Broomhead Moor

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 Broomhead Moor site was re-surveyed during 31 March to 2 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

Broomhead Moor is located in the North Peak and covers 1714 ha. The site falls within the Dark Peak SSSI, South Pennine Moors SSSI and Peak District Moors SAC. Much of the vegetation in the eastern and north-eastern parts of site comprises heather heath (48% of sample points in 2014), in parts almost entirely dominated by *Calluna* (H9 *Calluna vulgaris - Deschampsia flexuosa* heath), but with *Vaccinium myrtillus* patchily abundant (H12 *Calluna vulgaris - Vaccinium myrtillis* heath) and both *V. vitis-idaea* and *Empetrum nigrum* also present. The area is managed for grouse by controlled burning in small patches, which has created a patchwork of different aged heather. Sheep grazing is also a significant factor, although relatively high levels of browsing of dwarf-shrubs in places appeared largely to reflect preferential grazing of bilberry rather than heather.

There are extensive areas (41% of sample points) of blanket bog (M19 *Calluna vulgaris - Eriophorum vaginatum* blanket mire) in the eastern part of the site (White Carr Moss, Upper Commons and Middle Moss). This is rather impoverished with *Sphagnum* largely absent and filamentous algae conspicuous in many small pools, which probably reflects relatively high levels of historical pollution. There is peat erosion along the gullies; despite good vegetation cover and low grazing levels much of the steep banksides have exposed bare peat.

Building, mature and pioneer heather growth stages were all widespread in 2014, with some degenerate plants also present. Graminoids were absent across much of the site but *Eriophorum vaginatum* was the most commonly dominant graminoid in the blanket bog.

2.2 Site management

The site was in an agreement in the North Peak Environmentally Sensitive Area (ESA), and was subjected to surveys of heather condition in 1993, 1994, 1995 and 1996. These surveys focussed on grazing pressure on dwarf shrub, deriving a heather grazing index (GI) from shoots collected in the field, from around 100 quadrats in each survey, stratified by dominant and sub-dominant heather areas. 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.

During 1994 – 1996 the site was in a Tier 1C agreement, which specified a maximum stocking rate of 0.15 LU ha^{-1} (1 ewe ha^{-1} plus followers) and during winter (November to February inclusive) to exclude cattle and horses and remove 25% of the flock of overwintering ewes and replacement hogs. There was also a requirement to avoid localised damage from heavy grazing and to agree a burning management plan. In 1993, it had been in Tier 2 in the original ESA scheme, which specified the same maximum stocking levels but a shorter off-wintering period (January to March inclusive). The site entered a Higher Level Stewardship (HLS) agreement in 2013, which specified a maximum of 0.035 LU ha^{-1} in summer (March – October; 0.44 ewes ha^{-1}) and 0.026 LU ha^{-1} in winter (November – February; 0.33 ewes ha^{-1})[1]. A Moorland Management Plan (MMP) is in place which sets limits on burning frequency and extensive bog restoration work is planned.

2.3 Condition and grazing pressure in 2014

The mean GI in 2014 was at moderate levels (21% in heather heath, 16% in blanket bog, 19.5% overall; Table 1), however, 17% of samples points containing heather did not meet the CSM GI target of less than 33%, above which level grazing is likely to be damaging (Table 1, Figure 2, Map 1b). These points were generally found around Barnside Moor in the north of the site, on the cloughs around the valley of Ewden Beck, and a small cluster on the southern boundary near Flint hill. Sheep droppings were present at approximately one third of sample points in both vegetation types (Figure 3f) (although it is thought that some records might have been attributable to mountain hares) and heavily grazed features at 11% of points in heather heath, and 9% of all points where heather was present (Figure 3d, Map 2). A high cover of heavily grazed features is indicative of longer term grazing pressure and was more commonly found around Earnshaw Ridge and White Carr Moss. The different distribution of 2014 grazing indices suggests a change in grazing pattern in this year, or perhaps longer term. Numbers of detached stems or vegetation were negligible (Figure 3g). The mean sward height at 32% of sample points where graminoid height could be measured, or 11% overall, indicated that heavy grazing was likely in these areas (Map 2). Where measured, these short swards had a similar distribution to high heather grazing indices.

