- Blanket Mire Development -
Climate change and human land-use

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> The Status of British Blanket Mire

- Patterned blanket mire (Fig. 1) is a globally scarce habitat, geographically restricted to the World's most oceanic regions [1].
- There are relatively large areas of patterned blanket mire in the British Isles, and the UK has an international responsibility towards this mire-type [1, 2].
- Patterned mire is a component of Britain's extensive nutrient-poor 'ombrotrophic' wetlands, whose associated peats are geomorphologically important, covering *ca* 22,500 km^2 of Britain's land surface [2].

Figure 1: Patterned blanket mire in Scotland's Flow Country, Sutherland.

> Structure and Function

- 'Patterned' mires derive their name from the system of 'hummocks and hollows', raised and lower areas (Fig. 2), which cover their surface.
- This topographic structure creates a diversity of micro-habitat conditions for wetland species, with different plant communities on the top of hummocks (which are drier) compared to the lower areas (wetter hollows, flats or pools).
- As mire plants grow (fixing carbon through photosynthesis, and removing CO_2 from the atmosphere) then die, their litter is left partially undecomposed because of the wet, water-logged conditions and the low nutrient environment, both of which limit respiration and the break-down of litter [3, 4].

Figure 2: Hummocks and pool complex at the Knockfin Heights, Sutherland.

- Wetlands may persist over millenia, and their undecomposed litter accumulates, layer upon layer, building into organic deposits of carbon-rich peat. The global development of these peats represents a potentially massive sink and store of carbon [4, 5]. *Sphagnum* mosses are one of the most important components in this process (Fig. 3).

Figure 3: *Sphagnum capillifolium*

- However, many blanket mires in the British Isles have suffered massive erosion [2, 6], with loss of surface vegetation and the formation of deep peat gullies (Fig. 4).

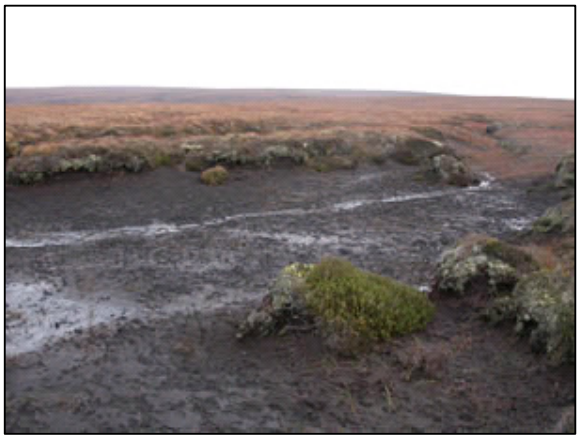

Figure 4: An eroded peat complex at Knockfin Heights, Sutherland

> Palaeoecological research

- We can reconstruct the long-term development of peat-forming wetlands by taking a vertical core through the underlying peat, and identifying undecomposed plant remains from contiguous strata (e.g. moss stems and leaves, pollen grains), building a picture of vegetation change during mire formation.

- If the ecological requirements of species are well known (i.e. species restricted to drier or wetter sites), past changes in vegetation can be used to reconstruct past environments, i.e. past changes in surface moisture.

- My research has used these palaeoecological techniques to address the role of climate and human land-use in controlling the recurrent long-term development or erosion of blanket mires.

> KEY FINDINGS <

Climatic sensitivity of blanket mire development [7]

- Radiocarbon-dated changes in moss communities, indicating wetter or drier surface moisture, and levels of peat decomposition, were compared between four cores collected from hummocks in an oceanic blanket mire (Kentra Moss, north-west Scotland).

- These inferred changes in past mire wetness matched analogous changes in surface moisture reconstructed from eight mires in Britain and Ireland. The temporal association of these events across a large geographic area suggests a macroclimatic influence.

- The results confirm the climatic sensitivity of oceanic blanket mire - supporting and extending previous work in the southern Pennines by Dr John Tallis [8, 9, 10]. The study at Kentra Moss indicated eight shifts from a drier to a wetter mire surface at: *ca* 3250, 2550, 2150, 1400, 1150, 875, 600 & 325 cal. yr BP.

- The results demonstrated the sensitivity of oceanic blanket mire to past climatic variability, implying susceptibility to predicted, human-induced climate change.

- Studies in an upland eroded mire complex (The Migneint, North Wales) demonstrated that climatically-controlled blanket mire development was interrupted by an early period of erosion, initiated between *ca* 2000 and 1350 cal. yr BP.

- This early period of erosion was associated with maximum deforestation of the surrounding landscape during the Iron Age and Romano-British Period. Deforestation is thought to have triggered the headward extension of streams into the peat blanket.

- Mire recovery during the Dark Ages was explained in response to forest regeneration and a wetter climate.

- The most recent period of erosion was attributed to a second period of extensive forest clearance, associated with a resurgence of upland pastoralism, initiated at *ca* 550 cal. yr BP.

- The results suggest an interaction between climate and human land-use in the long-term development and erosion of blanket mire, highlighting the inter-connectedness of ecosystems within a landscape, i.e. forested hill-slopes and upland plateau.

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