



Exmoor mires project - an innovative monitoring scheme

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Outline

- The context
- Aims of the project
- Ditch blocking
- Monitoring scheme
 - Catchment scale
 - Drain / Experimental pool scale
 - Site characterisation

The context





The context: effects of drainage

- **Vegetation**

- **No significant improvement of vegetation for grazing** (Stewart and Lance, 1983)
- **Degradation of blanket bog vegetation adjacent to ditches** (Wilson *et al.*, 2010)
- **Lack of peat accumulation** due to *Sphagnum* being disconnected from the water table



The context: effects of drainage

- **Vegetation**
- **Water quantity**
 - **Water tables** lower within c. 5 m of drainage features (Wilson *et al.* 2010).
 - **Surface water** is less common within c. 2 m of drainage features (Wilson *et al.* 2010).
 - **Increased flashiness** (Holden *et al.*, 2006)



The context: effects of drainage

- **Vegetation**
- **Water quantity**
- **Water quality**
 - Increased dissolved organic carbon / colour (Wallage *et al.*, 2006).



The context: effects of drainage

- **Vegetation**
- **Water quantity**
- **Water quality**
- **Increased peat decomposition**
 - Gaseous carbon emissions
 - Carbon sequestration low compared to storage capacity (Anderson, 2002).



Aims of the project

- **Restoring hydrological functioning**
(storage of water and the re-establishment of natural stream flows)
- **Improving water quality**
- **Habitat and biodiversity restoration**
- **C storage**

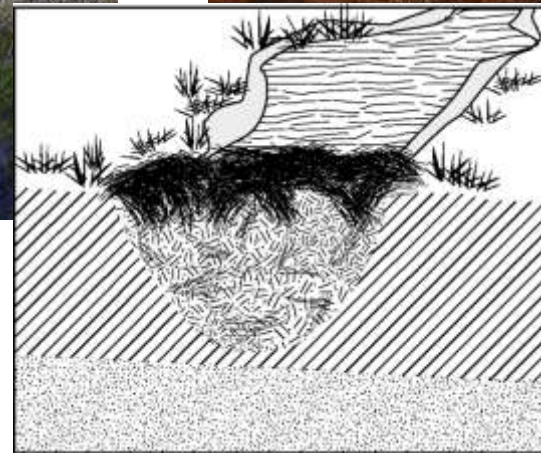


Aims of the project

... The *mires project* so far

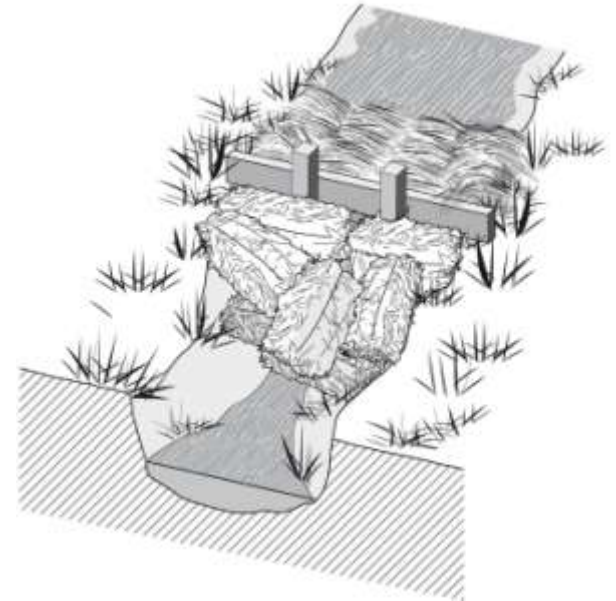
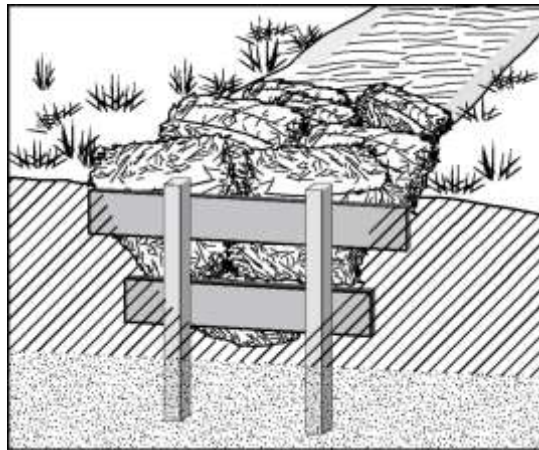
- Ditch blocking started in 2006
- Over 300ha restored on Exmoor so far
- £3.8 m invested by South West Water until 2015 for Dartmoor and Exmoor
- Aim is for 2000ha on Exmoor and 110ha on Dartmoor

