Ennerdale

1. Introduction

Natural England (NE) and its predecessors has carried out a series of monitoring programmes on many upland sites in England that contain Priority Habitats, including dry and wet heath, blanket bog and calcareous grassland. These sites have been managed under agri-environment schemes for up to two decades or more, and some were formerly also subject to grazing restrictions under Environmental Cross Compliance (ECC) regulations. Monitoring focussed initially on the condition of heather (*Calluna vulgaris*) in relation to grazing pressure, and latterly also on the overall condition of the vegetation across the range of habitats present on a site.

The aim of this project was to re-survey a selection of these sites using standardised methods, and to provide a series of individual site reports describing their current and changing habitat condition, along with a separate overview of the findings from the complete set of sites. Data from the surveys have also been provided to NE to allow more detailed examination of individual sites to help guide local management inputs.

Each site comprised a whole moorland grazing unit and encompassed a range of vegetation types. A range of variables was recorded at 100 randomly located sample points in each site. Variables to be recorded were agreed with NE prior to the survey, to assess heather grazing and the condition of key habitats. The methodology was based on a modified version of the NE overgrazing surveillance methodology (including laboratory assessment of a heather Grazing Index) and the Common Standards Monitoring (CSM) Guidance for Upland Habitats. Full details of the project objectives and methodology are given in the main overview report. Defra, UK - Science Search

The Ennerdale site was surveyed during 7 – 9 April 2014. Results of the survey are presented in a standard format in the following sections. Management information (particularly grazing) is also summarised from reports provided by NE. An assessment is then made of change in vegetation since the previous surveys and this is considered in the context of current and past management practices.

2. Overview

2.1 General description

The grazing unit is part of Ennerdale Fell to the south of Ennerdale Water, located in the western Lake District and covers 323 ha. Much of the vegetation (49% of sample points in 2014) comprises heather heath, along with wet heath (17%) and smaller amounts of fragmented heath, montane heath, blanket bog and flush, fen & swamp. The heather heath on the steeper slopes of The Side is rather species-poor and dominated by mature to degenerate heather, with some *Erica cinerea* (H10 *Calluna vulgaris* - *Erica cinerea* heath) on the slopes of Sail Hills. There was little or no evidence of grazing and appreciable amounts of dead heather (considered to be natural rather than due to damage by heather beetle) at the time of the re-survey, but with some evidence of regeneration through layering. This grades into wet heath (M15 *Scirpus cespitosus* - *Erica tetralix* wet heath) where the gradient is a little shallower, with small pockets of blanket bog (M17 *Scirpus cespitosus* - *Eriophorum vaginatum* blanket mire). Above The Side and Ennerdale Fell, much of the heather was in the building phase of growth, but with some evidence of heather beetle damage. The heather heath grades into montane heath above about 600 metres towards the summit above Iron Crag. This is characterised by variable amounts of low-growing heather*, Vaccinium myrtillis, Empetrum*

nigrum, Carex bigelowii and *Racomitrium lanuginosum*, and appeared to be in good condition with frequent luxuriant growths of *Huperzia selago*.

Across the whole site, most heather was in the mature or building growth stages, with also some degenerate and a small amount of pioneer (Figure 3c). The most commonly dominant graminoid was *Festuca ovina* (Figure 3h).

2.2 Site management

The site was entered into a Tier 1 agreement in the Lake District Environmentally Sensitive Area (ESA) in 1993. Only information on winter sheep stocking densities is available from that period, which was 0.11 LU ha^{-1} (0.73 ewes ha^{-1}, based on ESA LU equivalent[1]) before entry into the scheme and this was unchanged by 1995-6. The Tier 1 ESA prescriptions for heather fell require that livestock numbers cannot be increased on the fell, with a maximum stocking rate of 0.225 LU ha^{-1} (1.5 ewes ha^{-1}, based on ESA LU equivalent[2]) and removal of all cattle and replacement hoggs, and 25% of overwintering ewes during October to February inclusive. It also required stock control to avoid localised damage, and a programme for any necessary burning or cutting to be agreed.

In 2013, the site entered a Higher Level Stewardship (HLS) agreement, which required average stocking rates of 0.066 LU ha^{-1} (0.82 ewes ha^{-1},based on HLS LU equivalents) in summer and 0.015 LU ha^{-1} (0.19 ewes ha^{-1}) in winter, along with a detailed monthly calendar of maximum and minimum numbers of ewes and followers.

