**European Community Directive**
**on the Conservation of Natural Habitats**
**and of Wild Fauna and Flora**
**(92/43/EEC)**

# Second Report by the United Kingdom under Article 17

## on the implementation of the Directive from January 2001 to December 2006

## Conservation status assessment for :

# S1334: *Lepus timidus* - Mountain hare

Please note that this is a section of the report. For the complete report visit http://www.jncc.gov.uk/article17

Please cite as: Joint Nature Conservation Committee. 2007. *Second Report by the UK under Article 17 on the implementation of the Habitats Directive from January 2001 to December 2006*. Peterborough: JNCC. Available from: www.jncc.gov.uk/article17

# S1334 *Lepus timidus* Mountain hare

*Audit trail compiled and edited by JNCC and the UK Inter-Agency Mammal Working Group*

This document is an audit of the data and judgements on conservation status in the UK's report on the implementation of the Habitats Directive (January 2001 to December 2006) for this species. Superscript numbers accompanying the headings below, cross-reference to headings in the corresponding Annex B reporting form. This supporting information should be read in conjunction with the UK approach for species (see 'Assessing Conservation Status: UK Approach').

## 1. Range Information[2.3]

*Lepus timidus* is found in the highlands of Scotland, as well as in the borders and in the south-west of Scotland and the Peak District. *Lepus timidus hibernicus* is currently regarded as a separate subspecies of *L. timidus*, and occurs only in Ireland. Both the Northern Ireland subspecies, and the Great Britain (GB) population of *L. timidus*, are reported on below.

