Natural England Commissioned Report NECR089

Mapping the status of upland peat using aerial photographs

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Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

Information relating to the extent, condition and use of peatlands in England, Wales and Northern Ireland, was collated to inform the multi-agency Partnership Project to Protect and Enhance Peat Soils. This exposed a general paucity of information on the extent of gripping (moorland drainage), rotational burning, erosion, bare peat and other upland peatland condition and land use features in England, and revealed no consistent and comprehensive data sources across the country.

To address this problem, Natural England commissioned this project to deliver an assessment of the extent of gripping, rotational burning, erosion, bare peat and peat cutting affecting deep peatlands in upland England. The approach involved identifying areas of deep peat within the Moorland Line using soil, geological drift and habitat mapping, and using aerial photographs taken between 1999-2008, to create maps of visible peatland status and land use.

The reliability of the data was explored by conducting a field survey of points across the mapped area, checking the mapping assessment and likely reasons for inaccuracies. This process indicated that the aerial photograph assessment was 61% accurate, but that many of the inaccuracies were due to small-scale heterogeneity in the mapping units or increases in the extent of rotational burning, and only 14% were due to misinterpretation. Some 73% of the samples visited supported peat >40cm deep. However, the data suggest that, with the exception of peat cuttings, the extent of the main peatland features assessed was likely to have been underestimated by the mapping.

The maps produced by this project represent a more comprehensive and consistent approach to understanding the status of England's upland peatlands. They communicate the scale of the issues facing upland peatlands and contribute much to our national understanding of peatland management. This understanding enables improved estimations of greenhouse gas flux and carbon storage and delivery of other ecosystem services, as influenced by peatland status and management. The maps can also inform research and restoration priorities, provide a baseline to which future assessments of peatland status can be compared, and help to underpin policies to support improvements to our management of peatlands.

The approach applied will be of interest to other UK countries seeking to develop inventories of peatland status. This report, by showing the methods used to generate these map, will help researchers and policy makers understand how these data were collected and evaluate and learn from the approach taken.

Natural England Project Manager - Matthew Shepherd, Renslade House, Bonhay Road, Exeter, EX4 3AW
matthew.j.shepherd@naturalengland.org.uk

Contractor - Penny Anderson Associates Ltd, Park Lea, 60 Park Road, Buxton, Derbyshire SK17 6SN

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Further information
This report can be downloaded from the Natural England website: **www.naturalengland.org.uk**. For information on Natural England publications contact the Natural England Enquiry Service on 0845 600 3078 or e-mail **enquiries@naturalengland.org.uk**.

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The maps and images used in the report use the Peat dataset derived from BGS, NRSI and NE layers:

The aerial photographs are from:

SUMMARY

A GIS-based upland peat status data layer has been prepared showing the distribution across England of the five main peat categories defined within the report. The peat statuses are Burnt; Gripped; Hagged/gullied; Bare; and Peat cuttings. There are a number of additional categories where these statuses overlap. The status has been assigned from aerial photographic interpretation at a 1:5000 scale.

The results show that over 55% of the mapped upland peat falls into any of these categories. Over 31,000ha have at least two categories assigned. The most common category is Burning, which accounts for 24% of the upland peat area. Gripping accounts for 15% and Hagging/gullying almost 13%. Bare peat and Peat cutting are less than 2%.

Ground truthing was carried out on 70 sample sites and this revealed a number of discrepancies, the majority of which are attributable to the digitising scale used for mapping of the features.

The data presented gives an overview of the areas covered by the categories and this is a first step towards assessing potential restoration costs for the deep peat areas in the English Uplands.

1. INTRODUCTION

1.1 Penny Anderson Associates Ltd (PAA) was commissioned by Natural England (NE) in November 2008 to undertake a contract for mapping the status of upland peat using aerial photographs. The project has been managed by Natural England's Evidence team with Matthew Shepherd as the nominated officer.

1.2 The aim of the project is to prepare a GIS-based, upland peat status data layer from the existing overview layer, but containing additional status information gained from aerial photographic interpretation. The data layer would show the location and status of deeper peat soils across England. This would then be used to provide an insight into the extent of restoration and remedial work required and the likely costs and benefits of undertaking such work.

1.3 This report outlines the details of the work to be done as described in the tender and, where appropriate, gives reasons why the methods have altered from that originally envisaged.

2. BACKGROUND & METHODOLOGY

Data Capture

Peat Layer

2.1 The details of the work required were outlined in Annex A of the tender document but are reproduced here in a way which emphasises how and why certain decisions to depart from the tender brief were made.

2.2 Natural England provided an 'upland deep peat layer' GIS file. This was produced from a larger GIS peat layer data set. The full peat layer had been created from a variety of mapping sources including soils and geology maps, some at small scales. It shows the location of deep peaty soils, shallow peaty soils and organic or mineral soils with pockets of deeper peaty material. Onto this GIS map was laid the areas of blanket bog taken from the National Biodiversity Action Plan (BAP) theme. These data therefore provide an indicative layer for the area of peat and peat soils in England. Soils classed as "deep peaty soils" were selected for use in this project. These represent areas of Soil Association mapping where the dominant series have more than 40cm of peaty surface material, where British Geological Survey (BGS) drift mapping indicated peat deposits, and where the BAP habitat inventory mapping indicated blanket bog habitat.

2.3 The 'moorland line' classification was used to select upland areas from within this mapped area of deep peaty soils. The moorland line is mapped to represent areas of unimproved, moorland vegetation and was established to support the MAFF moorland scheme in the 1990s. It has recently been revised for use in determining moorland area payments for the Single Farm Payment scheme during 2004-2005, when landowners were given the opportunity to make representations to remove areas of non-moorland land from the moorland line. As such, it represents our best mapping of upland moorland in England, and should contain no areas of non-moorland vegetation larger than 5ha in size. This provides a map of deep peaty soils under moorland vegetation.

2.4 In addition, all areas under 1ha were deleted from the data set. The aim of this was to remove all areas which were smaller than the minimum mappable unit for this exercise and to reduce the total number of polygons to be assessed, while maintaining the greatest possible assessment area. This was the original data that PAA was provided with in the format of an ESRI shapefile. The data provided were then classified into 14 geographical areas, depending on the peat polygon groupings and administrative boundaries such as the National Parks (NP) and Areas of outstanding Natural Beauty (AONB) (Figure 1). These areas were then split between the ecologists undertaking the work. The regions are listed below (Table 1) with the upland peat areas given in hectares for each region.

Table 1. The Regions and Peat Areas within Them

Region	Ha	% of total peat area
North Pennines Massif	107,480	34
Yorkshire Dales and Nidderdale	49,707	16
Northumberland	31,084	10
Peak District National Park	30,262	9
South Pennines	29,851	9
Lake District National Park	24,757	8
Dartmoor National Park	18,694	6
Forest of Bowland AONB	15,879	5
North York Moors National Park	5,514	2
Exmoor National Park	4,279	1
Cornwall	1,896	1
Hereford and Worcester	1,139	<1
Shropshire Hills AONB	16	<1
Quantock Hills - Somerset	11	<1
Total	**320,570**	**100**

2.5 In addition to the peat layer, Natural England provided two further layers which indicate known areas of peat cutting from historical and archaeological evidence. These sites are recorded as points (1,081 features) and polygons (154 features) on the peat cutting layer. These data were collated from local authority historic environment recorders, the National Trust and English Heritage's monuments records.

2.6 Digital aerial photographs at high resolution (0.25m resolution), orthorectified, were provided by NE. Two sets of photographs were provided, as the most recent pictures do not cover all the required areas. These photographic sets were referred to as Epoch 1 (full coverage 1999-2004) and Epoch 2 (partial coverage 2003-2008). Epoch 2 was generally used where available, but only covers Exmoor, the Peak District and parts of the South Pennines, North York Moors NP and Northumberland. The exact coverage is shown on Figure 2. There were advantages in having both sets of photographs in areas where the quality was poor in one set or the other, where there was cloud cover or where shadows obscured certain features.

2.7 Data capture work for the peat status layer is based on the interpretation of the aerial photographs. The work was undertaken using direct, heads-up, on screen digitising techniques. The main upland deep peat layer was divided using the "cut" feature rather than digitising new polygons to avoid edge-matching difficulties in the new polygons produced.

2.8 The detailed data capture protocol, described in Annex A of the tender includes:

- The production of an ESRI Shapefile attributed vector polygon dataset for peat status;
- A reference data capture scale of 1:5,000. This represents the relatively broad-scale feature data capture requirements, where areas or zones are captured, rather than individual features;
- A pre-defined list of status categories or descriptions, as listed below; and
- A minimum mappable area of approximately 1ha.

Mapped Categories

2.9 Importantly, the status layer also identifies and maps those areas which are subject to more than one status, reflecting levels of complexity on the ground, in some areas.

2.10 The statuses which were initially to be mapped included peat in the following 6 situations:

- Burnt
- Gripped
- Hagged/gullied (eroded)
- Bare
- Peat cuttings (where visible)
- Purple moor-grass dominated (peatlands where the dominant species is purple moor-grass).

However, these categories needed some further explanation and definitions, which were agreed between NE and PAA at an initial meeting when the peat layer and photographs were available to study.

Burnt

2.11 This category includes areas which are regularly burnt in a pattern related to grouse management - excluding wildfires or large burnt areas including purple moor-grass burns. Grouse management burns are situated in heather and are visible over long periods (up to 20 years) as the heather regains its dominance. Although it would be extremely useful to know the area of moorland subject to burning for grassland management, these areas would be problematic to separate from accidental wildfires and as they occur in grass dominated areas, the regrowth of grass the following year makes the identification of the areas from photographs very difficult unless annual sets of photographs were available. The potential for error is too high to include areas of grass burning in the current analysis country wide.

Gripped

2.12 Gripped peat is peat modified by the creation of regular artificial drainage patterns throughout the peat area. This is generally easy to detect on aerial photographs. The grips tend to be on parallel lines, often herringboned together at one end. However, grips patterns can vary significantly and their visibility depends on a number of factors such as whether the vegetation has recently been burnt, the depth and width of the grip and the abundance of water in them.

2.13 In this exercise any regular patterning of drains has been included in this category and it is accepted that on the ground there will be a very wide range of variation on drain depth, width, water flow and restoration requirements. The actual zone of water table depletion caused by a grip only extends to a few metres at most, but grips may divert water flow from a much larger area and increase runoff rates overall from a moor. An approximate 50m buffer has been used to report on the gripped areas. The use of this 50m buffer means that drains have to be more than 100m apart to be excluded from this category. The aim of this category is to delineate broad areas which have their hydrology affected by artificial drainage and where restoration work might be required.

Hagged/gullied

2.14 Erosion from a peat body is often associated with ‘hagging’ of the peat. Extreme hagging can result in bare mineral soil with peat pedestals, with or without toupées of vegetation on top. Gullies and groughs are also included in this category, the gullies being an erosion feature which can be historic or active. When the gullies have revegetated, for example, they still affect the water table regime of the peat. If the peat is drier than it has been previously because of the gullying or hagging, it has been recorded as gullied/hagged.

2.15 This is a variable category and is more subjectively determined than those mentioned above. It is particularly hard to consistently record borderline areas since, if there are few other features in an area, minor gullying may be recorded more often than in complex eroded areas with severe hagging, bare peat and gullying. When the bare peat is more extensive than the hagging then the area is classed as bare peat and, in reality, badly eroded areas are often included in both categories.

2.16 In some areas, small pockets of bare peat throughout the otherwise flat surface can be seen on aerial photographs but there is no hagging, nor necessarily any gullying at this stage, although it can develop later. These have been formed by fire damage, either wildfire or too regular managed burning. Where these have been recorded there is a comment that the polygon contains peat pans, which is a precursor to hagging and gullying.

Bare ground

2.17 Bare ground is not often continuous, but usually contains patchy vegetation. There are very unlikely to be many areas of bare ground with no vegetation over 1ha in size (this being the minimum mappable area). A decision was made that where bare ground was obvious then an approximate boundary would be drawn to include an area as tight as possible to the majority of the bare ground but, in reality, there could be between 40% and 100% bare ground in the area mapped.

2.18 Areas where the peat has been eroded to a mineral substrate are mapped as bare, but comments have been made to this effect.

Peat cuttings

2.19 As described above, known peat cutting sites were provided on a GIS layer, the sites being derived from a range of sources: English Heritage, Local Authorities, National Parks and The National Trust. The peat cuttings are, in almost all cases, historical and have largely revegetated, making them hard to see at the 1:5,000 scale used for this project. Where the peat cuttings layer suggested that there is/has been peat cutting and it is not visible at 1:5,000, the area was viewed at a smaller scale, but if no evidence is visible on the aerial photographs the area was recorded as the 'none' category.

Purple moor-grass

2.20 The ability to identify purple moor-grass on aerial photographs is dependent on the time of year the photograph is taken. Purple moor-grass is most visible in winter and least visible in summer. It became apparent at the inception meeting that this category could not be reliably identified from the aerial photographs provided as these are taken largely from April to September. This category was thus dropped from the study as it was decided that the confidence in the mapping would be poor and could affect confidence in the other classes

Excluded categories

2.21 Additional status categories listed in the tender specifications include the following six categories:

- 1 Afforested – Planted woodlands;
- 2 Wooded – Natural woodlands;
- 3 Cultivated – Arable or horticultural land;
- 4 Improved grassland – Agriculturally improved grassland;
- 5 Removed – as a product of other development ie quarry, building, etc; and,
- 6 Extracted – current peat extraction.

These areas were mapped in the same GIS layer as the other statuses and classified as excluded with the relevant number code in the polygon information.

2.22 In some cases the peat layer boundaries appeared to be potentially incorrect in that there appeared to be no differences in the vegetation between the areas within or outside the peat layer, as may have been expected if the soil/peat characteristics altered sharply. In other cases, especially on the edge of moorland areas, there appears to be a shift in the peat layer boundary which mirrors the field boundary but which is offset, excluding areas which potentially appear to be in the peat layer or including areas which appear to be outside the peat layer. In the latter case, these areas often occur in the excluded category. It should be recognised that there are potential problems with the original peat layer in some places but that it represents a good starting point. No attempt has been made to alter the extent of the peat layer in this study. The areas within this layer have been categorised and the areas outside have been ignored.

Digitising

2.23 Each ecologist was given training in the GIS techniques to be used and in the aerial photographic interpretation. Each peat polygon was studied on the aerial photograph and 'cut', then allocated to one of the five main statuses or the exclusion category if relevant. Each of the five columns was populated with 0 or 1 for present and absent. If there were no features to categorise then a "Y" was entered into the attribute table to indicate that the polygon had been scrutinised. This then filled the area with a coloured hatching so that the operator could identify the next area to study and reduce the possibility of missing polygons from the interpretation.

2.24 The polygons supplied were unrelated to the status categories described above. Therefore, the polygons required cutting and smaller polygons were created which related to the status categories. These polygons were stored in an ESRI shapefile with attributes polygons. The minimum size of any polygon was 1ha. Within this table one or more statuses could be allocated. An example of mapped polygons and attributes table is given in Appendix 1.

2.25 A number of the polygons originally supplied were linked to each other as 'multipolygons'. It was thought that this may be a result of cutting large polygons using the moorland line, thereby creating separate and smaller ones. This issue was resolved by 'exploding the polygons' into single parts.

Ground Truthing

2.26 A sample of areas were subjected to ground truthing to check the data interpretation from aerial photographs. The rationale and methodology of selecting the sites has evolved as the digitising has been undertaken. The brief suggested that 70 sites would be visited rapidly to check the peat status present against the categories assigned from the aerial photographic interpretation. This exercise is designed to indicate the level of accuracy of the map and it is not intended to revise or correct the digitised data. This could be achieved by a simple tick or cross for each site. However, the field visits presented an opportunity to collect a little more information on the peat status and a more detailed recording form was devised (Appendix 2).

2.27 The selection of the survey sites has been undertaken using ten status categories with seven samples from each category.

2.28 These are the main categories mentioned above:

- burnt;
- gripped;
- hagged/gullied;
- bare; and
- peat cuttings.

In addition, a 'nothing' (ie peat with no additional classification) category was included and the four most common combinations of status. These could not be defined until the digitising was completed.

2.29 Decisions then had to be made on the number of samples in each geographic region depending on the statuses recorded in those regions. The process is explained in detail in the next section.

2.30 To reduce the time taken to access sites in the field, a GIS file with roads buffered by 1km (500m either side) was supplied by Natural England and all 70 sites were intended to be within this buffer. The area to be surveyed at each site has been reduced to 1ha, a 50m radius, (from the 9ha in the tender) and the survey was to be conducted from a central point within the status polygon with (where possible) an additional 50m buffer from the edge of that polygon.

2.31 The following sets out the survey protocol:

- Find the centre of the hectare to be surveyed and write down the grid reference.
- Take 4 photos at 90 degrees ie; north (1), east (2), south (3) and west (4).
- Complete the survey data sheet (Appendix 2).

The data collected has been entered into an Excel spreadsheet for analysis and reporting purposes.

3. RESULTS

Digitised Results

3.1 The main output of the project is the ESRI Shapefile (attributed vector polygons) GIS dataset. These data are supplied on a separate disc.

3.2 The new upland deep peat layer has 5,762 polygons compared with the original data set which contained 1,777. This increase in polygon number reflects the complexity of the peat status within the area of peat. There are 14 peat categories recorded in the peat layer and these are listed below (Table 2) with the associated area.

3.3 Seven sites from ten categories were to be used as ground truthing sites (para 2.28). These were to include the five main peat status categories, the 'nothing' category and the four most common combined categories these are shown in bold in Table 2.

Table 2. Areas of the Different Peat Categories

Frequency	Peat Status	Ha	% total area
1	**Peat with no category**	**178,882**	**55.8**
2	**Burnt only**	**51,194**	**16.0**
3	**Hagged/Gullied only**	**32,428**	**10.1**
4	**Gripped only**	**24,826**	**7.7**
5	**Gripped & Burnt**	**22,063**	**6.9**
6	**Hagged & Bare**	**3,682**	**1.1**
7	**Hagged & Burnt**	**3,161**	**1.0**
8	**Hagged & Gripped**	**1,300**	**0.4**
9	**Peat Cutting only**	**1,065**	**0.3**
10	Hagged & Gripped & Burnt	507	0.2
11	**Bare Peat only**	**436**	**0.1**
12	Bare Peat & Hagged & Burnt	66	0.0
13	Peat Cut & Gripped	6	0.0
14	Bare Peat & Hagged & Gripped	3	0.0
	Excluded Areas	951	0.3
Total		**320,570**	**100.0**

3.4 From Table 2 it can clearly be seen that 55.8% of the area classified as upland deep peat does not fall into any of the five peat statuses described in Section 2. Of the other 44.2%, moorland which is regularly burnt, but not otherwise altered, accounts for 16%, with hagged peat only accounting for 10.1%. All other categories are less than 10%.

3.5 However, if the figures are re-assessed to give the total area in each status irrespective of other classifications, the areas for each category increase to those given in Table 3. From this it can be seen that 24% of all the upland deep peat is burnt, with 15.2% gripped and 12.8% hagged.

