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Scotland's Nature Agency
Buidheann Nàdair na h-Alba

MERRICK KELLS SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE

Photo by Alison Averis

Site Details

Site name:	Merrick Kells
Map:	https://sitelink.nature.scot/site/8313
Location:	South Western Scotland
Site code:	UK0019841
Area (ha):	8,730.25
Date designated:	17 March 2005

Qualifying features

Qualifying feature	Assessed condition	SCM visit date	UK overall Conservation Status
Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels	Favourable Maintained	18 July 2009	Unfavourable - Bad
Acid peat-stained lakes and ponds	Favourable Maintained	18 July 2004	Unfavourable - Bad
Wet heathland with cross-leaved heath	Unfavourable Recovering	17 September 2009	Unfavourable - Bad
Dry heaths	Favourable Recovered	27 August 2013	Unfavourable - Bad
Montane acid grasslands	Unfavourable No change	28 August 2013	Unfavourable - Bad
Blanket bog	Unfavourable Recovering	17 September 2009	Unfavourable - Bad
Depressions on peat substrates	Favourable Recovered	17 September 2009	Unfavourable - Bad
Acidic scree	Favourable Maintained	17 September 2010	Unfavourable - Inadequate
Plants in crevices on acid rocks	Favourable Maintained	28 August 2013	Unfavourable - Inadequate
Otter (*Lutra lutra*)	Favourable Maintained	1 April 2012	Favourable

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.

Other overlapping Protected Areas

Merrick Kells SSSI
https://sitelink.nature.scot/site/1148

Key factors affecting the qualifying Natura features

Merrick Kells SAC consists of two parts. The larger part is dominated by the Merrick in the west and the smaller part by the Rhinns of Kells to the east; the two areas are separated by a conifer plantation. The site is the most extensive area of unafforested upland in Galloway and includes a wide range of plant communities from acid grassland through bog and heathland to the moss and sedge-dominated vegetation of the summits.

Sheep, cattle, deer (red and roe) and by feral goats are all present on the SAC. Grazing intensity over many parts of the site does not appear to be very high and a lack of grazing should favour the spread of heather over purple moor-grass.

The leached soils, combined with the low potential of the geology to neutralise acid inputs, mean that the area is sensitive to acidification. The water bodies within the site currently have a high acid level.

Currently recreational use of the site is not a problem due to the improvements to the access paths onto the site limiting the majority or visitors to those paths. An increased risk of accidental fires is however possible particularly in spring when *Molinia* litter is dry.

Most of the SAC is owned by Forestry and Land Scotland and is managed for biodiversity and nature conservation. Adjacent plantations form a potential local source of tree seeds and restrict any muirburning to inherently safe areas.

Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels
This habitat type at Merrick Kells comprises oligotrophic (nutrient-poor) lochs. Loch Narroch has been monitored as representative of this habitat on the site. The dominant substrates of oligotrophic waters are silt, sand, gravel, stones and boulders. The clear soft water, which characterises this habitat type, contains low to moderate levels of plant nutrients and supports characteristic assemblages of plant species. The vegetation community is characterised by amphibious short perennial vegetation the marginal components of which can be exposed on the lake shores during summer.

Key management issues include changes to hydrology, invasive non-native species, surface water pollution and air pollution.

The combination of the low pH, the low diversity of aquatic plants, the abundance of filamentous algae and the relatively high frequency of *Juncus bulbosus* at Loch Narroch, (a typical stony oligotrophic loch) suggests that the loch has been affected by acidification. Data from other lochs suggests that the lochs are recovering.

Further information about Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels can be found here.

Acid peat-stained lakes and ponds

Acid peat-stained lochs and lochans most often occur on blanket bogs, but may also be present on raised bog and may include isolated seasonal pools, permanent waters, and arrays of pools and small lochs.

The health of these lochs is closely linked with the surrounding bog. Key requirements for this habitat type are the maintaining of an appropriate hydrological regime and prevention of pollution. Due to their relative shallow depths and size they are particularly vulnerable to changes in rainfall due to climate change.

This feature is best represented on Silver Flowe by Round Loch of the Dungeon and Long Loch of Dungeon at the East end of the SAC. These, and the other water bodies are very acidic and nutrient poor. They are predominantly rain-fed, their water has a high humic acid content, and it is usually stained dark brown through exposure to peat. The pools are naturally species-poor with a peaty bottom which provide an ideal breeding habitat to the scarce Azure Hawker dragonfly *(Aeshna caerulea)*.

Further information about Acid peat-stained lakes and ponds can be found here.

Wet heathland with cross-leaved heath

Wet heath occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage. Wet heaths occur in several types of ecological gradient. In the drier areas of the south and east, wet heaths are local and often restricted to the transition zone between European dry heaths and constantly wet valley mires. In the uplands they occur most frequently in gradients between dry heath and other dry, acid habitats and blanket bogs.

The key management issues are the nature and extent of deer pressure, grazing generally, burning, forestry, non-native species, air pollution and habitat loss for development.

Flushed wet heaths dominated by dense tussocks of *Molinia caerulea* are well spread across the wet Galloway hills and quite frequent on the SAC. These particularly occur as topogenous fens or on shallow gradient, usually in channels within heath or grassland vegetation. High covers of *Molinia* are recorded where there is burning and that this practice has probably exacerbated the spread of the grass within the site overtime.

Further information about wet heathland with cross leaved heath can be found here.

European dry heaths

European dry heaths are widely distributed in Scotland, typically occurring on freely-draining, acidic to almost neutral soils with generally low nutrient content. Ericaceous dwarf-shrubs dominate the vegetation but all heaths vary in their flora and fauna according to climate, altitude, aspect, soil conditions (especially base-status and drainage), maritime influence, and grazing and burning intensity.

Nearly all dry heath is semi-natural, being derived from woodland through a long history of grazing and burning. Most dry heaths are managed as extensive grazing for livestock (sheep, cattle and deer) or, in upland areas, as grouse moors. Additional influences are tracks and paths that can cause fragmentation, degradation and erosion. Other key management issues include forestry, problematic native and non-native species and currently renewable energy proposals.

On the Merrick Kells, dry heath vegetation is distributed across the site, on steeper slopes and adjacent to and over rock outcrops and usually dominated by *Calluna vulgaris* in most cases.

Further information about European dry heath can be found here.

Montane acid grasslands

Montane acid grasslands are the most extensive type of vegetation in the high mountain zone, i.e. above an altitude of about 750 m. It characteristically forms large continuous tracts, covering summit plateaus and the tops of the higher summits and ridges. The habitat comprises a range of grassland types whose composition is influenced by contrasting extremes of exposure and snow-lie.

The habitat is vulnerable to nutrient inputs and physical damage occur due to dunging and urination by grazing animals, acid deposition, human and animal trampling, skiing and use of all-terrain vehicles.

Although it is thought that past atmospheric acid deposition on the Merrick Kells may have exacerbated the effects of grazing and contributed to the replacement of Carex - racomitrium heath community by a more grassy vegetation, it may also be natural for these southern and western summit heaths to be grassier than their counterparts in the Highlands.

Further information about Montane acid grassland can be found here.

Blanket bogs

Blanket bogs are found in areas of moderate to high rainfall and a low level of evapotranspiration, allowing peat to develop over large expanses of undulating ground. Blanket bogs are considered active when they are supporting a significant area of vegetation that is peat-forming. This is a Habitats Directive Priority habitat.

