**Heathland Conference 1992**
**Proceedings**

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## HEATHLAND CONFERENCE 1992

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Front cover: Thursley NNR Rob McGibbon

## EDITOR'S FOREWORD

These proceedings, long in gestation, cover the Conference held at the University of Surrey on 8, 9 and 10 July 1992. Following on from a meeting held at Swanage in Dorset in 1990, we aimed the Conference at those involved in practical heathland management.

After the publication of the Strategy for Surrey Heathland in 1988 and the setting up of the Heathland Project in 1989, the momentum of heathland management in Surrey had been building. The group which came together to organise the Conference recognised that it should primarily be a forum for exchange of information between heathland managers nationwide but it should also provide an opportunity for raising the profile of heathland in the county. Consequently, the opening reception was to set the conference in perspective, not just for the delegates but also for those other individuals - landowners, land managers and politicians - who have influence on the future of heathland in our county. As for the content of the Conference proper, we tried to include subjects hitherto given scant attention or matters of topical interest. The field visits aimed to illustrate some of the subject matter of the talks.

The conference was well attended with more than 125 delegates attending over the two full days. The lecture theatre was sometimes hot ( a distant memory as I write early in April 1993) but the talks engendered lively discussion, most of which was caught by the roving mike. However, in spite of reminders from the organisers, the tendency for people to forget to introduce themselves has resulted in a scattering of 'anons' in the texts of discussions.

Out in the field, our wanderings across heathland generally returned with the full complement of delegates and, thanks to a backup team of landrovers, nobody was reported missing. Many of those who went on the field visits will remember the 'Minivox' which (when it was used!) enabled all to hear. Unfortunately, technology did not stretch to field recording so the discussions which took place on site are not included in this document. However, many of the more important points were covered in discussions in the lecture theatre.

Finally, thanks should be expressed to all those who made the Conference possible - to English Nature for their generous sponsorship; to the organisers - the staff of Surrey County Council Planning Department, the Surrey Wildlife Trust, English Nature and the Heathland Project; to Sir William Wilkinson for his opening address, the chairmen of the various sessions, the speakers and Professor Gimingham for his summing up. Thanks are also due to the conference staff of the University of Surrey, Safeguard Coaches, the Hog's Back Hotel and especially to the delegates, for wholeheated participation and for bringing a wealth of experience to the meeting.

As organisers we have learned much from the experience of holding the Conference. For those who follow us in organising similar meetings we wish all success and will be happy to provide them with advice where we are able.

Robert McGibbon
Project Officer, Heathland Countryside Management Project
on behalf of the Conference organisers

April 1993

# HEATHLAND CONFERENCE
# 8-10TH JULY 1992

## Organisers

| | |
|---|---|
| Dr. Rob McGibbon | Heathlands Countryside Management Project |
| Marcus Turley | Heathlands Countryside Management Project |
| Nick Baxter | Surrey County Council |
| John Edwards | Surrey County Council |
| Chris Manly | Surrey County Council |
| Peter Tinning | English Nature |
| Ian Davies | English Nature |
| Simon Nobes | English Nature |
| Martin Newman | Surrey Wildlife Trust |

## Speakers

| | |
|---|---|
| Dr. David Bird | Surrey County Council |
| Dr. Feiko Prins | Natuurmonumenten |
| Dr. Nigel Ainsworth | Imperial College |
| Prof. Charles Gimingham | University of Aberdeen |
| Stewart Dakers | Waverley Borough Council |
| Tim Allen | Countryside Commission |

## Chairmen of Sessions

| | |
|---|---|
| Colin Tubbs | English Nature |
| Dr. Tim Bines | English Nature |

## Delegates

| | |
|---|---|
| Peter Adcock | Christchurch Borough Council |
| Mary Adler | Surrey Wildlife Trust |
| Ken Adsett | Waverley Borough Council |
| Ron Allen | Ron Allen Associates |
| Penny Anderson | Penny Anderson Associates |
| Phil Baarda | East Dorset District Council |
| Stephen Barnes | Suffolk Wildlife Trust |
| Jill Barton | Surrey Wildlife Trust |
| Sharon Beacom | Reigate & Banstead Borough Council |
| David Boddy | Surrey County Council |
| Alison Bowles | Ashford Borough Council |
| Martin Boyle | London Borough of Merton |
| David Braithwaite | Bishop Burton College of Agriculture |
| Mark Bridges | Countryside Commission |
| Andrew Brockbank | Metropolitan Borough of Wirral |
| Margaret Brown | BBONT |
| Dave Burges | RSPB |
| Nic Butler | East Devon Heritage Coast Service |
| Robert Cameron | English Nature |
| Clive Chatters | Hampshire Wildlife Trust |
| Philip Chesterfield | ECC International Ltd - Estates Dept |
| Chris Chinn | Surrey Grazing Project |
| Michael Clarke | Forestry Commission |
| Mike Coates | Waverley Borough Council |
| Keith Corbett | Herpetological Conservation Trust |
| Bob Crompton | Surrey County Council Ranger |

