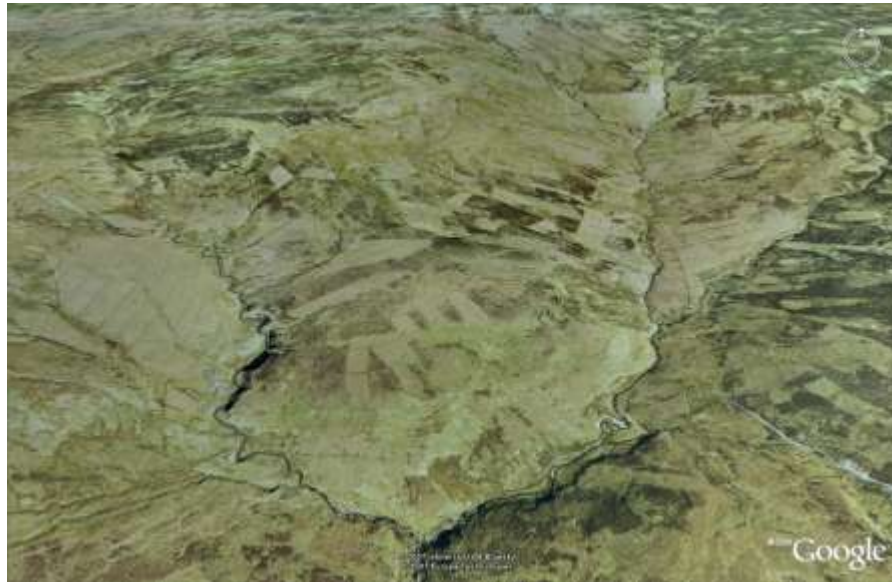


# *Monitoring: Lessons from grip blocking and grazing in Bowland and the Peak District*



*Penny Anderson, Sarah Ross, Peter Worrall,  
Gene Hammond and Andy Keen, Penny  
Anderson Associates*

