Birkbeck Commons

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 Birkbeck Commons site was re-surveyed during 18 – 27 February 2015. 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

Birkbeck Commons is located in the Lake District and is 714 ha in area. It is part of the Shap Fells SSSI and Lake District High Fells SAC. A significant proportion of the site comprises rough acid grassland (29% of sample points in 2015), along with blanket bog (21%), flushes, fens & swamps (16%) and fragmented heath (15%) (Figure 1). The site is generally wet, with a few areas dominated by *Myrica gale*. Wet heath is also present but is somewhat degraded. In addition to domestic livestock (including 15 – 20 ponies present during the survey) it is grazed by red deer.

Heather was only present at 33% of sample points, with overall mean cover of 14% (Figure 3a). In wet heath and heather heath vegetation types its mean cover was 47%, but only 9% in fragmented heath. Heather was in the building growth stage at just over two thirds of the sample point where it was present, and the mature stage at the remainder; no pioneer or degenerate heather was recorded (Figure 3c). Recent burning was only recorded at one sample point (Figure 3e). The most commonly dominant graminoid across the site was *Nardus stricta* (49% of sample points; Figure 3h).

2.2 Site management

The first formal complaint of overgrazing on the site was made in 1995, and in 1998 an agreement was reached with commoners not to exceed existing grazing rights. These were 3.2 sheep ha^{-1} (2286 sheep), 0.17 cattle ha^{-1} (121 cattle), 0.05 equines ha^{-1} (i.e. 39 ponies, horses, followers) and 4 breeding geese. In 2001, 12 of the 15 commoners entered agreements under the Lake District Environmentally Sensitive Area (ESA) scheme, which permitted grazing levels of 0.225 LU ha^{-1} (1.5 ewes per ha^{-1}) plus followers in summer and a 25% reduction in winter, although in 2002 it was noted that stocking was slightly higher than this.

The site was entered into a Higher Level Scheme (HLS) agreement in 2010. This included options HL10 (restoration of moorland), HL12 (management of heather, gorse and grass) and HL15 (seasonal livestock exclusion supplement). A stocking calendar was prescribed, which specified maximum and minimum numbers of sheep on a monthly basis (Table 1). Maximum permitted stocking density is equivalent to 1.3 sheep ha^{-1} (August and September) or 0.104 LU ha^{-1} based on revised rates for hill sheep breeds, and no sheep grazing is permitted from November to March inclusive[1]. The scenario is complicated by the unauthorised presence of fell ponies. The sheep stocking levels in the HLS agreement allow for 25 fell ponies from November to April and 7 from May to October, but these pony numbers have been exceeded from time to time. Burning is also restricted to a 110 ha area and a rotation of no less than 20 years, with an annual average of 5.5 ha per year. Further restrictions applied to burning include the avoidance of sensitive areas.

Table 1. Stocking calendar specified under the HLS agreement.

Month	**Swaledale Ewes**		**Hoggs**	
	Maximum	**Minimum**	**Maximum**	**Minimum**
Jan	0	0	0	0
Feb	0	0	0	0
Mar	0	0	0	0
Apr	0	0	230	173
May	250	187	230	173
June	430	322	230	173
July	495	371	230	173
Aug	700	525	230	173
Sept	700	525	230	173
Oct	505	378	0	0
Nov	0	0	0	0
Dec	0	0	0	0

A number of surveys of the site have taken place over the last 20 or so years. Early surveys focussed on grazing pressure on dwarf shrub, deriving a heather grazing index (GI) from shoots collected in the field. In ESA monitoring surveys the GI was converted to a measure of Biomass Utilisation (BU) using a mathematical function. Overgrazing was originally identified in 1994 in a 'stage 1' survey using a modified version of the then English Nature Grazing Index (ENGI) - a more subjective visual assessment than the GI method used in ESA monitoring. Subsequent overgrazing surveys followed the GI approach but eventually dropped the conversion to BU. The development of the Surveillance Survey 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 minimum grazed heights for broad habitats, below which a sample area is deemed to be heavily grazed. Other 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 has

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

subsequently entered an agri-environment agreement. The various types of grazing assessment survey undertaken on Birkbeck Common are set out in Table 2.

Table 2: Past surveys of grazing pressure and impacts on Birkbeck Commons, with the type of survey and sampling strategy followed.

