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Importance of monitoring GHG emissions from peatlands: Cors Caron as a case study.

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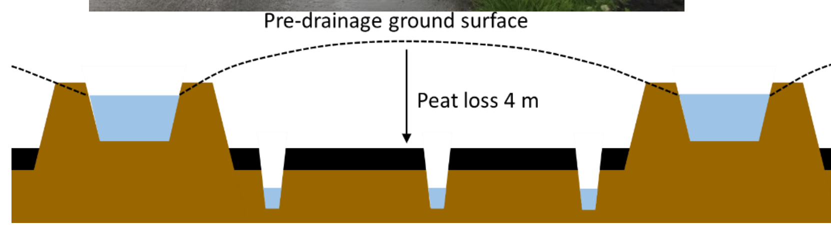
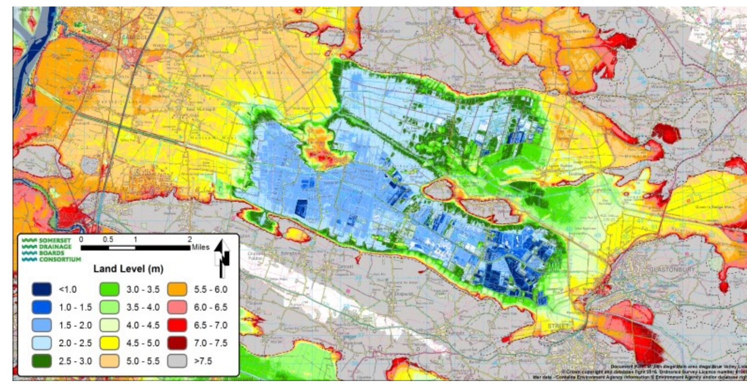
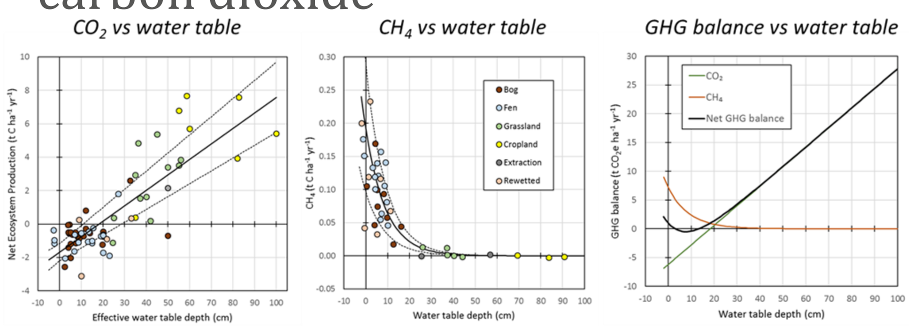
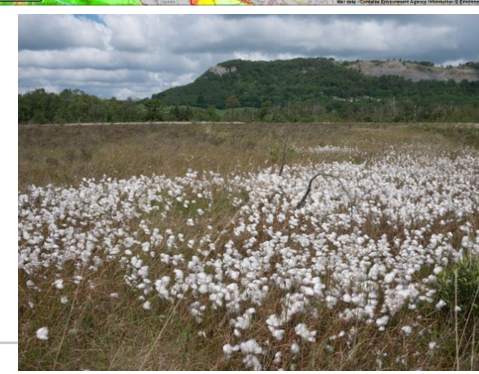
Greenhouse gas emissions from peatlands

- Carbon dioxide and methane
- Dry peat emits carbon dioxide via peat decomposition
- Waterlogged peat is anaerobic
- Standing water results in increased methane emissions
- Global warming potential of methane 28 times higher than carbon dioxide









