



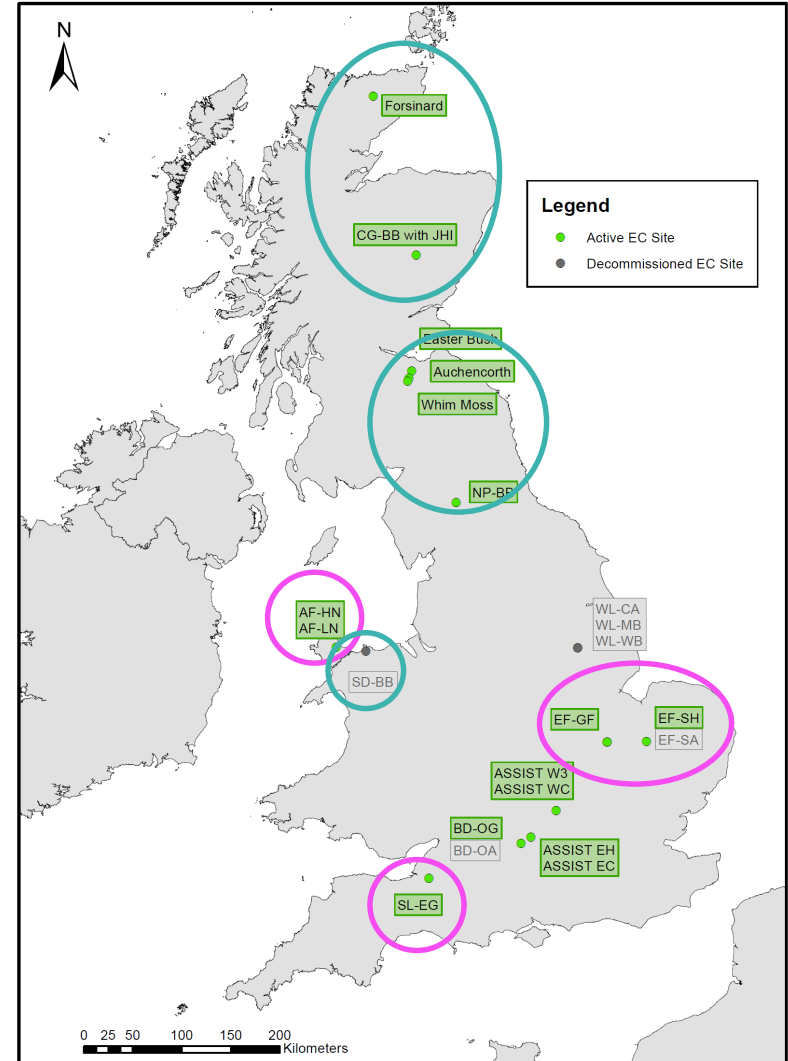
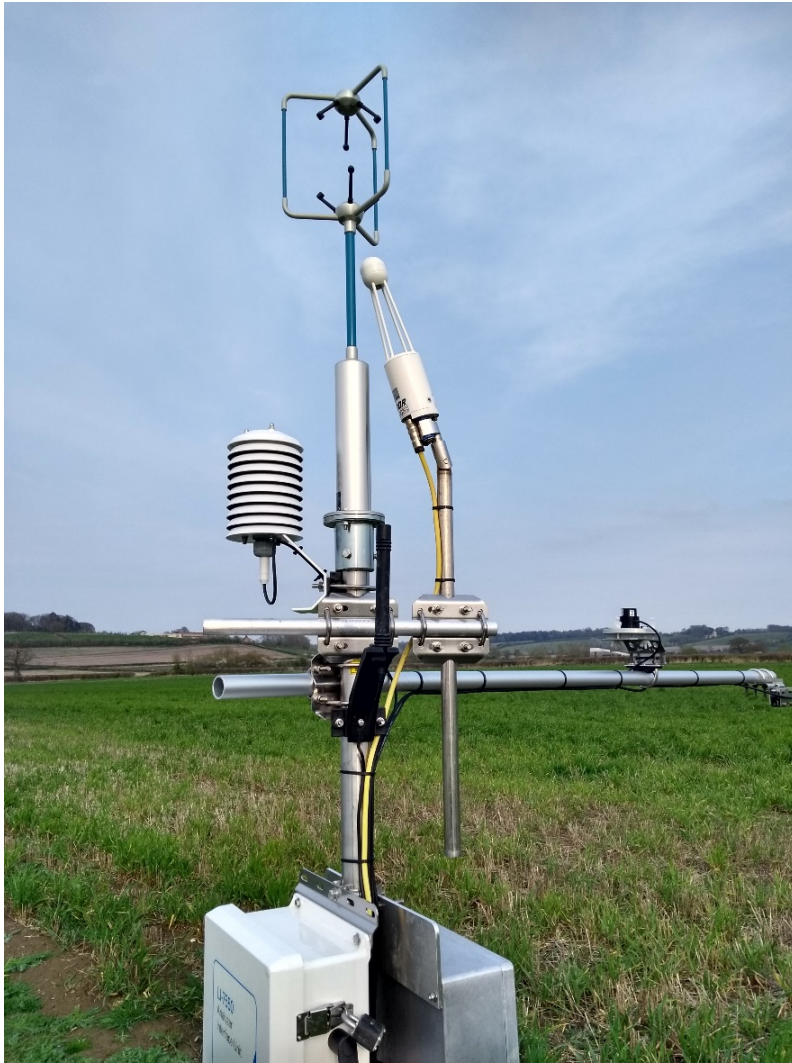
Quantifying the carbon balance of lowland peatlands