Penny Anderson  
Associates Ltd  
CONSULTANT ECOLOGISTS



# *United Utilities SCaMP 2005 - 2010*

---

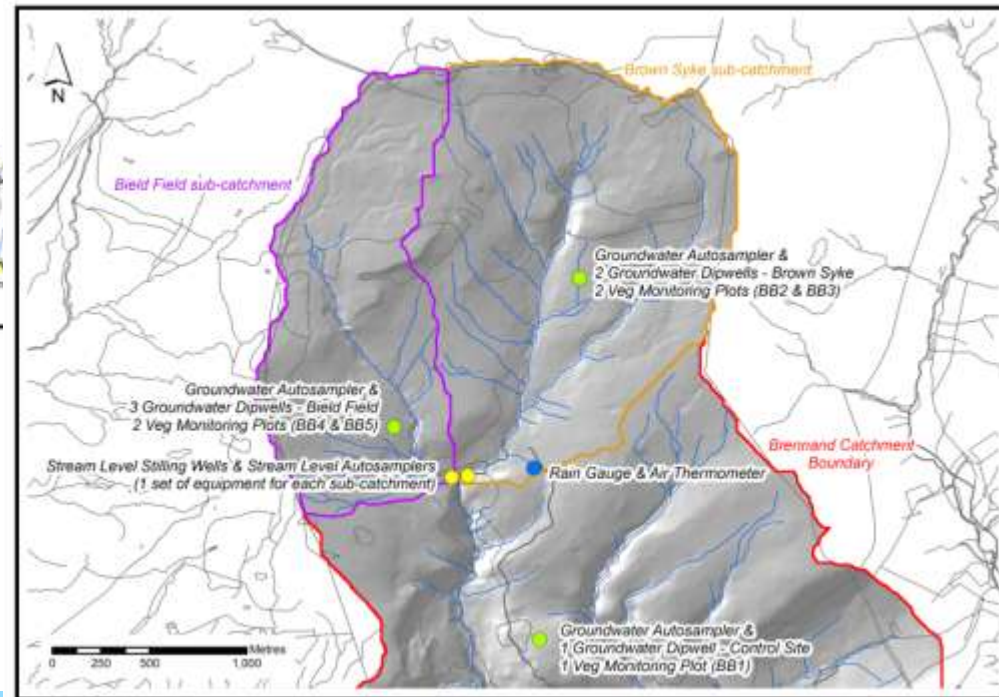
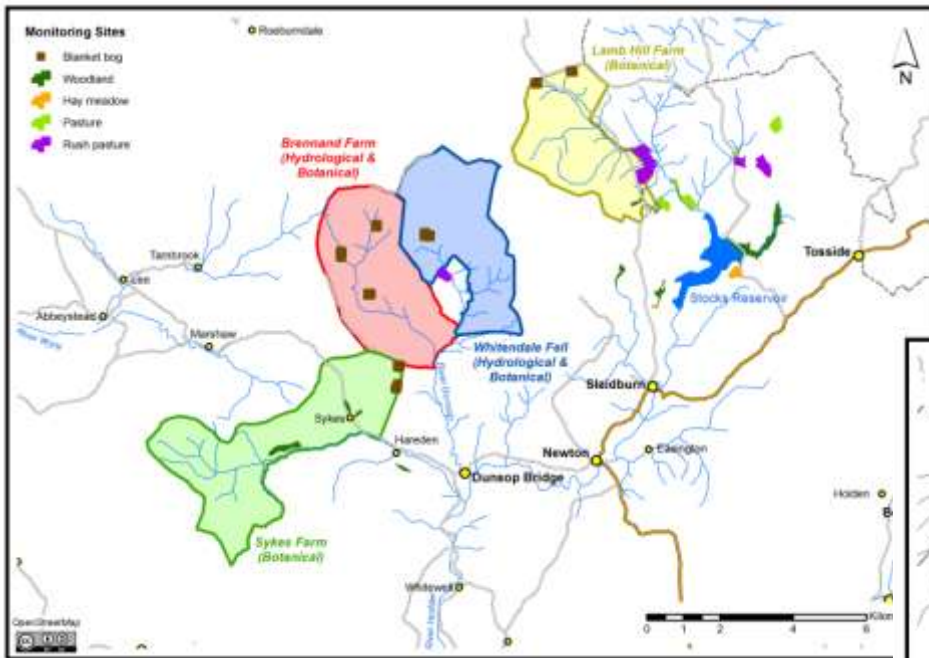
- Objectives
  - PSA target for SSSIs
  - Improved water quality (colour and sediment)
- Measures
  - Grip blocking (85.23kms)
  - Reduction of grazing levels to ESA Tier 2 levels
  - Reduction/prevention of burning



