Ugborough & Harford Commons

1. Introduction

Natural England (NE) and its predecessors have 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 Guidance (CSM) for Upland Habitats. Full details of the project objectives and methodology are given in the main overview report: Defra, UK - Science Search.

The Ugborough and Harford Commons site was surveyed during 31 March to 1 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

Ugborough and Harford Commons are located partly on Dartmoor South SSSI and Dartmoor SAC and cover 1700 ha. Heathland on the site mostly comprises western heath (14% of sample points in 2014; Figure 1), with a dwarf-shrub component consisting almost entirely of *Ulex gallii*, and fragmented (western) heath (17%). Heather occurs only at low cover (mean of 0.8%), and was heavily grazed. Most heather was in the building growth stage (64% of sample points where it occurred), with mature stage also fairly frequent (36%). No other growth phases were recorded. *Vaccinium myrtillus* was more common and frequent in the north end of the site and was also heavily grazed, with heather sparse here. Fragmented western heath had been mown in one location and the disturbed bare ground was probably the result of damage from machinery.

Most of the drier areas of the site at the south end are either heavily grazed bent-fescue grassland (22% of sample points) or rough acid grassland (18%) with large areas of *Pteridium aquilinum* (9%) and a golf course. Across the site as a whole, the most commonly recorded dominant graminoids were *Agrostis capillaris* and *Molinia caerulea*.

Molinia dominated blanket bog vegetation with strong affinities to M25 *Molinia caerulea – Potentilla erecta* mire (12% of sample points) is restricted to the northern, higher end of the site. *Eriophorum vaginatum* occurs occasionally in small amounts and *Sphagnum* is rare to locally frequent.

2.2 Site management

The site entered an Environmentally Sensitive Area (ESA) agreement in September 1999 after being under overgrazing Environmental Cross Compliance (ECC) grazing prescriptions since 1998. Prior to 1998, stocking rates were thought to be 0.49 LU ha^{-1} in summer and 0.44 LU ha^{-1} in winter. The Dartmoor ESA Tier 1E agreement set maximum livestock stocking levels of 0.17 LU ha^{-1} (sheep) for the period 1 November – 15 April; 0.17 LU ha^{-1} (cattle and sheep) for the period 1 September - 31 October; 0.26 LU ha^{-1} (cattle and sheep) for the period 16 April to 31 August; and 0.04 LU ha^{-1} (ponies) all year round. There were also supplementary payments on the site for 'Early Winter Cattle Removal' and 'Early Winter Stocking Levels' which further reduced levels during these periods. In 2010, the site entered an agreement under Higher Level Stewardship (HLS), which specified average stocking rates of 0.3 LU ha^{-1} in summer (June – August) and 0.17 LU ha^{-1} in winter (November to April)[1]. A detailed stocking calendar with monthly maximum and minimum numbers of sheep, cattle and equines was also set.

A number of surveys have taken place over the last 15 or so years, and are summarised in Table 1. The initial 1998 survey which confirmed an overgrazing problem and 1999 follow-up focussed on grazing pressure on dwarf shrub, deriving a heather grazing index (GI) from shoots collected in the field, although data was collected on other dwarf shrub variables. The development of the Surveillance Survey following the Moorland Appraisal Pilot Project (MAPP) in 2002 saw a more holistic approach to the assessment of grazing pressure and added the measurement of sward heights, which could be compared to threshold heights for broad habitats, below which a sample area is deemed to be heavily grazed. Some sward height data had been collected in previous surveys, but not used in reporting. Other surveillance variables, including dwarf shrub heights, the presence of suppressed heather growth features, bare ground, animal droppings etc, are measured as part of these surveys. Surveillance surveys were often carried out on land where overgrazing measures had been implemented, but had subsequently entered an agri-environment agreement. The various types of grazing assessment survey undertaken on Ugborough and Harford Common are set out in Table 1.

Table 1: Past surveys of grazing pressure and impacts on Ugborough and Harford Common, with the type of survey and sampling strategy followed.

