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Scotland's Nature Agency
Buidheann Nàdair na h-Alba

STRATHGLASS COMPLEX SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE

Site Details

Site name:	Strathglass Complex
Map:	https://sitelink.nature.scot/site/8385
Location:	Highlands and Islands
Site code:	UK0014739
Area (ha):	23,591.92
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	23th July 2004	Unfavourable - Bad
Wet heathland with cross-leaved heath	Unfavourable Recovering	14th July 2016	Unfavourable - Bad
Dry heaths	Unfavourable Recovering	23rd July 2017	Unfavourable - Bad
Alpine and subalpine heaths	Unfavourable Recovering	21st July 2016	Unfavourable - Bad
Mountain willow scrub	Unfavourable Recovering	14th July 2016	Unfavourable - Bad
Montane acid grasslands	Favourable Maintained	16th June 2016	Unfavourable - Bad
Tall herb communities	Favourable Recovered	19th July 2016	Unfavourable - Bad
Blanket bog*	Unfavourable Recovering	17th June 2016	Unfavourable - Bad
Acidic scree	Favourable Maintained	21st July 2016	Unfavourable-Inadequate
Plants in crevices on acid rocks	Favourable Maintained	21st July 2016	Unfavourable - Bad
Plants in crevices on base-rich rocks	Favourable Maintained	14th July 2016	Unfavourable-Inadequate
Caledonian forest*	Unfavourable No change	4th November 2011	Unfavourable - Bad
Bog woodland*	Favourable	28th June 2017	Unfavourable -

	Maintained		Inadequate
Otter (*Lutra lutra*)	Favourable Maintained	31th August 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 a Habitats Directive Priority Habitat

Overlapping Protected Areas:

Affric – Cannich Hills SSSI, Glen Strathfarrar SSSI, Glen Affric SSSI, Liatrie Burn SSSI, West Inverness-shire Lochs SSSI, Glen Affric to Strathconon SPA and, West Inverness-shire Lochs SPA, Glen Affric NNR, Glen Strathfarrar NSA, Glen Affric NSA.

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
This habitat type comprises both oligotrophic (nutrient-poor) and mesotrophic (moderate nutrient levels) waters, and more rarely may include intergrading types. The dominant substrates of both oligotrophic and mesotrophic 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 Affric-Beauly hydro-electric power scheme runs through Glen Strathfarrar and Glen Cannich, with dams at Loch Monar, Loch Mullardoch, Loch Beannacharan and Loch Beinn a' Mheadhoin. Although this hydro scheme predates designation of the SAC, changes to the hydro regime can affect water levels throughout both Glens. As such, open water levels have the potential to fluctuate. Sediment loading is not thought to be an issue due to the fact that the income flow is only compensation flow.

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. In the uplands they occur most frequently in gradients between dry heath or other dry, acid habitats and blanket bogs.

At high altitude in the Scottish Highlands wet heaths occur in mosaics with Alpine and Boreal heaths; in these situations lichens and northern or montane species may be well-represented. Flushed wet heaths are especially frequent in areas of high

rainfall, and occur as topogenous fens, usually in channels within heath or grassland vegetation.

This feature is widespread across the SAC, and includes a range of sub-types representative of the western Scottish Highlands. These wet heaths are typically of a more oceanic type to the west, transitioning to a more continental form in the east. The site is especially notable for the extensive development of a northern form of wet heath at high altitude. The greatest areas of wet heath can be found at Fasnakyle, North Affric, Braulen, Pait and Glen Cannich.

The key management issue is over-browsing and trampling pressure from red deer, responsible for this feature being in unfavourable condition, as well as habitat loss from forest expansion. Cattle, roe deer, feral goat and sheep browsing has a minor impact in some areas. Additional, localised influences are ATV tracks, tracks associated with small-scale hydro schemes and paths that can cause fragmentation, degradation and erosion.

<u>European dry heaths</u>
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.

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.

Dry heath are commonest on steeper, more sheltered and often rocky slopes of the SAC, e.g., on the northern side of the two Sgurr na Lapaichs and on the southeastern shore of Loch Mullardoch.

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<u>Alpine and Boreal heaths</u>
Alpine and Boreal heaths occur on acid rocks on mountains, both on exposed lower summits and ridges and on sheltered slopes. Exposure or snow-lie, which suppress the growth of dwarf-shrubs, also favour the growth of characteristic lichens and bryophytes. Alpine heaths develop above the natural altitudinal tree-line. Boreal heaths develop below the tree-line in gaps among scrubby high-altitude woods or as replacements for those subalpine woods lost due to grazing and burning. On lower slopes, Boreal heaths may grade into floristically-similar European dry heaths.

Strathglass Complex SAC is intermediate between heathland types of the east and the less extremely oceanic parts of the north-west, and contains the second largest areas of this feature in the SAC series (after the Cairngorms SAC). The site has one of the largest occurrences of the mainly north-western *Vaccinium myrtillus – Racomitrium lanuginosum heath*. Also present is the most extensive area of the characteristic eastern heathland type *Calluna vulgaris – Cladonia arbuscula* heath to be found in the north-west. Overall, the site has the largest extent of the Alpine and Boreal heaths feature in the north-west Highlands. Alpine heath tended to be dominant on exposed slopes at high altitude with thin, stony soils, or else around screes.

This feature is vulnerable to excessive browsing pressure and trampling by deer, often leading to areas of disturbed bare ground and 'undesirable' grasses dominating which at this site is causing the feature to be at unfavourable status. Alpine and Boreal heaths that are rich in bryophytes and also juniper-rich heaths are particularly susceptible to disturbance, especially by fire (although this is very scarse and localised at this site). Similarly, lichen-rich heaths are susceptible to damage by fire or trampling. Rocky ground can be important in protecting heaths from fire.

<u>Mountain willow scrub</u>

Mountain willow scrub is the UK's highest-altitude shrubby vegetation, occurring on moist, relatively base-rich soils in rocky situations on mountains. It is predominantly a natural habitat, with succession prevented by the harsh climate at the high altitudes at which it is found. It tends to be associated with the more sheltered areas of the upper subalpine and low alpine zones of mountains, and there may be a positive association with moderately late snow-lie.

Stands of *Salix* scrub survive on ungrazed ledges and, more rarely, on lightly grazed, steep rocky slopes or boulder fields, occurring only as small, discrete stands or more scattered bushes. The largest continuous stand of this habitat type is about 0.5ha in extent and most stands are much smaller.

Strathglass is the best representative in the SAC series of *Salix lapponum – Luzula sylvatica* scrub on generally base-poor schist up to high altitude in the north-west Highlands. The Sub-Arctic *Salix spp.* scrub occurs in a series of localities in two widely separated corries, and scattered plants also occur in a few other places. The main occurrences are on ungrazed rock ledges, on steep rocky ground (including boulder fields) and on open slopes, where the willows are heavily grazed. While downy willow *Salix lapponum* is the most widespread willow species, whortle-leaved willow *S. myrsinites* is also present. Good examples can be seen from the west side of Sgurr nan Clachan Geala and the north side of Creag Dhubh.

The key management issue for this habitat is grazing pressure; overgrazing at this site is believed to have reduced and restricted its occurrence leading the feature to be in unfavourable condition. At many sites its continued future is precarious, since it is confined to often unstable rock ledges and reproducing populations are very small, isolated, and of uncertain long-term viability. Past efforts to protect areas of montane willow using high level electric fencing has failed at this site due to snow damage, rock fall and maintenance issues.

Montane acid grasslands

Montane acid grassland 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 plateaux 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 Affric-Cannich Hills within Strathglass Complex have the second-largest extent of Siliceous alpine and boreal grasslands in the UK, and are representative of the habitat type in the north-west Highlands. Extensive areas of montane acid grassland occupy the summit plateau and many of the mountain ridges across the SAC.

The habitat is vulnerable to nutrient inputs, nitrogen deposition, animal trampling and the use of all-terrain vehicles.

Tall herb communities

Tall herb communities habitat is typically found on ungrazed upland cliff ledges, occasionally extending on to open ground, and is restricted to base-rich substrates and somewhat sheltered situations. It provides a refuge for rare, grazing-sensitive, montane plants.

Variation within the habitat type is related chiefly to geographical position, altitude, and soil conditions and rock type. In Strathglass Complex SAC, this feature is mainly found on the northern side of Loch Mullardoch, in similar locations to the montane willow scrub feature.

Key management issues include grazing pressure from deer and other stock. This area is known to be frequented by feral goats, which are capable of reaching isolated cliff ledges out of reach of other herbivores.

