JOINT NATURE CONSERVATION COMMITTEE

Looking to the Hills

Newsletter of the Uplands Lead Co-ordination Network

Issue 13 **May 2005**

Welcome

CONTENTS

Welcome 1
Guest Editorial from Marcus Yeo 2
Climate change 3
Agricultural and other land management changes 6
Projects & Research 15
Snippets 21
Conferences and other events 22
Forthcoming events… 24
Uplands Staff across the Country Conservation Agencies 25

A huge amount of new work is reported here, clearly, a lot is happening in the uplands. Three things have struck us in this issue. First, a growing number of contributions relate to climate change. This is long overdue, as we must focus more research and thinking on understanding, and addressing, climate change impacts (remembering that change is not necessarily 'good' or 'bad'). Second, there is a growing theme of work which is considering reductions in grazing pressures in the uplands. Third, and this concerns what is not in the Newsletter, we have never had a single entry or submission on renewable energy developments – yet these seem to dominate a lot of the public debates on the future of the uplands! Like the earlier impacts of forestry and grazing, we run the risk of doing research and taking stock of the issue too late!

Enjoy this issue, and keep the contributions coming.

Des Thompson and Sally Johnson

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 Marcus Yeo

Looking back

Back in 1994 I was a (fairly) young and callow upland ecologist working for the Countryside Council for Wales in Bangor. As I grappled with the challenges of a new job, one of the activities I became involved in was participation in the newly-established Uplands Lead Co-ordination Network (ULCN). This was an exciting development for me, as it gave me the chance to engage with people doing similar work in other parts of Britain, and to contribute to nature conservation beyond the boundaries of Wales. Little was I to know that 11 years (and three job changes) later, not only would the ULCN still be going strong, but I would continue to have a connection with it …

It is fascinating to look back over the past 11 years. The ULCN was set up by the JNCC to provide advice on UK-wide and international upland nature conservation issues by bringing together specialists from each of the country agencies. This has proved to be a powerful way of working, and the Network has undoubtedly made a major contribution to UK nature conservation. Notable achievements include advice on the selection of a suite of Special Areas of Conservation (SACs) to fulfil the requirements of the Habitats Directive, the preparation of detailed guidance on monitoring upland habitats within protected sites, and the publication of a comprehensive guide to plant communities in the British uplands. All of this has been achieved under the leadership of Des Thompson, who has chaired the Network since its inception in 1994 (though he may not thank me for reminding him of this).

And looking to the future…

So much for the past – what of the future? Well, the JNCC will be going through some major changes over the next couple of years, and these will impact in various ways on the work of the ULCN. Important structural changes have taken effect in April 2005, when the JNCC established a company limited by guarantee, which will be responsible for delivering the organisation's work. This will not affect the type of work we do, but it will allow us to do it more effectively, for example by enabling JNCC to employ its own staff.

More importantly from the ULCN's perspective is the implementation of the JNCC's new 10-year strategy. The strategy builds on the JNCC's strengths (e.g. in data collation and dissemination), but also signals a significant shift in direction in some areas, including enhanced involvement in global nature conservation and greater consideration of the social and economic factors that affect wildlife. Over the next few years, specific activities that are likely to require input from the ULCN will include:

- advising on the UK's contribution to the World Summit on Sustainable Development target to achieve a significant reduction in the rate of global biodiversity loss by 2010;
- advising on measures to mitigate the negative impact of UK activities (such as trade, tourism and development aid) on biodiversity in other countries;
- developing a framework for terrestrial habitat surveillance across the UK;
- publishing annual statistics on the status of UK wildlife.

Looking further ahead, we anticipate further changes to the JNCC through the Natural Environment and Rural Communities Bill (recently published by Defra as a draft for pre-legislative scrutiny). In particular, we hope that the Bill will formalise the position of Northern Ireland in relation to the JNCC, so that all of the JNCC's functions extend across the UK.

This is, then, a period of major change for the JNCC, and the ULCN will inevitably adapt in line with this. The Network will also be affected by other changes within the nature conservation agencies, such as the formation of the 'Natural England' integrated agency in England (bringing together English Nature, parts of the Countryside Agency, and the Rural Development Service) and the relocation of Scottish Natural Heritage's HQ to Inverness. I am confident that the ULCN will continue to thrive during this period by maintaining its role of providing high-quality advice on upland nature conservation. Who knows – in 2016 I may be writing an article celebrating another 11 years of success!

Contact: **Marcus Yeo,** Director of Resources and External Affairs, JNCC.
Email: marcus.yeo@jncc.gov.uk

Predicting the impact of climate change on upland birds

Consequences for upland birds?

Most studies of changes in the timing of bird breeding in response to climate change have focused on temperate passerines. However, the consequences of such environmental change for UK bird conservation may be more severe for other groups, such as upland birds. To examine this, we have analysed large-scale climatic correlates of the timing of golden plover breeding, and the timing of emergence of their adult tipulid prey (both obtained from published sources), to assess the potential for climate change to disrupt breeding performance (Pearce-Higgins *et al.* 2005).

Golden plover laying dates and the timing of tipulid emergence were inversely correlated with spring temperature; birds nest earlier and their tipulid food supply emerges earlier in warmer springs (Figure 1.).

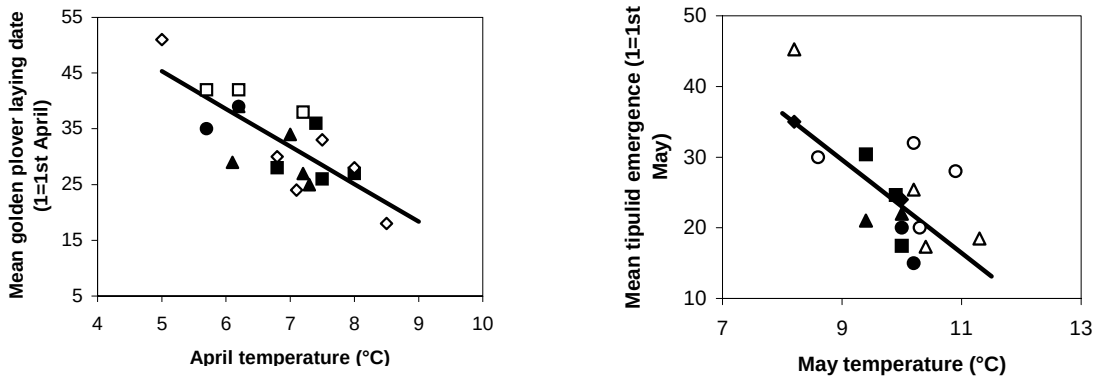

Figure 1. Correlations between golden plover first-laying dates and April temperature (left), and the peak of tipulid emergence and May temperature (right). Data from different study locations presented as different symbols.

In combination with historical climate data, our models suggest a nine day advancement of golden plover first laying dates occurred during the 1990s. Climate predictions for 2070-2099 suggest potential advances in golden plover first laying dates by 25 days, mean first-clutch dates by 18 days, and tipulid emergence by 12 days. Given the importance of adult tipulids to young golden plover chicks, these changes may result in a mismatch between the timing of first-laying dates and tipulid emergence, so reducing the success of early breeding attempts.

New RSPB-SNH project

This work forms a precursor to a new RPSB-SNH project commencing in 2005 on the impacts of climate change on upland birds. This new project will have two components, a literature review, and analysis of existing data on breeding phenology of upland birds, and their prey. The aim of the literature review is to allow the likely sensitivity of northern and upland species to be assessed, drawing inferences from studies of other species as appropriate. The analytical component will repeat the approach described for golden plover, for as wide a range of UK northern, moorland, montane and blanket bog species as possible. Thus, data on the timing of breeding will be collated from published, grey literature and unpublished sources, and correlated with relevant climatic measures to assess the relative sensitivity of each species to climate change. Where relevant, an assessment of likely changes in the phenology and magnitude of peaks in abundance of key prey will also be quantified (e.g. caterpillars, chironomids and meadow pipits). This will test the hypothesis that future climate change will decouple the link between the timing of bird breeding and peaks in abundance of their prey, allowing an assessment of the relative sensitivity of each species to climate change.

An important part of the work will therefore be to collate existing data on annual variation in the timing of bird breeding, breeding success, and bird abundance from a wide range of sites, to allow correlative analyses in relation to spatial and temporal variation in weather. Additionally, we will

require data on temporal and spatial variation in the abundance of invertebrates (focussing on Araneae, Hemiptera, Lepidoptera, Diptera, Hymenoptera and Coleoptera groups), and mammalian (primarily voles) prey, to conduct equivalent analyses on prey groups. These data will be analysed to model climatic correlates of prey abundance, and where appropriate, the phenology of peaks in prey availability.

Seeking more data

I would be interested to learn of any studies (including unpublished reports / theses) or data sets that could potentially contribute to such analyses. At this early stage, if you hold such information which you would be interested in contributing to the project, even if it is one or two years of data from one site, then please contact James Pearce-Higgins (details below).

Pearce-Higgins, J.W., Yalden, D.W. & Whittingham, M.J. (2005) Warmer springs advance the breeding phenology of golden plovers *Pluvialis apricaria* and their prey (Tipulidae). *Oecologia*.

Contact: **James Pearce-Higgins**, RSPB, 25 Ravelston Terrace, Edinburgh, EH4 3TP.
Tel: 0131 311 6559, Email: james.pearce-higgins@rspb.org.uk.

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Montane moths – an indicator of climate change

Of the twelve UKBAP 'Priority' moths in Scotland there are only two that can truly be classified as montane - the netted mountain moth *Semiothisa carbonaria* and the northern dart *Xestia alpicola alpina*. Their life-cycles and behaviour are adapted to their harsh environment.

