

Welcome

**CONTENTS**

Welcome ..... 1

EU review of Less Favoured Areas and introduction of Areas with Natural Handicap ..... 3

IUCN UK Peatland Programme ..... 6

Crowberry dieback in moorlands? ..... 7

Experimental high altitude re-vegetation around eroded footpaths on Ben Lawers NNR..... 8

Sustainable Estates for the 21<sup>st</sup> Century: project overviews and findings ..... 11

Projects & Research ..... 15

Books and other new resources ..... 32

Uplands Staff across the Country Conservation Agencies ..... 33

This is a time for reflection as we bid farewell to several colleagues, and look ahead to tough times within the agencies and across the uplands as a whole. For almost twenty years the government conservation agencies have worked together under the umbrella of ‘lead agencies’ and ‘lead co-ordination networks’. Sadly, resources are now so tight now that we have to reduce the number of groups, and in the future joint working will be through more opportunistic means.

Much has changed across the British upland landscape since the JNCC uplands network formed in 1994. Then we were talking about having Special Areas of Conservation – now we have several hundred, an active monitoring programme, and a means of reporting on the condition of habitats across these. Then we had major concerns about sheep grazing pressures – now we have far fewer sheep in the uplands, but the concerns are still there in terms of trying to get the best management in place. Then we were agitating about the afforestation of key peatland areas – now the trees are coming out of large parts of the Flow Country, and the debate has switched to quantifying the benefits of peatlands for carbon management and the best techniques to restore drained bogs. Then we were taking forward some of the early work arising from the Rio CBD conference and developing action plans – now we have to move beyond the 2010 State of the European Environment report, and the Nagoya CBD COP held in October last year, which produced a sobering overview of the state of nature in Europe and the real work needed to improve matters. Then we were talking about birds of prey impacts on grouse moors, persecution issues and reintroduction programmes – and we still are, though we now have red kites and sea eagles thriving in some parts.



*The Joint Nature Conservation Committee’s Upland Lead Co-ordination Network was established to carry out the special functions with respect to GB nature conservation needs for upland habitats. It involved staff in the three country conservation agencies, the JNCC support unit and EHS in Northern Ireland.*

We now have more collaborative research, greater effort going into communicating with one-another – and others, and a growing awareness of what needs to be done to improve matters. As we see in this issue, there has never been a greater need for us to share what we are doing, and to join forces where we can.

This is the last newsletter produced by the JNCC Uplands Lead Co-ordination Network. The JNCC is no longer able to fund an Uplands Network Officer, and the UK networks have been disbanded. Staff in the country agencies and JNCC will continue to work together to develop common standards for key work and to take forward joint projects. Several long-standing colleagues have retired, and we thank them for all their hard work and remarkable insights – Barbara Jones in Wales, Dave Horsfield in Scotland, and Ian Strachan who did so much at the UK level in JNCC and more recently SNH. Recently, we learnt of the tragic death of Mark Crick. Mark was a hugely effective networker on the JNCC staff, and made a real difference to our work on monitoring and wider surveillance.

Good communication will be vital to underpin work ahead. So, we need to hear from you if you feel we need to put some time to continue with this newsletter. Do let us have your views. Finally, we offer our thanks to the scores of contributors and hundreds of readers who have made what this newsletter is – a digest of good science, sound management and some real wins for nature.

**Sally Johnson and Des Thompson**

### In Memoriam – Mark Crick

We are very sad to report the death of Mark Crick in March. Mark died while swimming in Turks and Caicos, after a week advising the Environment Department. He was helping in the production of the first habitat maps for the island by advising on methods in a project using remote sensing techniques. He was invited to visit the islands to help make the practical links between map and on the ground action.

Mark's career started and stayed very much with a practical approach, always looking at how to make an impact for conservation and the environment. His first chance, after doing an Ecology MSc, was to join a survey team, followed shortly by spells as a Wildlife Trust conservation officer, as a local authority ecologist and a period in consultancy.

His work at JNCC over the last 8 years started with habitats advice. He was a major driving force behind the UK's Article 17 report under the Habitats Directive. Here, Mark was greatly concerned with making sense of the bureaucratic processes and preparation of future reports. He was critical in making sure there were structured audit trails of the evidence used for each habitat/species, and these have proved invaluable ever since.

Mark's in-tray in March was demanding and reflects Sally and Des's tribute above to his networking abilities. Mark was helping the agencies, DECC and DEFRA conclude on the peatland carbon flux research needs, was advising DEFRA and the agencies on the outcome of research into the potential scale of impact of *Phytophthora* on biodiversity and ecosystems, and was close to completing research on one of his passions, ensuring that remote sensing techniques deliver far more for biodiversity than they have to date. It took over half a day to assemble the list of Mark's immediate working colleagues across agencies and departments, and the final tally was over 120 people – a measure of his great span of influence.

Mark was a caring, honest, hardworking person, with a tremendous sense of humour. Mark is greatly missed and it was a privilege to have been a close colleague. He was very active in the local community in Stamford, where his family live, recently organising a ghost writing festival with the local arts centre.

**Lawrence Way.** Programme Leader for Surveillance and Monitoring, JNCC



# EU review of Less Favoured Areas and introduction of Areas with Natural Handicap

## Background

Aid for farmers in Less Favoured Areas (LFAs) was a concept introduced to the then European Economic Community (EEC) by the UK. It was adopted as a European support measure on the country's accession to the EEC in 1975. Originally targeted at hill farmers the measure has undergone several reforms and, today, LFAs cover not only the uplands of Europe but also other areas where farming is a marginal economic activity. The objectives of the support measure have also changed. Originally aimed at addressing rural depopulation the focus is now on promoting sustainable agricultural land use where it is environmentally beneficial to do so.

Forty five percent of the UK's agricultural land is designated as LFA. Coverage in England is 18% whilst in Northern Ireland, Scotland and Wales it is between 70% and 85% (See Figure 1). Around 37,000 farmers in these 3 countries receive support payments totalling £113 million annually.

In the 2007-2013 Rural Development Regulation (RDR) LFAs have been replaced by Areas with Natural Handicap (ANH). Whilst LFAs could be designated under 4 different sets of circumstances, ANH are designated either as Mountain Areas or 'other' which approximately corresponds with the intermediate LFAs under which all the UK LFA was designated with the exception of the Scilly Isles.

The loosely defined physical and socio-economic designation criteria for intermediate LFA enabled a steady expansion of designated area across the EU 15 member states. This led to concerns that some States were using the designation as a means of channelling LFA payments to as many of their farmers as possible, irrespective of land quality. In 2003, the European Court of Auditors investigated the intermediate LFA designation process. They were critical of the designation criteria and called for the EC to review LFAs, particularly the designation process for non-mountain, 'intermediate' areas, now defined as "*areas affected by significant natural handicaps, notably low soil productivity or poor climate conditions and where maintaining extensive farming activity is important for the management of the land.*" They stated that designation of these areas should be based solely on objective common bio-physical criteria (ECA, 2003).

Unfortunately, agreement on these common criteria could not be reached in time for the start of the present RDR so the existing LFA boundaries and 1999 LFA measure remains in place. It has, and still is proving difficult to reach agreement on the common criteria and it is likely that Areas with Natural Handicap will not now replace LFAs until 2014. However, progress has been made and a set of criteria were proposed by the EC in 2007. Since then, these criteria and the threshold cut-offs have been debated and discussed at a number of EC technical workshops. 2009 -10 saw the testing of the criteria by member states, each producing map simulations in their countries to assess how well they reflect land with significant natural handicap (EC 2009).

## New designation criteria

A total of 13 bio-physical criteria are proposed, although not all of them are expected to be relevant in all member states. Briefly, there are two climate criteria. Is the temperature too hot or too cold? There are nine soils criteria. Are the soils too wet, too stony, too fine or coarse textured, too

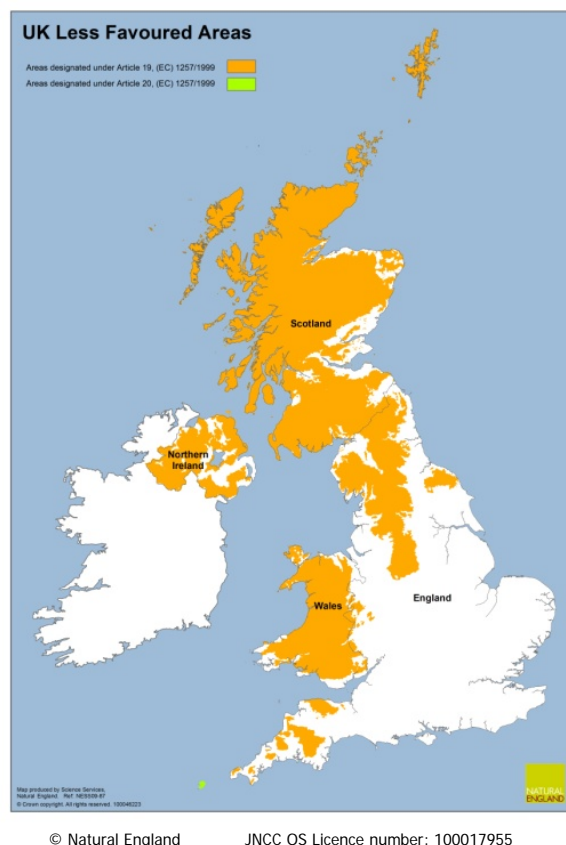


Figure 1. UK LFA coverage

organic or shallow, saline, sodic or have too much gypsum content? Additionally, does the combination of temperature, rainfall and soil type lead to drought conditions? Finally, is the land too steep for normal mechanised agricultural activity?

These criteria are very similar to those adopted in UK land classification systems. The proposed EC system is similar to our own, as it follows Leiberg's agronomic law of minimum. That is, that crop productivity is controlled not by the total amount of resources available, but the most limited one. Therefore, it only requires one of the above the criteria to be rated as severely limiting for the land to be classed as an ANH.

This principle has not gone down well across all of the EU as some countries are used to applying 'index systems' to classify agricultural potential. These systems give a score to the severity of constraint for each criterion in the system and each land grade has a numerical points cut off. Land can be classified as severely constrained if it has a relatively large number of minor constraints rather than just one major constraint. It is because of this variability in systems that the Commission decided to develop its own standardised classification system.

The Commission states that the ANH classification system should be simple, objective, scientifically based, transparent and based on a set of common single bio-physical criteria. The criteria cut-off thresholds should be the same across the whole EU, from the east Mediterranean to the Atlantic Ocean and Baltic Sea. In principle, this is all well and good, but in practice, crop production (including grass) is often dependant on the inter-relationships between these physical criteria, particularly climate and soils. Additionally, the EU has three major climate zones, Mediterranean, Maritime and Continental and the simplified climate criteria and thresholds are not really able to reflect these climate differences. It is notable that precipitation is not a climate criterion but is supposedly reflected in the soil wetness criterion. There has been ongoing debate over this issue between the UK and the Commission for over three years as the UK argues that rainfall periodicity in the summer and early autumn months has a significant effect on agricultural operations. This issue has yet to be resolved satisfactorily.

The classification system also presupposes that each member state has natural resource data of similar quality, resolution and accessibility. As may be expected, this is far from the case. In the UK, the resolution of soils mapping varies between countries, although at least data are available on all the relevant criteria. Some countries, particularly in central Europe have excellent soils data, but some or all have not been converted to digital format, making mapping and analysis by GIS difficult and potentially costly.

Most, if not all member states have had difficulty applying the designation criteria in the mapping simulation exercise but, nevertheless attempts have been made and submitted to the EC.

The mapped simulations for the UK are quite similar to the existing Severely Disadvantaged Area (SDA) of LFA in terms of core distribution. There are, however some significant differences that need to be considered further.

### **Mapping resolution**

LFA and future ANH boundaries are unlikely to coincide. This is because World Trade Organisation rules state that support payments for ANH-type schemes should be paid only within areas of distinct economic or administrative identity. The Commission proposes that the level of Land Administration Unit (LAU) to be used should be that of the municipality which, in the UK corresponds to electoral wards. If the majority of agricultural land within a ward is classified as constrained using the ANH bio-physical criteria, then the whole ward will be designated and as an ANH. Wards therefore become the mapping unit for ANH and, at present the 'majority of agricultural land' is interpreted as greater than 66%. Whilst this concept is new to the UK it has always applied in the rest of Europe, albeit with the percentage that constitutes 'the majority' being interpreted closer to the 50% rather than 66% mark. The UK has escaped this system up to present because its LFA (SDA) boundary was in place before LFAs were adopted by the EEC so the original boundaries and mapping system was retained. Electoral wards may not be the ideal administrative unit and it is possible that each UK country will have the flexibility to use what is considered to be the most suitable, eg parishes or, in the case of Northern Ireland, townlands.

However, using the LAU for ANH mapping inevitably will lead to some areas of legitimately disadvantaged land being excluded from ANH and areas of better quality land being included.

### **Future ANH measure and implications for nature conservation**

To date, the role of LFA payments has been interpreted as to aid the maintenance of traditional farming systems and the associated cultural landscapes. In evidence to the 2009 House of Lords select committee inquiry into the LFA, the Commission made clear that the LFA measure differed from the agri-environment measure and payment was not for positive environmental work. UK Government policy of expecting public goods and services from public money has made it difficult to justify LFA payments in this country. This was the main reason why England ended its LFA scheme in 2010 and used the £25 million budget for the Uplands Entry Level Environment Stewardship scheme. Wales also is ending LFA payments in 2011 and farmers who join Glastir, the new agri-environment scheme due to be launched in 2012, will receive higher payments if their land is in the LFA. Scotland and Northern Ireland retain their LFA schemes and there are plans in Scotland to develop the scheme to give some environmental pay back. This is not easy, and the revised schemes will have to operate along a fine line between the EC LFA regulations ensuring that they are not agri-environment schemes whilst delivering some positive environmental benefit in line with UK policy.

