Predicting the impact of wind farm developments upon blanket bog habitat: approach and professional standards in the case of the controversial proposed Lewis Wind Farm

by Tom Dargie, CEnv MIEEM

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The version here includes a small number of changes to clarify confused text in the IMCG version resulting from edits hampered by a tight deadline. The changes are highlighted in yellow and the original text is retained but in struck out form.

Predicting the impact of wind farm developments upon blanket bog habitat: approach and professional standards in the case of the controversial proposed Lewis Wind Farm

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Summary

In this article I defend my work undertaken on peatland habitats for the proposed Lewis Wind Farm development. This work has been attacked by the Royal Society for the Protection of Birds and their objections were used by the Scottish Wildlife Trust and IMCG. This paper shows how these attacks were flawed and often based on questionable professional standards.

Background

The proposal for a very large windfarm located predominantly on blanket bog within the Lewis Peatlands SPA/Ramsar site, the second largest area of peatland in Britain, was bound to be highly controversial from the outset, given its location within nature conservation designations of international importance.

The Lewis Wind Farm development has changed since the original application in 2004 (234 turbines, 170 km of road plus other infrastructure), shrinking to 181 turbines and 141 km of road plus other infrastucture in a revised 2006 layout, with a further required reduction to 176 turbines coming as a condition of local planning approval by Western Isles Council in 2007. The application is currently being considered by the Scottish Government in terms of approval, rejection or public inquiry. Approval is likely to be challenged in the European Court.

Strong objections on various environmental grounds have been made by many organisations and individuals, including Scottish Natural Heritage (SNH) as statutory advisor to the Scottish Government. The main focus of concern has been on bird impacts but work on habitats for the 2004 and 2006 versions of the Environmental Statement (ES) has been particularly attacked by the Royal Society for the Protection of Birds (RSPB), with Richard Lindsay of IMCG as its peatland expert. Other organisations have based their habitat objections on this material, including the Scottish Wildlife Trust and the IMCG.

As examples of the degree of concern, the IMCG 2007 letter of objection to the Scottish Government describes the ES approach to peatland issues as:

- based on information which is ill-prepared;
- uses an approach which is ill-conceived and naïve;
- adopts highly-questionable positions on various ecological issues;
- favours a minimalist view of impact evaluation, instead of identifying the realistic scale and extent of combined impacts.

This is strong stuff.

My group was responsible for habitat work in the Lewis Wind Farm ES and I reject most if not all of the criticism directed at it. Actually, when comparing the criticism with ES material, published literature and official guidance and using an evidence-based approach, many very serious flaws are identified in the counterarguments to our case.

This article considers a few key contentious issues in the Lewis debate, set in the wider context of blanket bog hydrology, baseline survey, ecological assessment, monitoring and site management during construction and operation of a wind farm upon blanket bog. It might contribute towards the emerging themes for the forthcoming IMCG symposium in Santiago de Compostela, particularly the formulation of wise use guidelines for wind farms sited on present or past blanket bog (e.g. afforested bog).

Four (of many) bones of contention

1 Habitat and hydrology work for the LWF ES

Habitat survey was undertaken in 2002 and 2003 over an area of almost 25,000 ha in the northern Lewis Peatlands (Fig. 1), based on an approach agreed in advance with SNH under scoping discussion. Air photos were used in the field to divide the area into >5,000 polygons, each described using a microtopographic framework which allowed recording of vegetation types, extent, structure, erosion and peatland condition using >50 attributes. A team of seven highly qualified field surveyors was trained to use this system. Their combined peatland experience extends over more than 100 years. Results were captured as a GIS database. In addition, a minimum of 5 quadrats (specified in an SNH brief) was recorded for each of the main vegetation types present, based on the UK National Vegetation Classification (NVC). Results were then used for ecological assessment, including an ecohydrological account of the eroded character of this part of the Lewis Peatlands. All of the above work was the responsibility of Boreas Ecology, led by me.

