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Buidheann Nàdair na h-Alba

INVERNAVER
SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE

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Site Details

Site name:	Invernaver
Map:	https://sitelink.nature.scot/site/8276
Location:	Highlands and Islands
Site code:	UK0013041
Area (ha):	287.67
Date designated:	17 March 2005

Qualifying features	SCM assessed condition on this site	SCM visit date	UK overall Conservation Status
Shifting dunes with marram Shifting dunes along the shoreline with Ammophila arenaria “white dunes”) [H2120]	Favourable Maintained	9 June 2016	Unfavourable - Bad
Dune grassland* (Fixed dunes with herbaceous vegetation “grey dunes”) [H2130]	Favourable Declining	9 June 2016	Unfavourable - Bad
Coastal dune heathland* Atlantic decalcified fixed dunes [H2150]	Favourable Maintained	9 June 2016	Unfavourable - Bad
Dunes with creeping willow Dunes with Salix repens ssp. argentea (Salicion arenariae) [H2170]	Favourable Maintained	9 June 2016	Unfavourable - Bad
Dunes with juniper thickets* Coastal dunes with Juniperus spp [H2250]	Favourable Maintained	9 June 2016	Favourable
Alpine and subalpine heaths Alpine and subalpine heaths [H4060]	Unfavourable Recovering	18 August 2010	Unfavourable - Bad
Alpine and subalpine calcareous grasslands	Unfavourable No change	28 September 2011	Unfavourable - Bad
Base-rich fens Alkaline fens [H7230]	Unfavourable Recovering	18 August 2010	Unfavourable - Bad

Notes:
Assessed condition refers to the condition of the SAC feature assessed at a site level as part of NatureScot’s Site Condition Monitoring (SCM) programme.
Conservation status is the overall condition of the feature throughout its range within the UK as reported to the European Commission under Article 17 of the Habitats Directive in 2019.
* Indicates a Habitats Directive Priority Habitat

Overlapping and linked Protected Areas:

Invernaver Special Area of Conservation (SAC) overlaps with part of

- Invernaver Site of Special Scientific Interest (SSSI) https://sitelink.nature.scot/site/815

is adjacent to the mouth of the

- River Borgie SAC https://sitelink.nature.scot/site/8356

and overlaps the mouth of the River Naver, which leads to the

- River Naver SAC https://sitelink.nature.scot/site/8362

Key factors affecting the qualifying features

Shifting dunes with marram

This habitat encompasses the vegetation of unstable dunes, just inland of high tide, where there is active sand movement. This is a dynamic vegetation type maintained only by change. It can occur on both accreting and eroding dunes, but can rapidly change and disappear if stability is imposed. Under these conditions sand-binding marram *Ammophila arenaria* is the dominant plant.

Key factors affecting this habitat at Invernaver include cycles of erosion and accretion related to weather conditions, potential future changes in sea level and the severity/frequency of storms, trampling (by visitors, horses/ponies) and unauthorised vehicle use.

Dune grassland

This Habitats Directive Priority habitat occurs throughout the lower part of the site, as the Naver, Borgie and seaward-facing dune systems all have the width to allow it to develop. It occurs inland of the 'Shifting dunes with marram' SAC habitat, and represents the vegetation that replaces marram as the dune stabilises and the organic content of the sand increases.

The vegetation consists of a short sward characterised by red fescue *Festuca rubra* and lady's bedstraw *Galium verum* and which is also rich in species that grow in calcareous (lime-rich) substrates.

This feature has been assessed through NatureScot's Site Condition Monitoring (SCM) programme as being in favourable declining condition at this SAC due to undergrazing at one specific location only - the Borgie side of the site.

Key factors affecting this habitat at Invernaver are grazing/trampling levels (by sheep and horses/ponies) and grazing/burrowing by rabbits. Additional likely factors are damage from unauthorised vehicle use, invasive species (nettles and thistles) and large scale movements of sand.

Coastal dune heathland

This Habitats Directive Priority habitat type occurs in the lower parts of Invernaver SAC on mature, stable dunes just to the north of the 'football pitch' on the Borgie side of Druim Chuibhe. This habitat has formed where the initial shell content of the dune sand was low and the surface soil layers have lost their remaining calcium carbonate through leaching, making the soil sandy, but acidic.

Coastal dune heathland is a 'fixed' dune habitat where the dunes are no longer mobile and is well protected from the sea by the width of the dune system. It forms a mosaic with other

dune habitats towards its seaward and landward edges, and its most characteristic species are heather *Calluna vulgaris* and sand sedge *Carex arenaria*.

Key factors likely to affect this habitat at Invernaver include grazing/trampling levels (by domestic stock, horses and ponies), grazing/burrowing by rabbits, invasive non-native conifers and large scale movements of sand.

Dunes with creeping willow

This habitat type comprises parts of dunes where creeping willow *Salix repens* ssp. *argentea* is dominant, forming prominent, low scrubby growth. At Invernaver, it is found in and around dune slacks amongst hummocky dunes near the base of Druim Chuibhe on the Borgie side of the site.

The dunes with creeping willow habitat represents a mature phase in the life cycle of calcareous dune slacks. When found with other types of dune vegetation, as it is at Invernaver, it indicates that successional processes are still active and that the structure and function of the dune system are well-conserved. This habitat type occurs alongside a number of others, particularly humid dune slacks, calcareous fixed dune vegetation and dune heath.

Key factors likely to affect this habitat at Invernaver include grazing/trampling levels (by domestic stock, horses and ponies), grazing/burrowing by rabbits, unauthorised vehicle use and large scale movements of sand.