The Commission communiqué on CAP reform is not entirely clear on the future of the ANH measure. It implies that Pillar 1 is to be greened and that some (or all) of the ANH measure could be moved back into Pillar 1 to promote “sustainable development of agriculture in areas with specific natural constraints by providing an additional income support to farmers in such areas in the form of an area-based payment as a complement to the support given under the 2nd pillar.” It does not explain what 2nd pillar support it is complementing; it could also be an ANH payment. Nor does it say if the future ANH scheme will be compulsory, although if it rests in pillar 1, the implication is that it will be; this would also make it non-discriminatory within the area of natural constraint.

If pillar 1 single farm payment levels fall significantly in the next CAP round it is likely that many upland farms would not be able to continue in business. Research commissioned by Defra into the responses of upland farmers to experimental scenarios for changes in upland support suggests that many farms in the English uplands are now at an economic tipping point. A reduction in support payments, if not counterbalanced by significant increases in production, or other income sources would lead them to cease trading, (Gaskell et al, 2010). It seems reasonable to assume that the Commission is suggesting additional support payments to make up the shortfall from single farm payment in areas with specific natural constraints where the economic options are more limited.

The communiqué suggests that, under pillar 2, “*investments should be more closely tailored to the specific needs of regions and even local areas such as Natura 2000 and HNV areas.*” The 2008 EC consultation document on ANH gave an option for ANH to be targeted at HNV areas. It is unlikely that this will be adopted but it is not unreasonable to suppose that that vast majority of HNV farmland in the UK will fall within ANH under the proposed designation criteria. Eligibility rules for the ANH schemes have yet to be agreed, and there remains the opportunity for some or all ANH payments to be targeted specifically to these areas.

Although the profile and importance of LFA type schemes is regarded as relatively low by some organisations in the UK and other parts of the EU, the long drawn-out consultations and negotiations over the designation criteria has surprised the Commission and brought home how important this measure is to some member states. A clearer picture of where the ANH measure sits, the designation process, and eligibility criteria is unlikely to emerge before the summer of 2011. Hopefully, the new measure will be designed both to help farmers stay in valued landscapes and to promote environmentally sustainable management.

### **References**

European Commission (2003). European Court of Auditors (2003) *Special Report No 4/2003*. Official Journal of the European Union, 151.27.6.2003, Brussels <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2003:151:0001:0024:EN:PDF>

European Commission,(2009) Rural Development policy 2007-2013 Commission Communication 21/04/2009 : *Towards a better targeting of the aid to farmers in areas with natural handicaps* [http://ec.europa.eu/agriculture/rurdev/lfa/comm/index\\_en.htm](http://ec.europa.eu/agriculture/rurdev/lfa/comm/index_en.htm)

Gaskell, P., Dwyer, J., Jones, J., Jones, N., Boatman, N., Condliffe, I., Conyers, S., Ingram, J., Kirwan, J., Manley, M., Mills, J., and Ramwell, C. (2010) *Economic and environmental impacts of changes in support measures for the English Uplands: An in-depth forward look from the farmer's perspective*, Final report to the Defra Agricultural Change and Environment Observatory programme by the Countryside and Community Research Institute and the Food and Environment Research Agency

Contact: **Ian Condliffe**. An independent consultant and presently is the UK technical co-ordinator for the LFA review. [www.iancondliffe.co.uk](http://www.iancondliffe.co.uk)

Email: [ian@iancondliffe.co.uk](mailto:ian@iancondliffe.co.uk) Website: [www.iancondliffe.co.uk](http://www.iancondliffe.co.uk)

## IUCN UK Peatland Programme

The IUCN UK Peatland Programme has been set up to promote peatland restoration. There is an enormous amount of peatland activity across the UK which the Programme aims to draw together to promote and celebrate, while highlighting the need for cohesive national strategies and funding to take forward restoration work.

A three year programme of work is underway providing a 'conservation quartet' consisting of partnerships, strong science, sound policy and effective practice. One of the overarching themes for this work is the promotion of the multiple benefits of peatlands to society.

The Programme's aims are to:

- Provide a focus for peatland research and management
- Offer credible messages for decision makers
- Facilitate consensus building and knowledge exchange
- Highlight the benefits and values of peatland ecosystem services



### Commission of Inquiry on Peatlands

Peatland restoration is already a high priority for governments internationally and in the UK. More effort, however, is required to understand and quantify the multiple benefits of this work and to provide the right support to maintain and restore peatlands as a healthy functioning ecosystem.

A crucial aspect of the work of the Programme has been setting up a Commission of Inquiry on Peatlands, launched in March 2010 with the support of three patrons; Lord Jamie Lindsay, Professor Andrew Watkinson and Sir Graham Wynne.

Chaired by Martyn Howat, former Director of Uplands at Natural England, with Dr Stephen Chapman, Macaulay Institute, as Scientific Coordinator, the Inquiry brings together experts in science, policy and practice to review key peatland issues and deliver clear scientific consensus about peatland restoration, particularly in relation to climate change, biodiversity and other ecosystem services.

Stakeholder consultation identified eight topics where there is a priority need for scientific consensus to help deliver the right policies and support for peatland restoration.

In collaboration with the Joint Nature Conservancy Council (JNCC) and the Lead Co-ordination Networks for Soils, Uplands and Lowland Wetlands (LCN) and co-funded by English Heritage, the North Pennines AONB Partnership, the Macaulay Institute, the Scottish Environment Protection Agency (SEPA) and the Rural Economy and Land Use Programme (RELU), eight brief scientific reviews on the key peatland topics were undertaken to assist the Commission of Inquiry. The Reviews are available online at [www.iucn-uk-peatlandprogramme.org/commission](http://www.iucn-uk-peatlandprogramme.org/commission).

The Commission of Inquiry's Core Expert Panel is currently preparing its Assessment Report, which will be launched at the Peatland Programme's June conference.

## Investing in Peatlands: Delivering Multiple Benefits Conference 20<sup>th</sup> – 22<sup>nd</sup> June 2011

Following the success of 2010's 'Investing in Peatlands: the Climate Challenge' conference in September 2010, the focus of the second annual IUCN UK Peatland Programme Conference is on securing peatland ecosystem service benefits through different funding opportunities.

The Conference is taking place at the stunning University of Stirling Campus, from 20<sup>th</sup> – 22<sup>nd</sup> June, and will be a meeting place to exchange ideas, form new partnerships and join a strong peatland community.

Programme highlights include keynotes from Prof Pete Smith, University of Aberdeen, Sir Graham Wynne, Committee on Climate Change Adaptation Sub-Committee, Micheal O'Briain, Natura 2000, EU Commission, and Prof Nick Hanley, University of Stirling.

Sessions will discuss major national and international market and regulatory mechanisms and consider present and future opportunities for better targeting of resources to help deliver functioning peatlands.

The key findings of the IUCN UK Commission of Inquiry on Peatlands will be launched at the conference, and will provide a central steer for discussion.

The event will provide an opportunity to showcase current advances in research, practice and policy of relevance to the wide range of interests looking to secure funds for peatland conservation and restoration. It will also be of interest to scientists in the fields of climate change, water and biodiversity, looking to identify the future drivers for peatland research.

The Conference is supported by SNH, SEPA, RSPB, North Pennines AONB and Yorkshire Water.

For more information on the conference programme, and to register visit <http://www.iucn-uk-peatlandprogramme.org/news/conference2011>. **NB closing date is June 10th 2011.**

Next year's conference 'Investing in Peatlands – Demonstrating Success' is being held in collaboration with the British Ecological Society as a Symposium, at the University of Bangor on 26<sup>th</sup> -28<sup>th</sup> June 2012.

Contact: **Mary Church** Communications Co-ordinator IUCN UK Peatland Programme  
Email: [mary.church@iucn.org.uk](mailto:mary.church@iucn.org.uk)

## Crowberry dieback in moorlands?

Has anyone else found crowberry (*Empetrum nigrum*) die-back on a significant scale within the moorland environment? I first found patches of dead or dying plants in the mid 1980s on a moorland at the northern edge of the Peak District, but attributed this to heavy sheep grazing and trampling (crowberry is very sensitive to this) and to exposure to north-east winds in winter.

However, we have undertaken surveys at all times of the year since then, especially in the last 10 years, over some 30,000ha of moorland and found further extensive die-back. This varies from an individual plant to all plants across a patch of 100m or more in diameter. Death occurs in cottongrass (*Eriophorum*) dominated blanket bog, drier mixed shrub – crowberry, bilberry (*Vaccinium myrtillus*) and heather (*Calluna*) with cottongrasses on blanket peat, on shallower peat and on dry mineral soils on banks. There does not seem to be any pattern related to altitude, slope or aspect, but most has been found in the Peak District and South Pennines rather than elsewhere.

We originally thought (assumed?) that the plants were dying in winter and were invoking hypotheses which varied from lack of snow cover to exposure to high nitrogen deposition, trampling, disease or to some synergistic interaction between any or all of these. The dead plants were grey and brittle with no leaves. Some re-growth was found in places, but recovery was generally slow.

But then I found large patches of dying plants on a north-facing mineral soil mixed with healthy heather in the Peak District, which had turned a foxy-red (like heather when attacked by heather beetle), with leaves dying back and falling off from the bottom upwards. The following spring, these plants were also grey and brittle.

Researchers from Manchester Metropolitan University tried following some plants individually, but did not find out why crowberry was dying.

I have also found something very similar in cross leaved-heath. The leaves fall off on the lower part of the stem, the plant dies to a grey, brittle mass. It can affect one plant or a whole patch. I first noted this in the Lancashire South Pennines in about 2000, but it does not seem to be as extensive as the loss of crowberry (not that I see that much cross leaved-heath anyway).

Now I am also finding die back in bilberry – shoots turning grey and dying amongst shoots that are still healthy. It has been suggested that this is caused by a moth, but the pattern of dieback does not seem to match the way a plant is normally eaten.

I am worried. The Peak District was highlighted by Ratcliffe (1977) for its abundance of crowberry. Our blanket bogs are very species-poor anyway, so losing a major constituent is a significant loss. Does anyone have evidence of something like this happening anywhere else? If so, have you any idea what is causing it? Do we need some serious research on this issue, or is it merely an case of sending some affected plants (not yet dead) to a lab that can identify diseases or invertebrates in plants?

Has anyone got any thoughts or advice?

#### Reference

Ratcliffe D. A. 1977 *A Nature Conservation Review*. Cambs Uni Press

Contact: **Penny Anderson** Managing Director Penny Anderson Associates Ltd

Email : [penny.anderson@pennyanderson.com](mailto:penny.anderson@pennyanderson.com)

## Experimental high altitude re-vegetation around eroded footpaths on Ben Lawers NNR

### Footprints on our fragile mountains

Ben Lawers National Nature Reserve (NNR) is owned and managed for conservation by the National Trust for Scotland (NTS). It includes the southern slopes of nine mountains in the Ben Lawers and Meall nan Tarmachan ranges of which seven are Munros (over 3000 feet or 914 m). Ben Lawers itself is the 10<sup>th</sup> highest mountain in Scotland and the highest in the southern highlands. Their relative accessibility and scenic landscapes attract over 30,000 walkers each year to the most popular routes but this level of recreational use destroys the fragile montane vegetation, exposing the soil to the erosive powers of Scotland's high rainfall. The NTS has been working to repair and contain the resulting scars on the landscape here, and at its other upland properties, for over 30 years, continually striving to ensure that work is of a quality and sensitivity appropriate to the sites in its care.

Revegetation of bare ground is an integral part of footpath work but at high altitudes vegetation composition, steep ground, shallow soils and short growing seasons render conventional methods inappropriate. At Ben Lawers NNR we have been experimenting with alternative techniques to promote recovery of high altitude vegetation and since 1997 have trialled several methods at altitudes between 1000-1200m. These have included airlifting low altitude turf, laying biodegradable netting, transplanting small plugs of local vegetation and planting locally collected species raised in our nursery.

### Healing the hills

By the early 1990's the damaged area on the main route up to the summit of Ben Lawers (Photo 1) was over 20m at it's widest. Work to contain erosion on this steep and dynamic slope began in



**Photo 1. Ben Lawers main path showing defined path line within large area of erosion. Experimental revegetation has taken place within this area.** Photo by David Mardon, NTS

1997 by defining a path line that majority of the walkers would stick to. The initial section to be worked was a very steep gully, between 1000-1050m altitude, where stabilisation of loose material adjacent to the new path necessitated blanket turfing. The cutting of turfs locally to facilitate this was not considered appropriate for a number of reasons; many of the habitats at this altitude are designated, their composite species insufficiently robust for successful transplantation and the harsh conditions and short growing season would hinder recovery of vegetation at donor sites.

Donor turfs were therefore cut turf from the lower slopes at an altitude of 545m and airlifted up the hill. They were laid to give total coverage adjacent to the steepest section of the newly completed path. The gradient was so severe that in addition to ensuring that they were adequately bedded in, they were held in place by wooden pegs. After further pathwork in 1998, more turfs were relocated to sites surrounding the initial section but on this occasion spot-turfing was carried out. Rather than laying the turfs in a adjacent to each other in a block, fragments were scattered across a larger area of bare ground.

Potential methods for monitoring the progress of these turfs were considered (McIntosh, 1998) and from 1999- 2008 fixed quadrats were visited annually. The turfs took well with no indication of stress being caused by the change in altitude and with little evidence of change in species composition. During the course of monitoring it became apparent that loss of turf was due to other factors, such as movement of stones and silt onto the turf or damage by humans. In some cases trampling increased as a result of general deterioration of the path and there was evidence of cumulative damage caused by walking poles.