Key management issues include over-grazing, aspects of red deer pressure, burning, energy use, changes in the hydrology, non-native species, abiotic natural changes, air pollution, infrastructural development and outdoor recreation.

Blanket bog habitat is found across the site and predominates the broad valley mires. The Merrick Kells was not extensively drained and represent one of the least-disturbed and most varied areas of acid peatland in southern Scotland. Silver Flowe, locate to the east of the SAC, is the best example of oceanic blanket bog found in the Southern Uplands.

Dominance by purple moor-grass is the main reason for the blanket bog failing the Site Condition Monitoring assessment, when it would otherwise appear to be in favourable condition, but it is difficult to ascribe this to any particular management deficiency.

Further information about Blanket bog can be found here.

Depressions on peat substrates

Depressions on peat substrates occur in complex mosaics with lowland wet heath and valley mire vegetation, in transition mires, and on the margins of bog pools and hollows in both raised and blanket bogs. The vegetation is typically very open, usually characterised by an abundance of white beak-sedge *Rhynchospora alba*.

This habitat is found in complex mosaics, particularly in wetter areas of blanket and raised bogs, and heaths, on the edge of bog pools and so can be of a transitional nature depending on hydrological changes, direct and indirect.

Key factors affecting this habitat are changes to hydrology that may alter the height of the water table, inappropriate grazing pressure and, disturbance e.g., through trampling or burning.

This habitat of a few square metres at a time is scattered across the Merrick Kells by the clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels. It is also well represented on Silver Flowe. There it occurs on very gentle sloping gradient of deep peat substrate where water tables are continuously close to ground level.

A fuller account of the habitat can be found here.

Acidic scree

Scree habitats consist of rock fragments covering the frost-shattered summits of mountains or accumulating on slopes below cliffs. Scree is intrinsically unstable and rocks will frequently move meaning that this habitat is vulnerable to disturbance naturally. Acidic screes are made up of siliceous rocks such as quartzite, granite and sandstone. They may occur at any altitude, but screes in the lowlands are excluded from the Annex I definition.

On the Merrick Kells, slopes with scree are typically scored with other runs of scree and some large and unstable areas of boulders. This habitat is closely associated to Siliceous rocky slopes with chasmophytic vegetation.

A fuller account of the habitat can be found here.

Siliceous rocky slopes with chasmophytic vegetation

Chasmophytic (grows in the crevices of rocks) vegetation consists of plant communities that colonise the cracks and fissures of rock faces and is widespread in upland areas but is localised and fragmentary in its occurrence. The type of plant community that develops is largely determined by the base-status of the rock face. Siliceous communities develop on acid rocks.

The chasmophytic vegetation that colonises siliceous (silica based, acidic) rock faces is widespread in upland areas. The plants in crevices are found in harsh and sometimes extreme conditions with limited soil development, but where there is some shelter and moisture, and so plants are sparse and scattered. Chasmophytic plant species are adapted to the stresses of drought and low nutrient availability. They can be sensitive to overgrazing and trampling although many sites are protected by inaccessibility.

On the Merrick Kells, siliceous rocky slopes are located on all parts of the site, where the underlying bedrock is exposed. This habitat is closely associated with acidic scree.

A fuller account of the habitat can be found here.

Otter

Otter require continued proximity to unpolluted open water either freshwater or coastal. There should be a plentiful food supply and features for providing shelter for both resting and breeding. They are wide ranging and normally occur at low densities.

Previous population declines in otters were primarily due to pollution, persecution and habitat loss.

The Merrick Kells is largely undisturbed, high and exposed, with a number of small to medium standing waters suitable as otter feeding habitat. Potential holts are available in jumbled boulders, in peat haggs and associated shrub, under small tree vegetated margins and islands.

Further information about otters can be found here.

Feature Priorities

The necessity to maintain the extent, distribution and structure, function and processes of the qualifying features should not generate any conflicting management objectives and situations where there might be a need to favour the management of one feature over another.

Ensuring good water quality and maintaining the appropriate water levels and water tables will benefit the succession of wet heathland with cross-leaved heath – blanket bog – depressions on peat substrates – acid peat - stained lakes and ponds. Controlling the grazing pressures by following best farming and stalking practices and preventing the expansion of invasive plant species across the range of qualifying habitats will benefit the integrity of the site.

Conservation Objectives

Overarching Conservation Objectives for all habitat features of Merrick Kells SAC

1. To ensure that the qualifying features of Merrick Kells 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 improving 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 assessment 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 assessments 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 assessment. 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 Merrick Kells SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature.
The aim at this SAC is to maintain or restore all qualifying features at or to favourable condition as a contribution to their wider 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, 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 there is certainty that the features will be able to quickly recover. This objective recognises that each 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 exception to this is when the favourable condition of a habitat is dependent on halting or managing natural succession. 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.

Conservation Objectives for Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* [H3130] (Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels)

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

The extent of Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels habitat feature has been estimated at 183.34ha.

The area figure has been taken from the Standard Data Form. Fundamentally, there should be no measurable net reduction the extent of the habitat and, most importantly, its distribution throughout the site and the number of sites should be maintained.

This should include the total surface area, depth of water and type and distribution of loch substrate sediments.

This conservation objective is considered to be met if the conditions to ensure the habitats' long-term existence are in place.

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

The structure and function of lochs are strongly influenced by activities within their catchment. Changes in land management or development can affect the integrity of the feature which will manifest itself in changes to the loch.

Physical Attributes
-Surface Area
Changes to surface area can indicate pressures on the structure and function of lochs. The surface area of a loch may fluctuate slightly naturally. However changes to surface area and the associated change to depth can adversely affect the character of the loch, particularly the edge vegetation. Artificial fluctuations to depth found in controlled water bodies such as reservoirs can adversely affect the vegetation.

Changes to the surface area may also indicate a number of pressures such as abstraction, regulation, construction, excessive sediment deposition and natural succession which may occur in the catchment.

-Hydrological regime
The hydrology of the loch affects both water level fluctuations and annual and within year flushing patterns. Flushing is important as it is strongly related to dilution and removal of nutrients and plankton. Changes to the flushing pattern can be caused by factors similar to those affecting area; abstraction, regulation, construction, excessive sediment deposition and natural succession which may occur in the catchment.

-Loch substrate character
The type and distribution of sediment particles within a loch will affect the biology of the loch and the availability of habitats. Changes to the substrate character may also be indicative of changes to the area and hydrological regime. Reduction in area or flushing may affect the substrate character as finer sediments become trapped and there is increased input of leaf-litter from scrub encroachment.

-Natural sediment load
Accumulation of nutrient-rich sediment may have a strong effect on the water quality and biology of the loch. Increases in sediment loading may result from both changes in land management practice in the catchment or on the shoreline and short term events such as

construction. Evidence is growing that an increase in storm events associated with climate change may increase the amount of sediment deposited in lochs.

-Connectivity between the loch and the surrounding area
While a loch is often perceived as a discrete entity the connections between it and the surrounding area are vital to its functioning as part of a natural system. These natural connections can be reduced or changed by, for example, hard engineering works on the shoreline or loch bed and anything that impedes the exchange of water either on the surface or with the underlying water table.