The site was subjected to surveys of heather condition in 1993 and 1996, under the ESA monitoring programme. These surveys focussed on grazing pressure on dwarf shrub, deriving a heather grazing index (GI) from shoots collected in the field, from 150 quadrats in each survey, arranged in random clusters. In ESA monitoring surveys the GI was converted to a measure of Biomass Utilisation (BU) using a mathematical function, although later surveillance surveys on other sites and in the current survey have reverted to the more objective measure of GI, with additional dwarf shrub variables and grass sward heights also recorded.

2.3 Condition and grazing pressure in 2014

The mean GI was very low in the heather heath and wet heath vegetation types (5-6%; Table 1) and across the site as a whole and only one of the samples failed to meet the CSM GI target of less than 33% (Figure 2, Table 1, Map 1). Although not targeted for condition assessment in this project, the five montane heath samples had a slightly higher mean GI of 11.8%. The number of sample points at which heavily grazed features (Figure 3d, Map 2), detached stems or detached vegetation (Figure 3g) were recorded was negligible, and sheep droppings (Figure 3f) were also very scarce. However, heather beetle damage was present at one quarter of sample points in heather heath and about half that in wet heath, and 17% overall (Figure 3d). There was no evidence of any recent burning. The mean graminoid sward height indicated that heavy grazing was likely at only 6% of points where measurements could be made, or 5% of points overall (Map 2), scattered around the upper slopes of Iron Crag.

This is supported by the condition assessment: the dry heath habitat surpassed all thresholds (targets to be passed at 90% of sample points) except for the number of indicator species, which was only just missed by a margin of 1%, and cover of indicator species- if the measure of dwarf shrub cover is taken as this attribute, which for Ennerdale is a reasonable assumption as *Racomitrium lanuginosum* was only recorded at 4% of points. The site fails this attribute despite a mean dwarf shrub cover of around 65% overall (including estimates of cover for bilberry and other dwarf shrubs). Condition assessment thresholds for dwarf shrub composition are however met in

[1] Note that LU equivalents have varied among different schemes

dry heath. Wet heath was above all condition assessment thresholds apart from presence of bell heather (*Erica cinerea*) and the proportion of dwarf shrubs and graminoids. The observed good condition is probably attributable to low levels of grazing, with the failings on species composition possibly a legacy of former management. The dominance of heather (together with, in places, bell heather) and the associated lack of other indicators may also partly be a consequence of the steep and rocky nature of the ground across the side of Ennerdale Fell.

2.4 Change since previous surveys

Previous surveys of the site as part of the ESA monitoring programme used a different sampling regime from that in 2014 so formal analysis of change is not possible. However, some general comparisons can be made. Using a heather biomass utilisation calculation based on the GI, during the period 1993 – 1996 it was estimated that heather growth was suppressed by grazing in 33% of the sample. Due to methodological problems, no conclusions about change in the condition of heather could be made during that period, although the GI in 1996 (6.9%) was similar to that in 2014 (Table 1). Although the methods used in the current survey were different, the overall assessment indicates that the condition of the target habitats on the site is likely to have improved since the 1993 – 1996 surveys.

The grazing management under the ESA agreement appears to have been successful in at least maintaining, and possibly improving the condition of heather on the site. The HLS agreement had only been in place for one year at the re-survey and is unlikely to have had significant effect to that date. However, the current winter stocking levels at least are much lower than those in place before the site was under agri-environment scheme management and the condition of habitats on the site is likely to be maintained or improved in the longer term.

