GSP Managing Living Soils, Rome, 5 Dec 2012

Status and priorities of soil management in the United Kingdom

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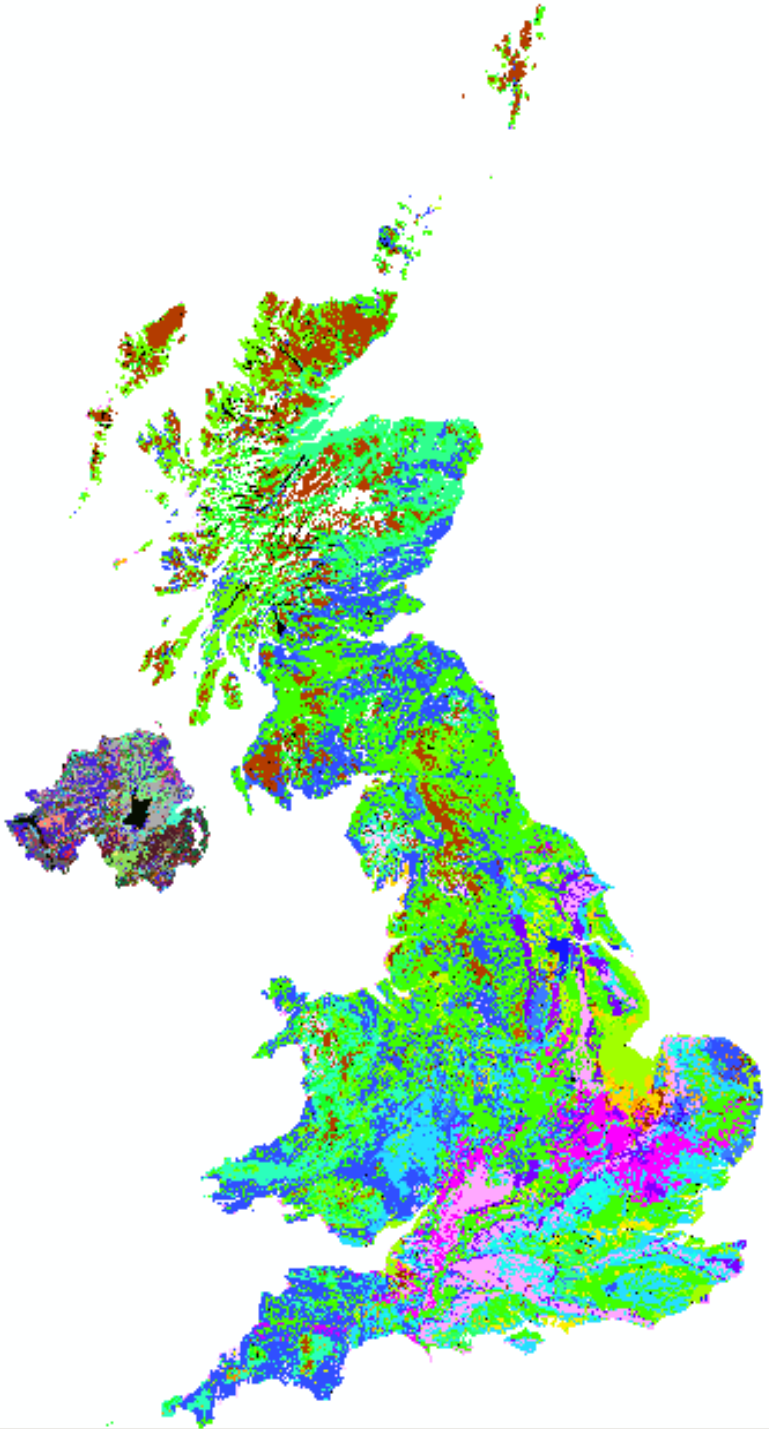
Topics

- Soils Policy in UK
- Institutions and research programmes
- Technical issues in UK soil management

UK Soils Policy



Soil policy - a matter of devolution

- England
  - Natural Environment White Paper
    - Defra Soil Policy Team
      - Natural England / Environment Agency / Forestry Commission
      - Commercial agric. advisory (e.g. ADAS)
- Scotland
  - Scottish Soil Framework and Land Use Strategy
    - SG Soils Policy Unit
      - CAMERAS (SNH, SEPA, FCS, QMS, etc)
      - SG Agric. Advisory = MRPs (JHI, SAC, Rowett, Moredun)

- Wales
  - Natural Resources Wales /Cyfoeth Naturiol Cymru
- Northern Ireland
  - Agrifood and biosciences institute (AFBI)

Overlapping policy issues

- Legislation
  - Good Agricultural and Environmental Condition
  - Water Framework Directive
  - IPCC - pollution prevention
  - Biodiversity conservation
    - Aichi targets