Ditch blocking



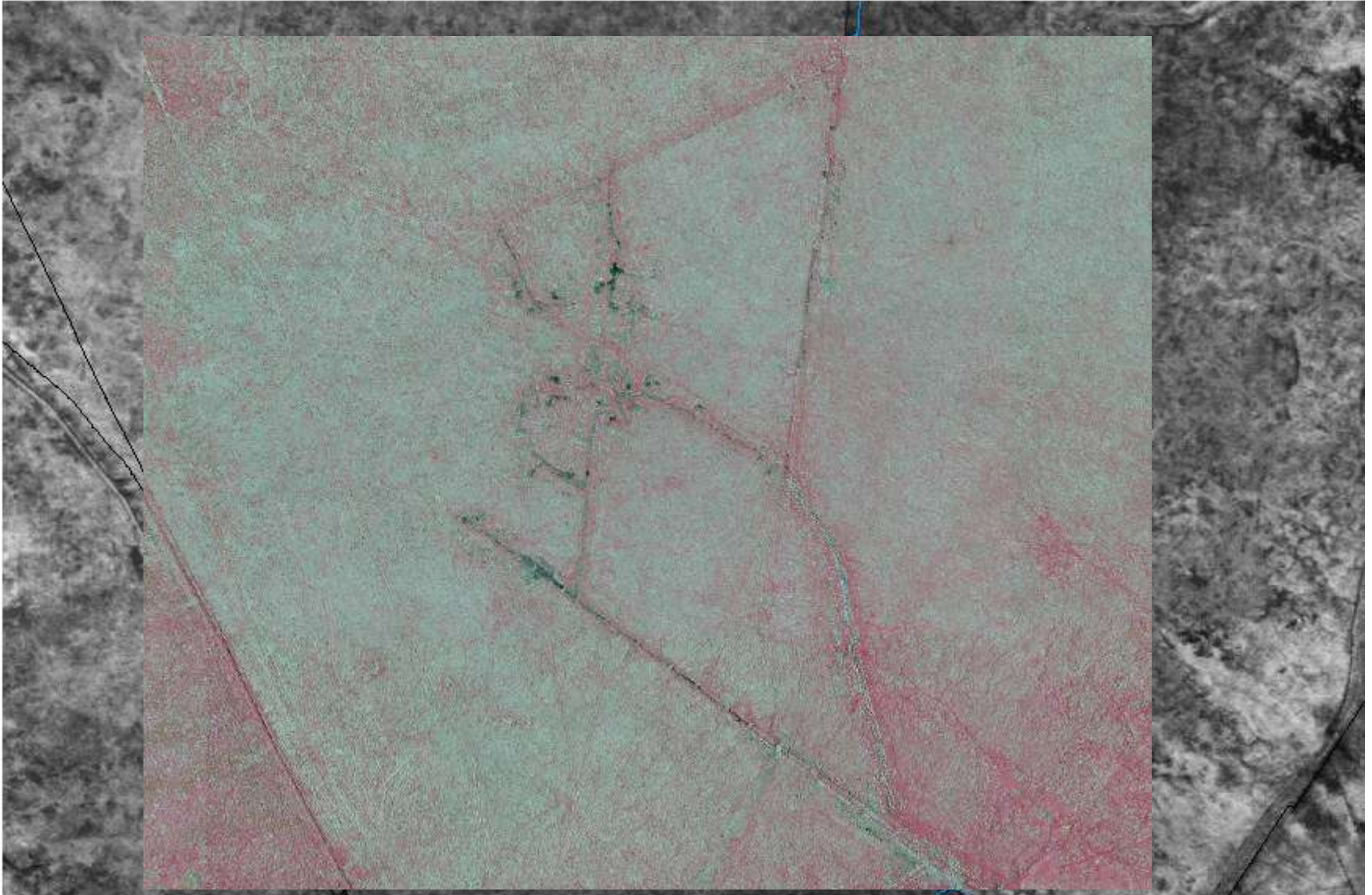
- Peat dams built from ditch edge peat.

