Spring!

It took a while to get started, but when it did, spring brought sunshine and even warmth to the Flows. With it, the students, volunteers, researchers and nature lovers head back north to visit, sample, core, measure, count… This spring, an interesting crowd of engineers and international peatland experts also gathered in Thurso for a discipline bridging workshop, some of them setting foot on a bog for the first time, and many making a promise to return! We provide here a short summary of the spring highlights from the Flow Country Research Hub, and wish to thank everyone for providing contributions and pictures.

Jasmijn Sybenga looking at a riparian peatland in Dalchork, near Lairg. Photo credit: Scott Timpany

New faces and projects in the Flows

Seeing the Wood for the Trees

Last February I started my UHI and Scottish Forestry Commission joint-funded PhD on the reinstatement of the "natural" woodland in the highlands. Within this PhD I will be using palaeobotanical data to understand how the "natural" woodland developed and changed over thousands of years and applying the results to conservation management strategies for areas of current Scottish Forestry Commission land. In order to obtain the palaeobotanical data that would give these long-term records, three different sites in the highlands under the care of the Scottish Forestry Commission were sampled; Rowens and Braehour, two blanket peats in Caithness and Dalchork, a riparian site in Sutherland.

Information previously provided by the Scottish Forestry Commission on peat depths within these areas helped to prioritise which areas would be investigated in the field. During fieldwork an initial auger survey was undertaken to gauge the overall stratigraphic sequences, together with the depth and thickness of the peat. Based on the collected auger data a decision was then made in regard to selecting the best location at each site to collect a core for palaeobotanical study. A series of three cores were then collected varying in depth from 5.4m at Braehour to 3.3m at Dalchork. All of the collected cores contained depths of peat with macroscopic wood fragments suggesting the presence of former in-situ woodland, which will be of direct relevance to my PhD topic. The next phase of this project will be the detailed recording and subsampling of the cores and preparation of samples for pollen analysis, which will provide long-term records of vegetation change at the three field sites and information on the former woodland present at each. *Jasmijn Sybenga, UHI*

Project updates

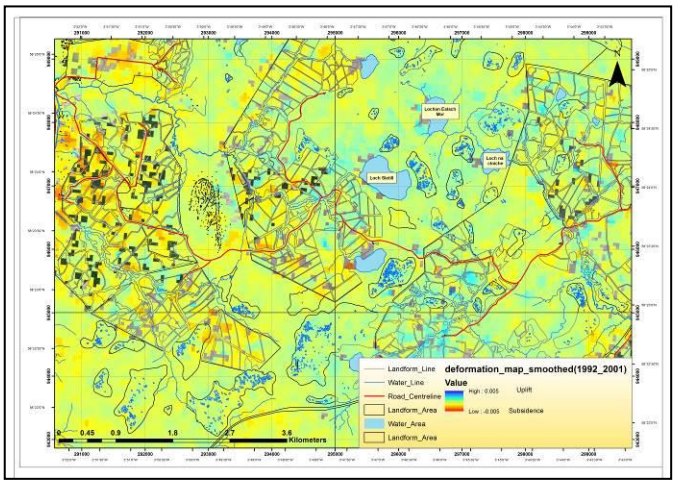
Measuring peatland deformation from satellites: a tool for the future?

InSAR (Interferometric Synthetic Aperture Radar) is a technique used for mapping ground deformation based on radar images of the Earth's surface, collected from orbiting satellites. The technique can be extremely accurate and has been widely used in geodesy and remote sensing. By combining two images together and applying a series of filters and some modelling, it is possible to detect millimetre-scale changes in deformation in a given area over spans of days to years.

In 2015, a group of remote sensing specialists, mechanical engineers and peat scientists led by Dr David Large from the University of Nottingham acquired InSAR images covering most of the Flow Country peatlands in Scotland and large areas of tropical peatlands in Malaysia. After applying newly developed InSAR data processing technique they achieved virtually continuous ground motion coverage of the Flow Country. From the results they observed interesting patterns of deformation: some areas seemed to be rising, others were sinking, and some areas didn't change over time. *Where did this ground motion come from, and what did it mean?*

In peatlands, many processes could lead to an apparent deformation of the ground surface: peat accumulation and vegetation growth could produce a rise over time. Pool collapse, subsidence following drainage, gully formation or erosion could lower the ground surface. *Could InSAR reliably detect such changes?* It all depends on what InSAR actually measures… But if it were possible, combining InSAR with other remote sensing techniques that can measure peatland properties would open the amazing possibility of remotely evaluating peatland condition (e.g. carbon loss, biodiversity, success of land management practices) at any scale. This would overcome many barriers associated with monitoring, scale and evidence and importantly, greatly reduce associated costs. *How realistic is that prospect?*

To answer these questions and assess the potential of InSAR mapping in peatland research, David Large needed to bring together scientists who could understand the peatlands, engineers who could understand ground motion and remote-sensing specialists who could understand satellite imagery. David Large and his colleagues teamed up with ERI to host such a gathering. On the 8th of May a group of 25 world-leading experts in these fields arrived in Thurso from as far as Canada, Malaysia and the United States for two and a half days of discussions and site visits. The workshop culminated with an afternoon of brainstorming on the 10th of May, during which the next steps to take InSAR further were identified.