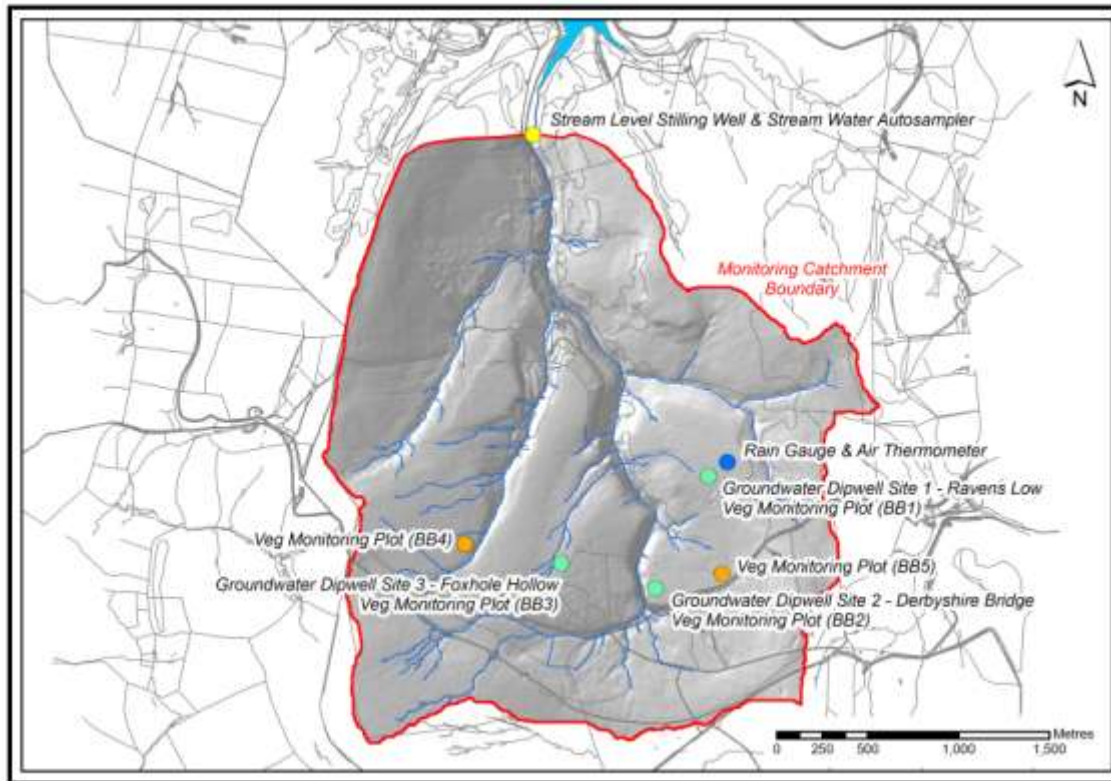
# Bowland

**Bowland - Brennand and Whitendale catchments – grip blocking, stock changes**

**Brennand monitoring locations. 15% and 37% gripped west and east**



# Goyt, Peak District



Grip blocking, stock reduction and temporary cessation of burning



# *Hydrological monitoring parameters*

---

- daily raw water colour in streamflow (Hazen units) at sub-catchment outlet;
- daily streamflow raw water turbidity (NTU units) at sub-catchment outlet;
- 15 minute interval streamflow stage (water level) at sub-catchment outlet;
- 15 minute interval streamflow discharge (cumecs), calculated using stage-discharge rating equations;
- 15 minute streamflow temperature (degrees Celsius);
- 15 minute air temperature (degrees Celsius);
- 15 minute groundwater levels in peat;
- 15 minute groundwater temperature; and
- 15 minute interval rainfall totals for each study sub-catchment.



# *Vegetation monitoring methods*

---

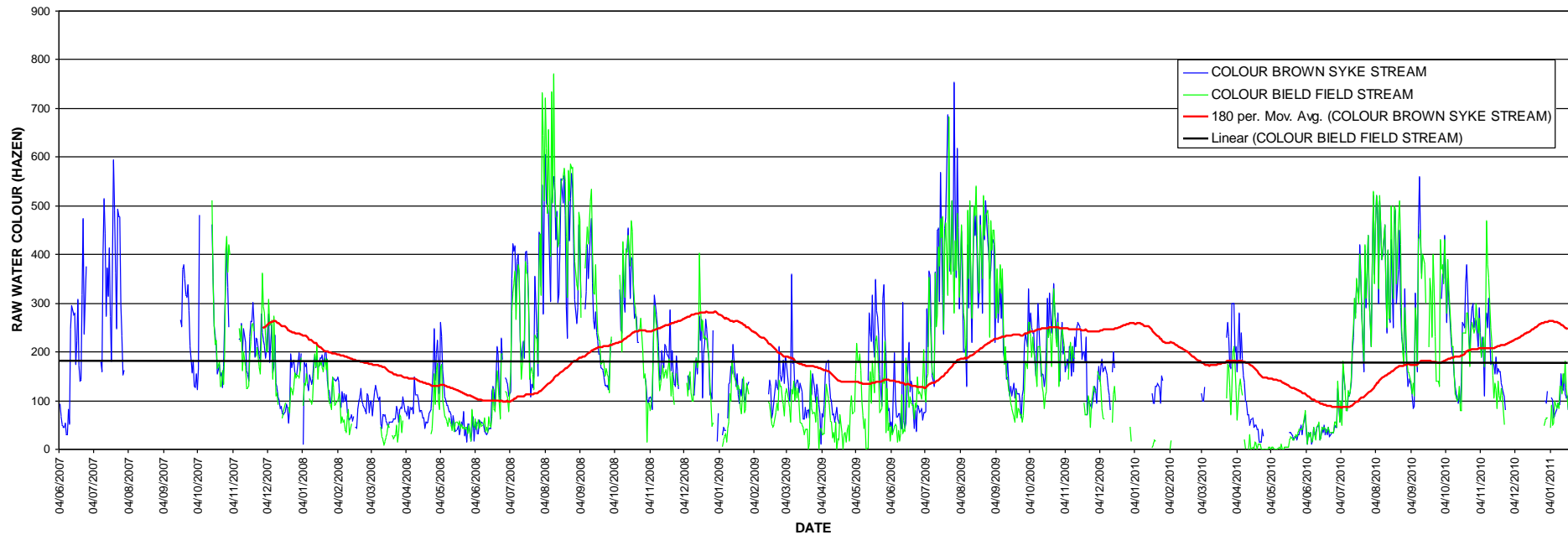
- Plots representative of habitat being restored
- 'reference' plots for comparison.
- In each plot, 30 random 2m x 2m quadrats
  - % cover plant species or groups
  - % cover bare peat
  - vegetation height
  - damage to vegetation
  - dwarf shrub growth phase
  - drainage/erosion
  - presence/indications of grazing animals
  - flowering/fruitleting of key species
  - peat pH and soil moisture
- Fixed point photography