3.6 Figures 3a and 3b give an overview of the distribution of the peat categories across the northern and southern areas of England, respectively. The figure distinguishes between the 'peat with no category' and the other peat statuses.

Table 3. Areas of Each of the Six Peat Categories

Peat Status	Ha	% area of each status
Peat with no category	178,882	55.8
Burnt	76,991	24.0
Gripped	48,704	15.2
Hagged	41,147	12.8
Bare	4,187	1.3
Peat Cutting	1,071	0.3
Excluded Areas	951	0.3
Total	**351,874**	**109.8**

3.7 Distilling out the parts of multiple classes in this way gives a better estimate of the area of each of the five main statuses, and the 'nothing category'. It shows that over 31,363ha are subjected to two or more statuses.

3.8 The excluded areas referred to in both Tables 2 and 3 include the 6 categories described in 2.21 above. A breakdown of the areas for each of these classes is given in Table 4.

Table 4. Areas of Each of the Six Excluded Categories

Excluded Category		Ha	% area of each category
1	Afforested	395	41.5
2	Wooded	402	42.3
3	Cultivated	0	0
4	Improved grassland	18	1.9
5	Removed	136	14.3
6	Extracted	0	0
	Total Excluded	**951**	**100**

3.9 From Table 4 there does not appear to be any areas of cultivated land or current peat extraction in the polygons within the upland peatland layer. There was one site in Northumberland which was classified as bare peat which could possibly be an area cleared of vegetation for possible extraction or removal, but there was no evidence of active extraction on the aerial photograph. The 'removed' category tends to refer to quarries, reservoirs, mines and a caravan park.

Regional Variation

3.10 There is a significant variation in both the extent of the statuses and the character of the upland deep peat vegetation across England, as would be expected. This is explored in the tables produced for the selection of sites for ground truthing described below and is evident in the GIS, which can be studied to show the distribution of the classes across the peat area and the relative size of the areas. Interrogation of the GIS can give a wide range of information about sizes, numbers and distribution of the different classes. This is best done in a targeted fashion to answer specific questions as they are needed.

3.11 A number of comments can, however, be made from the digitising process on specific traits of the regions.

Northumberland

3.12 Northumberland occupies the third largest regional area at 31,084ha, or 10% of the total upland peat layer. Despite this, the peat boundary was quite complex, made up of many dispersed polygons of small size and larger, more irregular shaped areas. In some cases, for instance around Kielder, the small peat areas were a result of larger afforested blocks having been excluded, but elsewhere there was no apparent reason for the small isolated peat polygons. The peat boundary itself did not appear to complement the vegetation, indicating potential inaccuracies especially around the upland fringe areas. In this region there is intense and regular burning of heather moorlands, while gripping, although evident, appears to be less intensive. Large areas of bare peat were not evident, although severe hagging was encountered. Peat cuttings were rarely visible on aerial photographs although historic records were common in the area.

North Pennines

3.13 The north-eastern edge of the North Pennines differed slightly in management regime to Northumberland. In this region, a combination of gripped and burnt moor was more frequent than in Northumberland. Gripping is widespread but it was noted that obvious 'nodes' were apparent at regular intervals along some sections of grips. It is thought that these 'nodes' may be grip 'blocks' or peat dams and be part of moorland restoration schemes in this area. Ground truthing or discussions with practitioners in the area are required to determine the exact nature of these features. Again, despite many historic records of peat cutting, few were visible on the aerial photos.

3.14 The southern edge of the North Pennines is contiguous with the extensively burnt and gripped northern edge of the Yorkshire Dales. These continue to be the predominant management treatments until the boundary between County Durham and Cumbria is reached, where there is a substantial area of peat with no burning or gripping, but some extensively gullied/hagged areas. To the north-west, the burning and gripping typical of grouse moor management is predominant again around Long Man Hill and Ousby Fell in Cumbria. Gripping and burning continue to be the frequent statuses around the boundary between Cumbria and Northumberland, but here there are also some extensive areas of hagged/gullied peat. Areas of bare peat in the North Pennines were generally small and scattered, unlike in the Peak District where some extensive areas were recorded.

The Lake District

3.15 Much of the upland deep peat identified in the Lake District did not fall into any of the categories recorded by this study. Burning and gripping were most prevalent on the Shap Fells, with a further small area of grouse moor located between Skiddaw and Great Calva.

Bowland

3.16 The predominant management technique in Bowland was burning, with some substantial continuous burnt areas being recorded throughout the Area of Outstanding Natural Beauty (AONB). Occasionally, burning was combined with gripping on grouse moors, though gripping without burning was more common, particularly in the north-west of the AONB. Hagged and gullied peat was concentrated in the centre and to the south of the AONB, and these areas were associated with the small amount of bare peat recorded in Bowland.

Yorkshire Dales

3.17 Peat condition in the Yorkshire Dales was generally of better quality than in many other areas, with very little hagging and gullying to the south-east where burning was the dominant management type. Moving up towards the north-west, burning decreased in frequency and hagging became more widespread, although the extent of erosion appeared less than in the Peak District. Gripping was frequently observed in conjunction with burning, and also as a single management strategy. Gripping and hagging were generally mutually exclusive. In many

cases the hagging occurred on the higher ground and the gripping on adjacent lower areas. There was no evidence of gripping leading to hagging/gullying. There were very few areas of bare peat and the majority of them were below the minimum mappable unit (less than 1ha). As with Northumberland and the North Pennines, very few areas of peat cutting were identified on the aerial photographs and these did not coincide with historic records. A few areas had unusual patterns of what appeared to be surface vegetation mowing and it has been suggested that this may be a form of *Molinia* control for restoration purposes. This has been noted in the comments for relevant polygons.

North York Moors

3.18 Burning is the most frequent management activity in the North York Moors, particularly within the continuous areas of peat in the centre of the region where it was also associated with gripping. Several of the larger outlying pockets of deep peat were also extensively burnt but many of the smaller areas did not fall into any category.

South Pennines

3.19 Most of the upland deep peat in the South Pennines could not be attributed to any status relevant to this study. The most frequently encountered management treatments were gripping and burning, although the latter was largely restricted to the north of the region, with some large contiguous areas (combined with gripping) on Widdop Moor, Wadsworth Moor, Dove Stones Moor, Keighley Moor and, to the north-west, Ilkley Moor. Hagged/gullied and bare peat areas were, in general, less frequent and much less extensive in the South Pennines than the Peak District. However, two large areas of bare peat were identified to the north and south of White Holme Reservoir. This region also includes some outlying areas of deep peat to the north and south of the Rossendale Valley. Much of this area was unclassified though there were isolated pockets of gripping and several large hagged/gullied and bare areas. The further outlying area of Darwen Moor and Withnell Moor, north-west of Bolton, was patchily burnt and gripped but much of it did not fall into any of the peat categories.

Peak District

3.20 The dominant management type in the Peak District was burning. Extensively burnt areas included Goyt's Moss and Combs Moss, around Buxton, and in the north-east of the National Park, around Bradfield Moor. The upland peat in the west of the Park, around Kinder Scout, Bleaklow and further north around Rakes Moss and Saddleworth Moor was found to be in very poor condition, with large areas suffering from extensive hagging and gullying sometimes combined with large expanses of bare peat. Burning was also a frequently used management technique in the eastern Peak District although the distribution of burnt areas was patchy. Gripping was often associated with burning as a part of grouse moor management but was not as widespread as in the North Pennines. As with the other areas in the north of England, peat cutting was not commonly located from the photographs despite the abundance of historical records.

Shropshire

3.21 The areas of upland deep peat identified in Shropshire were very small and concentrated mainly in the south of the county. None of the deep peat could be attributed to any of the statuses relevant to this study.

Hereford and Worcester

3.22 Much of the upland deep peat identified along the Welsh border could not be attributed to any status relevant to this study. Two substantial fire-damaged areas were recorded around the Offa's Dyke path, on the edge of the Brecon Beacons.

Exmoor

3.23 Exmoor is one of only two areas, the other being Dartmoor, where peat cuttings were identifiable during the study. The peat cuttings are concentrated in the north and west of the National Park, around Exe Plain in Somerset and Brendon Common in Devon. Apart from one large gripped area, identified at Squalcombe, close to the Somerset border, the remaining areas of upland deep peat in Exmoor could not be attributed to any of the other statuses relevant to this study.

Dartmoor

3.24 Peat cuttings on Dartmoor tended to cover larger areas than those on Exmoor, particularly in the northern part of the deep peat area. Here, the area of cutting at Woodcock Hill extends over 258ha, while the one at Standon Hill and Lynch Tor extends over 318ha. Notably, peat cuttings on Dartmoor were found to differ from those on Exmoor in that they were linear in organisation, rather small and seemingly compartmentalised, and that they were often much less defined. One large gripped area was identified within the Merrivale Range Area and to the north, a large gullied/hagged area extending into the Okehampton Range Area. The remaining areas of upland deep peat identified on Dartmoor could not be attributed to any of the statuses relevant to this study.

Cornwall

3.25 Apart from two small gullied/hagged areas, the remaining areas of upland deep peat identified on Dartmoor could not be attributed to any status relevant to this study.

Ground Truthing

3.26 The selection of samples for the ground truthing was a complicated process, bearing in mind the need to restrict sample numbers and to select sites that were easily accessible as well as having a good geographical distribution.

3.27 As has been explained previously, the 5 peat statuses (burnt, gripped, hagged/gullied, bare and peat cuttings) and 'nothing' were to be six of the ten categories for the ground truthing. The other four categories were to be the most common combination of statuses. From Table 2 these categories were:

- Gripped & Burnt
- Hagged & Bare
- Hagged & Burnt
- Hagged & Gripped

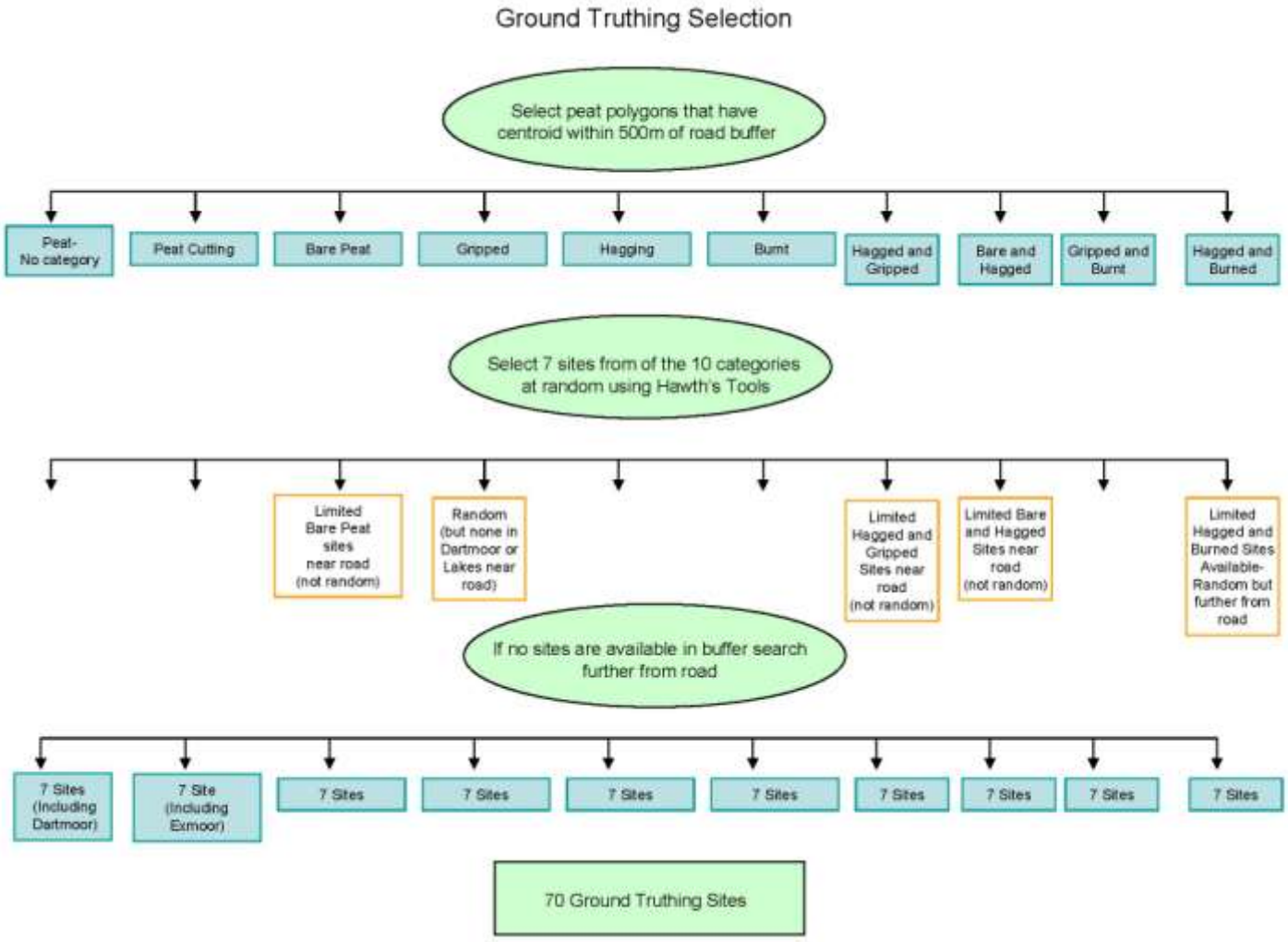
3.28 Seven samples of these categories were to be selected across the whole of England. However, the actual distribution of these categories across the regions was complex. As the first step in site selection, a matrix was constructed to show which status categories occurred in each region and this is provided in Table 5. This table shows that in Herefordshire and Worcester, Shropshire Hills AONB and Quantock Hills – Somerset, none of the upland peat polygons shows any of the 5 statuses or combination of the 5. As the amount of upland peat in these regions is very small, less than 1% of the total area, these regions were excluded from the ground truthing.

3.29 Seventy ground truthing sites were required from the 5,762 peat polygons. As mentioned above, to make the most of the time and resources available, the peat polygons were 'clipped' to the more accessible moorland areas using the road buffer. Seven sites were selected from each of the ten categories. To select the points randomly, a basic statistical and spatial analysis tool called "Hawth's Analysis Tools" was used. This is an add-on for ArcGIS designed specifically for spatial ecology research. Hawth's sampling tool "Random selection" was run on each category when there were more than seven sites. In this way the majority of ground truthing sites were randomly selected and their regional distribution is given in Table 6. For the bare peat and bare peat & hagged categories there were only seven sites within the road buffer so all were automatically selected. Whilst for the hagged & gripped category only six sites fell within the road buffer so an additional site was selected; and for the hagged & burnt category, six sites outside the road buffer were required.

3.30 The larger geographical regions with most peat, such as the North Pennines and Yorkshire Dales, contain the most sampling areas, whereas smaller areas such as Cornwall are not represented. Although this is not a completely random sample of the data, it was felt it was a good representation of the actual dataset. The full set of ground truthing survey points are provided in Appendix 3. Figure 5 has an overview of the distribution of the polygons with or without a peat category status. It also shows the road buffer. Figures 6a and 6b show the distribution of the ground truthing sites, their numbers and their distribution across the regions.

3.31 The surveyors undertook the ground truthing using the form discussed earlier and provided in Appendix 2. They were also supplied with Ordnance Survey maps and air photographic coverage of the survey site and adjacent polygons, examples of which are given in Appendices 4a and 4b.

Figure 4. Flow Diagram for selection of the Ground Truthing Sites



Differences in the Aerial Photographic Interpretation and Ground Truthing Results

3.32 Despite the pilot trial of the form, it became apparent that there was ambiguity in the responses to the question 'Is the assessment the same as the AP interpretation?' and new response categories were created to answer this question and are given below.

- Sample site heterogeneity; ie rest of polygon fits description but not the 1ha sample;
- Features not visible at digitising scale; particularly small areas of bare peat;
- Features not significant at digitising scale; gullies are often visible on the ground but too minor to have been included in the hagging category for the AP interpretation;
- AP misinterpretation; wrong in the field and on the AP when looked at again; and
- Change in burning regime; altered burning since AP taken.

3.33 For the ground truthing box to be ticked as a 'Yes', ie the same as the aerial photographic interpretation, the same status features, and only those features, can be shown on the record form. If any discrepancies were found following the field assessment, these sites were re-analysed to ensure consistency of categorisation of the differences between interpretations. On this basis, only 43 of the 70 sample sites (61.5%) were interpreted correctly from the air photographs.

3.34 This interpretation rate (61.4%) is poor and the errors in the results would lead to a very questionable data set. However, if the reasons for the 'No', ie incorrect interpretation, are analysed more fully, the picture is more positive. Table 7 shows the pertinent data for the sites where the aerial photographic interpretation does not match the features recorded on the ground. These are summarised in Table 8.

Table 8. Reasons for the Differences in Interpretation

Reason	Number of Sites
Features not significant at the digitising scale	6
Features not visible at the digitising scale	5
Sample site heterogeneity	3
Changes in the burning regime	5
Aerial Photographic misinterpretation	10
Total sites with apparent misinterpretation between aerial photographs and ground truthing	27 (2 have multiple reasons)

3.35 Table 8 shows that 14 of the reasons given in Table 7 are explained by the digitising scale used and the spatial heterogeneity of the sample sites. In many cases, 'bare peat' is associated with 'hagging/gullying' and *vice versa.* However, these two categories are not consistently recorded together from the aerial photographs as the categories are quite broad and, frequently, the bare ground has been omitted from the photographic interpretation and recorded on the ground. The same can be said for polygons where hagging or bare peat is one of several statuses. This mis-match of hagging and bare peat accounts for the differences between interpretation on 8 sites - almost a third of apparently misclassified sites. This means that the amount of bare ground is generally under-recorded from the photographic interpretation because of the scale at which the digitising is undertaken.

3.36 At five sites the burning pattern had altered, increasing in four sites and declining in the other one. This appears to indicate that since the photographs were taken there has been more deep peat taken into rotational burning, but there is no easy way to quantify it from the current survey. This is possibly surprising in that English Nature, and now Natural England, have been attempting to reduce the overall burning of heather on deep peat, at least in SSSIs.

3.37 Aerial photographic interpretation was incorrect for ten sites or 14.3% of the 70 sites surveyed. Three of these sites were peat cuttings in the northern regions. The extensive peat cuttings in the south appear to have been correctly interpreted, but those in the South Pennines, North York Moors NP and Forest of Bowland were incorrectly identified. In all cases, the areas show disturbance of the peat, but on the ground there is no evidence of systematic cutting.

3.38 Gripping has not been recorded in the field from three of the 21 polygons which were interpreted as containing this category from the air photographs, despite being visible on two of the photographs, albeit faintly, at the 1:5,000 scale.

3.39 In broad terms then, a figure of 14.3% accuracy can be put on the figures derived from the aerial photographic interpretation, and therefore the areas of the different peat classes given in Table 3. However, it is apparent from the discourse above that the errors are higher for certain classes than others. To assess the errors for the different features would be complex and has not been undertaken for this report.

