

Red List of Ecosystem assessment series

Produced by JNCC and NatureScot, supported by Natural Resources Wales, Natural England, and Northern Ireland Environment Agency.

This resource is one in a series/number of Ecosystem Red List assessments developed to accompany the UK Biodiversity Indicator '[Red List of Ecosystems](#)'. The assessments are available at: <https://jncc.gov.uk/resources/7b922dfc-708b-4c8c-9e6a-e2040447fb39>.

Resilient ecosystems are crucial for preventing biodiversity loss and species extinction. Maintaining healthy ecosystems safeguards the essential services they provide, which are fundamental to human well-being and a thriving economy. However, pressures and threats such as deforestation, overfishing, or climate change, can disturb the balance of ecosystems and threaten their health and functioning. Assessing the level of threat facing ecosystems is important in helping us understand the current status of the environment, and on a practical level, assessments can be used to help prioritise conservation funding decisions and where to take conservation management action on the ground.

The 'Red List of Ecosystems' (RLE) is a global assessment approach set out by the International Union on Conservation of Nature (IUCN). The approach includes consideration of a series of criteria, including change in geographic distribution through time; whether the ecosystem distribution is geographically restricted; evidence for any environmental degradation; and disruption to biotic processes or interactions. We have not carried out the quantitative analyses of the probability of ecosystem collapse necessary to assess criterion E as we do not have the data needed to carry out such analyses consistently. The IUCN methodology is widely used as a robust approach to assessing the status of ecosystems. Further details of the criteria used in these assessments are available on the [IUCN portal](#).

This assessment series sets out the RLE assessment conclusions for ecosystems found in the UK, alongside the details of how the assessment was made, including for each IUCN component criterion. The assessments have been peer-reviewed, and source data is referenced. Once complete, the series will cover the full range of natural and seminatural habitats that occur in the UK, throughout marine, terrestrial and freshwater environments.

Assessments are conducted according to the [Global Ecosystem Typology Level 3](#) (Ecosystem Functional Groups). This enables the assessments to feed into the Kunming-Montreal [Global Biodiversity Framework](#) (GBF) headline indicator A.1 Red List of Ecosystems. This indicator, which has been incorporated into the UK Biodiversity Indicator suite, is designed to measure progress against [Goal A](#) ('Protect and restore') and [Target 1](#) ('Plan and manage all areas to reduce biodiversity loss') of the GBF.

Any gridded maps are derived from public sector information licensed under the Open Government Licence v3.0. Coastline boundary is derived from the Oil and Gas Authority's and Lloyds Register SNS Regional Geological Maps (Open Source).

FM1.2 Permanently open riverine estuaries and bays

1. Key facts

Ecosystem description: Estuaries and bays are habitat complexes which comprise an interdependent mosaic of subtidal and intertidal habitats, which are closely associated with surrounding terrestrial habitats. Many of these habitats are identified in the Global Ecosystem Typology in their own right (e.g. MFT1.3 Saltmarshes and reedbeds, MT1.1 Rocky shores, MT1.2 Muddy shores, MT1.3 Sandy shores, M1.1 Seagrasses beds, M1.2 Kelp Forests, M1.4 Shellfish beds and M1.6 Subtidal rocky reefs). The hydrological, biogeochemical and biological cycles all combine in these coastal areas, which results in high level of biological productivity, making them areas of great ecological and economic importance.



Image credits: (Left to right) Ythan estuary, Sands of Forvie NNR ©Lorne Gill; Loch Laxford, ©George Stoye

Overall assessment conclusion: Vulnerable (VU) based on criteria C2b and D2b.

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Corresponding habitat classifications:

The following habitats were considered in the production of this assessment:

EUNIS codes: None specifically for estuaries and bays

UK Marine Habitat Classification: None specifically for estuaries and bays

2. Assessment against IUCN criteria

Criterion A: Reduction in geographic distribution

Criterion A considers reduction in geographic distribution over ANY of the defined time periods for criteria A1, A2a, A2b or A3. For details of time periods and criteria see [IUCN Red List of Ecosystems Criteria Summary Sheet 2.2 EN.pdf](#)

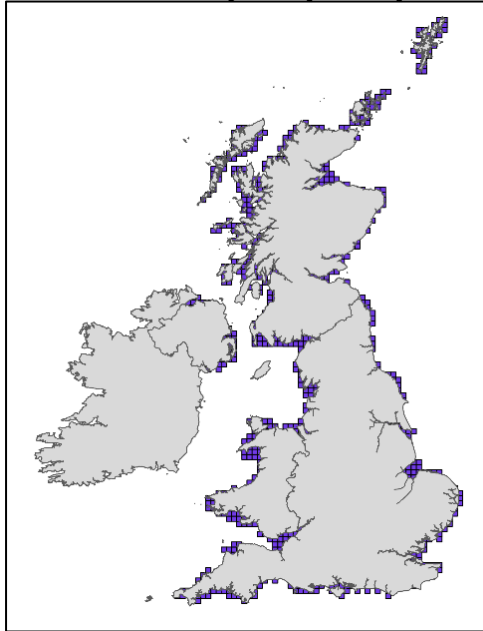
Estuaries and bays are physiographic features, determined primarily by geomorphological and hydrographic processes occurring over long timescales. There have been no records of a decline in the geographic distribution of these features (Natural England, 2019a and 2019b; Daera, 2024; NatureScot, 2025a and 2025b; NRW, 2025).

Least Concern – there is no evidence of a reduction in geographic distribution of permanently open riverine estuaries and bays.

Criterion B: Restricted geographic distribution

Criterion B considers restricted geographic distribution indicated by ANY of the time periods for criteria B1, B2 or B3. For details of time periods and criteria see [IUCN Red List of Ecosystems Criteria Summary Sheet 2.2 EN.pdf](#).