Water Quality
-Dissolved Oxygen
Oxygen is vital to respiration. An artificially high biomass caused by increased loadings of organic matter or algal blooms can create a heavy demand which causes low levels of dissolved oxygen. Dissolved oxygen is likely to be lowest in July and August. The target is dissolved oxygen >7.0mg/l for lochs classified as at Good Ecological Status (GES) under the Water framework Directive (WFD) or >9.0 Mg/l for lochs classified as High Ecological Status (HES) during July and August.

-pH
This influences many of the chemical processes in lochs such as the binding of phosphorus. Artificial changes through eutrophication or acidification can therefore have a significant effect. Oligotrophic lochs should have pH of 5.5 to 7 and Mesotrophic 6.5 to 8. Loch Narroch was measured as having a pH of 4.3 in 2009.

-Chlorophyll a
Chlorophyll a is a good measure for phytoplankton abundance. Phytoplankton is an important part of the processes of a loch ecosystem affecting light penetration and oxygen demand. A high biomass is usually associated with nutrient enrichment and sedimentation of organic matter. Target Chlorophyll a can be calculated for each loch based on site specific targets related to alkalinity and depth. Where a site is in favourable condition current Chlorophyll a can be used to set a baseline.

-Total Phosphorus
Phosphorus is one of the main nutrients required for plant growth and there is strong correlation between TP concentration and phytoplankton biomass. The target for TP is based on an annual mean; for deeper lochs (mean depth >3m) 15ugP/l maximum annual mean TP, very shallow (Mean depth <3m) 20ugP/l. Site specific targets may also be set where there are good records.

-Total Nitrogen
Nitrogen is the other main nutrient important in loch ecosystems. It is generally less likely to be limiting than phosphorus because of the ability of some organisms to fix Nitrogen from the atmosphere. The target for all lochs is that Annual Mean Total Nitrogen should not exceed 1.5mg/l. with no deterioration from baseline. For N limited lochs consideration may be given to setting site based targets. More site specific targets for Nitrogen for lochs are currently under development as part of WFD.

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

Typical species recorded for the lochs are:

Isoetes lacustris	lake quillwort
Litorella uniflora	shoreweed
Lobeliia dortmanna	water lobelia

Sparganium angustifolium floating bur-reed

Characteristic species for this habitat can be found in table 6 of the Common Standards Monitoring Guidance Table 6a is for more nutrient poor sites while 6b is more transitional sites. Given the poor buffering capacity most lochs on Merrick Kells will have vegetation closer to 6a

The viability of the characteristic species is determined by water quality and other conditions that support the plant community such as water clarity. Loss or reduction in frequency of species may therefore be an indicator of deteriorating or changing water quality or some other adverse impact.

Alien species can have direct effects upon the natural plant communities through competition. They may also have more subtle effects as the niche they fill is different and this may directly or indirectly affect the rest of the ecosystem. A list of high impact species has been agreed as part of the Water Framework Directive. Other species that may also affect the integrity of the site include Waterweeds (*Elodea nutallii*, *E.canadensis* and *Crassula helmsii)*.

Black-throated Divers (*Gavia arctica*), Goldeneyes (*Bucephala clangula*) and Goosanders (*Mergus merganser)* can regularly be seen on the Merrick Kells Clear-water lochs while Common sandpipers (*Actitis hypoleucos*) can forage nearby.

Conservation Objectives for Natural Dystrophic lakes and ponds [H3160] (Acid peat-stained lakes and ponds)

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

There should be no measurable net reduction to the extent of the habitat and its distribution throughout the site. The extent of the Acid peat-stained lakes and ponds has been estimated at 78.57ha.

In contrast to most loch habitats this habitat can be composed of many relatively small lochs and lochans scattered throughout the site. Drainage and forestry could dry out the peat catchment associated with the lochs.

This conservation objective is considered to be met if the conditions to ensure the habitats' long-term existence are in place.

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

The structure and function of lochs are strongly influenced by activities within their catchment. Changes in land management or development can affect the integrity of the feature which will manifest itself in changes to the loch.

Physical Attributes
-Surface Area
Changes to surface area can indicate pressures on the structure and function of lochs. Because they tend to be small and rather shallow the surface area of dystrophic lochs may fluctuate naturally more than other lochs. However, changes to surface area and the associated change to depth can adversely affect the character of the loch. Artificial fluctuations to depth from activities such as abstraction can adversely affect the vegetation.

Changes to the surface area may also indicate a number of pressures such as abstraction, regulation, construction, excessive sediment deposition and natural succession which may be caused by issues in the catchment.

-Hydrological regime
The hydrology of the loch affects both water level fluctuations and annual and within year flushing patterns. Flushing is important as it is strongly related to dilution and removal of nutrients and plankton. Changes to the flushing pattern can be caused by factors similar to those affecting area; abstraction, regulation, construction, excessive sediment deposition and natural succession which may occur in the catchment. The habitat is rain fed but may be affected by fluctuations in the water table of the surrounding bog.

-Loch substrate character
The type and distribution of sediment particles within a loch will affect the biology of the loch and the availability of habitats. Sediment type can be indicative of exposure. The substrate of the majority of dystrophic lochs is dominated by peat although there are rare examples on more mineral gravels. Changes to the substrate character may be indicative of changes to the area and hydrological regime. Reduction in area or flushing may affect the substrate character as finer sediments become trapped.

-Natural sediment load
Accumulation of nutrient-rich sediment may have a strong effect on the water quality and biology of the loch. Enrichment can be caused by the release of nutrients bound to silt. Increases in sediment loading may result from both changes in land management practice in the catchment or on the shoreline and short term events such as construction. Release of sediment from afforested catchments particularly during site preparation and harvesting is a particular issue. Eroding peat within the catchment may also be an issue for this type of loch. Evidence is growing that an increase in storm events associated with climate change may increase the amount of sediment deposited in lochs. Poaching of loch margins and feeder burns may also be important.

-Connectivity between the loch and the surrounding area
While a loch is often perceived as a discrete entity the connections between it and the surrounding area are vital to its functioning as part of a natural system. These natural connections can be reduced or changed by, for example, hard engineering works on the shoreline or loch bed and anything that impedes the exchange of water either on the surface or with the underlying water table. Poaching of loch edges can damage or destroy the characteristic edges and marginal vegetation

Water Quality
-Dissolved Oxygen
Oxygen is vital to respiration. An artificially high biomass caused by increased loadings of organic matter or algal blooms can create a heavy demand which causes low levels of dissolved oxygen. Dissolved oxygen is likely to be lowest in July and August. The target is dissolved oxygen >7.0mg/l for lochs classified as at Good Ecological Status (GES) under the Water framework Directive (WFD) or >9.0 Mg/l for lochs classified as High Ecological Status (HES) during July and August.

-pH
This influences many of the chemical processes in lochs such as the binding of phosphorus. Artificial changes through eutrophication or acidification can therefore have a significant effect. Dystrophic lochs should have pH of less than 5. Careful consideration should be given to afforestation of catchments with low buffering capacity.

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

There should be a low to medium diversity and characteristic species with a macrophyte community typical of the lake type with appropriate species richness and a natural assemblage.

Dystrophic lochs vary greatly in their macrophyte communities some having none at all. The target species can be found from previous monitoring including notable species from each site.

