DRAFT INTERIM METHOD

ENVIRONMENTAL CROSS COMPLIANCE

ASSESSMENT OF GRAZING ON HEATHER

RDS **4 March 2002**

CONTENTS

1. INTRODUCTION

1.1. This method sets out the standard approach for undertaking an assessment to measure grazing pressure on Heather (*Calluna vulgaris*), for the purposes of Environmental Cross Compliance. The assessment represents an in-depth investigation to evaluate the grazing pressure by herbivores (particularly sheep) on last season's Heather shoot production, within a variety of vegetation types. In addition other information is collected to provide further corroborative evidence of high grazing pressure. This assessment will usually follow a modified English Nature Grazing Index (mENGI) assessment (FRCA, 1997) which has indicated significant overgrazing.

1.2. The methodology follows a standard national (DEFRA) approach, and is broadly based on that developed by ADAS for the assessment of Heather condition in ESAs (Poulton, 1991); as used in monitoring six English ESAs since 1990, and in addition in monitoring ESAs in Wales and Northern Ireland, and overgrazing cases to-date.

1.3. This process is a simple and objective technique to determine the level of grazing (Grazing Index). This can then be compared with known 'Grazing Index' thresholds to see if the Heather is under severe grazing pressure.

1.4. The main aims of the method are:

- To keep the time spent in the field to a minimum;
- To reduce subjectivity of Heather stem selection; and
- To make grazing assessment as easy and as objective as possible.

1.5. The technique can be divided into two stages:

- **Field Technique** - Collection of Heather stems in the field; and
- **Laboratory Technique** - Laboratory Assessment of Grazing Index.

1.6. Sufficient training in field and laboratory techniques should be given to all surveyors carrying out this process, along with quality control measures to ensure consistency.

2. FIELD TECHNIQUE

2.1. The assessment should be undertaken between the end of the main Heather grazing period and the start of the new season's growth. The main window for fieldwork is March–May. It is important to ensure that fieldwork is completed before the Heather starts to put on any substantial growth.[1] The on-set of production of new growth will vary depending on locality, management and weather from year to year.

2.2. The Grazing Unit[2] under investigation is sampled using a 'square' grid system, with quadrat positions spaced to achieve a minimum of 50 Heather samples[3]. A sampling grid can be generated using GIS software and put on a suitable medium for use in the field, ideally at a scale of between 1:10,000–25,000 with OS backdrop; a suitable file may also be produced for downloading onto a hand held Global Positioning System (GPS). The surveyor will locate each sample point using compass bearings and calibrated pacing, or locating with pre-programmed hand-held GPS[4]. On arriving at each sampling point a 1m × 1m quadrat is placed parallel with the surveyors feet. Heather (where present) and other data are collected at all accessible sampling points throughout the Grazing Unit.

Heather Stem Selection

2.3. At the quadrat position firstly record all Heather (*Calluna*) related variables (see Table 1, codes OG to HBd), then record the other variables listed in Table 1. However, if there is a likelihood of damaging the Heather stems while recording the other variables (i.e. where Heather cover is high), the Heather samples should be collected after recording Heather (*Calluna*) related variables. This is to ensure the Heather collected from inside quadrat is not damaged while taking other measurements.

---

[1] Where necessary, Heather samples can be collected after the Heather shoots have begun to grow (see para 3.2.).

[2] A Grazing Unit is a self-contained piece of land, through which stock can move freely.

[3] The grid spacing ideally should be between 100-300m depending on the size of the Grazing Unit, with a maximum sampling density of one point per ha. For small Grazing Units (<100ha), less than 50 samples are acceptable, given resource implications when investigating small sites.

[4] The position will be located using a GPS in 'goto waypoint' mode and arriving at 0.00km of position with a Garmin 12 GPS, or when at <5.0m with Garmin eTrex GPS.

