JOINT NATURE CONSERVATION COMMITTEE

Looking to the Hills

Newsletter of the Uplands Lead Co-ordination Network

Issue 14 **April 2006**

Welcome

CONTENTS

Welcome to this issue. As ever we have a diverse range of articles. A growing amount of attention is focusing on the need to manage the wider upland 'ecosystems'. For those of you long-in-the-tooth there will be a deep sigh. Most good ideas tend to cycle, and this is no different. Some of us were taught Eugene Odum's '*Ecology'* (1963) at University, and now find that many of his ideas have real currency now! Still, it is good news that ecologists are taking a more holistic view of upland ecosystems when thinking about conservation and management needs – how could we do otherwise?

Enjoy the spring and Summer!

Sally Johnson and Des Thompson

Cyngor Cefn Gwlad Cymru
Countryside Council for Wales

ENGLISH NATURE

ENVIRONMENT AND HERITAGE SERVICE

SCOTTISH NATURAL HERITAGE

*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 involves staff in the three country conservation agencies, the JNCC support unit and EHS in Northern Ireland.*

Guest Editorial from the Soils LCN

Soils in the uplands: a key, but often misunderstood, resource

Soils, like biodiversity, geodiversity[1] and landscape character, are a key component of the natural heritage. Soils are in effect a non-renewable resource with continuously changing properties reflecting the interactions over time of local soil-forming factors (climate, relief, flora, fauna and geology) and human impacts. Human-driven impacts on soils are of a much greater magnitude than those arising from natural drivers. With increasing concerns about atmospheric carbon levels, and the realisation that some soils (notably peat) are rich sinks of carbon, the soils agenda is growing in profile. Add to this a future EC Soils Directive and it is clear that we need to have a greater focus on the role of soils in the environment.

Interest in soils has in the past been dominated by the agriculture and forestry sectors. However, soils are increasingly valued as part of the natural heritage for the wide range of ecological, environmental and physical functions they support.

The rationale for soil protection within the nature conservation agencies is driven primarily by two issues. First, we need to ensure soils function to support the long-term Favourable Conservation Status (FCS) of special features of nature conservation interest. Second, we should strive to maintain those soil resources and functions which underpin ecosystems and landscapes of nature conservation value across the wider countryside. In practice, it is not the intrinsic value of soils which we value most, but rather the potential functions of soil as part of the ecosystem.

A holistic understanding of soil functions in the uplands requires an accurate assessment of the current status of the soil, the drivers of change to its status (e.g. land use change, climate change), the threats/risks (e.g. contamination, planning development, loss of biodiversity), and the responses to stress (resilience and resistance). In setting conservation objectives, the wider links between soil, air and water quality also need to be considered. Despite being essential to the sustainable management of the natural heritage, many aspects of environmental protection are not under the statutory remit of the UK conservation agencies. So, there is a need for nature conservation practitioners to be aware of, and to be able to clearly identify, threats to soils and their interactions with other elements of the natural heritage.

In the uplands, where deep peat soils support moorland and blanket bog communities, healthy soils are vital; mountain soils are often shallow because of slow rates of soil formation and extreme weather conditions. Managing the risk of soil erosion and degradation of soil by trampling, grazing and drying out of peat will not only contribute to the maintenance of valued habitats but will also limit wider environmental degradation through release of greenhouse gases to the atmosphere and nutrient and dissolved organic carbon to watercourses. Good soil management is fundamental to sustaining biodiversity and essential ecological functions in terrestrial and freshwater ecosystems. Despite limited direct control over sources of atmospheric deposition and diffuse contamination, which may lead to acidification and nutrient enrichment of upland soil, an understanding of how soils respond to natural and human threats is key to ensuring the conservation and restoration of soils.

The need for a better integration of soil issues with other environmental policies is driving the development of national and European soil strategies and, indeed an EC Soil Directive. The Soils LCN, through its involvement with UK Soil Indicators Consortium, is supporting the development of indicators of soil quality, a UK soil monitoring framework and a framework to assess the conservation value of soils. We shall keep you posted on developments.

Contact: **Patricia Bruneau** JNCC Soils Network Officer, SNH

Tel: 0131 446 2074 Email: Patricia.Bruneau@snh.gov.uk

Soils LCN information and newsletter can be found at www.jncc.gov.uk/page-1435. Contributions to the Soils Newsletter would be very welcome.

[1] Geodiversity is the variety of rocks, minerals, fossils, landforms, sediments and soils, together with the natural processes which form and alter them.

Mongolia: a home from home

Mongolia is usually thought of as an exotic place, the very term 'Outer Mongolia' conjuring up visions of Genghis Khan and his Mongolian hordes charging across the plains and conquering practically half of the then known world. Life is somewhat different in the country now. After centuries of upheaval, followed by domination by the Chinese and then the Russians, Mongolia eventually reached a state of independence at the beginning of the 1990s since when it has been trying to catch up with the rest of the world. However, with a population of two and a half million, in an area 6 times the size of Britain and practically no national infrastructure, they have some way to go.

The conservation of Altai biodiversity

I visited the Mongolian Altai as part of a Darwin Initiative Project, whose main aim is to collect and collate (for the first time) information on the rare and endemic flora of the Altai Mountains, identify 'hot spots' of diversity and examine the effects of economic activities on these. Using British expertise, the project is training scientists, students and local administration staff, and developing new cross-border approaches for the conservation of Altai biodiversity, in addition to preparing species action plans, habitat management plans and GIS-based species distribution maps. The collaborating partners are the Department of Animal and Plant Sciences, University of Sheffield, the Department of Botany; Tomsk State University, Russia; Hovd branch of the Mongolian State University and the Altai Botanical Gardens, Ridder, Kazakhstan.

Figure 1. Mongolian pastoralist and horse. Photo by Sue Shaw.

On the western side of the country, the Altai Mountains cover an area of over 600,000 km^2 in central Asia, lying within the borders of four countries (China, Russia, Kazakhstan, Mongolia). They extend for 2000km from Russia south to the Gobi desert and support a variety of habitats characterised by extremely high biodiversity and form an important centre of endemism in Eurasia. Tensions have existed at these country boundaries for many years, but recent initiatives have been established to try to encourage co-operation, particularly in conserving the unique flora and fauna of these mountains (one of the last strongholds of the snow leopard). The area is coming under increasing anthropogenic pressure, which is resulting in damage to some of the most valuable habitats. Apart from grazing, other threats include construction of transcontinental pipelines and power lines, use of agricultural fertilisers and detergents, atmospheric pollution and even rocket fall-out! Tourism is increasingly seen as an important aspect of future development in the region, catering for local as well as international 'green' tourism. These activities are largely unregulated as yet.

Degradation from livestock pressure

One of the main impacts and problems in the Altai, as it is in many parts of Mongolia, is the number of livestock. Pastoralism in Mongolia goes back thousands of years, with nomadic pastoralists seasonally grazing livestock in patterns that have only begun to change in the past 100 years. The old nomadic ways were collectivised under the Soviets, but since independence, privatisation has resulted in a dramatic increase in the number of livestock as the loss of subsidies and guaranteed markets accompanied urban unemployment and a drift back to the countryside. This has resulted in overgrazing and consequent degradation of pasture land, with many of the mountains resembling some of our worst overgrazed examples in the UK. Hence the 'home from home' feeling which accompanied me during much of the time I spent in the field. Too many stock,

soil compaction, degraded vegetation, conflict with protected areas and conservation objectives, all very reminiscent of our problems in the uplands of the UK.

However, the similarities do not go too far. We have problems mainly with sheep and locally other stock, whereas in Mongolia, the grazing animals comprise vast herds of cattle, sheep, goats, yak, camels and horses. Goat numbers have risen particularly since independence with the trade in cashmere proving to be financially rewarding as tourism increases in the country. Forms of transhumance are still practised and herds are shepherded between locations in the age old way on horseback. Considering the high numbers of livestock, I was very surprised at our alpine camp, at 3000m metres, to see the grassland literally covered with thousands of tiny alpine plants in mid-June. *Primula farinosa* was one of the most common, together with *Eritrichium villosum*: the abundance and diversity coming as a feast to the eyes of an upland ecologist used to searching out the occasional gem in the comparative botanical famine which characterises the British mountains. I even had the extra bonus of finding a valley brimming full with *Lloydia serotina* the Snowdon lily, a species I have spent some time researching in Wales.

Fig 2. Groups of camels move between grazing grounds in the Altai Mountains. Photo by Sue Shaw.

There was probably more *Lloydia* in that small valley than occurs in the whole of the UK! Why this abundance continues to exist in such a heavily grazed landscape, seems to be linked to the seasonality of the grazing system, whereby the stock first graze the lower slopes and only come to the higher pastures when the snow has melted in June. In fact, even as we moved away from our camp the horses moved in. If we had arrived three days later, the feast would have been vastly reduced. The flora must have adapted by flowering early and reproducing mainly by vegetative means to cope with the yearly onslaught.

In addition to the effects of high numbers of livestock on the flora and the soils, conflicts with wild grazing animals such as the Altai argali or wild sheep have also increased over the years as herders and livestock increasingly encroach on argali habitat. Herders have a strong, traditional conservation ethic and recognise the need to protect the land and its wildlife, but economic necessities and demands for material needs tend to be stronger influences in the 21st century. More integrated management involving local communities which provide direct economic benefits are starting to be developed, possibly Mongolian versions of our agri-environment schemes and community projects!

Mongolia is a fascinating country with a troubled past and an uncertain future. I was privileged to be part of a project aiming to provide expertise and further co-operation between countries to conserve the wildlife of this unique mountain system. It is sad to see even in this far flung part of the world, that political forces and economic necessities have altered the way pastoralists have used and worked with nature for centuries. This has also happened in the past in Europe and in every case it seems to involve pressure to increase livestock numbers with the consequent breakdown of systems developed over the centuries to work with the seasons and the available herbage. Returning to such systems is probably impossible now on our crowded planet, with so many competing demands on the land. However, we still need to find ways to successfully incorporate the needs and requirements of those who use the land, whether they be Mongolian pastoralists or UK farmers, with the increasingly urgent need to conserve the remaining biodiversity of the worlds mountain areas.

Contact: **Barbara Jones**, Upland Ecologist, CCW.