3.40 The photographs taken in the field are not presented in the paper copy of the report as there are 4 photographs for each of 70 sites and will only be relevant to those interested in particular sites. They have, however been made available digitally and are useful in interpreting some of the differences between the aerial photographic and ground truthing results. They also show the wide range of habitats within each of the peat status categories surveyed.

Peat Depth Measurements

3.41 The ground truthing visits included an assessment of peat depth. Appendix 5 shows the full results from the site visits and there is a field recording the average peat depth. Bearing in mind that the peat layer should only include areas of deep peat, defined as being over 0.40m deep, it is surprising that 19 of the 70 ground truthing sites (27%) have an average depth of peat of less than this amount.

3.42 There is no reason to suppose that the sample sites are atypical of the whole data set and, therefore, this finding has serious implications for the definition of areas included and excluded from the peat layer.

Additional Comments on the Data Set

3.43 The whole data set has not been systematically checked for inconsistencies and mistakes. However, some sites were revisited for a variety of reasons and the following points were noticed and thought worthy of comment.

3.44 It is clear that the whole data set can only be as good as the original peat layer polygons. Throughout the project, the apparently arbitrary nature of the peat layer boundary has been noticeable. There are irregular and unaccountable holes in the peat layer, whilst the vegetation is identical to that abutting it. There are also issues about areas missing from the peat layer which are managed and vegetated in the same way as the adjoining land within the peat layer. This was particularly noticeable on the south-eastern side of the Peak District around Baslow, Calver and Chatsworth. The peat here is thinner and close to the 0.4m limit but the management continues across the vegetation type.

- Excluded area category 1 – afforested includes areas which have been recently felled, ie felled between the dates of the photographs. These areas have been retained as excluded area as it is unclear what the future management will be.

- In the North Pennines there are some areas of heather moor which have mown firebreaks; however, it is not clear if the heather is mown within these areas or burnt. They have been included in the burnt category.

- There are several areas where some type of experimental moorland works are visible on the aerial photographs. These areas do not fit into the peat status categories and are included in the 'Peat with no status category'.

- Where a large fire is within an area of moorland regularly burnt it has been included in the burnt category as it is likely to be within this management in the future, although the fire may have, in this case, been a wildfire or a controlled burn which got out of hand.

- The most likely digitising errors are to be found in a complex area with multiple categories. In two cases, large areas were incorrectly labelled as 'nothing' when they were obviously burnt. The concentration on the smaller areas and multiple categories has resulted in the digitiser returning 'done' to the larger area rather than assigning the correct category.

- In some situations, the aerial photographs show that gripped areas are being blocked. Regular 'nodes' can be seen on the photographs and relate to the use of peat and surrounding vegetation to block the grips. Areas of blocked grips have been categorised as gripped.

4. CONCLUSIONS

4.1 This contract has resulted in a GIS layer showing the status of the deep peat in the English Uplands as identified from aerial photographs. The peat layer covers 320,570ha of the English Uplands.

4.2 Over half the peat in these areas 178,882ha, or 55.8%, has been classified as 'peat with no category', that is, it is not burnt regularly for grouse moor management, gripped, hagged/gullied, significantly bare or exhibiting signs of previous peat cutting operations.

4.3 Several of the peat categories overlap showing the complexity of the peat within the layer. In total, this project has revealed figures for managed burnt deep peat of 76,991ha and gripped deep peat (including those where grip blocking has been undertaken) of 48,704ha. Hagging and gullying (erosion features) have been recorded over 41,147ha of the peat area examined, whilst significant bare peat accounts for 4,187ha. Peat cuttings have been identified across 1,071ha.

4.4 Ground truthing has shown that at a digitising scale of 1:5,000, only 61.5% of the 70 sample sites were correctly categorised. In 14 sites (20%), the ground truthing revealed minor differences between the photographic interpretation and features recorded on the ground. Some of these sites were found to have additional features not visible on the aerial photographs at this scale (frequently bare ground or hagging), or not considered to be significant at the digitising scale (again, bare ground or hagging). In some cases, the sample site was atypical of the whole of the polygon in which it was situated. This indicates that at the 1:5,000 scale, 20% of polygons will have attributes which are not shown.

4.5 On 5 sites, ie 7% of the sample, between the date the photograph was flown and the ground truthing there has been a change in burning regimes. There was misinterpretation of 14.3% of the ground truthed sites. This figure can be applied as a blanket confidence limit to the data but it will vary between features. This further analysis remains to be undertaken.

4.6 The ground truthing has revealed that 27% of the sample sites had an average depth of less than 0.40m of peat.

4.7 The figures produced from this report are a valuable overview of the state of the upland deep peat areas in England. However, the variation in the peat layer boundary, the high number of sites with shallow peat and the level of photographic misinterpretation at the digitising scale used, means that there is more work to be done on the peat layer to obtain a more accurate picture of the area and status of deep peat in England.

4.8 As most of the status categories are, of necessity, imprecise and subjective, the interpretation and location of boundaries will vary to a degree between any two ecologists and, therefore, the areas assigned to any status will differ. Add to this the variability in the quality of some of the aerial photography and it will be difficult to obtain definitive areas for each peat status. However, this work has produced an approximate area for each category, which is a first step towards this target.

TABLES

Table 5. The Occurrence of the Different Peat Statuses in the Different Regions

Region	Area		Categories (6 single & top 4 combinations)										
	Ha	%	Nothing	Peat cutting	Bare peat	Hagged & gripped	Hagged & Burnt	Bare & Hagged	Gripped & Burnt	Gripped	Hagged	Burnt	Total No
North Pennines Massif	107,480	34	+		+	+	+	+	+	+	+	+	9
Yorkshire Dales and Nidderdale	49,707	16	+	+	+	+	+		+	+	+	+	9
Northumberland	31,084	10	+	+	+	+	+	+	+	+	+	+	10
Peak District NP	30,262	9	+		+	+	+	+	+	+	+	+	9
South Pennines	29,851	9	+	+	+	+	+	+	+	+	+	+	10
Lake District NP	24,757	8	+		+			+	+	+	+	+	7
Dartmoor NP	18,694	6	+	+						+	+		4
Forest of Bowland AONB	15,879	5	+	+	+		+	+	+	+	+	+	9
North York Moors NP	5,514	2	+	+		+		+	+	+	+	+	8
Exmoor NP	4,279	1	+	+						+			3
Cornwall AONB	1,896	1	+								+		2
Hereford and Worcester	1,139	0	+										0
Shropshire Hills AONB	16	0	+										0
Quantock Hills - Somerset	11	0	+										0
	320,570	100	14	7	7	6	6	7	8	10	10	8	**83**

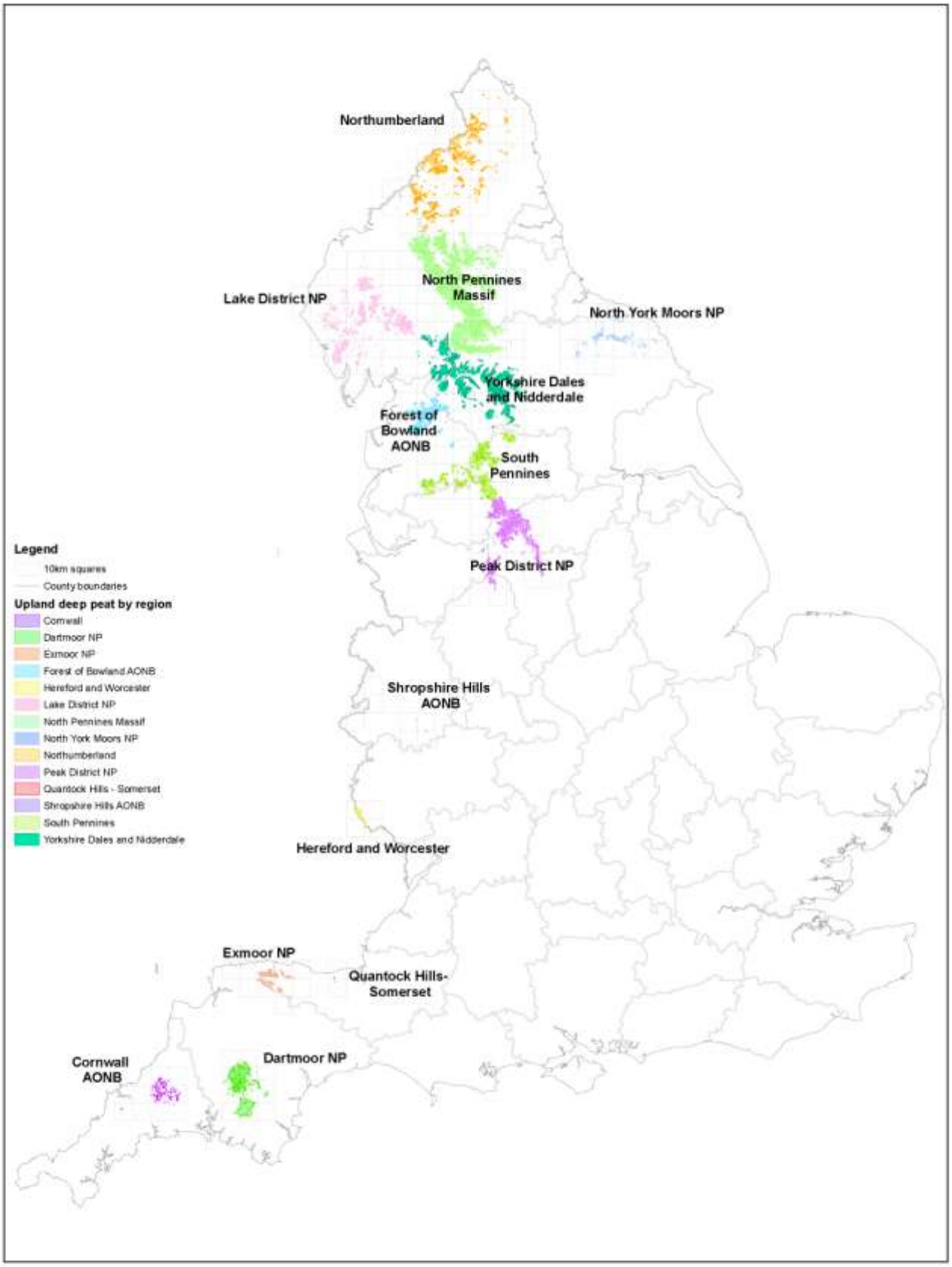
Table 6. Final Distribution of the Ground Truthing Sites

Region			Categories (6 single & top 4 combinations)										
	Area	No of Samples	Nothing	Peat cutting	Bare peat	Hagged & gripped	Hagged & Burnt	Bare & Hagged	Gripped & Burnt	Gripped	Hagged	Burnt	Total No
North Pennines Massif	107,480	21	2		3	3	2	3	2	2	2	2	21
Yorkshire Dales and Nidderdale	49,707	11	1			1	1		1	2	3	2	11
Northumberland	31,084	5	1			1	1		1	1			5
Peak District NP	30,262	10			1	1	1	2	1	1	1	2	10
South Pennines	29,851	10	1	1	3	1	1	1	1		1		10
Lake District NP	24,757	2	1							1			2
Dartmoor NP	18,694	1		1									1
Forest of Bowland AONB	15,879	3		1			1		1				3
North York Moors NP	5,514	3		1				1				1	3
Exmoor NP	4,279	4		4									4
Cornwall AONB	317,507	70	6	8	7	7	7	7	7	7	7	7	**70**

Table 7. Those Sites where Aerial Photographic Interpretation and Ground Truthing Surveys Recorded Different Peat Statuses

Region	Status from Aerial Photographs	Site No	Gripped	Hagged	Haggs/ Gullies	Bare	Burning	Peat Cutting	Reason for Differences
North Pennines Massif	Bare Peat	28	No	No		Yes	Yes	No	AP misinterpretation & change in burning regime
North Pennines Massif	Bare Peat	29	No	No		Yes	Yes	No	Change in burning regime
Peak District NP	Bare Peat	60	No	Yes	H & G	Yes	No	No	Features not visible at digitising scale
South Pennines	Bare Peat	53	No	Yes	H	Yes	No	No	Features not significant at digitising scale
Yorkshire Dales and Nidderdale	Burnt	42	Yes	No		No	Yes	No	AP misinterpretation
North Pennines Massif	Gripped	10	No	Yes	G	No	No	No	AP misinterpretation
North Pennines Massif	Gripped	26	Yes	No		No	No	No	Sample site heterogeneity
Peak District NP	Gripped	64	Yes	Yes	G	No	Yes	No	Change in burning regime & features not significant at digitising scale
Peak District NP	Gripped & Burnt	65	Yes	Yes	G	No	Yes	No	Features not significant at digitising scale
South Pennines	Gripped & Burnt	47	No	Yes	G	No	No	No	AP misinterpretation
Yorkshire Dales and Nidderdale	Gripped & Burnt	36	Yes	Yes	G	No	No	No	Features not significant at digitising scale
North Pennines Massif	Hagged	18	No	Yes	H & G	Yes	No	No	AP misinterpretation
Peak District NP	Hagged	56	No	Yes	H & G	Yes	No	No	Features not significant at digitising scale
Yorkshire Dales and Nidderdale	Hagged	34	No	Yes	H	Yes	No	No	Features not visible at digitising scale
Yorkshire Dales and Nidderdale	Hagged	35	No	Yes	H	Yes	No	No	Features not significant at digitising scale
Yorkshire Dales and Nidderdale	Hagged	38	Yes	No		No	No	No	AP misinterpretation
Forest of Bowland AONB	Hagged & Burnt	44	No	Yes	H & G	Yes	Yes	No	AP misinterpretation
North Pennines Massif	Hagged & Burnt	15	Yes	Yes	G	No	Yes	No	Features not visible at digitising scale
Northumberland	Hagged & Burnt	3	No	Yes	G	No	No	No	Change in burning regime
Yorkshire Dales and Nidderdale	Hagged & Burnt	40	No	Yes	H & G	Yes. Peat pools	Yes	No	Features not visible at digitising scale
North Pennines Massif	Hagged & Gripped	8	No	Yes	G	No	No	No	Sample site heterogeneity
North Pennines Massif	Hagged & Gripped	14	Yes	Yes	G	Yes	Yes	No	Features not visible at digitising scale
South Pennines	Hagged & Gripped	46	No	Yes	H & G	No	No	No	Sample site heterogeneity
Yorkshire Dales and Nidderdale	Nothing	39	No	No		No	Yes	No	Change in burning regime
Forest of Bowland AONB	Peat Cutting	43	Yes	No		Yes	Yes	No	AP misinterpretation
North York Moors NP	Peat Cutting	23	No	Yes	H & G	Yes	No	No	AP misinterpretation
South Pennines	Peat Cutting	48	No	Yes	H	Yes	No	No	AP misinterpretation

