

## Getting ready for winter in the Flows

*As the days got shorter shorter, field work calmed down in the Flows, but seasonal campaigns, routine monitoring and equipment check-up and maintenance are still on-going. Over the winter, there will be projects to prepare, proposals to write, theses to complete... and of course, the second edition of the Flow Country Research Conference is just around the corner! Here is a little update on what people have been up to this autumn. Many thanks to all the contributors of this edition of the newsletter.*



*Autumn sunset on the moors, Lewis peatlands*

## UPDATES ON PROJECTS...

### Flow to the Future: updates from the Peatlands Partnership

Good progress is being made with the *Flow to the Future* Project being put together by the Peatlands Partnership. A planning application has just been submitted for the proposed field centre, which will include a small field lab and accommodation for visiting researchers, students and volunteers. This should really help everyone who is already doing research in the Flows and maybe even encourage some more. A planning application has also been submitted for the proposed viewing tower or observatory to be built on the Dubh Lochan Trail at Forsinard. Proposals are coming along for a range of other interpretive proposals both around Caithness and Sutherland and further afield which will spread the message not only about the importance of the peatlands but also the ongoing management and research. All being well, we should know whether we have funding from the Heritage Lottery Fund by late May 2014 and hope to start on the project soon after that. See [here](#) for more details about the Peatlands Partnership. *Caroline Eccles and the Peatland Partnership*

### Understanding the impact of Forestry on the blanket bogs in the Flows

October and November 2013 were active and energising months for fieldwork in the Flow Country. Joss Ratcliffe (MRes student), Angela Creevy (TCV Natural Talent Apprentice), supervisors Dr Roxane Andersen and Dr Richard Payne and others collected 8 cores and 72 surface samples from four areas representative of the blanket bog and plantation forestry in the Flow Country peatlands. With data collection and analysis already underway we are starting to see some interesting preliminary results. Collectively, both studies aim to investigate the potential environmental effects of afforestation on the Flow Country peatlands.

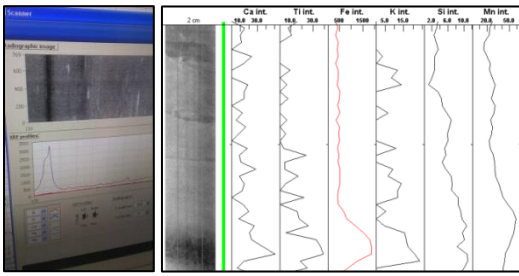


*We are grateful to the Forestry Commission for help carrying the heavy load using the Argo!*



*Coring and sampling at Catanach. Who says ecologists don't do fieldwork in the rain!*

Joss's project entitled "The Flow Country peatlands: Studying the past to shape the future" is using a combination of radio carbon dating and Tephrochronology, the study of volcanic ash layers, to investigate carbon stocks and carbon accumulation in the Flow Country over the past 10 000 years. The project will help us understand how conifer plantations may, or may not, have impacted carbon storage. Microscopic layers of Tephra are preserved in peat stratigraphy, with each Tephra layer having a unique geochemical composition that allows it to be matched to a database of known eruptions. This provides a cheap and highly accurate way of dating the peat column. Tephra layers can often be dated to an accuracy of a week, as oppose to plus or minus fifty years, which is the norm for carbon dating. The project aims to use tephrochronology to date all the cores from afforested and natural open bog.



In December Joss and Richard visited Aberystwyth University to test whether a new analytical approach using an 'ITRAX' core scanner, which allows us to quickly identify ash layers in our Flow Country cores (image on the left). The initial results are very promising with several large Tephra layers showing up on X-ray imaging and over 50 possible layers showing up on the more sensitive geochemical data, the next step will be to confirm these are Tephra under the microscope.

Using light and scanning electron microscopy, Angela's project aims to determine microbial community structure in open bog, forested and restored peatland microsites. Microorganisms respond rapidly to environmental change and some groups may provide a promising tool for monitoring recent changes in the peatland environment, such as the removal of commercial plantation forestry. In addition to studying the structure of microbial communities, this project also aims to investigate microbial functional traits. This is an emerging theme in microbial ecology and may give us a deeper understanding of what the species changes mean.