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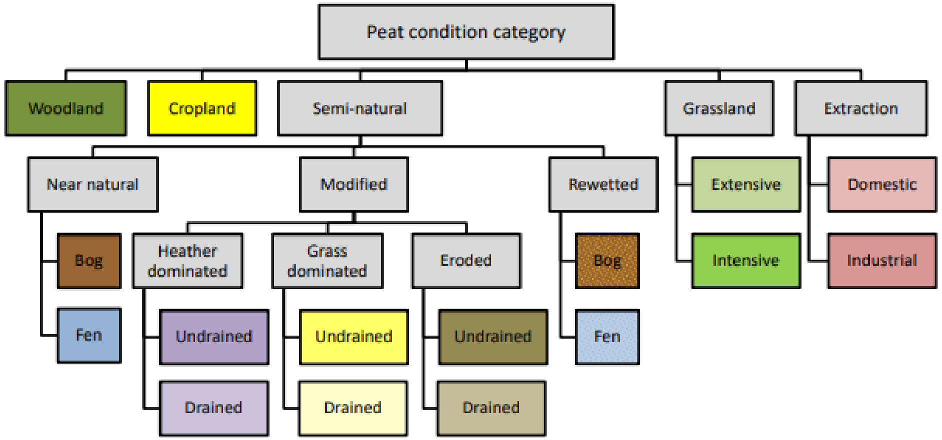
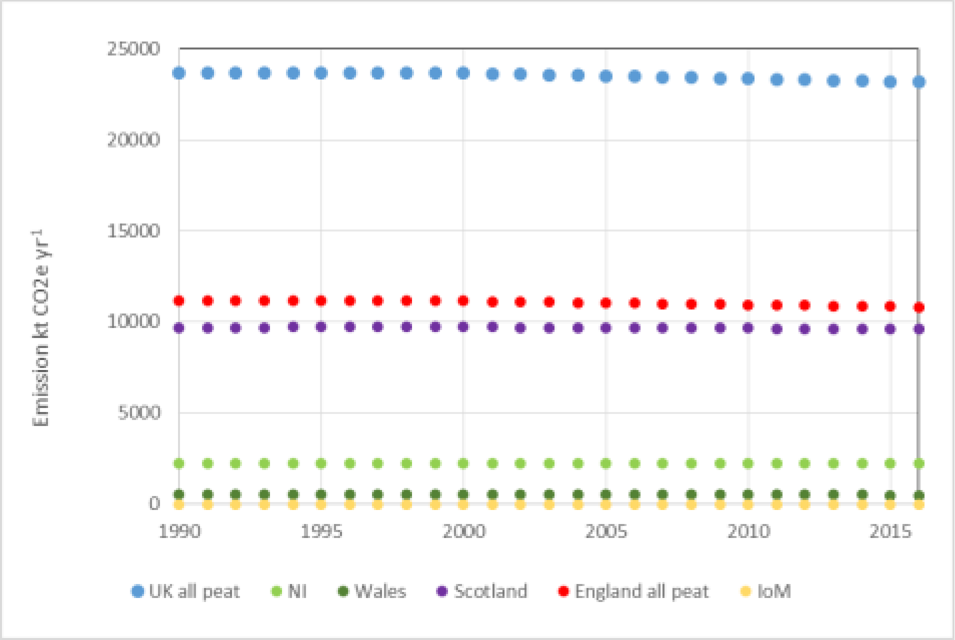
National emissions inventories

- UNFCCC 1992 – Kyoto Protocol
- IPCC provides standard methods for GHG emissions modelling
- Peatland GHG emissions included under Land Use, Land Use Change and Forestry.
- Currently modelled based on land use and national scale peat maps





Net Zero

- Inclusion of 18.8 Mt CO_2e yr^{-1} of peatland emissions in the 2019 inventory turned the land-use sector from a GHG sink into a GHG source
- Reducing peat emissions through restoration is an important component of the CCC 6th Carbon Budget pathway to Net Zero
- But the potential of peatlands to actually *remove* GHGs is assumed negligible