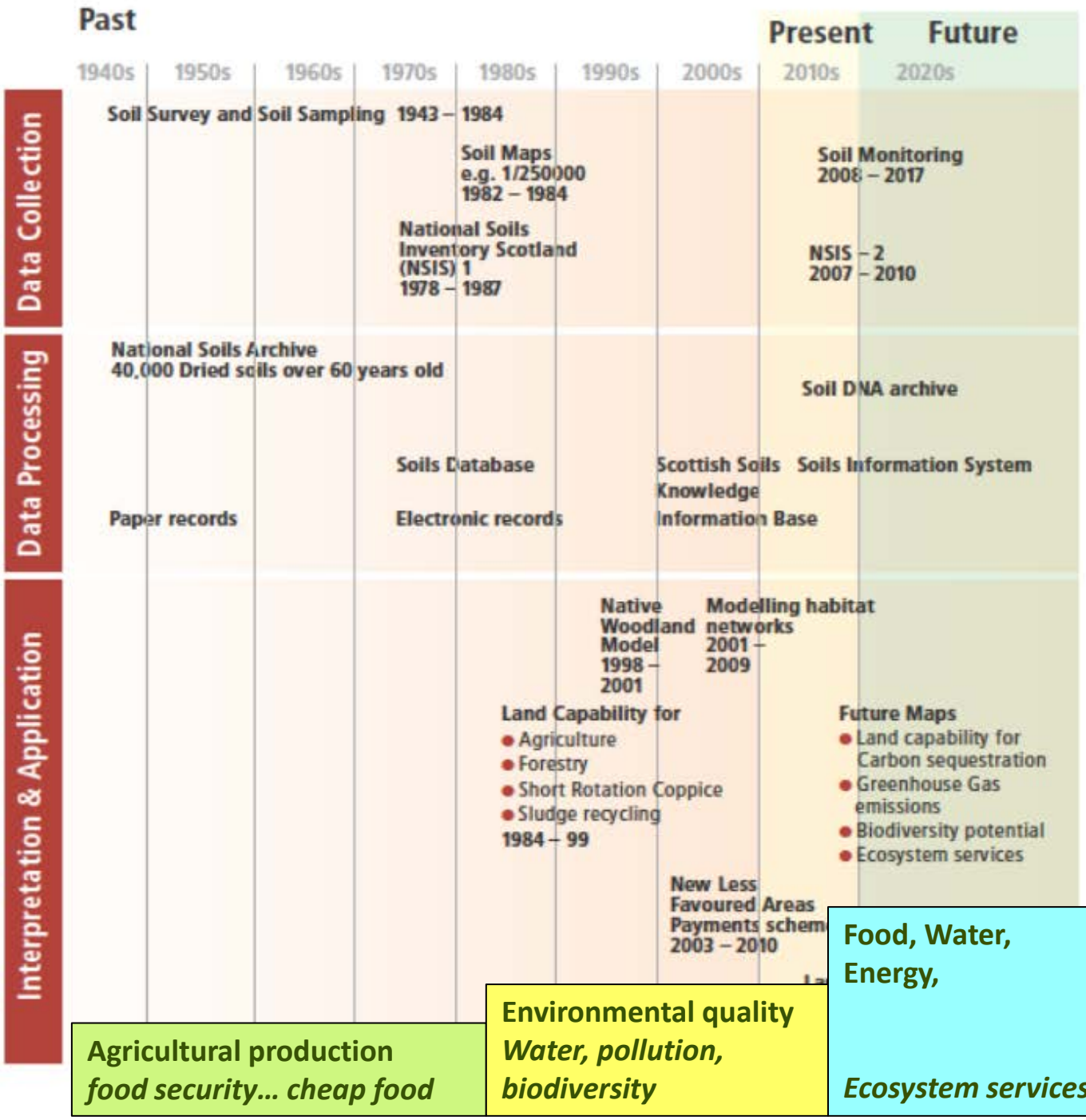
- Policies
  - Monitoring
    - Limiting threats and protecting functions
  - Sustainable use of soils
  - Standards in Forestry
  - Protecting organic soils
  - Reducing GHG emissions

Institutions

- Government Agencies by country
- Research institutes
  - Rothamsted Research; Centre for Ecology and Hydrology; British Geological Survey; The James Hutton Institute; Natural History Museum
- Universities and Colleges
  - Cranfield, Scottish Rural Universities and Colleges (ex SAC), Harper Adams, Reading, Newcastle, Nottingham, Lancaster, Queens Belfast, Edinburgh, Imperial London, Cardiff, Bangor, Heriott Watt, Dundee, Stirling, York, Aberyswyth, Durham, Oxford, Exeter, Plymouth, Norwich, Birmingham, Central Lancashire, Bristol, Cambridge…
- Research Councils UK
  - BBSRC and NERC

- Consultancies
  - ADAS, HyderCreswell, Penny Anderson, etc
- Learned Societies
  - British Society of Soil Science
    - IPSS (inc. CSi)

http://www.soilscientist.org/pages/ipss/find-expert



The Knowledge Chain (Bouma et al)

