



# Stewarding the land: The State and Change of Soil Resources in Wales

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# Glastir Outcomes

- Improving soil quality and management
- Moreover, Welsh Government is committed to restore semi-natural peatlands by 2020





## Soils underpin food production:

‘Land used for agricultural purposes accounts for approximately 84% of the total land area in Wales and the sector alone is worth over £150 million (Gross Value Added) to the Welsh economy.’ WG



# Soils provide wider benefits

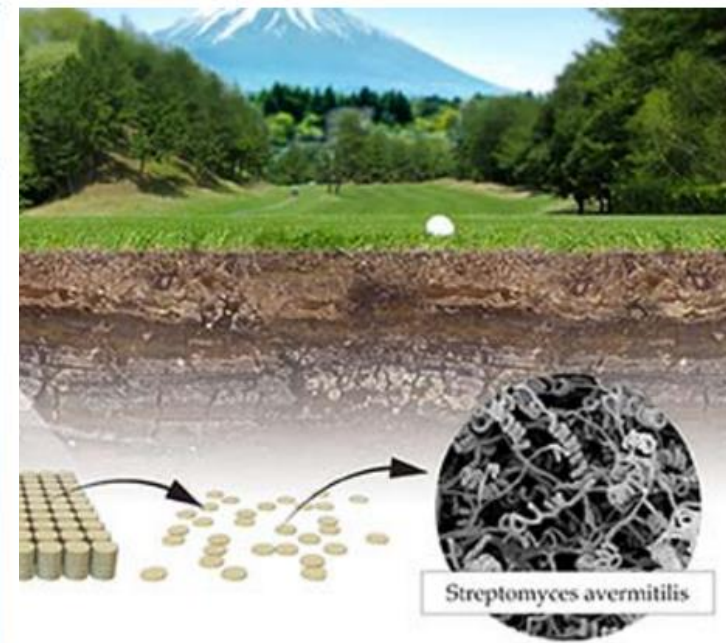
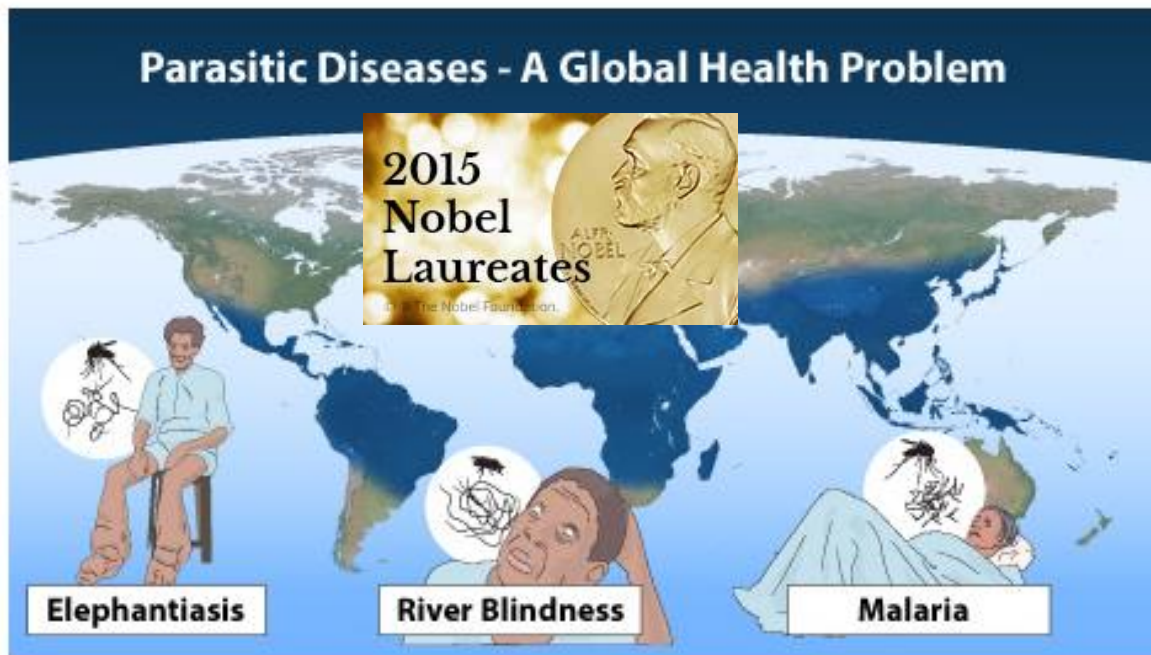
Soil **organisms** recycle nutrients

They **store carbon**, enhancing structure and limiting climate change.

They **store and filter water**

**25%** of global biodiversity is in soils





Many antibiotics are extracted from soils which has led to 2 Nobel prizes:

2015 Nobel Prize for Physiology and Medicine

What organisms do Welsh soils contain that could help future generations?



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Soils are a valuable resource:

# UK retail prices range from £10 - £135 / tonne

Bulk recycled screened topsoil, £ 10	3900 tons	£ 39,000 / ha
Bulk topsoil, Median UK price £ 30.38	3900	£ 117,000
Retail topsoil premium grade £ 100	3900	£ 390,000





# We are subject to threats

Extreme weather,  
Changing land-use,  
Pollution and  
Invasive species.

# How do we know the state and change?

We need evidence on which to base our policy

In England a soil health parliamentary enquiry was launched Dec 02 2015

Key question: How could soil health best be measured and monitored?  
How could the Government develop a strategy for tracking soil health?