Extending the concept of spot-turfing, it was decided that it would be possible to remove small plugs of vegetation from the areas surrounding the path using a tree-planting dibble without causing too much damage. The planting tools remove a core of soil and vegetation 120mm deep and with a surface area of 1600mm<sup>2</sup>. The resulting the small holes resulting were filled with spoil from the pathworks and soon became invisible.

Cores were taken from areas with different types of predominant vegetation in them, viviparous fescue (*Festuca vivipara*), alpine lady's mantle (*Alchemilla alpina*), mat grass (*Nardus stricta*) and moss with the aim of comparing them. However, the dominant species within each plug was not always obvious once the plugs were cut. The cores were planted in bare areas either side of newly worked path over approximately 120m. Owing to their small size, the number cut and area over which they were planted and inclement weather conditions at the time it was not possible to keep an exact record of planting which made accurate monitoring difficult. A few discrete groups of planted cores were tagged, photographed subsequently revisited and survived well. Over the larger area in which they had been planted it soon became impossible to distinguish between naturally recovering vegetation and planted cores.

Biodegradable netting (jute and coir) was laid as an alternative way of stabilising large areas of bare, mobile ground around the path and providing a micro-habitat in which seeds could establish (Photo 2). The netting and steel fixing pins were flown to the site by helicopter, the latter in larger quantities than recommended by the suppliers to compensate for the severe exposure of the site. Loose stone was cleared from the areas where the material was laid and then scattered back on top as added fixings and to make it look a bit more natural. Both types, but particularly the coir, were initially visible from a distance, but soon weathered.

Progress was monitored by inspection and fixed point photography. Despite the exposure and frost heave of some of the fixing pins all the netting remained in position and degradation took place more slowly than predicted. The supplier had suggested that it would be faster than usual (approximately 2 years) on such an exposed site (Photo 3). The jute degraded faster than the coir and was largely complete after 5 or 6 years and after 10 years all but tiny remnants of coir were gone. Where it was laid over vestigial vegetation, recovery was good and in other areas a bryophyte crust soon developed. In some areas we planted Viviparous Fescue through it (see below). An unexpected advantage was that its presence seemed to act as a visual deterrent to walkers straying from the path.

Encouraged by our success at propagating montane willows, experimental propagation of locally occurring species was attempted. Seeds were collected from were moss campion (*Silene acaulis*), alpine lady's mantle (*Alchemilla alpina*) and least willow (*Salix herbacea*) and sown in our nursery.

Propagation had limited success, with only alpine lady's mantle produced in sufficient numbers for subsequent planting on the hill.



**Photo 2 Coir and jute netting laid adjacent to Ben Lawers main path.** Photo by Helen Cole



**Photo 3 Coir and jute after 3 years, the netting has weathered and patchy vegetation is beginning to show.** Photo by Helen Cole

Plantlets were also harvested from viviparous fescue (*Festuca vivipara*) which grows abundantly on the lower slopes and planted out in small plug trays in the nursery. Stiff sedge (*Carex biglowii*) was also collected and split and multiplied well in trays. However, the rhizatomous growth meant that plants were not easily contained within plugs making it difficult to plant out on the hill.

Viviparous fescue grew vigorously producing robust root plugs and producing plantlets which were harvested and pricked out for use the following year. Prior to transporting the plants up the hill the leaves were trimmed close to the base to minimise stress after planting and make them less obvious to sheep grazing in the area. Large numbers of plants could be carried up the hill without the need for wrapping; we found that plastic mushroom boxes with handles were good for transporting the root-plugs and these could be carried in a rucksack or tree planting bag. The grass plugs were also relatively quick to plant, although care had to be taken to ensure that they were well bedded in as the mineral soil is very loose and on some occasions, when planting was followed by heavy rain, plants were washed out. Monitoring showed that plugs took very well and after a few years were indistinguishable from naturally occurring plants.

## Conclusions

We have drawn the following conclusions from our trials;

- Airlifted turfs survived well and offer the potential of providing blanket coverage, but were expensive to import.
- Spot-turfing with locally cut cores was relatively quick and easy, and apparently caused minimal damage to the surrounding vegetation at the extraction sites.
- Biodegradable netting stabilised steep, dynamic ground allowing growth of remnants of vegetation. Material costs in addition to requirement to airlift.
- Viviparous fescue spikelets were easy to propagate, produced robust root-plugs which could be carried uphill, planted quickly and survived well.

It is important to emphasise that for it to be effective, any revegetation work has to be carried out alongside regular, ongoing maintenance on the footpath so that the majority of walkers keep the path.

**Acknowledgements:** The experimental revegetation work was initiated with funding from the European Agricultural Guidance and Guarantee Fund, Scottish Mountaineering Trust (SMT) and Scottish Natural Heritage (SNH) and has continued as part of our agreed work programme with financial support from SNH.

Contact: **Helen Cole**. Manager/Senior Ranger Naturalist, Ben Lawers NNR & Moirilanich, National Trust for Scotland

Email: [hcole@nts.org.uk](mailto:hcole@nts.org.uk)

## Sustainable Estates for the 21<sup>st</sup> Century: project overviews and findings

In Scotland, upland areas have a unique pattern of landownership, with much of the land divided into 'estates' owned by private individuals and organisations, public bodies, and non-governmental and community organisations. The extent to which estate management practices seek a balance between the use of natural resources and the economic and social needs of communities is a key aspect of sustainability. However, little academic attention has been devoted to understanding the values and opinions of the numerous stakeholders; the estate management strategies associated with the diverse estate ownership types and estate management objectives; and how these different strategies relate to the principles of sustainability. Such knowledge is particularly relevant in the context of the rapidly evolving policy context, e.g., with regard to the implementation of the Scotland Rural Development Programme, the development of the Scottish Land Use Strategy, and wider debates considering reform of the EU Common Agricultural Policy.



**Scotland's uplands are divided into 'estates'**. Photo: J. Glass

The [Sustainable Estates for the 21<sup>st</sup> Century project](#) began in September 2007 at the Centre for Mountain Studies at Perth College UHI. Three PhD students and one post-doctoral researcher have been studying a range of topics concerning estate management in Scotland's uplands. The main objectives of the project are to understand both the complex driving forces that influence upland estate management and how estate owners and managers make decisions that allow them to achieve their management objectives within the context of sustainability.

Annie McKee and Pippa Wagstaff have conducted research that focuses on privately-owned estates, while Rob Mc Morran and Jayne Glass have studied community-owned and NGO-owned estates respectively.

In 2011, the researchers will be holding several feedback workshops and seminars, as well as compiling the results for publication in a book entitled 'Lairds, Land and Sustainability: Scottish perspectives on upland management', to be published by Edinburgh University Press.

To ensure the on-the-ground relevance of the project, an Advisory Group has overseen the work at intervals. The Group includes representatives from the Scottish Government, the [Scottish Rural Property and Business Association \(SRPBA\)](#), [Scottish Environment LINK](#), the [Cairngorms National Park Authority](#), and the [Knoydart Foundation](#).

The project is funded by the Henry Angest Foundation and the research is being supervised by [Professor Martin Price](#) (Centre for Mountain Studies), [Dr Charles Warren](#) (University of St Andrews) and Dr Alister Scott (Birmingham City University).

### **The role of private landownership in facilitating sustainable rural communities**

Annie McKee ([annie.mckee@perth.uhi.ac.uk](mailto:annie.mckee@perth.uhi.ac.uk))

Private sporting estates dominate Scotland's uplands, and their owners and managers retain an influence over those living and working on their land. Land management has received little attention in recent academic literature, despite its potential to progress sustainability targets in Scottish policy; there has also been little consideration of the impact of the Land Reform (Scotland) Act 2003 on landowner-community dynamics and minimal consideration of the contemporary 'estate community'.

In an attempt to reverse these knowledge gaps and explore practical elements required for estate 'sustainability', a large-scale survey of private landowners in upland Scotland was undertaken



**Crofting land in the Highlands.** Photo: C. MacDonald.

with Pippa Wagstaff, with the help of the SRPBA, in 2008 (see below). Findings revealed that the modern Highland estate is extremely diversified, with a variety of income streams and increasing uptake of renewable energy and tourism developments, yet the 'traditional' landowner profile is preserved.

Subsequent ethnographic fieldwork provided a unique and rich understanding of the threats and opportunities facing rural communities and private landowners in upland Scotland. On six case-study estates, research was carried out within each estate community for 2-3 weeks, volunteering in local pubs, village shops, cafés, community centres, community groups and fundraising events, as well as doing various jobs with estate maintenance staff, gamekeepers, gardeners and housekeepers. On-the-ground fieldwork included: household questionnaires, interviews with key actors in the local community and estate management, and participant observation over several weeks, recorded in a case study diary. The findings illustrated the potential impacts of estate management decisions on rural community resilience with regard to housing, employment, community cohesion and vitality.



**A meeting at the head of Loch Fyne.**  
Photo: A. McKee.

The emerging role of the private landowner appears to be in ensuring estate 'business' sustainability in order to maintain rural employment, whilst also supporting community-generated



**Innovative and affordable housing in Speyside.** Photo: A. McKee.

entrepreneurship. The rural estate community suffers from depopulation, service decline, diminishing rural employment, and a lack of affordable housing, with under-utilised social capital. Of particular importance is the urgent need for affordable housing in rural areas and the prioritisation of 'locals' for available housing. In each community visited, suitable rural employment and 'sustainable jobs' have been discussed. It is suggested that landowners provide more land or premises for small-scale community enterprises or industry on their estate, to diversify local employment, provide greater opportunities for women, and reduce reliance on big industry and the estate itself for employment. 'Rural stories' from case studies are currently being translated into best practice recommendations for mutually

beneficial landowner-community partnerships that promote estate sustainability.

### **Landowners' motivations and perceptions of sustainability: Exploring visions for the future of Scotland's uplands**

*Pippa Wagstaff* ([pippa.wagstaff@perth.uhi.ac.uk](mailto:pippa.wagstaff@perth.uhi.ac.uk))

The upland estate provides the background against which owner motivation and perceptions of sustainability inform strategic objectives and create a vision for the future. The attitudes and aspirations of these landowners are crucial to a sustainable future; therefore the successful alignment of government policy to engender economic, environmental, and social sustainability will depend on its ability to influence the landowner whose primary motive may be none of those. Traditional assumptions of the dependency of the Scottish rural economy on agriculture may be inappropriate as landowners are often not primarily interested or engaged in farming. Therefore, understanding the motivation of landowners is essential for the design of effective policy.



**Understanding the motivations of landowners is important for designing sustainability policy.** Photo: A. Duncan

The research used a combination of questionnaires and case study data. Data from the private landowner questionnaire (conducted with Annie McKee, with the help of the SRPBA) provided an insight into the attitudes of landowners to the three aspects of sustainability based on the tripartite representation of economic, environmental and social sustainability. An overall response rate of 34% (83 from a possible 245) covering in excess of 1.7 million acres was achieved. Ten case



**Using a Q sort to determine landowners' motivations.** Photo: P. Wagstaff

studies were chosen from the respondents (representing a mix of resident/absentee landowners and inherited/purchased estates), and these landowners were interviewed to explore their views on sustainability and the effectiveness of Government policy, enabling identification of causal processes in a way that was not possible with the landowner survey results. Landowners on the case study estates were asked to rank the importance of various factors in their future plans for their estate using Q-sort techniques. Through factor analysis, the results will provide a detailed understanding of the variety of subjective opinions among

landowners. Finally, each case was also studied in depth 'in the real world' through visits and further interviews to add the narratives that are essential to understanding the outcomes.

Preliminary results indicate that, for all types of private landowners interviewed, economic sustainability is paramount. Once the economic needs of an estate have been met, then most of the inherited estates visited focus on social sustainability, whereas the landowners of purchased estates visited are less economically challenged and more interested in pursuing a programme of environmental sustainability. All landowners expressed a wish to achieve a balance between the three types of sustainability, but a lack of funding limited their ability to make the changes required. In addition, landowners felt that some Government policies restricted their ability to achieve the goal of sustainability. The dissertation will explore this aspect of the research in some depth.

The questionnaires, Q-sorts and interviews contain real, on-the-ground opinions and responses from landowners; it is not a measured response from professionals employed in the industry but a rare insight in to the 'hearts and minds' of those who ultimately control vast expanses of the Scottish uplands. This analysis of the views of landowners on the difficult issues involved in balancing the conflicting demands of the environment with social and economic priorities deals with current issues of concern to policy makers and other stakeholders.

### **A study of the experiences of internal and external actors in community-owned estate initiatives in Scotland**

*Rob Mc Morran* ([robert.mcmorran@perth.uhi.ac.uk](mailto:robert.mcmorran@perth.uhi.ac.uk))

The development of community estate 'partnerships' has been an important aspect of many community estate buyouts, with local communities being supported through the formation of management trusts or foundations reflecting local and wider stakeholder interests in rural areas with high recreational and environmental value. Community buyouts have often been hailed as having facilitated a secure future for fragile rural communities through the creation of a framework for sustainable rural development.

However, concerns are often raised in relation to a perceived reliance by community initiatives on public funding. Furthermore, a considerable degree of state involvement is often evident in both the buyout process and the follow-on estate management. Such state involvement raises questions relating to the common assumption that community buyouts are predominantly 'bottom-up'



**View of Inverie on the Knoydart peninsula.** Photo: Subaruite  
[[www.geograph.org.uk/photo/1714](http://www.geograph.org.uk/photo/1714)]

endeavours, with a high level of state involvement potentially counter-productive to the original aim of community ownership (i.e. community empowerment and bottom-up rural development).

From a sustainability perspective, the processes by which community estate partnerships make decisions and the network of relations with other actors in the policy arena are therefore of considerable interest, particularly in relation to the balance of power between stakeholders.

