climateXchange

Scotland's centre of expertise connecting climate change research and policy

WORKSHOP - Developing a National Peatland Monitoring Framework - Thursday 1st March 2018

ClimateXChange was invited to facilitate a workshop to identify priorities for peatland monitoring in Scotland (the 'what') and explore what datasets (the 'how') are needed.

We recognised that developing a monitoring strategy is a huge task, and the aim of the event was to bring the professional perspectives of delegates together to agree a firm basis for action, highlighting the key priorities and identifying realistic actions to take forward.

Why:

Scotland's National Peatland Plan identifies the importance of monitoring

> "As we manage and repair our peatlands it is essential to monitor and study the impacts on carbon, water, biodiversity and other landuses and landuse changes, so that we can assess and report on progress and inform the various funding streams and policies that will secure a healthy peatland future"

For the workshop, we focused on the idea of a 'healthy peatland' to create the foundations for a framework to accommodate the different subject matters (biodiversity, hydrology, GHG flux etc), scales (ground survey, drone, aerial, satellite) and timescales.

Anticipated outcome:

(i) a list of priority 'signals' (i.e. – the 'indicator' or 'evidence' that should be included in a monitoring framework), and

(ii) (ii) an outline action plan for next steps (including identification of key parameters (both existing and potential)

Who for?

Attendees represented the committed community of specialists, but recognised the importance of the wider audience with an interest in a healthy peatland:

- Ministers and senior government officials (responsible for delivery of strategic goals, and allocation of related funding)
- Policy colleagues and decision-makers, responsible for prioritisation within and across different sectors, looking for succinct, plain English narratives of the underlying science (including confident knowledge, areas of active debate and gaps) and what it means.

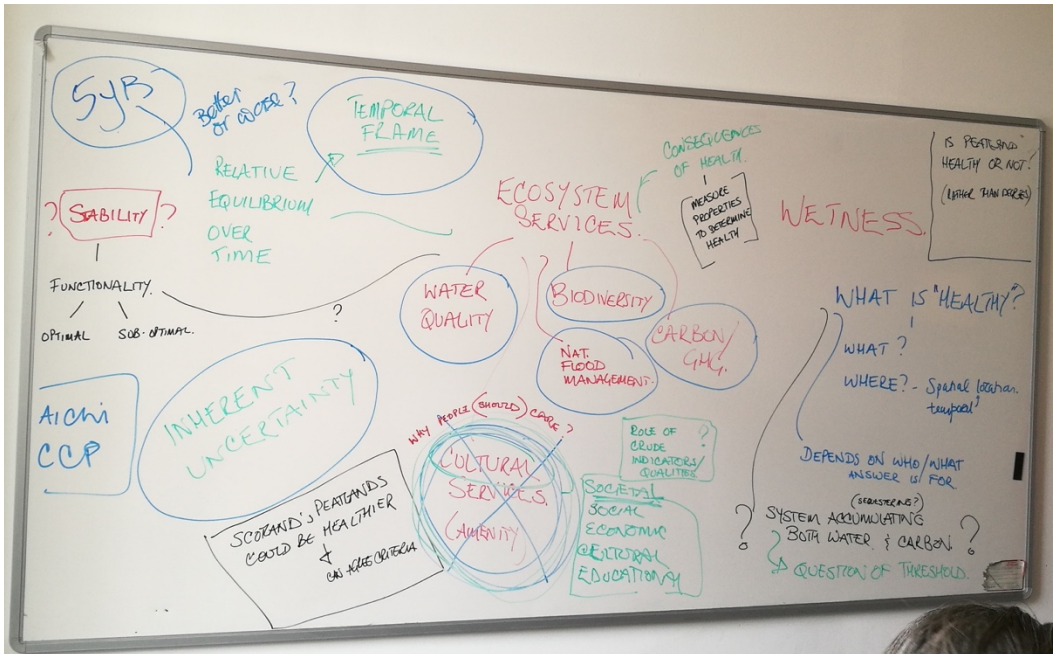
- Statutory agencies (responsible for delivery of strategic goals in relevant sectors)
- Science and research community, responsible for creation of new knowledge via inter-disciplinary research projects and longer-term monitoring
- People/ the taxpayer – the source of the core funding, and the potential beneficiaries as part of the wider economic and social system.

