Manor and Trehudreth Common

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 Manor & Trehudreth Common site was surveyed during 27 to 28 March 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

Manor & Trehudreth is a common located on Bodmin Moor North SSSI and covers 360 ha^{-1}. It is composed primarily of fragmented heath (25% of sample points in 2014; Figure 1) and western heath (21%) on shallow peat, with areas of bent-fescue grassland (25%) and rough acid grassland (17%). Most of the heather is in the building growth stage (67% of sample locations where heather was present) and heavily grazed, with pioneer (23%) and mature (10%) stages also present. The most commonly dominant graminoids were *Molinia caerulea*, *Agrostis capillaris* and *A. curtisii*.

Vegetation showing similarities to M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire is scattered throughout low-lying areas of the site (7% of sample locations), primarily on peat over 1 m deep and with frequent bog pools, with the main concentration at Menacrin Marsh. This vegetation also has affinities to other mire communities, especially M6, M15 and M21. On Bodmin Moor such vegetation is normally regarded as a valley mire (fen) habitat. These mires appear to be in good condition with abundant *Sphagnum* and locally frequent ericoid shrubs.

2.2 Site management

The site was entered into a Countryside Stewardship Scheme (CSS) Bodmin Moor Special Project agreement in 2000. The precise stocking densities before 2000 are not known but grazing levels were high and stocking may have been up to 1.2 LU ha^{-1} at times. The stocking densities permitted under the initial agreement were 0.42 LU ha^{-1} from 16 April to 15 July, 0.23 LU ha^{-1} from 16 July to 30 September, and 0.17 LU ha^{-1} from 1 October until 15 April. However, these rates were frequently exceeded and as a result, in 2003 these were reduced to 0.17 LU ha^{-1} (excluding ponies) from 16 April to 31 August and no grazing from 1 September to 15 April. The autumn levels were adjusted in 2005 and 2006 to allow cattle grazing at 0.17 LU ha^{-1} to continue until the end of September. The site was entered into a Higher Level Stewardship (HLS) agreement in 2010, which resulted in a higher summer level and the reintroduction of winter grazing, with some further minor adjustments in 2014[1]. These are currently sheep at 0.05 LU ha^{-1} in summer and 0.03 LU ha^{-1} in winter, cattle at 0.2 LU ha^{-1} in summer and 0.1 LU ha^{-1} in winter, and ponies at 0.06 LU ha^{-1} year round.

Following entry to CSS, three surveys were carried out on Manor and Trehudreth Commons between 2003 and 2007. These followed the Surveillance survey methods which also formed the basis of the 2014 survey, although the 2003 survey used a grid rather than random sampling strategy. Surveillance surveys were often carried out on land where overgrazing had been a concern, but had subsequently entered an agri-environment agreement. The various grazing assessment surveys undertaken on Manor and Trehudreth Commons are set out in Table 2.

Table 1: Past surveys of grazing pressure and impacts on Manor and Trehudreth Commons, with the type of survey and sampling strategy followed (GI = heather Grazing Index).

Years	Survey type	Main variables	Sampling Strategy	Sample numbers
2003	Surveillance	GI, dwarf shrub variables, sward heights	grid	03
2005	Surveillance	GI, dwarf shrub variables, sward heights	random	95
2007	Surveillance	GI, dwarf shrub variables, sward heights	random	90

2.3 Current condition and grazing pressure

There was evidence of historic and continuing high levels of grazing in 2014, with heavily grazed features at 75% of sample points on fragmented heath and 80% on western heath (74% overall; Figure 3d, Map 2). Droppings of cattle / ponies were present at one fifth of sample points in fragmented heath and western heath (Figure 3f), as were detached vegetation or heather stems (Figure 3g). Sheep droppings were also recorded in fragmented heath. The mean GI was also high overall and especially in western heath and fragmented heath at 52% and 60.5% respectively, levels that are likely to be damaging. Overall, 78% of samples with heather present failed to meet the CSM GI target of less than 33%, above which level grazing is likely to be damaging (Figure 2, Table 2, Map 1), and 22% of samples had a GI of 100%. Moreover, these could be underestimates because the GI is based primarily on recent grazing by sheep, but cattle and ponies were both present on the site. The mean sward height at 41% of sample points, or 43% of points where graminoid height could be measured, indicated that heavy grazing was likely in these areas (Map 2). On this measure alone the site would be considered overgrazed applying past ECC criteria.