The netted mountain moth

The day-flying netted mountain moth (Figure 1.) is a small to medium-sized moth with a wing-span of 23-25mm (c1”). Its UK distribution is centred on the Cairngorms with outlying sites in Moray, Easter Ross and northern Perthshire where the majority of colonies occur at moderate altitudes 200-750m (600 –2500ft). Its caterpillars only feed on bearberry (*Arctostaphylos uva-ursi*) (Figure 2.) where this grows in extensive carpets. The moth times its life-cycle to enable its caterpillars to feed on the freshest young leaves and shoots of the new season’s growth. It pupates in the autumn, overwintering in a cocoon on the ground. The adults are on the wing from the end of April until early June, however, populations at more sheltered or lower altitude sites emerge several weeks before those on more exposed or higher ground.

Figure 1. The day-flying netted mountain moth. Photo bv Rov Leverton

Figure 2. Bearberry, the sole foodplant of the netted mountain moth. Photo by Tom Prescott

Both sexes are similar and fly in sunshine, but on windy days walk or make short hopping flights just above the vegetation. The moth’s dark colouration probably allows it to readily absorb heat from the weak and irregular Highland spring sunshine enabling the adults to become active quickly to feed on nectar from moorland flowers. Care should be taken not to confuse the Netted Mountain Moth with the slightly larger Common Heath that also shares these upland haunts, flight period and day-flying habits. The Common Heath comes in different colour hues, the darker grey forms being very similar to the Netted Mountain Moth. Common Heath caterpillars,
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however, are not as fussy and feed on most types of heather. It is therefore more widespread and occurs on virtually all moorlands in Scotland.

The long-term survival of the netted mountain moth, as with many other species, is more likely if sites are linked, enabling an exchange of adults between neighbouring colonies. The fragmentation of suitable habitat is damaging making the surviving populations more isolated. The fortunes of the netted mountain moth are directly linked to the presence of extensive areas of bearberry. If bearberry heaths are not burnt, then bearberry becomes scarce as heather slowly dominates. In the absence of controlled burning, bearberry can maintain its presence on disturbed ground, especially steep slopes, track and verge sides or in more exposed conditions usually at higher altitudes under natural erosion.

In May 2004, Butterfly Conservation Scotland ran a netted mountain moth day at Newtonmore. The aim of the day was to survey two key sites to give participants field experience of the moth and encourage them to survey other sites. The resulting survey produced over 60 records from around 12 sites, included the discovery of 4 new colonies, showing that the moth is probably quite widespread in the Cairngorms area. It is believed that the remoteness of its habitat, elusive nature of the adults, combined with visiting lepidopterists only visiting one or two favoured sites has led to this species previously being under-recorded. Further survey work is planned in 2005.

The northern dart

The northern dart (Figure 3.) is more widespread and is primarily found at altitudes above 450m (1500'), though in Shetland it is known to occur at much lower altitudes. It has been recorded from most of the mountain ranges in Scotland including the Southern Uplands as well as the more mountainous offshore islands.

Its caterpillar's main foodplant is crowberry (*Empetrum nigrum*) but heather (*Calluna vulgaris*) and other mountain plants are also probably used. Like other moths living at high altitudes and latitudes the caterpillars develop slowly in the cooler climate. As a result the caterpillars, which hatch in August, generally overwintering twice before becoming fully grown in the May of their second year. They pupate in late May - early June at ground level under lichen and moss in close vicinity to the foodplant, or under mats of crowberry growing over flat rocks. The adults are on the wing from mid-June to August and fly late at night and are attracted to light. They have also been recorded flying in hot sunshine during the day.

Figure 3. The variegated northern dart is chiefly found above 450m. Photo by Roy Leverton

Interestingly its two-year life-cycle has resulted in most local populations being *in sync,* with most adults emerging in either even or in odd years. In Scotland the adults seem to be on the wing in even-numbered years in all parts except Ross-shire. However, the Northern Dart is so under-recorded that this is uncertain. This is illustrated by the results of a three year SNH funded project (2002-2005) *"Scotland's Butterflies and Moths: - Implementing Action Plans"* implemented by Butterfly Conservation Scotland. One important aspect of the project was to raise the profile of Scotland's UKBAP Priority butterflies and moths. For all species, apart from the northern dart, there has been a significant increase in records in the current five-year recording period compared to the previous five years, with a noticeable increase during the course of the project. Hopefully this will soon change. National Moth Night is Britain's annual celebration of moths and moth recording organised jointly by Atropos and Butterfly Conservation. The date varies each year to enable recording to focus on different species. Although 2005 is an odd year, the northern dart is one of the target species on 9th July.

Excellent indicators of environmental change

As both netted mountain moth and northern dart illustrate, many moths and butterflies have very strict habitat requirements, particularly in their early stages. They can, therefore, be at great risk from changes in their habitat, however, their short life-cycles and specific requirements make them highly responsive to environmental changes. They are both excellent biodiversity indicators and flagship species for these habitats.

Studies on the effects of climate change on butterflies have shown that as temperatures rise, northern species that prefer a cooler climate, are being forced to seek habitat further north and at higher and higher altitudes. The worry is what will happen to our montane moths as they retreat uphill to an ever decreasing area of habitat. It is vitally important that we learn more about these sensitive species and their current status and distribution.

Contact: For more information on netted mountain moth, northern dart and National Moth Night contact **Dr Tom Prescott,** Butterfly Conservation Scotland.
Tel: 0870 7706160, Email: tprescott@butterfly-conservation.org
or visit www.butterfly-conservation.org and www.nationalmothnight.info.

Agricultural and other land management changes

Implications of changing grazing intensities in parts of the Peak district

In the 1980s the National Trust (NT) changed its grazing policies on three properties in the Peak District. Two of these, one on the western slopes of Kinder Scout, the other to the east of the Ladybower, Derwent and Howden reservoirs on the River Derwent, were mainly open moorland, but the third is enclosed land at Lyme Park in north east Cheshire. The following gives details of changes.

Western slopes of Kinder Scout

From 1983 sheep were continually herded from the vulnerable eroding western slopes of Kinder Scout, reducing grazing pressures from about 0.4 ha per sheep to 5.6-2.3 ha per sheep. The results are briefly described by Wilson (1993) and more fully by Anderson and Radford (1994). By 1990 vegetation cover along the 12 monitored transects had increased from 49 to 92 %. However, vegetation cover was greatest (94-98 %) on the lower (450m) and gentler (c.11^{o}) slopes and lowest on the very steep (c.30^{o}) upper (530m) slopes. After ten years the vegetation had changed from a severely degraded acid grassland to a rich heath community with heather and bilberry beginning to dominate. The NT considers that the recovery of the Kinder hillsides is almost complete.

East of Derwent Reservoir

Two localities within the one property have been monitored for erosion. A small catchment to the east of the River Derwent since the mid 1960s, and part of the nearby Derwent Edge since the mid 1970s. Photographs have been taken to record the eroded sites. Some of this work has been described previously but has now been updated (to 2001) and a full account is given in Evans (2005). Some other implications of reducing grazing pressures in the uplands, based on this work, with regard to vegetation changes, especially tree regeneration, were noted earlier (Evans 2002).

A reduction in sheep grazing pressure in the winter of 1968/9, due to a harsh winter and a poor crop of lambs, led to colonisation of bare soil patches in acid grassland in much of the catchment (land lying between 253-422m) but not on the higher (510-525m) land of Derwent Edge. Sheep grazing pressure was permanently reduced in the early 1980s as part of a new grazing regime. Many formerly eroding sheep scars in the small catchment have over time become completely colonised by vegetation and only those scars still actively used by sheep remain. It took two decades before vegetation began to invade the bare soil on the higher slopes. There it was not until all the peat and underlying leached soil horizon was stripped off that vegetation was re-established. Colonisation is a rapid process and c.80% of the bare soil is covered within 5-10 years. Factors other than sheep grazing pressure that exacerbated erosion were a cooling climate

through the 1950s and '60s and the presence of cattle on the slopes in the 1960s. Temperatures have risen since, then and cattle no longer graze the slopes.

Lyme Park

An unpublished report (Evans 1997) describes the past and present impacts of grazing on the Park. The walled Park, famous for being a setting in TV's adaptation of Jane Eyre's *'Pride and Prejudice*', lies between 170-380m and is underlain by north westerly dipping Upper Carboniferous sandstones and shales. Much of the southern part lies above 270m and was until very recently (see below) open moor covering *c.*392 ha. It is covered by purple moor grass, tussocks being up to 0.8m tall, with wet valley floor flushes with steep-sided narrow and deep channels, both obstacles are very difficult to negotiate unless you are a nimble four-footed animal.

Soils are very acid and poorly drained, often with a peaty surface horizon, coarser in texture and podzolic where over sandstone but finer textured where over shales. In places it can be seen where severe burns have occurred. Where the peat has burnt away soils are thinner and more bouldery and matt grass is dominant. On the lower slopes (<260-270m) of the south west corner of the Park, around Cluse Hey, a deeply incised valley, soils are generally freer drained and shallow over sandstones and shales. The vegetation here is more varied comprising acid grasses, bracken and isolated trees and heather and bilberry are occasionally found. The vegetation is described by the National Trust as ancient Wood Pasture. There is much bare shale exposed flanking the very steep (30^{o}+) valley sides, especially on the west facing slopes and under isolated trees. Cluse Hey and its east bank tributaries are separated from the upper slopes by a wall, possibly of similar age to the Park boundary wall.

