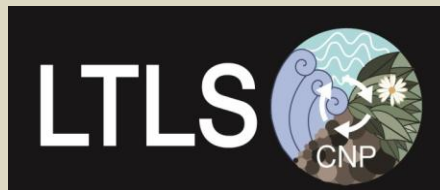


# LTLS new data collection update: Soils, peat, plant productivity



[www.ltls.org.uk](http://www.ltls.org.uk)



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# The LTLS Soil Survey

**Aim:** Obtain new comparable data for C, N & P pools and  $^{14}\text{C}$  derived C residency times of UK soils to:

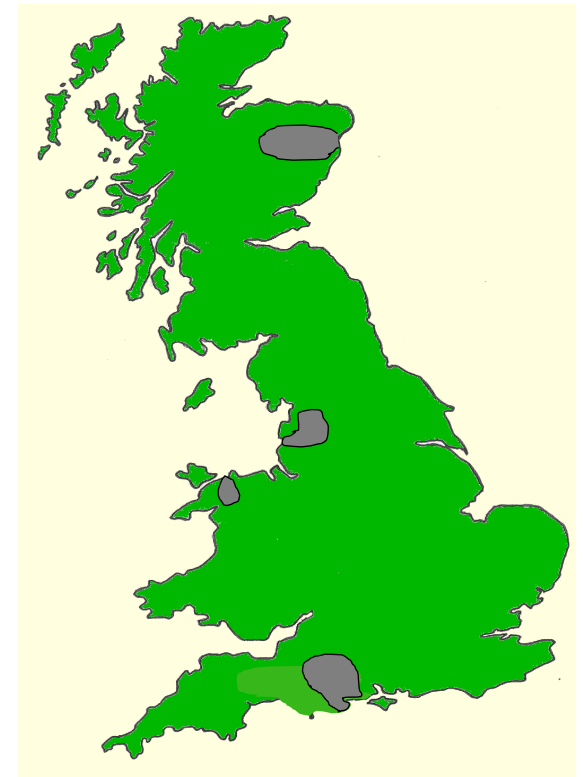
- test how closely predictions from the LTLS terrestrial model for soil C, N, P and organic matter residency times match measured values for a suite of UK sites;
- provide most comprehensive survey of UK bulk soil  $^{14}\text{C}$  values to date.

## Survey sites:

80 sites

Located in Macronutrient Programme catchments & Scottish Dee:

- Ribble - range of agricultural & industrial intensity
- Conwy - low agricultural & industrial intensity
- Avon - southerly climate
- Dee – northerly climate & atmospheric deposition



# The LTLS Soil Survey: site classification

## Site classification:

LTLS model broad veg types (herbs, shrubs, trees) & presence/absence of inorganic fertilisation:

	Site class	Definition
<b>Not inorganically fertilised</b>	<b>Unimproved grassland:</b> <b>a). Acid; b). Calcareous</b>	Grassland with no inorganic fertiliser additions: a). Acidic soil; b). Calcareous soil
	<b>Heathland</b>	Shrubs dominant; no inorganic fertilisation; not ombro bog
	<b>Ancient woodland</b>	Woodland since at least 1600s
	<b>Montane</b>	High altitude (> 700m)
	<b>Ombrotrophic bog</b>	Receiving water as precipitation only; peat accumulation
<b>Inorganically fertilised &amp;/or planted</b>	<b>Improved grassland</b>	Inorganic fertilised grassland; often also re-seeded
	<b>Arable</b>	Inorganically fertilised crops
	<b>Tree plantation</b>	Forestry plantations



No. of sites for each class based on proportional UK coverage from Countryside Survey 2007