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.

Strathglass Complex encompasses much of the east–west gradient that occurs in blanket bog north of the Great Glen. Both wet, oceanic *Scirpus cespitosus – Eriophorum vaginatum* blanket mire and the drier, more upland *Calluna vulgaris – Eriophorum vaginatum* blanket mire occur extensively. Bog vegetation is at its most extensive on the lower slopes of these high hills, extending up glacial troughs and in to high corries and on to ridges. The blanket bog grades into a diversity of heathlands and grasslands on the better-drained upper slopes. At high altitudes Calluna vulgaris is replaced by other dwarf-shrubs such as crowberry *Vaccinium vitis-idaea*, cowberry *Empetrum nigrum ssp. hermaphroditum* and bog bilberry *Vaccinium uliginosum*. Notably, these include the scarce dwarf birch Betula nana and alpine bearberry *Arctostaphylos alpinus* at one of their few known locations in blanket bog outside Ben Wyvis.

This feature is generally dominant in the main corries (lower parts of the highest ones, such as Coire Domhain, Coire Gorm Mòr and Toll an Lochain) and the glens, e.g., Gleann Nam Fiadh, Gleann a' Choilich and Coire nan Each.

Key management issues include overgrazing and trampling by red deer which are causing this feature to be assessed as unfavourable at this site. Other key issues for this habitat can include changes in the hydrology, non-native species, climate change, air pollution, infrastructural development and localised damage from paths and ATVs.

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.

Siliceous scree is comparatively widespread across the SAC, with particular concentrations on the northern Sgurr na Lapaich ridge, on Carn nan Gobhar, north of Toll Creagach and on either side of the Mullach Cadha Rainich-Sgurr na Lapaich ridge in the south. No active pressures on this feature are known.

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 (grows in the crevices of rocks) vegetation that colonises siliceous (silica based, acidic) rock faces and 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.

Strathglass Complex SAC has some of the most extensive outcrops of siliceous rock in the UK. Crevices in the more shady rocks support a flora of Atlantic mosses and liverworts. Particular groupings of this feature can be found southwest of Màm Sodhail, east of Sgurr nan Clachan Geala, on Creag Feusag and on either side of Coire Domhain.

Calcareous 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.

Calcareous sub-types develop on lime-rich rocks such as limestone and calcareous schists.

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 but can be sensitive to overgrazing and trampling although many sites are protected by inaccessibility. The base-richness of calcareous rocks may encourage competition from more vigorous native species, or non-native invasives such as New Zealand willowherb.

This feature is scarce across the SAC, with the main examples found at northwest-facing outcrops of calcareous schist at between 700 and 800m, such as Toll na Lochain and the west side of the northern Sgurr na Lapaich, with seepage and species such as *Alchemilla alpina, Thalictrum alpinum, Hieracium* sp., *Saxifraga aizoides* and *Cystopteris fragilis* in or beside cracks in the rock, often associated with and grading into stands of tall herb vegetation.

Caledonian forest

Caledonian forest comprises relict, indigenous pine forests of Scots pine *Pinus sylvestris* var. *scotica*, and associated birch *Betula* spp. and juniper *Juniperus communis* woodlands of northern character. Self-sown stands naturally regenerated from stock of genuinely native local origin recorded in the Caledonian Pinewood Inventory (Forestry Commission 1998) are included in the Annex I type. It is usually found on strongly-leached, acidic podzols, and these soil conditions are reflected in the ground flora.

A key factor affecting this habitat is inappropriate grazing by herbivores, currently it is overgrazing that is leading to this feature being in unfavourable status at this site. The habitat requires low, but not zero, levels of grazing to sustain it. High levels of grazing can distort the natural structure and variation within the woodlands, producing a habitat that lacks a natural representation of intermediate life classes; abundance of old trees with very few younger ones. Insufficient grazing impacts can include excessive regrowth leading to changes in microclimates such as light and humidity levels.

Other management issues include impacts from forestry and woodland management, burning and recreational impacts. Further pressures on the habitat are also anticipated, particularly from the effects of climate change (drought, waterlogging, windblow etc.). Novel pests (pine tree lappet moth) and pathogens (such as Dothistroma needle blight) are also a risk, currently exerting negative pressure at this site although not responsible for it being at unfavourable condition.

The Caledonian forest areas in Strathglass Complex are representative of the North Central biochemical region and are intermediate in type between the western and eastern geographic variants. Within the site, the Caledonian forest is mostly found within Glen Affric SSSI and Glen Strathfarrar SSSI, which comprise some of the largest remaining intact stands of this woodland type in the country, and the most important for the epiphytic lichen community they support. Much smaller areas of pinewood occur in Affric-Cannich Hills SSSI and Liatrie Burn SSSI.

Several regeneration exclosures exist on the SAC, some of which were erected before the SAC was selected, and much work has been carried out to date by Estates, FCS and others to encourage woodland regeneration and safeguard existing Caledonian forest.

Bog woodland

Bog woodland exists under specific physical conditions, where scattered trees (principally Scots pine) co-exist across a rain-fed (ombrotrophic) bog without the loss of the bog species.

This feature requires a combination of suitable hydrological conditions within bogs, tree-seed sources, and low grazing levels from herbivores. These conditions allow tree-seeds to germinate and establish during relatively drier periods on the bog, while the low level of grazing impacts and the high water table in the bog also help to prevent excessive tree growth. Such a balance of conditions can be either very stable or transitory depending on numerous factors.

Key management issues include grazing levels, forestry activity, problematic native and non-native species, burning, changes to local and catchment hydrology, pollution to surface and ground-waters and waste disposal/dumping. Pine weevils have been noted causing damage to bog woodland within Struy Estate

Bog woodland is limited in extent and found in pockets scattered throughout the pinewood areas of the site.

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. Within Strathglass Complex SAC otters are known to frequent Loch Beinn a' Mheadhoin as well as the River Farrar. It is likely that they are also present in the River Cannich and River Affric, as well as their associated lochs. Much of the River Farrar is managed primarily for salmon fishing.

Previous population declines in otters were primarily due to pollution and persecution. Otters are also sensitive to human disturbance (for example large events and water based activities), development activities and loss of foraging and breeding habitat. Disturbance where this prevents animals from resting or sheltering, can have a detrimental effect on the body condition of an individual. Developments that cause changes to water courses (including water abstraction, flow changes, physical alterations and point or diffuse pollution) have the potential to affect prey (salmonids, sticklebacks and eels) availability for otter and damage breeding or resting holts. Otherwise, supporting habitat for otters is abundant.

Further information about this SAC's protected habitats and species can be found on the JNCC website.

Conservation Priorities

All of the features on Strathglass Complex SAC are important in their own right. There are a few cases where management or natural processes require decisions on prioritising one feature over another, as outlined below. The defaults are that Priority European habitats are a higher priority than the other European features, European features take priority over SSSI features, and European and SSSI features take priority over un-designated interests.

The priority features of Strathglass Complex SAC are:

- Caledonian forest
- Blanket bog
- Bog woodland

Caledonian forest expansion

Expansion of the Caledonian forest feature should be favoured over retaining open habitat features, as per the rationale approved by Scottish Government. Whilst there has been no loss in extent of existing woodland on the SAC since 2005, the woodland is considered to be in an unfavourable condition because it is not regenerating enough to maintain the habitat in the long-term. The conservation status of the UK Caledonian forest resource is considered 'bad and declining'. This is largely attributed to the inadequacy in extent of the habitat, lack of expansion/replacement through natural regeneration and because a large proportion of the existing habitat is of poor quality. Much of the current regeneration of Caledonian forest is restricted to fenced deer exclosures, many of which were put in place prior to the SAC designation.

It is anticipated that expansion of the Caledonian forest feature will primarily be at the expense of wet heaths, dry heaths and blanket bog habitats.

Blanket bog is also a priority habitat for the SAC, however reduction in the extent of blanket bog is expected only as a consequence of regeneration taking place on adjacent heath habitats. This may also lead to the formation of bog woodland, another priority habitat for the SAC, in which case the continuity of much of the flora and fauna of the original blanket bog would likely be maintained.

It is also noted that since the *Myrica-Molinia* wet heath persists within Caledonian forest, total losses of wet heath extent within regenerated pinewood areas is very unlikely. Further, in the case of European dry heath, dwarf-shrub cover is usually maintained under the pine and these communities are linked in a dynamic system in any case. The dry heaths present within the SAC do not include the scarcer NVC types H16 and H21.