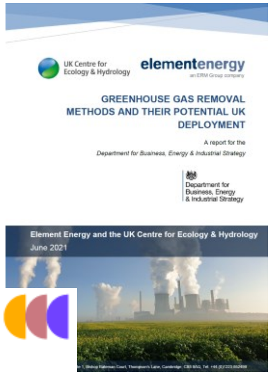
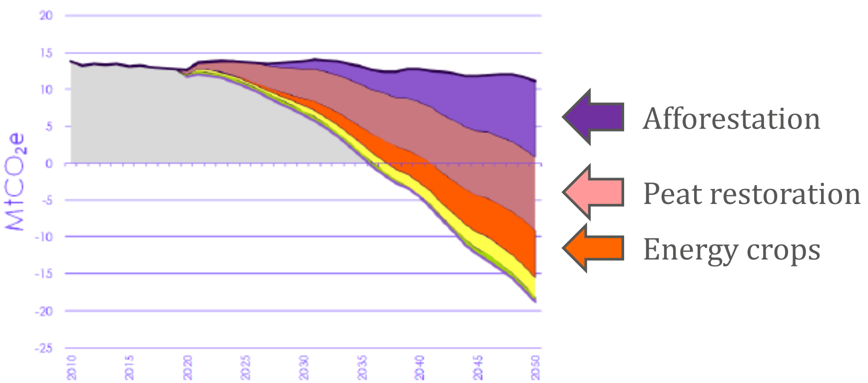


Figure A.3.6.d Sources of abatement in the Balanced Net Zero Pathway for the LULUCF sector



GHG monitoring

- Flux towers
- GHG removal field trials
- Plot scale monitoring

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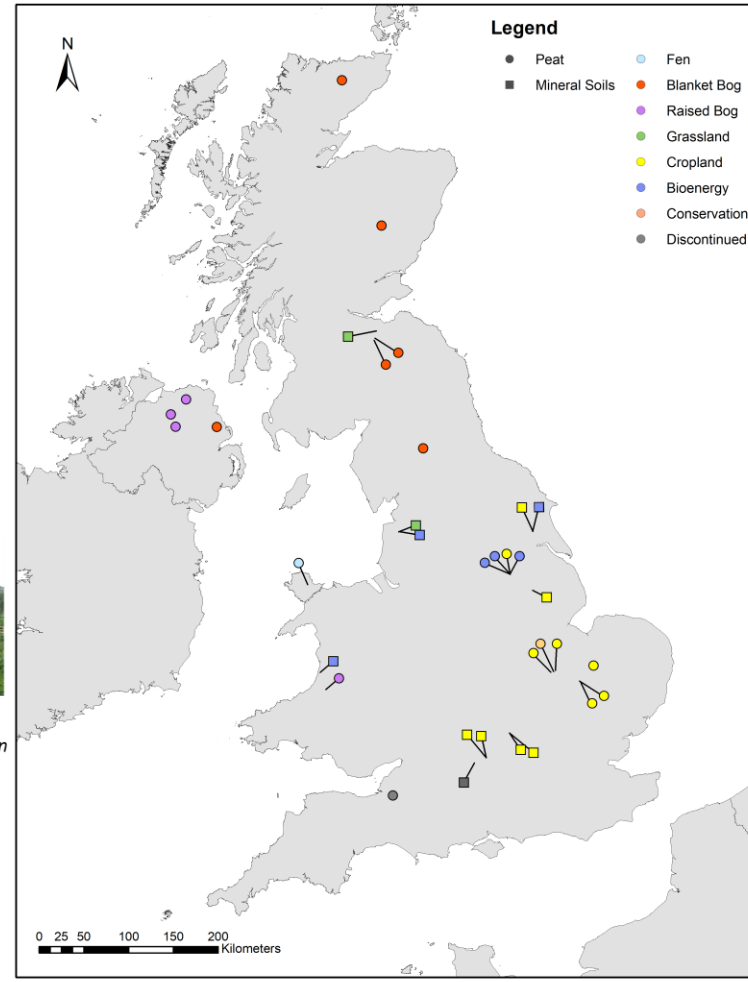
1. Axholme: Lowland fen drained for arable/horticulture