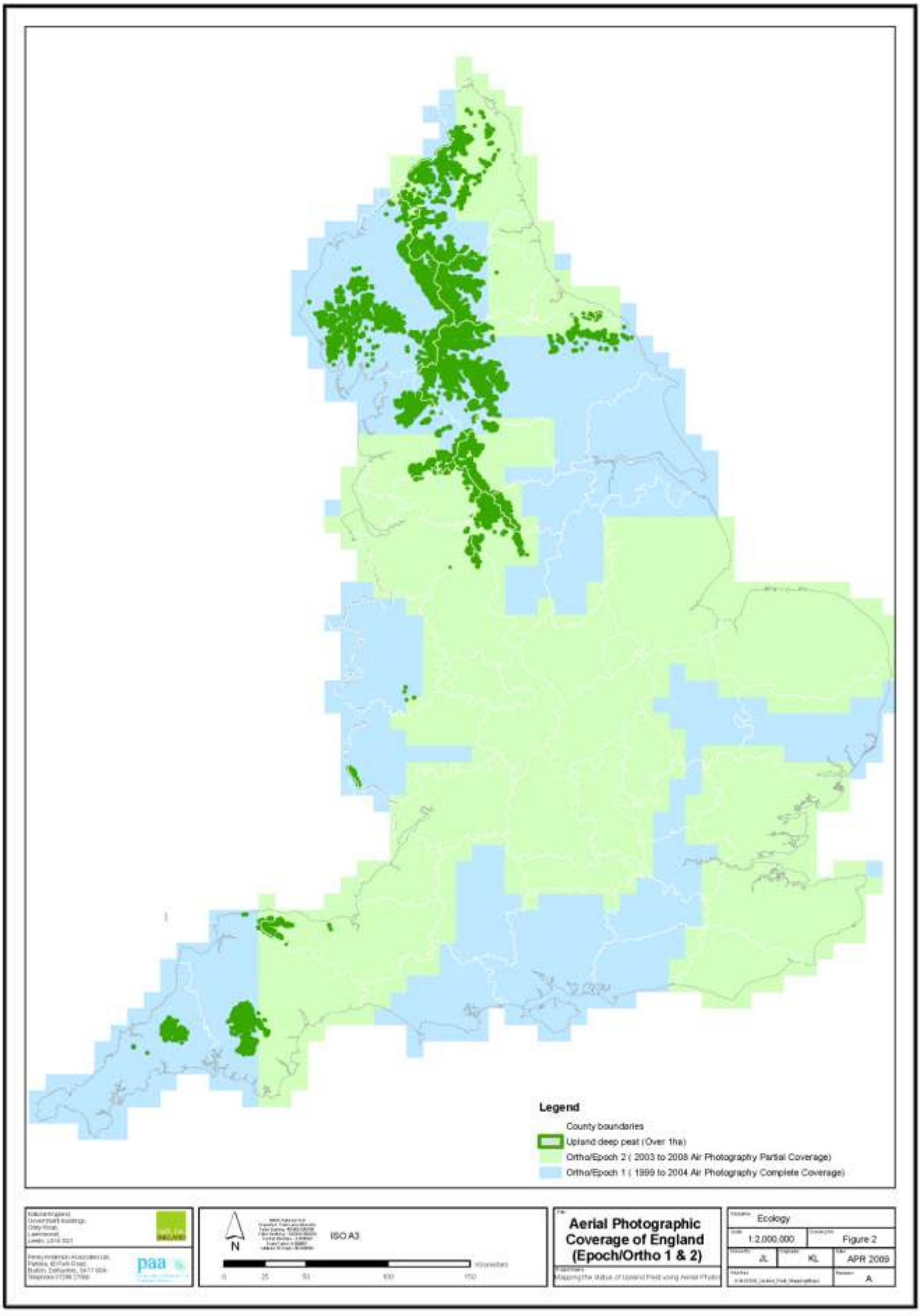
FIGURES

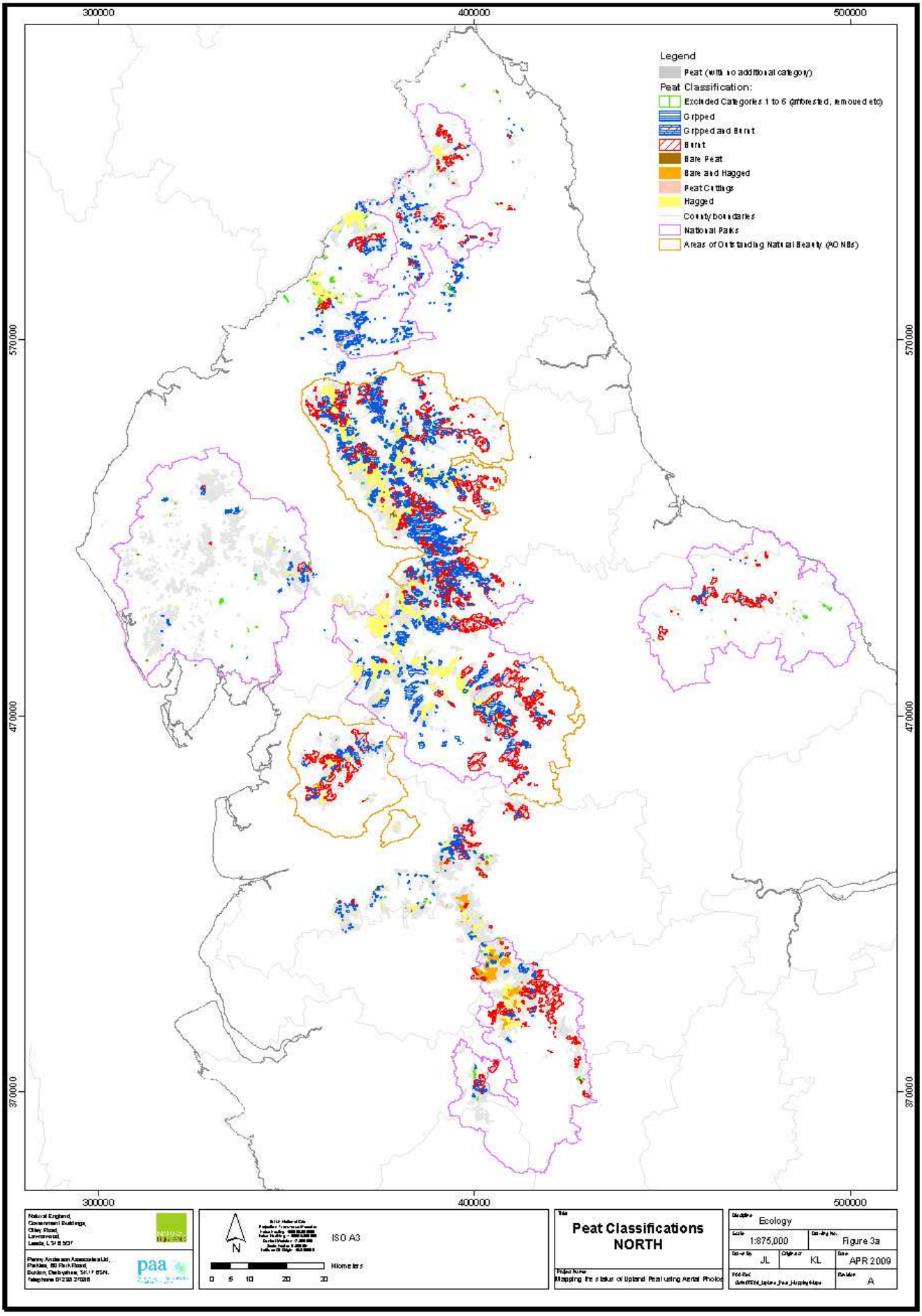


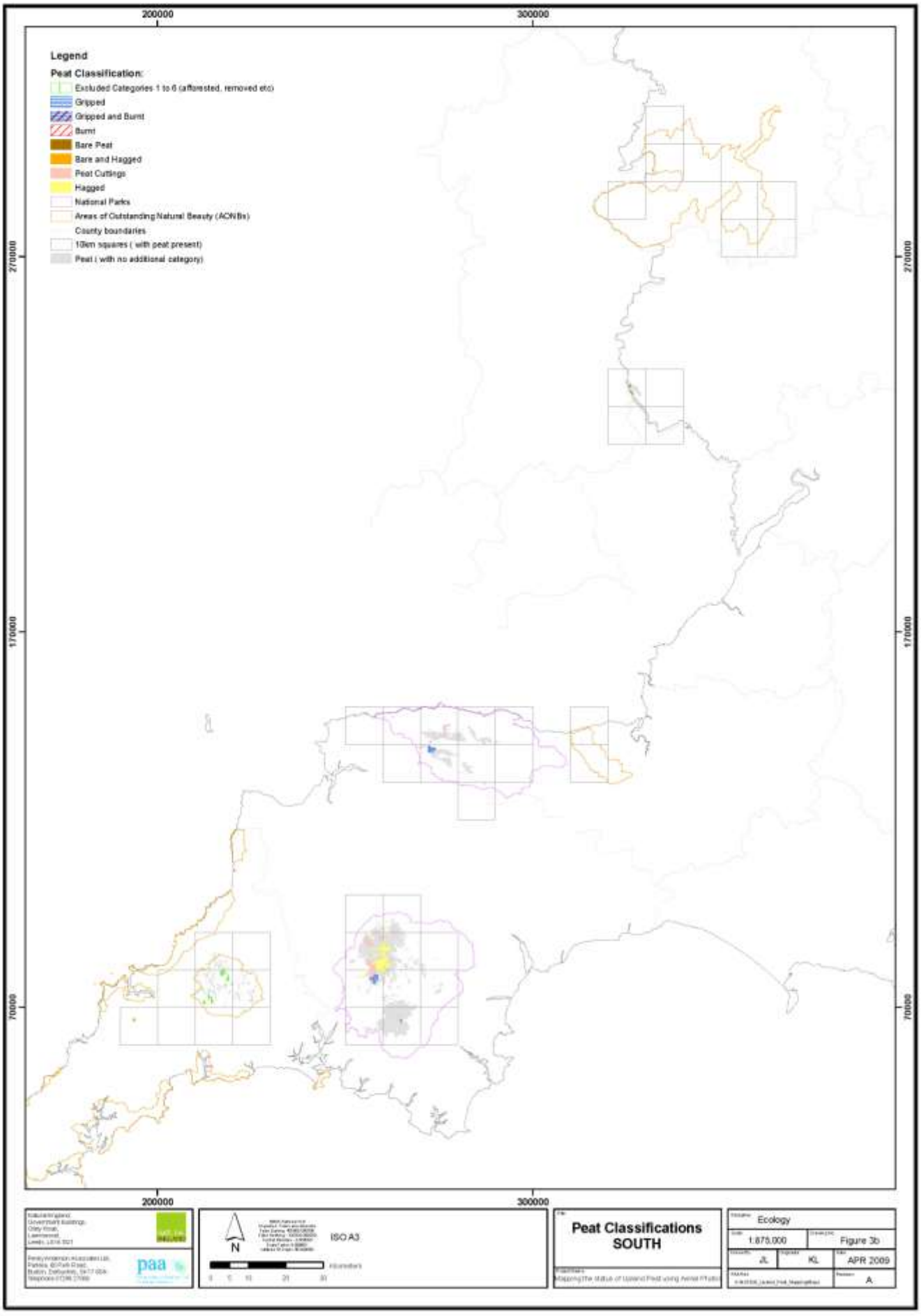
Upland Peat Mapping Areas by Region

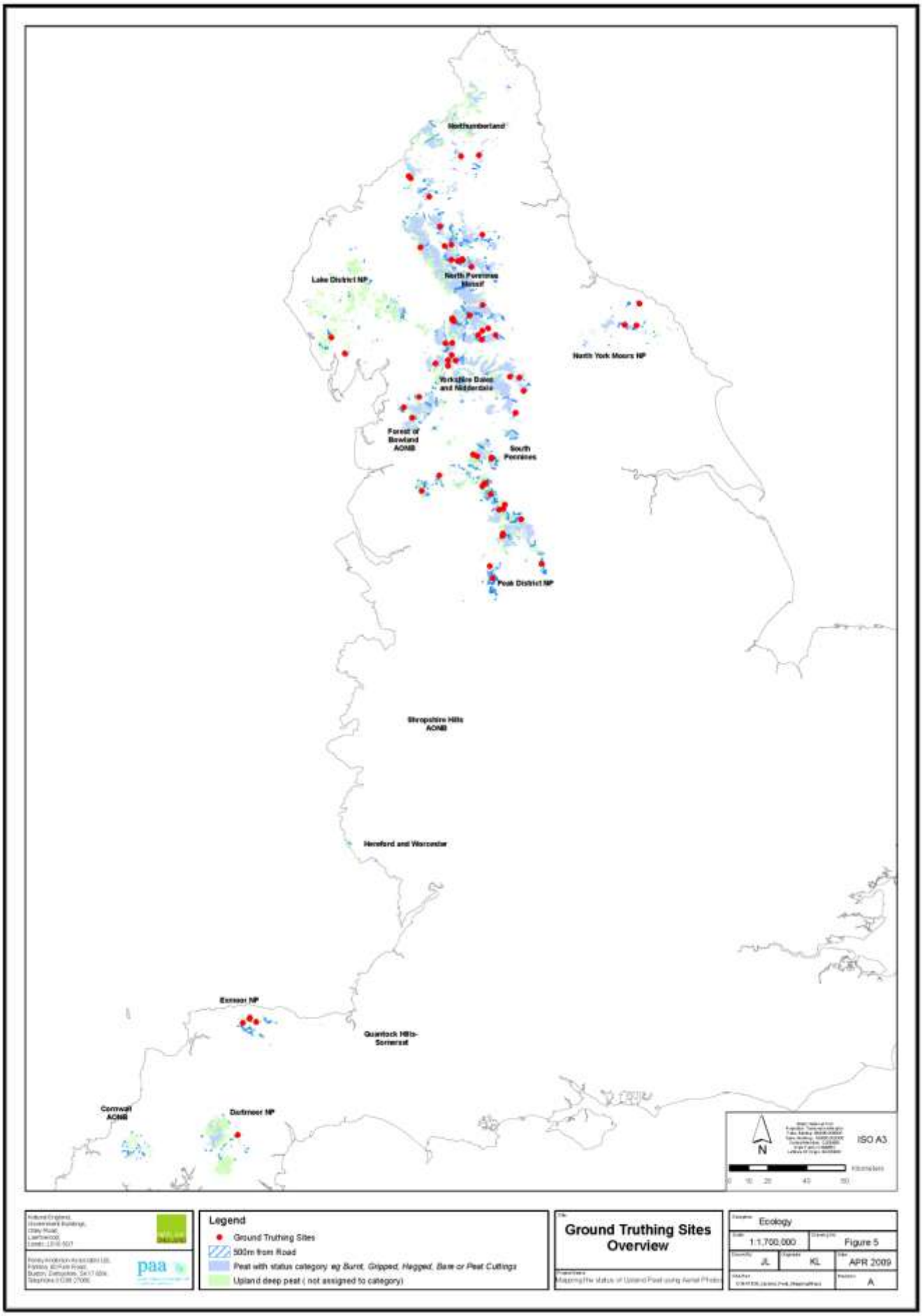
Mapping the Status of Upland Peat using Aerial Photos

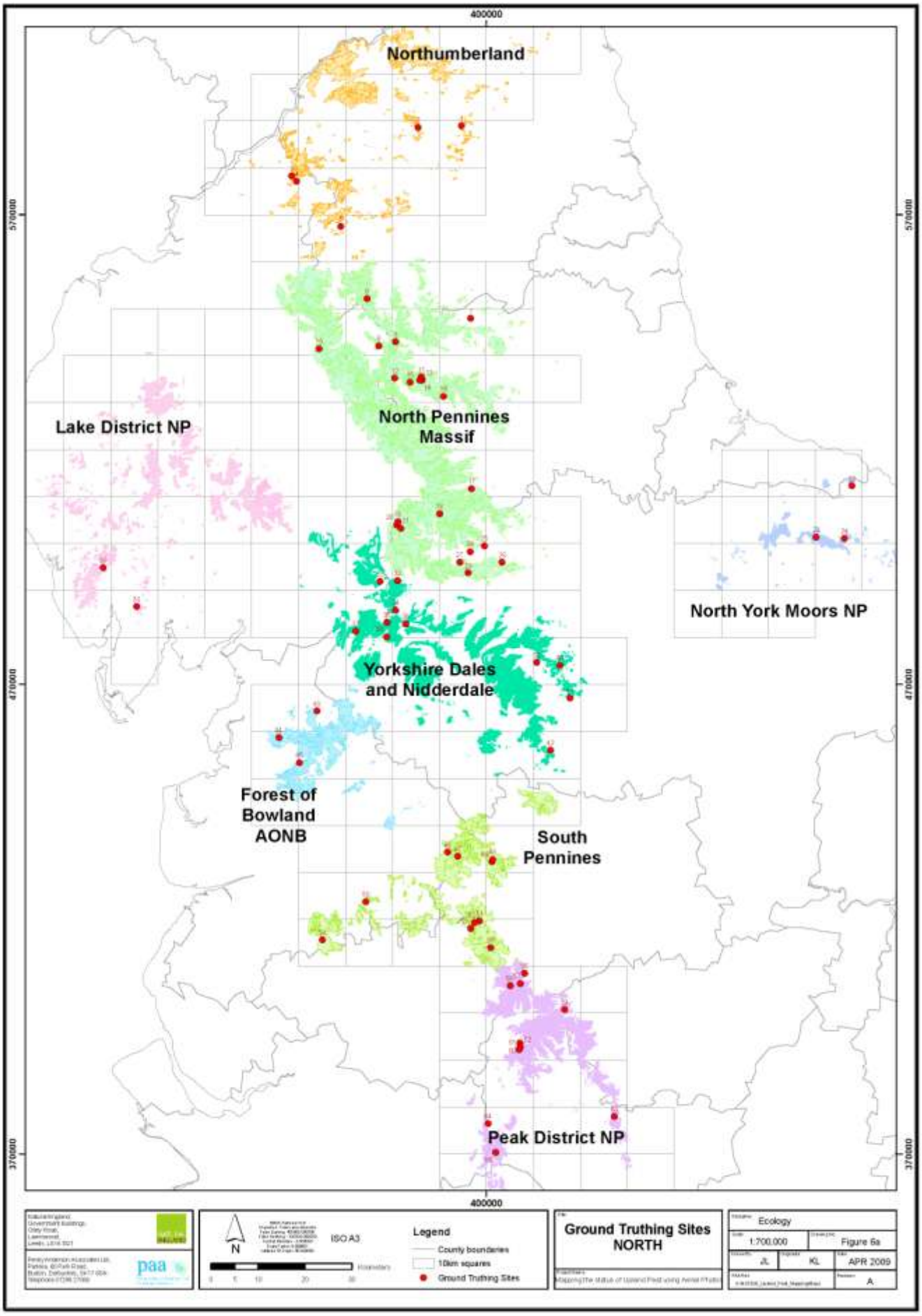
Ecology			
1:2,000,000		Figure 1	
JL	KL	APR 2009	
		A	

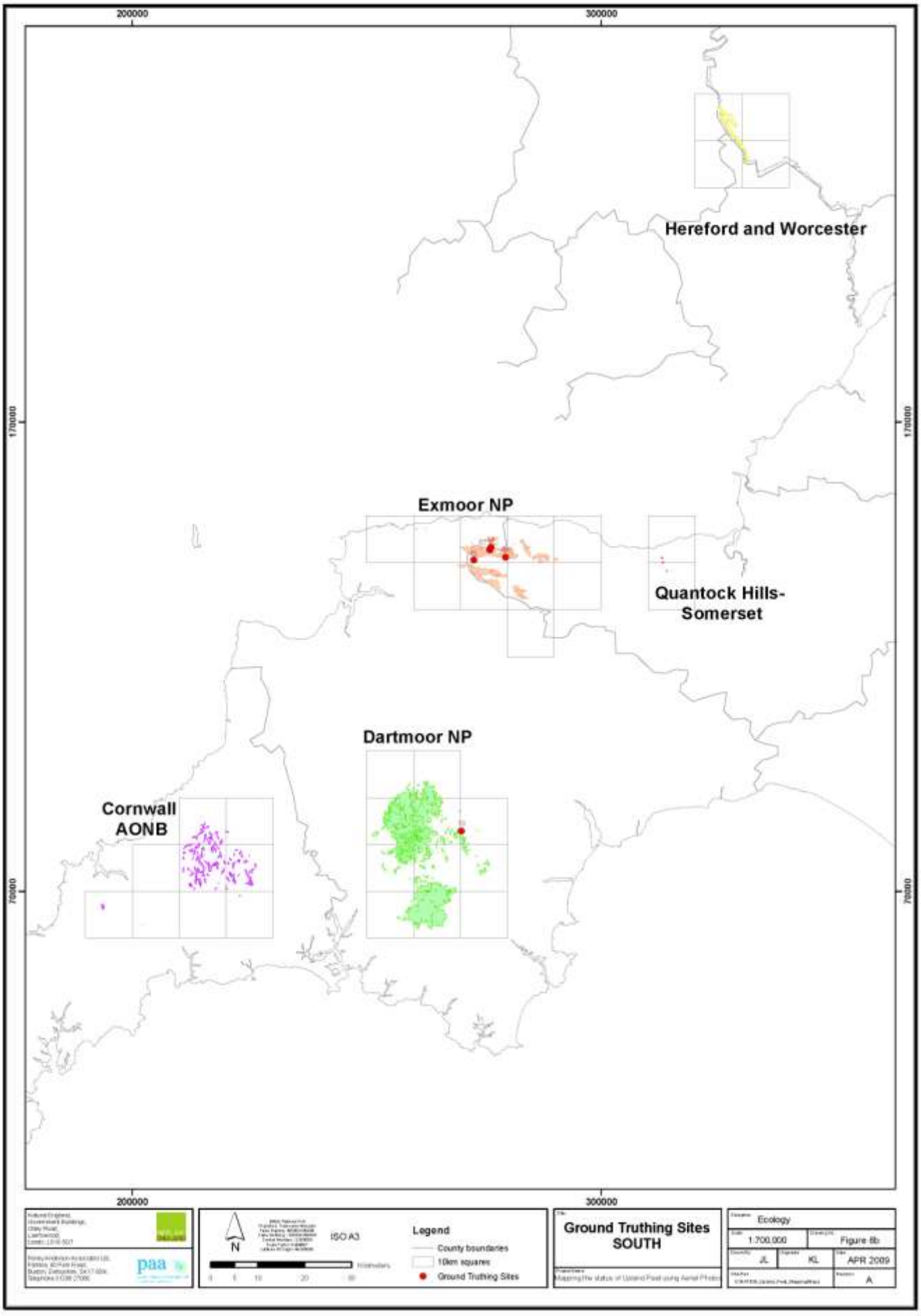

Legend
County boundaries
Upland deep peat (Over 1ha)
Ortho/Epoch 2 (2003 to 2008 Air Photography Partial Coverage)
Ortho/Epoch 1 (1999 to 2004 Air Photography Complete Coverage)
N
ISO A3
0
25
50
100
150
Kilometers
Aerial Photographic Coverage of England (Epoch/Ortho 1 & 2)
Ecology
1:2,000,000
Figure 2
JL
KL
APR 2009
A