Current survey data indicate that there are no associated typical species present in the wet and dry heath and the blanket bog habitats that may suffer loss as the pinewood recovers. Such species are well represented elsewhere in the site and,

additionally, many of them will continue to exist within the more open areas of the woodland. Any woodland expansion proposals should however take into account any particularly sensitive or valuable areas within heathland and blanket bog habitats, and exclude these from any proposals for regeneration. Woodland expansion should avoid unnecessary fragmentation of heathland and bog habitats, while contributing as much as possible to habitat networks for the woodland interests.

Features recognised as being a primary reason for designation, but not priority features, are:

- Northern Atlantic wet heaths with *Erica tetralix*
- Alpine and Boreal heaths
- Sub-Arctic *Salix spp*. Scrub
- Siliceous alpine and boreal grasslands
- Siliceous rocky slopes with chasmophytic vegetation

Montane willow scrub occupies small, highly fragmented niches and current populations are showing poor regeneration success, making this habitat particularly vulnerable to small site or climatic changes.

This SAC overlaps with Glen Affric to Strathconon SPA and, West Inverness-shire Lochs SPA. Any pro-active management for the SAC or assessment of plans or projects will also need to take account of the SPA interests.

Conservation Objectives

Overarching Conservation Objectives for all habitat qualifying features

1. To ensure that the qualifying features of Strathglass Complex 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 Strathglass Complex SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature.

The aim at this SAC is to restore or maintain the habitats in a favourable condition as a contribution to its wider conservation status. Therefore any impacts on the objectives, for each feature, 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 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 80.21ha.

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. The Affric-Beauly hydro-electric power scheme runs through Glen Strathfarrar and Glen Cannich, with dams at Loch Monar, Loch Mullardoch, Loch Beannacharan and Loch Beinn a' Mheadhoin. Although this hydro scheme predates designation of the SAC, changes to the hydro regime can affect water levels throughout both Glens.

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

Typical species of oligotrophic lochs;

Litorella uniflora	shoreweed
Lobeliia dortmanna	water lobelia
Subularia aquatic	awlwort
Isoetes lacustris	lake quillwort
Triglochin palustrus	marsh arrowgrass

Other non-plant typical species include otters.

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.

Non-native 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 and which can cause problems when they die and decay.

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 to approximately 1486.29ha, but also accepting some loss of extent in favour of woodland regeneration and expansion (to a maximum of 434ha loss of wet heath). With regards to this 'loss' it is worth nothing that *Myrica-Molinia* wet heath persists within

Caledonian forest, therefore total losses of wet heath extent within regenerated pinewood areas is very unlikely.

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. 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. At high altitudes wet heath can be found in mosaics with Alpine and Boreal Heath, usually in areas with some topographic shelter.

However, outside the specific situation outlined above, 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

The structure and function of the wet heath feature requires restoration in some areas due to high grazing and trampling pressure, leading to dominance of graminoids and a lack of *Erica tetralix*. Deer grazing levels should be maintained at a low level as is appropriate for this habitat.

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 levels of grazing and burning; such levels will vary according to a number of factors such as altitude, aspect, location (i.e. montane, coastal etc).

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. The distribution and viability of typical wet heath species are currently being negatively affected by grazing and trampling pressure.

Typically associated birds are red grouse (*Lagopus l. scotica)*, golden plover (*Pluvialis apricaria*), dunlin (*Calidris alpina schinzii)* and greenshank (*Tringa nebularia*) golden eagle (*Aquilla chrysaetos*), merlin (*Falco columbarius*) and hen harrier (*Circus cyaneus*) as well as mammals such as red deer (*Cervus elaphus*) and mountain hare (*Lepus timidus*).

In summary the key indicator species for Northern Atlantic wet heaths with *Erica tetralix* in Strathglass Complex SAC are:

Erica spp.	
Andromeda polifolia	
Calluna vulgaris	Ling heather
Carex spp.	Sedge spp.
Drosera spp.	Sundew spp.
Eriophorum angustifolium	Common cottongrass
Myrica gale	Bog myrtle
Narthecium ossifragum	Bog asphodel
Arctostaphylos spp	Bearberry spp.
Betula nana	dwarf birch
Empetrum nigrum	crowberry
Cladonia spp.	Cladonia lichens
Non-crustose lichens	
Pleurocarpous mosses	
Racomitrium lanuginosum	Woolly fringe-moss
Rhynchospora alba	White beak-sedge
Rubus chamaemorus	Cloudberry
Salix repens	Creeping willow
Sphagnum spp.	
Trichophorum cespitosum	Deergrass
Vaccinium spp.	

Conservation Objectives for European dry heaths [H4030]

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

Maintain to approximately 1297.56ha, but also accepting some loss of extent in favour of woodland regeneration and expansion (to a maximum of 34ha loss of dry heath). Dwarf-shrub cover associated with dry heaths is usually maintained under pinewood and so will not be lost. 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, grazing or burning. High grazing and browsing pressure from red deer has heavily influenced this feature causing it to be in unfavourable condition, although evidence suggests that this is improving.

High levels of herbivore use can damage dry heath, but a low level of grazing and browsing is necessary to maintain this habitat.

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. Over-grazing is currently leading to this attribute failing, contributing towards the feature being at unfavourable status.

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.

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*). At altitude with increasing snow-lie blueberry abundantly increases.

Typical, associated vertebrates of upland heaths are red deer (*Cervus elaphus*) and mountain hares (*Lepus timidus*), red grouse (*Lagopus l. scotica)*, black grouse (*Tetrao tetrix*), golden plover (*Pluvialis apricaria*), twite (*Carduelis flavirostris*), hen harriers (*Circus cyaneus*), merlin (*Falco columbarius*) and golden eagle (*Aquila chrysaetos)*.

In summary the indicator species for European dry heath are:

Arctostaphylos spp.	Bearberry spp.
Betula nana	Dwarf birch
Calluna vulgaris	Ling heather
Erica spp.	
Empetrum nigrum	Crowberry
Loiseleuria procumbens	Alpine azalea
Minuartia sedoides	Mossy cyphel
Phyllodoce caerulea,	Blue heath
Salix lapponum	Downy willow
Racomitrium lanuginosum	Woolly fringe-moss

Vaccinium spp.	
Genista anglica	Petty whin
Myrica gale	Bog myrtle
Salix repens	Creeping willow
Ulex gallii	Western gorse

Over-grazing is currently altering the vegetation composition, with indicator species missing or at levels too low, contributing towards this feature being at unfavourable status. Low levels of grazing are required to allow this objective to be met.

Conservation Objectives for Alpine and Boreal heaths [H4060] (Alpine and subalpine heaths)

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

Maintain at approximately 1179.6ha. The area figure for this SAC has been taken from the Standard Data Form, and is an estimate based on the fact that both Alpine and Boreal heaths can grade into other heath types, especially the latter into floristically-similar European dry heaths. However there should be no measurable net reduction in the extent of the habitat and its distribution throughout the site.

Alpine and subalpine heaths are generally found on on acid rocks on mountains, both on exposed lower summits and ridges and on sheltered slopes where the dominant plants can cope with harsh climatic conditions such as high winds and prolonged snow cover. These conditions will largely determine the extent and distribution of the habitats throughout the SAC, although the habitats' long-term existence will also be affected by:

- an appropriate low level of grazing , preventing excessive browsing and trampling of dwarf shrubs
- The effects of access and recreation

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

Alpine and Boreal heaths are climax vegetation in exposed and extreme conditions which result in slow growth; they are therefore very sensitive to disturbance and are slow to recover.

As with many other Scottish upland habitats, maintaining Alpine and Boreal heaths is a fine balance between degrading to grasslands with intensive management and succession to scrub/ woodland with too low a level of browsing, grazing or burning. This is especially the case with the Boreal (sub-alpine) heaths where there may be only subtle differences between them and some adjacent habitats.

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%.
- less than 10% of live leaves should show signs of grazing (of any of *Carex bigelowii*, *Deschampsia flexuosa*, *Festuca ovina*, *Festuca vivipara*, *Juncus trifidus*)
- less than 33% of the last complete growing season's shoots of dwarf-shrub species (collectively) should show signs of browsing
- no signs of burning inside the feature boundaries

- less than 10% of the ground cover should be 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'.)

Over-grazing, above low levels, is currently causing this feature to fail on two of the indices above (browsing of last growing season's shoots and disturbed ground) and in turn meaning the feature is at unfavourable status.