A wall was probably re-built around the Park to enclose deer beginning in the early 1700s. The slopes may well have been dominantly covered by heather moor at that time. Heather is still found just to the south outside the Park, now mostly fenced off to stop its recent rapid decline (almost halved in area between 1964 and 1996) due to overgrazing by sheep. At the turn of the twentieth century Moss (1913) noted the eastern portion of the Park was acid siliceous grassland. Continuous grazing by deer (and sheep) have led to the purple moor grassland we see now.

Red deer have grazed the Park for many centuries and occasionally numbers have been very high (>1000), as in the 1960s when it was not unknown for 50-60 animals to die every winter (Shane Bates, personal communication). In 1996 about 360 deer grazed the Park, up from about 250 in 1977, although the number has been as low as 153 in 1984. Sheep were removed from the Park in 1988 when the National Trust took the land back in hand from the Local Authority. Prior to that 1000 sheep grazed the Park in summer and 400 in winter. In September and October 1996 when a rapid survey was undertaken highland cattle were also grazing the Park. Grazing intensities were generally low (deer >0.4 ha per animal, cattle >2.7 ha) except on steeper low sandstone escarpments with short acid grasses where red deer were found (*c.*0.1 ha per deer). Rabbits were formerly found in the Park, but are no longer.

In 1996 actively disturbed bare soil was found only where cattle had been feeding around supplementary feeding points, where deer had created wallows in wet ground and rutting circles in peat and where they had broken down stream channel banks. Scars formed by sheep occasionally showed signs of disturbance of the backwalls by deer.

However, the very steep bare shale scars of Cluse Hey, the largest of which was big enough to be shown on OS 1:10 560 maps after 1910, but not before that (1881, 1899), showed little sign of disturbance and a small number of low gorse plants (<*c.*0.3m tall) was present. Many of the bare soil scars formed by sheep were becoming colonised by acid grasses and their backwalls were unrubbed and mosses and lichens were becoming established on them. Walkers in the Park said that terracettes on steep slopes were less obvious in Cluse Hey than they had been earlier in the 1990s.

Recent observations

A rapid visit to Cluse Hey one afternoon in January 2004, armed with photos from the previous field visits, showed that the sheepscars were more overgrown and the backwalls stable. The very steep slopes on shale were no longer being disturbed, and small rills had formed cutting into the surfaces. Terracettes flanking the shale slopes were less visible than in 1996 and in general grass

was encroaching onto the margins of the bare soil. Only in a few places had isolated tussocks of grass become undercut by weathering and fallen down the slope. What was most striking, however, was the further colonisation of the large shale scar. This now had a number of large gorse bushes on it, up to *c.*2m tall, and the margins and surface were being further encroached upon by grasses. Most noteworthy was that a number of spruce saplings, <c.2m tall, were growing from the shale surface. These had seeded from the trees in the plantation just over the wall, a few metres away.

Since 1996 the wall separating Cluse Hey from the upper moors has been rebuilt and now keeps the deer from encroaching onto the ancient Wood Pasture and its bare shale slopes. Many trees have been planted. The large shale scar by the plantation has been fenced off. On one side the fence runs a sharp break of slope, with the steeper slopes away from the revegetating shale scar. The grasses within the exclosure are longer and the shorter grazed grasses on the steep slope are somewhat terracetted. However, comparing photographs taken in 1996 and 2004 it can be seen the terracettes are in general less visible in 2004 and the slope appears less tracked by animals than it was in 1996.

Some conclusions

In all four localities (two to the east of the Derwent valley) a reduction of sheep grazing pressure has allowed the colonisation of bare soil by vegetation. Once colonisation starts the scar appears to become stabilised and well covered by vegetation within about a decade.

However, whereas in Lyme Park sheep have been completely removed from the moors, and grazing pressures greatly decreased on the western slopes of Kinder, to the east of the Derwent it seems that a reduction in number by only about 30%, resulting in one sheep grazing 0.3-0.5 ha of land in summer or 0.75 ha all year round, has been sufficient to allow revegetation. Rather than stopping grazing altogether such an approach may be a more feasible and economic way for the land manager to tackle overgrazing.

It appears that in Lyme Park in comparison to sheep, red deer are far less efficacious at initiating and maintaining bare soil.

Throughout the Pennines there are exposures of shales on very steep (30^{o}+) valley sides. I had considered that many of these scars were initiated when trees were stripped from slopes so destabilising them. The thin soils moved slowly downslope over the shale due to gravity leaving a substrate sufficiently unstable that plants could not colonise it. The evidence from Lyme Park suggests that if such steep slopes are not tracked by sheep they may, if suitable plant species such as gorse are close by, be quickly colonised. More quickly than if only by grasses.

Such shale slopes may provide sufficient nutrients to the plant for it to become rapidly established unlike on nutrient poor and very acidic subsoils on peat or leached podzolic horizons.

Changes in grazing policy, such as those described here which were brought in by the National Trust, indicate the way Government policy could be take in combating overgrazing in the uplands.

Anderson P & Radford E (1994). Changes in vegetation following reduction in grazing pressure on the National Trusts's Kinder Estate, Peak District, Derbyshire, England. *Biological Conservation* 69: 55-63.

Evans R (1997). *Lyme Park's vegetation and the impacts of grazing upon it*. Report for Lancaster University Archaeological Unit (now Oxford Archaeology North) for the National Trust.

Evans R (2002). Recovery from erosion following reduction in grazing in the Peak district. *Looking to the Hills* 11: 13-14.

Evans R (2005). Curtailing grazing-induced erosion in a small catchment and its environs, the Peak District, central England. *Applied Geography* 25 (1): 81-95; available on-line since December 2004.

Moss, CE (1913). *Vegetation of the Peak District*. Cambridge University Press.

Wilson D (1993). Ten years on: Kinder Scout. *ENACT* 1: 4-6.

Contact: **Bob Evans**, Department of Geography, APU, East Road, Cambridge CB1 1PT.
Tel: 01223 363271 x 2180; email: r.evans@apu.ac.uk

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Local help with regeneration of fire damaged moors in the North York Moors

Background

A wildfire ran out of control in September 2003, and badly damaged 250ha of SSSI moorland and over 30 Scheduled Monuments on Fylingdales Moor. We have since had to re-vegetate the moor. English Heritage funded a rapid survey recording over 2,400 archaeological features, many of them previously unknown. Professional advice was sought from Val Hack and Penny Anderson who emphasised the urgency for work to begin. Several inches of peat were lost in the exceptionally intense blaze, destroying the seed bank and leaving a bituminised surface. English Heritage, English Nature and the North York Moors National Park Authority pooled resources and embarked on Phase One of the recovery project, which cost £55,000, and lots of staff time.

Figure 1. An aerial photo taken in November 2004 showing the burn area. The top area which has not been treated and bottom area which was seeded in May 2004. Photo by English Heritage.

Management measures

The main objective was to stabilise the remaining peat and scorched soil which was being blown and washed off the site in the first months after the fire. The blocking of gullies with small heather bales proved very successful and the National Park's 'modern apprentices' were a great help doing this and other fiddly jobs. In May 2004, 60% of the site was sown with nurse grass and heather seed. This work was done on quad bikes by a specialist contractor, Matt Dinsdale, who had to work closely with archaeologists to ensure that no damage occurred to exposed features. By mid summer the seeded areas had changed from black to green. We were very lucky to have had such a damp summer!

A total of 1,300 of the locally harvested heather bales were airlifted to sensitive areas of the site and were spread by volunteers. Wavy hair-grass seed was harvested from the North York Moors and then spread by a local contractor, Ian Fletcher, using his quad bike and specially adapted seed collector and spreader. To increase species diversity, cross-leaved heath and bell heather were hand collected and spread from adjacent sites.

Figure 2. Ian Fletcher sowing heather seed in Nov 2004 on a previously untreated area.

Early results

Less than a year after the fire it was clear that areas which had suffered relatively cool burns, especially the wetter cotton grass areas, would regenerate quite happily on their own. However, there were still extensive areas of bald, black ground showing no signs of recovery. The Strickland Estate, as landowner, has been successful in agreeing a Countryside Stewardship Special Project with DEFRA's Rural Development Service. This will provide £192,000 for Phase Two of the work, which began in October 2004 and will run for two years. The money will be spent on more of the same work but all will be done by local contractors and suppliers using local heather seed,
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brash and wavy hair-grass seed.

The re-vegetation will be monitored over the next two years, after which a decision will be taken as to whether any further works are necessary. This case has highlighted the need to avoid having large areas of unmanaged heather without sufficient firebreaks and English Nature are working with the Estate to implement fire control measures through a Wildlife Enhancement Scheme.

Contact: **Rachel Pickering,** Moorland Project Officer, North Yorkshire Moors National Park (Joint funded by English Nature).
Email: R.Pickering@northyorkmoors-npa.gov.uk

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Sustaining upland agriculture in Cumbria: the Fell Farming Training Scheme

The Challenge

The current upland landscape of Cumbria has been shaped by the activity of farmers for thousands of years (Winchester, 2000). The driving force is the hill farming system, which operates through a form of transhumance (the movement of livestock, mainly sheep, up and down the hillside depending on the time of year). This flow of stock has led to open unenclosed moor and grassland developing on the higher ground and a valley-bottom, enclosed, walled landscape of small fields and barns. Such a system requires high numbers of people to gather over large areas of open fell with well trained sheep dogs.

