

CAIRNGORMS SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE



Glen Quoich

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Site Details

Site name:	Cairngorms
Map:	https://sitelink.nature.scot/site/8217
Location:	Highlands and Islands, North Eastern Scotland
Site code:	UK0016412
Area (ha):	57,691.73
Date designated:	17 March 2005

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	23 June 2010	Unfavourable - Bad
Acid peat-stained lakes and ponds	Favourable maintained	9 September 2014	Unfavourable - Bad
Wet heathland with cross-leaved heath	Favourable recovered	24 September 2021	Unfavourable - Bad
Dry heaths	Unfavourable recovering	14 September 2021	Unfavourable - Bad
Alpine and subalpine heaths	Favourable recovered	31 August 2021	Unfavourable - Bad
Mountain willow scrub	Unfavourable recovering	1 September 2021	Unfavourable - Bad
Juniper on heaths or calcareous grasslands	Favourable maintained	1 September 2021	Unfavourable - Bad
Montane acid grasslands	Favourable recovered	6 September 2021	Unfavourable - Bad
Dry grasslands and scrublands on chalk or limestone	Unfavourable recovering	15 September 2021	Unfavourable - Bad
Species-rich grassland with mat-grass in upland areas	Unfavourable declining	15 August 2021	Unfavourable - Bad
Tall herb communities	Favourable maintained	1 September 2021	Unfavourable - Bad
Blanket bog	Unfavourable recovering	21 September 2021	Unfavourable - Bad

Very wet mires often identified by an unstable 'quaking' surface	Favourable maintained	28 September 2021	Unfavourable - Bad
Hard-water springs depositing lime	Favourable maintained	3 April 2007	Unfavourable - Bad
High-altitude plant communities associated with areas of water seepage	Unfavourable recovering	1 September 2021	Unfavourable - Bad
Acidic scree	Favourable maintained	8 September 2015	Unfavourable - Inadequate
Plants in crevices on acid rocks	Favourable maintained	3 September 2021	Unfavourable - Bad
Plants in crevices on base-rich rocks	Unfavourable no change	1 September 2021	Unfavourable - Inadequate
Caledonian forest	Unfavourable recovering	5 October 2015	Unfavourable - Bad
Bog woodland	Favourable maintained	5 September 2002	Unfavourable - Inadequate
Otter (<i>Lutra lutra</i>)	Unfavourable declining	22 September 2011	Favourable
Green shield-moss (<i>Buxbaumia viridis</i>)	Favourable maintained	2 May 2006	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. This will change over time as new surveys are undertaken.

Conservation status is the overall condition of the feature throughout its range within the UK as reported to the European Commission under Article 17 of the Habitats Directive in 2019.

Other overlapping Protected Areas:

[Cairngorms SSSI](#), [Eastern Cairngorms SSSI](#), [Abernethy Forest SSSI](#), [Northern Corries SSSI](#), [North Rothiemurchus Pinewood SSSI](#), [Inchrory SSSI](#), [Glenmore Forest SSSI](#), [Allt Mor SSSI](#), [River Feshie SSSI](#)

[Abernethy Forest SPA](#), [Cairngorm Massif SPA](#), [Cairngorms SPA](#)

River Spey SAC, River Dee SAC

Cairngorm Lochs Ramsar site.

There are also a number of overlapping geological (Geological Conservation Review) sites.

CONSERVATION ADVICE PACKAGE

This conservation advice package sets out the Conservation Objectives for the Cairngorms SAC, and explains what management would benefit the Annex 1 habitats and Annex II species for which the site is designated. It is advice, and it will provide a framework for future decision making affecting the site. It is not intended to set out a response position for all potential future casework – each proposal will be considered according to its merits. It is not a management plan. It is intended to cover a 200 year time scale.

The package is supported by:

- Prioritisation guidance on favouring one feature over another
- Guidance on tree planting in the Cairngorms SAC
- Habitats Regulations Appraisal of effect of expansion of Caledonian Forest on other European sites

1. Key factors affecting the qualifying features

The Cairngorms SAC is 57,685 ha, which is a large site by UK standards. It encompasses the Cairngorm mountains, Britain's largest area of arctic-alpine habitats, and its associated moorland, forests and grasslands. It includes a number of lochs and lochans, many of which are also part of Cairngorm Lochs Ramsar site. The SAC habitats cover the altitudinal range of the site, with the lower level wet mires, species rich grassland with Mat-grass on the valley bottoms and sides, and Caledonian forest and bog woodland. Base rich areas have juniper on heaths or calcareous grasslands and dry grasslands and scrublands on limestone. The higher moorlands have blanket bog, dry heath and wet heath. These grade into wind clipped and rocky habitats with alpine and sub-alpine heaths and the montane grasslands with thin vegetation amongst rock and gravel on the highest ground. The cliffs have plant communities in crevices in rock faces, scree, and tall herb communities on cliffs and steep ground. Finally, otter and green shield-moss are specific species recognised by this designation. A description of each feature is provided below with the key factors affecting it.

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

This habitat includes 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 is typical of 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, which can be exposed on the lake shores during summer.

Cairngorms SAC contains the highest altitude oligotrophic waterbodies in the UK. This complex of lochs has a range of conditions. The very highest waters (corrie and

plateau lochs at >900 m) have rocky substrates and very low nutrient status, and suffer a harsh climate by British standards. These factors lead to low species diversity and the absence of aquatic macrophytes. This is an extreme variation of the habitat type. Lochs on the valley floors have more sheltered conditions and the occurrence of finer sediments allows limited establishment of higher plants, although these are still extremely nutrient poor systems. Some of the major lochs include Loch an Eilein, Loch Eanaich, Loch Avon, and Loch Builg and there are many smaller lochs and lochans.

Key management issues potentially include changes to hydrology, invasive non-native species, surface water pollution, and air pollution. The risk of non-native species is both plant species such as *Crassula helmsii*, also known as the New Zealand Pigmyweed or Australian Swamp Stonecrop, and animal species such as the release of pike in lochs and lochans where it does not naturally occur. Some degree of artificial nutrient enrichment is likely to occur from pollution in rainfall.

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

1.2 Acid peat-stained lakes and ponds

Acid peat-stained lochs and lochans are lochs with brown water on peat. They most often occur on blanket bogs, but may also be present on raised bog and may include isolated seasonal pools, permanent waters, and groups of pools and small lochs. These water bodies are very acidic and poor in plant nutrients. They are predominantly rain fed, and their water has a high humic acid content, which colours the water. The pools are naturally species-poor often with a peaty bottom. Notable scarce dragonfly species are associated with dystrophic lakes and ponds.

There are many acid peat-stained lochs and ponds on Cairngorms SAC. An example is Loch Etchachan which is an upland loch located at an altitude of 927m. The lochs vary significantly in size and are scattered across the site wherever suitable peatlands exist.

The health of these lochs is often closely linked with the surrounding land. Key requirements for this habitat type are the maintaining of an appropriate hydrological regime and prevention of pollution.

Further information about Acid peat-stained lakes and ponds can be found [here](#).

1.3 Wet heathland with cross-leaved heath

Wet heath is one of the most widespread habitats in Cairngorms SAC and the site has the largest extent of wet heath in this part of the UK. Wet heaths usually occur on wet, shallow peat and typically have cross-leaved heath *Erica tetralix* and/or deergrass *Trichophorum cespitosum* along with heather *Calluna vulgaris*.

On Cairngorms SAC wet heath is extensive on gentler slopes, and on the lower slopes of corries and small glens. It usually occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage so they remain wet for much of the time.

At high altitude in Cairngorm SAC, wet heaths occur in mosaics with Alpine and Boreal heaths; in these situations lichens and northern or montane species may be well represented. Cross-leaved heath *Erica tetralix* is typically absent due to the severity of the climate. Wet heaths also occur in gradients between dry heath and blanket bogs.

This habitat was found to be favourable recovered. Based on monitoring in 2021, the average browsing of dwarf shrubs was 6%, and there was negligible drainage due to human or animal activities. Two samples failed the assessment, both on the periphery of the SAC, and one was in an atypical location. The measure for crushed sphagnum and disturbed bare ground were both under 1%.

The potential generic key management issues are the nature and extent of deer pressure, grazing and trampling generally, burning including wildfire, peat erosion, forestry, non-native species, and air pollution. At some locations, wet heaths can be vulnerable to habitat loss for development such as hill tracks. These pressures are not currently affecting the wet heath feature on Cairngorms SAC to any great extent.

Further information about wet heathland with cross-leaved heath can be found [here](#).

1.4 European dry heaths

Cairngorms SAC has the largest extent of European dry heaths in a UK designated site, and is representative of the upland heaths of the cool and less oceanic north-east of Scotland. The site contains extensive examples of all the heath types characteristic of the eastern Highlands. Dry heaths are usually dominated by heather *Calluna vulgaris* and can have a significant proportion of bearberry *Arctostaphylos uva-ursi*. Bearberry heaths are uncommon in a UK context and the distribution of one type, *Calluna vulgaris* – *Arctostaphylos uva-ursii* heath (H16), is centred on north-east Scotland. Cairngorms SAC is important for the rare species rich type of this heath, principally known in the SAC at Tulloch Moor. Other species rich heaths mostly occur at Inchroary in the SAC.

Dry heaths typically occur on freely draining, acidic to almost neutral soils with a generally low nutrient content. Ericaceous (heathy) 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), and grazing and burning intensity.

Dry heath is one of the most abundant habitats in Cairngorms SAC. It is widespread at dryer locations, typically on peat over gravel, across the whole site. It disappears at the higher altitudes where it is replaced by the alpine heaths, or under the Caledonian forest on the lower ground.

Nearly all dry heath is semi-natural, being derived from woodland through a long history of grazing and burning. Most dry heath on this site is managed as deer forest or grouse moor, with some extensive grazing for livestock (sheep and cattle). Grazing pressure is the most important factor for this habitat. Very high grazing can suppress the heathers and ultimately convert a heath to a grassland. Additional influences for all dry heath includes tracks and paths that can cause fragmentation,

degradation and erosion. Other generic key management issues include forestry, problematic native and non-native species and development.

The dry heath was found to be in unfavourable recovering condition. Overall it is recovering from past burning in sensitive areas, and browsing, in this case due to sheep grazing, in part of the site.

Further information about European dry heath can be found [here](#).

1.5 Alpine and Boreal heaths

Alpine and boreal heaths are characterised by the dominance of the vegetation by a heather *Calluna vulgaris* and other dwarf-shrubs, along with a mixture of Cladonia lichens and woolly hair-moss (*Racomitrium lanuginosum*). The heather and other heathy species are often severely wind-clipped.

This habitat is widespread on the upper slopes and plateaux across the whole of the Cairngorms SAC, usually over 700m. 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. They can include scattered trees and shrubs. On lower slopes, Boreal heaths may grade into floristically similar European dry heaths.

The Alpine and Boreal heath is in favourable recovered condition. In the 2021 monitoring, all plots passed the favourable condition thresholds. In the past it has been unfavourable due to the low collective cover of indicator species, the levels of grazing and burning, and amount of disturbed bare ground.

Alpine and Boreal heaths which are rich in bryophytes, lichens, and also juniper-rich heaths, are particularly susceptible to disturbance, especially by fire. Rocky ground can be important in protecting heaths from fire. Similarly, lichen-rich heaths are susceptible to trampling. Grazing is another potential impact on this habitat, and tree regeneration could also be an issue on the boreal heaths.

Further information about Alpine and Boreal heaths can be found [here](#).

1.6 Mountain willow scrub

Mountain willow scrub is the UK's highest-altitude shrubby vegetation, occurring on moist soils in rocky situations on mountains. It is predominantly a natural habitat, and is the climax vegetation due to the harsh climate at the high altitudes where it occurs. 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.

Different species of willow demand greater or lesser amounts of lime in the rocks. Some species are relatively undemanding and can grow on lime-poor rocks, and are therefore the most widespread species because lime-poor rocks are widely

distributed. Other species are more lime-demanding and are rare because suitable lime-rich rocks are localised. At Mar Lodge mountain willows occur on habitats which are not especially base-rich.

Stands of willow *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 scattered bushes.

Mountain willow scrub occurs in Glen Einich at Coire Odhar, Glen Feshie at Slocht Beag, Creag an h'olaire, Druim na Bo, and Coire Garbhiach, Beinn Bhrotain, the slopes above the southern shore of Loch Avon, an Garbh Coire to the east of Carn na Criche, Creag an Dail Beag, Garbh Choire and by the Glas Allt Mòr as it descends off Mòine Bhealaidh at the top of Glen Derry.

Most of these sites are dominated by whortle-leaved willow *Salix myrsinites*. At Coire Odhar in Glen Einich there is a population of downy willow *Salix lapponum*, along with browsed downy birch and rowan, and *S. lapponum* also occurs by the Glas Allt Mor in Glen Derry.

Mountain willow scrub was found to be in unfavourable recovering condition. Although some populations were browsed by deer and mountain hare, others are stable and in some places there are indications that the population is recovering, with willow spreading to accessible slopes. The populations are generally quite small.

The key management issue for this habitat is grazing pressure; this is believed to have reduced and restricted its occurrence. Climate change may alter the amount of snow falling and how long it lasts, which could result in the willows being more exposed to grazing and to frost/wind damage. Muirburn also has the ability to have serious negative impacts on this habitat.

In the long term 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. Willows are dioecious (male and female flowers on different trees), so seed cannot be produced unless both male and female plants are present. Planting may therefore be necessary in order to enable some populations to reproduce, otherwise some populations may be limited to vegetative propagation.

Further information about mountain willow scrub habitat can be found [here](#).

1.7 Juniper on heaths or calcareous grasslands

This habitat has juniper bushes which can be scattered or continuous, occurring over both heaths and/or calcareous grasslands. In Cairngorms SAC it occurs in Glen Feshie around Ruigh-aiteachain and Glen Feshie Lodge, but it is also present in smaller quantities within the Inchroy SSSI part of Glen Avon.

This habitat is influenced by the calcareous or acidic substrate, altitude, the grazing regime and whether it is a transition between a range of habitats with the result that a diversity of scrub types may occur within an individual location.

Juniper can occur in heaths and Caledonian pinewood, and the transition between the two. Abernethy Forest is an important area for this transition.

Juniper is a dioecious species (male and female flowers on separate plants). Most populations are large enough to have both male and female plants and juniper berries can be produced, but any very small populations may benefit from reinforcement.

Heavy grazing, by stock or deer, can result in juniper becoming like topiary, and no new growth surviving from year to year. This removes many of the berries, and young seedlings are also likely to be eaten where the grazing level is heavy.

Juniper bushes are killed by burning.

Disease is another key factor. Juniper in Badenoch and Strathspey has been shown to carry the fungal pathogen *Phytophthora austrocedrae*, which can kill bushes, but it was not found in the Site Condition Monitoring for Cairngorms SAC carried out in 2015. At the moment, where *Phytophthora* occurs only a small number of juniper bushes are affected, but the long term prognosis is unknown. There is no management which can effectively control the disease. [Guidance](#) is available on planting juniper in Scotland to minimise the risk of infection from *Phytophthora austrocedrae* to native populations.

Key management issues are grazing, particularly red deer activities, burning and disease. Liming and fertilising for agriculture or changes to land use such as afforestation, or invasion by non-native species could also affect this habitat.

Further information about Juniper on heaths or calcareous grasslands can be found [here](#).

1.8 Montane acid grasslands

Montane acid grassland is normally short, high altitude vegetation with species such as mat grass *Nardus stricta*, stiff sedge *Carex bigelowii*, and woolly-hair moss *Racomitrium lanuginosum*. It occurs on thin soils where the exposure is such that mosses, especially woolly hair-moss, dominate the vegetation.

This habitat is exceedingly widespread across most of the central and higher altitudinal parts of the SAC, 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.