From soil sample…

to data…

to information

… to knowledge

Advocacy – UK Political engagement

The All-Party Parliamentary Group on Agroecology

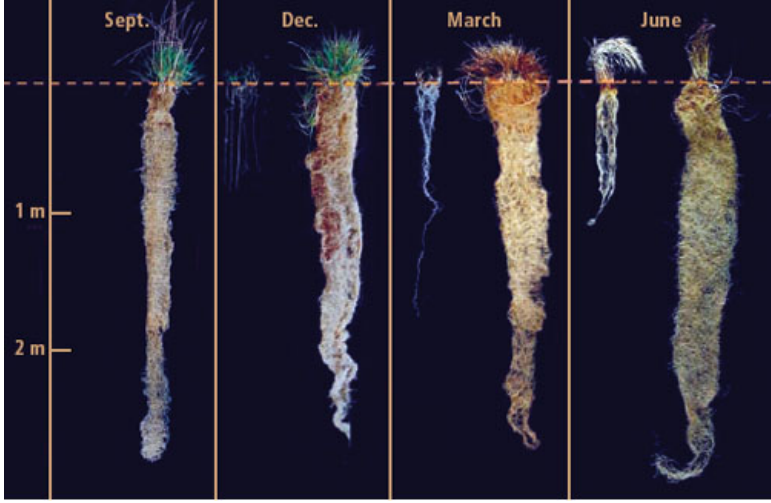
Boosting Britain's soils to meet farming needs

Thursday 6th December 2012, Committee Room 16 Palace of Westminster.

The day is jointly sponsored by the APPG, British Society of Soil Science (BSSS) and the Food Ethics Council

BSSS interview about World Soils Day on BBC Radio 4 Farming Today 5th December 2012

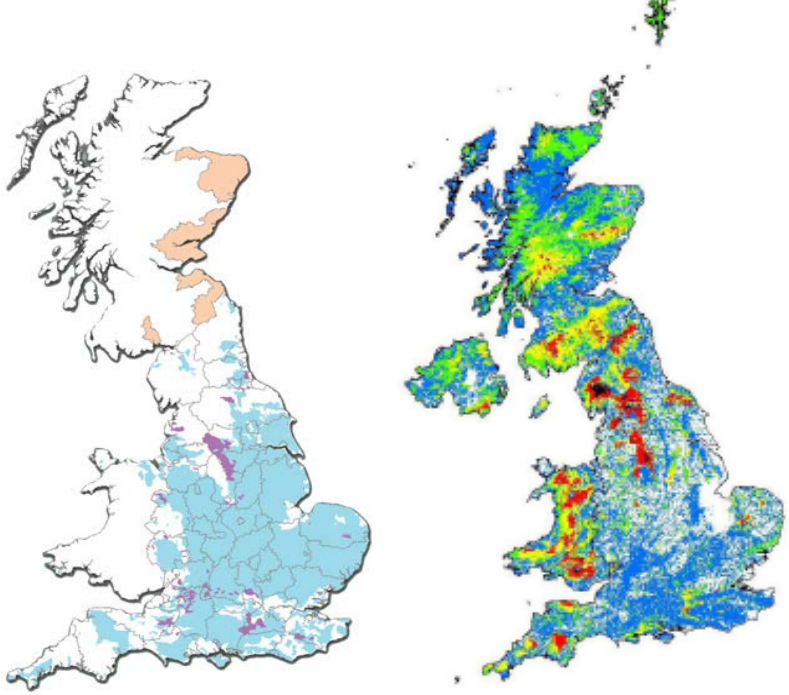
Near future for UK soils R&D



- Government
  - Strategic priorities
    - Spending reductions 10-20% pa
- RCUK – cooperation on soil science research
  - BBSRC 2013 (£4.5M)
    - Soil and Rhizosphere Interactions for Sustainable Agri-Ecosystems
      - Innovations to support Global Food Security
  - NERC 2014 (£5-7M)
    - Soil Security
      - Predictive understanding of soil multi-functionality and its resistance / resilience to change

Technical issues

Soil fertility / nutrients



- Issue = Excess N and P
  - Excess nutrients in agricultural soils
    - Nitrate Vulnerable Zones
  - Critical loads exceedance (N)

