

RANNOCH MOOR SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE



Site Details

Site name:	Rannoch Moor
Map:	https://sitelink.nature.scot/site/8348
Location:	Eastern Scotland, Highlands and Islands
Site code:	UK0012870
Area (ha):	10,113.57
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	13 August 2009	Unfavourable - Bad
Acid peat-stained lakes and ponds	Favourable Maintained	2 September 2014	Unfavourable - Bad
Wet heathland with cross-leaved heath	Unfavourable No change	26 May 2016	Unfavourable - Bad
Dry heaths	Unfavourable No change	26 May 2016	Unfavourable - Bad
Blanket bog*	Favourable Maintained	13 April 2007	Unfavourable - Bad
Very wet mires often identified by an unstable 'quaking' surface	Favourable Maintained	13 April 2007	Unfavourable - Bad
Depressions on peat substrates	Favourable Maintained	13 April 2007	Unfavourable - Bad
Freshwater pearl mussel (Margaritifera margaritifera)	Unfavourable No change	8 September 2010	Unfavourable - Bad
Otter (Lutra lutra)	Favourable Maintained	25 May 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

*Indicates Habitats Directive priority habitat

Overlapping Protected Areas:

Rannoch Moor SSSI, River Tay SAC, Rannoch Moor RAMSAR, Glen Etive and Glen Fyne SPA and Rannoch Lochs SPA

Further information on these protected areas can be found on [SiteLink](#).

Key factors affecting the qualifying features

Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels

Rannoch Moor SAC contains a range of nutrient-poor freshwater habitats from dystrophic to oligotrophic waterbodies. The waterbodies vary in size from small lochans to relatively large lochs such as Loch Bà and Loch Laidon. Many of the small lochans have a predominantly peaty substrate resulting in a very low nutrient status, and consequently low species diversity. However the larger lochs support vegetation typical of oligotrophic to mesotrophic standing waters. 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 from climate change, invasive non-native species, surface water pollution and air pollution.

Acid peat-stained lakes and ponds

Acid peat-stained lochs and lochans (also known as dubh lochans) occur within the upland blanket bogs on Rannoch Moor SAC. The dystrophic lochans of this site exhibit considerable diversity in size, depth and shoreline type, including those with mineral shorelines, a relatively uncommon variant. These upland dystrophic waters are characteristically shallow, very acidic and poor in plant nutrients, with an impoverished flora and fauna.

They usually do not have either inflow or outflow streams, are predominantly rain fed, with the water being held in the pool due to the high water table in the surrounding peat. Their water has a high humic acid content and is usually stained dark brown through exposure to peat. The pools are naturally species-poor and usually have a peaty, rather than a stony, bottom.

The health of these lochs is often closely linked with the surrounding bog. Key requirements for this habitat type are the maintaining of an appropriate hydrological regime and prevention of pollution (from air and surface water).

Wet heathland with cross-leaved heath

Wet heath usually occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage. At Rannoch Moor SAC this habitat is

widespread across the site, occupying ground between the very wettest parts of blanket bog habitat and the drier knolls and hills where dry heath predominates.

The key management issues leading to unfavourable condition at this site are too high grazing pressure from red deer (above low levels suitable for the habitat) and muirburn. Other issues that can affect this habitat include forestry, non-native species, wildfires, air pollution and potential developments.

European dry heaths

European dry heaths are widely distributed in Scotland although most extensively in the central and north western Highlands. With such a broad geographic range they can dominate the landscape but exhibit a considerable variation in their structure and form. They typically occur 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.

At Rannoch Moor SAC the habitat is found site on the knolls formed by moraine deposits or rock outcrops, and on the steeper slopes of the hills that surround the central core of the site.

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 contemporary 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.

The key management issues leading to unfavourable condition at this site are too high grazing pressure from red deer (above low levels suitable for the habitat) and muirburn. Other issues that can affect this habitat include forestry, non-native species, wildfires, air pollution and potential developments.

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 Priority habitat and makes up the largest feature by area at Rannoch Moor SAC.

Whilst currently at favourable condition key management issues that have negatively impacted the habitat at this site include over-grazing and trampling by red deer and burning. Other key issues that can impact this habitat are changes to the hydrology of the site and human recreation activities.

Very wet mires often identified by an unstable 'quaking' surface

This feature is also known as transition mires and quaking bogs. The term 'transition mire' relates to vegetation that in floristic composition and general ecological

characteristics is transitional between acid bog and alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich.

Transition mires and quaking bogs can occur in a variety of situations, related to different geomorphological processes: in flood plain mires, valley bogs, basin mires and the lagg zone of raised bogs, and as regeneration surfaces within mires that have been cut-over for peat. Or, as in the case of Rannoch Moor, areas of mineral soil influence within blanket bogs (e.g. ladder fens).