**Delegates (Cont)**

| | |
|---|---|
| Deborah Cousins | Imperial College |
| Linda Culver | Surrey County Council |
| Fred Currie | Forestry Authority |
| Charles Cuthbert | Hampshire County Council |
| Patty Davey | Councillor, Waverley B.C. |
| Andrew Davidson | Hampshire County Council |
| Anthony Davis | Hampshire County Council Ranger |
| Jeremy Davy | Berkshire County Council |
| Michael Dawson | ACPO, Surrey County Council |
| Mick Douglas | Downlands Project |
| John Dover | Environmental Advisory Unit |
| Paul Edgar | North East Hants Heathlands Project |
| Alwyn Edwards | Defence Land Agent, MoD |
| Deborah Elton | |
| Sue Everett | Nature Conservation Bureau |
| Gordon Flower | National Trust |
| Michael Freeman | States of Jersey |
| Stephen Fry | Surrey County Council Ranger |
| Peter Gotham | RSPB |
| Ann Griffiths | West Sussex County Council |
| Richard Grogan | Isle of Wight C.C. |
| Bruce Gwynn | Hampshire County Council |
| Gavin Harkness | Surrey County Council Ranger |
| David Haslam | Walsall M.B.C. |
| Mark Havler | Surrey County Council Ranger |
| Andrew Hill | ECC International Ltd |
| Bridget Hyder | English Nature |
| Douglas Ireland | RSPB |
| Bill Jenman | Sussex Wildlife Trust |
| Dr. Jennifer Joy | Butterfly Conservation |
| Dr. David Kennington | National Trust |
| Ms Lisa Kerslake | Notts County Council |
| Dr. Richard Keymer | English Nature |
| David King | Sussex Wildlife Trust |
| Dr. Stephen Larkin | Silsoe College |
| Gary Lees | Hampshire County Council |
| Ashley Leftwich | Poole Borough Council |
| Niall Machin | London Ecology Unit |
| Andrew Mahon | Dorset County Council |
| Sarah Manning | Stewardship Officer, Countryside Commission |
| Christopher Marrable | Ashdown Forest Centre |
| David Morris | Forestry Commission |
| Neil Morris | Kent Trust for Nature Conservation |
| Simon Moss | National Trust |
| Jonathan Mullard | Swansea City Council |
| Douglas Napier | London Borough of Hounslow |
| Dr. Simon Newell | Colchester Borough Council |
| Martin Noble | Forestry Commission |
| Harry Oram | Forestry Commission |
| Clive Osgood | Walton Heath Golf Club |
| Nick Owen | Lower Mole Countryside Management Project |
| David Page | Elmbridge Borough Council |
| Jennifer Page | Woking Borough Council |
| John Patmore | English Nature |
| Ian Pearson | English Nature |
| Dr. Catherine Pike | Waverley Borough Council |
| Michael Rebane | RSPB |

**Delegates (Cont)**

| | |
|---|---|
| Paul Rimmer | Horsell Common Preservation Society |
| Robert Rose | Inst. Terrestrial Ecology, Furzebrook Research Station |
| Neil Sanderson | |
| Jenny Shepherd | Lower Mole Countryside Management Project |
| Sara Shepley | Witley Information Centre, N.T. |
| Susan Sheppard | English Nature |
| Mike Smith | Elmbridge Borough Council |
| Andrew Storey | National Trust |
| Peter Sturgess | University of Bristol |
| Dr. William Syratt | BP Engineering |
| Chris Thain | Surrey Wildlife Trust |
| Peter Thompson | |
| John Tickle | Hampshire County Council |
| Mark Timms | Hampshire County Council |
| Gordon Voller | Surrey Heath B.C. |
| Craig Vincer | National Trust |
| Stephen West | Oxford Preservation & Cecil Pilkington Charitable Trusts |
| Diana Westerhoff | English Nature |
| Heather Whetter | English Nature |
| James White | English Nature |
| Michael Williams | Clinton Devon Estates |
| Alan Wilson | Bracknell Forest BC |
| Andy Wragg | Surrey County Council Ranger |