### 1.1 Surface area of range[2.3.1]

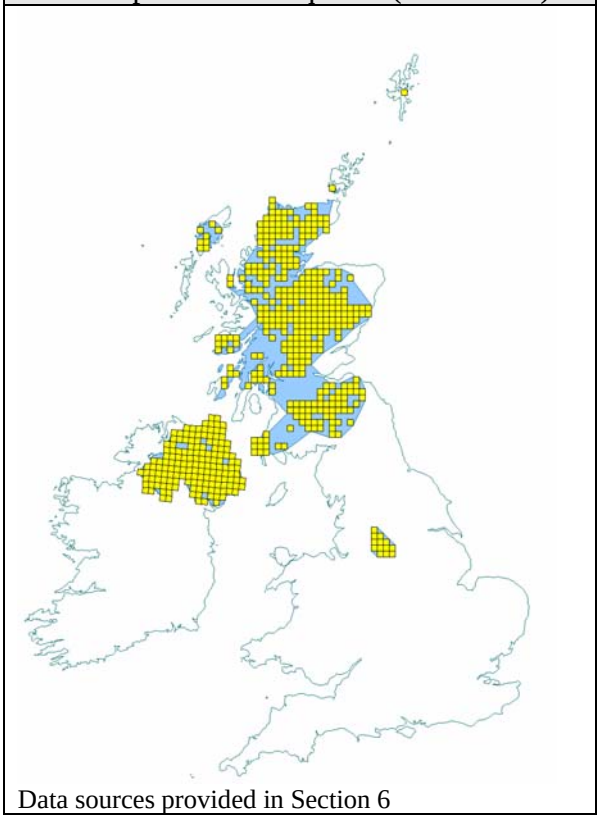
**76,721km$^2$ *L. timidus* UK**

60,406km$^2$ *L. timidus*

16,315km$^2$ *L. timidus hibernicus*

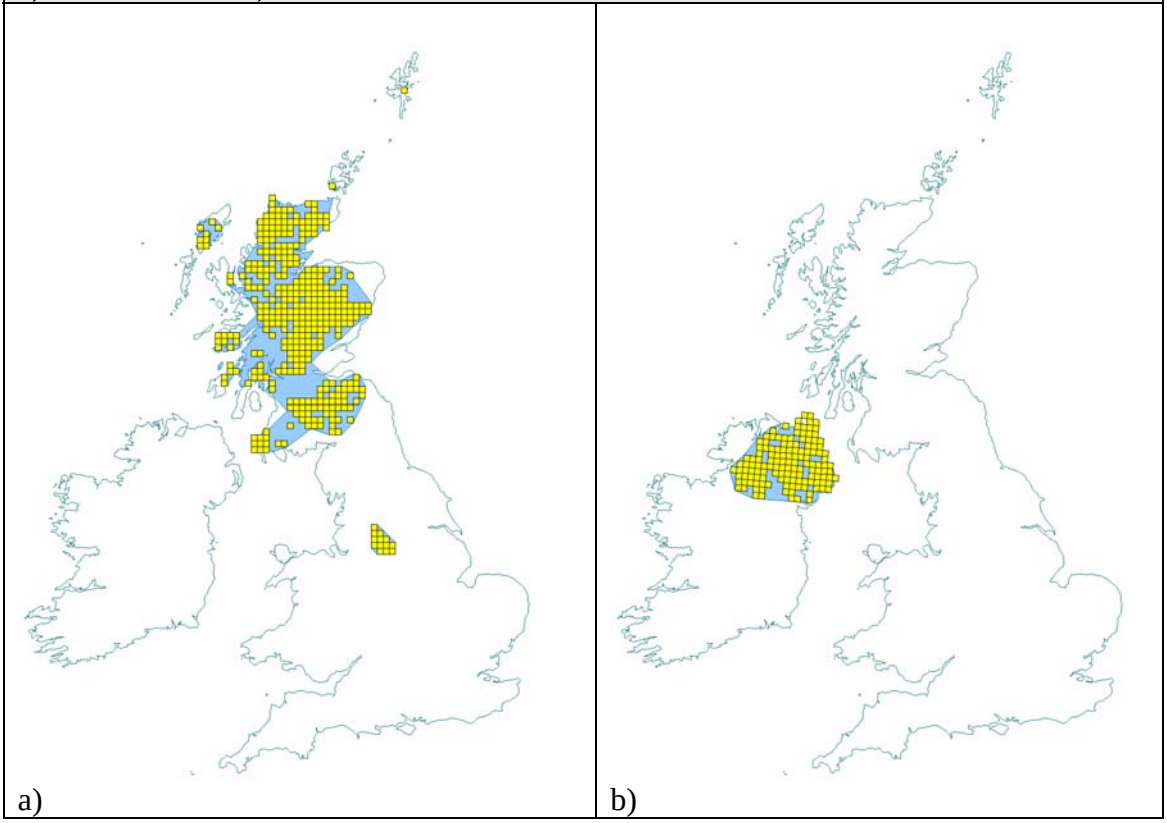
The above estimates were calculated within Alpha Hull software, using extent of occurrence as a proxy measure for range (see Maps 1.1 and 1.2). The value of alpha was set at 25 km to reflect the limited mobility of this (these) species.

**Map 1.1** Current UK extent of occurrence and occupied 10-km squares (1995-2006)



Data sources provided in Section 6

**Map 1.2** Extent of occurrence and occupied 10-km squares (1995-2006) of:
a) *L. timidus* and b) *L. timidus hibernicus*



a) b)

## 1.2 Date of range determination[2.3.2]

**1995 – 2006**

## 1.3 Quality of range data[2.3.3]

**Moderate**

In Scotland an extensive questionnaire survey was carried out in 1995 (Tapper 1996), and distribution data from ongoing surveillance schemes and *ad hoc* recording have also been included in the surface area assessment, but there have not been any comprehensive surveys of the whole of Scotland. In England three surveys have been carried out in the Peak District by Yalden (1984), Mallon (2001) and Wheeler (2002), which provide good estimates of the current range in England for this species.

The Northern Ireland Irish Hare Surveys (Preston *et al.* 2003; Tosh *et al.* 2005) have provided extensive survey coverage of this species. However, there has not been a full census of the species in either case and so the data quality is assessed as moderate.

## 1.4 Range trend[2.3.4] & Range trend magnitude[2.3.5]

**Stable**

*L. timidus* – There is no information to suggest that there has been a change in range for this species during the specified time period 1995-2006.

*L. timidus hibernicus* – There is no information to suggest that there has been a change in range for this species during the specified time period 1995-2006.

## 1.5 Range trend period [2.3.6]

**1995 – 2006**

The time period selected is considered to reflect the current situation regarding range change for this species and incorporates the time period since the Habitats Directive came into force.

## 1.6 Reasons for reported trend in range[2.3.7]

**Not applicable**

## 1.7 Favourable reference range[2.7.1]

**76,721km$^2$ *L. timidus* UK (Equal to current)**

60,406km$^2$ *L. timidus* (Equal to current)

16,315km$^2$ *L. timidus hibernicus* (Equal to current)

The favourable reference range value has been derived using 1994 as the baseline and making a judgement on whether the range in 1994 was sufficient to allow the long-term survival of the species, using the decision tree in Note 1 (of 'Assessing Conservation Status: UK Approach') as a guide. Historic and current information on range size and trends have been used to assess this and, if the 1994 level was not sufficient, then consideration has been given to what would constitute a large enough range.