2.4. Four Heather stems are selected in association with each quadrat, using the following criteria to reduce observer bias; firstly choose:

a) Heather stem(s) which touch the four **inside corners** of the quadrat, if none then;

b) Select Heather stem(s) touching the **inside edge** of the quadrat closest to the inside corners, and finally if none;

c) Heather stem(s) closest to the four corners **inside** the quadrat.

d) If no stems are selected using the above method, record a nil (0) result on the form. Do not select stems from outside the quadrat.

In some cases Heather may be restricted to only one small area of the quadrat, in which case all stems will come from this locality selected using criteria (c). If less than four stems are available (i.e. 1-3) they should still be collected.

2.5. The four Heather stems should be cut with secateurs through approximately three-year-old growth (see Figure 1), or the maximum available if under this age (i.e. 1-2 year-old), and should ideally be greater than 4 cm in length. However, young or heavily suppressed "button" stems and carpet Heather may be collected if less than 4 cm in height and should be cut just above the root stock (see para 3.3.).

2.6. Each group of up to four stems should be placed in a polythene bag, sealed and clearly labelled with the site identifier, quadrat number, date and observer's initials. On the recording form the number of stems should be noted (range 0–4) along with the age class representing the majority of Heather present in the quadrat.

2.7. Estimating the age class of Heather can be very difficult, but as a guide counting back through the number of growth increments gives the best estimate. At the base of each year's increment the previous season's leaves form a tight cluster (or scars) at intervals around the stem, accompanied by branching from the next seasons growth. As the whole stem may be taken (by cutting through the base of the plant) in heavily suppressed Heather, the number of growth rings can then be counted at the cut by viewing with a hand lens. Height and general appearance can be used as a guide, but requires care in heavily suppressed Heather, where the thickness of the main stem may give some guide to the age.

2.8. Dead Heather (grey and brittle) and Heather showing signs of severe Heather Beetle (*Lochmaea suturalis*) damage (reddish-brown in coloration with last season's leaves removed) should not be sampled and these stems ignored when applying the rule sets in para. 2.4. Heather Beetle damage within the quadrat should be noted on the recording form.

2.9. All other associated variables (vegetation and animals signs) including Moorland Appraisal Pilot Project (MAPP) data should be recorded whether Heather is present or not (see example recording form Appendix III). These variables are summarised below in Table 1 and should be recorded from within each quadrat position. (Variables marked with an * are those collected solely for the MAPP).

Table 1: Data collected from within quadrat positions

Variable: description, units and range.	**Code**
Current grazing pressure – Recorders assessment of grazing pressure Heavy, Moderate or Light	**OG***
Dwarf Shrub cover[5] - Use nearest 1% for 1–20%, then to nearest 5% for 20–100%, and 0.5% to indicate presence (i.e. ≤0.5%). Include Bilberry cover as stem cover (see Bilberry cover below).	**DS%**
Heather cover - Use nearest 1% for 1–20%, then to nearest 5% for 20–100%, and 0.5% to indicate presence (i.e. ≤0.5%).	**C%**
Heavily Grazed features - Percentage of the *Calluna* present showing growth forms indicative heavy grazing pressure (see FRCA, 1997).	**HGF***
***Calluna* height** - height of *Calluna* from centre of main block within quadrat.	**C HT**
***Calluna* Growth Stage** - Main age class of *Calluna* present: Pioneer 1–5 years, building 6–15 years, Mature > 15 years.	**GS**
Burnt - burnt within the last two years.	**Bu**
Heather Beetle damage - Yes if *Calluna* within quadrat is showing signs of Heather Beetle damage.	**HBd**
***Calluna* collected** - Note number of stems collected from within quadrat (0–4).	**CC**
Bilberry (*Vaccinium myrtillus*) **cover** – Record Bilberry as stem cover (not in leaf). Use nearest 1% for 1–20%, then to nearest 5% for 20–100%, and 0.5% to indicate presence (i.e. ≤0.5%).	**B%***
Bilberry Heights – Take four heights (cm) of Bilberry nearest the centre of each quadrat quarter.	**B Ht's**
Heath Height - height of any dwarf shrub other than *Vaccinium myrtillus* from centre of main dwarf shrub plant(s)/stand block within quadrat. If this height is *Calluna* this will be the same as the *Calluna* height measurement.	**Heath Ht***

[5] Dwarf shrubs to include the following species *Calluna vulgaris*, *Erica* sp., *Empetrum nigrum*, *Ulex gallii* and *Vaccinium* sp.

