SACs, SPAs and SSSIs, for all site features for which critical loads and deposition data can be assigned (Hall et al., 2015). Metrics are calculated by:

a) Feature (within each site)

- Exceedance

- Exceeded area⁵
- Accumulated Exceedance (AE) (i.e. exceedance * exceeded area)
- Average Accumulated Exceedance (AAE)(i.e. AE / total site area)

b) Site

- Total number of features with SRCL
- Number and percentage of features with exceedance of SRCL.
- Maximum area exceeded for any feature within a site⁶
- Maximum AE for any feature within a site
- Maximum AAE for any feature within a site

c) Country

- Total number of sites
- Total number and percentage of sites with SRCL for one or more features
- Total number of features with SRCL
- Total number and percentage of sites with exceedance of SRCL for one or more features
- Total number and percentage of features with exceedance of SRCL
- Total area of all sites
- Total area of all sites with SRCL
- Maximum exceeded area⁷
- Maximum AE calculated as the sum of the maximum AE for all sites
- Maximum AAE; calculated from the country maximum AE and total area of all sites (with SRCL) within a country.

The sections below summarise the key results by country, based on CBED deposition (Section 1.2) for 1996 to 2017. Summary statistics and maps present the worst case, since they are based on exceedance of at least one feature. Other features within a site may have a smaller exceedance, or not be exceeded. The results for AAE are based on the maximum exceedance of any feature within a site.

⁵ Feature exceeded area: if the critical load is exceeded and the deposition values are constant across the whole site, the exceeded area equals the site area; if the deposition values vary across the site (e.g. as a result of the site crossing the boundaries between grid squares with different deposition values), then the exceeded area will be the sum of the 1 km x 1 km portions of the site where the deposition exceeds the critical load.

⁶ Site maximum exceeded area: set to the maximum exceeded area for any feature within a site.

⁷ Country maximum exceeded area: calculated as the sum of the site maximum exceeded areas for all sites within a country.

4.2.1 Exceedance of acidity critical load

The trends in acidity critical load exceedances are summarised in Tables 4.2 to 4.4 and present the percentage of sites (with SRCL) by country, where the SRCL was exceeded for one or more features, together with the maximum Excess Acidity.

Between 2003 and 2023, there was a 14.4% decrease in the percentage of SACs with acidity critical load exceedance in England and a 29.1% decrease in Scotland, but smaller decreases in Wales or Northern Ireland, 9.9% and 6.4% respectively. Excess Acidity for SACs fell by between 52% (NI) to 97% (Scotland). For SPAs, the reductions in percentage of sites exceeding acidity critical loads in four countries span a range from 20% in Northern Ireland to 30.8% in Scotland, accompanied by a range of 66 - 88% reduction in their maximum Excess Acidity values. For SSSIs (ASSIs in NI) as well, all countries showed reductions in the percentage of exceeded sites (Scotland 34%; England 18.9%, Wales 24.3% and NI 11.8%), with a 55 to 82% reduction in maximum Excess Acidity values.

At the UK level, the trends results show:

- for SACs, the percentage of sites with acidity exceedance decreased from 79.9% in 2003 to 61.6% in 2023, and the maximum AAE fell by 69% from 0.88 keq ha⁻¹ year⁻¹ to 0.26 keq ha⁻¹ year⁻¹ over the same time period;
- for SPAs, the percentage of exceeded sites fell from 73.7% in 2003 to 46.3% in 2023, and the maximum AAE decreased by 70% from 0.67 keq ha⁻¹ year⁻¹ in 2003 to 0.20 keq ha⁻¹ year⁻¹ in 2023.
- for SSSIs/ASSIs, the percentage of exceeded sites decreased from 64.5% in 2003 to 42.2% in 2023, and the maximum AAE fell by 70% from 0.68 keq ha⁻¹ year⁻¹ in 1996 to 0.20 keq ha⁻¹ year⁻¹ in 2023.

Maps of the maximum AAE per site (Figure 4.1) based on the latest CBED deposition (2023) show the highest exceedances of acidity critical load mainly in northern England, parts of Wales and south-west England and southern Scotland. Some sites in the far north of Scotland have no exceedance for any site feature due to low levels of acid deposition. Some SACs and SPAs and many small SSSIs in southern and eastern England are also not exceeded, because more calcareous soils in this region mean that site features are less sensitive to acidity pollution.

Table 4.2: Trends in acidity exceedances for SACs: a) per cent of sites with SRCL with exceedance of Site-Relevant Critical Load for at least one feature; b) Excess Acidity [maximum AAE keq ha⁻¹ year⁻¹].

Note: NR means Not recorded. Number of sites with SRCL is given for the most recent year of the calculations. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	Eng/Wales*	Eng/Scot*	UK
Number of sites with SRCL	180	71	182	47	6	1	487
2007-2009	88.9 [0.93]	76.9 [0.63]	54.7 [0.10]	70.0 [0.24]	100.0 [NR]	70.3 [0.49]	76.2 [0.66]
2012-2014	73.3 [1.12]	90.1 [0.84]	71.4 [0.23]	97.9 [0.78]	100.0 [NR]	100.0 [NR]	77.8 [0.68]
2013-2015	72.2 [1.11]	90.1 [0.88]	72.5 [0.27]	97.9 [0.68]	100.0 [NR]	100.0 [NR]	77.8 [0.69]
2014-2016	70.0 [1.03]	90.1 [0.88]	70.9 [0.23]	97.9 [0.61]	100.0 [NR]	100.0 [NR]	76.4 [0.64]
2015-2017	69.4 [0.88]	88.7 [0.77]	64.3 [0.15]	95.7 [0.56]	100.0 [NR]	100.0 [NR]	73.3 [0.53]
2016-2018	71.7 [0.84]	88.7 [0.67]	61.5 [0.09]	97.9 [0.66]	100.0 [NR]	100.0 [NR]	73.3 [0.48]
2017-2019	72.2 [0.84]	87.3 [0.58]	62.6 [0.08]	97.9 [0.73]	100.0 [NR]	100.0 [NR]	73.7 [0.47]
2018-2020	71.7 [0.80]	87.3 [0.53]	61.5 [0.07]	97.9 [0.73]	100.0 [NR]	100.0 [NR]	73.1 [0.44]
2019-2021	68.3 [0.64]	85.9 [0.44]	52.2 [0.06]	93.6 [0.58]	100.0 [NR]	100.0 [NR]	67.8 [0.36]
2020-2022	65.0 [0.50]	87.3 [0.44]	46.7 [0.05]	87.2 [0.36]	100.0 [NR]	100.0 [NR]	64.1 [0.29]
2021-2023	62.2 [0.46]	87.3 [0.40]	45.1 [0.04]	89.4 [0.35]	100.0 [NR]	100.0 [NR]	62.6 [0.26]
2022-2024	62.2 [0.47]	83.1 [0.38]	43.4 [0.04]	91.5 [0.38]	100.0 [NR]	100.0 [NR]	61.6 [0.26]
Change 2003-2023	-14.4 [-0.99]	-9.9 [-0.67]	-29.1 [-0.26]	-6.4 [-0.41]	0.0 [NR]	0.0 [NR]	-18.3 [-0.61]

* Some sites cross the England/Wales or England/Scotland border. For Excess Acidity calculations, each 1 x 1 km square (or part thereof) within each border site was assigned to a single country, so results are calculated for individual countries only.

Table 4.3: Trends in acidity exceedances for SPAs: a) per cent of sites with SRCL with exceedance of Site-Relevant Critical Load for at least one feature; b) Excess Acidity [maximum AAE keq ha⁻¹ year⁻¹]

Note: NR means Not recorded. Number of sites with SRCL is given for the most recent year of the calculations. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	Eng/Wales*	UK
Number of sites with SRCL	63	13	86	10	30	175
2002- 2004	76.7 [1.46]	93.0 [1.04]	72.5 [0.30]	97.9 [0.79]	100.0 [NR]	79.9 [0.88]
2007-2009	73.3 [1.11]	91.5 [0.85]	66.5 [0.20]	97.9 [0.74]	100.0 [NR]	76.2 [0.66]
2012-2014	73.3 [1.12]	90.1 [0.84]	71.4 [0.23]	97.9 [0.78]	100.0 [NR]	77.8 [0.68]
2013-2015	72.2 [1.11]	90.1 [0.88]	72.5 [0.27]	97.9 [0.68]	100.0 [NR]	77.8 [0.69]
2014-2016	70.0 [1.03]	90.1 [0.88]	70.9 [0.23]	97.9 [0.61]	100.0 [NR]	76.4 [0.64]
2015-2017	69.4 [0.88]	88.7 [0.77]	64.3 [0.15]	95.7 [0.56]	100.0 [NR]	73.3 [0.53]
2016-2018	71.7 [0.84]	88.7 [0.67]	61.5 [0.09]	97.9 [0.66]	100.0 [NR]	73.3 [0.48]
2017-2019	72.2 [0.84]	87.3 [0.58]	62.6 [0.08]	97.9 [0.73]	100.0 [NR]	73.7 [0.47]
2018-2020	71.7 [0.80]	87.3 [0.53]	61.5 [0.07]	97.9 [0.73]	100.0 [NR]	73.1 [0.44]
2019-2021	68.3 [0.64]	85.9 [0.44]	52.2 [0.06]	93.6 [0.58]	100.0 [NR]	67.8 [0.36]
2020-2022	65.0 [0.50]	87.3 [0.44]	46.7 [0.05]	87.2 [0.36]	100.0 [NR]	64.1 [0.29]

Years	England	Wales	Scotland	NI	Eng/Wales*	UK
2021-2023	62.2 [0.46]	87.3 [0.40]	45.1 [0.04]	89.4 [0.35]	100.0 [NR]	62.6 [0.26]
2022-2024	62.2 [0.47]	83.1 [0.38]	43.4 [0.04]	91.5 [0.38]	100.0 [NR]	61.6 [0.26]
Change 2003-2023	-23.8 [-0.80]	-30.8 [-0.72]	-31.4 [-0.15]	-20.0 [-0.23]	0.0 [NR]	-27.4 [-0.47]

* Some sites cross the England/Wales border. No SPAs cross the England/Scotland border. For Excess Acidity calculations, each 1 x 1 km square (or part thereof) within each border site was assigned to a single country, so results are calculated for individual countries only.