Ross Morrison, Alex Cumming, Nathan Callaghan, Chris Evans & many, many others

Outline

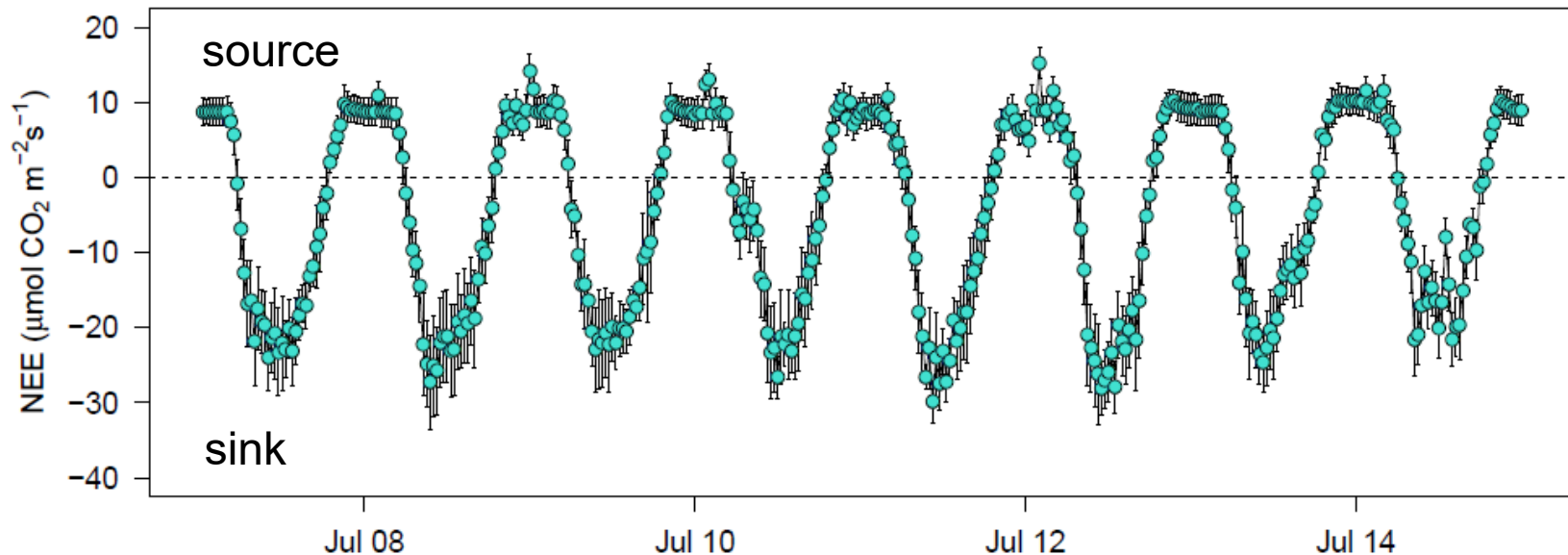
- Past and current work at UK lowland peatlands
- Forthcoming work at lowland agricultural peatlands

Eddy covariance flux tower network



Eddy covariance

- Direct measurement of land to atmosphere fluxes (water, CO₂, CH₄, energy, etc.)
- Whole ecosystem dynamics
- Quasi-continuous (thirty minute) flux densities
- Large upwind source area (flux footprint)



AF-LN (Anglesey, Low nutrient)