It was found to be favourable recovered when monitored, and all samples passed the assessment.

Montane acid grassland is vulnerable to nutrient inputs and physical damage such as occurs due to dunging and urination by grazing animals, acid deposition, human and animal trampling, skiing and use of all-terrain vehicles. Some aspects of this habitat, for example mosses, liverworts and lichens, may be affected by climate change in the longer term.

Further information about Montane acid grassland can be found [here](#).

1.9 Dry grasslands and scrublands on chalk or limestone

This habitat is dominated by grasses and it is often species-rich. The grasslands are found on thin, well-drained, lime-rich soils, which on this site are associated with metamorphosed limestone and base-rich gneiss. The structural and floristic characteristics of the habitat are strongly influenced by climatic factors and management practices, in particular the intensity of grazing. This habitat occurs at Inchrory and Glen Feshie.

The monitoring of this habitat found it was unfavourable recovering. Most of the plots were favourable but a few were not, due to too few forbs (flowering plants), not enough grazing, too much disturbed bare ground and cover of tall grassland species and weeds.

Key management issues are managing the grazing pressure so that it is not too high that plants cannot establish, or too low, so that vigorous grasses come to dominate the vegetation. Grazing can be from rabbits and deer as well as stock. Too great an impact from trampling can lead to disturbance and erosion. Another issue is tree or scrub establishment, which would lead to shading and a decrease in species richness. Non-native species can occur, as can bracken.

Further information about Dry grasslands and scrublands on chalk or limestone can be found [here](#).

1.10 Species-rich grasslands with mat-grass in upland areas

Species-rich grassland with mat-grass *Nardus stricta* in upland areas tend to develop where there is flushing through base-rich strata on siliceous bedrock. These may include moderately base-rich metamorphic and igneous rocks. The soils have an acidic pH (<7.0 and mainly <6.0) and are derived from bedrocks with at least some silica. On Cairngorms SAC the largest areas are in Glen Feshie and Inchrory, but it also occurs in smaller patches on suitable ground elsewhere, for example at Mar Lodge.

This feature was monitored as unfavorable declining because the composition of the grassland (too few forbs – flowering plants and too much crested dog's-tail *Cynosurus cristatus*), grazing level not being high enough, and disturbed bare ground.

Key management issues are managing the grazing pressure so that it is not too high that plants cannot establish, or too low, so that vigorous grasses come to dominate the vegetation. Another issue is tree or scrub establishment, which would lead to shading and a decrease in species richness. Non-native species can occur, as can bracken. This habitat is particularly susceptible to changed nutrient status e.g. agricultural improvement, burning over and under-grazing, forestry, air pollution and damage from recreational pressure.

This is a Habitats Directive Priority habitat.

Further information about Species-rich *Nardus* grasslands can be found [here](#).

1.11 Tall herb communities

Tall herb communities contain species such as greater woodrush *Luzula sylvatica*, wood cranes bill *Geranium sylvaticum* and other large herbs. The habitat typically occurs on ungrazed upland cliff ledges, occasionally extending on to open ground, and are restricted to base-rich substrates and somewhat sheltered situations. It provides a refuge for rare, grazing-sensitive, montane plants. This is one of the few near-natural habitats remaining in Britain and frequently occurs in intimate mosaics with other Annex I habitat types in these ungrazed, or very lightly grazed, situations.

Variation within the habitat type is related chiefly to geographical position, altitude, and soil conditions and rock type. It is characterised by a species-rich mix of tall, broad-leaved herbs, most of which are otherwise rare in the uplands owing to their sensitivity to grazing. On Cairngorm SAC it mainly occurs on base-rich cliffs in areas such as Glen Feshie.

Key management issues include ensuring only low/no grazing from domestic stock and deer and invasion by other species.

Further information about Tall-herb communities can be found [here](#).

1.12 Blanket bogs

Blanket bogs normally occur on deep peat and tend to have tussocky, thick vegetation with species such as heather *Calluna vulgaris*, hair's-tail cottongrass *Eriophorum vaginatum*, common cotton-grass *Eriophorum angustifolium* and bog-moss *Sphagnum* species. These bogs are found in areas of moderate to high rainfall with gentle slopes or flat ground, where drainage is impeded. The wet conditions allow 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.

Blanket bog is one of the most commonly occurring habitats on Cairngorms SAC. It can occur at any altitude and the site has some of the highest altitude blanket bog in the UK, for example over 950m at Moine Mhor.

There are extensive areas of peat erosion of the blanket bog in some areas. High altitude blanket bogs are more susceptible to peat erosion than lower level bogs. An example is the area between Carn Bàn Mòr and Mullach Clach a' Bhlàir and further south towards the confluence of the Rivers Eidart and Feshie. Some gullies are starting to re-vegetate and to stabilise, and typically common cotton-grass *Eriophorum angustifolium* is re-vegetating on the sides and bottoms of the gullies. Where erosion progresses to the mineral soils, blanket bog tends to be replaced by other habitats such as montane acid grasslands or alpine heaths.

Blanket bog was found to be in unfavourable recovering condition when it was monitored in 2021. In the past it failed because it had too much disturbed bare peat, and eroding peat. It also failed because the browsing level was too high and there

were too few indicator species. More recent survey found low herbivore impacts, and recovery is occurring.

Key generic management issues include peat erosion, over-grazing and/or trampling by domestic stock or red deer, burning, changes in the hydrology, non-native species, air pollution, and infrastructural development.

Further information about Blanket bog can be found [here](#).

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

This feature is also known as transition mires and quaking bogs. The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is transitional between acid bog and alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich.

The habitat occurs within the Abernethy Forest SSSI, North Rothiemurchus Pinewoods SSSI and Glenmore Forest SSSI parts of the Cairngorms SAC. It occurs in small scattered locations in the very wettest parts of basin mires, the edges of blanket bog habitat and seepage areas within mire complexes.

Key factors affecting this habitat type are alterations to the hydrology, overgrazing and disturbance to the surface i.e., trampling, and tree/scrub establishment.

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

1.14 Hard water springs depositing lime

This habitat occurs as small, scattered flushes, and the total area is small. Groundwater rich in calcium bicarbonate comes to the surface forming a hard deposit of calcium carbonate (tufa). Tufa formation is characteristic of hard-water springs, and has been forming for thousands of years at this site.

Within the Cairngorms SAC, the Hard-water springs depositing lime habitat is only found within Inchroary SSSI. It occurs on metamorphosed limestones and related calcareous schists. There are a number of springs where tufa formations is very active, but not all of them support the curled hook-moss *Palustriella commutata* dominated vegetation often characteristic of this habitat. The vegetation is open, scattered, and contains rare and scarce species.

Key management issues for this habitat type are grazing pressure/trampling, primarily from deer at the current time.

This is a Habitats Directive Priority habitat.

Further information about Hard water springs depositing lime can be found [here](#).

1.15 High altitude plant communities associated with water seepage

This habitat is usually very small in extent and can occur wherever there is a suitable flush on the higher ground where sheathed sedge *Carex vaginata* is present. The flushes are usually mossy, and some of the arctic-alpine plants which characterise

the alpine flushes in the Cairngorms SAC are three-flowered rush *Juncus triglumis* and Scottish asphodel *Tofieldia pusilla*.

The characteristic plant communities colonise open substrates that are constantly flushed by surface seepage of cold, base-rich water. They are amongst the few remaining natural plant communities in the UK and are maintained by harsh climatic and soil conditions.

Key factors affecting this habitat include inappropriate levels of grazing and/or trampling by deer and livestock and, atmospheric pollution adding nitrogen, and maintaining the hydrology especially the wetness of the habitat.

This is a Habitats Directive Priority habitat.

Further information about High altitude plant communities associated with water seepage habitat can be found [here](#).

1.16 Acidic scree

Scree consists 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 natural disturbance. Acidic screes are made up of siliceous rocks such as quartzite, granite and sandstone.

This habitat is widespread on the steep slopes of the glens, particularly below cliffs and is also frequent on gentler slopes and ridges of the highest mountains and around corries. What little vegetation is present is usually dominated by woolly hair-moss *Racomitrium lanuginosum*, heather *Calluna vulgaris* and sometimes blaeberry *Vaccinium myrtillus*.

Key factors include removal of rock for footpath works, quarrying for road stone or other uses, or overgrazing by deer or goats.

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

1.17 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.

This habitat is widespread at Cairngorms SAC where suitable cliffs and steep rocky slopes exist. It occurs on the granite and base-poor metamorphic rocks. 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.

The key factor is that they can be sensitive to overgrazing and trampling although many sites are protected by inaccessibility.

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

1.18 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 calcareous rock faces. These are lime-rich rocks such as metamorphosed limestone and calcareous schists. Due to the rarity of calcareous rocks, the habitat is localised and fragmentary. The type of plant community that develops is largely determined by the base-status of the rock face.

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.

The Plants in crevices on base-rich rocks habitat occurs at the cliffs and outcrops of limestone within the Inchroy SSSI, and also at Coire Garbhloch in Glen Feshie, and on the cliffs above Lochan Uaine on the east side of Ben Macdui.

The habitat was found to be unfavourable when it was last monitored in 2007, due to high tree and shrub coverage, the presence of alien species (fairy foxglove *Erinus alpinus*) and low presence of indicator species at some of the locations monitored. Also, Cotoneaster species have established on the cliffs immediately above Inchroy Lodge.

The habitat can be sensitive to overgrazing and trampling although many sites are protected by inaccessibility. The base-richness of calcareous rocks may facilitate competition from more vigorous native species, or non-native invasives such as Fairy foxglove, New Zealand willowherb and Cotoneaster. Trees can establish on the habitat.

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

1.19 Caledonian forest

Cairngorms SAC is the most important site in Scotland for Caledonian Forest because it is the most extensive area of native pinewood in the UK and comprises almost half the total area of ancient Caledonian Forest in Scotland.

Caledonian Forest comprises relict, indigenous pine forests of Scots pine *Pinus sylvestris* var. *scotica*, and associated birch *Betula* spp., rowan *Sorbus aucuparia* and juniper *Juniperus communis* woodlands of northern character. These stands are mapped in the Caledonian Pinewood Inventory (Forestry Commission 1998) and include self-sown stands naturally regenerated from stock of genuinely native local origin recorded in the inventory. It is usually found on strongly-leached, acidic podzols, and these soil conditions are reflected in the ground flora. This habitat

includes some birch-dominated stands of oak-birch or birch-molinia character, and also stands of juniper-oxalis woodland where these occur within pine forest.

The majority of this habitat corresponds to pine woodland, but it also includes some birch-dominated woodland stands. Caledonian forest is therefore defined as being dominated by Scots pine, but it may contain areas of native broadleaved trees where this is ecologically appropriate. This is determined by the ecology of each species, the local seed source, and the soil type.

Caledonian Forest is a Habitats Directive Priority habitat. The key areas of Caledonian Forest within Cairngorms SAC are Mar Lodge, Abernethy Forest, Rothiemurchus, Glenmore Forest including the Northern Corries and Ryvoan, Inshriach and Invereshie, and Glen Feshie.

Caledonian Forest is unfavourable recovering because it has too much non-native regeneration and not all age classes fully represented, i.e., not enough young trees in some places, and large stands of single-age trees in others. It is recovering due to positive site management.

Management issues include grazing levels, spread of forest over other European habitat types, impacts from forestry and woodland management, burning and recreational impacts. Regeneration of non-native species is present in places. Further pressures on the habitat are also anticipated, particularly from the effects of climate change (drought, waterlogging, windblow etc.), and of novel pests and pathogens.

Further information about Caledonian forest can be found [here](#).

1.20 Bog woodland

Bog woodland exists where the trees (principally Scots pine) grow on a rain-fed (ombrotrophic) bog without the loss of the bog species. It is found over bog and wet heath habitats and due to the wetness of the ground, the trees are characteristically scattered, slow growing, and stunted. On Cairngorm SAC most trees on bog woodland are Scots pine, but other native tree species such as downy birch are also included in this habitat.

Bog woodland occurs in Abernethy Forest, Dell Wood, Rothiemurchus, Glenmore Forest, the lower parts of the Northern Corries SSSI and on the eastern side of the Cairngorms, east of the Lui and at Doire Braighaid around NO069905. This is a Habitats Directive Priority habitat.

This feature requires a combination of suitable hydrological conditions within bogs. Many bogs were cut over historically and on this site, they have fully re-vegetated with natural vegetation. Many bog woodlands also have ditches or drains which lower the water table. On parts of this site, bog woodland has been enhanced by blocking ditches, which has raised the water table to a more natural level. Some areas still have old drainage. The bog in these sites should be actively growing. This habitat is sensitive to climate change.

Key management issues include past drainage, other changes to local and catchment hydrology, the presence of a seed source of native species, non-native tree regeneration, and grazing and trampling levels with their effects on tree recruitment.

Further information about Bog woodlands can be found [here](#).

1.21 Otter

Otter are widespread across the Cairngorms SAC, everywhere where there are streams, lochs and lochans, especially where the water is productive enough for fish and amphibians to be present.

Otter require continued proximity to unpolluted open water. 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.

Otter were recorded at unfavourable declining when last monitored, due to a reduction in the number of signs of otter and otter prey in terms of fish.

Previous population declines in otters were primarily due to pollution, persecution and habitat loss. Otter are vulnerable to road traffic and development can lead to loss of habitat, holts or resting places.

Further information about otters can be found [here](#).

1.22 Green shield-moss

Green shield-moss is a scarce moss. It has a restricted distribution within Scotland and is not found in the rest of the UK. It occurs in Abernethy and Glenmore Forests. It is found primarily on well-rotted Scots pine, birch, rowan, willow, alder, juniper, oak and commercial conifer logs, however, and also on Norway spruce cut down no more than ten years ago, old wood ant nests, old bracket fungi, and occasionally on organic soil.

The main factor that could affect the green shield-moss population at the Cairngorms SAC is from competition with other mosses and liverworts through micro-habitat succession on occupied deadwood. Other threats and pressures include the removal of dead and dying trees, including debris, or forest management to reduce old growth forests, both of which would reduce the availability of suitable habitat.

Further information about green shield-moss can be found [here](#).

2. Conservation Priorities

This SAC overlaps with Cairngorms SPA, Cairngorms Massif SPA and Cairngorm Lochs Ramsar site. Any proactive management for the SAC or assessment of plans or projects will also need to take account of the SPA and Ramsar interests.

All of the features on Cairngorms 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 Habitats Directive Priority habitats are given a higher priority than the other European features, habitats which are a primary reason for site selection also generally take priority over habitats which were not the primary reason for site selection, European features take priority over SSSI features, and European and SSSI features take priority over un-designated interests.

Table of Conservation Priorities

European habitat	Is the habitat a primary reason for site selection?	Is the habitat a priority habitat?
Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels	Primary reason for site selection	
Acid peat-stained lakes and ponds		
Wet heathland with cross-leaved heath	Primary reason for site selection	
Dry heaths	Primary reason for site selection	
Alpine and subalpine heaths	Primary reason for site selection	
Mountain willow scrub		
Juniper on heaths or calcareous grasslands	Primary reason for site selection	
Montane acid grasslands	Primary reason for site selection	
Dry grasslands and scrublands on chalk or limestone		
Species-rich grassland with mat-grass in upland areas	Primary reason for site selection	Priority
Tall herb communities		
Blanket bog	Primary reason for site selection	Priority
Very wet mires often identified by an unstable 'quaking' surface		
Hard-water springs depositing lime	Primary reason for site selection	Priority
High-altitude plant communities associated with areas of water seepage	Primary reason for site selection	Priority

Acidic scree	Primary reason for site selection	
Plants in crevices on acid rocks	Primary reason for site selection	
Plants in crevices on base-rich rocks		
Caledonian forest	Primary reason for site selection	Priority
Bog woodland	Primary reason for site selection	Priority
Otter (<i>Lutra lutra</i>)		
Green shield-moss (<i>Buxbaumia viridis</i>)		

This document advises that Caledonian Forest should in general be allowed to extend from existing forests by natural regeneration, onto dry heath, wet heath, heath with juniper, blanket bog and boreal heath (alpine heath is too high for trees) without area limits or time limits. Natural regeneration may also be allowed by Caledonian Forest onto chasmophytic vegetation. Natural regeneration would be an ongoing process but may need to be subjected to closer HRA-type scrutiny in certain situations.

