



Quantifying and Understanding the Earth System

Peatland Programme Peatlands and the climate challenge in the UK Pete Smith

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Global SOC stocks

- 1500 Pg C to 1 m (2 x atmospheric C, 3 x vegetation C)
- >2000 Pg C in total
- ~500 Pg in peatlands
- ~1/4 of total global soil C

Smith (2004)

Global SOC stocks



USDA (2010)

Global importance of peatlands

- 1990's C emissions ~ 8 Pg C per year
- 1990's annual increase in atmospheric
 C = 3.2 +/- 0.1 Pg per year
- ~500 Pg in peatlands
- So loss of 1.6% of peatland C = total annual human C emissions
- Or loss of 0.6% of peatland C = total annual increase in atmospheric CO_2 -C

Smith (2004)

Peatlands – the UK's biggest Carbon store

UK soils: 9838 ± 2463 Mt C in soils (compare to 114 Mt C in vegetation; Dawson & Smith, 2009; Bradley et al., 2005)

Of this, nearly $\frac{1}{2}$ is held in Scottish peatlands, but other important peatlands throughout the UK (Bradley et al., 2005)



Importance of peatlands in UK

- 2007 UK GHG emissions: 635 Mt CO₂-eq. / yr = 170 Mt C / yr (CCC, 2010)
- UK LULUCF emissions: -2 Mt CO2-eq. / yr =
 0.5 Mt C / yr (Dyson et al., 2009)
- To 1m, UK peats contain: 1357 Mt C (Bradley et al., 2005)
- So loss of 12% of UK peatland C = total annual UK human GHG emissions
- Or loss of 0.04% of UK peatland C would wipe out the current UK LULUCF sink

Smith et al. (2010)

Peatlands - take home messages

- Extremely important in the global C cycle and in the UK GHG budget
- C cycle and UK GHG budget extremely sensitive to changes in peatland C emissions
- Peatlands themselves very sensitive to climate change / (mis-)management

Climate threats to peatlands

- Increased temperature (speeds decomposition)
- Decreased rainfall (peatlands depend on wet conditions)
- Change in vegetation structure due to climate change - indirect impact on peatlands
- Threat of pressure on land as climate suitability for agriculture moves north

Will peatlands still be able to exist under future climates?



See the talk of Jo Clarke et al.

Need to measure and monitor



e.g. Billett et al. (2010) - see also Chris Robinson on MICCI

Threats & Opportunities

- Land management interventions (burning, grazing, liming, drainage, land-use change) plus other drivers (e.g. acid deposition)
- Potential restoration practices (grip blocking, grazing and fire regime management)
- Aims for restoration:
 - Reduce ongoing emissions from damaged peatlands
 - Sequester carbon
 - Improve resilience to future climate change
 - Reduce vulnerability to other pressures

See the talk of Fred Worrall et al., and other presenters

Mitigation potential of peatlands



Smith et al. (2007; 2008)

Identifying the opportunities

- Are there win-win opportunities (improve resilience and reduce emissions) in peatlands in terms of climate change?
- Are there win-win-win opportunities in peatlands in terms of delivering other ecosystem services?