Dominant graminoid Species – Record dominant graminoid species within quadrat, including Rushes (*Juncaceae*) and Sedges (*Cyperaceae*).	**D-Species***
Sward Height's - Measure graminoid heights (cm) at centre of quadrat quarters, circle measurement if not the name dominant graminoid species.	**Sward Ht's***
Faecal Events – Record the number of faecal events spilt by cattle / ponies and sheep in separate columns.	**Faecal E's**
Detached *Calluna* – Record the number of pieces of detached *Calluna*. The pulled *Calluna* leaves should be at least green or brown in colouration. Avoid recording detached brittle grey *Calluna* which can result from Heather Beetle damage.	**DC**
Detached vegetation – Record the number of pieces of detached graminoid vegetation (usually small pulled grass tussocks). Do not include detached litter such as Bracken and Purple Moor-grass.	**DV**
Bare ground - Record % of bare ground present within the quadrat, represented by exposed soil/peat with no vegetation, bryophyte, lichen or water cover. Use 5cm x 5cm as minimum area.	**BG**
Vegetation type*Stand / Quad – Assign the quadrat to the 'Stand' (surrounding homogeneous) vegetation type using codes given in the key in Appendix I. If the vegetation type within the Quadrat is atypical of the surrounding vegetation, record the alternative vegetation type accordingly.	**Veg Type***
Grazing Index Assessment - See laboratory technique section 3.	**GI Assessment**
Non-favourable Species – Note any non-favourable species listed in Appendix II. Makes **notes** if borderline vegetation types if not a clear fit, suggest alternative. Any factors, which could significantly influence grazing pressure, should be noted on the back of the recording form e.g. distance to / position of supplementary feeding sites.	**NFS*/ Notes**

3. LABORATORY TECHNIQUE

Assessment of Grazing Index

3.1. To minimise growth of the Heather samples collected, they should be stored in a fridge, or ideally frozen (if not examined within one week of collection). Samples should be assessed in date order as collected in the field, using the following procedure to determine the Grazing Index.

3.2. Each stem is cut with scissors, 4 cm from the tip of the leading shoot (or 'crown'), 4 cm being the zone most likely to be grazed[6]. The line of cut will depend on the growth form of the Heather. In vigorously growing, relatively straight Heather, shoots can be bunched and cut across at 4 cm. If one or two straggling or creeping long shoots are present which extend 4 cm or more above the main crown, these should be ignored and the 4 cm zone should be measured from the main crown (Figure 1).

3.3. In old or contorted Heather, a 4 cm 'zone' around the crown should be cut (Figure 2). Young or heavily suppressed 'button stems' may be less than 4 cm in length and are thus treated as one shoot in the laboratory assessment.

3.4. In old or contorted growth forms the 4 cm zone may include old woody growth as well as young shoots, but the aim of the method is to make subjective interpretation of what constitutes a shoot unnecessary. Keeping to the 4 cm zone allows an objective cut to be made.

3.5. Depending on the growth form, four stems should yield a sample of between four to over one hundred shoots. All shoots less than 1 cm long are discarded. This rejects most side shoots, whilst keeping the majority of long shoots. In the case of contorted shoots any obvious mid sections which have been cut at both ends should be discarded. Dead shoots which are grey and brittle should also be rejected. Any discarded items should be kept for samples used for quality control (see para 3.12)

[6] Any new season's growth should be ignored in making the 4 cm cut, and when assessing grazed and ungrazed shoot tips.

