



## Scotland's National Nature Reserves

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### **The Reserve Plan for Keen of Hamar National Nature Reserve 2009 - 2015**



**Scotland's  
National Nature  
Reserves**





## The Reserve Plan for Keen of Hamar National Nature Reserve 2010 - 2016

### Foreword

At first sight it may look like a barren hillside set amongst green fields, but the Keen of Hamar National Nature Reserve (NNR) is a truly unique botanical site: this, the largest expanse of serpentine debris habitat in Europe, is home to rare Arctic-alpine plants including one - Edmondston's chickweed - that grows only here and on the nearby slopes of Nikka Vord and nowhere else in the world.

Serpentine debris, a gravelly soil formed on serpentine rock which has a sparse scattering of plants and has probably changed little since the end of the last glaciation, covers roughly half of the 42.4 hectare (ha) Reserve. It is still affected each winter by freezing and thawing which in places sorts the debris into stripes of alternating large and small pebbles. Arctic-alpine plants which are normally found only on high mountain screes and in glacial regions thrive in these conditions created by this unusual geology. Elsewhere on the Reserve, a thin layer of finer soil covers the debris and rock and provides more stable ground which supports an unusual form of heathland, rich in wild flowers such as thyme, dog violet, mountain everlasting, alpine meadow-rue and early purple orchid.

The Keen of Hamar is one of 54 NNRs in Scotland. NNRs are special places where some of the best examples of Scotland's wildlife are cared for. Nature is the first priority on NNRs, but people are welcome to discover the rich natural heritage of these places and to contribute to our knowledge and enjoyment of these areas.

The Story of the Keen of Hamar is a companion document which has more information about Keen of Hamar NNR and its history. The Story provides the foundation for managing the Reserve and is recommended reading for those wishing to understand more about the management of this very special place. You can download 'The Story of Keen of Hamar NNR' from: <http://www.nnr-scotland.org.uk/managing.asp>

The first section of the Plan gives our vision for Keen of Hamar, describing how we would like to see the Reserve in 2030. It specifies our objectives for management and outlines projects planned to deliver these objectives.

In 2009, we carried out a public consultation on our proposals for management. The consultation report is available from the SNH Shetland Office. Your feedback from the consultation has informed the completion of this Reserve Plan.

During the final year of the plan, we will review our progress against this plan to determine the future direction of our management on the Reserve.

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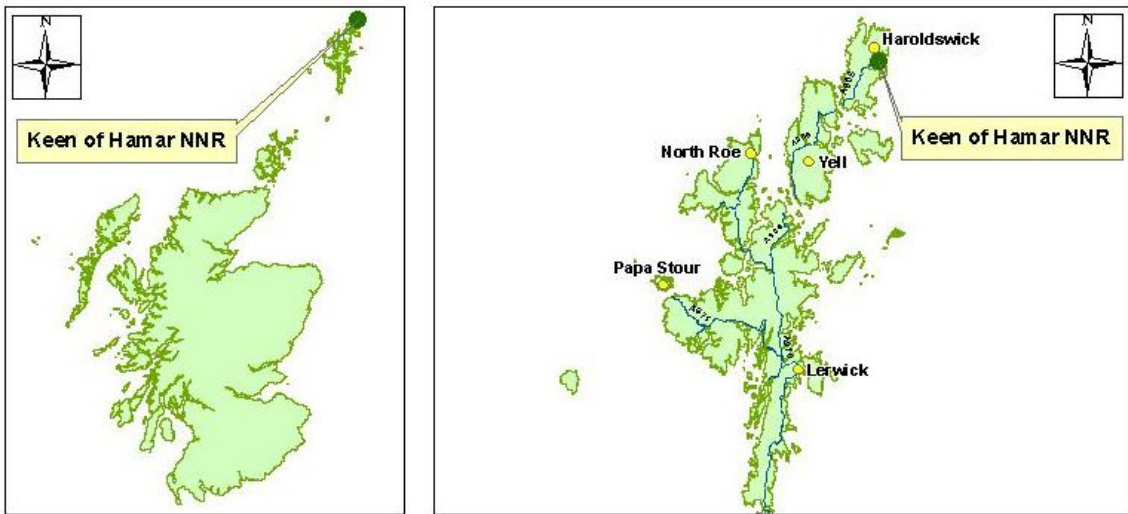
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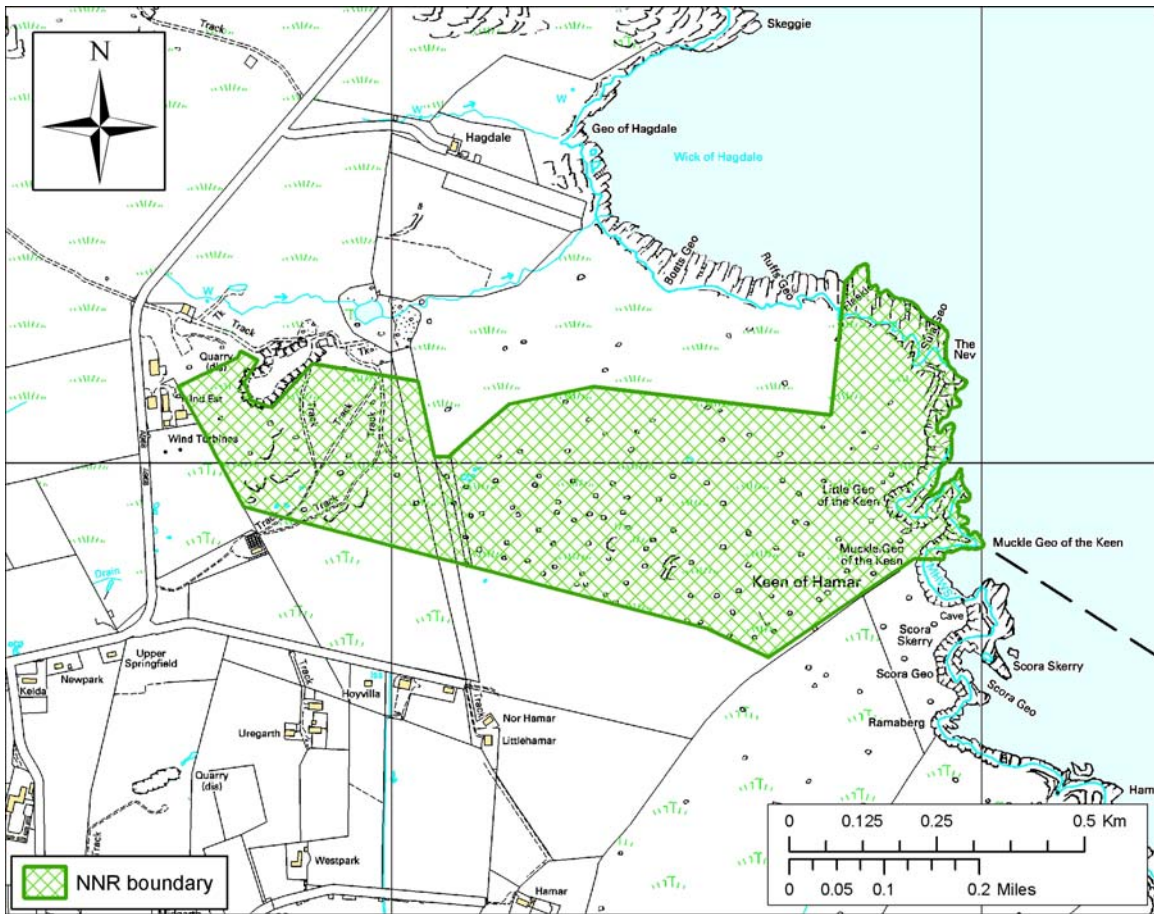
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## Maps of Keen of Hamar NNR

### Location maps



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## 1 Our vision for the Keen of Hamar NNR

Our vision for the Reserve describes how we would like the Reserve to be in 2030. The Reserve Plan will help us work towards our vision during the next 6 years.