Years	Survey type	Main variables	Sampling Strategy	Sample numbers
1993, 1996	ESA monitoring	GI, BU	Random clusters	150
1994	Overgrazing, ENGI	Dwarf shrub cover, proportion showing suppressed growth	Index units, structured walk	13 units each with 25 stops
1995, 1996, 1997, 1998, 1999, 2000	Overgrazing	GI, BU	grid	120
2002, 2003	Surveillance	GI, dwarf shrub variables, sward heights	grid	120
2004, 2005, 2006, 2009	Surveillance	GI, dwarf shrub variables, sward heights	random	120

2.3 Condition and grazing pressure in 2015

Levels of grazing on heather in 2015 were moderate, with the mean GI being 15% in blanket bog and 22% in the other target vegetation types. All samples in blanket bog met the CSM GI target of less than 33%, above which level grazing is likely to be damaging, although 16% had a GI in excess of this in the other target vegetation types (Figure 2, Table 3, Map1). There were other signs of localised grazing pressure, with heavily grazed features being recorded at 15% of the sample points where heather was present (Figure 3d, Map 2), mainly in the north east of the site, and detached vegetation at 11% of sample points across the site (Figure 3g). Sheep droppings were recorded at 21% of sample points Figure 3f). The mean graminoid sward height at 9% of sample points indicated that heavy grazing is likely at these points (Map 2), mainly in the north of the site and scattered around the southern slopes.

The dry heath, wet heath and mires habitats were all well below the condition assessment thresholds (targets to be passed at 90% of sample points) for criteria relating to numbers or cover of indicator species. Dry heath met the targets for number and overall cover at only 31% and 25% of points respectively. The measure of dwarf shrub cover in dry heath samples was taken as an approximation of indicator species cover, which is a reasonable assumption as no *Racomitrium lanuginosum* was recorded. Wet heath met targets for indicator species cover at 42% of points and only 17% did not suffer from over-dominance of graminoids or dwarf shrub. In the mire habitat 11% of points met the target for number of indicator species and 46% for cover.

Dry heath also failed the criterion for heather growth phases, but the thresholds for dwarf shrub composition, in terms of the proportion of dwarf shrub cover made up of group (i) and group (ii) indicators, are however met. The failure to meet condition assessment thresholds are probably attributable to heavy grazing in the past, and possibly also to burning. Levels of browsing on dwarf shrubs were also below the condition assessment threshold in dry and wet heath, although not in the mires habitat. Burning was not an issue in wet heath and mires in 2015.

2.4 Change since previous surveys

Annual survey reports from 1995 to 1999 concluded that the condition of heather was deteriorating due to heavy grazing. By 2000, grazing intensity had increased further, with mean heather grazing index of 64%, compared to a mean of 38% during 1995-1999. By 2003, grazing pressure had been reduced (mean grazing index 46%) but the site was still assessed as being susceptible to damage from heavy grazing.

Subsequent surveys in 2004, 2005, 2006 and 2009 used a similar sampling method to that in the current (2015) survey. The grazing index varied significantly over time ($F_{4,194} = 5.79$, $P < 0.001$; Table 3), the overall trend being downwards from 2004 to 2009, before levelling off between 2009 and 2015. The index was significantly lower in the latter two years (*c*. 20%) than in the first year (48%) ($P < 0.01$; unequal N HSD tests). Taking covers, heights and detached stems collectively, there was a significant difference between the five surveys ($P < 0.001$; Table 4). Heather cover and height were all greatest in 2015, having shown a general trend upwards since 2005. Graminoid height showed an increasing trend from 2006 and was also greatest in 2015. Detached vegetation and heather stems were least numerous in 2015. The incidence of livestock droppings had also declined significantly and heavily grazed features on heather have reduced substantially over this period. Overall, this evidence is indicative of reduced levels of grazing since 2004, with a corresponding positive response in the vegetation structure from around 2005 or 2006 to the present.

The reduction in stocking levels under the ESA and subsequent HLS agreements, along with cessation of winter grazing under HLS, have been successful in reducing the grazing intensity on heather and other vegetation. Similarly, the controls on burning appear to have prevented further damage to the vegetation. The increases in heather cover and in vegetation heights reflect these management restrictions and indicate that some beneficial changes are occurring. However, grazing levels on dwarf shrubs are still higher than the optimum across much of the site, with evidence of localised heavy grazing, and restoration of the full species complement of the target habitats is likely to take much longer.