Key factors affecting this habitat type are alterations to the hydrology, over/undergrazing and disturbance to the surface i.e., trampling.

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.

Freshwater pearl mussel (FWPM)

Freshwater pearl mussels are long-lived freshwater molluscs that live in the gravel beds of clear, unpolluted rivers. For part of their lifecycle they are dependent upon a healthy population of salmonids (young salmon or trout) which act as host species. The mussel larvae attach to the gills of salmonid fish in mid to late summer and drop off the following spring. When they detach from their hosts they must land in sandy or gravelly substrates to settle and grow to adulthood.

Key management issues at this site include wildlife crime and habitat degradation of river beds and banks. To a lesser extent hydrological alterations from climate change could be a factor.

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 and persecution.

Further information about this SAC's protected [habitats](#) and [species](#) can be found on the JNCC website.

Conservation Priorities

Blanket bog is a priority habitat and management of the site should take this into consideration. In practice there should be little conflict in the management requirements for the different habitats on this site. All the habitats will benefit from low levels of grazing.

Blanket bog and associated habitats; depressions on peat substrates and very wet mires will benefit from raising of the water table and retaining surface water. Some wet heath and dry heath habitat may be lost or altered as a result. Clearwater lakes with aquatic vegetation and poor to moderate nutrient levels and acid peat-stained lakes and ponds, will not be affected by these changes

Freshwater pearl mussel would benefit from new riparian woodland as trees would shade rivers and streams and increase the biomass of invertebrate food in the river from leaves and invertebrates falling into the water, which would in turn support the host species. Riparian woodland would also stabilise banks, reducing sediment loads in the water column. These benefits, especially increase in fish numbers and provision of additional riparian shelter would also benefit otter.

FWPM will be prioritised over dry heath and wet heath where the expansion from natural regeneration or planting would result in the loss of a small amount of heath. The wet and dry heath habitats are extensive in the site and the loss of habitat likely from riparian woodland creation is likely to be much less than 1% of the total area of wet and dry heath.

The site condition monitoring guidelines allow for up to 20% of the dry and wet heath habitats to contain scattered trees or woodland, so these habitats would still be in good condition for this target. Each case would be assessed in a Habitats Regulations Appraisal. Any tree planting should be kept to the margins of the river, away from blanket bog habitats.

FWPM would not be prioritised over depressions in peat substrates and very wet mires often identified by an unstable 'quaking' surface. These features make up a very small percentage of the overall site. Therefore each case would need to be assessed in a Habitats Regulations Appraisal.

Conservation Objectives

Overarching Conservation Objectives for all habitat features

1. To ensure that the qualifying features of Rannoch Moor SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.

Favourable Conservation Status (FCS) is considered at a European biogeographic level. When determining whether management measures may be required to ensure that the

conservation objectives for this site are achieved, the focus should be on maintaining or restoring the contribution that this site makes to FCS.

When carrying out appraisals of plans and projects against these conservation objectives, it is not necessary to understand the status of the feature in other SACs in this biogeographic region. The purpose of the appraisal should be to understand whether the integrity of the site (see objective 2) would be maintained. If this is the case, then its contribution to FCS across the Atlantic Biogeographic Region will continue to be met. Further details on how these appraisals should be carried out in relation to maintaining site integrity is provided by objective 2 (including parts a, b and c). If broader information on the feature is available then it should be used to provide context to the site-based appraisal.

Note that “appropriate” within this part of the conservation objectives is included to indicate that the contribution to FCS varies from site to site and feature to feature.

2. To ensure that the integrity of Rannoch Moor SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature.

The aim at this SAC is to maintain, or where appropriate restore, the protected habitats in a 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 they do not prevent the ability of a feature to recover and there is certainty that the features will be able to quickly recover.

This objective recognises that the qualifying habitats are 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 habitats’ 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 809.09ha

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(s)

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

-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.

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

The larger lochs support vegetation typical of oligotrophic to mesotrophic standing waters including water lobelia and bulbous rush.

Typical plant species of this habitat include water lobelia *Lobelia dortmanna*, bulbous rush *Juncus bulbosus*, shoreweed *Littorella uniflora*, and alternate water-milfoil *Myriophyllum alterniflorum*. Uncommon and significant plant species found at Rannoch Moore SAC include least water-lily *Nuphar pumila* and floating bur-reed *Sparganium angustifolium*. And this is the only place in Britain where the Rannoch-rush *Scheuchzeria palustris* is found.

The larger lochs also support important bird populations including black-throated diver *Gavia arctica*, little grebe *Tachybaptus ruficollis* and teal *Anas crecca*.