### **The Keen of Hamar NNR in 2030**

The Keen of Hamar NNR has an international reputation as a unique botanical site.

The rare habitats and species of the Keen of Hamar continue to thrive across the whole Reserve, including in areas previously damaged by cattle feeding and waste dumping.

The Keen of Hamar attracts a wide range of visitors in increasing numbers.

Research on the Keen of Hamar continues to contribute to understanding of serpentine ecology and ecological succession.

The Reserve provides an educational resource for local schools and for universities and colleges.

Scottish Natural Heritage (SNH) developed a policy for all NNRs in 1996 (see Appendix 1). Our policy requires all NNRs to be nationally important for nature and managed primarily for the nature conservation interest (primacy of nature), following best practice. Our future management for the Keen of Hamar aim to achieve this. We also require that Reserves are used for one or more of three purposes: raising national awareness, specialised management and, research and demonstration. The Keen of Hamar meets all three purposes and we use the Reserve primarily for raising national awareness of nature but it also has an important research value.

## Management Objectives

Our objectives for managing the Keen of Hamar NNR over the next 6 years are:

Management of the Natural and Cultural heritage	<ol style="list-style-type: none"> <li>1. To maintain the extent of serpentine debris habitat and the full range of plants that it supports.</li> <li>2. To maintain the extent and species diversity of the serpentine heath and basic wetland habitats.</li> <li>3. To maintain and enhance biodiversity on the Reserve.</li> <li>4. To support and encourage research and survey work.</li> </ol>
Management for People	<ol style="list-style-type: none"> <li>5. To provide good access for visitors.</li> <li>6. To promote the Keen of Hamar, provide information and maintain a range of interpretive material.</li> <li>7. To facilitate the educational use of the Keen of Hamar by self-supporting groups.</li> <li>8. To develop opportunities for people to participate in the running of the Reserve.</li> </ol>
Property Management	<ol style="list-style-type: none"> <li>9. To carry out property management and maintenance works following best practice.</li> </ol>

## Designations

The Keen of Hamar covers 42.4 ha and first became a NNR in 1975 when the eastern part of the Reserve, known as the upper Keen, was designated. It was enlarged in 2005 to include the western section, or lower Keen. The Reserve has other designations that reflect its national and international importance. The Keen of Hamar is a Special Area of Conservation (SAC) and included in the Natura 2000 network of protected areas of European importance. It is also included in the larger Keen of Hamar Site of Special Scientific Interest (SSSI), part of the UK network of protected areas.

Whilst managing the Keen of Hamar NNR we also have to take account of our legal obligations and Government policy to manage the features that are listed as important in a European or international context. Where a proposal may affect one or more of the qualifying interests of the SAC, we will carry out an 'appropriate assessment'. This includes all proposals, whether they are direct habitat management or providing a new visitor facility on the Reserve. We will only proceed with projects that do not adversely affect the interests. Likewise, we will also take account of obligations to manage features that are valued as important in a British context, as well as features that are locally important. See Appendices for descriptions of designations and maps.



**Table 1: Designations, qualifying features and other important habitats and species of the Keen of Hamar NNR**

Designation	Special Area of Conservation	Site of Special Scientific Interest	Species				
			W&CA	RDB	UKBAP	SBL	LBAP
Level	European	UK					
Site name	Keen of Hamar	Keen of Hamar					
<b>Habitats</b>							
Base-rich scree (Serpentine debris)	✓					✓	
Grasslands on soils with heavy metals (Calaminarian grassland)	✓	✓			✓		
Dry heath (Serpentine heath)	✓	✓			✓	✓	
Basic flush					✓	✓	
Maritime cliffs and slopes					✓		
Intertidal boulder communities					✓		
Ungrazed areas							✓
<b>Species</b>							
Vascular plant assemblage		✓					
<i>Weissia controversa</i> (a moss)						✓	
Norwegian sandwort			✓	✓	✓	✓	
Edmondston's chickweed				✓	✓	✓	
Hoary whitflow grass						✓	
Mountain sandwort				✓	✓	✓	
Frog orchid					✓		
<i>Chrysolina crassicornis</i> (a leaf beetle)				✓			
Bumblebees							✓
Oystercatcher				✓		✓	✓
Ringed plover				✓		✓	✓
Curlew					✓	✓	✓
Golden plover						✓	✓
Lapwing					✓	✓	✓
Herring gull					✓	✓	
Arctic skua					✓	✓	
Skylark					✓	✓	✓
Twite				✓			

Designation	Special Area of Conservation	Site of Special Scientific Interest	Species				
			W&CA	RDB	UKBAP	SBL	LBAP
<b>Level</b>	<b>European</b>	<b>UK</b>					
<b>Site name</b>	<b>Keen of Hamar</b>	<b>Keen of Hamar</b>					
Raven				✓			
Farmland birds							✓
<b>Earth Science</b>							
Quaternary of Scotland (stone stripes)		✓					
Mineralogy of Scotland		✓*					

\* Feature found on the wider SSSI but not within the boundary of the NNR

W&CA - Wildlife and Countryside Act 1981

RDB - Red Data Book

UKBAP - UK Biodiversity Action Plan

SBL - Scottish Biodiversity List

LBAP - Local Biodiversity Action Plan

## 2 Natural and Cultural Heritage Management

### Serpentine debris and rare plants

Roughly half of the area of the Keen of Hamar NNR consists of serpentine debris. As well as being unusual in itself, the debris supports the rare plants for which the Reserve is particularly renowned. The debris also forms stone stripes, maintained by freezing and thawing each winter. Consequently the serpentine debris areas are of primary importance to the Reserve.

#### Objective 1

To maintain the extent of serpentine debris, its associated natural processes, landforms and the full range of plants that it supports.

### Background

During the 1980s, before the area became part of the Reserve, silage feeders were put out for cattle on the Lower Keen. The concentration of cattle dung around the feeders caused grass and "weeds" to grow over some areas of debris habitat. Part of the Lower Keen was also damaged by used chip fat from the adjoining hotel being disposed of over the fence. Our first attempts to remedy this damage by removing the fat soaked soil and some of the dung affected turf have only been partially successful. The restored areas have remained free from grass and other unwanted vegetation but there has been little or no colonisation by the typical serpentine species.

Some of the areas affected by cattle dung that we did not try to restore are now showing signs of reverting naturally and these can be left for this process to continue. Other areas may need intervention to restore them, although this should be done in a more subtle manner than the previous attempt. The ground within the cattle corridor - the strip of land between the upper and lower Keen that allows livestock to cross the Reserve - was also affected by cattle dung. The corridor was narrowed in the 1990s and as a result some of the affected ground now lies within the lower Keen fence and restoration work could be undertaken.