Years	Survey type	Main variables	Sampling Strategy	Sample numbers
1998, 1999	Overgrazing	GI, dwarf shrub variables	grid, in main heather areas	257
2002	Surveillance	GI, dwarf shrub variables, sward heights	grid	396
2004, 2007	Surveillance	GI, dwarf shrub variables, sward heights	random	200

2.3 Condition and grazing pressure in 2014

Heather was sparse in the fragmented heath (present in 6 sample points only and overall mean cover 3%), and where it occurred it was heavily grazed. The mean GI was very high (77.9%), with 82% of samples failing to meet the CSM GI target of less than 33% indicating grazing that is likely to be damaging (Figure 2, Table 2, Map 1), and 45% of sample points with a GI of 100%. This might be an underestimate since cattle and ponies graze the site as well as sheep, although the sample

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

size of heather shoots was small (Table 2). In fragmented heath, heavily grazed features were present at the majority of sample points (83%) in which heather was present, and at 64% of points overall (Figure 3d, Map 2). The mean sward height at 40% of sample points where graminoids could be measured (35% of samples overall) indicated that heavy grazing was likely in these areas (Map 2). This, together with the high frequency of heather heavily grazed features, suggests that the site is at risk of overgrazing[2]. Sheep droppings were also present at just under half the sample points in fragmented heath, but were much less frequent in western heath and none were recorded in blanket bog. Cattle / pony droppings were present at low frequencies in all three vegetation types and at 16% of points overall (Figure 3f). A small amount of heather beetle damage was present in blanket bog and fragmented heath (Figure 3d), although heather was present at very few sample points in these habitats. No recent burning was evident on the site (Figure 3e).

Both dry heath and mires habitats did not meet the condition assessment thresholds (targets to be passed at 90% of sample points) for browsing levels on dwarf shrubs and indicator species frequency and cover. In dry heath the measure of dwarf shrub cover was taken as indicator species cover, a reasonable assumption for Ugborough and Haford as no *Racomitrium lanuginosum* was recorded. Thresholds were similarly not met for either composition of dwarf shrub cover (*Ulex gallii* cover too high) and diversity of lower plants / lichens. The levels of browsing in 2014 are probably attributable to selective grazing by sheep in the fragmented heath, as dwarf shrubs are more likely to be browsed when they occur in mosaics with grassy patches. In addition, areas of western heath were almost entirely dominated by *U. gallii*, which is relatively unpalatable. Sheep, in particular, are likely to be physically deterred from grazing in areas of taller western heath with relatively high cover of *U. gallii* and more likely to be preferentially grazing areas of fragmented heath and grassland. The impoverished species composition is also likely to be the consequence of past high grazing intensity.

2.4 Change since previous surveys

Previous surveys in 2004, and 2007 used a similar sampling method to that in 2014 so can be directly compared. The mean GI increased significantly from 44.1% in 2004 to 77.9% in 2014 ($F_{2,68}$ = 7.17, P < 0.01), although the sample sizes in 2007 and 2014 were small (Table 2). The overall vegetation composition and structure also changed significantly, taking into account the main variables of cover, height and detached heather (Table 3). The cover of dwarf shrubs and *Vaccinium* increased significantly, although it remains low, and, although no change was detected in the cover of heather, the frequency of detached heather declined (Table 3). The increase in dwarf shrubs was probably attributable largely to *U. gallii*. Mean graminoid height was lower in 2014 than in the other surveys. The incidence of heavily grazed features and sheep droppings was lower in 2007 than in 2004 or 2014 (Table 4). Together, these results suggest some slight improvement in condition especially between 2004 and 2007, although the current lack of pioneer growth stage and reduced graminoid height is of concern. Grazing intensity on heather was also very high, especially on fragmented heath, and it increased considerably in 2014 suggesting a high grazing impact. This might be partly due to the fact that heather is distributed sparsely amongst the more palatable graminoid vegetation, and/ or to increases in stocking densities under HLS. This is likely to pose a risk to further improvement in, or even maintenance of the condition and extent of heather and probably priority habitats in general.

The previous surveys of the site between 1998 and 2002 used a different sampling regime from that in 2004, 2007 and 2014 (with samples located systematically on a grid) and those prior to 2002 excluded parts of the southern grassland area and recorded fewer variables, so formal analysis of change was not possible. However, some general comparisons could be made with the findings from subsequent surveys described above for some variables. The dwarf shrub results from 2002 were generally similar to those in 2004, although mean GI was higher (60.7%) and mean heather (9.8 cm) and graminoid heights (8 cm) were slightly lower suggesting reduced grazing impact in

[2] Note that avoiding overgrazing is no longer a cross compliance requirement.

2004. Mean GI was higher still in earlier years (66% in 1999 and 75% in 1998). The GI results are probably more comparable than for other variables as they are by definition from heather areas so the exclusion of parts of the grassy southern part probably has little effect. Taken together, these earlier data confirm the suggestion of an initial reduction in grazing impact and improvement in condition up to 2007 followed by an increase in grazing impact in 2014. The mean GI in 2014 is slightly higher than that in the first (1998) survey at the time of the overgrazing investigation and the graminoid sward height in 2014 is lower than that in 2002 when it was first measured.