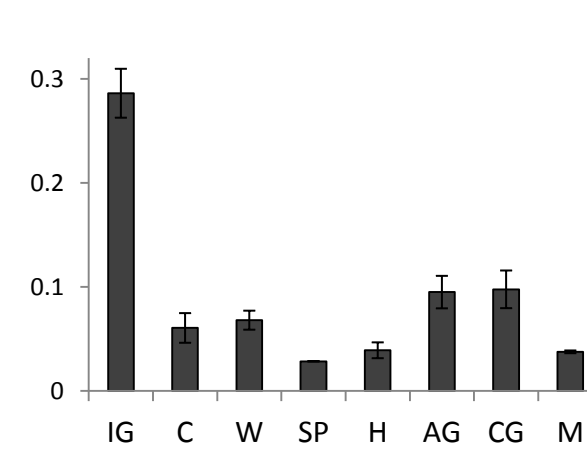
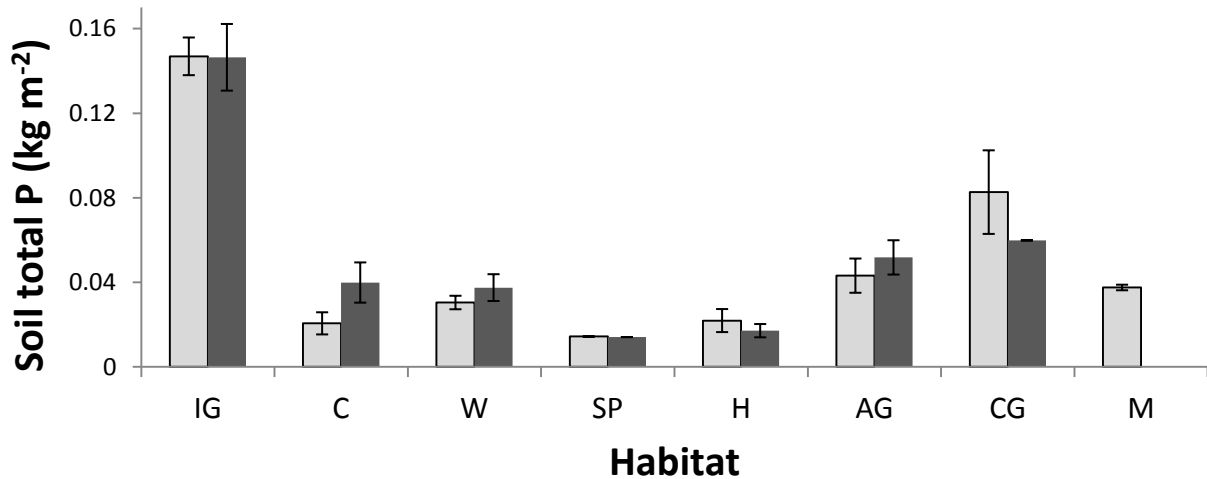
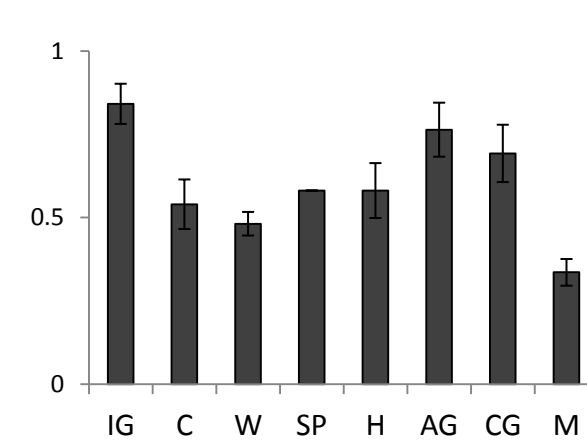