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 *Elodea nutallii*, *E.canadensis* and *Crassula helmsii*.

Filamentous algae are indicative of high nutrient levels. This can create dense blankets reducing light, which can cause problems for other typical plant species, when they die and decay.

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

2a. Maintain the extent and distribution of acid peat-stained lakes and ponds (also known as 'dubh lochans') within the site

This habitat is composed of many relatively small, un-named lochs and pools (known as dubh lochans) scattered throughout 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 202.7ha (estimate taken from the Standard Data Form).

2b. Maintain the structure, function and supporting processes of acid peat-stained lakes and ponds (also known as 'dubh lochans')

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

Because they tend to be small and rather shallow the surface area of dystrophic lochs may fluctuate naturally more than other lochs. Otherwise see objective 2b for 'clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels'.

Hydrological regime

The habitat is rain fed but may be affected by fluctuations in the water table of the surrounding bog. Otherwise see objective 2b for 'clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels'.

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 by grazing animals may also be important.

Connectivity between the loch and the surrounding area

Poaching of loch edges should be avoided as this can damage or destroy the characteristic edges and marginal vegetation. Otherwise see objective 2b for 'clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels'.

Water Quality

Dissolved Oxygen

See objective 2b for 'clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels'.

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.

Nutrients

See objective 2b for 'clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels'.

Filamentous algae

Filamentous algae are a negative indicator associated with high nutrient levels. Some species can form dense floating rafts or coat macrophytes. Filamentous algae should only generally be found at low levels in dystrophic lochs. Presence of *Batrachospermum* sp. filamentous algae is acceptable as this species occurs naturally in pools on this site.

2c. Maintain the distribution and viability of typical species of acid peat-stained lakes and ponds (also known as 'dubh lochans')

There should be a low to medium diversity and typical 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. Typical species found in this habitat on Rannoch Moor SAC are:

<i>Aquatic Sphagnum</i> species	bog mosses
<i>Menyanthes trifoliata</i>	bogbean
<i>Eriophorum angustifolium</i>	common cottongrass
<i>Juncus bulbosus</i>	bulbous rush
<i>Utricularia minor</i>	lesser bladderwort

There should be no loss or significant decline in the distribution or abundance of these species.

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 (or restore where necessary) to approximately 1011ha.

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 drier areas dry heaths. Baseline surveys will include smaller areas of

other habitats. The vegetation is very variable in composition. Dwarf shrub cover and structure is variable, similar to dry heath in some areas, and to blanket bog in other, usually wetter areas, particularly on degraded bog.

However there should be no measurable net reduction in the extent of the habitat and its distribution throughout the site.

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

Wet heathland with cross-leaved heath is sensitive to inappropriate grazing or burning that may affect the habitat structure and function in two main ways. Burning can lead to creation of a grass sward if this is continued over several years. Overgrazing can result in high levels of nutrient input and trampling. A combination of both over grazing and burning accelerates these impacts. Under grazing can lead to the habitat type being colonised by non-typical species if this management is continued over many years. An appropriate level of grazing is therefore needed to maintain this habitat.

Wet heath should be restored from the legacy of damage from past trampling, overgrazing and burning. The structure of the habitat is based around the presence of:

- 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.
- There should be no bare peat, active drains, bracken cover or non-native species. Where these are present, management should focus on reducing their extent and impact.

Therefore the predominant requirement for wet heath is suitably managing active drainage in conjunction with the appropriate low levels of grazing and an absence of burning.

Management effort should 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. Maintain 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.

Key indicator species for Northern Atlantic wet heaths with *Erica tetralix* are :

Erica tetralix
Betula nana
Carex spp.
Drosera spp.
Eriophorum angustifolium
Myrica gale
Narthecium ossifragum
Non-crustose lichens
Pleurocarpus spp.
Racomitrium lanuginosum

Typically associated species include grouse (*Lagopus l. scotica*), dunlin (*Calidris alpina schinzii*) stonechat (*Saxicola rubicola*) and large herbivores such as red deer (*Cervus*

elaphus). As well as a particularly diverse invertebrate fauna with three nationally scarce beetles: *Gyrinus opacus*, *Bembidion bipunctatus*, *Dytiscus lapponicus*; uncommon flies including two nationally rare species: *Brevicornu kingi* (Mycetophilidae) and *Tasiocera fuscescens* (Tipulidae); and several notable moth species including: *Apamea zeta* (Noctuidae), *Carsia sororiata*, *Eurois occulta* (Noctuidae), *Ectoedemia weaveri* (Nepticulidae) and *Coleophora genistae*

Conservation Objectives for European dry heaths [H4030]

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

Maintain to approximately 506 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 low level of grazing
- avoidance of negative effects of access and recreation

2b. Restore 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 and grazing.