There was extensive evidence of recent burning, with one third of sample points in heather heath burnt in the last 3-4 years and 6% in the last 12 months, at the time of the survey. In blanket bog, there was also a significant amount of burning in the last 3-4 years, being recorded at over one quarter of sample points. The proportion in each age class for the site as a whole is given in Figure 3e). There was a small amount of heather beetle damage in both vegetation types (Figure 3d).

The mires habitat was not in good condition, being below the condition threshold (targets to be passed at 90% of sample points) for species composition (apart from negative indicators), for burning and for eroding peat. *Sphagnum fallax* was the only bog-moss species recorded and was present at only three sample points. This is almost certainly the consequence of burning management, as well as historically high levels of industrial pollution and possibly also high grazing

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

levels in the past. The dry heath habitat was in better condition, although it was below the threshold for indicator species diversity, and if the measure of dwarf shrub cover is taken as indicator species cover, a reasonable assumption for Broomhead as no *Racomitrium lanuginosum* was recorded, this threshold is similarly not met, despite a mean dry heath dwarf shrub cover of over 70% (including bilberry, which was recorded separately). Condition assessment thresholds for dwarf shrub composition are however met. This habitat was just below the threshold for lower plants and lichens (85% of sample points passed). This is probably also attributable to intensive burning management and possibly also heavy grazing in the past. Both habitats surpassed the threshold for browsing on dwarf shrubs.

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 40% of the sample, but the level of biomass utilisation (and presumably suppression) of heather declined during that period, albeit with annual variation. The GI also varied, but declined slightly from 25.8% in 1993 to 17.4% in 1996. These values are similar to the 2014 means (Table 1). Although the methods used in this survey were different, the overall assessment does indicate that the condition of heather on the site was likely to have improved further since the 1993 – 1996 surveys. However, the continued frequent burning on the site is probably inhibiting recovery of habitat condition, and especially that of the blanket bog, but should be addressed through adherence to the MMP.

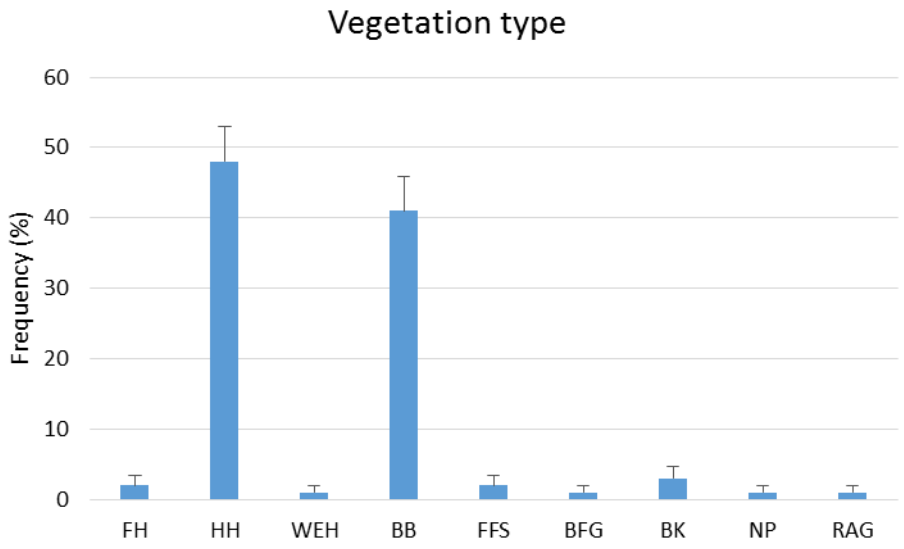

Figure 1. Frequency of vegetation types across the site in 2014. Bars are standard deviations. FH – fragmented heath; HH – heather heath; WEH – wet heath; BB – blanket bog; FFS – flush, fen, & swamp; BFG – bent-fescue grassland; BK – bracken; NP – non-productive; RAG – rough acid grassland.

