

Mountain Hare Counting Guidance

Scotland's Moorland Forum is preparing a range of guidance through the Moorland Management Best Practice project that provides practitioners, working in upland and moorland areas, with a source of information that reflects good practice and establishes a standard for accepted management techniques.

Information that is available elsewhere has not been duplicated, but a reference to it is included.

All the documents should be seen as representing evolving guidance. The aim is to review the documents at least annually so that they reflect the latest information.

Practices in this guidance, which are backed up by legislation and/or regulation, contain the word '**MUST**' in bold, letters. Failure to adopt these practices could lead to prosecution.

Parts of the guidance contain the word '**should**' in bold, lowercase letters. The actions identified in this way are not covered by legislation but land managers are expected to follow these parts of the guidance, as they represent sound, acceptable practices, which aim to achieve effective counting of the mountain hare population.

Mountain Hares have been added to Schedule 5 of the [Wildlife and Countryside Act 1981 \(as amended\)](#)¹ which means they now have full protection. From 1st March 2021 Mountain Hares may only be killed under licence for certain limited reasons as listed in section 16 of the [Wildlife and Countryside Act 1981 \(as amended\)](#)¹. Monitoring and developing accuracy of counting methods will be increasingly important – to detect changes across the Mountain Hare's range and, using data collected over a number of years, to better understand the population dynamics – so that informed licensing decisions can be made. Following a standardised method for counting Mountain Hare numbers enables comparisons in space and time.

This Mountain Hare Counting guidance consists of:

- A brief background and overview of the standard counting methods available to land managers/practitioners for monitoring Mountain Hare numbers on their property; and
- Supplementary Information (listed on page 10).

¹ Wildlife and Countryside Act (as amended) - [The Birds Directive and Wildlife and Countryside Act 1981 | NatureScot](#)

Acknowledgements

The guidance has been prepared for Scotland's Moorland Forum by representatives of: The Game & Wildlife Conservation Trust, The James Hutton Institute and NatureScot; and it has been reviewed by the Moorland Management Best Practice Steering Group.

The members of the MMBP Steering Group are available from the [MMBP website](#), and the members of Scotland's Moorland Forum are listed on the [Forum's website](#).

Revision Table

Date	Reference	Details
21/06/19	Para 2.6	Relationship with National Monitoring Scheme added.
28/01/20		Update PoMM references to MMBP
13/04/2021		Revision in the light of Mountain Hare becoming a fully protected species

*This section is repeated for reference from the Mountain Hare Management Guidance.
This is available from the Moorland Management Best Practice website²*

1 The Law and Mountain Hare management

- 1.1 It is an offence to intentionally or recklessly kill, injure or take a Mountain Hare without a licence.
- 1.2 A licence **MUST** be held to:
 - 1.2.1 Take Mountain Hares at any time of year
 - 1.2.2 Take Mountain Hare by any means including the use of: snares, spotlight, thermal imaging, semi-automatic weapons, and non-selective traps.
- 1.3 Licences may only be issued by NatureScot in exceptional circumstances and for specific purposes including: to prevent the spread of disease, to prevent serious damage to forestry interests or for social, economic or environmental purposes.
- 1.4 Controllers, caterers and retailers seeking a licence for the sale, advertisement, possession & transportation of Mountain Hare carcasses & Mountain Hare meat should visit <https://www.nature.scot/general-licence-gl162021-sale-advertisement-possession-transportation-mountain-hare-mountain-hare> .