Ditch blocking



- Wooden planks, bales or a combination

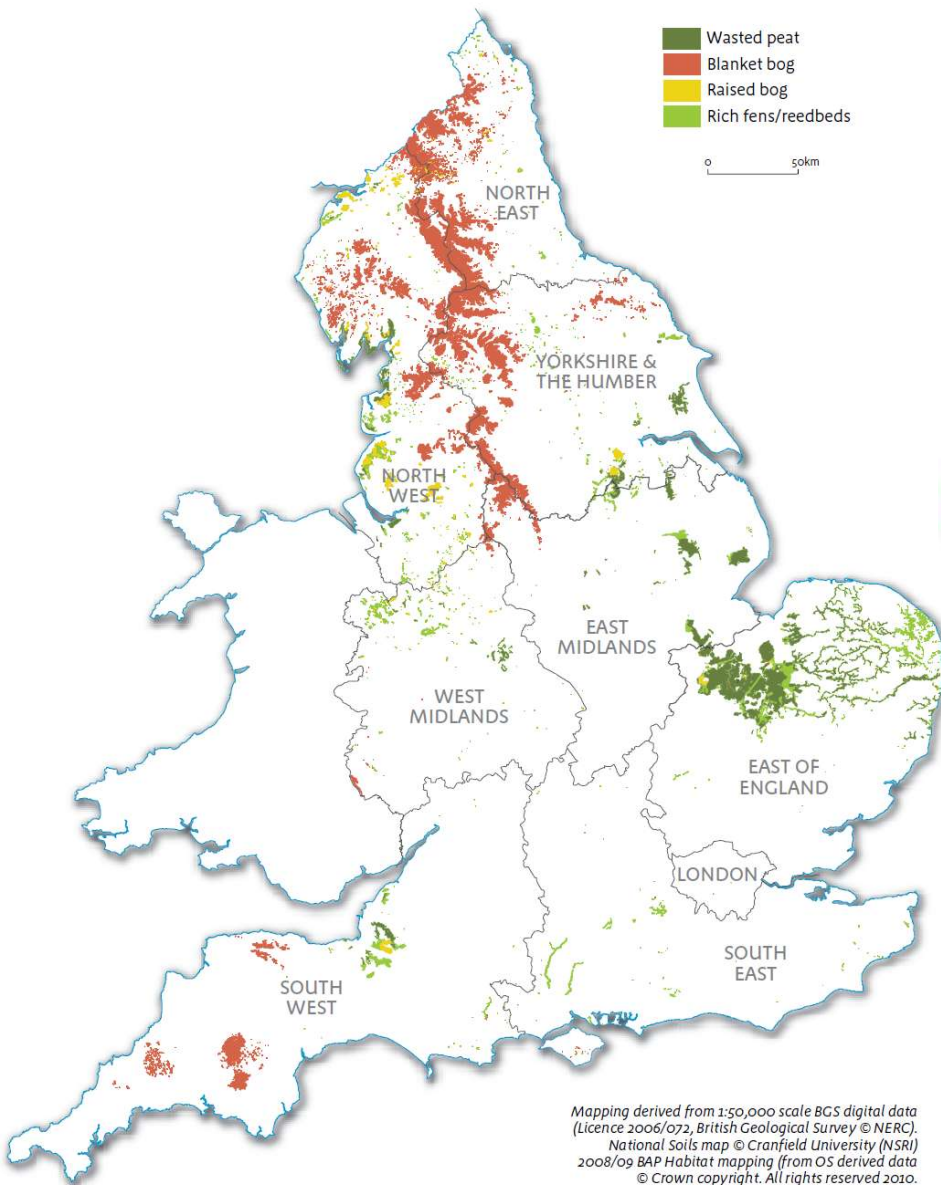
Ditch blocking



Mire pool patterns on a moorland at Squallacombe in the 1940's (© RAF)