Dunes with juniper thickets

This Habitats Directive Priority habitat type comprises common juniper *Juniperus communis* scrub which is found mainly on the coastal sand dunes near the base of Druim Chuibhe on the Borgie side of the site. The prostrate form of juniper is found on this site. Stands are usually small and are intimately mixed with other habitat types, including dune grassland and heath. There is a range from discrete stands, to more scattered and occasional individuals, which occur within the fixed dunes and on the climbing dunes where sand has blown up the slope of Druim Chuibhe and there are complex transitions to upland habitats.

Key factors likely to affect this habitat at Invernaver include grazing/trampling levels (by domestic stock, horses and ponies), grazing/burrowing by rabbits, unauthorised vehicle use and large scale movements of sand.

Alpine and subalpine heaths

Alpine and subalpine heaths occur on upland parts of Invernaver where the soil is more acidic because there is less influence from wind-blown sand. Wind exposure suppresses the growth of dwarf-shrubs in favour of characteristic lichens and bryophytes in some places.

This feature was assessed in 2004 through NatureScot's SCM programme as being in unfavourable condition at this SAC due to the legacy of high levels of past grazing, mainly by sheep, in combination with past burning. Burning has not been carried out recently but high levels of sheep grazing have caused the heaths to be overly dominated by grasses at the expense of the dwarf shrub species that should be typical of this habitat. Following a large reduction in sheep stocking levels, the 2010 survey found the condition of the habitat to have improved, leading to an unfavourable, recovering assessment.

Grazing levels are the most important factor affecting this habitat at Invernaver. Other key factors affecting Alpine and subalpine heaths are trampling and wildfire.

Alpine and subalpine calcareous grasslands

This habitat occurs extensively on Invernaver SAC where soils are rich in blown shell sand. It is found from near sea level to just over 100 m. It consists of short, grazed, species-rich mixtures of arctic-alpine cushion herbs, grasses and sedges. These species are found at a much lower altitude than normal at Invernaver, due to the unusual combination of blown shell sand and exposure to wind and sea salt. This is one of the most important upland habitats in the UK for rare arctic-alpine plants and other rare montane or northern plants, including the endemic Scottish primrose *Primula scotica*.

This feature has been assessed through NatureScot's SCM programme as being in unfavourable condition at this SAC due to the spread of juniper, which is encroaching on this habitat in the upland part of the site, and preferential sheep grazing of the habitat itself which reduces the growth of typical plants and their ability to flower and set seed (which in turn also allows colonisation by juniper).

Balancing grazing levels is key to the creation and maintenance of this habitat as juniper will colonise this habitat at Invernaver if livestock grazing levels are too low and if preferential sheep grazing of the habitat is too high. However increased stocking levels by more suitable, heavier stock, such as cattle or horses/ponies and use of temporary fencing, will break up the juniper whilst not over-grazing areas where alpine and subalpine calcareous grasslands are still present. A Management Agreement with NatureScot is now in place which is trialling the effects of increased shepherding and heavier stock such as horses/ponies.

This habitat is also vulnerable to invasion by non-native conifers and the non-native fairy foxglove *Erinus alpinus* which has established near the broch. Exposure to wind (with the consequent level of supply of blown shell sand) and the current temperature regime are also important in maintenance of this habitat. Some of the plants that grow in this habitat are at the lower limit of their altitudinal range whilst also occurring on the highest parts of this site, so may be vulnerable to climate change in future.

Base-rich fens

There are a large number of small base-rich fens on the upland part of Invernaver SAC, mostly embedded within Alpine and subalpine heath. This means that management of base-rich fen is difficult to separate from management of the surrounding (drier) habitat.

Base-rich fens have developed where relatively nutrient-rich water from underground comes to the surface forming isolated patches that are damp or wet year round. These patches have vegetation that is markedly different from the surrounding upland vegetation, often containing distinctive stands of black bog rush *Schoenus nigricans*.

This feature has been assessed through NatureScot's SCM programme as being in unfavourable condition at this SAC due to the legacy of high levels of past grazing, mainly by sheep. Following reduction in stocking levels, the 2010 survey found the condition of the habitat to have improved leading to an unfavourable, recovering assessment.

Other factors likely to affect this habitat at Invernaver include trampling by livestock, horses/ponies and red deer and large scale movements of sand.

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

Conservation Priorities

Dune grassland, coastal dune heath and dunes with juniper thickets are all Habitats Directive Priority Habitats. Appropriate management of these habitats should have priority, followed by features that are in unfavourable condition, if any conflict between management of different habitats were to arise within Invernaver SAC. However, the impact of any proposed management measure on all the qualifying features should first be considered as part of a Habitats Regulations Appraisal.

Invernaver SAC is adjacent to, and/or downstream of, both the River Naver SAC and River Borgie SAC. Both these river SACs have Atlantic salmon and freshwater pearl mussel interests. Freshwater pearl mussels are not found within Invernaver SAC. However, part of the freshwater pearl mussel lifecycle depends on the Atlantic salmon that migrate through Invernaver SAC. Otter from the River Borgie SAC are also likely to use Invernaver SAC for feeding and resting.

Any management of Invernaver SAC or assessment of plans or projects will need to take account all features of Invernaver SAC as well as features of both the River Naver SAC and River Borgie SAC.

