Carbon

Uplands Symposium 2023

# Uplands & Carbon

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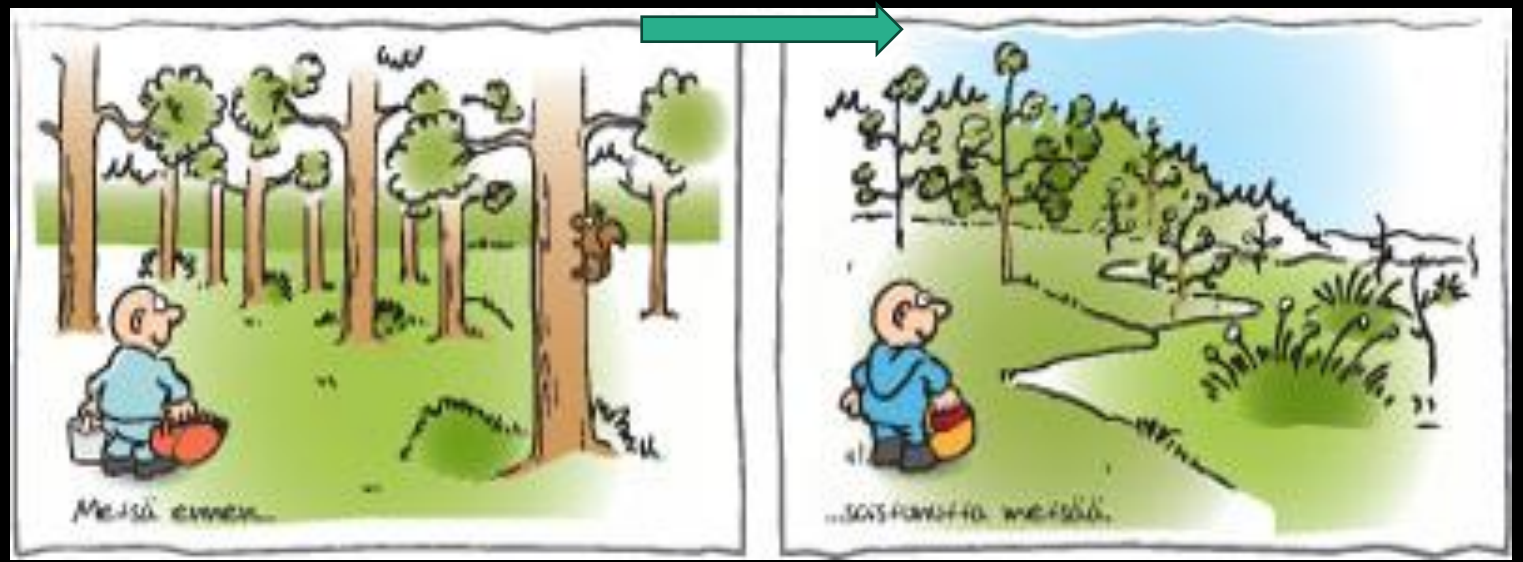
# How are farmers helping manage and maintain carbon in peat soils for future generations?