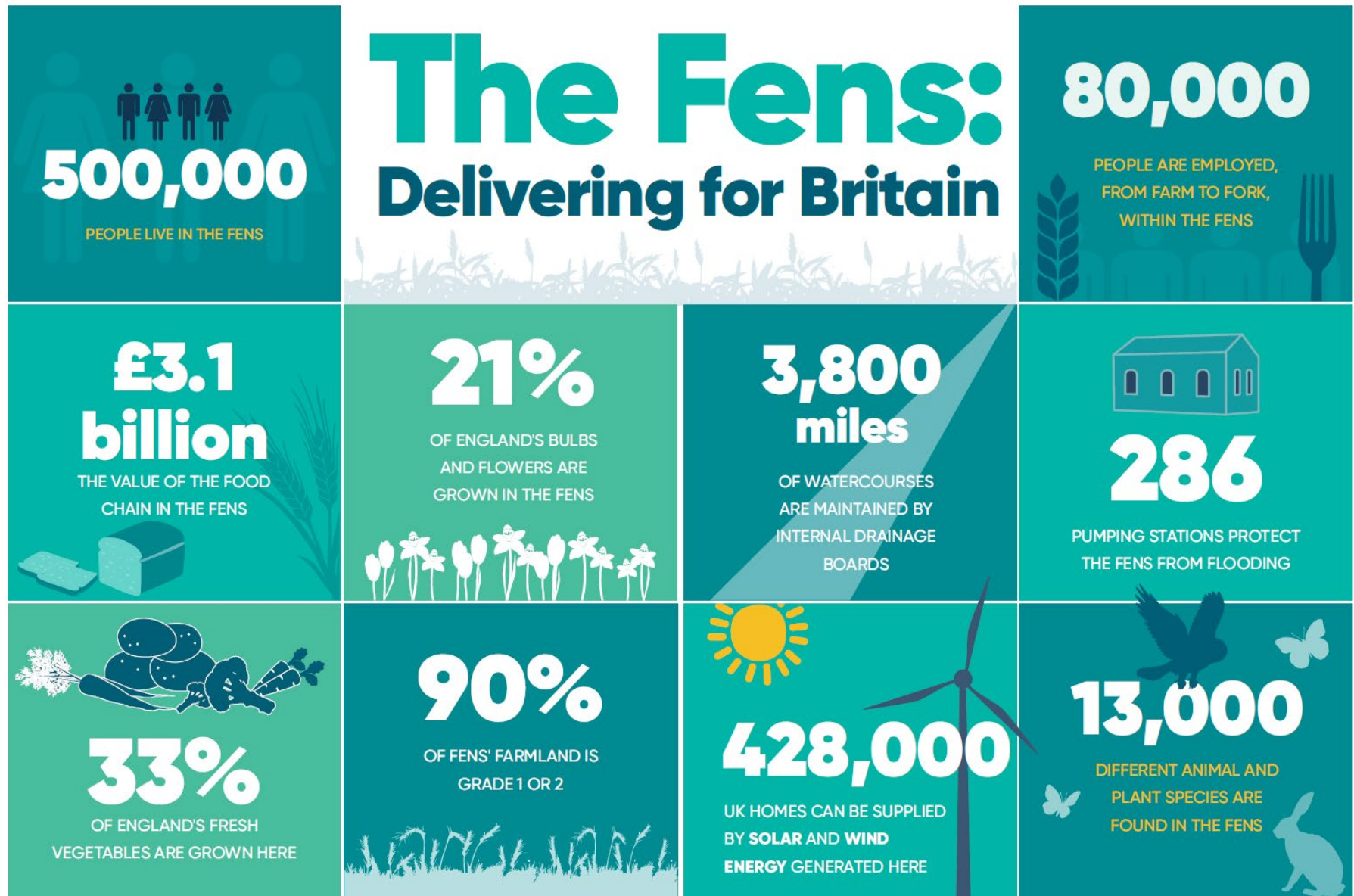


Managed Grassland: Somerset Levels



Cropland, East Anglia





Source: https://www.nfuonline.com/pcs-pdfs/food-farming-in-the-fens_web/

Soil loss & land subsidence

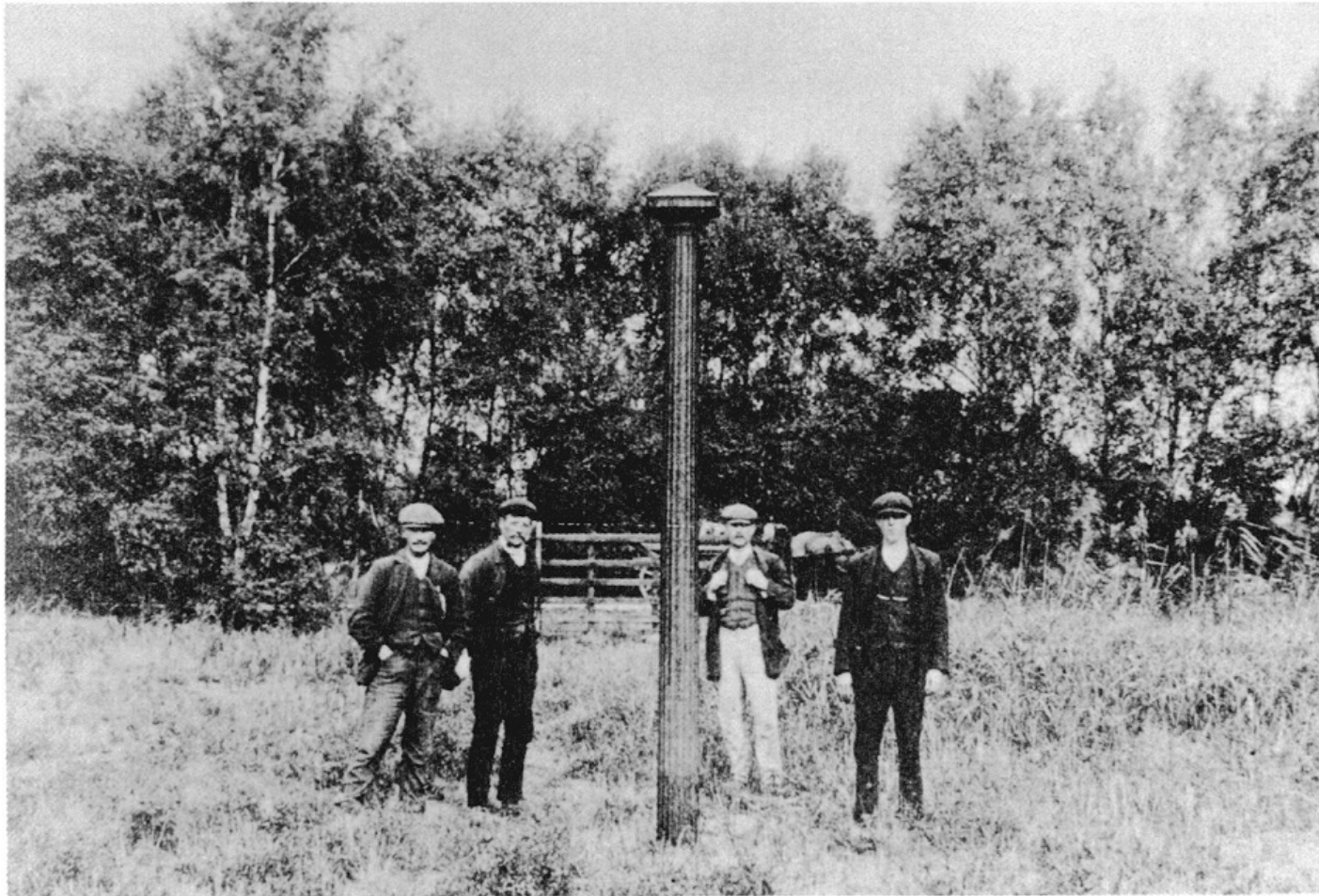
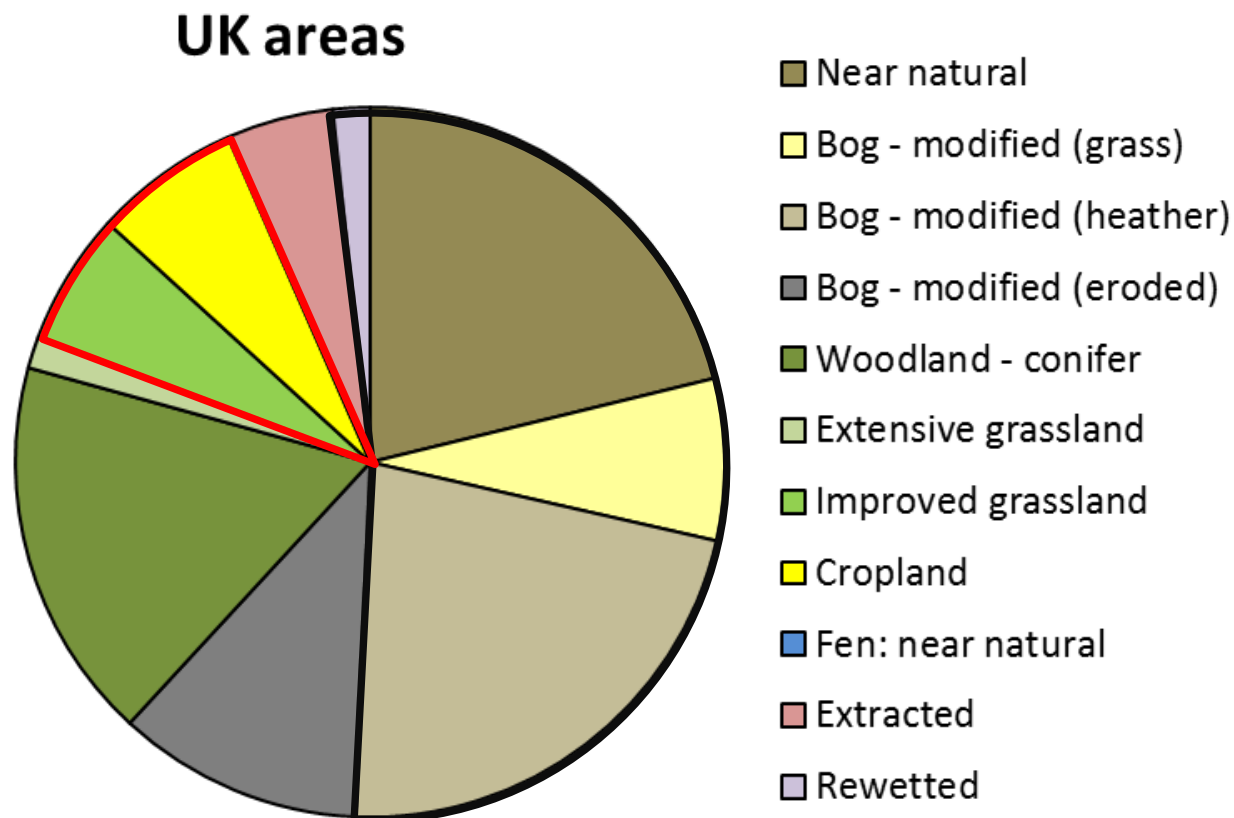