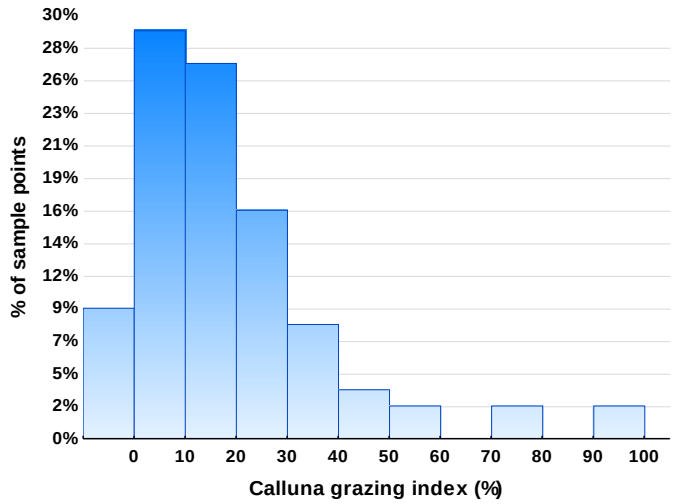

Figure 2. Frequency distribution of heather Grazing Index from sample points containing heather at whole site level in 2014.

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 (*n* = 86)	Heather Heath (*n* = 44)	Blanket Bog (*n* = 38)
Grazing Index	19.5 ±20.04	20.9 ±22.52	16.0 ±15.00
Samples ≥ 33.3%	17.4%	20.5%	10.5%
Samples ≥ 66.6%	4.7%	4.5%	2.6%

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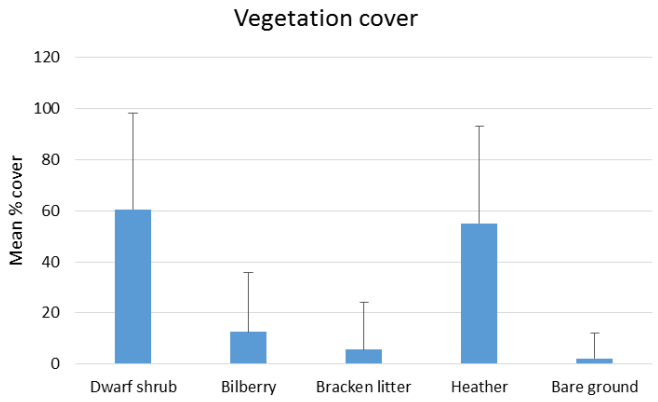

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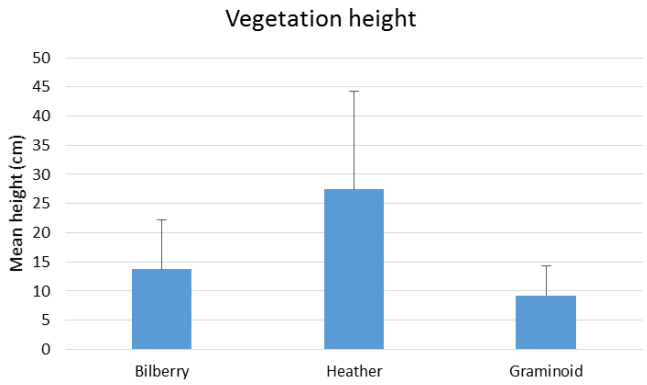

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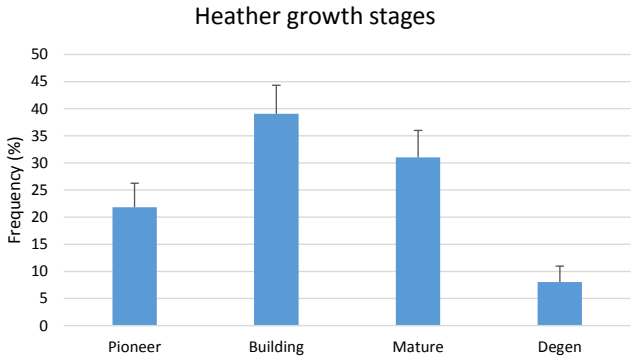

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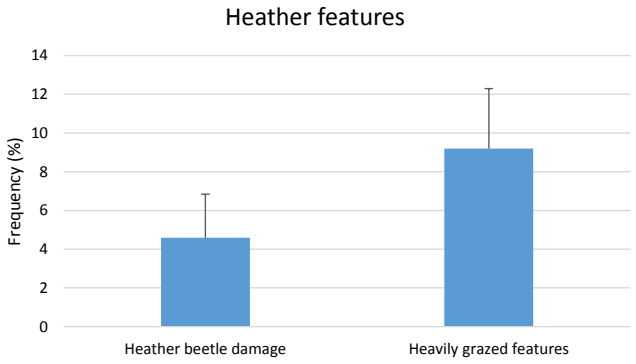