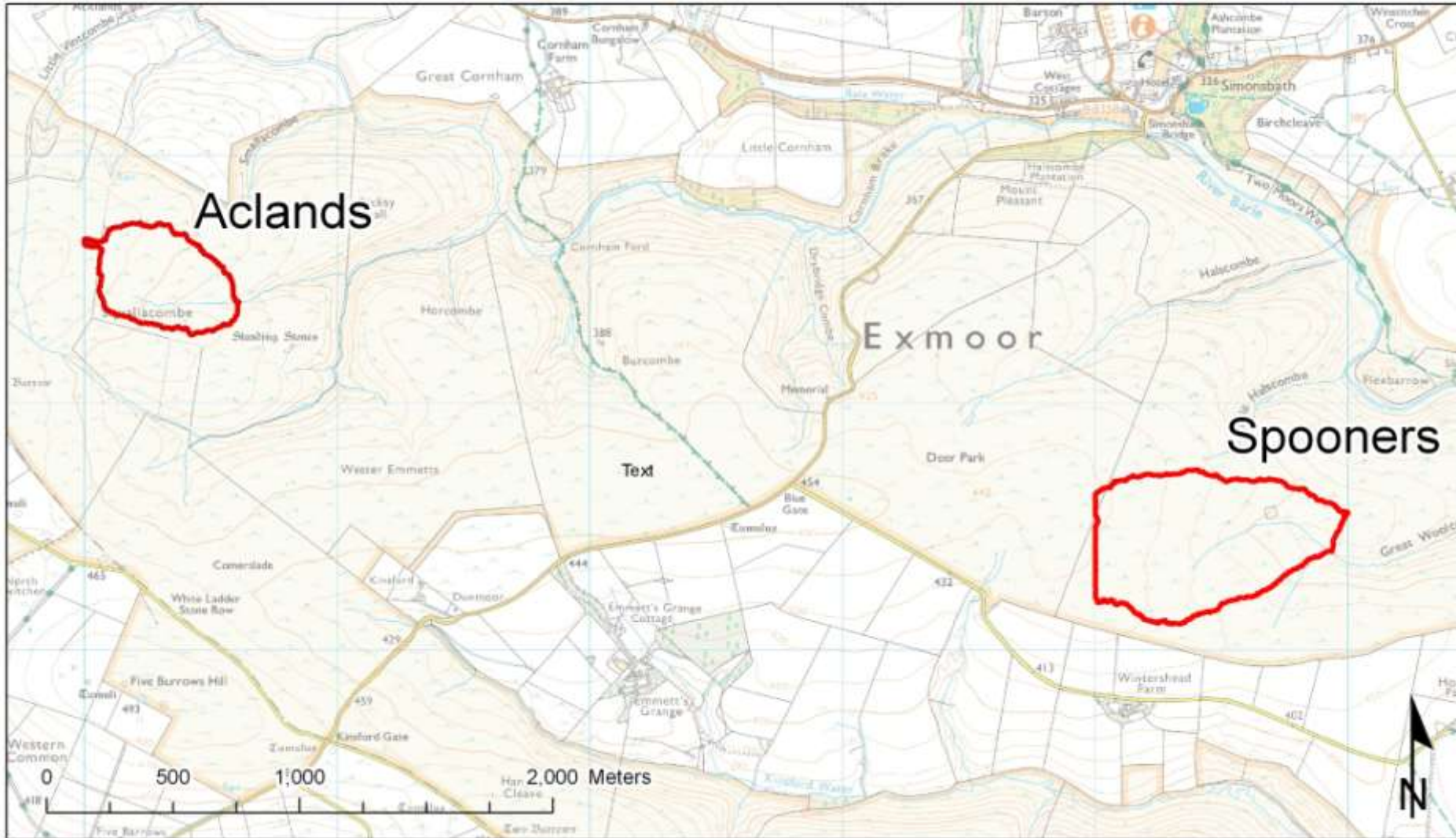


Monitoring Scheme



- Exmoor: 2 sites
- Dartmoor: 1 site

Monitoring Scheme



Monitoring Scheme



Typical
drainage ditch



Main channel

Experimental approach

- **Catchment budget approach:**
 - hydrological inputs and outflows

} Large scale
- **Detailed water flows and water quality**
 - 3 experimental pool systems on each site located on drains.

} Small scale
- **Restoration effect:**
 - before and after blocking.