The populations of rare plants on the Reserve fluctuate dramatically for reasons that remain largely obscure. There are several possible factors that are essentially natural processes and beyond the bounds of human control, principally climate, but also disease and seed predation or grazing by invertebrates. The likely effects of climate change on these populations are not known but studies are under way which will improve our understanding and may allow us to identify possible compensatory measures. Climate change may also affect whether the stone stripes are reformed if there is less freezing in winter.

The debris habitat is in favourable condition but the rare plants no longer occur in some areas where they were recorded in David Slingsby's first survey in 1978. In addition, the number of Norwegian sandwort plants has fallen to less than 10% of its 1997 level. One rare species, Arctic sandwort (*Minuartia rubella*) was lost from the Keen of Hamar before it became an NNR, being last recorded in 1953. Consequently the vascular plant assemblage is judged to be in unfavourable condition.

## **Management and Monitoring**

We will continue our approach of non-intervention as the best means of maintaining the extent of existing serpentine debris areas, except in those areas damaged in the past by cattle feeding or the disposal of cooking fat. Here we will assess, area by area, whether natural recovery appears likely, and if not we will consider further restoration work. The lack of any successful precedents means that any active intervention will, by necessity, be experimental. Options for intervention include further turf stripping and measures to encourage re-colonisation by those species that naturally occur on the debris, such as spreading seed collected from elsewhere on the Reserve or propagating serpentine plants and planting them in the scalped areas to act as focus for colonisation. However we do not, at this stage, favour large scale transplanting.

We will continue to monitor numbers of the key plant species to gain a better understanding of their population dynamics and the factors affecting them. This will include the annual monitoring of selected quadrats for Edmondston's chickweed, Norwegian sandwort, northern rock-cress and stone bramble. If these studies show that the rare plants are likely to have difficulty adapting to future climate change we will try to find ways of helping them to cope.

We hope to restore the full complement of Arctic alpine plant species on the Reserve by re-establishing mountain sandwort using plants raised from seed collected from other sites in Scotland. The reasons for its disappearance since 1953 are not known, but there is no obvious change in the habitat that might explain it. Small and isolated populations are very vulnerable to extinction through chance events, especially where their numbers fluctuate markedly as is the case for the surviving rarities on the Keen. Such reintroductions need to be progressed with care so we will initially undertake a carefully controlled and monitored trial reintroduction within a small area to assess the feasibility of the measure.

We need to ensure that open access for visitors does not threaten the site's designated features, particularly as one of our long term aims for the site is to increase the number of visitors. At present it is not known whether trampling by visitors is having an impact on the debris habitat and its rare plants and periglacial stone stripes. We will therefore establish and monitor "no trampling" areas of at least 100m<sup>2</sup> from which visitors are excluded on suitable areas of the upper Keen. If it appears that the features in this area fare better than the rest of the Reserve we will need to consider alternative access arrangements.

**The key projects are to:**

- continue to exclude grazing by maintaining all fences in a stock-proof condition;
- identify damaged areas of debris suitable for restoration, and investigate measures to promote recolonisation;
- assess whether and how quickly previously restored areas are being colonised and investigate measures to encourage the process;
- monitor the numbers of key plant species and assess the population changes against climatic variables and other possible causes;
- carry out trial transplanting of mountain sandwort plants, grown from seed, in a discrete area of the Reserve and monitor their performance;
- establish “no trampling” areas on suitable areas of the upper Keen; and,
- carry out Site Condition Monitoring for serpentine debris at least once every six years, and implement management recommendations.

## **Serpentine heath**

Serpentine heathland occurs on areas of the Keen of Hamar where there is a thin cover of glacial till. Studies have shown that the margins of some of the patches of glacial soil are eroding slowly to reveal serpentine debris underneath. Over time, therefore, the extent of serpentine debris is likely to increase slowly at the expense of the serpentine heath.

### **Objective 2**

To maintain the extent and species diversity of the serpentine heath and basic wetland habitats.

## **Background**

The serpentine heath and associated wetland areas are currently in favourable condition but we need to ensure that they remain so and that the lack of grazing is not harming the diversity of wild flowers that is characteristic of this habitat.

Since livestock was excluded from the Reserve it has been grazed only by rabbits and the occasional sheep that managed to break in. Enclosures set up on the heathland in 1991 show no visible difference between the vegetation inside and out, indicating that rabbit grazing is not significant. As a result of the lack of grazing, the height of the vegetation in the heathland and wetland areas has increased and, particularly in the heathland, there has been a build-up of dead plant material which may be affecting the botanical diversity by choking out low-growing or less robust species.

## **Management and Monitoring**

We will investigate whether the lack of grazing and build up of plant debris are affecting species diversity in the closed heath and wetland habitats and whether some form of active management is desirable. Reintroduction of grazing as a tool for managing these areas is not favoured because of the possible impact on the fragile serpentine debris, which cannot realistically be fenced off, but cutting and burning are possible. We will therefore assess various heights of cut and timings of burning to determine whether intervention is desirable and, if so, what the most appropriate management method would be.

The erosion of the glacial soils is a very slow and natural process that has probably been occurring on the Keen since the last glaciation. Although it results in the slow loss of heathland, it creates debris habitat, which is globally much rarer and more important. We will therefore allow natural soil erosion to continue but will consider remedial measures if there are signs of erosion being exacerbated by trampling or other human activity.

**The key projects are to:**

- carry out experimental burning and cutting of the vegetation on 5x5 metre plots within suitable areas of heathland and wetland and monitor the effect on species diversity over the following five years;
- monitor the rate of erosion of the margins of areas of serpentine heathland and look out for any areas of human-induced erosion; and,
- carry out Site Condition Monitoring for the serpentine heath at least once every six years, and implement management recommendations.

## Biodiversity

### Objective 3

To maintain and enhance biodiversity on the Reserve.

### Background

In addition to the rare plants and the habitats that are of international and national importance, several Red Data Book (RDB) and UK Biodiversity Action Plan (UKBAP) species occur on the Reserve. A number of these already benefit from our management of the Reserve. The serpentine debris supports sea plantain, the food plant of the rare beetle *Chrysolina crassicornis*, and is the favoured nesting habitat for ringed plover. Skylark and meadow pipit and possibly twite nest among the ungrazed heathland vegetation and curlew, lapwing and Arctic skua have occasionally nested on the heathland in the past whilst flocks of migrating golden plover can often be seen sheltering and feeding on the Reserve in autumn.

The vertical cliffs at the eastern end of the Reserve between Muckle Geo of the Keen and the Nev have numerous ledges which support maritime cliff vegetation including red campion, sea campion, Scots lovage and scurvy grass but these are primarily maintained by exposure to salt and wind and require no management. Ravens occasionally nest in the Little Geo of the Keen and black guillemots may also breed in crevices in the cliffs. The sloping rocks to the west of the Nev are wave-swept in winter and have little or no vegetation but are used by oystercatcher and herring gull for nesting and feeding.

Dry-stone dykes on the Keen provide nesting sites for starlings and wrens and in one location also support black spleenwort, which has a restricted distribution on Shetland.