The community-owned estates project attempts to address these questions, through carrying out case studies on four community-owned estates. The project involves a general review of the sustainability of community estate ownership and management, an exploration of buyout drivers and the impacts of buyouts on those involved, and the functioning of the estate partnerships in relation to power sharing and knowledge networking. The research is being carried out on four estates: Knoydart (Knoydart Foundation); South Uist (South Uist Trust); Assynt (Assynt Foundation); and North Harris (North Harris Trust). The methodology incorporates documentary review, semi-structured interviews and participant observation. The Assynt Foundation is presently under study, with the Knoydart study having been completed.

Key initial findings include:

- The Knoydart Estate buyout was driven by a partnership of local community and 'external' (e.g. Highland Council) interests concerned with the decline of the community and associated services which had resulted from a (recent) history of irresponsible private landownership.
- Following an initial period of intensive input by 'external' partners, the balance of power within the Foundation has evolved towards local community dominance.
- Knoydart Foundation has considerably strengthened the sustainability (including economic) of the estate, and considerable localized social capital has developed as a result of the buyout.
- Key benefits associated with the buyout/partnership include the creation of a secure and stable base for development; associated infrastructural improvement; the further diversification of the community and business sector; community empowerment and collaboration (resulting in knowledge sharing and access to funding streams).
- Key issues include an over-reliance on key personnel; a lack of support from minority elements within the community – linked with cultural mindsets and differing ideologies; limited assets; the conflict between development and the area's wild character and limited resources.
- Continued leadership from within the community and the taking of personal responsibility for the estate by all community members is critical for future sustainability.

### **Developing a toolkit for monitoring sustainability on upland estates**

*Jayne Glass* ([jayne.glass@perth.uhi.ac.uk](mailto:jayne.glass@perth.uhi.ac.uk))

Sustainability indicators are useful tools for monitoring progress towards sustainability and to define the central tenets of the concept. However, rationales for indicator selection are often unclear, and their 'top-down' nature can antagonise stakeholders and hinder their effective implementation, particularly when they do not take into account the values of relevant stakeholders. To tackle this, the research has developed a new approach for bringing a range of stakeholders together to develop a 'toolkit' for monitoring sustainability on upland estates. Nineteen participants made up a multi-disciplinary 'panel' of stakeholders with expertise in sustainability, rural/upland land use and/or estate management, incorporating land management professionals, researchers, policy-makers and members of representative bodies. This secured a range of experts who had not previously discussed sustainability in this context and went beyond traditional definitions of 'expert' knowledge, recognising local managerial knowledge as having expert quality. As panellists did not know the identity of other participants during the process, a safe environment for open dialogue was created.

The toolkit was developed by the panel over a series of four interview and questionnaire rounds. The response rate was very high (89%), with panellists putting a lot of effort and thought into their responses. After each round, the responses were collated and fed back to the panel in a new format. This allowed the ideas to evolve and areas of agreement and disagreement to be explored in detail.

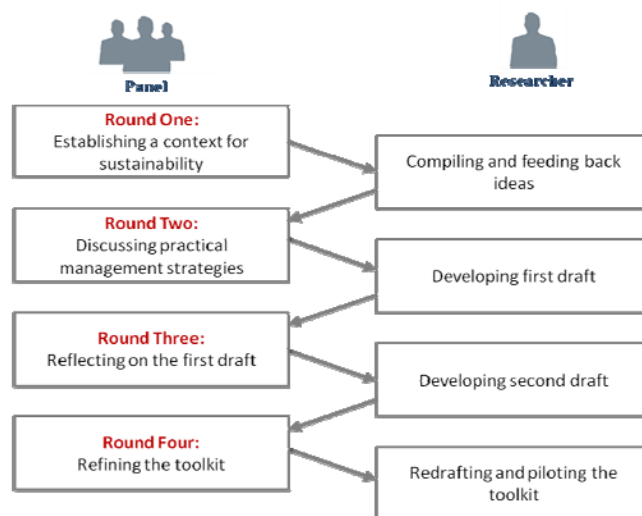
Spending time at the outset exploring different perceptions of sustainability allowed a working definition of sustainable upland estate management to be developed prior to selecting indicators. This gave a sound, rational basis to the process. Five 'sustainable estate principles' comprise this definition, around which the assessment tool is organised (Adapting Management; Broadening Options; Ecosystem Thinking; Linking into Social Fabric; Thinking beyond the Estate).

Sixteen 'opportunities' (effectively, indicators) for sustainable upland estates were identified, developed and endorsed by the panel. The extent to which an estate takes advantage of each opportunity can be assessed by the tool's user to judge whether an estate's management practices are deemed 'proactive' (more sustainable), 'active' or 'underactive' (less sustainable). 'Creativity', 'innovation', and a 'proactive' attitude were regularly cited by more than half of the panel as crucial for moving beyond traditional ideas to promote management that demonstrates a shift towards a more sustainable approach.

This approach proved very effective for bringing together different types of expert knowledge in order to find common solutions, going beyond what can be achieved using more traditional methods. The active role that the researcher played in developing and feeding back material (based on the participants' input) created an excellent platform for continual deliberation, reflection and development of ideas. There is scope for this method to be applied to other situations where bringing together different types of knowledge to discuss the sustainable use of natural resources is problematic.

For more information about the 'Sustainable Estates' research, please visit the [CMS website](#) or contact a member of the team (e-mail addresses above, or telephone 01738 877761).

Contact: **Jayne Glass**. Centre for Mountain Studies  
Email: [jayne.glass@perth.uhi.ac.uk](mailto:jayne.glass@perth.uhi.ac.uk)



**Figure 2. Overview of the research process**

## Projects & Research

### *Racomitrium* heath: current condition and recovery potential

In 2005 SNH announced the funding of its first three PhD studentships (see Britton *et al* LttH Issue 14). One of these, co-supervised by Aberdeen University and the Macaulay Institute, focussing on the ecology of *Racomitrium* heath (NVC U10), has now been successfully completed. This mountain summit community, dominated by the moss *Racomitrium lanuginosum*, is one of the most extensive near-natural habitats remaining in the UK and supports populations of breeding birds, including dotterel and ptarmigan. It is a habitat of international conservation significance; maintaining and improving its condition and extent in the UK is an important conservation objective.

Compared to 50-60 years ago *Racomitrium* heaths have greatly declined in condition and extent in the UK, particularly south of the Scottish Highlands. Loss of moss-dominated heath and its

replacement by grassland communities has been attributed to two main drivers, atmospheric nitrogen (N) deposition and high sheep grazing pressures. High levels of N deposition were thought to be toxic to the moss and to encourage grass growth, while sheep grazing created additional local nutrient enrichment (from dung) and physical disturbance, further disrupting the moss mat and accelerating the transition from moss heath to grassland.

a)



b)



**a) Typical *Racomitrium* heath with shoots of *R. lanuginosum* interspersed with species such as *Vaccinium vitis-idaea* and *Cladonia uncialis*. Photo: Simon Webb b) Dotterel chick in *Racomitrium* heath Photo: Gina Prior.**

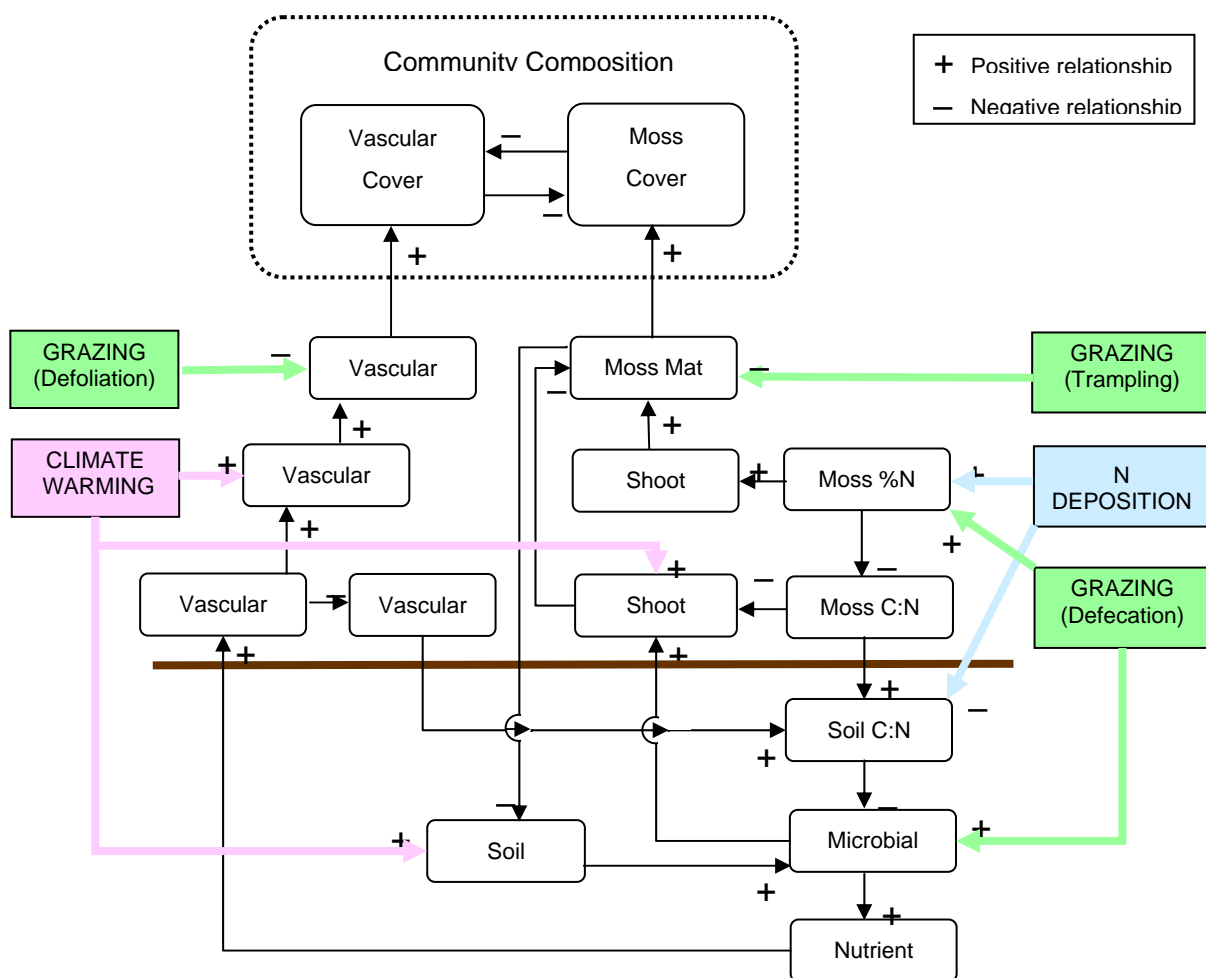
In the face of ongoing decline, this PhD project aimed to provide the UK conservation agencies with the information needed to determine effective management strategies to safeguard remaining heaths and to develop a framework for restoration. The main objectives of the project were to assess the current condition of *Racomitrium* heath across the UK, to put this in the context of similar vegetation in Europe and then to assess the potential for improvement in the condition of UK heaths under various scenarios of management and air pollution abatement.

### **Current condition of *Racomitrium* heath**

An extensive survey of *Racomitrium* heaths across the UK (29 sites) and Europe (9 sites across Iceland, Norway and the Faroes) allowed an assessment of UK heath condition and for this to be placed within the broader European context. Within the UK we found a strong latitudinal gradient of *R. lanuginosum* and overall heath condition. Along this gradient, from north to south, moss condition declined i.e. as tissue N content increased, both moss mat depth and cover declined. This was clearly associated with increased dominance of graminoids (predominantly *Carex* species in the Southern Uplands and grasses in Cumbria and Snowdonia) and increased species diversity, indicating major shifts in habitat composition. Comparison of UK heaths with those in Europe showed that heaths in the Scottish Highlands were amongst the best developed, with a high cover of *R. lanuginosum* (~75%) and low cover of graminoids, this being comparable to heaths in Iceland and the Faroes. The Scottish Highlands thus appear to represent the best remaining areas of this moss-dominated habitat within the UK but also a core part of the European resource, emphasising the importance of conserving UK heaths.

### **An improved understanding of the degradation process**

One of the key findings of the survey was the discovery that elevated N deposition is not inhibiting moss growth (as suggested by previous experimental studies) but is actually stimulating growth, even at the highest levels of N deposition currently experienced in the UK uplands (~40 kg N ha<sup>-1</sup> yr<sup>-1</sup>). This new piece of information together with other data collected during the survey and from a number of field manipulation and controlled environment experiments, and in conjunction with the wider literature, led to an improved understanding of how N deposition, grazing and climatic conditions contribute to the loss of *R. lanuginosum* abundance and degradation of *Racomitrium* heath (summarised in the diagram below).



**Figure 3. Conceptual diagram showing the main effects, above and below ground, of three environmental drivers (N deposition, grazing and climate warming) on the performance of the dominant moss, *R. lanuginosum*, and the vascular plant community of *Racomitrium* heath.**

Declines in *R. lanuginosum* abundance appear to be attributable to nitrogen-enhanced shoot decomposition (facilitated by lower tissue C:N), which leads to reductions in moss mat depth, despite the stimulating effect of N on shoot growth. A thinner moss mat is more vulnerable to competition from neighbouring vascular plants, e.g. through shading, and also to the physical damage caused by sheep trampling, resulting in loss of moss cover. The effects of higher temperatures and grazing pressure were found to exacerbate the impacts of N deposition, with a number of positive feedbacks via the soil environment leading to increased nutrient availability, enhanced vascular plant performance, shifts in community composition and ultimately loss of habitat. In the UK, N deposition and temperature increase along the north to south gradient, thus creating conditions that intensify the shift in balance between *R. lanuginosum* shoot growth and decomposition. Stocking densities of sheep are also generally higher in regions south of the Highlands, contributing further to reductions in moss depth and loss of cover. The worst levels of habitat degradation, seen in Wales and Cumbria, thus represent the cumulative impacts of all three environmental factors.