Caledonian Forest is defined as being dominated by Scots pine, but it may contain areas of native broadleaved trees where this is ecologically appropriate, as determined by the ecology of each species, the local seed source, and the soil type.

Where *Calluna vulgaris*-*Arctostaphylos uva ursi* (H16) heath occurs within the Caledonian pine expansion zone, management decisions on whether to prioritise forest or heath are made on a case-by-case basis. Factors to be considered might include the type of H16 heath, its extent and representivity, and the feasibility of management. For example, there may be conservation reasons such as removing trees from *Arctostaphylos* heath to benefit the heath, or to keep open an area used by black grouse to lek, and there will be other similar reasons why open ground might be retained. Regeneration could also be removed for management reasons, such as to create patches of open ground to facilitate deer control within the forest or the forest edge.

Other species-rich grass-heaths, for example species-rich H10 *Calluna vulgaris* – *Erica cinerea* heath and associated species-rich areas of H12 *Calluna vulgaris* – *Vaccinium myrtillus*, are very limited in extent and mostly occur at Inchrory where they should be maintained as open ground, to maintain the range of heath types on the SAC.

Most of the Heath with juniper habitat occurs within the Caledonian Forest expansion zone. Juniper is a component of Caledonian Forest and at lower altitudes, heath with juniper may precede a transition to forest. Juniper would be generally allowed to colonise the European heath habitats, and Scots pine to colonise heath with juniper. These changes would be allowed where they are natural establishment from existing seed sources.

Juniper can be an important component of the tree line Caledonian Forest, as occurs at Creag Fhliaclach. The tree-line is moving up the hill as a result of herbivore

control, as trees become denser and able to provide mutual support, and as the climate changes. Further heath with juniper might be expected to develop above this through natural processes where conditions are suitable.

At Inchrory, juniper occurs on calcareous soils in contrast to the majority of the SAC where it occurs on acidic soils. Juniper on heath/grassland at Inchrory should be maintained in keeping with management to maintain the species rich grassland and heath at this part of the SAC.

As Mountain willow scrub is a rare and threatened habitat, willows are allowed to expand onto other cliff-based communities such as *tall herb, dry grasslands and scrublands on chalk or limestone* and *species-rich grassland with mat-grass in upland areas*. Ideally expansion of mountain willow would be by natural regeneration, and achieved by reducing grazing by herbivores. However, under current conditions, it is likely that expansion would need to be achieved by planting. Natural regeneration would be retained unless removal is critical to maintain another European habitat.

Scots pine would be allowed to colonise blanket bog and *very wet mires often identified by an unstable 'quaking' surface* where this is a natural process, since this would create bog woodland which is a rare European habitat. Bog woodland is a priority habitat; and very wet mires are not a priority habitat.

There are two European grassland habitats on this site:

- species-rich grassland with mat-grass in upland areas
- dry grasslands and scrublands on chalk or limestone

These occur at two key areas: Glen Feshie and Inchrory, although they are also scattered elsewhere for example Mar Lodge. At Inchrory SSSI, management should favour the grasslands because this is one of the best parts of the SAC for them, and the aim is to maintain both the extent and the good condition of the grasslands. Elsewhere management for Caledonian Forest could be prioritised where it is occurring from natural regeneration from existing forests. Decisions should be made on a case-by-case basis.

Atlantic salmon are a qualifying species for the overlapping River Spey and River Dee SACs. Salmon would benefit from new riparian woodland because trees shade rivers and streams, and they would increase the biomass of invertebrate food from leaves and invertebrates falling into the water. Blanket bog is a priority habitat which must be prioritised over a non-priority feature such as salmon, but small amounts of trees or shrubs could be accommodated alongside rivers and streams while keeping the blanket bog habitat in good condition. Small amounts of trees and shrubs could also be accommodated in dry heath and wet heath, where the trees arise from natural regeneration or small scale planting.

More information on these priorities can be found in the supporting document on favouring one feature over another in the Cairngorms SAC. Supporting guidance has also been produced on small-scale tree planting in the Cairngorms SAC.

3. Conservation Objectives

3.1 Overarching conservation objectives for all habitat features

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

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

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

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

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

The aim at this SAC is to restore the protected habitats in a favourable condition as a contribution to their wider favourable conservation status. Therefore any impacts on the objectives shown in 2a, 2b, or 2c below must not persist so that they prevent the achievement of this overall aim. When carrying out appraisals of plans or projects the focus should be on restoring site integrity, specifically by meeting the objectives outlined in 2a, 2b and 2c. If these are met then site integrity will be restored. Note that not all of these will be relevant for every activity being considered. Any impacts on the objectives shown in 2a, 2b or 2c below must not persist so that they prevent the restoration of site integrity. Temporary impacts on these objectives resulting from plans or projects can only be permitted where there is certainty that the features will be able to quickly recover.

This objective recognises that 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 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.

3.2 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 Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels 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 1153.83ha. The area figure has been taken from the Standard Data Form. Examples include Loch an Eilein, Loch Eanaich, Loch Avon, and Loch Builg, and there are many smaller lochs and lochans.

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. Natural processes are allowed to operate and if some lochs or lochans fill in through natural infilling and the growth of vegetation over time, this would be allowed to occur.

2b. Maintain the structure, function and supporting processes of the Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels

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

Physical Attributes

-Surface Area

Changes to surface area can indicate pressures on the structure and function of lochs. The surface area of a loch may fluctuate slightly naturally. However, changes to surface area and the associated change to depth can adversely affect the character of the loch, particularly the edge vegetation. Natural processes would be allowed to occur where succession is naturally reducing the surface area of a loch or lochan.

Changes to the surface area may also indicate a number of pressures such as abstraction, regulation, construction, and excessive sediment deposition.

-Hydrological regime

The hydrology of the lochs 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, or excessive sediment deposition.

-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.

-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 the most commonly occurring form of chlorophyll. 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.

-Invasive non-native species

INNS are important for water bodies and can threaten the structure and function of a loch. *Crassula helmsii*, known as swamp stonecrop or New Zealand pigmyweed, is very invasive in many situations and has the ability to swamp both lochside and in-water vegetation. It occurs in the area and there is a risk that it could affect the Cairngorms Lochs, most likely from wildfowl transference. Pike can have a highly negative effect on fish fauna if released into water bodies where they are not naturally present, as can other fish, non-native or not, which are not naturally occurring in the water body. There is also

the risk of transferring disease or parasites in illegal releases. A list of high impact species has been agreed as part of the Water Framework Directive.

2c. Maintain the distribution and viability of typical species of the Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels

Key species for this habitat type are present in Loch Einich (altitude 500 m), which supports quillwort *Isoetes lacustris* and shoreweed *Littorella uniflora*. The rare six-stamened waterwort *Elatine hexandra* has also been recorded here. The lochs also support an important assemblage of specialist phytoplankton and zooplankton.

Typical species of oligotrophic lochs on this site:

<i>Littorella uniflora</i>	shoreweed
<i>Isoetes lacustris</i>	lake quillwort
<i>Juncus bulbosus</i>	bulbous rush
<i>Subularia aquatica</i>	awlwort
<i>Lobelia dortmanna</i>	water lobelia
<i>Salmo trutta</i>	brown trout
<i>Salvelinus alpinus</i>	arctic charr
<i>Lutra lutra</i>	otter

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.

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

2a. Maintain the extent and distribution of Acid peat-stained lakes and ponds within the site

There should be no measurable net reduction to the extent of the habitat and its distribution throughout the site except where reductions occur due to natural processes such as succession. The extent of the Acid peat-stained lakes and ponds has been estimated at 57.69ha. This figure is from the Site Data Form.

In contrast to most loch habitats, this habitat can be composed of many relatively small lochs and lochans scattered throughout the site. Where natural processes result in lochs and lochans filling in over time through natural sedimentation and/or the growth of vegetation, this is allowed to occur.

2b. Maintain the structure, function and supporting processes of Acid peat-stained lakes and ponds

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

Physical Attributes

-Surface Area

Changes to surface area can indicate pressures on the structure and function of lochs. Because they tend to be small and rather shallow the surface area of dystrophic lochs may fluctuate naturally more than other lochs. However long term changes to surface

area and the associated change to depth can adversely affect the character of the loch. Natural processes such as succession would be allowed to occur, and in the long term could result in a reduction in surface area. Artificial fluctuations to depth from activities such as abstraction can adversely affect the vegetation.

Changes to the surface area may also indicate a number of pressures such as abstraction, regulation, construction, excessive sediment deposition.

-Hydrological regime

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

-Loch substrate character

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

-Natural sediment load

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

-Connectivity between the loch and the surrounding area

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

Water Quality

-Dissolved Oxygen

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

-pH

This influences many of the chemical processes in lochs such as the binding of phosphorus. Artificial changes through eutrophication or acidification can therefore have a

significant effect. Dystrophic lochs should have pH of less than 5. Careful consideration should be given to afforestation of catchments with low buffering capacity

Nutrients

In general issues with nutrient levels are inferred from effects upon the vegetation. However there may be measurements from SCM or in some cases WFD monitoring by SEPA. Phosphorus (P) is one of the main nutrients required for plant growth and there is strong correlation between total phosphorus (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.

Nitrogen is the other main nutrient important in loch ecosystems. Although generally less likely to be limiting than phosphorus it can be limiting either on its own or co-limiting with P and nitrate has been found to adversely affect macrophytes. Both Nitrogen and Phosphorus should be low. The target for all lochs is that Annual Mean Total Nitrogen should not exceed 1.5mg/l. with no deterioration from baseline.

-Filamentous algae

Filamentous algae is a negative indicator associated with high nutrient levels. Some species can form dense floating rafts or coat macrophytes. Filamentous algae should only generally be found at low levels in dystrophic lochs.

-Invasive non-native species

INNS are important for water bodies and can threaten the structure and function of a loch. *Crassula helmsii*, known as swamp stonecrop or New Zealand pigmyweed is very invasive in many situations and has the ability to swamp both lochside and in-water vegetation. It occurs in the area and there is a risk that it could affect the Cairngorms Lochs, most likely from wildfowl transference. Pike can have a highly negative effect on fish fauna if released into water bodies where they are not already present, as can other non-native fish. There is also the risk of transferring disease or parasites in illegal releases. A list of high impact non-native species has been agreed as part of the Water Framework Directive.

2c. Maintain the distribution and viability of typical species of Acid peat-stained lakes and ponds

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

Dystrophic lochs vary greatly in their macrophyte communities, with some having none at all. Loch Etchachan has only sphagnum present. The target is no loss of typical species. Generic characteristic species are:

Sphagnum spp

This habitat can be used by dragonflies and damselflies such as white faced darter, azure hawk, northern emerald and four-spotted chaser, and other invertebrates such as pond skaters.

There should be no non-native species.

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

2a. Maintain the extent and distribution of Wet heathland with cross-leaved heath within the site

Maintain to approximately **3,800** ha. The area figure is an estimate because wet heath typically covers large areas, forming complex mosaics with blanket bog, dry heath 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.

The only acceptable reason to allow the reduction of wet heath is where the priority habitat Caledonian Forest expands by natural regeneration. In this specific case, reduction would be allowable.

Scrub is a feature of Northern Corries SSSI. Native trees and shrubs are allowed to colonise wet heath, to maintain and expand this habitat. It is effectively a component of Caledonian Forest.

There should be no measurable net reduction in the extent of wet heath and its distribution throughout the site for other reasons.

2b. Maintain the structure, function and supporting processes of Wet heathland with cross-leaved heath

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

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

- at least 25% (up to 90%) cover of dwarf-shrub heath species with *Erica tetralix* as the defining dwarf-shrub (although in some forms of wet heath, *Erica tetralix* may be infrequent or not present).
- 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.
- less than 10% of the Sphagnum cover should be crushed, broken, and/or pulled-up.
- less than 10% of the ground cover should be made up from disturbed ground (i.e. bare ground is where a substrate of bare humus, bare peat, bare mineral soil, bare gravel, or soil covered only by an algal mat, has its surface broken and imprinted by hoof marks, wallows, human foot prints, or vehicle and machinery tracks).
- less than 10% of the total feature area should show signs of active (i.e. facilitates the movement of water away from the site) drainage, resulting from ditches or heavy trampling or tracking.
- less than 10% of vegetation cover should be made up of bracken.

- less than 1% of vegetation cover should be made up of non-native species.
- less than 20% of the vegetation cover should be made up of scattered native trees and scrub (exclude *Betula nana* and *Myrica gale*).

Wet heath can be in good condition, as measured by Site Condition Monitoring, with up to 20% cover of native trees and scrub. Dwarf birch and bog myrtle can occur at any abundance – there is no limit for these species. Caledonian Forest is allowed to expand without limits onto wet heath where this is by natural regeneration from existing Caledonian forests. For other woodland types, priority is given to natural regeneration from existing woodlands, particularly where this is riparian woodland or where it would promote structural diversity (scattered native scrub and trees and small patches of woodland in areas of open heath).

The predominant requirement for wet heath is to maintain to appropriate levels of grazing and burning. These will vary according to a number of factors such as type of grazing (stock, deer or a combination) altitude, aspect, and location. Management effort should therefore be directed to maintain, and restore where necessary, 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 habitat fragmentation.

Artificial drainage damages the habitat by drying it out and should be avoided.

Where bare, eroding, peat is present on wet heath, it should be restored. This would allow the habitat to be vegetated, hence restoring natural processes.

Wildfire is damaging to this habitat and should be prevented.

2c. Maintain the distribution and viability of typical species of Wet heathland with cross-leaved heath

The wet heath community often encountered at Cairngorms SAC is deergrass *Trichophorum cespitosum* – cross-leaved heath *Erica tetralix*, which occupies the strongly flushed soils. There is also purple moor-grass *Molinia caerulea* – Tormentil *Potentilla erecta* mire and the cross-leaved heath *Erica tetralix* - *Sphagnum compactum* wet heath community.

Notably lichen-rich wet heath occurs in wet hollows amongst high altitude windswept alpine and boreal heath. Wet heath is also developed in hollows within the upper parts of Caledonian forest, and in mosaics with blanket mire and dry heath, resulting in a variety of ecological transitions.

Cross-leaved heath becomes less frequent with altitude and can disappear from the habitat on higher ground.

Typically associated birds are red grouse *Lagopus l. scotica*, golden plover *Pluvialis apricaria*, dunlin *Calidris alpina schinzii* and greenshank *Tringa nebularia* golden eagle *Aquila chrysaetos*, merlin *Falco columbarius* and hen harrier *Circus cyaneus*. Other species include red deer *Cervus elaphus* and mountain hare *Lepus timidus*. The rare montane ground-beetle *Curtonotus alpinus* is associated with wet heath in the Cairngorms, feeding on seed-heads of deergrass *Trichophorum cespitosum*. Wet heath is an important habitat for a range of vascular plant and bryophyte species.

In summary the indicator species for Northern Atlantic wet heaths with *Erica tetralix* include:

common heather *Calluna vulgaris*
bog-mosses *Sphagnum* spp.
heaths *Erica* spp.
common deergrass *Trichophorum cespitosum*
sundews *Drosera* spp.
bog asphodel *Narthecium ossifragum*

3.5 Conservation Objectives for European dry heaths [H4030]

2a. Maintain the extent and distribution of European dry heaths within the site

Maintain to approximately **11,538.35** ha. The area figure has been taken from the Standard Data Form, and is an estimate based on the fact that European dry heaths can form complex mosaics with habitats such as grasslands, wet heaths and bogs. There should be no measurable net reduction in the extent of the habitat and its distribution throughout the site except where this is due to the natural expansion of Caledonian forest habitat from existing forest.

