United Utilities' SCaMP Project - monitoring the effects of habitat restoration on hydrology, water colour and carbon over a 10 year period.

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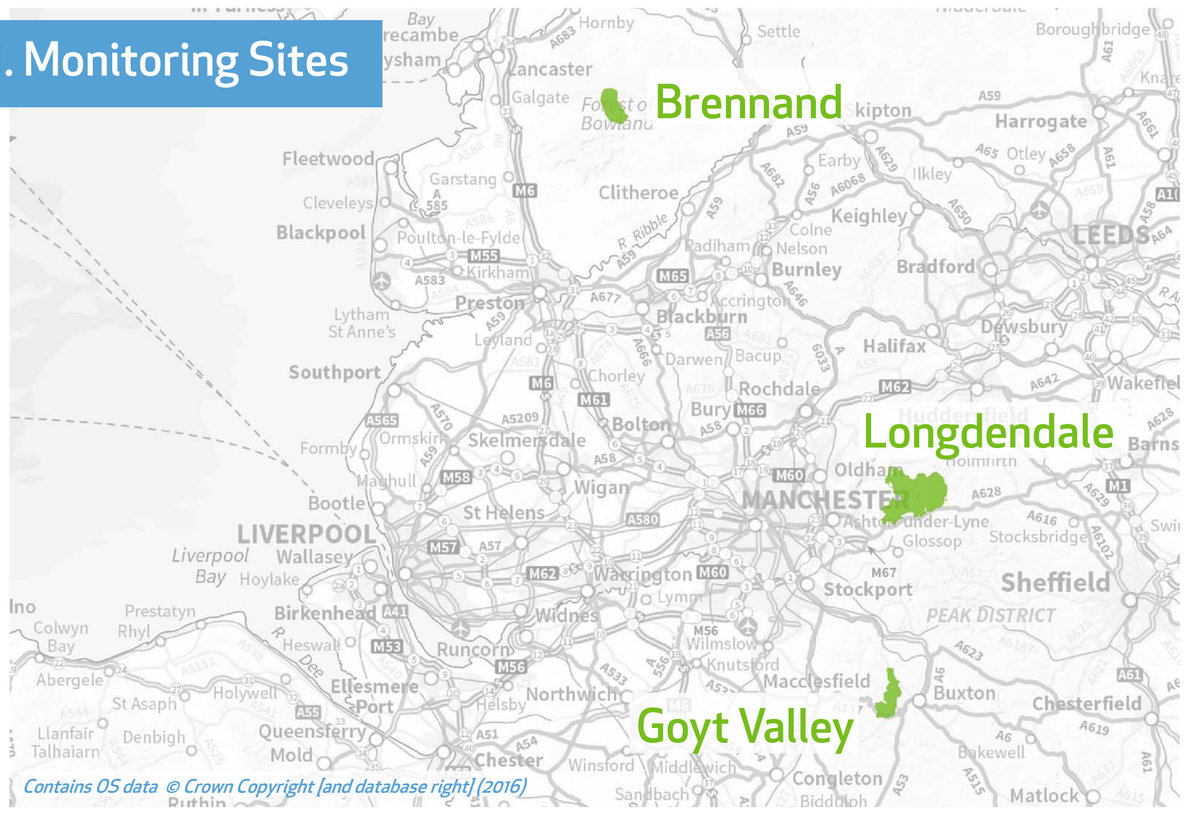
United Utilities' Sustainable Catchment Management Programme (SCaMP) aims to improve catchment quality for nature conservation, raw drinking water and carbon retention via implementation of a suite of habitat restoration measures.

Monitored over a 10-year period, and set to continue to 2020, the results form a significant dataset for the analysis and interpretation of the impacts of restoration on peat groundwater levels, colour production/release and vegetation enhancement. Data from the SCaMP catchments in North-West England show positive trends across the majority of the factors measured.

1. Monitoring Sites



2. Prior to Restoration

Prior to restoration a number of issues were present across the sites:

- Areas of extensive bare peat.
- Significant artificial drainage and gully erosion.
- Poor vegetation condition and loss of peat from the moorland.
- Effect of grazing and burning regimes over decades.

3. Restoration Measures

The following restoration measures were applied across 12,300ha blanket bog:

- 85km grips blocked with peat or plastic dams.
- 470ha eroding bare peat treated with 'nurse' crop, heather brash, geojute textile.
- 'Novel' coir roll installation.
- Gully blocking with stone dams.
- Reduced or removed grazing and burning across all sites.