When making these assessments it should be recognised that Invernaver has a unique and intricate mosaic of habitats and that as a consequence management that benefits one feature could be sub-optimal for another. For instance, juniper is currently spreading into the Alpine and subalpine calcareous grasslands habitat in the upland part of Invernaver SAC. Management of the upland part of the site should aim to reduce the juniper cover in this part of the site to prevent it from out-competing species that are typical of the Alpine and subalpine calcareous grasslands. The Habitats Directive Priority habitat 'dunes with juniper thickets' is found on the coastal part of the site. Management of juniper that is growing in the dunes should not be altered (as this is a valuable habitat and the juniper here is encroaching on Alpine and subalpine calcareous grassland).

Conservation Objectives

Overarching Conservation Objectives for all features of Invernaver SAC

1. To ensure that the qualifying features of Invernaver SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status
Favourable Conservation Status (FCS) is considered at a European biogeographic level. When determining whether management measures may be required to ensure that the conservation objectives for this site are achieved, the focus should be on maintaining or restoring the contribution that this site makes to FCS. When carrying out appraisals of plans and projects against these conservation objectives, it is not necessary to understand the status of the feature in other SACs in this biogeographic region. The purpose of the appraisal should be to understand whether the integrity of the site (see objective 2) would be maintained. If this is the case then its contribution to FCS across the Atlantic Biogeographic Region will continue to be met. Further details on how these appraisals should be carried out in relation to maintaining site integrity is provided by objective 2 (including parts a, b and c). If broader information on the feature is available then it should be used to provide context to the site-based appraisal. Note that "appropriate" within this part of the conservation objectives is included to indicate

that the contribution to FCS varies from site to site and feature to feature.

2. To ensure that the integrity of Invernaver SAC is restored by meeting objectives 2a, 2b and 2c for all qualifying features.

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

This objective recognises that each qualifying habitat is exposed to a wide range of drivers of change. Some of these are natural and are not a direct result of human influences. Such changes in the habitat's extent, distribution or condition within the site which are brought about by natural processes, directly or indirectly, are normally considered compatible with the site's conservation objectives. An exception to this is when the favourable condition of a habitat is dependent on halting or managing natural succession. An assessment of whether a change is natural or anthropogenic, or a combination of both, will need to be looked at on a case by case basis.

Conservation Objectives for shifting dunes with marram

2a. Maintain the extent and distribution of shifting dunes with marram within the site

The extent of the shifting dune with marram feature has been estimated at approximately 9 ha (area taken from the Standard Data Form). This should be maintained within a broad tolerance taking into account that changes are likely to be caused by the action of the wind and sea.

This habitat, by its very nature, is restricted in the area it can occupy at Invernaver as dune systems are dynamic. Its extent may be subject to sudden changes, due to natural cycles of erosion and accretion as well as potential future losses due to rising sea level and the severity/frequency of storms.

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

2b. Maintain the structure, function and supporting processes of shifting dunes with marram

This habitat can occur on both accreting and eroding dunes, but will rapidly change. Cycles of erosion followed by stability are part of the natural development of shifting dunes with marram and are essential to the maintenance of diversity. It does not occur in isolation because of its dynamic nature and because the inland edge of this habitat transitions into other coastal habitats.

A continued supply of new sand is vital for the continued existence of the shifting dune community and the long-term survival of the dune ecosystem. Dunes form a natural buffer against coastal erosion, performing best when they are allowed to adjust themselves to changing natural forces. The sand supply from the beach and from offshore can fluctuate

naturally over periods of years, and the dunes react to this by advancing or retreating. This process should not be interfered with as that may lead to consequences for sediment movement over a wider area. An appreciation of the behaviour of sediment is thus essential to the understanding of the dune habitat. Dune dynamism should not be confused with coastal erosion.

The natural mobility and transition of the shifting dunes with marram and continuity with associated habitats should be maintained and not disrupted by track construction or extraction of sand.

Healthy marram grass *Ammophila arenaria* and lyme grass *Leymus arenarius* is essential to bind the sand together, which is key to maintaining the structure, function and supporting processes of this habitat. These grasses can survive harsh environmental conditions but are particularly vulnerable to trampling by beach users and crushing by vehicles (including unauthorised vehicle use). Intensive or widespread trampling or crushing should be avoided, as they can cause accelerated erosion in localised areas which has the potential to spread uncontrollably leading to loss of habitat structure and extent.

2c. Maintain the distribution and viability of typical species of shifting dunes with marram

The species composition of shifting dunes with marram is constrained by the harsh conditions and should continue to consist mainly of marram with a high proportion of bare sand. Lyme-grass should also be present in some areas.

Zonation is a fundamental attribute of a dynamic sand dune ecosystem. The range of vegetation zones and the transitions between them should be maintained. Unless the dunes are undergoing a phase of erosion, the strandline should contain sea rocket *Cakile maritima*, sea sandwort *Honckenya peploides,* orache sp. and *Atriplex* spp*.* Further inland, there should be a transition to fixed dune grassland with grasses such as red fescue *Festuca rubra*.

Excessive tracking/trampling by visitors / vehicles should be avoided as this can lead to erosion of the shifting dune with marram and therefore a reduction or loss in the typical/indicator species and a deterioration in the habitat structure.

This habitat also supports breeding ringed plover and little terns sometimes nest here.

Conservation Objectives for dune grassland

2a. Maintain the extent and distribution of dune grassland within the site

The extent of the dune grassland feature has been estimated at 38 ha (area taken from the Standard Data Form). This should be maintained within a reasonable range taking into natural changes.

This habitat occurs when the dunes become more stabilised, or ‘fixed’ and represents a zone inland where sand deposition decreases. However, this does not preclude an element of mobility, but such mobility should be minor. The inland extent of the dune grassland forms a gradual transition to upland habitats.