Dry heath should be restored from the damage from past trampling, inappropriate grazing (above low levels) and 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 range of species. At least 10% of the heather cover should be in the late mature/degenerative phase.

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')

- Current levels of disturbed bare ground should not be increased. Activities that might cause an increase include excessive use of vehicles or increasing use of the habitat by red deer. The overall aim should be little to no disturbed bare ground within the habitat.

Invasive native and non-native species

- cover by species that are not typical of this habitat should not increase. Examples of inappropriate species are bracken, trees and non-native species. In the long-term there should be no non-native species within the habitat.

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

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

Typical species vary depending upon location. In the uplands the sub-montane heaths are dominated by heather (*Calluna vulgaris*), blaeberry (*Vaccinium myrtillus*) and crowberry (*Empetrum nigrum*) and, in the eastern Cairngorms, bearberry (*Arctostaphylos uva-ursi*).

In summary the indicator species for European dry heath are:

Betula nana

Calluna vulgaris

Erica spp.

Empetrum nigrum

Loiseleuria procumbens

Racomitrium lanuginosum

Vaccinium spp.

Genista anglica

Myrica gale

Salix repens

Typical associated vertebrates of dry heaths are black grouse (*Tetrao tetrix*), golden plover (*Pluvialis apricaria*), twite (*Carduelis flavirostris*), hen harriers (*Circus cyaneus*), merlin (*Falco columbarius*) and golden eagle (*Aquila chrysaetos*) and large herbivores such as red deer (*Cervus elaphus*).

Ensuring grazing is not above low levels and burning is avoided will allow for the viability of these typical species to be restored

Conservation Objectives for Blanket bog [H7130]

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. Blanket bog here is found in a high-level basin at about 300m altitude and encompasses one of the most extensive and undisturbed blanket bog and fen complexes in Britain. The habitat occupies hollows, level ground and gentle slopes, the precise species composition reflecting overall wetness and water movement.

To maintain extent of the blanket bog habitat, there should be no measurable net reduction of approximately 7079.5ha.

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.

2b. Maintain 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.

Where mineral-enriched water flows through areas of bog, plants more typical of fen habitats occur, sometimes forming features known as 'ladder fens', in which narrow strips of vegetation and open water alternate for up to several tens of metres on gentle slopes. On the steeper slopes associated with the numerous knolls and small hills, the bog grades into wet heath on shallow peat.

In addition, reducing negative impacts caused by burning, inappropriate grazing (above low levels), 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.

Rannoch Moor used to support a substantial riparian woodland. The remnants of which are still in evidence with scrub trees on islands and near the A82 and tree roots and stumps visible along the river. The loss of trees from this area has exposed natural water channels to frost and wind action, gradually deepening them and increasing flow and surface water run-off from the bog.

Any non-native species should be removed.

The main targets for habitat structure for the SAC are:

- Restore all areas of currently eroding peat, raising the water table to improve structure of blanket bog, re-establishing peat-forming vegetation to promote 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 damming of natural channels and peat reprofiling as appropriate
- Restore trees to appropriate areas to stabilise channels and slow surface water run-off
- Burning should be avoided,
- Appropriate management of the effects of access and recreation

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 grasses *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.* Rannoch Moor is one of only two places in Britain where Rannoch rush *Scheuchzeria palustris* has been found.

Other indicator species include:

<i>Arctostaphylos spp</i>	
<i>Carex magellanica</i>	tall bog sedge
<i>Lycopodiella inundata</i>	marsh clubmoss
<i>Betula nana</i>	dwarf birch
<i>Carex bigelowii</i>	stiff sedge
<i>Cornus suecica</i>	dwarf cornel
<i>Erica spp.</i>	heaths
<i>Empetrum nigrum</i>	crowberry
<i>Menyanthes trifoliata</i>	bogbean
<i>Myrica gale</i>	sweet gale
Non-crustose lichens	(lichens)
Pleurocarpous mosses	(mosses)
<i>Racomitrium lanuginosum</i>	wooly hair moss
<i>Rubus chamaemorus</i>	cloud berry
<i>Rhynchospora alba</i>	white beak-sedge
<i>Trichophorum cespitosum</i>	deer grass
<i>Vaccinium spp</i>	

Non-plant typical species of this habitat include bird species such as greenshank *Tringa nebularia*, dunlin *Calidris alpina* and wheatear *Oenanthe oenanthe* and large herbivores such as red deer (*Cervus elaphus*).

