

Brennand, Jack, Carr, Simon ORCID: <https://orcid.org/0000-0003-4487-3551> and Evans, Elizabeth (2022) Evaluating peatland restoration using 3D x-ray micro-computed tomography. In: British Ecological Society Annual Meeting 2022, 18-21 December 2022, Edinburgh, UK. (Unpublished)

Downloaded from: <https://insight.cumbria.ac.uk/id/eprint/6794/>

Usage of any items from the University of Cumbria's institutional repository 'Insight' must conform to the following fair usage guidelines.

Any item and its associated metadata held in the University of Cumbria's institutional repository Insight (unless stated otherwise on the metadata record) may be copied, displayed or performed, and stored in line with the JISC fair dealing guidelines (available [here](#)) for educational and not-for-profit activities

provided that

- the authors, title and full bibliographic details of the item are cited clearly when any part of the work is referred to verbally or in the written form
 - a hyperlink/URL to the original Insight record of that item is included in any citations of the work
- the content is not changed in any way
- all files required for usage of the item are kept together with the main item file.

You may not

- sell any part of an item
- refer to any part of an item without citation
- amend any item or contextualise it in a way that will impugn the creator's reputation
- remove or alter the copyright statement on an item.

The full policy can be found [here](#).

Alternatively contact the University of Cumbria Repository Editor by emailing insight@cumbria.ac.uk.



Website

Evaluating Peatland Restoration Using 3D X-ray Micro-Computed Tomography

Mr Jack R. Brennand¹, Dr Simon J. Carr¹, Dr Elizabeth Evans²

¹University of Cumbria

²NICT, Manchester University

Contact Details

Email:
Jack.Brennand@uni.cumbria.ac.uk

Twitter:
@brennand_j

Introduction

Restoration aims to return peatlands to functional behaviour, enabling sequestration and the long-term storage of carbon. However, restored peatlands often fail to function effectively, and continue to be net carbon sources, rather than sinks. We need to understand the fundamental processes that govern peatland functionality if we aim to use peatland restoration as a key tool to meet the climate crisis.

Legend:

Structural Feature

Inference on Carbon Function

3D (voxel), 51µm resolution visualisation of a restored peat core sample in Drieh.

New Sphagnum

Carbon Sequestration

Air Filled Pores

Gaseous Exchange (CO₂ & CH₄)

Peat Matrix

Retarded Decay

Air Filled Roots

Gaseous Exchange (CO₂ & CH₄)

Water Filled Roots

DOC & POC

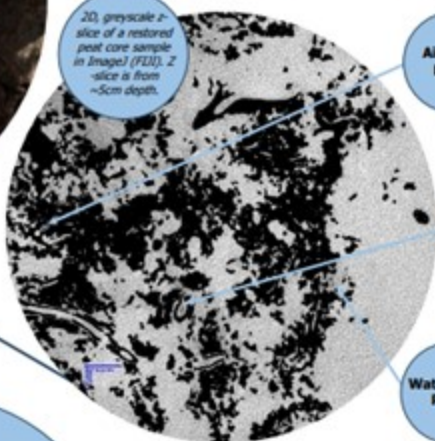
Water Filled Pores

DOC & POC

Samples are carefully extracted from 'degraded', restored, and 'pristine' peatlands for scanning using µCT.



2D, greyscale z-slice of a restored peat core sample in ImageJ (FID). Z-slice is from ~5cm depth.



µCT

µCT is a non-destructive imaging technique used to evaluate the 3D structure and composition of environmental materials. The attenuation of X-Ray energy enables the mapping of density variations within a sample, in this case to spatial resolutions in the 50-100 micron range.

Research

This project applies µCT for the first time to explore peatland restoration. Structural characteristics (pore-space, plant roots, and humification) are integrated with traditional laboratory and field methods (moisture content, bulk density, humification, LOI, pH, and redox potential) to derive a rich dataset from each sample.

Quantifying these properties will enable detailed examination of functional behaviour, particularly water and gas exchange that determine the health of restored peatlands and their carbon storage potential.

Laboratory sub-sampling of a restored peat core post µCT (MC, BD, humification, LOI, pH, and redox).



Acknowledgements

I'd like to thank the ERDF ECO-1 NW project and Barker & Bland Ltd for funding this research. This work was also supported by the National Research Facility for Lab X-ray CT (NICT) through EPSRC grant EP/T02593X/1.