Characteristic species are:

Dreplanocladus spp	hook-moss
Eleogiton fluitans	floating club-rush
Juncus bulbosus	bulbous rush
Menyanthes trifoliata	bogbean
Nymphaea alba	european white water lily
Potamogeton polygonifolius	bog pondweed
Sparganium angustifolium Floating	bur-reed
Sphagnum spp	aquatic sphagnum
Utricularia spp	bladderworts

Characteristic species for this habitat can be found in table 4 of the Common Standards Monitoring Guidance

There should be no loss or significant decline.
The pools and their margins surveyed as part of SCM cycles contain a typical bog flora, with no rare aquatic macrophytes. A number of locally uncommon species are present including english sundew *(Drosera anglica)*, white beak-sedge *(Rhynchospora alba)*, bog-rosemary *(Andromeda polifolia)*, few-flowered sedge *(Carex pauciflora)* and lesser bladderwort (*Utricularia minor)*.

Azure hawker dragonfly *(Aeshna caerulea)* breeds in the bog pools of Silver Flowe, one of it's most southerly locations in the UK.

Conservation Objectives for Northern Atlantic wet heaths with *Erica tetralix* [H4010] (Wet heathland with cross-leaved heath)

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

Maintain at approximately 1746.05 ha. The area figure has been taken from the Standard Data Form, and is an estimate. This is because wet heath typically covers large areas, forming complex mosaics with areas of blanket bog, and in dryer areas dry heaths and grassland. Baseline surveys will include smaller areas of other habitats. The vegetation is very variable in composition. At higher altitudes wet heath can be found in mosaics with Alpine and Boreal heath, usually in areas with some topographic shelter.

During past Site Condition Monitoring surveys, the feature was found to fail several of the sample points for several of the attributes. The reason was centred on the dominance of *Molinia* caerulea on the site and the extent of burning, both for agricultural purposes and following successive extensive accidental fires across large areas of the site. It is notable that high covers of *Molinia caerulea* are recorded where there is burning and that this practice has probably exacerbated the spread of the grass within the site. Given the slow rate of change on this upland site and the difficulty in managing grazing, there is a likelihood that the feature will take some time to show signs of recovery.

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

Northern Atlantic wet heath with *Erica tetralix* is sensitive to inappropriate grazing or burning that may affect the habitat structure and function in two main ways. Overgrazing/burning, can lead to creation of a grass sward. Overgrazing, by livestock, can also result in high levels of nutrient input and trampling. Under grazing/burning can lead to the habitat type being colonised by non-typical species.

The structure of the habitat is based around the presence of:

- at least 25% (up to 90%) cover of dwarf-shrub heath species with *Erica tetralix* as the defining dwarf-shrub.

- less than 33% of the last complete growing season's shoots of dwarf-shrub species (collectively but excluding *Betula nana* and *Myrica gale*) should show signs of browsing.

- less than 10% of the Sphagnum cover should be crushed, broken, and/or pulled-up.

- less than 10% of the ground cover should be made up from disturbed ground (i.e. bare ground is where a substrate of bare humus, bare peat, bare mineral soil, bare gravel, or soil covered only by an algal mat, has its surface broken and imprinted by hoof marks, wallows, human foot prints, or vehicle and machinery tracks.

- less than 10% of the total feature area should show signs of active (i.e. facilitates the movement of water away from the site) drainage, resulting from ditches or heavy trampling or tracking.

- less than 20% of vegetation cover should be made up of scattered native trees and scrub (excluding *Betula nana* and *Myrica gale*).

- less than 10% of vegetation cover should be made up of bracken.

- less than 1% of vegetation cover should be made up of non-native species.

Therefore, the predominant requirement for wet heath is suitably managing active drainage in conjunction with the appropriate levels of grazing and burning; such levels will vary according to a number of factors such as altitude, aspect, location. Management effort should therefore be directed to restore species composition, vegetation mosaics and ground/soil structure and integrity. This should also avoid surface erosion and deposition, introduction of alien and invasive species and scrub and habitat fragmentation.

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

Wet heath is an important habitat for a range of vascular plant and bryophyte species. Generally the vegetation is dominated by mixtures of cross-leaved heath, heather, grasses, sedges and *Sphagnum* bog-mosses.

On the Merrick Kells SAC, *Trichophorum germanicum-Erica tetralix* wet heath M15, along with *Molinia caerulea-Potentilla erecta* grassland M25, covers most of the gentle to moderate slopes in the SAC and gives this area much of its distinctive and interesting Southern Upland character.

M15 has a sward of deer grass (*Trichophorum germanicum),* purple moor grass *(Molinia caerulea),* cross-leaved heath *(Erica tetralix)* and common heather (*Calluna vulgaris),* with sweet-smelling spreads of bog myrtle (*Myrica gale)* at low altitudes.

At moderate to high altitudes and on thinner peat, bell heather (*Erica cinerea)* grows with or instead of cross-leaved heath in the *Cladonia* sub-community M15c. The swards are dotted with smaller species such as bog asphodel (*Narthecium ossifragum),* tormentil *(Potentilla erecta),* devil's-bit scabious (*Succisa pratensis),* heath spotted orchid *(Dactylorhiza maculate),* heath milkwort *(Polygala serpyllifolia)* and carnation sedge *(Carex panacea).*

Cross-leaved heath is not a palatable species and tends to be one of the last dwarf shrubs to be browsed where bell heather and common heather are still plentiful and the heaths have a diverse array of other species. The absent of cross-leaved heath from the Cladonia dominated sub-community M15c appears to be of natural occurrence.

Typically associated birds are red grouse (*Lagopus l. scotica)*, golden plover (*Pluvialis apricaria*), dunlin (*Calidris alpina schinzii)* and golden eagle (*Aquilla chrysaetos*), merlin (*Falco columbarius*) and hen harrier (*Circus cyaneus*).

Conservation Objectives for European dry heaths [H4030]

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

Maintain to approximately 576.2 ha. The area figure has been taken from the Standard Data Form, and is an estimate based on the fact that European dry heaths can form complex mosaics with habitats such as grasslands, wet heaths and bogs. However there should be no measurable net reduction in the extent of the habitat and its distribution throughout the site.

The habitat is found on freely-drained, nutrient-poor, acidic soils. This can determine the extent and distribution of the habitat throughout the SAC, although it is also dependant on heathland management to maintain its extent including:

- appropriate level of grazing and muirburn.
- avoidance of any loss of habitat through increased extent of successional or adjacent natural habitats, afforestation or invasion by alien species.
- avoidance of negative effects of access and recreation.

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

European dry heaths are closely associated with scrub and woodland habitats, which would form the climax habitat without heathland management. Therefore maintaining dry heath is a fine balance between degrading to grasslands as a result of intensive management, and succession to scrub or woodland from too low a level of browsing, grazing or burning.

The structure of the habitat is based around the presence of at least 25% cover of dwarf shrub heath species, but can be up 90%. In particular heather *(Calluna vulgaris)*, as a dominant species, should be present in all phases of growth (pioneer, building, mature and degenerative) to provide a wide range of ecological variety and conservation benefit to a variety of species. At least 10% of the heather cover should be in the late mature/degenerative phase. Appropriate burning or cutting can contribute to the variation

in age phase, but it is important that this does not result in a monoculture of large areas of same age heather.