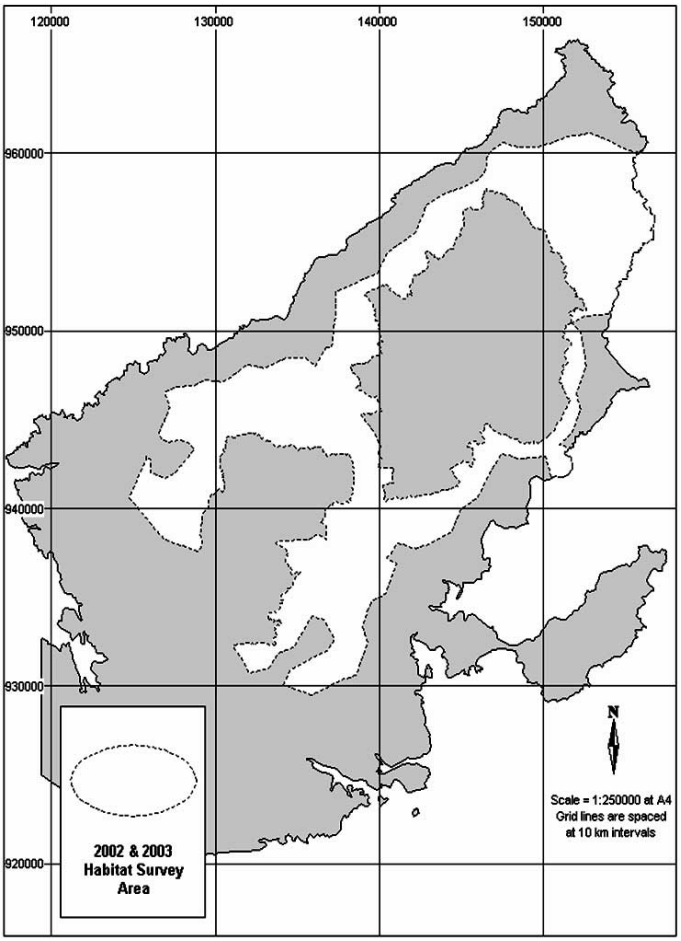

Figure 1: Part of the Isle of Lewis and Harris with the Lewis Windfarm Habitat Survey Area in white

A separate hydrological baseline and assessment covering >50,000 ha was undertaken in the same period and was based on a catchment approach. This work also covered issues of peatland erosion, water quality and a separate study on peatslide risk. These studies were the responsibility of Enviros Consulting Ltd.

There was liaison in the assessment phase between the two sets of studies and habitat GIS data were used as part of the hydrological work. Habitat data were used to define areas of wet peatland, surrounding them with a 50 metre no-go buffer. This information was used by developers in designing the windfarm layout, avoiding the most sensitive habitats.

Criticism of our work fails to acknowledge the separate ES authorship of habitats and hydrology, the different sizes of ground used for assessment and the avoidance of sensitive habitats in the windfarm design. The criticism places much importance on ~~catchment based~~ hydromorphological methods for understanding peatland hydrology, undertaking hydrological assessments and protecting the integrity of peatlands. ~~Indeed~~ However, a catchment approach is recommended by the Ramsar Convention. Like all UK assessments by hydrology professionals our work has been catchment-based. What it does not do, however, is adhere to the formal hydromorphological methodology specified in UK guidance for the selection of land as peatland SSSIs (but neither does a major 1987-89 Nature Conservancy Council [NCC] survey of the Lewis Peatlands). In my opinion this formal method is not necessary. It is misrepresented as a well-applied field technique. It has in fact been rarely used, even for its main purpose (designation of UK SSSIs). It is unproven as a framework for hydrological assessment as part of a major development ES.

2 The identification of blanket bog vegetation types

The ES habitat survey concluded that dry peatland conditions were dominant in this sector of the northern Lewis Peatlands. Three NVC vegetation types (M17b dry blanket bog, M15c wet heath, H10b dry heath) were found to be the most extensive, making up almost 60% of the survey area. Wetter NVC blanket bog types (e.g. M1 bog pool, M17a wet blanket bog) make up only about 10% of survey ground, with *Sphagnum* cover (recorded if present for all polygons) estimated as only 12%. The largest extents of M1 bog pool vegetation are present in the floors of eroded peat gullies, particularly in two types of eroded ground categorised as either stable or regenerating. There is very little evidence in GIS data or additional notes for clear, rapid regeneration of eroded ground (cases exist but they make up only about 2% of the survey area). This contrast between extensive dry peatland surfaces and restricted wet blanket bog is illustrated in Figs 2 and 3.