One of the most pressing issues is the ground validation of satellite measurements required to give stakeholders confidence in the capacity of this technology to monitor the condition of peatland and quantify changes in carbon stocks. David Large and his team are now working together to develop a strategy to pursue this interesting avenue of research. The InSAR map of the Flow Country and smoothed maps of areas like Loch Sletill (left) will be shortly available to download from the Flow Country Website in the Research section. For more information, contact Dr David Large (david.large@nottingham.ac.uk)

Forest-to-Bog Restoration update

Following the removal of the trees on the restoration monitoring plots in the Dyke Forest, the last of the timber and brash was removed from these plots by November 2015. Ongoing felling of areas adjacent to some restoration plots delayed access to these. Furrow blocking was carried out from December 2015 until late winter 2016. Following all this restoration work, the relocation of dipwells and repairing or replacing of the few that needed it continued, and is now nearly complete. The control plots have been visited to check and maintain the dipwells and their markers. The accuracy of the waypoints for all dipwells has been improved, by using GPSs that average these grid references and, for the restoration plots, due to the absence of tree cover. Forward planning is now focussed on April 2017 when the first full year of post-restoration monitoring of control and restoration plots will take place. *Trevor Smith RSPB Scotland*

Methods of rewetting afforested sites with cracked peat

Severe drying and cracking of peat sometimes occurs as a result of afforestation. Sites with cracked peat may not respond to conventional rewetting methods for bog restoration (i.e. damming drains and plough furrows) because water may continue to drain away through underground cracks.

Forest Research is working with the Environment team at North Highland Forest District and a local contractor on a methods trial for rewetting cracked peat. The replicated trial at Dalchork Forest compares three rewetting treatments against a 'do-nothing' control. The treatments are:

1. Damming drains and plough furrows with peat
2. Contour trenching with repacking to seal off peat cracks
3. Contour trenching with repacking and a plastic membrane inserted

Water-table levels are being monitored by Duncan Williams and Russell Anderson to compare the treatments. Water-table loggers have been provided by SNH through Peatland Action.

A similar trial on a lowland bog (Longbridgemuir) shows both trenching treatments to be successful where drain and furrow damming had failed to raise the water table due to peat cracking. It will be interesting to see whether they are as successful on this more steeply sloping blanket bog. *Russell Anderson, Forest Research*

Other news and announcements

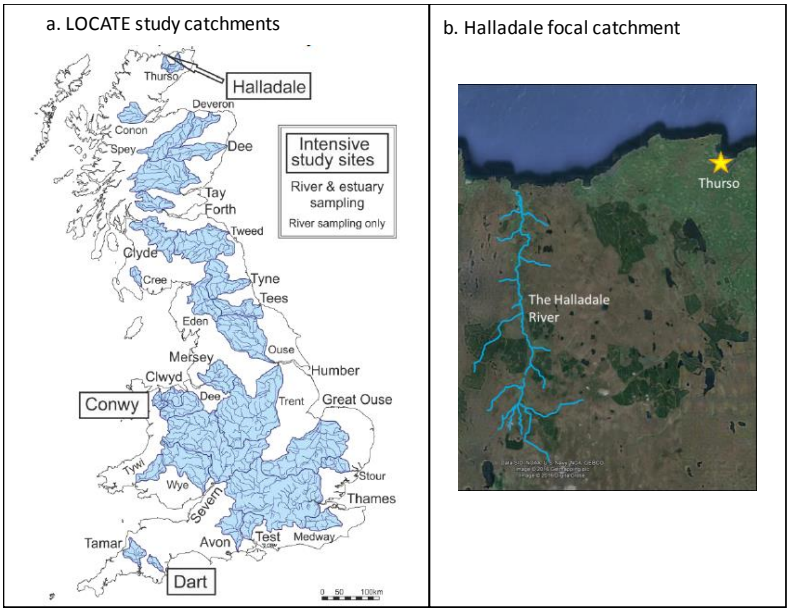
Flows Field Centre nears completion

The new Flows Field Centre at Forsinard is fast becoming a reality and will be completed in late August 2016. As well as long term accommodation for volunteers, there will be 16 short term beds available in twin/ quad rooms to individuals or groups studying, volunteering, doing research or work experience in the Flows. There will be a small field laboratory and also an education room. The charging rate will reflect the bunk house style accommodation with self-catering facilities – although there are several local businesses that can help with catering if required. It will make the ideal base for peatland research and also for undergraduate or postgraduate courses or events.

The field centre is being built as part of the Heritage Lottery Funded Flows to the Future Project, a Peatlands Partnership project. Please get in touch to discuss any ideas or plans for how you could use the centre: we'd love to see you! *Caroline Eccles, Project Manager, Flows to the Future Project.*

Find out more on our website www.theflowcountry.org.uk or email caroline.eccles@rspb.org.uk

Land Ocean CArbon TransfEr: LOCATE



LOCATE is an ambitious and challenging new collaboration between the National Oceanography Centre (NOC – Lead), the Centre for Ecology and Hydrology (CEH), the British Geological Survey (BGS) and the Plymouth Marine Laboratory (PML). The NERC funded project aims to i) quantify the transport of carbon from soils, via river flow, to the ocean, ii) understand the key transformation and removal processes controlling total organic matter (tOM) fluxes through the river, estuary and sea shelf, and iii) integrate this knowledge into models to predict how land-ocean tOM fluxes are likely to evolve under future climate scenarios. The Halladale River has been chosen as one of the LOCATE focal catchments where intensive monitoring will be combined with a series of process studies and experiments to accurately quantify the key biotic and abiotic processes that modify the tOM flux and drive C outgassing. The ERI is a partner in this new programme which will kick-off in July 2016 with fieldwork and stakeholder engagement planned for later in the year. For more details, contact Kerry Dinsmore, CEH (kjdi@ceh.ac.uk)

The next edition of the newsletter will come out in September, please email your contributions to Roxane Andersen (roxane.andersen@uhi.ac.uk) before the Wednesday the 21st of Sept. 2016.