Extended abstract No: 390

WISE PEATLAND CHOICES - A GIS BASED TOOL TO PRIORITISE RESTORATION OPPORTUNITIES ON THE PEATLANDS OF SCOTLAND

Rebekka R.E. Artz (JHI); David D. Donnelly (JHI); Stephen J. Chapman (JHI); Matt Aitkenhead (JHI); Roger Cummins (JHI); Jo Smith (UoA); Pete Smith (UoA); Clifton Bain (IUCN) and Andrew Coupar (SNH)

JHI - The James Hutton Institute, Ecol. Science, Craigiebuckler, Aberdeen, AB15 8QH, UK. +44 1224 395317, E-mail: rebekka.artz@hutton.ac.uk
UoA – University of Aberdeen, St Machar Drive, Aberdeen, AB24 3UU, UK.
IUCN - International Union for Conservation of Nature UK Peatland Programme, c/o Harbourside House, 110 Commercial Street, Edinburgh, EH6 6NF, UK.

SNH – Scottish Natural Heritage, Great Glen House, Inverness, IV3 8NW, UK

SUMMARY

Under the UK Biodiversity Action Plan, there is a requirement to aid the restoration of 600,000 hectares of peatlands in Scotland. Many of the Scottish peatlands are in poor condition, at least 50% of the blanket bog and over 90% of the raised bog resource has been damaged by poor management practices. We are developing a decision support tool, based on engagement with the stakeholder community and underpinned by national data of carbon stocks, habitat condition and future climatic scenario modelling, to enable policy makers and land managers to obtain the best possible information on where such habitat restoration could be most optimally employed.

KEYWORDS: peatlands, decision making tool, policy, GIS, restoration

INTRODUCTION

The blanket bogs and raised bogs in Scotland are a globally important resource and are protected under the EU Habitats Directive Annex I and hence are included in the UK Biodiversity Action Plan (UK BAP) as a Priority Habitat. The UK BAP has a target for blanket bog restoration, of which Scotland's share is around 600,000 hectares. Although the primary aim of UK BAP is to stop loss of biodiversity, it is thought that this target area of restored peatland could deliver up to 0.3 million tonnes in C savings per annum. This would be equivalent to the estimated carbon savings from planned woodland expansion. It is clear that substantial carbon savings or even offset potential are available through the restoration or wise management of the Scottish blanket bog resource, to enable Scotland to meet its targets for carbon emissions reduction (as set by the Kyoto agreement), and its aims to halt the loss of biodiversity (through the EU Biodiversity strategy). Annex 1 of the EC Habitats Directive also includes two lowland raised bog habitats. The active raised bog category is afforded

priority habitat status and includes areas which still support a significant area of vegetation that is normally peat forming. Degraded raised bogs that are still capable of regeneration are regarded as areas where there has been widespread disruption to the hydrology of the peat body, leading to pronounced surface desiccation or peat wastage and the loss of species or changes to the composition of species assemblages. The current target is to maintain the extent of existing raised bogs (13,000 ha) and to achieve favourable condition of those areas which have been damaged but still retain nature conservation interest (ie primary degraded and drained) through restoration measures (13,000 ha by 2020). Although smaller in extent, raised bogs can contain very large carbon stores on account of their more extensive depth and can hence also contribute to substantial carbon savings. Where possibilities to pursue carbon abatement options or options to enhance site biodiversity through restoration or management practices exist, these should be encouraged. To enable policy makers, land owners and land managers in Scotland to assess the value of a given peatland area and the potential for targeted restoration measures, a framework for a GIS-based decision support tool was built through which priority areas for restoration can be identified.

MATERIALS AND METHODS

Data on peatland extent, location, site condition, carbon storage and climatic forecasts that were available at national level were structured against a set of proposed site selection criteria. These site selection criteria were identified by consensus during a participatory stakeholder meeting that included individuals that are employed in a position of a regulatory capacity, land managers, consultant ecologists, industry representatives, individuals involved in active restoration projects and academics. Following the collation of the available national information, a structure for a decision support tool was developed to enable objective assessments of priority areas for restoration to be made. Stakeholders were asked to assign their own relative importance to the 19 site selection criteria. The weights derived from these opinions were assigned to a multi-criteria analysis spreadsheet that could theoretically be used as a decision support tool during site selection prioritisation. This is currently being developed further by disaggregating GIS layers to relevant spatial resolution and weighting individual squares against the selection criteria, thus building a GIS layer of area scores for each criterion. During a second stakeholder survey, the available information at national scale was presented and stakeholders were asked for opinions on potential priority areas for restoration efforts. These, and other areas identified as candidates based on the available information against the site selection criteria that had objective information databases at a national scale, were included in a remote prioritisation exercise as well as a test of the draft decision support tool.