300000
400000
500000
570000
470000
370000
Legend
Peat (with no additional category)
Peat Classification:
Excluded Categories 1 to 6 (afforested, removed etc)
Gripped
Gripped and Burnt
Burnt
Bare Peat
Bare and Hagged
Peat Cuttings
Hagged
County boundaries
National Parks
Areas of Outstanding Natural Beauty (AONBs)
N
ISO A3
0 5 10 20 30
Kilometers
Peat Classifications
NORTH
Mapping the status of Upland Peat using Aerial Photos
Ecology
1:875,000
Figure 3a
JL
KL
APR 2009
A


200000
300000
270000
170000
70000
Legend
Peat Classification:
Excluded Categories 1 to 6 (afforested, removed etc)
Gripped
Gripped and Burnt
Burnt
Bare Peat
Bare and Hagged
Peat Cuttings
Hagged
National Parks
Areas of Outstanding Natural Beauty (AONBs)
County boundaries
10km squares (with peat present)
Peat (with no additional category)
N
ISO A3
Peat Classifications
SOUTH
Ecology
1:675,000
Figure 3b
JL
KL
APR 2009
A

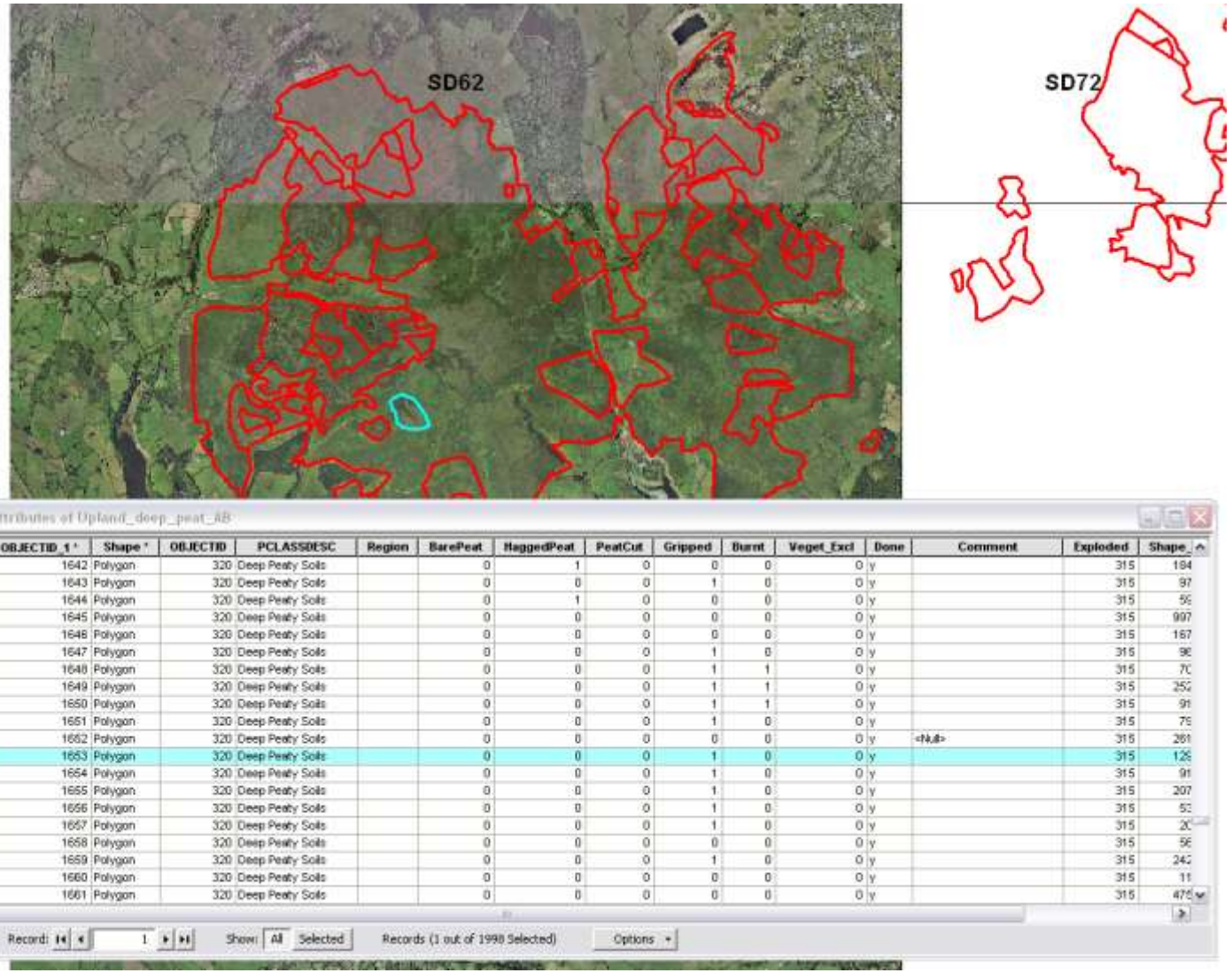

Northumberland
Lake District NP
North Pennines AONB
North York Moors NP
Yorkshire Dales and Nidderdale
Forest of Bowland AONB
South Pennines
Peak District NP
Shropshire Hills AONB
Herefordshire and Worcester
Exmoor NP
Quantock Hills-Somerset
Cornwall AONB
Dartmoor NP
N
ISO A3
Legend
Ground Truthing Sites
500m from Road
Peat with status category eg Burnt, Gripped, Hagged, Bare or Peat Cuttings
Upland deep peat (not assigned to category)
Ground Truthing Sites Overview
Mapping the status of Upland Peat using Aerial Photos
Ecology
1:1,700,000
Figure 5
JL
KL
APR 2009
A


400000
570000
470000
370000
Northumberland
Lake District NP
North Pennines Massif
North York Moors NP
Yorkshire Dales and Nidderdale
Forest of Bowland AONB
South Pennines
Peak District NP
N
ISO A3
Legend
County boundaries
10km squares
Ground Truthing Sites
Ground Truthing Sites NORTH
Ecology
1:700,000
Figure 6a
JL
KL
APR 2009
A


200000
300000
170000
70000
Hereford and Worcester
Exmoor NP
Quantock Hills-
Somerset
Dartmoor NP
Cornwall
AONB
N
ISO A3
Legend
County boundaries
10km squares
Ground Truthing Sites
Ground Truthing Sites
SOUTH
Ecology
1:700,000
Figure 8b
JL
KL
APR 2009
A

APPENDICES

APPENDIX 1. GIS Attribute Table



Attributes of Upland_deep_peat_AB

OBJECTID_1 *	Shape *	OBJECTID	PCLASSDESC	Region	BarePeat	HaggedPeat	PeatCut	Gripped	Burnt	Veget_Excl	Done	Comment	Exploded	Shape_
1642	Polygon	320	Deep Peaty Soils		0	1	0	0	0	0	y		315	184
1643	Polygon	320	Deep Peaty Soils		0	0	0	1	0	0	y		315	97
1644	Polygon	320	Deep Peaty Soils		0	1	0	0	0	0	y		315	59
1645	Polygon	320	Deep Peaty Soils		0	0	0	0	0	0	y		315	997
1646	Polygon	320	Deep Peaty Soils		0	0	0	0	0	0	y		315	167
1647	Polygon	320	Deep Peaty Soils		0	0	0	1	0	0	y		315	98
1648	Polygon	320	Deep Peaty Soils		0	0	0	1	1	0	y		315	70
1649	Polygon	320	Deep Peaty Soils		0	0	0	1	1	0	y		315	252
1650	Polygon	320	Deep Peaty Soils		0	0	0	1	1	0	y		315	91
1651	Polygon	320	Deep Peaty Soils		0	0	0	1	0	0	y		315	75
1652	Polygon	320	Deep Peaty Soils		0	0	0	0	0	0	y	<Null>	315	261
1653	Polygon	320	Deep Peaty Soils		0	0	0	1	0	0	y		315	126
1654	Polygon	320	Deep Peaty Soils		0	0	0	1	0	0	y		315	91
1655	Polygon	320	Deep Peaty Soils		0	0	0	1	0	0	y		315	207
1656	Polygon	320	Deep Peaty Soils		0	0	0	1	0	0	y		315	53
1657	Polygon	320	Deep Peaty Soils		0	0	0	1	0	0	y		315	20
1658	Polygon	320	Deep Peaty Soils		0	0	0	0	0	0	y		315	56
1659	Polygon	320	Deep Peaty Soils		0	0	0	1	0	0	y		315	242
1660	Polygon	320	Deep Peaty Soils		0	0	0	0	0	0	y		315	11
1661	Polygon	320	Deep Peaty Soils		0	0	0	0	0	0	y		315	475

Record: 1 Show: All Selected Records (1 out of 1998 Selected) Options

Blue = gripped polygon

APPENDIX 2.

Natural England - Peat Mapping Ground Truthing Forms

Region	1	Status	2
Surveyor	3	Date	4
GIS Site No.	5	Grid Ref	6

	B Bog	V mire	Ns acid G	Ag/Fo G	Dry H	Wet H	Mc G	Other
dominant vegetation	7							

Sphagnum DAFOR: 8

Peat Depth 3 measurements	9		

Gripped: 10

typical depth	stable?	eroding?	revegetating?
11	12		

Hagged/ Gullied: 13

haggs?	gullies?
14	

activity	
stable	15
eroding sides	
eroding sides & tops	

predominant base features	
peat	16
bare mineral soil at base	
revegetated mineral soil	
revegetated redeposited peat	

Bare: 17

estimated % cover of bare…	
peat	18
mineral soil	

of bare peat…	
% eroding	19
% redeposited	

Burning	20	type of burn		severity of most recent burn	
		managed	21	hot	22
		wildfire		cool	

Peat Cutting	23	total extent		peat depth in cutting
		% area cut	24	25

Grazing Pressure		on heather		on grasses
	high	26	high	27
	moderate		moderate	
	light		light	
	N/A		N/A	

Same as AP assessment?	28	reason	29
		site heterogeneity	
		AP misinterpretation	
		change of peat status	

Notes

On arrival at site, take 4 photos (N, E, S and W), each including marked 2m bamboo cane for scale.
Fill in survey form as follows. Small cells require ticks, larger cells require other information.

Question No	
1	Region - Taken from GIS
2	Status taken from GIS
3	Initials of surveyor
4	Date of survey
5	Site number from upland peat data set
6	6 figure grid reference
7	Note main vegetation type (tick more than one box if ~evenly split) - (BB - Blanket Bog *(Eriophorum/Sphagnum* dominant), VM - Valley Mire, mire vegetation in flush, valley or basin, RAG - Rough Acid Grassland (dominants *Nardus stricta, Agrostis curtisii, Juncus squarrosus,* sedges or mix of these), BFG - Bent-Fescue Grassland - *Agrostis capillaris* and/or *Festuca ovina/tenuifolia,* HH - Heather Heath (>25% cover dwarf shrubs), Wet Heath - Heath including *Erica tetralix* and *Sphagnum,* MG - *Molinia* Grassland (>75% cover, otherwise RAG), O - Other note - Bracken (BK) , Western Heath (WSH), Improved grassland (IG), Woodland (W), Scrub (S), Bare Rock/Scree (R)
8	Abundance of Sphagnum on DAFOR scale
9	Peat Depth Measurements in cm - to nearest 25cm using 2m bamboo cane - only record to 1.5m, then use "more". Where there are major erosion features, peat depth can be estimated from height of these from mineral soil
10	Y/N if grips present in unit. If yes answer questions 11 and 12
11	Use bamboo cane to determine typical depth in cm
12	Tick predominant activity of grip in unit, or more than one if ~evenly spread between types
13	Y/N if haggs/gullies present. If yes answer questions 14, 15 and 16
14	Tick to indicate presence of haggs and/or gullies
15	Tick to indicate dominant level of activity (or more than one if ~evenly split)
16	Tick to indicate dominant substrate at base of gullies - more than one if ~evenly spread
17	Y/N if there is appreciable cover of bare ground (>10% cover). If yes answer questions 18 and 19
18	Estimate the %cover of bare peat and mineral soil in the unit to the nearest 10%
19	Of the bare peat, estimate the percentage eroding (in situ) and redeposited, to nearest 10%
20	Y/N if site has been rotationally burned or obviously affected by wildfire. If yes answer questions 21 & 22
21	Tick to indicate the dominant type of burning on the site
22	Tick to indicate the likely severity of the most recent burn (hot - bare peat, cool - litter layer unaffected)
23	Y/N if site has signs of past peat extraction. If yes answer questions 24 and 25
24	Tick to estimate the total area of peat cutting activity in the site
25	Test the depth of peat accumulation in the bottom of peat cuttings, and give typical depth in cm

26	Y/N Grazing pressure on heather - additional assessment by eye High - carpet or topiary growth forms Moderate - occasional carpet or topiary forms only Low - heather uninterrupted growth form N/A no heather at the site
27	Grazing pressure on grass - additional assessment by eye High - lawn like under 7cm Moderate - sward typically 7-15cm Low - sward 15cm plus N/A no grass at the site
28	Y/N if field assessment is different from aerial photo assessment, if yes answer question 29
29	Tick most likely cause of difference between assessments

APPENDIX 3. Ground Truthing Sites

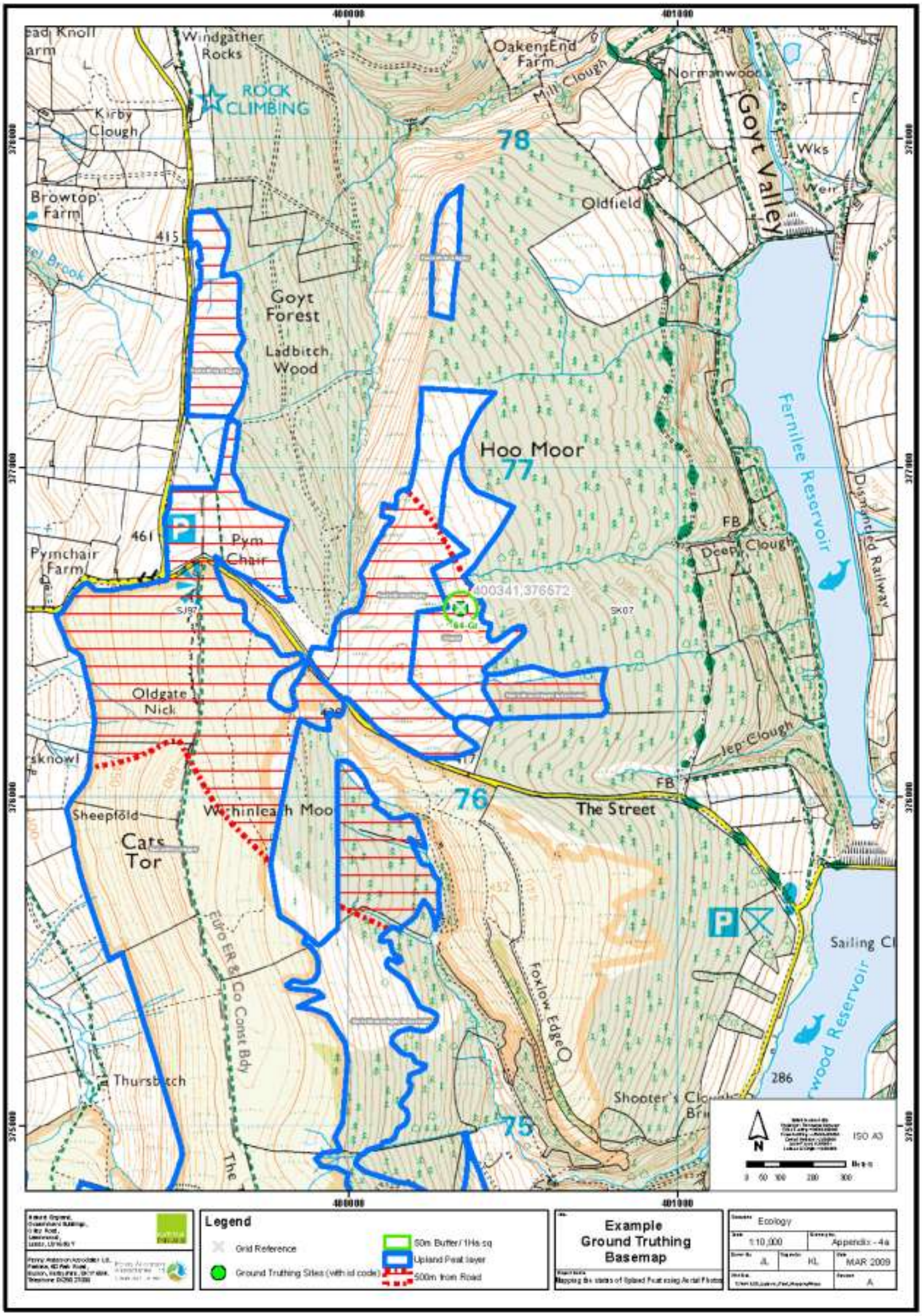
Site No	Eastings	Northing	GridSq	Region	Bare Peat	Hagged Peat	Peat Cutting	Gripped	Burnt	Vegetation excluded	Status	Comment	Digitiser	Type	Selection
1	394723	588961	NY98	Northumberland	0	0	0	1	1	0	Gr&Bu		CW	Gripped and Burned	Survey - randomly selected but near road
2	385470	588616	NY88	Northumberland	0	0	0	1	0	0	Gr		CW	Gripped	Survey - randomly selected but near road
3	358581	578296	NY57	Northumberland	0	1	0	0	1	0	Ha&Bu		CW	Hagged and Burned	Ground truth - additional (far from road)
4	359588	577137	NY57	Northumberland	0	1	0	1	0	0	Ha&Gr		CW	Hagged and Gripped	Survey
5	369051	567522	NY66	Northumberland	0	0	0	0	0	0	Nothing		CW	Peat with no category	Survey - randomly selected but near road
6	374580	552156	NY75	North Pennines Massif	0	0	0	1	1	0	Gr&Bu		CW	Gripped and Burned	Survey - randomly selected but near road
7	396642	547931	NY94	North Pennines Massif	0	0	0	0	1	0	Bu		CW	Burned	Survey - randomly selected but near road
8	380595	542958	NY84	North Pennines Massif	0	1	0	1	0	0	Ha&Gr		CW	Hagged and Gripped	Survey - only areas nr rd (centroid outside)
9	377045	542121	NY74	North Pennines Massif	0	1	0	0	0	0	Ha		CW	Hagged	Survey - randomly selected but near road
10	364419	541449	NY64	North Pennines Massif	0	0	0	1	0	0	Gr		AB	Gripped	Survey - randomly selected but near road
11	386139	535467	NY83	North Pennines Massif	0	1	0	1	0	0	Ha&Gr		CW	Hagged and Gripped	Survey- only areas with centroid near road
12	380466	535197	NY83	North Pennines Massif	0	0	0	1	0	0	Gr		CW	Gripped	Survey - randomly selected but near road
13	386323	534795	NY83	North Pennines Massif	1	1	0	0	0	0	BP&Ha		CW	Bare Peat and Hagged	Survey- only areas with centroid near road
14	385833	534776	NY83	North Pennines Massif	0	1	0	1	0	0	Ha&Gr		CW	Hagged and Gripped	Survey- only areas with centroid near road
15	383758	534374	NY83	North Pennines Massif	0	1	0	0	1	0	Ha&Bu		CW	Hagged and Burned	Ground truth - additional
16	390883	531306	NY93	North Pennines Massif	0	0	0	0	0	0	Nothing		CW	Peat with no category	Survey - randomly selected but near road
17	396834	511672	NY91	North Pennines Massif	0	0	0	0	1	0	Bu		AB	Burned	Survey - randomly selected but near road
18	389997	506347	NY80	North Pennines Massif	0	1	0	0	0	0	Ha		AB	Hagged	Survey - randomly selected but near road