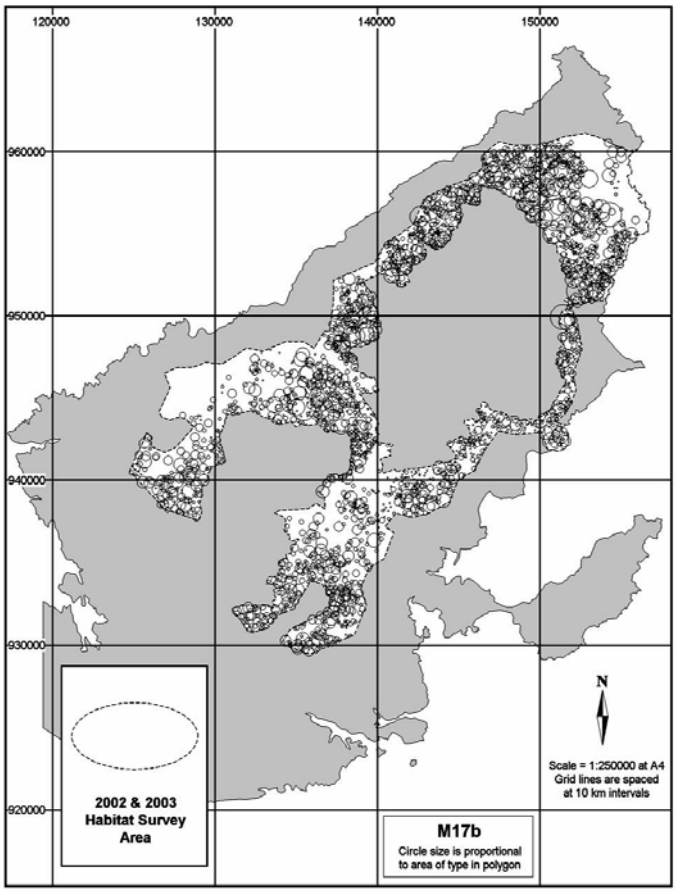

Figure 2 Distribution of dry blanket bog (M17b Scirpus cespitosus - Eriophorum vaginatum *mire,* Cladonia spp. *sub-community) Circles located at polygon centres containing this cover type. The largest circle represents a maximum polygon area of 53 ha for this cover type. Total M17b extent is 6236 ha.*

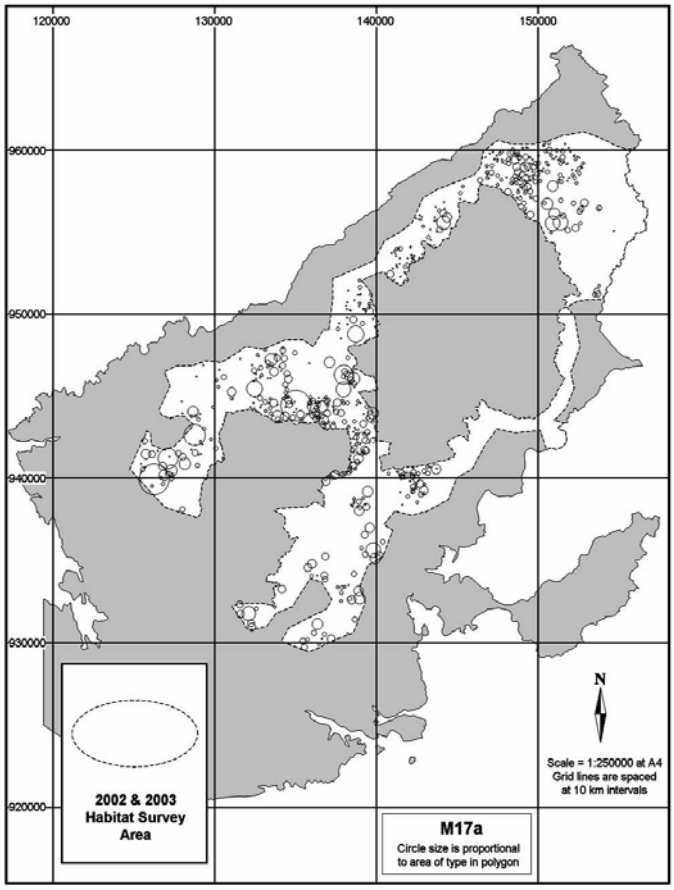

Figure 3 Distribution of wet blanket bog (M17a Scirpus cespitosus - Eriophorum vaginatum *mire,* Drosera rotundifolia - Sphagnum spp. *sub-community) Circles located at polygon centres containing this cover type. The largest circle represents a maximum polygon area of 26 ha for this cover type. Total M17a extent is 604 ha.*

These results of our ES have been refuted as an inaccurate summary of habitat conditions. It has been claimed that wet ground is much more extensive and furthermore that widespread peatland regeneration is present. This would mean that the Lewis Peatlands show a recent switch to wet conditions after thousands of years of erosion.