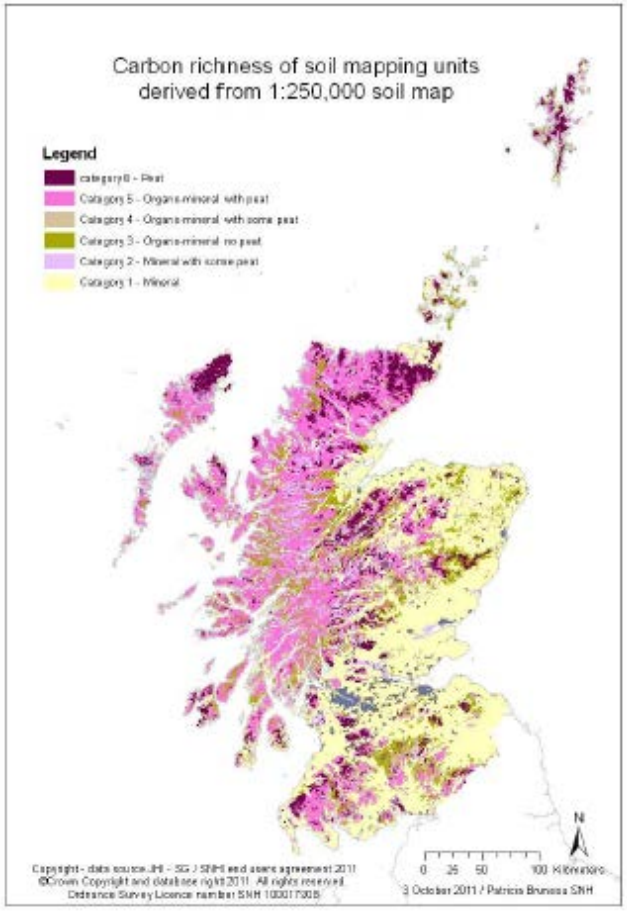
- Consequences of excess nutrients
  - Poor water quality (N & P)
  - High GHG emissions (N_2O)
  - Limitations to soil use and management (N, OM, “wastes”)
  - Poor habitat condition assessments

- Opportunities with improving nutrient management
  - Cost savings : NUE and improved plant access of soil nutrients
  - Agricultural contribution to climate change mitigation (N_2O)
  - Reduced costs of water purification

Soil organic matter / carbon

- Issues
  - Low SOM in arable soils
    - Compromised soil structure
  - Organic (peat) soils degraded

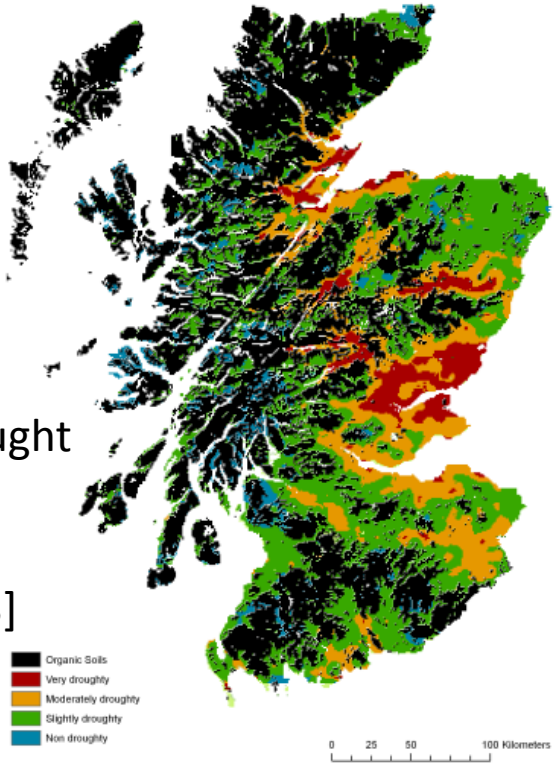
- Consequences
  - Crop productivity constraints
  - Poor water quality – DOC, sediment
  - Adding to elevated atmospheric CO_2
  - Threatening biodiversity conservation



- Opportunities through increasing and protecting soil carbon
  - Alternate use of “wastes”
  - Range of soil quality benefits
  - “Quick” climate change mitigation benefits

Soil moisture / water

- Issues
  - Increasing frequencies of soil moisture deficits and excesses in agricultural soils
  - Flooding!



Wheat drought risk 2050s projection [UKCP09 q3]

- Consequences
  - Costs of irrigation
  - Crop production losses
  - Water quality issues – DOC, sediment
  - Biodiversity conservation threats