Over the last twenty years hill farming has begun to struggle to survive economically, as the cost-price squeeze has tightened its grip. For many farms, gross margins are down to around £5000/ year (Chadwick, 2003). Reduced incomes have led farmers and their families to take difficult decisions. Many now have no labour beyond the immediate family, most none at all. Further problems are emerging at the other end of the life cycle. The average age of farmers is now around 57 (Defra, 2000). Few have heirs who wish to continue the farm or simply have no heir at all. This situation is leading to a transfer gap in cultural inheritance in terms of traditional skills and knowledge related to the hill farming management system. This is the main reason why the *Fell Farming Traineeship Scheme* (FFTS) was set up by a consortium of land management organisations in Cumbria led by the Cumbria Fells & Dales LEADER+ (LEADER+ is an EU funded initiative designed to support small projects at the grassroots level to aid in economic and social rural development).

It would be remiss to assume that the FFTS is simply there to continue a farming system, which to some is outmoded, uneconomic and destructive of the environment. The value of hill farming goes much deeper for the Nation and is often overlooked. First, the hill farming sector forms the underpinning for the sheep *stratification* system in the United Kingdom. Second, the hill farming sector is responsible for a landscape we now cherish for its habitats and wildlife (Fielding & Howarth, 1998). Finally, the upland landscapes produced are used extensively for tourism and leisure. Indeed, the Lake District National Park Authority's campaign for World Heritage Status rests squarely on the perpetuation of a landscape produced mainly by hill farming (Chitty, 2002).

With the decline of hill farming, addressing these additional benefits has become more demanding as the labour force has declined. This economic crisis has been exacerbated by changes in EU and UK agricultural policy, which has led to undesirable landscape and environmental impacts in hill farming areas (eg. Fuller *et al*. 2002; Hester et al. 1996; Petit *et al*. 2003). New ideas in environmental land management have gone some way to halting these changes through the operation of the Environmentally Sensitive Areas Scheme and the Countryside Stewardship Scheme (MAFF, 1997; Morris & Young, 1997). However, the improvement as a result of these schemes is not always universal (Finch & Slater, 2003; Slater, 2003).

There are a number of reasons why we should maintain a hill farming community:

- To secure knowledge transfer
- To produce a desired upland landscape environment
- To underpin other cultural and economic needs

Thus the FFTS was devised as an appropriate vehicle to help address these challenges.
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The Solution - The Fell Farming Traineeship Scheme

The Fell Farming Traineeship Scheme is a pilot project devised 3 years ago by the Cumbria Fells & Dales Leader+ as part of a consortium of agencies including English Nature, National Trust, RSPB, the Lake District National Park and Yorkshire Dales National Park. The scheme has run for the last year from July 2003 to June 2004. The overall aim of the scheme was:

> 'To tackle the issue of providing the effective transmission of the culture (skills, knowledge and understanding) of hill farming in a situation where the labour market is falling.'

The project revolves around the training of young people between the ages of 16 and 30 who would, otherwise, have no opportunity to enter into the hill farming sector. The hope was that these young people would remain in the sector and take over farms as the older generation retired.

Each trainee is placed with a cluster of farmers. Each 'farmer ring' has a lead farmer who mediates the patterns of work between the farms in the ring. The farm ring comprises of 4 or 5 farms each of which has a different enterprise mix. All farms have a hill sheep enterprise as well.

The trainee then moves around the farms to an agreed pattern of attendance. During their time on the farm, the trainee works with the farmer and any other staff to learn stock tasks, estate and machinery skills in context. At various points the trainee is taken off the farm and put through a range of competence based certificated courses or training days.

The Evaluation

The Centre for the Management of the Uplands (CMU) were brought in to evaluate the scheme. The evaluation's overall aim was to identify and evaluate the learning outcomes of the FFTS with a view to 'mainstreaming' the scheme. Specific objectives included:

- To measure the acquisition of skills, knowledge and application of learning the trainees over the life of the project
- To measure the awareness of the trainees of the opportunities for income generation alongside traditional farming, and identify the skills needed to maximise this potential
- To identify the wider benefits of the scheme for participating farmers and the wider community
- To compare the FFTS training method with other similar schemes

A range of techniques were used to address these aims and objectives including: informal interviews, diaries, practical skills assessment and an environmental goods exercise.

The Results

Some of the results are summarise here, and the authors would be happy to provide more details on request. The evaluation has provided positive evidence that the trainees have acquired hill farming skills, with individual's improving at different rates, this was to be expected. Trainees were provided with opportunities to develop skills to enable them to appraise on-farm non-farm income streams. However, all trainees tended to focus on farming activities rather than diversification. This was demonstrated through poor results in the environmental goods exercise. Informal and formal feedback overwhelmingly supported the view that hill farming and the FFTS provide wider benefits for the rural communities in which hill farmers (and trainees) operate. The farming community was particularly pleased with the scheme as it has shown that there is a need for the hill farming sector to continue. With regard to training methods, it is suggested here that a 'pick-and-mix approach of the best bits of all types of training delivery be developed in a coherent and structured manner.

The evaluation has shown that hill farming is an essential part of the upland landscape and environment. However in order for it to survive there needs to be a skilled labour force. The FFTS offers the opportunity to ensure hill farming continues. The evaluation team strongly recommend further support for the FFTS as it has filled a niche that other mainstream training modes fail to address. The essence is that the FFTS is trainee-centred, supported by a range of professional hill farmers and land management staff, all of whom are immersed in the actual working environment. Furthermore, the FFTS model of hill farming training provides a range of added benefits and values that other schemes cannot provide immediately, whereby trainees are trained within the environment in which they are already working. In this way the FFTS offers, from 'day one', wider

benefits to the community, increased economic security for the individual and farmers, management of the upland environment and a broad based educational package.

A full account of the evaluation can be obtained from Cumbria Fells & Dales LEADER+ Redhills, Penrith, Cumbria CA11 0DT or from CMU.

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Contact: **Lois Mansfield & Harry Martin**, Centre for Management of the Uplands (CMU), Penrith Campus, UCLan, CA11 0AH. Tel 01772-894177, Email: lmansfield@uclan.ac.uk

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Fire and cattle on moorland – suitable tools for promoting tree regeneration?

Background

Britain has lost almost all of its ancient native Caledonian pine forest. In the remaining pinewood fragments, promoting natural regeneration is usually a key management objective. The largest surviving remnant of pine forest in Britain is at Abernethy Forest, an RSPB reserve near Aviemore in the Scottish Highlands. Like many other such remnants, the forest adjoins large areas of heather moorland, much of it below the natural tree line. At Abernethy, encouraging woodland regeneration onto this moorland is an important aspect of reserve management. After RSPB acquired the main forested areas of Abernethy in the late 1980s, deer culls were significantly increased. These keep deer numbers low enough for most young trees to survive and grow. However, surveys in the 1990s showed that establishment of new tree seedlings was limited. We attribute this to increased depth of ground vegetation, particularly heather and mosses. This led to discussions among the reserve team and Scottish Natural Heritage (SNH) on methods of improving rates of seedling establishment. Ground disturbance, such as that produced by mechanical scarification, has been shown to improve rates of tree seedling establishment.
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At Abernethy, we decided to look at two types of disturbance that are thought to be important in natural pinewoods - fire, and trampling by large herbivores – and investigate their potential as management tools.

Management experiments

Because of uncertainty over how effective these management approaches would be, we set up three small-scale management experiments. These test the idea that ground disturbance with fire or trampling, near to natural seed sources, will result in increased seedling establishment. There are two fire experiments (Figure 1), each with 10 plots, making up a total of about one hectare. Spring heather-burning was carried out at each plot at the start of the experiments. For this we used two fire fogging units and a team of 8-10 staff. There is one herbivore trampling trial (Figure 2), at a single, larger plot (*c*6 ha). In late summer, a small herd of suckler cows were brought to the experimental area and allowed to graze and trample the vegetation for two months. This was a single event rather than a prolonged grazing/trampling regime. In all experiments, numbers of seedlings establishing on burnt/trampled areas were compared with those on adjacent 'control' areas which were left unaltered. We took a range of vegetation measurements in experimental areas, to see if particular vegetation types indicate more suitable areas for using disturbance to promote seedling establishment. For similar reasons we also characterised the experimental management itself, by making measurements of fire and cattle behaviour.

Figure 1. Carrying out burning at one of the experimental fire plots, spring 2002. Photo by Shaila Rao.

Results

So far, our results from the burning trials have been encouraging. We found a three- to five-fold increase in seedling establishment rates following burning. Interestingly, slow-moving fires appear to be particularly suitable for creating good ground conditions for seedling establishment – the difference between slow- and fast-moving fires was similar to that between average fires and no fires. We still have questions to answer on using burning for regeneration e.g. will deer be attracted to burnt patches by fresh growth, hence preventing seedling development? Therefore, seedling

Figure 2. Cattle in the trial area, at the forest edge at Abernethy, late summer 2002. Photo by Gary Servant.

monitoring will continue for a number of years on the experimental burnt patches. However, we have been sufficiently encouraged to develop, with SNH, a prescription for burning heather-dominated patches in forest gaps, to promote regeneration. This management is currently under way and will take a number of years.

Our cattle experiment has so far pointed to poor seedling development. There have been significant impacts on the vegetation – such as a four-fold increase in light-level scores at ground level, and a similar increase in amount of bare ground. As yet we have found negligible numbers of new seedlings in the experimental area. But, again, we will be monitoring the area for a number of years. Seed rain in Scots pine woodland is highly variable between years and we have yet to have a really big seed year at Abernethy since the experiments began.

Acknowledgements

This work is supported by BP under the Scottish Forest Alliance. For further information, please contact Mark Hancock (re. the experimental studies), Andy Amphlett (re. developing prescriptions) or Desmond Dugan (re. implementing management) at RSPB Abernethy Forest Reserve, Nethy Bridge, Inverness-shire, PH25 3EF (email firstname.secondname@rspb.org.uk).