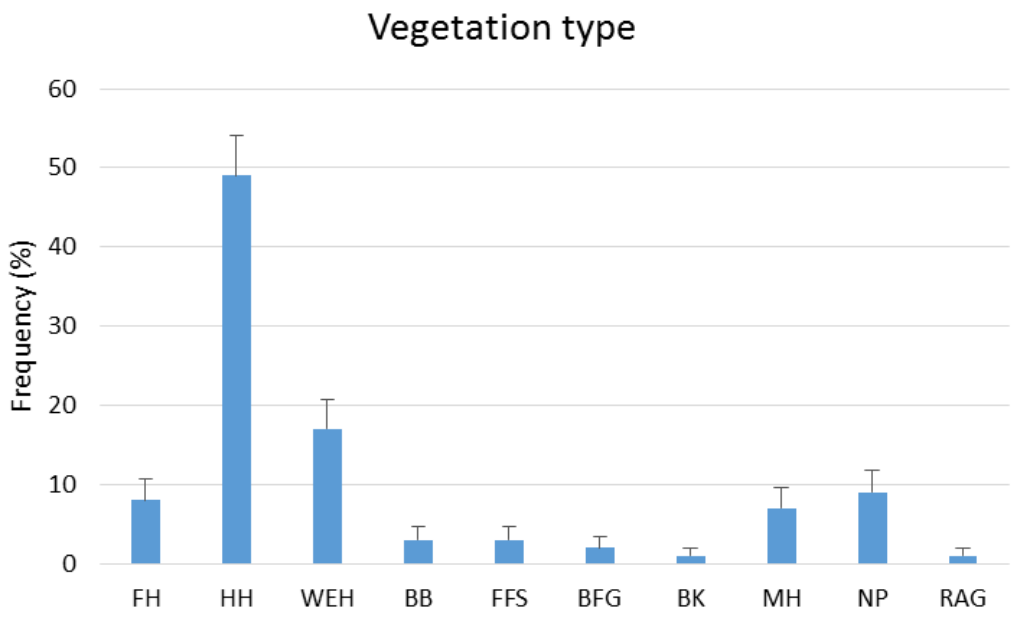


Figure 1. Frequency of vegetation types across the site in 2014. Bars are standard deviations. FH – fragmented heath; HH – heather heath; WEH – wet heath; BB – blanket bog; FFS – flush, fen, & swamp; BFG – bent-fescue grassland; BK – bracken; MH – montane heath; NP – non-productive; RAG – rough acid grassland.

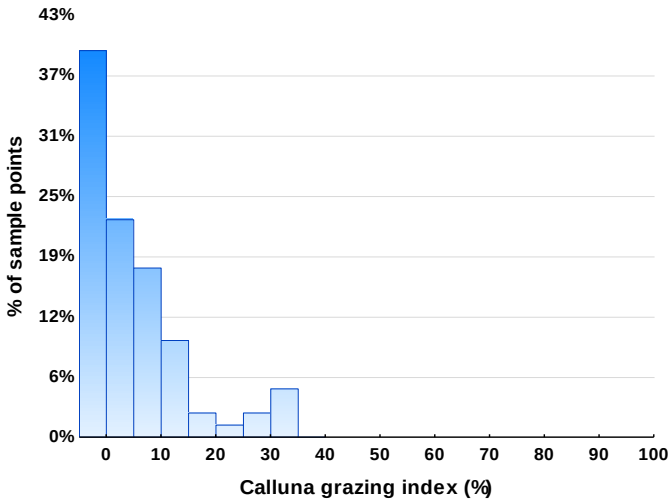


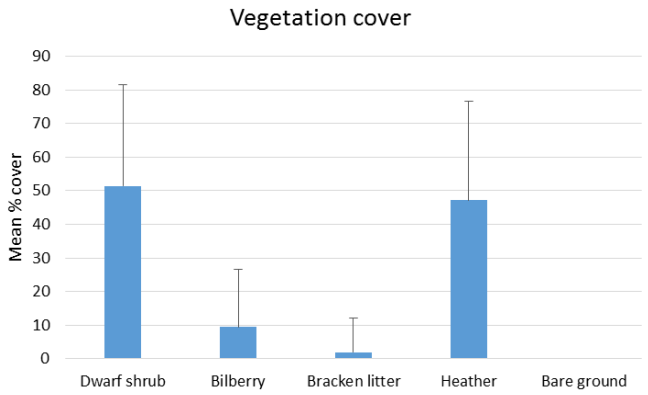
Figure 2. Frequency distribution of heather Grazing Index from sample points containing heather at whole site level in 2014.

Table 1. Heather Grazing Index at site level and by target vegetation type in 2014 (mean ± standard deviation; *n* is number of sample points with heather stems).