Further targets to achieve suitable habitat structure include:

Grazing/browsing
- less than 33% of the last complete growing season's shoots of dwarf-shrub species (collectively but excluding dwarf birch *(Betula nana)* and bog myrtle *(Myrica gale*)) should show signs of browsing.

Trampling/disturbance
- less than 10% of the ground cover should be made up from disturbed bare ground (ie where a substrate of bare humus, bare peat, bare mineral soil, bare gravel, or soil covered only by an algal mat, has its surface broken and imprinted by hoof marks, wallows, human foot prints, or vehicle and machinery tracks. The emphasis is on 'disturbed' rather than 'bare')

Invasive native and non-native species
– non-native species should be absent from the habitat, with less than 1% of vegetation cover should be made up of non-native species.
- bracken coverage should be minimised, making up less than 10% of the vegetation cover.
- less than 20% of the vegetation cover should be made up of scattered native trees and scrub (exclude *Betula nana* and *Myrica gale*).

Note that interaction of burning and grazing is an important cause of loss of dwarf shrub cover.

The dry heaths on the Merrick Kells are currently in good condition. There is no evidence of recent burning, though there are signs of an old, now-recovering burnt area on Mullwarchar. Grazing is not at all heavy at present in these communities. The latest survey showed that *Vaccinium myrtillus* was consistently more browsed than the other dwarf shrubs, but this is normal and not necessarily a cause for concern.

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

On the Merrick Kells SAC, dry heaths occur on the steeper, rockier slopes on well-drained mineral soils. Here they include *Calluna vulgaris-Erica cinerea* heaths H10, *Calluna vulgaris-Vaccinium myrtillus* heaths H12, *Vaccinium myrtillus-Deschampsia flexuosa* heaths H18 and *Calluna vulgaris-Vaccinium myrtillus-Sphagnum capillifolium* damp heaths H21. The monitoring points included all but H21.

In summary the indicator species for European dry heath are:

Calluna vulgaris	ling heather
Erica spp.	heather
Empetrum nigrum	crowberry
Salix lapponum	downy willow
Racomitrium lanuginosum	woolly Fringe-moss
Vaccinium spp.	dwarf shrubs
Myrica gale	bog myrtle
Salix repens	creeping willow
Ulex gallii	western gorse

Winchats (*Saxicola rubetra*) and Northern weathers (*Oenanthe oenanthe*) breed on the dry heath of the Merrick Kells.

Conservation Objectives for Siliceous alpine and boreal grasslands [H6150] (Montane acid grasslands)

2a. Restore the extent and distribution of the habitat(s) within the site

Restore where necessary to approximately 873.03ha.

The area figure has been taken from the Standard Data Form, and is an estimate based on the amount and complex, yet often limited, mosaic of several different high altitude communities. Fundamentally the habitat extent should be restored to its distribution throughout the site.

Factors at the global/national level that may affect Montane acid grasslands' extent over the site may be linked to climate change, reduced snow cover and, atmospheric acid deposition.

This conservation objective is considered to be met if the conditions to ensure the habitats' long-term existence are in place.

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

Whilst these grasslands are some of the very few predominantly near-natural habitats remaining in the UK, they are very sensitive to changes in current pressures, especially grazing and nutrient input. Excessive grazing, and the associated manuring, may favour grasses over bryophytes.

Where appropriate levels of grazing/browsing are in place to allow survival of component species of the habitat the structure, throughout the site, should meet the following conditions:

- Less than 10% of grass and sedge tillers uprooted;
- Less than 10% of live leaves and/or flowers of any of the following showing evidence of grazing *Alchemilla alpina*, *Carex bigelowii*, *Deschampsia flexuosa*, *Festuca ovina*, *Festuca vivipara*, *Juncus trifidus*, *Nardus stricta*, *Sibbaldia procumbens*, *Thymus polytrichus*;
- Less than 50% of live leaves of any of the following showing evidence of grazing *Agrostis capillaris*, *Agrostis vinealis*, *Anthoxanthum odoratum*, *Poa* spp.

Where appropriate levels of disturbance are in place, that allow for survival of component species of the habitat throughout the site, then the following conditions should be met:

- No signs of burning inside the feature boundaries;
- Less than 10% of the ground cover should be disturbed bare ground
  a) distinct and clearly defined paths and tracks (exclude constructed tracks) across the feature or,
  b) diffuse/scattered disturbance of the ground, not on clearly defined paths or tracks.

This feature failed to meet the SCM targets, because the cover of grasses and common herbs was greater than 20%.

Some of the summit heath vegetation does appear to be excessively grazed and trampled, especially on Corserine and on parts of Kirriereoch Hill, where it has been reduced to a very thin skin of vegetation over stony ground, but elsewhere on the Corserine ridges and on the Merrick and Benyellary there are some fine stands of *Carex-Racomitrium* heath with a deep carpet of *Racomitrium* that seem to be in good condition despite the presence of grasses. A reduction in the numbers of sheep using these summits would be beneficial, though a complete absence of grazing might result in a denser sward of grasses and the loss of some of the more exacting montane species such as dwarf willow (*Salix herbacea).* In the mild climate of southern Scotland, light to moderate grazing is probably necessary to reduce the competition from more vigorous grasses and ensure the survival of the smaller montane plants.

It is also possible that there is some pollution from atmospheric nitrogen, as there is intensively managed and fertilised farmland to the west and south-west (downwind) of these hills. This could lead to an increase in grasses and herbs at the expense of mosses in the summit heaths, which would not only overshadow the mosses and lichens but could attract more grazing animals and intensify the effects of trampling.

However, the patchy distribution of mossy and grassy U10 does not suggest a straightforward relationship with presumably widespread and even deposition of nitrogen over the high ground, so there may be another, or more than one, explanation for the variability of this type of vegetation here.

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

There are multiple NVC communities that can be form Montane acid grassland habitat. These vary geographically with the relevant types for this site listed below:

The number of sub-types in the habitat results in a spectrum of specialised plants, the actual species in any one dependent upon the specific topography where the community occurs.

On the Merrick Kells SAC, montane acid grassland is mainly *Carex bigelowii-Racomitrium lanuginosum* heath U10 and smaller areas of vegetation transitional between U10 and mossy montane *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland U4e. U10 is the characteristic summit vegetation of the higher hills in Britain and Ireland. In the Merrick Kells SSSI it occurs on Benyellary, the Merrick, Kirriereoch Hill and Corserine.

On the SAC, there are good examples of U10, with continuous silvery-grey carpets of Woolly fringe-moss (*Racomitrium lanuginosum*) clothing the high plateaux and ridges. These are dotted with montane species such as Stiff sedge (*Carex bigelowii),* Dwarf willow (*Salix herbacea*), Alpine clubmoss (*Diphasiastrum alpinum*)*,* Alpine haircap (*Polytrichum alpinum*) and Iceland moss (*Cetraria islandica*) as well as with more widespread upland species such as Bleaberry (*Vaccinium myrtillus*), Cowberry (*V. vitis-idaea*)*,* Crowberry (*Empetrum nigrum* ssp. *hermaphroditum),*Fir clubmoss *(Huperzia selago)* and Pill sedge *(Carex pilulifera).* In most stands there is also a thin sward of Sheep fescue *(Festuca vivipara*) and Wavy hair grass *(Deschampsia flexuosa),* tufts of Matgrass *(Nardus stricta)* and trailing shoots of Tormentil *(Potentilla erecta)* and Heath bedstraw *(Galium saxatile)*.