RESULTS

A major concern in any effort to objectively evaluate areas of land for their suitability to restoration efforts or changes in management is having a list of objective site selection criteria. These need to fulfil certain requirements. Ideally, they need to address mutually exclusive issues and they need to be sufficiently defined so that the evidence in relation to each individual criterion can be adequately assessed. Selection criteria are often agreed by consensus. During this project, the main stakeholder communities that hold an interest or authority in the management of blanket bogs were asked for input. Stakeholders ranged from individuals who are employed in a position of a regulatory capacity, land managers, consultant ecologists, industry representatives, individuals involved in active restoration projects and academics. At a stakeholder workshop on the 13th of January, 2011, participants were asked to draw up their ideal requirements for selection of a blanket bog site for restoration. This exercise was initially performed as a fast, carousel-style, brainstorming session under the five overarching themes. Participants were subsequently asked to condense the resulting long list of criteria to a shortlist containing no more than 5 or 6 criteria for site selection. The results of this exercise are shown in Table 1.

The available information at national scale for each of these 19 criteria was assessed in separate GIS layers. For certain criteria, several data types were available (e.g. Current type and condition of vegetation and other species assemblages). At present, such multiple data sources have been treated as additive evidence within each criterion, i.e. not weighted. An example of the type of information available is shown in Figure 1, which shows carbon storage in peatlands on an area basis. Some large areas that look particularly interesting from this point are the eastern parts of Caithness and Sutherland, as well as the Island of Lewis & Harris and the Shetland Isles.

The five major criteria and nineteen sub-criteria identified during the stakeholder workshop were used in an online survey to gather data on criterion weights. Stakeholders were asked to assign their relative importance to the criteria for the selection of potential restoration sites. The online survey was set up to rank the criteria in order of perceived importance against the objectives of maximising carbon and biodiversity benefits. Taking the weights of the arithmetic mean for these rankings, scores were calculated for each site selection criterion by normalising the weight of each individual, lower level, criterion against the weight of the top level criterion of its' group, thus obtaining scores that totalled 100 amongst the 19 criteria. This enabled development of the basic structure of a decision support tool based on this multi-criteria analysis. A simple scoring system was subsequently used to determine which areas would be relevant to investigate as potential priority areas in more detail, by overlaying the available GIS information for each relevant area and scoring these as low, medium, high, or unknown/not enough information, on each criterion. It is evident that much of the desired information is not currently available at a national level, hence the assessment of potential

Table 1. Suggested site selection criteria, reached by consensus at a stakeholder workshop

Top level criterion	Nested specific subcriteria within top level
Biological potential to maximise biodiversity and carbon sequestration	Current type and condition of vegetation and other species assemblages (e.g. birds, soil animals, microbes) Potential for functional blanket bog to regenerate under present and future climate Potential to be biologically connected to surrounding landscapes and biodiversity Conflicts with existing biodiversity that may arise from changes to other desired land uses (e.g. forest bird species vs. open bog species; development for renewables versus restoration)
Physical potential to maximise biodiversity and carbon sequestration	Level or rate of current physical degradation (i.e. erosion, extraction, hydrological condition) Ease of access or potential access issues Geophysical attributes: area/size/altitude and variation within site Peat type and depth
Site designation, existing monitoring or limitations in site status	Is there a site designation in place If non-designated, is monitoring in existence or are there existing historical data If non-designated, are there existing management option limitations or requirements for consents
Land use and management in relation to site potential	Sustainability of current and historic land use Existing management and/or guarantees for the future Timescale and deliverability of restoration efforts Is the site managed as a hydrological unit (i.e. is there a management plan for the entire catchment)
Funding and resources in relation to management potential	Conflicts in sources of income from current versus potential management (e.g. income from using site as a forestry enterprise versus restoration) Availability/eligibility/continuity of funding for restoration from the Scotland Rural Development Programme (SRDP) and other sources Would restoration offset other costs (e.g. water treatment costs) or create socio-economic benefits (e.g. rural jobs) Potential for partnerships (e.g. private companies, conservation groups and local population working together)