PLATE 4. Holme Post (protruding c. 3.0 m). Photograph taken not later than 1913, and probably between 1910 and 1913, looking NW (with acknowledgments to Cooper Square Publishers, N.Y.).

UK peat emissions inventory

UK peatland condition, circa 2013

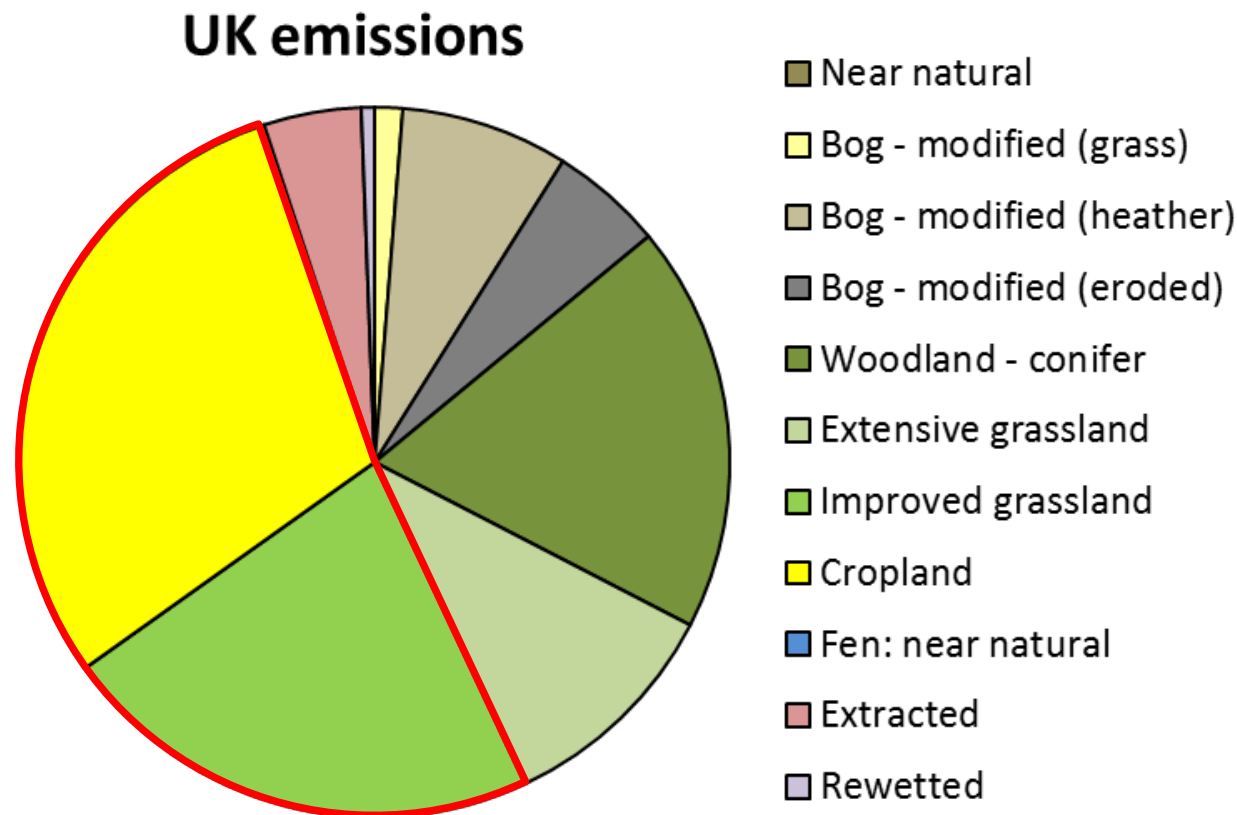
- Around 50% of UK peatland is still in a semi-natural condition (mostly in the uplands)
- **Agricultural peatlands comprise < 15% of the total peat area (all in the lowlands)**



