

# 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).

## MT2.1 Coastal shrublands and grasslands (Machair)

This assessment covers the Machair component of ecosystem type MT2.1

### 1. Key facts

**Ecosystem description:** Machair is an unusual form of dune grassland, usually forming a plain built on sand rich in shell fragments and subject to a hyperoceanic climate characterised by strong winds and frequent rainfall. Scotland's machair resource is globally significant with approximately two-thirds of the world's extent, the remainder being confined to the Republic of Ireland (Angus, 2006). Machair is a semi-natural habitat historically and currently influenced by low intensity agricultural practices that are believed to contribute to enhanced biodiversity.

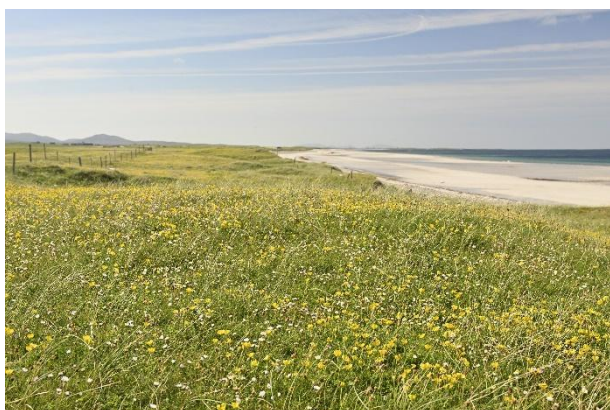


Image credit: Uist Machair, Na h-Eileanan an Iar (C) Lorne Gill/NatureScot

**Overall assessment conclusion:** Endangered (EN) based on criteria A2a, B1b, and C2a

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**Corresponding habitat classifications:**

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

**EUNIS codes:** B1.9 Machair;

**UK Marine Habitat Classification:** Machair

**Habitats Directive Annex I habitats:** H21A0 Machair

### 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](#)

Machair still broadly covers its former and potential natural range (JNCC, 2007). Despite some decline in area and some substantial localised historical losses, notably in Orkney, there is no evidence to suggest that there has been a significant decline in the broad range of machair in recent or historical times.

The likely impacts of climate change scenarios for Scottish Machair systems have been considered by Angus & Hansom (2006). Climate change scenarios for NW Scotland and the Western Isles envisage a combination of rising sea level, increased winter precipitation, and increased frequency and severity of winter storms. The flat, low-lying land occupied by machairs are particularly vulnerable, not only from marine overtopping of coastal dune ridges, but also from inland flooding and restricted drainage, which may enhance the duration and area of seasonal standing waters. The drainage network of the Uist machairs is a legacy of historic drainage of a more extensive loch network, which now forms an intricately balanced complex of linked water bodies exhibiting a wide range of pH and salinity. Any future change in water levels would impose significant environmental shifts. The pattern of rotational cultivation of machairs that largely employs traditional methods is already under economic threat, and increased flooding could have far-reaching consequences for both agriculture and wildlife.

**Assessment: Endangered (EN) A2a** There are no direct threats to habitat extent, but climate change impacts coupled with agricultural abandonment if crofting declines in viability are likely to lead to sizeable losses (Coll et al., 2004; Angus & Hanson 2006; Angus 2018), potentially of the order of over 50% in the next 50 years.

### **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](#).

Scotland's machair resource is globally significant with approximately two-thirds of the world's extent, the remainder being confined to Ireland (Angus 2006).

Machair occurs within 89 10x10km squares in Scotland and the range surface area is approximately 5,950 km<sup>2</sup> (JNCC, 2019). There are 11,680 ha of machair on the west coast of Scotland and its Western and Northern Islands (JNCC, 2019). Because machair can only exist within a wider habitat complex of beach, dune, marsh, loch and even saltmarsh, tidal flats and saline lagoons, the area that must be considered in structural and functional conservation terms is much larger.

**Assessment: Endangered (EN) B1b** Machair has a very small global extent and even in Scotland its range is highly limited (Angus, 2006). Furthermore, there are observed adverse climate change impacts which have been predicted to increase (Coll et al., 2004; Angus & Hanson, 2006).

### **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](#).

Extensive areas of machair on Benbecula and South Uist in the Outer Hebrides lie below the level of the highest tides and are vulnerable to marine and freshwater flooding, which is forecast to increase over the next 50 years. Over time, this could lead to the conversion of machair to saltmarsh and sandflat, as well as a reduction in machair cultivation (Angus, 2018). Inadequate grazing following agricultural abandonment would reduce the value of this ecosystem for many species, notably flowering plants and invertebrates (JNCC, 2007; 2019). Currently, agricultural intensification is largely prevented by the economics of smallholdings and the legal context of the crofting system, but there are slight impacts of

modernisation in cultivation and harvesting methods where contractors are employed. Most machair exists in areas of very low pollution of water or air.

**Assessment: Endangered (EN) C2a** Machair is one of the UK ecosystems at greatest threat from climate change over the next 50 years, with over half of its extent threatened with severe degradation.

### **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](#)

The abiotic pressures listed under Criterion C lead to biotic pressures. Changes to agricultural practices such as earlier cutting of grass for silage rather than hay would reduce the value of machair for late-flowering plants, the insects which depend on them and for nesting birds. Similarly increased use of artificial fertilisers would reduce plant diversity with a trophic cascade particularly affecting specialist invertebrates.

**D1, D2a Vulnerable.** The habitat is not generally at risk from Invasive Alien Species; however, ground-nesting birds on machair are vulnerable to predation from introduced hedgehogs, mink and ferrets. Small areas of machair in Lewis have patches of invasive butterbur *Petasites hybridus* (Currie, 1979; NBN, 2025).

### **Conservation measures in place**

There are 34 Sites of Special Scientific Interest (SSSIs) designated for their machair feature and 8 Special Areas of Conservation (SACs) (JNCC, 2025). A strategy has been devised to inform climate change adaptation in the islands with the greatest machair extents that are most at risk (Angus & Hansom, 2021). Article 17 reporting by the UK in 2019, indicated that 2.4% of the habitat (by area) was in Unfavourable condition, and 35.7% of the habitat (by area) was in Favourable condition (JNCC, 2019). However, the remaining 62% of machair habitat in Scotland (the only country in the UK where the habitat occurs) is located outside designated sites, where there was no information on habitat condition.

As an agricultural system, machair is shaped by Scotland's Agri-Environment Climate Scheme (AECS), which aims to maintain a wide range of flowers, farmland birds and important insects (Scottish Government, 2016) and the continued use of seaweed as a fertiliser (Scottish Government, 2015).

### **Overall assessment conclusion**

**Machair is assessed as Endangered (EN) based on criteria A2a, B1b and C2a.**

## **3. Literature references**

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