# How did peatland start growing?

RAISED bog


**In-filling of lake (Terrestrialisation) → Fen then raised bogs**

BLANKET bog

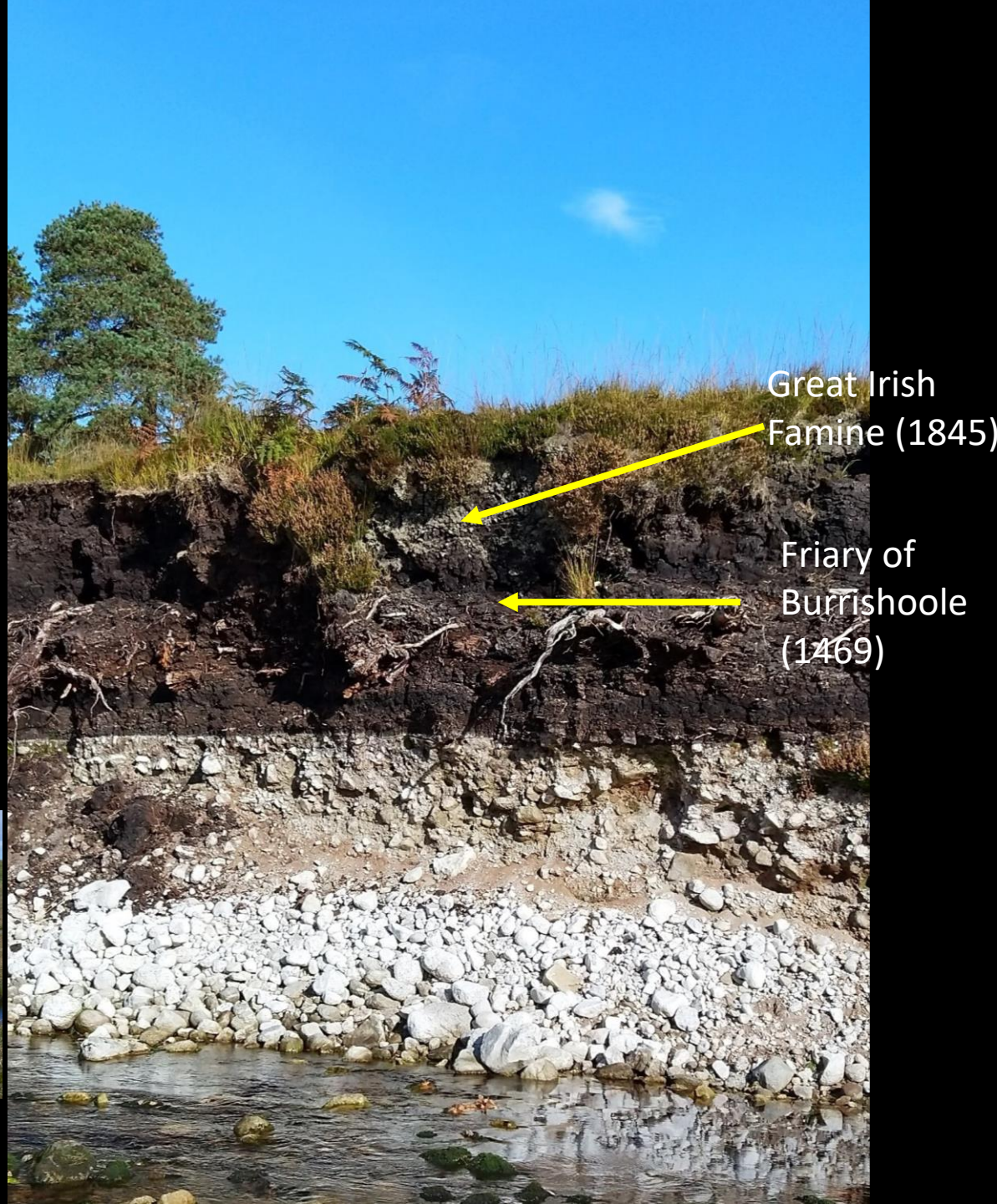



**Wetter soils (Paludification) → blanket