² Management of Mountain Hare Guidance - <https://moorlandmanagement.org/guidance-2/management-of-mountain-hare/>

INTRODUCTION

2 Background

- 2.1 Monitoring animal populations is important for a number of reasons. Changes in populations can tell us about responses of species to land and wildlife management, helping to set targets for conservation, sporting interest and population management.
- 2.2 Mountain Hares have been added to Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) which means they are now fully protected. The Mountain Hare Management guidance, produced by the Moorland Management Best Practice project, signposts those wishing to apply for a licence to control hares to the relevant websites.
- 2.3 Wildlife managers are encouraged to continue monitoring Mountain Hare populations using one or both of the techniques described below. This will provide an evidence base that could support future management decisions and may help justify applying for a licence to control hares – in situations where they are preventing the establishment of woodland, for example.
- 2.4 Two Mountain Hare counting techniques have been developed: night-time spotlight / lamping surveys and dung counts. These methods have been based on the recommendations in the NatureScot (SNH) Commissioned Research Report 1022¹.
- 2.5 This guidance provides ‘rules of thumb’ to help set up and carry out surveys for Mountain Hares that are expected to be suitable for a wide range of conditions or circumstances but may not be suitable for all occasions. Practitioners are advised to refer to the guidance and seek expert advice, if there is any doubt.
- 2.6 It is intended that wherever possible, the population data collected by counting will feed into a National Monitoring Scheme that is being developed by NatureScot in order to provide a means to assess the conservation status of Mountain Hares.
- 2.7 As part of the National Monitoring Scheme, the volunteer Scottish Mountain Hare survey seeks to complement the count methods identified in 2.4 to allow broad monitoring of mountain hares across their range in Scotland. The primary focus for the volunteer survey is in areas where the night-time counting method is often not appropriate due to difficult terrain and/or low hare population density. The survey uses the Mammal Mapper App which walkers can use to record any Mountain Hare and upland bird species. More information on the volunteer approach can be found at www.mammal.org.uk/mountainhareproject/
- 2.8 Alongside records of Mountain Hare made whilst out walking, more focused volunteer surveys can be undertaken in specific 1 km squares. These are administered through BTO Scotland. Details are available at www.bto.org/mountain-hares

- 2.9 This guidance will be updated to reflect any changes to advice and guidelines that may arise as further research is carried out.

3 Aim of the Guidance

- 3.1 This guidance aims to provide the owners and managers of land with an understanding of how to monitor their mountain hare population using approved counting techniques.

4 Counting Techniques

- 4.1 Two survey types are outlined in this guidance: night-time spotlighting and establishing a dung accumulation rate.
- 4.2 There are concerns that daylight surveys in autumn appear to detect an inconsistent number of mountain hares and are unlikely to present an accurate, repeatable counting method. This guidance addresses these concerns.
- 4.3 Whichever method is used, the method **should** be consistent between years and across sites.
- 4.4 Monitoring areas:
- 4.4.1 **Should** include areas used by hares, but not just the best areas,
 - 4.4.2 **Should** represent the variation in habitats within the site, and
 - 4.4.3 Might need to include areas used in different weather conditions
- 4.5 The method selected **should** be most relevant to the questions being asked.
- 4.6 Dung counting may offer some advantage over night-time surveys:
- 4.6.1 Dung counting may cause less disturbance and be more suitable for monitoring areas which are hard to reach, or locations where disturbance may be an issue.
 - 4.6.2 This method avoids the need for anyone to be out in remote areas at night.
- 4.7 Manpower and equipment resources need to be considered in selecting the best method.

MOUNTAIN HARE SPOTLIGHTING SURVEYS

5 The Aim

- 5.1 The aim of these surveys is to provide data over a number of years that would help determine where in the Mountain Hare cycle the population is and assist in licensing decisions.

6 The Overall approach

- 6.1 The number of hares seen when walking transects across moorland with a spotlight is related to the actual number of hares present:
- 6.1.1 More hares seen in the spotlight means there are more hares in that area.

- 6.1.2 In open terrain and habitats, counts along transects of known length can be used to provide an 'encounter rate', which represents a reasonable index of hare density.
- 6.1.3 The 'encounter rate' is simply the number of hares encountered by walking along transects at night with a spotlight divided by the total length of the transects.
- 6.1.4 Much the same approach can be used to carry out surveys using thermal imaging equipment.