Estuaries and bays vary widely in habitat and species diversity according to their geographic



location, size, shape, geology (e.g. rock or sediment), salinity and tidal influence. They are naturally dynamic ecosystems, with the degree of wave exposure being a critical factor in determining habitat and species diversity on the shore and in the sublittoral zone. The UK is estimated to have 11,773 km² of estuaries and bays (Mountford et al., 2025). Changes in extent or area of individual estuaries and bays will vary either positively or negatively depending on the pressures experienced. On the basis of benthic habitat assessments, 31.2% of the UK's estuaries and bays are considered to be in a good condition, 22.8% in a poor condition and 45.9% in an unknown condition (Natural England, 2019a and 2019b; Daera, 2024; Jackson-Bué et al., 2025a and 2025b; NatureScot, 2025a and 2025b).

Data deficient (DD) – The extent of individual estuaries and bays varies depending on the pressures experienced. Currently the condition of this habitat mosaic is largely unknown.

Criterion C: Environmental degradation

Criterion C considers environmental degradation over ANY of the time periods for criteria C1, C2a, C2b or C3. For details of time periods and criteria see [IUCN Red List of Ecosystems Criteria Summary Sheet 2.2 EN.pdf](#).

Over the last century human activities (e.g. land reclamation for industrial development) have driven significant changes in the areas of estuaries and bays (Mahoney and Bishop, 2017; Stamp et al., 2022). For example, the Cardiff Bay Barrage, one of the largest civil engineering projects in Europe, was constructed in the 1990s converting a large area of intertidal mudflats into a freshwater lake (Reed, 2007; NRW, 2025). The benthic habitats of estuaries and bays also experience fisheries disturbance and pollution including litter (Blaber et al., 2000; Kennish 2002; Bergman et al., 2015; Little et al., 2017; Mahoney and Bishop, 2017; Stamp et al., 2022).

The effects of climate change through increases in water temperature and sea level rise are already being experienced in the UK's estuaries and bays (Robbins et al., 2016; Scottish Government, 2020; Cornes et al., 2023). Changes to physical and chemical processes within the river catchment may also increase the pollution of transitional and coastal waters. Drier summers, but more extreme rainfall events, will exacerbate microbial delivery from livestock farming and sewage overflows, whilst low water flows during drought conditions will reduce the dilution of chemicals effluent discharges (Sheahan et al., 2013). Increases in microbial and chemical pollution can, in turn, have an impact on aquaculture, as well as commercial and recreational fisheries (Pinnegar et al., 2023; Murray et al., 2025).

C2b Vulnerable (VU) – Significant environmental degradation of estuaries and bays has been recorded over the last 40 years and is expected to continue into the future as the effects of climate change become more pronounced.

Criterion D. Disruption of biotic processes or interactions

Criterion D considers Disruption of biotic processes or interactions over ANY of the time periods for criteria D1, D2a, D2b or D3. For details of time periods and criteria see [IUCN Red List of Ecosystems Criteria Summary Sheet 2.2 EN.pdf](#)

Nutrient enrichment is generally regarded as one of the greatest pollutants to estuarine and coastal ecosystems (Mahoney and Bishop, 2017). Eutrophication can lead to hypoxic and anoxic conditions which can result in local population extirpations, as well as shifts from benthic to pelagic biomass, altering trophic structures (Breitburg, 2002; Kennish, 2002). The ecological status of estuaries and bays is assessed at regular intervals, taking into account various indicators of water, habitat and biological quality. 19% of assessed estuaries and 45% of assessed coastal waters are at good ecological status for England (Environment Agency and Natural England, 2025), 16% of estuaries and 26% of coastal waters are in a good ecological condition for Wales (Water Watch Wales, 2024), whilst in Scotland almost all estuaries and coastal waters are considered to be at good ecological status with the exception of the Leith Docks to Port Seton, and Irvine Bay (Scottish Government, 2020; SEPA, 2023). Estuaries and bays provide key hubs for the maritime transportation, meaning they are often where non-native species arrive and spread from (Bishop et al., 2015; Dewey et al., 2020; Davison et al., 2025).

D2b Vulnerable (VU) – The good environmental and ecological status of the UK's estuaries and bays has not been met in all locations, and there is a lack of systematic risk-based non-native species monitoring in the UK's estuaries and bays.

Conservation measures in place

Whilst some conservation measures have been implemented, it is recognised that not all required measures are currently in place for the UK's estuaries and bays. Many of the UK's estuaries and bays contribute to the marine protected area (MPA) network, which includes Special Areas of Conservation (SACs). For SACs and MPAs, site-specific Conservation Objectives, information on pressures and threats, and details of the habitats and species are contained within the Conservation and Management Advice packages. Most human activities with the potential to have adverse effects on protected sites, such as construction and dredging, are managed through a licensing and consents process. For a number of the sites with estuaries and bays as a designated feature, fisheries management measures have been introduced.

Additionally outside of MPAs, potential impacts are considered on Scotland's Priority Marine Features (PMFs) which includes Low or Variable Salinity Habitats (<https://www.snh.scot/professional-advice/safeguarding-protected-areas-and-species/priority-marine-features-scotlands-seas>). This requires consideration through Environmental Impact Assessments. Policy GEN 9 on the *Natural Heritage* in Scotland's National Marine Plan (Marine Scotland, 2015) requires that development and use of the marine environment must not result in a significant impact on the national status of PMFs.

Additional fisheries management measures are currently being explored for the remaining MPAs in the Scottish network, as well as a suite of proposed PMF management areas identified for sensitive seabed habitats in estuaries and bays.

Overall assessment conclusion

Permanently open riverine estuaries and bays in the UK are assessed as being Vulnerable (C2b, D2b).

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