### Management and Monitoring

The internationally important habitats cover most of the Keen and we will continue to manage the Reserve principally for their benefit. There are opportunities for us to take account of some of the species that are listed on the UKBAP, Local Biodiversity Action Plan (LBAP) and RDB. For example, shorter vegetation may be better for nesting curlew and lapwing but not so good for skylark and meadow pipit. Bumble bees, which are probably in decline in Shetland, might also benefit if we manage the heathland to promote flowering of heather and other wild flowers. We could also create bee nesting sites on the Reserve. We will investigate how management changes can enhance the biodiversity of the Reserve.

We will maintain the dry-stone dykes, so that they remain suitable for nesting starling and wrens.



We also know less about the ecology of the flushes along the spring-line on the north side of the hill than we do about the serpentine heath and debris habitats. We will carry out a survey of these flushes, so that we can find out more about their potential value for biodiversity as a first step towards determining how best to manage them. We know a good deal about the plants, spiders and beetles of the Reserve but very little about other groups of invertebrates. Given the unusual nature of the soil and habitats of the site, unusual invertebrate communities might well be found living here. We will attempt to fill the gaps in our knowledge by encouraging recording of species and carrying out surveys of less well studied groups.

**The key projects are to:**

- carry out a detailed survey of the flushes and fens to assess their significance for biodiversity;
- maintain dry-stone dykes in a condition suitable for starlings and wrens to nest;
- create and monitor nest sites suitable for bumble bees;
- monitor BAP species;
- encourage surveys of invertebrates other than spiders and beetles; and,
- maintain species lists in conjunction with Shetland Biological Records Centre.

## **Research and demonstration**

### **Objective 4**

To support and encourage research and survey work.

### **Background**

The Keen of Hamar is an important site for understanding botanical succession and the ecological effects of ultra-basic soils and heavy metals. Although considerable research has been done over the past thirty years, the ecology of the Reserve is not yet fully understood. Potential future work includes testing the "drought theory" that the barren nature of the serpentine debris is due in large part to the free-draining nature of the site which causes seasonal water shortage and prevents the normal vegetation succession, and work on understanding the impacts of climate change.

The Keen of Hamar has been known to botanists since Thomas Edmondston's first discoveries in the 1830s and its higher plants have been well recorded in that time. There are also more recent studies of spiders and beetles, bryophytes and fungi, however other invertebrate species are not fully studied and, given the unusual nature of the soil, may well prove interesting.

The earliest datable historical remains derive from chromite mining during the 19<sup>th</sup> Century and consist of numerous trial diggings and small quarry pits with associated spoil heaps, a derelict explosives store and three tracks running across the lower Keen which were originally tramways running to the large chromite quarry at Hagdale. These are of local interest but await a proper assessment of their significance in the history of mining.

### **Management and Monitoring**

SNH has not generally been involved in fundamental research on the Keen in the past as this is not our area of expertise, however a better understanding of the evolution and dynamics of the Keen ecosystem is valuable to us in our task of securing the conservation of the Reserve's habitats and species. In particular, Dr David Slingsby and his associates are investigating the relationship between climate and the changing populations of the rare Arctic-alpine plants. This will be important in understanding and, if possible, planning for the likely impact of climate change on the Reserve.

We will continue to monitor the populations of the rare plants and the condition of the various notified features and carry out surveys of the other species on the Reserve, but will look to others to investigate the underlying ecology. To promote this we will identify and publicise research and survey opportunities to research institutions and local

colleges and, where we are able and judge it appropriate we will support that research directly.

We will work with Shetland Amenity Trust and others to ensure that the artefacts of the chromite mining era are preserved and recorded.

**The key projects are to:**

- encourage links with research institutions and local colleges;
- encourage and contribute to further research into the Reserve's ecology;
- undertake surveys of invertebrates other than beetles and spiders;
- make the research and survey results available to a wide audience;
- liaise with Shetland Amenity Trust and Unst Heritage Centre; and,
- encourage historical investigation of the chromite workings.

## **Summary**

Our future management of the natural heritage at the Keen of Hamar is in line with our vision, our policy for primacy of nature, our legal obligations for wildlife and our desire that visitors should enjoy the Reserve in a responsible way.

Monitoring shows that the features of the Reserve are largely in favourable condition. The main negative impacts on the vascular plant assemblage appear to result from climatic conditions and are beyond our control, although we are seeking to understand the optimal conditions for seed production and seedling survival so that we can identify any possible compensatory measures. Therefore, we are not planning to radically change the current management of the debris areas. Although the species diversity targets set for the serpentine heath as a feature of the SAC and SSSI are being met, it may be possible to enhance the vegetation further by active management. A decision on this will be informed by small scale trials of cutting and burning.

### **3 Management for People**

Although no hard figures are available, the Keen of Hamar is thought to attract only a few hundred visitors each year. This compares to an estimated 20,000 annual “holiday visitors” to Shetland and around 5000 to each of the other two NNRs in Shetland (Hermaness and Noss). At present, our only means of surveying visitors to the Keen is the visitor book at the Reserve entrance, which gives only a rough measure of visitor numbers and their nationality. In recent years, the visitor book shows that between 70% and 85% visitors are from the UK and Ireland with only 4-7% from Shetland. The remainder have a wide range of nationalities, however because the numbers from any one country is almost always small it is not possible to analyse the figures in any meaningful way.

Visitor facilities on the Reserve are low key, comprising a Reserve leaflet which is available at the car park and eight moveable interpretation panels to help visitors locate the various plant species.

There is a low but important use by educational groups.

## Visitor facilities and infrastructure

### Objective 5

To provide good access for visitors.

#### Background

At present, access to the Keen is by way of a path across farmland and a number of stiles. Once on the Reserve, walking conditions are relatively easy and visitors have unrestricted access, guided only by the interpretation panels. The moderate slopes of the upper Keen with loose serpentine debris and some areas of taller vegetation may deter those who are not too steady on their feet but can be avoided without missing any of the Keen experience.

With the possible exception of the areas immediately inside the entrance, trampling appears to be having no visible impact but a more detailed assessment of the issue is necessary to ensure that we are not inadvertently damaging the site.

During 2006, the Keen of Hamar was audited to establish what work is needed to fulfil the requirements of the Disability Discrimination Act 1995 (DDA). This identified the need for gates rather than stiles to provide access to the Reserve.

#### Management and Monitoring

We want visitors of all abilities to enjoy their visit without harming the natural heritage or spoiling the enjoyment of others. We have already started work to replace all the stiles on the access route with self-closing gates to make the Reserve more easily accessible to all abilities. Horses and cycles would cause unacceptable damage to the fragile habitats of the Keen so we will also need to erect signs advising that they should be left outside the Reserve boundaries. We are about to install bike racks for cyclists and explain why we are operating this arrangement. We hope that the provision of bike racks will also promote green travel options to the Reserve and encourage more visitors to travel by bike.

We will continue to allow unrestricted pedestrian access to most of the Reserve but will create a "trample free" area to assess the impact of visitor pressure. If this shows that trampling is having an adverse effect on the debris habitat and the rare plants that it supports we may need to establish formal routes around the Reserve.

We would like a clearer idea of how many people are visiting the Reserve and therefore will install a people counter at the same time as replacing the first entrance gate. This should provide more accurate information on how many people visit and when.