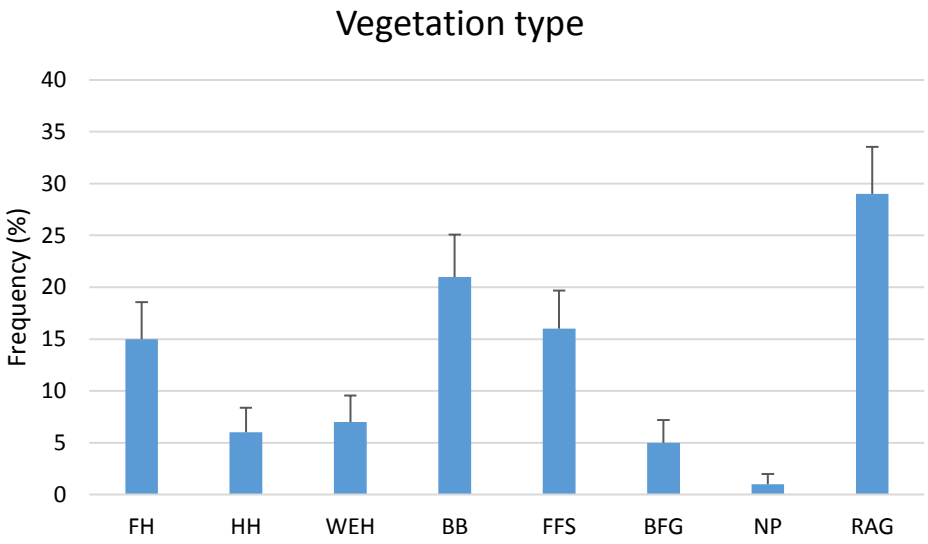

Figure 1. Frequency of vegetation types across the site in 2015. Bars are standard deviations. FH – fragmented heath; HH – heather heath; WEH – wet heath; BB – blanket bog; FFS – flushes, fens & swamps; BFG – bent-fescue grassland; NP – non-productive; RAG – rough acid grassland.

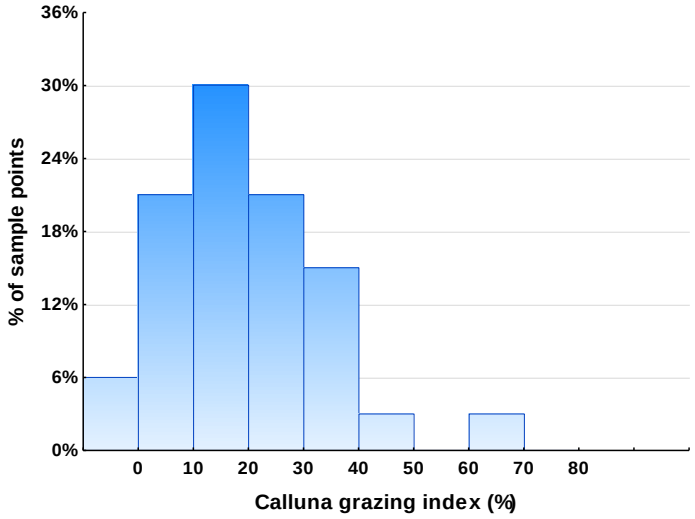

Figure 2. Frequency distribution of heather Grazing Index from sample points containing heather at whole site level in 2015.

Table 3. Heather Grazing Index in current (2015) and previous (2004-2009) surveys (mean ± standard deviation; *n* is number of sample points with heather stems).

	2004	2005	2006	2009	2015		
	Overall (*n* = 32)	Overall (*n* = 40)	Overall (*n* = 48)	Overall (*n* = 46)	Overall[1] (*n* = 33)	Blanket Bog (*n* = 12)	Other[2] (*n* = 19)
Grazing Index	48.1 ±34.68	39.4 ±27.02	28.6 ±35.53	20.3 ±27.19	19.4 ±13.94	14.8 ±8.59	22.1 ±16.33
Samples ≥ 33.3%	62.5%	52.5%	31.3%	19.6%	9.1%	0.0%	15.8%
Samples ≥ 66.6%	34.4%	20.0%	20.8%	13.0%	3.0%	0.0%	5.3%

[1] non-target habitats *n*=2

[2] wet heath *n*=5; heather heath *n*=4; flush, fen & swamp *n*=3; fragmented heath *n*=7

Table 4. Cover, height and detached stems in current (2015) and previous (2004-2009) surveys (mean ± standard deviation; *n* is total number of sample points (covers, detached heather, detached vegetation), number of sample points containing heather or graminoids (heights)). Insufficient data on bilberry height to include in the analysis; no data on detached vegetation in 2005.

	2004			2005			2006			2009			2015			$F_{4,159}$	*P*
	n	mean	st.dev.	*n*	mean	st.dev.	*n*	mean	st.dev.	*n*	mean	st.dev.	*n*	mean	st.dev		
Dwarf shrub cover	120	12.2	±24.75	119	12.0	±22.31	120	15.7	±25.48	120	16.0	±24.71	99	16.8	±27.15	1.8	n.s.
Bilberry cover	120	0.6	±0.62	119	0.6	±0.68	120	0.9	±0.54	120	0.1	±0.79	99	0.9	±0.39	0.4	n.s.
Heather cover	120	9.0	±22.87	119	6.0	±17.75	120	10.7	±23.58	120	10.7	±22.93	99	13.7	±26.69	5.8	<0.001
Bare ground	120	0.0	±0.05	119	0.0	±1.00	120	0.1	±0.92	120	0.0	±0.33	99	0.4	±2.62	0.9	n.s.
Heather height	24	17.3	±9.28	40	14.1	±8.77	48	15.0	±9.96	46	19.1	±11.27	31	24.9	±11.10	5.5	<0.001
Graminoid height	102	11.0	±5.35	112	12.3	±8.03	99	8.3	±4.29	109	11.9	±10.92	93	14.2	±5.87	8.4	<0.001
Detached heather	120	0.5	±1.24	119	0.5	±1.44	120	0.6	±2.28	120	0.3	±1.27	99	0.0	±0.22	2.7	<0.05
Detached vegetation	120	0.5	±1.84	-	-	-	120	2.3	±7.33	120	1.0	±5.25	99	0.2	±0.54	6.6	<0.001