Overall, changes to grazing management under consecutive agri-environment scheme agreements appears to have had only limited positive effects on the condition of the vegetation, although there was some initial recovery and dwarf shrub cover has increased overall. Burning is not an issue on the site. However, even under optimum grazing intensity, full recovery of the vegetation is only likely in the long term, due to the degraded condition of the heath and bog in part reflecting historically high stocking levels.

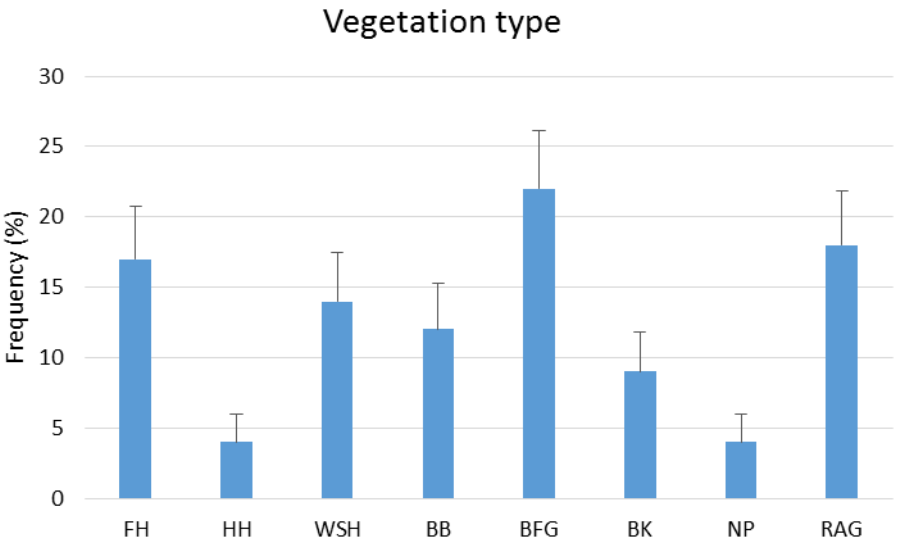

Figure 1. Frequency of vegetation types across the site in 2014. Bars are standard deviations. FH – fragmented heath; HH – heather heath; WSH – western heath; BB – blanket bog; BFG – bent-fescue grassland; BK – bracken; NP – non-productive; RAG – rough acid grassland.

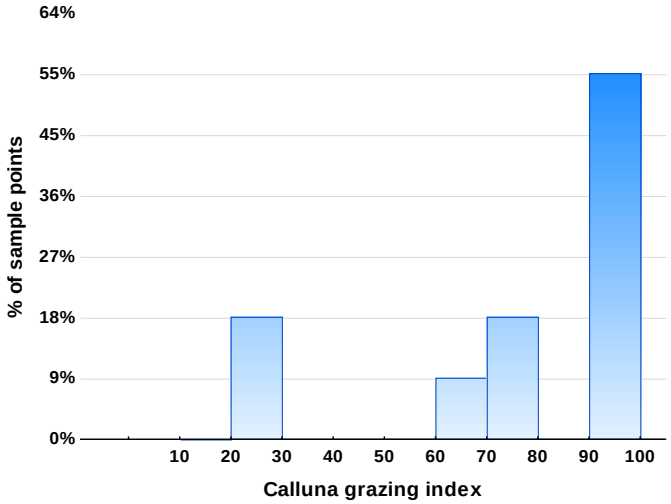

Figure 2. Frequency distribution of heather Grazing Index from sample points containing heather at whole site level in 2014.

Table 2. Heather Grazing Index in current (2014) and previous (2004, 2007) surveys (mean ± standard deviation; *n* is number of sample points with heather stems).

	2004	2007	2014	
	Overall (*n* = 45)	Overall (*n* = 15)	Overall* (*n* = 11)	Fragmented Heath (*n* = 6)
Grazing Index	44.1 ±25.34	56.4 ±29.62	77.9 ±29.24	91.1 ±13.88
Samples ≥ 33.3%	68.9%	80.0%	81.8%	100.0%
Samples ≥ 66.6%	15.6%	40.0%	81.8%	100.0%

* western heath *n* = 1; blanket bog *n* = 2; non-target habitats *n* = 2

Table 3. Cover, height and detached stems in current (2014) and previous (2004, 2007) surveys (mean ± standard deviation; *n* is total number of sample points (covers, detached heather), number of sample points containing heather or graminoids (heights)).