Catchment budget: inputs



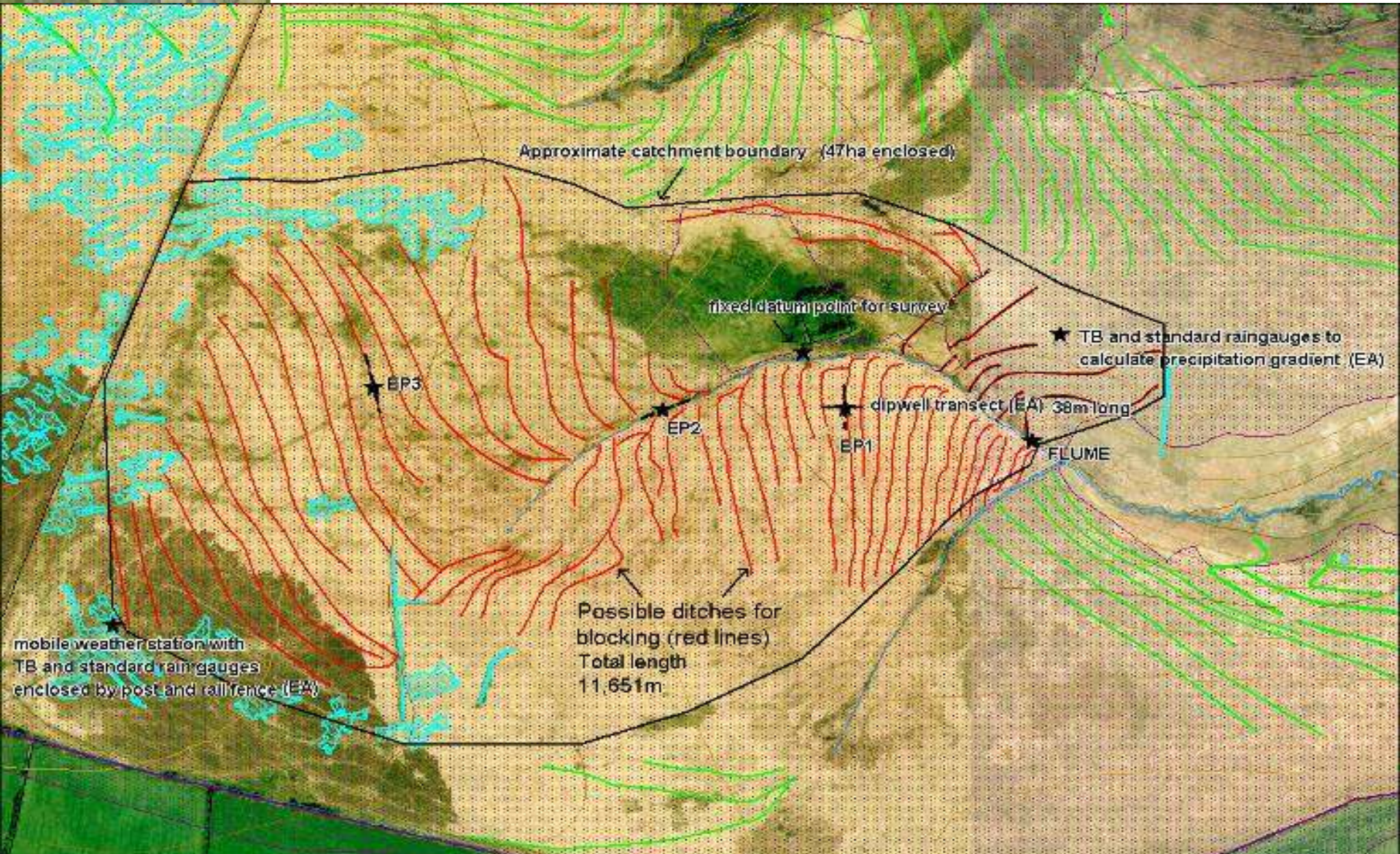
- Mobile weather station / standard & tipping rain gauges at each site