2. Pennines: Blanket bog degraded by burn-management and historic pollution

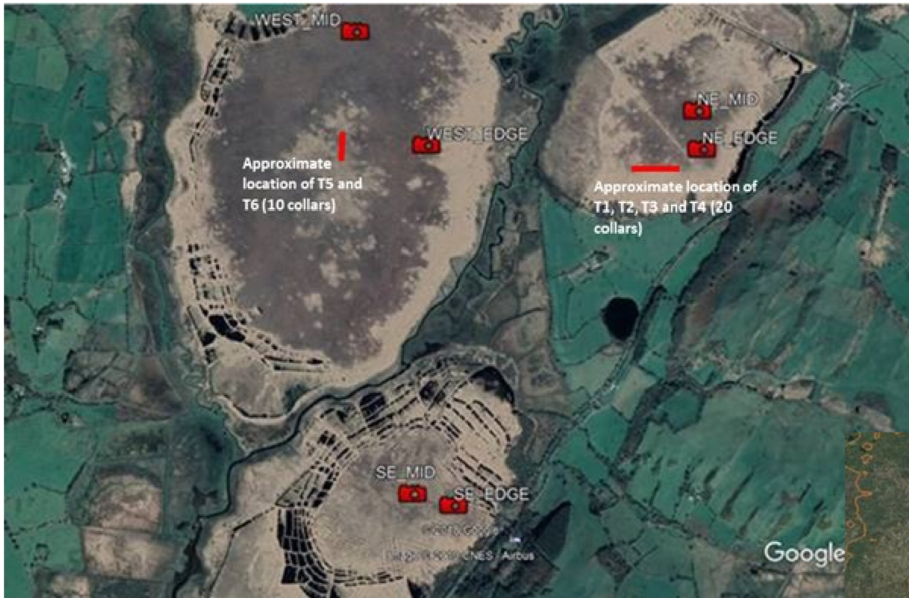
3. Pwllpeiran: Blanket bog degraded by grazing

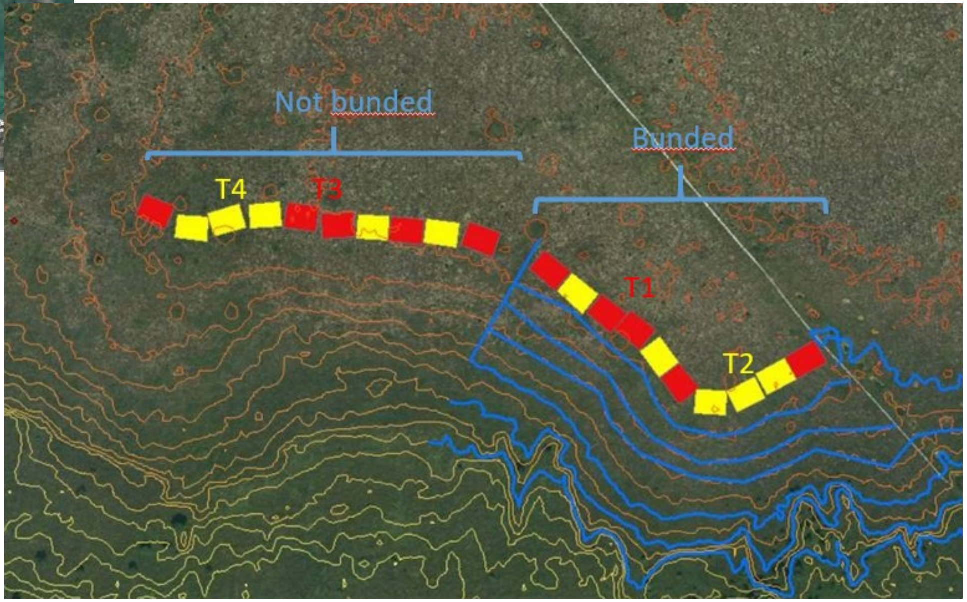


Cors Caron raised bog

- 800 ha over 3 raised bog domes
- Restoration includes mowing, scrub removal and bund creation
- Monitoring includes water table levels, peat surface movement and GHG emissions

Cors Caron raised bog





Code	Treatment
T1	South edge of NE dome, above top bund, not cut
T2	South edge of NE dome, above top bund, cut
T3	South edge of NE dome, not bunded but above where the top bund will eventually be, not cut
T4	South edge of NE dome, not bunded but above where the top bund will eventually be, cut
T5	Centre of the W dome, currently dominated by *Molinia caerulea*
T6	Above the top bund on the W dome in good-ish M18 with abundant *Erica tetralix*