The current range is considered to be sufficient to support viable populations of this species in the long term in both cases and is set as the favourable reference range**.**

## 1.8 Range conclusion[2.8]

**Favourable**

There is no evidence of important declines in range since the Habitats Directive came into force and the current range is equal to the favourable reference range for both *L. timidus* and *L. timidus hibernicus*. The range assessment is, therefore, Favourable

# 2. Population of the species[2.4]

## 2.1 Population estimate[2.4.1]

**403,700 individuals *L. timidus* UK**

*L. timidus*: 10,000 in England; 350,000 in Scotland

*L. timidus hibernicus*: 43,700 in Northern Ireland

## 2.2 Date of population estimate[2.4.2]

**2002 – 2005**

2002 *L. timidus*

2005 *L. timidus hibernicus*

## 2.3 Method of population estimate[2.4.3]

**1 = based on expert opinion *L. timidus***

**2 = extrapolation from surveys of part of the population, sampling *L. timidus hibernicus***

*L. timidus* -The estimate is based on the original estimate by Harris *et al.* (1995) and amended to reflect the most recent survey of the England population (Wheeler 2002).

In Scotland there are approximately 12,000 $km^2$ of heather moorland. Using a simple population estimate based on this area of heather moorland, and a mean density of 30 hares per $km^2$, the population in Scotland would be about 300,000.

An alternative method was used by Arnold (1993), who recorded mountain hares in 363 10-km squares, including the Scottish islands and the Pennines. It was assumed that they were found in these squares but nowhere else, that they occurred at an average density of 2/$km^2$ on the Scottish islands and north-west of the Great Glen (an area of about 5,500 $km^2$). Over the rest of Scotland a density of 20/$km^2$ was assumed where they are present (an area of about 35,200 $km^2$). However, hares are likely to be absent from large areas of this range which do not consist of heather moorland. Based on these two mean densities, and assuming that only half the range was suitable for hares, the Scottish estimate of 350,000 was calculated.

In the Peak District, extensive surveys showed that the annual late winter density varied between 1.4 and 3.3 per $km^2$ (average 2.1 per $km^2$) (Yalden 1984a). Since they occupy an area of 246 $km^2$, the late winter population for the Pennines was about 500 animals. A further survey carried out over the winter of 2001-2002 suggests that the population may currently be as large as 10,000 individuals (Wheeler 2002).

*L. timidus hibernicus* - A survey of Irish hares in Northern Ireland was undertaken in spring 2005 and compared to a similar survey undertaken in spring 2004 and 2002. The survey was based on observations of hares made at night using a spotlight while driving eight transects along roads. Distance Sampling techniques were applied to determine hare densities. Population estimates were calculated by multiplying density estimates by land areas. The density was estimated to be 3.10/km² (with 95% confidence was between the limits 2.49–3.87) in 2005. Using these density estimates multiplied by land area, the population was estimated to be 43,700 (95% CL 35,000–54,400) (Tosh *et al.* 2005).

Since it is almost impossible to count every individual during surveying, the surveys did not provide an absolute census, but rather gave a range with an upper and lower population estimate.

## 2.4 Quality of population data[2.4.4]

**Moderate**

*L. timidus* – Small sample sizes and large between year fluctuations make data difficult to interpret. Harris *et al.*'s reliability rating of the above estimate was three, meaning that "the population estimate was based on a limited amount of data on population densities in different habitat types, or for which the population estimate was obtained by scaling abundance relative to a species for which there was a reasonable population estimate."

*L. timidus hibernicus* – The population estimate was not based on an absolute census, but it was derived from extensive survey effort, by specialists with a high level of survey experience.

## 2.5 Population trend[2.4.5] & Population trend magnitude[2.4.6]

**Unknown**

*L. timidus* – The National Gamebag Census trend from 1995–2005 suggests a 31% decline in gamebag returns, but this is not significant because of wide confidence limits (Aebischer & Davey 2007). Data from the British Trust for Ornithology (BTO)/Joint Nature Conservation Committee (JNCC)/Royal Society for the Protection of Birds (RSPB) Breeding Bird Survey

indicate stable populations between 1995 and 2005 (Davis *et al.* 2007). Populations may show a weak tendency towards population cycles with a periodicity of about 9.5 years (Tapper 1987).

The England population in the Peak District, has shown a sustained increase in numbers in recent years, with the highest count (184 hares) in 2002 (Wheeler 2002).