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

This habitat comprises a wide range of heath types, with variation related to climate, local exposure and snow-lie. It includes:

- *Calluna vulgaris – Cladonia arbuscula* heath
- *Calluna vulgaris – Racomitrium lanuginosum* heath
- *Calluna vulgaris – Arctostaphylos alpinus* heath
- *Vaccinium myrtillus – Racomitrium lanuginosum* heath
- Vaccinium myrtillus - Deschampsia flexuosa

And, boreal heath type *Calluna vulgaris – Erica cinerea* heath

The dominant plants in UK examples of Alpine and Boreal heaths are usually dwarf-shrubs of heather *Calluna vulgaris*, bilberry *Vaccinium myrtillus* or juniper *Juniperus communis*, which are low-growing or prostrate owing to exposure to high winds or prolonged snow cover at moderately high altitudes.

On less-exposed, more sheltered ground at the lower altitudinal range of the habitat, *Calluna* generally dominates. *Calluna* is usually accompanied by other dwarf-shrubs, such as *V. myrtillus*, bell heather *Erica cinerea*, bearberry *Arctostaphylos uva-ursi* and crowberry *E. nigrum* ssp. *nigrum* (NVC communities *Calluna – Erica*; *Calluna – Vaccinium*; heaths). On more exposed and windswept ground, a range of dwarf-shrubs may dominate, forming an altitudinal progression. The first in the progression, and often the most extensive, are heaths dominated by *Calluna* growing in a prostrate form (NVC communities *Calluna – Cladonia* and *Calluna – Racomitrium* heaths). Heather may also be combined with dwarf juniper *Juniperus communis* ssp. *nana* (NVC community *Calluna – Juniperus* heath) or with *Arctostaphylos alpinus* and *Loiseleuria procumbens* (NVC community *Calluna – Arctostaphylos alpinus* heath). At higher altitudes, where conditions are too extreme for heather, short or prostrate *Vaccinium* spp. and *E. nigrum* ssp. *hermaphroditum* dominate (NVC communities *Vaccinium – Cladonia* and *Vaccinium – Racomitrium* heaths). On sheltered slopes where snow lingers, the dominant shrub is *V. myrtillus*, which is either the sole dominant (NVC community *Vaccinium – Deschampsia* heath)

In addition to this altitudinal zonation, there are other lines of floristic variation within the habitat type. For example, in the east, favoured by a less oceanic climate, lichens may be abundant (especially those of the reindeer-moss group *Cladonia* spp.). These heaths achieve the nearest approach in the UK to the lichen heaths of Scandinavia and the Arctic (especially in the *Calluna – Cladonia* and *Vaccinium – Cladonia* communities), and often support rare montane species. Conversely, in the more oceanic climate of the north-west and north, woolly fringe-moss *Racomitrium lanuginosum*, bell heather *Erica cinerea* and Atlantic liverworts and mosses (especially the species of the northern Atlantic hepatic mat) may be abundant in *Calluna – Racomitrium*, *Calluna – Juniperus*, *Calluna – Arctostaphylos alpinus* and *Vaccinium – Racomitrium* heaths. In the northern Scottish Highlands and Northern Isles, favoured by a cooler climate, mountain bearberry *Arctostaphylos alpinus* and trailing azalea *Loiseleuria procumbens* are abundant (characteristically in *Calluna –*

Arctostaphylos alpinus heath, but also in *Calluna – Racomitrium* and *Calluna – Juniperus* heath). Different structural forms of heath also occur, owing to differences in exposure, giving rise to closed or open heaths with crescentic waves (wave-form).

In summary, some of the sub-types of the habitat have a restricted distribution in the UK. *Calluna – Racomitrium* heaths occur only in the Scottish Highlands and Islands. *Calluna – Juniperus* heath is mainly restricted to the north-west Highlands and Islands with an outlier in North Wales, while *Calluna – Arctostaphylos alpinus* heath occurs only in the northern Highlands and on Orkney. *Calluna – Cladonia* and *Vaccinium – Cladonia* heaths are better-developed in the eastern Highlands, but the latter community is the only alpine heath to occur extensively south of the Highlands. *Vaccinium – Rubus* heath is most extensive in the Highlands, especially in the east.

Typical associated vertebrates of these high habitats are the mammals red deer (*Cervus elaphus*) and mountain hares (*Lepus timidus*) and the birds ptarmigan (*Lagopus muta)*, dotterel (*Charadrius morinellus*), golden eagle (*Aquila chrysaetos*) and, on a very localised basis, snow bunting (*Plectrophenax nivalis*).

In summary the indicator species for Alpine and Boreal heaths are:

Arctostaphylos alpinus	Mountain bearberry
Arctostaphylos uva-ursi	Bearberry
Calluna vulgaris	Heather
Cetraria islandica	Iceland moss
Cladonia spp.	
Empetrum nigrum ssp. Hermaphroditum	Crowberry
Erica cinerea	Bell heather
Erica tetralix	Cross-leaved heath
Loiseleuria procumbens	Trailing azalea
Juniperus communis ssp. nana	Dwarf juniper
Racomitrium lanuginosum	Woolly fringe-moss
Vaccinium myrtillus	Blaeberry
Vaccinium uliginosum	Bog blaeberry
Vaccinium vitis-idaea	Cowberry

Conservation Objectives for Sub-Arctic *Salix* spp. Scrub [H4080] (Mountain willow scrub)

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

Maintain (or expand where appropriate) the extent of existing mountain willow scrub at 2.36ha. The area figure has been taken from the Standard Data Form, and is an estimate. This habitat is unlikely to remain viable at its current extent so an increase in extent should be aimed for, including increasing its distribution possibly through the use of translocations, and this is unlikely to be possible with protection from browsing alone.

This habitat is a very localised habitat type found usually on ungrazed ledges on steep rocky slopes or boulder fields, occurring only as small discrete stands or more scattered bushes (0.5ha or smaller). 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.

In Strathglass Complex SAC good examples of this habitat are found at the west side of Sgurr nan Clachan Geala and the north side of Creag Dhubh.

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

This habitat is the UK's highest-altitude shrubby vegetation, occurring on moist, relatively base-rich soils in rocky situations on mountains. The willow scrub survives on ungrazed ledges and, more rarely, on lightly grazed, steep rocky slopes or boulder fields.

However, over-grazing/browsing is believed to have reduced and restricted the occurrence of this habitat. At many sites its continued future is precarious, since it is confined to often unstable rock ledges and reproducing populations are very small, isolated, and of uncertain long-term viability. Excessive trampling can damage the habitat.

Where grazing/browsing occurs it should be of a level where distinct browse lines or shaping of the canopy (topiary-like effects) does not occur.

Deer grazing levels should be maintained at as low a level as possible. This habitat is highly vulnerable to too much grazing but is not affected by a lack of grazing. Current over-grazing is leading this habitat to be unfavourable as it is failing to meet favourable attributes with indicator plant species showing signs of heavy grazing and not being able to flourish.

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

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

This habitat consists of a mixture of willow species which have arctic-alpine and arctic-subarctic distributions in Europe. The indicator sub-arctic species are;

Salix lapponum	downy willow
S. myrsinites	whortle-leaved willow
S. arbuscula	mountain willow
S. lanata	woolly willow
S. reticulate	net-leaved willow
S. myrsinifolia	dark-leaved willow
S. phylicifolia	tea-leaved willow

As willows are dioecious to maintain a viable population it is important that there is a suitably large population size with both male and female plants present.

The willows grow among a rich mixture of dwarf shrubs, grasses, rushes and broad-leaved herbs, such as;

blaeberry	*Vaccinium myrtillus*
tufted hair-grass	*Deschampsia cespitosa*
great wood-rush	*Luzula sylvatica*
Alpine lady's-mantle	*Alchemilla alpina*,

Since this habitat is small and fragmented and generally occurs within a wider landscape-scale, maintenance of the typical species will need to be managed as part of the wider site management. Current over-grazing (above low levels) is resulting in both indicator species being absent and, where present, not being able to reach the stage where they can produce seed. This is contributing towards the feature being in unfavourable condition.

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

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

Maintain to approximately 3774.71ha.

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 however there should be no measurable net reduction the extent of the habitat and 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. Maintain the structure, function and supporting processes of the habitat

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. Deer grazing levels should be maintained at a low level. This habitat is vulnerable to too much grazing but is unlikely to be affected by too little grazing.

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.

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.