	Overall[1] (*n* = 81)	Heather Heath (*n* = 49)	Wet Heath (*n* = 17)	Other[2] (*n* = 9)
Grazing Index	6.2 ±8.44	5.2 ±7.64	6.1 ±10.48	7.6 ±6.51
Samples >= 33.3%	1.2%	2.0%	0.0%	0.0%
Samples >= 66.6%	0.0%	0.0%	0.0%	0.0%

[1] included non-target habitats: montane heath *n*=5, non-productive habitat *n*=1
[2] blanket bog *n*=3, flushes, fens & swamps *n*=1, fragmented heath *n*=5

a)



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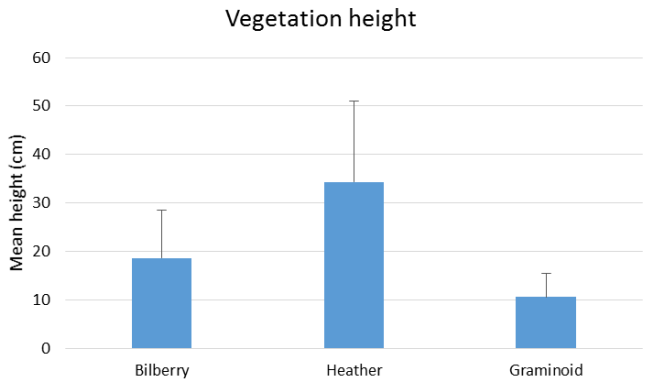

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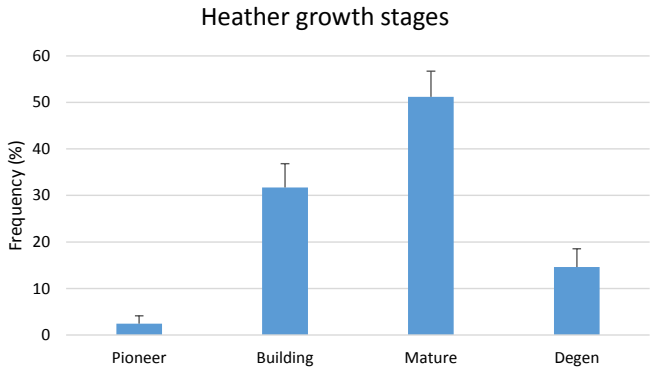

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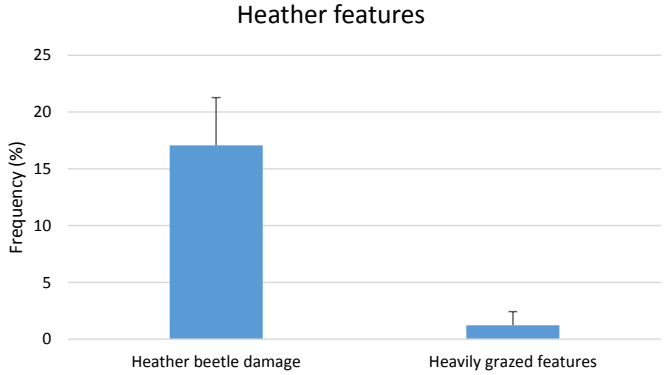

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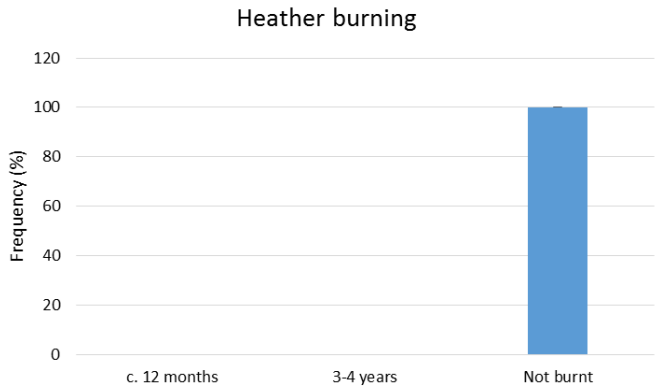

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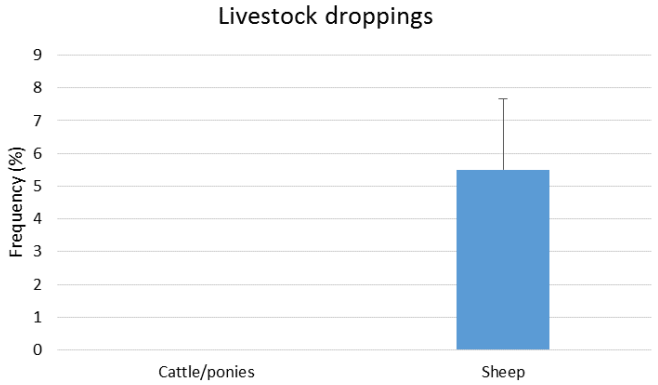