**In Wales**, GMEP is providing this evidence:

In addition:

it aligns with the European LUCAS survey in terms of methodology

It could also provide the evidence base for United Nations resource reporting





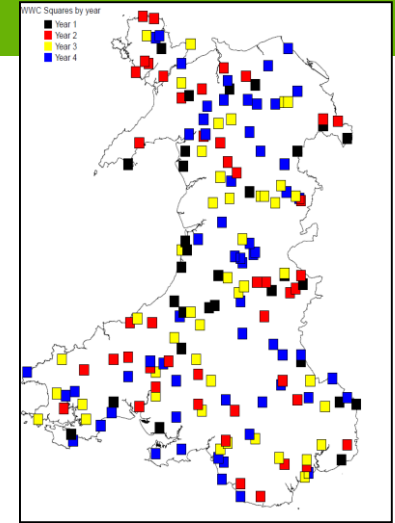
Llywodraeth Cymru  
Welsh Government

# GMEP field survey



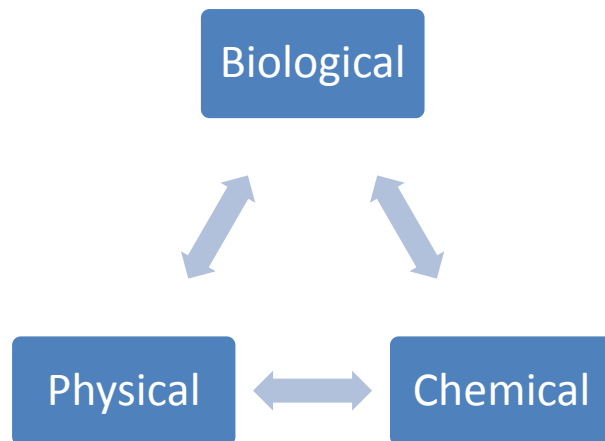
# Scale of the task

- Soils:
  - train 12 surveyors each year
  - Survey 1500 sites
  - Collect 6000 samples
  - Labs determined 45 parameters (~67,500 measurements) without the sequencing
- Parameters
  - Carbon, acidity, nutrients, density, mesofauna