Our findings, however, are in line with earlier published NVC surveys of the northern Lewis Peatlands that also conclude that dry conditions are extensive or dominant. The earlier surveys include one by Hulme which was used by Rodwell for the published NVC description of Lewis conditions, ~~and which was also used in~~ as well as a major 1987-89 Nature Conservancy Council (NCC) survey of the Lewis Peatlands supervised by Richard Lindsay. Lindsay fails to quote this data in his recent work, however, in which he challenges our ES results.

It has been suggested that our conclusions are based on an insufficient number of quadrats and that our quadrat data show considerable mis-identification. We have, however, followed accepted standard procedures and our results are in line with earlier NVC descriptions of the site.

On the basis of "corrected" proportions, critics claim wet peatland to be much more extensive (e.g. M17a wet blanket bog is increased from 604 ha to 3722 ha) covering a 2-3 times larger area. These "corrected" proportions are based on a non-standard method of NVC assignment, however, which is a major deviation from recommended practice authored by Professor Rodwell and published by the Joint Nature Conservation Committee (JNCC). Applying this non-standard method to NVC surveys destroys the structural integrity of NVC data and could ultimately discredit the UK NVC system if it is applied more widely.

A quotation from respected independent NVC experts has been used to back up a claim that, contrary to our findings, H10b dry heath cannot be found on deep blanket bog peat. This quote is incorrect, however, and upon inviting their opinion, the quoted experts agree that H10b dry heath is present in Lewis Peatlands and Shetland peatland NVC surveys.

Findings and conclusions of a recent multi-proxy peatland stratigraphy study produced for SNH by a leading UK Quaternary scientist (Tony Stevenson) have been misrepresented to debunk our findings. We have addressed this issue in our rebuttal of the RSPB

report and I invite you to follow the link at the end of this article. It is too detailed and specialist an issue to deal with in this Newsletter article.

In our rebuttal of the RSPB report, we show that there is a very strong correlation between peatland quadrats and Ellenberg moisture scores. NVC quadrat sets from multiple vegetation surveys in Lewis Peatlands are significantly different and form a moisture continuum. We show that there has been a major change in the balance and location of vegetation types in the period between 1976 and 2003. This is interpreted as a regional drying pattern, suggesting that the Lewis Peatlands are indeed getting drier.