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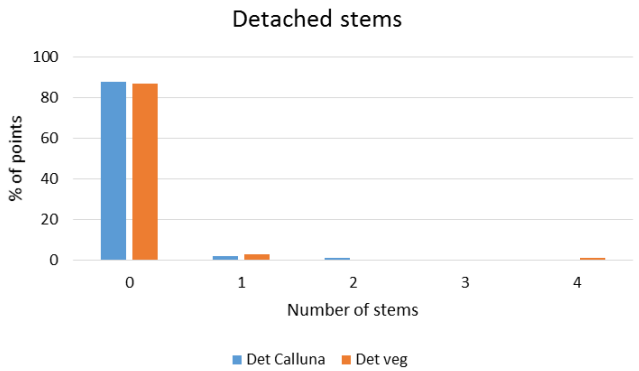

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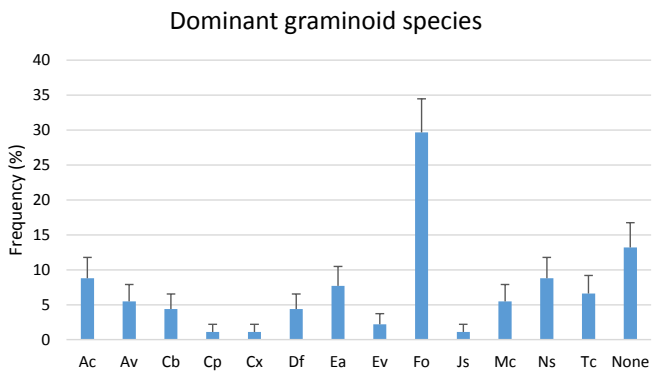


Figure 3. Surveillance variables at whole site level in 2014 (bars are standard deviations).

3. Overgrazing surveillance variables 2014

		Heather Heath (n =49)			Wet Heath (n =17)			Other Target Types* (n = 14)		
Category	**Variable**	**Mean**	**SD**	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**	**n**
Peat	Peat depth (cm)	16	8.5	49	23	10.6	17	19	15.3	14
Vegetation cover	Dwarf shrub cover (%)	58	27.9	49	61	18.8	17	38	31.1	12
	Bilberry cover (%)	14	20.1	35	2	3.8	8	4	7.4	7
	Bracken litter cover (%)	0	1.6	2	1	2.4	1	0	0.0	0
	Calluna cover (%)	54	26.7	49	57	21.1	17	31	27.5	11
	Bare ground (%)	0	0.0	0	0	0.0	0	0	0.0	0
Vegetation height	Bilberry height (cm)	21	9.4	35	19	6.9	8	24	8.4	7
	Calluna height (cm)	37	17.8	49	36	11.4	17	34	12.5	11
	Graminoid height (cm)	11	4.2	39	12	4.4	16	12	6.4	13
Heather growth stages	Pioneer (% of points)	4	2.8	49	0	0.0	17	0	0.0	11
	Building (% of points)	33	6.7	49	24	10.3	17	9	8.7	11
	Mature (% of points)	51	7.1	49	59	11.9	17	64	14.5	11
	Degenerate (% of points)	12	4.7	49	18	9.2	17	27	13.4	11
Heather features	Heather beetle damage (% of points)	24	6.1	49	12	7.8	17	0	0.0	11
	Heavily grazed features (% of points)	2	2.0	49	0	0.0	17	0	0.0	11
Heather burning	Burnt (*c.* 12 months) (% of points)	0	0.0	49	0	0.0	17	0	0.0	11
	Burnt (3-4 years) (% of points)	0	0.0	49	0	0.0	17	0	0.0	11
Droppings	Cattle / ponies (% of points)	0	0.0	49	0	0.0	17	0	0.0	14
	Sheep (% of points)	4	2.8	49	0	0.0	17	7	6.9	14
Detached stems	Detached Calluna (no.)	0	0.3	49	0	0.0	17	0.1	0.4	14
	Detached vegetation (no.)	0.1	0.6	49	0	0.0	17	0.0	0.0	14

* Other target types = Fragmented Heath (n=8); Blanket Bog (n=3); and Flushes, fens & swamps (n=3).