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

Heather beetle damage was recorded at one sample point in the mires (Figure 3d). There was no evidence of recent burning in any vegetation type though it is known to have occurred over a small area in the relatively recent past (D. Glaves, pers. comm.).

The dry heath habitat failed to achieve condition assessment thresholds (targets to be passed at 90% of sample points) for number of indicator species, including cover, if the measure of dwarf shrub cover is taken as indicator species cover, which for Manor and Trehudreth is a reasonable assumption as no *Racomitrium lanuginosum* was recorded. Thresholds were also not met for the contribution of group (ii) indicator species, due to a high proportionate cover of *Ulex gallii*, the level of browsing on dwarf shrubs and the range of heather growth stages. This is probably attributable to higher than optimum levels of grazing on dwarf shrubs that have been applied in the past which, although reduced subsequently under CSS, have increased again more recently in winter under HLS.

2.4 Change since previous surveys

In 2003, the vegetation was considered to be in poor condition with a suppressed sward and evidence of continuing high grazing pressure on the remaining heather, despite the site being under CSS agreement (with mean dwarf shrub cover <0.5%, mean heather height just 3.1 cm and a GI of 71.9%) . Subsequent surveys in 2005 and 2007 used a similar sampling method to that in 2014. The mean GI varied significantly between these three surveys ($F_{2,122} = 6.79$, $P < 0.01$; Table 2), and was significantly higher in 2014 (54.9%) than both 2005 (33.5%) and 2007 (29.1%) ($P <0.05$ and $P < 0.01$ respectively; unequal N HSD tests). In 2014 high GI values were scattered across the site with perhaps a slight tendency for the highest levels to occur in the central and southern sections (Map 1). There was also a significant difference between surveys in overall vegetation composition and structure, taking into account the cover, height and detached vegetation variables (Table 3). There was a significant reduction in mean graminoid height and an increase in detached vegetation in 2014, consistent with increased grazing pressure. However, both dwarf shrub and heather cover increased consistently between the three surveys and the frequency of detached heather declined slightly after 2005. The increase in dwarf shrub cover was attributable primarily to *U. gallii*, which had mean cover of 9.2% in 2014 but only 0.8% in 2007 and <0.5% in 2005. Livestock droppings were significantly more frequent in 2014 than previously, and heavily grazed features were less frequent in 2007 than the other surveys (Table 4). Together, these results suggest some overall improvement in the condition of dwarf shrub vegetation since 2005, despite higher levels of grazing impact in 2014. It seems likely that the increases in indicators of recent grazing pressure reflect the elevated stocking rates under HLS since 2010, whereas the increase in dwarf shrub and heather cover is likely to have been a response to the reduction in stocking levels prior to HLS.

Grazing management under agri-environment scheme agreements appears to have resulted in some improvement in the condition of the vegetation since 2003 and especially 2005, but the current grazing intensity is much higher than optimum (reflected in higher GI, reduction in graminoid sward height and the proportion below thresholds indicative of heavy grazing, and increase in detached vegetation in 2014) and vegetation condition is likely to deteriorate if this continues. Even under optimum grazing intensity, full recovery of the vegetation is only likely in the long term, due to the historically high levels. However, burning does not appear to be an issue on this site.