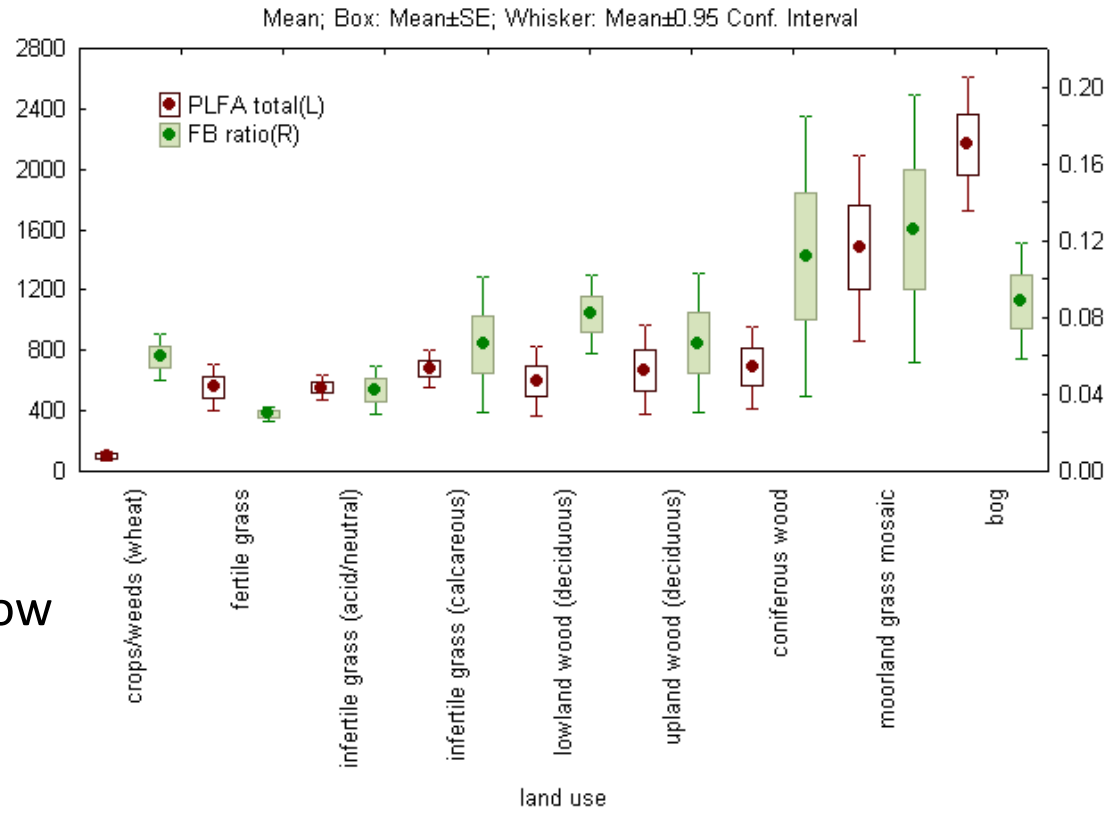
- Opportunities
  - Target irrigation
  - Crop selection
  - Off site benefits of flood mitigation – Payments for Ecosystem Services

Soil physical structure

- Issues
  - erosion
  - compaction
  - landslides
  - reduced extent of soil
- Consequences
  - Water quality issues
  - Water logging
  - Mechanical impedance
  - Sediment build up
  - Loss in productive area
- Opportunities
  - Farm level cost efficiencies
  - Increase productive area
  - Off site benefits of water quality and flood mitigation (PES?)

Soil Biology

- Issues
  - Historical sparse knowledge
    - What have we got?
    - Where is it?
    - How important is it?
  - Agricultural soils relatively low in soil biodiversity
  - Safe ecological limits?



- Implications
  - Biological functions reduced
  - Unable to protect biodiversity effectively

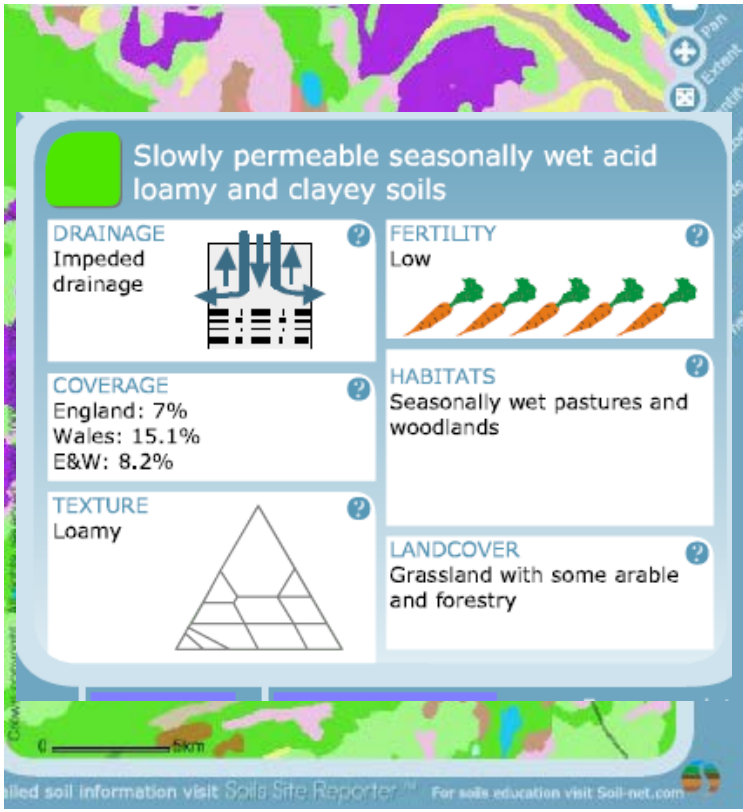
- Opportunities
  - Soil quality improvements
  - Mitigate GHG emissions
  - Ecological farming
  - Halt biodiversity losses

www.genomenviron.org/Projects/METASOIL.html

Soil – other Restoration

- Issues
  - Construction continues a pace in all habitats
    - Historical brownfield sites
    - New developments
  - Poor condition of existing habitats
- Consequences
  - Loss of productive areas
  - Loss of other benefits from healthy soils
  - On-going remediation costs
- Opportunities
  - Improved approaches to soil restoration
  - Financial and social benefits from quicker / effective habitat restoration
    - On-site and off-site