4. Habitat condition assessment results 2014

4.1 Dry heath

Targets assessed at habitat level in 2 x 2 m quadrat:

Dry heath (n=49 heather heath + 7 fragmented heath)		
Target	% of points passed	Habitat pass or fail
Presence of moss, liverworts and non-crustose lichens[1]	100	Pass
At least 50% of vegetation cover made up of Table 1 indicator species[2]	79	Fail
At least 25% of dwarf shrub cover should be made up of Group (i) indicator species	100	Pass
Less than 50% of dwarf shrub cover made up of Group (ii) indicator species	100	Pass
At least two indicator species from group (i)	89	Fail
Cover of weeds < 1%	100	Pass
Cover of soft rush < 10%	100	Pass
Dwarf shrub browsing < 33%	96	Pass
Disturbed bare ground < 10%	100	Pass

[1] assessed in 1 x 1 m quadrat

[2]assessed as total dwarf shrub cover, excluding dead and pioneer heather and recent burns

Targets assessed at feature extent:

Target	**Pass or fail**
Cover of non-native species < 1%	Pass
Cover of bracken < 10%	Pass
Cover of native trees/ shrubs < 20%	Pass
Cover of weeds < 1%	Pass
Cover of soft rush < 10%	Pass
Burning of sensitive areas absent	Pass
Disturbed bare ground < 10%	Pass
Mature heather ≥10% & all growth phases present	Pass

Indicator species frequencies (*n* = 56):

Species	**Frequency (%)**	**SD**
Calluna vulgaris	100	0.0
Erica tetralix	16	4.9
Erica cinerea	23	5.6
Vaccinium myrtillus	66	6.3
Vaccinium oxycoccus	0	0.0
Vaccinium vitis-idaea	4	2.5
Empetrum nigrum	14	4.7
Racomitrium lanuginosum	4	2.5
Ulex gallii	0	0.0
Myrica gale	0	0.0

4.2 Wet heath

Targets assessed at habitat level in 2 x 2 m quadrat:

Wet heath (n=17 wet heath + 1 fragmented heath)		
Target	% of points passed	Habitat pass or fail
Erica tetralix present	67	Fail
At least 50% indicator species cover and 20% ericoid species	88	Pass
Cover of negative indicators < 1%	94	Pass
Cover of soft rush < 10%	100	Pass
Cover of dwarf shrubs ≤ 75% and graminoids ≤ 75%	76	Fail
Dwarf shrub browsing < 33%	100	Pass
Broken/ crushed Sphagnum < 10% *	100	Pass
Disturbed bare ground/ drainage < 10% *	100	Pass

Targets assessed at feature extent:

Target	**Pass or fail**
Cover of native trees/ shrubs < 20%	Pass
Cover of bracken < 10%	Pass
Cover of non-native species < 1%	Pass
Cover of negative indicators < 1%	Pass
Cover of soft rush < 10%	Pass
Burning of bryophyte layer absent	Pass
Burning of sensitive areas absent	Pass
Active drainage < 10%	Pass
Disturbed bare ground < 10%	Pass

Indicator species frequencies (*n* = 18):