	2004			2007			2014			$F_{2,86}$	*P*
	n	mean	st.dev.	*n*	mean	st.dev.	*n*	mean	st.dev		
Dwarf shrub cover	200	3.5	±10.15	187	4.9	±15.67	94	11.4	±22.51	5.0	<0.01
Bilberry cover	200	0.6	±1.75	187	2.4	±9.26	94	5.3	±11.61	9.6	<0.001
Heather cover	200	1.4	±6.16	187	0.9	±4.91	94	0.8	±2.67	0.7	n.s.
Bare ground	200	0.3	±2.17	187	0.2	±1.08	94	1.2	±5.50	0.5	n.s.
Heather height	47	11.6	±6.21	32	15.8	±8.20	11	13.7	±7.42	3.1	<0.05
Graminoid height	198	9.0	±4.04	180	9.8	±6.01	88	7.0	±6.09	6.3	<0.01
Detached heather	200	0.5	±2.13	187	0.1	±0.82	94	0.0	±0.10	3.8	<0.05
										$F_{14,160}$	*P*
								Overall		4.62	<0.001

Table 4. Livestock droppings, burning and heavily grazed features in current (2014) and previous (2004, 2007) surveys (presence, standard deviation and chi-square results; *n* is total number of sample points (droppings), number of sample points containing heather (heavily grazed features, burning)).

	2004			2007			2014			*Chi-square*	*P*
	n	presence	st.dev.	*n*	presence	st.dev.	*n*	presence	st.dev		
Livestock droppings	200	40	5.66	197	20	4.24	94	22	4.12	10.3	<0.01
Heavily grazed features	47	35	2.99	28	11	2.58	11	7	1.60	9.2	<0.05
Burning	47	0	0.00	32	0	0.00	11	0	0.00	-	-

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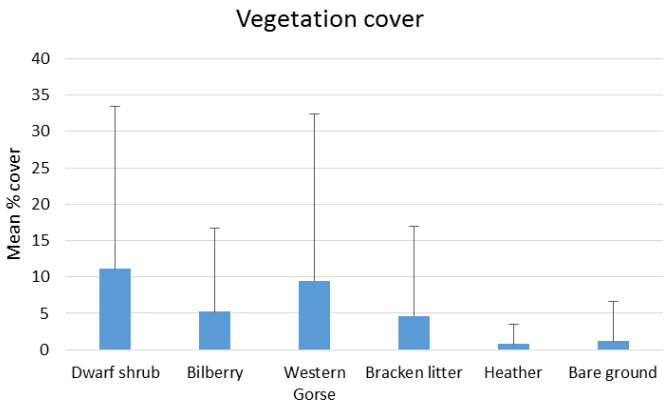

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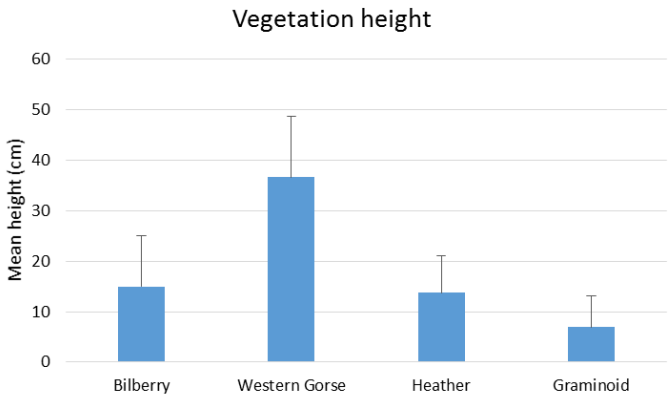

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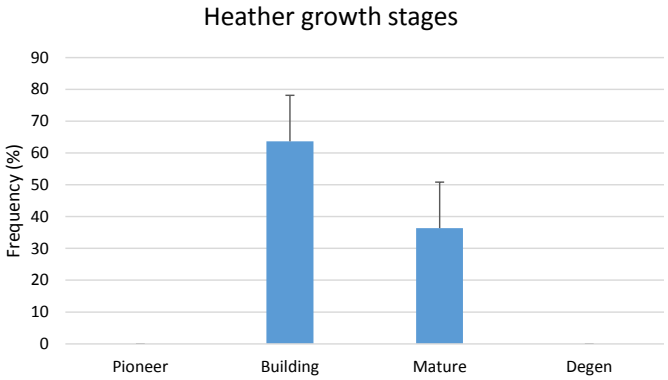