bogs**

# Uplands = Blanket bogs

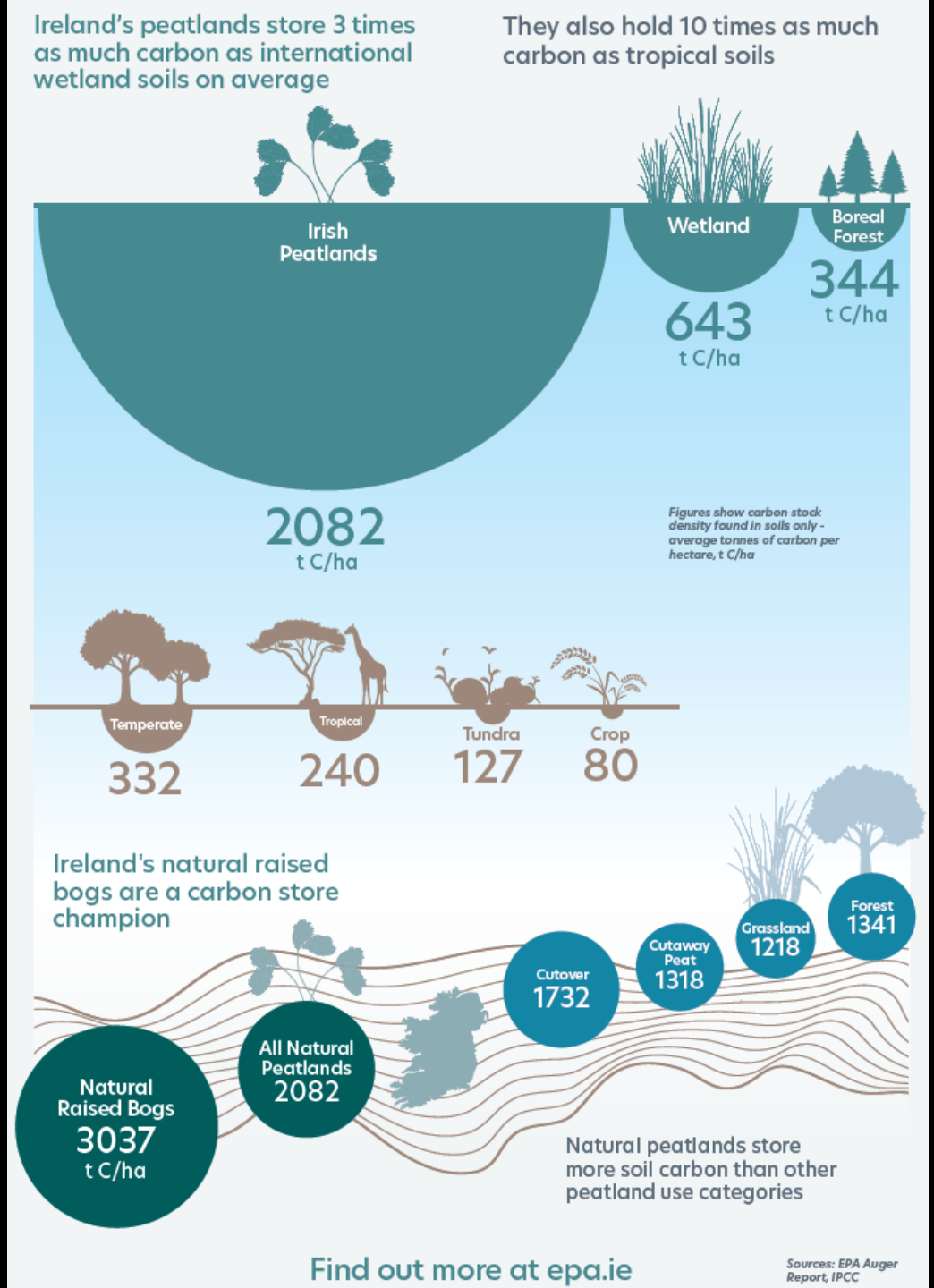
- Accumulated peat under WET conditions
- Water table within 10 cm of surface in Winter and 20 cm in Summer
- Peat accumulation 0-1 mm per year