There is a particularly diverse invertebrate fauna with three nationally scarce beetles: *Gyrinus opacus*, *Bembidion bipunctatus*, *Dytiscus lapponicus*; uncommon flies including two nationally rare species: *Brevicornu kingi* (Mycetophilidae) and *Tasiocera fuscescens* (Tipulidae); and several notable moth species including: *Apamea zeta* (Noctuidae), *Carsia sororiata*, *Eurois occulta* (Noctuidae), *Ectoedemia weaveri* (Nepticulidae) and *Coleophora genistae*.

Conservation measures should aim to maintain or improve 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 from restoring areas of bare peat and slowing water runoff.

Healthy bog vegetation can sustain light grazing by livestock and/or wild herbivores that may help maintain a diverse open structure but without causing surface damage/erosion or loss of more grazing-sensitive species.

Conservation Objectives for Transition mires and quaking bogs [H7140] (Very wet mires often identified by an unstable 'quaking' surface)

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

Maintain the extent of existing transition mires and quaking bogs at 202.27ha.

However, by definition this habitat is transitional with other adjacent wetland habitats so 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 Rannoch Moor SAC this habitat is found in a complex mosaic with blanket bog, depressions on peat substrates, wet and dry heath.

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

This habitat is usually present as a mosaic with other wetland habitats. The term “transition mire” relates to vegetation that, in floristic composition and general ecological characteristic, is transitional between acid bog and alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich.

The maintenance of appropriate hydrology for this habitat is important to retain the structure and function. Management to prevent or reduce detrimental effects of drainage, including in the wider surrounding area, is key. Natural drainage has occurred on this site over the past several decades, following the loss of natural riverine vegetation including riparian trees, which has opened up channels which are exposed to the elements. Future management of the site should address this issue.

Grazing, browsing and trampling by deer can damage the structure of this habitat and the wider mosaic of wetland habitats in which it is found.

Grazing at appropriately low levels can be beneficial in helping to maintain species-richness and in preventing succession. However, over-grazing and excessive poaching is detrimental which can result in disturbed bare ground. This 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. The emphasis is on ‘disturbed’ rather than ‘bare’.

Heavy trampling and/or tracking by deer/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.

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

This habitat is found in lowland and upland situations in transition with other habitats and the typical species are dependent on the site and location of the habitat.

Rannoch Moor in west Scotland supports an unusual ecological variant of transition mire developing in the midst of blanket bogs, and supporting the very rare Rannoch-rush *Scheuchzeria palustris* for which this one of only two sites it's found. Such vegetation, clearly belonging to the *Scheuchzerietalia palustris* order, is developed in regeneration surfaces within raised and blanket bogs elsewhere in Europe, but in this site Rannoch-rush is also found in situations where the blanket bog is locally influenced by mineral-rich groundwater. The community containing Rannoch-rush has some affinities to M1 *Sphagnum auriculatum* bog pool community and is a distinctive and unusual type. Other types of transition mire occur widely, including ladder fens.

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 to 1.01ha. The extent of the depressions on peat substrates feature has been estimated.

This habitat is found in complex mosaics in wetter areas of bog and these support only very small (<1ha) extents. 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.

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

This habitat is found in complex mosaics in wetter areas of bog. It is often found on the edge of bog pools and so can be of a transitional nature depending on hydrological changes. It also occurs in pools at the upslope end of some transition mires

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 deer/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 at times of drought and this should be avoided.

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 is usually characterised by an abundance of white beak-sedge *Rhynchospora alba* however on Rannoch Moor this species is infrequent and with a patchy distribution, predominantly in the west.

Typical species for this habitat are those found in NVC types M1, M2, M17 and M18 such as the bog moss *Sphagnum denticulatum*, round-leaved sundew *Drosera rotundifolia* and, in relatively base-rich sites, brown mosses such as *Drepanocladus revolvens* and *Scorpidium scorpioides*. The nationally scarce species brown beak-sedge *Rhynchospora fusca* and marsh clubmoss *Lycopodiella inundata* are present.

Excessive grazing//trampling by deer 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.

Conservation Objectives for [S1029] Freshwater pearl mussel

1. To ensure that the qualifying features of Rannoch Moor SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status

Favourable Conservation Status (FCS) is considered at a European biogeographic level. When determining whether management measures may be required to ensure that the conservation objectives for this site are achieved, the focus should be on maintaining or restoring the contribution that this site makes to FCS.