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

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

This habitat occurs inland of the zone dominated by marram on coastal dunes. It represents the vegetation that replaces marram where accretion is no longer significant and the dune stabilises, or becomes 'fixed', and the organic content of the sand increases. The largely closed swards are maintained by grazing, by livestock (sheep), horses/ponies and rabbits.

This feature has been assessed through NatureScot's SCM programme as being in favourable, declining condition at this SAC due to the low level of recent grazing at one specific location only - the Borgie side of the site. Habitat structure should be restored in the 'football pitch' area at the Borgie side of the site by increasing grazing by livestock (sheep) and/or horses/ponies. Grazing levels by a combination of livestock (sheep), horses/ponies and rabbits should not be increased at the Invernaver side of the site, but maintained at existing levels.

Grazing management of the dune grassland at Invernaver should aim for a 2-10 cm high grassy sward, preventing the development of a thatch so that smaller species are not out-competed and the typical plants (listed in 2c) are able to grow, flower and set seed.

Additional pressures likely to affect this habitat, which may also affect all coastal habitats at Invernaver are: dunging and/or trampling by livestock (horses/ponies and sheep), damage from vehicles (including unauthorised vehicle use), burrowing/grazing by rabbits, invasive species (nettles and thistles) and trampling by recreation users. As well as direct damage, these can all cause localised destabilisation of the habitat through loss of surface vegetation. Where left unchecked this has the potential to lead to large-scale destabilisation via blowouts, loss of structure and extent and fragmentation of the habitat as well as loss of continuity with adjacent associated habitats.

2c. Maintain the distribution and viability of typical species of dune grassland

Dune grasslands should be maintained as species-rich with at least eight of the following present: lady's bedstraw *Galium verum;* sand sedge *Carex arenaria;* glaucous sedge *Carex flacca;* ribwort plantain *Plantago lanceolata;* white clover *Trifolium repens;* birdsfoot trefoil *Lotus corniculatus;* wild thyme *Thymus praecox;* common mouse-ear *Cerastium fontanum;* self-heal *Prunella vulgaris;* mouse-ear hawkweed *Pilosella officinarum;* germander speedwell *Veronica chamaedrys;* catsear *Hypochoeris radicata;* red fescue *Festuca rubra; Viola spp.;* dog lichen sp. *Peltigera sp.; Cladonia sp.;* springy turf-moss *Rhytidiadelphus squarrosus;* big shaggy-moss *Rhytidiadelphus triquetrus;* wall screw-moss *Tortula muralis;* Fairy flax *Linum catharticum;* mountain avens *Dryas octopetala*; purple oxytropis *Oxytropis halleri*; Scottish primrose *Primula scotica* (a nationally scarce endemic).

This habitat should have a moderate level of grazing to maintain the short, closed sward. Grazing should not be removed entirely, as this can lead to the development of taller, coarser, species-poor vegetation of lower botanical interest, such as coarse grassland, and loss of sensitive species. Equally, levels of grazing in summer should be low enough that typical species can grow, flower and set seed. Under grazing at the Borgie side of the site has occurred. The structure of this habitat should be restored at this specific location by increasing grazing by livestock and/or horses/ponies.

Stock feeding, especially by hay/silage, should be avoided on or near this feature because these are likely to introduce seeds from vigorous plants (e.g., thistles) that are undesirable in this habitat and uneaten hay/silage can smother dune grassland vegetation. Stock feeding should also be avoided because it can cause localised areas of dunging by animals, leading to soil eutrophication which encourages vigorous species such as nettles at the expense of the typical species of this habitat.

Excessive colonisation of this habitat by vigorous native species such as nettle *Urtica dioica* common ragwort *Senecio jacobaea;* creeping thistle *Cirsium arvense;* perennial ryegrass *Lolium perenne;* or bracken *Pteridium* should be avoided as this can cause irreversible loss of typical species in the longer term.

Excessive trampling by visitors/livestock or crushing by vehicles (including use of unauthorised vehicles) can contribute to deterioration in the habitat structure, and a consequent reduction or loss in the typical species for this habitat.

The activities of large numbers of rabbits can damage this habitat, but this is also an important habitat for rabbits due to the ease of burrowing. This habitat also supports breeding birds such as wheatear and meadow pipit.

Conservation Objectives for coastal dune heathland

2a. Maintain the extent and distribution of coastal dune heathland within the site

The extent of the coastal dune heathland feature has been estimated at 1.7 ha (area taken from the Standard Data Form). This should be maintained within a reasonable range taking into account natural changes in these dune systems where one SAC habitat tends to merge gradually into another.

This habitat type occurs in a restricted part of Invernaver SAC where the soil conditions are appropriate on mature, stable dunes just to the north of the 'football pitch' on the Borgie side of Druim Chuibhe.

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

2b. Maintain the structure, function and supporting processes of coastal dune heathland

The main pressures likely to affect this habitat also affect all coastal habitats at Invernaver. These pressures are: grazing/browsing and/or trampling by stock (horses/ponies and sheep), damage from vehicles (including unauthorised vehicle use), burrowing/grazing by rabbits and trampling by recreation users. As well as direct damage, these can all cause localised destabilisation of the habitat through loss of surface vegetation. Where left unchecked this has the potential to lead to large-scale destabilisation via blowouts, loss of structure and extent and fragmentation of the habitat as well as loss of continuity with adjacent associated habitats.

