

BLAWHORN MOSS SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE



Reflection of the dragonfly sculpture on the Blawhorn Moss NNR trail (©Lorne Gill/NatureScot)

Site Details

Site name:	Blawhorn Moss
Map:	https://sitelink.nature.scot/site/8210
Location:	Eastern Scotland
Site code:	UK0019758
Area (ha):	108.86
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	12 September 2014	Unfavourable-Bad
Degraded raised bog [H7120]	Unfavourable Recovering	12 September 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

- [Blawhorn Moss Site of Special Scientific Interest \(SSSI\)](#)
- [Blawhorn 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. This 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 the bog, especially the surface layers.

The active raised bog feature at Blawhorn Moss has been assessed through NatureScot's site condition monitoring programme as being in unfavourable condition. This was due to a lower than expected frequency of the peat-forming moss *Sphagnum cuspidatum* (a legacy of past drainage of the site) as well as too much of the moss *Polytrichum commune* which is an indicator of nutrient enrichment and is frequently found on sites that have previously been burnt.

However, the SAC is almost entirely owned by SNH (NatureScot) and managed as an NNR with a key management aim being to improve the condition of the qualifying features of the SAC. This management has led to a significant improvement in the condition of the active raised bog to the point where 95% of the bog is now considered to be active raised bog. The overall condition assessment is therefore recorded as 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 in that 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.

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 degraded raised bog feature at Blawhorn Moss has been assessed through NatureScot's site condition monitoring programme as being in unfavourable condition. This was due to a lower than expected frequency of raised bog indicator species, including peat-forming Sphagnum mosses (a legacy of past drainage of the site) as well as too much of the moss *Polytrichum commune* which is an indicator of enrichment and is frequently found on sites that have previously been burnt.

However, as noted above for active raised bog, the SAC is almost entirely owned by SNH (NatureScot) and managed as an NNR which has led to a significant improvement in the condition of the degraded raised bog feature. The overall condition assessment is therefore recorded as unfavourable recovering.

It is important to note that despite this management, there are areas of the same hydrological unit, including areas of deep peat which are outside the site boundary and where no remedial work has been undertaken. While these unrestored areas of bog will continue to have an effect on areas within the SAC by enabling water loss from the site, restoration work carried out to date should be sufficient to lead to the formation of active bog across all areas of the SAC.

A fuller account of the habitat can be found [here](#).

Conservation Priorities

The overall objective for this SAC is 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. Over time, as restoration works progress, it is anticipated that the degraded raised bog will be entirely replaced by new areas of active raised bog so that the degraded raised feature will eventually no longer be present on the site.

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 Blawhorn Moss SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status
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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 Blawhorn Moss 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 on 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 comprise all areas originally categorised as active (75.07ha) and degraded (17.79ha) raised bog – a total of 92.86ha. The remaining 16ha within the SAC comprises habitats on mineral ground or influenced by groundwater which provide a buffer between the raised bog and surrounding land use.

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 affect the hydrology of the site (e.g. by the digging or deepening of ditches, or by inappropriate vehicle usage).

There remain some areas of the site where drains are continuing to impact on the structure and functioning of the habitat. Additional dams or trench bunds or repairs to existing dams may be required in these areas to further improve the condition of the raised bog.

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 suppress the encroachment of young trees and scrub, and can help to lessen the dominance of heather. This is particularly the case on sites where the hydrology has been modified and water levels are not sufficiently high to suppress tree establishment. Grazing levels should be set with reference to the condition at the 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 acts in part as a buffer between the bog and adjacent land use and therefore the maintenance of the lagg fen is important in maintaining the structure and function of the raised bog. There is very little typical lagg vegetation around the edge of the bog, this having been damaged and disrupted in the past by peat cutting and drainage. Much of the area where the lagg was originally present is beyond the SAC boundary, so restoration opportunities are limited. One exception is at the south-east corner of the site where an area of remnant lagg has been enhanced through restoration work (ditch blocking). Further opportunities for similar restoration work either within or outside the SAC boundary on other areas of degraded lagg should be investigated and pursued where feasible.

An unusual feature of this site is an area of mineral ground close to the centre of the bog which contains groundwater dependent vegetation akin to what might normally be found within a lagg fen.

Burning can destroy areas of habitat leading to drying out of the peat, a loss of Sphagnum, a loss of diversity of dwarf-shrubs with increasing dominance by heather, exposure of bare peat, the encouragement of grass species not typical of this habitat, and alterations to the chemistry in the burnt area. There have been a number of accidental or malicious fires at this site in the past which have damaged the structure and functioning of the habitat and allowed the colonisation of the site by undesirable species such as the moss *Polytrichum commune*. Burning at this site should 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/src1) identified a three year (2015-17) average nitrogen deposition rate for Blawhorn Moss SAC of 13.6kg N/ha/yr. The SAC is likely, therefore, to experience some level of nutrient enrichment. 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. Development proposals in the area which could significantly add to the atmospheric nitrogen load (i.e. intensive poultry units) should be carefully assessed for potential impacts on the site.

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

The distribution of plant species 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.