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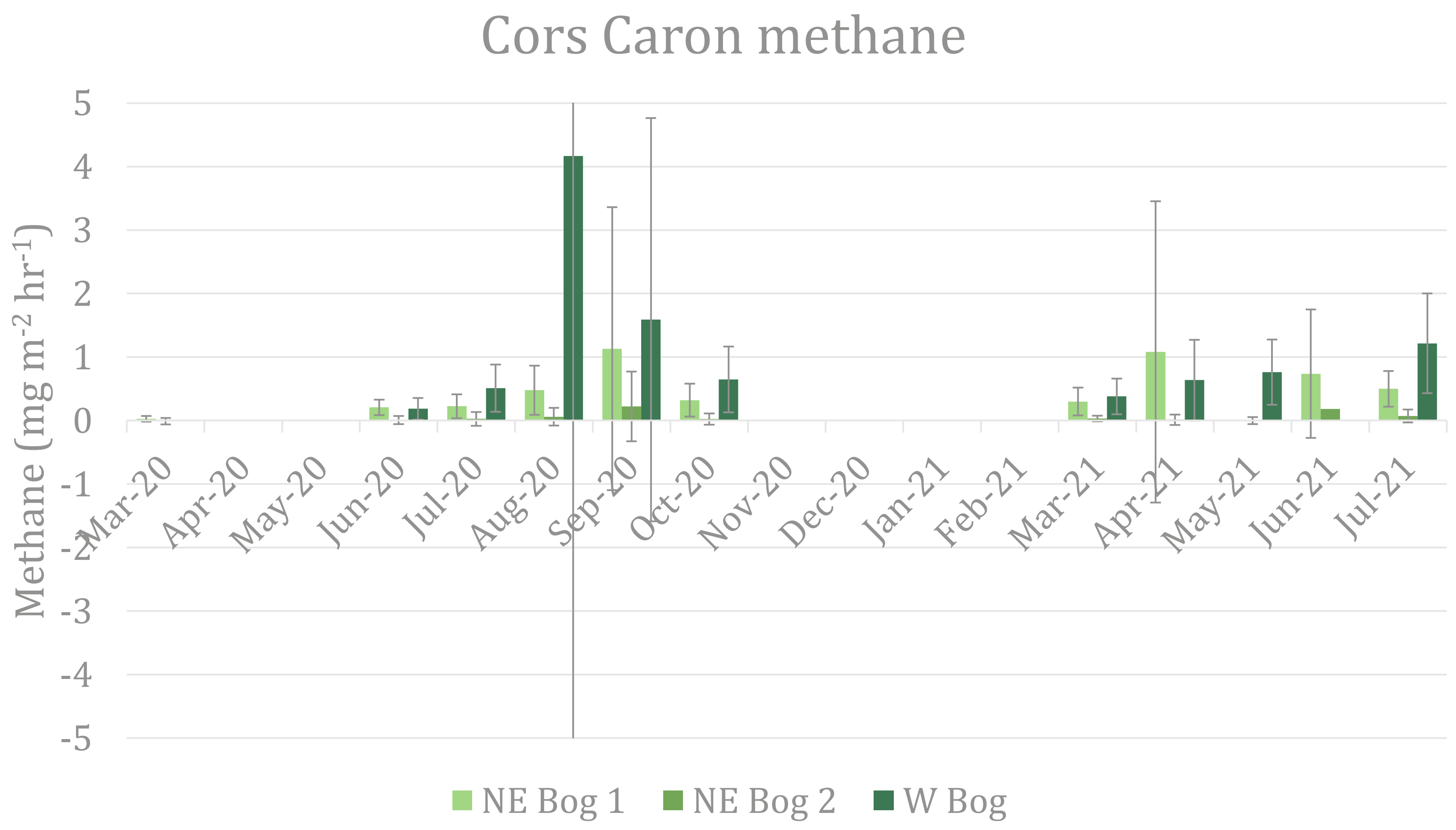
GHG emissions