### **Recovery potential of degraded *Racomitrium* heath**

Field manipulation experiments (reciprocal transplants, grazer exclusion and phosphorus addition) and two short-term (3 month) controlled environment experiments provided evidence that both *R. lanuginosum* and *Racomitrium* heath in general have the potential to recover from the effects of N pollution and heavy grazing, despite their long history of impacts. *Racomitrium* shoots and cores removed from degraded sites in Cumbria and Wales showed an improvement in condition within 2 years when transplanted to a low N deposition site in Scotland, suggesting that reductions in N deposition could yield relatively fast improvements in this habitat. Grazer exclusion studies showed

that reductions in sheep grazing densities may provide an opportunity for degraded heaths to improve, even while high rates of N deposition continue, however, recovery is dependent upon the degree to which the habitat has already become dominated by grasses. Phosphorus addition also showed promise as a means to mitigate the effects of continuing N deposition and facilitate recovery of the most degraded heaths by improving moss nutrient balances.

### The future

This study has improved our knowledge of current *Racomitrium* heath condition and the mechanisms leading to its degradation. It has also given hope that the recovery of degraded heaths is possible given a reduction in N deposition and introduction of appropriate management regimes. The future of this important habitat now depends on national and international atmospheric pollution policy, local land management and the looming fact of climate change. Clearly, a reduction in N deposition should be a key policy goal and results from the project have already been used in the revision of the critical loads of N for this habitat type, which are used in European environmental legislation. Grazing levels across the UK have been in decline since the outbreak of foot and mouth disease, closely followed by CAP reform. Reductions in grazing pressure may help to start the recovery process, but monitoring of local impacts will continue to be necessary. However, even with alleviation of these past pressures, the threat of climate change, particularly increased temperatures, presents a significant threat to the condition of heaths across the UK. Further research is urgently required to make a comprehensive evaluation of climate change impacts both directly on *R. lanuginosum* and on the community as a whole. The third national dotterel survey (May-August 2011) may reveal some important changes in breeding range.

Acknowledgements:

Our thanks go to agency staff, landowners and tenants who granted permission and allowed access to sites and to the many field assistants whose help was invaluable. We are also grateful to SNH, Macaulay Institute and University of Aberdeen for funding this project.

Heather Armitage<sup>1,2</sup>, Andrea Britton<sup>2</sup>, Imogen Pearce<sup>1</sup>, Rene van der Wal<sup>1</sup>, Sarah Woodin<sup>1</sup> and Des Thompson<sup>3</sup>  
1. University of Aberdeen, 2. Macaulay Institute (now, The James Hutton Institute), 3. SNH

Contact: **Dr Heather Armitage**. Plant & Soil Science, University of Aberdeen  
Email: [h.armitage@abdn.ac.uk](mailto:h.armitage@abdn.ac.uk)

~~~~~

### McVean & Ratcliffe re-visited: some headline messages

A re-visitation project based on vegetation data from the 1950s, published in the volume “Plant Communities of the Scottish Highlands” by Donald McVean and Derek Ratcliffe, has now been completed (see LttH Issues [15](#) and [16](#)). We assessed the changes in plant species composition over the last 50 years in alpine and dwarf-shrub heaths, ombrogenous and soligenous mires, and grassland communities of the North-West Highlands of Scotland.

Overall, this vegetation has undergone biotic homogenisation over the last 50 years through the loss of diversity at the local, community and landscape scales. Previously distinct vegetation types have become more similar in composition to each other, characterised by the increased dominance of generalist upland graminoids (grasses, sedges and rushes) and reduced dwarf-shrub, forb and lichen cover. Boreal and liverwort-rich heaths were shown to be particularly vulnerable to change. Species with an oceanic element to their distribution increased at the expense of those with an arctic-montane element. The degree of



**Louise at one of her plots surveying montane vegetation in Torridon, Ross-shire.**  
Photo by Matt Parsons

change varied between vegetation types, although the nature of change shows similar characteristics. Heath and grassland vegetation have undergone the greatest change since the original survey, with declines in species richness and increased community similarity, whilst mire communities showed greater stability.

Analyses using co-registered environmental data showed that in this region, climate change in the form of increased oceanicity and grazing were most important in explaining vegetation change, and information on the ecology of the most changed species suggests that acidification is also important. The results indicate that the upland vegetation of the Scottish Highlands has undergone major changes in the second half of the twentieth century, although this change varies between different vegetation types and regions. This new understanding of vegetation change can be used to inform nature conservation management by highlighting the species and communities that are most at risk from environmental change.

Louise Ross<sup>1</sup>, Sarah Woodin<sup>1</sup>, Des Thompson<sup>2</sup>, Alison Hester<sup>3</sup> and John Birks<sup>4</sup>

1.University of Aberdeen, 2.Scottish Natural Heritage, 3.Macaulay Institute (now, The James Hutton Institute), 4. University of Bergen and University College London

Contact: **Dr Louise Ross**. Institute of Biological and Environmental Sciences, University of Aberdeen.

Email: [louise.ross@abdn.ac.uk](mailto:louise.ross@abdn.ac.uk)

~~~~~

## Beef farming systems and whole-farm greenhouse gas emissions

Beef production systems in Great Britain have considerable socio-economic importance as well as their role in biodiversity conservation and maintenance of agricultural landscapes particularly on upland grasslands. Official figures show that agriculture in UK contributes 8% of the total greenhouse gas (GHG), but 38% of total methane (CH<sub>4</sub>) and 54% of nitrous oxide (N<sub>2</sub>O) emissions. Much of the methane comes from beef cattle and much of the nitrous oxide can be linked to land used for beef production. Scotland has a much greater dependence upon beef systems in its uplands and thus the Scottish target of reducing their total emissions by 42% by 2020 is very pertinent (Scottish Government, 2008). Therefore, if the UK, and especially Scotland, wants to either produce beef, continue to convert grass into human food, or manage upland habitats by traditional means then understanding how GHG emissions occur in beef farming systems and how they might be reduced are essential.

The three main GHGs produced by livestock production systems are CH<sub>4</sub>, N<sub>2</sub>O and carbon dioxide (CO<sub>2</sub>). Ruminants produce CH<sub>4</sub> as a by-product of their enteric fermentation. The quantity produced of this gas is directly related with the amount of feed intake and, in many complex ways, it is also driven by structural and chemical characteristics of the feeds. It is impossible for ruminants to digest food without producing large quantities of methane. N<sub>2</sub>O is emitted from animals manure and through volatilization lost of the nitrogen applied as organic or inorganic fertiliser. Microbial and plant respiration has consequences for C losses from the soil, which are mainly affected by land use management through re-seeding and arable rotations. The more direct use of fossil fuel (e.g. fertiliser application) also contributes with CO<sub>2</sub> emissions. Therefore, whether management is principally for food production or biodiversity conservation, such as avoiding under and over-grazing of semi-natural grasslands, they all have a Carbon cost/benefit.

In order to assess the impact of management options that may mitigate or increase GHG emissions and their interactions at farm level, the present PhD study is focussed on whole-farm system analysis. A key aim of this work is to evaluate different scenarios within suckler cows and finishing systems. The main factors of each part of the system which are feasible to control, such as animal (their management and diet), pasture, soil and manure management are identified as one of the first steps of this project. Accurate and sensitive estimations of net GHG emissions for different system parameters and scenarios are needed, and whilst many of these are available in the literature, they are not put together for whole-farm systems or for Scottish systems. Some gaps in knowledge will be filled by on-going Scottish Agricultural College (SAC) field work.

To do this a deterministic model is being built to represent emissions from the herd. This will be linked with a dynamic land use model in order to assess the whole-farm carbon footprint. Beef

systems and their production parameters will be selected in a participative approach with the help of farmers and experts. Future scenarios, including mitigation options, will be analysed with the model, such as intensity of management and the relative use of different pasture types, all with important biodiversity related environmental interest. Results from the model, feedback from farmers and conservation interests will help to conclude about the robustness and reliability of management options proposed as well as their possible impact on biodiversity conservation.

This study expects to demonstrate the relative importance to the climate change debate of different management options under a whole-farm beef systems approach, and also to understand the impact on other system issues.

This project is being supervised by Tony Waterhouse<sup>1</sup>, Jimmy Hyslop<sup>1</sup>, Bob Rees<sup>1</sup>, Ron Wilson<sup>2</sup> and Sally Johnson<sup>3</sup> funded by RERAD with financial support from SNH.

<sup>1</sup>Scottish Agricultural College, <sup>2</sup>School of Geosciences, University of Edinburgh and <sup>3</sup>Scottish Natural Heritage.

Contact: **Patricia Ricci**. PhD student at Scottish Agricultural College (SAC) Roslin Institute Building, Easter Bush, Midlothian, EH25 9RG.

E-mail: [Patricia.Ricci@sac.ac.uk](mailto:Patricia.Ricci@sac.ac.uk)

---

## Grazing and carbon management in the uplands

The majority of terrestrial carbon is stored in the soil, and upland peats offer some of the densest stores of soil carbon in the UK. Substantial efforts are now being made to understand how these stores can be conserved or enhanced, thereby mitigating human carbon emissions to the atmosphere. Despite declining livestock numbers (see *Looking to the Hills*, **Issue 16**), livestock grazing continues to be the dominant management practice across the uplands, yet the impact of domesticated herbivores on the carbon cycle is not really known.

Livestock predominantly influence the carbon cycle by eating and digesting plants, which changes the quantity and quality of carbon being returned to the soil. The impact of livestock is dependent on stocking densities, but also the type of grazer. For example, *Molinia caerulea*, purple moor grass, is a tussock-forming grass that can dominate upland areas: sheep only eat *Molinia* in the spring and avoid its apparently unpalatable leaves the rest of the year, whereas cattle will graze *Molinia* tussocks all summer. Currently, there is little information about grazer type and varying stocking densities on the carbon cycle.

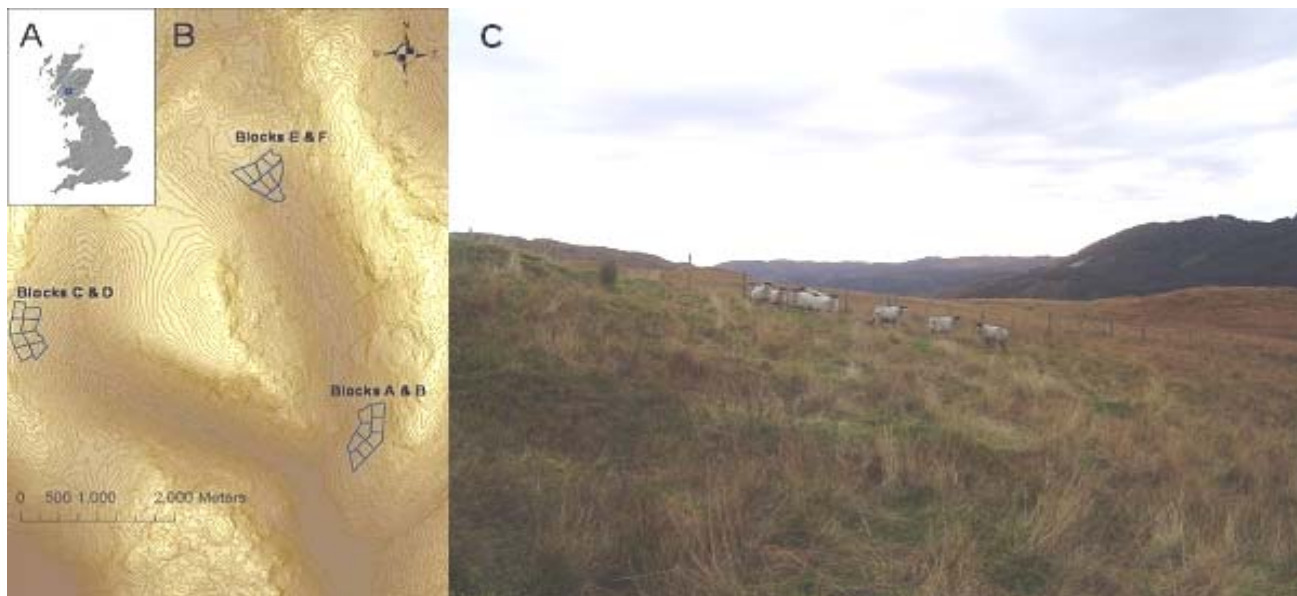
The Macaulay Land Use Research Institute have been running a landscape-scale grazing experiment at the Glen Finglas estate, Scotland (NN514108) since 2003 (**Fig 1 a, b**). There are four grazing treatments:

- “High sheep”, commercial stocking density (9 sheep per plot) (**Fig 1c**),
- “Low sheep”, one-third commercial stocking density (3 sheep per plot),
- “Mixed”, one-third commercial sheep stocks and two cows & suckling calves (cattle are on the plots for only four weeks of year for a comparable off-take to year round sheep grazing),
- No grazing.

There are 24 plots in total, each with an area of 3.3 hectares. The size and vegetation heterogeneity of this experiment offers a challenging, yet important, context in which to study the carbon cycle.