**grip blocking**

# *Raw Water Colour – Brennand Brown Syke and Bield Field Streams*

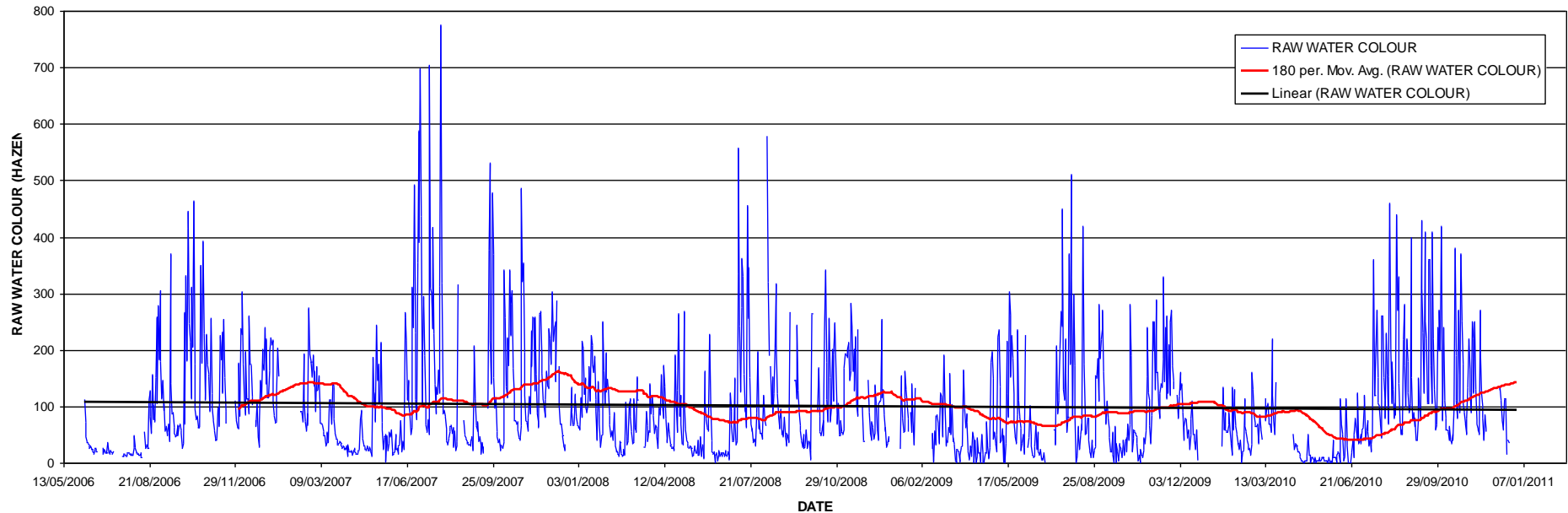
RAW WATER COLOUR - BRENNAND STREAMS



**grip blocking undertaken 2008-9 winter – significant, but small decline in DOC after two years after increase before and during works**