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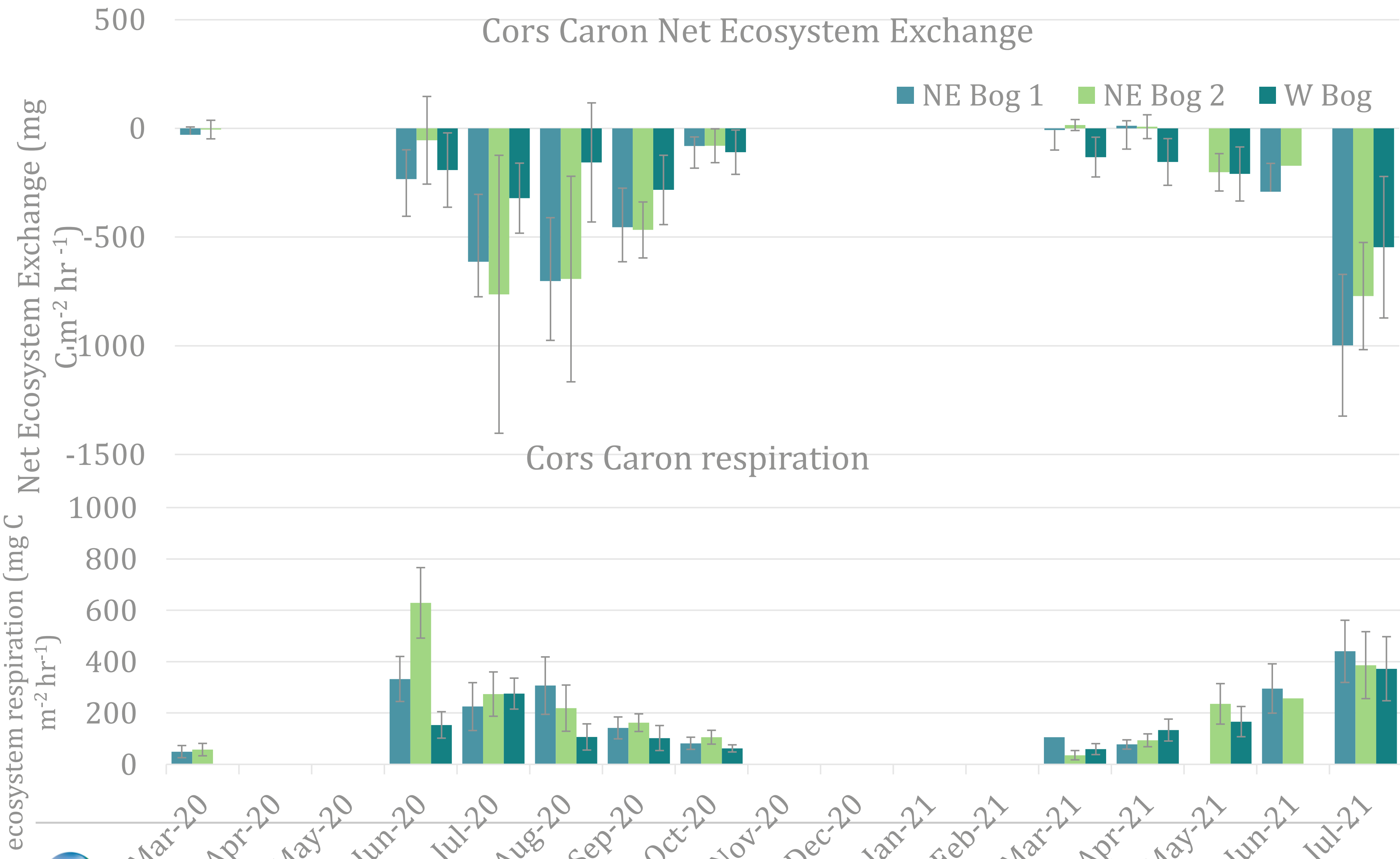
GHG emissions