Soil – other Information for end-users



- Issues
  - User friendly information
    - Access to existing data and information
    - Up-to-date data
  - Monitoring of status and trends
    - Threats and Functions
- Implications
  - Inadequate or out-dated advice
  - Unable to mitigate harmful changes
  - Limiting R&D
- Opportunities
  - Web-based information
  - Smart phone access
  - Rapid and multi-soil property analyses methods

Soils in the context of ecosystem services

Provisioning

- Crop production
  - LCA/ALC
  - Crop suitability
  - Commercial trees
- Groundwater recharge
  - HOST
- Wild foods
  - Fungi

Cultural

- Preservation of history
  - Animal, plant & other remains
- Recreation and tourism
- Conservation
  - BAP species
  - Priority habitats

Regulating

- Environmental quality
  - Critical loads N, S, metals, NVZ, CLEA
  - Flooding and erosion risks
  - GAEC
- Pest and pathogen control
- Climate regulation
  - Carbon storage, GHGs
  - Water exchange

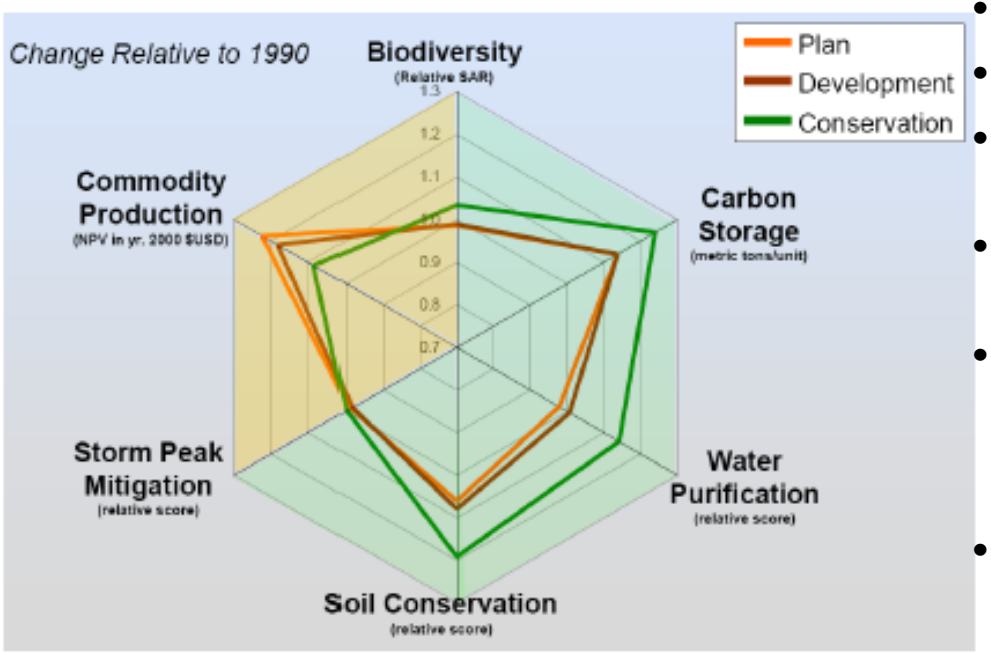
Supporting

- Plant establishment and growth
  - Native habitats + species
- Food supply for native animals
- Genetic reservoir
- Resilience to change

Interactions and trade-offs

1. Ecosystem Service Trade-offs

One indicator won't tell you everything



- Multiple indicators
- Alternate outcomes
- Change from known state or dynamic
- Quantifiable units of measurement
- Defined and compatible areas Economic, Social and Environmental costs can be compared*
- Translate into spatial planning tools and practical information for farmers

UNEP WCMC

*Glenk, K.; McVittie, A.; Towers, W.; Watson, C.; Black, H.I.J. (2010) Socio-economic data on Scottish soils - collection and development. Contract Report to SEPA.
See also the State of Scotland's Soils Report, 2011

Conclusions from UK

- Messy policy arena but sustainable use of soils central to all UK government bodies
- R&D organisations working together on common UK issues and research areas
- Demand for new types of soil information which requires contemporary data on soil B + P + C + E
- Momentum for monitoring
- More to do on joining up UK soil data and information resources
- Diverse soil science community with a chequered history but with the skills and the knowledge, and many post-docs
- New tools and technologies being developed
- New research initiatives bringing together environmental and agricultural aspects of soil science to address multiple demands from soils

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Thank You!

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"The missing link in the cognitive understanding of soil ecosystems is that there is a failure to recognize it as an intelligent system with all of its components acting as a unit, ..."

