PROJECT TITLE: How effectively can we restore contaminated peatlands?

University of Bristol Theme: Climate and Environment Research Challenge Area
Research Group(s): Marine and Terrestrial Environments Group
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Project keywords: biogeochemistry, geomicrobiology, carbon, peat, climate change, contaminants, metals, greenhouse gases, environment, restoration
Funder: University of Bristol Scholarship

(Left) Iron and arsenic contaminated peatland in Norfolk (Middle) Deep peat coring in the field (Right) Hydrological restoration of former agricultural peatlands.

Project Background
Peatlands store more carbon than all of the world's forests combined, yet this crucial carbon store has been decimated by decades of degradation and neglect. There is currently strong political will to invest in the restoration of peatlands globally, which typically involves blocking historical drainage channels and allowing these wetlands to return to their natural, waterlogged state. However, drainage is not the only type of degradation experienced in peatland areas. Many of the world's peatlands are now contaminated with nutrients (like nitrogen and phosphorus) or metals, which were either deposited atmospherically from heavy industry, added to the land during decades of intensive agriculture, or which were released during biogeochemical changes in the soils associated with drainage. It is unclear how effective hydrological interventions will be in restoring natural biogeochemistry to these contaminated systems which have been fundamentally altered by the presence of metals and nutrients, and the impact of these contaminants on greenhouse gas emissions is not considered in current emissions projections. Since peatland restoration is seen as an essential part of future climate mitigation efforts, it is essential that we understand the impact of historical contamination on the biogeochemistry of rewetted peatlands.

Project Aims and Methods
This project will combine field observation with laboratory experiments and modelling to determine the impact of common contaminants on peatland biogeochemistry and greenhouse gas emissions. The student will 1) investigate in situ greenhouse gas emissions along gradients of metal and nutrient contamination in two UK peatlands (in Somerset and Norfolk respectively) alongside differences in soil geochemistry and microbiology. 2) Measure GHG emissions in peats amended with various types/concentrations of contaminants to quantify the effect on microbial production of GHGs and 3) ultimately develop numerical models to predict the extent to which peatland rewetting in contaminated regions will lead to reduction of GHG emissions.
The balance of field, experimental and modelling components can be driven by the student’s interests. There may also be opportunity to compare the UK-based results to sites in Scandinavia or tropical regions via collaboration with other ongoing projects.

Candidate
The ideal candidate will have a strong background (preferably MSc-level) in a related discipline e.g. Earth Science, Physical Geography, Microbiology, Molecular Biology or Environmental Chemistry as well as a strong interest in Environmental Microbiology and Geochemistry. A desire to conduct field work is essential. Experience with wet chemical laboratory methods, microbial cultivation or molecular ecology would be highly beneficial. Good written and oral communication skills are required, as is the ability to work independently and in a team.

Project partners
The project will be conducted in collaboration with numerous UK-based environmental organisations including Natural England and the Somerset Wildlife Trust.

Training
This project will provide training in cutting-edge laboratory methods required for geochemical monitoring, microbial cultivation and community analysis, and characterization of minerals and organic matter. The student will also be provided with extensive training in field skills with the opportunity to conduct multiple field campaigns in the UK and, potentially, abroad. The student will be encouraged to participate in personal development courses to develop both technical and personal skills essential for a successful scientific career. Opportunities to present at conferences will be actively supported.

Background reading and references

Useful links
http://www.bristol.ac.uk/earthsciences/courses/postgraduate/

Eligibility
UK and International students are eligible for a University of Bristol Scholarship. UoB Scholarships are fully funded for 4 years and cover university fees, living expenses at the UKRI standard rate, and an allowance of £2000 per year towards research expenses.

Application deadline: Tuesday 16th January, 2024, 23.59 GMT
(Interviews are expected to take place in mid/late February)

How to apply
Applications are online only at: http://www.bristol.ac.uk/study/postgraduate/apply/
Please select “PhD in Geology” as the programme in the online application system.
Please specify the project title and supervisors for the project that you are applying for.
To ensure your application is considered under the University of Bristol Scholarship funding scheme you must complete the Funding page in your online PhD application as follows:
1. For “What is your likely source of funding?” select Studentship
2. For the free text field “Please give the name of your scholarship or studentship” enter University of Bristol Scholarship.
3. Set “Percentage from this source” to 100%
4. Set “Is this funding already secured?” to No