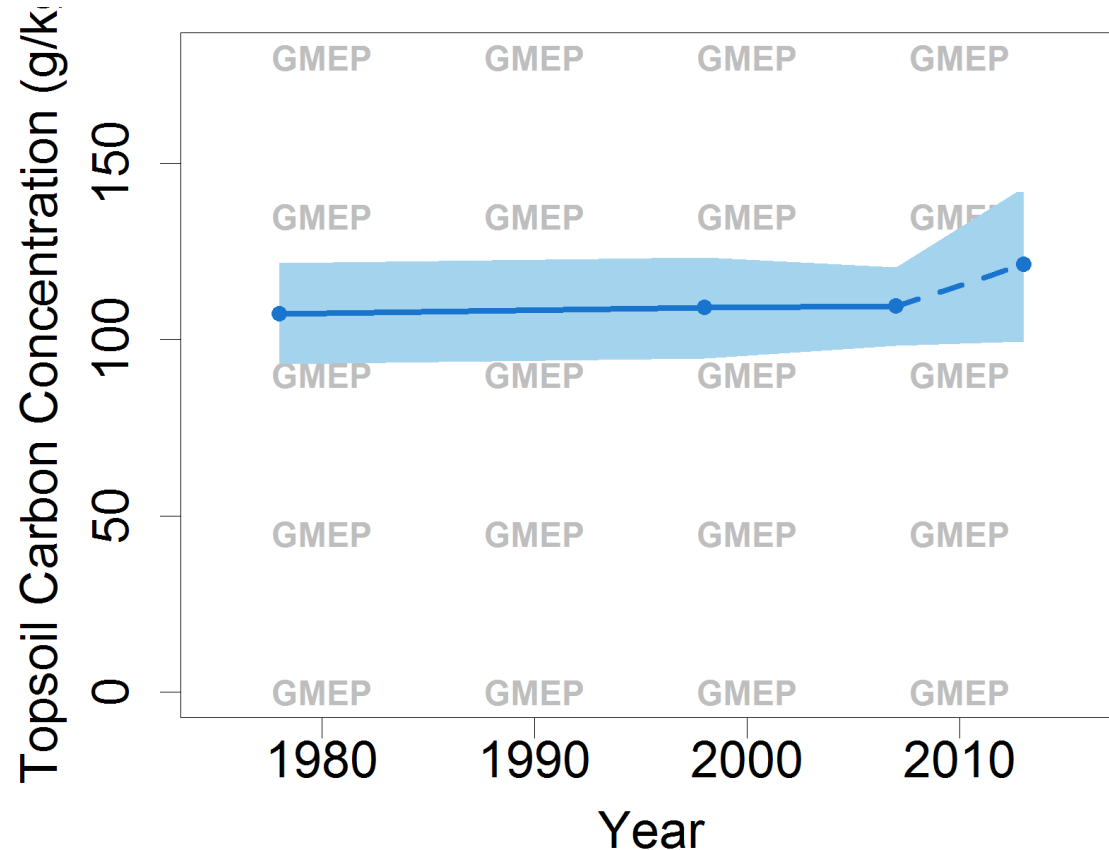


# Processing samples



GMEP strength: it collects integrated data on all aspects of soils

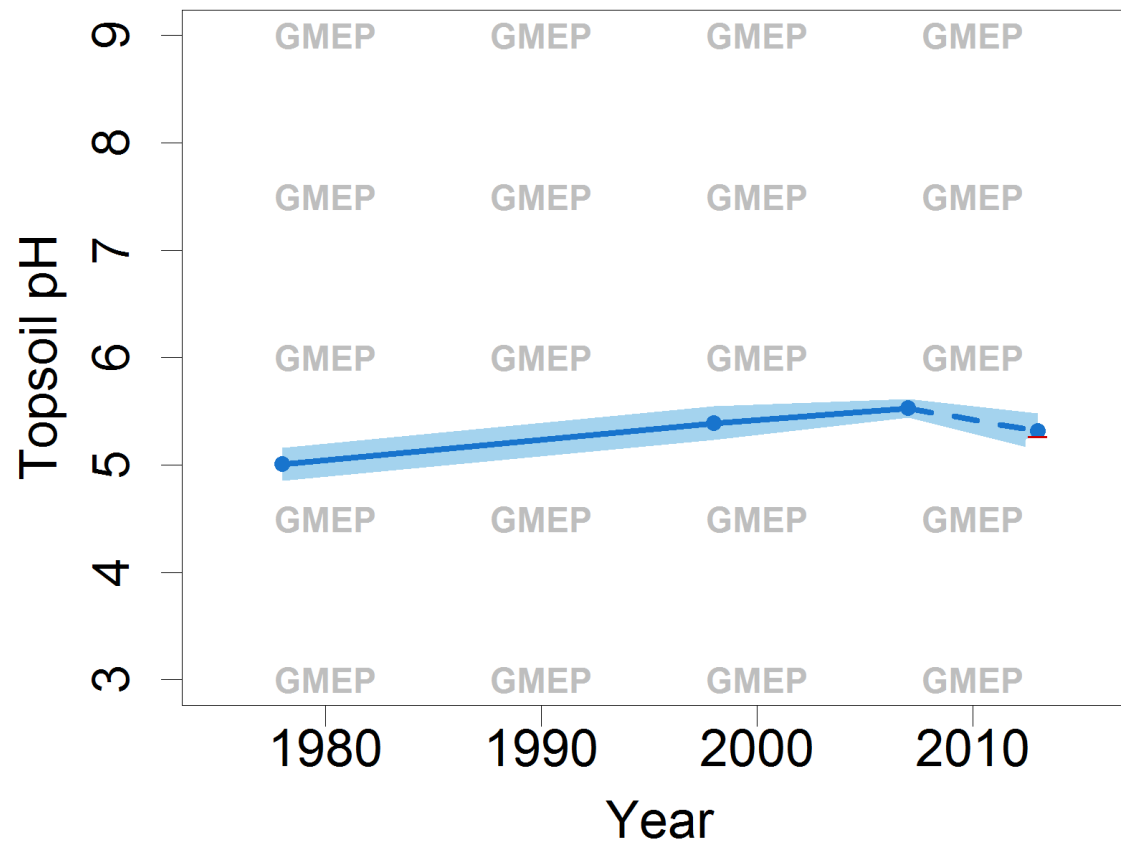
# How is Carbon changing in Welsh topsoil?