	$F_{32,562}$	*P*
Overall	3.2	<0.001

Table 5. Livestock droppings and heavily grazed features in current (2015) and previous (2004-2009) 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)). No burning data available prior to 2015.

	2004			2005			2006			2009			2015			*Chi-square*	*P*
	n	pres.	st.dev.	*n*	pres.	st.dev.	*n*	pres.	st.dev.	*n*	pres.	st.dev	*n*	pres.	st.dev		
Livestock droppings	120	49	5.38	119	30	4.74	120	43	5.25	120	28	4.63	99	21	4.07	*16.2*	<0.05
Heavily grazed features	24	20	1.83	-	-	-	48	26	3.45	46	23	3.39	33	5	2.06	*27.0*	<0.001

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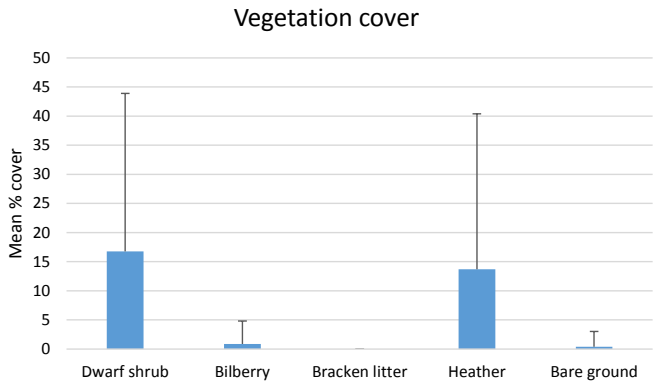

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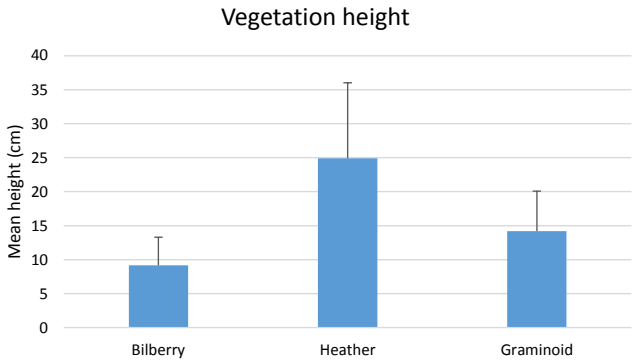

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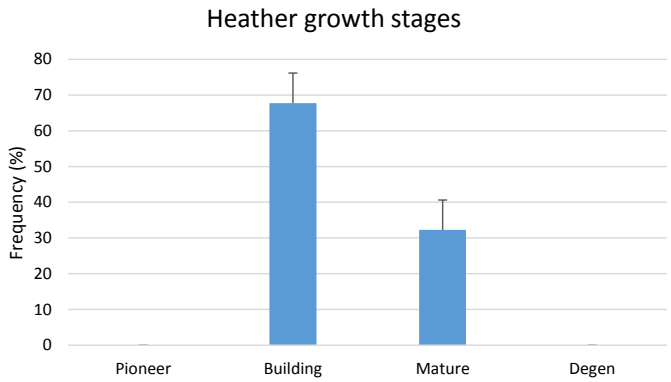

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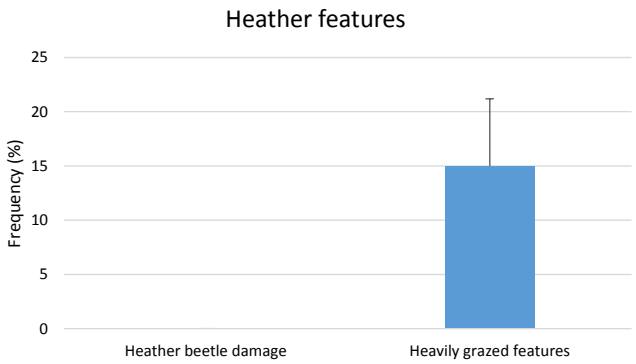