Table 4.4: Trends in acidity exceedances for SSSIs/ASSIs: a) per cent of sites with SRCL with exceedance of Site-Relevant Critical Load for at least one feature; b) Excess Acidity [maximum AAE keq ha⁻¹ year⁻¹].

Note: NR means Not recorded. Number of sites with SRCL is given for the most recent year of the calculations. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	UK
Number of sites with SRCL	2899	660	891	178	4628
2007-2009	55.9 [0.76]	75.3 [0.75]	55.1 [0.19]	73.6 [0.59]	59.2 [0.50]
2012-2014	54.5 [0.76]	73.1 [0.75]	57.6 [0.23]	76.4 [0.63]	58.6 [0.53]
2013-2015	53.1 [0.75]	72.9 [0.78]	57.6 [0.26]	74.7 [0.55]	57.7 [0.54]
2014-2016	52.3 [0.70]	72.9 [0.79]	54.1 [0.23]	71.9 [0.49]	56.4 [0.50]
2015-2017	50.8 [0.60]	70.4 [0.68]	47.2 [0.16]	70.2 [0.44]	53.7 [0.41]
2016-2018	52.7 [0.57]	70.7 [0.59]	44.9 [0.12]	73.6 [0.52]	54.6 [0.37]
2017-2019	53.0 [0.57]	69.4 [0.52]	46.1 [0.11]	76.4 [0.58]	54.9 [0.36]
2018-2020	52.1 [0.55]	67.8 [0.50]	45.0 [0.10]	75.8 [0.58]	53.9 [0.35]
2019-2021	48.1 [0.44]	63.3 [0.42]	37.8 [0.07]	71.9 [0.45]	49.2 [0.28]
2020-2022	44.9 [0.33]	63.5 [0.38]	31.0 [0.05]	62.4 [0.27]	45.6 [0.21]
2021-2023	42.8 [0.30]	59.4 [0.35]	29.7 [0.05]	62.4 [0.26]	43.4 [0.19]
2022-2024	42.1 [0.31]	53.3 [0.32]	30.0 [0.05]	62.9 [0.28]	42.2 [0.20]
Change 2003-2023	-18.9 [-0.70]	-24.3 [-0.60]	-34.0 [-0.24]	-11.8 [-0.35]	-22.3 [-0.48]

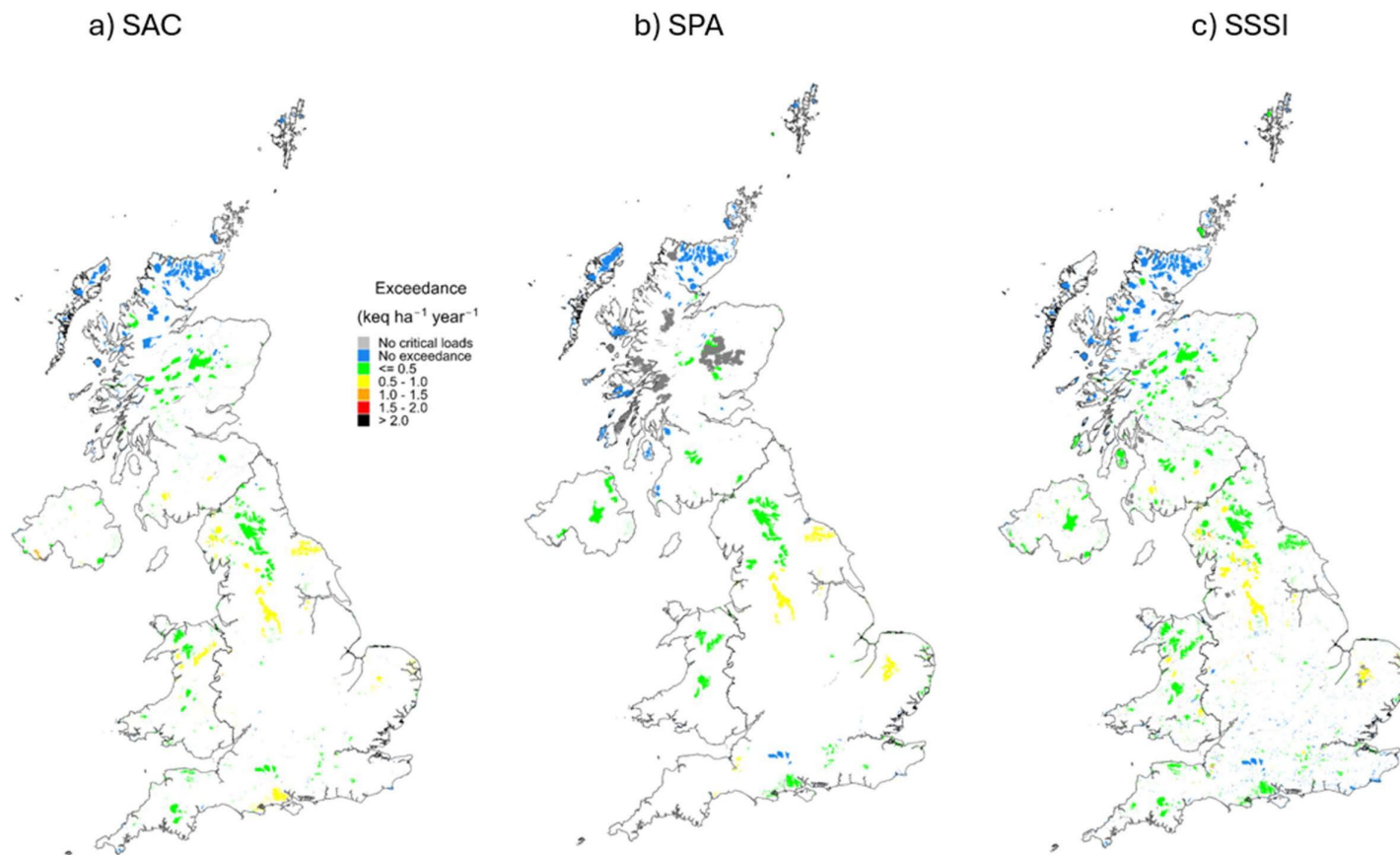


Figure 4.1: Excess Acidity. Average Accumulated Exceedance (AAE) of acidity critical loads by CBED deposition for 2022-2024; maps show the maximum Excess Acidity for any feature within each site (other features may have lower or no exceedance).

Figure 4.1 shows maps of the severity of acidity critical load exceedance at UK protected sites in 2022–2024. Higher exceedance levels are concentrated in northern England, Wales, south-west England and southern Scotland, while many sites in northern Scotland and parts of southern and eastern England have low or no exceedance.

4.2.2 Nutrient-nitrogen results

The trends in nutrient-N critical load exceedances from 2003 to 2023 are summarised in Tables 4.5-4.7. The decreases in the percentage of sites with exceedance of nutrient-N critical loads for one or more features, and decreases in Excess Nitrogen, were smaller than the decreases seen for acidity, reflecting the smaller decline in N deposition than in acidity deposition. Reductions varied by country for the different site types. In Wales, there was no decrease in the percentage of SACs and SPAs with critical load exceedance, although there was a small decrease in Excess N. The largest decreases in the percentage of sites with exceedance were in Scotland for SACs (13.6% reduction), SPAs (14.8% reduction) and SSSIs (22.5% reduction). A significant reduction in the percentage of SACs and ASSIs exceeding nutrient N critical load occurred in Northern Ireland, 4% and 14.5% respectively.

At the UK level:

- for SACs, the percentage of sites with nutrient-N exceedance decreased from 97.4% in 2003 to 91.4% in 2023, and the maximum Excess Nitrogen decreased from 12.2 kg N ha⁻¹ year⁻¹ to 8.9 kg N ha⁻¹ year⁻¹ over the same time period.
- for SPAs, the percentage of exceeded sites decreased from 91.6% in 2003 to 81.9% in 2023, and the maximum Excess Nitrogen decreased from 12 kg N ha⁻¹ year⁻¹ in 2003 to 6.3 kg N ha⁻¹ year⁻¹ in 2023.
- for SSSIs/ASSIs, the percentage of exceeded sites decreased from 98.2% in 2003 to 90.2% in 2023, and the maximum Excess Nitrogen decreased from 12.7 kg N ha⁻¹ year⁻¹ in 2003 to 7.4 kg N ha⁻¹ year⁻¹ in 2023.

Maps of the maximum Excess Nitrogen per site (Figure 4.2) based on the latest CBED deposition (2022-2024) show few sites with no exceedance for any feature. Exceedances are widespread across all countries, although lower proportions of protected sites are exceeded in Scotland. Except for Scotland, the maximum Excess Nitrogen is above 7 kg N ha⁻¹ year⁻¹ for the majority of sites, with some sites still having maximum Excess Nitrogen up to 28 kg N ha⁻¹ year⁻¹.

Table 4.5: Trends in nutrient nitrogen exceedances for SACs: a) per cent of sites with SRCL with exceedance of Site-Relevant Critical Load for at least one feature; b) Excess Nitrogen [maximum AAE kg N ha⁻¹ year⁻¹].