7 Step 1 - Identify the area to be surveyed

- 7.1 The survey **should** include areas where hares are known (or suspected) to feed at night but **should** also represent the variation in habitats within the site (i.e. areas dominated by heather, grass or rushes), including less used areas.
- 7.2 If hares are known to move between areas, e.g. in response to changes in wind direction, then the survey area **should** include both areas (or two survey areas may be needed).

8 Step 2 - Mark the area on a map and identify transect lines:

- 8.1 For a 4km square (400ha) area a minimum of four transects is recommended, each of around 2km in length (minimum 8km of transects), however more transects will give more precise results, especially where habitats are variable.
- 8.2 Transects **should** run uphill-downhill and **should** be 250-500m apart.
- 8.3 The start of each transect **should** be approached without disturbing the area to be surveyed.
- 8.4 Transects **should not** follow tracks, walls, rivers, or habitat edges such as forest or woodland boundaries, as this will bias the number of hares seen.
- 8.5 The same survey area and transects **should** be used in future years.

9 Step 3 - Survey timing:

- 9.1 Surveys **should** be undertaken late September to November.
- 9.2 Surveys **should** start 1-2 hours after sunset, as hares are likely to be most active at this time.
- 9.3 Surveys **should** only be carried out only when the visibility is good (avoid fog / rain / strong winds).
- 9.4 Multiple transects can be covered in one night (a 2km transect will take about 1.5 hours to cover, plus the time needed to walk between transects).
- 9.5 The area **should not** be disturbed for 1-2 days prior to the survey.

10 Equipment Required

- 10.1 Map and GPS to aid navigation and define the start and end locations.
- 10.2 Hand held spotlight and battery (e.g. 50watt, Tracer Sport Light 140), or thermal imaging equipment. A spotlight, lamp, or torch with the same beam size and brightness, **should** be used for all surveys to avoid variation in the number of hares detected.
- 10.3 Notebook.

11 Survey Method

- 11.1 To aid comparison between years, record the following information: survey dates, times, observer details, and the start and end location of each transect.
- 11.2 Transects **should** be aligned uphill and downhill, 250–500m apart
- 11.3 Transects **should not** follow linear features
- 11.4 Walk at a steady pace along each transect moving the spotlight beam side to side, in a 180° arc, recording all hares seen.
 - 11.4.1 If using thermal imaging, it is best not to use a light at all.
 - 11.4.2 The exact approach will depend on the make and model of thermal imaging device used, but it is usually appropriate to walk and stop every 50m and then use the imaging equipment to scan the 180° arc and record the hares seen.
- 11.5 To minimise double counting, take into account that, when disturbed, hares often move uphill.
- 11.6 Each transect can be surveyed again on a different night to obtain a better estimate of precision, though adding new transects is usually better.
- 11.7 Calculate the encounter rate as total number of hares / length of transect. See the example in Supplementary Information No. 1.

MOUNTAIN HARE DUNG ACCUMULATION RATE SURVEYS

12 Aim

- 12.1 To provide an over-winter density index.

13 Overall approach

- 13.1 The rate at which Mountain Hare dung accumulates on cleared sites is associated with the number of hares; the more hares, the faster the accumulation of dung.
- 13.2 Dung accumulation rate is therefore useful as an index of Mountain Hare density, especially when access to an area may be difficult, or disturbance undesirable.

- 13.3 The method involves clearing dung from circular plots marked with a single peg, and revisiting the plots after a period of four to six months to count the pellets deposited during the known time period.
- 13.4 Implementing this method from autumn, over winter, reduces the effect of decomposition of pellets, and spans a period of relative population stability in comparison to the summer period of rapid pellet decomposition and population change.

14 Step 1 - Identify area to be surveyed

- 14.1 The recommended area to be surveyed **should** cover at least 4km² (400ha) – the same area as the spotlighting survey method.
- 14.2 The survey area **should** include the entire area that will be used by hares over the winter period; if hares are known to move between areas in response to prolonged bad weather then the survey area **should** include both areas (or two survey areas may be needed).
- 14.3 The survey area **should** also include areas where hares are known to feed at night, but **should** also represent the variation in habitats within the site (i.e. areas dominated by heather, grass or rushes), including areas used to a lesser degree by hares, due to short term or seasonal variation in weather conditions.