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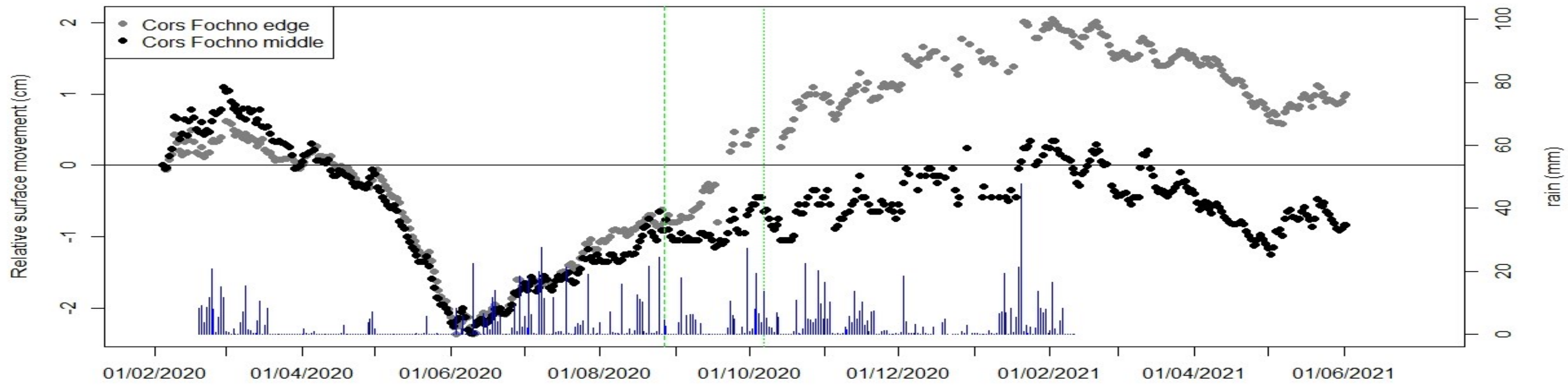
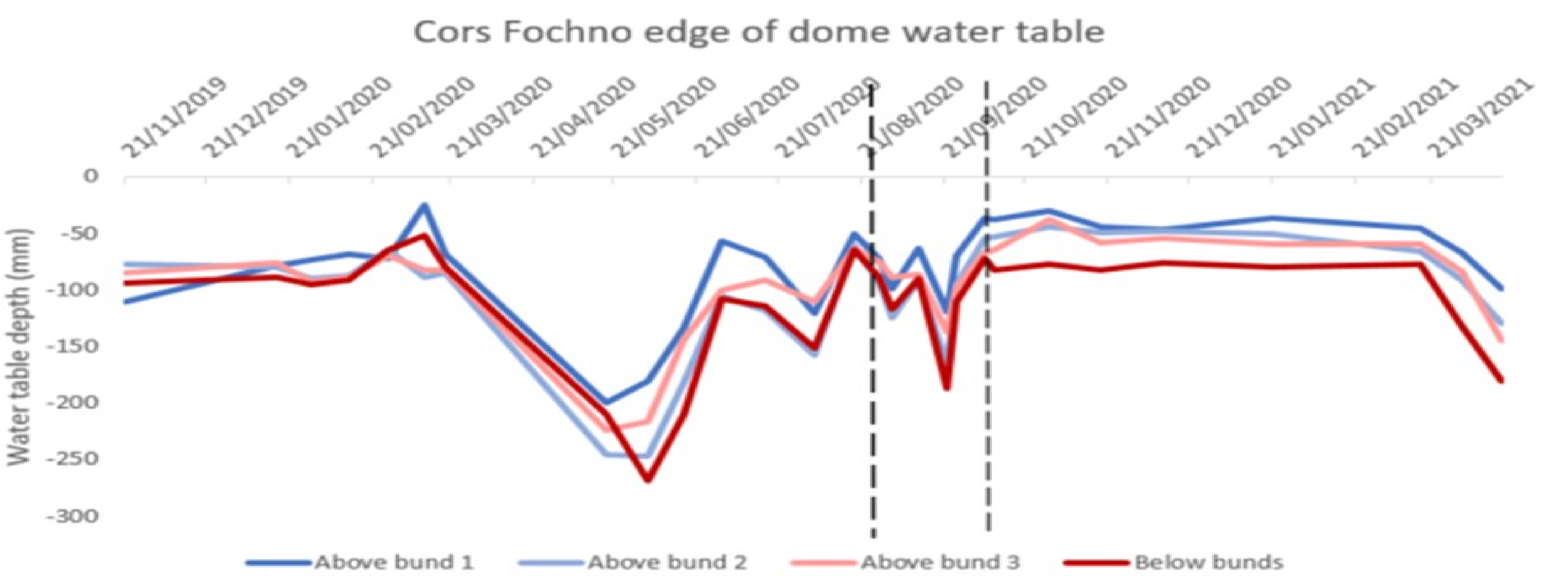
Water table depth