Tel: 01248 385 662, Email: b.jones@ccw.gov.uk

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

BioScene: Integrated futures for Europe's mountain areas: From Less Favoured Areas to highly valued landscapes

Agricultural decline and biodiversity

Priorities in nature conservation management in Europe's mountains have changed dramatically during the 20th century. Previous concerns for the management of wildlife in pristine landscapes has been superseded by acknowledgement of the value of cultural landscapes and their associated species and man-made habitats. It is now recognised that mountain biodiversity has been largely defined by direct and indirect impacts of agricultural management on habitats, species and landscapes. Ongoing trends of agricultural decline and abandonment are already showing negative impacts on mountain biodiversity.

The BioScene project

BioScene is funded by the European Commission's 5th Framework Programme under the Energy, Environment and Sustainable Development Programme. BioScene evaluates the biodiversity consequences of agricultural decline and restructuring in mountain areas; and provides recommendations for reconciling biodiversity conservation with social and economic activities through an integrated rural development strategy. Commencing in 2002, the research takes a case-study approach in six contrasting European countries. France (Causse Méjan), Norway (East Jutenheimen), and Switzerland (Mid Grisons), Scotland (Cairngorms), Slovakia (Bukovské vrchy mountains), Greece (Pindos mountains).

Mountain biodiversity futures – stakeholders and scenarios

Stakeholder Panels, including around 12 local people with a broad range of views and perspectives, were established in each study area. Three Stakeholder Meetings were held in each area during the project to assess understandings of past changes, to discuss future trends and to evaluate the scenarios in a sustainability assessment process. Scenarios were used to explore, with the stakeholders, alternative futures for these mountain areas, their landscapes, biodiversity and human communities. Three main ***BioScene*** scenarios were evaluated: Business as Usual (BaU) – Assumes current trends continue with support payments for agriculture. Agricultural Liberalisation (Lib) assumes withdrawal of all support to the agriculture sector and removal of export aids. Managed change for biodiversity (MCB) assumes withdrawal of agricultural support as in LIB but here these funds are diverted to public and private nature conservation programmes designed to halt biodiversity loss and to encourage landscape management to meet biodiversity objectives.

Biodiversity consequences of the scenarios

The scenarios were integrated with ecological research describing landscape changes and habitat transitions over the last ca 50 years, and modelling the ecological consequences of the scenarios in terms of likely trajectories of priority species and habitats in each study area (Table 1 column 1). Our results make clear that the precise biodiversity consequences of any future scenario depends on the way in which biodiversity is conceptualised (e.g. species, habitats or ecosystem processes) and how biodiversity priorities and objectives are defined, e.g. different emphasis given to emblematic species, heritage species, culturally valuable species or territorial responsibility within a global setting.

Public acceptability and sustainability of the scenarios

The ***BioScene*** research process allowed stakeholders to discuss and evaluate the scenarios in terms of the visual landscape and biodiversity and socio-economic implications. Prior to the second stakeholder meeting each country produced a set of visualisations relating to a number of landscape settings from the study area (Figure 1). These photo sets were sent by post without any identifying scenario labels and each partner asked their stakeholders to rank these visualisations by preference. We then analysed these rankings and used them as a starting point for the second SH Meeting. We then used a sustainability assessment methodology which is a common tool for evaluation and based on participatory approaches and the SA allowed us to assess the broader sustainability of the scenarios integrating the biodiversity consequences with social acceptability and economic criteria (Table 1).

		Objectives	Biodiversity	Natural resources	Rural development	Social development	Economic development	Institutional capacity
Scenarios	BAU	UK						
		EL						
		F						
		SK						
		CH						
		N						
	LIB	UK						
		EL						
		F						
		SK						
		CH						
		N						
	MCB	UK						
		EL						
		F						
		SK						
		CH						
		N						

Table 1: Overall Sustainability Assessment of three scenarios in the six *BioScene* study countries. The colour codes represent aggregated scores for a range of sustainability objectives from very favourable (double green) through neutral (yellow) to very unfavourable (double hatched red).

Business as Usual

The results show that our stakeholders are generally fairly comfortable with the BaU scenario since it represents the most familiar setting and is based on current trends. BaU has certain positive biodiversity consequences and these could be enhanced by incorporating some of the additional elements of the MCB and even the Liberalisation scenarios into management interventions to enhance biodiversity conservation in the future. There is a certain potential for new business developments related to all scenarios, such as organic agriculture, quality niche products and tourism, however, there was little belief amongst our stakeholders that this could fully replace the current agriculture. In some respects, BaU can also be viewed as a slower path towards the Liberalisation scenario.

Liberalisation

The LIB scenario itself is a potential nightmare scenario for biodiversity as well as for people's livelihoods and our stakeholders were almost universal in their rejection of this scenario. The liberalisation scenario is, in any case, an unrealistic scenario and support for mountain areas is more likely to be reinforced or reconfigured than withdrawn in the foreseeable future. However the value of the liberalisation scenario here was that it opened up a dialogue with stakeholders on the possible threats, but also the opportunities, of liberalisation in mountain areas. In landscape terms liberalisation is not far from a wilding scenario, depending on how one frames the biodiversity conservation goals. For example, the liberalisation scenario offers opportunities for large-scale restoration and conservation projects including reintroduction of regionally or nationally extinct ecological keystone species (e.g. large predators, wolves and bears) to the less intensively managed and wilder landscapes of a liberalised future. In some study areas stakeholders reject the return of large carnivores while in others they might tolerate natural recolonisation of predators, but not their reintroduction by humans. Certainly, stakeholders in peripheral areas have little sympathy for a policy that financially supports rewilding but takes away all financial support for human livelihoods. While there may be new opportunities for the regional economy from rewilding, e.g. hunting and tourism, most stakeholders believe that cultural landscapes are much more attractive for tourists than any kind of wilderness. This issue, perhaps more than any other, demands the promotion of dialogue between urban, scientific and rural stakeholders to foster mutual understanding for divergent views.

Managed Change for Biodiversity

The MCB scenario was designed specifically for biodiversity, and is built on the premise of land-use for conservation goals. The model for delivery of MCB would be a system of conservation payments based on cross-compliance with the potential to reconcile biodiversity and rural development through the implementation of a range of regionally tailored incentive measures. New institutional structures would be needed to convene regional conservation management boards comprising representatives of all conservation stakeholders. Existing agri-environment and rural development funding would require reorganisation at EU level into a menu of biodiversity and conservation payments. The MCB scenario was generally favourably viewed by stakeholders but the potential livelihood and governance concerns of this balance between bottom-up and top-down approaches would need to be addressed e.g. through inclusion of a very broad range of stakeholders and participatory dialogue, conflict resolution and consensus building to define appropriate and regionally sensitive biodiversity plans.

Business as Usual

→ current trends

→ support payments for agriculture

Agricultural liberalization

→ withdrawal of all support to the agriculture sector

→ no significant new intervention from government and no financial support

Managed change for biodiversity

→ withdrawal of all support to the agriculture sector

→ funding for nature conservation prioritised

Figure 1: Visualisations of 3 scenarios of agricultural change in the Slovakia study area

Conclusion

Europe's mountain landscapes, biodiversity and cultural heritage face an uncertain and critical future. ***BioScene*** has illuminated the complex social, economic and ecological processes in these vulnerable areas. There is a great responsibility to highlight the risks and the potential opportunities of these areas to maintain these diverse rural landscapes but also to take some new turnings towards a truly integrated rural, agricultural and environmental strategy. With the general thrust of continuing CAP reform being towards the recognition of the value to society of landscapes maintained "in good agricultural and environmental condition", the results of ***BioScene*** show the way for a smooth transition for European mountain areas from "less-favoured" agricultural regions to "highly-valued" environmental landscapes.

Contact: **John Mitchley**, Bioscene. Further information; www.bioscene.co.uk

Email: j.mitchley@imperial.ac.uk

Managing the land

Predicting the effects of management change on moorland vegetation, birds, economy and employment

CAP reform will impact significantly on the management of our upland areas and on their associated wildlife and socio-economic interests. This article draws on work within a field and modelling study[1] that considers these impacts and will provide guidelines for best practice.

The project will model a wide range of management scenarios using four contrasting field sites. As a means to pilot this approach, five scenarios were modelled using one of the grazing field sites (grazing systems at ADAS Redesdale in Northumberland) as a starting template. This article summarises this approach, integrating theoretical models with field studies to investigate the effects of management change on birds, economics and employment in the UK uplands. The results of this piloting exercise in particular demonstrate the potential impact of the changing policy framework.

The five management scenarios initially modelled were selected to be deliberately extreme in relation to evolving policy mechanisms and possible land manager strategies:

1. High sheep stocking (aiming to **maximise sheep** production system without agri-environmental support, but retaining Single Farm Payments) – 2.1 ewes per ha, the historical level of grazing for the site;
2. A **mixed grazing** model with 0.66 ewes/ha plus 0.75 cows per ha for 2 months (to retain SFP and obtain the **Higher Level Scheme (HLS)** payment of £40/ha) – this coincides with a current grazing treatment that is yielding promising field results for high offtakes of Molinia, but low impact on heather;
3. Low Summer Only Sheep (aiming to **minimise sheep** numbers, whilst retaining Single Farm Payments) – sheep at 0.25 ewes/ha;
4. An alternative lower intensity **HLS** strategy, mixing the '**minimise sheep**' with added cattle - 0.25ewes/ha plus 0.2 cow/ha for summer;
5. **Abandon** the land with no income – no grazing.

N.B. Whilst the scenarios have used the principles of the different schemes, HLS, LFA payments (Hill Farm Allowance, single Payment Scheme (SPS), the exercise is hypothetical and indicative only. It explores the range of livestock systems that might be feasible, following discussion within the project team and with colleagues with good knowledge of the site. In particular, the predicted effects on birds are illustrative only because, as yet, they consider the impact of grazing regime on

[1] Determining environmentally sustainable and economically viable grazing systems for the restoration and maintenance of heather moorland in England and Wales (BD1228), funded by Defra with support of English Nature and CCW. Research partners are ADAS, University of Newcastle, IGER, CEH Banchory, RSPB Scotland, SAC and Penny Anderson Associates

vegetation composition but not structure, whilst final predictive bird-habitat models are yet to be produced.

The field template used for each grazing scenario was a 200 ha wet heath mosaic of *Calluna, Molinia, Nardus,* sedges and rush dominated communities. This was scaled up from the grazing treatments in the Redesdale field trial (total 72ha). Vegetation simulations were run for 20 years and vegetation change was analysed at both the whole moor and the plant community scale.