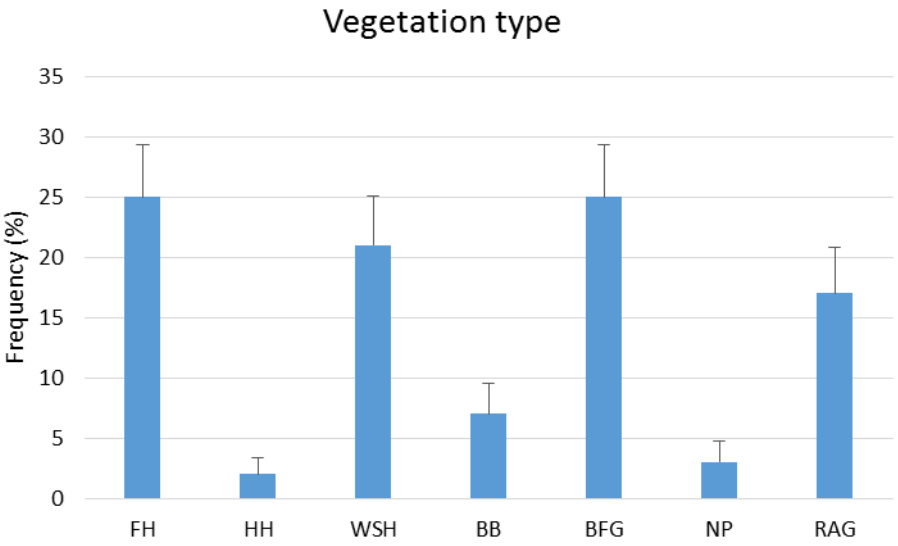

Figure 1. Frequency of vegetation types across the site in 2014. Bars are standard deviations. FH – fragmented heath; HH – heather heath; WSH – western heath; BB – blanket bog; BFG – bent-fescue grassland; NP – non-productive; RAG – rough acid grassland.

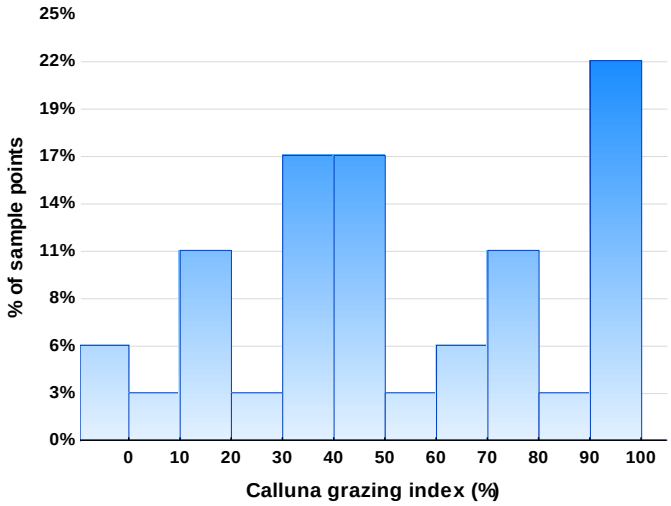

Figure 2. Frequency distribution of heather Grazing Index from sample points containing heather at whole site level in 2014.

Table 2. Heather Grazing Index in current (2014) and previous (2005, 2007) surveys (mean ± standard deviation; *n* is number of sample points with heather stems).

	2005	2007	2014		
	Overall (*n* = 48)	Overall (*n* = 41)	Overall (*n* = 36)	Fragmented Heath (*n* = 14)	Western Heath (*n* = 10)
Grazing Index	33.5 ±31.63	29.1 ±27.20	54.9 ±32.32	60.5 ±37.22	52.5 ±29.12
Samples ≥ 33.3%	37.5%	31.7%	77.8%	78.6%	80.0%
Samples ≥ 66.6%	18.8%	9.8%	38.9%	50.0%	30.0%

Table 3. Cover, height and detached stems in current (2014) and previous (2005, 2007) 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)).