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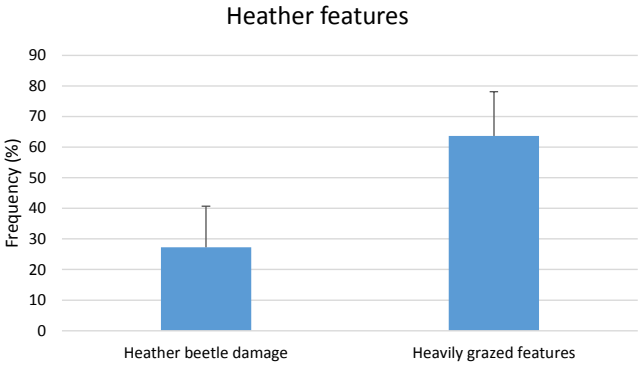

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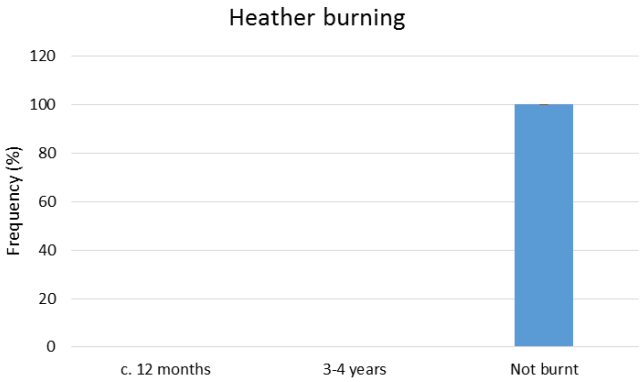

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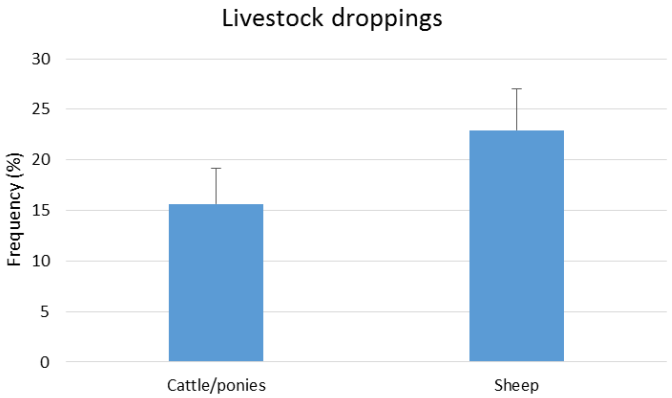

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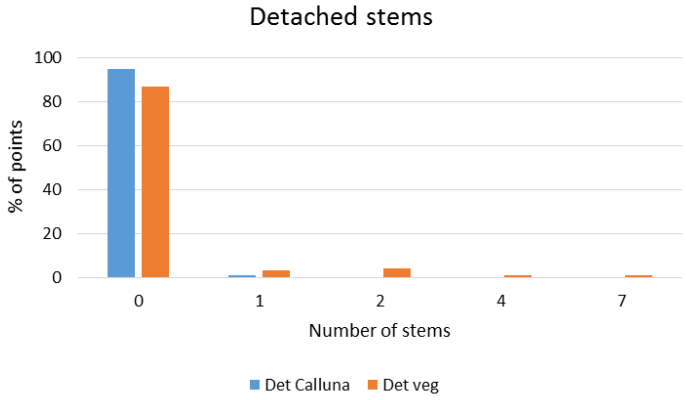

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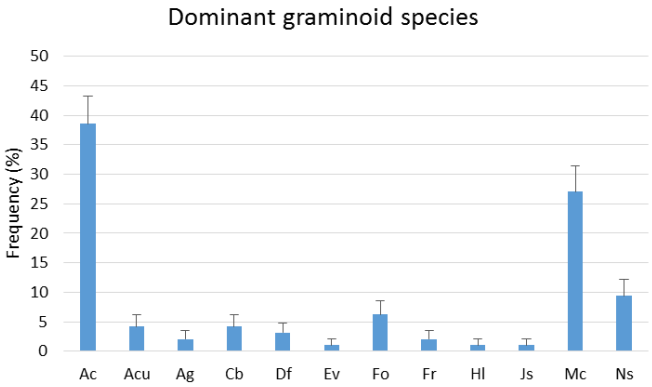


Figure 3. Surveillance variables at whole site level in 2014 (bars are standard deviations).