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Monitoring, reporting and verification

Monitoring, reporting and verification needs simple, repeatable, affordable metrics to confirm restoration is having the desired outcome.

Current methods (Peatland Code, GHG Inventory reporting):

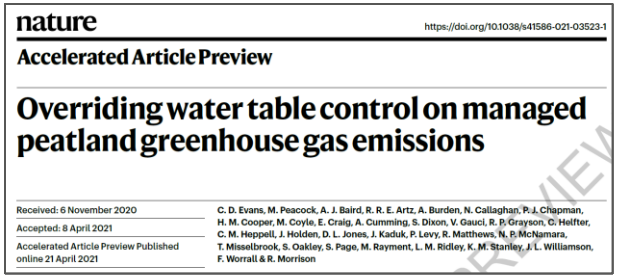
Assume emission change following change in land management

Restoration leads to reduced GHG emissions

rewetting

EF= 0.81 t CO_2-e ha^{-1} yr^{-1}

Monitoring, reporting and verification



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Accelerated Article Preview

Overriding water table control on managed peatland greenhouse gas emissions

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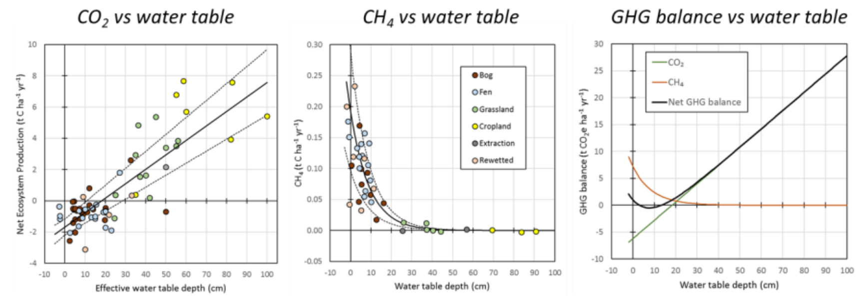
C. D. Evans, M. Peacock, A. J. Baird, R. R. E. Artz, A. Burden, N. Callaghan, P. J. Chapman, H. M. Cooper, M. Coyle, E. Craig, A. Cumming, S. Dixon, V. Gauci, R. P. Grayson, C. Helfter, C. M. Heppell, J. Holden, D. L. Jones, J. Kaduk, P. Levy, R. Matthews, N. P. McNamara, T. Misselbrook, S. Oakley, S. Page, M. Rayment, L. M. Ridley, K. M. Stanley, J. L. Williamson, F. Worrall & R. Morrison



WTD change from 25 to 10 cm below the surface:

Emissions decrease by 4.5 t CO_2-e ha^{-1} yr^{-1}

WTD change from 10 to 5 cm below the surface:

No change in emissions reported as CO_2-e

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Monitoring, reporting and verification

Mean post-bunding water table depth = 3 cm below the surface (Nov 2021 – Aug 2022):

Modelled GHG flux = 0.1 – 2.4 t CO_2-e ha^{-1} yr^{-1}
depending on classification.

Conclusions

- Directly monitoring GHG fluxes is costly.
- However: low cost (time and equipment) monitoring of proxy water table data can help inform GHG flux estimates.
- Category based models only allow a switch from one state to another.
- Post restoration water table depth monitoring suggests that Cors Caron is either GHG neutral or a small source of GHGs.
- Designing before/after/control/intervention monitoring is really important to determine the impact of restoration.

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Thank you

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