	2005			2007			2014			$F_{2,124}$	*P*
	n	mean	st.dev.	*n*	mean	st.dev.	*n*	mean	st.dev		
Dwarf shrub cover	92	2.1	±3.39	90	3.2	±5.40	97	11.7	±20.75	12.4	<0.001
Bilberry cover	92	0.1	±0.33	90	0.1	±0.23	97	0.0	±0.14	0.8	n.s.
Heather cover	92	1.0	±1.79	90	2.0	±4.09	97	2.4	±6.07	5.9	<0.01
Bare ground	92	0.7	±3.79	90	0.1	±1.06	97	0.9	±3.89	2.0	n.s.
Heather height	48	9.2	±5.13	41	11.9	±4.92	39	9.9	± 10.39	6.2	<0.01
Graminoid height	92	9.1	±5.68	90	8.9	±4.41	96	5.7	±3.49	26.3	<0.001
Detached heather	92	0.2	±0.47	90	0.0	±0.00	97	0.1	±0.44	4.7	<0.05
Detached vegetation	92	0.0	±0.00	90	0.0	±0.00	97	0.2	±0.62	4.8	<0.05
										$F_{16,234}$	*P*
								Overall		9.1	<0.01

Table 4. Livestock droppings, burning and heavily grazed features in current (2014) and previous (2005, 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)).

	2005			2007			2014			*Chi-square*	*P*
	n	presence	st.dev.	*n*	presence	st.dev.	*n*	presence	st.dev		
Livestock droppings	94	3	1.70	89	5	2.17	97	18	3.83	15.5	<0.001
Heavily grazed features	48	27	3.44	41	17	3.15	39	29	2.73	8.8	<0.05
Burning	48	0	0.00	41	1	0.99	39	0	0.00	2.1	n.s.

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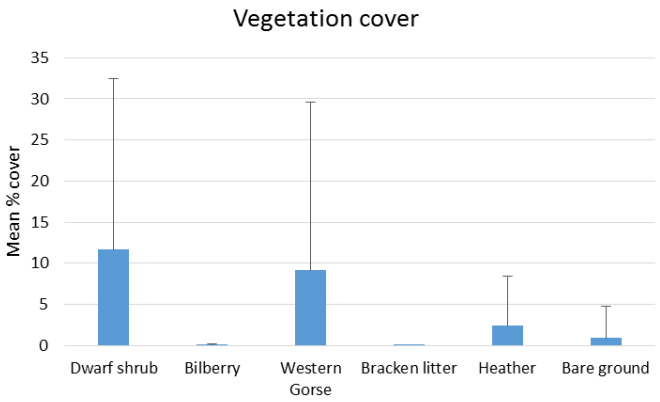

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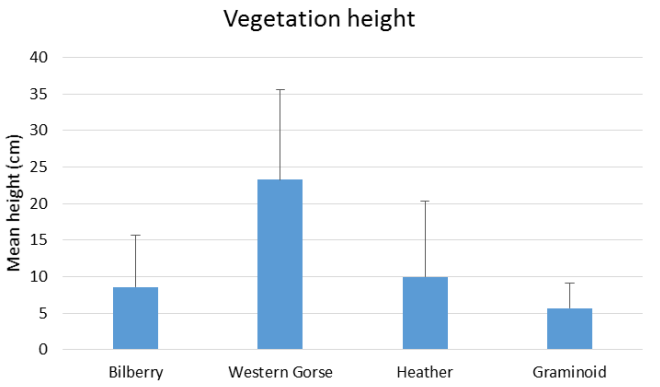

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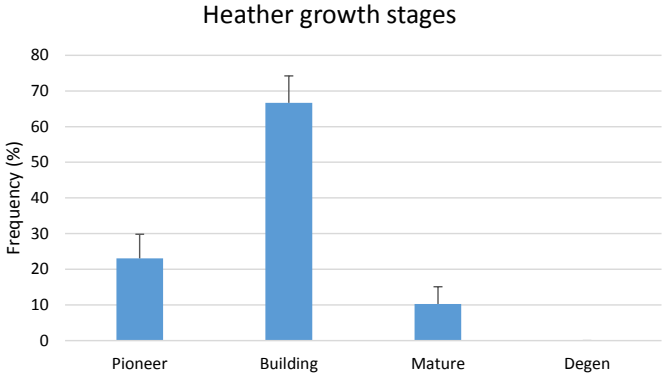