N. Nikolaidis. Applied Geochemistry 26 (2011) S230–S233

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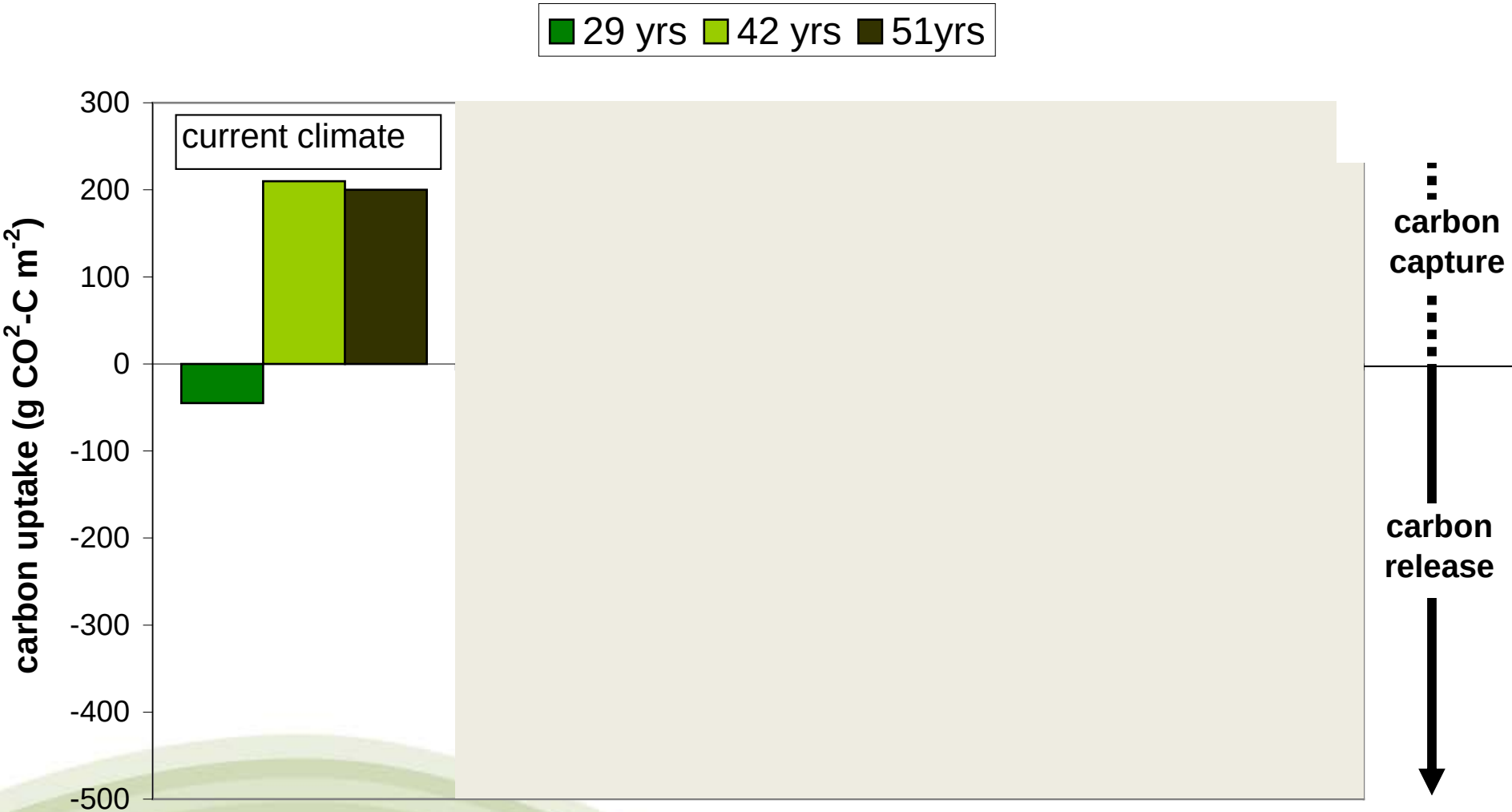
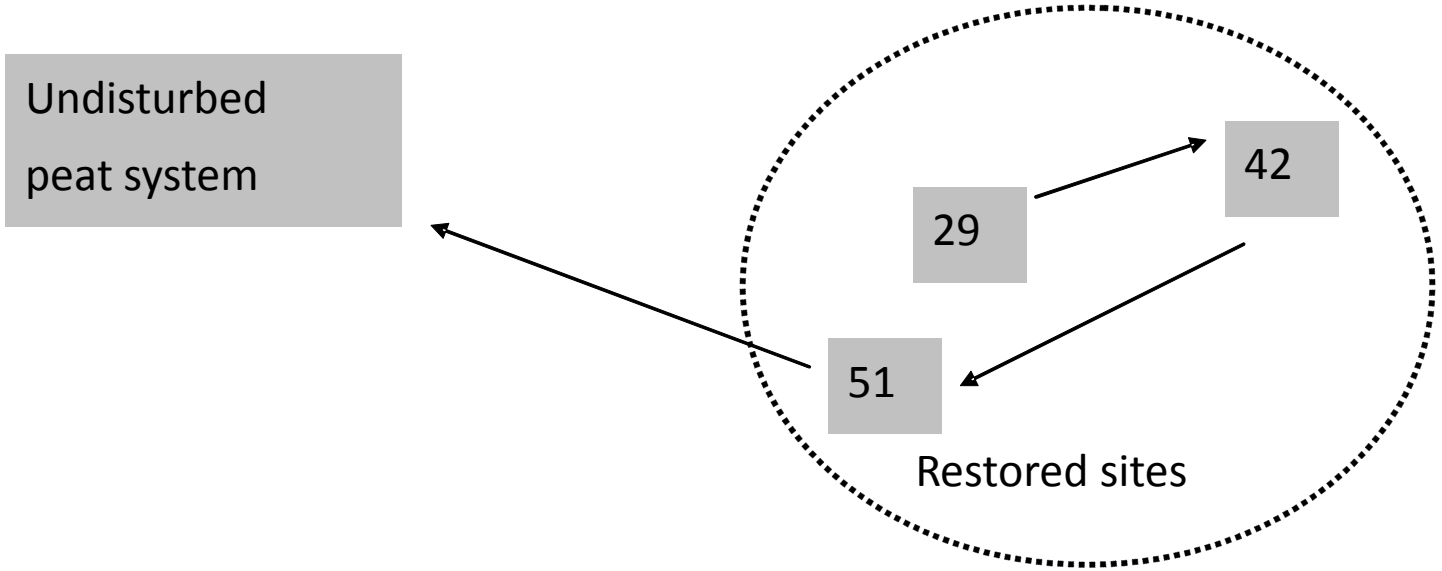
RESTORATION OF CARBON CAPTURE IN PEAT ECOSYSTEMS