Setting the scene

Short presentations were given by

1. Dr Andrew Coupar (SNH) introduced the event and explained the importance of setting a foundation from which to build a peatland monitoring strategy for Scotland.
2. Dr Rebekka Artz (JHI) summarised recent research activity, with particular reference to the Wetland supplement of the GHG Inventory
3. Dr Emma Goodyer (IUCN) provided an update on IUCN activity

Session 1 – Identifying key signals for a healthy peatland



Delegates were asked to consider what might constitute a healthy peatland, with key points being captured on the white board (fig. 1).

Some key issues emerged from this session, and concerns were expressed over the very concept of what a healthy peatland might constitute.

- how a monitoring framework can deliver outcomes in terms of monitoring 'health' rather than monitoring 'progress'. For example, when is the process of peatland

restoration completed and has resulted in a stable end point, or how monitoring can act as an early warning system for decline.

- Health can be assessed as a static parameter, but it is impossible to determine changes between the assessment cycles, and so it is possible to miss early warning signs if e.g. coincidentally 'health' is assessed in average or wet years, masking early decline during drought years etc.
- A focus on such a binary outcome (healthy versus not) automatically limits thinking about what a well-designed monitoring programme can potentially deliver. Almost all monitoring programmes are constrained by budget and technical feasibility within that budget, so should the limiting choices not realistically be around those subjects?

The original intention had been to focus minds on the desired outcome for monitoring and this drew attention to the complexities of defining what is to be monitored, at what scale and to demonstrate delivery of which outcomes.

The group agreed that, for the remainder of the workshop, we should explore the five areas identified in orange below, shown in a slightly reconfigured version with (hopefully) a more logical flow.

Questions that will help the decision on what to monitor against

1. Is peatland healthy or not (rather than degrees of healthiness)? *Delegates were not entirely happy with this approach.*
2. What is 'healthy'?
    a. Does it depend on who or what the answer is 'for'?
    b. Does it depend on where the peatland is (spatial/ temporal location)?
3. If it is agreed that 'Scotland's peatlands could be healthier', what are the relevant (and deliverable?) criteria?

Themes with potential to identify specific signals that could be/ are being monitored:

1. Natural flood management
2. Water quality
3. Carbon/ GHG emissions
4. Biodiversity
5. Cultural services (including amenity, and why people should care, and linked to the Scottish Government's National Performance Framework, and the specific national outcome to be achieved of "**We value, enjoy, protect and enhance our environment**; note - *delegates were keen to recognise the importance of cultural services, particularly in relation to the beneficiaries of improvement. However, it is challenging area for monitoring and metrics.)*

Session 2 – existing data sources with potential to support a monitoring framework for peatland

This session was designed to

i. capture in one place existing data sources that have potential to support a monitoring framework for peatland, tied to the key narratives identified above, and to
ii. identify important gaps that prevent us from communicating what matters.

NATURAL FLOOD MANAGEMENT

Data (Sources of knowledge)	**The current owner of the dataset?**	**What data sets might be missing – workshop attendees' responses**
Communities at risk (potentially vulnerable areas PVA) (Flood risk modelling)	SEPA	Data inventory – Peatland
Flood risk maps (Section 20)	SEPA	
Risk maps (soils)/erosion/ run-off	James Hutton Institute	
Rainfall	Met office	Low time resolution
National river flow archive	CEH	
Catchment Maps	SEPA	Modelling? Role of peatland and restoration in national flood management
Wetland inventory	SEPA/SNH	Cumulative impacts of agri-environment measures on water courses/peatland
Habitat map	SNH	
Long-term river monitoring	University of Dundee	Sphagnum cover and layer thickness (preferably as remotely sensed/EO (regional or national dataset) NOTE: _*We are probably still several years away from being able to produce a validated model for this*
Site hydrological monitoring	Site managers: SNH, FES, 3rd sector etc	Areas of bare peat/eroding peat (vegetated) again as earth observation dataset (Mi7 EODIP Defra;
NERC National flood management project	University of Manchester	
Research-impacts of deforestation on peatlands on flooding	Forsinard, Univ of Highlands & Islands PhD, Galloway Forest	

Data (Sources of knowledge)	The current owner of the dataset?	What data sets might be missing – workshop attendees' responses
	Park; Galloway Fisheries Trust	
Slowing the flow, pilot projects	FC/PDNP??	
HOST – Maps – soil wetness?		May not be good for peat.
Sentinel – soil moisture map	CEH, ECN, COSMOS – doesn't work on peat (lowlands especially)	SOIL MOISTURE MONITORING on the ground (i.e. the training and validation data for such a modelled map)
Pre/post restoration flood response	Penny Anderson – SCAMP	
Working with natural processes	Defra/CEH/SEPA & others; Scottish Water	