**The key projects are to:**

- replace stiles with self-closing gates;
- install a people counter;
- continue to allow unrestricted access except to the “trample free” zone, whilst assessing the impact of visitor pressure; and,
- install bike rack and promote green travel options.

## **Promotion and interpretation**

### **Objective 6**

To promote the Keen of Hamar, provide information and maintain a range of interpretive material.

## **Background**

The Keen of Hamar is promoted through the Scotland's NNRs website, through local publications and by placing the Reserve leaflet in shops and B&Bs. There is also information about the Keen of Hamar in the Hermaness NNR visitor centre where a Keen of Hamar garden, with examples of all the rare plants, is being developed.

At present there is only informal signage at the car park and none by the stile onto the Reserve. There are two obsolete stone monolith signs that were erected in the 1990s and face the former, no longer used, Reserve entrances.

Interpretation on the Reserve is provided by the Reserve leaflet, which is available from a box at the Reserve entrance, and by eight moveable panels, each detailing one of the interesting plant species and designed to be set down next to a good specimen.

SNH used to hold an "open day" each year when staff were available on the Reserve to give visitors a guided tour. This required a high input of staff time and reached only small numbers of visitors and locals so was judged unsustainable. The North Isles Ranger Service, managed by the Shetland Amenity Trust, has provided weekly guided walks on the Keen during summer for several years. In 2008 this service will be scaled down to provide an opportunity for a local commercial operator.

## **Management and Monitoring**

We will continue to promote the Reserve through an improved website and through information and Reserve leaflets placed at locations in Unst and elsewhere in Shetland and will also look for other opportunities to raise awareness of the Reserve. The Hermaness NNR Visitor Centre has more visitors in a year than Keen of Hamar NNR. We hope that the Keen of Hamar garden we are developing there will entice more people to visit the Reserve, rather than being an alternative to a visit, although it may serve that purpose for those who are unable for any reason to reach the Keen.

The stone monolith signs marking the old entrance are extremely durable and, although made of Caithness flagstone, reflect the colour of the weathered serpentine on the Reserve. For this reason we believe that they are particularly appropriate to the Keen and we wish to reuse them. The stone should be serviceable for many years to come but they will need to be moved to more appropriate locations and their information



panels need updating. This will give us an opportunity to ensure that the signs meet the requirements of the Disability Discrimination Act and to include information such as the whereabouts of public toilets, which is a matter of interest to many visitors.

The moveable interpretive panels have proved successful in guiding visitors towards the rare plants; however they can become a focus for more intense trampling which may be damaging to the debris habitat. We will continue to use the panels but will move them frequently and continue to monitor them to try to avoid the problem of trampling.

We are keen to have regular guided walks on the Reserve for visitors who prefer personal contact rather than interpretive panels. We are not in a position to provide this service ourselves but will continue to work with the Shetland Ranger Service and with commercial operators to promote the Reserve and provide appropriate information and interpretation.

**The key projects are to:**

- relocate and update the Reserve signs;
- move the interpretive panels more frequently to prevent localised damage;
- continue to provide a Reserve leaflet;
- develop the Keen of Hamar garden and other material at the Hermaness visitor centre;
- improve the Keen of Hamar entry on the Scotland's NNRs website by including monitoring results etc; and,
- liaise with Shetland Amenity Trust, Unst Heritage Centre, local tourist guides, VisitShetland and others to promote the Keen of Hamar.

## Education

### Objective 7

To facilitate the educational use of the Keen of Hamar by self-supporting groups.

## Background

The Keen of Hamar is used only infrequently for educational purposes, and mainly by local schools, although David Slingsby's studies over the past three decades have often involved student groups to the benefit of all concerned.

The Keen has educational potential for groups of all ages. For younger students it offers the attraction of rare plants and the clearly visible differences between natural serpentine vegetation and the vegetation of nearby acid soils on one hand, and on the other the fertilised pasture. For more advanced students and specialists it provides an opportunity unique in Britain to study soil evolution, low altitude periglacial features and the effects of climate soils and heavy metals on plant succession, amongst other things.

As there is no regular staff presence on the Reserve, groups using the Reserve in the past have tended to be self reliant, but there is potential for involvement of the seasonal Reserves Officer based at the Hermaness NNR Visitor Centre between April and September. The Shetland Amenity Trust ranger based at the Unst Heritage Centre may also be able to assist by arrangement.

## Management

We wish to see greater use of the Reserve by educational groups, both locally and from outwith Shetland, and will continue to welcome educational groups to the Keen of Hamar. We will promote the Reserve among local schools, both for informal visits and for science studies and will investigate the possibility of developing educational materials and projects linked to the Curriculum for Excellence. We will also publicise the Keen among universities and colleges and encourage students to pursue studies of the Reserve, particularly those that increase our understanding of the Reserve's ecology.

### The key projects are to:

- promote the learning opportunities that the Keen of Hamar can offer to schools, universities and colleges through website development;
- Reserves Officer to make contact with Unst and Yell Schools each year;
- investigate the production of educational resources specific to the Keen of Hamar and linked to the Curriculum for Excellence; and,
- evaluate more clearly what groups require, what support SNH can offer and whether there is untapped local assistance.

## **Involving people and community**

### **Objective 8**

To develop opportunities for people to participate in the running of the Reserve.

### **Background**

At present there is only limited involvement of local people in running the Keen of Hamar, at least in part because there is little active management. There are currently two Honorary Wardens on Unst who cover both the Keen of Hamar and Hermaness and mainly have an "eyes and ears" role, reporting incidents and wildlife sightings etc to SNH. We receive occasional enquiries from people wanting to get involved in the running of the Shetland NNRs, often students seeking conservation experience. As the Keen does not have a regular staff presence, no visitor surveys have been undertaken in the past, however it would be possible to make a questionnaire available at the Reserve entrance to investigate visitors' views on how the Reserve could be improved.

### **Management**

We are keen to involve people in the management of National Nature Reserves. Some Reserves have local advisory panels comprising of people with an interest, but we are not aware of a need for this for the Keen of Hamar. However we will consult with Unst Community Council, Unst Tourism Group, neighbouring land owners and other relevant locals over significant developments on the Reserve and will encourage visitor feedback by questionnaire.

We will investigate opportunities for volunteers to contribute directly to the management of the Reserve, for example helping with survey work, assisting with educational group visits or getting involved with any conservation management on the ground.

### **The key projects are to:**

- offer questionnaires at the Reserve entrance and other opportunities for feedback;
- consider developing volunteering opportunities on the Reserve; and,
- liaise with Honorary Wardens, Unst Community Council, Unst Tourism Group and others as appropriate.

## **Summary**

Our provisions for visitors to the Keen of Hamar are relatively low key and we are not proposing major changes to this approach although there is scope for improvements to existing facilities. We will review the way people are involved in the Reserve.

## 4 Property Management

### Objective 9

To carry out property management and maintenance works following best practice.

#### Background

SNH owns the whole of the Reserve and has responsibility for maintaining all the fences. We also have an access agreement across the neighbouring land which includes responsibility for maintaining the stiles, although we hope to replace these with self-closing gates in the near future. There are no vehicles or other equipment specifically allocated to the Keen of Hamar.

A full time, seasonal Reserves Officer is recruited each year to carry out visitor management and monitoring duties on Hermaness and the Keen of Hamar between April-September, although the balance of duties necessarily lies mainly with Hermaness. A permanent Area Officer in Lerwick is responsible for overall Reserve management and other Lerwick staff assist with managing the Keen as necessary.