Site No	Eastings	Northing	GridSq	Region	Bare Peat	Hagged Peat	Peat Cutting	Gripped	Burnt	Vegetation excluded	Status	Comment	Digitiser	Type	Selection
19	381166	504654	NY80	North Pennines Massif	1	1	0	0	0	0	BP&Ha		AB	Bare Peat and Hagged	Survey- only areas with centroid near road
20	380915	503995	NY80	North Pennines Massif	1	1	0	0	0	0	BP&Ha		AB	Bare Peat and Hagged	Survey- only areas with centroid near road
21	381746	503278	NY80	North Pennines Massif	0	1	0	0	1	0	Ha&Bu		AB	Hagged and Burned	Survey- only areas with centroid near road
22	477858	512271	NZ71	North York Moors NP	0	0	0	0	1	0	Bu		AB	Burned	Survey - randomly selected but near road
23	470242	501410	NZ70	North York Moors NP	0	0	1	0	0	0	PC	Peat cutting?	AB	Peat Cutting	Survey - randomly selected but near road
24	476260	501100	NZ70	North York Moors NP	1	1	0	0	0	0	BP&Ha		AB	Bare Peat and Hagged	Survey- only areas with centroid near road
25	399530	499495	SD99	North Pennines Massif	0	0	0	1	1	0	Gr&Bu		AB	Gripped and Burned	Survey - randomly selected but near road
26	396590	498298	SD99	North Pennines Massif	0	0	0	0	0	0	Nothing		AB	Peat with no category	Survey - randomly selected but near road
27	394282	496077	SD99	North Pennines Massif	1	0	0	0	0	0	BP	Peat eroded to mineral soil	AB	Bare Peat	Survey- only areas with centroid near road
28	403336	496003	SE09	North Pennines Massif	1	0	0	0	0	0	BP	Bare mineral soil	AB	Bare Peat	Survey- only areas with centroid near road
29	396163	493774	SD99	North Pennines Massif	1	0	0	0	0	0	BP		AB	Bare Peat	Survey- only areas with centroid near road
30	318426	494897	SD19	Lake District NP	0	0	0	1	0	0	Gr		AB	Gripped	Survey - randomly selected but near road
31	325465	486611	SD28	Lake District NP	0	0	0	0	0	0	Nothing		AB	Peat with no category	Survey - randomly selected but near road
32	381061	492147	SD89	Yorkshire Dales and Nidderdale	0	0	0	1	0	0	Gr		EG	Gripped	Survey - randomly selected but near road
33	377377	491955	SD79	Yorkshire Dales and Nidderdale	0	0	0	1	1	0	Gr&Bu		EG	Gripped and Burned	Survey - randomly selected but near road
34	380651	485841	SD88	Yorkshire Dales and Nidderdale	0	1	0	0	0	0	Ha		EG	Hagged	Survey - randomly selected but near road
35	378829	483200	SD78	Yorkshire Dales and Nidderdale	0	1	0	0	0	0	Ha		EG	Hagged	Survey - randomly selected but near road
36	382809	482847	SD88	Yorkshire Dales and Nidderdale	0	0	0	1	0	0	Gr		EG	Gripped	Survey - randomly selected but near road
37	372262	481378	SD78	Yorkshire Dales and Nidderdale	0	1	0	1	0	0	Ha&Gr		EG	Hagged and Gripped	Survey - only areas nr rd (centroid outside)

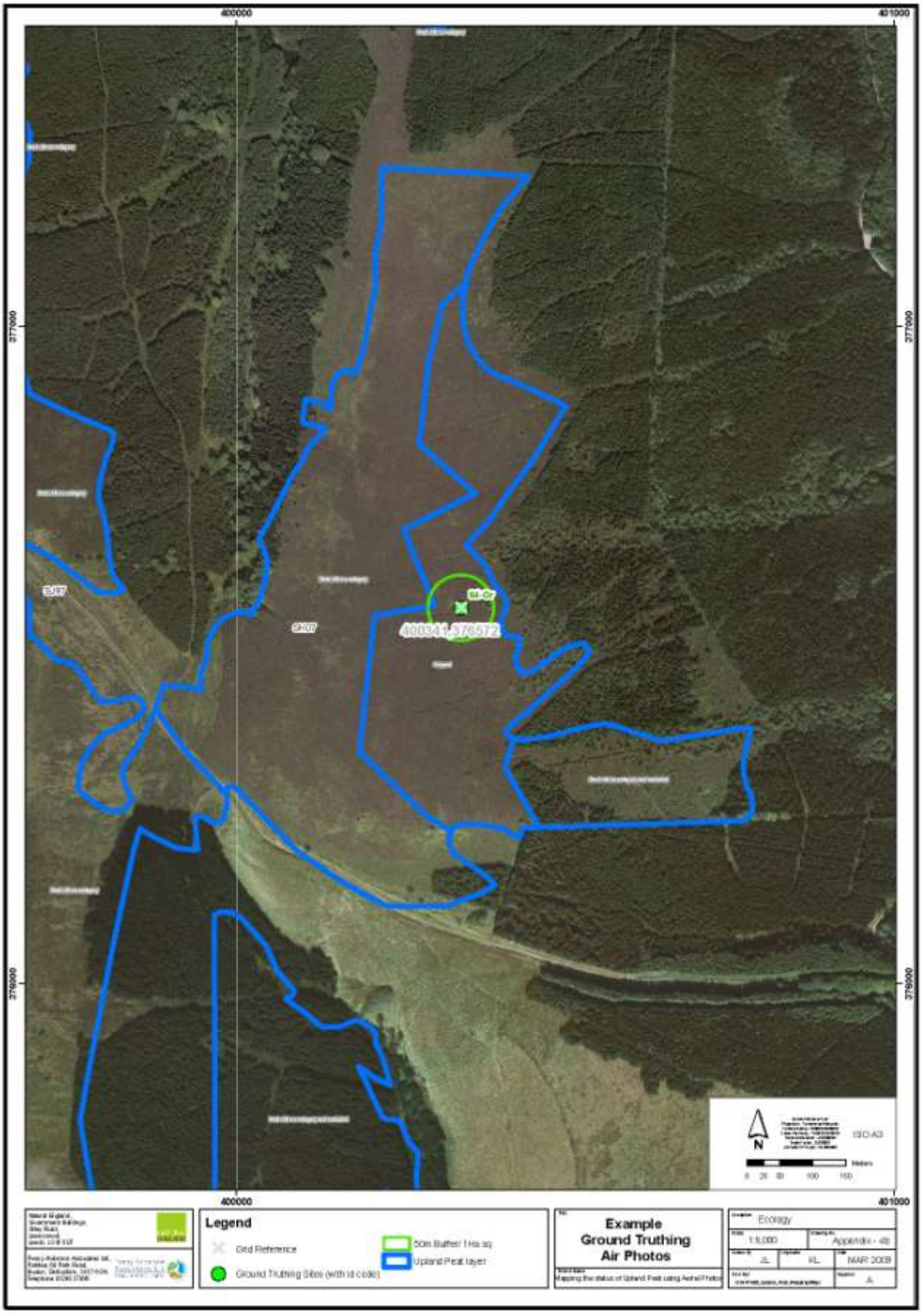
Site No	Eastings	Northing	GridSq	Region	Bare Peat	Hagged Peat	Peat Cutting	Gripped	Burnt	Vegetation excluded	Status	Comment	Digitiser	Type	Selection
38	378786	480141	SD78	Yorkshire Dales and Nidderdale	0	1	0	0	0	0	Ha		EG	Hagged	Survey - randomly selected but near road
39	410714	474701	SE17	Yorkshire Dales and Nidderdale	0	0	0	0	0	0	Nothing		EG	Peat with no category	Survey - randomly selected but near road
40	415727	474114	SE17	Yorkshire Dales and Nidderdale	0	1	0	0	1	0	Ha&Bu		EG	Hagged and Burned	Ground truth - additional (far from road)
41	417771	467140	SE16	Yorkshire Dales and Nidderdale	0	0	0	0	1	0	Bu		EG	Burned	Survey - randomly selected but near road
42	413664	455999	SE15	Yorkshire Dales and Nidderdale	0	0	0	0	1	0	Bu		EG	Burned	Survey - randomly selected but near road
43	363933	464320	SD66	Forest of Bowland AONB	0	0	1	0	0	0	PC	Evidence of peat cutting?	AB	Peat Cutting	Survey - randomly selected but near road
44	355794	458702	SD55	Forest of Bowland AONB	0	1	0	0	1	0	Ha&Bu	Bare mineral soil	AB	Hagged and Burned	Ground truth - additional (far from road)
45	360213	453412	SD65	Forest of Bowland AONB	0	0	0	1	1	0	Gr&Bu		AB	Gripped and Burned	Survey - limited sites to choose in region
46	391712	434300	SD93	South Pennines	0	1	0	1	0	0	Ha&Gr		AB	Hagged and Gripped	Survey- only areas with centroid near road
47	393887	433459	SD93	South Pennines	0	0	0	1	1	0	Gr&Bu		AB	Gripped and Burned	Survey - randomly selected but near road
48	401323	432755	SE03	South Pennines	0	0	1	0	0	0	PC	Peat Cutting?	AB	Peat Cutting	Survey - randomly selected but near road
49	401164	432275	SE03	South Pennines	1	1	0	0	0	0	BP&Ha		AB	Bare Peat and Hagged	Survey- only areas with centroid near road
50	374359	423721	SD72	South Pennines	1	0	0	0	0	0	BP	Peat pans	AB	Bare Peat	Survey- only areas with centroid near road
51	398521	419685	SD91	South Pennines	0	0	0	0	0	0	Nothing		AB	Peat with no category	Survey - randomly selected but near road
52	397455	419323	SD91	South Pennines	0	1	0	0	1	0	Ha&Bu		AB	Hagged and Burned	Ground truth - additional
53	396639	418036	SD91	South Pennines	1	0	0	0	0	0	BP		AB	Bare Peat	Survey- only areas with centroid near road
54	365096	415640	SD61	South Pennines	1	0	0	0	0	0	BP		AB	Bare Peat	Survey- only areas with centroid near road
55	400902	413936	SE01	South Pennines	0	1	0	0	0	0	Ha		AB	Hagged	Survey - randomly selected but near road
56	408124	408528	SK09	Peak District NP	0	1	0	0	0	0	Ha		AB	Hagged	Survey - randomly selected but near road

Site No	Eastings	Northing	GridSq	Region	Bare Peat	Hagged Peat	Peat Cutting	Gripped	Burnt	Vegetation excluded	Status	Comment	Digitiser	Type	Selection
57	407211	406351	SK09	Peak District NP	0	1	0	1	0	0	Ha&Gr	Some gullying of the grips	AB	Hagged and Gripped	Survey- only areas with centroid near road
58	405107	405842	SK09	Peak District NP	1	1	0	0	0	0	BP&Ha		AB	Bare Peat and Hagged	Survey- only areas with centroid near road
59	416637	400801	SK19	Peak District NP	0	0	0	0	1	0	Bu		AB	Burned	Survey
60	407173	393676	SK09	Peak District NP	1	0	0	0	0	0	BP		AB	Bare Peat	Survey- only areas with centroid near road
61	406933	392240	SK09	Peak District NP	0	1	0	0	1	0	Ha&Bu		AB	Hagged and Burned	Survey
62	407247	392831	SK09	Peak District NP	1	1	0	0	0	0	BP&Ha		AB	Bare Peat and Hagged	Survey- only areas with centroid near road
63	427201	378000	SK27	Peak District NP	0	0	0	0	1	0	Bu		AB	Burned	Survey - randomly selected but near road
64	400341	376572	SK07	Peak District NP	0	0	0	1	0	0	Gr		AB	Gripped	Survey - PDNP no sites in dartmoor nr road
65	402009	370386	SK07	Peak District NP	0	0	0	1	1	0	Gr&Bu		AB	Gripped and Burned	Survey - limited sites to choose in region
66	276427	143317	SS74	Exmoor NP	0	0	1	0	0	0	PC		AB	Peat Cutting	Survey - randomly selected but near road
67	276235	142782	SS74	Exmoor NP	0	0	1	0	0	0	PC		AB	Peat Cutting	Survey - randomly selected but near road
68	279618	141204	SS74	Exmoor NP	0	0	1	0	0	0	PC		AB	Peat Cutting	Survey - randomly selected but near road
69	272794	140605	SS74	Exmoor NP	0	0	1	0	0	0	PC		AB	Peat Cutting	Survey - randomly selected but near road
70	270189	82884	SX78	Dartmoor NP	0	0	0	0	0	0	Nothing		AB	Peat with no category	Survey - randomly selected but near road

APPENDIX 4a.


Windgather Rocks
Oaken End Farm
ROCK CLIMBING
Kirby Clough
Mill Clough
Normanwood
Goyt Valley
78
Wks
Weir
Browtop Farm
Oldfield
Goyt Forest
Ladbitch Wood
Fernilee Reservoir
Hoo Moor
77
Dismantled Railway
FB
Deep Clough
461
Pym Chair
Pymchair Farm
400341,376572
SK07
SJ97
Oldgate Nick
Jep Clough
76
The Street
Sheepfold
Cats Tor
Sailing Cl
Euro ER & Co Const Bdy
Foxlow Edge
286
Thursbitch
Shooter's Clough
75
The
ISO A3
0 50 100 200 300
400000
401000
Legend
Grid Reference
Ground Truthing Sites (with id code)
50m Buffer / 1Ha sq
Upland Peat layer
500m from Road
Example Ground Truthing Basemap
Mapping the status of Upland Peat using Aerial Photos
Ecology
1:10,000
Appendix - 4a
JL
KL
MAR 2009
A

APPENDIX 4b.


400000
401000
377000
376000
400341,376572
Legend
Grid Reference
Ground Truthing Sites (with id code)
50m Buffer (1Ha sq)
Upland Peat layer
Example
Ground Truthing
Air Photos
Ecology
1:5,000
Appendix - 4b
JL
KL
MAR 2009
ISO A3
N

APPENDIX 5. Results of Ground Truthing Surveys

									9 Peat Depth (metres)																					Aerial Photograph		
1 Region	2 Status	3 Surveyor	4 Date	5 GIS site No	6 Eastings	6 Northing	7 Dom Veg	8 Sphag	1	2	3	Average depth	10 Gripped	metres	12 Status	13 Hagged	14 H/G	15 Activity	16 Base feature	17 Bare	18 % Cover	19 State	20 Burning	21 Type	22 Severity	23 Peat Cut	24 Extent	25 Depth metres	26 Cv grazing	27 Grass grazing	28 Assessment	29 Reasons	30 Comments
	Gripped & Burnt	AB	02/04/09	1	394723	588961	Wet H	Occasional	0.35	0.30	0.50	0.38	Yes	0.10	Stable	No				No			Yes	Wildfire	Cool	No			Light	N/A	Yes		No evidence of recent burning but degenerating heather adjacent to c. 7 year old plants suggest fire in the past, though probably not managed burns. Grips old + revegetated with Sphagna and other bryophytes probably no longer effective at draining peat. Vegetation: Tussocky Eriophorum vaginatum with Calluna vulgaris, Polytrichum moss, Molinia caerulea, Deschampsia flexuosa and Erica tetralix most frequent between tussocks. Sphagnum infrequent except in grips where it can be abundant along with E. angustifolium. Meadow pipits abundant; skylark, linnet and buzzard seen/heard.
Northumberland	Gripped	AB	02/04/09	2	385470	588616	B Bog	Frequent	>1.00	>1.00	0.70	0.90	Yes	1.00	Revegetating	No				No			No			No			Light	N/A	Yes		Several of the main grips have been very recently re-excavated; now revegetating with Juncus sp. Dominant vegetation is tussocky blanket bog but some areas with much Cv and Df transition to dry-heath. Typical blanket bog species = Eriophorum vaginatum, Erica tetralix, Eriophorum angustifolium, and Sphagna. Juncus effusus invading from grips. Vaccinium oxycoccos; Molinia caerulea. Reed bunting, skylark, meadow pipit, curlew all present nearby.

Northumberland	Northumberland	Northumberland
Nothing	Hagged & Gripped	Hagged & Burnt
AB	AB	AB
02/04/09	01/04/09	01/04/09
5	4	3
369061	359588	358581
567522	577137	578296
V Mire	B Bog	Wet H
Dominant	Abundant	Locally dominant
>1.00	0.45	0.50
>1.00	0.30	0.20
>1.00	>1.00	0.25
1.00	0.58	0.32
Yes	Yes	No
Stable & revegetating	Eroding & revegetating	
No	Yes	Yes
	G	G
	Eroding sides	Eroding sides
	Bare mineral soil	Revegetated redeposited
No	No	No
No	No	No
No	No	No
Light	Light	Light
N/A	N/A	N/A
Yes	Yes	No
		Change in burning regime
Very wet valley mire dominated by Eriophorum vaginatum and Sphagnum. Other associates include Calluna vulgaris (f), Narthecium ossifragum (a) Empetrum nigrum (f), Trichophorum cespitosum (o), Erica tetralix (o) and Molinia caerulea (la). Other notable species include cranberry and bog rosemary (both lf). There are several grips but these have been blocked (wooden planking) and have fully revegetated with Sphagnum and E. angustifolium. A large dog fox was disturbed on the mire. Birds in the general area include: meadow pipit (a), skylark (f).	Some grips eroding into gully features though not uniformly across whole area. Blanket bog with much Sphagnum and Eriophorum vaginatum. Calluna vulgaris frequent; wetter areas with E. angustifolium. Trichophorum cespitosum and Cladonia lichens rare. Skylarks abundant, meadow pipits, curlew present to east.	Gullies still present but burning much less in evidence. Calluna and Eriophorum vaginatum dominant with Vaccinium myrtillus and V. vitis idaea occasional. Revegetated gullies often with much Sphagnum.