Catchment budget: outputs

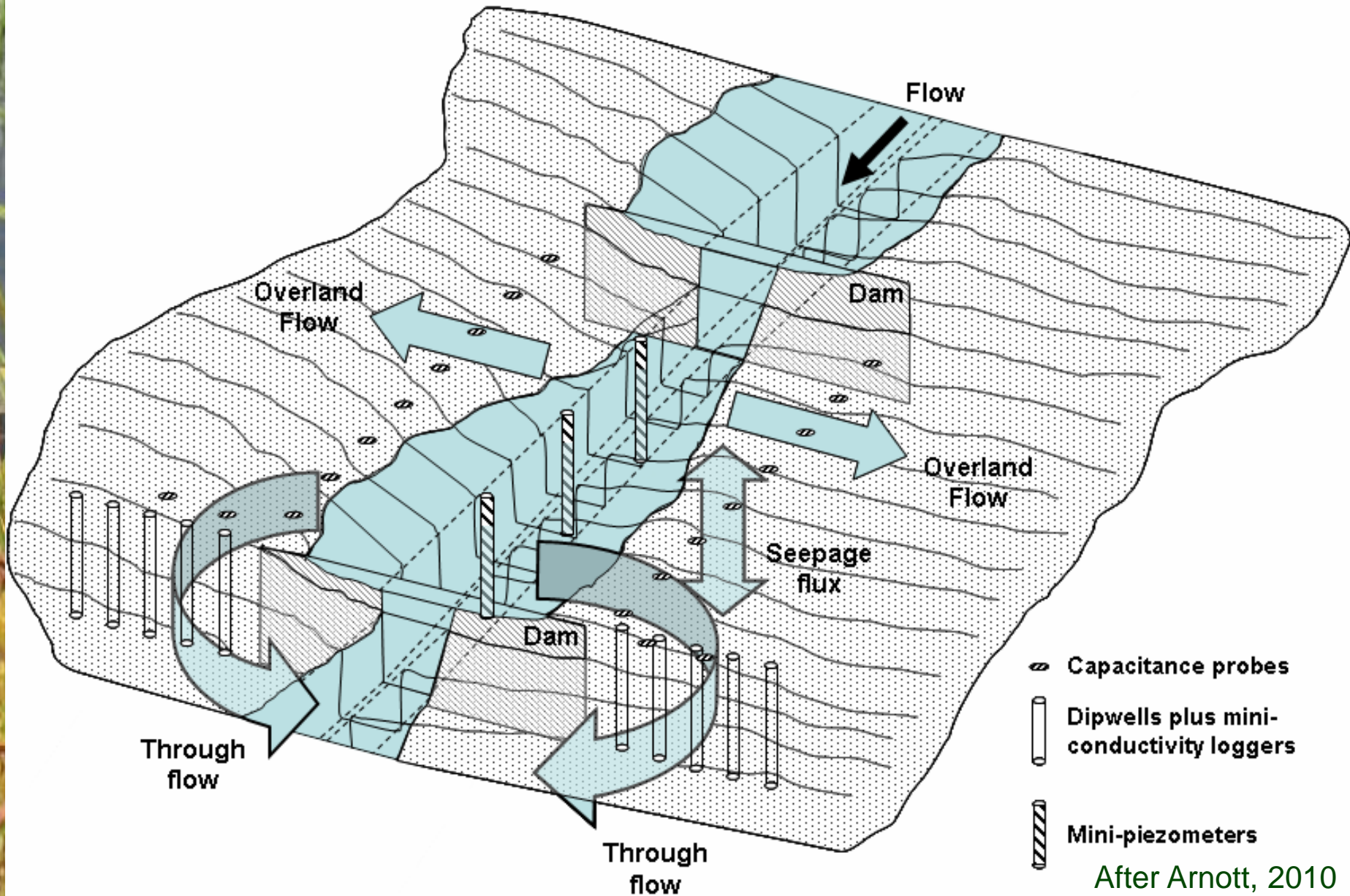


- Fibre Glass flume at the exit stream of the site to measure flow from the site.
- Automatic pump sampler

Experimental pools: locations



Experimental pools: principles





Experimental pools: sensors (x6)

Pressure Transducers (x16)

- **Water Table**
- **Overland Flow**
- **Channel Flow**

Thermal sensors (x6)