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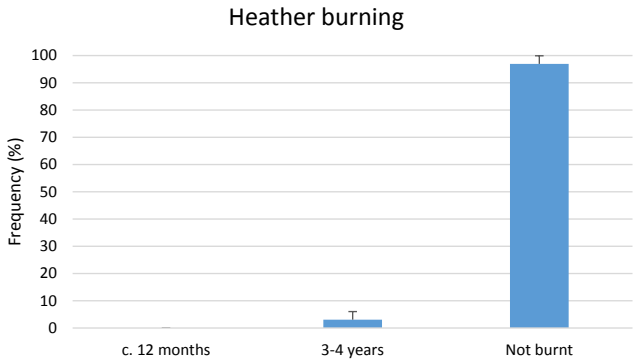

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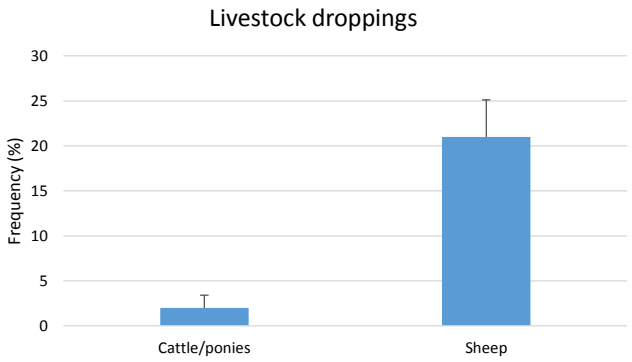

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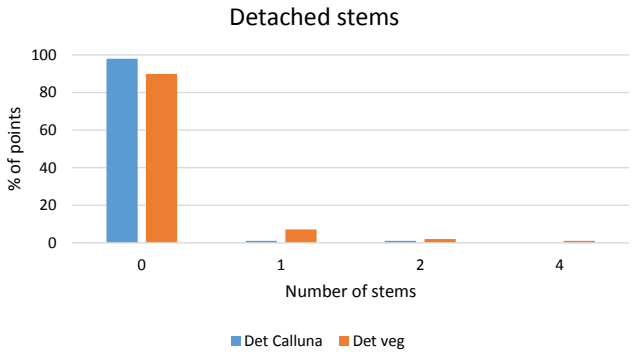

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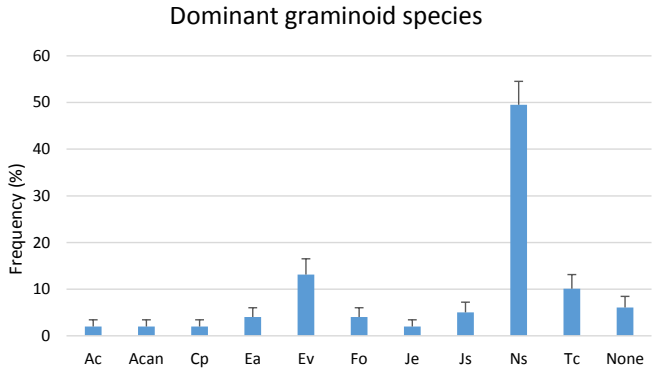


Figure 3. Surveillance variables at whole site level in 2015 (bars are standard deviations).

3. Overgrazing surveillance variables 2015

		Blanket Bog (*n* = 21)			Flushes, Fens & Swamps (*n* = 16)		
Category	**Variable**	**Mean**	**SD**	***n***	**Mean**	**SD**	***n***
Peat	Peat depth (cm)	71	27.5	21	44	26.9	16
Vegetation cover	Dwarf shrub cover (%)	31	34.2	21	1	3.4	16
	Bilberry cover (%)	0	0.0	21	0	0.0	16
	Bracken litter cover (%)	0	0.0	21	0	0.0	16
	Calluna cover (%)	28	36.2	21	1	1.7	16
	Bare ground (%)	1	5.5	21	0	0.0	16
Vegetation height	Bilberry height (cm)	-	-	0	-	-	0
	Calluna height (cm)	29	12.4	12	25	-	1[1]
	Graminoid height (cm)	17	5.2	20	13	6.3	14
Heather growth stages	Pioneer (% of points)	0	0.0	12	0	0.0	1[1]
	Building (% of points)	42	14.2	12	100	0.0	1[1]
	Mature (% of points)	58	14.2	12	0	0.0	1[1]
	Degenerate (% of points)	0	0.0	12	0	0.0	1[1]
Heather features	Heather beetle damage (% of points)	0	0.0	12	0	0.0	2
	Heavily grazed features (% of points)	0	0.0	12	0	0.0	2
Heather burning	Burnt (*c.* 12 months) (% of points)	0	0.0	12	0	0.0	2
	Burnt (3-4 years) (% of points)	8	8.0	12	0	0.0	2
Droppings	Cattle / ponies (% of points)	0	0.0	21	0	0.0	16
	Sheep (% of points)	10	6.4	21	0	0.0	16
Detached stems	Detached Calluna (no.)	0	0.0	21	0	0.0	16
	Detached vegetation (no.)	0	0.0	21	0	0.0	16