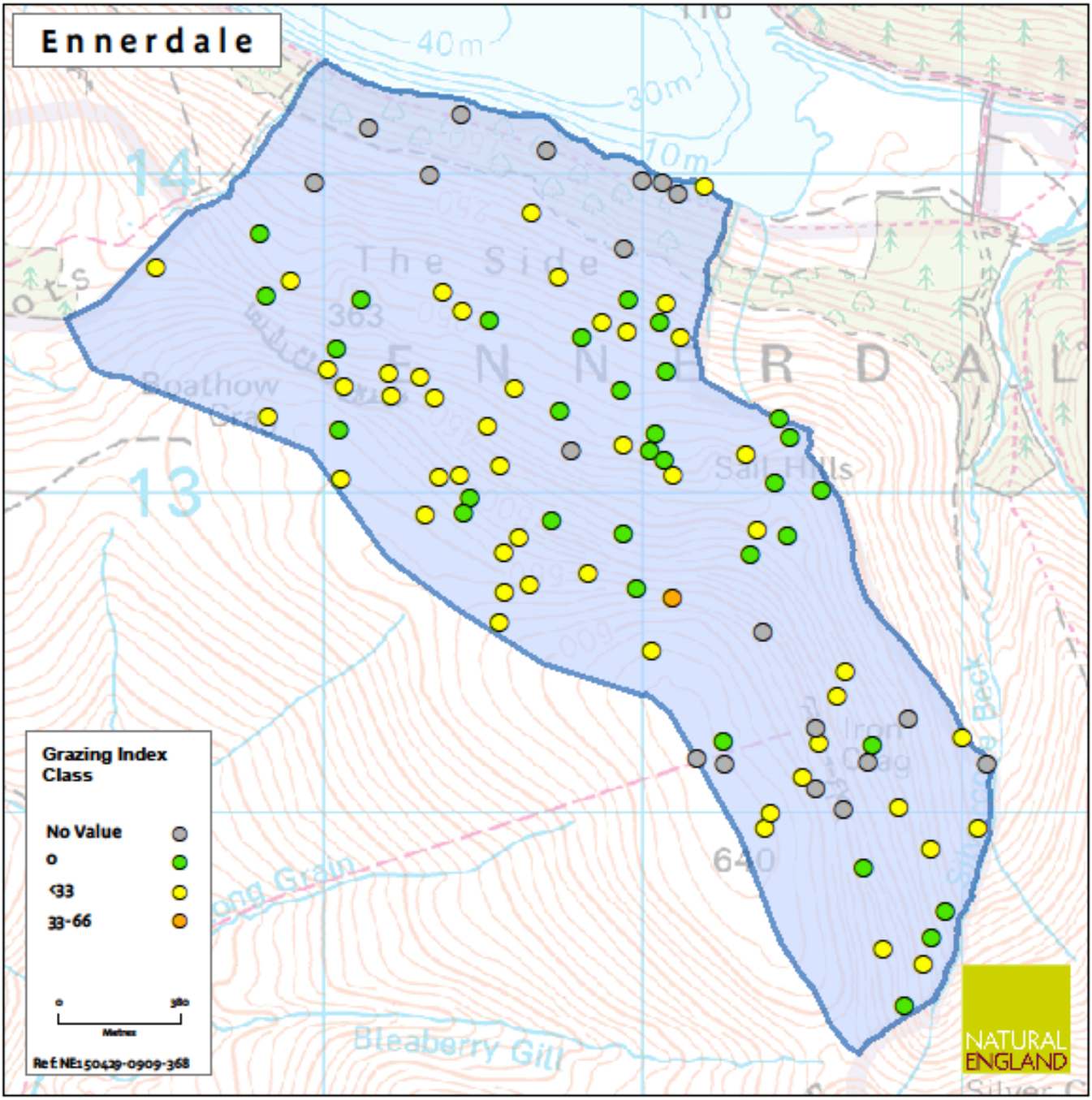
Species	**Frequency (%)**	**SD**		**Species**	**Frequency (%)**	**SD**
Calluna vulgaris	100	0.0		*Carex* spp.	44	11.7
Erica tetralix	44	11.7		*Rhynchospora alba*	0	0.0
Erica cinerea	33	11.1		*Narthecium ossifragum*	0	0.0
Rubus chamaemorus	0	0.0		*Drosera* spp.	0	0.0
Empetrum nigrum	0	0.0		*Sphagnum* spp.	89	7.4
Myrica gale	0	0.0		*Racomitrium lanuginosum*	22	9.8
Andromeda polifolia	0	0.0		Pleurocarpous mosses	72	10.6
Eriophorum angustifolium	17	8.8		Non-crustose lichens	6	5.4
Trichophorum cespitosum	44	11.7				

