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GAUGING DIFFERENCES BETWEEN BLANKET AND RAISED BOGS USING LEGACY DATA

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SUMMARY

The oceanic climate of Scotland leads to the formation of both blanket and raised bogs, with some intermediate types also evident. Apart from their location and mode of formation, superficially the vegetation and underlying peat can look much the same. Using legacy data from the Scottish Peat Surveys, mainly carried out in the 1950s, subtle differences in peat properties and vegetation at that time have been teased out. Raised bogs tended to be deeper than blanket bog but have a lower bulk density. Regardless of type, there was an inverse relationship between the mean bulk density and the depth of a bog. Bulk density changed little with depth to 5 m (blanket) or 6 m (raised) but then decreased in both types. The vegetation pattern varied between both types but was also influenced by latitude and drainage. Raised bogs had more *Eriophorum vaginatum* and *Calluna vulgaris* whereas blanket bog had more *Trichophorum caespitosum, Eriophorum angustifolium, Molinia caerulea, Sphagnum* spp., *Erica tetralix* and *Myrica gale*.

Keywords: *blanket bog, raised bog, peat depth, bulk density, vegetation*

INTRODUCTION

Wherever they are found, peatlands constitute a significant store of carbon. Assessing this store requires knowledge of the peatland area, depth, bulk density and carbon content. Often, information on bulk density and peat depth is lacking. Scotland's peatlands fall into two major types: blanket bog (aka hill peat) and raised bogs (aka valley peat). While the latter are similar to the raised bogs of more continental climates and form in natural basins, blanket bog can develop on sloping terrain due to the very cool and wet oceanic climate, typical of Scotland's upland areas. Once considerable blanket bog has formed, it can confine itself and take on more of a raised bog structure; hence there are also intermediate types (aka semi-confined peatlands).

In the search for more information on bulk density and peat depth, legacy data from the Scottish Peat Surveys, was utilized (e.g. Department of Agriculture and Fisheries for Scotland, 1964). These surveys were mainly carried out on major peatland deposits across Scotland in the 1950s. While peat depth was recorded, bulk density as such was not recorded. However, peat moisture content was measured, together with peat ash content. Assuming a value for peat specific gravity, it is possible to estimate the peat dry bulk density for saturated peat using these values. For peat above the water table, this method gives slightly inflated bulk density values. Nevertheless, it is a useful method for the majority of the peat body lying below the water table.

METHODS

Data which formed part of the Scottish Peat Surveys and was only found as figures within the original reports was digitised and analysed. Additional information as to whether it was a blanket or raised bog, as well as any details on dominant vegetation and any drainage features, was also collated. Drainage was not recorded quantitatively during the surveys but described as part of the surface features. We made a semi-quantitative index, scored as follows: '-' (No mention of drainage or only natural drainage); '+' (Little drainage or only sheep drains (shallow 20 inches deep), now overgrown (inoperative, unsatisfactory, not maintained); '++' (Has been drained in past with more frequent/deeper drains (one metre or more), but now not working); '+++' (Drained and still effective

(this would be case for cut-over areas or areas recently prepared for harvesting or forestry)). Vegetation was recorded as a list of species present within the area; in some cases this was semi-quantified by descriptors such as 'frequent', 'abundant' and 'dominant'. Hence the vegetation was scored on a scale of 1–3 (present–dominant) accordingly.

RESULTS

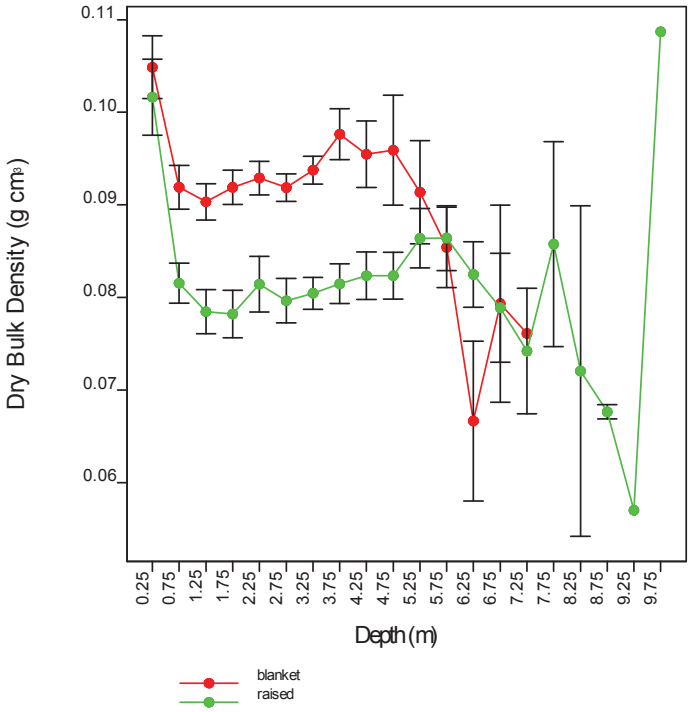

Figure 1: Bulk density over depth as determined using a pedotransfer function and using data from the Scottish Peat Surveys. Bars show standard deviation