The modelling approach aims to combine outputs from separate models of bio-economics, vegetation dynamics and bird abundance. The bio-economic model uses livestock energy demands and thresholds together with standard costs and assumptions, to trigger economic costs and output changes. For this pilot exercise, livestock and labour input data were taken from SAC (2003) and assumptions on government support payments (e.g. Single Payment Scheme) were taken from Defra (www.defra.gov.uk Nov 2004). Appropriate costs and livestock income were split proportionately to the duration of grazing on the moorland. The vegetation model uses a grid-based modelling approach in which vegetation change is driven by plant competition, spatial distribution, growth and management (Gardner 2002). Field data characterising the plant communities present on a site, their distribution, composition, growth phases and management, are used as input data. The bird models were derived from field data collected from 85 2-km^2 plots in southern Scotland (Pearce-Higgins & Grant, in press). Generalised Linear Models were used to identify variables that significantly affect the abundance of bird species, and incorporated both site and management effects, and variables describing vegetation composition and structure. These analyses indicate the relationships between bird abundance and specific vegetation variables, but provide preliminary bird-habitat models only. To determine the effect of management change on bird abundance and farm economics, the five grazing scenarios were simulated within the vegetation dynamics model, the outputs of which were used in the bio-economic and appropriate bird (red grouse, meadow pipit and curlew) abundance models.

The scenario analysed was a 200 ha wet heath mosaic of *Calluna, Molinia, Nardus,* sedges and rushes. This was scaled up from the grazing treatments in the Redesdale field trial (total 72ha). Vegetation simulations were run for 10 years.

Vegetation modelling predicted a small increase in *Calluna* cover across the moor under each scenario, except Maximising Sheep Production. *Molinia* was also predicted to increase by 10-15% across the moor, although this was least under the summer only Minimise Sheep scenario (Table 1). Fine-leaved grasses and sedges were predicted to decline under each scenario, with the smallest decline occurring under the summer only scenarios. Whilst change in *Calluna* cover appears modest across the whole site, change within specific plant communities was larger and showed greater variation between the different scenarios. For example, within the mixed *Calluna-Molinia* community (Table 2), *Calluna* cover was predicted to increase by around 7% under the summer only Minimise Sheep scenario, but predicted to remain unchanged or to decrease slightly under the Maximising Sheep Production and Land Abandonment scenarios.

Species	**Start**	**Max sheep**	**Mixed Grazing +HLS**	**Min. sheep**	**Min. sheep + cattle +HLS**	**Abandon**
Calluna	20	20.1	23.2	23.3	22.8	23.0
Molinia	29.2	44.6	43.3	40.4	42.5	41.4
Rushes	8.8	12.2	11.4	12.3	12.4	12.0
Carex	8.9	5.1	4.4	5.1	5.8	4.2
Fine-leaved grasses	2.4	0.3	0.4	0.6	0.3	0.4
Broad-leaved grasses	6.8	8.4	7.4	8.1	7.0	8.2

Table 1: Vegetation Cover (%) over the whole moor after 20 years

Such localised effects may be important in determining the compositional and structural heterogeneity of the moorland vegetation.

Bird modelling found that meadow pipit numbers were predicted to decline for all scenarios, potentially reflecting changes in the balance of *Calluna* to fine-leaved grasses and the declines in sedge cover. Pipits faired best under the summer grazing scenario with cattle. Red grouse increased under all scenarios, except that of Maximising Sheep Production, due to the predicted increase in *Calluna*. Curlew was also predicted to increase in each case, presumably related to the predicted increase in *Juncus effusus* cover for all scenarios. Differences in the predicted changes in bird abundance between scenarios were relatively small reflecting modest changes at the whole moor scale in the plant species important for these particular birds. However, the abundance of several bird species is also related to vegetation structural attributes that will be affected by grazing, as well as compositional ones. Vegetation structure has not yet been incorporated within the vegetation model, and its inclusion will have marked effects on the predictions for red grouse and curlew.

Scenario	***Calluna* cover**	***Molinia* cover**
Starting cover	31.0	37.9
Maximise Sheep	30.7	55.8
Mixed Grazing + HLS	33.7	55.7
Minimise. Sheep	37.5	46.4
Minimise sheep + cattle +HLS	34.8	49.7
Abandonment	30.2	54.0

Tables 2: Vegetation Cover (%) within mixed *Calluna/Molinia* heath community (occupying approximately 15% of the moorland site) after 20 years

Economic modelling predicted an annual financial turnover of £37,603, £53,508, £9,647, £19,987 and zero, for the five scenarios respectively. The first four scenarios included CAP area payments of £7878, and second and fourth have payments of £8,000 from the Higher Level Scheme as shown in Figure 1. Using standard figures for labour requirements per livestock head and the

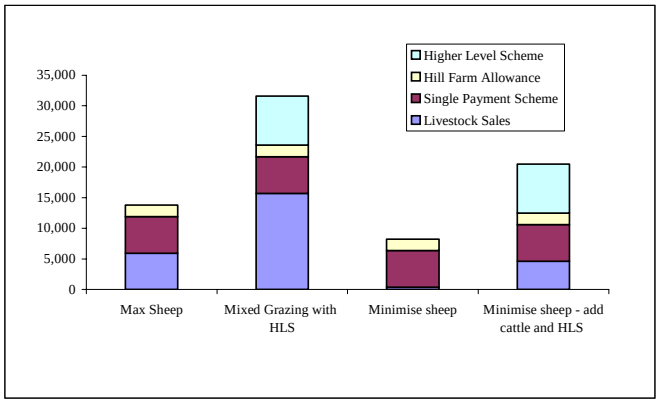


Figure 1. Annual income for different options for 200 ha moorland

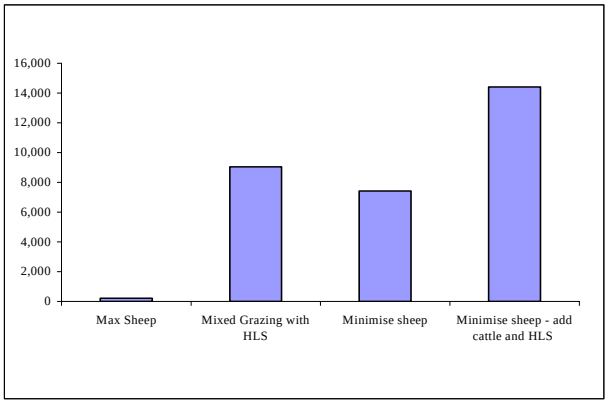


Figure 2. 'Net Margin' (Income less variable costs and labour costs), per 200 ha per year

number of stock involved, estimates of farm labour requirements were made of 0.37, 0.54, 0.02, 0.14 and zero labour units/year to manage the stock on the hill. Whilst, in practice, these undoubtedly under-estimate requirements for low stock number scenarios, there are for example large differences in the stock management labour predicted for the two HLS options (2 and 4). Some margin figures are shown in Figure 2, these being calculated for total income less variable costs and an estimate of labour costs. As the moorland component of a farm is responsible for a low proportion of many farm fixed costs, this provides a way of comparing these systems. They further demonstrate the relative attractiveness of combined production and environmental schemes, especially compared to a system focussing on managing high numbers of sheep for production. It may not be a surprise, but the 'minimise sheep' scenario produces better margins than the 'maximise sheep' system even if the two CAP payments are re-included. True decoupling,

removing the CAP money (of £7878) to a separate account, would leave the Maximise Sheep scenario with a large net margin deficit, unless the money is notionally recoupled within the farm accounts. There must be caution about how these results are interpreted, especially for modelling a 200 hectare piece of moorland linked to a larger hypothetical farm, with other stock and labour demands spread over the whole farm. Nevertheless the predictions indicate the trends in labour quantity required with different strategies, the scale of livestock workers who might be gainfully employed in stock work and a basis for comparing the value of different scenarios to the farm business. The impacts of changes in individual sheep and cattle performance and welfare, resulting from following the different scenarios, are not modelled here, but impacts on financial outputs and margins will be small in comparison to the main SPS, HFA and HLS payments.

The study illustrates how, by linking field data to theoretical models, changes in management practice, arising from external economic or policy decisions, may be analysed in relation to their direct and indirect effects on economy, employment and biodiversity. This exercise has proved useful in the process of developing a more robust modelling approach for a fuller set of management scenarios. The results illustrate the dramatic and divergent impacts that different management scenarios will have on livestock numbers, labour demand and on economic outcomes. They further illustrate the continued influence of public funds in managing the uplands.

References

Gardner, S.M. (2002). Managing upland vegetation for sheep and conservation. *British Grassland Society Occasional Symposium,* 36, 115-118.

SAC (2003). *Farm Management Handbook*. 2003/4. SAC, Edinburgh.

Pearce-Higgins, J.W. & Grant, M.C. in press. Relationships between bird abundance and the composition and structure of moorland vegetation. *Bird Study*.

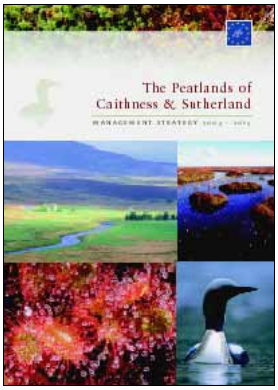
Authors: A. Water house (SAC), S.M. Gardener (ADAS), J.W. Pearce-Higgins and M.C. Grant (both RSPB)

Contact: **Tony Waterhouse**, Scottish Agricultural College.

Email: tony.waterhouse@sac.ac.uk

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Caithness and Sutherland Peatland Strategy launched



A new strategy for the long-term management of the peatlands of Caithness and Sutherland was launched on 16th August 2005 by Rhona Brankin, Scotland's Deputy Minister for the Environment and Rural Development.

The strategy has been developed by a host of organisations and individuals through the LIFE Peatlands Project, to take account of the conservation, community and economic needs of the area. Publication of the strategy follows a public consultation carried out earlier this year to take account of the views of local people, particularly farmers, crofters and land owners.

A key aim of the strategy is to provide a clear plan for the future of all the peatlands in Caithness and Sutherland, within and outwith designated areas, by promoting good land management and co-ordinated action. An underlying theme is to see how the community and economic benefits of the peatlands can be maximised, without damaging the interest of the peatlands themselves.

Included in the strategy are measures to address the balance between peatland and forestry in the area, and for increasing the amount of native woodland. The identification of new opportunities for tourism and recreation will also be pursued, in light of the fact that there are currently very few places where people can see and enjoy the peatlands at close quarters.