After 7 years, the impact of different sheep stocking densities on the amount of carbon held in *Molinia caerulea* has been quantified. The aim of this study was to examine how sheep are influencing future carbon inputs to the soil. Leaves, shoot-bases and roots of *Molinia* and soil were sampled and analysed for carbon. An estimate of *Molinia* tussock area was calculated from measurements of over 3000 tussocks. The combined dataset generated landscape-scale estimates of how much carbon was contained in *Molinia*. This carbon pool decreased with increasing sheep grazing intensity, thus the cessation of grazing leads to carbon accrual in *Molinia*. The cumulative effect after 7 years of grazing removal on carbon, (i.e. the difference between the

carbon pools of intensively grazed and ungrazed grass swards), per hectare, was equivalent to the average annual C footprint of two Scots<sup>1</sup>.



**Photo 12** Glen Finglas grazing experiment: (A) Location of Glen Finglas in UK, (B) Experimental setup of 6 blocks (in three pairs); each contains the four grazing treatments, (C) The heterogeneous vegetation landscape in a commercial grazed plot.

However, the quantity of carbon in the plants was dwarfed by that in the soil, and there were no differences in soil carbon between grazing treatments. In order to better understand the potential benefits of reducing grazing intensity, studies are ongoing to examine the turnover of plant carbon in soils subject to different grazing treatments.

<sup>1</sup>A footprint guide: for Scottish local authorities and community partnerships, estimated the 2006-2007 average C footprint at 12.7 tonnes of CO<sub>2</sub> per capita. See [www.localfootprints.org](http://www.localfootprints.org)

**Acknowledgements:** My PhD project is being conducted at the University of Aberdeen and is jointly supervised by <sup>1</sup>Sarah Woodin, <sup>2</sup>René van der Wal, <sup>1</sup>David Johnson and <sup>3</sup>Robin Pakeman. Results presented are a collaborative effort with Charlotte Vandenberghe<sup>4</sup>. I would like to thank to all my field research assistants and the Woodland Trust for maintaining stock densities at Glen Finglas. This is a BBSRC funded project.

<sup>1</sup>The University of Aberdeen, <sup>2</sup>Aberdeen Centre for Environmental Sustainability, <sup>3</sup>Macaulay Land Use Research Institute and <sup>4</sup>Ecole polytechnique fédérale de Lausanne.

Contact: **Stuart Smith**. Institute of Biological and environmental Sciences, University of Aberdeen