Note: NR means Not recorded. Number of sites with SRCL is given for the most recent year of the calculations. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	Eng/Wales*	Eng/Scot*	UK
Number of sites with SRCL	196	78	199	50	7	3	533
2002-2004	99.0 [18.3]	100.0 [10.8]	94.0 [6.3]	100.0 [12.5]	100.0 [NR]	100.0 [NR]	97.4 [12.2]
2007-2009	99.0 [16.5]	100.0 [10.2]	92.0 [6.3]	100.0 [13.1]	100.0 [NR]	100.0 [NR]	96.6 [11.4]
2012-2014	99.0 [16.6]	100.0 [9.7]	93.0 [6.4]	100.0 [13.4]	100.0 [NR]	100.0 [NR]	97.0 [11.4]
2013-2015	99.0 [16.8]	100.0 [10.2]	94.0 [7.0]	100.0 [12.5]	100.0 [NR]	100.0 [NR]	97.4 [11.7]
2014-2016	99.0 [16.4]	100.0 [10.3]	93.0 [6.3]	100.0 [11.8]	100.0 [NR]	100.0 [NR]	97.0 [11.3]
2015-2017	99.0 [15.3]	100.0 [9.6]	92.0 [5.5]	100.0 [11.5]	100.0 [NR]	100.0 [NR]	96.6 [10.4]
2016-2018	99.0 [15.2]	100.0 [9.1]	90.0 [4.7]	100.0 [12.9]	100.0 [NR]	100.0 [NR]	95.9 [10.0]
2017-2019	99.0 [15.6]	100.0 [8.8]	91.0 [4.7]	100.0 [14.1]	100.0 [NR]	100.0 [NR]	96.3 [10.2]
2018-2020	99.0 [15.1]	100.0 [9.0]	90.5 [4.6]	100.0 [14.3]	100.0 [NR]	100.0 [NR]	96.1 [10.0]
2019-2021	98.0 [13.2]	100.0 [8.1]	89.1 [4.1]	100.0 [12.4]	100.0 [NR]	100.0 [NR]	95.1 [8.7]
2020-2022	98.0 [14.7]	100.0 [13.6]	82.4 [4.3]	96.0 [11.3]	100.0 [NR]	66.7 [NR]	92.1 [9.6]
2021-2023	97.4 [14.1]	100.0 [12.9]	81.4 [3.9]	96.0 [11.1]	100.0 [NR]	66.7 [NR]	91.6 [9.1]
2022-2024	98.0 [14.1]	100.0 [12.5]	80.4 [3.5]	96.0 [11.3]	100.0 [NR]	66.7 [NR]	91.4 [8.9]
Change 2003-2023	-1.0 [-4.2]	0.0 [1.7]	-13.6 [-2.8]	-4.0 [-1.2]	0.0 [NR]	-33.3 [NR]	-6.0 [-3.3]

* Some sites cross these national borders. For Excess Nitrogen calculations, each 1 x 1 km square (or part thereof) within each border site was assigned to a single country, so results are calculated for individual countries only.

Table 4.6: Trends in nutrient nitrogen exceedances for SPAs: a) per cent of sites with SRCL with exceedance of Site-Relevant Critical Load for at least one feature; b) Excess Nitrogen [maximum AAE kg N ha⁻¹ year⁻¹].

Note: NR means Not recorded. Number of sites with SRCL is given for the most recent year of the calculations. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	Eng/Wales*	Eng/Scot*	UK
Number of sites with SRCL	74	14	133	13	3	1	238
2002-2004	98.6 [17.4]	100.0 [15.3]	85.5 [5.8]	100.0 [13.2]	100.0 [NR]	- [-]	91.6 [12.0]
2007-2009	98.6 [15.6]	100.0 [13.8]	83.1 [5.7]	100.0 [13.6]	100.0 [NR]	- [-]	90.2 [11.1]
2012-2014	98.6 [15.6]	100.0 [13.4]	86.3 [5.9]	100.0 [13.8]	100.0 [NR]	- [-]	92.0 [11.2]
2013-2015	98.6 [15.6]	100.0 [14.2]	86.3 [6.2]	100.0 [13.3]	100.0 [NR]	- [-]	92.0 [11.4]
2014-2016	98.6 [15.5]	100.0 [14.4]	84.7 [5.8]	100.0 [12.6]	100.0 [NR]	- [-]	91.1 [11.1]
2015-2017	98.6 [14.6]	100.0 [13.3]	79.8 [5.1]	100.0 [12.4]	100.0 [NR]	- [-]	88.4 [10.3]
2016-2018	98.6 [15.0]	100.0 [12.6]	81.5 [4.8]	100.0 [14.0]	100.0 [NR]	- [-]	89.3 [10.4]
2017-2019	98.6 [15.5]	100.0 [12.1]	80.6 [4.9]	100.0 [15.6]	100.0 [NR]	- [-]	88.9 [10.7]
2018-2020	98.6 [15.0]	100.0 [12.1]	80.6 [4.9]	100.0 [15.4]	100.0 [NR]	- [-]	88.9 [10.5]
2019-2021	98.6 [12.9]	100.0 [10.5]	76.6 [4.2]	100.0 [13.2]	100.0 [NR]	- [-]	86.7 [9.0]
2020-2022	95.9 [12.3]	100.0 [13.0]	72.9 [3.6]	100.0 [9.1]	100.0 [NR]	100.0 [NR]	83.6 [6.9]
2021-2023	94.6 [11.7]	100.0 [12.2]	72.2 [3.3]	100.0 [8.8]	100.0 [NR]	100.0 [NR]	82.8 [6.5]
2022-2024	94.6 [11.8]	100.0 [12.0]	70.7 [3.0]	100.0 [9.4]	100.0 [NR]	100.0 [NR]	81.9 [6.3]
Change 2003-2023	-4.0 [-5.6]	0.0 [-3.3]	-14.8 [-2.7]	0.0 [-3.8]	0.0 [NR]	- [-]	-9.6 [-5.7]

* Some sites cross these national borders. For Excess Nitrogen calculations, each 1 x 1 km square (or part thereof) within each border site was assigned to a single country, so results are calculated for individual countries only.

Table 4.7: Trends in nutrient nitrogen exceedances for SSSIs/ASSIs: a) per cent of sites with SRCL with exceedance of Site-Relevant Critical Load for at least one feature; b) Excess Nitrogen [maximum AAE kg N ha⁻¹ year⁻¹].

Note: NR means Not recorded. Number of sites with SRCL is given for the most recent year of the calculations. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	England	Wales	Scotland	NI	Eng/Wales	Eng/Scot	UK
Number of sites with SRCL	2836	774	968	242	21	5	4846
2002-2004	99.4 [18.2]	99.9 [15.9]	93.1 [6.0]	100.0 [14.6]	- [-]	- [-]	98.2 [12.7]
2007-2009	99.3 [16.5]	99.9 [15.3]	93.3 [5.8]	100.0 [15.1]	- [-]	- [-]	98.2 [11.9]
2012-2014	99.4 [16.4]	99.9 [14.9]	93.7 [6.1]	100.0 [15.3]	- [-]	- [-]	98.3 [11.9]
2013-2015	99.4 [16.6]	100.0 [15.7]	94.6 [6.8]	100.0 [14.8]	- [-]	- [-]	98.5 [12.4]
2014-2016	99.3 [16.3]	100.0 [15.8]	92.0 [6.2]	100.0 [14.0]	- [-]	- [-]	98.0 [12.0]
2015-2017	99.3 [15.3]	99.9 [14.7]	90.0 [5.3]	100.0 [13.6]	- [-]	- [-]	97.5 [11.0]
2016-2018	99.3 [15.4]	99.9 [13.8]	88.4 [4.5]	100.0 [15.2]	- [-]	- [-]	97.3 [10.7]
2017-2019	99.3 [15.8]	99.9 [13.1]	89.7 [4.4]	100.0 [16.9]	- [-]	- [-]	97.5 [10.8]
2018-2020	99.3 [15.4]	99.9 [13.3]	89.2 [4.3]	100.0 [16.9]	- [-]	- [-]	97.4 [10.6]
2019-2021	99.1 [13.4]	99.4 [12.1]	85.3 [3.7]	99.5 [14.7]	- [-]	- [-]	96.4 [9.3]
2020-2022	97.1 [11.8]	95.3 [12.5]	73.3 [3.5]	85.1 [9.5]	100.0 [NR]	80.0 [NR]	91.5 [8.0]
2021-2023	96.5 [11.0]	94.7 [11.9]	71.3 [3.2]	85.5 [9.2]	100.0 [NR]	80.0 [NR]	90.6 [7.5]
2022-2024	96.3 [11.0]	93.7 [11.4]	70.6 [3.0]	85.5 [9.5]	100.0 [NR]	80.0 [NR]	90.2 [7.4]
Change 2003-2023	-3.1 [-7.2]	-6.2 [-4.5]	-22.5 [-3.0]	-14.5 [-5.1]	- [-]	- [-]	-8.0 [-5.4]