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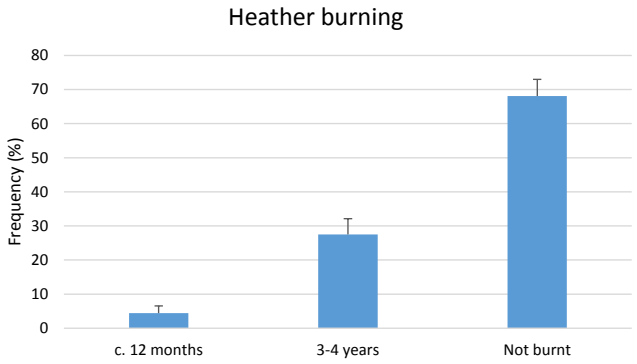

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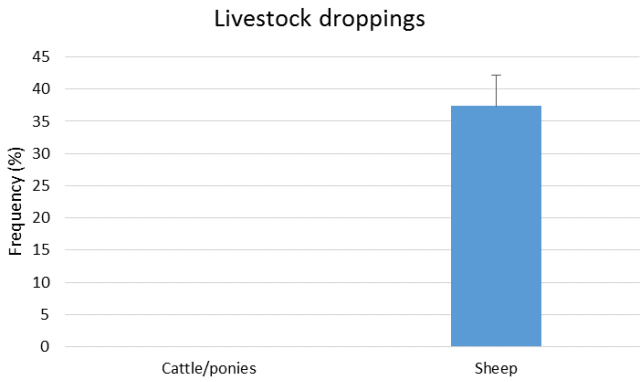

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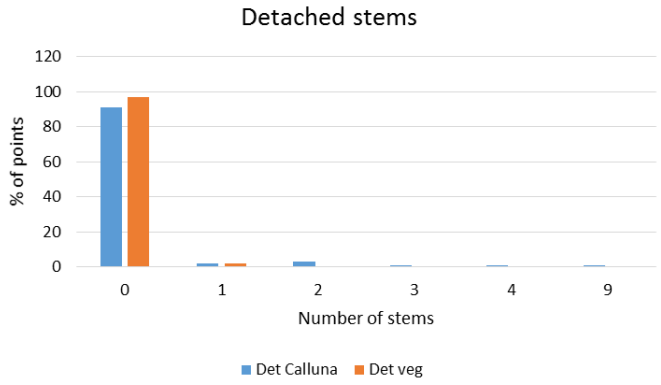

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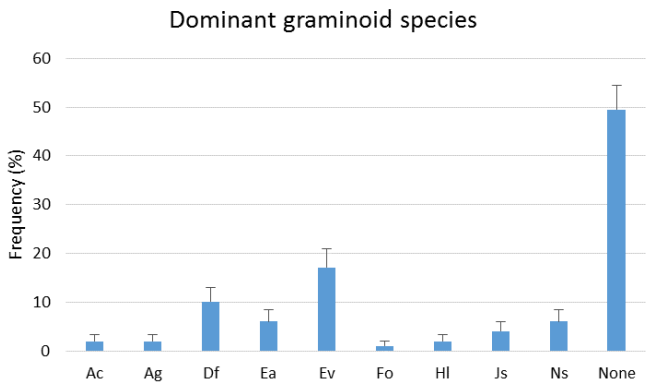


Figure 3. Surveillance variables at whole site level in 2014 (bars are standard deviations).