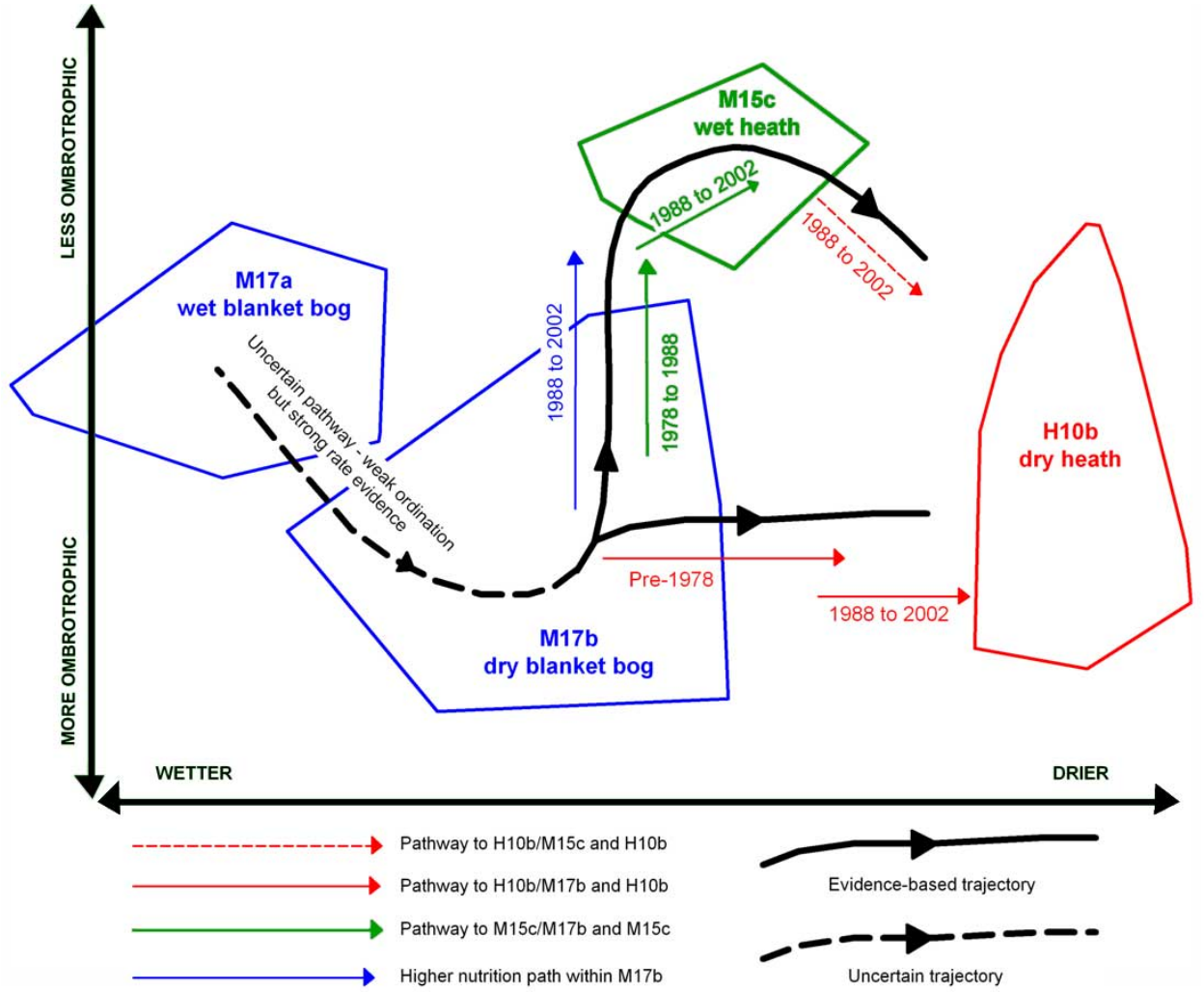

Figure 4 The Lewis Drying Hypothesis: possible pathways of vegetation change in the Lewis Peatlands over the past 3- 4 decades

3 Are the Lewis Peatlands getting wetter or drier?

The RSPB report (increasing wetness) and our findings (increasingly dry conditions) are diametrically ~~opposite~~ opposed. There is little evidence for the re-wetting assertions. A forthcoming report from the University of East London is promised to contain further evidence. That report has yet to be submitted to the Scottish Government.

In our rebuttal of the RSPB report, we look in detail at further evidence for the 'Lewis Drying Hypothesis'. We examined four NVC surveys covering the Lewis Peatlands between 1976 and 2002/2003, including the 1987-89 NCC study of Lindsay. It also considers two published remote sensing studies covering 1977 and 1992 Landsat images. Remote sensing work by Boreas Ecology is extended to a 2003 Landsat TM scene which is trained using ES and SNH Lewis Peatlands SAC surveys (the latter dated 2001/2). The results (Fig. 5) show dry peatland increasing over time at the expense of wet conditions. These results suggest that >600 ha of wet peatland are being converted to dry surface conditions on an annual basis. 2002 image analysis shows drying to be largely confined to the northern and central sectors of the Lewis Peatlands SPA/Ramsar site. This is interpreted as a 'dry shift' event, to use current palaeoenvironmental terms.