- **Exchanges between surface and ground water**

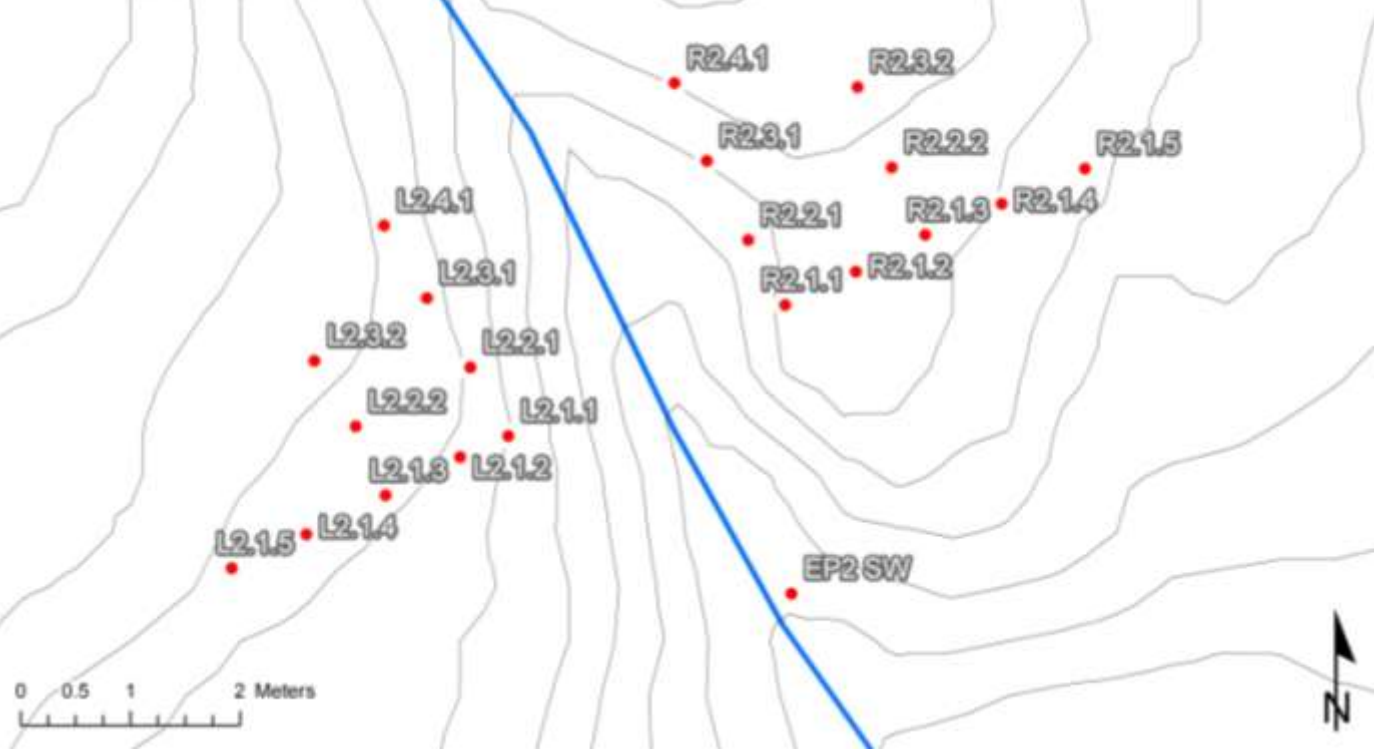
Electrical conductivity sensors (x6)

- **Tracing experiments to determine flow paths**

Water sampler (x1)

- **DOC / POC / colour**

Aclands EP2



Experimental pool





Data acquisition

- 17 sensors (x6 EPs)
- Total 104 sensors (including outlets).
- Measurements every 15 min
- Providing :
 - 35,040 data points per sensor year⁻¹
- Total of **3,644,160** data points year⁻¹



Site Characterisation: peat depth and vegetation

- LiDAR Survey (50cm resolution).
- Terrestrial Laser Scanning of vegetation and surface morphology (25mm resolution)
- dGPs ditch survey and classification
- Vegetation Survey and mapping
- National Mire Mapping Program datasets (GIS/aerial photographs).
- Peat depth surveys and classification.



Conclusion

- High spatial and temporal resolution
- Support of future modeling work – catchment scale
- Information on changes occurring in the southern limit of the peat extent in the UK

Thank you!

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