NatureScot
Scotland's Nature Agency
Buidheann Nàdair na h-Alba

FLANDERS MOSSES SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE

Image: © NatureScot

Site Details

Site name:	Flanders Mosses
Map:	https://sitelink.nature.scot/site/8258
Location:	Eastern Scotland
Site code:	UK0012902
Area (ha):	1,073.33
Date designated:	17 March 2005

Qualifying Features

Qualifying feature	SCM assessed condition	SCM visit date	UK overall Conservation Status
Active raised bog [H7110]*	Unfavourable Recovering	1 July 2014	Unfavourable-Bad
Degraded raised bog [H7120]	Unfavourable Recovering	1 July 2014	Unfavourable-Bad

Notes:
Assessed condition refers to the condition of the SAC feature assessed at a site level as part of NatureScot's Site Condition Monitoring (SCM) programme.
Conservation status is the overall condition of the feature throughout its range within the UK as reported to the European Commission under Article 17 of the Habitats Directive in 2019.
***** Habitats Directive priority habitat

Other overlapping Protected Areas

Flanders Moss Site of Special Scientific Interest (SSSI), Collymoon Moss SSSI, Offerance Moss SSSI, Shirgarton Moss SSSI, Killorn Moss SSSI and Flanders Moss National Nature Reserve (NNR).

Key factors affecting the qualifying features

Active raised bogs
Raised bogs are slow-growing, entirely rain-fed, nutrient-poor ecosystems, raised above the surrounding mineral soil, and formed and maintained by waterlogging of an area.

The bogs survive because water losses are matched or exceeded by regular precipitation inputs, and in good conditions they remain waterlogged despite

sometimes being several metres above the surrounding land. The bog grows over time as vegetation dies off and the remains accumulate but only partially decompose.

Sphagnum mosses are the main bog-forming plant species on most bogs, and they are unable to survive unless they lie close to the water table. This means the living growing surface of the bog is closely tied to the shape of the water table within the bog, and the low levels of nutrients that exist.

These bogs can be very sensitive to any changes in their hydrological conditions. Such changes can include changes to water levels through alterations to drainage and climatic changes; alterations to the acidic conditions (typically a weakening of the acidity) that the vegetation communities need to persist; and physical damage to their structure, especially to their surface layers. The feature has been assessed through NatureScot's site condition monitoring programme as being in unfavourable condition at this SAC due to the cover of non-desirable woody species on the rand and margins of the bog and the frequency of non-desirable woody species on mire being above acceptable thresholds. However there have been a number of management interventions across the SAC to remove trees and block ditches through a combination of Peatland Action funds, SNH (NatureScot) Management Agreements and Agri Environment Climate Scheme Contracts. Therefore the overall assessment is unfavourable recovering.

A fuller account of the habitat can be found here.

Degraded raised bogs

Degraded raised bogs are entirely rain-fed, nutrient-poor ecosystems, raised above the surrounding mineral soil, and formed by waterlogging of an area. They differ from active raised bogs as they are not currently forming peat. They will have also been subject to changes that have caused deterioration to their hydrology, structure and / or vegetation, usually through land management, either on the bog or nearby. Degraded raised bogs selected for designation are those that are capable of regeneration, for example with appropriate rehabilitation management.

The degraded bog on Flanders Mosses SAC is located on the periphery of the Flanders Moss SSSI on the relic gull colony to the east of the Flanders Moss SSSI. There is minimal degraded raised bog habitat also located at Killorn Moss SSSI.

Degraded raised bogs are important in the SAC series, mainly due to the habitat's potential to be restored to active raised bog, and thus contribute to attaining favourable conservation status for raised bogs as a whole.

The feature has been assessed through NatureScot's site condition monitoring programme as being in unfavourable condition at this SAC due to breaching acceptable limits of non-desirable woody species on the rand and margins of the bog, as well as the presence of *Polytrichum* species other than *P. strictum (alpestre),*

and *Juncus effusus*. However management measures are in place as described above, to encourage peat to reform and return these areas into active raised bog habitat. Where the relic gull colony (that for many years was situated on the north-east dome of Flanders Moss SSSI, east of the lochan) has impacted the site there is no mechanism to accelerate the recovery to active raised bog other than allowing natural recovery. However, the overall assessment is unfavourable recovering.