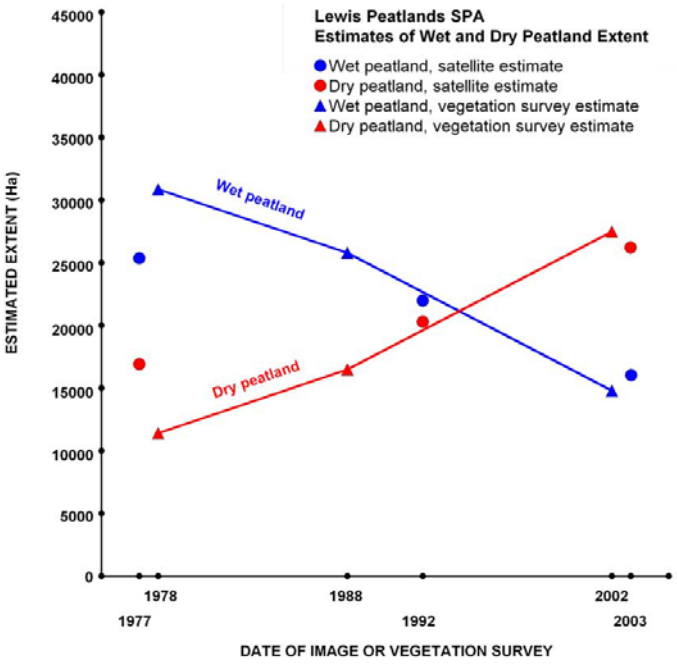

Figure 5 Trends in Lewis peatland wetness: validation of the Lewis Drying Hypothesis

The detailed mechanisms causing regional drying on such a scale are at present not understood. The ES and our RSPB rebuttal include speculative ideas concerning an evolving subterranean peat pipe network which might dewater wet ground rapidly. As yet, no work mapping peat pipe characteristics has been done on Lewis, although extensive recent work by Dr Joe Holden on UK blanket bog shows pipe densities which would fit North Lewis erosional conditions.

4 The distance of drainage effects on blanket bog

This issue is responsible for claims that the ES is minimalist in its assumptions of direct and indirect effects of development, underestimating the area of affected ground by up to a factor of 30 according to the RSPB report.

Assumptions in the ES are based on field observations on many eroded UK blanket bogs, which show that dry conditions are usually confined to within very short distances of drains or erosion gullies due to very limited drawdown.

Literature review of peatland vegetation and hydrology, especially on hydraulic conductivity, shows that it is very difficult indeed to drain a blanket bog using ditches. An important Dundee review shows that the hydraulic conductivity of blanket bog is much lower (by several orders of magnitude) than fen or raised bog peats. Dundee values are corroborated by Irish soil physics work and recent North Pennines work by Holden and Burt using compressible soil theory. Long-term Pennine observations by NCC staff on vegetation change around drains installed 40 years earlier show that drying effects rarely extend further than 10 metres and are usually much less.

The RSPB itself has published statements that most Flow Country ditches are not seriously affecting surrounding ground beyond about 2 metres of either side of a ditch. This has been confirmed by Boreas Ecology around old drainage ditches at Causeymire Wind Farm.

Boreas Ecology has carried out a year of confirmatory research using dipwell and piezometer transects at Farr Wind Farm during construction, mainly examining the effects of floating roads and deep excavations upon water levels and hydraulic conductivity, with water level results compared with control sets unaffected by infrastructure. This work is published as Appendix 11E in the Lewis 2006 ES Addendum. No serious effects were observed further than 10 metres and most were within 1 – 5 metres at most.

In contrast, critics of the ES often avoid reference to science, misrepresent, or casually dismiss it. This also lies at the basis of the claim that ES statements on effects are underestimated by a factor of 14 to 30. Firstly, the ES data are misquoted and ES assumptions on selection of buffer distances around infrastructure under worst-case and realistic scenarios are not addressed. Peatland ecohydrological research by Dr Kevin Gilman is casually dismissed. Secondly, citing a paper by Dan Boelter examining drawdown by ditches in two lacustrine peat basins in North America (both with a mature black spruce cover, i.e. not comparable with the Lewis situation), Boelter's observational distance (50 metres) is misquoted as 200 metres. Based on this misquote, the assumption is made that drawdown and drying (wastage) effects will occur over 250 metres.

Thirdly, an unrepresentative case study, Holme Fen Post[1] is used to indicate the scale of peat wastage by drying and oxidation. Our modelling work on ditch drawdown shows that this raised bog peat (in a dry climate with deep ditching and water pumping) is likely to exaggerate Lewis oxidation losses by a factor of at least 1000.

North Lewis windfarm impacts versus recent and ongoing habitat change on blanket bog – which is more serious?

To conclude, it is possible to use our ES and rebuttal material to compare the windfarm effects on habitats (2007 ES figures, Realistic Impacts Scenario) with other major UK blanket bog losses and habitat change identified via the Lewis Drying Hypothesis.