2c. Maintain the distribution and viability of typical species of coastal dune heathland

Typical species in this habitat are the dwarf shrubs heather *Calluna vulgaris* and bell heather *Erica cinerea* along with occasional bryophyte cover. Other indicator species are common sorrel *Rumex acetosella;* sand sedge *Carex arenaria;* sheep's fescue *Festuca ovina;* early hair-grass *Aira praecox;* marram grass*;* bird's foot trefoil *Lotus corniculatus* and the lichens - *Cornicularia aculeate & Cladonia* spp*.*

Levels of grazing/browsing (livestock - sheep, horses/ponies, red deer and rabbits) should be low enough to allow growth, flowering and fruiting of dune heath species whilst also being high enough to prevent more vigorous plants from out-competing smaller and slower-growing species.

Colonisation of this habitat by vigorous native species should be avoided (examples of such

species are false oat-grass *Arrhenatherum elatius*; cocksfoot *Dactylis glomerata;* rosebay willowherb *Chamaerion angustifolium*; and common ragwort). Any self-sown non-native conifers should be removed.

The activities of large numbers of rabbits can damage this habitat, but this is also an important habitat for rabbits due to the ease of burrowing. In combination with the other coastal habitats on this site, this habitat also supports breeding birds such as wheatear.

Conservation Objectives for dunes with creeping willow

2a. Maintain the extent and distribution of dunes with creeping willow within the site

The extent of the dunes with creeping willow feature has been estimated at 1.5 ha (area taken from the Standard Data Form). This should be maintained within a reasonable range taking into account natural changes in transitions to other coastal and upland SAC habitats

This habitat occurs mainly in and around dune slacks near the base of Druim Chuibhe on the Borgie side of the site. It comprises dunes or parts of dunes where creeping willow *Salix repens* ssp. *argentea* is dominant.

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

2b. Maintain the structure, function and supporting processes of dunes with creeping willow

This habitat represents the later, more mature, stages of the well-marked successional sequence characteristic of sand dunes especially in and around mature slacks where there has been little or no sand movement for some time and where the grazing is light. Creeping willow tends to grow most vigorously at the drier end of the spectrum of slack vegetation types and it is also mainly associated with calcareous dune sites such as found at Invernaver.

Transition and interchange between mobile dune, dune grassland, dune slacks and dune heathland will occur through natural processes. When dunes with creeping willow is found with other wetland and dry dune vegetation it indicates that successional processes are still active and that the structure and function of the dune system are well-conserved.

The main pressures likely to affect this habitat, also affect all coastal habitats at Invernaver. These pressures are: grazing/browsing and/or trampling by stock (horses/ponies and sheep), damage from vehicles (including unauthorised vehicle use), burrowing/grazing by rabbits and trampling by recreation users. As well as direct damage, these can all cause localised destabilisation of the habitat through loss of surface vegetation. Where left unchecked this has the potential to lead to large-scale destabilisation via blowouts, loss of structure and extent and fragmentation of the habitat as well as loss of continuity with adjacent associated habitats.

2c. Maintain the distribution and viability of typical species of dunes with creeping willow
Presence of creeping willow *Salix repens* defines this habitat, and this should remain the dominant plant and form a bushy canopy. Other typical species should include at least two of: red fescue *Festuca rubra;* glaucous sedge *Carex flacca;* sand sedge *Carex arenaria;* birdsfoot trefoil *Lotus corniculatus;* mouse-ear hawkweed *Pilosella officinarum;* eyebright *Euphrasia officinalis.* Species composition should be maintained with light grazing with timing appropriate to prevent loss and/or significant increase in creeping willow and to allow flowering and fruiting of the typical species of this habitat. Both complete removal of grazing and intensive grazing should be avoided as either can lead to loss of sensitive species and conversion to other habitats. Excessive colonisation of this habitat by vigorous native species, common ragwort*;* creeping thistle*;* perennial ryegrass *Lolium perenne;* or bracken should be avoided as this can cause potentially irreversible loss of typical/indicator species in the longer term. The activities of large numbers of rabbits can damage this habitat, but this is also an important habitat for rabbits due to the ease of borrowing. In combination with the other coastal habitats on this site, this habitat also supports breeding birds such as wheatear.

Conservation Objectives for dunes with juniper

2a. Maintain the extent and distribution of dunes with juniper within the site
The extent of the dunes with juniper feature has been estimated at 2.5 ha (area taken from the Standard Data Form). This should be maintained within a reasonable range taking into natural changes such as transitions between the different coastal habitats on this site. This habitat type occurs in a restricted part of Invernaver SAC where the soil conditions are appropriate. It is found on the coastal sand dunes near the base of Druim Chuibhe on the Borgie side of the site and on 'climbing dunes' where sand has been blown onto the slopes of Druim Chuibhe where there are complex transitions from coastal to upland SAC habitats. Juniper *Juniperus communis* is also found as more discrete areas of low scrub in the dunes. This habitat comprises dunes or parts of dunes where juniper is dominant, forming prominent, low scrubby growth. This conservation objective is considered to be met if the conditions to ensure the habitats' long-term existence are in place.

2b. Maintain the structure, function and supporting processes of dunes with juniper
The main pressures likely to affect this habitat, also affect all coastal habitats at Invernaver. These pressures are: grazing/browsing and/or trampling by stock (horses/ponies and sheep), damage from vehicles (including unauthorised vehicle use), burrowing/grazing by rabbits and trampling by recreation users. As well as direct damage, these can all cause localised destabilisation of the habitat through loss of surface vegetation. Where left unchecked this has the potential to lead to large-scale destabilisation via blowouts, loss of structure and extent and fragmentation of the habitat as well as loss of continuity with adjacent associated habitats.