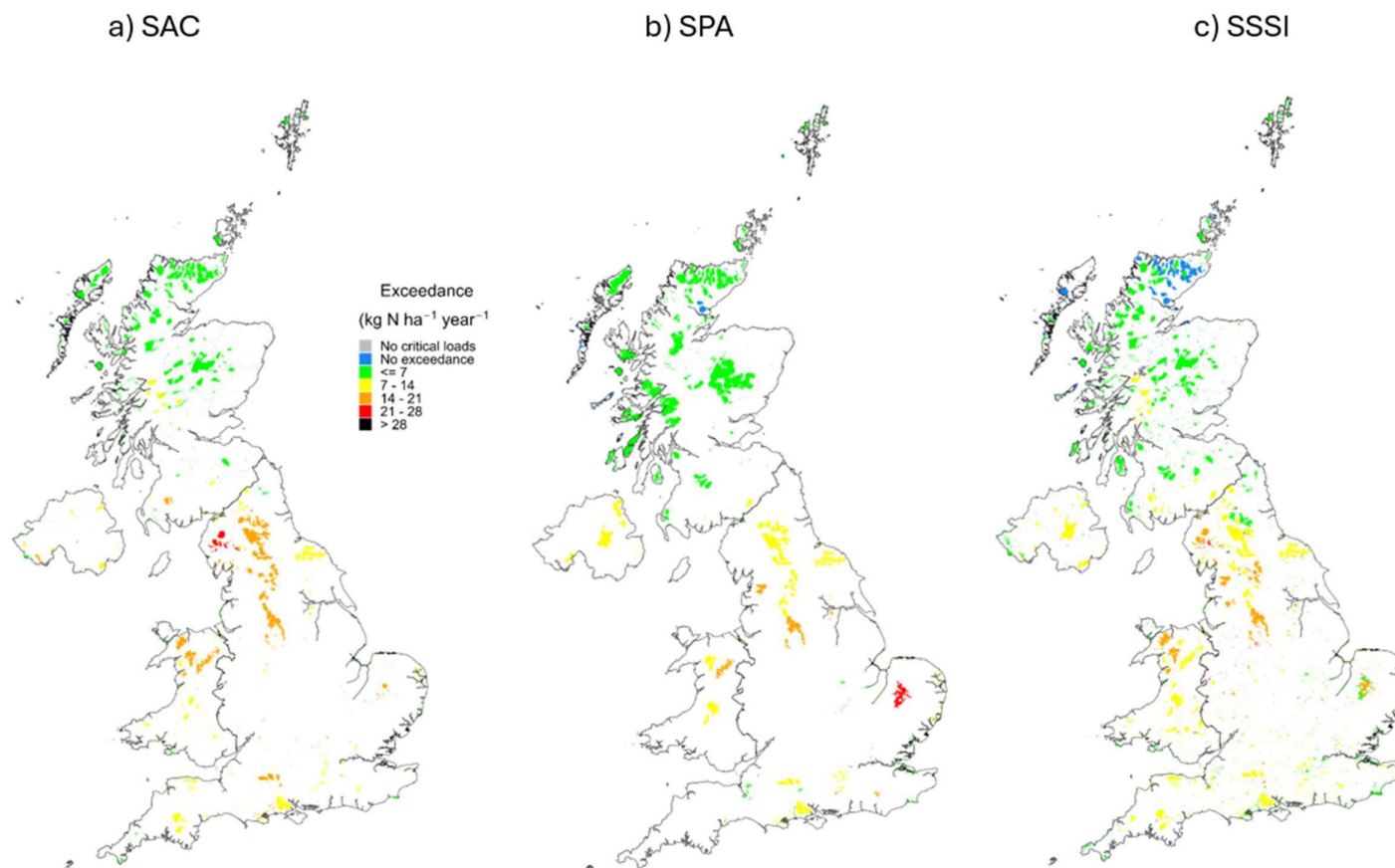


Figure 4.2: Excess Nitrogen: Average Accumulated Exceedance (AAE) of nutrient nitrogen critical loads by CBED deposition for 2022-2024. Maps show the maximum AAE for any feature within each site. Other features may have lower or no exceedance. Note that small sites may not show at this resolution.

Figure 4.2 shows maps of UK protected sites with excess nitrogen in 2022–2024. The highest levels of critical load exceedance occur across many sites in England, Wales and Northern Ireland, while lower exceedance levels are found across much of Scotland.

Section 5: Nitrogen deposition onto protected sensitive habitats

An indicator of air pollution pressure, “total deposition of reactive N onto nutrient-N sensitive, protected, priority habitat” (abbreviated as N_{sens}) is included (Table 5.1) to illustrate progress towards the target for England in the UK Government’s Clean Air Strategy (Defra, 2019). See section 1.8. This indicator has only been calculated for the most recent periods for which deposition data are available, i.e. periods centred on 2016, 2017, 2018, 2019, 2020, 2021, 2022 and 2023. Progress towards the target is assessed relative to a baseline year of 2016. Currently, this indicator is showing an 18.4% decrease in England during the period 2016 to 2023, thus already meeting the target of a 17% decline by 2030.

The CAS target applies only to England, but N_{sens} was also calculated for the Devolved Governments, for comparison. The Devolved Governments are considering atmospheric nitrogen pollution indicators and targets for their own countries, and these will be presented in future Trends Reports.

Table 5.1: Total deposition of reactive N onto nutrient-N sensitive priority habitat (N_{sens} , in $\text{kg ha}^{-1} \text{ year}^{-1}$), by country.

Years	England	Wales	Scotland	NI	UK
2015-2017	24.4	21.0	10.8	20.4	16.1
2016-2018	24.7	20.1	10.0	21.9	15.7
2017-2019	25.2	19.7	9.9	23.2	15.8
2018-2020	25.1	19.9	9.8	23.1	15.7
2019-2021	22.8	18.5	8.9	20.9	14.3
2020-2022	20.8	18.1	8.4	18.1	13.3
2021-2023	19.9	17.4	8.0	17.8	12.8
2022-2024	19.9	16.9	7.8	18.0	12.6
Percent change from 2016-2023	-18.4	-19.4	-27.8	-11.8	-21.8

Section 6: Impacts of changes in methodology

6.1 Update of the Site-Relevant Critical Loads database for nutrient N

The construction of Nutrient Nitrogen SRCL database used in Air Pollution Trends Report 2024 (APTR2024) included some duplicated rows, which caused an overestimation of total site areas and thus an underestimation of Excess N. Table 6.1 shows a comparison between results reported in the Air Pollution Trends Report 2024 and the updated results. To allow direct comparison, the update used the same deposition dataset as was used for the APTR2024, therefore these results will differ from results for year 2020-2022 reported in the current report. More details on differences in 2020-2022 deposition estimates are available in Section 6.2.

Table 6.1 Comparison of reported Excess N (maximum AAE kg N ha⁻¹ year⁻¹) in Air Pollution Trends Report 2024 and updated results.

Site Type	Country	Excess N (2020 2022) as reported in 2024	Corrected Excess N (2020 2022)
SAC	England	13.02	17.82
SAC	Wales	10.98	14.78
SAC	Scotland	3.45	4.57
SAC	Northern Ireland	9.75	11.51
SAC	England/Wales	0.00	0.00
SAC	England/Scotland	0.00	0.00
SAC	UK	8.60	11.13
SPA	England	10.75	13.57
SPA	Wales	13.30	14.35
SPA	Scotland	1.47	3.85
SPA	Northern Ireland	9.12	9.18
SPA	England/Wales	0.00	0.00
SPA	England/Scotland	0.00	0.00
SPA	UK	3.91	7.40
SSSI	England	9.51	13.85
SSSI	Wales	12.47	13.10
SSSI	Scotland	3.74	3.93
ASSI	Northern Ireland	9.77	10.07
SSSI	England/Wales	0.00	0.00
SSSI	England/Scotland	0.00	0.00
A/SSSI	UK	7.59	9.19

6.2 Update of the CBED 2020-2022 deposition and concentration data

The update of methodology for estimating CBED deposition (Section 1.6) resulted in differences between results reported in APTR2024 and in the current report for the year 2020-2022. The key differences were that current deposition values for 2020-2022 are lower for oxidised nitrogen, but higher for ammonia. This update resulted from:

- 1) The EMEP version used: the most recently available EMEP version at the time of running were used for the update
 - 2020: unchanged compared with APTR2024
 - 2021 and 2022: the APTR2024 dataset used EMEP version 4.45; the updated version used EMEP version 5.0.

At the same time the emissions totals were updated to the actual year of 2022 (which in the old submission was based on the year 2021) and the spatial emission fields were updated from originally 2019 to the actual years.

- 2) Observations included for the interpolation of secondary pollutants and base cations in air, and concentrations in precipitation: the observations were filtered in a similar way as for the midyears 2022 and 2023 to account for the reduced AGANet data coverage in recent years (see also Section 1.6). This included expert judgement of a more relaxed filter criteria, which depended on the compound, that created a realistic and sufficiently detailed concentration field that was consistent with previous years. The nearby sites of Auchencorth and Easter Bush were combined and the average concentration was used to avoid artefacts generated from the extrapolation of strong local gradients between these two sites.
- 3) Updates to the precipitation data provided by the Met Office, also with improved spatial coverage.

Consequently, the current estimation of exceedance of critical loads for year 2020-2022 varies from the results reported in APTR2024. Table 6.2 shows examples of differences in percentage of nutrient nitrogen sensitive habitats in the UK exceeding critical loads and Excess N for both datasets. In general, the differences were small with current CBED 2020-2022 resulting in slightly higher percent of habitat area exceeded and lower Excess N for most of the habitats.

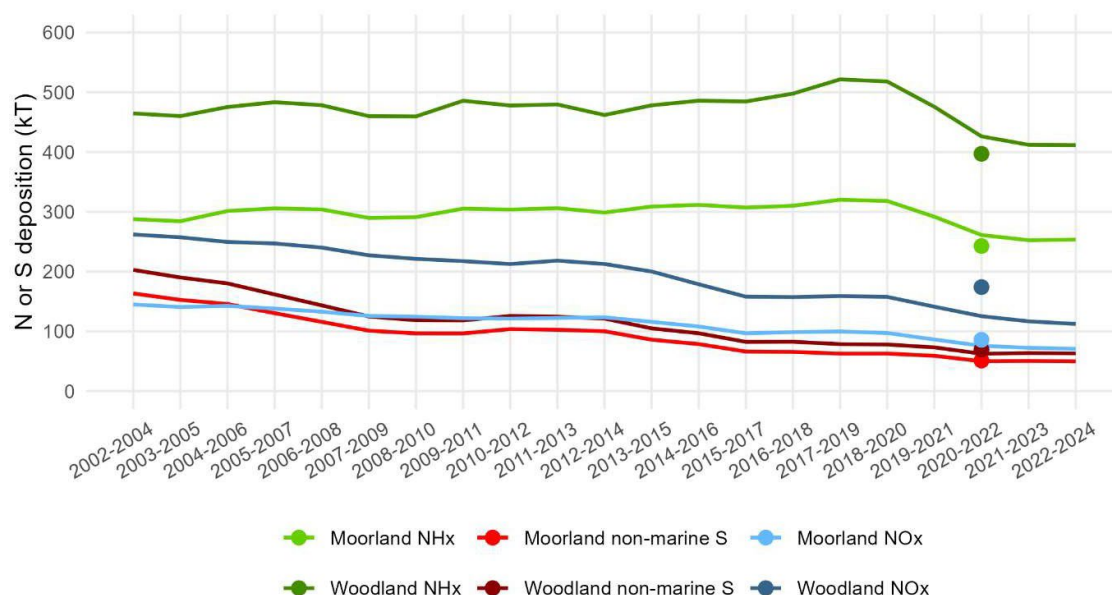


Figure 6.2 Comparison of deposition values (kilotonnes S or N per year) used in the current report Figure 1.3 (lines) with those used for 2020-2022 in the Air Pollution trends Report 2024 (dots).