Scrub is a feature of Northern Corries SSSI. The component species of this habitat is allowed to colonise dry heath, to maintain and expand this habitat. It is effectively a component of Caledonian Forest.

2b. Maintain the structure, function and supporting processes of European dry heaths

The dry heaths can be maintained by appropriate grazing levels, including by domestic stock, and burning in accordance with the Muirburn Code.

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 avoiding it degrading to grasslands as a result of intensive management, and avoiding succession to scrub or woodland from too low a level of browsing, grazing or burning. Where succession to woodland is due to natural regeneration of Caledonian Forest, this would be allowed to occur since it would help to maintain and improve the Caledonian Forest resource on the SAC.

Many areas of dry heath are managed for sport as part of a grouse moor, or deer forest. Where the management is for grouse, there is often associated infrastructure such as grouse butts, and mounds dug for grit to be placed on them. Sometimes medicated grit is used. New tracks are sometimes desired, and all-terrain vehicles can create erosion if not carefully used. Heather is regularly burnt, on rotation. This use for sporting purposes is consistent with maintaining the habitat in good condition where traditional and high-quality practices apply.

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, maintain species richness and prevent *Calluna vulgaris* from overwhelmingly dominating. It is important that this does not result in a monoculture of large areas of same age heather, and that sensitive areas are not burnt.

The interaction of burning and grazing can result in the loss of heather and a change to grassland, which would not be desirable.

Further targets to achieve suitable habitat structure include:

Grazing/browsing

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

Trampling/disturbance

- less than 10% of the ground cover should be made up from disturbed bare ground (i.e. 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.

Dry heath can be in good condition, as measured by Site Condition Monitoring, with up to 20% cover of native trees and scrub. Dwarf birch and bog myrtle can occur at any abundance – there is no limit for these species. Caledonian Forest is allowed to expand without limits onto dry heath where this is by natural regeneration from existing Caledonian Forests – although it would not necessarily be allowed to expand onto fine examples of sensitive types of heath such as *Arctostaphylos* heath and species rich heaths (see Conservation Priorities, above).

For other woodland types, priority is given to natural regeneration from existing woodlands, particularly where this is riparian woodland or where it would promote structural diversity (scattered native scrub and trees and small patches of woodland in areas of open dry heath). The cumulative percentage of trees and scrub must not exceed 20% to maintain 'good condition'.

Any tree planting should be in accord with the Guidance on Tree Planting in the Cairngorms SAC.

2c. Maintain the distribution and viability of typical species of European dry heaths

Cairngorms SAC has a variety of dry heath communities. Heather – blaeberry heath is abundant on lower and mid-elevation slopes, heather – bearberry heath is widespread and heather – blaeberry – *Sphagnum capillifolium* heath occurs. The Cairngorms holds the most extensive well-developed snow-bed forms of blaeberry – wavy hair-grass heath in the SAC series. Blaeberry abundance increases at altitude with increasing snow-lie. Bryophyte-rich damp heaths are found along the upper margins of the forest, and well above it. Species-rich forms of heather – bell heather heath occurs on base and/or lime rich soils at Inchroy and species-rich heath also occurs locally in Glen Feshie. Cairngorms SAC contains areas of H16 *Calluna vulgaris* – *Arctostaphylos* heath, which is

typical of North-East Scotland. This can be a species-rich habitat, depending on geology, climate and land management.

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*.

Bryophytes can include species such as the threatened Rusty fork-moss *Dicranum spurium*.

Indicator species for European dry heath include:

Heather *Calluna vulgaris*

Heaths *Erica* spp.

Crowberry *Empetrum nigrum*

Bearberry *Arctostaphylos uva-ursi*

Lichens *Cladonia* spp.

Blaeberry *Vaccinium* spp.

Petty whin *Genista anglica*

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

2a. Maintain the extent and distribution of Alpine and Boreal heaths within the site

Alpine and subalpine heaths are generally found 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.

Maintain to approximately **980.76** ha apart from losses due to expanding Caledonian Forest by natural regeneration from existing Caledonian Forest. 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 occur in mosaics, and they can grade into other heath types, especially the floristically-similar European dry heaths. There should be no measurable net reduction in the extent of the habitat, or change in its distribution throughout the site apart from natural regeneration of Caledonian Forest.

Scrub is a feature of Northern Corries SSSI. The component species of this habitat is allowed to colonise alpine and boreal heath, to maintain and expand this habitat. It is effectively a component of Caledonian Forest.

2b. Maintain the structure, function and supporting processes of the Alpine and Boreal heath

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. They can be restored by appropriate levels of grazing and trampling by red deer and domestic stock. This habitat should not be burnt, as it takes an extremely long time to recover and if the vegetation is removed, the soil below is vulnerable to erosion due to the altitude and exposure.

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 key issue for structure, function and supporting processes is grazing and trampling by animals.

The structure of the habitat is based around:

- the presence of at least 25% cover of dwarf shrub heath species, but can be up to 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 (i.e. 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'.)

The habitat can show effects from recreation, for example trampling by people alongside paths, and cycle tracks. Cycle tracks and vehicle use can show for many years after the event, because the *Cladonia* lichens can be destroyed along the route. To date, these effects are mainly localised along popular routes.

Boreal heath can include scattered trees and shrubs of native species such as Scots pine and birch. Trees at this altitude tend to be very slow growing and stunted due to exposure to wind, drought and cold, plus poor and unproductive soils. Where tree colonisation is occurring due to natural regeneration from existing Caledonian Forest, this natural process is allowed to occur to benefit the Caledonian Forest feature.

2c. Maintain the distribution and viability of typical species of the Alpine and boreal heath

This habitat comprises a wide range of heath types, with variation related to climate, local exposure and snow-lie. On this site it includes the following NVC types:

- *Calluna vulgaris* – *Cladonia arbuscula* heath
- *Calluna vulgaris* – *Racomitrium lanuginosum* heath
- *Vaccinium myrtillus* – *Cladonia arbuscula* heath
- *Vaccinium myrtillus* – *Racomitrium lanuginosum* heath

and boreal heath NVC types:

- *Calluna vulgaris* – *Vaccinium myrtillus* heath
- *Calluna vulgaris* – *Vaccinium myrtillus* – *Sphagnum capillifolium* heath

The dominant plants in Alpine and Boreal heaths are dwarf-shrubs of heather *Calluna vulgaris* and blaeberry *Vaccinium myrtillus*. Juniper *Juniperus communis*, tends to be 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*. 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. At higher altitudes, where conditions are too extreme for heather, short or prostrate *Vaccinium* spp. and *E. nigrum* ssp. *hermaphroditum* dominate. On sheltered slopes where snow lingers, the dominant shrub is *V. myrtillus*, which is either the sole dominant or grows with *E. nigrum* ssp. *hermaphroditum*, dwarf cornel *Cornus suecica* and cloudberry *Rubus chamaemorus*.

In Cairngorms SAC, lichens are 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, and often support rare montane species.

In the Cairngorms, creeping azalea *Loiseleuria procumbens* are frequent in some areas, while bearberry *Arctostaphylos uva-ursi* can be locally abundant. 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 some stands of Alpine and Boreal heaths the action of solifluction (by creating unstable soils, which provide more plant nutrients and maintain open conditions) favours the growth of certain plants. These include mountain everlasting *Antennaria dioica*, carnation sedge *Carex panicea*, pill sedge *C. pilulifera*, fir clubmoss *Huperzia selago* and viviparous fescue *Festuca vivipara*, enriching the flora of the heaths.

Lichens are conspicuous, mostly *Cladonia* species but also including montane species such as *Alectoria nigricans* and *Flavocetraria nivalis*. Bryophytes are important in alpine and boreal heaths, mostly common species such as *Racomitrium*.

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 snow bunting (*Plectrophenax nivalis*).

As noted above, these heaths can include trees and shrubs such as Scots pine *Pinus sylvestris*, birch *Betula* species and juniper *Juniperus communis*.

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

2a. Restore the extent and distribution of Mountain willow scrub within the site

No area is available for this habitat, which is very small and scattered, and occurs on cliffs and steep ground, but it should not be allowed to disappear or reduce in area at any of its locations.

This habitat is allowed to increase in area over other European habitats such as tall herb and chasmophytic vegetation because if it is to survive in the long term, an increase in the number of trees is essential to allow flower fertilisation and hence successful seeding and germination.

2b. Restore the structure, function and supporting processes of Mountain willow scrub

This habitat can be restored by appropriate grazing levels and at some locations, specific conservation action such as planting.

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.

Over-grazing/browsing and reduced snow lie is believed to have reduced and restricted the occurrence of this habitat so restoration involves the management of herbivores at appropriate levels. Where grazing/browsing occurs it should be of a level where no distinct browse lines or topiary-like effects occur.

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. Most browsing on the Cairngorms SAC is by red deer.

Some stands of montane willow scrub require specific conservation action if they are to survive, for example planting of new stock of appropriate provenance. Willows might expand naturally, or be planted. The current limited locations are due to a long history of browsing. If willows expand off the cliffs, natural processes should be allowed to take place unless there is a specific reason to prevent it. Some expansion might be by planting, subject to appropriate assessment. Planting should in accord with the Guidance on Tree Planting in the Cairngorms SAC. Each proposal would be assessed, but willow would not be planted on cliffs used by nesting golden eagle since golden eagle are a SPA qualifying species.

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

2c. Restore the distribution and viability of typical species of Mountain willow scrub

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:

Downy willow	<i>Salix lapponum</i>
Whortle-leaved willow	<i>S. myrsinites</i>
Woolly willow	<i>S. lanata</i>
Dark-leaved willow	<i>S. myrsinifolia</i>
Tea-leaved willow	<i>S. phylicifolia</i>

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	<i>Vaccinium myrtillus</i>
Tufted hair-grass	<i>Deschampsia cespitosa</i>
Great wood-rush	<i>Luzula sylvatica</i>
Alpine lady's-mantle	<i>Alchemilla alpina</i>

Mountain whorl snail *Vertigo alpestris* is a qualifying species for Inchrory SSSI and is associated with mountain willow scrub.

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.

3.8 Conservation Objectives for *Juniperus communis* formations on heaths or calcareous grasslands [H5130] (Juniper on heaths or calcareous grasslands)

2a. Maintain the extent and distribution of Juniper on heaths or calcareous grasslands within the site

Maintain to approximately 576.92ha. The area figure has been taken from the Standard Data Form, and is an estimate based on the fact that juniper on heaths or calcareous grasslands is often transitional at lower levels into Caledonian forest or birch woodland and at upper levels extends into dwarf-shrub heaths in the alpine zone. The Juniper on heaths or calcareous grasslands habitat is most abundant in Glen Feshie around Ruigh-aiteachain and Glen Feshie Lodge in general. On most of the site juniper occurs on acidic granite, but it is also present in smaller quantities within the Inchrory SSSI part of Glen Avon where it occurs on both neutral and calcareous soils.

At Creag Fhiaclach there is mixed tree-line woodland with stunted Scots pine *Pinus sylvestris* and juniper, giving way at higher altitude to alpine juniper scrub which is being colonised by scattered trees.

There should be no measurable net reduction in the extent of the habitat and its distribution throughout the site, except where natural processes result in Juniper on heath being replaced by Caledonian Forest. With low grazing levels, there is likely to be an expansion of juniper onto heath, and expansion of Caledonian Forest into the Juniper on heath habitat.

At Inchrory, areas of juniper with heath should be maintained in keeping with management to maintain the species rich grassland and heath at Inchrory.

The extent and distribution of the habitat type could be reduced through actions that alter the conditions unfavourably such as liming and fertilising for agriculture or changes to land use such as afforestation or invasion by alien species.

2b. Maintain the structure, function and supporting processes of Juniper on heaths or calcareous grasslands

Maintaining juniper on heaths or calcareous grasslands is a fine balance between degrading to open heath or grassland with intensive grazing/browsing or burning and succession to scrub/woodland where the level is too low.

To ensure recruitment of new juniper seedlings and reduce the main threats from over-grazing/browsing, trampling damage and burning damage, and therefore maintain the appropriate structure, the following conditions should be met:

- Cover of “pioneer” bushes (less than 75cm tall) should exceed the cover of old, ‘ailing’ or dead bushes (full-grown, well-branched but losing branches with thin or incomplete canopy usually more than 100 years old).

- Less than 10% of bushes should show evidence of bark stripping.
- Less than 33% of the current year's shoots (pale fawn to pale orange brown) should show evidence of having been browsed.
- Less than 33% of shoots should show evidence of having been browsed into shoot or stem material older than the current year's growth (mid-tone orange brown to dark brown).
- Less than 5% of the feature area should show severe disturbance (e.g. by heavy browsing and trampling or fire).

The appropriate levels of grazing/browsing, disturbance and burning will vary according to a number of factors such as altitude, aspect, and location.

Management effort should therefore be directed to maintain species composition, vegetation transitions and ground/soil structure and integrity. This should also avoid surface erosion and deposition, introduction of alien and invasive species and scrub, and habitat fragmentation.

2c. Maintain the distribution and viability of typical species of Juniper on heaths or calcareous grasslands

Juniper is found on a wide range of acidic substrates supporting acidophilous (thrives in an acidic environment) plant communities. In many instances these are simply stands of heathland or acidic grassland that have become invaded by juniper. However, at sites where the juniper has been established for longer, the community corresponds to *Juniperus communis* ssp. *communis* – *Oxalis acetosella* woodland. Such vegetation is typically dominated by juniper, with downy birch *Betula pubescens* and rowan *Sorbus aucuparia* often scattered throughout. The understory is rich in acidophilous species, such as blaeberry *Vaccinium myrtillus*, wood-sorrel *Oxalis acetosella*, heath bedstraw *Galium saxatile* and hairy wood-rush *Luzula pilosa*. Species with a northern distribution, including chickweed wintergreen *Trientalis europaea*, twinflower *Linnaea borealis* and lesser twayblade *Listera cordata*, occur locally. There is usually a well-developed layer of pleurocarpous mosses and ferns. On lower slopes with flushing and on more base-rich substrates the flora is enriched by species that reflect an increased base-status, such as common dog-violet *Viola riviniana*, dog's mercury *Mercurialis perennis* and northern bedstraw *Galium boreale*. More recent stands are heathlands or acidic grasslands that have become invaded by juniper and consequently tend to have a reduced species richness.

For long-term maintenance continuation of the existing grazing/browsing regime (at classification) is paramount alongside prohibition of burning. Restoration will require increase or reduction of grazing/browsing dependent upon individual site conditions.

Juniper is threatened by *Phytophthora*, but there are currently no management techniques for treating this disease.

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

2a. Maintain the extent and distribution of Montane acid grasslands within the site

Maintain at approximately **8,653.76ha**. 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.

2b. Maintain the structure, function and supporting processes of Montane acid grasslands

The key issue for maintaining the montane acid grassland is the management of herbivores to appropriate levels. 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 so the grazing level needs to be appropriate for the habitat.

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.

Red deer trampling can affect this habitat on this site so deer need to be managed appropriately.

Trampling by people can affect the habitat along popular routes, especially between the highest tops and the management of recreation has long been important on this site.

This habitat is one of the most vulnerable to climate change, since it occurs on the high tops. Long lying snow beds are a feature of this habitat and elements which are especially vulnerable include the mosses, liverworts and lichens in the snow-bed communities.