North Pennines Massif	North Pennines Massif	North Pennines Massif
Hagged & Gripped	Burnt	Gripped & Burnt
AB	AB	AB
03/04/09	02/04/09	03/04/09
8	7	6
380595	396642	374580
542958	547931	552156
B Bog	B Bog	B Bog
Occasional	Occ-locally dominant	Occ-locally dominant
>1.00	>1.00	>1.00
0.50	>1.00	>1.00
0.05	>1.00	>1.00
0.52	1.00	1.00
No	No	Yes
		0.30
		Stable & revegetating
Yes	No	No
G		
Eroding sides		
Revegetated mineral soil		
No	No	No
No	Yes	Yes
	Managed	Managed
	Cool	Cool
No	No	No
Light	Moderate	Light
Moderate (rabbits)	N/A	N/A
No	Yes	Yes
Sample site heterogeneity		
Sample site centred on small area of non-category (one wide gully) which, in my opinion, would have been too painstaking to digitise given the scale of the project. The surrounding peat (ie. that within the same polygon) appears to have been interpreted correctly. Vegetation is dominated by Eriophorum vaginatum with Sphagnum + Polytrichum moss. There is also a large amount of Juncus effusus. The drier raised areas to the west support Nardus grassland. Birds: Meadow pipits (a); curlew; golden plover, red grouse in vicinity. Mammals: rabbits.	Sample centred on small area of blanket bog on top of moor surrounded by dry heath. BB with Eriophorum vaginatum, Sphagnum dominant with E. angustifolium. Dry heath dominated by Calluna vulgaris with Empetrum nigrum and occasional E. vaginatum. Several bog pools of varying depth; the shallower ones with much Sphagnum, the deepest ones with several invertebrate species. Birds include, Red grouse, meadow pipit, skylark, curlew, golden plover, lapwing.	Sample site is blanket bog dominated by Eriophorum vaginatum with varying amounts of heather (d-o), which is less frequent in more recently burnt areas. The moor is gripped but nearly all of these have been blocked with turf cut from the bog. This creates a 'bog pool' behind the blockage (10m intervals) which are generally deep and seem unlikely to revegetate soon. The shallower parts of the grip immediately after the blockages are revegetating with E. vaginatum, E. angustifolium and a Sphagnum. Birds: Meadow pipit, lapwing, curlew, snipe.

North Pennines Massif	North Pennines Massif	North Pennines Massif	North Pennines Massif
Gripped	Hagged & Gripped	Gripped	Hagged
AB	AB	AB	AB
21/04/09	21/04/09	03/04/09	03/04/09
12	11	10	9
380466	386139	364419	377045
535197	535467	541449	542121
B Bog & Ag/Fo G	B Bog & Ns acid G	B Bog	B Bog
Rare	Frequent	Frequent	None
>1.00	>1.00	>1.00	>1.50
0.50	0.20	>1.00	0.50
>1.00	>1.00	1.00	>1.50
0.83	0.73	1.00	1.16
Yes	Yes	No	No
1.00	0.15		
Eroding & revegetating	Revegetating		
No	Yes	Yes	Yes
	G	G	H & G
	Eroding sides	Eroding sides	Eroding sides
	Peat & Revegetated redeposited peat	Revegetated redeposited peat	Revegetated redeposited peat
No	No	No	No
No	No	No	No
No	No	No	No
N/A	Light	Light	Light
Light	N/A	N/A	Light
Yes	Yes	No	Yes
		AP misinterpretation	
Agrostis/Festuca grassland with Juncus effusus and large cushions of mosses (Polytrichum sp. and Rhytidiadelphus squarrosus) grading to degraded blanket bog with Eriophorum vaginatum and E. angustifolium. Birds: Skylark, meadow pipit, black grouse (about 1km away), curlew, golden plover.	Sample site at edge of gripped area. Deep gullies. Vegetation: To north - BB with Eriophorum vaginatum, Calluna vulgaris, E. angustifolium, Trichophorum cespitosum, Vaccinium oxycoccos. To south: Nardus stricta dominated grassland with Juncus effusus, Galium saxatile, E. angustifolium in places. Club mosses on shale tips just outside site. Birds: Lapwing.	Definite misinterpretation/mistake on GIS. There is one short but quite deep gully within sample area thought not really apparent on air photograph. Gully bottom revegetated with Sphagna and Eriophorum vaginatum. Vegetation: Tussocky E. vaginatum + Sphagnum + Calluna dominant with occ. E. angustifolium, Empetrum nigrum. Birds; Meadow pipit, skylark, golden plover.	Sample site centred on a wide gully with tributary gullies coming off it. Sides of gully bare peat but bottom revegetating with Nardus, Calluna and, in wetter areas Sphagnum, Eriophorum vaginatum and E. angustifolium. Blanket bog to north and south relatively intact but to east gully complex expands into a more extensive hagged/gullied area. To west, main gully continues towards Sitka spruce plantation. Birds: Meadow pipit, skylark, curlew, lapwing.

North Pennines Massif	North Pennines Massif	North Pennines Massif
Hagged & Burnt	Hagged & Gripped	Bare Peat & Hagged
AB	AB	AB
21/04/09	21/04/09	21/04/09
15	14	13
383758	385833	386323
534374	534776	534795
B Bog	B Bog	B Bog & Wet heath
Rare	Frequent	Rare to locally abundant
>1.00	>1.00	>1.00
>1.00	>1.0	0.05
>1.00	0.10	>1.00
1.00	0.70	0.68
Yes	Yes	No
0.40	0.40	
Stable	Stable & Revegetating	
Yes	Yes	Yes
G	G	H & G
Stable & eroding sides	Eroding sides	Eroding sides and tops
Bare mineral soil at base & revegetated redeposited peat	Peat & Revegetated redeposited peat	Peat
No	Yes	Yes
	7.5%	15%
	100% eroding	95% eroding, 5% redeposited
Yes	Yes	No
Managed	Wildlfire	
Hot	Hot	
No	No	No
Light	Light	Light
N/A	N/A	N/A
No	No	Yes
Features not visible at digitising scale	Features not visible at digitising scale	
Not recently burnt; >5 years. Lack of Sphagnum and general paucity of other Bryophytes suggests hot burn. Gullies within sample part generally shallow c. 0.5m though just adjacent 3m+. Vegetation: Calluna vulgaris and Eriophorum vaginatum co-dominant. Empetrum nigrum frequent, E. angustifolium, occasional in wetter areas. Birds: Meadow pipit, red grouse, golden plover.	A proportion of the site seems to have undergone a relatively recent hot burn as much of the bryophyte layer has been stripped away to bare peat. This appears to have happened since the Ap (Epoch 1). Vegetation: Typical blanket bog - Eriophorum vaginatum and Calluna vulgaris with E. angustifolium. Peat approx 2m deep.	Hagged and gullied peat - debatable whether this qualifies for bare peat category but seems to be a cross-over between the two as bare peat covers a considerable area. Vegetation: Mostly typical blanket bog - Eriophorum vaginatum and Calluna vulgaris with Empetrum nigrum and E. angustifolium. Some wet heath type vegetation with Erica tetralix and much less E. vaginatum. Peat approx 4m deep.

North Pennines Massif	North Pennines Massif	North Pennines Massif
Hagged	Burnt	Nothing
AB	AB	AB
22/04/09	22/04/09	21/04/09
18	17	16
389997	396834	390883
506347	511672	531306
B Bog & Dry H	B Bog	Ag/Fo G & Bracken
Very rare	Abundant	Occasional
0.35	>1.00	0.30
>1.00	>1.00	0.40
>1.00	>1.00	>1.00
0.78	1.00	0.57
No	No	No
Yes	No	No
H & G		
Eroding sides & Eroding sides & tops		
Peat		
Yes	No	No
25%		
15% eroding; 10% redeposited		
No	Yes	No
	Managed	
	Cool	
No	No	No
Light	Light	N/A
N/A	N/A	Moderate
No	Yes	Yes
AP misinterpretation		
This polygon should also have been assigned a 'bare' category. However, it is most referable to 'hagged/gullied' - though there is some cross-over as bare peat is a feature of both categories. Have estimated cover of bare peat here for completeness. Vegetation: Obviously, once blanket bog, now peat, has lost integrity and is very dry, dry heath (Calluna vulgaris, Empetrum nigrum, Bryophytes (not Sphagnum) and Cladonia (lichens)) has taken over. Eriophorum vaginatum hanging on in some places and some areas where E. angustifolium is dominant. Birds: Skylark, meadow pipit, curlew, golden plover, red grouse. Peat max depth 2.5m.	Definitely a burnt site but evidence of diminishing vigour, probably not burnt since Ap was flown. Vegetation: eriophorum vaginatum, Calluna vulgaris, sphagnum co-dominant. Some scattered patches of Juncus effusus together with J. squarrosus. Birds: Skylark, meadow pipit, curlew.	Vegetation: Eriophorum vaginatum remains abundant but Juncus squarrosus, Anthoxanthum odoratum, Galium saxatile, Rhytidiadelphus squarrosus invading and taking over. Bracken dominated area to W. 50% of sample. Birds: Curlew, snipe, raven.

North Pennines Massif	North Pennines Massif	North Pennines Massif
Hagged & Burnt	Bare Peat & Hagged	Bare Peat & Hagged
AB	AB	AB
22/04/09	22/04/09	22/04/09
21	20	19
381746	380915	381166
503278	503995	504654
B Bog & Dry H	B Bog & Dry H	B Bog & Dry H
Occasional to locally abundant	Rare to locally frequent	Frequent
0.80	>1.00	0.65
0.15	0.70	0.60
>1.00	>1.00	>1.00
0.65	0.90	0.75
No	No	No
Yes	Yes	Yes
G	H & G	H & G
Stable	Eroding sides and tops	Eroding sides & Eroding sides & tops
Revegetated redeposited peat	Peat & Revegetated redeposited peat	Peat & Revegetated redeposited peat
No	Yes	Yes
	20%	10%
	17.5% eroding, 2.5% redeposited	10% eroding
Yes	No	No
Managed		
Cool		
No	No	No
Light	Light	Light
Light	N/A	N/A
Yes	Yes	Yes
Hillside managed for grouse by rotational burning. Vegetation: Most recently burnt areas - Eriophorum vaginatum dominated. BB - Dry (Sphagnum frequent. Less recently burnt areas - dry heath dominated by Calluna vulgaris (Sphagnum - o). Gullies - some with much Sphagnum and E. vaginatum/E. angustifolium. Others with less sphagnum and more Polytrichum sp. + Juncus effusus/squarrosus. Birds: Curlew, meadow pipit, skylark, red grouse.	Again it is debatable if this site should be categorised as bare as this is implied to an extent, by the hagged/gullied category. There is certainly more bare peat here than at site 19, but slightly less than site 18. As with both these other sites, bare peat will continue to increase as the gully tops erode, and therefore the category should remain. Vegetation: As per Site 19. Gully tops dominated by Calluna and Empetrum nigrum and also Eriophorum angustifolium with only a small amount of E. vaginatum. Gully bottoms (where vegetated) with much E. vaginatum and E. angustifolium. Birds: Meadow pipit, skylark, lapwing, curlew, golden plover, red grouse, snipe.	It is debatable as to whether this site should be categorised as Bare. There is certainly an amount of bare peat present though this is implied by the 'Hagged/Gullied' category. On balance it should probably stay as a combination of these two categories as the amount of bare peat will only increase as the gully tops continue to erode. Vegetation: Gully tops relatively dry (as expected) dominated by Calluna and Empetrum nigrum with also a lot of Eriophorum angustifolium. E. vaginatum only dominant in wetter gully bottoms.

North York Moors NP	North York Moors NP	North York Moors NP
Bare Peat & Hagged	Peat Cutting	Burnt
JE	JE	JE
08/04/09	08/04/09	09/04/09
24	23	22
476260	470242	477858
501100	501410	512271
Dry H	Dry H	Ag/Fo G & Dry Heath
None	None	None
0.05	<0.05	0.15
0.10	<0.05	0.25
0.03	0.10	0.15
0.06	0.07	0.18
No	No	No
Yes	Yes	No
H	H & G	
Eroding sides	Eroding sides	
Peat & Bare mineral soil at base	Peat & Bare mineral soil at base	
Yes	Yes	No
Peat 70%; mineral soil 30%.	Peat 70%; Mineral soil 30%	
Eroding 100%	Eroding 100%	
No	No	Yes
		Managed
		Cool
No	No	No
Light	Light	Light
Light	Light	Light
Yes	No	Yes
	AP misinterpretation	
Expanse of bare peat c. 5-10cm deep worn away to mineral layer in places with many stones protruding. Only slight hagging occurring. Eroding sides but vegetation intact on tops. Cv 'clumps' remain scattered at the edges of bare areas. All Cv either mature or late mature. Tyre tracks through bare peat. Burning outside of the bare peat areas, mixture of ages, all cool burns. Good Cv regeneration in older burns with good moss cover and V. myrtillus regrowth. Newer burns show no signs of Cv regeneration as yet but only c. 2 years old at most recent burn.	Aerial photograph misinterpretation. Area of bare peat, down to mineral layer in places, with slight hagging and a 'one sided' gully formed where slow stream has eroded through peat down to mineral layer. Other side opens onto bare peat roughly same height as water flow. slight hagging at edges where bare peat area is expanding outwards.	Mosaic of burns c. 50x50m. Mixture of ages from 2009 to 2001. Older burns show limited Cv regeneration and so grasses dominate these areas. Majority of Cv is in mature phase. Most burns are cool, all leaving Cv stems. Cv (a), Agrostis capillaris (a), Juncus squarrosus (o), Festuca ovina, Hyp. jutlandicum (o), Erica tetralix (r), Empetrum nigrum (r). Grazing slightly increases towards road.

North Pennines Massif	North Pennines Massif	North Pennines Massif
Bare Peat	Gripped	Gripped & Burnt
JE	JE	JE
02/04/09	02/04/09	02/04/09
27	26	25
394282	396590	399530
496077	498298	499495
NS acid G	Ag/Fo G	NS acid G
None	Rare	Rare
0.10	0.25	0.20
<0.05	0.30	0.25
<0.05	0.45	0.20
0.07	0.33	0.22
No	Yes	Yes
	0.30	0.30
	Revegetating	Revegetating
No	No	No
Yes	No	No
70-80% Mineral soil		
No	No	Yes
		Managed
		Cool
No	No	No
N/A	N/A	N/A.
Light	Moderate	High
Yes	No	Yes
	Sample site heterogeneity	
No exposed peat, just areas of scree on gentle slopes and stone on flat areas. Nardus stricta (d), Juncus squarrosus (o), Hypnum jutlandicum (f).	In retrospect this was not a good sample site as it was too thin without an adequate buffer from the adjoining gripped area. The grips included in the sample are in the adjacent digitised polygon. Localised areas of standing water some with Sphagnum associated + deeper peat layer (S. fallax (f), S. palustre (o). Only found 1 x grip (30cm deep x 1m wide), mosses, grasses + Juncus infilling. Also one active, slow flowing stream to south of polygon. Many of farmer's tracks housing water.	Burns - old burns c. 4 years old. Cool, leaving moss layer + long heather stems. Vaccinium myrtillus regeneration (heavily grazed). Campylopus dominant moss with Polytrichum commune (f). Grazing by sheep & rabbits. Grips: Shallow c. 30cm deep x 1m wide. Dry revegetating with Cv, mosses & Agrostis + Nardus. Eastern half of polygon relatively recently burned and now acid grassland species dominant, while western side has evidence of older burns and good Cv regeneration (now in building phase).

Lake District NP	North Pennines Massif	North Pennines Massif
Gripped	Bare Peat	Bare Peat
AB	JE	JE
20/04/09	02/04/09	02/04/09
30	29	28
318426	396163	403336
494897	493774	496003
B Bog & Mc G	Dry H	NS acid G
Occasional to locally abundant	None	None
0.10	>1.00	0.30
0.25	>1.00	0.25
0.15	0.80	0.40
0.17	0.93	0.32
Yes	No	No
0.30		
Revegetating		
No	No	No
No	Yes	Yes
	15% peat	30% Mineral soil
	10% eroding	
No	Yes	Yes
	Managed	Managed
	Cool	Cool
No	No	No
N/A	Light	N/A
Light	N/A	High
Yes	No	No
	Change in burning regime	AP misinterpretation & change in burning regime
Only lightly gripped - enhancement of natural drainage really - several grips present in W of sample area. Vegetation: Molinia caerulea dominated hill slope with affinity to blanket bog type vegetation. E vaginatum (r), Narthecium ossifragum (o-fl), Vaccinium myrtillus (o), V. oxycoccos (r), Sphagnum (r-la), Trichophorum cespitosum (r). Birds: skylark, meadow pipit, raven.	Sample areas have c. 2 year old cool burns to east and west and a large area of exposed peat to south. Bare Area should be tighter. To east side of polygon, more exposed peat and hagging. Still vegetation (Cv on tops), checked area - burnt. Predominantly CV regenerating - Pioneering and Building. 1 x (50 x 100m) 2 year (ish) burn. No regenerating CV yet, it was a cool burn.	Peat layer is thin. Area near shooting huts is scattered with stones and down to mineral layer. One 1m x 1.5m area of vegetation cut down to 15cm exposing peat. No great areas of bare peat. Several managed burns within the polygon. All appear cool, having good Cv stems left and moss layer intact. Majority of Cv is building phase. AP show large old burn not bare peat.

Yorkshire Dales and Nidderdale	Yorkshire Dales and Nidderdale	Yorkshire Dales and Nidderdale	Lake District NP
Hagged	Gripped & Burnt	Gripped	Nothing
JE	JE	JE	AB
03/04/09	02/04/09	02/04/09	20/04/09
34	33	32	31
380651	377377	381061	325465
485841	491955	492147	486611
NS acid G	Dry H	NS acid G & Dry heath	Mc G
Locally frequent	Occasional	Frequent	Rare
0.70	0.50	0.75	0.15
>1.00	0.25	0.50	0.25
>1.00	0.50	0.80	0.20
0.90	0.42	0.68	0.20
No	Yes	Yes	No
	0.50	0.30	
	Revegetating	Revegetating	
Yes	No	No	No
H			
Eroding sides			
Peat			
Yes	No	No	No
10% peat			
<5% eroding			
No	Yes	No	No
	Managed		
	Cool		
No	No	No	No
N/A	Light	Light	N/A
High	Light	Light	Light
No	Yes	Yes	Yes
Features not visible at digitising scale			
Some evidence within sample area of undercut eroding, gully sides collapsing. Still vegetation tussocks standing within bare peat, although most of these are becoming mini haggs. Most haggs c. 50cm from peat to vegetated top.	Grips: Majority full of Sphagnum with Cv encroaching. Burns: All over 4 years old. Cv regenerating. Majority of Cv in polygon is building phase.	Northern half of polygon dominated by acid grassland species (Agrostis stolonifera, Nardus stricta, Juncus squarrosus). Southern half Cv and acid grassland co-dominant. Vaccinium myrtillus (r). Most grips almost filled with Sphagnum (S. fallax, S. palustre, S. cuspidatum) but still functioning.	Molinia dominated grassland being invaded by low growing scrub - Myrica gale. Sphagnum rare. Other associates include Carex panicea, C. nigra, Nardus stricta, Juncus conglomeratus.