3. Overgrazing surveillance variables 2014

		Fragmented Heath (*n* = 17)			Western Heath (*n* = 14)			Blanket Bog (*n* = 12)		
Category	**Variable**	**Mean**	**SD**	***n***	**Mean**	**SD**	***n***	**Mean**	**SD**	***n***
Peat	Peat depth (cm)	13	5.1	17	15	4.5	14	55	16.2	12
Vegetation cover	Dwarf shrub cover (%)	12	14.0	17	53	26.0	14	5	6.7	12
	Bilberry cover (%)	13	15.7	17	1	1.5	14	6	8.2	12
	Western Gorse cover (%)	6	12.8	17	58	24.9	14	0	0.0	12
	Bracken litter cover (%)	0	0.2	17	0	1.3	14	0	0.0	12
	Calluna cover (%)	3	4.4	17	0	0.3	14	2	3.9	12
	Bare ground (%)	0	1.7	17	0	0.3	14	0	0.0	12
Vegetation height	Bilberry height (cm)	9	5.5	12	13	10.2	6	27	8.7	8
	Western Gorse height (cm)	27	14.5	5	40	9.3	14	0	0.0	0
	Calluna height (cm)	11	2.8	6	30	0.0	1	20	7.1	2
	Graminoid height (cm)	6	2.3	17	10	5.4	11	19	11.2	8
Heather growth stages	Pioneer (% of points)	0	0.0	6	0	0.0	1	0	0.0	2
	Building (% of points)	67	19.2	6	0	0.0	1	100	0.0	2
	Mature (% of points)	33	19.2	6	100	0.0	1	0	0.0	2
	Degenerate (% of points)	0	0.0	6	0	0.0	1	0	0.0	2
Heather features	Heather beetle damage (% of points)	17	15.2	6	0	0.0	1	100	0.0	2
	Heavily grazed features (% of points)	83	15.2	6	0	0.0	1	0	0.0	2
Heather burning	Burnt (*c.* 12 months) (% of points)	0	0.0	6	0	0.0	1	0	0.0	2
	Burnt (3-4 years) (% of points)	0	0.0	6	0	0.0	1	0	0.0	2
Droppings	Cattle / ponies (% of points)	6	5.7	17	14	9.4	14	8	8.0	12
	Sheep (% of points)	41	11.9	17	14	9.4	14	0	0.0	12
Detached stems	Detached Calluna (no.)	0	0.0	17	0	0.0	14	0	0.0	12
	Detached vegetation (no.)	0.2	0.5	17	0.1	0.5	14	0	0.0	12

4. Habitat condition assessment results 2014

4.1 Dry heath

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

Dry heath (*n*=14 western heath + 4 heather heath + 17 fragmented heath)		
Target	**% of points passed**	**Habitat pass or fail**
Presence of moss, liverworts and non-crustose lichens[1]	82[2]	Fail
At least 50% of vegetation cover made up of Table 1 indicator species[3]	34	Fail
At least 25% of dwarf shrub cover should be made up of Group (i) indicator species	48	Fail
Less than 50% of dwarf shrub cover made up of Group (ii) indicator species	51	Fail
At least two indicator species from Group (i)	49	Fail
Cover of weeds < 1%	100	Pass
Cover of soft rush < 10%	100	Pass
Dwarf shrub browsing < 33%	51	Fail
Disturbed bare ground < 10%	100	Pass

[1] assessed in 1 x 1 m quadrat
[2] n=34 (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* = 35):

Species	**Frequency (%)**	**SD**
Calluna vulgaris	46	8.4
Erica tetralix	9	4.7
Erica cinerea	3	2.8
Vaccinium myrtillus	77	7.1
Vaccinium oxycoccus	3	2.8
Vaccinium vitis-idaea	0	0.0
Empetrum nigrum	0	0.0
Racomitrium lanuginosum	3	2.8
Ulex gallii	60	8.3
Myrica gale	0	0.0

4.2 Mires

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

Mires (*n*=12)		
Target	**% of points passed**	**Habitat pass or fail**
At least 6 indicator species present	33	Fail
At least 50% of vegetation cover made up of at least 3 indicator species	0	Fail
Sphagnum cover should not consist of only *Sphagnum fallax*	100 [1]	Pass
Any one of *Eriophorum vaginatum*, Ericaceous spp. collectively or *Trichophorum* should not individually exceed 75% of veg cover	100	Pass
Less than 1% of vegetation cover to comprise of negative indicators	100	Pass
Dwarf shrub browsing < 33%	58	Fail
Disturbed bare ground/ drainage < 10%	100	Pass
Broken/ crushed *Sphagnum* < 10%	92	Pass