Note: Non marine S means non-marine sulphur; NOx means oxidised nitrogen; NHx means reduced nitrogen. The results shown are discussed in Section 6.2.

Table 6.2 Comparison of critical loads exceedance statistics for 2020-2022 as reported in the Air Pollution Trends Report 2024 with values using updated CBED data for deposition.

Habitat	Total Area (km ²)	Area Exceeding CL (%) (Current CBED)	Excess N (kg ha ⁻¹ yr ⁻¹) (Current CBED)	Area Exceeding CL (%) (Previous CBED)	Excess N (kg ha ⁻¹ yr ⁻¹) (Previous CBED)	Change in area exceeded	Change in Excess N (kg ⁻¹ ha ⁻¹ yr ⁻¹)
Acid grassland	20,365	81.7	4.55	81.5	5.10	0.2	-0.55
Bog	9,118	64.1	4.17	63.1	4.52	1.0	-0.35
Dwarf shrub	21,846	76.2	3.40	79.2	3.69	-2.9	-0.29
Calcareous grassland	1,012	99.2	6.22	99.2	6.47	0.1	-0.25

Habitat	Total Area (km ²)	Area Exceeding CL (%) (Current CBED)	Excess N (kg ha ⁻¹ yr ⁻¹) (Current CBED)	Area Exceeding CL (%) (Previous CBED)	Excess N (kg ha ⁻¹ yr ⁻¹) (Previous CBED)	Change in area exceeded	Change in Excess N (kg ⁻¹ ha ⁻¹ yr ⁻¹)
Coniferous woodland (managed)	14,450	84.9	8.05	87.4	10.11	-2.5	-2.06
Dune grassland	631	71.3	3.65	67.4	3.56	4.0	0.09
Other broadleaved woodland	8,706	96.0	14.00	95.6	15.75	0.4	-1.75
Beech woodland	2,059	100.0	14.07	99.8	16.10	0.2	-2.02
Montane	4,915	99.9	4.89	99.4	4.73	0.6	0.16
Acidophilous oak woodland	6,958	89.4	10.70	91.2	12.32	-1.8	-1.62
Saltmarsh	808	78.2	2.83	68.4	2.64	9.8	0.19
Scots Pine woodland	1,485	99.9	5.77	99.8	6.28	0.1	-0.51
Mixed woodland	1,422	94.2	12.76	93.8	14.04	0.5	-1.27

6.3 Mapping improvement programme

The CBED methodology was developed in the 1990s to provide concentration and deposition estimates that are independent of emissions. The CBED methodology has changed, been refined and adapted over time, including in response to changing input data. Whilst the independence from emission estimates remains a strength, the uncertainty in emissions has decreased over time and the CBED methodology also has its

own uncertainties, for example due to the limited spatial coverage of the underlying measurement networks, variable data coverage, the use of annual average concentrations. Importantly, since CBED requires observations, the approach cannot produce concentration and deposition maps consistent with those in the Trend Report for future scenarios.

A 4-year CBED Improvement Programme is therefore currently underway to quantify some of the uncertainties in more detail, and to combine the information of emission-based model prediction and measured concentrations to develop a mapping system that can be used for both annual updates based on observed data and scenario calculations.

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Annex: Critical load and critical level exceedances by habitat and country

This Annex contains summary critical load exceedance statistics for acidity and for nutrient nitrogen by habitat, with separate tables for each UK country, and ammonia critical level exceedances broken down by country and habitat.

Acidity results: Tables A1-A9

Nutrient nitrogen results: Tables N1-N9

Ammonia critical level results: Table M1

Table A1: Acid-sensitive habitat areas in England and percentage area of habitats where acidity critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
<i>Habitat area (km²)</i>	<i>4545</i>	<i>1000</i>	<i>2608</i>	<i>1782</i>	<i>366</i>	<i>3540</i>	<i>9588</i>	<i>1109</i>	<i>23429</i>
2002-2004	90.8	15.0	88.8	97.9	99.9	84.6	66.9	49.3	77.3
2007-2009	88.8	11.9	82.9	97.2	99.9	80.6	61.3	48.9	73.2
2012-2014	89.3	11.3	83.5	97.4	99.9	80.3	59.7	48.8	72.7
2013-2015	89.4	11.3	82.1	97.5	99.9	80.1	58.9	48.6	72.1
2014-2016	89.1	10.0	80.0	97.3	99.9	78.9	57.4	48.4	71.0
2015-2017	87.9	7.2	74.4	97.2	99.9	76.8	55.1	46.3	68.8
2016-2018	87.1	5.5	75.2	97.1	99.9	76.9	56.6	45.8	69.3
2017-2019	87.0	6.1	74.9	97.1	99.9	77.1	57.4	45.4	69.6

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2018-2020	87.1	4.6	78.1	97.1	99.9	78.4	57.0	45.6	69.9
2019-2021	86.8	2.1	69.6	97.1	99.9	74.5	52.7	44.3	66.5
2020-2022	79.5	0.5	52.1	95.2	99.9	71.1	48.0	41.5	60.4
2021-2023	79.0	0.3	49.6	95.1	99.9	70.2	43.8	41.3	58.2
2022-2024	77.8	0.6	51.5	94.8	99.9	69.6	42.4	41.2	57.5
Change 2003-2023	-13	-14.4	-37.3	-3	-0.1	-15	-24.5	-8.1	-19.8

Table A2: Excess Acidity in England (Average Accumulated Exceedance in keq ha⁻¹ year⁻¹) by habitat and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2002-2004	1.15	0.09	0.81	1.54	1.76	1.37	0.90	0.79	1.04
2007-2009	0.92	0.04	0.57	1.19	1.44	1.07	0.65	0.60	0.78
2012-2014	0.96	0.04	0.60	1.27	1.57	1.01	0.57	0.63	0.76
2013-2015	0.99	0.04	0.56	1.28	1.70	0.98	0.53	0.58	0.75
2014-2016	0.92	0.04	0.53	1.19	1.54	0.94	0.51	0.56	0.70
2015-2017	0.77	0.02	0.43	0.98	1.22	0.86	0.47	0.49	0.61
2016-2018	0.68	0.01	0.42	0.87	0.94	0.90	0.53	0.49	0.61
2017-2019	0.63	0.01	0.42	0.85	0.85	0.93	0.57	0.47	0.62
2018-2020	0.66	0.01	0.40	0.82	0.85	0.98	0.55	0.42	0.62

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2019-2021	0.55	0.00	0.28	0.65	0.73	0.81	0.43	0.33	0.50
2020-2022	0.38	0.00	0.15	0.46	0.55	0.61	0.35	0.24	0.37
2021-2023	0.35	0.00	0.13	0.43	0.52	0.56	0.31	0.23	0.33
2022-2024	0.37	0.00	0.14	0.45	0.55	0.55	0.30	0.25	0.34
Change 2003-2023	-0.78	-0.09	-0.67	-1.09	-1.2	-0.82	-0.6	-0.55	-0.7

Table A3: Acid-sensitive habitat areas in Wales and percentage area of habitats where acidity critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
<i>Habitat area (km²)</i>	4444	1	677	193	17	1590	2152	1225	9075
2002-2004	93.5	41.0	87.0	99.1	100.0	79.5	64.3	48.4	83.8
2007-2009	92.6	24.3	84.9	99.0	100.0	72.6	54.0	45.5	79.5
2012-2014	92.6	25.9	84.5	99.0	100.0	69.2	46.8	44.9	77.2
2013-2015	92.6	25.9	83.9	99.0	100.0	70.3	47.4	45.9	77.5
2014-2016	92.6	25.9	84.1	99.0	100.0	70.5	46.4	45.8	77.3
2015-2017	92.5	3.6	82.3	99.0	100.0	66.6	41.0	41.8	75.1
2016-2018	92.5	24.3	79.4	99.0	100.0	63.3	41.4	29.2	74.4
2017-2019	91.8	24.3	76.4	98.7	100.0	62.5	42.8	26.2	74.1

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2018-2020	90.0	41.8	74.3	97.4	100.0	62.7	45.3	23.7	73.6
2019-2021	88.3	34.1	67.5	84.0	100.0	59.7	39.7	22.9	70.1
2020-2022	91.4	0.0	63.4	98.5	98.4	57.5	33.1	24.8	69.7
2021-2023	90.3	0.0	55.8	98.5	95.2	55.6	30.7	23.9	67.7
2022-2024	86.8	0.0	50.3	89.6	95.2	55.0	30.1	23.3	65.1
Change 2003-2023	-6.8	-41	-36.6	-9.5	-4.8	-24.6	-34.1	-25.2	-18.7

Table A4: Excess Acidity in Wales (Average Accumulated Exceedance in $\text{keq ha}^{-1} \text{ year}^{-1}$) by habitat and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2002-2004	0.91	0.09	0.63	0.89	1.59	1.03	0.54	0.46	0.82
2007-2009	0.74	0.02	0.47	0.72	1.55	0.80	0.40	0.36	0.65
2012-2014	0.77	0.04	0.49	0.72	1.52	0.76	0.37	0.34	0.65
2013-2015	0.80	0.03	0.52	0.78	1.59	0.79	0.37	0.38	0.67
2014-2016	0.81	0.02	0.52	0.79	1.60	0.78	0.36	0.40	0.68
2015-2017	0.69	0.00	0.41	0.67	1.39	0.68	0.31	0.33	0.58
2016-2018	0.59	0.01	0.34	0.52	1.13	0.62	0.32	0.23	0.51
2017-2019	0.53	0.04	0.29	0.41	0.93	0.57	0.32	0.16	0.46
2018-2020	0.53	0.10	0.28	0.37	0.90	0.56	0.33	0.14	0.47

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2019-2021	0.45	0.05	0.19	0.30	0.85	0.46	0.26	0.13	0.38
2020-2022	0.40	0.00	0.14	0.30	0.76	0.44	0.23	0.14	0.34
2021-2023	0.36	0.00	0.11	0.27	0.72	0.41	0.21	0.14	0.31
2022-2024	0.34	0.00	0.10	0.24	0.61	0.37	0.19	0.13	0.29
Change 2003-2023	-0.57	-0.09	-0.53	-0.66	-0.98	-0.66	-0.35	-0.33	-0.53

