THE MACAULAY LAND USE RESEARCH INSTITUTE

PEATLAND RESTORATION - CAN IT RESTORE MICROBIAL DIVERSITY AND THEIR FUNCTIONS IN THE SOIL?

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POLICY RELEVANCE: THE IMPORTANCE OF PEATLANDS FOR SCOTLAND'S C BUDGET AND BIODIVERSITY

Peatlands in their pristine state are a significant net sink for atmospheric CO_2. As they represent a major part of the land cover of Scotland, adequate estimates of the carbon balance of peatland ecosystems are a key factor in assessing Scotland's greenhouse gas emissions. Similarly, the need to reduce future UK net carbon emissions is fuelling interest in alternative methods of carbon capture. The UK Biodiversity Action Plan (UKBAP) and the Scottish Biodiversity Strategy recognise the importance of peatlands and have stipulated ambitious targets for their restoration over extensive areas.

Restoration of large areas of peatland in the Flow Country

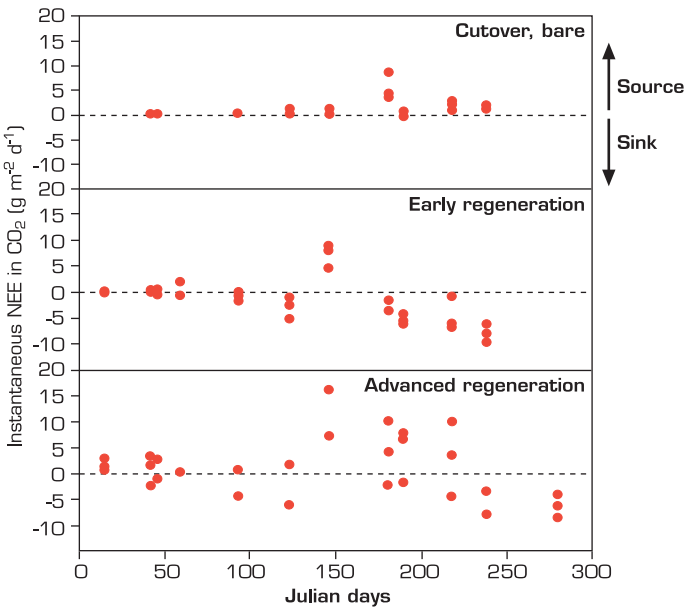


Fig. 1. Net ecosystem exchange of carbon dioxide at Middlemuir Moss, 2004 data

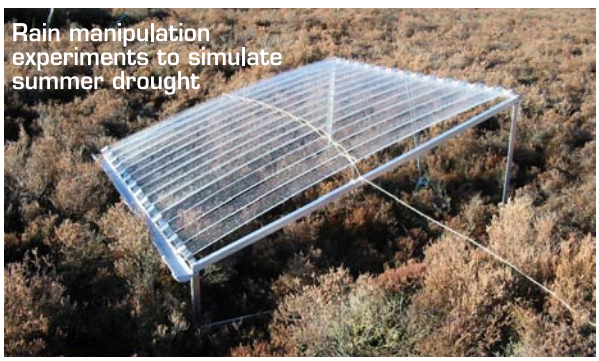
DEGRADED PEATLANDS ARE A NET C SOURCE, YET C SINK FUNCTION CAN BE RESTORED

Significant net C emissions have been attributed to peatlands that have been affected by drainage, afforestation, erosion, or harvesting for fuel or horticultural purposes. Hence, there is growing interest in active management or even restoration of such ecosystems. Recent studies at the Macaulay Institute suggest that a return to carbon sink function may be feasible within a few decades following active restoration (Fig. 1, Artz et al, 2008). The management and restoration of degraded peatlands is focusing primarily on vegetation and hydrological properties, however, an adequate understanding of how soil carbon is utilised and/or sequestered by the soil microbial communities is necessary if management options for different land use scenarios and soil types are to be developed that protect or enhance soil biodiversity and functioning.

RESEARCH CARRIED OUT AT THE MACAULAY LAND USE RESEARCH INSTITUTE

We provide both data for modelling studies and to enhance our scientific understanding of the carbon and nutrient cycles in peatlands. Ongoing projects include:

- Whether peatland restoration restores the functions of the soil microbial community in carbon turnover and nutrient mobilisation
- Whether revegetation of bare peat fuels feedback loops that may threaten already stored soil C via the 'priming effect'
- Whether forecasted climate change effects (e.g. extended summer drought) threaten to turn peatlands from net C sinks to net sources



Rain manipulation experiments to simulate summer drought

Natural abundance soil respiration partitioning to establish 'priming'

References. Artz et al., Journal of Applied Ecology 45: 1799-1809 (2008)