Launching the strategy, Rhona Brankin MSP said: "I am delighted to be here today to launch the Peatlands Strategy. The future of these peatlands will now be ensured through striking a careful
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

balance between land use, forestry, conservation and recreation. The comprehensive nature of the plan is a real testament to many organisations who have worked together to make today a reality.

The LIFE Peatlands Project, is part funded by the European Union's LIFE Nature Programme, and supported by Forestry Commission Scotland, Scottish Natural Heritage, RSPB and Plantlife International.

Copies of the strategy can be downloaded from the LIFE Peatlands Project website at www.lifepeatlandsproject.com/htm/publications/reports.asp

Contact: **Andrew Coupar**, Scottish Natural Heritage.
Tel: 01463 706 450 ext 469 Email: Andrew.Coupar@snh.gov.uk

The importance of geodiversity

Failed Slopes : Geodiversity equals Biodiversity

Thousands of square kilometres of British hillsides and coasts are affected by Rock Slope Failure (RSF), its effects ranging from conspicuous landslides through more subdued landslips to almost intact or creeping slope deformations. Those on the Carboniferous, Jurassic and Cretaceous escarpments and sea-cliffs, where resistant beds overlie weaker strata, are well-known. Those on the older harder rocks of Britain are surprisingly ill-recognised. In the mountain areas, they are less due to geological controls, and more the product of stress release after deglaciation – 'paraglacial RSF' – and mostly date back 5-15,000 years.

Research in the mainland Scottish Highlands has identified 500+ RSFs, with 150 being over 0.25 km^2. A few larger ones occur in the Lake District (eg. Fairfield, Robinson) and Wales (eg. Llyn Tal-y-llyn). These extensive sites are characterised by source scarps reaching 50 m high, antiscarps (uphill-facing breakouts) up to 10 m high, and rockmass fracturing which may penetrate 100 m or more. The largest known, on Beinn Fhada in Kintail, extends 3 km along the glen wall and has an estimated failed volume exceeding 100 million m^3 (Figure 1.).

All published work has focussed on their geomorphology and engineering geology. Observation suggests that these RSFs contribute considerably to local and regional biodiversity. In turn, they will have influenced human colonisation and the cultural landscape. This is primarily because they are dry 'anti-oases' in hyper-wet environments, being comprehensively underdrained. They are minerally less impoverished, and often have springlines valuable in drought. They tend to have southerly aspects, and offer numerous sheltered niches – in both microclimate and security senses.

These failed valley slopes today support the richest ground flora in many glens, and often the only surviving trees for miles. The drier, fractured terrain lends itself to rodent colonies, and is thus valuable to birds of prey. Today they are the most favoured haunts of deer, for breeding, feeding, resting, even for peat wallows in antiscarp trenches (and stalkers paths take advantage of the disrupted ground to get up craggy glen sides). In the past they offered some of the best transhumance grazing, and Highland shieling groups are often found nearby. Conversely, the more disrupted RSFs afford cavities for carnivores: extant native woodland on some RSFs may reflect proximity to wolf lairs, as well as seedling niches beyond browse reach.

Figure 1. Beinn Fhada. Photo by David Jarman.

A down side is that RSFs are prone to exotic invasion, notably by rhododendron and spruce. A prominent RSF on Ben Ledi (Callander) is fast becoming a spruce forest of almost Alaskan landscape character.

RSF tends to cluster in areas of favourable geology (especially schists), but research suggests an association with concentrated glacial erosion, eg. breaches. RSF density is typically 5% and locally 15% in these clusters. In the areas of harsh terrain and climate, such as Cowal, Knoydart, and Glen Shiel, the role of RSF in sustaining both natural biodiversity and human occupancy should repay specialist investigation.

Until now, RSFs have suffered little from development or mismanagement; afforestation has generally skirted it. Renewable energy installations would do well to avoid them, including access roads. The welcome trend towards native woodland re-establishment runs the risk of obscuring RSFs and diminishing existing small-species habitat value – happily the Woodland Trust project in Glen Finglas avoids the splendid RSF on Benvane; advice has been proffered to FCS on its planning for the Katrine catchment.

Generally, at all scales from individual site reports to SEAs, greater attention might be paid to the geomorphic inheritance in the uplands, and the synergy between geo- and biodiversity should be explored.

JNCC will publish this year a major overview of RSF in Britain, as the Mass Movements Volume of the Geological Conservation Review.

David Jarman will welcome feedback, especially examples of biodiverse RSFs. He also offers a range of visual presentations on the landshaping effects of RSF, and could do with more images on the wildlife front. His RSF inventory is not yet online, but enquiries are welcomed.

His favourite 'cultural landscape' RSF feature is a bold antiscarp concealing illicit whisky still hearths – location a closely-guarded secret.

Contact: **David Jarman**, Mountain Landform Research, Findon Cottage, Culbokie, Ross-shire IV7 8JJ.

Tel: 07798 940169 Email: david.jarman914@virgin.net

Global warming and food for golden plover

A response from John Coulson

A summary of the recently published paper in *Oecologia* "Warmer springs advance the breeding phenology of golden plovers and their prey (Tipulidae)" by Pearce-Higgins, Yalden and Whittingham appeared in the last issue of *Looking to the Hills* (Issue 13). I believe some further reservations should be attached to the predictions.

Both craneflies (Tipulidae) and many bird species rely upon photoperiod (as well as temperature) in determining the timing of breeding. While this is well appreciated by physiologists, ecologists often ignore the photoperiod effects, probably because they usually work in one place. However, the photoperiod effects could appreciably moderate the predictions made of the impact of global warming on animals.

In craneflies, the timing of pupation, and hence emergence of adults, is influenced by photoperiod via the duration of a larval diapause (a "resting stage" which is essentially independent of temperature) which occurs in many species and, for example, which prevents premature emergence in winter or spring. Temperature causes a finer adjustment. It is important to recognise that each cranefly species, like birds, respond differently to photoperiod and to temperature. There is no overall general rule, so data on cranefly species should not be pooled as it can lead to incorrect conclusions. As an extreme example of this variation, my own experimental results of photoperiod effects on *Tipula montana,* a common fell-top species, is that climate warming is likely to cause the emergence to be weeks later, not earlier, because the life-cycle is likely to be changed from two years to one year.

In many bird species photoperiod plays a role in determining when individuals return to the breeding areas and the timing of the breeding season. Thus species which breed in both Iberia and Scandinavia start nesting at much higher temperatures in the former area than in the north. This is because the breeding season is primarily determined by photoperiod (or an endogenous rhythm), not temperature, and is only finely adjusted about that date by temperature effects. This seems likely to be the situation in the Golden Plover. Yet the field data presented on the effect of temperature on the Golden Plover do not take photoperiod into account. In the data used, the early breeding dates tend to be to the south and at lower altitudes (warmer), while late breeding to the north is at higher (colder) altitudes. Thus there is a correlation between photoperiod and temperature in these data, so why assume that temperature is the only causative factor? Further support for a photoperiod effect comes from the recent BTO research report 362 (Timing of breeding of moorland birds, by Moss *et al*.), which identifies the position north (photoperiod), rather the altitude (temperature) as being the significant and most important factor in the timing of breeding in the Golden Plover. If this result is confirmed, then the impact of temperature rise on the timing of breeding of the Golden Plover may be much less that suggested by Pearce-Higgins et al.

The important message is that we need to know the factors affect the timing of breeding of birds and emergence of insects before realistic predictions about the future impact of global warming can be made. Temperature is only one of the factors involved and the others, such as photoperiod or endogenous rhythms, are not likely to be influenced by climate change.

Contact: **John Coulson** Email: JohnCoulson1@compuserve.com

Reference

Moss D., Joys A.C., Clark J.A., Kirby A., Smith A., Baines D., & Crick H.Q.P. (2005). *Timing of Breeding of Moorland Birds.* BTO Research Report No. 362. BTO, Thetford.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

A reply from James Pearce-Higgins, Mark Whittingham & Derek Yalden

In the last issue of *Looking to the Hills*, we summarized a recently published paper on the phenology of golden plovers and tipulids (*Oecologia* 143:470-476). John Coulson has outlined a number of reservations that he feels should be attached to our predictions. Firstly, he suggests that by ignoring the effect of photoperiod we will have exaggerated the likely impact of warmer temperatures. Secondly, he suggests that by pooling data from cranefly species, our conclusions will be incorrect. We shall examine each of these in turn.

Coulson is correct to observe that photoperiod is an important determinant of breeding phenology, and that our analyses of the phenology of tipulid emergence and golden plover breeding incorporate data from a range of sites, subject to differing photoperiod regimes. However, prior to examining correlations with temperature, we included 'site' as a factor in the analyses, thus accounting for variation that could be attributable to between-site variation in either temperature or photoperiod. In other words, we examine temporal variation in phenology at the site level only, and our correlations with temperature are therefore robust to confounding photoperiod effects. Further, as we understand BTO Research Report 362 (cited by Coulson), it does show the timing of golden plover first egg dates is negatively correlated with year (Table 3.3.4a in the BTO report), supporting the findings of our analysis that breeding dates have changed with time.

Because of the nature of the majority of the tipulid data, it was not possible to analyse variation in the timing of emergence of individual species separately, as we discuss in the *Oecologia* paper. We acknowledge this may have introduced a bias in our analysis, but it would be more likely simply to reduce any likelihood of detecting significant correlations between tipulid phenology and temperature. The fact that we detected a significant correlation between phenology and temperature suggests to us that there is a biologically meaningful response of tipulid species to increasing May temperatures, which merits further examination. Although Coulson suggests that *T. montana* is likely to emerge later as it switches from a two to one year cycle with increasing temperatures, this species was probably rare or absent at most sites covered in our analysis, which were of relatively low altitude. Available data suggests the tipulid assemblages at these sites were probably dominated by a small number of species, particularly *T. subnodicornis (cf.*
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Butterfield & Coulson 1975, Whittingham *et al.* 2001), which is usually abundant on cotton-grass moors with peat substrate. The key question is therefore how typical were our sites of the general picture of tipulid distribution and abundance; a common issue with regard to ecological studies from a restricted number of sites. In our paper, we have used all the data available to us to address our questions. Only further studies across a broader range of altitudes and latitudes will shed light on the generality of our results.