Yorkshire Dales and Nidderdale	Yorkshire Dales and Nidderdale
Gripped & Burnt	Hagged
JE	JE
03/04/09	03/04/09
36	35
382809	378829
482847	483200
NS acid G	NS acid G
Locally frequent	Frequent
0.30	>1.00
0.50	>1.00
0.75	>1.00
0.52	1.00
Yes	No
30-50cm. Stony in places	
Half stable; half revegetating	
Yes	Yes
G	H
Eroding sides	Stable
Peat & Bare mineral soil at base	Peat
No	Yes
	<5 Peat
	<5% eroding
No	No
No	No
N/A	Light
Light	Light
No	No
Features not significant at digitising scale	Features not significant at digitising scale
Grips to north of polygon almost completely Sphagnum filled (50cm wide x 30cm deep). Sample area within fenced off gully with trees planted on gully slopes. Planting has been done to try and stabilise the gully sides as there has been some land slippage. Area should also have been possibly categorised as hagged/gullied. The gullies look like natural features? hard to decide what to do with them.	Dominated by Nardus & Agrostis, Eriophorum angustifolia (f); Juncus squarrosus (ff); Cv (f). Only v. slight hagging occurring. They appear stable. Some Eriophorum remains within open areas of peat. No area of bare peat larger than 1.5 x 2m.

Yorkshire Dales and Nidderdale	Yorkshire Dales and Nidderdale	Yorkshire Dales and Nidderdale
Nothing	Hagged	Hagged & Gripped
JE	JE	JE
09/04/09	03/04/09	03/04/09
39	38	37
410714	378786	372262
474701	480141	481378
Dry H	NS acid G	NS acid G
None	Occasional	Occasional
0.15	0.40	0.80
0.20	0.20	0.80
0.20	0.10	0.80
0.18	0.23	0.80
No	Yes	Yes
	0.15	0.60
	Revegetating	Stable
No	No	Yes
		H
		Eroding sides
		Peat
No	No	No
Yes	No	No
Managed		
Cool		
No	No	No
Light	N/A	N/A
Moderate	Light	Light
No	No	Yes
Change in burning regime	AP misinterpretation	
Beginning of mosaic of Cv burns. Oldest burn c. 4 years old. All burns were cool, leaving good Cv stems and moss layer intact. Each burn shows good Cv, Vaccinium myrtillus regeneration. Beginning of slight 'lawning' from grazing rabbits and sheep in grassier areas. Cv (d), V. Myrtillus (f), crowberry (o), Hypnum jutlandicum (f). AP used were Epoch 1 therefore before area was burnt but this is a small area unburnt on the AP in burnt landscape, should not have been ID as separate from the surrounding burnt area really.	No peat haggs present. Several old grips (at least 4) which are almost fully revegetated. Grips feed into stream running c. east-west feeding into Gayle Beck (Grips c. 50cm wide x 10-20cm deep). Some areas along grips have eroded back years ago, but now stable and revegetated. This may have looked like gullying/hagging, shallow peat gives more texture to AP and patchy veg rather than hagging.	Area is gripped, with all grips blocked with peat. Hagging must have been seen, where the areas of peat were removed for the blocks. Almost all areas where peat was removed are all revegetated. Grips c. 1.2-2m wide x 60cm deep. Tops of grip blocks vegetated having taken peat layer and vegetation for block. Hagging: One small area of hagging between 2 grips. Could be where water is finding its way around the edge of a grip block. c. 80cm from vegetation top to peat base. One large unblocked grip to west of polygon towards road c. 1m wide x 1m deep (1.5m deep in places). Down to mineral. Active stream flowing. Sample not representative of whole polygon but category OK.

Yorkshire Dales and Nidderdale	Yorkshire Dales and Nidderdale	Yorkshire Dales and Nidderdale
Burnt	Burnt	Hagged & Burnt
JE	JE	JE
09/04/09	09/04/09	09/04/09
42	41	40
413664	417771	415727
455999	467140	474114
Dry H	Dry H	Dry H
Occasional	None	None
>1.00	0.10	>1.00
0.50	0.10	>1.00
0.50	0.20	>1.00
0.67	0.13	1.00
Yes	No	No
0.25		
Revegetating		
No	No	Yes
		H & G
		Eroding sides
		Peat
No	No	Yes. Peat pools
		<10%
		Eroding 100%
Yes	Yes	Yes
Managed	Managed	Managed
Cool	Cool	Hot & Cool
No	No	No
Light	Light	Light
Light	Light	Light
No	Yes	No
AP misinterpretation		Features not visible at digitising scale
Burns: Only evidence of recent burns around sample area. c. 100x100 max burn site. Cool burns. Older burns (+ 4 years) to south close to road. These have been slightly hotter. Shorter Cv stems and less intact moss layer. Tendency for Juncus invasion in burnt areas. Cv (d), Juncus (a), Trichophorum cespitosum (f), Hypnum jutlandicum (f), Polytrichum commune. Grips: c. 50cm wide x 25cm deep (at deepest point). At least 4 grips on the site. Both retaining water. Highly vegetated with Juncus and Polytrichum commune. Very difficult to see on site apart from rows of Juncus! Easily missed on aerial photo and also burnt to edges of grips so mistaken as edges of burns rather than grips. Majority of the grips seen, run north-east to south-west.	Managed cool burns c 50x50m leaving Cv stems, although majority of moss regrowth appears to be Campylopus. Good Vaccinium myrtillus and Cv regrowth. Increased grazing at edges by rabbits.	Burns: New burns have been cooler leaving Cv stems. However, older burns (+ 4 years) have been hot, leaving no/short (c.5cm) Cv stems. No regeneration of Cv in these areas. Predominantly Campylopus regrowth. Peat Pools: Scattered throughout the plateaux where the sample site is located, no bigger than 2mx2m. Some are dry, leaving exposed bare peat, while most are wet. Most free of vegetation. Hagging: Only associated with slight stream which borders the north around to the south-east of the sample area. eroding side, continuing to erode.

Forest of Bowland AONB	Forest of Bowland AONB	Forest of Bowland AONB
Gripped & Burnt	Hagged & Burnt	Peat Cutting
AB	AB	AB
07/04/09	07/04/09	07/04/09
45	44	43
360213	355794	363933
453412	458702	464320
Dry H	Dry H	B Bog
Occasional -locally abundant (in grips)	None	Frequent -locally dominant
0.40	0.00	>1.00
0.75	0.15	>1.00
0.80	0.90	>1.00
0.65	0.35	1.00
Yes	No	Yes
0.40		0.30
Eroding & revegetating		Stable & eroding &
No	Yes	No
	H & G	
	Eroding sides	
	Peat & Bare mineral soil at base	
No	Yes	Yes
	Peat 10%; Mineral soil 5%	Peat 2%
	Eroding 100%; 50% redeposited	Eroding 2%; redeposited 2%
Yes	Yes	Yes
Managed	Wildfire	Wildfire
Cool	Hot ?	Hot ?
No	No	No
Light	Light	Light
Light	N/A	N/A
Yes	No	No
	AP misinterpretation	AP misinterpretation
Dry heath probably derived from blanket bog through drainage and repeated burning. Centre of sample site burnt c. 5-10 years ago, other patches burnt more recently. Vegetation: Calluna vulgaris dominant with Vaccinium myrtillus. Eriophorum Vaginatum still frequent as tussocks but few other typical blanket bog species: Erica tetralix (la), sphagnum abundant in some gripps otherwise occasional. Birds: Meadow pipit, Curlew. Rabbits on site.	The Bare category should have been assigned to this polygon too. Area of eroded peat on top of fell. Grey areas on air photo are gritstone blocks c. 0.5mx0.5m in size. Erosion as a result of fire damage and then severe action of weather due to exposed position. Vegetation: Calluna vulgaris dominant with Vaccinium myrtillus sub-dominant. Cladonia lichens present on exposed sides of haggs/gullies. Typical range of moss present. Questionable as to whether the burn on air photos is really rotational or wildfire but area is at the edge of a rotationally burnt area of moor. Birds: Meadow pipit, red grouse.	It seems as though this site was given the wrong category, it was recorded as a possible peat cutting site. It appears that the site was subject to a quite severe fire which stripped away much of the vegetation to leave the moss layer and sparse tussocks of Trichophorum and Eriophorum vaginatum + Sphagnum in wetter areas. The short tussocky vegetation and wetness of site has meant it is highly favoured by breeding waders. Birds: Lapwing (a), oyster catcher, snipe, curlew, mallard.

South Pennines	South Pennines	South Pennines
Peat Cutting	Gripped & Burnt	Hagged & Gripped
GJH	GJH	GJH
21/04/09	21/04/09	21/04/09
48	47	46
401323	393887	391712
432755	433459	434300
B Bog	Dry H	B Bog
Rare	Frequent - in vegetated gullies	None
>1.50	>1.50	>1.00
>1.50	>1.50	>1.00
>1.50	>1.50	>1.00
1.50	1.50	1.00
No	No	No
Yes	Yes	Yes
H	G	H & G
Eroding sides	Stable	Eroding sides
Peat	Peat	Bare mineral soil at base
Yes	No	No
10%		
50% eroding, 50% redeposited		
No	No	No
	Managed	
	Cool	
No	No	No
N/A	Light	Light
N/A	N/A	Light
No	No	No
AP misinterpretation	AP misinterpretation	Sample site heterogeneity
No evidence of peat cutting. Patches of bare peat with Eriophorum angustifolium colonisation. Predominantly Eriophorum vaginatum tussocks and hagged edges. The lines visible on the AP are not visible on the ground. There are areas of bare peat possibly peat pans which must have been what was misinterpreted as peat cuts.	Managed heather burn - approx. 4 years since burn. Vegetated gullies 4m wide x 1m deep with Sphagnum and purple moor-grass. No gripping visible on the AP should possibly have been classified as Hagged/Gullied and burnt but border line site for this category. Major feature is burning adjacent polygon Burnt & gripped.	More hagged than rest of polygon with deeper gullies. Less Eriophorum angustifolium than elsewhere. (Some bilberry, but very little). No grips evident on the ground in the sample site some minor gripping elsewhere in polygon.

South Pennines	South Pennines	South Pennines	South Pennines
Hagged & Burnt	Nothing	Bare Peat	Bare Peat & Hagged
GJH	GJH	JE	GJH
21/04/09	21/04/09	23/04/09	21/04/09
52	51	50	49
396639	398521	374359	401164
418036	419685	423721	432275
B Bog	B Bog & Dry H	Ag/Fo G	B Bog
Rare	None	None	Rare
>1.00	>1.00	>1.00	0.50
>1.00	>1.00	>1.00	0.10
>1.00	>1.00	>1.00	0.05
1.00	1.00	1.00	0.22
No	No	No	No
Yes	No	No	Yes
H			H
Eroding sides			Eroding sides & tops
Peat			Revegetated redeposited peat
No	No	Yes	Yes
		<10% peat; 0% mineral soil	20% peat; 5% mineral soil
		100% eroding	50% eroding; 50% redeposited
Yes	No	No	No
Managed			
Cool			
No	No	No	No
N/A	Light	N/A	Light
Light	Light	Light	Light
Yes	Yes	Yes	Yes
Some soft-rush and rare Sphagnum. Molinia dominant. The hagging is the edge of the peat block rather than small pedestals of peat.	Calluna dominant. Patches of Molinia.	Grass dominated. Bare peat occurring in patches where water pools on the surface and dries out over spring/summer months.	Severely hagged. Original peat depth approx. 1m to mineral substrate. Bare and redeposited peat with some Eriophorum angustifolium recolonisation. Pedestals with old woody Calluna vulgaris predominant.

South Pennines	South Pennines	South Pennines
Hagged	Bare Peat	Bare Peat
GJH	JE	GJH
22/04/09	23/04/09	21/04/09
55	54	53
400902	365096	396639
413936	415640	418036
NS acid G	Ag/Fo G	Mc G
Rare	Occasional	Rare
>1.00	0.85	0.25
>1.00	>1m	0.25
>1.00	>1m	0.25
1.00	0.95	0.25
No	No	No
Yes	No	Yes
H & G		H
Eroding sides & tops		Eroding sides & tops
Peat		Bare mineral soil at base
Yes	Yes	Yes
30% peat	<3% peat; 0% mineral soil	60% peat; 5% mineral soil
60% eroding; 40% redeposited	3% eroding	100% eroding
Yes	No	No
Wildlife		
Hot		
No	No	No
Light	N/A	Light
N/A	Moderate	Light
Yes	Yes	No
		Features not significant at digitising scale
Burned remnants of heather - no regeneration yet. Short Eriophorum angustifolium regeneration + some (but very little) Vaccinium myrtillus (bilberry). Grassland dominates. Recent large wildfire affected site winter 08/09.	Majority of bare peat appears to be from poaching by cattle. No sign of cattle on the site at time of survey although sheep present to south.	Extensive areas of bare peat. There are different heights of the peat where erosion or fire has removed the vegetation and peat. Not typical hagging but an erosion feature therefore classified as such. Much less hagged than site to north on AP. Eriophorum angustifolium recolonisation on bare peat areas. Molinia dominant.

Peak District NP	Peak District NP	Peak District NP
Bare Peat & Hagged	Hagged & Gripped	Hagged
GJH	GJH	GJH
22/04/09	23/04/09	22/04/09
58	57	56
405107	407211	408124
405842	406351	408528
B Bog	B Bog	Dry H
None	Rare	None
>1.50	>1.50	>1.50
>1.50	>1.50	>1.50
>1.50	>1.50	>1.50
1.50	1.50	1.50
No	Yes	No
	0.75	
	Revegetating	
Yes	Yes	Yes
H & G	G	H & G
Eroding sides	Eroding sides	Eroding sides
Peat	Revegetated redeposited peat	Revegetated redeposited peat
Yes	No	Yes
20% peat		20% peat; 3% mineral soil
80% eroding; 20% redeposited.		80% eroding; 20% redeposited
No	No	No
No	No	No
N/A	N/A	N/A
N/A	N/A	N/A
Yes	Yes	No
		Features not significant at digitising scale
Extensively hagged and gullied. V. deep peat apparent in gullies. Small number of pedestals. Eriophorum angustifolium recolonisation apparent. Peat frequently 3m plus.	Grips largely vegetated and in large-scale herringbone, well spaced, some heather but largely cottongrasses. Elsewhere in polygon there are some haggs as well as gullies and small amounts of Bare peat but would not be significant at digitising scale. Large polygon with heterogeneity. Peat approx 2m plus.	Calluna dominant. Recolonisation of peat by Eriophorum angustifolium.

Peak District NP	Peak District NP	Peak District NP	Peak District NP
Bare Peat & Hagged	Hagged & Burnt	Bare Peat	Burnt
KL	KL	KL	GJH
26/03/09	26/03/09	26/03/09	23/04/09
62	61	60	59
407247	406933	407173	416637
392831	392240	393676	400801
Dry H	Dry H	Dry H	Dry H
None	Rare	None	None
>1.50	0.80	>1.50	>1.50
>1.50	0.60	>1.50	>1.50
0.90	0.30	>1.50	>1.50
1.30	0.57	1.50	1.50
No	No	No	No
Yes	Yes	Yes	No
H & G	G	H & G	
Eroding sides and tops	Eroding sides	Eroding sides & tops	
Peat	Bare mineral soil at base	Peat	
Y	No	Yes	No
Peat 15%		Peat 60%	
100% eroding		Eroding 95%; redeposited 5%	
No	Yes	No	Yes
	Managed		Managed
	Cool		Cool
No	No	No	No
Light	Light	Light	N/A
N/A	N/A	N/A	N/A
Yes	Yes	No	Yes
		Features not visible at digitising scale	
Poor sample of large polygon. Some areas with much bare peat than sample area. Cv dominant. Dry - no running water in this sample.	Sample is very atypical - site heterogeneity. Little burnt in survey area. Gully potentially natural to stream - but probably encouraged by burning and sudden runoff from bare ground when newly burnt.	Peat pipes across the area have caved in in places so open water see. Burns are close by but not in damaged areas. Cv (d), Vm (f) En (ff)	Managed moorland.

Peak District NP	Peak District NP
Gripped	Burnt
KL	KL
01/04/09	26/03/09
64	63
400341	427200
376572	378001
Dry H	Dry H
None	Rare - locally occasional
>1.50	0.12
>1.50	0.15
>1.50	0.30
1.50	0.19
Yes	No
1.00-1.50	
Revegetating	
Yes	No
G	
Stable	
Revegetated mineral soil; revegetated redeposited peat.	
No	No
Yes	Yes
Managed	Managed
Cool	Cool
No	No
Light	Moderate
Light	High
No	Yes
Change in burning regime & features not significant at digitising scale	
Change of management to include burning of heather. Cv/Vm dominated plus cottongrasses. Should be BB vegetation but modified to dry heath. Dead tree stumps and trunks in area. Some newly fenced exclosures, possibly to allow tree regeneration. Grips are old and look more gully like on ground, well vegetated - slopes and bases. Previous slumps have provided blocks and narrow points which 'bends' grips more. Depth hard to estimate, not obvious with no clear peat exposure. Gullies very infrequent.	Cv dominant with Vm and En frequent , Mc occasional, Df, Fo , Ns all locally occasional. Some cottongrasses too. Very dry shallow peat over gritstone. Old, leggy heather and still grazed. Some small gullies/runnels under heather and largely unseen under the vegetation, but no restoration required. Not intensively burnt and occasional some heather is cut.

Dartmoor NP	Exmoor NP	Exmoor NP	Exmoor NP	Exmoor NP	Peak District NP
Nothing	Peat Cutting	Peat Cutting	Peat Cutting	Peat Cutting	Gripped & Burnt
MS	MS	MS	MS	MS	KL
16/04/09	15/04/09	15/04/09	15/04/09	15/04/09	01/04/09
70	69	68	67	66	65
2702	2728	2796	2762	2764	402009
829	1406	1412	1428	1433	370386
V Mire	B Bog	B Bog	Mc G	Wet H	B Bog/Dry H
Abundant	Abundant	Abundant	Occasional	Abundant	Rare
0.45	0.75	0.35	0.75	0.40	>1.50
0.35	0.87	0.30	0.65	0.45	>1.50
0.60	0.94	0.49	0.50	0.50	>1.50
0.47	0.85	0.38	0.63	0.45	1.50
No	No	No	No	No	Yes
					<0.50
					Revegetating
No	No	No	No	No	Yes
					G
					Eroding sides
					Peat
No	No	No	No	No	No
No	No	No	No	No	Yes
					Managed
					Cool
No	Yes	Yes	Yes	Yes	No
	90	50	75	80	
	0.63	0.27	0.25	0.22	
Light	Moderate	Light	N/A	Light	Light
Light	Light	Light	Light	Light	N/A
Yes	Yes	Yes	Yes	Yes	No
					Features not significant at digitising scale
Site contained limited conservation burning of western gorse.					Grips have recently been blocked and reprofiled so depth and width of grips hard to assess, currently <50cm from surface + 2m wide from reprofiled edges. Holding water and containing peat sediment. Surrounding vegetation is cottongrass and heather dominant. No blocking of gullies! although gullies present, few, and minor effect on area. Not classed as hagged from AP as too few to warrant this category.