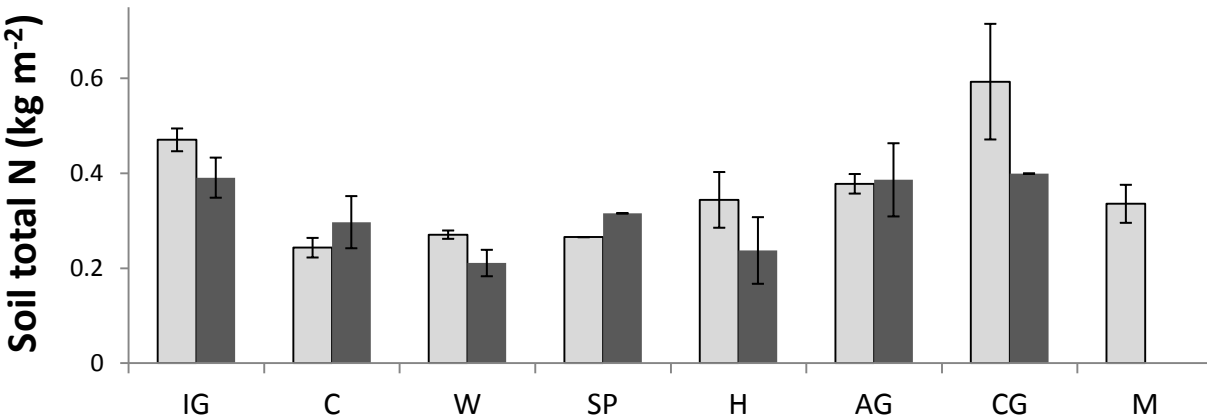
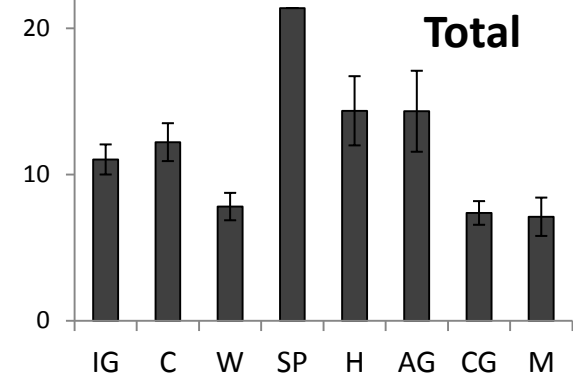
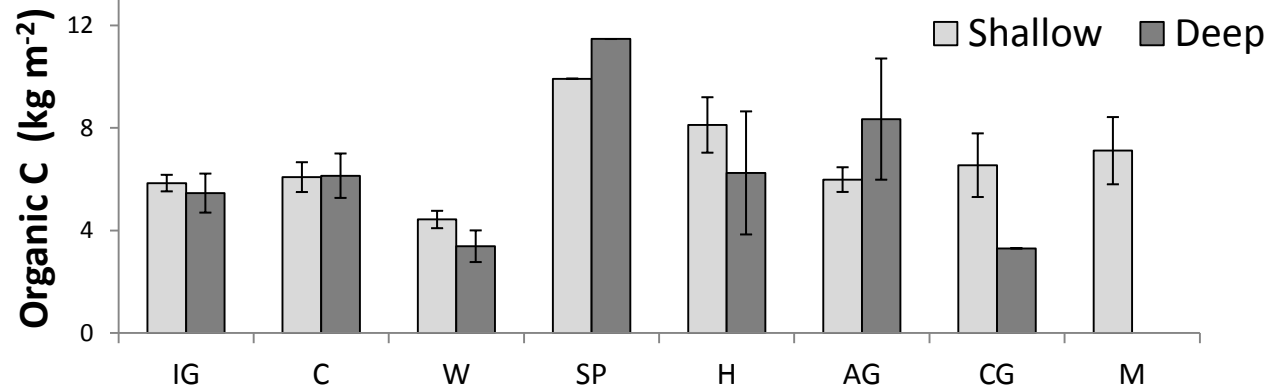