4.3 Mires

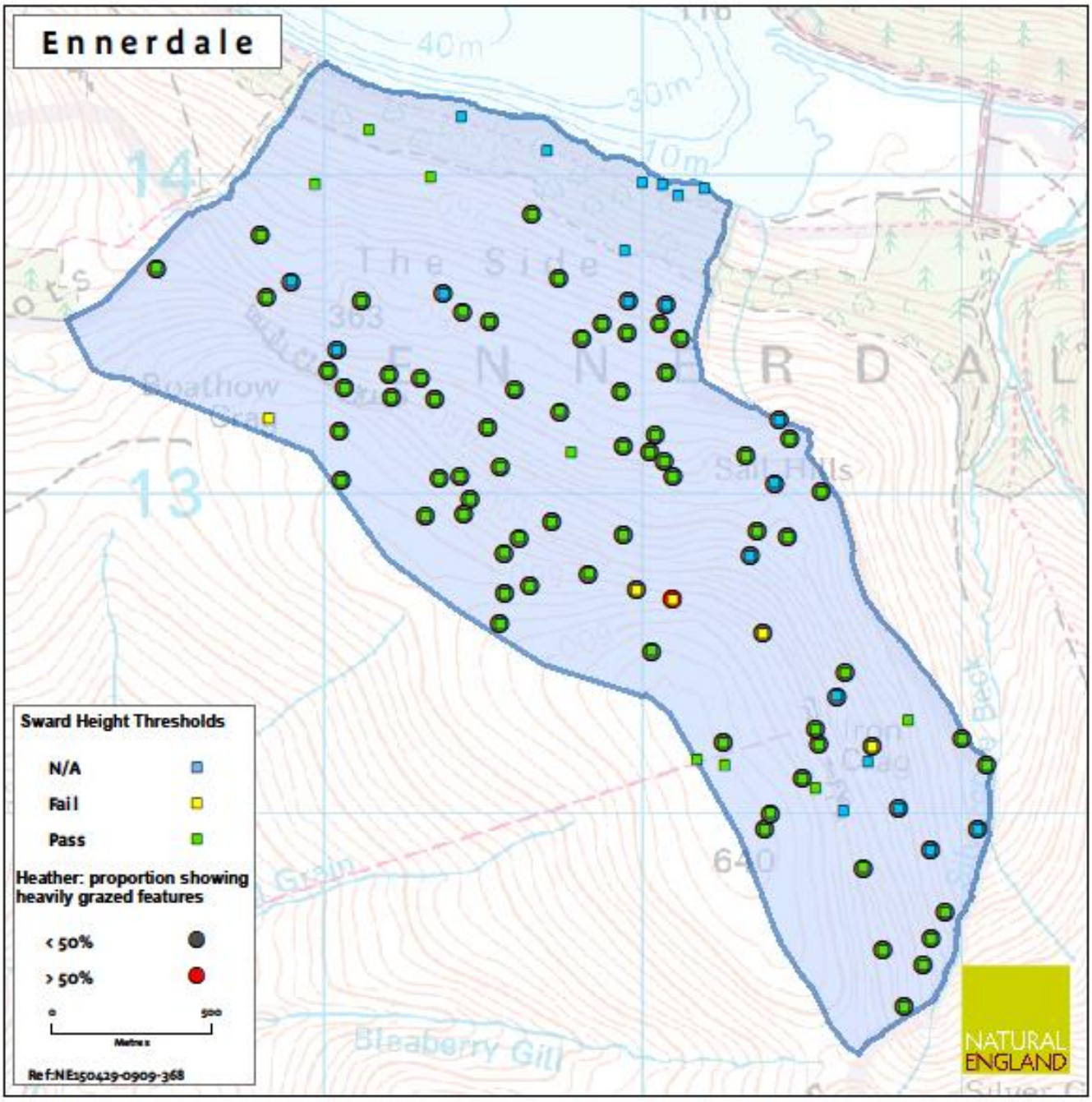
This habitat type was recorded at less than 10 sample points so condition cannot be accurately assessed at 2 x 2m quadrat level.

Targets assessed at feature extent:

Target	**Pass or fail**
Cover of non-native species < 1%	Pass
Cover of native trees/ shrubs < 10%	Pass
Cover of negative indicators < 1%	Pass
Burning of bryophyte layer absent	Pass
Burning of sensitive areas absent	Pass
Extent of eroding peat	Pass
Disturbed bare ground < 10%	Pass



Map 1: Distribution of random sampling points on Ennerdale in 2014, showing those where heather was present, along with heather grazing index (GI) class, derived from collected heather shoots.



Map 2: Distribution of sample points on Ennerdale in 2014 showing those which fall above (pass) or below (fail) habitat-related height thresholds indicative of heavy grazing, and with more or less than 50% of heather cover showing suppressed growth features.

Further information

Natural England evidence can be downloaded from our **Access to Evidence Catalogue**. For more information about Natural England and our work see **Gov.UK**. For any queries contact the Natural England Enquiry Service on 0300 060 3900 or e-mail **enquiries@naturalengland.org.uk** .

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