## OPENING ADDRESS

**Sir William Wilkinson**
**Formerly Chairman of the Nature Conservancy Council**

You do not need me to tell you about the importance of British heathlands in international terms. As you know, it is a rare habitat and has recently been the subject of articles, and indeed conferences. Within the whole context of heathlands, these heathlands in Surrey have great significance, and not only as examples of a rare habitat type. They also provide, perhaps in miniature, a measure of the problems that beset nature conservation as a whole. They contain many SSSIs and also an important National Nature Reserve, Thursley Common. Indeed about 50% of Surrey heathlands are already designated under the SSSI label. They have a variety of owners, but are unusual in one respect, in that two thirds of them are owned by the Ministry of Defence. This situation provides a balance of advantages and disadvantages. It is certainly a situation that needs to be watched as the programme of disarmament gathers pace. As things stand, this MOD ownership is, I believe, beneficial. The Ministry has an agreement with English Nature that the MOD lands should be managed in a way sympathetic to nature conservation, as far as this does not conflict with military purposes, which are after all the prime reason for the MOD owning the land in the first place. But for this ownership I am quite sure that some of the main pressures, development for housing, golf courses and even factories, would have been infinitely worse. This ownership has provided an opportunity for nature conservation policies to be worked out. It is, however, but a breathing space and it is, I fear, now coming to an end. When the recession ends, the pressures for development are going to be intense. Plans to meet this situation need to be prepared now. This is where this conference can make a valuable contribution. After it, however, steps will have to be taken in the political field if the situation is not to deteriorate beyond recovery.

There is, unfortunately, no national designation which confers absolute protection. Even when the appeal procedure takes matters to ministerial level, the answer is not always satisfactory, as Twyford Down shows only too clearly. Of the various designations, National Nature Reserve status is the strongest, but even this does not carry the day, and there are definite problems with the Surrey heathlands position. As a whole they do not fall within National Nature Reserve criteria. Some special protection mechanism therefore, and preferably within a European context, needs to be drawn up. It will need to be a special case. What is wrong with making a special case for special protection status for an area which cries out for special protection?

Linked in with the National Nature Reserve position, there is the SSSI designation, which I have already mentioned. As has been pointed out on many occasions, and in recent times with increasing anxiety, SSSI designation does not confer protection though it helps. It has not allowed, until recently, for resources to be made available for positive management. Two recent schemes now being piloted by English Nature could be particularly relevant here in Surrey. One of these covers species recovery, and the other habitat enhancement. You at this conference, who know the position in Surrey much better than I do, will agree I am sure that they could be of considerable assistance. They do, however, fail on the actual protection of the habitat itself. If the habitat goes everything else is irrelevant.

*Sir William emphasised the importance of Partnership and Management. He gave a brief resume of the changing effects of management in the countryside.*

It is important, I believe, to define what I mean by management. Management to me means care. Care involves looking after our wildlife and habitats in such a way that we retain their richness and diversity as completely as we can for those that come after us. In order to care for and manage our countryside, with this overall objective, we need to know what we have got. This process of gathering information is generally called survey. We also need to know what is happening to it over time. This is referred to as monitoring. We need to find out why such and such a trend is manifesting itself. We then need to take a view on whether we wish this trend to

continue as it is or whether we wish to change it in any way. Our decision will depend on a number of factors. The most important of these will be to determine what our actual objectives are for the particular area of ground. I believe that the hardest part of management, which perhaps requires the most rigorous discipline, rests upon the actual setting of objectives. These can lie between managing the habitat in such a way, for example, here in the Surrey heathlands, to promote an increase in the number of Dartford warblers, or whether we want to see flourishing an increasing communities of sand lizards and smooth snakes. Although these two objectives can overlap, they are to some extent fundamentally contradictory, since they require different vegetation conditions. In addition, in order to arrive at a sensible view, knowledge of the status of those various species outside Surrey will be required - in neighbouring counties, in England, and in Britain as a whole, and even in Europe. There will also be other considerations, for example do we want to put the emphasis on conserving rare species perhaps in relatively small numbers, alternatively do we want to see large populations of flowers and creatures which are relatively common? After all, there are few more attractive sights than large numbers of peacock butterflies or common blues. Those of us who remember what the hay meadows in the Thames Valley looked like say, before 1950 will want to see this wonderful conglomeration of meadow flowers conserved almost as it were, as a spiritual inspiration to our successors. These selective judgements are not easy, but the more sites and areas that can be managed in parallel but with differing objectives, the more likely we are to maintain the diversity of our wildlife.