No overall statistical change

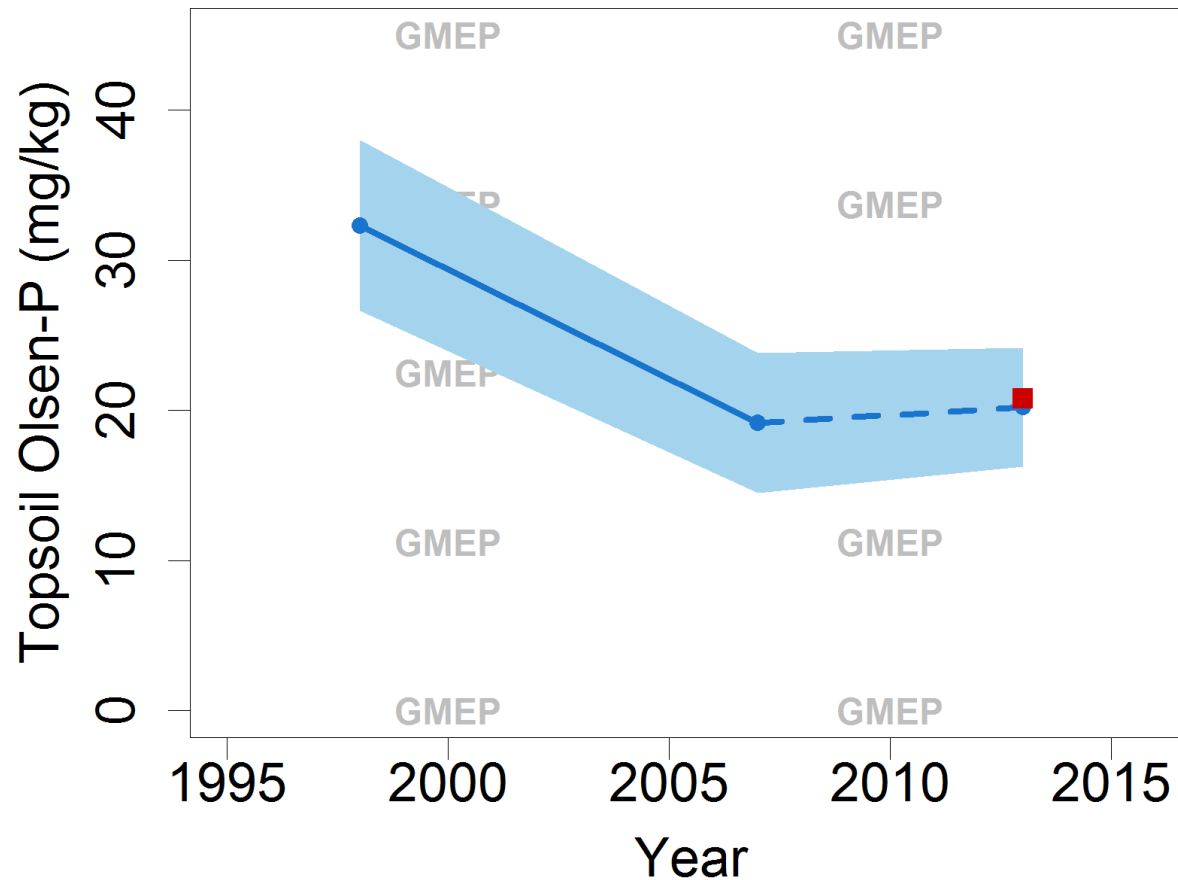


# How is soil acidity changing?



pH is increasing, recovering from  
historical air pollution

# How is soil phosphorous changing?



Phosphorous is declining to appropriate levels

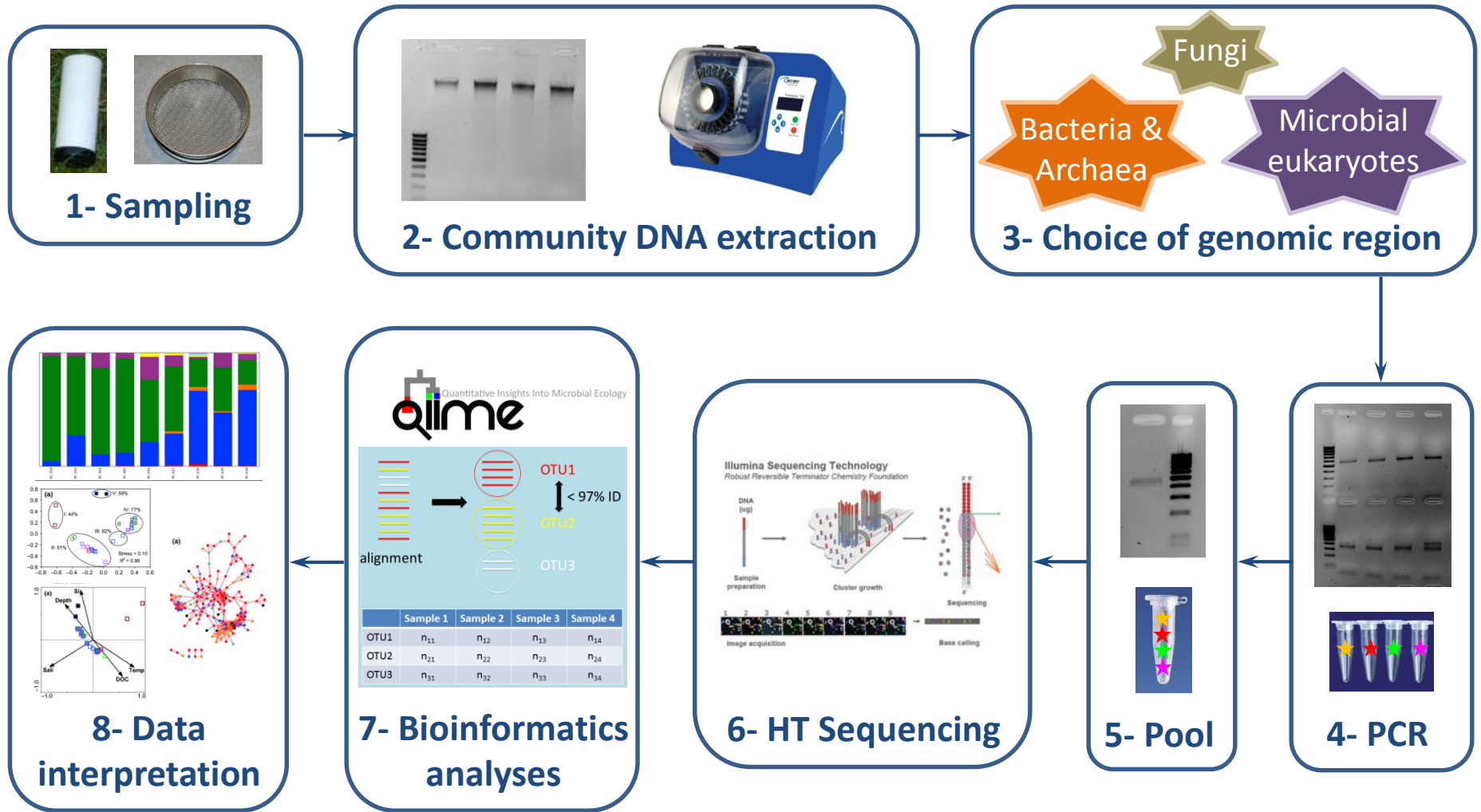
# Soil Animals

- A scoop of soil can contain:
- Bacteria
  - 1 billion individuals
  - 10,000 species
- Fungi
  - 50 km of fungal hyphae
  - 500 species
- Algae
  - 10,000 cells
- Nematodes
  - 1000