A fuller account of the habitat can be found here.

Conservation Priorities

The overall objectives for this SAC are to restore the healthy condition of the areas of active raised bog, and to restore the areas of degraded raised bog to become active raised bog.

Conservation Objectives

Active and degraded raised bogs are considered separate habitat types for the purposes of designating SACs. However as the aim is to restore degraded raised bog habitat to active raised bog, and both are hydrologically linked, they have been considered together within the conservation objectives.

Conservation Objectives for active raised bogs and degraded raised bogs

1. To ensure that the qualifying features of Flanders Mosses SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status
Favourable Conservation Status (FCS) is considered at a European biogeographic level. When determining whether management measures may be required to ensure that the conservation objectives for this site are achieved, the focus should be on maintaining or restoring the contribution that this site makes to FCS. When carrying out appraisals of plans and projects against these conservation objectives, it is not necessary to understand the status of the feature in other SACs in this biogeographic region. The purpose of the appraisal should be to understand whether the integrity of the site (see objective 2) would be maintained. If this is the case then its contribution to FCS across the Atlantic Biogeographic Region will continue to be met. Further details on how these appraisals should be carried out in relation to maintaining site integrity is provided by objective 2 (including parts a, b and c). If broader information on the feature is available then it should be used to provide context to the site-based appraisal. Note that “appropriate” within this part of the conservation objectives is included to indicate that the contribution to FCS varies from site to site and feature to feature.

2. To ensure that the integrity of Flanders Mosses SAC is restored by meeting objectives 2a, 2b and 2c

The aim at this SAC is to restore the areas of degraded raised bog habitat to active raised bog, and to restore the active raised bog habitat to favourable condition, as a contribution to wider raised bog conservation status. Therefore any impacts to the objectives shown in 2a, 2b, or 2c below must not persist so that they prevent the achievement of this overall aim.

When carrying out appraisals of plans or projects the focus should be on restoring site integrity, and ensuring that they do not prevent restoration of the raised bog habitat, specifically by meeting the objectives outlined in 2a, 2b and 2c. If these are met then site integrity will be restored. Note that not all of these will be relevant for every activity being considered. Any impacts on the objectives shown in 2a, 2b or 2c below must not persist so that they prevent the restoration of site integrity. Temporary impacts on these objectives resulting from plans or projects can only be permitted where they do not prevent the ability of the feature to recover and there is certainty that the features will be able to quickly recover.

This objective recognises that the qualifying habitat is exposed to a wide range of drivers of change. Some of these are natural and are not a direct result of human influences. Such changes in the habitat's extent, distribution or condition within the site which are brought about by natural processes, directly or indirectly, are normally considered compatible with the site's conservation objectives. An assessment of whether a change is natural or anthropogenic, or a combination of both, will need to be looked at on a case by case basis.

2a. Maintain the extent and distribution of the habitat within the site

There should be no reduction in the extent and distribution of raised bog habitat within the site. The extent of active raised bog should be increased where possible through regeneration and through restoration of the degraded raised bog feature. This will mean areas defined as degraded raised bog will decline in extent over time as active raised bog areas increase. The aim is to increase the extent of active raised bog on the site to at least 966ha.

2b. Restore the structure, function and supporting processes of the habitat

The slow formation of raised bogs, and their typical domed shape, means they rely heavily on specific hydrological conditions. Degraded raised bogs will likely have been subject to some deterioration of these conditions. The natural hydrology of this site should be maintained with no modifications, both within and outwith the site, that may negatively change the hydrology of the site (e.g. by the digging or deepening of ditches, or by excessive vehicle usage).

Historical damage of the interest is primarily through drainage, afforestation and peat cutting for horticulture purposes. Degraded raised bog is located primarily on the Flanders Moss SSSI and NNR, at the periphery of the SSSI but also in the location of the historical black-headed gull colony in the north-east of the Flanders Moss SSSI component of the SAC. There is limited extent of degraded raised bog on the satellite SSSIs. NatureScot, together with other Flanders Moss SSSI owners, have undertaken restoration works covering a significant area of the SAC. This has involved installing dams and removing trees and stumps to prevent water from leaving the site and raising the water table to near surface levels

There are no management prescriptions available to restore the area of the gull colony and it is anticipated that over time the nutrient levels will reduce and active raised bog will return but this is likely to be a slow process and take many years.