[1] 1 missing value

		Fragmented Heath (*n* = 15)			Other* (*n* = 13)		
Category	**Variable**	**Mean**	**SD**	***n***	**Mean**	**SD**	***n***
Peat	Peat depth (cm)	18	9.3	15	24	10.9	13
Vegetation cover	Dwarf shrub cover (%)	16	11.5	15	56	27.8	13
	Bilberry cover (%)	2	5.6	15	2	8.3	13
	Bracken litter cover (%)	0	0.0	15	0	0.0	13
	Calluna cover (%)	9	11.7	15	47	34.0	13
	Bare ground (%)	0	1.3	15	0	0.0	13
Vegetation height	Bilberry height (cm)	12	1.5	3	11	-	1
	Calluna height (cm)	17	8.8	7	26	9.7	10
	Graminoid height (cm)	15	5.7	15	16	5.2	10
Heather growth stages	Pioneer (% of points)	0	0.0	7	0	0.0	10
	Building (% of points)	100	0.0	7	80	12.6	10
	Mature (% of points)	0	0.0	7	20	12.6	10
	Degenerate (% of points)	0	0.0	7	0	0.0	10
Heather features	Heather beetle damage (% of points)	0	0.0	7	0	0.0	10
	Heavily grazed features (% of points)	29	17.1	7	20	12.6	10
Heather burning	Burnt (*c.* 12 months) (% of points)	0	0.0	7	0	0.0	10
	Burnt (3-4 years) (% of points)	0	0.0	7	0	0.0	10
Droppings	Cattle / ponies (% of points)	7	6.4	15	8	7.4	13
	Sheep (% of points)	20	10.3	15	8	7.4	13
Detached stems	Detached Calluna (no.)	0	0.3	15	0	0.0	13
	Detached vegetation (no.)	0	0.4	15	0	0.3	13

* Other target types = Wet Heath (*n*=7); Heather Heath (*n*=6)

4. Habitat condition assessment results 2015

4.1 Dry heath

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

Dry heath (*n*=6 heather heath + 10 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]	25	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)	31	Fail
Cover of weeds < 1%	100	Pass
Cover of soft rush < 10%	100	Pass
Dwarf shrub browsing < 33%	63	Fail
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	Fail

Indicator species frequencies (*n* = 16):

Species	**Frequency (%)**	**SD**
Calluna vulgaris	19	9.8
Erica tetralix	0	0.0
Erica cinerea	31	11.6
Vaccinium myrtillus	0	0.0
Vaccinium oxycoccus	0	0.0
Vaccinium vitis-idaea	6	6.1
Empetrum nigrum	0	0.0
Racomitrium lanuginosum	0	0.0
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*=7 wet heath + 5 fragmented heath)		
Target	% of points passed	Habitat pass or fail
Erica tetralix present	100	Pass
At least 50% indicator species cover and 20% ericoid species	42	Fail
Cover of negative indicators < 1%	100	Pass
Cover of soft rush < 10%	100	Pass
Cover of dwarf shrubs ≤ 75% and graminoids ≤ 75%	17	Fail
Dwarf shrub browsing < 33%	75	Fail
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* = 12):

Species	**Frequency (%)**	**SD**		**Species**	**Frequency (%)**	**SD**
Calluna vulgaris	75	12.5		*Carex* spp.	42	14.2
Erica tetralix	92	8.0		*Rhynchospora alba*	0	0.0
Erica cinerea	0	0.0		*Narthecium ossifragum*	0	0.0
Rubus chamaemorus	0	0.0		*Drosera* spp.	0	0.0
Empetrum nigrum	8	8.0		*Sphagnum* spp.	83	10.8
Myrica gale	8	8.0		*Racomitrium lanuginosum*	0	0.0
Andromeda polifolia	0	0.0		Pleurocarpous mosses	58	14.2
Eriophorum angustifolium	50	14.4		Non-crustose lichens	0	0.0
Trichophorum cespitosum	50	14.4				

4.3 Mires

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

Mires (*n*=21 blanket bog + 16 flushes, fens & swamps)		
Target	% of points passed	Habitat pass or fail
At least 6 indicator species present	11	Fail
At least 50% of vegetation cover made up of at least 3 indicator species	46	Fail
Sphagnum cover should not consist of only *Sphagnum fallax*	89[1]	Fail
Any one of *Eriophorum vaginatum*, Ericaceous spp. collectively, or *Trichophorum* should not individually exceed 75% of veg cover	92	Pass
Less than 1% of vegetation cover to comprise of negative indicators	100	Pass
Dwarf shrub browsing < 33%	96	Pass
Disturbed bare ground/ drainage < 10%	100	Pass
Broken/ crushed Sphagnum < 10%	100	Pass