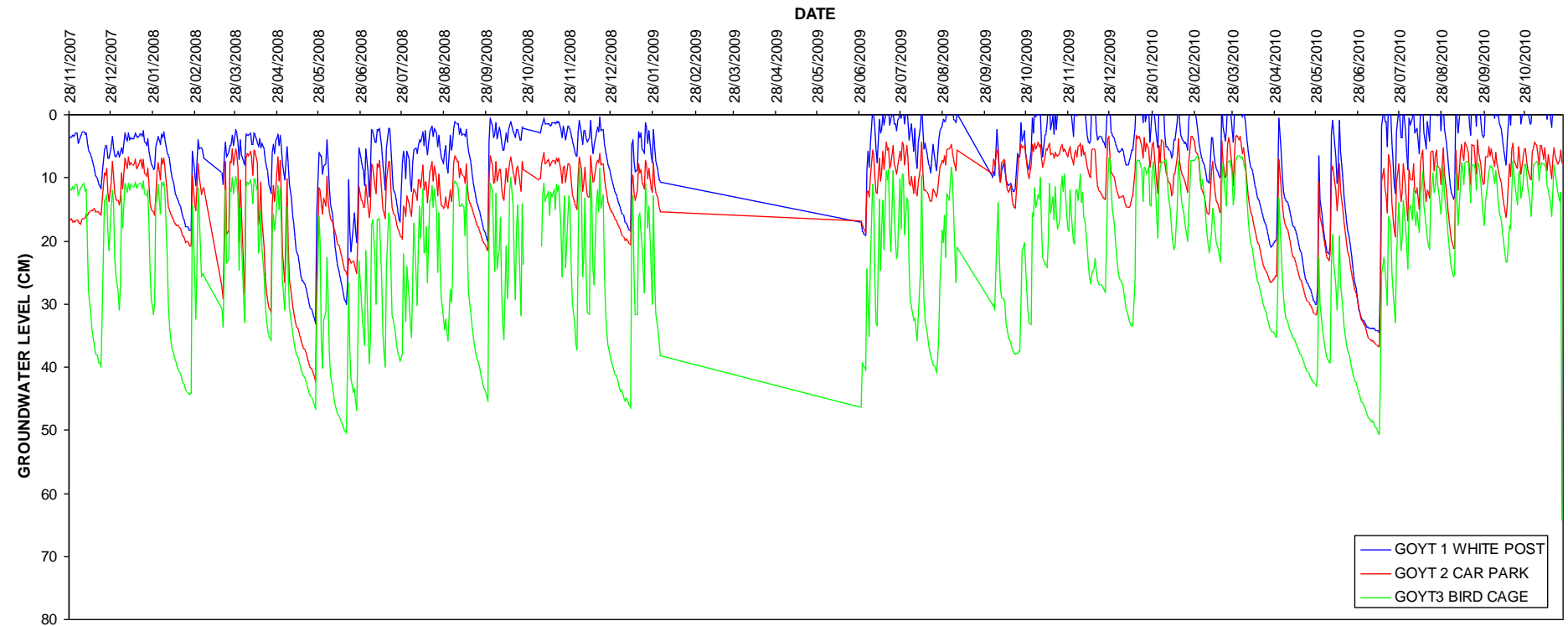
# Raw Water Colour - Goyt

RAW WATER COLOUR 2006-2010 - UPPER GOYT



**Slight, statistically significant decline in streamflow colour levels ( $p < 0.001$ ) 2 years after monitoring started. Works commenced prior to monitoring and completed 2007.**

# Changes in water tables in peat - Goyt



**Statistically significant increasing monotonic trends in groundwater levels and corresponding reduction in variability**