*L. timidus hibernicus* – During the 1990s, research undertaken by Queen's University Belfast (QUB) indicated that the Irish hare population in Northern Ireland was between 8,250–21,000 hares and that there was evidence of a decline from historical levels.

In 2002, QUB undertook a survey using line transect spotlight surveys conducted while driving along roads at night. The population was estimated to have been between 7,000–25,200 hares, indicating that hare numbers had not changed significantly since the previous estimate during the 1990s. The survey was repeated in 2004 and 2005.

As part of the 2005 study, the 2004 estimates were revised; density was estimated at 5.11 hares per km² (95% CL 4.23–6.16) in 2004 and the population estimate was calculated as 72,000 (95% CL 59,700-86,900). The estimate in 2005 was 43,700 and since the confidence intervals of the 2004 and 2005 estimates did not overlap, it was concluded that the hare population decreased between 2004 and 2005. However, both were more than 200% higher than the 2002 population (Tosh *et al.* 2005). Annual surveillance is planned for this species in Northern Ireland, but as yet data are not sufficient to produce statistically analysed trends.

Evidence suggests a major decline in hare numbers throughout the 20th century (Preston *et al.* 2003), with recent increases being noted since the turn of the 21st century.

## 2.6 Population trend period[2.4.7]

**1995 – 2005 *L. timidus* UK**

1995-2005 *L. timidus*

2002 -2005 *L. timidus hibernicus*

These time periods have been selected because they allow consideration of the most recent trend data from surveillance schemes during the period since the Habitats Directive came into force.

## 2.7 Reasons for reported trend in population[2.4.8]

**Not applicable**

Trends for this species are not clear and may be masked by cycling populations.

## 2.8 Justification of % thresholds for trends[2.4.9]

**Not applicable**

## 2.9 Main pressures[2.4.10]

**101 Modification of cultivation practices**
**102 Mowing/Cutting**
**151 Removal of hedges and copses**
**140 Grazing**
**180 Burning**
**190 Agriculture and forestry activities not referred to above**

**401 continuous urbanisation**
Afforestation of heather moors
Large-scale unregulated culls
Climate change

## 2.10 Threats[2.4.11]

**101 Modification of cultivation practices**
**102 Mowing / Cutting**
**151 Removal of hedges and copses**
**140 Grazing**
**180 Burning**
**190 Agriculture and forestry activities not referred to above**
**401 continuous urbanisation**
Afforestation of heather moors
Large-scale unregulated culls
Climate change

## 2.11 Favourable reference population[2.7.2]

**393,700 individuals *L. timidus* UK**
350,000 *L. timidus* (Equal to 1995 estimate)
43,700 *L. timidus hibernicus* (Equal to current)
The favourable reference population value has been derived using 1994 as the baseline and making a judgement on whether the population in 1994 was viable in the long-term, using the decision tree in Note 1 (of 'Assessing Conservation Status: UK Approach') as a guide. Historic and current information on population size, distribution and trends have been used in order to assess viability and, if the 1994 level was not viable, then consideration has been given to what would constitute a viable population.

*For L. timidus* the population estimate for 1994 was approximately 350,000 and this is considered to be of sufficient size for a long-term viable population, although trends are unclear at present. For *L. timidus hibernicus*, in the absence of a 1994 population estimate, the most recent population estimate is considered to be of sufficient size to be long-term viable. These values have been set with limited information and could be revised in the future if better information becomes available.

## 2.12 Population conclusion[2.8]

**Favourable**
There are no indications of declines for this species since 1994. There is some evidence of cycling populations over the long term. The current estimates are equal to the favourable reference populations and the assessment is, therefore, Favourable in both cases.

# 3. Habitat for the species in the Biogeographic region or sea[2.5]

*L. timidus* favours upland moors. A dense understorey is thought to be important for food and shelter. *L. timidus* populations are localised; they reach the highest densities in north-east Scotland, and are particularly scarce in north and west Scotland (Watson & Hewson 1963). Population densities range from 3-46 per $km^2$, depending upon habitat type. The highest densities occur on heather moors overlying base-rich rocks, with the lowest densities where there are acidic rocks; locally densities may reach 300 per $km^2$ (Hewson 1991).

*L. timidus hibernicus* is found from seashore to hill-top, mainly in open country, in many habitats including unimproved and semi-improved pasture, expanding into areas of intensive farmland; upland habitats including heather dominated heaths and bogs; and coastal habitats including dunes, coastal stripes and seashore.