3. Overgrazing surveillance variables 2014

		Heather Heath (*n* =48)			Blanket Bog (*n* = 41)		
Category	**Variable**	**Mean**	**SD**	***n***	**Mean**	**SD**	***n***
Peat	Peat depth (cm)	16	9.4	45	91	17.1	41
Vegetation cover	Dwarf shrub cover (%)	66	36.7	48	67	32.5	41
	Bilberry cover (%)	19	28.1	48	8	16.3	41
	Bracken litter cover (%)	3	13.0	48	2	11.7	41
	Calluna cover (%)	59	36.4	48	63	35.1	41
	Bare ground (%)	1	3.8	48	3	14.2	41
Vegetation height	Bilberry height (cm)	17	9.2	26	10	5.8	24
	Calluna height (cm)	30	18.8	44	24	14.1	39
	Graminoid height (cm)	6	4.4	9	11	4.8	18
Heather growth stages	Pioneer (% of points)	27	6.7	44	15	5.8	39
	Building (% of points)	41	7.4	44	41	7.9	39
	Mature (% of points)	32	7.0	44	28	7.2	39
	Degenerate (% of points)	0	0.0	44	15	5.8	39
Heather features	Heather beetle damage (% of points)	2	2.2	44	8	4.3	39
	Heavily grazed features (% of points)	11	4.8	44	3	2.5	39
Heather burning	Burnt (*c.* 12 months) (% of points)	6	3.6	47	3	2.5	39
	Burnt (3-4 years) (% of points)	32	6.8	47	23	6.7	39
Droppings	Cattle / ponies (% of points)	0	0.0	48	0	0.0	41
	Sheep (% of points)	35	6.9	48	34	7.4	41
Detached stems	Detached Calluna (no.)	0.4	1.4	48	0.2	0.7	41
	Detached vegetation (no.)	0	0.0	48	0	0.0	41

4. Habitat condition assessment results 2014

4.1 Dry heath

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

Dry heath (*n*=48 heather heath + 1 fragmented heath**)**		
Target	% of points passed	Habitat pass or fail
Presence of moss, liverworts and non-crustose lichens[1]	85[2]	Fail
At least 50% of vegetation cover made up of Table 1 indicator species[3]	78	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)	71	Fail
Cover of weeds < 1%	98	Pass
Cover of soft rush < 10%	100	Pass
Dwarf shrub browsing < 33%	93	Pass
Disturbed bare ground < 10%	98	Pass

[1] assessed in 1 x 1 m quadrat
[2] *n*=48 (1 point with no information)
[3]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	Fail

Indicator species frequencies (*n* = 49):

Species	**Frequency (%)**	**SD**
Calluna vulgaris	96	2.8
Erica tetralix	0	0.0
Erica cinerea	0	0.0
Vaccinium myrtillus	69	6.6
Vaccinium oxycoccus	0	0.0
Vaccinium vitis-idaea	31	6.6
Empetrum nigrum	22	6.0
Racomitrium lanuginosum	0	0.0
Ulex gallii	0	0.0
Myrica gale	0	0.0

4.2 Wet heath

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

4.3 Mires

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

Mires (*n*=41 blanket bog + 2 flush, fen & swamp)		
Target	% of points passed	Site feature pass or fail
At least 6 indicator species present	26	Fail
At least 50% of vegetation cover made up of at least 3 indicator species	74	Fail
Sphagnum cover should not consist of only *Sphagnum fallax*	0 [1]	Fail
Any one of *Eriophorum vaginatum*, Ericaceous spp. collectively or *Trichophorum* should not individually exceed 75% of veg cover	35	Fail
Less than 1% of vegetation cover to comprise of negative indicators	98	Pass
Dwarf shrub browsing < 33%	93	Pass
Disturbed bare ground/ drainage < 10%	98	Pass
Broken/ crushed *Sphagnum* < 10%	100	Pass