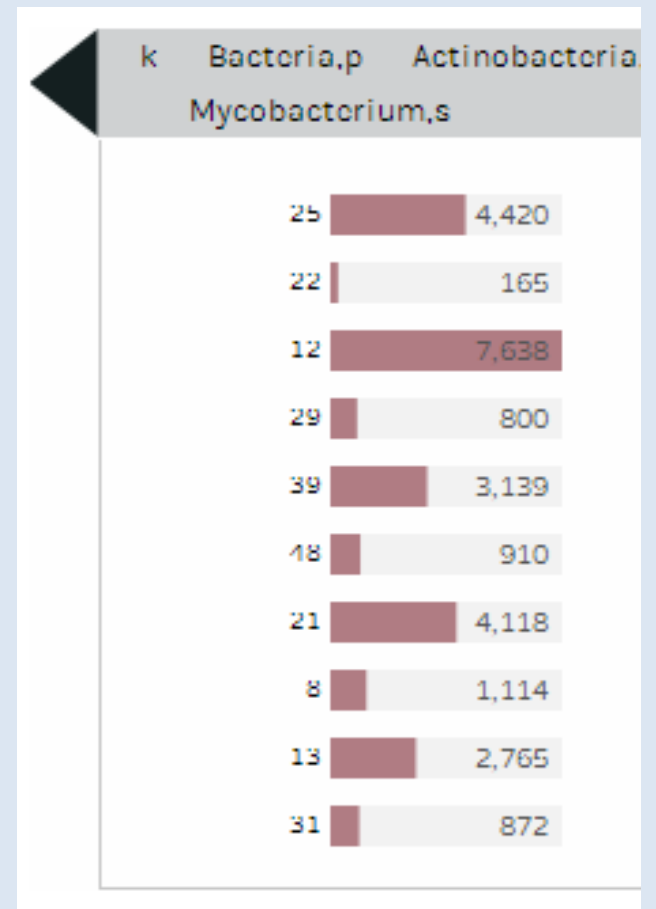


# Hi Tech Gene sequencing



# How many human/animal pathogens are in Welsh soils?

- Not detected
  - Shigella, Salmonella, Klebsiella, Aeromonas
- Detected at low abundance
  - Campylobacter, Enterococcus, Listeria
- Detected at higher abundance
  - Mycobacterium





# Peat Soils

Peat is an important carbon and water store in the Welsh uplands, and provides a unique habitat

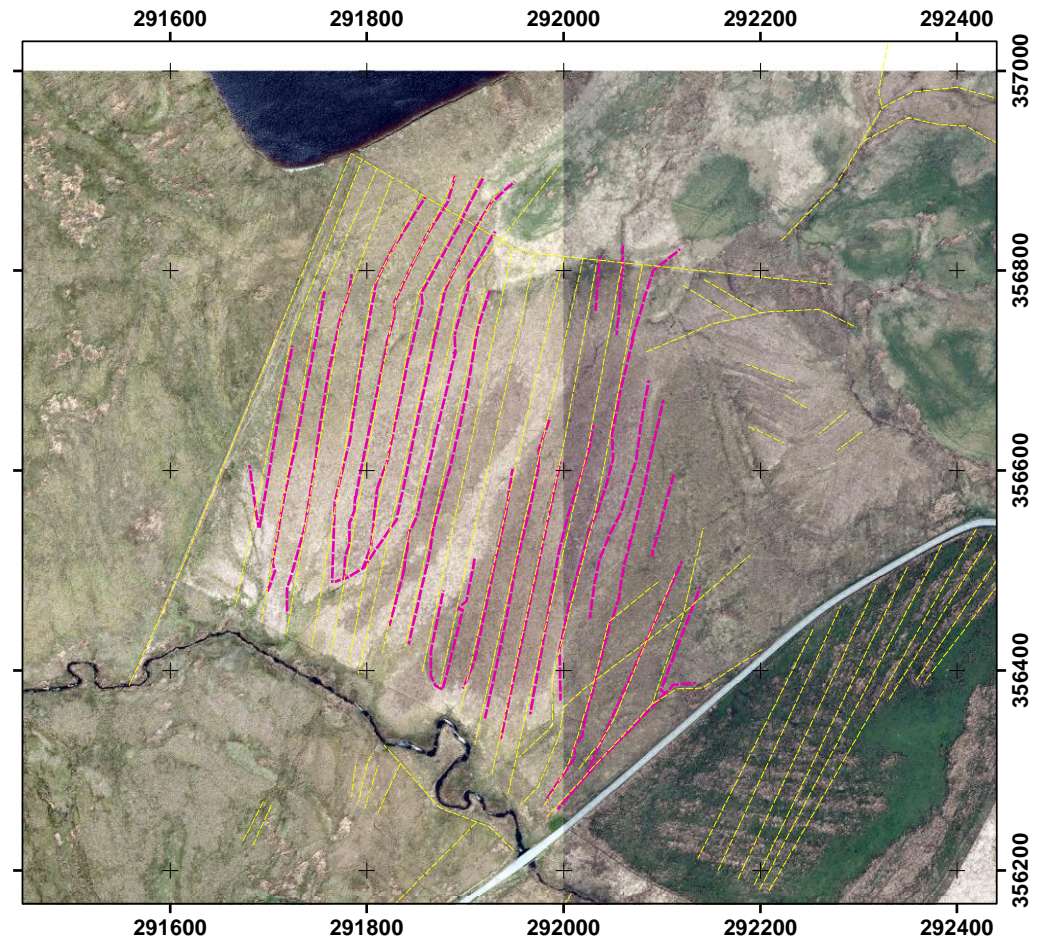


# New ditch mapping algorithm for peat

## *Mynydd Hiraethog*

- *Yellow ditches: BGS air photo analysis*
- *Pink ditches: RSPB/NRW ground survey*