Recent research suggests that it may be the variety of grasses within *L. timidus hibernicus'* diet that limit its distribution. It seems to avoid areas of improved grassland dominated by rye grass species though there are certainly other factors contributing to this absence, such as distribution and lack of cover.

## 3.1 Surface area of habitat[2.5.2]

**Unknown**

The area of habitat being used by *L. timidus* within each occupied 10-km square is unknown.

*L. timidus hibernicus* uses a variety of habitats. However, at a local level, habitat use is determined by plant diversity and percentage vegetation cover. Since this varies within habitat types, it is not appropriate to make broad habitat area estimates for this species, and there is insufficient data to make estimates at a local level.

## 3.2 Date of estimation[2.5.3]

**2006**

## 3.3 Quality of data on habitat area[2.5.4]

**Poor**

Habitat requirements for this species have been documented. However, there are no current estimates for habitat area.

## 3.4 Habitat trend[2.5.5]

**Decreasing**

*L. timidus* – This species relies on heather moorland and benefits from traditional management for grouse shooting and both are in decline. There is evidence from the latest Countryside Survey (Haines-Young *et al.* 2000) of significant loss of 8% of dwarf shrub heath in intermediate upland areas (Environmental Zone 5) of Scotland and 5% loss in the uplands (Environmental Zone 6), but this is not significant. These are the areas most likely to support *L. timidus* populations at intermediate or high densities.

*L. timidus hibernicus* – Habitat supporting adequate plant diversity and shrub cover is thought to have declined during the 19$^{th}$ and 20$^{th}$ centuries.

## 3.5 Habitat trend period[2.5.6]

**1990 – 1998**

The time period selected reflects the results of two Countryside Surveys carried out in 1990 and 1998 (Haines-Young *et al*. 2000).

## 3.6 Reasons for reported trend in habitat[2.5.7]

**3 = Direct human influence (restoration, deterioration, destruction)**
**4 = Indirect anthropo(zoo)genic influence**
**5 = Natural processes**

*L. timidus* – Overgrazing of heather moorland has led to vegetation changes, including a reduction in heather, which it vital for the mountain hare in terms of feeding and shelter.

Also, as grouse moors have become less popular, heather management has declined and some moorland areas are being afforested; although new areas of natural woodland regeneration and young plantations can initially support large numbers of hares, as the trees mature, the canopy closes and the ground cover diminishes. This drastically reduces hare numbers.

It is important to note that the maintenance of optimal mountain hare habitat (grouse moor) is entirely artificial and if all such areas were allowed to revert back to native woodland cover, hare populations would be expected to revert to a level similar to that present in neolithic times, i.e. the **natural** carrying capacity of the available habitat.

*L. timidus hibernicus* – Changing farming methods and management of farmed landscape (e.g. conversion from species rich grasslands to ryegrass, and removal of shrub cover used for refuge) are thought to have resulted in habitat declines.

## 3.7 Suitable habitat for the species (in km$^2$)[2.7.3]

**Unknown**

*L. timidus* – In 1988 the Macaulay Land Use Research Institute (MLURI http://216.239.59.104/search?q=cache:xtBRkcfccoIJ:www.scotland.gov.uk/stats/envonline/_data/LANDsiglandcovermosaics.xls+area+of+heather+moorland+in+scotland&hl=en&ct=clnk&cd=3&gl=uk) assessed land cover in Scotland and showed that there was approximately 12,300 km$^2$ of heather moorland, representing 15% land cover of Scotland. In addition, there was approximately 3,000 km$^2$ of poor rough grassland and heather moorland and 1,500 km$^2$ of good rough grassland with heather moorland. Overall, about 22% of Scotland surface area had habitat that could possibly support varying densities of *L. timidus* populations. The actual area of suitable habitat being used by the species has not been assessed.

*L. timidus hibernicus* – Current area of habitat used by this species is unknown and it is not possible to suggest an area of 'suitable habitat' to support a favourable population.

## 3.8 Habitat conclusion[2.8]

**Unfavourable - Inadequate**

The area of habitat used by the species and suitable for the species has not been accurately estimated in either case. However, there are indications of decline in suitable habitat and this could affect the survival of the species in the longer term.

# 4. Future Prospects[2.6]

**Good prospects**

Both species are expected to survive and prosper.
Factors likely to affect the species over the next 12-15 years are considered below.

**Legislation:**

*L. timidus* – This species has limited national and European legal protection. The species is listed on Regulation 41 of the Conservation (Natural Habitats, &c.) Regulations 1994 and on Annex V of the Habitats Directive.