Locally these grasses and herbs thicken up into a more definite mossy grassland and belong to the *Racomitrium lanuginosum* sub-community of the *Festuca-Agrostis-Galium* grassland U4e.

In other examples, the heaths are dominated by *Carex bigelowii* growing in a dense continuous sward: an unusual type of montane vegetation that seems to be particularly associated with the higher hills in the western Southern Uplands.

Dotterels (*Charadrius morinellus*) breed on the tops of the Merrick Kells.

Conservation Objectives for Blanket bog [7130]

2a. Maintain the extent and distribution of blanket bog within the site

Blanket bog typically covers very large areas, forming complex mosaics with other wetland habitats as well as heath and grass habitats in drier areas. There should be no measurable net reduction in the extent of the habitat on the site such that the area of blanket bog is maintained at approximately **1746.05**ha.

Extents, distributions and patterns of mosaics therefore need to be assessed in relation to the expectation for each site. Where recovery is the issue these should not differ significantly from those expected under the particular physical and climatic conditions anticipated for the geographical location of the site.

Blanket bog habitat is frequent across the site, predominantly within the broad valley mire. These include Silver Flow that is also a wetland protected under the Ramsar Convention.

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

The predominant requirement for blanket bog is to be actively forming peat, a process that relies on peat-forming species having suitable conditions to maintain growth. Blanket bog that is degraded through damage or drying is likely to resume active peat-forming function following suitable restoration. A covering of 'active' peat-forming vegetation will protect the peat surface and will be more resilient to climate change.

Maintaining appropriate hydrology for blanket bog is critical. This will depend on management to prevent or reduce detrimental effects of drainage, including in the wider surrounding area and potentially at a distance from the habitat.

In addition, reducing negative impacts caused by burning, inappropriate grazing, trampling and nitrogen deposition is important; these are often combined and can make the habitat more vulnerable to more frequent and intense weather events. Wind and heavy rainfall can have dramatic impacts resulting in erosion or even landslips.

In drier areas invasion of scrub and non-native species can further reduce the water table, and so coverage of trees and non-peat forming grasses, bracken and other plants should be minimised. Any non-native species should be removed.

The main targets for habitat structure for the SAC are:

- Restore all areas of currently eroding peat, re-establishing peat-forming vegetation so that the extent of eroding peat is less than the extent of stable re-deposited peat and new growth of bog vegetation.

- Manage grazing to maintain a natural, diverse and open sward of typical plant species by avoiding overgrazing that affects habitat condition.

- Reduce active drainage through targeted ditch damming and peat reprofiling as appropriate

- Burning should be avoided, but where it is considered necessary e.g. for wild fire control, agreed good practice should be adhered to, as set out in the Muirburn Code

- Appropriate management of the effects of access and recreation

Blanket bogs on the Merrick Kells are in good condition, with interesting pool systems and plenty of structural and floristic diversity. During last round of full Site Condition Monitoring there was some local damage, notably on the Silver Flowe where ATVs have been driven across the bogs. Damage by trampling in blanket bogs on the low ground were apparent where cattle seem to move around the area on the same routes. Forestry Land Scotland recently raised the water table of the peat body on Silver Flowe by blocking historical drains and moor-grips.

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

Typical species include the important peat-forming species, such as bog-mosses Sphagnum species and cotton sedges *Eriophorum spp*., or purple moor-grass *Molinia caerulea* in certain circumstances, together with heather *Calluna vulgaris* and other ericaceous species and forbs such as bog asphodel *Narthecium ossifragu*) and the carnivorous sundews *Drosera spp*).

The majority of the blanket bog, especially on the lower ground within the basin mires, is of the *Eriophorum vaginatum-Trichophorum cespitosum* community (M17) and is quite wet in places with abundant *papillose bog-moss (Sphagnum papillosum*) and other peat building *Sphagna,* including feathery bog-moss (*Sphagnum cuspidatum*) in depressions. On higher ground, plateaux and shoulder mires *Calluna vulgaris-Eriophorum vaginatum* mire (M19) is more prevalent.

Other indicator species include:

Carex bigelowii	stiff sedge
Erica spp.	heaths
Empetrum nigrum	crowberry
Menyanthes trifoliate	bogbean
Myrica gale	sweet gale
Non-crustose lichens	(lichens)
Pleurocarpous mosses	(mosses)
Racomitrium lanuginosum	wooly hair moss
Rhynchospora alba	white beak-sedge
Trichophorum cespitosum	deer grass
Vaccinium spp	dwarf shrubs

Conservation measures should aim to maintain or restore conditions suitable for these species. All characteristic bog species rely on a high water table, and are likely to benefit from measures to improve the bog's hydrological integrity, principally by damming of artificial drainage. Healthy bog vegetation relies on light to moderate grazing by livestock and/or wild herbivores, sufficient to maintain a diverse open structure but without causing surface damage/erosion or loss of more grazing-sensitive species.

Curlews (*Numenius arquata*) are found on low ground and Golden plovers (*Pluvialis acicaria*) at higher altitude.

Conservation Objectives for [H7150] Depressions on peat substrates

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

Maintain the extent of existing depressions on peat substrates. The extent of the feature has been estimated at 0.87 ha.

This habitat is found in complex mosaics in wetter areas of bog and heaths and many sites support only very small (<1ha) extents and it is generally fragmented therefore current baseline estimates may not be very precise and any changes in extent estimates as a result of new survey may not represent real change but greater precision.

On the Merrick Kells SAC this habitat is best represented on Silver Flowe.

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

This habitat is found in complex mosaics in wetter areas of bog and heaths. It is often found on the edge of bog pools and so can be of a transitional nature depending on hydrological changes.

The maintenance of appropriate hydrology for this habitat is important to retain the structure and functions. A high water table is required and this will depend on management to prevent or reduce detrimental effects of drainage, including in the wider surrounding area, potentially at a distance from the habitat.

Heavy trampling and/or tracking by livestock and ATVs can result in active drainage of the habitat. Drainage should be considered active if it has altered, or is likely to alter, or remove, the original vegetation, and facilitate the removal of water from the site.

This habitat is very sensitive to muirburn and should be avoided in these areas.

The influence of *Molinia,* which is a result of repeated accidental fires, is also noticeable on this small fragmented plant community. Light grazing on some locations help maintain the condition of the feature across its extent.

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

This habitat occurs in hollows and depressions in complex mosaics in wetter areas of bog and heaths and is mainly characterised by an abundance of white beak-sedge *Rhynchosporion alba* which is the key species.

White beak-sedge (*Rhynchospora alba)* occurs sparsely here in cow-horn bog-moss (*Sphagnum denticulatum*) bog pools M1 and *Trichophorum germanicum-Erica tetralix* soligenous mires M15a. It is common in the wetter parts of the Silver Flowe, in M1 bog pools with species such as cross-leaved heath *(Erica tetralix),* Bog asphodel *(Narthecium ossifragum),* bog-myrtle *(Myrica gale),* ling *heather (Calluna vulgaris),* round-leaved sundew *(Drosera rotundifolia),* English sundew (*D. anglica),* bogbean(*Menyanthes trifoliata),* papillose bog-moss (*Sphagnum papillosum*) , magellanic bog-moss *(S. magellanicum*), flat-topped bog-moss (*S. fallax*) and cow-horn bog-moss (*S. denticulatum)*.