Identifying the scale of the restoration task

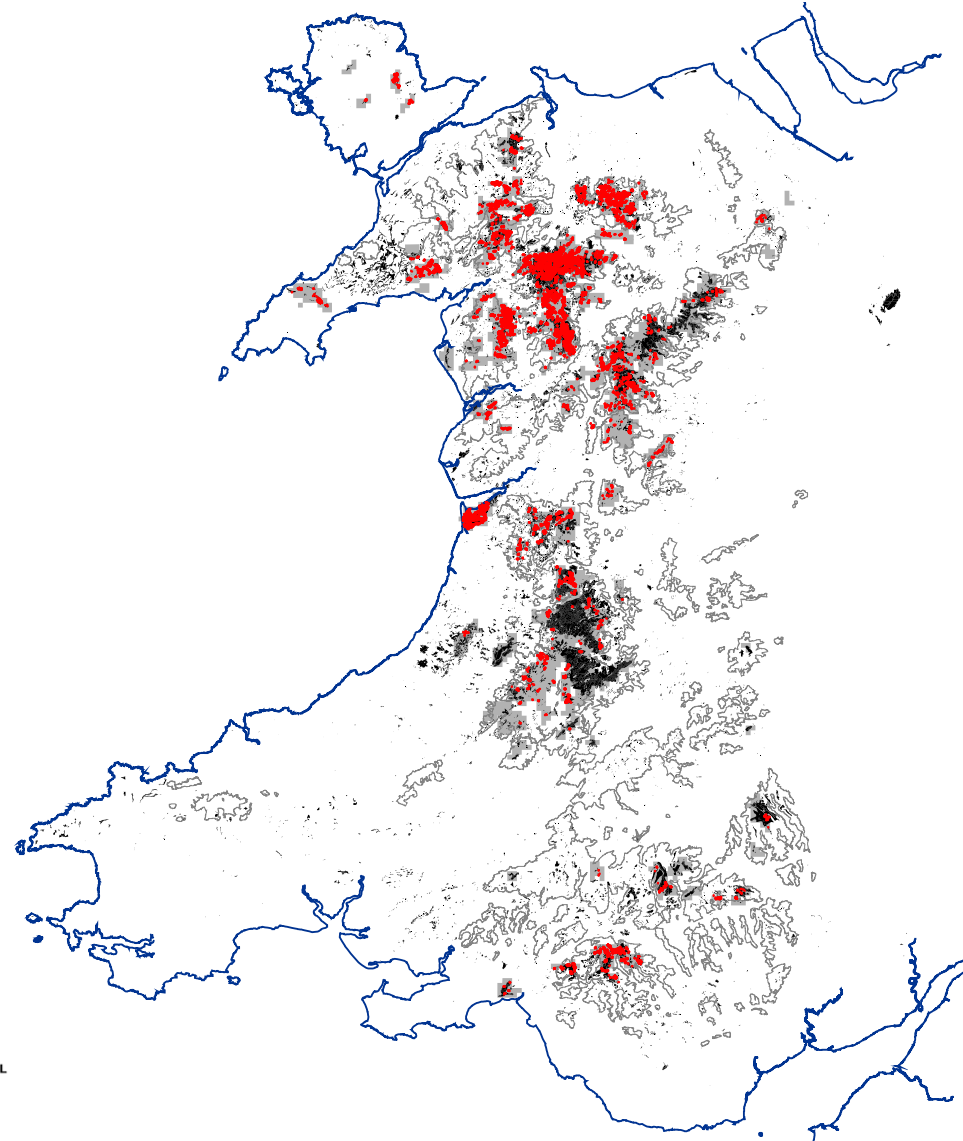


# Analysis of ditches in Wales

## Ditch lengths:

- 3,144 km of ditches digitised, of which:
- 1,502 km on upland peat
- 309 km on lowland peat
- 1,344 km outside mapped peat polygons
- Extrapolating to unmapped regions suggests approx. 3,000 km of ditches on peat in total
- **Does not include ditches under forestry**