Ditch damming and scrub removal has also taken place on Shirgaton Moss, Offerance Moss

and Killorn Moss SSSI's through various funding mechanisms.

Active raised bogs typically display a distinctive micro-topography, with patterns of hummocks and hollows rich in Sphagnum mosses and other peat forming species. This habitat structure should also be maintained and where necessary improved. Any increases in drainage can cause deterioration in the bog's mosaic of habitats through drying out and shrinkage of the peat. Burning and vehicle use can also impair the topography, natural functions and processes of the raised bog habitat. Excessive trampling and inappropriate grazing regimes can also contribute to deterioration in the habitat structure.

Overgrazing can cause poaching, damaging and dislodging the surface vegetation of Sphagnum mosses and other bog species, resulting in areas of bare peat and erosion. Light grazing with appropriate numbers and types of stock can help to supress the encroachment of young trees and scrub, and can help to lessen the dominance of *Calluna vulgaris*. This is particularly the case on sites where the hydrology has been modified and water levels are not sufficiently high to supress tree establishment. Grazing levels should be set with reference to the condition at this site and other land management measures, to ensure the maintenance of the vegetation communities and bog structure and function across the whole of the site. Where possible it is preferable to graze the bog in association with adjacent drier land and, where this is the case, stocking rates should be set to reflect the areas and types of habitats being grazed (bog, lagg fen and adjacent land). Grazing regimes should be sufficiently flexible to take into account variations in water levels and ground conditions within and between years.

Trees and scrub can cause the habitat to dry out through transpiration and should be no more than occasional on the bog, although they can be slightly more frequent on the rand (the sloping bog margin) and lagg (an area of wetland at the edge of the bog). Generally tree cover should not be increasing on site. The likelihood of the establishment of scrub or non-native invasive species on the bog surface is increased where the hydrology has already been compromised by drainage, planting or peat cutting.

The remaining lagg fen is a component of the raised bog. It supports the raised bog, and acts in part as a buffer, and therefore the maintenance of the lagg fen is important in maintaining the structure and function of the raised bog. There are two areas of original lagg fen habitat located on the western boundary of the Flanders Moss SSSI, the satellite SSSI bogs have limited or no lagg fen habitat to any great extent as they have peripheral ditches abutted by either forestry or agricultural land holdings.

Bunding has been constructed along 2.4 km of the northern edge of the Flanders Moss SSSI / NNR boundary so slowing down the flow of water off the peat body, raising the water table with the designated site and creating lagg fen on the edge of that part of the designated site. This is just the start of the restoration process and the impact on the water table in the peat body and the peripheral fen habitat could take a long time to develop.

Burning can destroy areas of habitat leading to drying out, a loss of Sphagnum, a loss of diversity of dwarf-shrubs with increasing dominance by *Calluna vulgaris* (heather), exposed peat, possibly encouraging grass species not typical of this habitat, and altering the chemistry in its vicinity. Burning should therefore be avoided.

Nutrient enrichment via aerial deposition of nitrogen may negatively affect the condition of the typical bog species. The critical load for nitrogen for this habitat is 5kg/ha/yr. The characteristic bog species, such as Sphagnum, are dependent on low nutrient conditions and, in the long term, nutrient enrichment would favour the growth of dwarf shrub species and grasses over the bog-building Sphagnum mosses. There should therefore be no alteration to the acidic conditions needed for the bog species to be maintained, or where

necessary restored. The Air Pollution Information System (www.apis.ac.uk/srcl) identified a three year average Nitrogen deposition rate for Flanders Moss SAC of 11.5kg N/ha/yr between 2015-17. The SAC is likely, therefore, to experience some level of eutrophication. Increases in Nitrogen inputs to the site should therefore be avoided. Bogs that have been hydrologically compromised are more sensitive to the effects of Nitrogen deposition and therefore the natural hydrology of this site should be maintained or where appropriate restored.