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 include;

<i>Sphagnum papillosum</i>	papillose bog-moss
<i>S. magellanicum</i>	magellanic bog-moss
<i>S. cuspidatum</i>	feathery bog-moss (in pools)

The best quality bog habitat at Blawhorn Moss is found on the central part of the site. These wetter areas of the mire surface exhibit a well-developed hummock and hollow topography. Here the *Sphagnum* layer is particularly extensive and luxuriant and includes frequent *S. magellanicum* and *S. papillosum* with cranberry (*Vaccinium oxycoccus*) and round-leaved sundew (*Drosera rotundifolia*). Heather (*Calluna vulgaris*), crowberry (*Empetrum nigrum*), hare's-tail cotton grass (*Eriophorum vaginatum*) and cross-leaved heath (*Erica tetralix*) are also common in these areas, tending to occupy the drier hummocks.

The raised bog habitat at Blawhorn is unusual in that it exhibits both raised and blanket bog characteristics, with the topography of the site being more akin to blanket bog towards the north-east of the site.

Damage to the habitat by any of the factors discussed in section 2b above will also negatively impact upon the typical species found at the site through the disruption of the raised bog hydrology on which many of these plants rely, thereby encouraging the growth of species which prefer drier conditions. Physical damage or nutrient enrichment of the habitat will also lead to changes in species composition, with a loss of typical raised bog species and their replacement by species tolerant of disturbance or more nutrient-rich conditions.

Measures to further improve the structure, functioning and supporting processes of the habitat through the installation of additional dams, trench bunds or the repair of existing dams will also benefit the typical species associated with the habitat.

These effects of previous drainage can currently be seen within the remaining areas of degraded raised bog habitat where species preferring drier conditions (such as heather and non-peat-forming mosses such as *Sphagnum capillifolium* and *Hypnum cupressiforme*) tend to dominate, leading to a much reduced diversity and level of cover of peat forming *Sphagnum* mosses and other wet ground specialists. An increase in the level of nutrients in some degraded areas has also led to the colonisation of the bog with more competitive, nutrient-demanding species such as the moss *Polytrichum commune*.

As previously stated, much of the original lagg vegetation has been damaged or lost through drainage of the main bog and its peripheries. However, there remains a small area of good quality lagg fen at the south-eastern corner of the site which, as well as containing the only record for broad leaved cotton-grass (*Eriophorum latifolium*) in West Lothian, also hosts

bottle sedge (*Carex rostrata*), bog bean (*Menyanthes trifoliata*) and marsh cinquefoil (*Comarum palustre* – previously called *Potentilla palustris*). The majority of the site's original lagg (now in a highly degraded state) lies outside the site boundary. Unrestored areas of lagg fen within the site boundary are generally dominated by either soft rush (*Juncus effusus*) or purple moor grass (*Molinia caerulea*).

An area of groundwater dependent vegetation towards the centre of the site resembles a lagg fen and is a natural feature of the site but altered by man's activities due to the mineral ridge running east-west beneath the raised bog. This area of fen is fed by water running from the mineral ridge but the natural flow line of mineral enriched water has been altered by ditching. This area is dominated by bottle sedge with significant amounts of soft rush also present.

The condition of the remaining lagg within the site should be maintained and where possible, improved by preventing nutrient enrichment, drainage or land-use change that could compromise the integrity of the habitat. Opportunities for reconnecting the lagg to areas of degraded habitat now outside the site boundary should also be explored where possible.

Conservation Measures

Blawhorn Moss SAC is notified as an SSSI 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
Hydrological damage	<p>The management of almost the entire SAC as an NNR has allowed a significant programme of ditch blocking to be undertaken which has greatly reduced the extent of degraded raised bog on the site. Degraded areas are considered to be in the process of recovery towards active bog. However, further restoration work, including additional trench bunding damming and repairs to existing dams will help to secure and enhance this recovery. On-going hydrological and habitat monitoring will be used to assess the continued success of these works and identify areas where further restoration work will be most effective.</p> <p>Opportunities to improve the condition of the remaining lagg fen through peripheral drainage modification and reconnection of the lagg with areas outside the site boundary will be explored.</p>	<ul style="list-style-type: none"> • NatureScot • Adjacent land managers

Grazing management	Ensure that current light grazing regime continues so that a suitable habitat structure can be maintained.	<ul style="list-style-type: none"> • NatureScot • Grazing tenant
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 as necessary.	<ul style="list-style-type: none"> • NatureScot
Fire prevention	Ongoing liaison with the local community by the NNR management team will aim to discourage further malicious fires on the site. Works to repair the hydrology of the site will also have reduced the risk of uncontrolled spread of fire across the bog.	<ul style="list-style-type: none"> • NatureScot • Local community
Aerial pollution	<p>NatureScot will highlight, through its role as a statutory consultee, the potential damage that could be caused to the site by aerial pollution from industrial or large-scale agricultural developments in the locality and seek to avoid, reduce or mitigate any impacts.</p> <p>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.</p>	<ul style="list-style-type: none"> • NatureScot • SEPA • Local authorities
NNR Management	Almost all of the SAC is within Blawhorn Moss NNR. The NNR is managed in accordance with an approved management plan. The plan sets out conservation measures to be carried out on the NNR.	<ul style="list-style-type: none"> • NatureScot
Research and monitoring	<p>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.</p> <p>There is an established hydrological monitoring programme at the site which has been collecting data on water levels from four data loggers in the peat body since early 2015. This</p>	<ul style="list-style-type: none"> • NatureScot • Universities

	<p>data could be used to assess trends in the relationship between water levels and rainfall and to look at the stability of the water table. Initial findings suggest that restoration work has helped to reduce fluctuations in the water levels, with levels staying closer to the surface of the bog all year-round. These findings could also be used to plan future restoration work by highlighting areas where water level fluctuations are still apparent.</p>	
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