We would like to thank all the people who helped in the field including RSPB staff and volunteers, the Forestry Commission and colleagues at ERI. We will produce posters highlighting some interesting preliminary results of their work at the second Flow Country Research conference to be held in March 2014. *Angela Creevy (TCV/ERI), Joss Ratcliffe (ERI/Stirling), Richard Payne (U.Stirling) and Roxane Andersen (ERI)*



*Sampling Sphagnum species in the pools, hummocks and bog lawns at Cross Lochs, Forsinard (left) and bryophytes in different microsites within the forested areas of Catanach (right).*

**Towards the end...**

After starting my PhD research, funded by SSER (Scottish and Southern Energy Renewables, EPSRC (Engineering and Physical Sciences Research Council) and ETP (Energy Technology Partnership) in July 2010 on the Gordonbush Estate (near Brora) my funding period is over at end of December 2013. My data collection activities stopped in September 2013 and I am currently writing up my thesis entitled "Assessing carbon and nutrient leakage from peatland soils arising from the Gordonbush Renewable Energy Development" (subject to change!), which I hope to complete by Easter 2014 (fingers crossed!). Over last 3.5 years I have worked mainly on characterising DOC and POC export during storm events with the aim of using this data to estimate annual aquatic carbon fluxes for catchments on Gordonbush Estate. My research has also focussed on carbon sequestration rates within Gordonbush peat and Loch Brora sediment cores in order to better understand peatland carbon cycle characteristics. Furthermore, I have monitored water table depths around drainage channels throughout my research period. It included periods before and after they were blocked so I could investigate the impact drain blocking may have on re-wetting areas of peatland. Although it will not likely appear on this summer's New York Best-seller's list, results, discussion and conclusions regarding all the above topics will hopefully, at the very least, be available in the University of Glasgow Library by the end of academic year! *Ben Smith (U. Glasgow)*

**Sexy peat" in Edinburgh**

The art work produced by the artists involved in the project "Sexy peat", led by Highland Print Studio in Inverness, are now on show at the RBGE in Edinburgh until the 26<sup>th</sup> of January. If you have the chance, go and see this celebration of the Lewis peatlands, or read the [blog](#) that the artists produced about their experience. The exhibition will move to Inverness on March 7<sup>th</sup>, in time for people to stop on their way back from the conference. *Alison McMenemy (Highland Print Studio)*



### Munsary, the stronghold of *Saxifraga hirculus* in Britain

Plantlife's Munsary Peatland Reserve is a hidden-away wonder worth seeking out for those interested in exploring the rich variations of blanket bog. Following the three-mile long track from the car park at Loch Stemster, by Achavanich, brings the adventurous person to an old cottage sitting in splendid isolation atop a small knove, overlooking a wide expanse of peat. This is the Back of Beyond. And further beyond, deep within the muir lies



wonderful dubh loch systems and natural drainage burns, with the additional cultural pleasures of old stone sheep fanks.

There is what you expect, with heather and sphagnum, bog cotton and sundew, and jewelled flashes of dragonflies glinting in the sunlight. But further into the untracked peat, a mile or more, and there lies a grassy flush amongst the dark heather. Investigate the flush and find little yellow flowers speckling the vegetation; "ah, lesser spearwort" you say, and yes, there is, but look closer and you see some with flowers

more cupped, whose stems are covered in filaments of red hairs and whose petals are dotted with orange spots – this is rare and declining Marsh Saxifrage, *Saxifraga hirculus* (pictured on page 3).

This little plant is one of Britain's rarities, found in less than two dozen locations in the Pennines and in upland Scotland. It lives in base-enriched flushes, which makes its presence at Munsary, and acid peat bog, all the more remarkable. It was not known this far north until about 12 years ago when Plantlife took over the management; a team from the University of London were conducting a range of surveys across the reserve and came across it. Local botanist Ken Butler made a detailed survey of the area and concluded that it appeared to be the largest site in Scotland, with approximately 1000 flowering shoots visible. Two more flushes nearby, discovered by Sandy Payne in 2009 makes Munsary one of the most important places for this plant in Britain. Since little is known about the population dynamics of this species other than being sensitive to drainage and overgrazing, Plantlife is looking for annual count data to measure trends. This August saw a handful of volunteers from the Caithness Biodiversity Group muster at Munsary Cottage, check their gps and compass bearings, and head out across the peatland for the flush, a mile and a half distant from the cottage.

Three transects across the flush are in place to count flowering spikes, and an overall count revealed between 300 and 350 flowers this August. The two other flushes have never had detailed counts of plants, so this expedition by the Caithness Biodiversity Group is intended to gather population counts on all three flushes on an annual basis. We need to know how it is affected by the growth of rushes and grasses and browsing by deer, as well as natural seasonal fluctuations in numbers.