Contact: **Mark Hancock,** RSPB Abernethy Forest Reserve. Email: mark.hancock@rspb.org.uk

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Deer issues in Scotland: joint working between the agencies and the Scottish Executive

Wild deer are a valued part of the natural heritage, contributing to the maintenance of habitat and species diversity and to local economies through employment, tourism and venison production. However, the detrimental impact of too many deer (or deer in the wrong place) on habitats of local, national or international importance, continues to pose problems. The 1996 Deer (Scotland) Act introduced powers to control deer where they were damaging the natural heritage. However, a Scottish Executive review of the legislation in 2003 recognised that no single agency had the powers to adequately address deer impacts and encouraged the public agencies to work together to deliver sustainable deer management through an appropriate balance of incentive and regulation.

Over the last year there have been two significant inter-agency announcements which point the way forward for dealing with deer issues in Scotland.

The first announcement, in March 2004, was entitled an '*Agreement On Strategic Principles For Using Incentives & Regulation In Dealing With Adverse Impacts To The Natural Heritage, Woodland & Agriculture & Threats To Public Safety By Wild Deer*', was signed by the Scottish public bodies most closely involved with deer and other herbivore impacts (Deer Commission for Scotland, Forestry Commission Scotland, Scottish Executive Environment and Rural Affairs Department, and Scottish Natural Heritage). As it suggests, this agreement recognises the need for joint working to secure effective management of deer and other herbivores where their impacts on the environment or public safety are causing concern. A particular focus is placed on achieving effective local management on sites assessed as a priority by the agencies acting jointly. This agreement also formalised the inter-agency grouping (Deer Inter-agency Liaison Group, DILG) which seeks to maintain communication between the agencies and to arbitrate on a joint approach in cases referred up from local staff. In such cases, agencies will take careful account of the views of local owners and deer managers. For full details see http://www.snh.org.uk and go to 'Deer' in the A-Z index.

The second announcement, in June 2004, was a '*Joint Agency Statement & Guidance On Deer Fencing*', again agreed by DCS, FCS, SEERAD and SNH. The statement recognises that deer fencing can serve a useful purpose for controlling deer, helping to achieve environmental objectives and preventing deer causing a public hazard. However, the main focus of the statement is to provide landowners and public bodies with guidance on the issues that should be considered when deciding whether or not fencing is likely to be appropriate. Six key areas are identified as potentially high impact issues: public safety; deer welfare; biodiversity; landscape and cultural
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heritage; access; and socio economics. Hence, proposals should consider impacts and potential mitigation under each of these key areas before a decision is reached, with approval or financial support being dependent on any adverse impacts being adequately mitigated. More detailed guidance is under discussion to set out what form impact assessments should take. For full details see http://www.dcs.gov.uk/downloads/final%20fencing%20policy.pdf

Contat: **Jenny Bryce,** Deer Advisory Officer, SNH.
Tel: 01463 706 471, Email: jenny.bryce@snh.gov.uk

Projects & Research

Further development of the treeline model

Background

In the last issue of *Looking to the Hills* I reported on work to develop a treeline model, needed to set an upper limit to upland heath (which has been defined in the Biodiversity Action Plan in terms of potential natural treeline).

As a reminder, the model is a descriptive, multiple regression model using geographical position, aspect and topographic shelter variables for locations, checked in the field, where plants of tree and shrub species appear to be prevented from growing taller than 3 m because of climatic constraints. Thirty-five calibration sites were used scattered all over Scotland from Hoy in the north to Galloway and the Borders in the south, and from the Cheviots and Deeside in the east to Trotternish in the west. The model was then used to produce a GIS mask of the above-treeline area, at 50 m resolution, across the whole of Scotland.

This original model produced what appeared to be reasonably realistic patterns of occurrence in most areas, although I suspected that it probably overestimated the amount of ground above the 3 m treeline. This was a useful characteristic at the time as overlaying the mask on woodland maps allowed the identification of additional locations where the model could be checked and instructive anomalies sought. Anomalies were found, and somewhat unexpectedly, they were in the central Highlands such as around Rannoch and in parts of the eastern Cairngorms. In these areas, the predicted treeline seemed to be quite accurate in topographically sheltered locations but too low in exposed locations. The underestimate was occasionally, but very locally, substantial. In western and northern areas near the coast these anomalies did not seem to occur.

The anomalies were probably partly due to a high proportion of calibration sites being in the west and north, although I also suspected that topographic exposure might need to be weighted according to distance to the sea. Further locations were investigated in the field to give more sites in the central Highlands and provide greater variation in aspect within particular localities.

The new model

A new model has now been produced based on a total of eighty-one locations, and using individual topographic exposure values for eight compass directions weighted according to distance to the open sea (a GIS buffer was used to exclude narrow sea lochs and bays from what we considered to be the ‘open sea’).

This new model accounts for about 95% of the variation in the recorded treeline of the calibration sites. The model is simpler than the previous model, only using the topographic shelter variables from western directions as well a geographic location variables, and interactions between these. It does appear to greatly improve predictions in most of the anomaly situations (e.g. see Figure 1) as well as generally raising the altitude of the predicted 3 m treeline. The mask for above-treeline ground now accounts for 21% of the terrestrial land area of Scotland rather than the previous 29% (see Figure 2). Approximate 95% confidence limits for predicting the mean treeline altitude at locations where the treeline is at 100 m, 350 m and 600 m are +/- 10 m, +/- 23 m and +/- 28 m respectively. As always, predictions for individual locations will have wider confidence limits of +/- 29 m, +/- 75 m and +/- 95 m respectively. Although further progressive improvement of fit would be possible, the output now seems sufficiently accurate for HAP reporting purposes. The article in the

last newsletter highlighted how the model suggested that there were a much larger number of native woodland fragments that were likely to reach (or almost reach) the treeline than is commonly appreciated, particularly in the west. Despite the new model predicting a higher general altitude for the treeline, this is still very much the case.

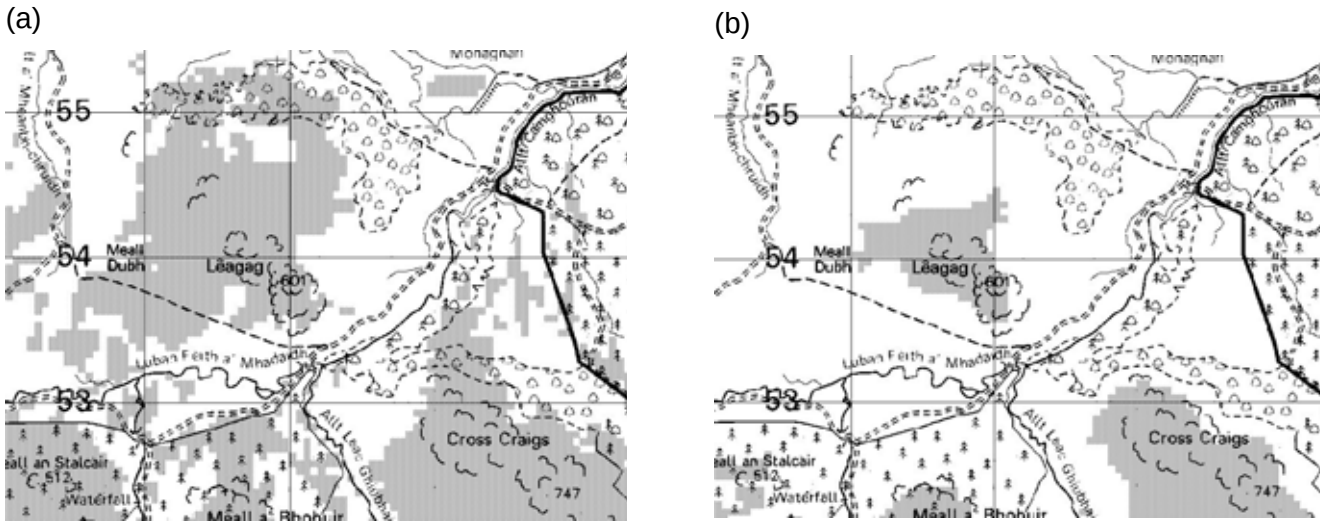

Fig. 1 Land above the predicted 3m treeline for the anomaly area in in Camghouran, Rannoch. (a) uses the previous model, and (b) uses the new model (basemap © Crown Copyright, based on Ordnance Survey data with the permission of the Controller of HMSO GD03135G0005).