2c. Maintain the distribution and viability of typical species of Montane acid grasslands

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

This feature is abundant on the upper slopes and along broad ridges in the Cairngorms SAC. The NVC communities found are mostly species-poor U9 three-leaved rush – woolly hair-moss *Juncus trifidus* – *Racomitrium lanuginosum* rush-heath, U10 stiff sedge – woolly hair-moss *Carex bigelowii* – *Racomitrium lanuginosum* moss-heath and U7 mat sedge – stiff sedge *Nardus stricta* – *Carex bigelowii* grass-heath, the latter often in sheltered hollows with moderate snow-lie.

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.

The *Alchemilla* – *Sibbaldia* dwarf-herb community requires a certain amount of base-rich flushing to develop its distinctive flora of small herbs. *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.

Typical, associated vertebrates of montane acid grasslands are red deer *Cervus elaphus* and mountain hares *Lepus timidus*.

The rocks and soil in very late snow beds have a widespread and distinctive lichen community including *Ameliella andreaeicola*, *Lecanora leptacina*, *Catillaria contristans*, *Frutidella caesioatra*, *Lecanora formosa*, *Lecanora marginata*, *Micarea incrassata*, *Micarea turfosa*, *Porina mammillosa* and *Rhizocarpon jemtlandicum*. The oceanic element within the last snow lie communities is internationally important.

The snow beds are also a very important habitat for bryophytes, with key species *Andreaea frigida*, *A. nivalis*, *Cephalozia ambigua*, *Marsupella condensata*, *Nardia breidleri*, *Pleurocladula albescens*, and *Pohlia obtusifolia*. Monitoring of the snowbed communities is a valuable method of measuring effects arising from climate change.

This community is key for the montane hepatic mat bryophytes, although it can occur in others such as alpine and boreal heaths. It includes species such as *Anastrophyllum donnianum*, *Plagiochila carringtonii*, *Bazzania tricrenata*, *Anastrepta orcadensis*, *Mylia taylorii*, *Barbilophozia floerkei*, *Diplophyllum albicans*, *Lepidozia pearsonii* and *Tritomaria quinquedentata*. The hepatic mat depends on high rainfall and humid conditions, and may be vulnerable to climate change.

3.10 Conservation Objectives for Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) [H6210] (Dry grasslands and scrublands on chalk or limestone)

2a. Maintain the extent and distribution of Dry grasslands and scrublands on chalk or limestone within the site

Maintain to approximately **115** ha. The area figure has been taken from the Standard Data Form, and is an estimate based on the fact that dry grasslands and scrublands on chalk or limestone can form complex mosaics with habitats such as grasslands, dry heaths and bogs. However there should be no measurable net reduction in the extent of the habitat and its distribution throughout the site.

Most of this habitat is at Inchrory in Glen Bulg, with some also occurring at Glen Feshie. It is found on thin, well-drained, lime-rich soils associated with base-rich rocks. The base-rich rocks determine the extent and distribution of the habitat throughout the SAC. The habitat's long-term existence will also be affected by avoidance of the effects that could lead to a permanent reduction in the extent or distribution of the habitat, such as afforestation or invasion by non-native species. Where loss is due to the expansion by natural regeneration of Caledonian Forest, from existing forests, this would be allowed to occur with decisions made on a case-by-case basis. At Inchrory, which has the best examples of this habitat, this grassland habitat is prioritised.

2b. Restore the structure, function and supporting processes of Dry grasslands and scrublands on chalk or limestone

Dry grasslands and scrublands on chalk or limestone comprise mixtures of grasses and herbs, in which there is at least a moderate representation of calcicolous (lime-loving) species. The structural and floristic characteristics of the habitat are strongly influenced by climatic factors and management practices, in particular the intensity of grazing. The main threats to this habitat are therefore under-grazing, over-grazing, trampling damage and colonisation by other species. In Glen Bulg there is a large population of rabbits, which graze the grassland.

The habitat can be restored with an appropriate level of grazing that allows species to germinate and seedlings to survive, but without grazing levels to the point that flowers are all grazed off. Management of the habitat should aim to achieve:

- Less than 1% of vegetation cover should be made up of non-native species
- Less than 10% of the vegetation cover should be made up of bracken and/or scattered native trees and scrub that is visible while standing at a sample location
- At least a quarter of the tips of live leaves and/or flowering shoots of vascular plants should be more than 5 cm above the ground surface
- At least a quarter of the tips of live leaves and/or flowering shoots of vascular plants should be less than 5 cm above the ground surface
- Less than two-thirds of live leaves of grasses with signs of having been grazed
- The percentage of ground cover for which dead plant litter forms a "thatch" or "felt", in patches more than 2 cm across, should be less than 10%
- Less than 10% of ground cover should be disturbed bare ground for distinct and clearly defined paths and tracks (exclude constructed tracks) by visual estimate for as much of the feature as is visible while standing at a sample location
- For over-grazing/browsing - at least 50% of live leaves and/or flowering shoots of vascular plants should be more than 20 cm above the ground.
- For colonisation by other species - less than 10% of vegetation cover should be made up of bracken and/or scattered native trees and scrub.

At Inchrory management should aim to benefit this habitat through appropriate grazing levels. This would maintain the best examples of the habitat on the SAC. At Glen Feshie grazing levels, which is mostly red deer at this location, are currently low to benefit the regeneration of trees within the Caledonian Forest. Changes in the dry grassland as a result of this management would be acceptable.

2c. Maintain the distribution and viability of typical species of Dry grasslands and scrublands on chalk or limestone

On Cairngorm SAC this habitat occurs on different plant communities. It includes the flea sedge–carnation sedge *Carex pulicaris* - *C. panicea* sub-community of the sheep's fescue–common bent–thyme *Festuca ovina* - *Agrostis capillaris* - *Thymus* grassland community. It also includes the sheep's fescue–common bent–alpine lady's mantle *Festuca ovina* - *Agrostis capillaris* - *Alchemilla alpina* grassland, the flea sedge–common dog-violet *Carex panicea* – *Viola riviniana* sub-community of the mat grass–heath bedstraw *Nardus stricta* – *Galium saxatile* grassland and a species-rich type of the sheep's fescue–common bent–heath bedstraw *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland. This can be a very species-rich habitat.

Northern brown argus butterfly *Aricia artaxerxes* is a qualifying species for Inchrory SSSI.

3.11 Conservation Objectives for Species-rich *Nardus* grassland, on siliceous substrates in mountain areas [H6230] (Species-rich grasslands with mat-grass in upland areas)

2a. Maintain the extent and distribution of Species-rich grasslands with mat-grass in upland areas within the site

Maintain to approximately **1,153.83ha**. The area figure has been taken from the Standard Data Form, and is an estimate based on the fact that Species-rich *Nardus* grasslands can grade into Alpine and subalpine calcareous grasslands or, next to limestone areas, form transitions to Semi-natural dry grasslands and scrubland on calcareous substrates. However there should be no measurable net reduction in the extent of the habitat and its distribution throughout the site.

It occurs in Glen Feshie, Inchrory, Glen Lui at Mar Lodge, beside the River Gairn south of Lochbuilg Lodge and on sheep-grazed pasture at Rynettin in Abernethy. At some locations, it is the main calcareous grassland type found.

In some parts of the site there may be an allowable reduction in area if Caledonian Forest is expanding by natural regeneration into this feature. At Inchrory the grassland is prioritised.

2b. Restore, the structure, function and supporting processes of Species-rich grasslands with mat-grass in upland areas

As with many upland habitats maintaining Species-rich grasslands with mat-grass in upland areas is mainly reliant on appropriate levels of grazing. Reduction in grazing may cause a change towards tall herb communities or, at higher altitudes, towards *Dryas octopetala* vegetation. Overgrazing or burning/muirburn may cause increase in unpalatable species i.e. *Prunella vulgaris*, *Cirsium* spp and mosses and local trampling to communities with *Lolium*, *Plantago* and *Poa*.

The key factors affecting the habitat type and measures to assess whether or not they are causing damage are given below;

- For overgrazing/browsing
 - At least 25% of the tips of live leaves and/or flowering shoots of vascular plants should be more than 5 cm above the ground surface.
 - at least 25% of the tips of live leaves and/or flowering shoots of vascular plants should be less than 5 cm above the ground surface.
- For colonisation by other species
 - Less than 10% of vegetation cover should be made up of bracken and/or scattered native trees and scrub.
- For trampling
 - Less than 10% of ground cover should be disturbed bare ground.

The level of grazing required to maintain this feature in good condition is higher than the low level of grazing required to establish tree regeneration, or to maintain dry heath, wet heath and blanket bog in good condition. The grassland feature is prioritised at Inchroy, which is the best available habitat, to maintain the representation on the site. Elsewhere, where tree establishment is by natural regeneration from existing forest, Caledonian Forest may be prioritised with decisions made on a case-by-case basis.

2c. Restore the distribution and viability of typical species of Species-rich grasslands with mat-grass in upland areas

Species-rich *Nardus* grassland on this site largely consists of bent-fescue *Agrostis – Festuca – Thymus* grassland. However, there are also a few stands of sheep's fescue – common bent – alpine lady's mantle *Festuca ovina-Agrostis capillaris-Alchemilla alpina* grassland and, very rarely, of mat grass – heath bedstraw *Nardus stricta-Galium saxatile* grassland, which is sufficiently species-rich to qualify.

Swards are closely grazed and consist of a complex mosaic of grasses, small herbs and bryophytes. The species composition of this habitat type will be affected by factors such as altitude and soil moisture levels.

At high altitude there is a greater representation of arctic-alpine plants, and the habitat can be transitional floristically to and grade into Alpine and subalpine calcareous grasslands. Floristically richer areas develop where there is a concentration of base-rich or calcareous strata, giving suitable conditions for the rarer base- or calcium-loving species. In such situations, especially where outcrops of limestone occur, transitions to Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) may develop.

At Creag an Dail Bheag, the calcareous grassland includes the bryophytes *Tortella tortuosa*, *Ditrichum gracile*, *Ctenidium molluscum var molluscum*, *Scapania aspera*, *Schistidium apocarpum*, *Bryoerythrophyllum recurvirostrum* and more unusual plants like *Thuidium recognitum*, *Schistidium robustum*, *Hypnum hamulosum*, *Herzogiella striatella* and *Pterigynandrum filiforme*. There is also a good bryophyte flora on the north facing crags above the River Gairn opposite Creag an Dail Bheag.

The very rare cross whorl snail *Vertigo modesta* occurs in Coire Garbhloch. These grasslands are grazed by red deer and mountain hare.

Indicator species for species-rich grassland with mat grass in upland areas are:

<i>Alchemilla alpina</i>	alpine lady's mantle
<i>Angelica sylvestris</i>	wild angelica

<i>Briza media</i>	quaking grass
<i>Campanula rotundifolia</i>	harebell
<i>Carex caryophyllea</i>	spring sedge
<i>Carex panicea</i>	carnation sedge
<i>Succisa pratensis</i>	devil's bit scabious
<i>Thymus polytrichus</i>	wild thyme
<i>Veronica officinalis</i>	heath speedwell

3.12 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 Tall herb communities within the site

No area figure is available from the Site Data Form, as this community normally occurs on cliffs and very steep ground. 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. In some circumstances, this habitat may be colonised by montane willows and this may be allowed to occur subject to suitable appraisal, depending on the area of each feature at any one location.

2b. Maintain the structure, function and supporting processes of Tall herb communities

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. Where grazing pressure is low enough, this habitat should be allowed to expand onto scree and steep slopes below the cliffs.

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.
- Less than 50% of live flowering shoots of indicator tall herbs should show evidence of grazing.

The structure of this habitat can also be impacted by succession from tall-herb communities to woodland although this should normally be allowed to progress where the woodland is montane willows.

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*.

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

Furthermore, muirburn negatively impacts upon this habitat type.

2c. Maintain the distribution and viability of typical species of Tall herb communities

Tall herb community 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. This habitat is species-rich and include species such as great wood-rush *Luzula sylvatica*, wild angelica *Angelica sylvestris*, roseroot *Sedum rosea*, wood crane's-bill *Geranium sylvaticum*, water avens *Geum rivale* and globe-flower *Trollius europaeus*. Some of these species, such as the last three, can be found as very impoverished, non-flowering plants in grazed pastures adjacent to cliff refuges. This demonstrates the restrictive effects of grazing and the potential for expansion of the habitat.

In summary indicator species for Tall-herb communities include:

<i>Alchemilla</i> spp.	lady's-mantles
<i>Angelica sylvestris</i>	wild angelica
<i>Cirsium heterophyllum</i>	melancholy thistle
<i>Crepis paludosa</i>	marsh hawk's-beard
<i>Galium boreale</i>	northern bedstraw
<i>Geranium sylvaticum</i>	wood crane's-bill
<i>Geum rivale</i>	water avens
<i>Hieracium</i> spp.	hawkweeds
<i>Hypericum</i> spp.	St. John's-worts
<i>Luzula sylvatica</i>	great wood-rush
Ferns (excluding bracken)	
<i>Vaccinium</i> spp.	Blaeberry and other heaths

3.13 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 restored to approximately **4788.41**ha.

Loss of area of blanket bog is acceptable where it is due to natural regeneration of Caledonian forest from adjacent Caledonian forest habitat. Scrub is a feature of Northern Corries SSSI. The component species of this habitat is allowed to colonise blanket bog, to maintain and expand this habitat. It is effectively a component of Caledonian Forest.

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

Restoration of blanket bog can be achieved by restoring the vegetation cover on bare peat, and restoring the hydrology. 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. Re-vegetation of eroding peat can occur naturally, but it can also be assisted by peat restoration.

Maintaining appropriate hydrology for blanket bog is critical. This will depend on avoiding new drainage, and repair of existing drainage except where it is required for infrastructure such as hill tracks.

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

In drier areas invasion of scrub and non-native species can further reduce the water table, and so coverage of trees and non-peat forming grasses, bracken and other plants should be minimised. Where natural regeneration occurs from Caledonian Forest, this would be allowed to expand, to support the Caledonian Forest habitat. Any non-native species should be removed.

The main targets for habitat structure for the SAC include:

- The extent of eroding peat should be less than the extent of stable re-deposited peat and new growth of bog vegetation within the feature;
- At least 6 indicator species should be present and at least 50% of vegetation cover should consist of at least 3 indicator species;
- Sphagnum should not consist only of *Sphagnum fallax* (*S recurvum* p.p.)
- Any one of *Eriophorum vaginatum*, Ericaceous species collectively, or *Trichophorum* should not individually exceed 75% of the vegetation cover;
- Less than 33% of the last complete growing season's shoots of dwarf-shrub species (excluding *Betula nana* and *Myrica gale*) should show signs of browsing.
- Less than 10% of vegetation cover should be made up of scattered native trees and scrub.

In order to achieve this:

- 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. It can take decades for upland vegetation to recover from past grazing or burning.
- Reduce active drainage through targeted ditch damming or infilling
- Burning should be avoided, but where it is considered necessary e.g. for wild fire control, agreed good practice should be adhered to, as set out in the Muirburn Code
- Appropriate management of the effects of access and recreation

Blanket bog can be in good condition, as measured by Site Condition Monitoring, with up to 10% cover of native trees and scrub. Caledonian forest is allowed to expand without limits onto blanket bog where this is by natural regeneration from existing Caledonian forests. Caledonian forest species on active blanket bog creates bog woodland, a priority Annex 1 habitat. For other woodland types, priority is given to natural regeneration from existing woodlands, particularly where this is riparian woodland or where it would promote structural diversity (scattered native scrub and trees and small patches of woodland in areas of open dry heath). The cumulative percentage of trees and scrub must not exceed 10% to maintain 'good condition'.