Excessive grazing-browsing and trampling by livestock and excessive ATV tracking can contribute to a deterioration in the habitat structure, leading to a reduction or loss in the

typical/indicator species for this habitat and should be only be done in a controlled, appropriate manner that helps maintain the habitat within the wider site management.

Snipe (*Gallinago gallinago*) can be heard drumming at dusk during summer time.

Conservation Objectives for Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) [H8110] Acidic scree

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

The extent of the acidic scree feature has been estimated at 104.76ha. This should be maintained.

However, due to the localised and fragmentary nature of this habitat current baseline estimates may not be very precise and any changes in extent estimates as a result of new survey may not represent real change but greater precision.

On the Merrik Kells SAC siliceous rocky slopes are recorded from all parts of the site, where the underlying bedrock is exposed.

This habitat is well represented by Carin's Cairn, Meaul and on the steep slopes of The Merrick and Kirriereoch Hill. It is also closely associated with plants in crevices on acidic rock where the same rock type is also found forming the scree.

Screes are common on the steeper slopes, especially on Corserine, and there are also examples on the more level ground of the hill tops and ridges. Much of the habitat on slopes is precariously balanced above big drops and is difficult to access safely.

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

Scree is intrinsically unstable and rocks will frequently move so this habitat is vulnerable to disturbance naturally.

Additional disturbance may be seen through herbivore grazing, trampling and recreation activities. There is also the possibility of colonisation, particularly of more stable scree, by other species, including trees and scrub where there are seed sources.

Inappropriate grazing pressures applied by domestic stock and feral goats have the potential to harm this feature through over-grazing and trampling damage.

Colonisation or shading of this habitat by bracken, tree growth and/or woodland expansion can reduce or eliminate cover of indicator species, including bryophytes.

Trampling from walkers can contribute to a deterioration in the habitat structure, having harmful effects on the typical species.

This habitat is also very sensitive to muirburn.

On the SAC, Excessive grazing, browsing and trampling by deer, feral goat and/or livestock can contribute to a deterioration in the habitat structure, having harmful effects on the typical species. Scree is a naturally unstable habitat, but the current pressure from herbivores does not seem to be increasing the rate of erosion.

This habitat is generally in good condition though relatively species-poor.

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

This habitat may be colonised by a range of pioneer species. It also provides shelter for many species sensitive to frost such as parsley fern *Cryptogramma crispa*, species requiring a humid microclimate such as Wilson's filmy-fern *Hymenophyllum wilsonii*, and species sensitive to grazing such as stone bramble *Rubus saxatilis*. It is important for its rich fern flora and act as refugia for a number of rare species.

On the Merrick Kells, most stands are largely bare with fine-leaved grasses, ling heather (*Calluna vulgaris),* blueberry *(Vaccinium myrtillus),* lichens and mosses in the crevices. Woolly Fringe-moss *(Racomitrium lanuginosum)* is the most abundant moss.

The associated vegetation in the screes on Corserine includes *Vaccinium myrtillus-Racomitrium lanuginosum* heath H20, *Carex bigelowii-Racomitrium lanuginosum* heath U10, mossy *Nardus stricta-Galium saxatile* grassland U5e, *Deschampsia cespitosa-Galium saxatile* grassland U13 and the *Cryptogramma crispa-Deschampsia flexuosa* fern community U21.

Conservation Objectives for Siliceous rocky slopes with chasmophytic vegetation [H8220] (Plants in crevices on acid rocks)

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

The extent of the plants in crevices on acid rocks feature has been estimated at 226.99 ha. This should be maintained.

However, due to the localised and fragmentary nature of this habitat, current baseline estimates may not be very precise and any changes in extent estimates as a result of new survey may not represent real change but greater precision.

On the Merrik Kells SAC, this habitat is found in crags, outcrops, rock pavements and spreads of boulders throughout the site, but especially on the very rocky ridge running from Craig Lee north to Dungeon Hill. It is also closely associated with acidic scree where the same rock type is also found forming the scree.

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

This habitat is found in harsh and sometimes extreme conditions with limited soil development, but where there is some shelter and moisture, and so plants are sparse and scattered. Chasmophytic plant species are adapted to the stresses of drought.

Colonisation or shading of this habitat by vigorous native species, such as bracken, tree growth or invasive non-native species can reduce or eliminate cover of typical species including bryophytes.

Inappropriate grazing regimes have the potential to harm this feature through over-grazing and trampling damage. However, some examples of this habitat are protected from herbivores by inaccessibility.

Excessive grazing, browsing, trampling by deer, feral goats and/or livestock can contribute to a deterioration in the habitat structure, having harmful effects on the typical species, and should be only be done in a controlled, appropriate manner that helps maintain the habitat.

Colonisation or shading of this habitat by bracken, tree growth and/or woodland expansion can reduce or eliminate cover of indicator species, including bryophytes.

This habitat is very sensitive to muirburn and should be avoided in these areas.

Trampling from walkers can contribute to a deterioration in the habitat structure, having harmful effects on the typical species.

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

There are crags, outcrops, rock pavements and spreads of boulders throughout the site, but especially on the very rocky ridge running from Craig Lee north to Dungeon Hill.

This habitat typically comprises mixtures of a limited number of species, most of which may also occur in other adjacent habitats, with mosses and ferns often prominent.

Although most of the actual rocks are bare apart from a thin skin of crustose lichens such as *Rhizocarpon geographicum*, and tufts of bryophytes such as Woolly Fringe-moss (*Racomitrium lanuginosum)* and Heath Plait-moss (*Hypnum jutlandicum)*, they are set in a matrix of vegetation and this extends on to ledges and among boulders.

Key species include:

Erica tetralix
Calluna vulgaris
Vaccinium myrtillus
Deschampsia flexuosa
Agrostis capillaris
Nardus stricta
Luzula sylvatica

Conservation Objectives for Otter [S1355]

1. To ensure that the qualifying features of Merrick Kells 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 improving 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 assessment 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 assessments 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 assessment.

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 Merrick Kells SAC is maintained or restored by meeting objectives 2a, 2b and 2c for each qualifying feature

The aim at this SAC is to maintain Otters in a favourable condition as a contribution to its wider favourable 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 maintaining site integrity, specifically by meeting the objectives outlined in 2a, 2b and 2c. If these are met then site integrity will continue to be maintained. 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 maintenance of site integrity. Temporary impacts on these objectives resulting from plans or projects can only be permitted where there is certainty that the features will be able to quickly recover.

This objective recognises that the qualifying species are exposed to a wide range of drivers of change. Some of these are natural (e.g. population fluctuations/ shifts or habitat changes resulting from natural processes) and are not a direct result of human influences. Such changes in the qualifying species’ distribution and use of 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 population of the species as a viable component of the site

An estimate of the number of otters occupying the site is not available and therefore there is no numerical baseline that can be given for the site. When considering the impacts of a plan or project this conservation objective is considered to be met if the conditions for the species’ long-term existence are in place. This includes:

- avoiding effects that could lead to a permanent reduction in the otter population through mortality, injury, or impacts caused by disturbance or displacement. This includes for example the effects caused by development, river engineering, water pollution, roads without adequate crossing provision for otters or suitable culverts, or entanglement in fishing gear.
- maintaining the species’ ability to use all areas of importance within the site (to be considered under conservation objective 2b)
- maintaining access to, and availability of, undisturbed resting places
- maintaining access to, and availability of, supporting habitats and prey (to be considered under conservation objective 2c).