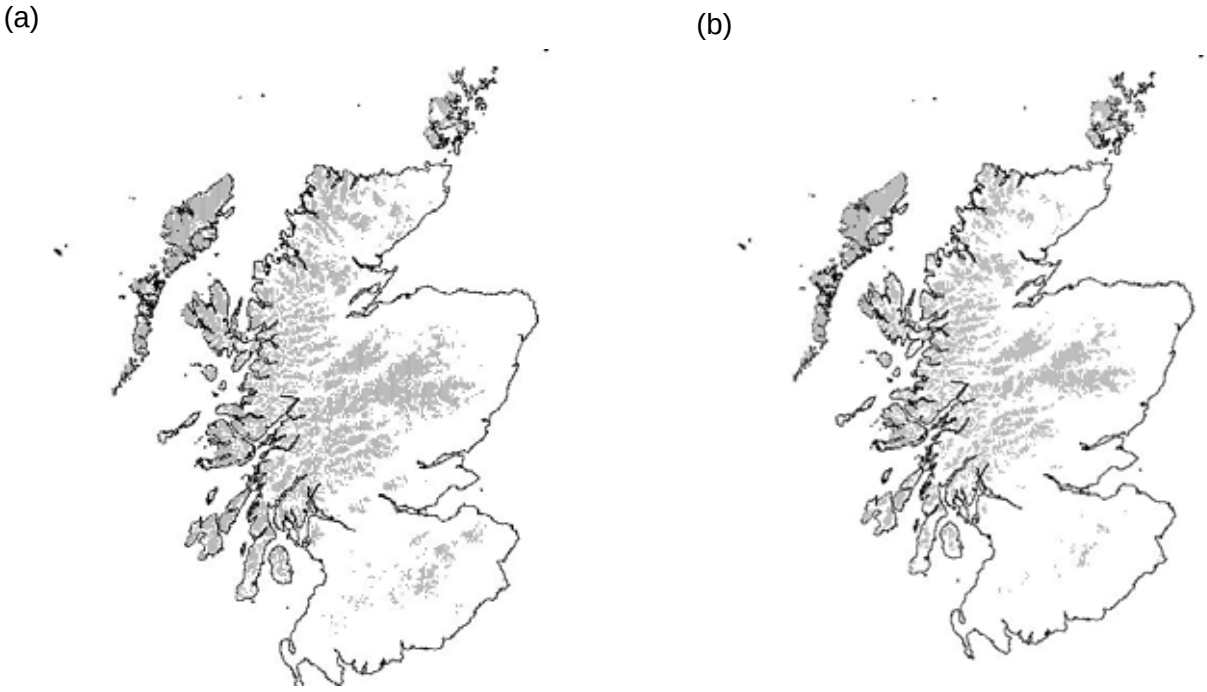

Figure 2. Land above the predicted 3m treeline in Scotland.(a) uses the previous model, and (b) uses the new model.

Contact: **Angus MacDonald**, Uplands Advisor, SNH.
Tel 0131 446 2474, Email; Angus.MacDonald@snh.gov.uk

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The application of satellite images for mapping upland vegetation and aiding bird conservation

Background

UK moorlands and blanket bogs are of national and international conservation importance, and hold important breeding bird populations, as well as being Biodiversity Action Plan (BAP) habitats. The extent of these habitats, together with physical problems of access and the nature of terrain, make these areas very difficult to survey. Remote sensing has previously been used successfully to map upland vegetation, although such work has defined habitats at a coarse grain. Mapping individual plant species, or similar groups of species, may be more useful when monitoring the condition of such habitats, and in predicting bird distribution and abundance. In collaboration with Scottish Agricultural College, we recently conducted a pilot study to examine the potential of using satellite images to produce extensive habitat maps of moorland vegetation, determining the cover of key individual species where possible. The applicability of this information in predicting bird abundance using bird - habitat association models was then tested (Buchanan *et al*, 2005).

Method

Satellite images are increasingly used across the world to map and monitor vegetation, especially tropical and temperate forest habitats. Improvements in technology have improved the quality and value of these satellite images and they are now being used to monitor other habitats, including moorlands. We undertook a supervised classification of a Landsat 7 image of south-east Scotland using vegetation data. These data, collected as part of another project, consisted of a large number of point samples, 1m long bits of bamboo cane, taken across 2km^2 plots (100 samples per plot), rather than the large, homogenous stands of vegetation that are more conventionally used. At each point the dominant vegetation type and height of plants was recorded. The accuracy of the resultant classification was tested using the plots that the classification was based on (training plots) and a new set of plots from the area covered by the satellite image (test plots). This showed that we were successful in identifying the cover of the commoner species (e.g. heather and purple moor grass – see figures below) but less successful at classifying the scarcer vegetation types (e.g. tall rushes, moss). In addition to vegetation composition, vegetation structure can also be important in determining site conservation value and bird abundance. We found that by using linear regression to relate reflectance to the height of dwarf shrubs and grasses we were able to extract some information on vegetation height from the satellite images.

Results

Encouraged by these results, we tested whether the information could be used to predict the abundance of two typical upland birds (red grouse and golden plover) over both the training and the test plots. Predictions of abundance based on the satellite derived data were of similar accuracy to those produced using the actual vegetation data for red grouse, but inclusion of the satellite data in the golden plover model produced inaccurate abundance predictions, due to over prediction of dwarf shrub height, suggesting that more refinement is needed. Following the success of this pilot study, similar methods are now being used to study the distribution of black grouse and ring ouzels, and identify potential reasons for declines in the populations of these two birds.

Next steps

The identification of upland BAP habitats, such as blanket bog and upland heath is increasingly important, and the restoration of degraded dwarf shrub habitats is seen as a priority in the BAP plans. The results of our work indicate that remote sensing may be a very useful tool in providing an objective assessment of vegetation extent and composition across extensive areas that, due to logistical constraints, would be difficult to monitor using conventional methods, such as field surveys. Previously, comprehensive surveys have been undertaken of blanket bog habitats using remote sensing (e.g. Reid *et al.* 1998). Development of a method that is robust across regions would enable the extent of such habitats to be monitored, while development of methods may permit monitoring of changes in condition too. Refinement of methods that can be used to assess vegetation structure from remote sensing may also enable the monitoring of structural changes.

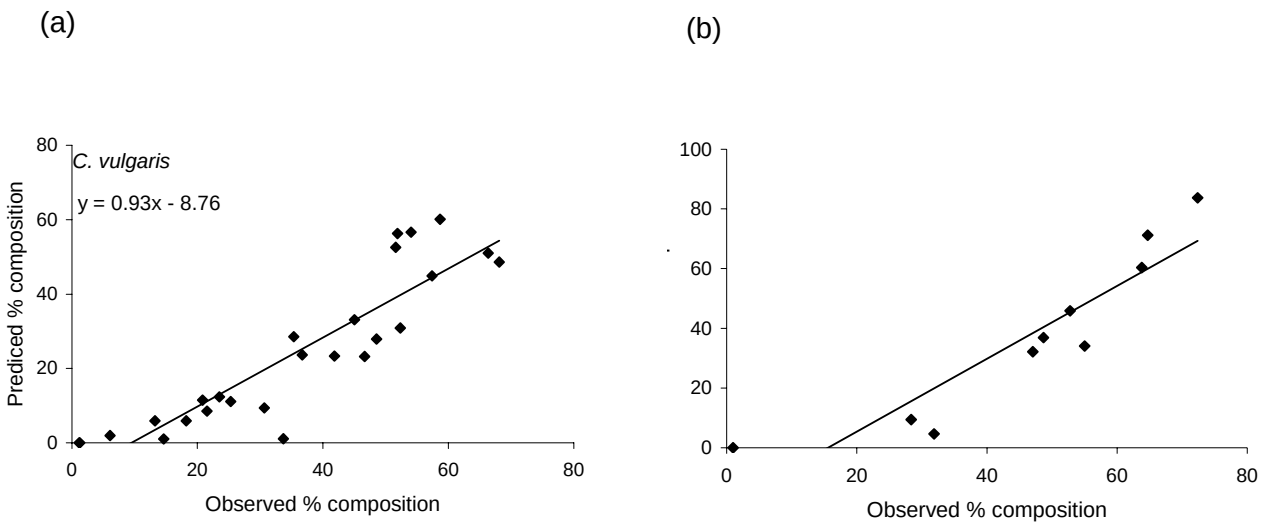

Figure 1. Relationship between observed heather cover and that predicted from a supervised classification of the satellite image across the training plots (a) and the independent test plots (b). Trend lines are least squares regression.

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Reid, E., Mortimer, G.N, Thompson, D.B.A. & Lindsay, R.A (1996) Blanket bogs in Great Britain: An assessment of large-scale pattern and distribution using Remote Sensing and GIS. In *Large Scale Ecology and Conservation Biology* (Eds. P.G. Edwards, R.M. May and N.R. Webb), pp 229-246. 35th Symposium of the British Ecological Society, Blackwell Scientific Publications, Oxford.

Contact: **Graeme Buchanan,** RSPB. Email: graeme.buchanan@rspb.org.uk

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The biodiversity of restored moors – some new results, and new challenges

Background

Techniques for moorland restoration have evolved rapidly over the last 10 to 15 years. Whilst the results of some earlier restoration attempts were disappointing in some areas, considerable success has more recently been enjoyed in the Peak District thanks to the pioneering work of Geoff Eyre. As Penny Anderson reported in the last issue of this newsletter it is now possible to successfully re-establish *Calluna vulgaris*-dominated vegetation on sites where it has previously been replaced by *Molinia caerulea*. Some success has also occurred on ground dominated by *Nardus stricta*, and work to recreate heather moor on areas covered by bracken continues. In 1995 the Upland Heathland Habitat Action Plan proposed a target of restoring dwarf shrubs to at least 25% cover on between 50,000 and 100,000 ha of land from which they had been reduced or lost due to inappropriate management. Clearly the Peak District experience has the potential to make a huge contribution towards achieving this target.

The restoration of the Peak District moors has entailed intensive mechanical habitat management methods. These include the use of a herbicide to kill the dominant grasses, scarification of the ground to create germination niches, and the spreading of *Calluna* seed that has been harvested from elsewhere and treated to encourage germination. It has been recognised for some time, though, that the flora of moors restored by such means may be depleted compared to moors in an original state. There have been concerns that such moors may therefore have an impoverished biodiversity.
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We have recently completed a 3 year project assessing the response of moorland flora and fauna to such restoration management. We have also studied the restoration of sites elsewhere in England and Scotland where heather moor vegetation has recovered from a highly suppressed state through the control or exclusion of livestock grazing.