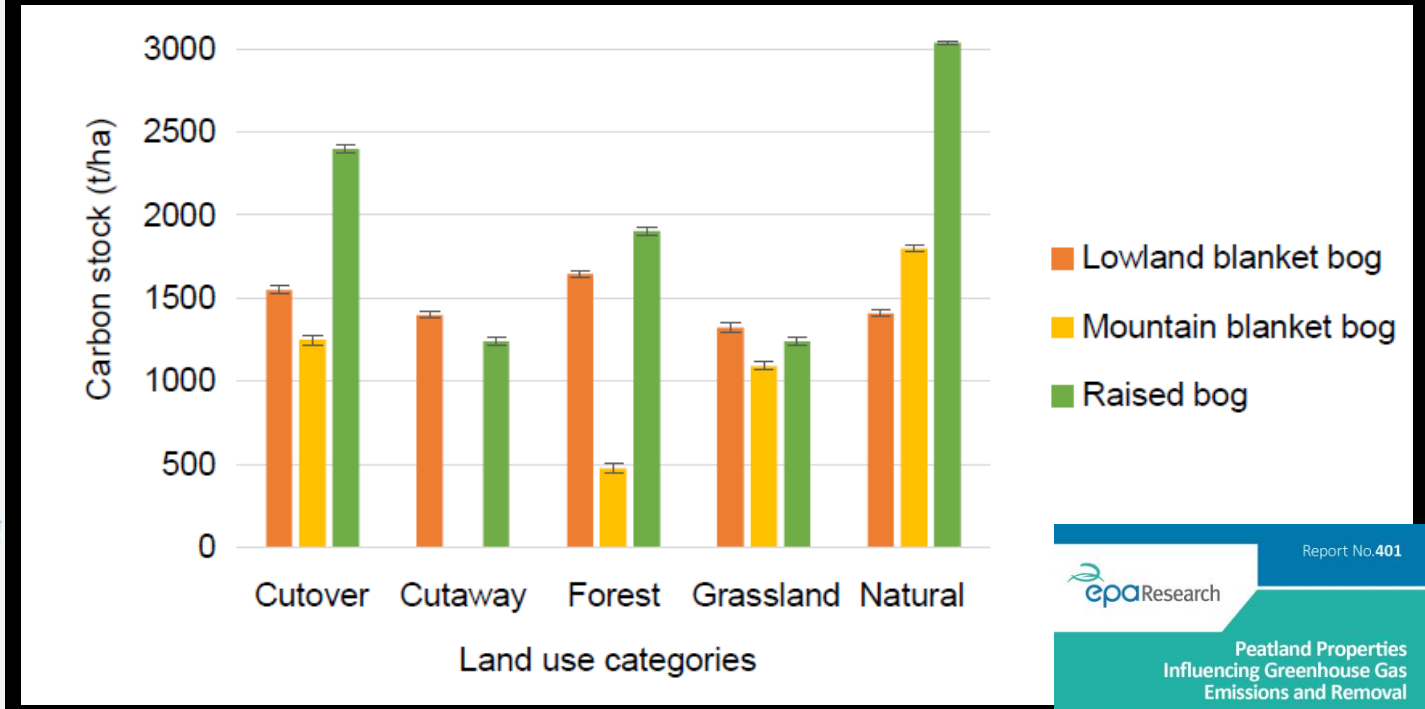
**Water is the blood of a bog**

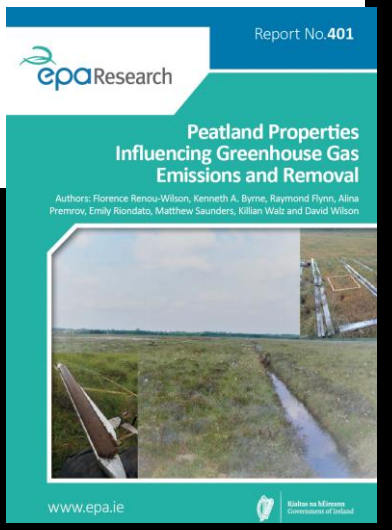


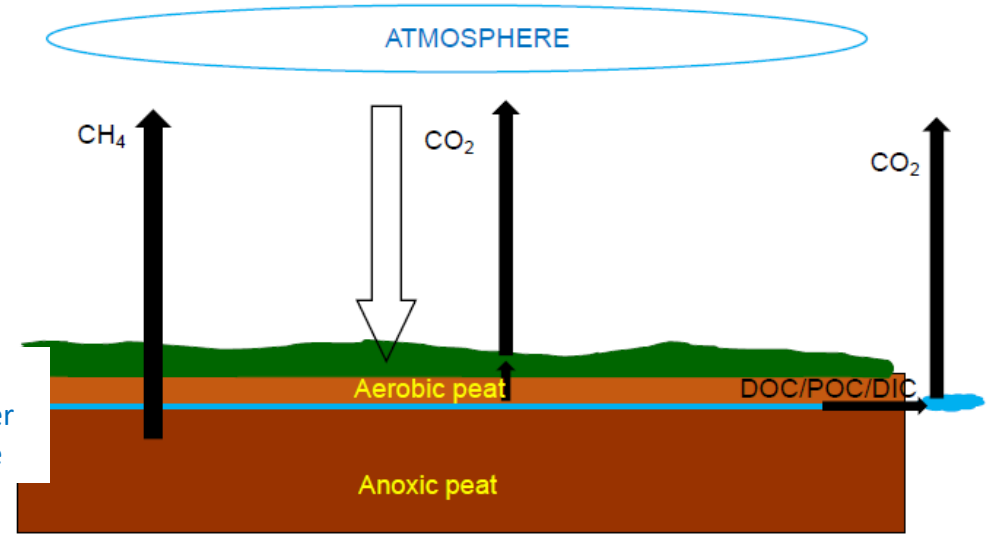
# Carbon stocks in peatlands: 2,216 Mt C

Natural < Cutover < Forest < Cutaway < Grassland



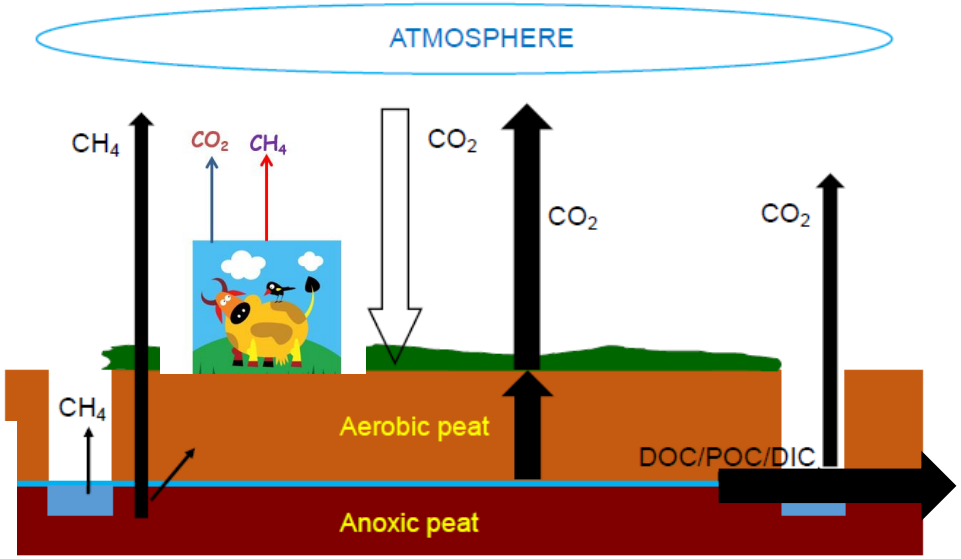






Carbon dynamics in natural peatlands

Ditches




Carbon dynamics in drained peatlands under grassland/forest/vegetated cutover

# Impact of drainage: increased $CO_2$ emissions from the mass of dry peat and from drains

Negative balance of carbon =emissions

# Peatlands and GHG emissions and removals

1) Farmed drained peat soils are emitting carbon dioxide and Nitrous oxide to the air.

2) Farmed drained peat soils are emitting also more carbon and ammonia to the water.