2c. Restore the distribution and viability of typical species of Blanket bog

Blanket bog on Cairngorms SAC occur in a higher altitude than any other SAC in the UK, around 1000m. This is heather – common cotton-grass blanket mire and some of these are moderately extensive on the gently sloping plateau below the mountain tops. Above about 850m, heather disappears from the blanket bog and is replaced by crowberry and bog bilberry. Dwarf birch occurs locally in this higher-altitude bog. Cladonia lichens (*Cladonia arbuscula* and *C. rangiferina*) are abundant, and the Cairngorms have some of the best examples of lichen-rich bogs in the UK. Cross-leaved heath – *Sphagnum papillosum* mire occurs at low altitude along valley sides and in depressions amongst the undulating glacial deposits.

Typical species include the important peat-forming species, such as bog-mosses *Sphagnum* species and cotton grasses *Eriophorum spp.*, together with heather *Calluna vulgaris* and other ericaceous species and forbs such as bog asphodel *Narthecium ossifragum*) and the carnivorous sundews *Drosera 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.

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

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

2a. Maintain the extent and distribution of Very wet mires often identified by an unstable 'quaking' surface within the site

Maintain the extent of existing transition mires and quaking bogs at 57.69ha. This figure is from the Standard Data Form.

However, by definition this habitat is transitional with other adjacent wetland habitats so current baseline estimates may not be very precise and any changes in extent estimates as a result of new survey may not represent real change but greater precision.

Where very wet mires experience tree recruitment by natural processes, this would be allowed to occur since it would create bog woodland which is a priority European habitat. This is subject to:

- The mire remaining a fully functioning mire with a natural hydrological system with active bog building processes.
- There being no anthropogenic reasons for the mire drying out.
- The trees forming a bog woodland (trees scattered, stunted, slow growing) with no canopy closure, since closed canopy woodland is not a bog woodland.

2b. Maintain the structure, function and supporting processes of Very wet mires often identified by an unstable 'quaking' surface

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

The maintenance of appropriate hydrology for this habitat is important to retain the structure and function. Management to prevent or reduce detrimental effects of drainage, including in the wider surrounding area, is key. The water quality is also important and any incoming water should not have a raised nutrient level or other non-natural characteristics.

Colonisation of this habitat by vigorous native species such as Scots pine should be allowed where the trees are native species and the source is Caledonian forest, since it could create bog woodland, a European sites habitat.

Invasive non-native species could led to irreversible habitat loss in the longer term, and should be prevented.

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

Grazing can be beneficial in helping to maintain species-richness and in preventing succession. However, over-grazing and excessive poaching is detrimental which can result in disturbed bare ground. This is where a substrate of bare humus, bare peat, bare mineral soil, bare gravel, or soil covered only by an algal mat, has its surface broken and imprinted by hoof marks, wallows, human foot prints, or vehicle and machinery tracks. The emphasis is on 'disturbed' rather than 'bare'.

Heavy trampling and/or tracking by deer/livestock / ATVs can result in active drainage of the habitat. Drainage should be considered active if it has altered, or is likely to alter, or remove, the original vegetation, and facilitate the removal of water from the site. This is not currently a problem for this site.

2c. Maintain the distribution and viability of typical species of Very wet mires often identified by an unstable 'quaking' surface

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

Carex rostrata – *Sphagnum recurvum* mire

Carex rostrata – *Sphagnum squarrosum* mire

Carex echinata – *Sphagnum recurvum*/S. *auriculatum* mire

Carex rostrata – *Equisetum fluviatile* sub-community of the *Carex rostrata* – *Potentilla palustris* tall-herb fen

For Cairngorms SAC the typical/indicator species are:

Carex spp.: small to medium sized spp.,
Equisetum fluviatile,
Hydrocotyle vulgaris,
Hypericum elodes,
Mentha aquatica,
Menyanthes trifoliata,
Potentilla palustris,
Sphagnum spp

3.15 Conservation Objectives for Petrifying springs with tufa formation (Cratoneurion) [H7220] (Hard water springs depositing lime)

2a. Maintain the extent and distribution of Hard water springs depositing lime within the site

No area figure is available for this habitat in the Site Data Form. This is because the habitat is of very restricted occurrence.

On Cairngorms SAC this habitat is found in Inchroy on the slopes surrounding the River Avon. The current extent must be maintained by avoiding physical damage or destruction, including by collectors.

2b. Maintain the structure, function and supporting processes of Hard water springs depositing lime

Maintaining an appropriate grazing level by both domestic stock and deer is critical. Over-grazing and excessive poaching can be detrimental, resulting in damage to the fragile tufa formations and/or result in disturbed bare ground. Disturbed bare ground is where a substrate of bare humus, bare peat, bare mineral soil, bare gravel, or soil covered only by an algal mat, has its surface broken and imprinted by hoof marks, wallows, or human foot prints. The emphasis is on 'disturbed' rather than 'bare'.

Excessive grazing/browsing/trampling by deer and/or livestock can also contribute to a deterioration in the habitat structure, leading to a reduction or loss in the typical species for this habitat and should be only be done in a controlled, appropriate manner that helps maintain the habitat.

The natural flow of water from the spring is critical to this habitat and there should be no artificial drainage or any activity which would impact on the water source uphill, at the point of emergence or at the downhill flush.

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

2c. Maintain the distribution and viability of typical species of Hard water springs depositing lime

This habitat is dominated by mixtures of small sedges and bryophytes with the latter sometimes being completely dominant, particularly around spring-heads. Liverworts and scattered small herbs are also present.

Tufa-forming spring-heads are characterised by the swelling yellow-orange mats of the mosses *Cratoneuron commutatum* and *C. filicinum*. Many rare, lime-loving (calcicole) species live in the moss carpet, particularly arctic-alpine species. At Inchroy there is yellow mountain saxifrage *Saxifraga aizoides*, small-fruited yellow sedge *Carex viridula* ssp. *oedocarpa*, flea sedge *C. pulicaris*, carnation sedge *C. panicea* and dioecious sedge

C. dioica. Other species include common butterwort *Pinguicula vulgaris* and fairy flax *Linum catharticum*.

3.16 Conservation Objectives for Alpine pioneer formations of the *Caricion bicoloris-atrofuscae* [H7240] (High altitude plant communities associated with water seepage)

2a. Maintain the extent and distribution of High altitude plant communities associated with water seepage within the site

Maintain the extent of existing High-altitude plant communities associated with areas of water seepage. No area figure is available from the Site Data Form for this habitat, because it occurs on very small areas in scattered locations.

This habitat occurs throughout the high ground in Cairngorms SAC where suitable water seepages occur, for example in Glen Feshie and Glen Builg.

2b. Maintain the structure, function and supporting processes of High altitude plant communities associated with water seepage

This habitat can be maintained through appropriate levels of grazing and trampling, and avoiding muirburn.

This habitat usually forms mosaics and shows complex transitions to other upland habitat types and is maintained by harsh climatic and soil conditions. There is variation in this habitat because of differences in altitude, geographic location, length of snow-lie, nature of the substrate, and the amount of water flushing through the plant communities.

The habitat can be maintained by addressing over-grazing and excessive poaching/trampling which is detrimental to this habitat and can result in disturbed bare ground. This is where a substrate of bare humus, bare peat, bare mineral soil, bare gravel, or soil covered only by an algal mat, has its surface broken and imprinted by hoof marks, wallows, human foot prints, or vehicle and machinery tracks. The emphasis is on 'disturbed' rather than 'bare'.

Appropriate grazing levels will vary between and within locations, and should be considered at an individual site level to ensure the restoration of the high-altitude plant communities associated with areas of water seepage within the wider habitat structure and function across the whole of the site.

The following should occur:

- At least two positive indicator species should be present
- At least one flowering shoot of each of the arctic-alpine species present should not be grazed
- Less than 25% of the ground cover, of each flush, should be disturbed bare ground

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

2c. Maintain the distribution and viability of typical species of High altitude plant communities associated with water seepage

This habitat is characterised by the presence of a number of rare species. It is usually very small in extent and can occur wherever there is a suitable flush on the higher ground where sheathed sedge *Carex vaginata* is present. The flushes are usually mossy, and

some of the arctic-alpine plants which characterise the alpine flushes in the Cairngorms SAC are three-flowered rush and Scottish asphodel. These small species of wetland plant were mostly found within the *Carex demissa* – *Saxifraga aizoides* mire community and less often in stands of the *Carex dioica* – *Pinguicula vulgaris* mire community. The vegetation consists of mixtures of small sedges, rushes, small herbs and bryophytes, and includes many arctic-alpine species.

On this site the rare species include scorched alpine-sedge *Carex atrofusca*, bristle sedge *C. microglochin*, alpine rush *Juncus alpinoarticulatus*, chestnut rush *J. castaneus*, two-flowered rush *J. biglumis*, three-flowered rush *J. triglumis*, false sedge *Kobresia simpliciuscula* and Scottish asphodel *Tofieldia pusilla*. Other uncommon species may occur, such as hair sedge *Carex capillaris*, sheathed sedge *C. vaginata* and variegated horsetail *Equisetum variegatum*. There is a range of calcicolous mosses, some of which are rare.

A number of commoner species are also characteristic of the habitat. These include yellow sedge *Carex viridula*, carnation grass *C. panicea*, flea sedge *C. pulicaris*, russet sedge *C. saxatilis*, jointed rush *Juncus articulatus*, common butterwort *Pinguicula vulgaris*, yellow saxifrage *Saxifraga aizoides*, alpine bistort *Persicaria vivipara*, alpine meadow-rue *Thalictrum alpinum* and the moss *Blindia acuta*.

The flushes have a characteristic bryophyte community including *Anthelia juratzkana*, *Barbilophozia floerkei*, *Ceratodon purpureus*, *Diplophyllum albicans*, *Kiaeria blyttii*, *K. falcata*, *K. starkei*, *Nardia compressa*, *Oligotrichum hercynicum*, *Pohlia nutans*, *Polytrichastrum sexangulare*, *Racomitrium fasciculare* and *Scapania uliginosa*. In places there are rare base-rich flushes with carpets of *Sphagnum teres* and hummocks of *S. warnstorffii*. At *Creag an Dail Bheag* a very rich bryophyte flora includes *Pseudocalliergon trifarium*, *Cinclidium stygium*, *Tritomaria polita* and *Scapania degenii* and one nationally rare liverwort, *Barbilophozia quadriloba*.

Excessive grazing/browsing/trampling by deer and/or livestock can contribute to a loss in the typical species for this habitat and should be only be done in a controlled, appropriate manner that helps maintain the habitat within the wider site management.

3.16 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 Acidic scree within the site

The extent of the acidic scree feature has been estimated at 2,884 ha, based on the Standard Data Form. 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.

This habitat is 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 Acidic scree

Scree is intrinsically unstable and rocks will frequently move so this habitat is vulnerable to natural disturbance. This is a natural process, which should not be prevented.

The acidic scree is largely inaccessible to red deer and sheep, and the vegetation is of poor quality, and therefore over-grazing is very rarely a problem. Grazing is more likely to be by ptarmigan and mountain hare than large herbivores. Where grazing by large herbivores exists, over grazing and trampling is possible and could result in a deterioration of habitat structure.

There is also the possibility of colonisation, particularly of more stable scree, by other species, including trees and scrub where there are seed sources. Some level of tree growth is acceptable and tree covered screes can be found within Caledonian forests. The sensitivity of any particular scree would depend on the species present, and their light requirements.

This habitat is also very sensitive to muirburn.

Scree should not be used as a source of rock for footpath works or road stone.

Trampling from walkers can contribute to a deterioration in the habitat structure but is generally very localised and not an important factor for this site.

Currently, none of the potential pressures above are having a significant effect and this habitat is in favourable condition at Cairngorm SAC.

2c. Maintain the distribution and viability of typical species of Acidic scree

This habitat is usually dominated by woolly hair-moss (*Racomitrium lanuginosum*), heather (*Calluna vulgaris*) and sometimes blaeberry (*Vaccinium myrtillus*). Where the vegetation is sufficiently well developed it is best placed in the *Calluna vulgaris* – *Erica cinerea* heath community. 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 crispera*, and species sensitive to grazing. It is important for its rich fern flora and act as refugia for a number of rare species.

Acidic scree is an important habitat for bryophytes with species such as *Bryum muehlenbeckii*, *Hylocomiastrum pyrenaicum*, *Marsupella arctica*, *Plagiomnium medium*, *Sciuro-hypnum glaciale* and *S. starkei*. The nationally scarce *Tetralophozia setiformis* is frequent in many areas of scree. *Cynodontium jenneri* occurs and there are localised records of *Cynodontium strumiferum* and the rare liverwort *Anastrophyllum saxicola* at Clais Fhearnaig in the Eastern Cairngorms.

Higher on the hills where the snow lies late over scree is a good habitat for bryophytes, often picked out by the fronds of the fern *Athyrium distentifolium*. In the crevices with the fern litter there may be *Lophozia obtusa*, *Diplophyllum taxifolium*, *Hylocomiastrum umbratum*, *Hypnum callichroum* often with an abundance of *Plagiothecium denticulatum* var *obtusifolium*.

Other species include ring ouzle *Turdus torquatus* and ptarmigan *Lagopus mutus*.

Colonisation or shading of this habitat by bracken, tree growth and/or woodland expansion has the potential to reduce or eliminate cover of sensitive, light demanding species, including bryophytes.

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

2a. Maintain the extent and distribution of Plants in crevices on acid rocks within the site

The extent of the plants in crevices on acid rocks feature has been estimated at 1,153.83ha. This figure was taken from the Site Data Form. 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 Cairngorms SAC this habitat is found in many locations and is also closely associated with acidic scree where the same rock type is also found forming the scree.

This habitat would be allowed to reduce in extent where montane willows are allowed to expand or, subject to suitable appraisal, are planted. The reason is that the montane willows need to be allowed to expand if they are to be maintained, and the extent of willows is much less than this habitat.

Rockfalls and landslips are natural processes and should normally be allowed to occur without intervention.

2b. Maintain the structure, function and supporting processes of Plants in crevices on acid rocks

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.

Inappropriate grazing regimes have the potential to harm this feature through over-grazing and trampling damage. Most grazing on this habitat at Cairngorms SAC is red deer and mountain hare. Grazing by mountain hare is a natural process and no action is required. Many examples of this habitat are protected from large herbivores by inaccessibility. In theory, if the grazing levels are low enough, this habitat should be able to naturally expand onto scree and slopes below the cliffs and this would be a beneficial change.

Apart from the European habitat mountain willows, there should be less than 25% of ground cover made up of bracken or scattered native trees and scrub. The percentage could be higher only if it benefits mountain willows.

2c. Maintain the distribution and viability of typical species of Plants in crevices on acid rocks

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.

Typical species include:

Highland cudweed *Gnaphalium norvegicum*,
alpine speedwell *Veronica alpina*,
spiked wood-rush *Luzula spicata*
hare's-foot sedge *Carex lachenalii*.

Bryophytes such as *Paraleucobryum longifolium* occur in this habitat. The cliffs on which this habitat occurs can support golden eagle *Aquila chrysaetos*, raven *Corvus corax* and peregrine falcon *Falco peregrinus*.

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. The exception is montane willows, which are allowed to expand as outlined above.

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

2a. Maintain the extent and distribution of Plants in crevices on base-rich rocks within the site

The extent of the plants in crevices on base-rich rocks feature has been estimated at **57.69ha**. This should be maintained. It occurs at Inchrory and also at Coire Garbhloch in Glen Feshie, and on the cliffs above Lochan Uaine on the east side of Ben Macdui.

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.

Generally the area of this habitat should be maintained, but at Coire Garbhloch work has been undertaken to increase the cover of mountain willows. This coire is large enough to include both this habitat and some montane willow habitat, and the willows should be allowed to expand/be planted. At all sites, any proposals to plant mountain willows would be subject to an appropriate assessment.

Rockfalls and landslips are natural processes and no action should be taken to prevent these.