2c. Maintain the distribution and viability of typical species of dunes with juniper
Presence of juniper *Juniperus communis* defines this habitat, and this should remain at a variety of densities between scattered or dominant. Other typical species should include heather *Calluna vulgaris*, bell heather *Erica cinerea*; common sorrel *Rumex acetosella;* sand sedge *Carex arenaria;* sheep's fescue *Festuca ovina;* early hair-grass *Aira praecox;* marram grass *Ammophila arenaria;* bird's foot trefoil *Lotus corniculatus* and the lichens - *Cornicularia aculeate & Cladonia* spp*.* Levels of grazing/browsing (livestock, horses/ponies, red deer and rabbits) should allow be low enough to allow growth, flowering and fruiting of dune heath species but also high enough to prevent loss of sensitive species that can tolerate the harsh environmental conditions but are not able to compete with more vigorous plants. Colonisation of this habitat by vigorous native species should be avoided (examples of such species are false oat-grass cocksfoot*;* rosebay willowherb; and common ragwort). Any self-sown non-native conifers should be removed. The activities of large numbers of rabbits can damage this habitat, but this is also an important habitat for rabbits due to the ease of borrowing. In combination with the other coastal habitats on this site, this habitat also supports breeding birds such as wheatear.

Conservation Objectives for Alpine and subalpine heaths

2a. Maintain the extent and distribution of Alpine and subalpine heaths within the site
The area of this habitat should be maintained at approximately 29 ha. The area figure for this SAC has been taken from the Standard Data Form, and is an estimate based on the fact that this habitat can grade into other heath types. Modest changes in the area of Alpine and subalpine heaths assessed by future surveys may therefore represent changes in survey accuracy rather than change in habitat area. The overarching objective is for there to be no measurable net reduction in the distribution of Alpine and subalpine heaths throughout the site. Alpine and subalpine heaths occur on upland parts of Invernaver where the soil is more acidic because there is less influence from wind-blown sand. They are found both on exposed ridges and on sheltered slopes where the dominant plants can cope with harsh climatic conditions such as high winds. These conditions will largely determine the extent and distribution of the habitats throughout the SAC, although the habitats' long-term existence will also be affected by an appropriate levels of grazing and muirburn (see Objective 2b). This conservation objective is considered to be met if the conditions to ensure the habitats' long-term existence are in place.

2b. Restore the structure, function and supporting processes of the Alpine and subalpine heath
Alpine and subalpine heaths are climax vegetation in exposed and extreme conditions which result in slow growth; they are therefore very sensitive to disturbance and are slow to recover. As with several other habitats at Invernaver, maintaining Alpine and subalpine heaths is a fine balance between degrading to grasslands (which tends to happen if grazing/browsing and burning levels are too high) and succession to scrub/ woodland/ dense juniper thicket

(which happens if browsing/grazing is too low).
At Invernaver, typical heath species composition should be allowed to continue to recover from being overly dominated by grasses due to past grazing by large numbers of sheep and past burning. This should be achieved by continuing a low level of grazing by sheep and horses/ponies that allows typical plants (listed in 2c) to grow and set seed.

Alpine and subalpine heath should not be burnt. Burning has not taken place recently at Invernaver. Bracken should be kept to less than 10% of the ground cover. Less than 10% of the ground cover should be disturbed bare ground (the emphasis is on 'disturbed' rather than 'bare'.)

2c. Restore the distribution and viability of typical species of Alpine and subalpine heath

The distribution and abundance of typical species of Alpine and subalpine heath should be restored. The heath should be dominated by short heather *Calluna vulgaris,* bell heather *Erica cinerea* and bearberry *Arctostaphylos uva-ursi*, together with other dwarf shrubs such as juniper *Juniperus communis* and crowberry *Empetrum nigrum.* Grasses and sedges such as stiff sedge *Carex bigelowii*, wavy hair grass *Deschampsia flexuosa*, sheep's fescue *Festuca ovina* and viviparous sheep's fescue *Festuca vivipara* should also be scattered throughout the heath. There should be no further loss or significant decline in the distribution or abundance of these species.

There should continue to be widely-developed transitions to Alpine and subalpine calcareous grasslands, for which the site is also selected, and to coastal habitats. These complex transitions mean that lime-loving species such as thyme *Thymus praecox* and white flax *Linum catharticum* can also be found in the Alpine and subalpine heath habitat.

An appropriate level of grazing is needed to maintain this habitat: low enough to allow typical plants to flower and set seed whilst also high enough to prevent more vigourous plants from out-competing the smaller or slower-growing species. Most of the grazing on Invernaver SAC is currently by sheep and horses/ponies. The habitat is recovering from past levels of intensive grazing following a decrease in sheep numbers.

Birds and mammals that use this habitat include red grouse *Lagopus lagopus* and red deer *Cervus elaphus*.

Conservation Objectives for Alpine and subalpine calcareous grasslands

2a. Restore the extent and distribution of the Alpine and subalpine calcareous grasslands within the site

The objective is to restore the extent of the habitat to approximately 28 ha. The area figure has been taken from the Standard Data Form, and is an estimate based on the mosaic of high altitude communities.

Alpine and subalpine calcareous grasslands occur extensively on the upland part of Invernaver SAC where soils are rich in blown shell sand.

The extent of Alpine and subalpine calcareous grasslands has been reduced at Invernaver as a result of the spread of juniper on the upland part of the site. Alpine and subalpine calcareous grassland extent should be restored by reducing juniper cover on the upland part of the site, for example by increasing the number of heavier stock to break up the juniper (see 2b).