Restoring vegetation assemblages

Quite distinct differences were apparent between sites restored by mechanical means and those restored by grazing control. Mechanical restoration was generally more successful in an extensive context with a continuous cover of *Calluna* achieved across large areas. On grazing control sites vegetation recovery was patchy and, whilst there were frequently large zones of vigorous *Calluna* and other dwarf shrubs, areas dominated by *Molinia* or *Nardus* remained. However, within these areas, where dwarf shrubs had regained dominance, the remainder of the vegetation assemblage was much more similar to the original state than was the case in mechanically restored sites. The dwarf shrub component contained larger quantities of bilberry, crowberry and even cranberry whilst the moss layer was much better developed under grazing controlled situations. The mechanically restored sites contained a more uniform and less species rich flora. However, techniques for re-establishing other moorland plants as part of the restoration process are continually developing and may pay dividends in future schemes.

Moorland insect assemblages

A novel part of this project was a survey of some of the insect faunas of restored moors. Hemiptera (bugs) were collected using a converted leaf blower as part of a suction apparatus, whilst moths were caught in light traps. Sampling was also carried out on degraded ground on which restoration had not yet begun and in nearby heather moor that might represent a suitable “target” for restoration. As a general conclusion, moorland restoration aided the reassembly of moorland insects; the insect faunas of all restored moors were more similar to the corresponding semi-natural area than the degraded area. However reassembly of the insect faunas was most successful on sites where the largest proportion of the original flora had been restored; in most cases, this meant sites managed purely by grazing control.

Barriers to invertebrate colonisation of restored moors

We hypothesised that, in addition to the composition of the restored vegetation assemblage, there may be other barriers to the successful recolonisation of heather moors by insects. We investigated the limiting influence of one such factor, distance, on colonisation by Hemiptera. This was done by artificially creating patches of heather moor habitat within a grassland at varying distances from a continuous block of heather moor that was a potential source of insect colonists. After one year, recolonisation of patches adjacent to the heather moor was very successful. However, colonisation effectiveness was much reduced at a distance of just 5 m from the heather moor source. Colonisation further declined sharply up to a distance of around 20 m, with more gradual decreases at greater distances. Whilst some moorland restoration is carried out immediately adjacent to established heather moor vegetation which can act as a source of colonists, other schemes are more isolated.

The experiment here was carried out over just one year and the reassembly of moorland insects might be expected to increase over a longer duration. However, the findings do show that caution is required in the selection of areas for moorland restoration, and that the reassembly of moorland fauna may take some time to occur.

Some recommendations

Previous monitoring of moorland restoration schemes has concentrated on the dominant plant, *Calluna vulgaris*. Clearly, widespread re-establishment of this species is crucial for any scheme to be considered successful. However, this project demonstrates that, in terms of wider aspects or moorland biodiversity, not all restored heather moor is the same. There are clear biodiversity benefits from allowing natural vegetation recovery where possible. Where degradation is more severe and active restoration is required, any remnant moorland vegetation should be retained, or restoration should be prioritising towards parts of the site as close as possible to established heather moor.

Acknowledgements

Our thanks go to the land owners and site managers who allowed access to their sites and to the Natural Environmental Research Council and Macaulay Institute for funding the project.

Nick Littlewood[1&2], Robin Pakeman[1] and Sarah Woodin[2],

1. Macaulay Institute, 2. University of Aberdeen

Contact: **Nick Littlewood**, Macaulay Institute, Craigiebuckler, Aberdeen, AB15 8QH.
Tel: 01224 498200, Email: n.littlewood@macaulay.ac.uk

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Re-introduction programme for oblong woodsia *Woodsia ilvensis* in Britain

Background

The oblong woodsia *Woodsia ilvensis* is a rare fern that used to be found in several choice localities in the hills of Wales, the North of England and Scotland. Because it was so rare it was especially attractive to Victorian botanists. It was found around Moffat in the Scottish Borders, for example, and a book was produced called '*The Ferns of Moffat*' with blank pages to fill with pressed specimens. This inevitably included oblong woodsia and would have added to the pressure on the fern, with whole plants collected instead of merely a single frond. By the 1990s the only two locations in the whole area were on opposite sides of one valley. One site had just one plant; the other had two, although there had been twenty-five plants when it was first found in the 1950s. Spores were collected under licence to test viability, and plants were successfully propagated at the Royal Botanic Garden in Edinburgh, although there appears to be some inbreeding depression which might account for the lack of regeneration. As spores were also collected from all the British populations, the resulting progeny make up a conservation collection that is carefully maintained at the Botanic Garden. This collection contains most of the genetic variation found in Britain, and if any colony should be completely lost it would theoretically be possible to replant a population with a similar genetic structure. Additional plants have also been grown to use in re-introductions.

Fig 1. Oblong woodsia *Woodsia ilvensis*

Recent re-introductions

In 1999-2000 and 2003-2004 two re-introductions were made into sites where the plant was until then absent. Careful searches were made, using ropes where necessary, to ensure that there really were no plants left. For the two Moffat re-introductions, locally sourced plants were used. For the other two sites in Teesdale (both 1999-2000), there were no local plants so a mixture of all the British plants was used, in case single-site plants suffered from inbreeding. In no instances were existing populations augmented. All the re-introductions have been into 'plant-extinct' sites.

Progress

The plants in the three 1999-2000 re-introductions have now been monitored over a five year period. As it was difficult to plant into rock crevices some plants were put into adjacent scree. It was feared that these scree plants might be especially vulnerable to grazing but this has not been a major problem. Between 50% and 90% of the introduced plants have survived, and at least two thirds of these are producing good spores. The most recent re-introduction was into Carrifran where the Borders Forest Trust are reforesting the whole valley. This was a very well-known *Woodsia* site in the past, and the re-introduction is located just above the treeline. By providing a local spore source it is hoped that plants might once again colonise the most appropriate sites, if suitable conditions occur. It could be, however, that climate change is having an increasingly adverse effect on this species already at the edge of its range. It is still too early to assess the
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success of this most recent site, but, as for all the re-introductions, success can only be demonstrated if regeneration is observed.

Contact: **Dr Heather McHaffie**, Royal Botanic Garden Edinburgh.
Tel: 0131 248 2876, Email: H.McHaffie@rbge.ac.uk

Snippets

Congratulations … to the authors of '*An illustrated guide to British upland vegetation*' for the award of the Presidents' Prize from the Botanical Society of the British Isles (BSBI) and The Wildflower Society. The book was praised for making the NVC more accessible to students, researchers and land managers. The authors, all regular contributors to *Looking to the Hills,* are: Alison Averis, Ben Averis, John Birks, David Horsfield, Des Thompson and Marcus Yeo.

CCW… have just produced guidance on where burning and cutting on upland and lowland dwarf-shrub heath and blanket bog should and should not normally be consented in Wales. There is also guidance on preparing and assessing management plans for burning and cutting. This will hopefully help with the national reviews of burning guidance and improve management on statutory sites and on land under management agreements with CCW. For further information contact Jan Sherry j.sherry@ccw.gov.uk or Barbara Jones b.jones@ccw.gov.uk.

Farewell … to Dr Phil Whitfield, who leaves SNH to become a Director with Natural Research. Phil has made a massive contribution to our understanding of upland bird ecology and conservation, and in the last two years alone has led the publication of 6 papers on the conservation and management of golden eagles.

The BTO … has just produced a report on the nesting dates of upland birds, and changes in these over the last 25 years. The work was commissioned by Scotland's Moorland Forum, and funded by Defra and SNH. This research will inform discussion on the muirburn season and climate change effects on upland birds. For further information contact Mike Thornton mike.thornton@snh.gov.uk and Des Thompson des.thompson@snh.gov.uk.

The UK Upland Habitat Action Plan Steering Group … has published a leaflet '*Caring for our uplands. Delivering the UK Upland Habitat Action Plans*' (copies are available from Sally Johnson, sally.johnson@snh.gov.uk and a pdf is available on the JNCC website at http://www.jncc.gov.uk/page-3324). The Steering Group has also submitted proposed revised action plan targets to government as the first stage of the UKBAP Target Review.

SNH is funding three PhD studentships, each starting this year … one of these, at Aberdeen University (in conjunction with Macaulay Institute and CEH), is concerned with the restoration of montane/alpine heaths in Europe. Contact Sarah Woodin s.woodin@abdn.ac.uk, or Des Thompson, des.thompson@snh.gov.uk

The UK Raptor Working Group Report … marked its 5th anniversary with a discussion paper considered by the Committee of the JNCC. The paper is available at http://www.jncc.gov.uk/pdf/comm05p04.pdf . The paper summarises progress in addressing the report's 25 recommendations.

The hen harrier population in the UK … has at long last increased. The population has risen from 521 pairs in 1998 to 749 pairs in 2004. However, the population in England remains perilous at only 10 pairs.

Mountains of Northern Europe: conservation, management, people and nature… will be published this summer by The Stationery Office. Contact: enquiries@tsoscotland.com Tel: 0870 606 55 66 Fax: 0870 606 55 88, mention the *Looking to the Hills* newsletter, and you will get a 10% discount on the sale price of £30.

Sustainable Uplands… is a new project developing more sustainable land management in the Peak District National Park through collaboration between stakeholders, social scientists and

natural scientists. There is a newsletter and an interim report available at www.env.leeds.ac.uk/sustainableuplands.

ACIA - Arctic Climate Impact Assessment… has produced a detailed report on climate change impacts that is of great relevance to countries beyond the Arctic. A free brochure highlights the main points and PDF versions of the pre publication release chapters are available at http://www.acia.uaf.edu/ or contact Bill Heal o.w.heal@durham.ac.uk.