Table A5: Acid-sensitive habitat areas in Scotland and percentage area of habitats where acidity critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
<i>Habitat area (km²)</i>	<i>10928</i>	<i>0</i>	<i>17604</i>	<i>6295</i>	<i>4526</i>	<i>10314</i>	<i>4847</i>	<i>5338</i>	<i>54512</i>
2002-2004	80.1	0.0	22.4	36.9	91.9	83.9	63.2	14.2	56.7
2007-2009	67.0	0.0	9.9	38.3	77.6	77.8	53.6	12.5	47.0
2012-2014	73.3	0.0	14.5	31.2	84.0	80.7	57.0	13.1	50.3
2013-2015	77.7	0.0	16.9	32.5	91.6	82.9	59.3	13.9	53.3
2014-2016	75.6	0.0	14.8	28.2	88.7	78.1	55.4	13.6	50.3
2015-2017	67.5	0.0	7.8	22.6	78.8	70.2	48.5	11.8	42.8
2016-2018	57.0	0.0	5.7	20.2	53.0	63.0	40.8	8.1	35.6
2017-2019	54.3	0.0	5.5	20.0	47.2	63.6	41.6	8.1	34.6

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2018-2020	55.0	0.0	4.5	17.1	44.5	63.0	40.7	8.1	33.7
2019-2021	47.6	0.0	1.8	10.8	41.1	57.1	37.3	7.3	28.9
2020-2022	41.3	0.0	0.5	9.7	43.7	48.2	31.8	6.6	25.2
2021-2023	37.0	0.0	0.3	8.5	37.0	45.7	29.7	6.5	22.8
2022-2024	38.1	0.0	0.4	9.3	32.8	47.0	28.7	6.7	23.0
Change 2003-2023	-42.1	0	-22	-27.6	-59.1	-36.9	-34.5	-7.5	-33.7

Table A6: Excess Acidity in Scotland (Average Accumulated Exceedance in $\text{keq ha}^{-1} \text{ year}^{-1}$) by habitat and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2002-2004	0.49	0.00	0.06	0.11	0.60	0.66	0.39	0.10	0.34
2007-2009	0.28	0.00	0.02	0.09	0.31	0.49	0.26	0.08	0.22
2012-2014	0.38	0.00	0.03	0.09	0.41	0.58	0.31	0.09	0.27
2013-2015	0.45	0.00	0.04	0.10	0.51	0.61	0.34	0.10	0.30
2014-2016	0.40	0.00	0.03	0.08	0.46	0.53	0.29	0.09	0.26
2015-2017	0.28	0.00	0.01	0.06	0.30	0.41	0.22	0.06	0.19
2016-2018	0.21	0.00	0.01	0.05	0.17	0.36	0.19	0.05	0.15
2017-2019	0.18	0.00	0.01	0.05	0.14	0.37	0.20	0.05	0.14
2018-2020	0.17	0.00	0.01	0.04	0.12	0.35	0.18	0.05	0.13

2019-2021	0.10	0.00	0.00	0.03	0.09	0.27	0.14	0.03	0.10
2020-2022	0.08	0.00	0.00	0.01	0.09	0.19	0.11	0.02	0.07
2021-2023	0.06	0.00	0.00	0.01	0.08	0.17	0.10	0.02	0.06
2022-2024	0.07	0.00	0.00	0.01	0.07	0.18	0.10	0.02	0.07
Change 2003-2023	-0.42	0	-0.06	-0.1	-0.53	-0.48	-0.29	-0.08	-0.27

Table A7: Acid-sensitive habitat areas in Northern Ireland and percentage area of habitats where acidity critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
<i>Habitat area (km²)</i>	<i>448</i>	<i>10</i>	<i>957</i>	<i>848</i>	<i>6</i>	<i>490</i>	<i>768</i>	<i>186</i>	<i>3527</i>
2002-2004	89.5	6.7	61.2	88.3	93.3	93.3	77.9	18.7	79.3
2007-2009	88.6	6.3	59.6	87.7	93.3	93.2	77.5	18.7	78.5
2012-2014	90.2	6.7	64.2	89.4	93.3	93.3	78.2	20.0	80.5
2013-2015	89.3	6.6	60.0	89.0	93.3	93.2	77.8	18.4	79.1
2014-2016	87.9	2.6	54.9	87.9	93.3	93.0	77.1	18.4	77.1
2015-2017	85.0	2.2	49.6	85.7	93.3	92.8	76.8	16.0	74.6
2016-2018	87.1	2.9	55.6	87.0	93.3	93.1	77.8	16.0	77.1
2017-2019	87.5	3.1	58.4	86.6	92.5	93.5	78.7	16.0	78.1

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2018-2020	87.2	3.1	57.0	85.8	90.7	93.5	78.8	16.3	77.5
2019-2021	82.5	2.9	47.9	80.5	87.3	93.0	77.5	16.0	72.8
2020-2022	74.4	0.9	31.0	69.4	87.3	92.3	76.0	14.3	64.1
2021-2023	75.0	0.9	29.1	69.7	87.3	92.3	75.8	14.3	63.6
2022-2024	78.1	0.9	32.8	73.5	87.3	92.3	75.7	14.3	65.9
Change 2003-2023	-11.3	-5.8	-28.5	-14.9	-6	-1.1	-2.1	-4.4	-13.4

Table A8: Excess Acidity in Northern Ireland (Average Accumulated Exceedance in $\text{keq ha}^{-1} \text{ year}^{-1}$) by habitat and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2002-2004	0.55	0.01	0.28	0.53	1.06	1.18	1.15	0.18	0.69
2007-2009	0.50	0.01	0.25	0.49	1.02	1.14	1.12	0.17	0.65
2012-2014	0.58	0.01	0.27	0.57	0.95	1.23	1.14	0.16	0.71
2013-2015	0.51	0.01	0.20	0.52	0.76	1.17	1.11	0.13	0.65
2014-2016	0.43	0.01	0.17	0.46	0.69	1.07	1.04	0.11	0.59
2015-2017	0.36	0.00	0.15	0.39	0.67	0.97	1.00	0.11	0.53
2016-2018	0.45	0.01	0.22	0.45	0.83	1.06	1.10	0.13	0.61
2017-2019	0.49	0.01	0.27	0.49	0.96	1.16	1.22	0.16	0.68
2018-2020	0.49	0.01	0.27	0.48	1.01	1.14	1.21	0.17	0.68

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2019-2021	0.35	0.01	0.18	0.36	0.79	0.98	1.06	0.13	0.55
2020-2022	0.18	0.00	0.06	0.23	0.37	0.73	0.86	0.06	0.38
2021-2023	0.18	0.00	0.05	0.23	0.35	0.73	0.84	0.06	0.38
2022-2024	0.20	0.00	0.06	0.24	0.41	0.74	0.83	0.07	0.39
Change 2003-2023	-0.35	-0.01	-0.22	-0.29	-0.65	-0.44	-0.32	-0.11	-0.3

Table A9: Acid-sensitive habitat areas in the UK and total area of habitats where acidity critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
<i>Habitat area (km²)</i>	<i>20365</i>	<i>1012</i>	<i>21846</i>	<i>9118</i>	<i>4915</i>	<i>15935</i>	<i>17354</i>	<i>7857</i>	<i>90543</i>
2002-2004	17,438	151	7,435	5,009	4,547	13,367	11,460	1,935	59,407
2007-2009	15,869	120	5,046	5,079	3,901	12,491	10,232	1,804	52,740
2012-2014	16,589	114	5,925	4,651	4,190	12,719	10,099	1,828	54,287
2013-2015	17,069	114	6,258	4,731	4,535	12,958	10,137	1,876	55,801
2014-2016	16,818	101	5,790	4,444	4,401	12,429	9,775	1,857	53,758
2015-2017	15,865	72	4,348	4,071	3,956	11,477	9,109	1,686	48,897
2016-2018	14,687	56	4,042	3,928	2,788	10,682	8,896	1,327	45,079
2017-2019	14,364	61	4,001	3,916	2,523	10,742	9,046	1,289	44,653

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland	Broadleaved and mixed woodland (unmanaged)	Fresh waters	All habitats
2018-2020	14,355	47	3,873	3,726	2,401	10,723	9,017	1,256	44,142
2019-2021	13,442	21	3,042	3,253	2,249	9,931	8,314	1,190	40,253
2020-2022	12,521	6	2,178	3,087	2,364	8,859	7,437	1,140	36,451
2021-2023	11,980	3	2,010	3,009	2,060	8,532	6,877	1,121	34,471
2022-2024	11,901	6	2,074	3,074	1,873	8,633	6,692	1,127	34,253
Change 2003-2023	-5537	-145	-5361	-1935	-2674	-4733	-4768	-808	-25,153

Table N1: Nutrient-sensitive habitat area in England and percentage area of habitats where nutrient-nitrogen critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh	All
Habitat area (km²)	4545	1000	2608	1782	366	3540	5950	1753	3222	0	538	199	535	26038
2002-2004	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	99.4	100.0
2007-2009	100.0	99.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	97.9	99.9
2012-2014	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	98.6	100.0
2013-2015	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	98.6	100.0

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland and (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh	All
2014-2016	100.0	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	98.5	100.0
2015-2017	100.0	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	98.0	99.9
2016-2018	100.0	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	98.6	100.0
2017-2019	100.0	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	98.9	100.0
2018-2020	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	99.0	100.0
2019-2021	100.0	99.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	96.3	99.9

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2020- 2022	99.2	99.3	99.9	100.0	100.0	100.0	99.8	100.0	99.9	NA	99.9	86.7	89.5	99.4
2021- 2023	99.4	98.7	99.9	100.0	100.0	100.0	99.8	100.0	99.9	NA	99.9	86.7	85.0	99.4
2022- 2024	98.5	98.6	99.9	100.0	100.0	100.0	99.8	100.0	99.9	NA	99.9	86.7	79.2	99.1
Chang e 2003- 2023	-1.5	-1.3	-0.1	0	0	0	-0.2	0	-0.1	NA	-0.1	-13.3	-20.2	-0.9