Carex – Racomitrium moss-heath occurs on windswept ground blown clear of snow during winter, and is the most extensive sub-type of the habitat across most of the UK. Where snow-lie builds up, such moss-heath gives way initially to *Nardus – Carex* grass-heath, and then to *Carex – Polytrichum* sedge-heath where snow-lie is more prolonged. The longest lying snow-beds (*Polytrichum – Kiaeria* snow-bed, *Salix – Racomitrium* snow-bed and *Alchemilla – Sibbaldia* dwarf-herb community) are dominated by mosses and hardy herbs. These communities occur around the edges of high plateaux on steep slopes where a snow cornice develops in high corries or in gullies where deep snow accumulates. They can also occur in snow hollows on the highest summits. *Carex – Racomitrium* moss-heath grades into *Juncus – Racomitrium* rush-heath where exposure is more severe or the substrate unstable, and the latter community represents the habitat type at its highest altitude.

Nardus-Carex grasslands occupy the summit plateaux and much of the ridges of the site, e.g. on the two Sgurr na Lapaichs, the Carn Èige-Màm Sodhail-Beinn Fhionnlaidh ridge, An Riabhachan to An Socach and Meall a' Chàisg, along with many of the higher corries – e.g., Coire Domhain, Coire Mhàim, Coire Gorm Mòr, Toll an Lochain, etc. *Carex-Racomitrium* sedge heath is dominant on the Sgurr na Lapaich-Màm Sodhail ridge, but also occurs widely elsewhere, and *Juncus trifidus-Racomitrium* rush heath is, while generally rarer, also relatively widespread.

In summary indicator species for Montane acid grassland are:

Alchemilla alpina	alpine lady's mantle
Carex bigelowii	stiff sedge
Cetraria islandica	Iceland moss (lichen)
Cladonia arbuscula	(lichen)
Cladonia uncialis	thorn lichen
Dicranum fuscescens	dusky fork-moss
Empetrum nigrum ssp. hermaphroditum	crowberry
Gnaphalium supinum	dwarf cudweed
Juncus trifidus	three-leaved rush
Kiaeria starkei	Starke's fork-moss
Nardus stricta	mat-grass
Polytrichum alpinum	alpine haircap
Ptilidium ciliare	ciliated fringewort
Racomitrium lanuginosum	woolly hair moss
Rhytidiadelphus loreus	little shaggy-moss
Salix herbacea	dwarf willow

Non-plant typical species include red deer (*Cervus elaphus*) and mountain hare (*Lepus timidus*).

Conservation Objectives for Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [H6430] (Tall herb communities)

2a. Maintain the extent and distribution of the habitat within the site
Maintain to approximately 2.36ha. 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 however there should be no measurable net reduction in the extent of the habitat and its distribution throughout the site. Where possible opportunity should be taken to restore and/or extend this habitat.

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 extreme sensitivity of this habitat to grazing pressure is responsible for its scarcity. Whilst this habitat would have once been more abundant it is now largely confined to areas inaccessible to grazers. Introduction of additional grazing pressure, especially from highly agile species such as goats, has the ability to cause major losses. Direct management of grazing pressure has the ability to restore or extend this scarce habitat. In Strathfarrar and Glen Cannich this feature is more likely to be grazed by feral goats, rather than deer.

Deer grazing levels should be maintained at a low level. This habitat is highly vulnerable to too much grazing but is unlikely to be negatively affected by too little grazing.

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:

- At least 50% of tall herb stems should be more than 20 cm tall, or there should be few observable signs of grazing on tall herbs or ferns, and most tall herb species should be flowering or showing signs of being able to flower. (Qualifier: include flowering stems, other than those of *Luzula sylvatica* which can be hard to see clearly from a distance and do not tend to form a distinct stratum.) assessed against visual estimate at individual stand scale.
- Less than 50% of live flowering shoots of indicator tall herbs (see below in 3 for list) should show evidence of grazing.

The structure of this habitat can also be impacted by succession from tall-herb communities to woodland.

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:

- Less than 25% of the ground cover, of each patch or stand, should be disturbed bare ground*.
- Over the whole feature scanned from sample locations, less than 10% of the ground cover should be disturbed bare ground*. Assessed against the aggregate of visual estimates for as much of the feature as is visible while standing at all sample locations.

* The emphasis is on 'disturbed' rather than 'bare'. Exclude distinct and clearly defined paths or tracks.

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

The Tall herb communities habitat is a species-rich habitat corresponding to NVC type *Luzula sylvatica – Geum rivale* tall-herb community. In Strathglass Complex SAC, this feature is found on the northern side of Loch Mullardoch, especially at Toll an Lochain on the west side of Sgurr na Lapaich, the steep slopes on the east side of Mullach a'Ghlas-thuill overlooking Coire Beag and An Glas-tholl, the greater Coire Mhàim area and on the north side of An Riabhachan.

It is characterised by the abundance of a species-rich mix of tall, broad-leaved herbs, most of which are otherwise rare in the uplands owing to their sensitivity to grazing.

In summary indicator species for Tall-herb communities, some or all of which may be found on this site, are:

Alchemilla spp.	lady's-mantles
Angelica sylvestris	wild angelica
Cirsium heterophyllum	melancholy thistle
Crepis paludosa	marsh hawk's-beard
Filipendula ulmaria	meadowsweet
Galium boreale	northern bedstraw
Geranium sylvaticum	wood crane's-bill
Geum rivale	water avens
Heracleum sphondylium	hogweed
Hieracium spp.	hawkweeds
Hypericum spp.	St. John's-wort
Leucanthemum vulgare	ox-eye daisy
Luzula sylvatica	great wood-rush
Meconopsis cambrica	welsh poppy
Mercurialis perennis	dog's mercury
Oxyria digyna	mountain sorrel
Pimpinella saxifraga	burnet-saxifrage
Potentilla crantzii	alpine cinquefoil
Primula vulgaris	primrose
Ranunculus acris	meadow buttercup
Rubus saxatilis	stone bramble
Rumex acetosa	common sorrel
Saussurea alpina	alpine saw-wort
Sedum rosea	roseroot
Silene dioica	red campion
Solidago virgaurea	goldenrod
Succisa pratensis	devil's-bit scabious
Trollius europaeus	globe-flower
Valeriana officinalis	common valerian
Calluna vulgaris	common heather
Empetrum nigrum	crowberry
Erica spp.	heaths
Ferns (excluding bracken)	
Vaccinium spp.	

Non-plant typical species of this habitat include red deer (*Cervus elaphus*) and mountain hare (*Lepus timidus*).

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 (or restored where necessary) to approximately 3798.3ha. However some loss, up to 101ha, to woodland regeneration should be allowed for, most likely leading to a transition to priority bog woodland habitat.

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. 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. Low deer grazing levels should be maintained.

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 not be carried out on this habitat as per the Muirburn Code
- Appropriate management of the effects of access and recreation

Currently overgrazing, above low levels, is causing this feature to be in unfavourable condition specifically through vegetation showing heavy grazing and too high a prevalence of areas where sphagnum cover has been crushed, broken and pulled-up.

2c. Restore 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*). These typical species are negatively affected by grazing and trampling pressure, overgrazing is the main reason for this feature being in unfavourable condition with the cover (and so distribution) of sphagnum mosses being reduced and other typical species being grazed too heavily to remain viable in the long term.

Blanket bog supports vertebrates including red deer (*Cervus elaphus*), mountain hares (*Lepus timidus*) and the birds dunlin (*Calidris alpina*), golden plover (*Pluvialis apricaria*), and curlew (*Numenius arquata*). Mountain hare supports raptors such as golden eagle (*Aquila chrysaetos*).

The main blanket bog vegetation type present is the *Scirpus cespitosus-Eriophorum vaginatum* bog, mainly the *Cladonia spp.* subcommunity, but with the *Drosera rotundifolia-Sphagnum spp.* subcommunity also locally common. The *Calluna vulgaris-Eriophorum vaginatum* blanket bog is also very common, particularly on higher parts of the hills. Bog was generally dominant in the main corries (lower parts of the highest ones, such as Coire Domhain, Coire Gorm Mòr and Toll an Lochain) and glens, e.g., Gleann Nam Fiadh, Gleann a' Choilich and Coire nan Each.

Other indicator species include:

Arctostaphylos spp	
Betula nana	dwarf birch
Carex bigelowii	stiff sedge
Cornus suecica	dwarf cornel
Erica spp.	heaths
Empetrum nigrum	crowberry
Menyanthes trifoliate	bogbean
Myrica gale	sweet gale
Non-crustose lichens	(lichens)
Pleurocarpous mosses	(mosses)
Racomitrium lanuginosum	woolly hair moss
Rubus chamaemorus	cloudberry
Rhynchospora alba	white beak-sedge
Trichophorum cespitosum	deer grass
Vaccinium spp	

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.