WATER QUALITY

Data (Sources of knowledge)	The current owner of the dataset?	What data sets might be missing – workshop attendees' responses
Public water quality sampling source/sub catchment monitoring	Scottish Water, Research Institutes NGOs – e.g. RSPB in Flow Country, Scottish Power Renewables – for some wind farm sites	Can't apportion the relative contribution from peatland (or which bit of peatland)
LOCATE project (Halladale)	NOC/UHI/CEH	
River basin management plan/WFD	SEPA	Lead waters
DOC,IONS (ECN)	Environmental change network	
Water table of peatland (not inherent ground water)	Dispersed – NGOs e.g. SWT, Research Institutes, FES (for restoration projects), SNH Peatland Action & SNH wetland hydrology lets	Not always relative to stable ground datum level
Fisheries data - Acidity - DOC - Turbidity – POC	Fishery Trusts	
Whitlelee research windfarm (Several publications)	Edinburgh/Glasgow University (Kate Heal/Susan Waldron)	
Private water supplies	Local Authority Environmental Health Teams	Compilation (data is owned by many local authorities)
Water treatment costs/water colour – Scottish water	Scottish Water	
Individual restoration projects (especially in sensitive catchments)	Peatland Action/Renewable energy companies/NGO restoration sites/Forest Enterprise	Not always strategically placed to disentangle effects of restoration activity

Data (Sources of knowledge)	The current owner of the dataset?	What data sets might be missing – workshop attendees' responses
Fertiliser inputs (e.g. agriculture pesticides) - impact on these in particular water framework directive	SEPA	Missing measurements on peatlands as a baseline?
Upland water quality monitoring network – DOC (acidification) – heavy metals	SEPA & CEH	Continuity – long term dataset
Catchment monitoring e.g. Fleet catchment – water quality from land use (e.g. forestry)	FCS/FR/SEPA Universities e.g. Dundee for Forestry	
Scotland wide water quality maps from EO data	University of Stirling	Impacts of restoration on water quality at a catchment scale – does restoration affect water quality at the point of water abstraction? – publication of available data
Harmonised monitoring scheme	Defra/SEPA	
Data held by drinking water industry regulator	Scottish Government	
Land use/Forestry activity sets agriculture	RPID/Forestry Commission Scotland	
Ugie Catchment Project	Scottish Water, SEPA, SNH (Peatland Action), IUCN UK Peatland Programme	

CARBON/ GHG

Data (Sources of knowledge)	**The current owner of the dataset?**	**What data sets might be missing – workshop attendees' responses**
Peat depth & carbon content	Historic University of Dundee data JHI – survey/point/model SNH Peatland Action BGS Soil series	Local planning authority data – in PDF; Missing as GIS/number
Bulk density	James Hutton Institute (but limited)	Data from developers
DOC/POC/TOC Dissolved/particulate organic carbon in water. Colour and airborne TOC	Scottish Water SEPA (WFD class nitrogen) NERC pools project – Leeds University , lots of research projects – Higher Education Institutes, individual sites and restoration projects, NERC LOCATE	Can't determine its source (whether from peatlands) unless at site scale
(CO_2) Fluxes GHG – CO_2, CH_4, (N_2O) volatile organic C (metal halides)	Flow Country Research Hub, ECN? CEH Edinburgh University Geosciences JHI/FR UK emission inventory	National level particularly change (there currently only 6 flux towers in Scotland!) Upscaling modelling More flux joiners?
Sphagnum moss cover		Remote sensing Need more data on primary production! Accuracy/ground truthing
Wetness	Insar – Nottingham Landsat/sentinel – 2 NASA/ESA Scottish Water catchment risk mapping (Rezatec contract)	Calibration for agriculture land use (*note: These don't hold actual wetness data – the data products are indices of surface moisture (NDWI – normalised difference wetness index) but these data are not tested as to whether they*

Data (Sources of knowledge)	**The current owner of the dataset?**	**What data sets might be missing – workshop attendees' responses**
		release useable data for peatlands yet
Extent of bare peat/worldview2	Dundee University	
Forested peatlands – C balance and fluxes (water quality links too)	University of Highlands & Islands (Roxane Andersen) – primary under restoration Forest Research	Pre-afforestation conditions. Techniques have evolved for restoration since monitoring has started – not always monitoring what is relevant <u>now</u> (pitfalls of long-term) Data on carbon loss/GHGs in relation to peat extraction

