

What is the optimal heather moorland management regime for carbon sequestration?



Supervisors: Prof. Susan Waldron (Geographical and Earth Sciences), Dr. Alona Armstrong (Geographical and Earth Sciences), Dr. G. Matt Davies (Interdisciplinary Studies).

Rationale: Heather moorlands are a characteristic component of the Scottish landscape and the peat soils on which they grow represent a significant carbon store. The open landscape of heather moorlands was created, and is maintained by, human intervention and it is essential to manage heather in these environments given its impact on site condition and land use. Land management activities, including cutting and burning, have been shown to affect gaseous and aqueous peatland carbon fluxes (Armstrong *et al.*, 2010, Ward *et al.*, 2007 and Clutterbuck & Yallop, 2010).



However, the Muirburn Code has no evidence base with regard to carbon sequestration. Given the increased concern regarding the source/sink status of our peatlands, and the beginnings of a carbon trading market which could use moorland carbon sequestration to offset emissions, it is essential that the most appropriate land management is employed to maximise carbon sequestration and protect existing carbon stocks. Impacts of changes in heather

management will be significant as it is a dominant land management activity in Scotland and changes in heather management techniques are relatively easy to implement. This project will address this crucial scientific and practical knowledge gap by establishing a protocol for optimising heather management for carbon sequestration.

Approach: The research undertaken by the student will examine differences in gaseous and aqueous carbon fluxes from moorland under different heather management regimes. The three principal objectives are:

1. Assess the effects varying heather management regimes on carbon dynamics
2. Assess heather age-related variation in carbon cycling for moorlands under different management regimes.
3. Establish the heather management strategies for maximising carbon sequestration in the context of competing moorland management objectives (e.g. biodiversity, wildfire management)

The research will be undertaken at a range of sites and will involve close collaborations with appropriate stakeholders with regard to organizing fieldwork and disseminating of results.

On completion of the Ph.D. the successful candidate will be well trained in a very topical academic research area and will have invaluable experience of interacting with various stakeholders including policy makers.

References:

Armstrong, A., Holden, J., Kay, P., McDonald, A., Gledhill, S., Foulger, F., & Walker, A. (2010) Peatland drain-blocking reduces dissolved organic carbon loss and discolouration of water; results from a national survey. *Journal of Hydrology*, **381**, 112-120.

Ward S.E., Bardgett R.D., McNamara N.P., Adamson J.K., Ostle N.J. (2007) Long-term consequences of grazing and burning on northern peatland carbon dynamics. *Ecosystems*, **10**, 1069-1083

Clutterbuck, B. & Yallop, A.R. (2010) Land management as a factor controlling dissolved organic carbon release from upland peat soils 2: Changes in DOC productivity over four decades. *Science of the Total Environment*, **408**, 6179-6191.

About you: We are seeking dynamic candidates, able to function across disciplines, but with a sound understanding of Earth system processes / ecology / environmental chemistry (particularly the terrestrial-aquatic C cycle). Enthusiasm for fieldwork and engaging with stakeholders is essential, along with sound laboratory skills. Applicants should hold a minimum of a UK Honours Degree at 2:1 level or equivalent. This studentship requires significant fieldwork and thus a driving license is preferred.

Your skill-development: In addition to the project specific skills that will leave you well-placed for a career as a research scientist, you will be expected to take part in the University of Glasgow's extensive programmed of transferable skill training development. This combination will ensure that the doctoral training you receive has balance between subject specific research skills and broader skills that employers seek, and that you are prepared for a diverse range of career options.

About us: The student will join the [College of Science and Engineering Graduate School](#), a thriving post-graduate research community. The supervisory team is drawn from researchers in the College of Science and Engineering and the [College of Social Science](#).

[Professor Susan Waldron](#) of the School of Geographical and Earth Sciences leads the growing Carbon Landscape Research Group, which currently comprises three post-doctoral researchers and four PhD students, all researching aspects of the terrestrial-aquatic carbon cycle and active in [knowledge exchange](#). Susan has more than 7 years experience of profiling [DIC] by spot sampling and characterisation of hydrological functioning; she also has applied continuous water quality monitors to her research for several years, both in rivers and lakes. Susan will provide supervision in field measurement of CO₂ efflux.

[Dr Alona Armstrong](#) of the School of Geographical and Earth Sciences is a peatland scientist with most of her research focused on carbon cycling, both aqueous and gaseous. Alona has ten years of experience working within peatland environments and actively collaborating with stakeholders to ensure results inform land management as appropriate.

[Dr G. Matt Davies](#) of the School of Interdisciplinary Studies is a fire ecologist with research interests focusing on understanding the factors that control fire behaviour and effects. He has more than ten years of experience working on fire-management issues including time spent studying the effects of burning on UK moorlands and investigating the impact of modified fire regimes on sagebrush-steppe habitats of western North America. He work has involved close collaboration with moorland managers and private land-owners. See <http://www.firereimes.org.uk> for more information.

Funding details: The first studentship is eligible for [NERC funding](#) and will pay the Research Council minimum stipend per year for a period of up to 3.5 years. Please note that due to restrictions on the funding, this studentship is for UK/EU applicants only and [eligibility criteria apply](#).

How to apply: In the first instance please contact Prof. Susan Waldron to discuss your interest in these projects, providing a c.v. with relevant skills and experience: susan.waldron@glasgow.ac.uk. Susan will then advise on formal application as appropriate. This studentship will remain open until the funding is no longer available or an appropriate candidate is appointed.