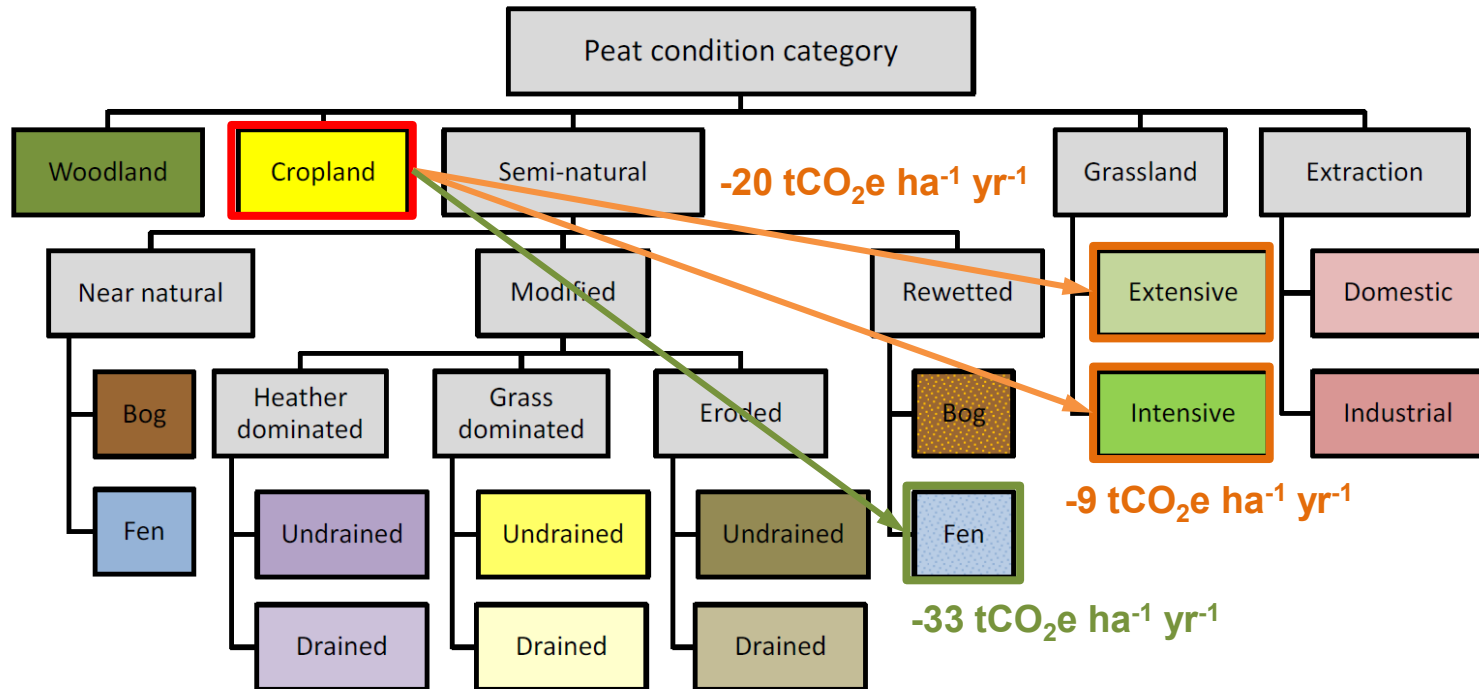
UK peat emissions inventory

Total GHG emissions from UK organic soils

- Total emissions estimated to be 23 Mt CO₂e yr⁻¹
- This is around 4% of UK total GHG emissions
- **Over 50% of UK peat GHG emissions are from intensive agricultural land**
- These areas occupy <2% of the total UK land area