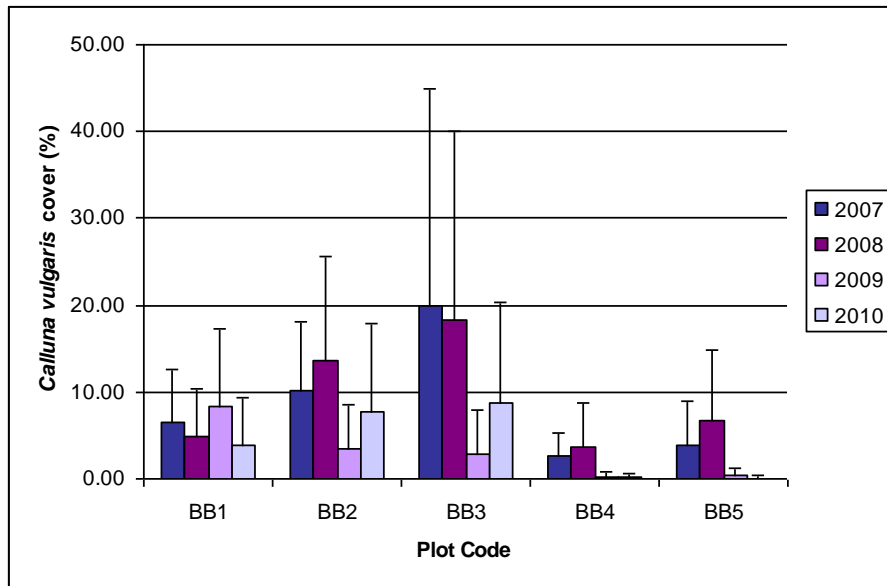
# *Turbidity*

---

- No significant changes after grip blocking (levels low to start with)
- Statistically reduced turbidity (sediment) in streams from areas previously bare peat, now re-vegetated (Longdendale)