Table N2: Excess Nitrogen in England: Average Accumulated Exceedance for nutrient-Nitrogen (in kg N ha⁻¹ year⁻¹) by country and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2002-2004	13.52	10.73	15.94	19.54	21.79	21.94	23.54	21.47	21.99	NA	22.88	8.35	6.11	19.20
2007-2009	12.85	9.58	14.96	18.33	21.56	19.73	20.94	19.14	19.66	NA	20.37	7.72	5.16	17.44
2012-2014	13.72	9.94	15.45	19.34	23.11	19.04	19.61	18.02	18.63	NA	19.37	7.78	5.25	17.13
2013-2015	14.56	10.06	15.64	20.15	25.13	19.17	19.22	17.83	18.61	NA	19.23	7.91	5.07	17.29
2014-2016	14.05	9.93	15.46	19.44	23.86	18.78	19.16	17.58	18.32	NA	19.11	7.93	5.12	16.99
2015-2017	12.47	9.19	14.45	17.40	20.64	17.94	18.63	16.98	17.62	NA	18.44	7.78	4.90	16.02

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2016- 2018	11.35	9.43	14.51	16.40	17.70	18.72	20.07	18.11	18.43	NA	19.64	7.99	5.40	16.38
2017- 2019	11.01	10.02	14.64	16.40	16.91	19.42	21.38	18.84	19.17	NA	20.75	8.22	5.91	16.91
2018- 2020	11.38	9.40	14.41	15.92	16.83	19.98	21.10	18.50	18.85	NA	20.57	8.16	5.62	16.83
2019- 2021	9.73	7.59	12.43	13.74	15.39	17.14	18.20	15.87	16.35	NA	17.79	7.14	4.38	14.48
2020- 2022	7.46	6.24	10.03	11.42	13.25	14.24	16.32	14.19	14.38	NA	15.92	5.66	3.41	12.36
2021- 2023	7.01	5.64	9.71	11.14	13.01	13.26	15.08	12.75	13.15	NA	14.74	5.31	2.99	11.50

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2022- 2024	7.39	5.92	9.98	11.53	13.52	13.12	14.86	12.41	12.91	NA	14.58	5.16	2.93	11.51
Chang e 2003- 2023	-6.13	-4.82	-5.96	-8	-8.27	-8.82	-8.68	-9.06	-9.08	NA	-8.31	-3.19	-3.18	-7.69

Table N3: Nutrient-sensitive habitat area in Wales and percentage area of habitats where nutrient-nitrogen critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh	All
<i>Habitat area (km²)</i>	4444	1	677	193	17	1590	281	279	1567	0	125	106	131	9412
2002-2004	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	92.4	99.9
2007-2009	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	93.6	99.9
2012-2014	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	95.4	99.9
2013-2015	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	95.5	99.9

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2014- 2016	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	97.4	100.0
2015- 2017	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	93.5	99.9
2016- 2018	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	88.0	99.8
2017- 2019	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	77.3	99.6
2018- 2020	99.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	74.9	99.3
2019- 2021	99.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	100.0	68.6	99.1

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2020- 2022	100.0	100.0	99.8	100.0	100.0	99.9	99.2	99.9	99.9	NA	99.9	91.5	82.1	99.6
2021- 2023	100.0	100.0	99.8	100.0	100.0	99.9	99.2	99.9	99.9	NA	99.9	91.5	79.3	99.5
2022- 2024	100.0	98.9	99.8	100.0	100.0	99.9	99.2	99.9	99.9	NA	99.9	91.5	73.7	99.4
Chang e 2003- 2023	0	-1.1	-0.2	0	0	-0.1	-0.8	-0.1	-0.1	NA	-0.1	-8.5	-18.7	-0.4

Table N4: Excess Nitrogen in Wales: Average Accumulated Exceedance for nutrient-Nitrogen (in kg N ha⁻¹ year⁻¹) by country and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassl and	Calcareous grassl and	Dwarf shrub heath	Bog	Montane	Coniferous woodl and (managed)	Other broadleaved woodl and	Beech woodl and	Acidophilous oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltmarsh	All
2002-2004	10.83	8.04	14.38	14.48	18.42	19.87	17.46	18.30	17.73	NA	18.27	5.76	3.64	14.21
2007-2009	10.46	7.02	14.16	14.57	20.91	18.74	15.62	17.31	16.98	NA	17.08	5.88	3.41	13.61
2012-2014	10.85	7.65	14.55	14.61	20.74	17.96	14.95	16.56	15.93	NA	16.26	5.84	3.24	13.46
2013-2015	11.78	7.80	15.46	15.82	22.25	19.02	15.32	17.07	16.67	NA	16.89	5.99	3.48	14.33
2014-2016	12.18	7.86	15.81	16.29	22.70	19.25	15.35	17.11	16.77	NA	17.00	6.11	3.71	14.62
2015-2017	11.00	6.86	14.68	15.22	20.80	17.75	14.38	15.88	15.67	NA	15.86	5.75	3.38	13.43

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2016- 2018	9.91	7.21	13.80	13.53	17.78	16.57	14.78	15.96	15.19	NA	15.68	5.59	3.32	12.54
2017- 2019	9.24	8.46	13.10	12.42	15.65	15.61	15.18	16.15	14.99	NA	15.69	5.41	3.40	11.97
2018- 2020	9.52	11.05	13.05	12.09	15.50	15.41	15.68	16.45	15.11	NA	15.98	5.55	3.52	12.11
2019- 2021	8.36	9.51	11.63	11.15	14.93	13.65	13.61	14.36	13.53	NA	14.10	5.06	2.84	10.72
2020- 2022	7.81	5.16	11.24	11.43	14.20	13.89	12.50	13.56	13.33	NA	13.53	4.92	2.55	10.37
2021- 2023	7.29	4.37	10.55	11.01	13.73	12.94	11.49	12.40	12.27	NA	12.49	4.56	2.10	9.64

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2022- 2024	6.99	4.30	10.31	10.66	12.30	12.12	11.03	11.60	11.27	NA	11.78	4.21	1.88	9.11
Chang e 2003- 2023	-3.84	-3.73	-4.06	-3.82	-6.12	-7.74	-6.43	-6.7	-6.47	NA	-6.49	-1.56	-1.75	-5.1

Table N5: Nutrient-sensitive habitat area in Scotland and percentage area of habitats where nutrient-nitrogen critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland and (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh	All
Habitat area (km²)	10928	0	17604	6295	4526	8829	1867	28	2038	1485	336	258	141	54333
2002-2004	84.5	0.0	90.9	89.9	100.0	85.9	87.9	100.0	87.4	100.0	91.1	79.8	55.2	89.3
2007-2009	79.9	0.0	92.4	90.1	100.0	91.7	89.5	100.0	87.7	100.0	92.6	79.6	45.0	89.9
2012-2014	81.5	0.0	90.9	89.9	100.0	88.6	89.3	100.0	89.2	100.0	92.8	82.1	52.4	89.3
2013-2015	88.1	0.0	92.1	88.6	100.0	91.3	91.9	100.0	94.0	100.0	95.5	82.7	56.8	91.6

Years	Acid grassl and	Calcareous grassl and	Dwarf shrub heath	Bog	Montane	Coniferous woodl and (managed)	Other broadleaved woodl and	Beech woodl and	Acidophilous oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltmarsh	All
2014-2016	87.2	0.0	89.0	85.3	100.0	86.5	88.2	100.0	87.8	100.0	91.2	79.5	54.7	88.8
2015-2017	83.4	0.0	87.5	77.6	100.0	84.3	86.4	100.0	82.4	100.0	87.1	74.0	50.0	86.0
2016-2018	74.5	0.0	83.4	72.1	98.8	80.9	83.9	100.0	75.3	100.0	79.0	79.5	49.0	81.2
2017-2019	71.8	0.0	83.1	73.0	96.3	82.1	85.1	100.0	76.6	100.0	79.2	84.1	51.8	80.8
2018-2020	73.0	0.0	83.1	65.1	95.7	81.9	85.4	100.0	76.5	100.0	78.8	83.9	49.7	80.0
2019-2021	65.7	0.0	79.8	53.4	97.6	80.4	84.4	100.0	72.7	100.0	76.8	74.9	44.6	75.8

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland and (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh	All
2020-2022	66.4	0.0	70.6	48.1	99.9	75.3	82.2	99.3	64.1	99.9	76.2	49.3	32.0	71.1
2021-2023	61.4	0.0	67.4	44.3	99.8	72.3	80.8	99.3	59.8	99.9	72.5	49.1	28.2	68.0
2022-2024	60.6	0.0	56.0	32.6	95.6	71.8	80.0	99.3	58.9	99.9	71.0	48.4	30.3	62.2
Change 2003-2023	-23.9	0	-34.9	-57.3	-4.4	-14.2	-7.8	-0.7	-28.5	-0.1	-20.1	-31.4	-24.9	-27.1

Table N6: Excess Nitrogen in Scotland: Average Accumulated Exceedance for nutrient-Nitrogen (in kg N ha⁻¹ year⁻¹) by country and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassl and	Calcareous grassl and	Dwarf shrub heath	Bog	Montane	Coniferous woodl and (managed)	Other broadleaved woodl and	Beech woodl and	Acidophilous oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltmarsh	All
2002-2004	5.20	0.00	3.90	3.00	8.20	8.80	9.50	14.50	6.50	9.40	8.70	2.70	1.80	5.70
2007-2009	4.10	0.00	3.60	3.60	6.70	8.20	8.50	15.00	5.40	9.00	7.80	2.80	1.60	5.10
2012-2014	5.40	0.00	3.90	3.20	7.70	9.40	9.20	15.80	6.30	9.60	8.50	3.00	2.10	5.80
2013-2015	6.60	0.00	4.40	3.40	9.30	10.00	9.70	16.10	7.10	10.50	9.10	2.90	2.40	6.50
2014-2016	6.20	0.00	4.20	3.00	8.90	9.00	8.90	15.60	6.30	9.50	8.30	2.60	2.30	6.00
2015-2017	4.90	0.00	3.50	2.60	7.20	7.80	8.00	14.70	5.20	8.20	7.30	2.40	1.90	5.10