Note that the Alpine and subalpine calcareous grasslands habitat is found in the upland part of Invernaver SAC. The Habitats Directive Priority habitat 'dunes with juniper thickets' is found on the coastal part of the site. Management of juniper growing in the dunes should not be altered as this is not encroaching on Alpine and subalpine calcareous grassland.

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

2b. Restore the structure, function and supporting processes of the Alpine and subalpine calcareous grasslands

Alpine and subalpine calcareous grasslands are one of the few near-natural habitats remaining in Scotland but they are very sensitive to pressures such as under-grazing (which contributes to encroachment of juniper at Invernaver), over-grazing and trampling.

Maintaining the Alpine and subalpine grasslands at Invernaver is a fine balance between losing typical species due to intensive grazing and losing them due to removal or very low levels of grazing. This habitat can be lost when grazing/browsing levels are too high to allow the typical plants listed in 2c to grow, flower and set seed). No/low grazing can also lead to loss of Alpine and subalpine calcareous grasslands if a dense thatch of dead plant litter builds up, supressing future plant growth, or when there is succession to dense juniper thicket. Grazing by a combination of livestock, horses/ponies and rabbits should be low enough to allow typical plants (listed in 2c) to grow, flower and set seed whilst also high enough to prevent a mat of dead vegetation from building up and to prevent encroachment by juniper.

At Invernaver, juniper has spread at the expense of Alpine and subalpine calcareous grasslands during a number of years with low levels of grazing. The habitat should be restored by increasing stocking levels, particularly by heavier stock such as cattle or horses/ponies to break up the juniper and provide open ground without competition/shading from taller plants. Appropriate shepherding, careful placement of feed blocks and (potentially) mobile grazing of areas using temporary fencing should be used to ensure that livestock use the areas where juniper has encroached whilst not over-grazing areas where Alpine and subalpine calcareous grasslands are still present, as preferential sheep grazing of the habitat can occur e.g., on mountain avens *Dryas octopetala* . A Management Agreement with NatureScot is now in place which is trialling increased shepherding and heavier stock such as horses/ponies.

Bracken should be kept to less than 10% of the ground cover. Cover of non-native conifers and fairy foxglove should not increase, with the long term presumption that these should not be present on the site. Less than 10% of the ground cover should be disturbed bare ground (the emphasis is on 'disturbed' rather than 'bare'.)

Alpine and subalpine grasslands should not be burnt to avoid damage to the structure, function and supporting processes of this habitat.

2c. Restore the distribution and viability of typical species of the Alpine and subalpine calcareous grasslands

The distribution and abundance of typical species of Alpine and subalpine calcareous should be restored. The Alpine and subalpine calcareous grassland habitat at Invernaver is NVC type CG13. There are widely-developed transitions to Alpine and subalpine calcareous heaths, for which the site is also selected, and to coastal communities.

The lime-loving mountain avens should be one of the most distinctive plants in this habitat. Other woody plants should include the lime-hating crowberry *Empetrum nigrum*,

bearberry *Arctostaphylos uva-ursi* as well as creeping willow *Salix repens* ssp. *argentea* and juniper *Juniperus communis* ssp. *nana*. Other plants found here should include yellow saxifrage *S. aizoides*, hair sedge *Carex capillaris*, thyme *Thymus polytrichus* and the endemic Scottish primrose *Primula scotica*. There should be no further loss or significant decline in the distribution or abundance of these species.

Scattered, low juniper is a valuable component of the habitat, but dense juniper that has out-competed all the smaller plants is undesirable. Carefully controlled grazing management, utilising both sheep and heavier stock such as horses/ponies or cattle, is required to restore this habitat at Invernaver SAC see Objectives 2a and 2b.

Birds that use this habitat include skylarks, meadow pipits and wheatears.

Conservation Objectives for base-rich fens

2a. Maintain the extent and distribution of base-rich fens within the site

Maintain the extent and distribution of a large number of small patches of base-rich fen at an estimated total area of 1.7 ha (area taken from the Standard Data Form).

This habitat is found in upland parts of Invernaver where relatively nutrient-rich water from underground comes to the surface forming isolated patches that are damp or wet year round. Due to the small extent of each patch, and their fragmentary nature, current baseline estimates of the area of this habitat may not be very precise and any changes in extent as a result of new surveys may represent greater precision rather than real change.

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

2b. Restore the structure, function and supporting processes of base-rich fens

This habitat is found where there are springs or seepages, fed by base-enriched waters in the upland part of Invernaver SAC.

The appropriate stocking level needed for base-rich fens is a fine balance between too low (which tends to lead to loss of species-richness through dominance by taller plant species) and too high (which causes loss of more palatable species and/or excessive poaching).

At Invernaver, the habitat is recovering from a long period of intensive grazing by sheep which has led to loss of species from some of the base-rich fens. The current low levels of use of this habitat by livestock and red deer should be continued to allow habitat species composition to recover (see Objective 2c).

Excessive poaching (or wallowing by red deer) should be avoided by keeping herbivore numbers low enough that less than 25% of each flush is 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').

Heavy trampling and/or tracking by livestock/ATVs should be avoided as this can result in active drainage of the habitat. Drainage should be considered active if it has altered or removed the original vegetation (or is likely to do so) or facilitates the removal of water from the site.
This habitat is very sensitive to muirburn, which should be avoided in these areas. No burning has taken place recently on Invernaver.