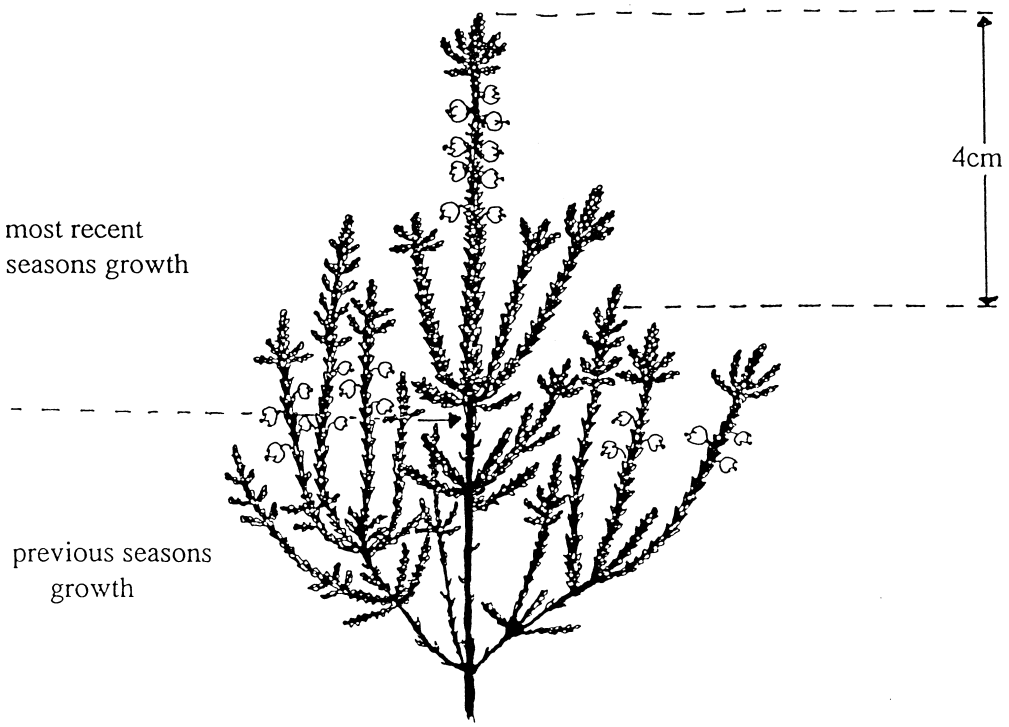

Figure 1. Heather stem cut through two year old growth. The 4 cm cut zone as measured from the end of the leading shoot (the 'crown') is shown.