Otters are wide-ranging and highly mobile. The population at the Merrick Kells SAC is reliant on suitable habitat in the surrounding wider countryside and is unlikely to be viable (capable of functioning) in isolation. The home range of an otter will vary depending on their sex, habitat quality and food availability. It will also vary between freshwater and coastal environments. Males living in rivers and streams can have a mean linear range size of 48km and females living in the same habitat can have a mean linear range of 21km. Males have been known to range as far as 80km. When assessing the effects of any plan or project consideration should be given to whether impacts outwith the SAC could affect achievement of this conservation objective.

Temporary short-term changes to otter due to anthropogenic influences may be considered not to compromise the conservation objectives within the site provided it can be demonstrated beyond reasonable scientific doubt that the population can fully recover. Recovery will need to be considered in the context of the species life history traits and the scale and duration of the impact being assessed.

Otters are a European protected species (EPS) and it is an offence to deliberately or recklessly capture, injure, kill, harass or disturb them in certain circumstances, or to damage or destroy their breeding or resting places anywhere in Scotland unless a licence has been issued to do so. A licence can only be issued for particular purposes which the law allows. Further, there must be no satisfactory alternative and no detrimental impact on the contribution to the maintenance of otter at a favourable conservation status for a licence to be issued. This assessment considers impacts on the otter population at a local and regional level. The licensing requirement is in addition to considering whether a plan or project will result in any impacts (including incidental impacts) to the otter population within the SAC.

2b. Maintain the distribution of the species throughout the site

Distribution of otters within the site can be affected by disturbance originating both within and outwith the site. Plans and projects that cause displacement and barrier effects to the species can also affect species distribution. Examples include use of night-time floodlighting of watercourses, road and bridge construction works and general disturbance from human activity (and dogs) by watercourses especially at dusk/night-time.

2c. Maintain (or where appropriate restore) the habitats supporting the species within the site and availability of food

Otters require suitable habitat for foraging, breeding and resting. In freshwater environments abundant boulders, crevices and/or peat, or other cavity-forming features such as tree root systems are needed to provide secure holt sites above high water. Dense scrub is also valuable for providing lie-ups and couches. Suitable areas supporting a healthy fish population within a nearby watercourse or still water body are required within each otter's home range, to enable foraging for key prey species such as salmonids and eels. Access to ponds, ditches, reedbeds and wetlands where amphibians may breed is also important.

Changes to water flow and water quality can adversely affect otter habitat and prey on which they depend. Otters' food supply is normally associated with good water quality and therefore the water quality standards set out under the Water Framework Directive (2000/60/EC) should be met. Signs of otter activity should be noticeable by Loch Valley, the confluence of Eglin Lane and Black Garpel, Loch Macaterick, Loch Neldricken, Long Loch of the Dungeon and Cooran Lane.

Conservation Measures

Merrick Kells 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 NatureScot (SNH).

Current and recommended management for

- **Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels**
- **Acid peat-stained lakes and ponds**

Factor affecting the feature	Measure	Responsible party
Water quality	The water quality of the clear water loch shows stable nutrient levels, stable pH/ ANC values that are appropriate to 'Clearwater lochs', adequate dissolved oxygen levels sustain a healthy characteristic fauna.	SEPA Landowner/ Land manager Funding authority
Abstraction	Ensure timing and volume of abstraction is not damaging through discussions with regulator. Ensure that drought plans adequately address the interests of the site.	SEPA Scottish Water
Grazing, deterioration and enrichment	Ensure no degradation of the feature from diffuse or point sources such as excessive grazing leading to poaching and nutrient enrichment, or use of vehicles in or near the loch fringes.	Land Manager SEPA

Current and recommended management for

- **Wet heathland with cross-leaved heath**
- **European dry heaths**
- **Montane acid grasslands**

Factor affecting the feature	Measure	Responsible party
Muirburn	Muirburning has been practised over wet heath in the past, this have not been taken place over the recent years. Muirburn should be done in line with the Muirburn Code. Herbivore movements should be carefully controlled during the aftermath.	Land manager NatureScot.
Drainage	There has been limited drainage carried out on parts of the site. No further drainage works should be permitted.	Land manager Funding authority
Grazing, deterioration and enrichment	There can be large numbers of sheep (and locally goats, and red deer) on the high ground, with significant evidence of grazing, trampling and droppings in the	Land Manager

	moss heaths. Appropriate levels and timing of grazing need to be established and agreed to restore the habitat.	
Vehicle tracks	ATV track have been recorded during SCM past cycles. Such damage usually associated to farming or cull activities should be kept to a minimal.	Land Manager
Acid deposition	Discussions on options available and participation in available local are ongoing to support national and international monitoring initiatives and mitigate this effect on mountain acid grassland habitat and its specific species.	Land manager, Local authority, Scottish/UK government NatureScot.

Current and recommended management for:

- **Blanket bog**
- **Depressions on peat substrates**
- **Acidic scree**
- **Siliceous rocky slopes with chasmophytic vegetation**

Factor affecting the feature	**Measure**	**Responsible party**
Invasive species	*Molinia caerulea* can be quite dense across some of the larger basins e.g. to the east of Kirriereoch Hill and along Millmore to the north and within Silver Flowe. Summer cattle-grazing is in place to address *molinia* dominance and bracken encroachment at some locations. This needs to be checked for effectiveness and adapted as necessary	Land manager NatureScot.
Hydrology	Drain-blocking has been undertaken on Silver Flowe. Peat dams should continue to be monitored, maintained and adapted as necessary.	Land manager, NatureScot. Peatland Action.
Grazing	Grazing is light apart from in upper Glen Trool where there can be large numbers of cattle. Ensure that herbivore sheep, deer and goat impacts on the feature are 'low' based on the SNH Guide to Upland Habitats – Surveying Land Management Impacts to prevent poaching and/or loss of typical species	Land manager
Muirburn	No burning has taken place on blanket bog in recent years and muirburning is discouraged on the SAC. Care is needed to prevent accidental spread of burning from the neighbouring land. Any burning should be carried out in accordance with the Muirburn Code and	Land manager

	discussed with NatureScot beforehand to avoid burning in sensitive areas.	
Vehicle damage	ATV access associated to farming activities has caused some local damage on the wetter parts of the Silver Flowe. Although these were very localised and did not adversely affecting bog habitats, the situation should be monitored and kept under review. Avoid activities that can damage the habitat and lead to an increase in exposed bare peat.	Land manager, Permitting authority, NatureScot.
Habitat management	FLS control and manage a large proportion of the SAC. They work with others (tenants and neighbours) to deliver their management policies and plans.	NatureScot, Land managers, Forest and Land Scotland.

Current and recommended management for Otter

Factor affecting the feature	**Measure**	**Responsible party**
Disturbance and potential damage to features necessary to survival	The otter is a European Protected Species, fully protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). This protection also extends to its holts. Landowners and occupiers can apply for a licence to allow proposed development works that might affect otters to proceed legally. Such proposal should be discussed with NatureScot before such application is made.	Land managers NatureScot.
Water quality	Maintain key water quality parameters.	NatureScot SEPA

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Approved on 21 June 2023 by:

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