2c. Restore the distribution and viability of typical species of the habitat

The typical species, and those which are key for the active raised bog, are those that have a role as the main bog-builders. These are mainly Sphagnum species, and especially include;

Sphagnum capillifolium	red bog-moss
S.papillosum	papillose bog-moss
S.magellanicum	magellanic bog-moss
S. cuspidatum	feathery bog-moss (in pools)

S. austinii (Austin's Bog-moss) is a locally regionally rare sphagnum but can be found both on Flanders Moss SSSI and Offerance Moss SSSI components of the SAC.

Andromeda polifolia (bog rosemary) and Rynchospora alba (white beak-sedge) have restricted distributions and can also be found at both Flanders Moss and Ofference Moss. New populations of *Sphagnum fuscum* and *Spahgnum beothuk* are also found on Flanders Moss SSSI.

Other characteristic bog species such as cotton grasses (*Eriophorum* species), heather (*Calluna vulgaris*) and other ericaceous plants, and the carnivorous sundews (*Drosera* species) should also be considered typical species.

Flanders Moss is home to the bog sun jumper (Heliophanis dampfi) and a wide variety of rare moth species and these invertebrates need a range of vegetation states. Over grazing or scrubbing over of the site will reduce available niches for features of the designated site.

The floral distribution within the raised bog habitat, and its continued viability, relies heavily on the presence of small variations in height above the water table across the hummocks and hollows of the bog. Therefore the hydrology of the site (including water levels and drainage) is crucial to sustain this mosaic and floral distribution.

Excessive trampling, and inappropriate grazing regimes can contribute to deterioration in the habitat structure, having harmful effects on the typical species, and grazing should only be done in a controlled, appropriate manner that does not prevent restoration of the habitat or its continued maintenance.

Areas of the SAC are being damaged by large numbers of deer tracking through active and degraded raised bog habitat. Although not presently contributing to the unfavourable condition, this deer damage is being controlled in the wider Flanders area under a Section 10 agreement due to the combination of damage to agriculture and forestry as well as the natural heritage interests.

Alterations to the acidic conditions through nutrient enrichment should also be avoided.

Conservation Measures

Flanders Mosses SAC is notified as a Site of Special Scientific Interest and management changes described on the list of Operations Requiring Consent must have prior consent from SNH (NatureScot).

Current and recommended management for active and degraded raised bog

Issue	Measure	Responsible party
Herbivore impacts	Maintain grazing on the bog at levels low enough to avoid damage through trampling and overgrazing, but sufficient to maintain an open vegetation structure and prevent encroachment of trees and scrub. Currently about 1/8 of Flanders Moss SSSI is grazed by sheep and cattle with plans to extend this to enable further, very low levels of grazing across the site. Effective, co-ordinated deer control and monitoring of deer damage through regular bare peat surveys.	Land managers, FLS, NatureScot, Deer Management Groups, Lowland Deer Network
Habitat Management	The majority of the Flanders Moss SSSI is also part of the Flanders Moss National Nature Reserve (NNR). These areas are managed in accordance with an approved NNR management plan. The plan sets out conservation measures to be carried out on the NNR.	NatureScot, landowners, land managers.
Excessive water loss	Damming of ditches has taken place across all of the SSSI that are components of the SAC using a variety of techniques, mainly plastic piling and peat dams. These have been funded through Management Agreements, Agri-Environment funds and through Peatland Action and the Eco- Co EU Life project. The maintenance of these dams is imperative to maintain the water to near surface level. Water levels on Flanders Moss are monitored through a comprehensive monitoring system to check the effectiveness of the management measures.	Land owners and land managers
Scrub management	The cover of scrub on the site will continue to be monitored and removal work (co-ordinated by the NNR management team) undertaken	NatureScot

	as necessary. Some scrub is required to support important invertebrate populations	
Research and monitoring	To identify emerging impacts on the habitat and their causes, in order to understand the long term issues, and to inform future management of the habitat across Scotland.	NatureScot, Universities, land managers
Nutrient enrichment from aerial deposition of nitrogen	Bogs that have been hydrologically compromised are more sensitive to the effects of Nitrogen deposition and therefore the natural hydrology of this site should be maintained or where appropriate restored. Increases in Nitrogen inputs to the site should be avoided.	NatureScot, land managers, SEPA

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