In summary: (1) clearly our results, for both golden plovers and tipulid spp., cannot be caused by differences in photoperiod or temperature between sites because our study only examined annual differences in temperature at individual sites (i.e. at the *within* site level); (2) we accept the point that different Tipulid species may respond to temperature in different ways, however this does not invalidate the correlations with temperature presented in our paper but simply suggests that more data are needed to investigate the generality of our findings. Whilst it may be surprising to some, that such temperature effects on phenology are apparent, they surely indicate that climate change is producing detectable biological changes within potentially sensitive upland ecosystems.

Contact: **James Peace-Higgins**, RSPB. Email: james.pearce-higgins@rspb.org.uk

Projects & Research

Studies into the condition and conservation of montane heath and summit heath vegetation in Wales – some results

You may remember (or not!) that back in Issue 12 of *Looking to the Hills* we reported on the initiation of a collaborative project between the Macaulay Institute, CEH-Banchory and CCW to investigate the impacts of grazing and nitrogen deposition on the montane heaths of the Carneddau massif. The Carneddau contains the largest remaining area of montane heathland in Snowdonia and is an important example of this type of vegetation at the southern limit of its distribution. In order to meet conservation objectives the Welsh montane heaths need to be brought into favourable condition, however monitoring has indicated that there has been a decline in the cover and condition of characteristic montane species on the Carneddau over the last 40 years. In fact, there is so much concern over the status of montane heaths in the UK that proposals for a montane heath HAP are currently being discussed. Both overgrazing and nitrogen (N) deposition have been implicated in the decline in condition but their relative roles are unclear. Field work was carried out during the summers of 2003 and 2004, in order to set the condition of the welsh heaths in a UK context, and to begin teasing apart the effects of overgrazing and pollution.

The key questions which we set out to answer were:

- How does the current species composition of the vegetation relate to grazing pressure, soil chemistry and plant nutrient status?
- What is the nutrient limitation status of the vegetation, does this vary between areas with different grazing pressure, and is there any evidence of N saturation?
- What is the status of the soils underlying these montane communities and is there any evidence of changes linked to N deposition or acidification that may adversely affect the potential for montane communities to re-establish under reduced grazing pressure?
- Is there any evidence for N saturation causing decreased growth in the N-sensitive moss *Racomitrium lanuginosum* and does this vary between areas subject to different grazing pressures?
- From results of all of the above - would a reduction in grazing pressure result in the restoration of the montane heath communities on the Carneddau?

For the purposes of the study, montane vegetation was split into 4 broad categories: scree areas with monospecific *Racomitrium* cover, *Racomitrium-Carex* heath, *Vaccinium* heath and degraded areas (areas of low % vegetation cover thought to have previously been *Racomitirum* heath). During summer 2003 information was collected on species composition, soil chemistry, herbivore density (through dung counts) and plant chemistry in each of the habitat categories. In summer

2004 further work was carried out focussed on the condition of the key bryophyte *Racomitrium lanuginosum*.

Results of the first phase of work confirmed casual observations that all of the habitat categories are currently subjected to high sheep densities with the exception of the blocky scree areas which were rarely accessed. Dung counts were well above recommended targets set for conservation of Scottish montane heaths. One of the most striking differences between the degraded areas and the 'good condition' *Racomitrium* and *Vaccinium* heaths was the loss of soil organic matter in the former. This may make the degraded areas more prone to desiccation and consequently less favourable for the re-establishment of vegetation. Comparison of the Carneddau soil chemistry and plant tissue N contents with data from montane sites in the Scottish Highlands revealed evidence of N accumulation in both the vegetation and soils of the welsh site. This is consistent with the higher N deposition rates in Wales (30 kg N ha^{-1} y^{-1} for Carneddau compared with 7-15 kg N ha^{-1} y^{-1} for most Scottish sites) but may also be due in part to deposition of nutrients in animal dung and urine since the N content of *Vaccinium* was found to be significantly related to dung count. This eutrophication of soils and vegetation is bad news for montane species, most of which are adapted to low nutrient conditions, as the increased nutrient availability may make it easier for less specialist species to invade. Increased tissue N content can also alter plant physiology and affect frost and drought tolerance.

Figure 1. Clearing dung from monitoring plots in the Carneddau. Photo by Andrea Britton.

The second phase of work focussed on the condition of *Racomitrium* and compared its performance on the Carneddau with that on Glas Maol in the Grampian Highlands a mountain site that is also grazed by sheep but receives only about 18 kg N ha^{-1} y^{-1}. The Carneddau *Racomitrium* had the highest tissue N content when compared with a range of sites from the central and northwest Scottish Highlands, and also showed a decreased ability to take up added N due to reduced activity of the enzyme nitrate reductase (NR). The moss' response to added N was similar to that seen in plots on Glas Maol which had been receiving 10 kg N ha^{-1} y^{-1} in addition to background deposition (i.e. a total of 28 kg N ha^{-1} y^{-1}). This similarity suggests that modelled N deposition rates in North Wales are probably correct and also supports the use of *Racomitrium* N content and NR activity as biological indicators of N impacts on montane communities.

Racomitrium growth rates and cell damage (determined by the amount of potassium leakage) were also measured. This showed that, despite the high N deposition rate on the Carneddau, *Racomitrium* in ungrazed boulder scree or remaining areas of *Racomitrium* heath in good condition attained a growth rate similar to that at the less polluted Glas Maol site (approx 1 mm per month!). The growth rate on the degraded areas was much lower and moss from this area also had the highest rates of potassium leakage suggesting that the *Racomitrium* in these areas is in a poor condition.

These results give some hope that reductions or removal of grazing may allow montane habitats in this area to recover. Although high N deposition rates appear to be causing gradual eutrophication of the vegetation and soils, key species such as *Racomitrium* are able to sustain healthy growth rates when not subjected to additional pressures such as heavy grazing pressure. The relationships between grazing, nitrogen inputs and species performance have not been fully resolved by this study however, and climate change has the potential to add further complications in future. A new PhD studentship funded by SNH and supervised jointly by the Macaulay Institute, CEH – Banchory, the University of Aberdeen and SHN will investigate the impacts of nitrogen

deposition and climate change in more detail. It will also examine the extent to which local management changes (grazing reductions) will allow successful recovery of degraded heaths at a range of UK sites. Heather Armitage started this exciting new project in November 2005, so watch this space.

Further information can be found in:

Britton, A.J., Pearce, I.S.K. & Jones, B. (2005) Impacts of grazing on montane heath vegetation in Wales and implications for the restoration of montane areas. *Biological Conservation* 125, 515-524.

Armitage, H., Pearce, I.S.K., Britton, A. (2005) The impact of grazing and nitrogen deposition on the condition of *Racomitrium lanuginosum* on the Carneddau Mountains, North Wales. Contract report to CCW, Contract no. C00691NEW.

Britton, A. & Pearce, I. (2004) Studies into the condition and conservation of montane heath and summit heath vegetation in Wales. Contract report to CCW, Contract no. FC 73-01-453.

Pearce I.S.K., Woodin S.J. and van der Wal R. (2003) Physiological and growth responses of the montane bryophyte *Racomitrium lanuginosum* ((Hedw.) Brid) to atmospheric nitrogen deposition. *New Phytologist* 160: 145-155.

Contacts:

Andrea Britton, Macaulay Institute, Tel: 01224 498200, Email: a.britton@macaulay.ac.uk
Imogen Pearce, CEH – Banchory, Tel: 01330 826300, Email: iskp@ceh.ac.uk
Barbara Jones, CCW, Tel: 01248 370444, Email: b.jones@ccw.gov.uk

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Unravelling the causes of small cow-wheat's rarity

Background

Small cow-wheat (*Melampyrum sylvaticum*) is a nationally scarce hemiparasitic summer annual with a UK distribution reduced to 18 sites mostly in the Scottish Highlands. The status of small cow-wheat has resulted in the production of a management strategy under the UK Biodiversity Action Plan. However, given that the current state of the existing populations was unknown and the reasons for small cow-wheat's rarity were speculative, the available information was not sufficient for effective management to be planned. The findings described below are the results of a PhD project initiated in order to fill in the many gaps in our knowledge of small cow-wheat's autecology and improve prospects for its continued survival.

Habitat availability

The habitat of small cow-wheat is characterised by light woodland cover, often birch-dominated with other native deciduous species such as oak, rowan and hazel present. The Scottish populations are frequently found in W11 and W17 woodland remnants along the edges of fast-flowing burns. Within the understorey small cow-wheat shows a preference for herb-rich patches over ericoid shrub dominated areas. While this represents the core community type, small cow wheat's altitudinal range of 110 – 760 m a.s.l. encompasses many more communities. Altitude is an important driver - with increasing altitude, canopy cover decreases (from 70% to no canopy at all), growing seasons becomes shorter, moisture deficit decreases and small cow-wheat is smaller and less reproductively fit. Some features are constant at all surveyed sites; close proximity to water, north-facing aspect, and pH and soil moisture levels are typical of upland soils. Taken together this suggests that small cow-wheat has a requirement for high humidity that is met by being close to water and under a closed canopy at lower altitudes, while at higher altitudes the climate is cool enough to maintain adequate moisture levels although the shorter growing season constrains plant size.

There is a large discrepancy between the availability of suitable habitat, which is fairly common in upland Britain, and the number of sites small cow-wheat actually occupies. The occupied habitat patches are isolated and have been for a long time – today's small cow-wheat woodlands are depicted in maps from *circa*. 1760 often with unchanged boundaries and coverage. Long-term
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

isolation may be implicated in the eventual extinction of populations through changes in population and ecosystem dynamics, some of which have been shown to affect small cow-wheat and are discussed below.

Breakdown of ecosystem and population processes

Some key factors have been identified which cause limited reproductive fitness of individuals, small population size and lack of ability to colonise favourable habitats.

Small cow-wheat populations occupy extremely small areas of ground (normally < 30 m^2), seed dispersal is very ineffective and so the plants tend to be densely clustered. Ants are reported as being the main dispersal agent and carry seeds to nest sites where the elaiosome is consumed leaving the seed intact and viable. However, when seed was placed as bait, rodents were the primary seed consumers and ants were absent from surveyed sites (possibly due to habitat fragmentation). The failure of this dispersal mechanism has two linked effects: the populations are unable to expand out of existing sites resulting in high seedling density and density dependent mortality then reduces the reproductive population size.

Grazing may also limit reproductive success. Small cow-wheat populations generally grow in ungrazed or very lightly grazed sites, and grazing of the surrounding sward was shown to decrease plant size and seed production. This may be because the vigour of the surrounding plants is reduced and it is these that small cow-wheat parasitises.