When carrying out appraisals of plans and projects against these conservation objectives, it is not necessary to understand the status of the feature in other SACs in this biogeographic region. The purpose of the appraisal should be to understand whether the integrity of the site (see objective 2) would be maintained. If this is the case then its contribution to FCS across the Atlantic Biogeographic Region will continue to be met. Further details on how these appraisals should be carried out in relation to maintaining site integrity is provided by objective 2 (including parts a, b, c – and for freshwater pearl mussel - d). 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 Rannoch Moor SAC is restored by meeting objectives 2a, 2b, 2c and 2d for each qualifying feature

The aim at this SAC is to maintain, or where appropriate restore, the qualifying species in a favourable condition as a contribution to their wider conservation status. Therefore any impacts to the objectives shown in 2a, 2b, 2c or 2d 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, 2c and 2d. 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, 2c or 2d 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 a feature to recover and 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. Restore the population of the species as a viable component of the site

The conditions for the species’ long-term existence at Rannoch Moor SAC should be restored. This includes encouraging and allowing the number and density of mussels to increase and this conservation objective is considered to be met if the conditions for the species’ long-term existence are in place.

These conditions include:

- avoiding effects that could lead to an inability of the population to successfully reproduce and recruit sufficient juveniles into the population (e.g. >20% of the population should be juvenile (<65mm long). Very young juveniles (<30mm long) should also be present).
- avoiding effects that could lead to a permanent reduction in the density and number of freshwater pearl mussels in the population, or that prevent a recovery in density and numbers, through mortality, injury or impacts caused by disturbance. These effects could be caused by development, water pollution, river engineering, land-use change, abstractions, and wildlife crime. For a healthy mussel population the aim is to have at least 5 mussels per m².
- ensuring high quality habitat in river reaches that support freshwater pearl mussels (see conservation objective 2c)
- allowing the species distribution within the site to be maintained and expanded (see conservation objective 2b)
- maintain the distribution and viability of the freshwater pearl mussel’s host species, and their supporting habitat (see conservation objective 2d).

At Rannoch Moor SAC the FWPM population currently fails to meet the objectives for population density and age structure causing the feature to be in unfavourable status.

Temporary short-term changes to a SAC qualifying interest due to anthropogenic influences may be considered not to compromise the conservation objectives within a site provided it can be demonstrated beyond reasonable scientific doubt that the population can fully recover. However, freshwater pearl mussels are in unfavourable condition at this site. Recovery of freshwater pearl mussel populations is notoriously difficult. This is partly due to their unusually long lifecycle and also due to their requirement for very high water quality and other habitat requirements, with the species requiring near natural conditions for important factors such as fine sediment and nutrients. These conditions generally need to be provided for all of the time. The early stages of the pearl mussels' lifecycle is also complex and delicate, as it relies on the presence of healthy, abundant, juvenile, native salmonid populations. It is therefore also important that the local salmonid populations are robust and able to access all relevant areas of an SAC.

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.

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

Distribution of mussels within the site can be affected by disturbance originating both within and outwith the site. Factors such as water pollution, illegal pearl fishing, river engineering and intensification of land use can risk directly affecting freshwater pearl mussels. The species can be directly affected, or the species' habitat quality reduced such that recruitment is unsuccessful, leading to a contraction in the species' distribution in the site. It is important that both up- and down-stream distribution is maintained within the site. Freshwater pearl mussels may be present in the mainstem river within a site, as well as in tributaries (and tributaries may contain populations that are not currently known) and lochans.

Plans and projects that cause disturbance, displacement and barrier effects to the host species can also affect mussel distribution (see conservation objective 2d).

2c. Restore the habitats supporting the species within the site and availability of food

Freshwater pearl mussels are typically found in soft-water, gravel bed rivers, with extremely high water quality. They feed by inhaling river water and filtering out fine organic particles.

In order to maintain the supporting freshwater pearl mussels' habitat it is important that the species' high quality river habitat requirements are met. Freshwater pearl mussel populations are particularly vulnerable to nutrient enrichment and fine sediment increases, both of which can affect the juvenile mussels that predominantly live buried in river gravels. River engineering can also directly damage populations, as well as interrupt the supply of sediment that maintains habitat. Changes in land use have the potential to increase nutrient and fine sediment concentrations in the river. However land use changes, such as the establishment of native riparian woodlands, also have the potential to improve habitat by providing shade that can mitigate damaging temperature peaks, stabilising river banks and reducing erosion. Current riparian habitat along waterways is lacking and should be improved.

Specific targets for some water quality parameters include:

- Nutrient concentrations should be near-natural. Soluble reactive phosphorus is particularly important (the annual mean should be <0.005mg/l, or if this is exceeded then a site specific target of reference conditions, or the tighter of Water Framework Directive High status or the target for Common Standards Monitoring river habitat should apply).
- Mean Biochemical Oxygen Demand should be <1 mg/L.
- Filamentous algae should have <5% coverage of the river bed during the summer months.
- Excess fine sediment is a considerable danger to freshwater pearl mussels and there should be no pronounced difference in the redox potential between open water and

interstitial water at 5cm depth.