3) Where are we losing carbon the most?
   a. Deep drained peat
   b. Bare peat
   c. Nutrient rich peat

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4) Where are we gaining carbon (removals)?
   a. Near natural/Restored peatlands
   b. Some specifically managed ‘wet’ farmed peat

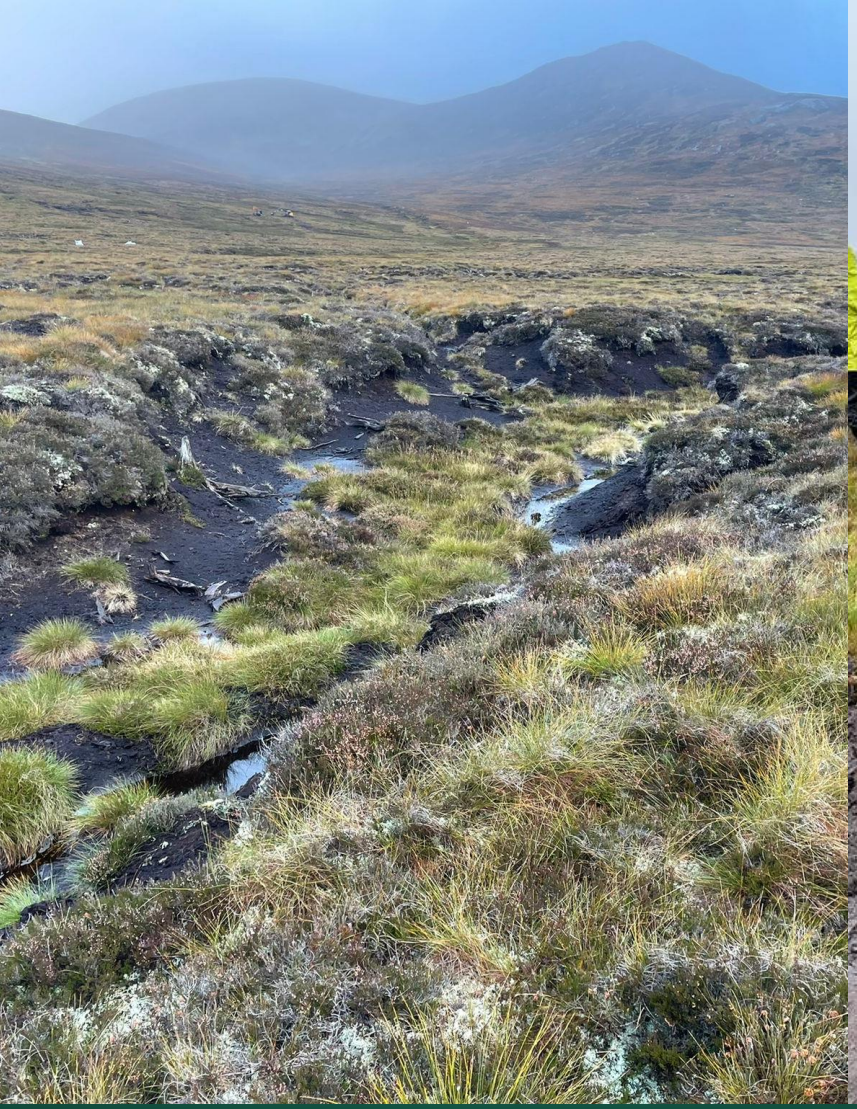
# Managing uplands for Carbon

3 Key factors:

1) Vegetation cover

2) Drainage status

3) Nutrient status