Small cow wheat is insect pollinated. To promote genetic diversity, many plants are self-incompatible so the absence of pollinators results in decreased seed-set. However, we found no difference between seed production in small cow-wheat plants that were allowed to be insect pollinated and those that were 'bagged' to prevent pollinators reaching the flowers. Therefore, small cow-wheat has no internal mechanism for preventing self-fertilisation.

The combined effect of habitat fragmentation, lack of dispersal and self-fertilisation is one of genetic isolation and inbreeding. The genetic divergence of small cow-wheat populations has been identified by Catherine Sharp (formerly of RBGE) who concluded that small cow-wheat is currently incapable of gene flow even over small distances. The effects of genetic isolation may include depressed seed viability and reduced fitness through the expression of deleterious genes.

Recovery of small cow-wheat?

To combat the threats posed by habitat fragmentation, breakdown of ecosystem processes, genetic impoverishment and potentially, climate change, the Small cow-wheat National Steering Group has set up a reintroduction project (coordinated by Alice Broome, Forest Research) with the aim of decreasing the chances of extinction of small cow-wheat in UK by moving seed from natural populations to new sites. We aim to:

1. increase the number of small cow-wheat individuals and populations in UK;
2. reinstate populations to continuous habitat networks;
3. increase the genetic diversity of the species.

The reintroduction sites were selected according to the habitat definition generated by surveys undertaken as part of my PhD work and are situated in the Highland Perthshire Core Forest Area. The seeds were collected from populations at the Birks of Aberfeldy, Loch Ossian (Corrour Estate) and Glen Affric and mixed in equal parts to promote genetic crossing of material from across the species' Scottish range. Extra seeds from donor plants have been sown in the Forest Research nurseries to grow more seed for future work without sampling donor populations again. Leaf tissue samples were also taken from donor plants and will be genetically analysed. The new populations have been set out and marked so that demographic and genetic monitoring programmes can be undertaken and the success of the project can be assessed. If successful, we will have five self-sustaining, genetically diverse populations within a protected habitat network; the species will be better equipped to cope with potential threats and have a much improved chance of survival.

Acknowledgments: Thanks to Perth & Kinross Rangers, NTS, SWT and Corrour Estate for site access and the members of the Small cow-wheat National Steering Group. NERC and SNH

provided funding for the PhD at University of Aberdeen and the Recovery project is funded by the Scottish Executive's Biodiversity Action Grant Scheme.

Sarah Dalrymple[1], Sarah Woodin[1] and Chris Sydes[2],

1. University of Aberdeen, 2. Scottish Natural Heritage.

Contact: **Sarah Dalrymple**, Plant & Soil Science, University of Aberdeen, St Machar Drive, Aberdeen, AB24 3UU. Email; s.e.dalrymple@abdn.ac.uk

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

The Orkney Viking Heaths project

Introduction

The largest Farming and Wildlife Advisory Group (FWAG) project in the UK was launched in Orkney in June 2005. The Viking Heaths Project will run for five years and aims to increase awareness off and access too coastal and lowland heath in Orkney as well as restoring and re-creating areas of this internationally important habitat.

Figure 1. Randell Moss, West Mainland Moorlands. Orkney. Photo by Orkney FWAG staff.

FWAG are lead partners in the £1.26 million Viking Heaths project which has secured a £950,500 Heritage Lottery Fund grant. Project partners include: Scottish Natural Heritage, Orkney Islands Council, the Royal Society for the Protection of Birds, the Scottish Wildlife Trust and Orkney Enterprise.

Figure 2. Lochs and lochans at Noup Head. Photo by Orkney FWAG staff.

As one of 23 Tomorrow's Heathland Heritage projects in the UK, the Viking Heaths is the only Scottish example and crucially the only project to include significant farmer involvement. The project has targeted 18 key areas, covering 5,500 ha. This gives tremendous scope for FWAG and Orcadian farmers to demonstrate proactive and integrated environmental management.

The Project employs a team of four staff and funding will be available to Orcadian farmers with land within the 18 key sites for a range of capital and management works.

Orkneys Heathland Resource & Ecology

Coastal and lowland heathlands have been an integral part of the Orcadian landscape and cultural history since at least the Viking era. They have been shaped by the activities of man and help give Orkney its special character.

Coastal and lowland heath covers 7% of Orkney and is a UK priority habitat. It is a unique wind clipped, salt-spray exposed environment which occurs on acidic soils with very low nutrient levels. It supports 80 flora and fauna species which are of Conservation Concern. Orkney's 7,000 ha of heath is of international importance as this represents approximately 8% of the total lowland heath habitat found in the UK and 1.5% of the world's resource.

Plants commonly found on Orkney heath include; Common Heather; Cross-leaved Heather; Bell Heather; Crowberry; Scottish Primrose; Spring Squill; Orchids; Grass of Parnassus; Plantain; Kidney Vetch; Thrift; Sundew; Butterwort; Sea Campion and; a variety of Mosses. Fauna indigenous to Orkney heath include: Orkney Vole; Plover; Hen Harrier; Curlew; Short Eared Owl; Snipe; Redshank; Oystercatcher; Skylark; Artic Tern and; Artic Skua. Furthermore, heaths contain diverse invertebrate populations including a *Chrysomelid* leaf beetle which only exists in Orkney and Shetland.
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Identified Threats

Over 10% of heaths in Orkney have been ploughed, drained, re-seeded, fertilized, heavily stocked or, conversely abandoned over the last 50 years. Much of this has been driven by lucrative grants and subsidies or land abandonment, creating the dichotomy of "between the anvil of intensification and the hammer of neglect". Without conservation and restorative land management this decline will continue and it is estimated that over 4,000ha of heath is in need of restoration.

Project Aims and Objectives

The principal objectives of the Viking Heath Project are fivefold. These are to: re-create 104 ha of heath; restore 1,700 ha of degraded heath; improve access to and interpretation about Orkney's heath; increase awareness of Orkney's heath and; meet 20 of the Local and National Biodiversity Action Plan targets.

£568 000 will be spent directly on capital works which will be split into two phases. Phase 1 runs for the first two years of the project and includes work on land owned by project partners. Phase 2 runs for the following three years and covers work on privately owned agricultural units.

Heath Re-creation - 104 ha of heath are to be re-created of which 6 ha is in Phase 1 and 98 ha in Phase 2. This will be achieved by nutrient striping soil, by cutting and removing vegetation for a number of years, and seeding it with heather seeds treated to increase the germination rate.

Heath Restoration - 1,700 ha of heath will be restored of which 276 ha will be in Phase 1 and1,424 ha in Phase 2. This will be achieved by delaying grazing to allow wild flowers to seed and by removing annual grass growth with grazing in September to prevent the formation of a matt of rank and unpalatable vegetation. In this way seed availability and suitable germination conditions will co-exist. By allowing plants to grow to maturity a virtuous circle is created as the existence of vegetation of differing ages and the flowering and seeding of plants encourages the formation of complex natural food webs. Additionally, where appropriate, burning and cutting will also be used.

Access and Interpretation Improvement -Improvements in access and interpretation over 2 000 ha will be created and this will provide benefits for local people as well as tourists. Additionally, an interpretation centre will be constructed at one of the sites.

Awareness Raising - Awareness of heaths will be raised among tourists, the general public and the 850 farmers of Orkney. Workshops and events including walks and talks for farmers, visitors and schoolchildren will be undertaken. Visitors will be educated on the work that farmers have undertaken on heaths. This will promote a better understanding and enjoyment of heathlands by local people, businesses, agencies and tourists

The project will also demonstrate good management practice and produce literature as well as providing bespoke advice and capital support for works.

Local Biodiversity Action Plan Targets

Activities undertaken by the Viking Heath Project will assist in the achievement of 20 Local and National Biodiversity Action Plans. Some of the main targets are as follows.

- Restore 1 700 ha of heath (3% UK target).
- Recreate 104 ha of heath (2% UK target).
- Ensure management advice is available to all heath owners in Orkney.
- Provide free advisory and demonstration information.

Contact: **John Robertson**, Viking Heaths Project Officer, Orkney Farming and Wildlife Advisory Group (FWAG)

Email: john.robertson@fwag.org.uk Tel: 01856 874974

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Heather restoration project on Bucka Hill Area of Big Moor

Peak District National Park, Eastern Moors Conservation Property

Background

Degraded heather moorland dominated by Purple Moor Grass (*Molinia caerulea)* is found on the shallow peat areas of the Peak District Eastern Moorlands, particularly on the lower slopes of Big Moor. Historical factors such as past overgrazing, burning management, peat cutting and lime applications are thought to have caused the loss of Heather is these areas. The Bucka Hill area of Big Moor was identified as an area particularly suitable for restoration due to the dominance of *Molinia* in this area. In addition it is an easy area to exclude stock from as it is enclosed on 2 sides by major roads. Only 1km of additional fencing was required to create an exclosure of 100ha.

The project aims to achieve restoration of Heather moorland without the use of chemical herbicides to control the *Molinia*. Various treatments aimed at decreasing the dominance of *Molinia* and increasing the cover of other moorland plants will be tried within the exclosure over a 5 year period.

Action

The project started in spring 2004 (09/03/04) with the burning of the *Molinia* grassland across half of the enclosure area. This aimed to reduce the vigour of grass species and to remove the accumulated biomass of ungrazed *Molinia* tussocks. This treatment was followed by flail mowing (17/03/04) where practical (Figure 1.), in order to further suppress the *Molinia* and to remove the remains of the burnt tussocks. The work was done with a heavy duty machine which flailed down to the underlying peat where possible to create bare areas where the *Molinia* tussocks once were. 14 ha of burnt moorlands were flailed with this machine.

The net effect of these treatments was to create a lush spring growth of *Molinia* which was grazed hard by the sheep, cattle and Red Deer (wild herd) on Big Moor. This grazing kept the growth of grass in check in 2004.

The final treatment in spring 2004 was that a 3ha area was seeded with brushed heather seed (collected the previous autumn from Big Moor but unfortunately kept in a frost free store). This was applied on 06/05/04 at a rate of approximately 40kg/ ha, which is a very high rate.

An additional 4.5ha was flailed with a lighter machine in spring 2005 (14-16/03/05). This area was then re-seeded with treated (vernalised) heather seed at a rate of 40-60 kg/ha on 21/02/05 and 09/03/05.