2d. Maintain the distribution and viability of freshwater pearl mussel host species and their supporting habitats

Salmonid fish (native salmon and trout) are an integral part of the freshwater pearl mussels' lifecycle and should be available in sufficient numbers to ensure continued recruitment of juvenile mussels to the population. It is important that juvenile host salmonids, including any range of genetic types, are present in all areas of the catchment to which they, and adult fish, have natural access and where freshwater pearl mussels have historically been present. It is important to note that in some sites, this can include naturally impassable waterfalls.

The host species can vary in different sites. At this site trout are the primary salmonid host known to be used by the local freshwater pearl mussel population. An abundance of >0.1 native juvenile host salmonid per m² should ensure sufficient host species are available. More generally, the density of host juvenile salmonids should not differ significantly from those expected for the river type/reach under conditions of high physical and chemical quality.

Freshwater pearl mussel population viability is dependent upon host salmonid population viability, so any threats to host species stocks should be avoided. Factors that can affect the viability of host species include those that affect freshwater pearl mussel, but potential barriers to fish migration, inappropriate fish stocking and biosecurity are also further increased risk factors.

Host species should be able to continue to use and access all areas of importance within the site. Plans and projects that cause disturbance, displacement and barrier effects to host species can affect their distribution and in turn the distribution of freshwater pearl mussels.

To ensure a viable population of host species is present supporting salmonid habitat should be maintained throughout the site trout require the presence of clean gravels for spawning. For large trout, these typically occur at the tail of pools, although spawning may take place if suitable gravels and flows are present. On emergence, usually between March and early May, the young fry disperse and set up territories which they defend aggressively. Trout fry prefer areas of relatively low velocity water near the streambed. Cover from stones, plants or debris is required and good cover is essential for maintaining high fry densities.

Trout parr generally favour areas of relatively low current speed where cover is available. Juvenile trout are often to be found in cover alongside the banks, in undercuts, among tree roots or in marginal vegetation. Cover remains important for adult trout particularly in smaller streams. In larger rivers this may be less important, as deep water, in pools and deep glides, provide refuge.

Conservation Objectives for Otter [S1355]

1. To ensure that the qualifying features of Rannoch Moor SAC are restored to favourable condition and make an appropriate contribution to achieving favourable conservation status

Favourable Conservation Status (FCS) is considered at a European biogeographic level. When determining whether management measures may be required to ensure that the conservation objectives for this site are achieved, the focus should be on maintaining or restoring the contribution that this site makes to FCS.

When carrying out appraisals of plans and projects against these conservation objectives, it

is not necessary to understand the status of the feature in other SACs in this biogeographic region. The purpose of the appraisal should be to understand whether the integrity of the site (see objective 2) would be maintained. If this is the case then its contribution to FCS across the Atlantic Biogeographic Region will continue to be met. Further details on how these appraisals should be carried out in relation to maintaining site integrity is provided by objective 2 (including parts a, b and c). If broader information on the feature is available then it should be used to provide context to the site-based appraisal.

Note that “appropriate” within this part of the conservation objectives is included to indicate that the contribution to FCS varies from site to site and feature to feature.

2. To ensure that the integrity of Rannoch Moor SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature

The aim at this SAC is to maintain the species in a favourable condition as a contribution to its 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 continue to 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 a feature to recover and 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
- 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 Rannoch Moor 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 around 40km and females living in the same habitat can have a mean linear range of around 20km. 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 by watercourses especially at dusk/night-time.

The A82 trunk road, the West Highland Railway Line and the West Highland Way transect Rannoch Moor. Therefore this upland population is subject to some disturbance but usually only in specific areas. Construction work on the railway and trunk road will be subject to an HRA.

2c. 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.

Conservation Measures

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

Current and recommended management for Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels and Acid peat stained lakes and ponds

Issue	Measure	Responsible party
Hydrological flushing regime	Maintain current hydrological/ flushing regime or improve where man-made constraints exist. The main regulatory mechanism is the Controlled Activities Regulations, CAR.	Land manager SEPA NatureScot
Water quality	Implement and maintain monitoring of key water quality parameters.	SEPA NatureScot
	Any development proposals in the catchment should include appropriate measures to minimise sediment run-off and prevent pollutants from entering the marshes.	Highland Council
	Tackle water quality issues if they should arise, especially eutrophication.	SEPA Landowners
Avoidance of introduction of known invasive non-native species and pathogens	All anglers and other water users (such as canoeists or researchers) should follow the Check, Clean, Dry biosecurity procedures to help prevent the spread of problem non-native species. If identified, action to control invasive non-native species by physical removal should be implemented as soon as possible.	All

Current and recommended management for Wet heathland with cross-leaved heath and Dry Heath