SNH also has to work within its budget, obtain good value for money and meet best management standards. Annual expenditure is generally low except when major works such as replacement of fences or interpretive panels are necessary. Running costs are likely to remain at a similar level over the course of this Plan.

#### Management and Monitoring

There is little infrastructure on the Keen of Hamar that requires maintenance other than fences, gates and stiles, but there are a number of natural and man-made hazards such as the chromite quarries and old explosives store. We will carry out regular checks to ensure that the property is safe and fences are stock-proof, and carry out repair and maintenance as necessary. The honorary wardens and neighbouring farmer can also keep an eye on the Reserve between our regular inspections. We will also ensure that we comply with the Access Agreement conditions.

#### The key projects are to:

- inspect the condition of fences, stiles and gates regularly and repair as necessary;
- ensure the management of the property conforms with all Health and Safety Regulations: this includes carrying out risk assessments and quarterly safety checks, updating fire & emergency plans and maintaining warning notices;
- liaise with honorary wardens, neighbours and other interested parties;
- recruit, train and manage seasonal site managers; and,
- carry out Reserve Review and revise Reserve Plan 2015-16.

## **5 Document properties**

The Reserve Plan for Keen of Hamar National Nature Reserve have been written by Jonathan Swale (Area Officer - Lerwick), edited by Susan Luurtsema and Emma Philip (Managed Sites Officer's) and approved by John Uttley (Area Manager - Northern Isles).

We would like to thank the following SNH staff for their contribution and comments on earlier drafts: John Gordon (Policy & Advice Manager - Earth Science), Rachel Wignall (Policy & Advice Officer - Earth Science), Ashleigh Tooth (Policy and Advice Officer - Recreation and Access) and Susi Hodgson (Geographic Information Officer).

We would also like to sincerely thank, Dr David Slingsby for his contribution.

**Published:** May 2010

## Appendix 1 - National Nature Reserves (NNR)

Scotland's NNRs are special places for nature, where many of the best examples of Scotland's natural heritage are protected. Nature comes first on our NNRs, (referred to as primacy of nature). These Reserves, also offer special opportunities for people to enjoy and find out about the richness of our natural heritage. NNRs are declared under the National Parks and Access to the Countryside Act 1949 or the Wildlife and Countryside Act 1981.

A new policy for NNRs in Scotland was developed in 1996. This Policy requires NNRs in Scotland to have four attributes, and to be managed for one or more of the three purposes.

The attributes are

- **Primacy of nature.** The needs of nature will be placed at the heart of decisions about land-use and management of our NNRs, and nature conservation will be the overriding land use, although it may not be the sole purpose of management.
- **National importance.** It must be of national importance that the NNR be managed as a nature Reserve, for the protection of geological features, habitats, or species found there.
- **Best practice management.** NNRs must be well managed, not only to safeguard the nature conservation interests, but also to provide for people's enjoyment and understanding.
- **Continuity of management.** Both research and management on NNRs require us to take a long-term view, so it is important that management continuity is assured.

The purposes are

- **National awareness** of NNRs - on these Reserves people can take pride in the natural heritage 'on display' and come to understand it better and enjoy it to the full.
- **Specialised management** of NNRs - the character of the interest requires specialised and pro-active management, which is best, delivered by a nature Reserve.
- **Research-related** NNRs - These NNRs will offer opportunities for research into the natural heritage and its management, which specifically require a nature Reserve location and which are not available elsewhere.

From 2000 - 2003 all of Scotland's NNRs were reviewed against this policy. Because of the review there are now 54 (2010) NNRs in Scotland. There are currently a number of NNRs identified during the review which have still to be taken through the de-declaration process. As a result of this a search on many SNH systems will show more than 54 NNRs until this work is completed.

More information can be found at:

**Scotland's National Nature Reserves: A policy statement**

<http://www.snh.org.uk/pdfs/polstat/nnrpolicy.pdf>

**National Nature Reserves - General Information** <http://www.nnr-scotland.org.uk>

## **Appendix 2 - Special Area of Conservation (SAC)**

Special Areas of Conservation are areas designated under the European Community Council Directive on the Conservation of Natural Habitats and Wild Fauna and Flora (92/43/EEC), commonly known as the Habitats Directive. Together with Special Protection Areas, which are designated under the Wild Birds Directive for wild birds and their habitats, SACs form the Natura 2000 network of sites. The Natura 2000 network is designed to conserve natural habitats and species of animals and plants which are rare, endangered or vulnerable in the European Community. Appendixes I and II of the Habitats Directive list the habitats and (non-bird) species respectively for which SACs are selected. In Great Britain the Directive was transposed into domestic legislation via the Conservation (Natural Habitats &c.) Regulations 1994, which are relevant to Special Protection Areas (SPAs) as well as SACs. Natura sites are generally underpinned by the SSSI mechanism in the terrestrial environment, although there are a few exceptions where other management measures are employed. The Scottish Executive Rural Affairs Department Circular No. 6/1995 (Revised June 2000) on the Habitats and Birds Directives gives further details of how the Regulations apply in Scotland.

SNH acts as the advisor to Government in proposing selected sites for ministerial approval as possible SACs. SNH then consults with key parties over the site proposals on behalf of Scottish Ministers. The consultees, who include owners and occupiers of land, local authorities and other interested parties, are sent details of the proposed site boundaries and the habitats and/or species for which they qualify. SNH also negotiates the longer-term management of these sites. Following consultation, SNH forwards all responses to Scottish Ministers who then make a decision about whether to submit the site to the European Commission as a candidate SAC. Once submission of all candidate sites is completed, the Commission, together with Member States, will consider the site series across Europe as a whole. At this stage sites which are adopted by the Commission become Sites of Community Importance (SCIs), after which they can be finally designated as Special Areas of Conservation by national governments.

The following websites provide further information:

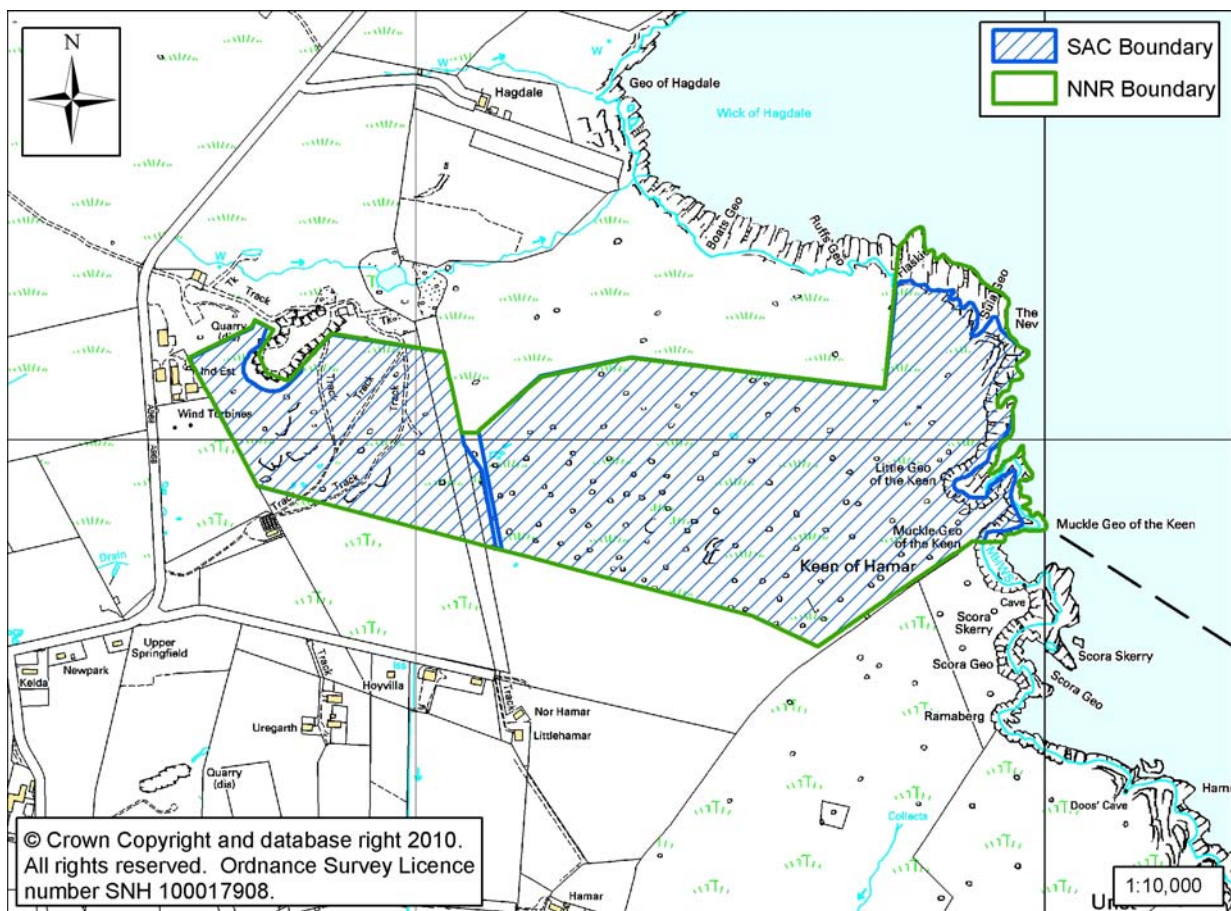
### **Special Areas of Conservation:**

<http://www.jncc.gov.uk/ProtectedSites/SACselection>



## The Keen Of Hamar SAC

Country	Scotland
Unitary Authority	Shetland Islands
Grid Ref*	HP645098
Latitude	60 46 00 N
Longitude	00 49 00 W
SAC EU code	UK0012815
Weblink	<a href="http://www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0012815">http://www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0012815</a>
* This is the approximate central point of the SAC.	



Appendix I habitats that are a primary reason for selection of this site

Calaminarian Grasslands of the *Violetalia calaminariae*

Keen of Hamar has the largest surviving area in the UK of near-natural Calaminarian grasslands on serpentine. The site is rich in rare northern species, such as arctic sandwort *Arenaria norvegica* ssp. *norvegica* and northern rock-cress *Arabis petraea*, and includes the endemic Shetland mouse-ear *Cerastium nigrescens*, found only on serpentine rocks at this site. The site has ecological features and floristic composition

similar to those of serpentine grasslands in Scandinavia, where the habitat type is also rare.

Calcareous and calcschist screes of the montane to alpine levels (*Thlaspietea rotundifolij*)

Keen of Hamar, in the north of Shetland, is the most northerly site selected to represent calcareous and calcschist screes in Scotland. It is highly unusual in that the communities have developed on serpentine rock debris, which occurs extensively throughout the site and forms a mosaic with 6130 Calaminarian grasslands of the *Violetalia calaminariae* at low altitude. The scree supports a flora that is unique in the number of endemic races and subspecies it contains. These include moss campion *Silene acaulis*, northern rock-cress *Arabis petraea*, arctic sandwort *Arenaria norvegica* ssp. *norvegica* and Shetland mouse-ear *Cerastium nigrescens*.

Appendix I habitats present as a qualifying feature, but not a primary reason for selection of this site

European Dry Heaths

## **Appendix 3 - Site of Special Scientific Interest (SSSI)**

Scottish Natural Heritage is the key statutory agency in Scotland for advising Government and for acting as the Government's agent in the delivery of conservation designations in Scotland. Site of Special Scientific Interest (SSSI) is the main nature conservation designation in Great Britain. These sites are special for their plants or animals or habitats, their rocks or landforms or a combination of these.

The SSSI series has been developed over the last 50 years, and since 1981 as the national suite of sites providing statutory protection for the best examples of GB's flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, many SSSIs were renotified and others newly notified under the Wildlife and Countryside Act 1981 or the Nature Conservation (Scotland) Act 2004. Further changes in the protective mechanisms were introduced by the 2004 Act.

These sites are also used to underpin other national and international nature conservation designations. Most SSSIs are privately owned or managed; others are owned or managed by public bodies or non-government organisations. There are more than 1400 SSSIs in Scotland.

### **Web Links:**

#### **'The Nature of Scotland - A Policy Statement'**

<http://www.scotland.gov.uk/library3/environment/nas00.asp>

#### **'People and Nature: A New Approach to SSSI Designations in Scotland'**

<http://www.scotland.gov.uk/library/documents-w1/pandn00.htm>

#### **Guidelines for selection of biological SSSIs**

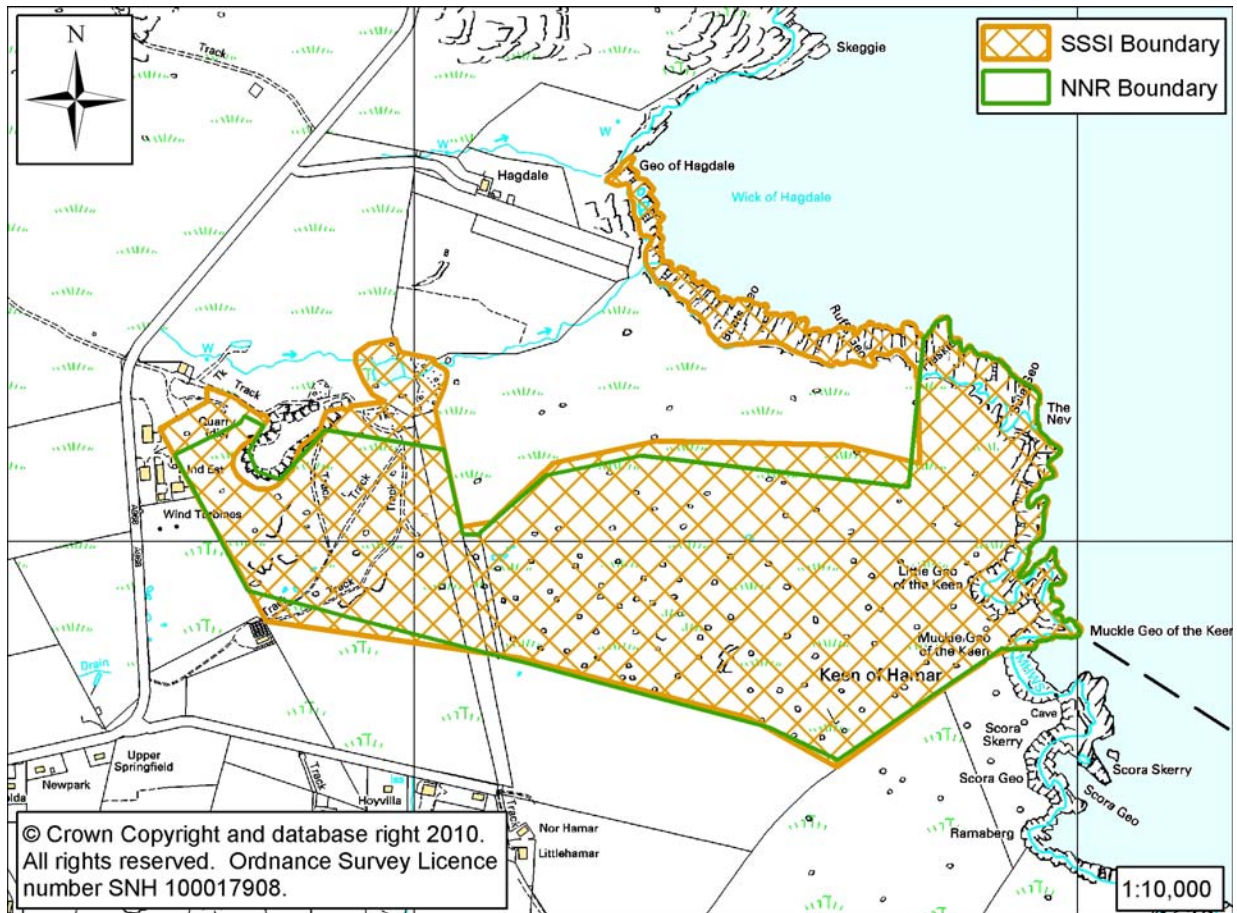
<http://www.jncc.gov.uk/Publications/sssi/default.htm>