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2016- 2018	4.00	0.00	3.00	2.30	5.10	7.20	8.00	14.80	4.60	6.70	7.00	2.60	1.70	4.30
2017- 2019	3.80	0.00	3.00	2.30	4.50	7.40	8.70	15.80	5.00	6.80	7.70	3.10	1.90	4.30
2018- 2020	3.50	0.00	3.10	2.30	4.10	7.20	8.60	15.40	4.70	6.50	7.40	2.90	1.70	4.20
2019- 2021	2.50	0.00	2.40	1.70	3.70	5.70	7.20	13.90	3.60	6.00	6.30	2.10	1.20	3.30
2020- 2022	2.00	0.00	1.80	1.30	4.20	4.30	5.30	11.60	2.70	5.80	4.70	1.20	0.90	2.70
2021- 2023	1.70	0.00	1.60	1.10	3.80	3.90	5.00	11.00	2.40	5.30	4.40	1.20	0.80	2.40

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2022- 2024	1.80	0.00	1.50	1.10	3.20	4.10	5.00	11.10	2.50	4.90	4.40	1.30	0.90	2.30
Chang e 2003- 2023	-3.36	0	-2.48	-1.88	-5.02	-4.7	-4.49	-3.45	-3.97	-4.47	-4.26	-1.42	-0.86	-3.34

Table N7: Nutrient-sensitive habitat area in Northern Ireland and percentage area of habitats where nutrient-nitrogen critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
<i>Habita t area (km²)</i>	448	10	957	848	6	490	608	0	131	0	424	68	0	3990
2002-2004	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	61.7	100.0
2007-2009	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	61.7	100.0
2012-2014	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	100.0	100.0
2013-2015	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	100.0	100.0

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland and (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh	All
2014-2016	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	61.7	100.0
2015-2017	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	61.7	100.0
2016-2018	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	100.0	100.0
2017-2019	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	100.0	100.0
2018-2020	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	100.0	100.0
2019-2021	99.9	100.0	100.0	100.0	100.0	100.0	100.0	NA	100.0	NA	100.0	100.0	61.7	100.0

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland and (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh	All
2020-2022	98.8	95.0	99.2	99.7	99.1	99.9	99.7	NA	99.2	NA	99.7	78.4	61.7	99.1
2021-2023	99.3	96.5	99.2	99.7	99.1	99.9	99.7	NA	99.2	NA	99.7	78.4	61.7	99.2
2022-2024	99.6	97.3	99.2	99.7	99.1	99.9	99.7	NA	99.2	NA	99.7	78.4	61.7	99.2
Change 2003-2023	-0.4	-2.7	-0.8	-0.3	-0.9	-0.1	-0.3	NA	-0.8	NA	-0.3	-21.6	0	-0.8

Table N8: Excess Nitrogen in Northern Ireland: Average Accumulated Exceedance for nutrient-Nitrogen (in kg N ha⁻¹ year⁻¹) by country and deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2002-2004	7.78	6.04	12.50	11.60	16.99	15.71	20.64	NA	15.91	NA	17.84	7.72	0.22	14.00
2007-2009	8.44	6.93	13.06	12.38	17.47	17.00	21.45	NA	16.99	NA	18.94	8.10	0.53	14.82
2012-2014	9.56	7.48	13.65	13.53	17.17	18.18	21.38	NA	17.72	NA	19.56	8.33	1.75	15.56
2013-2015	8.72	7.30	12.83	12.98	15.14	17.59	21.22	NA	17.42	NA	19.17	7.78	1.41	14.99
2014-2016	7.74	6.35	12.08	12.10	14.22	16.13	20.34	NA	16.34	NA	18.01	7.37	0.88	14.03
2015-2017	6.99	5.63	11.68	11.27	14.29	15.05	20.06	NA	15.65	NA	17.30	7.24	0.46	13.40

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2016- 2018	8.40	6.37	13.13	12.35	16.40	16.52	22.04	NA	17.12	NA	18.97	8.50	0.98	14.87
2017- 2019	9.18	6.99	14.18	12.96	18.18	18.08	24.64	NA	18.94	NA	21.00	9.54	1.34	16.22
2018- 2020	9.04	6.80	14.06	12.76	18.79	17.87	24.51	NA	18.85	NA	20.89	9.58	1.34	16.07
2019- 2021	6.88	5.36	11.97	10.99	15.80	15.46	21.56	NA	16.52	NA	18.32	7.94	0.41	13.83
2020- 2022	4.48	3.85	9.29	8.86	10.09	12.11	18.58	NA	13.72	NA	14.89	4.97	0.46	11.07
2021- 2023	4.24	3.73	9.04	8.74	9.66	11.86	17.87	NA	13.26	NA	14.43	4.87	0.43	10.75

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2022- 2024	4.69	3.84	9.48	9.03	10.39	11.93	17.70	NA	13.02	NA	14.32	5.18	0.48	10.94
Chang e 2003- 2023	-3.09	-2.19	-3.02	-2.57	-6.61	-3.78	-2.94	NA	-2.89	NA	-3.52	-2.53	0.27	-3.06

Table N9: Nutrient-sensitive habitat area in the UK and total area of habitats where nutrient-nitrogen critical load is exceeded, by deposition dataset year. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

Years	Acid grassland	Calcareous grassland	Dwarf shrub heath	Bog	Montane	Coniferous woodland (managed)	Other broadleaved woodland	Beech woodland	Acidophilous oak woodland	Scots Pine woodland	Mixed woodland	Dune grassland	Saltmarsh	All
Habitat area (km ²)	20365	1012	21846	9118	4915	14450	8706	2059	6958	1485	1422	631	808	20365
2002-2004	18,669	1,011	20,243	8,484	4,914	13,206	8,479	2,059	6,702	1,485	1,392	579	731	100.0
2007-2009	18,167	1,008	20,511	8,494	4,915	13,718	8,509	2,059	6,708	1,485	1,397	578	710	100.0
2012-2014	18,341	1,011	20,240	8,481	4,914	13,446	8,505	2,059	6,739	1,485	1,398	585	727	100.0
2013-2015	19,063	1,011	20,452	8,402	4,914	13,685	8,555	2,059	6,835	1,485	1,407	586	734	100.0

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2014- 2016	18,966	1,009	19,910	8,190	4,914	13,262	8,486	2,059	6,709	1,485	1,393	578	732	100.0
2015- 2017	18,547	1,009	19,643	7,706	4,914	13,067	8,452	2,059	6,600	1,485	1,379	564	718	100.0
2016- 2018	17,583	1,009	18,926	7,362	4,860	12,767	8,406	2,059	6,455	1,485	1,352	578	712	100.0
2017- 2019	17,275	1,009	18,879	7,417	4,748	12,866	8,427	2,059	6,482	1,485	1,353	590	704	100.0
2018- 2020	17,383	1,011	18,879	6,919	4,721	12,850	8,433	2,059	6,478	1,485	1,351	589	698	100.0
2019- 2021	16,573	1,005	18,295	6,184	4,807	12,723	8,415	2,059	6,401	1,485	1,344	566	669	100.0

Years	Acid grassl and	Calcar eous grassl and	Dwarf shrub heath	Bog	Monta ne	Conife rous woodl and (mana ged)	Other broadl eaved woodl and	Beech woodl and	Acido philou s oak woodl and	Scots Pine woodl and	Mixed woodl and	Dune grassl and	Saltm arsh	All
2020- 2022	16,644	1,004	16,651	5,847	4,911	12,269	8,359	2,059	6,222	1,484	1,341	450	632	99.1
2021- 2023	16,119	999	16,098	5,612	4,906	12,001	8,333	2,059	6,134	1,484	1,328	450	599	99.2
2022- 2024	15,984	997	14,082	4,873	4,715	11,951	8,319	2,059	6,116	1,484	1,323	448	563	99.2
Chang e 2003- 2023	-2685	-14	-6162	-3611	-198	-1255	-160	-1	-586	-1	-69	-131	-168	-0.8

Table N10: Percentages of the area of nitrogen-sensitive habitats where the 3 µg m⁻³ and 1 µg m⁻³ ammonia critical levels are exceeded in 2023, by country and habitat. To reduce the length of the table, this does not include data for mid-years 2004 to 2007 and 2009 to 2012.

	England		Wales		Scotland		Northern Ireland		UK	
Broad Habitat	1 µg m ³	3 µg m ³	1 µg m ³	3 µg m ³	1 µg m ³	3 µg m ³	1 µg m ³	3 µg m ³	1 µg m ³	3 µg m ³
Acid grassland	21.3	0.0	16.8	0.0	2.0	0.0	82.5	0.0	11.3	0.0
Calcareous grassland	72.8	0.0	40.7	0.0	0.0	0.0	97.8	0.6	73.1	0.0
Dwarf shrub heath	39.0	0.0	5.8	0.0	0.5	0.0	80.9	0.6	8.9	0.0
Bog	6.8	0.3	1.3	0.3	0.7	0.0	84.0	1.2	9.6	0.2
Montane	0.0	0.0	0.0	0.0	0.0	0.0	27.9	0.0	0.0	0.0
Coniferous woodland	64.6	0.6	17.9	0.0	5.0	0.0	76.1	1.6	23.5	0.2
Broadleaved woodland	91.5	1.6	59.2	0.3	26.7	0.0	98.3	16.4	77.2	2.2
Beech woodland	80.1	0.2	54.6	0.3	80.7	0.0	0.0	0.0	76.6	0.2
Acidophilous oak	75.6	0.9	49.3	0.0	7.0	0.0	89.6	6.7	50.3	0.5
Scots Pine	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	1.2	0.0
Mixed woodland	84.9	2.0	50.1	0.3	23.8	0.0	90.4	6.3	69.1	2.6
Saltmarsh	83.4	0.3	55.4	0.0	33.7	0.0	100.0	0.0	70.3	0.2
Dune grass	63.2	0.0	24.6	0.0	6.5	0.0	90.9	0.0	37.3	0.0