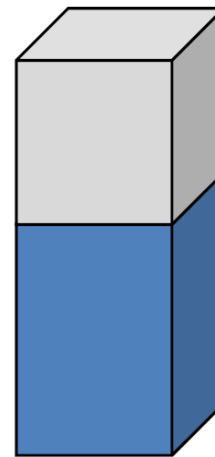
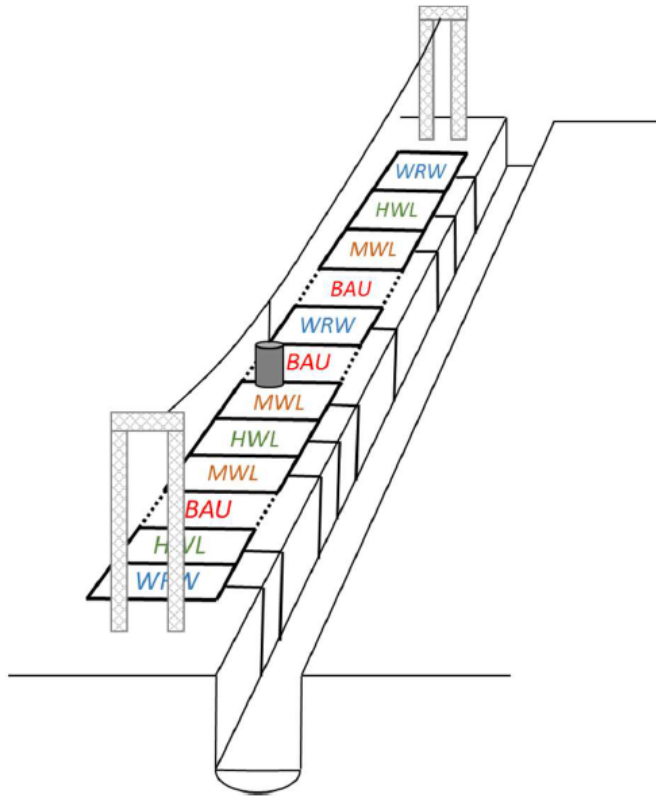


Cropland mitigation – all or nothing?

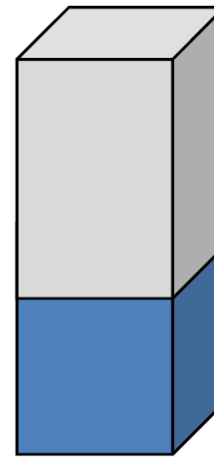


- Barriers to progress:
- Farmers do not want to stop farming
- Paludiculture not currently seen as a viable or economic alternative
- No reward for raising water levels in agricultural peatland

LP2: Water level manipulation experiment



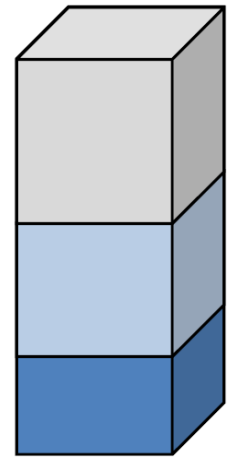
High WL
30 cm



Medium WL
60 cm

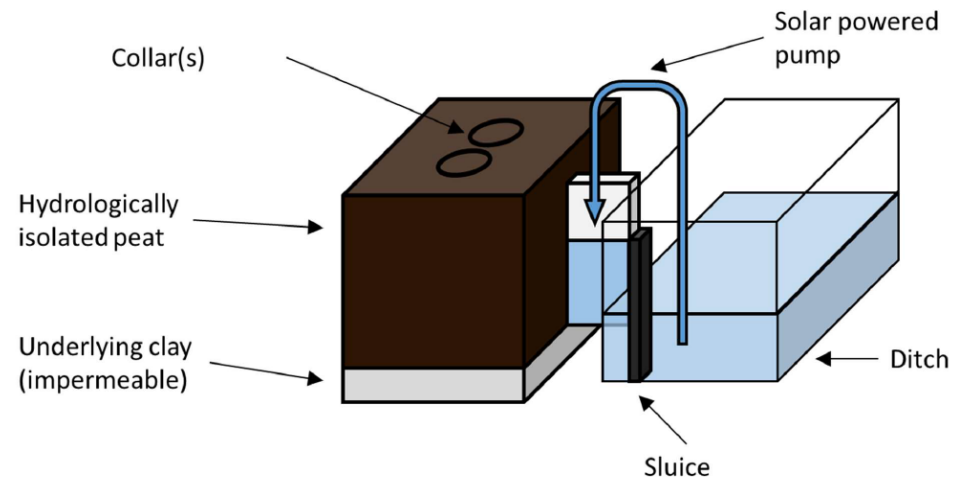


Low WL (BAU)
~90 cm*



Winter re-wetting
30/90 cm

*BAU treatment planned to reflect conditions in wider field (i.e. plots not hydrologically isolated). Alternative would be a fixed 90 cm WL (greater hydrological control, less realistic)