# LTLS Soil Survey: Soil sampling methods

- 6 (agricultural) or 10 (all other sites) cores from representative 100m<sup>2</sup> at each site.
- Surface (0-15 cm) and sub-surface core sections taken consecutively down same profile.
- Sub-surface core sections taken to 40 cm where possible and shallower at sites where impenetrable material hit at < 40 cm depth.
- Core sections bulked to give a surface and sub-surface bulked sample for each site.
- Soils sieved to 2mm
- 2mm fraction analysed for:
  - % organic C, total N, total & organic P
  - % organic matter
  - <sup>14</sup>C content
  - pH
  - Bulk density & particle size

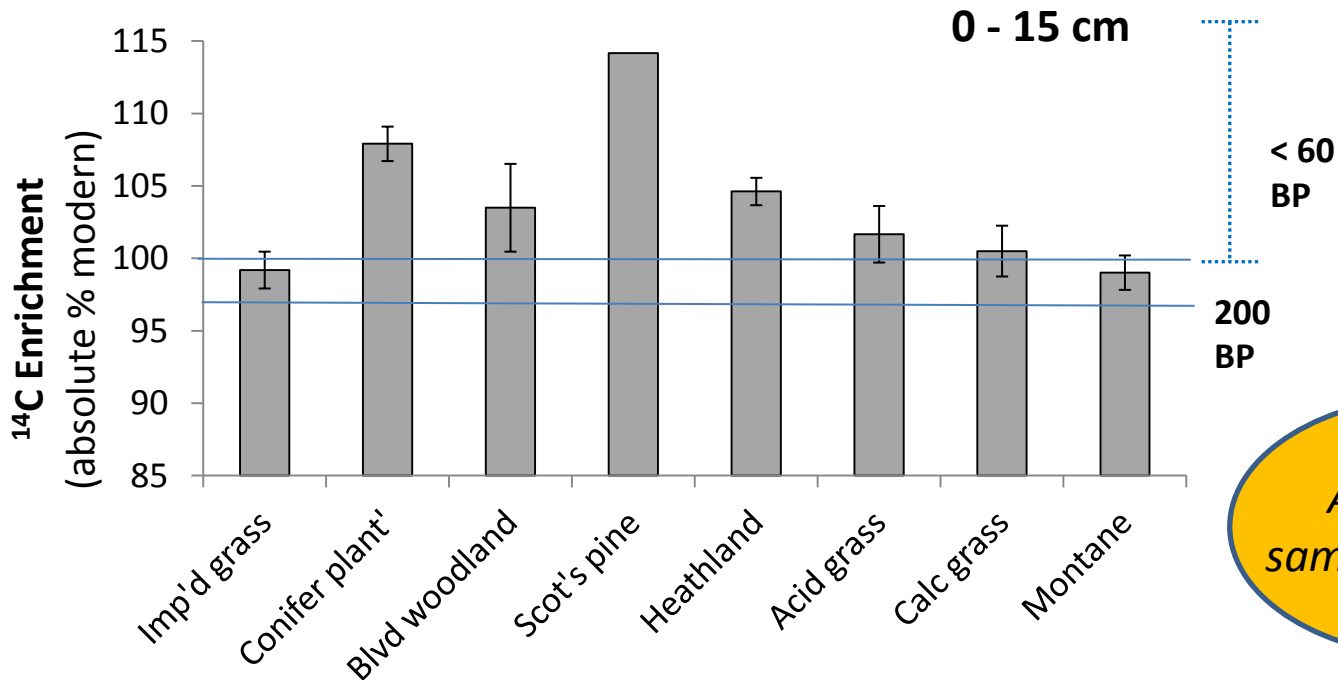
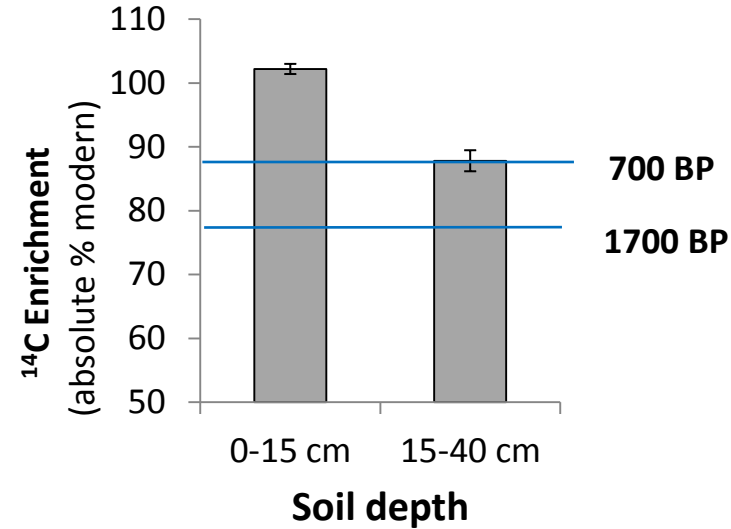