BIODIVERSITY

Data (Sources of knowledge)	**The current owner of the dataset?**	**What data sets might be missing – workshop attendees' responses**
Countryside Survey	CEH	Unpublished research data!
Site Condition Monitoring	Scottish Natural Heritage	An inventory of what there is!
Environmental Change Network	CEH/SEPA/Defra	
Life Projects	E.g. RSPB, Plantlife, SWT, BTO, Woodland Trust, Buglife, Butterfly Conservation, National Park?	*Sphagnum* cover and thickness of *Sphagnum (although issues around data access and need for compilation of existing data)*
National biodiversity network (NBN) gateway (species data)	NBN Trust and local recording centres – BSBI and Botanical Society Scotland	
Peat surveys & plant data	JHI data!!!	
NNRs, SSSIs, SPAs any other data (not SNH)	Local Authorities	
Woodland/Forestry related biodiversity/species data	Forestry Commission Scotland Forest Res. & Forest Enterprise Scotland	
Peatland Action restoration data	SNH	
EIA/SEA 1990+, 2000+, 2004, 2015 - Land Cover map - LCS88 - Habitat loss	 CEH Hutton ????	Not available Most peatland still missing Habitat loss and attributable to development, although estimated in EIAs, is not subsequently measured.
Deer/sheep stocking density	SNH/RPID	Data unlikely to be available at a meaningful scale
Air pollution data	Local authority/CEH/APTS	

Data (Sources of knowledge)	**The current owner of the dataset?**	**What data sets might be missing – workshop attendees' responses**
(as pressure on species e.g. high ammonia sulphur strongly affects mosses (Sphagnum) and lichens		
Fisheries - Freshwater pearl mussels - Salmonids	SNH Fisheries trusts	Public availability?
Drain blocking	Datasets on vegetation and water tables held by various organisations (RSPB, SNH, Universities, JHI, SPR, FES, FR)	Crane flies
Bird surveys – water surveys etc.	RSPB, BTO & WWT	
Open habitat surveys (vegetation 170,000)	Forest Enterprise	
All taxa (projects and individual records /academics)	Biological Records Centres/NBN gateway British Bryological Society	
Scottish butterfly survey	Buglife & Butterfly Conservation	
Palaeoecology (microbes, pollen analysis & algae	Academics/research institutes	

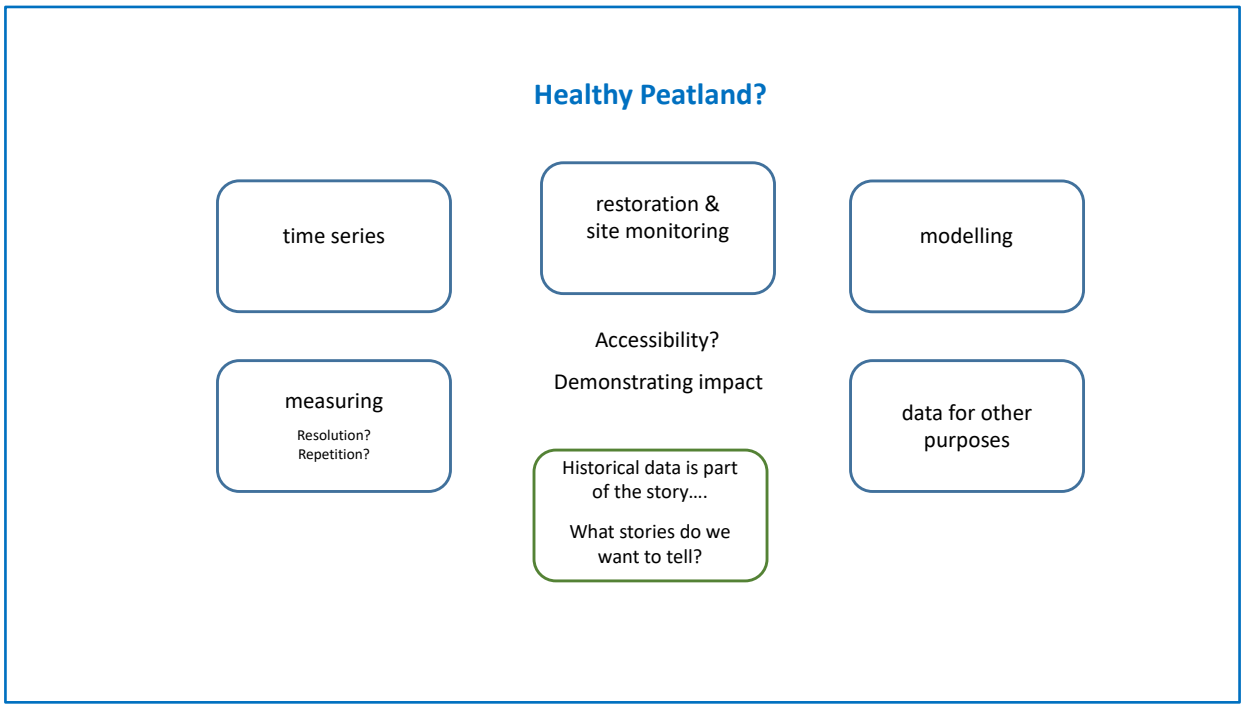
CULTURAL SERVICES (Social - Economic - Education)