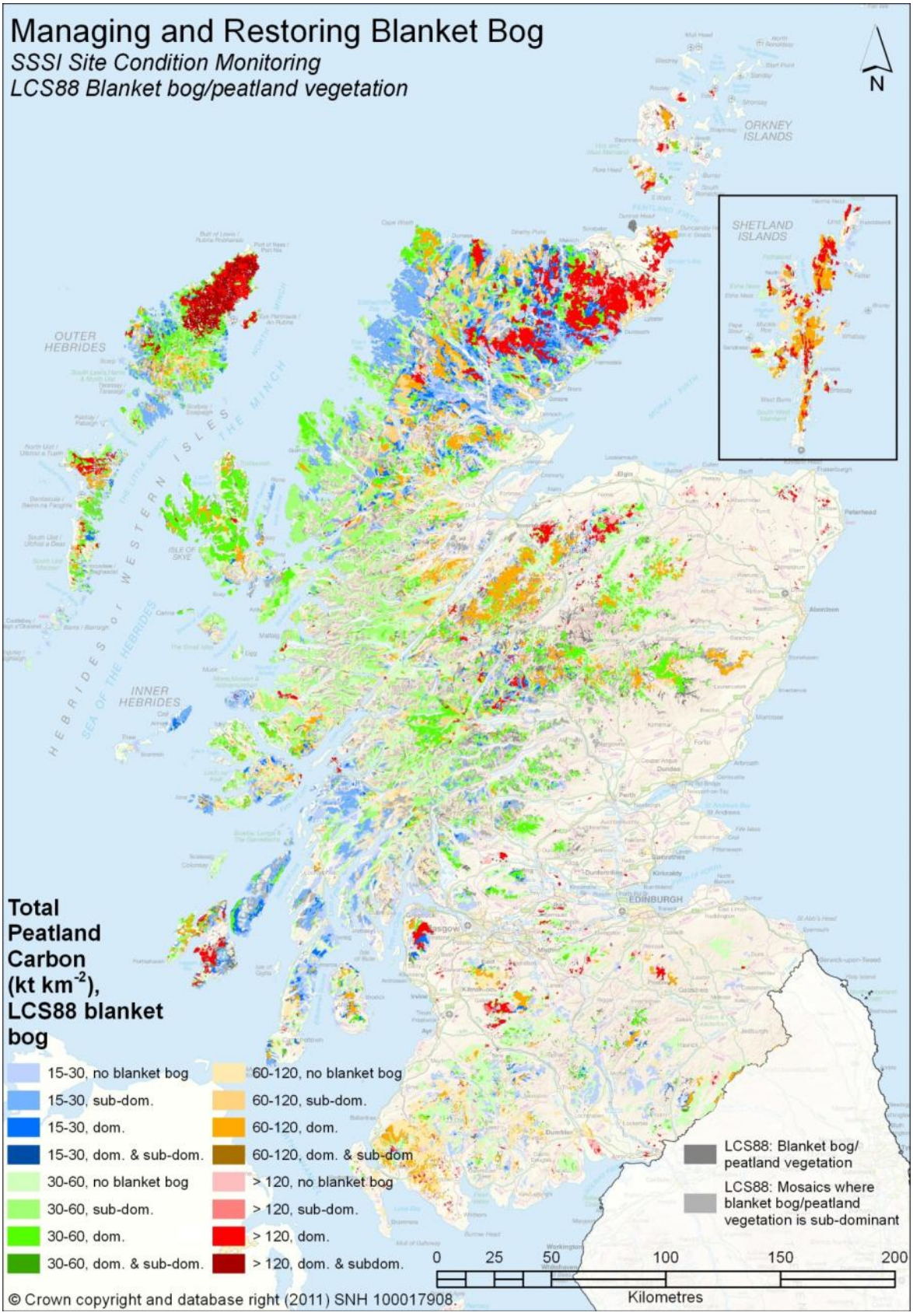

Fig. 1. Example of a GIS layer in the WISE decision support tool. Distribution of organic carbon content on areas of blanket bog in Scotland. Sources: JHI Scottish Soils Database overlaid on LCS88 filtered for blanket bog areas in dominant/subdominant classes.

priority areas was performed purely on the basis of evidence available for current type and condition, the potential for blanket bog to regenerate under present and future climate, the available data on level or rate of current physical degradation, peat type and depth and current and historic land use as well as some data on land ownership. Many of these datasets hold caveats themselves – for example there is only sufficient information on the condition of vegetation in designated areas and the information derived from the Land Cover of Scotland 1988 (LCS88) dataset is obviously dated as well as containing, in many cases, only information on the presence or absence of a feature (e.g. erosion, peat cutting, muirburn (managed heather burn)). Hence, while such information can be used to suggest potential priority areas for restoration, this information should be viewed with a certain amount of caution. We present some of these areas as case studies in our presentation.

CONCLUSION

In the light of policy targets to comply with the need to restore peatland habitats under UKBAP/EU requirements as well as the need to reduce carbon emissions under Kyoto obligations, any potential restoration project on peatlands should be viewed as highly valuable. A simple framework for a decision support tool, as presented here, could therefore be used to set the context for a potential restoration project.

ACKNOWLEDGEMENTS

The authors wish to thank the Scottish Government for supporting this work through the RESAS MRP WorkProgramme 2011-2015 and the Centre of Expertise on Climate Change (CxC).