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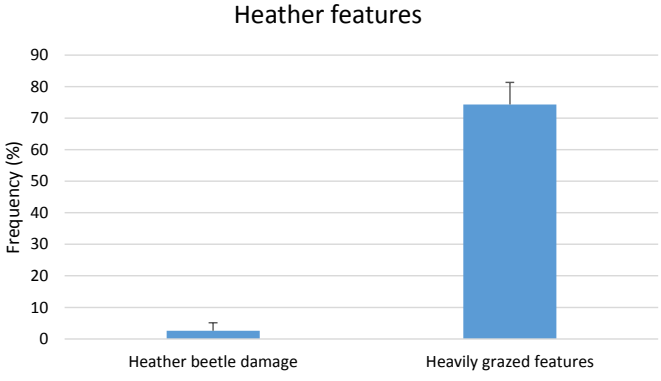

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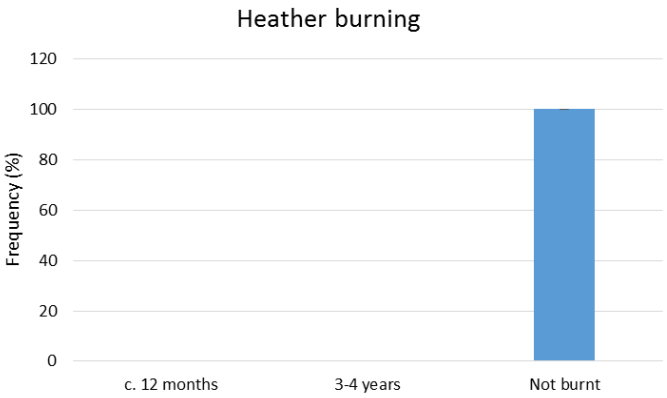

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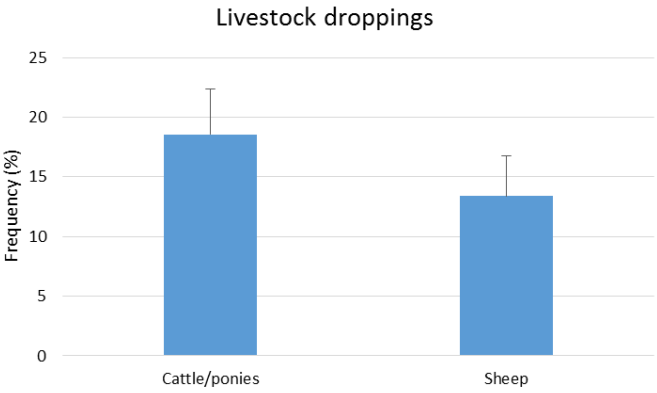

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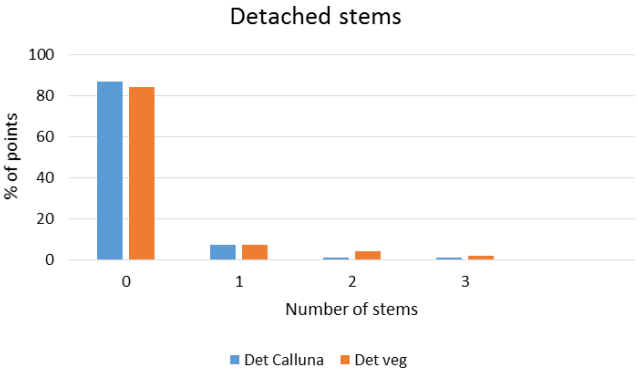

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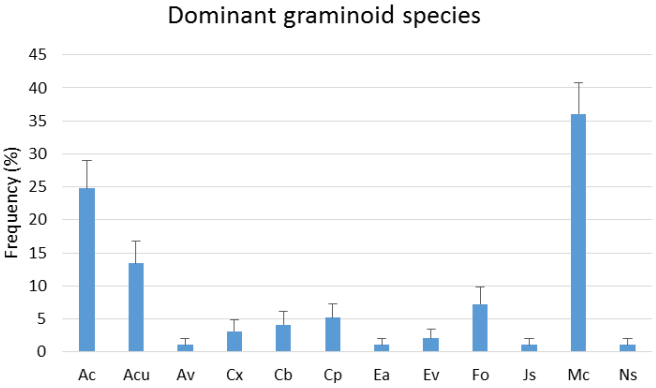


Figure 3. Surveillance variables at whole site level in 2014 (bars are standard deviations).

