

## **Moors for the Future Partnership Research and Monitoring**

**Feb 2011**

### **Monitoring**

MFF have three ongoing monitoring projects which are outlined below.

All three are linked by sharing sites and methodologies to maximise the added value (scientific and economic) of each project. All are BACI design; core common methods across these projects include:

- *Vegetation*: 2x2 m quadrats within 30 x30 m plots
- *Water quality* (DOC and POC): water samples filtered to measure sediment load (POC); colour measured using spectral photometer; subsample of samples analysis in laboratory.
- *Peat* (depth and erosion): erosion pins; permanent peat 'posts'; airborne LIDaR (pre and post restoration)
- *Water tables*: cluster of 15 dipwells; one equipped with an automated datalogger and 14 manually measured dipwells (measured weekly in six-month 'campaigns')

### **MoorLIFE (2010-2015)**

A five year monitoring programme to assess the impact of bare restoration work on four sites across the South Pennine Moors SAC (Bleaklow, Black Hill, Rishworth common and Turley Holes). Monitoring elements include:

- Monitoring the success of vegetation establishment and succession
- Monitoring changes to the water table, water quality and peat erosion
- Carbon audit of the project

Monitoring elements:

Vegetation; Water quality (DOC and POC); Peat (depth and erosion); Water tables; Sphagnum

### **Kinder Monitoring (2009-2015)**

A five year monitoring programme to assess the impact of restoration works on the Kinder Plateau (Kinder Catchment). The programme addresses the following broad questions:

- To what extent does the restoration work on the Kinder plateau effect water tables, run-off, and water quality?
- Can restoration techniques be shown to have reduced peat / carbon erosion rates?
- Can revegetation techniques be shown to be successful at covering bare peat with a nurse crop and increasing diversity towards moorland species assemblages?

Monitoring elements:

Vegetation; Water quality (DOC and POC); Peat (depth and erosion); Water tables; Discharge (see MS4W project below); Sphagnum

### **Making Space for Water (2010 – 2012)**

A two year project to demonstrate how land management changes (specifically moorland restoration) in the Upper Derwent catchment might impact on flood risk. The aim is to establish the runoff characteristics of restored and un-restored locations during high flow events, in particular the generation of overland flow. There are two potential mechanisms by which restoration might alter the runoff characteristics. Firstly, changes in overland flow production could be driven by changes in water table (i.e. saturation excess overland flow). Alternatively, changes in overland flow production could result from changes in the infiltration characteristics associated with different surface cover (i.e. infiltration excess overland flow). The work programme concentrates on testing the following hypotheses:

- 1) Storm-flow runoff ratios are lower in restored areas than in un-restored areas
- 2) Runoff peaks are delayed and/or reduced in restored areas compared to un-restored areas

If these hypotheses can be confirmed it will provide substantial support for the argument that restoration can contribute to reducing downstream flood risk. These hypotheses are being tested using two approaches: intensive monitoring of a small number of carefully selected sub-catchments to provide detailed information on water balances and runoff characteristics; extensive monitoring of basic runoff characteristics at a larger number of sites. (Additionally, water tables are being monitored at sites with different restoration status.)

#### ***Intensive sites***

Five sites will be instrumented to measure the water balance and to investigate the timing of runoff production from restored and un-restored sites.

At each catchment the following equipment will be installed and connected to loggers:

- Rainfall: automated rain gauge
- Discharge: continuously monitored V notch weir
- Water tables: logging dipwell
- Surface flow: continuously monitored runoff plot

#### ***Extensive sites***

The aim of this work package is to investigate the link between water table and surface runoff production at a larger number of sites than can be instrumented for intensive study. The full set of extensive sites represents different restoration conditions (bare peat, early stage restored, late stage restored, gully blocked and intact). They will be instrumented with basic equipment to allow characterisation of runoff production (overland flow).

At each of the 12 plots:

- Water tables: cluster of 15 dipwells
- Overland flow: nine crest stage samplers
- Rainfall: one bulk rainfall collector
- Runoff: one bulk runoff collector

### **Volunteer Monitoring Project**

This project aims to set up a long-term volunteer monitoring of the moorland landscape within the South Pennine Moors SAC to detect trends in condition under a changing environment. This

will be carried out by volunteers from a variety of 'sectors' from local communities. The data from the monitoring will drive future decisions as a good example of "big society" thinking. Initial monitoring components will include vegetation, water tables and peat depth.

## **Supporting resources / knowledge exchange**

### **South Pennine Moors GeoNetwork**

The SPM GeoNetwork is a web-based spatial data catalogue that provides a centralised portal for the region where spatial information relating to uplands in the South Pennine Moors can be stored and shared.

The main aim is to share information and knowledge on the existence and scope of datasets relevant to the South Pennine Moors. This aim to facilitate the sharing of spatial data, promote collaboration and provide added value. This will help with research and monitoring design, collaborations, standardization of methods and 'metadata' type projects.

There are many other types of information and data that we additionally encourage you to share on the SPM Geonetwork, including:

- Map on research and monitoring locations:
- Map of control / reference sites used within the SPM
- Map of restoration and management initiatives

### **South Pennine Moors Research and Monitoring Coordination Group**

To support and facilitate more efficient, effective research and monitoring projects through: sharing and collating information on the spatial and temporal locations of data and fieldwork and methodologies; maximise potential additionality of individual projects through a coordination role

#### *Activities*

- Share metadata on spatial datasets and fieldwork locations towards the creation of a comprehensive spatial map of research and monitoring programmes activity and data.
- Share information, where possible, on methodologies to support the development of standardised / compatible data collection methods across the entire area of interest
- Liaise with existing and future projects to help ensure added value
- Coordinate the establishment of network of control and reference sites with the aim of reducing the requirement for new projects to establish such sites; coordinate and identify resources towards the long-term protection and data collection on these sites
- Share information on relevant literature, funding sources, planned work programmes and any other information of potential interest

### **Moorland Restoration Handbook**

Contains a chapter on monitoring that is based on CSM monitoring protocol and focuses on monitoring habitats. Includes:

#### **1. Vegetation**

Plant species; Plant communities; Remote sensing; Vegetation structure

#### **2. Peat physical integrity**

Change in peat surfaces and depths; Bulk density; Humification; Paleoenvironmental condition

#### **3. Hydrology**

Groundwater; Channel flow; Precipitation; Evapotranspiration; Geochemical methods

#### **4. Biogeochemistry**

Peat and water chemistry; Carbon budget; Greenhouse gas fluxes

Based on:

Bonnett, S.A.F., Ross, S., Linstead, C. & Maltby E. (2009) A review of techniques for monitoring the success of peatland restoration. Report for Natural England. University of Liverpool.

Bonnett, S.A.F., Linstead, C., Ross, S. & Maltby, E. (2009) Guidelines for monitoring the success of peatland restoration. Report for Natural England. University of Liverpool.

Arnott, S. (2010) Exmoor Hydrological and Hydrogeological monitoring plan for the Mires-on-the-Moors project. Environment Agency.