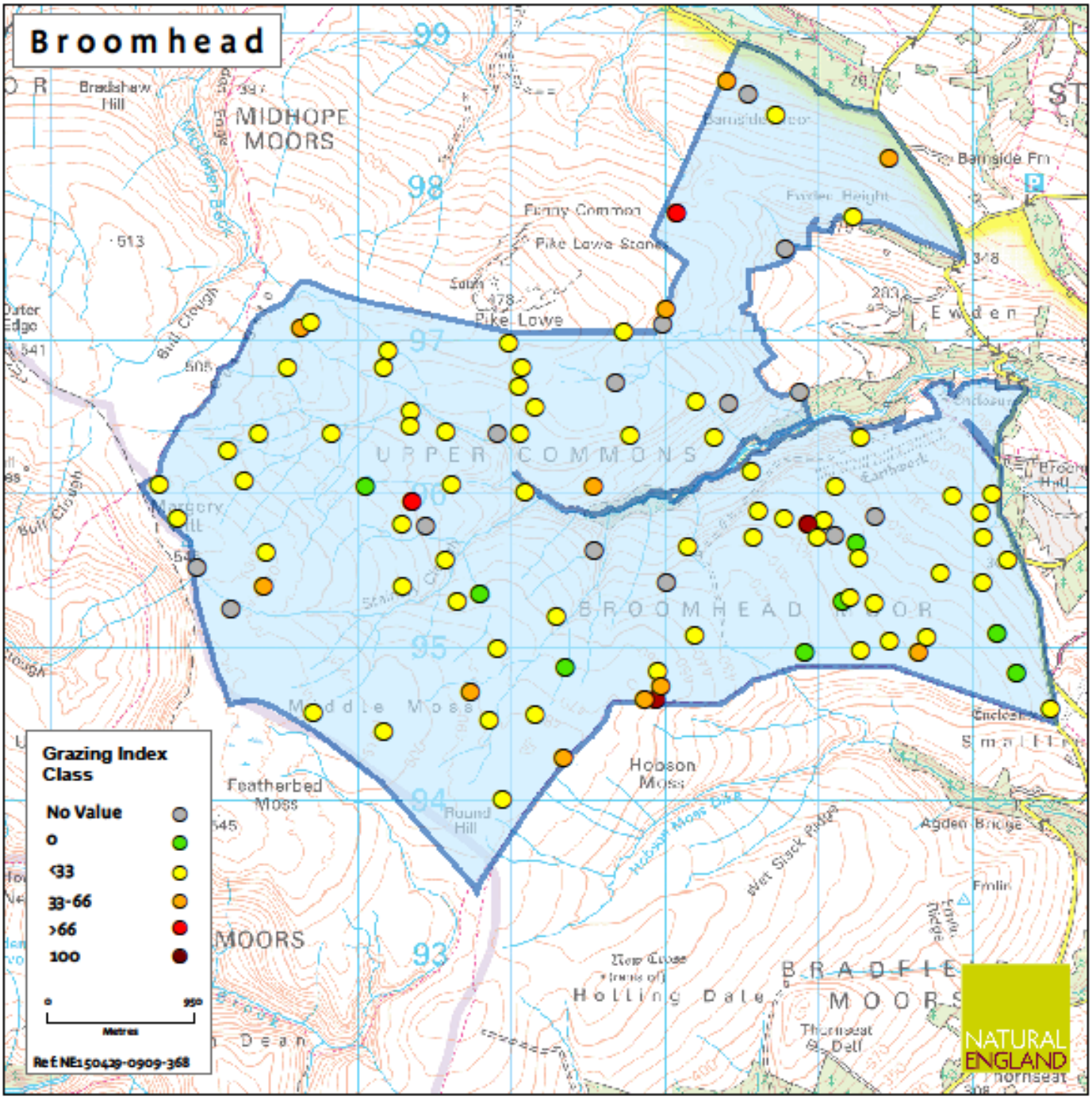
[1] *n*= 3 (3 points with *Sphagnum* present)

Targets assessed at feature extent:

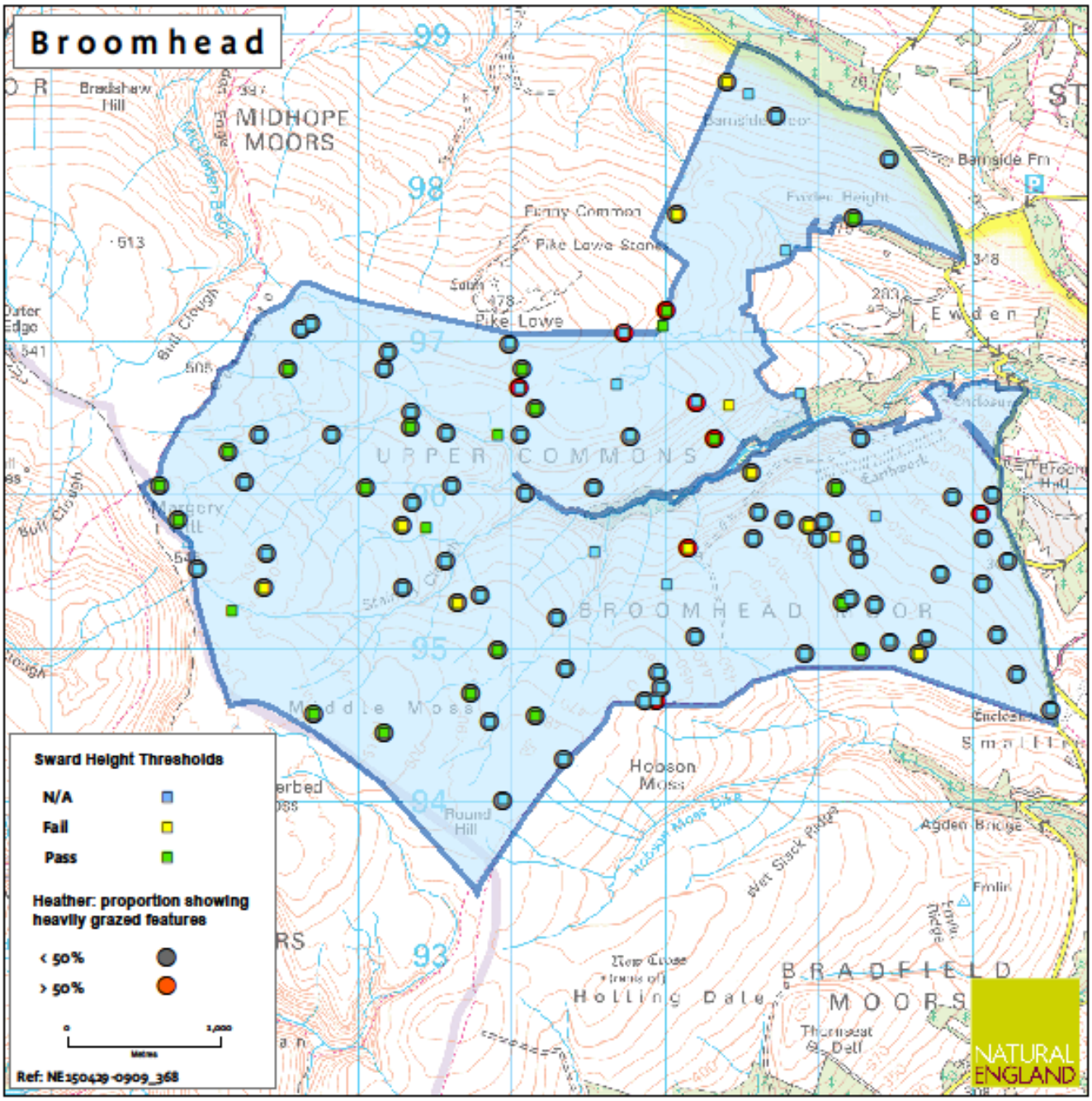
Target	**Pass or fail**
Cover of non-native species < 1%	Pass
Cover of native trees/ shrubs < 10%	Pass
Cover of negative indicators < 1%	Pass
Burning of bryophyte layer absent	Fail
Burning of sensitive areas absent	Fail
Extent of eroding peat	Fail
Disturbed bare ground < 10%	Pass

Indicator species frequencies (*n* = 43):

Species	**Frequency (%)**	**SD**		**Species**	**Frequency (%)**	**SD**
Calluna vulgaris	100	0.0		*E. vaginatum*	51	7.6
Erica tetralix	5	3.2		*Trichophorum cespitosum*	0	0.0
Erica cinerea	0	0.0		*Rhynchospora alba*	0	0.0
Vaccinium myrtillus	65	7.3		*Narthecium ossifragum*	0	0.0
Vaccinium oxycoccus	2	2.3		*Drosera* spp.	0	0.0
Vaccinium vitis-idaea	9	4.4		*Menyanthes trifoliata*	0	0.0
Rubus chamaemorus	0	0.0		*Sphagnum* spp.	7	3.9
Empetrum nigrum	35	7.3		*Racomitrium lanuginosum*	0	0.0
Myrica gale	0	0.0		Pleurocarpous mosses	81	5.9
Andromeda polifolia	0	0.0		Non-crustose lichens	23	6.4
Eriophorum angustifolium	58	7.5				



Map 1: Distribution of random sampling points on Broomhead Moor 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 Broomhead Moor 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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