4. Monitoring Approach

The monitoring programme developed by PAA covered three main interest areas:

- Hydrology - peat water levels, stage discharge, rainfall gauges.
- Water colour (DOC), turbidity (POC). Spectrolyser deployed in the field.
- Vegetation quadrats within plots, including reference plots, fixed point photography.

5. Results

- Significant reductions in bare peat and increases in vegetation cover were identified.
- *Sphagnum* cover is increasing where present, responding more quickly if greater cover remains.
- Removing/reducing grazing and burning alone results in positive change, in some areas.
- Stabilising bare peat is important in re-vegetation of bare peat.
- Nurse crop treatment is effective in promoting re-vegetation.
- Additional heather brash and geojute encourages more rapid re-vegetation of slopes, geojute is important on steeper slopes.
- Water quality is improving with reductions in colour (and turbidity), although colour is still problematic on severely eroded catchments.
- Peat water levels are generally increasing and stabilising, except where severe degradation has occurred.

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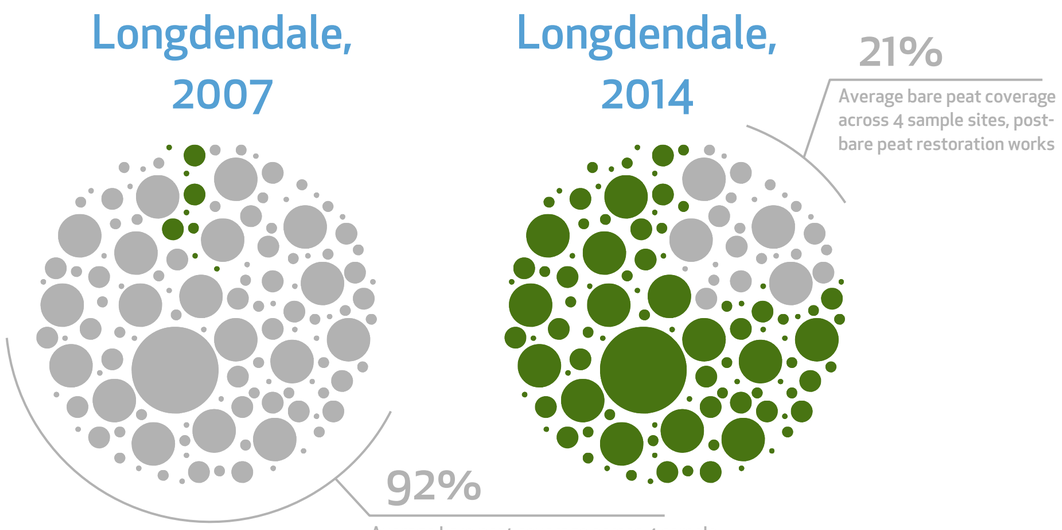
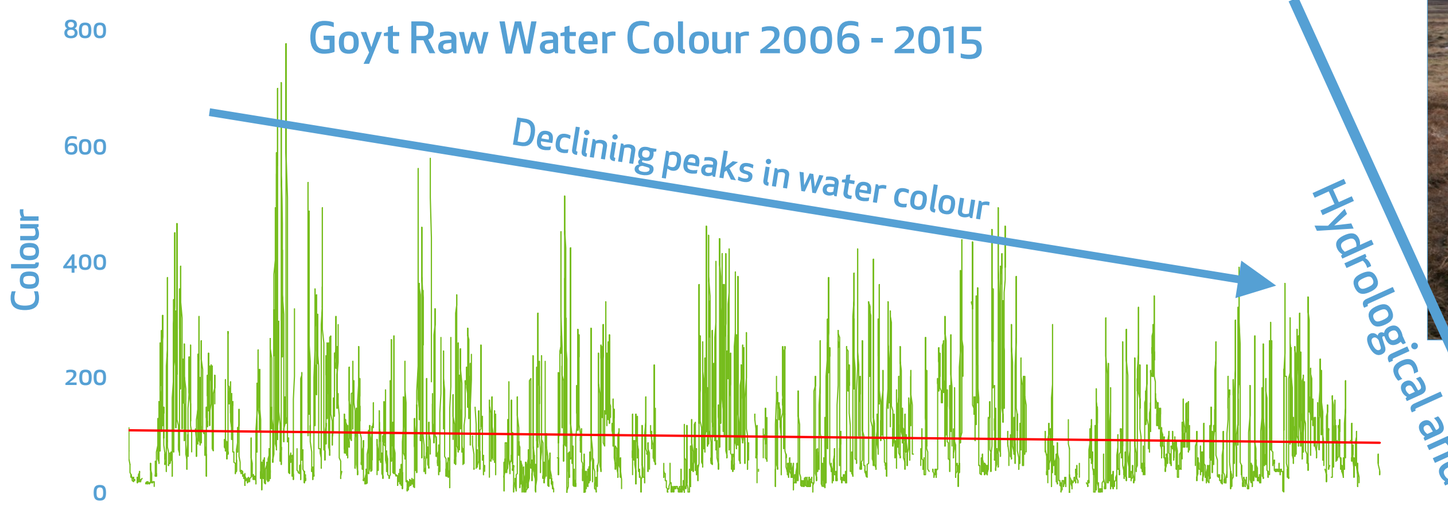
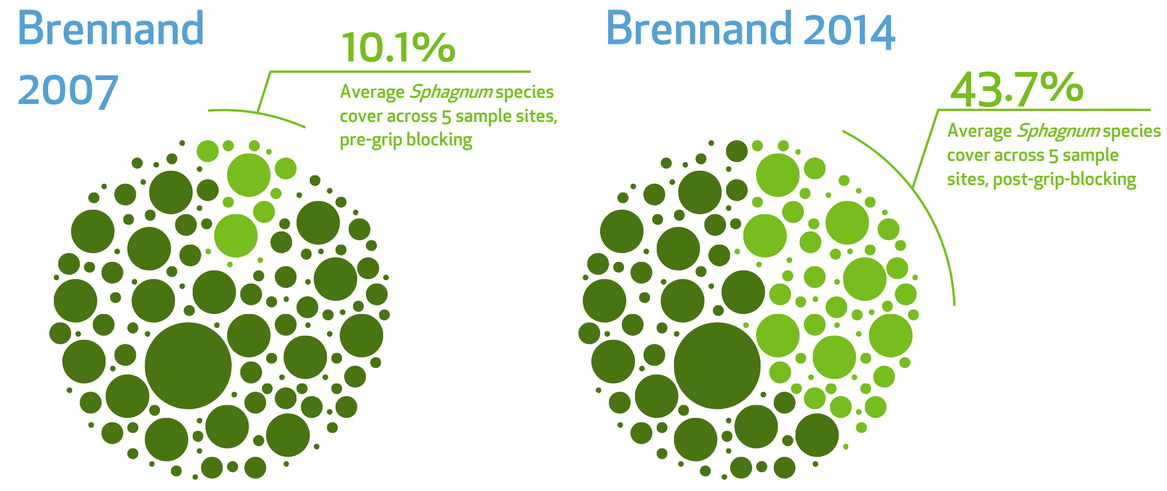
6. Bare Peat Restoration Effects