2c. Restore the distribution and viability of typical species of base-rich fens
The core vegetation of this habitat is short sedge mire (mire with low-growing sedge vegetation, often including extensive cover of black bog rush *Schoenus nigricans*) of the following NVC types: M9 *Carex rostrata – Calliergon cuspidatum/giganteum* mire M10 *Carex dioica – Pinguicula vulgaris* mire The current low grazing levels should be maintained (see Objective 2b) to allow species composition in the M10 mire to be restored following reduction in the previously high number of sheep grazing this habitat. At least five of the following indicator species should be present in each flush: brown mosses (e.g., *Campyulium stellatum*, *Scorpiduim scorpiodes*), *Brizia media*, *Carex dioica*, *C. flacca*, *C. hostiana*, *C. viridula*). In addition, less than 1% of the vegetation should be species that tend to colonise areas where long term grazing levels have been too high (*Anthoxanthum odoratum*, *Epilobium hirsutum*, *Holcus lanatus*, *Ranunculus repens*). In M9 mire, at least 2 of the following indicator species should be continue to be present in each flush: Brown mosses, *Carex rostrata*, *Menyanthes trifoliata*, *Potentilla palustris*. Livestock and red deer use this habitat for grazing and red deer sometimes use this habitat as wallows. The nationally scarce string sedge *Carex capillaris* and Scottish primrose *Primula scotica* are found in some of these fens. Some of the larger base-rich fens support snipe, but most of them are so small that they provide part of a larger patchwork of habitats used on occasion by grouse, red deer, skylarks and red grouse.

Conservation Measures

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

Current and recommended management for

- **Shifting dunes with marram**

Issue	**Measure**	**Responsible party**
Tracking/ trampling/ crushing by visitors, horses/ ponies or vehicles	Ensure trampling/crushing by visitors, horses/ponies and vehicles and is minimal to prevent erosion of the shifting dunes and loss of typical species. Recreational use of the site should follow the Scottish Outdoor Access Code. Unauthorised vehicles should not be taken onto the site.	Land managers/ owners/ visitors, NatureScot, Police Scotland
Coastal defences	Ensure that any coastal defences that may be proposed do not disrupt the natural mobility and supply of new sand or continuity with adjacent associated habitats.	Land managers/owners, NatureScot, The Highland Council

Current and recommended management for coastal habitats:

- **Dune grassland**
- **Coastal dune heathland**
- **Dunes with creeping willow**
- **Dunes with juniper thickets**

Issue	Measure	Responsible party
Grazing	Ensure appropriate grazing levels and timing to ensure that combined grazing levels by sheep, horses/ponies and rabbits are low enough to allow flowering and fruiting of typical vegetation whilst not being so low that the vegetation becomes rank enough to cause loss of typical species. Monitor rabbit population and introduce control measures if necessary. Review effectiveness of grazing management at agreed intervals with the potential to make agreed changes.	Land managers, NatureScot,
Habitat continuity	Ensure localised destabilisation through loss of surface vegetation (for example, as a result of rabbit activity) does not lead to large-scale destabilisation via blowouts to prevent loss of structure and extent within the system and any fragmentation of the habitat and loss of continuity with adjacent associated habitats.	Land managers/owners
Excessive trampling/ crushing by people and vehicles	Ensure trampling/crushing by people, horses/ponies and vehicles is minimal to prevent compaction of the soil, erosion and/or reduction/loss of the typical species. Recreational use of the site should follow the Scottish Outdoor Access Code. Unauthorised vehicles should not be taken onto the site.	Land managers/owners, NatureScot, Police Scotland
Colonisation by vigorous native species	Ensure colonisation by vigorous native species, such as nettles, creeping thistle and bracken is minimal to prevent loss of indicator species and conversion to other habitats.	Land managers
Invasive non-native species	Non-native conifers should be removed from the site. The non-native fairy foxglove is also a potential threat to these habitats.	Land manager, NatureScot

Current and recommended management for upland habitats within the site:

- **Alpine and subalpine heaths**
- **Alpine and subalpine calcareous grasslands**
- **Base-rich fen**

Issue	Measure	Responsible party
Grazing/browsing	Ensure appropriate grazing levels and timing to ensure that combined grazing levels by sheep, horses/ponies and red deer are low enough to allow growth, flowering and fruiting of typical plants whilst not being so low that juniper or other more vigorous plants dominate the vegetation so much that they cause loss of typical species. Review effectiveness of grazing management and the Management Agreement with NatureScot at agreed intervals with the potential to make agreed changes.	Land managers, NatureScot, Deer Management Group
Trampling	Trampling levels should be low enough not to damage habitats by causing extensive disturbed, bare ground whilst also high enough to prevent juniper from dominating the vegetation so much that it causes loss of typical species.	Land managers, NatureScot, Deer Management Group
Crushing by vehicles	These habitats are very sensitive to vehicle use so any use of vehicles needs to avoid creating bare ground. Unauthorised vehicles should not be taken onto the site.	Land Managers, NatureScot, Police Scotland
Muirburn	If any burning were to be planned, it should be carried out only with consent from NatureScot and in accordance with the Muirburn Code, avoiding burning in sensitive areas including the base-rich fen, alpine and subalpine heaths and alpine and subalpine calcareous grasslands.	Land managers, NatureScot
Invasive non-native species	Non-native conifers should be removed from the site. The non-native fairy foxglove grows near the broch and is a potential threat to these habitats in future.	Land managers, NatureScot
Colonisation by invasive native species	Ensure colonisation of these habitats by vigorous native species, such as bracken, is minimal to prevent loss of indicator species.	Land managers, NatureScot

All habitats

Research and monitoring	To identify emerging impacts on the habitat and their causes, in order to	NatureScot, University researchers

	understand the long term issues, and to inform future management of the habitat across Scotland. Research bodies should have a local contact they can call upon if undertaking field data collection remotely.	

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