Data (Sources of knowledge)	**The current owner of the dataset?**	**What data sets might be missing – workshop attendees' responses**
Visitor numbers/activities (and input of these on peatlands)	Some NGOs own some data - Flow Country - Flanders Moss (SNH)	National data compilation
Economic value - Food – dairy, veggies, sheep - Timber - Sporting	JHI SRUC Forest Enterprise/Forestry Commission Scotland	Focus on peatland (is just moor and plant soils)
Peatland cores/geological SSSI	Radiocarbon lab – East Kilbride (only a small proportion) Richard Payne – UK core compilation	Spatial resolution and replication
Archaeology	Local authorities, academia, archaeology Scotland, archaeology NGOs	
Education materials for primary schools and others!	Irish Peatland Conservation Council (IPCC) & SWT schools' material. The 'Flows to the Future' project	Uptake, needs updating?
Opinion polls (for Scottish Biodiversity Strategy)	SNH	Update needed IUCN are planning to do one
Agri environment grant payment	Scottish Government – RPID	Appropriate data analysis
Research – peatlands focus groups – how people value peatlands	JHI, University of Leeds (Martin Ortega)	Limited scope – small number, self-selecting participant and need more! (i) More places, (ii) repeated though time

Data (Sources of knowledge)	**The current owner of the dataset?**	**What data sets might be missing – workshop attendees' responses**
Domestic peat cutting and cultural use/value – traditional lifestyle/language/customs	Crofting Commission Scotland's Rural Past? (HES) Museums	There is no central registry of domestic peat cutting Who else
Cultural (not just economic) aspects of whisky industry	Scotch Whisky Association? RSPB did study in Wales relevant?	
Economic benefits to local community - Forsinard Flows	RSPB	
Commercial grower peat requirement (horticulture mushrooms)	Data from surveys Defra/CEH inventory team	Need more data on attitudes
Supply of drinking water	Scottish Water	
One potential source of knowledge was identified, but with no info on format or ownership: i. Peat cutting – Crofters? Fuel		

The story of a healthy peatland - prioritising data collection (the 'what' and the 'how')

After lunch, options were considered for how we might prioritise data collection in specific areas, identified below.



This prompted some **key issues and questions**, answers to which may help to inform the development of the framework.

1 Which datasets have time series?
- Past?
- Continuous

2 Issues with those datasets
- Scale
- Risks
- Threats

3 What are the issues with the different bodies collecting data
- Regulations
- Start with statutory?
- Point in the data processing chain (unstructured, collated, QC checked, processed, upscaled) -
- Priority for processing
- e.g. RSPB
  - bits and bobs of monitoring
  - using **proxies -** standard protocol that can be applied

4 how do we capture lessons learned?

5 what are the challenges with water quality data
- challenges in matching output to source
- Scottish Water human health data

6 Protocols
- Conditions for data collected (under-funding?)
- Then monitoring

7 How is restoration affecting individual sites?

8 How healthy are all peatlands?
- satellite/field based
- specific spatial & temporal scales
- tiered approach to monitoring

9 What is the correct ground information for remote sensing?

10 How do you get the new data?
- what are the question we ask of the datasets?
- Investments to maximise benefits of satellite data

WHAT NEXT?

The concluding discussion highlighted the challenge faced during the day – clearly defining the task is essential before we can establish what form any monitoring activity might take.

- Is the task 'MEASURING CHANGE'? and
- What is meant by 'HEALTHY', that would allow meaningful measurement of change?

One option might be for each of the major headings be tied to an individual working group to collate how the data sources could be used; to inform what a National Peatland Monitoring programme should include or which of these are strong enough on their own and should be linked to such a programme?

CXC Secretariat

22 May 2018