Bare peat = carbon loss = water pollution

More vegetation = reduced emissions & pollution

# Water table in drained grassland on peat is very irregular

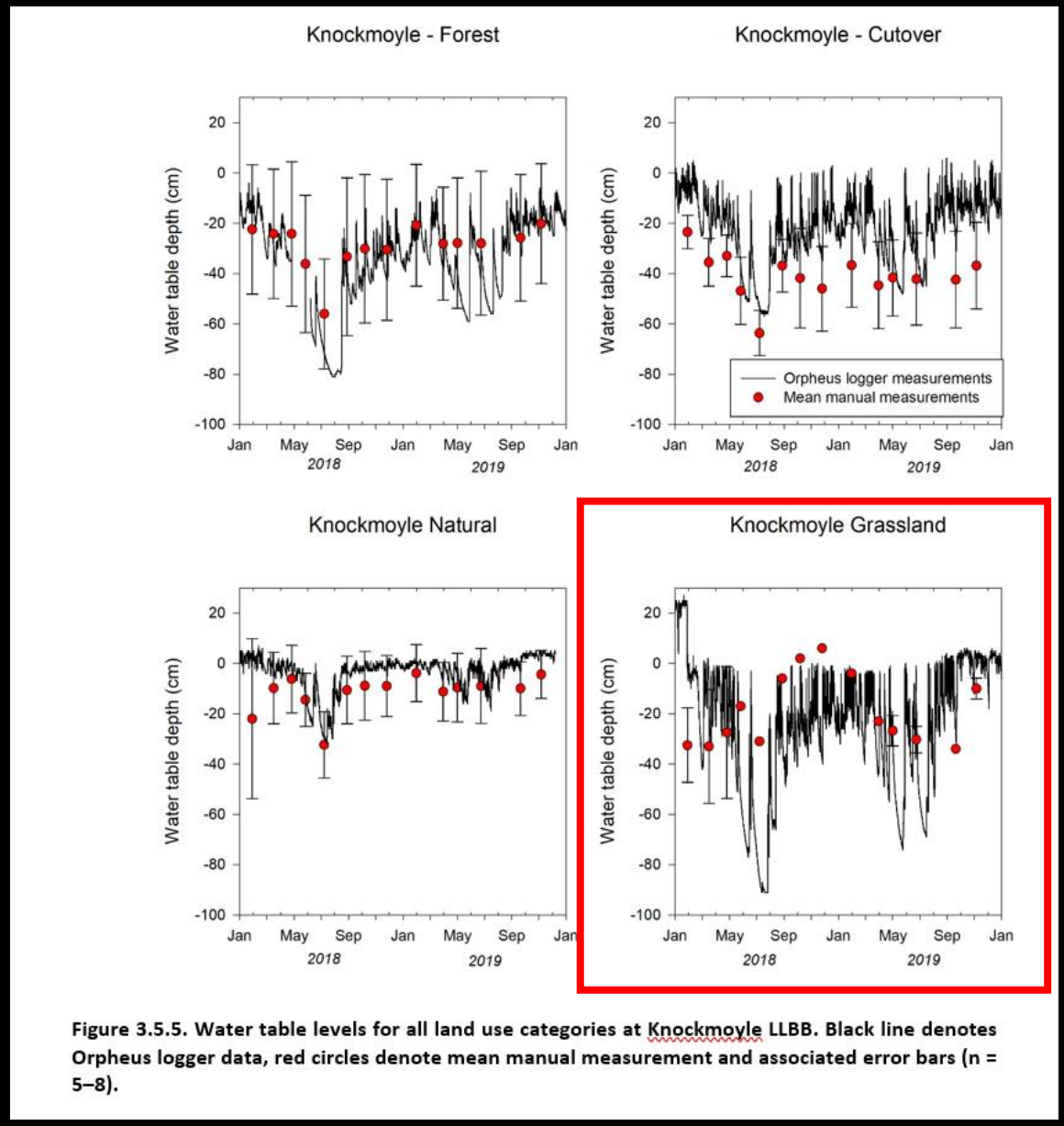
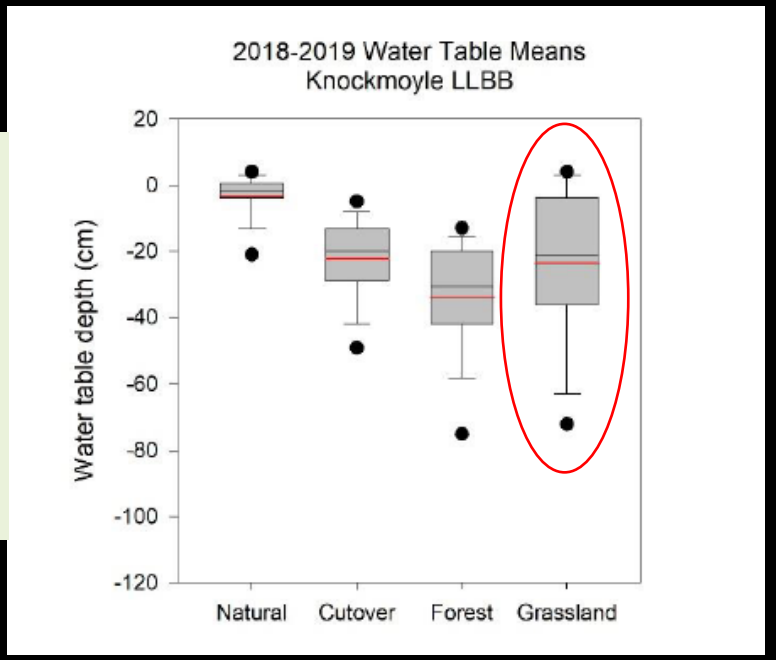



**Figure 3.5.5. Water table levels for all land use categories at Knockmoyle LLBB. Black line denotes Orpheus logger data, red circles denote mean manual measurement and associated error bars (n = 5–8).**