## *Ditched peatland areas*

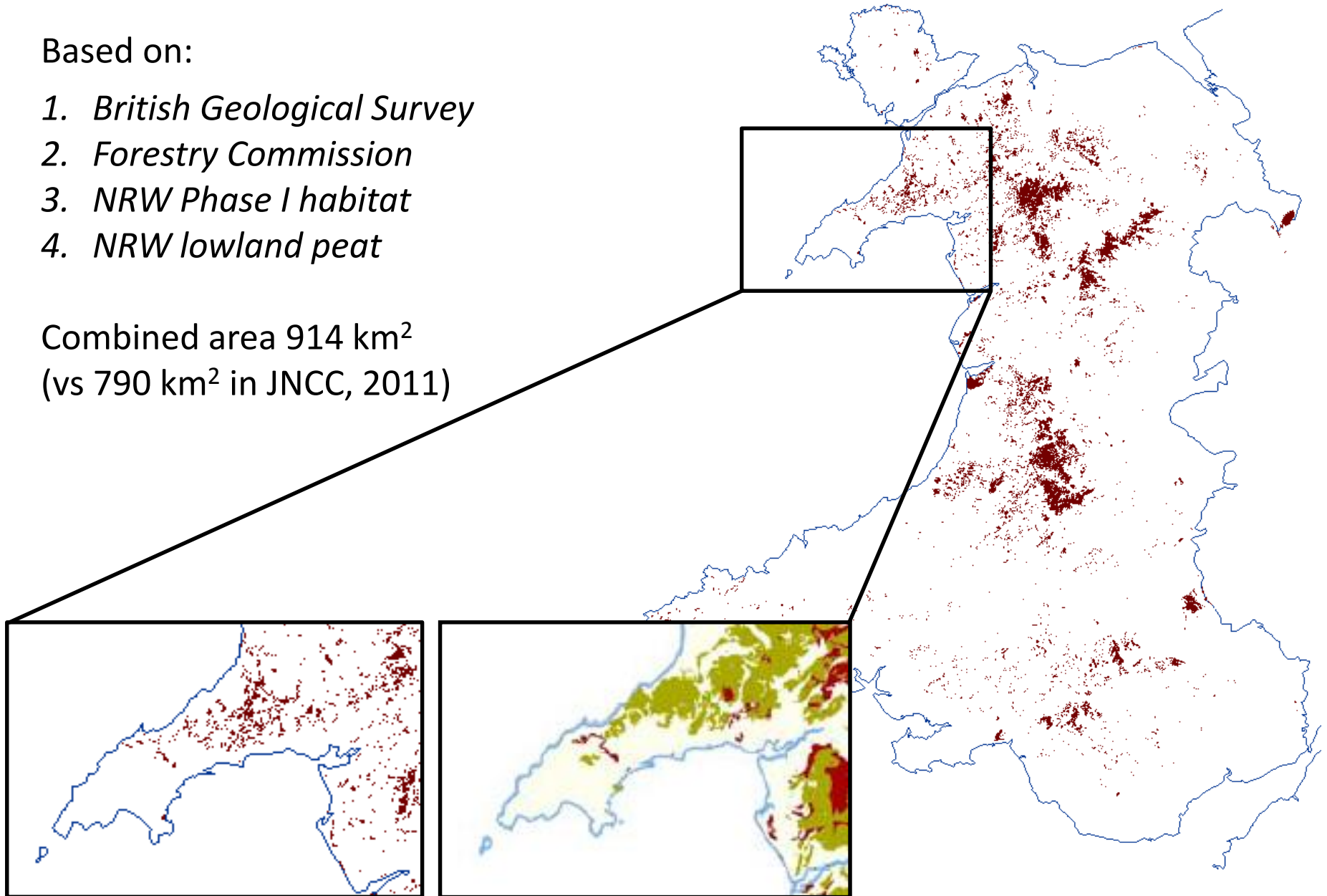


# New, unified peat map of Wales

Based on:

1. *British Geological Survey*
2. *Forestry Commission*
3. *NRW Phase I habitat*
4. *NRW lowland peat*

Combined area 914 km<sup>2</sup>  
(vs 790 km<sup>2</sup> in JNCC, 2011)





# Welsh peat emissions map

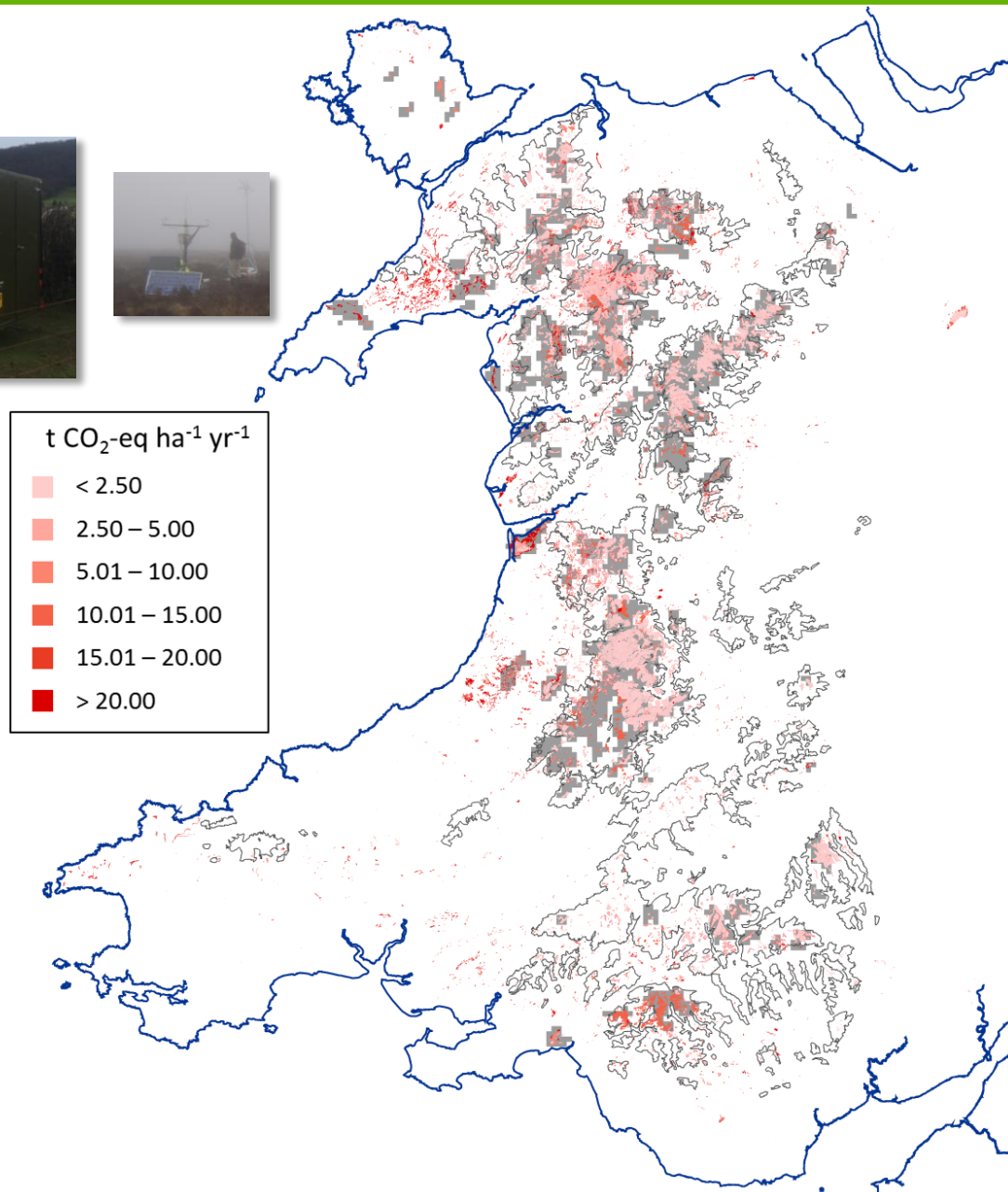
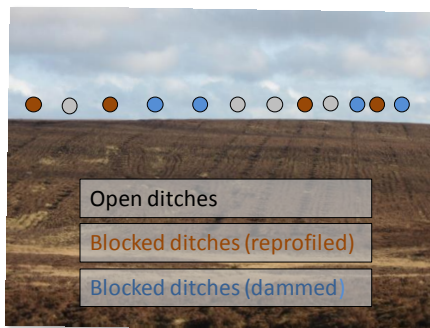
## Monitoring