*L. timidus hibernicus* – This species is currently listed on Schedule 6 of the Wildlife Order (1985) but may be given full protection in Northern Ireland as a result of an ongoing review. If this is the case there will be an increased focus on addressing factors affecting species populations such as agricultural intensification. Also, recent genetic work has suggested that the Irish hare is a distinct species, which will strengthen calls for full protection.

At present, due to concerns over populations in Northern Ireland, there is a temporary ban on hare coursing.

**Conservation action:**
*L. timidus* – There are no indications of recent range shrinkage or serious population declines. A survey is underway in Scotland to assess the distribution and abundance of this species. The species has been put forward as a priority species under the UK Biodiversity Action Plan (BAP).

*L. timidus hibernicus* – The species has been listed as a priority species (requiring conservation action and as a species of conservation concern (requiring monitoring to assess need for future action), is covered by the Northern Ireland Species Action Plan and is being monitored annually for changes in distribution and abundance.

**Threats:**
*L. timidus* – Relies on heather moorland and benefits from traditional management for grouse shooting, both of which are in decline in Scotland. Furthermore, *L. timidus* will rarely cross more than 20 km of unsuitable habitat, which means the Scottish population is effectively fragmented into a series of sub-populations, some of which could be quite vulnerable to extinction (Harris *et al.* 1995).

They are also a reservoir for louping ill, a tick borne disease that affects sheep and grouse, and can sometimes be regarded as pest species and is hunted for sport and in order to control populations.

There is some evidence of hybridisation between *Lepus europaeus* and *L. timidus*, which may threaten *L. timidus'* genetic diversity, but further survey is needed to confirm the extent of this threat.

*L. timidus hibernicus* – Historically, decline has been attributed to environmental changes, notably loss of plant species richness, associated with intensification of agriculture (but probably more likely to be loss of leverets due to significant increase in silage production). Loss of daytime resting sites, particularly rushes and good quality hedgerows has added further pressure.

Game bag records of estates in Northern Ireland have shown that during historic periods of intensive predator control there have been significant increases in their hare populations.

There is potential for populations to be impacted by competition with the introduced brown hare *Lepus europeaus.*

**Climate change:**
*L. timidus* **–** This is thought to be a possible long term threat if the extent of heather moorland declines further and hare populations become increasingly isolated.

## 4.1 Future prospects conclusion[2.8]

**Favourable**

For both *L. timidus* and *L. timidus hibernicus* range and populations appear stable and have been concluded as Favourable in the assessment. There is protection through legislation and conservation action in place, particularly for *L. timidus hibernicus*, that is likely to improve the species conservation prospects over the next 10-15 years.

There are still several important threats for the species, including habitat loss and modification and potential effects of climate change for *L. timidus*. However, overall the Future Prospects for this species are concluded as Favourable in the time period specified.

# 5. Overall Assessment[2.8]

**Unfavourable – Inadequate**

Range population and future prospects are Favourable for this species, but habitat for the species is assessed as Unfavourable-Inadequate because of recent and ongoing declines in suitable habitat. The overall assessment is, therefore, Unfavourable-Inadequate.

**Table 5.1** Summary of conclusions

| Parameter | Judgement | Grounds for Judgement (in accordance with Annex C) | Reliability* |
|---|---|---|---|
| **Range** | Favourable | Range is stable and not smaller than the favourable reference range | 2 |
| **Population** | Favourable | Population(s) not lower than favourable reference population | 2 |
| **Habitat** | Unfavourable – Inadequate | Historic and ongoing loss of suitable habitat, such as heather moorland | 2 |
| **Future Prospects** | Favourable | Main pressures and threats to the species not significant; species will remain viable on the long-term | 3 |
| **Overall Assessment** | Unfavourable – Inadequate | One or more Unfavourable – Inadequate but no Unfavourable – Bad | 2 |

*1=High, 2=Moderate, 3=Low

High – Expert opinion is that the concluding judgement accurately reflects the current situation based on a professional understanding of the species. For range, population, and habitat, quality of data used to establish the current estimate has been identified as "good"; data used to inform trends is comprehensive and up to date.

Moderate – A greater understanding of the feature, or the factors affecting it, is required before a confident concluding judgement can be made by experts. For range, population, and habitat, the current estimate and/or trend are based on recent, but incomplete or limited survey data; or alternately, a comprehensive, but outdated (pre-1994) review.

Low – Judgements, and comprising estimates, are based predominately on expert opinion.

N/A – Assessment conclusion is "unknown", on the basis of insufficient reliable information.

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**Map Data Sources**

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