# LTLS Soil Survey Results: C, N, P pools



# LTLS Soil Survey Results: $^{14}\text{C}$

- Increasing age of soil C with depth.
- Soil bulk  $^{14}\text{C}$  in different UK habitat types:
  - Improved grass: older than expected? – ploughing & C removal by intensive grazing
  - Conifer plantations: recent planting & fast growth
  - Montane: slower C cycling at altitude



*Arable to be  
sampled Nov 2014*

# LTLS peat research

- Focused upon **ombrotrophic peats**:
  - widespread in UK
  - interest from C,N,P cycling prospective as isolated from fluvial flow

## Work to date:

- Field sampling for new data on peat surface C, N, P & C residency times for model testing
- Field sampling for new data on peat C, N, P profiles with depth (in conjunction with existing peat data from JHI's Scottish Soils database):
  - *Hypothesis*:  
N is buried with C, whereas P (as is so limited) is retained in the peat surface
- Meta-analysis of published & unpublished (from CEH & JHI) data of surface N:P in ombrotrophic peatlands globally –
  - *Hypothesis*:  
given likely P limitation in omb peatlands, P likely critical factor controlling peatland systems, inc. major limitation of peatland N acquisition (*see poster*)



# LTLS peat research

## Fieldwork completed

Sites:

*Selected as sites where our work can feed into wealth of previous research conducted*

- **Migneint SAC**, Conwy, Wales
- **Moor House NNR**, Upper Teesdale, Eng
- **Dartmoor National Park**, Devon, Eng
- **Forsinard Flows Reserve**, Sutherland, Scot
- **Glensaugh Research Station (JHI)**, Aberdeenshire, Scot

Coring at each site:

- 3 profiles from peat surface to base:

*Analysis:* C, N, P &  $^{14}\text{C}$  dating at depth intervals





# LTLS bracken survey

## Aim:

Provide new data on plant productivity & soil nutrients for LTLS model testing.

## Plant productivity sampling resource & time intensive as:

- grassland requires repeated samples &/or exclosures
- woodland requires litterfall & stem increment
- heathland productivity is hard to measure

## Whereas bracken:

- Not greatly affected by herbivory, pests or diseases
- Dense stands with little other species representation
- Therefore sampling at peak biomass gives approximate above-ground annual primary productivity
- Wide distribution across range of soil types
- Visible range in productivity (height & frond density)



# LTLS bracken survey

## Field sampling

Carried out August 2014

49 sites in Snowdonia & the Lake District  
(similar climate; range of soil types)

### Protocol:

Bracken fronds cut & weighed from 1m x 1m  
quadrat

Any other veg also identified, cut & weighed

3 x 15 cm soil cores taken per quadrat & bulked  
(rhizome sub-sampled for possible nutrient analysis)

### Lab analyses:

Bracken & other veg:

- fresh-dry weight conversion
- % C,N,P
- (*rhizome nutrient analysis*)

Soil:

- pH
- % C,N,P
- bulk density