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 401.06ha. 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 Strathglass Complex SAC this habitat is found at the northern Sgurr na Lapaich ridge, on Carn nan Gobhar, north of Toll Creagach and on either side of the Mullach Cadha Rainich-Sgurr na Lapaich ridge in the south, and is also closely associated with plants in crevices on acidic rock where the same rock type is also found forming the scree.

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 regimes, above low levels, have the potential to harm this feature through over-grazing and trampling damage.

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.

Excessive grazing/browsing/trampling by deer and/or livestock can contribute to a deterioration in the habitat structure, having harmful effects on the typical species. This habitat is also very sensitive to muirburn.

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.

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 500.15ha. 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 Strathglass SAC this habitat is found to the southwest of Màm Sodhail, east of Sgurr nan Clachan Geala, on Creag Feusag and on either side of Coire Domhain, and is also closely associated with acidic scree where the same rock type is also found forming the scree, and/or plants in crevices on base-rich rocks where calcareous bands of rock are found within siliceous rock.

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, above low levels, 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.

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

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. There are no indicator species for this habitat. Typical species of this habitat type, of which some or all may be found on this site, include:

Cryptogramma crispa	parsley fern
Juncus trifidus	three-leaved rush
Salix herbacea	least willow
Saxifraga stellaris	starry saxifrage
Phegopteris connectilis	beech fern
Gnaphalium norvegicum	Highland cudweed

Excessive grazing/browsing/trampling by deer 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.

Conservation Objectives for Calcareous rocky slopes with chasmophytic vegetation [H8210] (Plants in crevices on base-rich rocks)

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

The extent of the plants in crevices on base-rich rocks feature has been estimated at 18.87ha. 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 Strathglass Complex SAC this habitat is found in northwest-facing outcrops of calcareous schist at between 700 and 800m with seepage and species such as *Alchemilla alpina, Thalictrum alpinum, Hieracium sp., Saxifraga aizoides* and *Cystopteris fragilis* in or beside cracks in the rock, often associated with and grading into stands of tall herb vegetation, and is also closely associated with base-rich scree where the same rock type is also found forming the scree, and/or plants in crevices on acid rocks where calcareous bands of rock are found within siliceous rock.

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.

However, the base-richness of calcareous rocks may encourage competition from more vigorous native species, such as bracken and/or scattered native trees or scrub; or non-native invasives such as New Zealand willowherb. Colonisation or shading of this habitat by vigorous native species, tree growth or invasive non-native species can reduce or eliminate cover of indicator species.

Inappropriate grazing regimes, above low levels, 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.

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

Plants in crevices on base-rich rocks is characterised by the presence of bryophytes such as *Tortella tortuosa, Anoectangium aestivum* and *Ctenidium molluscum*. Associated vascular plants include brittle bladder-fern *Cystopteris fragilis*, green spleenwort *Asplenium viride* and glaucous meadow-grass *Poa glauca*. However, floristic variation within the habitat type is influenced by geographical location, altitude and rock type.

The indicator species for this habitat, of which at least four should be present are: Alpine lady's mantle *Alchemilla alpine;* thyme-leaved sandwort *Arenaria serpyllifolia;* black spleenwort *Asplenium adiantum-nigrum;* wall-rue *Asplenium ruta-muraria;* maidenhair spleenwort *Asplenium trichomanes;* green spleenwort *Asplenium viride;* hair sedge *Carex capillaris;* flea sedge *Carex pulicaris; Ceterach officinarum;* brittle bladder-fern *Cystopteris fragilis;* mountain avens *Dryas octopetala;* common rock-rose *Helianthemum nummularium;* hawkweed spp *Hieracium spp.;* crested hair-grass *Koeleria macrantha;* alpine bistort *Persicaria vivipara;* hard shield fern *Polystichum aculeatum;* holly fern *P. lonchitis;* soft shield fern *P. setiferum; y*ellow saxifrage *Saxifraga aizoides;* purple saxifrage *Saxifraga oppositifolia;* biting stonecrop *Sedum acre;* lesser clubmoss *Selaginella selaginoides ;* moss campion *Silene acaulis;* alpine meadow-rue *Thalictrum alpinum;* wild thyme *Thymus polytrichus*

Excessive grazing/browsing/trampling by deer 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 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.

Conservation Objectives for Caledonian forests [91C0]

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

Maintain *and* expand the area of Caledonian forest, currently given as 1887.35ha, by approximately 570ha, encouraging natural succession where possible to the treeline within

50 years.

The area figure of the extent of the Caledonian forest feature has been taken from the Standard Data Form. This should be maintained or allowed to increase through natural regeneration. Fundamentally however there should be no measurable net reduction in the extent of the habitat and its distribution throughout the site.

This will include the avoidance of effects that could lead to a permanent reduction in the extent or distribution of the habitat such as medium or high levels of grazing or, minimising the risk of fire.

Caledonian forest in Glen Affric is in the most favourable condition, with forest in Glen Cannich and Strathfarrar largely struggling due to a lack of regeneration. Often any regeneration is taking place within fenced exclosures, protected from browsing pressure from deer. There has already been substantial effort by individual landowners/estates, SF, Trees for Life etc to extend woodland, leading to the current extent.

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

Caledonian pinewoods are found on soils dominated by low nutrient status, strongly-leached acidic podzols, ranging from well drained to very wet and boggy often over short distances. The habitat is characterised by vegetation that;

- has a diverse structure including young, mature, dying and dead trees in dense thickets and open glades with a range of shade cast on the woodland floor
- is mostly evergreen and coniferous, long lived (to >250 years) and grows to large dimensions with a variety of niches including furrowed bark, rot-holes, large slow-decaying snags and deadwood
- has small proportions of diverse broadleaved trees and shrubs (and juniper), especially on pockets of richer soils
- has ground flora dominated by dwarf ericaceous shrubs, grasses, bryophytes and in places rare pinewood specialist species

This can be achieved through the presence of key tree species at all ages up to senescence and death, particularly Scots pine, juniper, birch spp., and aspen providing continuous cover of young, mature and old trees, dead and dying trees throughout the site; absence of invasive species which compromise the critical characteristics; and grazing levels that allow trees, shrubs and ground flora to develop naturally and flower, fruit &c.

The habitat requires low, but not zero, levels of grazing to sustain it. High levels of grazing, as is currently leading to this feature being unfavourable on this site, can distort the natural structure and variation within the woodlands, producing a habitat that lacks a natural representation of intermediate life classes; abundance of old trees with very few younger ones. Insufficient grazing impacts can include excessive regrowth leading to changes in microclimates such as light and humidity levels.

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

Currently, the distribution of Caledonian forest habitat is restricted as regeneration of typical species is limited in some locations. In some areas of the SAC regeneration is restricted to enclosed areas or places where deer are unable to reach (steep, rocky ground), which is often itself unsuitable for pine growth due to dense ground vegetation or very wet ground conditions. Distance from seed source trees also poses a barrier to typical species recruitment in certain areas.

Caledonian forest comprises relict, indigenous pine forests of Scots pine *Pinus sylvestris* var. *scotica*, and associated birch *Betula* spp. and juniper *Juniperus communis* woodlands of northern character. It is usually found on strongly-leached, acidic podzols, and these soil conditions are reflected in the ground flora, which typically includes the dwarf shrubs heather *Calluna vulgaris*, bilberry *Vaccinium myrtillus* and cowberry *V. vitis-idaea*, wavy hair-grass *Deschampsia flexuosa*, and the bryophytes *Dicranum scoparium*, *Hylocomium splendens*, *Pleurozium schreberi* and *Rhytidiadelphus loreus*. This type of woodland is noted for several rare northern species, including creeping lady's-tresses *Goodyera repens*, twinflower *Linnaea borealis* and the moss *Ptilium crista-castrensis*. Some stands support populations of notable bird species, crested tit and Scottish crossbill *Loxia scotica*. Typical mammals include red deer, mountain hare, red squirrel, pine marten, and wildcat are amongst the most distinctive.

The relict Caledonian Forest sites have Scots pine populations with a local genetic distinctiveness. We value this distinctiveness in its own right, as well as in terms of adaptation to current local conditions, and current practice protects it. We do not know how the anticipated long term changes and potential threats will interact with this genetic distinctiveness and the variation within it. Further work should help us better understand these interactions, but for now we recommend that any planting or replanting of Scots pine should originate from the appropriate region.