2b. Restore the structure, function and supporting processes of Plants in crevices on base-rich rocks

This habitat can be restored through appropriate grazing regime and removal of non-native species where these threaten 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 Fairy foxglove, New Zealand Willowherb and Cotoneaster. 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. Although Fairy foxglove (*Erinus alpinus*) occurs at Inchrory, it is unlikely to be a significant threat to the habitat. If non-native invasive species do colonise this habitat to the extent that they are

out-competing the native species, they should be removed to maintain the structure and function of the habitat.

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

Less than 25% of the ground cover should be made up of bracken and/or scattered native trees and scrubs, although where the trees and scrub is Caledonian forest or mountain willows expanding by natural regeneration, natural processes would be allowed to operate. Mountain willows would be allowed to be planted, subject to appropriate assessment

2c. Restore the distribution and viability of typical species of Plants in crevices on base-rich rocks

Plants in crevices on base-rich rocks is characterised by the presence of bryophytes such as *Tortella tortuosa*, *Anoetangium 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 on this site are: Alpine lady's mantle *Alchemilla alpina*; hair sedge *Carex capillaris*; flea sedge *Carex pulicaris*; *Ceterach officinarum*; brittle bladder-fern *Cystopteris fragilis*; common rock-rose *Helianthemum nummularium*; hawkweed spp *Hieracium spp*; hard shield fern *Polystichum aculeatum*; holly fern *P. lonchitis*; soft shield fern *P. setiferum*; yellow 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*.

In the Eastern Cairngorms there are exposures of limestones and other base-rich rocks, concentrated along Creag an Dail Beag and the Derry Burn. Species of bryophyte include *Barbilophozia lycopodioides*, *Pseudoleskea patens*, *Pseudoleskeella catenulata*, *Scapania aequiloba*, *S. gymnostomophila*, *Schistidium trichodon*, *Seligeria donniana* and *Thuidium recognitum*. Other base-rich rocks have bryophytes such as *Ctenidium procerrimum*, *Schistidium atrofusum*, *Scapania gymnostomophila*, and *Timmia norvegica*.

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 grazing should be only be done in a controlled, appropriate manner that helps restore 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 includes non-native species such as Cotoneaster.

3.19 Conservation Objectives for Caledonian forests [91C0]

2a. Restore the extent and distribution of Caledonian forests within the site

Maintain at least approximately **7,499.92** ha. The area figure of the extent of the Caledonian forest feature has been taken from the Standard Data Form. This should be 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. Climate change is likely to increase the likely damage from fire because dry weather will increase the risk of wild fire, and increase the resulting potential damage.

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

The Caledonian Forest can be restored by ensuring that all age classes are present, in particular dead wood and young regeneration, to provide the next generation of trees to secure the habitat for the long term.

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
- includes patches of juniper and native broadleaved trees and shrubs, especially on pockets of richer soils, although they are not necessarily diverse at all locations and some forests, especially in the east, may contain only birch and rowan.
- has ground flora dominated by dwarf ericaceous shrubs, grasses, bryophytes and in places rare pinewood specialist species
- has abundant dead wood of a variety of ages, types and sizes, as this is the habitat for a variety of rare invertebrates, mosses, lichens and fungi.

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, rowan 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 including flowering and fruiting.

Caledonian pine forest requires natural regeneration to provide the next generation of mature trees. These are predominantly Scots pine, but also include broadleaved trees such as downy birch, silver birch, rowan, aspen, willow and alder. Natural regeneration can only survive if grazing and browsing levels are low. This is achieved by maintaining a low level of grazing by domestic stock and deer (red, roe and, should they extend into the site in future, sika deer). Fences are generally not used to control herbivores because the Caledonian forest is a habitat for capercaillie, which are a SPA qualifying species. Capercaillie can fly into fences and they can be an on-going cause of mortality which can make the difference between a population which is self-sustaining, and one which is declining. Fences which cannot be removed are marked to reduce capercaillie mortality, but marking only prevents some, not all deaths. Removal of fences is the better option where practical.

Most sites are dominated by Scots pine and have very few non-native species, but regeneration at some forests has some non-native species such as Noble fir, Norway spruce and Lodgepole pine. There has been significant progress over the last two decades to remove non-native conifer plantations and the resulting non-native

regeneration. This has released the remaining semi-natural pinewood from dense shade caused by these plantations. Many of the clear-fells where non-native plantation has been removed are now well stocked with native Scots pine regeneration. Non-native regeneration needs to be removed.

Some non-native Norway spruce are deliberately retained because they create the habitat for Green shield-moss *Buxbaumia viridis* (see below).

Some areas are dominated by mature or over-mature trees and recruitment is essential to maintain the habitat in the long term. Over most of this feature tree recruitment is excellent, mostly due to red deer control reducing browsing pressure on young trees. At Mar Lodge, thick vegetation and a mat of mosses, soil waterlogging, poor drainage, and distance from seed sources all affect tree recruitment. In some other areas too, recruitment is patchy. This means that as the trees grow, there would be open areas and areas with scattered trees. This adds to the variety of the forest and increases the number of habitat niches available to different plants and animals.

Some areas of Caledonian forest have been managed as plantation, and as a result are very even aged. Pine seedlings are light demanding and will not grow under closed canopy woodland in thick shade. Breaking these up, usually by thinning with small coupes, would improve age diversity and allow natural regeneration.

The preferred method of expansion is by natural regeneration from existing stands of native species. In some cases, small number of appropriate broadleaved species may be planted. Planting would be considered where the species would be part of the natural forest, but where due to past management the seed source is missing. In this situation it returns a natural component to the forest. Enrichment planting could be within a forest, on the forest edge, or in advance of a forest which is expanding, and would be of ecologically appropriate species for the soil and situation. It should be in accord with the supporting Guidance for small-scale planting of trees and shrubs in the Cairngorms SAC. Each case should be subject to a Habitats Regulations Appraisal.

Dothistroma (red band needle blight) occurs in the forests in Cairngorms SAC, but is not having a significant impact to date. Lodgepole pine is more susceptible than Scots pine, and can increase the risk to Scots where the two grow together. The removal of non-native Lodgepole will thus reduce the risk of damaging infection. To reduce the risk of introducing new strains of Dothistroma, pine will only be planted after careful assessment and according to Scottish Forestry guidelines.

Juniper in the Strathspey area has Phytophthora and it is likely that this pathogen is present on the site.

Climate change is likely to affect Caledonian forest, for example trees stressed by drought and heat are more likely to be vulnerable to pests and diseases. The main priorities for pests and diseases is biosecurity and the promotion of natural regeneration. This can be achieved by reducing herbivore impacts, which will allow natural selection to operate, promoting the fittest genotype. Regeneration of more palatable species will create increasingly diverse stands, and this will generally reduce the risk to the woodland ecosystem from species and genus-specific diseases.

Fire is a significant risk due to the high fuel load and the potential implications of uncontrolled wildfire in this habitat. Climate change is likely to increase the risk of fire by increasing average temperatures and reducing rainfall leading to dry vegetation and soils.

2c. Restore the distribution and viability of typical species of Caledonian forests

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 includes small areas of broadleaved trees such as Birch *Betula pendula* and *pubescens*, Rowan *Sorbus aucuparia* and aspen *Populus tremula*. An unusual herb-rich pine woodland occurs at Mar Lodge.

Caledonian Forest 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, such as western capercaillie *Tetrao urogallus*, Scottish crossbill *Loxia scotica* and crested tit *Lophophanes cristatus*. Of the mammals, red squirrel, pine marten, red deer and Scottish wildcat are amongst the most distinctive. The forest supports a rich specialist invertebrate fauna with species such as pinewood mason bee *Osmia uncinata* and the rare pine hoverfly *Blera fallax*.

The Caledonian Forests include a suite of pine forest lichens including the rare *Chaenotheca xyloxena*, *Chaenothecopsis pusiola*, *Hertelidea botryose* and many others. It also has a suite of specialised lichens in different habitats, including *Hertelidea botryose*, *Pycnora xanthococca* and *Xerotrema megalospora* on dead pine; a Lobarion community on broadleaved trees such as goat willow, with *Lobaria pulmonaria*, *Nephroma laevigatum* and *Parmeliella triptophylla*; wounded birch with *Sclerophora peronella*, *Bacidia igniarii* and *Bacidia vermifera*; alder with *Hypogymnia farinacea*; rowan with *Calicium salicinum*, *Chaenotheca brachypoda* and *Sclerophora peronella*; and aspen with *Lecidea erythrophaea*.

The nationally scarce moss *Dicranum polysetum* occurs in Glen Quoich. Green shield-moss *Buxbaumia viridis* is a feature of Cairngorms SAC and occurs in Caledonian forest along with brown shield-moss (*Buxbaumia aphylla*). They are found on fallen dead wood or bare soil in well drained situations which are shaded and kept humid by surrounding woodland.

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 climate changes and potential threats will interact with this genetic distinctiveness and the variation within it. Genetic diversity within a tree species provides the basis for future adaptation of trees and woodlands. Diverse stands of trees are more likely to survive changing conditions, since they should contain some individuals with higher fitness in the new environment. Genetic diversity within populations is integral to adaptation to future conditions. Further work should help us better understand these interactions, but for now we recommend that the next generation of trees should be achieved by natural regeneration, so natural selection can occur.

Planting of pine should not occur within or close to the existing pinewoods, to reduce the risk of introducing new strands of *Dothistroma*, unless the trees are raised within the site or from a nursery guaranteed free of *Dothistroma*. Should this change in future, or in locations where planting is agreed away from existing pine woodlands, any Scots pine for planting should originate from the SAC.

3.20 Conservation Objectives for Bog woodland [91D0]

2a. Maintain the extent and distribution of Bog woodland within the site

The extent of the Bog woodland feature has been estimated at 403.84ha. This figure is taken from the Site Data form. This should be maintained or allowed to increase through natural and managed hydrologically-related changes. Fundamentally however there should be no measurable net reduction in the extent of the habitat and its distribution throughout the site.

Bog woodland occurs at Carn a Chnuic and Tulloch at Abernethy Forest, near Loch Garten and Loch Mallachie, at Rothiemurchus, and in Glenmore.

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

Bog woodlands require native trees as a source of tree seeds 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 and a succession to closed canopy woodland. Such a balance of conditions can be either very stable or transitory depending on numerous factors. Bog woodland should have a variety of age classes including seedlings and dead wood.

Bog woodland has benefited from the control of red deer numbers across much of the area, which has resulted in regeneration surviving and growing instead of being suppressed from permanent heavy browsing.

On some bog woodlands there is non-native regeneration of trees such as Sitka spruce and these should be removed.

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 allowing natural processes to occur i.e. maintain existing natural drainage and water ingress processes, and remove man-made drainage. Block ditches where these occur.
- 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 although if natural processes result in bogs getting wetter, or conversely being colonised by trees, these processes should be allowed to occur.
- The continued presence of mature 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 herbivory that controls herbivore impacts balancing; fruiting, regeneration and growth of trees, shrubs, herbs and bryophytes and lichens, ground disturbance and structural variation.
- Absence of invasive non-native species. Remove non-native trees and shrubs.

Bog woodlands are particularly sensitive to climate change. Factors which could affect them include a reduction in rainfall, or a change in the seasonality of rainfall, higher temperatures, an increase in duration of high temperatures, and longer droughts. These factors could alter the balance between tree regeneration and the water level, and would favour tree regeneration. If not addressed, or if not possible to address, they could ultimately result in a loss of bog woodland to Caledonian forest.

2c. Maintain the distribution and viability of typical species of Bog woodland

Bog woodland on this site is found over Cross-leaved heath *Erica tetralix*-*Sphagnum papillosum* raised and blanket mire and heather *Calluna vulgaris*- *Eriophorum vaginatum* blanket mire, where this occurs with an open cover of stunted Scots pine trees.

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.

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

Scots pine (*Pinus sylvestris*),
 Birch (*Betula pendula* or *Betula pubescens*)
 Sphagnum species
 Cross-leaved heath (*Erica tetralix*)
 Common heather (*Calluna vulgaris*)
 Hare's-tail cottongrass (*Eriophorum vaginatum*)
 Deergrass (*Trichophorum caespitosum*)

3.21 Overarching Conservation Objectives for both species features of Cairngorms SAC – otter and green-shield moss

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

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

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

mussel, part d). If broader information on the feature is available then it should be used to provide context to the site-based assessment.

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

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

The aim at this SAC is to restore and maintain the otter and green-shield moss features in a favourable condition as a contribution to their wider conservation status. Therefore any impacts on the objectives shown in 2a, 2b, or 2c below must not persist so that they prevent the achievement of this overall aim. When carrying out appraisals of plans or projects the focus should be on restoring site integrity, specifically by meeting the objectives outlined in 2a, 2b, and 2c. If these are met then site integrity will be restored. Note that not all of these will be relevant for every activity being considered. Any impacts on the objectives shown in 2a, 2b, and 2c below must not persist so that they prevent the restoration of site integrity. Temporary impacts on these objectives resulting from plans or projects can only be permitted where there is certainty that the features will be able to quickly recover.

This objective recognises that 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.

3.22 Conservation Objectives for Otter [S1355]

2a. Restore the population of otter 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. Recent work in part of the site found a healthy population of otters, so although the latest large scale survey showed a decline, there is reason to believe that the population on this site may be healthy.

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 and holts
- 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 Cairngorm SAC is reliant on suitable habitat in the surrounding area and is unlikely to be viable (capable of functioning) in isolation. The home range of an otter will vary depending on their sex, habitat quality and food availability. Males living in rivers and streams can have a mean linear range size of 48km and females living in the same habitat can have a mean linear range of 21km. Males have been known to range as far as 80km. When assessing the effects of any plan or project consideration should be given to whether impacts outwith the SAC could affect achievement of this conservation objective.

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 otter 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. Other issues include food source and food abundance, which needs to sustain otters throughout the year. This depends on the good health and productivity of their habitats.

2c. Maintain the habitats supporting otter within the site and availability of food

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

Maintaining the freshwater and riverbank habitats free of pollution is critical, as is avoiding litter which can impact on otter through entanglement and indirectly through impacts on their food supply.

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.

3.23 Conservation Objectives for Green shield-moss (1386)

2a. Maintain the population of Green shield-moss as a viable component of the site

Green shield-moss has been recorded within 67 100-metre squares across 19-kilometre squares in the SAC. 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 green shield-moss population through the direct destruction of plants, loss of decaying wood occupied by the species, lack of decaying wood to colonise or changes to the microclimate within the SAC.
- maintaining the species distribution within the site (see conservation objective 2b)
- maintaining the supporting habitats within the site (see conservation objective 2c)

The moss occurs on ephemeral substrates so its population dynamics depend on a constant cycle of dispersal and colonisation of new substrates. Substrates are thought to remain viable for a window of 10-20 years. The core area for this moss within the SAC is at Abernethy. Background spore levels here are thought to be high and the moss is known to have colonised relatively new dead wood (10 years old). This suggests that local recovery times in Abernethy can be as short as a decade providing a strong local population is maintained. In smaller, more isolated patches of habitat, loss of continuity of deadwood could result in extirpation for longer periods, even if new deadwood is provided. Recovery depends on the chance colonisation of new substrate by spores, which may be at low concentrations in isolated patches of habitat.

2b. Maintain the distribution of Green shield-moss throughout the site

Distribution of the species within the site is dependent upon the availability of suitable habitat. Within the SAC green shield-moss has been most frequently recorded in the ancient pinewood areas of Abernethy. This should be considered as the current core distribution of the population. However, suitable habitat (broadly identified by the distribution of ancient woodland) occurs in Glen Derry, Glen Quoich, Glenmore, Inshriach and the Rothiemurchus parts of the SAC.