This is a great example of how volunteers can help look after internationally significant plants and make a difference to the conservation of these populations. Plantlife Scotland is grateful for the effort and enthusiasm of local volunteers in looking after this special place, and we welcome further (non-destructive) research into all aspects of peatland ecology. For more information, contact the Plantlife Scotland office: 01786 478509 or [scotland@plantlife.org.uk](mailto:scotland@plantlife.org.uk). *Davie Black, Plantlife Scotland*

### NEW PROJECTS IN THE FLOWS!

#### UV irradiation of aquatic organic carbon: an overlooked source of methane?

I am Amy Pickard, a second year NERC funded PhD student at Edinburgh University and my research concerns methane emissions from aquatic systems. Emissions from these systems have typically been attributed to microbial metabolism of organic carbon under anaerobic conditions, however a study by Keppler *et al.* (2006) showed that methane was produced in aerobic conditions when terrestrial plant matter was subject to stress. UV irradiation is a known source of plant stress that was later shown to initiate aerobic methane production (McLeod *et al.*, 2008). The founding hypothesis of my PhD is that plant-derived material transported from terrestrial environments to aquatic systems will release methane when exposed to UV irradiation.



*The Black Burn at Auchencorth Moss. Photo courtesy of Fraser*

I have collected water samples rich in dissolved plant material from a peatland stream draining Auchencorth Moss to test my research hypothesis in laboratory irradiation experiments. These experiments have determined that methane is produced upon UV irradiation in aerobic conditions. I now plan to collect water samples from peatland pool systems in the Flow Country to understand whether differences in plant source material affect UV-driven methane emissions. *Amy Pickard, Andy McLeod, Kate Heal (U. Edinburgh) and Kerry Dinsmore (CEH)*

#### References

- Kepler et al., 2006. Methane emissions from terrestrial plants under aerobic conditions. *Nature* 439, 187-191.  
McLeod et al., 2008. Ultraviolet radiation drives methane emissions from terrestrial plant pectins. *New Phytol* 180, 124-132.

#### Causes of decline in the common scoter in the Flow country inferred from paleoecology.



In September 2013, I started a PhD that will use lake sediment records to examine the causes of decline in common scoter breeding in the flow country, the work is funded by University College London, The Wildfowl & Wetlands Trust, The Natural History Museum and Scottish Natural Heritage. The Flow Country is a key site for common scoters breeding in Britain: numbers of breeding scoters in the UK have been declining by 5% per annum over about the last 30 years, at present ca. 50 pairs remain. Diagnosing the cause(s) of decline and identifying potential conservation management solutions are both critical and urgent.

Sediment cores will be taken from 10 current and 10 historic scoter breeding lochs in the Flows. The recent ecological history of these lochs will be evaluated by analysing diatom, chironomids and cladocera remains. Diatoms are sensitive to shifts in water quality and habitat availability and are, therefore, valuable indicators of ecosystem change especially changes in productivity and pH. Chironomid abundance has been found to show clear relationships with breeding success of water bird populations at other sites, because they form a crucial part of the diet of newly hatched chicks. Chironomids are also useful for detecting trophic change and past changes in macrophyte structure and abundance. Cladocera can be used to infer changes in fish population density. In October, we undertook the first part of the fieldwork taking cores from 16 of our 20 study lochs. These cores are currently being analysed. An update on progress and preliminary results will be presented at the Flow Country Research Conference in March. Hope to see you there! *Hannah Robson (Wildfowl & Wetland Trust, WWT)*

#### ANNOUNCEMENTS...

#### The second Flow Country Conference is now open for registration!

It's now time to register for the Flow Country research conference! You can visit the conference website at [www.eri.ac.uk](http://www.eri.ac.uk) to register, submit an abstract, or simply to get the latest updates on the programme. Early bird registration fees will be available until the **11<sup>th</sup> of January 2014**, and the deadline for abstract submission is the **17<sup>th</sup> of February 2014**. We look forward to seeing you all in Caithness!

*Roxane Andersen and the Flow Country Conference organising team*



#### PhD opportunity on Ecosystem Services following peatland restoration

As part of the Joint Studentship Scheme in partnership with the ERI, we are recruiting a candidate for a PhD project that will seek to establish which peatland management and restoration methods are optimal for the multiple benefits of both biodiversity conservation and carbon storage and sequestration. More details about the project are available [here](#). *Nick Littlewood & Rebekka Artz (JHI), Roxane Andersen & Kenny Boyd (ERI/UHI)*

*The next edition of the newsletter will come out after the conference in March, please email your contributions to Roxane Andersen ([roxane.andersen@uhi.ac.uk](mailto:roxane.andersen@uhi.ac.uk)) before the **15<sup>th</sup> of March 2014**.*