## GMEP Peat Core Study



## Defra ditch-blocking study



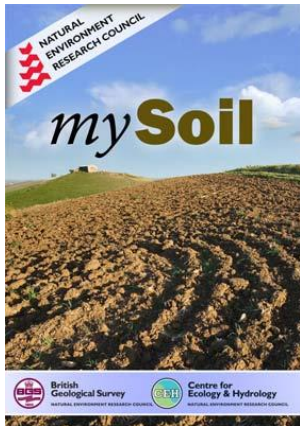
# Added value: NERC's commitment to new tools for Engaging the public, soil and vegetation information

The CEH & BGS KE teams launched mySoil app last year which now has more than **5 million** web hits and over **45,000** dedicated users highlighting real interest in soils information packaged in this format with crowdsourcing capability.

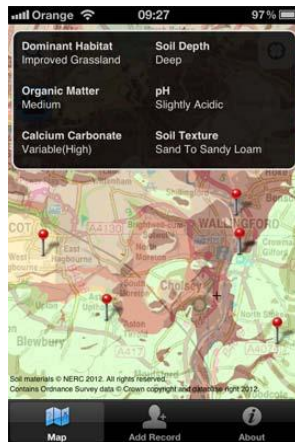
Nature: Technology: Crowd-sourced soil data for Europe



iphone  
ipad



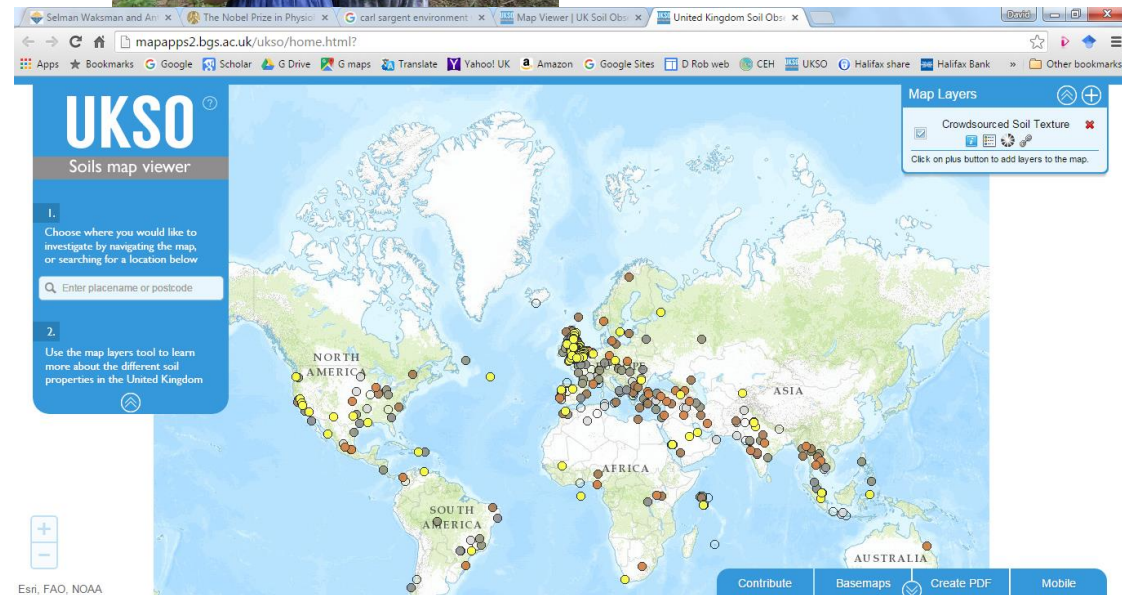
Democratising data



Engaging the public



Crowdsourcing data





# Soils, headline messages



J. Conway

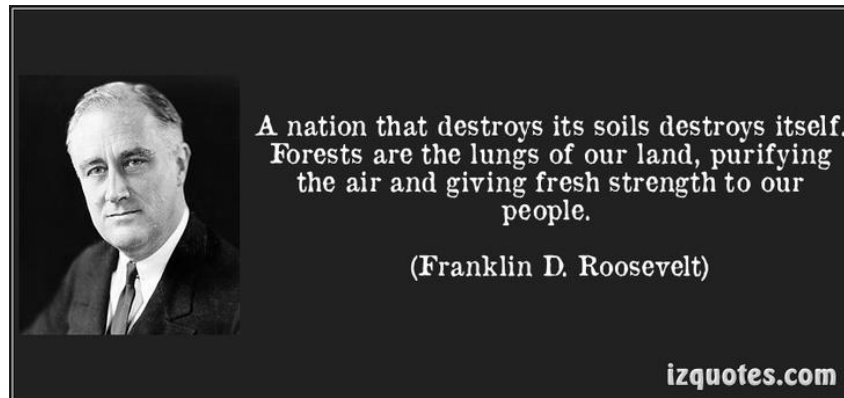
- **The 30 year record of topsoil carbon indicates no decline.**
- **Soil is recovering from air pollution and acid deposition.**
- **Available phosphorus has declined to more appropriate levels**



# Summary

The GMEP biophysical monitoring system empowers both us, and future generations, to develop a sustainable equitable future for Wales

CEH and partners are working together with NRW and WG to collect the evidence and inform policy



# Thank you

## Questions?