Skyline-2D: greenhouse gas (CO_2 , CH_4 , N_2O) measurement system



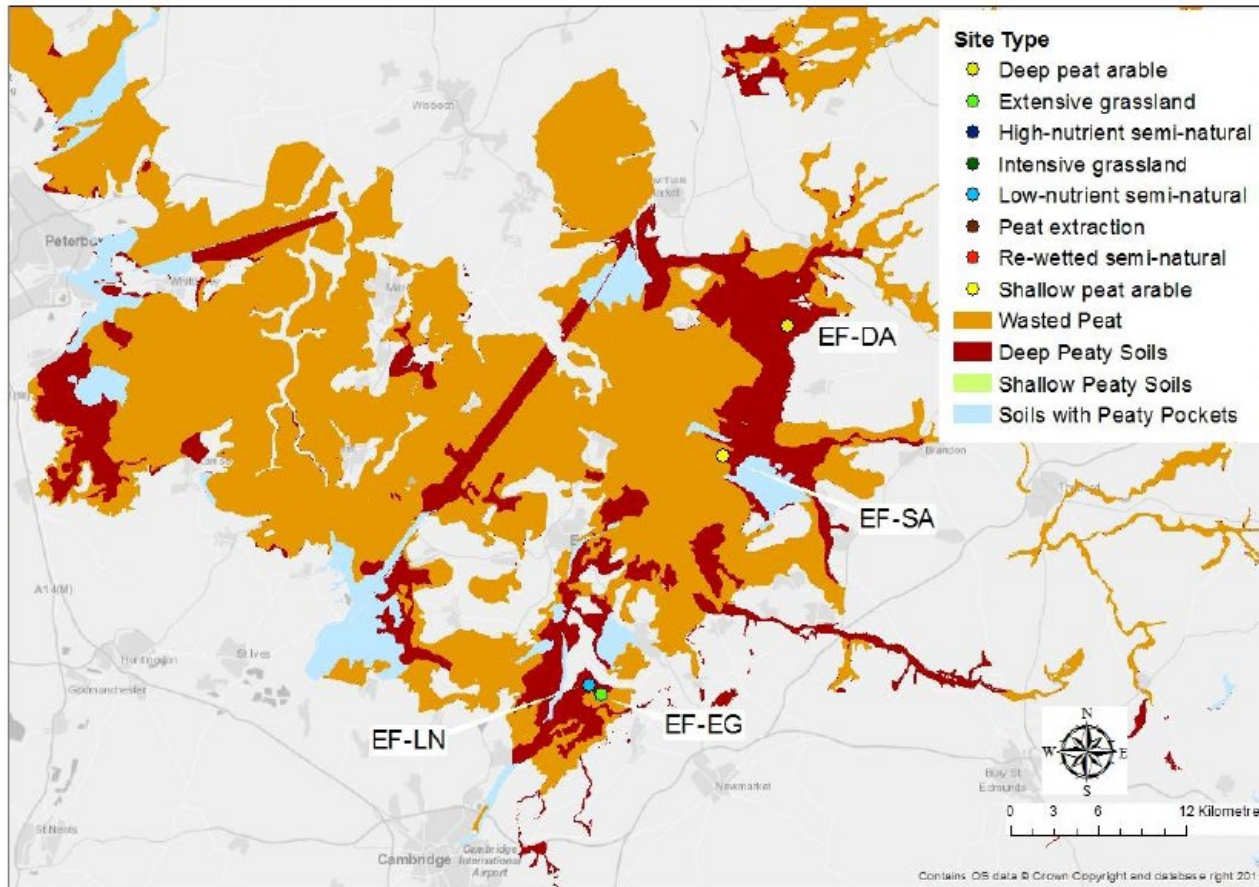
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Achieving Sustainable
Agricultural Systems

New flux site: Deep agricultural peat (EF-NE)



What about 'skirtland'...?



- 150,000 ha mostly deeper than 5 m
- 16,500 ha deeper than 0.4 m (Holman, 2009)

Evans et al. (2016) based on map data from Natural England (2010)

New flux site: Skirtland (EF-SK)





Water Works

PEAT PEOPLE SCIENCE

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Summary

- Ongoing (and forthcoming) flux tower work to quantify the carbon balance of lowland peatlands under different land use
- Experimental work focused on real-world solutions to mitigate emissions from lowland agricultural peatland