2c. Maintain the habitats supporting Green shield-moss within the site

Green shield-moss is found in a wide range of wooded habitats but primarily native pinewoods (on a number of tree species) and in older plantations of Norway spruce and other commercial/non-native conifers. The importance of non-native conifers is exemplified in the Cairngorms SAC where green shield-moss produces abundant capsules along the plough lines within Dell Wood NNR. This particular block of conifers is being retained in the short term as an important source of spores within the SAC. In the longer term, the aim is for a reduction in Norway spruce and replacement by native Scot's pine. Establishment of Norway spruce in adjacent Scots pine woodland is monitored and controlled where necessary.

Elsewhere, old growth forests should be retained, to maintain the availability of suitable habitat for the long term.

The moss requires damp, decaying wood and other organic debris, usually on logs or stumps but sometimes on live trees. It is absent from dry dead trees typical of open pine woodland. It is found on well-rotted Scots pine, birch, rowan, willow, alder, juniper, oak and conifer logs which are not pine. Although most sites are on well-rotted substrates,

some recent sites have been found on logs of Norway spruce cut down no more than ten years ago. It also occurs on old wood ant nests and occasionally on organic soil.

Dead wood in woodland goes through successional changes and has a limited lifetime. Over time the dead wood will rot away. At this site there should be continuity of supply of suitable deadwood to ensure the continued survival of this species. Where this is provided from felled trees the habitat benefits from being dropped to the soil so the wood remains damp.

Green shield-moss is also found where conditions are quite humid because of aspect, canopy cover or proximity to damp ground. This may be in close proximity to watercourses, often where they are incised.

Competition with other mosses and liverworts through micro-habitat succession on occupied deadwood is a natural process and the key factor is to ensure that there is enough new dead wood for constant colonisation.

4. Conservation Measures

Cairngorms SAC is notified as 9 Sites of Special Scientific Interest and management changes described on the lists of Operations Requiring Consent must have prior consent from SNH (NatureScot).

Where similar issues apply, habitats have been grouped together below.

4.1 Current and recommended management for loch communities:

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

Issue	Measure	Responsible party
Water quality	Maintain high water quality as defined under the Controlled Activities Regulations. No use of fertilisers near lochs or other factors which would decrease water quality.	Land manager SEPA
Water quantity	No artificial drainage or abstraction without CAR license or notification	Land manager SEPA
Sedimentation	The hydrological flushing regime should be naturally occurring, without carrying an un-naturally high sediment load especially peat from erosion.	Land manager NS
Invasive non-native species	Some invasive non-native species are already present in the wider catchment. Avoid spread and introduction of new species into the site, including non-native fish. Control if practical, before they become established.	Land managers SEPA River Boards Scottish Government NS

4.2 Current and recommended management for Mountain willow scrub

Issue	Measure	Responsible party
Herbivore impacts (grazing and/or trampling)	Ensure that herbivore [currently mostly red deer on this site] impacts on the feature are 'low' based on the FCS/NS Herbivore Impact Assessment Process to prevent browsing and/or loss of typical species. Grazing is the single most important factor for this habitat.	Land managers, NS, Deer Management Groups
Habitat Management	Conservation action to maintain willow stands where they are currently all male or female, or where very few trees are present. Consider expansion of extent and restoration through conservation management and planting.	NS, land managers.
Research and monitoring	To inform the habitat management identified above, and to identify emerging impacts on the habitat and their causes, including climate change, in order to understand the long term issues, and to inform future management of the habitat across Scotland.	NS

4.3 Current and recommended management for the grass, bog and heath communities:

- **Dry grasslands and scrublands on chalk or limestone**
- **Species-rich grasslands with mat-grass in upland areas**
- **Montane acid grasslands**
- **Juniper on heaths or calcareous grasslands**
- **Alpine and Boreal heaths**
- **European dry heaths**
- **Blanket bog**
- **Wet heathland with cross-leaved heath**

Issue	Measure	Responsible party
Grazing/trampling levels by deer and domestic stock	Grazing levels should be set so the appropriate monitoring shows the condition as good. This means that there is enough grazing for those habitats which require it, but not enough to damage the habitats, or cause damage from trampling. In case of conflict, priorities are set out above. Habitats which require some grazing are the dry grasslands, species rich grasslands, and juniper on heaths or dry heaths.	Land manager
Reindeer grazing, trampling and fraying	Research the impacts of reindeer on the wet heath and other open ground habitats, and progress actions accordingly.	NS Land managers

Trees and shrubs	<p>Trees and shrubs would be allowed to colonise dry heath, wet heath, blanket bog and alpine and boreal heath, where they are native species from existing Caledonian Forest by natural regeneration, subject to the priorities set out above.</p> <p>On grasslands the trees and shrubs would be managed on a case-by-case basis according to the priorities set out above.</p>	<p>Land managers Scottish Forestry Forest and Land Scotland NS</p>
Muirburn and wildfire	<p>The following habitats should not be burnt: Alpine and boreal heaths, Juniper, Blanket bog, Wet heath (except for cool burns) and grasslands.</p> <p>Other habitats should be burnt in accordance with Muirburn Code. If they are burnt, fire should not burn into the moss, liverwort, or lichen layer, or expose the peat surface. Wildfire should be avoided as far as possible.</p>	<p>Land managers NS</p>
Hydrology especially ditches and drains	<p>Artificial drainage should be avoided and where it occurs, repaired by drain blocking, building dams and other techniques as appropriate.</p>	<p>Land managers, Local authority, NS</p>
Peat erosion	<p>Peat erosion should be repaired by re-profiling of hags and gullies, installation of dams and other peat restoration methods.</p>	<p>Land managers, NS, CNPA Peatland Action</p>
Invasive non-native species (INNS)	<p>The site should be managed to avoid introduction or spread of alien or invasive species, other than New Zealand Willowherb <i>Epilobium brunnescens</i>, which is already widely established. Remove INNS wherever possible.</p>	<p>Land managers</p>
Development including hill tracks	<p>Only progress development where an appropriate assessment shows that it will not damage the qualifying features for the site.</p>	<p>Land managers Planning authority NS</p>
Recreation including Cairngorm Mountain uplift	<p>Continue to implement Section 50 agreement relating to Cairngorm uplift. Assess other new proposals by an appropriate assessment. Aim to manage access to avoid damage to any of the features of the site.</p>	<p>Land managers, Access authority, NS</p>
Vehicle use, including ATVs and helicopter	<p>Helicopters have potential to disturb typical species such as golden eagle, so use should be assessed and only occur if timing and frequency is acceptable. ATVs should be used in accordance with best practice to minimise tracking or erosion. Good quality footpaths helps to minimise trampling and path braiding by people.</p>	<p>Land managers Helicopter companies and clients</p>

Climate change	Monitor changes due to climate change, for example changes in extent of montane habitats and of mosses, liverworts and lichens in snow-bed communities.	Scottish/UK government, NS
Disease and pests	Monitor <i>Phytophthora</i> in juniper. If effective treatments are identified in future, treat priority sites. Scottish Forestry guidance on management of diseases and pests. National policy to prevent new introductions of novel pathogens.	Land managers Scottish Forestry

4.4 Current and recommended management for flushes, mires and springs:

- **High-altitude plant communities associated with areas of water seepage**
- **Hard water springs depositing lime**
- **Very wet mires often identified by an unstable 'quaking' surface**

Issue	Measure	Responsible party
Herbivore impacts (grazing and/or trampling) from deer and livestock	Grazing is critical to these habitats to keep the vegetation open and avoid tree establishment. However, the grazing level should not be allowed to increase to the point where soft, wet ground is damaged by trampling. Hence ensure that herbivore impacts on the features are 'low' based on the FCS/NS Herbivore Impact Assessment Process to prevent poaching and/or loss of typical species.	Land managers, NS, Deer Management Groups
Tree establishment	Tree establishment should generally be discouraged because shade on these habitats would result in a loss of rare and scarce vascular plants. An exception would be made for Very wet mires often identified by an unstable 'quaking' surface where the resulting habitat would be a bog woodland – this should generally be allowed since it would increase the area of bog woodland, which is a rare habitat.	Land managers, NS
Avoid artificial drainage	Prevent new drainage of wet habitats, and aim to block historic drains or ditches, to allow natural processes to operate.	Land managers, SEPA NS
Water quality and quantity	Allow natural processes to operate for the hydrology of these habitats. Avoid man-made damage to the hydrology of the features especially their water supply.	Land managers, SEPA NS
Climate change	Monitor changes due to climate change, for example changes in snow lie could affect hydrology and the distribution and plant composition in areas of seepage.	Scottish/UK government, NS

4.5 Current and recommended management for features dependent on screes and cliffs:

- **Siliceous rocky slopes with chasmophytic vegetation**
- **Calcareous rocky slopes with chasmophytic vegetation**
- **Acidic scree**
- **Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels**

Issue	Measure	Responsible party
Herbivore impacts (grazing and/or trampling)	Ensure that herbivore impacts including deer and/or livestock on the feature are 'low' based on the FCS/NS Herbivore Impact Assessment Process.	Land managers, NS, Deer Management Groups
Colonisation and/or shading by native species	Allow colonisation by montane willows/Caledonian forest unless assessment shows that this would threaten European sites habitat. Consider removal of other native trees where appropriate.	Land managers, NS
Colonisation and/or shading by non-native species (e.g. cotoneaster etc.)	Remove non-native species. Remove seed source if possible.	Land managers
Recreation activity	Ensure trampling by walkers is minimal to maintain cover of typical species. If climbers are gardening routes and causing impacts, aim to reduce this by discussion with climbing groups.	Land managers, Access authority
Path works or road stone	Scree should not be used as a source of stone for works such as path improvements or road stone, unless approved in a Habitat Regulations Appraisal. Rocks from other habitats may be used, subject to HRA, but not from the plateau or areas of late snow-lie, and only if no rare species of lichen or bryophyte are present.	Land managers, NS

4.6 Current and recommended management for Caledonian Forest and Bog Woodland

Issue	Measure	Responsible party
Deer grazing and trampling	Ensure that herbivore impacts on the feature are 'low' based on the FCS/NS Herbivore Impact Assessment Process. Maintain deer culls to keep deer at an appropriate level.	Land managers, NS, Deer Management Groups
Reindeer grazing, trampling and fraying	Research the impacts of reindeer on the Caledonian forest habitat (Northern Corries scrub feature) and progress actions resulting.	NS Land managers

Domestic stock grazing and trampling	Assess proposals for grazing by stock depending on the success of tree regeneration and the proposed stocking density. Extensive cattle grazing occurs in some areas. This is a traditional form of management, and it brings beneficial variation in habitats.	NS Land managers
Tree species	Allow natural regeneration of native species adjacent to all existing Caledonian forests. Regeneration includes broadleaved trees as well as Scots pine. Limited planting of native species of local origin where it is ecologically appropriate may be carried out in accord with the small-scale tree planting guidance prepared to support this CAP and subject to appropriate assessment.	Land managers Scottish Forestry
Woodland management	Structure and function targets - Encourage a diverse structure with a mix of age classes across the wider site, especially where plantation management has resulted in single age stands with dense canopies. Where natural regeneration has occurred, Scots pine naturally forms single age stands and these should be retained. Allow broadleaved trees amongst the pine – in places broadleaves may dominate for example riversides. Retain dead wood especially in areas with Green Shield-moss. Retain over-mature and veteran trees wherever possible for the many niche habitats they provide.	Land manager
Invasion by non-native species.	Most sites have few non-native species. Aim to manage all sites so they are, and remain, native species. Some mature Norway Spruce to be retained in the short term, to benefit Green Shield-Moss at Dell Wood. Other than this, the non-native trees and regeneration should be removed to less than 1% of the total.	Land manager
Recreation	Local and strategic approach to recreational impacts, especially lighting fires within the woodland, which poses a significant risk of wildfire.	Access authority, Land managers NS
<i>Dothistroma</i> , <i>Phytophthora</i> and future threats	Consider management approaches to tree diseases based on best available information from Scottish Forestry and develop site Management Plans accordingly. Monitor <i>Phytophthora</i> in juniper and <i>Dothistroma</i> in Scots pine. If effective treatments are identified in future, treat priority sites. Scottish Forestry guidance on management of diseases and	NS Land managers

	pests. National policy to prevent new introductions of novel pathogens.	
Bog Woodland - Maintenance of surrounding woodland structure	Retain woodland around bog woodland to provide seed source for pine regeneration.	Land manager
For Bog Woodland – maintain hydrological regime and increase naturalness	Allow natural processes to operate. Allow sites to get wetter if this happens naturally. Block or remove artificial drains, where there is no threat to property or infrastructure. Peatland Action and SRDP and subsequent agri-environment schemes to restore eroding peat or ditches.	Land managers NS
Bog Woodland – maintain healthy and active bog	If the trees on bog woodland start growing with a normal form (not scattered, stunted) and if the canopy closes, consider removal of trees, subject to appropriate assessment.	Land managers

4.7 Current and recommended management for Otters

Issue	Measure	Responsible party
Ongoing species protection	Otter are a European protected species and therefore the species protection provisions of the Habitats Regulations apply.	All
Habitat	Aim to maintain areas of dense cover which are free from human disturbance close to otter holts or areas frequented by otter.	Land managers
Avoid pollution and litter	Meet requirements of the Controlled Activities Regulations. Discourage litter and if it occurs, remove it regularly.	Land managers SEPA
Water quality monitoring	Implement and maintain monitoring of key water quality parameters.	NS/SEPA
Food supply	Maintain habitat suitable for healthy populations of Atlantic salmon, trout, amphibians and other prey for otter.	Land managers SEPA
Development	Based on adequate surveys, apply appropriate licencing and mitigation for otter during development, especially roads crossing water courses.	Developers NS Planning authorities

4.8 Current and recommended management for green shield-moss

Issue	Measure	Responsible party
Ongoing species protection	Green shield-moss is listed on Schedule 8 of the Wildlife and Countryside Act 1981 (as amended). It is an offence to	All

	intentionally or recklessly pick, uproot or destroy green shield-moss or to sell, offer for sale, possess or transport it for the purpose of sale unless a licence is issued to do so.	
Beneficial habitat management	Encourage management to increase the volume of dead wood present, mainly by retaining naturally fallen wood. Maintain continuity and retention of coarse woody debris of a range of tree species through the production and implementation of deadwood management plans	Land managers
	Maintain extent and continuity of sheltered native woodland, especially old growth forests, within the site.	Land managers
	Identify important populations in non-native conifer populations and draw up management plans to mitigate losses due to essential harvest operations. Consider retaining supporting habitat as ex-plantation forest reserves (a framework has been developed with Forest and Land Scotland).	Land managers
	Where appropriate, retain Norway spruce logs under continuous canopy cover. If possible, remove side branches to ensure log rots to provide suitable green shield-moss habitat.	Land managers
	Encourage adoption of continuous forest cover harvest methods in neighbouring commercial forest plantations. This increases the size of the local meta-population and therefore species resilience.	FLS/Land managers
	Retain the block of Norway spruce at Dell Wood NNR within the SAC where a large fertile population of green shield-moss has colonised undisturbed plough-lines. This population will provide a source of spores to maximise colonisation opportunities in adjacent native woodland. Allow natural loss of the Norway spruce here and gradual replacement by native trees.	NS
Monitoring	Establish a rolling programme of re-survey to assess the number of occupied 100 metre squares within occupied hectads (or monads where more appropriate).	NS/RSPB/NTS/CNPA/local volunteers
	Continue to survey previously surveyed habitat within the SAC	NS/RSPB/NTS/CNPA/local volunteers
	Continue to document the range of substrates this moss occurs on and update general management advice accordingly.	NS/RSPB/NTS/CNPA/British Bryological Society/local volunteers

Research	Develop and test DNA-based monitoring methods that do not require capsules to be present for survey.	NS/ Royal Botanic Garden Edinburgh (RBGE)/ Universities
	Research to better understand the lifecycle and population dynamics of green shield-moss.	NS/RBGE/Universities

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