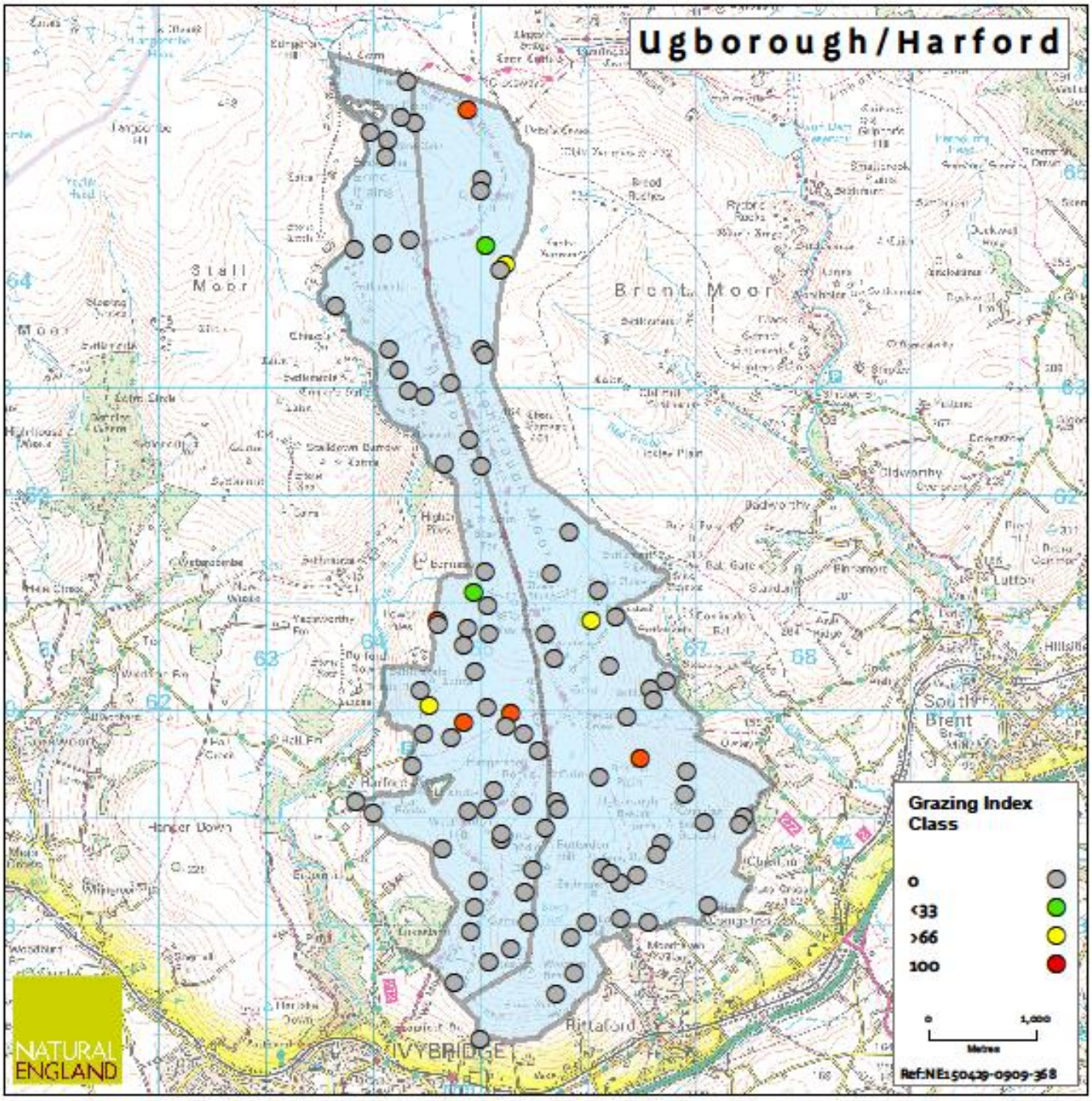
[1] n= 5 (5 points with *Sphagnum* present)

Targets assessed at feature extent:

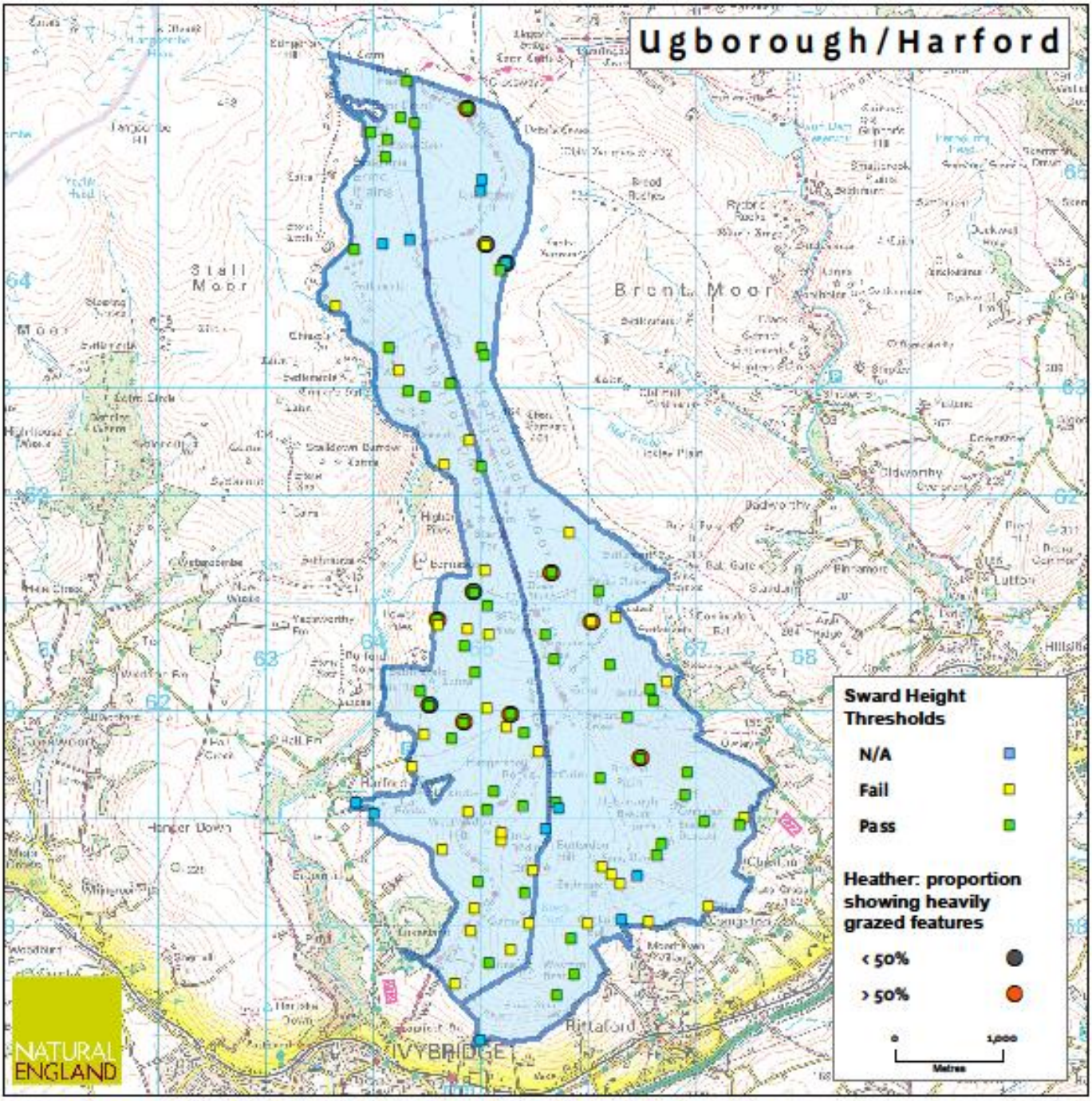
Target	**Pass or fail**
Cover of non-native species < 1%	Pass
Cover of native trees/ shrubs < 10%	Pass
Cover of negative indicators < 1%	Pass
Burning of bryophyte layer absent	Pass
Burning of sensitive areas absent	Pass
Extent of eroding peat	Pass
Disturbed bare ground < 10%	Pass

Indicator species frequencies (*n* = 12):

Species	**Frequency (%)**	**SD**		**Species**	**Frequency (%)**	**SD**
Calluna vulgaris	50	14.4		*E. vaginatum*	92	8.0
Erica tetralix	42	14.2		*Trichophorum cespitosum*	25	12.5
Erica cinerea	0	0.0		*Rhynchospora alba*	0	0.0
Vaccinium myrtillus	83	10.8		*Narthecium ossifragum*	0	0.0
Vaccinium oxycoccus	0	0.0		*Drosera* spp.	0	0.0
Vaccinium vitis-idaea	0	0.0		*Menyanthes trifoliata*	0	0.0
Rubus chamaemorus	0	0.0		*Sphagnum* spp.	42	14.2
Empetrum nigrum	0	0.0		*Racomitrium lanuginosum*	8	8.0
Myrica gale	0	0.0		Pleurocarpous mosses	92	8.0
Andromeda polifolia	0	0.0		Non-crustose lichens	8	8.0
Eriophorum angustifolium	50	14.4				



Map 1: Distribution of random sampling points on Ugborough and Harford Common 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 Ugborough and Harford 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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