Conservation Objectives for Bog woodland [91D0]

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

The extent of the Bog woodland feature has been estimated at 9.44ha. This should be maintained or allowed to increase through natural and managed hydrologically-related changes, this will likely be as a result of woodland regeneration in blanket bog habitats. Fundamentally however there should be no measurable net reduction in the extent of the habitat and its distribution throughout the site

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)

Bog woodlands are extremely complex ecosystems, and in order to maintain the structure, function and processes supporting the habitat, some of the key elements that should be in place should include:

- Ombrotrophic conditions with a water table at or near the surface, and some degree of surface-drying during summer periods to permit tree root growth within the upper peat layers.
- Maintain an appropriate hydrological regime i.e. maintain/restore both existing drainage and water ingress processes.
- The presence on the bog of Scots pine trees and other suitable trees with the characteristics of the existing tree species, (bark chemistry and structure, shade, needle-litter, fruiting, senescence and deadwood development). There should be relative ecological stability between the open woodland and bog species combination.
- The continued presence of mature trees suitable for bog woodland trees on nearby

drier ground to supply tree seed to the bog. Such trees need to have the characteristics of existing bog woodland species (especially Scots pine and downy birch). Maximum distance is likely to be 50-100m.

- Low levels of grazing that allows natural regeneration of trees and structural variation of trees. The grazing should also allow trees to grow, herbs, bryophytes and lichens to flourish, and avoid undue ground disturbance or trampling.

- Absence of invasive non-native species.

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

Where Bog woodland occurs there is a balance that exists between various hydrological criteria that allows both trees and bog plants to grow over the long-term.

Due to the complex intergradation of bog woodland with drier woodland and heathland communities lists of typical species are not easily defined.

The typical pine dominated subtype often gives way to mire habitats but the constant species are:-

Pinus sylvestris	Scots pine
Erica tetralix	cross-leaved heath
Calluna vulgaris	common heather
Molinea caerulea	purple moor-grass
Deschampsia flexuosa	wavy hair-grass

In the birch dominated variant the constant species are:-

Betula pubescens	downy birch
Salix pentandra	bay willow
S. cinerea	common sallow
Molinia caerulea	purple moor-grass
Angelica sylvestris	wild angelica
Carex rostrata	bottle sedge
Caltha palustris	marsh marigold
Filipendula ulmaria	meddlys
Galium palustre	common marsh-bedstraw
Geum rivale	water avens
Valeriana dioica	marsh valerian
Sphagnum recurvum	
S. palustre	blunt-leaved bog-moss
Calligiergon cuspidatum	heart-leaved spearmoss
Mnium hornum	Swan's-neck thyme-moss
Rhizomnium punctatum	dotted thyme-moss

Characteristic species of this site include:

Calluna vulgaris	Ling heather
Erica tetralix	Cross-leaved heath
Trichophourum cespitosum	Deergrass
Eriophorum vaginatum	Hare's-tail cottongrass
E. angustifolium	Common cottongrass
Narthecium ossifragum	Bog asphodel

Drosera rotundifolia	Round-leaved sundew
Sphagnum spp.	

Conservation Objectives for Otter [S1355]

1.To ensure that the qualifying features of Strathglass Complex 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 Strathglass Complex 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, 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 in Strathglass Complex SAC is reliant on suitable habitat in the surrounding wider countryside and is unlikely 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 (and dogs) by watercourses especially at dusk/night-time.

2c. Maintain 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. 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 otters 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. Several streams run though the site, however these are below the size threshold for SEPA's freshwater classification system and so separate water quality monitoring is needed.

Conservation Measures

Strathglass Complex 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

Issue	Measure	Responsible Party
Hydrological flushing regime	Flushing regimes should avoid significant alterations to water levels downstream, in line with SEPAs Water Framework Directive. There are likely to be more small scale hydro developments going forward, and applications for inpoundments to feed these during drought events. These developments should be carefully considered as they may result in small scale changes to hydrological systems. All hydro regimes should be compliant with the SEPA Water Framework Directive.	SEPA SSE
Loch substrate character	The existing substrate of predominantly gravel and silt, or gravel and sand, should be maintained.	SEPA Landowner
Natural sediment load	Excessive or un-natural sedimentation should be avoided. This may be increased due to hydro-power generation.	SEPA SSE
Water quality, pollution and fertilisation	Ensure that water chemistry, oxygen content, PH, chlorophyll, phosphorus and nitrogen levels all remain stable.	
Alien and exotic species	Filamentous algae can occur in areas of increased sediment loading, and so the hydro-power regime should be managed to prevent significant sediment loading.	SEPA River Board Scottish Government NatureScot SSE

The following heath, grassland and bog habitats have been rolled together as the pressures and recommended management are similar:

Current and recommended management for:

- **Wet heathland with cross-leaved heath**
- **European dry heaths**
- **Alpine and Boreal heaths**
- **Montane acid grasslands**
- **Blanket bog**

Issue	Measure	Responsible party
Grazing & trampling by deer	Strathglass SAC has been heavily affected by herbivore grazing and trampling, principally by red deer and locally by roe deer and feral goats. Although there is evidence that deer numbers have declined significantly with the implementation of the current Deer Management Plan, deer numbers should continue to be closely monitored and controlled. This will allow habitats to recover, set seed and regenerate released from excessive deer pressure. This is informed by Herbivore Impact Assessments and Site Condition Monitoring. The Deer Management Groups (Glen Strathfarrar DMG, Affric & Kintail DMG and Strathconon DMG) should set cull targets for the wider area based on the information available from both HIAs and SCM, since deer are a wide ranging species and management needs to be at a population level.	Land manager Deer Management Groups
Grazing and trampling by domestic stock	Domestic stock are not thought to be causing impacts to upland features. Should stock numbers increase in future, the aim is to manage them to achieve favourable condition for each feature in Site Condition Monitoring. The aim should be to ensure that herbivore impacts on upland features are 'low' based on the Herbivore Impact Assessment process.	Land manager
Muirburn	At present this site is not burnt. Should muirburn be carried out in future, it should be in accordance with the Muirburn Code. Wet heath and blanket bog, and all alpine habitats (wind clipped) should not be burnt.	Land manager
Drainage, afforestation and other developments	No active drainage should be carried out in upland habitats, as this is not compatible with the features of the SAC, unless for the maintenance of ATV tracks, paths etc. Blanket bog especially should not be drained. Afforestation through woodland regeneration and potentially enrichment planting should focus on areas of the more widespread features (wet and dry heath), as per the SE agreement to prioritise the Caledonian forest feature.	Land manager Funding authority FLS FS
Vehicle tracks and ATV use	Vehicle tracks should only be constructed if they have a positive assessment in a Herbivore Impact Assessment. ATVs should be used in accordance with best practice to minimise tracking or erosion,	Land Manager

	Ensure ATV and vehicle use avoids sensitive areas, especially blanket bog where it can result in increasing exposed bare peat, taking into account problem solving solutions to potential issues, for example 'green running routes through' sensitive bog habitats. Minor habitat losses to allow for agreed ATV access may be considered necessary where it can be demonstrated that this access will facilitate management to improve the condition of the qualifying open habitats and therefore, the nature conservation benefits outweigh the negative effects of minor habitat loss.	
Peat restoration and hydrology	Land managers should be encouraged to restore eroding peat and blanket bog. Drain blocking, reprofiling of hags and gullies, maintenance of existing dams should be carried out where appropriate.	Land manager
Access and recreation	Various access routes fall within the SAC, including the Affric to Kintail Way. These routes should be maintained sensitively, taking into account any potential impacts to the designated features of the SAC. For example, through potential significant increases in visitor numbers, encouraging potentially damaging recreation (mountain biking etc) or opening up access for damaging activities (use of ATV/access tracks for motorbikes etc) Events, such as the annual Highland Cross should be managed to prevent impacts to the SAC as far as possible, and the SOAC should be promoted. The Glen Affric NNR lies within the SAC, and is managed to encourage visitors to the Glen.	Land manager Recreation interests Event organisers
Research and monitoring	To identify emerging impacts on the habitats and their causes, in order to understand the long term issues, and to inform future management of the habitats. This should include the continued monitoring of the Coire a' Mhaim exclosures, in place to provide a measure of deer impacts in an area with high deer pressure. Carry out habitat surveys of open habitats prior to woodland expansion proposals being implemented to ensure notable open habitat communities are avoided.	NatureScot Research community Land managers FLS