Greatest variability in grassland peat
→ Greatest emissions



# Drained grassland on blanket peat

Co. Donegal

Co. Mayo

Co. Sligo

Shallow drained/wet

Moderate

Well drained

Raised water table = Reduced emissions

# Drainage of peat in Co Mayo

# Drainage of peat in Co Mayo


Deep drained grassland on nutrient poor peat in Co Mayo


# Managing Water Table

= Deliberate action of raising the water table on drained soils

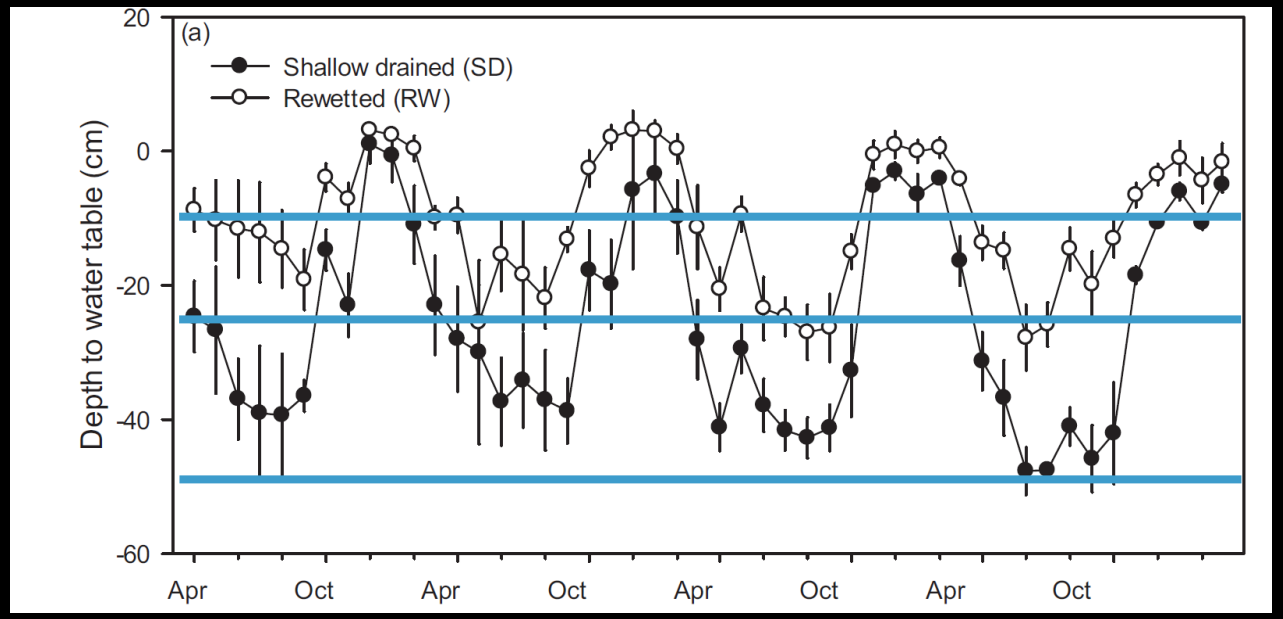
- by basic ‘plumbing’:
- reprofiling surface water slope
- blocking drains

= stopping unnecessary drainage

(doing less, not more)

≠ flooding

# Managing water table in a grassland over peat in Co. Donegal




Rewetted

Shallow drained

Deep drained

| | Water table | **Carbon balance** |
|---|---|---|
| Deep drained | -47 cm | +2.7 t C $ha^{-1}$ $yr^{-1}$ |
| Shallow drained | -23 cm | +2.3 t C $ha^{-1}$ $yr^{-1}$ |
| Rewetted | -14 cm | -0.35 t C $ha^{-1}$ $yr^{-1}$ |

Each cm of water table raised helps the climate!

nature

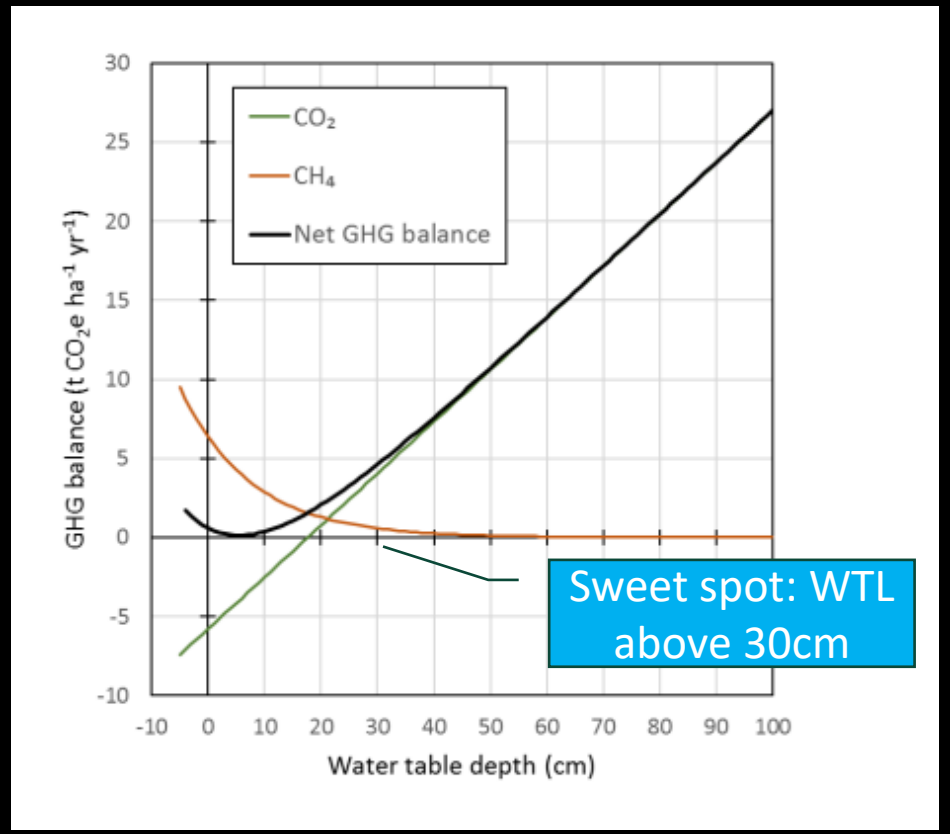
Article | Published: 21 April 2021

# Overriding water table control on managed peatland greenhouse gas emissions

Mitigations on farmed peat soils:

-Every 10 cm of reduction in Water Table could reduce at least 3 t $CO_2$/ha/yr

-Overall carbon emissions from peat soils drained for agriculture could be greatly reduced without necessarily halting their productive use.