Issue	Measure	Responsible party
Herbivore impacts	Ensure that herbivore impacts are appropriate for the habitats based on the Scottish Forestry/NatureScot Herbivore Impact Assessment Process and do not prevent the growth and regeneration of typical species.	Land manager
Fire	Avoid fire and muirburn on the site unless consented by NatureScot	Land manager Fire service
Afforestation	Up to 20% natural regeneration of native tree species on dry heath habitats	Land Manager
Alien and invasive	All non-native species to be removed	Land manager

species		SISI (NatureScot)
Access tracks	Each SSSI consent for tracks to be appraised individually	Land manager/ NatureScot

Current and recommended management for Blanket bog

Issue	Measure	Responsible party
Alien and invasive species	all invasive non-natives to be removed	Land manager NatureScot
Hydrology	Management of natural drains across the site to help support raising the water table. Drain blocking, re-profiling of hags and gullies where required.	Land manager, NatureScot
Herbivore impacts	Ensure that herbivore impacts are appropriate for the habitats based on the Scottish Forestry(SF)/ NatureScot Herbivore Impact Assessment Process and do not prevent the growth and regeneration of typical species	Land manager
Muirburn	Avoid fire and muirburn on the site, unless consented by NatureScot	Land manager
Woodland expansion	Natural expansion of native woodland species may be acceptable along riparian parts of the site. But should be limited to the very edges of blanket bog	Land manager
Habitat damage	Avoid activities such as ATV use that can damage the habitat and lead to an increase in exposed bare peat.	Land manager, Local authority, NatureScot

Current and recommended management for Very wet mires often identified by an unstable 'quaking' surface and Depressions on peat substrates

Issue	Measure	Responsible party
Herbivore impacts (grazing and/or poaching)	Ensure that herbivore impacts on the feature are 'low' based on the SF/NatureScot Herbivore Impact Assessment Process to prevent poaching and/or loss of typical species. trampling and tracking is kept to minimum to prevent drainage of these habitats	Land managers, NatureScot, Deer Management Groups
Colonisation by vigorous native and/or non-native species	Avoid colonisation of this habitat by native and non-native species, to prevent loss of indicator species and conversion to other open ground habitats or woodland by keeping water table high	Land managers, NatureScot
Habitat Management	Ensure that all management plans include this feature where it is present – or there is connectivity - and that they contain specific management to protect the feature e.g. NNR plan; deer management plan, AECS	NatureScot, landowners, land managers.
Research and	To identify emerging impacts on the habitat	NatureScot

monitoring	and their causes, in order to understand the long term issues, and to inform future management of the habitat across Scotland.	
------------	--------------------------------------------------------------------------------------------------------------------------------	--

Current and recommended management for freshwater pearl mussels

Issue	Measure	Responsible party
Low number and density of mussels present	Freshwater pearl mussels are fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 as amended. Offences include intentionally or recklessly killing, injuring or taking from the wild a freshwater pearl mussel.	All
	Continue to monitor for signs of illegal freshwater pearl mussel fishing, report any findings to the Police and implement agreed actions to deter criminal activity.	All
	Research to better understand the reason for the low number and density of freshwater pearl mussels at the site.	NatureScot, Local Fisheries Trust
Improvements needed to river morphology	Promotion of measures to increase resilience to climate change, particularly the creation of native riparian woodland and improved connection with floodplains. Measures to promote coordinated, catchment-scale activity are particularly important. Native tree planting on non qualifying habitats in the SAC would help improve the riparian habitat.	All
	Restore riparian and catchment peatlands to reduce fine sediment concentrations, improve floodplain connectivity and restore more natural hydrological regime.	All
	Applications for funding for improved water margin management, reduction of diffuse pollution and creation of native riparian woodlands through the Scottish Rural Development Programme that will be of benefit to the freshwater pearl mussel population are encouraged.	All
	Promote adherence to the Forest and Water Guidelines, and published best practice, during forest restructuring	All

Water quality monitoring	Implement and maintain monitoring of key water quality parameters.	NatureScot, SEPA
Ongoing site protection	Rannoch Moor is a SSSI and changes to land management described on the list of Operations Requiring Consent must have prior consent from NatureScot.	Land managers, NatureScot

Current and recommended management for Otters

Issue	Measure	Responsible party
Ongoing species protection	Otter are a European protected species and therefore the species protection provisions of the Habitats Regulations apply.	All
Ongoing site protection	Rannoch Moor is a SSSI, and changes to land management described on the list of Operations Requiring Consent must have prior consent from NatureScot.	Land managers NatureScot

Contact details: NatureScot
Cameron House
Oban
PA34 4AE

Telephone: 0300 244 9360

Approved on 30 March 2021 by:

Ben Ross
Head of Protected Areas
and Nature Reserves

Chris Donald
Area Manager
South Highland