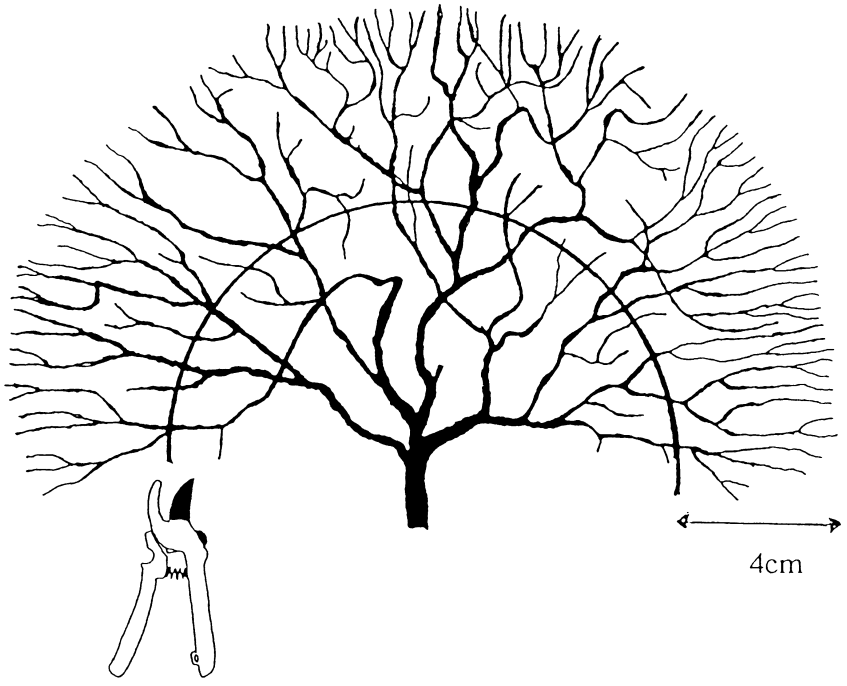

Figure 2. Example of a 4 cm cut zone in a contorted or suppressed heather stem.

3.6. Remaining shoots are now assessed for evidence of sheep herbivore grazing on last season's growth, and divided into three piles:

- shoots where the tip has been removed by grazing are placed in a '**grazed'** pile;
- shoots with the tip intact, or where the shoot tip is obviously missing as a result of other factors, e.g. frost or insect damage are placed in the '**ungrazed'** pile;
- where the cause of the loss of the shoot tip is unclear, they are placed in an '**indeterminate'** pile.

3.7. Cattle grazing can resemble that of sheep, but they also can remove more than one season's growth, therefore broken off stems where all last seasons' growth and more has been removed should be classed as grazed. It should be noted that although this method can be used on cattle grazed moors it cannot fully account for all the damage by cattle (eating more than one year's growth, pulling heather and trampling damage,) and therefore should be treated as a minimum estimate of grazing pressure. Thus the Grazing Index results should be interpreted along with other corroborative evidence e.g. detached heather stems and detached vegetation.

3.8. Shoots are classified as grazed only if the removal of the tip is judged to have taken place after the majority summer shoot production. If there is "definite" regrowth on the lower side-shoots (compensatory growth), extending well beyond the grazed shoot, which will appear old and withered then, the shoot is counted as ungrazed. If it is not clear whether there is compensatory growth the shoot should be classified as indeterminate.

3.9. In the case of cut stems with 'multiple shoots', if there is evidence of grazing on any one tip from the previous summer's growth, it should be classified as grazed. Grazing that took place on the previous season's growth prior to last summer's growth should not be counted and tends to be below the last summer's growth. However, where two or more season's growth has been removed by cattle this should be included.

3.10. The shoots from each of the three piles from each separate bag are now counted, and the values entered on the appropriate boxes on the recording form.

Quality Control

3.11. Ideally all observers undertaking the laboratory assessment should work in the same room together. Difficult shoots should be passed around all the observers and discussed resulting in consensus building, so that problems are identified and resolved as they occur. To aid this a library of reference samples should be kept. The number of shoots placed in the indeterminate pile should be kept to a minimum.

3.12. A minimum of one quality sample should be assessed by all laboratory observers each day to ensure consistency. This should include all of the shoots, including those which would normally be discarded (kept in a fourth pile) - this allows any issues relating to the discarded shoots (dead and <1cm) to be identified as well as those relating to the assessment of grazed shoots. **As a guide** for each quality sample the grazing index as assessed by each observer should fall between +5% and -5% of the mean grazing index of the sample as calculated by all surveyors. For example if the mean grazing index is 48% the grazing indices for observers should fall between 43% and 53%. It should be noted that for samples with a small number of shoots this target may be difficult to achieve (e.g. each shoot represents 5% of the sample if the sample contains 20 shoots, so just one shoot classified differently will result in a 5% difference). The results of the quality sample should be recorded and need to be continually analysed to ensure that no one observer is consistently over- or under-estimating the grazing index.

4. DATA ANALYSIS

4.1. Grazing Index (GI) for each quadrat is calculated using the formula:

$$\text{Maximum Grazing Index \%} = \frac{\text{Grazed + [Indeterminate]}}{\text{Grazed + Indeterminate + Ungrazed}} \times 100$$

The grazing index should be presented as a %, for example a grazing index of 20% indicates that 20% of the shoots within that sample were grazed (or classed as indeterminate).