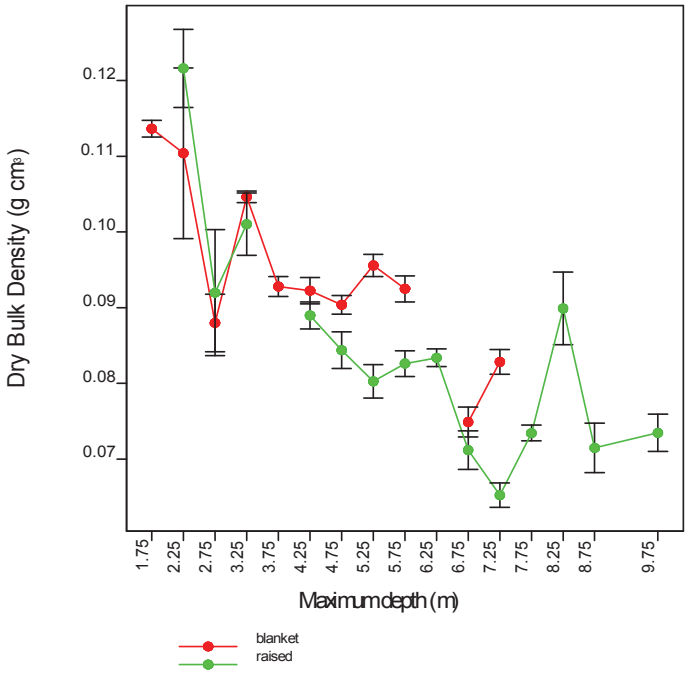

Figure 2: Bulk density as determined using a pedotransfer function plotted against the maximum depth of the bog from which the data was obtained. Bars show standard deviation

Figure 1 shows mean bulk density over depth for both blanket and basin peats. The apparent increase at the very surface is an artefact of the pedotransfer function which over-estimates bulk density where the soil is not

saturated. Hence, essentially there is little evidence of much change with depth until about 5 m where there is some decrease in bulk density (for those peats that are that deep). Also the standard deviations increase around this point as there are fewer examples of bogs with these depths. It is also clear that blanket peats have a slightly higher bulk density than basin peats. Replotting the data against the maximum depth of each particular peat bog (Figure 2) reveals that the deeper the particular bog, the lower the mean bulk density. Also, there is not a lot of difference in this plot between blanket bogs and raised bogs, suggesting that the reason basin peats have a lower bulk density than blanket peats is not so much an intrinsic difference in the peat per se but that basin peats tend to be deeper than blanket peats.

The vegetation pattern varied between both types but was also influenced by latitude, drainage and maximum peat depth. Raised bogs had more *Eriophorum vaginatum* and *Calluna vulgaris* whereas blanket bog had more *Trichophorum caespitosum, Eriophorum angustifolium, Molinia caerulea, Sphagnum* spp., *Erica tetralix* and *Myrica gale*. There was no relationship between either vegetation or drainage and bulk density (restricting this to the surface, 0–50 cm, values). However, the '++' drainage category had the greatest bulk density (there were only two values in the '+++' category) but this was not statistically significant. Multivariate analysis of the vegetation patterns showed no relationship with bulk density.

DISCUSSION

In previous estimations of peatland carbon stock within Scotland (Chapman *et al.*, 2009) it was assumed that bulk density did not vary with depth, based upon a preliminary analysis of the Scottish Peat Survey data (Smith *et al.*, 2009). Here it is indicating that bulk density can vary between blanket and raised bogs but that this is partly due to the latter being typically deeper than the former. There is evidence that bulk density is in fact little changed to about 5 m but then decreases slightly in those bogs deeper than 5 m. It is also apparent that the carbon stock of deeper bogs may be offset to some extent by the lesser values of bulk density. There were also significant differences in vegetation pattern between blanket and raised bogs at the time of the surveys. However, these were surveyed over 60 years ago so it is not known if this would still hold true today. Also, the bogs were selected based on the assumed size of the peatland deposit and hence were a biased sample; they may not completely reflect all bogs, particularly those which are shallower and smaller in area. Nevertheless, these findings will potentially aid the prediction of bulk density and hence of carbon stock across areas where bulk density determinations are rare or missing.

REFERENCES

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