15 Step 2 - Mark the area on a map and identify dung plot locations

- 15.1 The survey **should** cover a minimum of 50 dung plots per 1km² (100ha). This is equivalent to a total of 200 plots in a 4km² area.
- 15.2 The plots **should** be located randomly. This could be done in an Excel spreadsheet, which could then be imported into hand-held GPS and “route” planned (agents or advisors may be able to advise, if required).
- 15.3 The same survey area **should** be used in future years, although plot locations can vary.

16 Step 3 - Survey timing:

- 16.1 The plots **should** be cleared in October to November (but before snow lies on the study area).
- 16.2 A second visit **should** be undertaken in early spring (after snow melt, but before the weather warms up) in March to April, to allow four to six months between visits.

17 Equipment required

- 17.1 Map and GPS to aid navigation.
- 17.2 Wooden stakes (20-30cm in length) to mark plot centres, and a mallet.
- 17.3 Bamboo cane (1m long) to mark the centre of each plot and to aid relocation.

17.4 For plot measuring: string marked with 69cm (radius of circular plot) and 79cm (radius plus 10cm buffer) with a loop to place over the end of the cane and wooden stake.

17.5 Notebook.

18 Survey Method

18.1 Record survey dates and GPS location of each plot (if available, use the ‘averaging function’ of the GPS to provide a more accurate location record).

18.2 Each surveyor can survey about eight plots each hour, depending on the distance between plots and on the amount of dung that needs to be counted. Multiple observers or multiple days may be needed.

18.3 Mark the centre of the plot with a wooden stake (hammered into the ground leaving approximately 5cm above ground) and a long bamboo cane to aid relocation of the plot.

18.4 Remove all animal dung from the plot area, a radius of 69cm (equivalent to a 1.5m² plot) and a buffer area of a further 10cm extension to the radius.

18.5 Re-visit each plot to record the number of pellets within the plot area (radius 69cm).

18.6 Calculate the total area of plots (radius of 69cm equates to area of 1.5m² - 200 plots = 300m²).

18.7 Calculate the median (middle) date for the first and second visit and therefore the number of days between visits.

18.7.1 If the plots were set up initially over less than a week, and then cleared over less than a week, a median date is acceptable.

18.7.2 If plots were set up and then revisited over more than one week, it is best to use the actual date that the plot was revisited.

18.8 For each plot calculate the pellets collected on the second visit, divide this by 1.5, and then divide by the number of days between initially setting up the dung plot and when it was revisited to calculate the mean of these rates of accumulation.

19 Training and Monitoring

19.1 The practitioner guidance, training and management plan processes will be administered through MMBP.

19.2 Training commenced in Autumn 2018 and will continue, as required, to cover current practitioners and new entrants to land management.