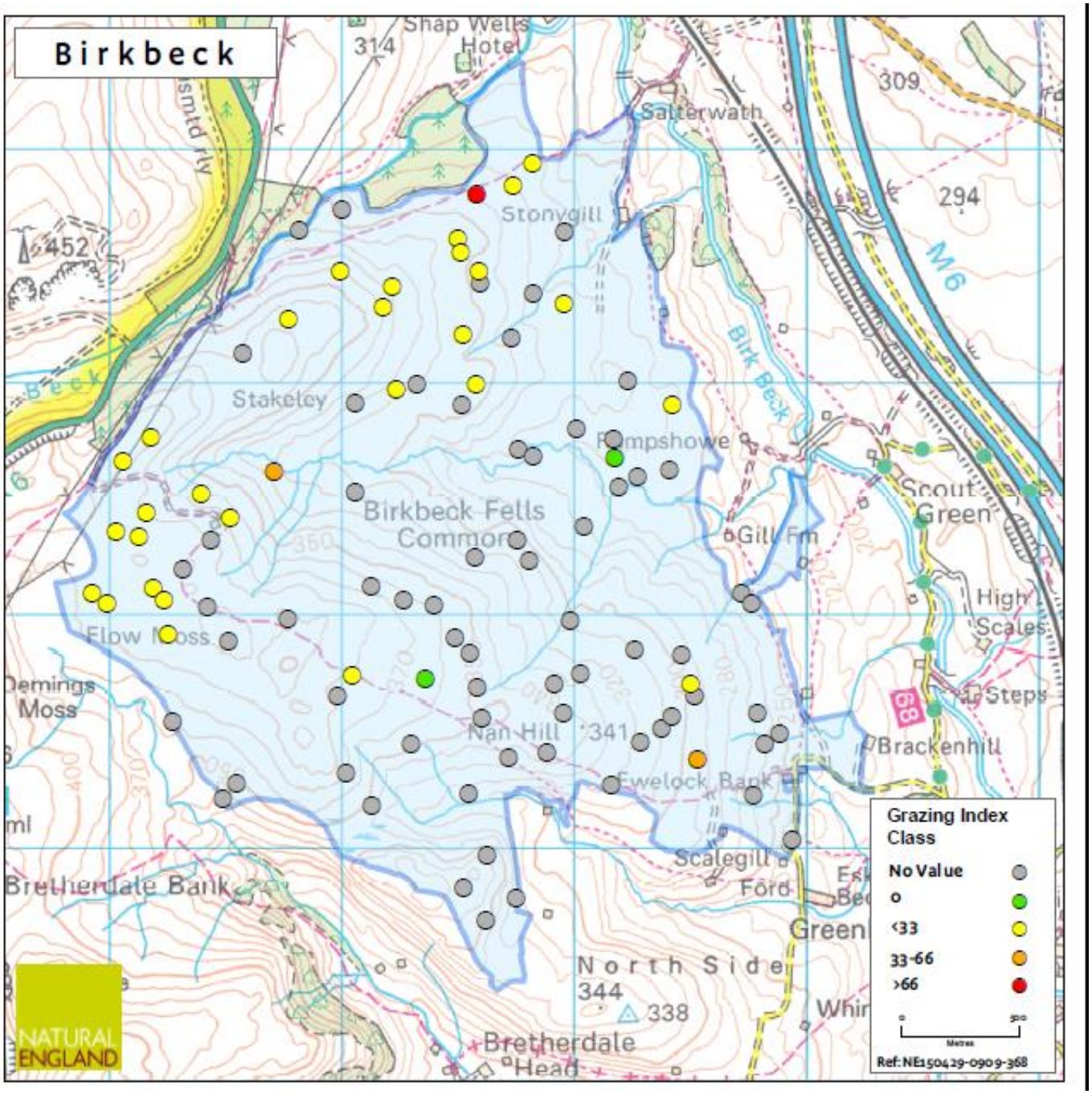
[1] *n*=36 (36 points with Sphagnum present)

Targets assessed at feature extent:

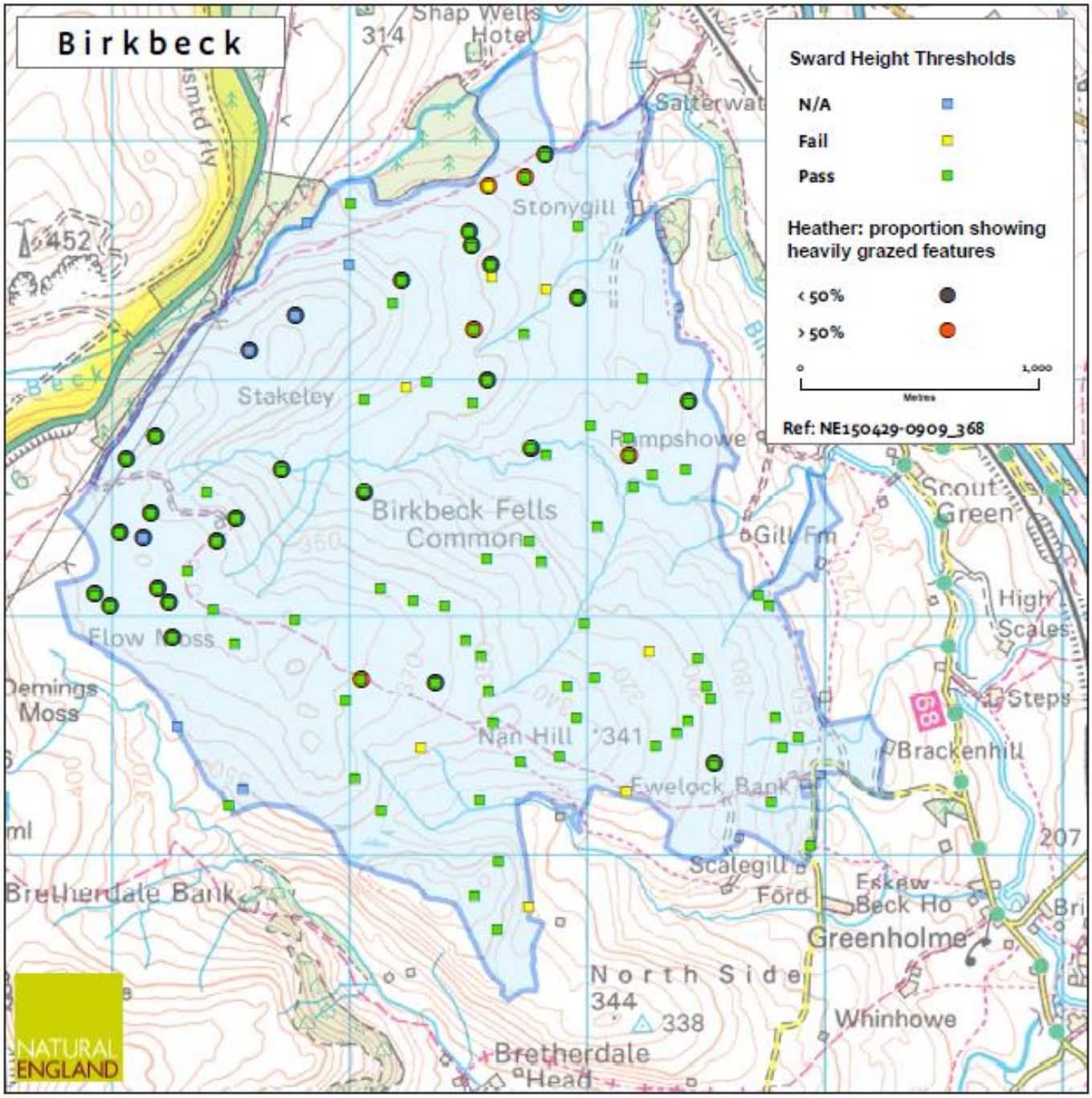
Target	**Pass or fail**
Cover of non-native species < 1%	Pass
Cover of native trees/ shrubs < 10%	Pass
Cover of negative indicators < 1%	Pass
Burning of bryophyte layer absent	Pass
Burning of sensitive areas absent	Pass
Extent of eroding peat	Pass
Disturbed bare ground < 10%	Pass

Indicator species frequencies (*n* = 37):

Species	**Frequency (%)**	**SD**		**Species**	**Frequency (%)**	**SD**
Calluna vulgaris	43	8.1		*E. vaginatum*	38	8.0
Erica tetralix	43	8.1		*Trichophorum cespitosum*	11	5.1
Erica cinerea	0	0.0		*Rhynchospora alba*	0	0.0
Vaccinium myrtillus	3	2.7		*Narthecium ossifragum*	0	0.0
Vaccinium oxycoccus	11	5.1		*Drosera* spp.	0	0.0
Vaccinium vitis-idaea	3	2.7		*Menyanthes trifoliata*	0	0.0
Rubus chamaemorus	0	0.0		*Sphagnum* spp.	92	4.5
Empetrum nigrum	11	5.1		*Racomitrium lanuginosum*	0	0.0
Myrica gale	3	2.7		Pleurocarpous mosses	54	8.2
Andromeda polifolia	0	0.0		Non-crustose lichens	5	3.7
Eriophorum angustifolium	30	7.5				



Map 1: Distribution of random sampling points on Birkbeck Commons in 2015, 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 Birkbeck Commons in 2015 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** .

Report number RP01639 Number 2

ISBN 978-1-78354-386-1