The wind farm development will:

- destroy 266 ha of blanket bog
- damage 275 ha of ground which should largely recover via succession mainly as relatively dry blanket bog

[1] a cast-iron column that was sunk into Holme Fen till its top was level with the peat surface in 1852. It now rises more than 5 m above ground level.

- change a further 280 ha of ground beyond ditches and disturbance due to changes in hydrology; this area will still remain as blanket bog.

We consider the above figures precautionary and change due to damage and altered hydrology will likely be notably lower. In the long term, 20 years after de-commissioning with the roads left in place, total habitat loss might only be around 300 ha. This is a significant amount within an international conservation site, but is also a relatively small footprint for what is a very large peatland (58,984 ha). The international site is not notified for its peatland habitat interest under EC SPA or Ramsar citations. The long term structure and function of the peatland habitats is not under threat.

Compare that level of loss and long term threat to overall loss of blanket peat in Scotland using published SNH data (41% in the period 1947-88, perhaps 4% of the world resource, amounting to perhaps 400,000 ha), mainly due to afforestation. There has been no significant change in peatland loss in Scotland since the Flow Country battle was won in the late 1980s.

The wind farm long-term losses also represent only half of the annual change from wet to dry peatland, as derived from the Lewis Drying Hypothesis. As part of this switch the Lewis Peatlands are probably now no longer a carbon sink but are a likely source as widespread natural drying steadily removes active blanket bog surfaces.

In short, we think that the proposed development will have a significant but only slight negative influence on blanket bog habitat.

References

The following web sources contain the key documents covered in this document:

- Lewis Wind Farm Environmental Statement, particularly Chapter 11 Habitats (including four appendices, 11A, 11B, 11C and 11D) and the Baseline Habitats Survey which is included as a Technical Report. There is also relevant material in Chapter 18 Carbon Savings. Together, these comprise my contributions to the ES. In addition there is a further Chapter 11 Habitats (including five appendices, 11A, 11B, 11C, 11D, 11E) in the LWP 2006 Addendum. These sources can be obtained at http://www.lewiswind.com/application/environment
- Lindsay (2005) Lewis Wind Farm Proposals - observations on the official Environmental Impact Statement. http://tinyurl.com/2o9ymb RSPB Scotland Objection Letter, Annex 1, January 2007: http://tinyurl.com/37qag7.
- Lindsay (2007) RSPB Scotland Objection Letter, Annex 1, January 2007: Appendix 1 Comments on (LWP 2006) Addendum to the Environmental Statement: http://tinyurl.com/38rvu2.
- The Boreas rebuttal of Lindsay work for RSPB, together with a recent but out-of-date paper on wind farm impacts on peatland: http://www.boreasecology.com

Acknowledgements

I would like to thank Hans Joosten for the invitation to make this defence of Lewis Wind Farm work on habitats. John Couwenberg edited and much-improved a draft version. Research is continuing and I hope to present a fuller version of this article as a paper at the Santiago de Compostela meeting in late April.

About the author

Tom Dargie, CEnv MIEEM is Senior Partner of Boreas Ecology and Peatland Habitats Adviser to Lewis Wind Power and Npower Renewables.

He has campaigned, researched and advised on UK peatlands over 37 years, particularly for Thorne Waste where in 1972, as a member of the "Bunting Beavers", he helped build dams in new deep drains threatening the best remaining habitats with active bog in old peat cuttings and extraction canals. That work led the UK Nature Conservancy Council, reluctantly, to declare a small SSSI which over time has produced a National Nature Reserve and SSSI/SAC/SPA/Ramsar status for very large areas of the remaining Humberhead Peatlands. He has continued work on this site and is responsible for three quinquennial surveys of re-wetting indicators for English Nature. He has contributed several ES chapters on habitats to windfarm developments on blanket bog and over the past 10 years has acted as Project Ecologist for three large windfarm construction and monitoring projects in Scotland involving 95 turbines and over 30 km of floating road at Novar (Ross-shire), Causeymire (Flow Country, Caithness) and Farr (Monadhliath Mountains, Inverness-shire).

For the record, Tom Dargie has, from the outset of involvement in 2001, advised Lewis Wind Power (a consortium of AMEC Wind and British Energy) to abandon the Lewis proposal due to the international conservation status of most of the site and a low likelihood of approval under European law. However, as Prime Minister Margaret Thatcher once said, advisers can only advise.