- Slowing the flow
- Structural changes and improvements to peat body
- Some observed re-wetting over time
- Restoration of hydrological function
- Vegetation changes and some improvements
- Raw water colour – stabilisation in rate of colour production and release, also some increases.
- Turbidity reductions/stabilisations



7. Grip Blocking Effects



- Slowing the flow
- Re-wetting of peat body
- Restoration of hydrological function
- Vegetation changes and improvements

- Raw water colour – changes in rate of colour production and release, including reductions
- Turbidity reductions/ stabilisations

Hydrological and ecological restoration trajectory

Restoration and Water Quality Trajectories

Table showing calculated water quality trajectories for the SCaMP study catchments

Site	Slope	Rate (Haz pa)	Trend	Years before 100% change
Goyt	-0.004	-1.460	Decreasing	68.49
Whitendale	-0.001	-0.365	Decreasing	273.97
B - Brown Syke	0.000	0.000	Stationary	na
B - Bield Field	0.007	2.550	Stationary	39.22
AG- Small Clough	0.000	0.000	Stationary	na
Etherow Control	0.290	3.480	Increasing	28.74
AG - Chew Clough	0.057	20.805	Increasing	4.81

8. Research Themes and Papers

United Utilities have commissioned PAA to prepare two peer-reviewed research papers, based on the results and observations gained from over nine years of SCaMP monitoring. Research 'themes' identified for publication include:

- An overview paper, presenting the key themes and outcomes from the SCaMP Project.
- Comparing the SCaMP water quality monitoring results within the context and trajectories in environmental monitoring data, collected nationally.
- A conceptual model of dissolved organic carbon (raw water colour) and a Bayesian Network Belief Model to demonstrate the complex interactions between key drivers of DOC production and release.

United Utilities SCaMP Website
http://corporate.unitedutilities.com/cr-scamp.aspx

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