3. Overgrazing surveillance variables 2014

		Fragmented Heath (*n* =25)			Western Heath (*n* =21)		
Category	**Variable**	**Mean**	**SD**	***n***	**Mean**	**SD**	***n***
Peat	Peat depth (cm)	10	2.8	25	10	2.7	21
Vegetation cover	Dwarf shrub cover (%)	8	8.3	25	40	28.3	21
	Bilberry cover (%)	0	0.0	25	0	0.0	21
	Western Gorse cover (%)	4	6.5	25	37	29.7	21
	Bracken litter cover (%)	0	0.0	25	0	0.0	21
	Calluna cover (%)	3	7.2	25	3	4.6	21
	Bare ground (%)	1	5.0	25	0	0.0	21
Vegetation height	Bilberry height (cm)	5	0.0	1	12	12.0	2
	Western Gorse height (cm)	16	8.9	12	31	9.2	19
	Calluna height (cm)	6	1.8	16	13	8.3	10
	Graminoid height (cm)	6	2.7	25	8	3.3	21
Heather growth stages	Pioneer (% of points)	25	10.8	16	0	0.0	10
	Building (% of points)	69	11.6	16	90	9.5	10
	Mature (% of points)	6	6.1	16	10	9.5	10
	Degenerate (% of points)	0	0.0	16	0	0.0	10
Heather features	Heather beetle damage (% of points)	0	0.0	16	0	0.0	10
	Heavily grazed features (% of points)	75	10.8	16	80	12.6	10
Heather burning	Burnt (*c.* 12 months) (% of points)	0	0.0	16	0	0.0	10
	Burnt (3-4 years) (% of points)	0	0.0	16	0	0.0	10
Droppings	Cattle / ponies (% of points)	20	8.0	25	19	8.6	21
	Sheep (% of points)	16	7.3	25	0	0.0	21
Detached stems	Detached Calluna (no.)	0.1	0.3	25	0.1	0.3	21
	Detached vegetation (no.)	0.1	0.4	25	0.1	0.3	21

4. Habitat condition assessment results 2014

4.1 Dry heath

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

Dry heath (*n*=21 western heath + 2 heather heath + 25 fragmented heath)		
Target	% of points passed	Habitat pass or fail
Presence of moss, liverworts and non-crustose lichens[1]	98	Pass
At least 50% of vegetation cover made up of Table 1 indicator species[2]	17	Fail
At least 25% of dwarf shrub cover should be made up of Group (i) indicator species	43	fail
Less than 50% of dwarf shrub cover made up of Group (ii) indicator species	69	Fail
At least two indicator species from Group (i)	50	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[3]	Pass

[1] assessed in 1 x 1 m quadrat
[2] assessed as total dwarf shrub cover, excluding dead and pioneer heather and recent burns
[3] *n*=43 (5 points with no information)

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* = 48):