# Benefits of better management of farmed peat soils?

- ✓Continued production (with perhaps exclusion zones)
- ✓Better landscape hydrology (reducing the speed of water downstream)
- ✓Better water quality (cleaning for drinking reservoir)
- ✓Preventing fires/future climate change effects
- ✓Prevent further land degradation
- ✓Prevent biodiversity reduction (rare birds)
- ✓Prevent peat entering streams (fishing, pearl mussels)

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Hen Harrier Project

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European Innovation Partnership

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PEARL MUSSEL PROJECT

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# Looking to the future

Farmers need to know :

- their soil properties: not only Carbon (bulk density and depth) but also nutrient status→ map areas (the larger the better)
- Water table baseline (simple waving pipes)
- Catchment-sensitive farming area?
- Drainage history: origin of the peat
- Diversification possible?

# Thank you

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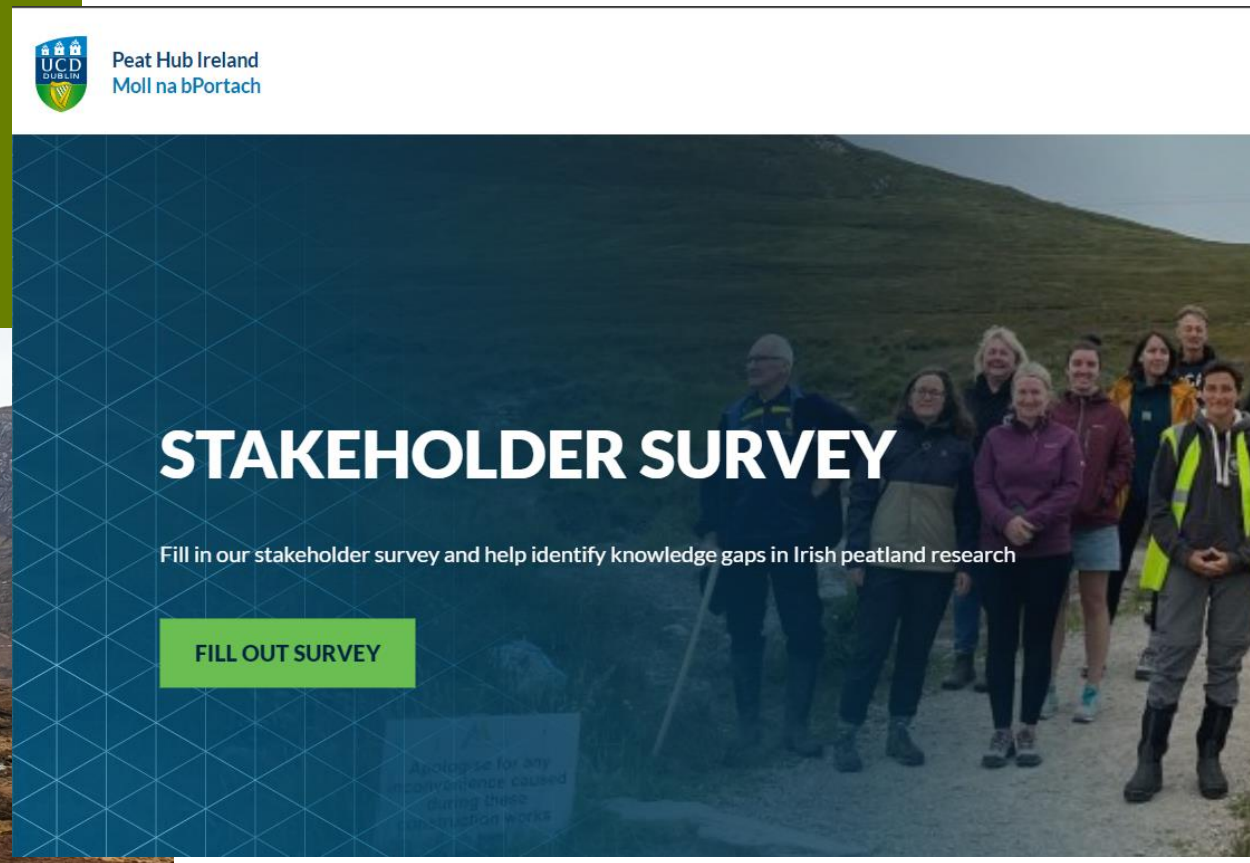
https://www.ucd.ie/peat-hub-ireland/

@PeatlandHub

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