Email: [s.w.smith@abdn.ac.uk](mailto:s.w.smith@abdn.ac.uk)

~~~~~

## Abergwesyn Commons Project

Abergwesyn Commons is a relatively unknown and isolated area located at the heart of the Cambrian Mountains. The 16,500 acres of upland consists of eight Commons, seven of which are contiguous. It also shares with the Elan Valley Estate the highest point between Pen-y-Fan and Pumlymon; Drygarn Fawr, its summit dominated by two enormous cairns.

In 2009 the Abergwesyn Commons Project was set up in order to address the site and its needs. The project, funded by BIFFA, National Trust and CCW, has four main objectives to be completed or initiated within the three years of the project. These objectives are: Fire Protection, Restoration of *Molinia* Dominated Blanket Bog, Bare Peat Restoration and an Options Appraisal. Monitoring of some of these objectives is also taking place throughout the project. These tasks rely heavily on community engagement as without the Commoners support the project would not be able to move forward successfully.



***Molinia* dominated Abergwesyn Commons.** Photo by Jessica Taylor

### **Fire Protection**

Over the years there have been many fires across all of the Commons. About 4/5 years ago, one of these fires covered an area 8 square kilometres with ash from the fire raining down on the local town. When these fires burn intensely they can burn down into the peat and smoulder for weeks. This causes irreparable damage. With wildfires becoming more of a problem throughout the UK looking to control and prevent wildfires is becoming pertinent. In the short term we are cutting *Molinia* to try and reduce the litter available to a fire and in doing so reducing the intensity with which the fire may burn. We are working with the local fire and rescue service, looking to provide education and support to protect these uplands from fire.

### **Restoration of *Molinia* Dominated Blanket Bog**

This is largely a grazing animal's project. Currently, over all of the eight Commons, there are only sheep and a handful of ponies still grazing. Grazing of the commons with cattle ceased around 20 years ago. Now there are many concerns about putting cattle back onto the hill. These include cattle straying as Abergwesyn Commons is a part of 100,000 acres of unfenced Open Access land. The spread of Bovine TB among cattle on the hill is also regarded as a threat. There are questions over how the cattle will grow and their sale value is also a concern. In order to lay some of these uncertainties to rest and to flag up potential problems the National Trust has teamed up with one of the Commons Graziers and put a small herd of six Welsh Blacks on one of the Commons. While six cows will not make much of a difference to the vegetation, it is an easier number to handle on this test run. We have found that they have not (so far) wandered off the grazier's heft, and they appear to be doing well. This project is in its early days but does seem to be producing positive results.



**Half of the grazing team.** Photo by Jessica Taylor

### **Bare Peat Restoration**

For reasons that are not entirely understood, but are most likely due to a combination of human activity and natural causes over many years, there are areas of bare peat that appear to be beyond self repair. Here the peat is constantly being eroded by the elements, releasing carbon, which should be locked away, into the atmosphere. To restore these areas the National Trust is landscaping the edges of the bare peat so they are not so exposed to the prevailing wind and using the excess peat to create a series of terraced dams. This in turn slows the run off and erosion allowing bog plants, such as Cotton Grass, to colonise and further stabilise the peat. On the large bare areas the cut *Molinia* from the Fire Protection project will be used to create a

protective layer of mulch which again is intended to create a more stable environment in which bog plants may become established.



**Peat depth monitoring around area of eroded peat.** Photo by J Taylor.

In order to record any success, failures or simple change we are carrying out monitoring. This is looking at the quality of vegetation on the blanket bog covering the site and was carried out in the summer of 2009. Eight sites, each with one hundred points has shown that while much of the blanket bog is in unfavourable condition it is by no means lost. By acting now and tackling the *Molinia* domination we hope to turn things around. Further monitoring of this sort is planned to take place on the areas cut. Peat depth monitoring is also now underway. This has already shown that the peat on Abergwesyn Commons is deeper in some areas than previously thought. The idea behind this monitoring is to build a profile of what is happening with the peat in relation to the bedrock beneath it and the vegetation on top. A better understanding of the dynamics of this area will aid in more comprehensive decisions being made on the future management of the Commons.

### **Options Appraisal**

While the project is currently set to run for three years, our long term aim is sustainable management - with mixed grazing and activities to control fire and minimise peat erosion. The Options Appraisal looks at the various choices available for long term management of the whole site. This open document has supported discussion about the future of the area with all those involved in the Commons, from the Commoners to adjoining land owners as well as government authorities and others who may hold some influence over the region. The progression of the discussions of the Options Appraisal has supported the initiation and potential delivery of a long term strategy for Abergwesyn Commons.

The Abergwesyn Commons Project is not in isolation and is part of a wider project, aimed at peat restoration, being run by the National Trust and supported by Biffaward. Sister projects are being carried out in the Peak District and Yorkshire.

Each of the above objectives have distinct outcomes, however they all overlap quite considerably. The approval of the Commoners in all aspects of the project is vital, as is the building and maintaining of strong links, to any long term success of the project. Ultimately, having the right balance and numbers of mixed stock on these Commons, cattle, ponies and sheep, should support and maintain a good outcome for the whole project. This can realistically only be done through supporting the rights holders and identifying ways to make managing this area viable for them. The nature of this site makes it difficult to access and then again to traverse but this isolation is partly what makes this site what it is and so makes the project so worthwhile.

Contact: **Jessica Taylor**. Project Officer – Abergwesyn, National Trust  
Email: [jessica.tyler@nationaltrust.org.uk](mailto:jessica.tyler@nationaltrust.org.uk)

## Building capacity through participatory action learning for sustainable natural resource management

### Rationale

Government agencies are increasingly considering deer and their impacts in the wider context of ecosystem services. Recent research (<http://www.macaulay.ac.uk/relu>) developed a participatory framework which for promoting collaboration amongst neighbours and between policy makers and practitioners to negotiate conflicts over deer management. Using map-based participatory methods, this work showed the value constructing GIS-based maps to combine practitioner and scientific knowledge across a landscape to create a better understanding of deer distribution and mobility, and their impacts on other resources. To build on these results, this follow-on project will provide support and training to help agency staff and land managers to incorporate this participatory framework into practice, so that they develop shared resource maps and foster collaboration over public and private objectives.

### Aims

This project will use a participatory, action learning approach to develop three core skills that are essential to the process of collaborative resource management:

1. participatory techniques to identify and address management issues and conflicts;
2. collate and use knowledge and data at the landscape scale using participatory GIS (PGIS);
3. analyse pooled knowledge to inform management issues.

*What is PGIS? Participatory GIS* is a method of mapping objectives, resources and knowledge across a landscape to develop a shared knowledge-base, facilitate communication, mediation and negotiation between stakeholders to address management conflicts by promoting transparency and building trust.

### Activities

1. Two **case studies**, one in Cumbria, England, and one in the Cairngorms, Scotland, to work with stakeholders to apply a map-based participatory process to integrate a range of land-use priorities and develop a shared knowledge base to inform discussions about these issues. Case study areas have been selected in consultation with the deer management sector. Lessons learned from this approach will inform practical, local-level implementation issues in the Code of Practice for deer management in Scotland.

2. **Participatory methods workshops** to provide training in methods and principles for stakeholder participation, using maps to illustrate and develop these skills. Participants will include deer officers, area officers, their managers and practitioners to build awareness and support for the use of these techniques. Workshop outcomes will be collated jointly with participants.

3. Two **dissemination meetings** (a) Best Practice Guidance partnership-style day for the deer sector to illustrate guidance on how to achieve collaboration using participatory techniques; (b) sharing good practice seminar drawing on academic and practitioner lessons and guidance to show how these approaches can be used to develop landscape-scale collaborative management of natural resources

Using the outcomes of these activities, researchers will work with stakeholders and policy-makers to produce '**Best Practice**' **Guidance** for developing sustainable deer management plans via participation.

Althea Davies<sup>1</sup>, Justin Irvine<sup>1</sup>, Brenda Mayle<sup>2</sup>, Piran White<sup>3</sup>, Rehema White<sup>4</sup> & Steve Yearley<sup>5</sup>

1. Macaulay Institute, 2. Forest Research, 3. University of York, 4. University of St. Andrews, 5. University of Edinburgh

Note that, from 1 April 2011, Macaulay Institute will merge with the Scottish Crop Research Institute to form the James Hutton Institute. Emails and webpages given above will be redirected to the new Institute.

Contact: **Althea Davies**. Macaulay Institute (now, The James Hutton Institute), Craigiebuckler, Aberdeen AB15 8QH

Email: [a.davies@macaulay.ac.uk](mailto:a.davies@macaulay.ac.uk)

## The value of knowledge exchange in the Cairngorms

### **It's not all just about research!**

Knowledge exchange has become a hot topic at the international level in recent years: strategic collaboration between researchers, cooperation with practice and adequate communication towards policy, practitioners and general public are key elements for sustainable development. The European Commission has recognised this need and currently supports various knowledge exchange projects around relevant topics (e.g. [www.mountainTRIP.eu](http://www.mountainTRIP.eu) concerned with sustainability issues in European mountain regions). In the Scottish Highlands, the Cairngorms National Park Authority (CNPA) and the Centre for Mountain Studies (CMS) at Perth College UHI are making the first steps towards better coordinated research strategy, adapted to the Park's needs and communication between research and practice.

### **KTP in Cairngorms National Park**

As Britain's largest National Park, Cairngorms National Park is a protected area of national and international importance. It encompasses a rich mosaic of habitats, wildlife, wild land and cultural landscapes and is home to around 17,000 people. The area is characterised by high biodiversity and numerous cultural landscapes which provide a range of services and goods. It offers a wide range of opportunities for tourism, game and outdoor access. These special qualities of the Cairngorms are highly sensitive to environmental and climate change as well as to social and economic pressures. The CNPA is committed to safeguarding the special qualities and the long-term interests of the area for future generations.



**Part of the Cairngorms National Park.** Photo by Prof M Price.

However, overall knowledge regarding current research about key topics like biodiversity and landscape conservation, sustainable land management and tourism is still patchy. There are therefore real needs and opportunities to involve research stakeholders much more effectively in the management of the National Park, bringing research and practice closer together in order to deliver a more effective National Park Plan and management of the Cairngorms.

The CNPA and CMS recently collaborated in a Knowledge Transfer Partnership, with support from the UK government's Technology Strategy Board, to foster knowledge exchange within the Park. In November 2010, they jointly organised an event to bring together researchers and stakeholders working in the Park, to increase awareness about ongoing research and to discuss opportunities and activities to improve the value of existing knowledge for practitioners.

### **Basis for a stakeholders' network for the Cairngorms National Park**

The project collected data on researchers and practitioners working in Cairngorms National Park through an on-line survey. More than 100 answers have been collected since June 2010. The survey showed that research activity in the Cairngorms has significantly increased since 2000. Over 75% of the network members have been carrying out research in the Cairngorms over the past two years. Most frequently addressed in their work are Conservation (74%), Biodiversity (68%), Environmental Management (60%) and Land use/management (60%). The collected data will form the basis of a central web portal for the Cairngorms. Such a resource will include

information on “who-is-who” and “who-does-what” in the Cairngorms, as well as relevant research results and monitoring sites across the Park.

### **Dialogue on hot-topics initiated at an interactive event**

The event in November 2010 addressed an existing need to start dialogue between researchers and practitioners. It brought together 60 participants from academia, research institutions, students, general public, trusts and NGOs. Some key recommendations for improved collaboration, cooperation and communication emerged.

Participants stressed the need for a central research portal to include details about projects in the Park. Such a resource should make use of the newest media opportunities, and link to existing forums and similar mechanisms. A section specially dedicated to potential student projects, allowing young researchers to get involved in Park-related work, would be most desirable.

In addition, the establishment of a common research strategy for the National Park would avoid overlap and contribute to filling current gaps; future research should adopt holistic inter- and trans-disciplinary approaches.



New media and alternative communication means were also encouraged. For instance travelling festivals, networking events and educational initiatives seem to have great potential for increasing awareness, understanding and engagement in the Park.

**Interactive workshop about sustainable development and knowledge exchange in the Cairngorms. November 2010.** Photo by Catalina Munteanu

The event highlighted the importance of constructive collaboration between

researchers from varied disciplines and was a significant step in initiating coordination and communication between diverse stakeholders in the Cairngorms at all levels.

### **Food for thought**

Cooperation, collaboration, and communication are the key to sustainable development in Cairngorms National Park. Through this knowledge exchange project, an important step was made towards increasing awareness about the significance of knowledge exchange. Only a better cooperation and communication between science and practice at all levels can support a more sustainable development of the Park. This will be one of the themes of the Research Strategy which the CNPA will develop with key stakeholders, as a major outcome of the project. In the new era of digital information, the Cairngorms knowledge exchange on-line platform, to be jointly developed by CMS and CNPA and based on the projects’ recommendations will provide support for all sustainability-related activities in the Park.

Contact: **Catalina Munteanu**. CMS or **Gavin Miles**. CNPA  
Email: [catalina.munteanu@perth.uhi.ac.uk](mailto:catalina.munteanu@perth.uhi.ac.uk) Tel: 01738 877 223  
[GavinMiles@cairngorms.co.uk](mailto:GavinMiles@cairngorms.co.uk) Tel: 01479 870 565

# Culling mountain hares to control ticks and louping ill

## Introduction

Louping ill virus (LIV) is a flavivirus transmitted by sheep ticks *Ixodes ricinus* and has been shown to cause high mortality in experimentally infected red grouse chicks in the lab. It is also thought LIV may be able to reduce grouse density and the associated revenues from shooting<sup>1</sup>. Therefore, controlling LIV is considered to be important for the continued viability of estates managed for grouse shooting. Although mountain hares do not show clinical symptoms of LIV, they are hosts for ticks, and laboratory trials have shown that non-viraemic tick to tick transmission of LIV (i.e. through the skin between ticks feeding close together on the same host, rather than via the blood system) can occur when they co-feed on mountain hares<sup>2</sup>, and mountain hares may therefore play a role in the spread and persistence of ticks and LIV. As a consequence, in some areas mountain hares are being culled as part of tick control measures<sup>3</sup> in attempts to control ticks and LIV and therefore increase red grouse numbers for shooting. Whilst to date no field study has specifically assessed the use of hare culling as a management tool to control ticks and LIV a recent article published in the *Journal of Applied Ecology*<sup>4</sup> which, for first time, assessed the available information on the use of mountain hare culls to control ticks and LIV and increase grouse numbers, concluded "... *that the evidence currently available is insufficient to provide scientific justification for culling of this Annex V species for the purposes of tick and LIV control*". Here we summarise the key points of this article.

## Mountain Hares

The Scottish mountain hare is a subspecies of the mountain hare and is native to Scotland. Although widespread throughout Scotland, they are typically more numerous in central and eastern Scotland and are strongly associated with the heather moorland that is managed for red grouse - where they are likely to benefit from habitat management and predator control aimed at improving grouse densities. Mountain hare populations are under threat from habitat loss, fragmentation, and local over-exploitation and are thought to have declined in numbers and range in Great Britain. Long-term climate change is likely to adversely influence the sub-arctic/alpine habitats favoured by mountain hares. Mountain hares are listed in Annex V of the EC Habitats Directive (1992), as a species '*of community interest whose taking in the wild and exploitation may be subject to management measures*'. Member States are therefore required to ensure the conservation status of mountain hares is maintained and that management of their populations is sustainable. The mountain hare has also recently been designated a UK Biodiversity Action Plan Species<sup>5</sup>.

Whilst mountain hares are an important quarry species in Scotland and are known to have been killed for sport for at least the past two centuries, little is known about the impact of harvesting or culling on their demography and population dynamics. As their habitat is fragmented, dispersal and any factors affecting it are likely to be important for maintaining population viability, particularly as mountain hares appear to show high site fidelity and limited dispersal. There is potential that intensive, localized culling could further fragment populations. Mountain hare populations in Scotland have been shown to exhibit cyclic, or unstable, population dynamics which complicates their management.

## Does culling mountain hares reduce tick abundance and LIV prevalence?

In what is to date the only study to investigate the role of mountain hares in maintaining ticks and LIV, and the response of these and grouse numbers to reducing hare density, Laurenson and colleagues<sup>1</sup> monitored mountain hares, red grouse, ticks and LIV on a Highland sporting estate that was eradicating mountain hares in an attempt to increase grouse bags. The subsequent changes in tick abundance, LIV prevalence, brood survival and post-breeding densities were compared to grouse moors where mountain hare density was not reduced. Over the 8 years of the study mountain hare numbers were reduced from around 20km<sup>-2</sup> to effectively zero. The results demonstrated that reducing mountain hare density resulted in fewer ticks, lower LIV seroprevalence in shot young grouse and increased grouse chick survival, and the estate was able to start driven grouse shooting again (although the post-breeding grouse densities were not higher than control areas). While these results might suggest, and indeed have been widely interpreted as

suggesting, that reducing hare numbers is a useful management tool to reduce ticks, LIV and increase grouse numbers on other estates, there are other important factors to consider.

First of all it must be understood that this was an experiment designed to test the hypothesis that mountain hares act as a reservoir for LIV, and was not designed to assess the management prescription of culling hares to increase grouse bags. Moreover, the study site was unusual in that it had no red deer and very few roe deer present on the grouse moor. While deer do not suffer from LIV they are the most important tick hosts in Scotland, and mathematical models predict that even total eradication of mountain hares in areas with deer will not reduce ticks or LIV because ticks are maintained by the deer population and LIV is maintained by the grouse population<sup>6</sup>. It is important to emphasise that deer are present on almost all upland grouse shooting estates in Scotland, and so mountain hare reduction is unlikely to be an effective method of increasing red grouse numbers in most areas. It is also worth noting that the study area was remarkable in showing very high LIV seroprevalence (80%) in shot young grouse at the start of the study; such high levels of LIV prevalence have not been found anywhere else studied in Scotland where typical prevalence ranges from 0-30%. Therefore, such a successful effect on reducing LIV and improving grouse chick survival may not be expected in other areas that have relatively low LIV prevalences to begin with.

Culling mountain hares to control ticks, LIV and increase grouse numbers presumes that ticks, mountain hares and red grouse occupy the same areas. However, although ticks, grouse and hares did share the same ground at the study site, research by Gilbert and colleagues<sup>7</sup> suggests that this may not always be true for all areas. While mountain hares and red grouse densities tend to increase with altitude between 400-700m, ticks show the opposite trend, due to higher deer densities and milder weather at lower altitudes. Therefore, reducing mountain hare numbers at low altitudes, where ticks are most numerous and likely to have the greatest impact on red grouse, is unlikely to reduce tick numbers significantly because ticks will be maintained by the high densities of red deer; similarly, culling hares at higher altitudes where they coincide more with red grouse is unlikely to have a significant effect on LIV and grouse since there are fewer ticks at those higher altitudes due to a harsher weather.

### **Do ticks and LIV affect red grouse demography?**

Grouse chicks in areas of high tick abundance tend to have high tick burdens and increased probability of contracting LIV. Ticks may also directly affect chicks through anaemia, reduced feeding due to ticks aggregating around the eyes, and secondary infections. Field evidence for the negative effects of ticks on red grouse chicks is, however, mixed. Tick reduction experiments where breeding female red grouse were treated with acaricide to kill ticks on themselves and brooded chicks have produced contradictory results that differ between years and studies. In one 2-year study carried out by Laurenson and co-workers<sup>8</sup>, LIV prevalence was very high (up to 75%), acaricide treatment had no significant affect on LIV prevalence nor chick survival in year 1, but reduced LIV prevalence and increased chick survival in year 2. In a similar study carried out by Mougéot and colleagues<sup>9</sup>, LIV prevalence was low (up to 1.4%), and acaricide treatment had no significant affect on LIV seroprevalence or brood survival compared to controls.

### **Conclusion**

The experimental results reported by Laurenson and co-workers have sometimes been interpreted as demonstrating that culling mountain hares is an effective management strategy to control ticks, LIV and increase grouse numbers. As a consequence, increasing numbers of hare are being killed as part of tick control measures in attempts to control ticks and LIV and increase grouse bags. However, our review of the available studies suggests that there is insufficient evidence to support the culling of mountain hares as part of tick and LIV control to increase grouse numbers. Importantly, in the presence of other hosts, such as deer which are widespread and numerous on most upland grouse estates, there is good evidence to suggest that culling mountain hares to control ticks and LIV will have no significant affect on tick numbers or LIV prevalence.

In parts of Scotland, commercial grouse moors can be crucial to livelihoods and the local economy. Ticks and LIV are perceived by grouse moor managers to be one of the most important current issues in the Scottish uplands and one of the biggest threats to their livelihoods. Despite this and in the face of their deteriorating conservation status, the continued practice of culling mountain hares

to control ticks and LIV in the belief that it will improve grouse numbers has to be questioned. This is both in terms of the potential impact on the conservation status of mountain hares and the efficacy of culling as a control strategy in the vast majority of cases.

## References

1. Laurenson, M.K., Norman, R. A., Gilbert, L., Reid, H. W. & Hudson, P. J. (2003) Identifying disease reservoirs in complex systems: mountain hares as reservoirs of ticks and louping-ill virus, pathogens of red grouse. *Journal of Animal Ecology* 72, 177-185.
2. Jones, L.D., Gaunt, M., Hails, R. S., Laurenson, M. K., Hudson, P. J., Reid, H. W., Henbest, P. & Gould, E. A. (1997) Transmission of louping ill virus between infected and uninfected ticks co-feeding on mountain hares. *Medical and Veterinary Entomology* 11, 172-176.
3. Patton, V., Ewald, J. A., Smith, A. A., Newey, S., Iason, G. R., Thirgood, S. J. & Raynor, R. (2010) *Distribution of mountain hares* *Lepus timidus* in Scotland: results from a questionnaire. *Mammal Review* (In Press)
4. Harrison, A., Newey, S., Gilbert, L., Thirgood, S. & Haydon, D. T. (2010) Culling wildlife hosts to control disease: mountain hares, red grouse and louping ill virus. *Journal of Applied Ecology* 47, 926-930.
5. Biodiversity Reporting and Information Group (BRIG) (2007). "UK Biodiversity Action Plan; Report on the Species and Habitat Review [ <http://www.ukbap.org.uk/bapgroupage.aspx?id=112>. (ed A.Maddock), UK Biodiversity Partnership. [Accessed: 06.07.2010].
6. Gilbert, L., Norman, R. A., Laurenson, M. K., Reid, H. W. & Hudson, P. J. (2001) Disease persistence and apparent competition in a three-host community: an empirical and analytical study of large-scale, wild populations. *Journal of Applied Ecology* 70, 1053-1061.
7. Gilbert, L. (2010) Altitudinal patterns of tick and host abundance: a potential role for climate change in regulating tick-borne diseases? *Oecologia* 162, 217-225.
8. Laurenson, M.K., Hudson, P. J., McGuire, K., Thirgood, S. J. & Reid, H. W. (1997) Efficacy of acaracidal tags and pour-on as a prophylaxis against ticks in red grouse. *Medical and Veterinary Entomology* 11, 389-393.
9. Mougéot, F., Moseley, M., Leckie, F., Martínez-Padilla, J., Miller, A., Pounds, N. & Irvine, R. J. (2008) Reducing tick burdens on chicks by treating breeding female grouse with permethrin. *Journal of Wildlife Management* 72, 468-472.

Scott Newey<sup>1</sup>, Lucy Gilbert<sup>1</sup>, & Annabel Harrison<sup>1,2</sup>

1. The Macaulay Land Use Research Institute (now, The James Hutton Institute), Craigiebuckler, Aberdeen AB15 8QH

2. Faculty of Biomedical and Life Sciences, University of Glasgow, Glasgow G12 8QQ

Contact: **Scott Newey**

Email: [s.newey@macaulay.ac.uk](mailto:s.newey@macaulay.ac.uk)

## ~~~~~

### The effect of future habitat changes on black grouse

Declines in black grouse populations during the latter part of the 20th century have been largely attributed to land-use and habitat changes. Research has shown that black grouse are detrimentally affected by an increase in plantation forestry as well as changes in moorland management and overgrazing. My PhD research is concerned with the long-term viability of Britain's black grouse populations and is focused on one particular population in Perthshire. I have been provided with a fantastic 18 year dataset which is the result of dedicated black grouse monitoring by the Perthshire Black Grouse Study Group. So far I have been using these data to assess population changes within the region and investigate black grouse habitat suitability.

The next step in my research is to look to the future. I aim to build a model of black grouse population dynamics where the fate of individual leks is based on their position in a landscape and the habitat around them. I would like these landscapes to be a range of scenarios which reflect the possible changes the UK uplands might undergo in the next 50 years. To this end, I have drawn up a list of scenarios which may or may not be likely to occur and would like uplands experts to give their views by ranking the most likely five from a selection of ten. This expert advice will mean that the final models are based on scenarios which not only may well occur but are also of interest to a wide variety of uplands researchers. Please contact me if you would like to contribute to the advice on scenarios.

Contact: **Matt Geary**. Manchester Metropolitan University

Email: [Matthew.Geary@stu.mmu.ac.uk](mailto:Matthew.Geary@stu.mmu.ac.uk)

## Willow planting in Corrie Fee National Nature Reserve

Corrie Fee NNR hosts one of the largest remaining populations of montane willow scrub in the UK. However, the pockets of willow scrub growing on rock ledges and the steep corrie sides are small and isolated. The willows are growing and seeding but not regenerating. The aim of the project (see Reintroduction of the Woolly Willow in LttH Iss [16](#)) is to increase the size of the existing population, and to improve the conditions for natural regeneration to occur in the future, by planting native stock within the fenced enclosure in Corrie Sharroch, where most of the willows within Corrie Fee NNR are found. Seeds and cuttings of woolly willow and associated willow species were collected from Corrie Sharroch in 2007 and 2008 by the Royal Botanic Garden Edinburgh, as part of their Scottish Plants Project. These were grown into seedlings and are available for transplantation. Over 800 seedlings were planted in 2009 and a further 800 will be planted in August 2011.



**Willow planting in Corrie Fee NNR**

The planting project is being co-ordinated by the Woolly Willow Steering Group, which includes members from Scottish Natural Heritage (SNH), National Trust for Scotland and Royal Botanic Garden Edinburgh. Species planted include the rare woolly willow *Salix lanata*, which is a UK Biodiversity Action Plan species and is one of those selected for additional support through the government and SNH's Species Action Framework.

Contact: **Suki Flemming** Area Officer, Scottish Natural Heritage  
Email: [Suki.Flemming@snh.gov.uk](mailto:Suki.Flemming@snh.gov.uk)

---

### Notes on the recovery of some formerly overgrazed and eroded sites in the uplands.

Bob Evans has been monitoring eroding acid grassland and heather moor slopes since the 1960s in the Peak District. This work has been described elsewhere (Evans 2005). Bob is now bringing that work up to date along with other monitoring from the Lake District (Coledale and Wythburn), and Glen Feshie, the Cairngorms. The results of these longterm monitoring exercises are too detailed to be given justice here, so please contact Bob directly for more information.

These monitoring exercises were carried out cheaply and quickly rely on the comparison of photographs and field notes that record the state of the ground at different times. Although crude and in these examples not susceptible to statistical manipulation important information is gained.

The monitoring undertaken by Bob has shown that even when carried out in a crude and rapid a way, can indicate if erosion caused by animals is taking place and its trend. It also shows if systems that are put in place mainly to lessen the ecological impacts of overgrazing are effective in curtailing erosion. Such monitoring is cheap to do.

In all the localities monitored, erosion is no longer the problem it was as sheep and deer numbers have been reduced. However, in the Lake District there are signs that grazing pressures may have increased again in the last few years. Changes in agricultural and conservation policies, associated often with more sympathetic approaches of land owners and managers, have helped to bring these changes about and to improve the biodiversity of the locations. Once sheep and deer stocking

intensities are reduced to very low levels and if trees are nearby rapid recolonisation of the slopes by saplings may take place. Culling has reduced red deer numbers (Glen Feshie) and not replacing ewes or moving sheep on to lower lying land have both reduced grazing intensities on the fells. However, that may just displace the problem. Greater stocking intensities in lowland fields can cause problems such as trampling and poaching and destruction of the topsoils' structure, so encouraging runoff that carries sediment and faecal material. Large storms may cause landslips on steep slopes and where stocking intensities are high recolonisation of these bare soils by vegetation will be inhibited.

## References

Evans, R. 2005. Curtailing grazing-induced erosion in a small catchment and its environs, the Peak District, Central England. *Applied Geography* 25, 81-95.

Contact: **Bob Evans**. Anglia Ruskin University.

Email: [robert.evans@anglia.ac.uk](mailto:robert.evans@anglia.ac.uk)