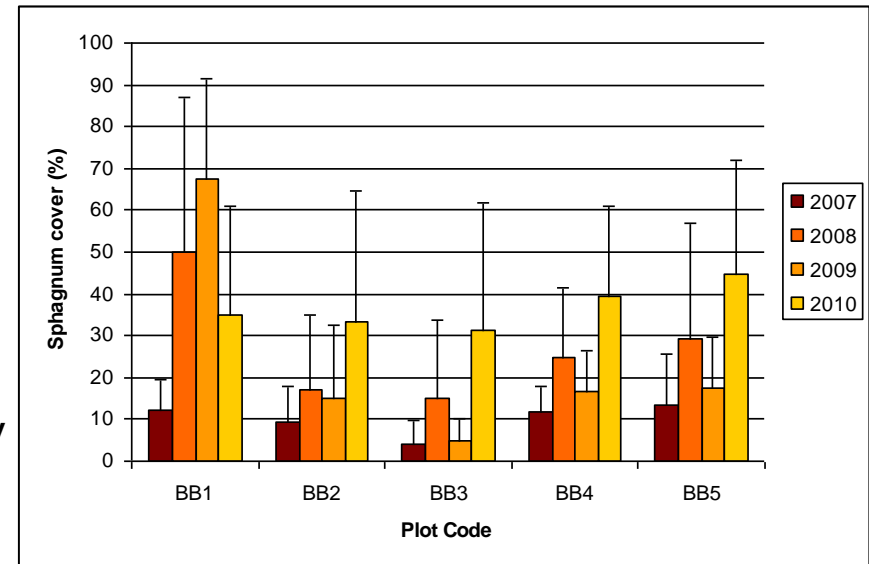
# Vegetation changes

## Brennand



Decline in heather BB4,  
BB5 stat sig, un-eroding  
catchment

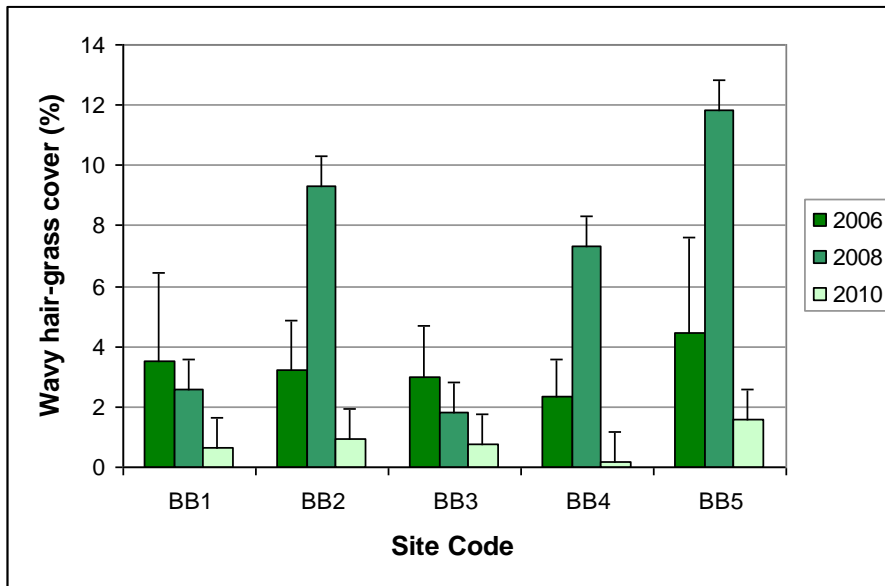
Increasing trend in *Sphagnum* (mostly *fallax*) except reference site (BB1),  
BB3 (eroded site) significant



# Vegetation changes

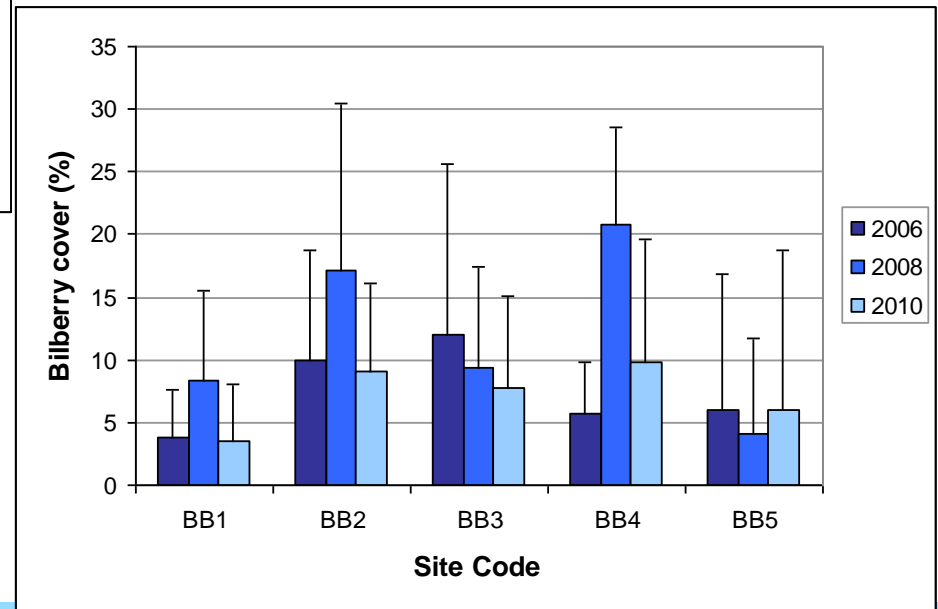
species	Brennand	Goyt	Whitendale
Heather	decline 2 plots	Increase	No change
Bilberry	Increase ref plot, increase then decline rewetted BB4 sig	Increase then decline	No change
Sphagna	Increase re-wetted, BB3 sig, ref site not	Increase rewetted, BB5 sig	No change
Wavy-hair grass	Increase, then decline, some sig	Increase then decline	
Other Mosses	Increase, then decline, not sig	Increase	No change
Vegetation height/cover	Increase/no change	Increase/increase	Sig Decline/ no change

# Goyt:



wavy-hair  
grass

bilberry



# Conclusions

---

- Significant reduction in colour –8.9g C/m<sup>2</sup>/year in 2006/7 to 4.9g C/m<sup>2</sup>/year 2009/10= 45% reduction
- Re-wetting of peat– higher water table, less perturbation, higher for longer
- Changes in vegetation height, total vegetation, moss cover and heather cover show positive effects of reduced grazing and cessation of burning on Goyt
- Trend towards increasing *Sphagnum* cover, decline in dwarf shrubs after rewetting
- Vegetation changes are slow
- Many Higher Level Stewardship indicators of success met after only 3 years