

Background

Every year **0.38%** of the global soil organic carbon pool (SOC) is lost as **75 billion tonnes** of soil are eroded by wind and water. Peatlands make up almost a quarter of this resource.

Northern hemisphere peatlands have an erosion rate of **1.41 t ha yr⁻¹** with **350,000 ha** of peat **actively eroding** in the UK, but what about overseas territories?

The Falkland Islands

8000 miles away, 300 miles from the coast of South America lies the Falkland Islands. Peat deposits here have been forming for almost **14,000 years** and cover over **43% of the total land area**.

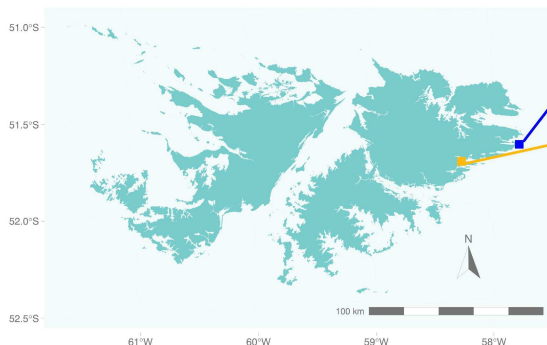
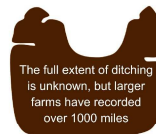
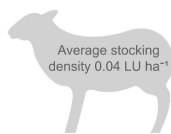


Figure 1. The geographical position of the Falkland Islands with the study sites CP (coastal peat) and FF (upland peat) located in blue and yellow respectively.

However 200 years of **sheep grazing** along with historical **ditching**, **pasture improvements** and **burning** have now combined with a **drying climate** to create vulnerable peatlands actively undergoing erosion.



Methods

Five passive wind sediment samplers (BSNE's) were set up to measure the horizontal mass transport (HMT) of eroded material across peatlands with different vegetation cover and grazing management styles. Erosion pins were also used to quantify the depth of material lost or gained at the peat surface. HMT, the mass of peat passing through a horizontal plane, was calculated by integrating the collected peat across the height of the sampler.

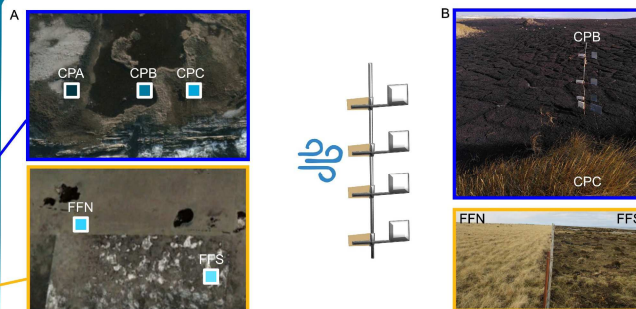


Figure 2. The location (A) and site photos (B) of the BSNE sediment traps indicated by the blue squares at CP (blue) and FF (yellow) the prevailing wind direction is westerly

Results

Erosion occurs **year round** with the greatest values of HMT in the **summer and autumn**.

Bare peat areas have higher HMT peaking at **590 g m⁻² d⁻¹** in December, this is over **110 times higher** than the mean recorded by a similar study on wasted peat in East Anglia

Across all erosion pins (CP) there was an average **surface loss of 5mm** over 18 months

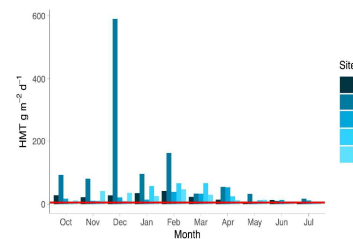


Figure 3. HMT at each site between 0.15 and 2 m. The month indicates the time of year in which the majority of the 28 day sampling collection occurred. The red line indicates the average HMT of 5.3 g m⁻² d⁻¹ recorded by Newman (2021) from agricultural fields on wasted peat.

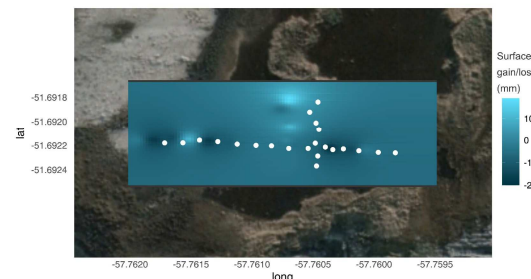


Figure 4. A projected map of surface height gained or lost between March 2022 and August 2023. The map has been produced using inverse distance weighted interpolation based on the change in peat height recorded across two overlapping transects of erosion pins. Material gain is shown in lighter colours and loss in the darker colours.

Why so high?

The Falklands has an average wind speed of 7 m s⁻¹ almost double the UK, however the data is too coarse for wind speed to be observed as a driving factor. Instead **soil moisture** and **soil temperature** seem to have a strong relationship with HMT whereby warmer drier soils are associated with higher HMT values. Where vegetation is sparse, there is evidence of **rainsplash** and **freeze-thaw** weathering increasing HMT.



So what?

At a rough estimate **0.008 Mt CO₂e** could be being lost as particulate organic carbon each year from eroding Falkland peat.

Particulate loss of material also results in:

- A direct loss of substrate for agricultural practice
- Vegetation smothering and subsequent loss in the wider area
- Resultant reduction in peatland biodiversity
- Unquantified impacts on the marine ecosystem

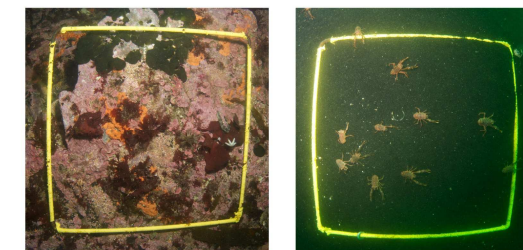


Figure 5. Quadrats on the sea floor showing a reduction in biodiversity from an area adjacent to intact peat (left) and actively eroding peat (right), photos: Amy Guest

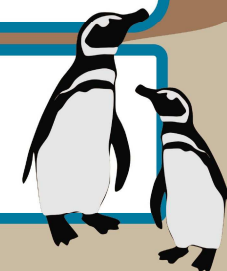
Recommendations

- Active **replanting** and **restoration** of bare areas
- Implementation of a **monitoring** and **management** system for increasing **soil moisture**
- Improved understanding of the fate of POC and its influence on the wider ecosystem

For more information

katros@ceh.ac.uk
@girl_in_a_bog

1 UK Centre for Ecology and Hydrology, Bangor, Wales
2 University of Leicester, Leicester, UK



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