Global warming increasing piste pressure on alpine plants… vegetation cover and diversity on pisted skiing areas is decreasing. A research team from the Swiss Federal Institute for Snow and Avalanche Research, University of Zurich and the University of Potsdam, Germany, have identified that the damage is caused by the extensive machine grading of slopes and use of artificial snow, which is slower to melt in spring. With global warming, this is a problem which will become more dramatic. The impact of ski runs being developed at higher altitudes, with increased use of artificial snow, will be particularly damaging to the more sensitive soils at higher altitudes. The results of this research by Rixen *et al* can be found in the *Journal of Applied Ecology* Volume 42 Issue 2 Page 306 - April 2005.

The Montane Scrub Action Group… is delighted to announce that they have been awarded Heritage Lottery funding, in partnership with Scottish Natural Heritage and Forestry Commission Scotland, to develop a major project focused on the demonstration and restoration of mountain woodlands, including tree-line and montane scrub habitats. This planning grant will establish a scrub site survey protocol for professional and non-professional use; develop a concept and action plan for establishing a demonstration network of different mountain woodland sites across Scotland; and identify key sites that would benefit from restoration activity. This development phase will last approximately seven months and is being undertaken by Diana Gilbert, contracted to Highland Birchwoods who manage the project. For more information about the project, Diana is contactable on d.dg@tinyworld.co.uk or 01381 610 204.

Conferences and other events

The Role of Large Herbivores in Shaping the Upland Landscapes of Britain

Making Space for Nature – A Case Study From the Netherlands

On the 16 February 2005 the National Trust for Scotland hosted a seminar titled ***The Role of Large Herbivores in Shaping the Upland Landscape of Britain.***

This seminar provoked some very interesting debate. One of the principle speakers at the seminar was Frans Vera, a Dutch ecologist, who is testing the conventional wisdom that Central and Northern Europe consisted of a closed canopy forest for much of the post glacial period. His alternative theory is that much of the post glacial forest was in fact more open, ‘park-like’ woodland having been heavily modified by grazing and browsing herbivores. Some of Frans Vera's work is being explored through one of the Netherlands premier nature reserves, Oostvaarderplassen, which I had the good fortune to visit in November 2004.

Oostvaardersplassen is a 6000 ha Reserve managed by the State Forest Department (Staatsbosbeheer) on land reclaimed as a polder in the early 1960s. Originally ear-marked for industrial development, the polder eventually gave way to nature when the Netherlands fell into economic recession in the early 1970s. The polder was designated as a National Nature Reserve in 1986, a Ramsar site in 1989, and was awarded a European Diploma in 1999. It also qualifies as a Special Protection Area (SPA) for a number of wetland bird species.

Consistent with one of the objectives in the nature conservation policy of the Netherland's Government, the site is being managed using a minimal intervention approach. Natural processes such as grazing, browsing, flooding, drought and decay are being encouraged to ‘self–manage’ this relatively young ecosystem. In the words of one of the park staff – this is an opportunity to "let nature lead" and it is hoped that this will effectively inform any management to restore a more

'natural' ecosystem. This is a bold policy in the context of such a densely populated and industrialised country as the Netherlands. Can we learn from this approach to nature conservation?

With the objective of reinstating grazing and browsing processes more akin to the postglacial forests of Central and Northern Europe, Heck cattle and Konic ponies were introduced in the early 1980's; and red deer in 1992 (some of which came from Scotland). Heck cattle and Konic ponies are the closest breeds to the original wild cattle (Aurochsen) and horses (Tarpan), respectively, which once roamed most of Europe after the last glaciation.

These populations of large herbivores have helped shape the vegetation dynamics of the site. An open park-woodland, consisting of a mosaic of open pasture and willow, alder and elder woodland has developed – looking almost like an African savannah! Grazing by large populations of wintering geese help maintain an open reedbed, providing important breeding and feeding sites for a diverse water bird community.

Twenty years on, the population of large herbivores has now reached high densities, to the extent that they are preventing forest regeneration. Has Oostvaardersplassen been an experiment gone wrong or an illustration of a natural cycle between grazers and browsers, and their habitats? Is this "letting nature lead" approach allowing us to look into past landscapes or just creating another artificial system? It's too early to say, but perhaps this more experimental approach could be developed over large areas of upland Scotland, particularly considering the newly emerging policies and legislation being driven forward by CAP and land reform. Can we create extensive areas of land set aside for wilderness values where natural processes can be restored by introducing a more diverse mammalian herbivore assemblage, ranging in size from the European beaver to large traditional breeds of cattle, all playing a distinct role in the system, and driving forward cyclic vegetation succession? This may ultimately lead to far greater habitat diversity through producing a habitat mosaic supporting greater biodiversity.

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

Some take home messages from the NTS conference

Like many participants at the NTS conference, I found the papers and discussions very thought provoking. Below are some thoughts I originally shared with colleagues, which the editors felt should be more widely shared.

Role of large herbivores in maintaining large open areas in the past is not proven

The role of large herbivores in maintaining open ground in the past is still not proven. But, this cuts both ways. The case for a closed forest landscape is also not proven. The potential importance of other factors that would maintain an open landscape, such as the spread of bog, were not discussed although it could have an important effect on some of the assumptions that are made in testing Vera's hypothesis.

Need for a better approach to managing multiple objectives represented by entrenched views

There are still a lot of entrenched views about past landscapes, naturalness, wilderness and re-wilding, and what nature conservation objectives should be (or not be). Even within conservation organisations there are conflicting notions of what is for the public good. There is some dispute about the relevance of past conditions for deciding what objectives should be now, especially when evidence of past conditions doesn't seem to support one's preferred position! We need to recognise that no one interest group is necessarily completely right and that there is no single right answer. The different components of the natural heritage, and its appreciation, have different requirements. We need to find ways of ensuring a mix of objectives and management so as to retain options for the long-term good of the public, as well as nature.

The importance of predation effects on distribution of herbivores

The talk by Dave Bullock usefully highlighted the role of large predators in modifying the distribution of herbivores, rather than controlling their population levels. This could give rise to patchy grazing pressure in the landscape. For example, this has been observed in Yellowstone

near to wolf dens, allowing regeneration of woodland and scrub in places even under quite high herbivore densities. The resulting concentration of herbivores could also help keep open habitats in an open state. Might a human analogue of this effect be a better approach to managing deer to maintain habitats and biodiversity rather than either trying to reduce deer populations to very low levels over large areas, or the extensive use of fencing with all its associated problems of bird strike, access, landscape impact and expensive long-term maintenance.

Despite changes to agricultural support, cattle grazing may be even more difficult to maintain in the future

The changes in agricultural support could cause significant changes to patterns of livestock grazing, and hill cattle may undergo an even more steep decline than at present. There is still much uncertainty about what farmers will do. This is bound to present problems for conservation planning and the maintenance of conservation options.

Aurochsen may not ever have been very important in the uplands, and red deer may always have been the most important herbivore prior to domesticated livestock

If cattle grazing cannot be maintained in the uplands, does it matter? From Dave Bullock's analysis of the probable ecology of the aurochsen, and the distribution of remains, the majority of aurochsen were probably found on flood plains with only bulls penetrating into the marginal uplands. This suggests that in the uplands red deer would have been the main large herbivore for most of the post glacial period. Of course, depending on what our objectives are, cattle grazing may be still be desirable regardless of their past importance in the uplands.

Language needs to be used more carefully

We need to be more careful in how we use language to avoid being led into misconceptions. Frans Vera made the point that we may think we use language but language also uses us. This applies not just to issues such as whether the presence of *trees* implies close-canopy *woodland*, or the difference between forest and wood in historical references. It was also highlighted in relation to carrying capacity for deer in Jos Milner's talk.

The unacceptable face of 'naturalism'

I was stuck and troubled by some statements voiced during the discussion concerning potential animal welfare problems with naturalistic grazing regimes. Advocates for 'naturalism' sometimes give the impression that they do not accept that animals in a natural state might suffer (stress, disease or pain) and even if they do that this is a price worth paying. I think this is both philosophically and ethically questionable.

Contact: **Angus MacDonald,** SNH. Email: angus.macdonald@snh.gov.uk

Forthcoming events...

Open Science Conference: Global Change in Mountain Regions - Perth, Scotland 2-6 October 2005

This is a conference for all researchers and managers interested in Mountain Biosphere Reserves (MBRs), and developing a strategy for implementing global change research in MBRs around the world.

Expected outcomes are:

- communication of new results between scientists and researchers working in the mountains of both industrialised and developing countries around the world
- a framework for long-term research on global change that can be implemented in Mountain Biosphere Reserves and other mountain locations in both industrialised and developing countries.

Further information can be found at http://www.mountain.conf.uhi.ac.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 Willaim Office / JNCC Support Unit in Peterborough.
E-mail: ian.strachan@jncc.gov.uk
℅ 01389 704716 / 01733 562626

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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

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ENGLISH NATURE

Mick Rebane - Senior Uplands Officer; 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

David Townshend - Manager of Habitats and Communications Branch, co-ordinating the uplands, woodland, grassland, heathland and communication specialist services. Leads on burning management policy issues
E-mail: david.townshend@english-nature.org.uk
℅ 01733 455 384

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

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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

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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

Angus MacDonald - Land management, especially fire issues, habitat condition assessment and large-scale ecology
E-mail: angus.macdonald@snh.gov.uk
% 0131 446 2400 ext 2474

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

Mike Thornton – Moorland Project Officer, provides support to Scotland's Moorland Forum and provides technical support to developing moorland projects.
E-mail: mike.thornton@snh.gov.uk
% 0131 446 2400 ext 2477

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At a recent ULCN visit to Cater's Beam SSSI, Dartmoor (Nature Conservation Review Site P.28) we discussed the history of the now diminished hummock-hollow mosaic. What did this look like several hundred years ago?

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 newsletters (including the pdf version of this with coloured photos), publications and other resources can be found under the various links.
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