The following features have been rolled together as the pressures and recommended management are similar. They are all found on scree, cliffs, or steep ground;

Current and recommended management for:

- **Mountain willow scrub**
- **Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels**

- **Acidic scree**
- **Siliceous rocky slopes with chasmophytic vegetation**
- **Calcareous rocky slopes with chasmophytic vegetation**

Issue	Measure	Responsible party
Grazing and trampling by deer	Strathglass SAC has been heavily affected by herbivore grazing and trampling, principally by red deer and locally by roe deer and feral goats. Although there is evidence that deer numbers have declined significantly with the implementation of the current Deer Management Plan, deer numbers should continue to be closely monitored and controlled. This will allow habitats to recover, set seed and regenerate released from excessive deer pressure. This is informed by Herbivore Impact Assessments and Site Condition Monitoring. The Deer Management Groups (Glen Strathfarrar DMG, Affric & Kintail DMG and Strathconon DMG) should set cull targets for the wider area based on the information available from both HIAs and SCM, since deer are a wide ranging species and management needs to be at a population level.	Land managers NatureScot Deer Management Groups
Grazing and trampling by domestic stock	Domestic stock are not thought to be causing impacts to upland features. Should stock numbers increase in future, the aim is to manage them to achieve favourable condition for each feature in Site Condition Monitoring. The aim should be to ensure that herbivore impacts on upland features are 'low' based on the Herbivore Impact Assessment process.	Land manager
Feral goats	Feral goats are known to frequent Glen Strathfarrar, and can cause browsing and trampling pressure to sensitive habitats out of the reach of deer (steeps crags and gullies). It would be useful to better understand this population and the factors that affect its population dynamics. It would be useful to combine goat counts with helicopter deer counts where possible, so we can be aware of numbers. Ensuring that the population doesn't exceed current numbers, and is preferably reduced in number, would help to safeguard sensitive habitats.	Land managers NatureScot
Habitat Management	This is currently being addressed through the Glen Strathfarrar and Affric to Kintail Deer Management Plans, as well as the Forestry and Land Scotland Upper Beauly Land Management Plan. Glen Affric NNR is also managed via the Glen Affric NNR Management Plan.	Land managers NatureScot FLS
Restricted Distribution	For mountain willow scrub, which currently has a restricted distribution and extent on site,	Land managers NatureScot

	translocations to bolster the population of willow spp and increase genetic diversity and distribution may be required to ensure the habitats long-term survival.	FLS
Research and monitoring	To identify emerging impacts on the habitat and their causes, in order to understand the long term issues, and to inform future management of the habitat across Scotland.	NatureScot

Current and recommended management for Caledonian forest

Issue	Measure	Responsible party
Habitat Management	Parts of the SAC are within the Glen Affric National Nature Reserve (NNR). These areas are managed in accordance with an approved NNR management plan. The plan sets out conservation measures to be carried out on the NNR. Much of this feature within Glen Affric lies within Forestry and Land Scotland (FLS) owned land, and is managed under their Glen Affric Land Management Plan.	NatureScot Landowners Land managers
Woodland expansion	A combination of measures to encourage woodland expansion should be encouraged, including deer control, fenced exclosures, natural regeneration and possibly planting and enrichment planting where necessary. Scarification and planting within existing exclosures could increase regeneration. Any fencing will have to be compliant with the policy agreed between the relevant agencies. Increased connectivity between areas of existing woodland should be encouraged. This site has significant scope for woodland expansion to meet the SAC objectives, building on the good work currently being carried out by Forestry and Land Scotland, Trees for Life, National Trust for Scotland and various Estates.	Land managers FS NatureScot
Grazing and trampling by deer	Strathglass SAC has been heavily affected by herbivore grazing and trampling, principally by red deer and locally by roe deer and feral goats. Although there is evidence that deer numbers have declined significantly with the implementation of the current Deer Management Plan, deer numbers should continue to be closely monitored and controlled. This will allow habitats to recover, set seed and regenerate released from excessive deer pressure. This is informed by Herbivore Impact Assessments and Site Condition Monitoring. The Deer Management Groups (Glen Strathfarrar DMG, Affric & Kintail DMG and Strathconon DMG) should set cull targets for the wider area based on the	Land managers NatureScot Deer Management Groups

	information available from both HIAs and SCM, since deer are a wide ranging species and management needs to be at a population level.	
Invasion by non-native species.	Pine tree lappet moth are known to be present in Glen Strathfarrar, especially at the Struy end. They continue to be monitored by the Pine Tree Lappet Moth Study Group.	Land manager Pine Tree Lappet Moth Study Group
Future threats	A coordinated resilience planning process should be developed to respond to anticipated future threats to the habitat. Management actions arising from the resilience planning process, and site-level plans, should be implemented to anticipate future threats to the habitat on the site This resilience work may also include further research to understand the vulnerabilities of the habitat.	NatureScot Land managers
Research and monitoring	To identify emerging impacts on the habitat and their causes, in order to understand the long term issues, identify refugia, and review site-level resilience plans in the light of updated future threat projections. Monitoring will help to inform future management to ensure that any changes from woodland expansion are within acceptable limits and there is no deterioration of the qualifying habitats themselves, nor the habitats of qualifying species, so that the overall integrity of the site is therefore maintained. Carry out research to inform management of needle-blight.	NatureScot, Universities Land managers FS

Current and recommended management for Bog woodland

Issue	Measure	Responsible party
Long-term resilience	A coordinated resilience planning process should be developed to respond to anticipated future threats to the habitat. Management actions arising from the resilience planning process, and site-level plans, should be implemented to anticipate future threats to the habitat on the site This resilience work may also include further research to understand the vulnerabilities of the habitat. Woodland expansion into blanket bog habitats should be encouraged to increase the extent of bog woodland, safeguarding this habitat in the long term.	NatureScot Land managers
Grazing and trampling	Strathglass SAC has been heavily affected by herbivore grazing and trampling, principally by red deer and locally by roe deer and feral goats. Although there is evidence that deer numbers have declined significantly with the implementation of the current Deer Management Plan, deer numbers should continue to be closely monitored and controlled. This will allow habitats to recover, set	Land manager Deer Management Groups NatureScot

	seed and regenerate released from excessive deer pressure. This is informed by Herbivore Impact Assessments and Site Condition Monitoring. The Deer Management Groups (Glen Strathfarrar DMG, Affric & Kintail DMG and Strathconon DMG) should set cull targets for the wider area based on the information available from both HIAs and SCM, since deer are a wide ranging species and management needs to be at a population level.	
Invasion by non-native species.	Detail on what is known of contemporary situation and discussions of options available (over what % of site/location)	Land manager
Excessive water loss and maintenance of hydrological regime	The hydrology of areas of bog woodland should be safeguarded though drain blocking, maintenance of existing dams and establishment of new dams where drainage is having a negative impact.	Land owners, Land managers
Maintenance of surrounding woodland structure	Surrounding woodland should be encouraged to regenerate into areas of existing bog woodland and extend into areas of existing blanket bog to form new areas of bog woodland.	Land manager
Habitat Management-recognising other overlapping designation interests	Parts of the SAC are within the Glen Affric National Nature Reserve (NNR). These areas are managed in accordance with an approved NNR management plan. The plan sets out conservation measures to be carried out on the NNR.	NatureScot Landowners, Land managers
Future threats	A coordinated resilience planning process should be developed to respond to anticipated future threats to the habitat. Management actions arising from the resilience planning process, and site-level plans, should be implemented to anticipate future threats to the habitat on the site This resilience work may also include further research to understand the vulnerabilities of the habitat.	NatureScot Land managers

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. Anthropogenic causes of disturbance which prevent otter from making full use of core foraging and resting areas should be avoided. Disturbance from within or outwith the site that results in a change in behaviour of individuals to the extent that energetics are effected and ultimately local survival and/or productivity is affected (potential for population decline in the long term), or disturbance which results in death of individuals (potential for population decline in the long term) should be avoided.	All

Ongoing site protection	Glen Strathfarrar, Liatrie Burn, Glen Affric and Affric to Cannich Hills are SSSIs, and changes to land management described on the list of Operations Requiring Consent must have prior consent from NatureScot.	Land managers NatureScot
Freshwater habitats	Ensure that extent of freshwater habitats is retained and access is not restricted. This includes suitable habitats for salmonids, sticklebacks and eels.	Land managers
Water quality monitoring	Implement and maintain monitoring of key water quality parameters.	NatureScot SEPA

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