4.2. Each quadrat where Heather was collected will have a Grazing Index value, which can then be compared with known thresholds, such as 33% and 67% and counted when exceeding these. [A grazing unit is considered to be overgrazed if 50% or more of the quadrat grazing indices are above 33% and / or 25% or more are above 67%. These thresholds are designed to capture widespread grazing at a high levels and /or more localised very heavy grazing.]

4.3. The Grazing Index values for quadrat positions can be plotted using GIS 'spatial analysis software' to produce an isopleth map indicating grazing pressure on Heather (for illustrative purposes only).

4.4. Summary statistics for other variables can also be calculated (e.g. to give an indication of mean dwarf-shrub and *Calluna* cover, % of quadrats containing growing *Calluna* which have pulled *Calluna* stems; number % of quadrats with dropping etc.)

5. REPORT FORMAT

5.1. [To be confirmed] A report, including the following sections, should be produced (reference can be made to the initial appraisal report for background information).

- Introduction.
- Brief outline of the method used.
- Results, to include tables and graphs showing the frequency distribution of Grazing Index, [and levels of suppression with reference to GI thresholds].

References

FRCA (1997) *The FRCA Modified Grazing Index (GI) for Heather Moorland*. Unpubl. Rep., FRCA, Leeds.

POULTON S.M.C. (1991) A methodology for the assessment of heather utilisation. In: *North Peak ESA biological monitoring Programme 1990.* Unpubl. Rep., ADAS, Wolverhampton

APPENDIX I: Key to Vegetation Types

Table 2: Draft simplified key to vegetation types (from MAPP)

1.	'non-productive' land (e.g. scrub, woodland, rock, scree, limestone pavement, road etc.)	Other (**O**)
	grassland and heath, generally grazed	2
2.	>600m asl	Montane heath (**MH**)
	<600m asl	3
3.	≥0.5m peat (*and bog-mosses and cotton-grass, especially hare's-tail, generally frequent in stand*). If ≥75% *Molinia* cover record (**mBB**).	Blanket bog (**BB**)
	<0.5m peat	4
4.	≥25% cover of dwarf shrubs (including Western Gorse)	5
	<25% cover of dwarf shrubs (including Western Gorse)	7
5.	Western Gorse and/or Bristle Bent present in quadrat and/or frequent in stand	Western heath (**WSH**)
	Western Gorse and Bristle Bent usually absent	6
6.	Bog-mosses present in quadrat and/or frequent in stand or other wetland spp., especially Cross-leaved Heath, frequent in stand (*though hare's-tail cotton grass usually absent, cf. Blanket Bog*)	Wet heath (**WEH**)
	Bog mosses absent (*and generally dominated by Heather*)	Heather heath (**HH**)
7.	mire in basin or valley topography (*and generally wet with bog-mosses and cotton-grass generally frequent in stand*)	Valley mire (**VM**)
	dense Bracken stand (with ≥50% cover at full frond emergence)	Bracken **(BK)**
	grassland or rush-pasture (*and generally dry, though species-poor rush-pasture included*) with less than 50% Bracken cover	8
8.	stand dominated by species typical of reseeded and/or fertilised swards (especially Rye-grass and/or White Clover)	Improved grassland (**IG**)
	semi-improved or unimproved grassland (not dominated by Rye-grass and/or White Clover)	9
9.	stand dominated by bents (especially Common Bent, but excluding Bristle Bent) and/or fescues (especially Sheep's Fescue)	Bent/fescue acid grassland (**BFG**)
	stand not dominated by bents and fescues	10.
10.	stand with frequent calcicoles (e.g. Blue Moor-grass, Crested Hair-grass, Spring Sedge, Glaucous Sedge, Limestone Bedstraw, Lady's Bedstraw, Fairy Flax, Thyme and Common Rock-rose) (*generally on limestone*)	Calcareous grassland (**CG**)
	rough/rank grassland with calcicoles generally absent	11
11.	Rough acid grassland dominated by Wavy Hair-grass, Bristle Bent, Mat-grass and Heath Rush. If ≥75% *Molinia* cover record (**mRAG**).	Rough acid grassland (**RAG**)
	semi-derelict rank grassland and rush-pastures generally dominated by rushes (especially Soft Rush, but not including Heath Rush) or Tufted Hair-grass, False Oat-grass or Yorkshire Fog.	Rush-pasture and rank grassland (**RRG**)