The area was fenced to give the option of excluding grazing from the end of March 2005. The stock (ewes and lambs) were locked into the exclosure until 02/06/05. After these were let out the gates were left open to allow free access to all grazing until mid June. New heather seedlings were noticed on the 3.5ha of re-seeded from mid June onwards, all stock were excluded at this point.

Figure 1. Flail mowing *Molinia* dominated moorland after burning treatment on Bucka Hill, Big Moor, Derbyshire (Spring 2004). Photo by D. M. Smith.

81 mixed cattle (non-specialised breed) were put back in on 30/06/05 in order to keep controlling grass growth. Sheep are now permanently excluded. Currently grass growth is being suppressed at acceptable levels by the grazing. When inspected in mid-September young heather plants were frequent in the sward, the cattle appeared to be grazing the Molinia off effectively but they did not appear to be grazing the heather plants at all- an encouraging start. We continue to monitor.

Consequences

The end result will hopefully be a large area of mixed moorland vegetation. Once restored sheep and cattle will be allowed back into this area in order to manage it. An additional side effect of this work will be the replacement of a low foraging value sward (*Molinia)* with a more palatable one. This will help to address the current over-grazing problems on the heather dominated parts of Big Moor, directly addressing the single largest cause of unfavourable habitat status on these moors.

In addition we hope to be able to prove that the use of Glyphosate and other chemicals is not an essential in the restoration of *Molinia* dominated moorlands.

The use of commonly kept cattle in this trail is significant as traditional breeds are not always available. The aim was to prove that ordinary cattle could be used to control *Molinia* also.

A further consequence of this work was that following flailing, birds were attracted to the area and 2 pairs of Lapwings successfully nested. As a result a complimentary means of enhancing the wildlife value of some *Molinia* areas, by mowing strips within it, may be trialled further on other parts of the estate early next spring.

Contact: **David Smith**, Ecologist Peak District National Park Authority
Email: David.Smith@peakdistrict.gov.uk

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

A year at the 'Upland Centre'

The International Centre for the Uplands – Cumbria is a "Research-Think-Action Tank" for the Uplands. Established in April 2004, it achieved its full complement of five staff in September 2005. Since then, the Centre has established a profile through a range of activities designed to celebrate the uplands and to establish what stakeholders consider relevant issues for research. The partnerships associated with the Centre comprise local, national and international contacts and hence our concerns are based on an holistic understanding of the impact of rural policies at a local scale and looking outwards from these to generic national and international issues.

Notable highlights of the year include our inaugural conference on community involvement in rural projects, commissioning research on the social capital of hill farming systems, provision of international elements on the subject of rural services to Defra's national Rural Conference, developing a "Sense of Place" project and the commissioning of artistic commissions on wild and managed landscapes.

These activities have all been focussed on achieving an impact on the understandings of stakeholders, academics and policy makers. Hence, papers using data from our commissioned research and from our own activities have been presented to international conferences; we have organised and plan many more stakeholder workshops to feed into policy development; and we are represented on Defra's Upland Land Management Advisory Panel. We have made many new friends at national and international conferences and plan to maintain contacts, we hope to mutual advantage.

Over the next year we will be particularly concentrating on four projects and exploring the scope for others in the longer term.

1) A socio-economic approach to hill farming
2) People, environment and landscape through time
3) Sense of Place Ecomuseum Project in the North Pennines AONB
4) Sustainable housing in the Uplands

We will also be hosting a conference this Spring on a 2020 Vision for Uplands (May 30th- June1st, for information see http://www.theuplandcentre.org.uk/conference.htm) with a specific focus on Cumbria. This will tackle issues on the role and future of uplands within the rural Agenda as it applies to Cumbria. It is planned to be complementary to an international conference on 'New Landscapes' being organised by Rural Regeneration Cumbria.
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Part of our role for uplands development is as a hub – gathering experience from elsewhere and as a source of broader knowledge. Networking is crucial and we are always interested in news of work elsewhere around the themes of our current projects. For example at the moment we are actively seeking experience of using scenarios for land-use policy development. Please get in touch if you have insights to share.

Contact: **Ian Soane**, Director, International Centre for the Uplands – Cumbria, Penrith.
Tel: +44 (0)1931 711112 Email: ian@theuplandcentre.org.uk Web: www.theuplandcentre.org.uk

Snippets

The late Dr Derek Ratcliffe… on 9th June 2006 there will an event to unveil a commemorative stone at Finglandrigg NNR dedicated to Derek. We are deeply saddened by the untimely death of Derek in May last year; many full obituaries appeared in the national papers, *British Wildlife*, and other periodicals. His book '*Galloway and the Borders*' will be published in the Harper Collins New Naturalist series next year. Further details from Des.Thompson@snh.gov.uk.

Natural England… shall be fully functioning in October. Dr Andy Clements, English Nature Director for the uplands, has been appointed Director of Science and Evidence.

www.conservationevidence.com the website for evidence based conservation and management … grows in use, and is experiencing a massive number of hits from conservation managers. We shall have a larger piece on this in the next newsletter. In the mean time we encourage you think of case studies that you could contribute to the site.

Staff leaving SNH... with the move north to Inverness of the SNH HQ, many staff have left SNH. We wish Angus MacDonald, Phil Shaw, Helen Riley and Alan Leitch all the best for the future; in different ways each has made a significant contribution to our work in the uplands.

Langholm…work involving SNH, EN, Buccleuch Estates, GCT and RSPB is pulling together an ambitious project proposal to revive the red grouse, raptor, habitat and other interests of the moor.

Species Conservation Framework… SNH has published a 'top 20' list of species which are a high priority for conservation and management action. Upland species include the hen harrier, white-tailed eagle and American mink. The consultation (which closes on June 30th) is available from the SNH website at www.snh.org.uk/strategy/sr-pc00.asp

NBN Gateway www.searchnbn.net … in only 2 years since the official launch, the 20 millionth species record has now been added. The development of habitat records is taking longer to establish but the NBN will be consulting with the country agencies later in the year to inform developments in this area.

Books and other resources

Review - *Beyond Conservation – a wildland strategy*

Peter Taylor (2005) Earthscan 296 pages, paperback £19.99 hardback £70.00

The "rewilding" movement has been gathering pace over the last decade and is currently being hotly debated in nature conservation, as well as the popular press. Its main proponents argue for the need to create large scale conservation areas linked by habitat networks, and the restoration of natural processes such as grazing, browsing and predation back to the landscape.

In his book *Beyond Conservation* - a *wild land strategy*, Peter Taylor describes three large scale rewilding initiatives (Coed Eryri, Caledon and Dartmoor) as well as a number of smaller scale projects where this approach to nature conservation is being applied. He then goes on to extensively review the science base behind the restoration of natural vegetation types and ecological processes. In the final chapter, he outlines his wildland strategy in the context of changing farming, forestry and economic policy.

This book offers a broad vision for the future of nature conservation in Britain. One issue that becomes apparent to the reader is the importance of natural processes, such as grazing, browsing and predation in driving forward natural ecosystem dynamics. The book illustrates that since the last glaciation, and even during previous interglacial periods, we have slowly lost natural ecosystem processes, through the extinction of wild herbivores and carnivores, such as forest rhino, elephant, auroch, tarpan, wolf, bear and beaver.

There has been a long history of protecting small, isolated fragments of semi-natural habitats in the UK in reserve networks but in his book, Peter Taylor makes a convincing case for a more pro-active approach to nature conservation. Natural processes of grazing, browsing and predation can be restored to some parts of the UK through the introduction of traditional breeds of cattle, horse, beaver, lynx and wolf. He also argues that the creation of large areas of protected land, with surrounding buffer zones, can be achieved through effective public and private conservation partnerships. The joining up of these protected areas by habitat networks is required if we want to sustain biodiversity and wild landscapes in the UK. This is all the more important if we are going to allow habitats and species to respond to the ever increasing threat of global climate change. Through the CAP reform, and the move away from using public subsidies to support ecologically damaging, intensive agricultural production, he argues that we are creating an opportunity to return large areas of land back to a more "natural" state. This would reverse a legacy of damage to our countryside. These projects will provide important public benefits, such as carbon sequestration, managed retreat (flood defence) and biodiversity conservation. In his chapter "The healing forest", Peter Taylor presents an almost "quasi-religious" argument for nature conservation and appeals for a restoration of mans relationship with nature.

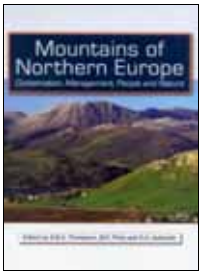
Beyond Conservation – a wild land strategy presents a long-term vision for nature conservation in the UK, and one which will receive support from many conservationists. Although some of the ideas presented are quite radical, this book presents a well researched and forward thinking strategy for taking nature conservation policy and practice into the twenty first century. It is strongly recommended that any discerning conservationist, land manager and policy maker reads this book.

Contact: **Mike Thornton** SNH, Tel: 0131 446 2477 Email: mike.thornton@snh.gov.uk

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Recent publication – *Mountains of Northern Europe: Conservation, Management, People and Nature*

Eds. D.B.A. Thompson, M.F. Price and C.A Galbraith (2005) TSO, Edinburgh.



Hdbk. Price £30.00. To order call 0870 606 5566 or email Edinburgh.bookshop@tso.co.uk or online www.tsoshop.co.uk

This publication contains updated and extended proceedings of an international conference, held in Pitlochry, Scotland in November 2002, to mark the UN International Year of Mountains 2002. There are 38 chapters dealing with the state of current knowledge about the mountains of Northern Europe; issues arising from the interactions between people and nature, and conservation and sustainable development activities needed to benefit the natural heritage of mountain regions in the UK, Norway and Sweden, Finland and Iceland.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Just out - *National Vegetation Classification: User's handbook*

John S. Rodwell (2006) JNCC, Peterborough.