- >30 years for restoration of C capture
- Oldest restored sites most resilient to climate change

Samaritani E. et al 2011. Seasonal Net Ecosystem Carbon Exchange of a regenerating Cutaway Bog: How long does it take to restore the C-sequestration Function? Reservation Ecology 19 (4): 480-489.

Restoration of the soil microbial community involved in carbon cycling



- Soil community structure still not restored to original state after 51 years, with consequences for soil carbon cycling

EU FP6 RECIPE project. Artz et al.,

Artz, R.R.E. et al (2012) Managing and restoring blanket bog to benefit biodiversity and carbon balance - a scoping study. Scottish Natural Heritage Commissioned Report.

Sources of information and help

- British Society of Soil Science

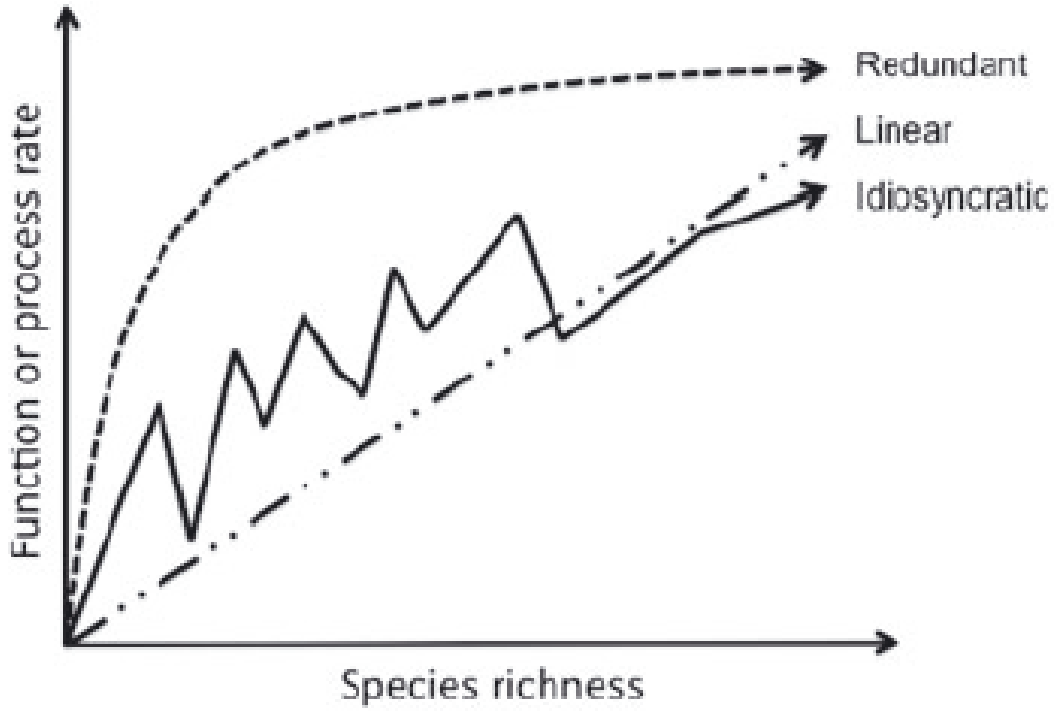
www.soils.org.uk

- Working with Soil – The IPSS Professional Competency Scheme

www.soilscientist.org/workingwithsoil

Functional significance of soil biodiversity?

Three commonly accepted relationships between species richness and ecosystem functioning or process rates.



idiosyncratic relationship most observed = some functional redundancy in soil communities.

BUT

little evidence for a generic predictive relationship between species richness and SOC cycling

+/- "keystone" species or functional groups influence SOC cycling, often in substantial ways.

Nielson et al. (2011) *Soil biodiversity and carbon cycling: a review and synthesis of studies examining diversity–function relationships.* European Journal of Soil Science 62, 105–116.