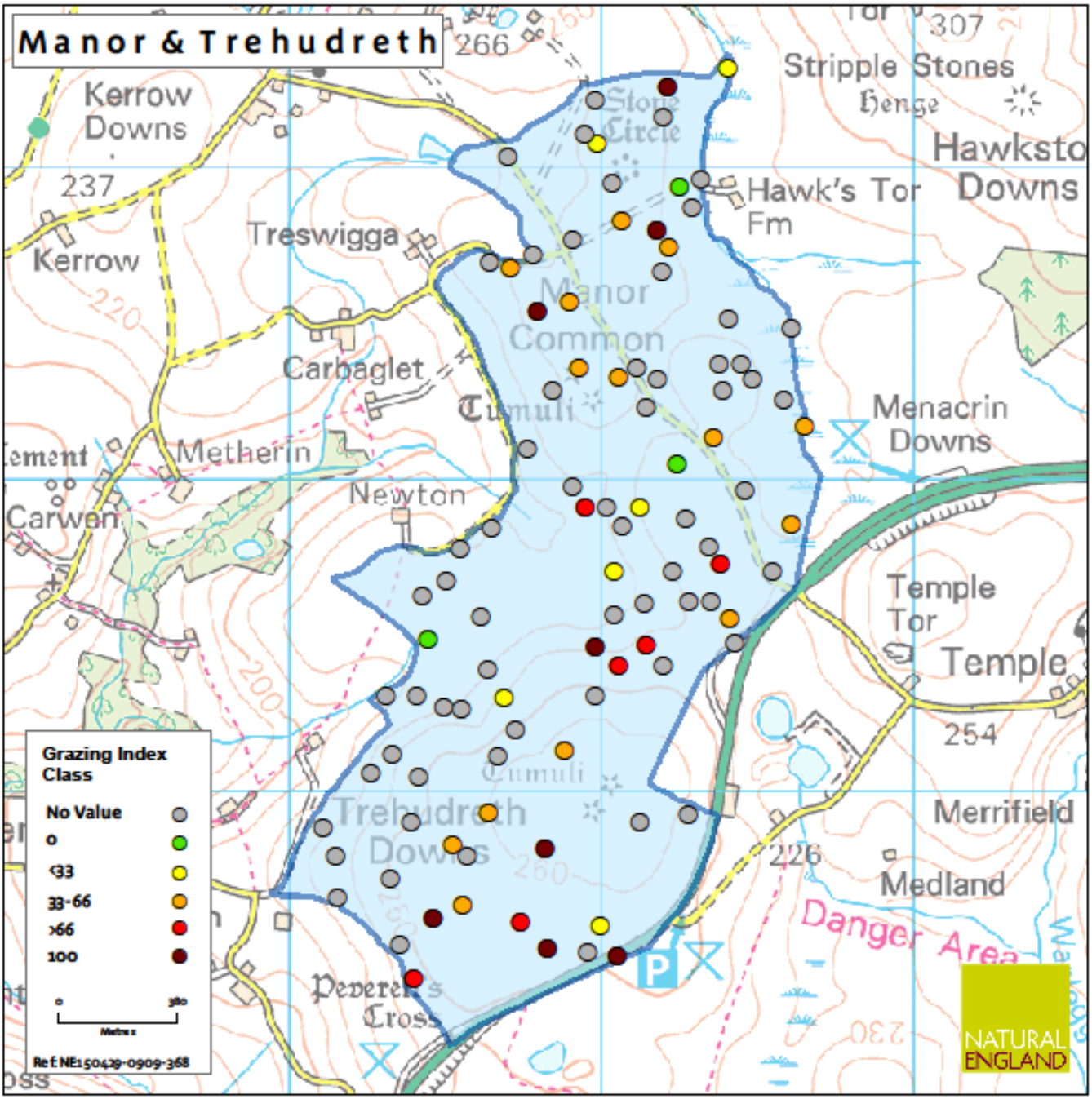
Species	**Frequency (%)**	**SD**
Calluna vulgaris	85	5.1
Erica tetralix	54	7.2
Erica cinerea	2	2.1
Vaccinium myrtillus	8	4.0
Vaccinium oxycoccus	0	0.0
Vaccinium vitis-idaea	0	0.0
Empetrum nigrum	0	0.0
Racomitrium lanuginosum	8	4.0
Ulex gallii	85	5.1
Myrica gale	0	0.0