Softcover. Price £13.50. To order call NHBS 01803 865913 or email nhbs@nhbs.co.uk or online www.nhbs.com

This handbook provides a general introduction to the National Vegetation Classification (NVC). It details the methodology for sampling and describing vegetation in the field, explains how such information can be used to identify plant communities and outlines the character of the classification itself and the

accounts of vegetation types it contains. It also discusses the important issues involved in carrying out an NVC survey of a site and gives a brief indication of other applications of the scheme.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Forthcoming publication – *Raptors: a field guide to survey and monitoring*

J. Hardey, H. Crick, C. Wernham, H. Riley, B. Etheridge and D.B.A. Thompson (2006). TSO, Edinburgh.

To be published June 2006. Price £14.99. To order call 0870 606 5566 or email Edinburgh.bookshop@tso.co.uk or online www.tsoshop.co.uk

At a time when many raptors in Britain and Ireland are recovering from low populations in the mid to late 20th Century, there is a growing demand for high quality information on numbers, distribution, and population trends of these birds. This book is aimed at people who watch, survey or monitor raptors. It provides detailed descriptions of survey methods for all species of raptor (Accipitriformes, Falconiformes, and Strigiformes), which regularly occur in Britain and Ireland.

This publication, including a CD of raptor calls, sets out to promote best practice for the survey and monitoring of raptors. It is hoped that it will provide a starting point for anyone wanting to begin a raptor study, and indeed encourage a new generation of raptor ecologists.

Written and edited by members of the Scottish Raptor Monitoring Group, this book draws on the knowledge and experience of over 300 raptor specialists. *'Raptors: A Field Guide to Survey and Monitoring*' has been funded by Scottish Natural Heritage, with assistance from the other Statutory Conservation Agencies in Britain and Ireland, as well as non-government bodies concerned with birds of prey.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Forthcoming publication - *The Nature of The Cairngorms: Diversity in a Changing Environment*

Eds. Philip Shaw and Des Thompson (2006) TSO, Edinburgh.

To be published June 2006. Price £20.00. To order call 0870 606 5566 or email Edinburgh.bookshop@tso.co.uk or online www.tsoshop.co.uk

The Cairngorms are arguably the most significant area for nature conservation in the British Isles. In *'The Nature of The Cairngorms: Diversity in a Changing Environment'*, over 30 authors have drawn from a wealth of published and unpublished sources to present an up-to-date review of the significance of the area's natural features, focusing mainly on those they consider to be nationally or internationally important.

The review falls into three parts, the first of which describes important elements in the Cairngorms, notably its geology, landforms, landscapes, habitats and main species groups. Each chapter describes recent research findings, trends and conservation issues for the landform, habitat or species group in question, and identifies areas particularly rich in these features.

The second part assesses the nature of change, assessing the scale and consequences of climate change, deer management and recreation. Part three identifies habitats and areas rich in species for which the Cairngorms are nationally important.

Conferences and other events

Peatland Carbon Research in the North Pennines – workshop report

The Lancaster Environment Centre recently hosted a one day workshop for scientists and land managers to discuss findings and plans for research into the carbon dynamics of blanket peat at Moor House – Upper Teesdale NNR. As blanket peat in upland Britain contains so much carbon it

is important to understand whether the peat is releasing carbon to the atmosphere and thus contributing to climate change or immobilizing carbon and thus partially offsetting releases from fossil fuels.

Since 1992 the UK Environmental Change Network (ECN) has been gathering weekly samples at Moor House within the catchment of the Trout Beck which has an area of 11.5 km^2 of which 90% is covered by blanket peat. Water samples from the Trout Beck itself, from tributaries of various sizes and from suction devices implanted in the peat have been analysed for, amongst other things, dissolved organic carbon (DOC). DOC gives the rich brown colour to upland rivers and is a product of the decomposition of the peat and within the peat there is a pronounced seasonal pattern in DOC concentration which peaks in late summer. The DOC exported in streams appears to mainly originate in the surface horizons of the peat and unexpectedly there is a marked decline in DOC during years with dry summers.

Such a long running weekly DOC data set from a peat-dominated catchment is proving of considerable value to researchers who are using this and other ECN data as a context for their own research. Experiments at the University of Leeds show that when dry summers are simulated in peat cores sulphate is produced that inhibits the release of DOC, suggesting a link between declining anthropogenic sulphur emissions and carbon dynamics in peat. Durham University and CEH Edinburgh are monitoring carbon dioxide and methane emitted by the peat and the streams while the Durham University and CEH and the University at Lancaster are looking at peat erosion. The age of carbon released is also being examined by Lancaster researchers. It is hoped that these different strands of research will result in refinement of models that will give a definitive indication of climate changes influence on whether the peat is accumulating or loosing carbon.

At present research into the impact of land management on peat carbon dynamics is concentrating on the impact of heather burning in the experimental plots established at Moor House in the 1950s and maintained with a very precise burning regime since then. Research has already shown that the burnt plots have accumulated less new carbon than the unburnt plots. The net situation is not yet understood and researchers from Durham, Reading and Lancaster are looking at this. Some of the experimental plots are due to be burned by English Nature this winter.

The meeting highlighted the importance of researchers collaborating on sites with good long term monitoring in place. There was a consensus that comparisons should be made between the NNR and a nearby area which is been more intensively managed for sheep grazing so the impact on the carbon dynamics of blanket peat agriculture could be evaluated. Topics were identified where further research was need and it is hoped to bring together the research in a special issue of scientific journal.

Recent papers and theses relating to carbon and other research at Moor House – Upper Teesdale NNR can be found on the web at http://www.ecn.ac.uk/sites/moorh.html

Contact: **John Adamson**, ECN Manager for Moor House – Upper Teesdale, CEH Lancaster.

Email: jka@ceh.ac.uk

Forthcoming events…

Scottish Biodiversity Fortnight: 27th May – 11th June 2006

This year Scotland's biodiversity will be celebrated with a fortnight of events and activities. Help celebrate Scotland's biodiversity, and spread the message that biodiversity matters, by taking part in and advertising events in your area. If you are organising an event that could contribute to the fortnight and would like to advertise it through biodiversity fortnight material please get in touch with the Biodiversity Implementation Team.

More information will be available at: http://www.biodiversityscotland.gov.uk/

Contact: **Biodiversity Implementation Team** on 0131 446 2431 or bit@snh.gov.uk

Uplands Staff across the Country Conservation Agencies

JOINT NATURE CONSERVATION COMMITTEE

Des Thompson – Chair of JNCC ULCN, Principal Uplands Adviser in SNH, UK Upland conservation issues, alpine and bird management issues.
E-mail: des.thompson@snh.gov.uk
% 0131 446 2400 ext 2419

Sally Johnson - JNCC Network Officer, for the Uplands Lead Co-ordination Network and the Uplands HAP Steering Group, based in SNH.
E-mail: sally.johnson@snh.gov.uk
% 0131 446 2400 ext 2056

Ian Strachan - Senior Habitats Advisor, SNH Fort William Office / JNCC Support Unit in Peterborough.
E-mail: ian.strachan@jncc.gov.uk
% 01397 704716 / 01733 562626

~~~~~~

Cyngor Cefn Gwlad Cymru
Countryside Council for Wales

Barbara Jones - Upland Ecologist. Lead officer for all generic upland conservation science issues for CCW including agricultural and overgrazing management issues. Upland grassland; rock habitats; tall herb ledge; montane.
E-mail: b.jones@ccw.gov.uk
% 01248 385 500

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.
E-mail: p.jones@ccw.gov.uk
% 01248 385 500

Jan Sherry – Heathland ecologist for upland and lowland heath. Conservation evaluation, ecology, management and monitoring advice.
E-mail: j.sherry@ccw.gov.uk
% 01248 385 500

~~~~~~

ENGLISH NATURE

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 English Nature on overgrazing policy issues. Chair of English Nature's Upland Focus Group.
E-mail: michael.rebane@english-nature.org.uk
% 01733 455 268

Alistair Crowle – Uplands Ecologist, responsible for the provision of specialist technical service on habitat condition and sustainable land management practices needed to deliver 'favourable condition' on upland SSSIs and in the wider countryside. Lead on monitoring and research.
E-mail: alistair.crowle@english-nature.org.uk
% 01733 455 409

~~~~~~

ENVIRONMENT AND HERITAGE SERVICE

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. (These are the NI equivalents of SSSIs; the NI programme of site designation lags well behind the rest of the UK); representing EHS on the Uplands Lead Co-ordination Network.
E-mail: paul.corbett@doeni.gov.uk
% 028 90546606

Martin Bradley - Biodiversity Unit. Responsible for the preparation, co-ordination and delivery of Northern Ireland biodiversity habitat and species action plans. The list of species of conservation concern for Northern Ireland is currently under review. Represents EHS on the UK UHAP group.
E-mail: martin.bradley@doeni.gov.uk
% 028 9054 6596

Bobbie Hamill - Responsible for survey and condition assessment of blanket bogs.
E-mail: bobbie.hamill@doeni.gov.uk
% 028 9054 6405

~~~~~~

SCOTTISH NATURAL HERITAGE

Andrew Coupar (Uplands and Peatlands Group Manager) - Peatland conservation evaluation, Natura, peatland inventory, casework and site condition monitoring
E-mail: andrew.coupar@snh.gov.uk
% 01463 706 450 ext 469

Dave Horsfield - Upland conservation evaluation, vegetation reports and Natura uplands support
E-mail: dave.horsfield@snh.gov.uk
% 0131 447 2400 ext 2058

Jenny Bryce – Deer Advisory Officer Advice to Areas in relation to deer. Dissemination of deer related information and research.
E-mail: jenny.bryce@snh.gov.uk
% 01463 706 450 ext 471

Graham Sullivan – Upland management, habitat condition assessment and evaluation of development impacts. Graham has taken over from Angus MacDonald.
E-mail: graham.sullivan@snh.gov.uk
% 01463 706 450 ext 466

~~~~~~

The SNH Uplands and Peatlands Group staff enjoying the Cairngorm views. What are they looking at?:
Dave Horsfield, Graham Sullivan, Angus MacDonald and Andrew Coupar.

A fond farewell to Angus MacDonald

After 19 years in uplands research and advisory work with NCC and SNH, Angus is moving on to undertake some further education, completing a Diploma in Statistics then an MSc in GIS. He will then be setting up as a consultant in October 2007.

A big thank you to all of you who have contributed to this issue.
We welcome any comments or views on this issue, or contributions for future issues.

Please contact our editor:
Sally Johnson,
JNCC Network Officer
SNH, 2 Anderson Place, Edinburgh, EH6 5NP. Tel: 0131 446 2056
Sally.Johnson@snh.gov.uk

Further information on upland and other habitats, as well as cross-cutting issues such as air pollution, climate change and soils, and the Lead Co-ordination Networks can be found on the JNCC website at: http://www.jncc.gov.uk/page-2. Follow the links in the left-hand list. 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.
~~~~~~