APPENDIX II: Unfavourable Species List

Table 3: Unfavourable species list (from MAPP)

Common name	Scientific name
Annual Meadow-grass	*Poa annua*
Perennial Rye-grass	*Lolium perenne*
Common Nettle	*Urtica dioica*
Spear Thistle	*Cirsium vulgare*
Creeping Thistle	*Cirsium arvense*
Broad-leaved Dock	*Rumex obtusifolius*
Curled Dock	*Rumex crispus*
Greater Plantain	*Plantago major*
Ragwort	*Senecio jacobaea*
Scentless Mayweed	*Tripleurospermum inodorum*
Pineappleweed	*Matricaria matricariodes*

APPENDIX III: Example Recording Form

DATE:									MOOR/COMMON:											FIELD RECORDER(S):												
Q No.	OG	DS%	Calluna variables						Bilberry					Heath	Sward ht's					Faecal E's		Other			Veg.Type		GI Assessment					NFS/Notes
			C %	HGF	C Ht	GS	Bu	HBd	B%	Ht 1	Ht 2	Ht 3	Ht 4	Ht	D-species	Ht 1	Ht 2	Ht 3	Ht 4	C / P	S	DC	DV	BG	Quad	Stand	CC	UNG	IND	GRA	OBS	

OG: recorders assesment of grazing pressure: **H**eavy, **M**oderate or **L**ight
DS % = Dwarf-shrub heath cover (incl. *Ulex gallii, Erica* sp., *Vaccinium* sp., *Calluna vulgaris., Empetrum nigrum*)

C % = *Calluna* cover only
NB: For all cover estimates: use 0.5% for present; then to the nearest 1% for 1-20; nearest 5% for 20-100
HGF = % of *Calluna* growth forms exhibiting **H**eavily **G**razed **F**eatures (not last season's growth)

C Ht = one ht from centre of *Calluna* block within quadrat
GS = *Calluna* Growth stage: **P**ioneer 1-5 years, **B**uilding 6-15 years and **M**ature >15 years
Burnt within last two years (Y or N)

HBd = Heather Beetle damage within quadrat (Y or N)
Bilberry: B % = cover only; and take 4 **Ht**'s to nearest 0.5cm, nearest centre of quadrat quarters.

Heath Ht (other than Billberry) = one ht from centre of heath block within quadrat (if Ht is *Calluna* same as **C Ht**).

Sward ht's: D-species = Name dominant grass type species, take 4 **Ht**'s to nearest 0.5cm, from centre of quadrat quarters. If species measured is not the dominant species circle measurement.

Record dominant **Vegetation type** in **Stand**; and if different in **Quadrat** (refer to MAPP key)
Record no. of **F**aecal **E**vents; in col. **C /P** for cattle and/or ponies, and in **S** for sheep.

Count no.of **D**etached **C**alluna stems.
Count no. of items of **D**etached **V**egetation (e.g. pulled stems, but do not include litter such as dead *Molinia*). If many (>20) guess to nearest 10.

BG = % cover of bare ground (only include areas of bare ground >5x5cm)
NFS = Presence of non-favourable species, name.
Notes: make notes on problems i.e. borderline vegetation types, use back of sheet if necessary.

CC = number of stems of *Calluna* collected (0-4)
Grazing Index assessment:
UNGrazed, **IND**eterminate, **GRA**zed
OBSserver (*for grazing assessment*)