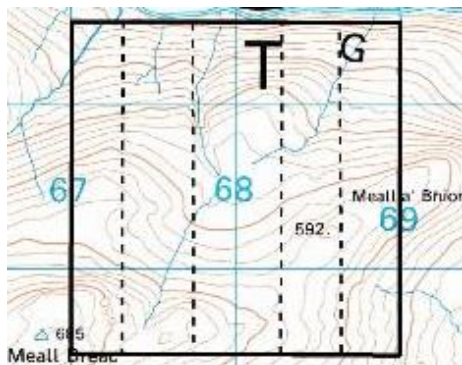
FURTHER INFORMATION

1. NatureScot (SNH) Commissioned Report 1022 - Developing a counting methodology for mountain hares (*Lepus timidus*) in Scotland
<https://www.nature.scot/snh-commissioned-report-1022-developing-counting-methodology-mountain-hares-lepus-timidus-scotland>
2. Hare populations:
<http://www.gwct.org.uk/research/species/mammals/mountain-hare/>
3. Licensing:
<https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/licensing/species/licensing-z-guide/hares-and-licensing>
4. BTO mammal population monitoring:
<https://www.bto.org/volunteer-surveys/bbs/latest-results/mammal-monitoring>
5. Volunteer Mountain Hare Survey starting in 2021:
<https://www.mammal.org.uk/2021/03/volunteers-wanted-for-innovative-scottish-mountain-hare-survey/#>
6. BTO MammalMapper app:
<https://www.mammal.org.uk/volunteering/mammal-mapper/>
7. James Hutton Institute Mountain Hares:
<http://www.hutton.ac.uk/hares>
8. The latest information on the distribution of mountain hares can be found in Hesford, N., Baines, B., Smith, A. A. and Ewald, A. J. 2020. Distribution of Mountain Hares *Lepus timidus* in Scotland in 2016/2017 and changes relative to earlier surveys in 1995/1996 and 2006/2007. Wildlife Biology 2020: DOI (10.2981/wlb.00650) and available at:
<https://bioone.org/journals/wildlife-biology/volume-2020/issue-2/wlb.00650/Distribution-of-mountain-hares-Lepus-timidus-in-Scotland-in-2016/10.2981/wlb.00650.full>
9. Mountain Hare Management:
<http://www.gwct.org.uk/policy/position-statements/mountain-hare-management/>
10. Mountain Hare Trends:
<https://www.gwct.org.uk/research/long-term-monitoring/national-gamebag-census/mammal-bags-comprehensive-overviews/mountain-hare/>

SUPPLEMENTARY INFORMATION

- 1 Spotlighting Surveys - Transect example
- 2 Example study area for dung survey

**Mountain Hare Counting Guidance - Supplementary Information No. 1
 Spotlighting Surveys - Transect example**

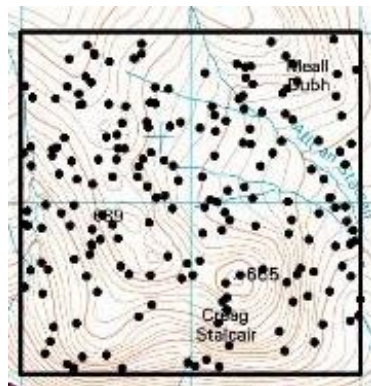


Survey example information:

Transect id (length)	Date of Survey	Number of hares seen
1 (2 km)	29.09.2017	10
	05.10.2017	8
2 (2.2 km)	30.09.2017	5
	07.10.2017	6
3 (1.8 km)	29.09.2017	13
	05.10.2017	9
4 (2 km)	30.09.2017	2
	07.10.2017	4

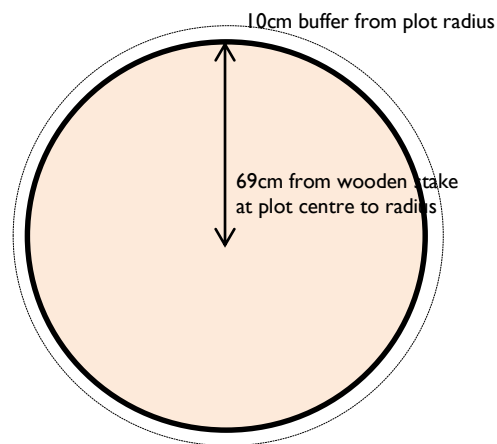
In this example, each of four transects were surveyed twice on different nights, giving a total transect length of 16 km, during which a total number of 57 hares were seen giving an encounter rate of 3.6 hares / km.

Mountain Hare Counting Guidance - Supplementary Information No. 2
Example study area for dung survey



50 plots per square km

Dung plot example



Plot cleared of animal dung at first visit (Oct-Nov)
 Mountain hare pellets counted at second visit (March-April)

Survey example information:

Plot	Pellet count	Count / 1.5	Days between visits	Count / 1.5 divided by days
1	30	20	150	0.13
2	65	43	151	0.28
3	44	29	155	0.18
4	12	8	150	0.05