#### **Site of Special Scientific Interest (SSSI):**

<http://www.snh.org.uk/about/ab-pa01.asp>

## Keen of Hamar SSSI

Country	Scotland
Unitary Authority	Shetland Islands
Grid Ref*	HP 645097
Notified	17 January 1985
* This is the approximate central point of the SSSI.	



### DESCRIPTION:

#### Geology

Two important localities for chromite mineralisation (ferrous chromate,  $\text{FeCr}_2\text{O}_4$ ) occur within this site; Hagdale quarry and the Wick of Hagdale.

Hagdale quarry was the largest chromite working in Britain, and although the quarry itself is now flooded, excellent samples of chromite ore and vein serpentine are present on the spoil dumps. Several rare and one new nickel mineral have been identified and this is the type-locality for the nickel hydroxite mineral theophrastiite. The rare purple chromium-bearing mineral Kammererite also occurs. The chromite mineralisation occurs as lenses within the serpentine host rock. In the Wick of Hagdale Chromite bands up to

5m thick occur within the serpentine. Clots of chromite crystals up to 1cm in diameter are also present. Along two series of shear zones well-developed fibrous and columnar varieties of the serpentine mineral antigorite occur, (a magnesium hydroxysilicate), as well as green resinous 'precious' serpentine. There is also some geomorphological interest present as the "stone stripes" found on the hill at around 70 metres are the product of frost action. This is the lowest known altitude in Britain for such active periglacial features.

## Botany

The site contains one of the finest examples of serpentine debris vegetation in Europe and possesses a number of national plant rarities. It provides an interesting contrast to the other major serpentine outcrops in Britain such as the Lizard Peninsula in Cornwall and those in North-East Scotland.

The unique flora is related directly to the unusual chromite-serpentine substrate and the soils derived from this, which are deficient in phosphorous, nitrogen and potassium but contain high levels of heavy metals such as chromium, magnesium and nickel. The principal vegetation types are a closed sward of short heather and grasses on organic soil and a sparse fell-field community on bare serpentine debris. The debris vegetation contains an unusual mixture of montane and maritime species and unusual forms of some of these are present eg. Sea Plantain *Plantago maritima*, and Scurvy grass *Cochlearia officinalis*. Rare species are also found such as Stone-bramble *Rubus saxatilis*, Northern Rock-cress *Cardaminopsis petraea*, and the national rarities, Scottish Sandwort *Arenaria norvegica*, and Mouse-ear chickweed *Cerastium arcticum* sub sp. *edmonstonii* - a sub species endemic to this site and Nikkavord.

The closed serpentine heath is interesting floristically and contains a large number of species including Mountain everlasting *Antennaria dioica*, Spring gentian *Gentianella campestris*, Spring squill *Scilla verna*, and Frog Orchid *Coeloglossum viride*.

## **Appendix 4 - Protected and other important species**

There are a number of laws protecting species in the UK; this is only a brief synopsis.

### **The Wildlife and Countryside Act 1981**

This is a key Act, which makes it an offence to intentionally or recklessly kill, injure, or take any wild bird or their eggs or nests (except for species listed in Schedule 2). There are additional offences of disturbing birds listed on Schedule 1 at their nests, or their dependent young. The Act also prohibits certain methods of killing, injuring, or taking birds, restricts the sale and possession of captive bred birds, and sets standards for keeping birds in captivity.

The Act makes it an offence (subject to exceptions) to intentionally or recklessly kill, injure, or take, possess, or trade in any wild animal listed in Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places. The Act also prohibits certain methods of killing, injuring, or taking wild animals.

The Act makes it an offence (subject to exceptions) to pick, uproot, trade in, or possess (for the purposes of trade) any wild plant listed in Schedule 8, and prohibits the unauthorised intentional or reckless uprooting of such plants.

Other Acts protect Wild Mammals, Badgers, Deer and Seals.

### **The Habitats Directive**

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora requires Member States to take the requisite measures to establish a system of strict protection for the animal species listed in Appendix IV, ie animal and plant species of community interest in need of strict protection. There are 13 European Protected Species in Britain.

In summary, for any European Protected Species of animal, the legislation makes it an offence to deliberately or recklessly capture, kill, injure or, in certain circumstances, disturb any such animal. This includes taking or destroying eggs of such animals. It is also an offence to damage or destroy their 'breeding sites' or 'resting places' (this does not have to be deliberate or intentional for an offence to have been committed). For any European Protected Species of plant, the legislation makes it an offence to deliberately or recklessly pick, collect, cut, uproot or destroy any such plant. This applies to all stages of their biological cycle. European Protected Species of plants and animals are also protected from being transported, kept, sold, exchanged, advertised for sale etc.

## **The Biodiversity Convention**

The Convention on Biodiversity was adopted at the Earth Summit in Rio de Janeiro, Brazil in June 1992. In the UK the Government launched the UK Biodiversity Action Plan, a national strategy which identified broad activities for conservation work over the next 20 years, and established fundamental principles for future biodiversity conservation. A number of Biodiversity Action Plans (UKBAP) have been produced for selected habitats and species, and some areas have developed local biodiversity action plans (LBAP) too.

## **Red Data Book Species**

Red Data Books list species that are threatened or endangered. In the past species in Britain were included as Red Data Book species if they occurred in fewer than 15 10km x 10km squares. Britain is moving towards the IUCN (The World Conservation Union) criteria which categories species as Extinct, Extinct in the Wild, Critically Endangered, Endangered or Vulnerable.