4.2 Mires

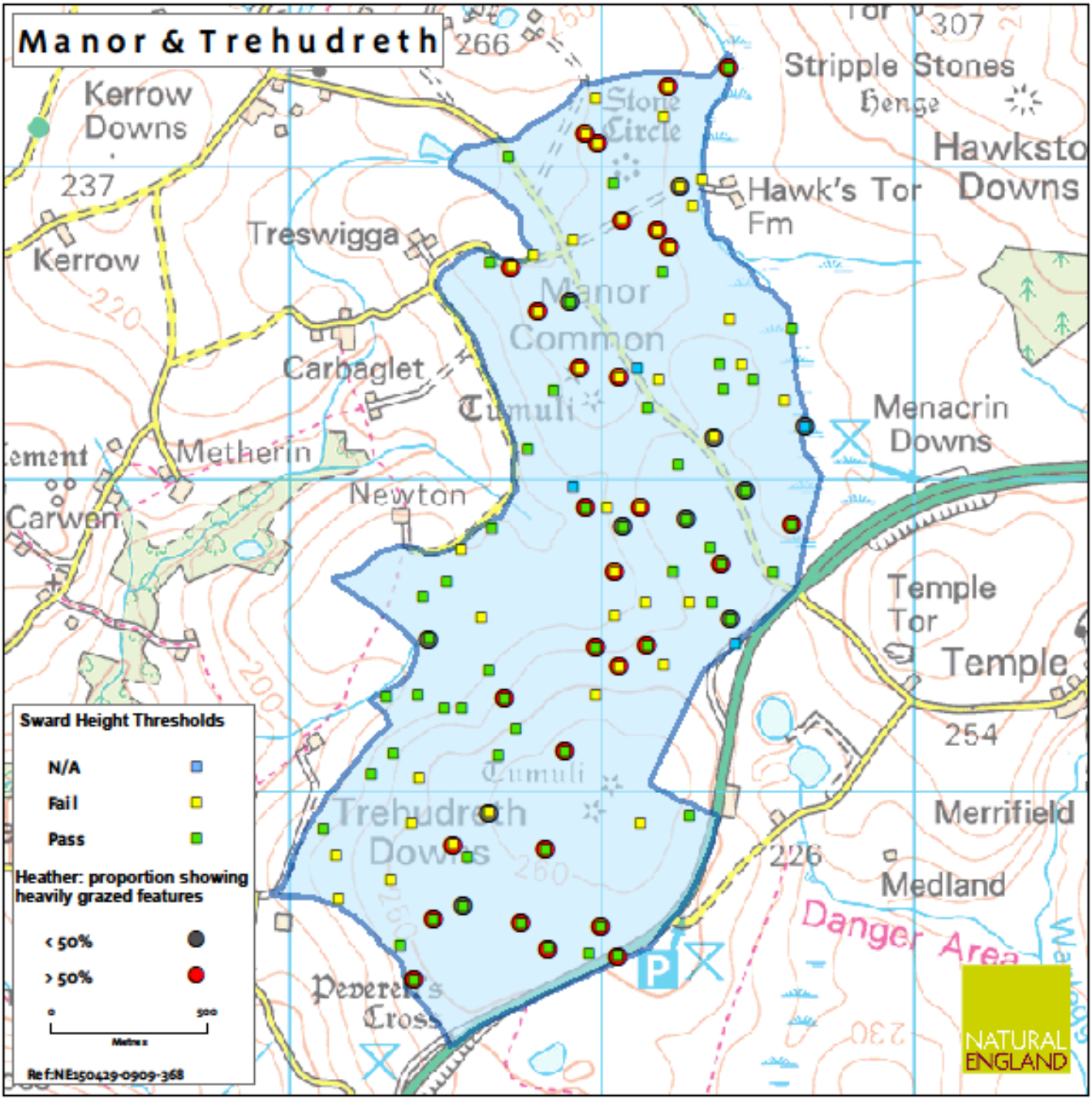
This habitat type was recorded in less than 10 sample points so condition cannot be accurately assessed at 2 x 2m quadrat level.

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 Manor and Trehudreth 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 Manor and Trehudreth Common 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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