~~~~~

## Does Scotland deserve more National Parks?

Two Scottish charities, the Scottish Campaign for National Parks (SCNP) and The Association for the Protection of Rural Scotland (APRS), are running a joint project to promote a strategy for developing a comprehensive network of National Parks across Scotland. For further details please see the Project Summary on either the [SCNP website](#) or the [APRS website](#).

SCNP Honorary Vice President Robert Maund said: "Scotland's landscapes rank amongst the best in the world, yet we have been slow thus far to celebrate this by designating National Parks. The first two Parks have made good progress, but now is the time to think about expanding the family. We feel there is probably a case for at least three more, including our first coastal and marine National Park".

APRS Convenor Charles Strang said: "APRS promotes the care of **all** of Scotland's rural landscapes, but some of them are particularly special. That is why we intend to draw up a strategy for future National Parks, to fill the vacuum which exists in national policy".

Project Manager John Mayhew said: "Scotland wouldn't have any National Parks if it wasn't for the voluntary environmental movement, and we won't have additional ones if we don't start planning for them now. We know public finances are tight, but if we start work now we'll be ready for the day when money is more available. I'd be delighted to speak to anyone interested in this project".

SCNP is a registered Scottish charity, No: SC031008 [www.scnp.org.uk](http://www.scnp.org.uk)

APRS is a registered Scottish charity, No: SC016139 [www.ruralscotland.btck.co.uk](http://www.ruralscotland.btck.co.uk)

Contact: **John Mayhew**. Project Manager Scottish National Parks Strategy Project

Email: [scnp-aprs@btconnect.com](mailto:scnp-aprs@btconnect.com) Tel: 0131 225 7012

~~~~~

## The wetter the better for daddy longlegs - and birds

People may be very interested in this research paper on peatland restoration and tipulid abundance:

<http://www.rspb.org.uk/news/277101-the-wetter-the-better-for-daddy-longlegs-and-birds>

## Books and other new resources

### ***SNH Commissioned Report 402: Developing guidance for managing extensive upland grazing where habitats have differing requirements***

The uplands present some challenges to conservation and to land managers due to the range and configuration of different habitats that are present; some of which have differing grazing requirements. This project sought to review recent surveys for evidence of such tensions between habitat requirements. Drawing on this evidence and expert opinion, the report seeks to establish principles that can be applied on an extensive scale to help manage these conflicts or to identify management priorities. *Managing upland habitats with differing grazing requirements - A Practical Guide* is available as a separate pdf to the project report.

**Authors** : Holland, J.P., Pollock, M., Waterhouse, T., Morgan-Davies, C., Bibby, H., Stewart, S. and Armstrong, H.M. (2010). *Scottish Natural Heritage Commissioned Report No.402*.

List Price: free download – Commissioned Report 402 <http://www.snh.org.uk/pubs/detail.asp?id=1654>  
Managing upland habitats with differing grazing requirements - A Practical Guide  
[http://www.snh.org.uk/pdfs/publications/commissioned\\_reports/402guide.pdf](http://www.snh.org.uk/pdfs/publications/commissioned_reports/402guide.pdf)  
Published by: Scottish Natural Heritage  
Publication Date: 2010

---

### ***JNCC Habitat Management search***

Habitat Management on the Web is a search engine designed for people who want to find out how best to manage habitats in the UK for biodiversity and conservation.

It is similar to a standard internet search, but it only searches web pages which have been pre-selected to take you to the most useful sources. It will not completely exclude irrelevant 'hits', but we hope it will guide you more quickly to the best management guidance. It only finds information which has been published on-line – papers and books are not covered.

Check it out at <http://jncc.defra.gov.uk/default.aspx?page=4332>

---

### ***JNCC Report 445 Towards an assessment of the state of UK peatlands (2011)***

<http://jncc.defra.gov.uk/page-5861>

This report was produced to assist the review process undertaken by the IUCN UK Peatland Programme <http://www.iucn-uk-peatlandprogramme.org/>. The report assesses the state of the UK peatlands, based on available information on the extent, location and condition of peat soil and peatlands, vegetation, land cover, land use, management and a range of environmental influences. It also provides estimates of extent and condition of peatlands in each of the four UK countries. Reconciling the various descriptions and classifications to provide a unified picture of the state of UK peatlands represents a significant challenge.

This review is divided broadly into two parts. The first part (section 2-5) addresses how we define, delineate and describe peatlands, and considers critically the sources of available information. This part also touches briefly on the likely impact of peatland management on the ecosystem services delivered by peatlands. The second part (section 6-10) provides a synopsis of the state of peatlands in the four countries.

The review also includes a glossary of terms and definition used in the UK to describe peatland soils and habitats types and conditions. There are still insufficient data and information to provide a definitive overview of the state of the UK's peatland resource as a whole. This report identifies key gaps in current knowledge necessary to provide a fit-for-purpose assessment of peatlands across the UK.

## Uplands Staff across the Country Conservation Agencies



**Cyngror Cefn Gwlad Cymru  
Countryside Council for Wales**

**Peter Jones** - Peatland ecologist for all upland and lowland habitats, blanket bog, fens and lowland raised bogs. Conservation evaluation, ecology, management, hydrological and monitoring advice. Bangor.

E-mail: [p.jones@ccw.gov.uk](mailto:p.jones@ccw.gov.uk)

☎ 01248 387 261



**Mick Rebane** - Head of Uplands Unit; Manager of Uplands Unit, responsible for the specialist service provided by the unit and national overview of all upland matters. Lead within Natural England on overgrazing policy issues. Chair of Natural England's Upland Focus Group. Peterborough.

E-mail: [Michael.Rebane@naturalengland.org.uk](mailto:Michael.Rebane@naturalengland.org.uk)

☎ 01733 455 268



**Paul Corbett** - Habitat Survey Team Leader; responsible for co-ordinating the survey and assessment of terrestrial habitats in NI, with the main aim of completing the declaration of Areas of Special Scientific Interest. (the NI equivalents of SSSIs; the NI programme of site designation lags well behind the rest of the UK); representing NIEA on the Uplands Lead Co-ordination Network. Belfast.

E-mail: [paul.corbett@doeni.gov.uk](mailto:paul.corbett@doeni.gov.uk)

☎ 028 9056 9637

**Bobbie Hamill** - Responsible for survey and condition assessment of blanket bogs. Belfast.

E-mail: [bobbie.hamill@doeni.gov.uk](mailto:bobbie.hamill@doeni.gov.uk)

☎ 028 9056 9636



**Scottish Natural Heritage**

All of nature for all of Scotland

**Andrew Coupar** Policy and Advice Manager for Uplands and Peatlands - Peatland conservation evaluation, Natura, peatland inventory, casework – particularly renewables. Inverness.

E-mail: [andrew.coupar@snh.gov.uk](mailto:andrew.coupar@snh.gov.uk)

☎ 01463 725247

**Graham Sullivan** - Upland management, habitat condition assessment, evaluation of development impacts and site condition monitoring. Inverness.

E-mail: [Graham.Sullivan@snh.gov.uk](mailto:Graham.Sullivan@snh.gov.uk)

☎ 01463 725248

**Jan Sherry** – Heathland ecologist for upland and lowland heath. Conservation evaluation, ecology, management and monitoring advice. Bangor.

E-mail: [j.sherry@ccw.gov.uk](mailto:j.sherry@ccw.gov.uk)

☎ 01248 387 268

**Alistair Crowle** – Upland Specialist, Biodiversity Team, Provides advice in relation to land management, site protection, biodiversity and condition assessment in the English uplands and commissions research and projects to support these areas of work. Peterborough.

E-mail: [alistair.crowle@naturalengland.org.uk](mailto:alistair.crowle@naturalengland.org.uk)

☎ 01733 455 409

**David Glaves** - Senior Specialist - Upland Ecology. Lead on agri-environment, including scheme development and implementation, research and monitoring, and input to overgrazing cross compliance. Exeter.

E-mail: [David.Glaves@naturalengland.org.uk](mailto:David.Glaves@naturalengland.org.uk)

☎ 0300 060 0164

**Richard Weyl** - Biodiversity Unit. Head of a team responsible for the preparation, co-ordination and delivery of selected Northern Ireland biodiversity habitat and species action plans. Currently co-ordinating a review of the list of priority species for Northern Ireland. Belfast.

E-mail: [Richard.weyl@doeni.gov.uk](mailto:Richard.weyl@doeni.gov.uk)

☎ 028 9056 9684

**Martin Bradley** - Biodiversity Unit. Leads on the preparation, co-ordination and delivery of selected Northern Ireland biodiversity habitat and species action plans, particularly relating to peatlands & uplands. Co-ordinates BAP Reporting in NI and represents NIEA on the UK BARS Advisory Group. Belfast.

E-mail: [martin.bradley@doeni.gov.uk](mailto:martin.bradley@doeni.gov.uk)

☎ 028 9056 9633

**Des Thompson** – Chair of JNCC ULCN (until March 2011), Principal Adviser on biodiversity development - responsible for the SNH policy and advisory work on biodiversity, ecosystems and climate change. Particular interests in UK upland conservation issues, alpine, raptor and other bird management issues. Edinburgh.

E-mail: [des.thompson@snh.gov.uk](mailto:des.thompson@snh.gov.uk)

☎ 0131 316 2630

**Sally Johnson** - JNCC Network Officer for the Uplands Lead Co-ordination Network (until March 2011), and Policy and Advice Officer in SNH. Edinburgh.

E-mail: [sally.johnson@snh.gov.uk](mailto:sally.johnson@snh.gov.uk)

☎ 0131 316 2619

**We said a fond farewell to Dave  
Horsfield in 2010...**



**... and this March also to Barbara Jones who  
left CCW and to Ian Strachan who left SNH.**



But all are still wandering the hills and  
spending less time behind a computer unlike  
the rest of us!

**Thank you to all of you who have contributed to this issue.  
We welcome any comments or views on this issue.**

**Please contact our editor:  
Sally Johnson,  
Policy and Advice Officer - Uplands  
SNH, Silvan House, 231 Costorphine Road, Edinburgh  
EH12 7AT Tel: 0131 316 2619  
[Sally.Johnson@snh.gov.uk](mailto:Sally.Johnson@snh.gov.uk)**

A wide range of publications and other resources can be found under the various links. Newsletters (including the pdf version of this with coloured photos) are available at <http://www.jncc.gov.uk/page-1844>.