There will also be other constraints and influences on our decision. "What is it going to cost?" is surely one of them, and "what value for money?" are we going to secure by following one course of action rather than another. Personally, I find the concept of "value for money" unattractive when talking about nature conservation. Emotionally, I should like to do the lot. Intellectually, however, I know that resources are finite and in the context of our wildlife and what needs to be done, relatively limited. So hard choices and decision have to be made in setting objectives and the management prescriptions needed to fulfil them.

After setting the objectives and the necessary management prescriptions, I am tempted to say that it is all relatively plain sailing. This is, actually, far from the case, and for example if we want to improve habitat for breeding waders, it will not be sufficient just to control water levels to what is considered the optimum level, since the requirements of even such closely linked species as the different types of waders will vary. Lapwing, redshank, snipe, oyster catcher, and ringed plover all have different requirements. There will also be the water quality to be borne in mind; also the levels of winter flooding; even the extent of acid deposition, since all these things will affect invertebrate populations, and will therefore be all important to breeding success.

Nature conservation is about people as much as about flora and fauna. To conserve our wildlife and wildlife habitats, people's interest has to be stirred and their enthusiasm and commitment mobilised. Partnership has now become a powerful means of doing this. Since 1984 when the old Nature Conservancy Council launched Nature Conservation in Great Britain, the concept of partnership has become increasingly to prominence, and rightly so. Sometimes, these partnerships come about because of a shared objective such as that between the voluntary and official bodies concerned with nature conservation. Or there may be a resource that needs to be shared, for example, land which is the subject of the partnership between those engaged in nature conservation and land-owners and farmers. There is also the necessary partnership between nature conservation bodies and national and above all, local government. We have at this conference today, a splendid example of partnership between local government, the voluntary organisations and the national countryside and wildlife agencies. Local government is represented primarily by the Surrey County Council and the Boroughs of Guildford, Waverley and Woking. The Surrey Wildlife Trust, which is a very effective member of the wildlife partnership, the Royal Society for Nature Conservation, has throughout taken an active and indeed very necessary and responsible interest in the future of their county's heathlands. In this, it has been supported by the World Wide Fund for Nature, who just recently have been campaigning for Sites of Special Scientific Interest and trying to press for the up-grading of the present A3, rather than choosing any of the new routes proposed, all of which would in some

way or another be detrimental to the county's wildlife interest. Finally, there are the Government agencies, the Countryside Commission and English Nature, which has taken on the promotion of the heathlands strategy drawn up by Derek Ratcliffe, the Chief Scientist of my old friends, the erstwhile Nature Conservancy Council. This partnership is, I believe, a model which could well be replicated in other parts of Britain where similar challenges have to be faced and overcome.

I would state emphatically that if these partnerships are to work, there has to be a sharing and a mutual respect. Even the warmest of relationships breaks down if one partner insists on hogging all the bed-clothes! It requires generosity of spirit between partners, neither seeking to gain all the publicity and credit but sharing it.

Often too, in forming partnerships there is a lot of important preliminary work to be done, and fundamental suspicions laid to rest. For example, where national government calls for partnership, this is often perceived as a wish to reduce its own commitments and responsibilities, rather than setting up a situation where partnership working can be truly productive.

You will probably be surprised that I have spoken for close on 20 minutes without once mentioning the Rio Summit. Many of us, myself included, held unreasonably high expectations, and perhaps are now somewhat disappointed.

We are too close to it to assess the Summit and its usefulness properly. Most of the results will not be apparent for years. What I do think the Summit has done, and the Prime Minister has flagged it up in this way, is that the process towards greater environmental stewardship is firmly under way.

A process is now firmly in train. Indeed it is remarkable that so many heads of government actually attended the conference. The Stockholm conference got the environment on to the political agenda. Rio has managed to give it much higher priority, thanks to a large extent, I believe through the pressure applied to politicians by many voluntary organisations. The voluntary organisations put the environmental case with vigour and determination. The process started at Rio provides the mechanism, at least in theory, for carrying things forward. Governments have made public commitments and many world politicians have put their necks on the block. It will be up to the voluntary organisations to pressure Governments to bring the promises, and half promises, of Rio to reality. There is a word of caution, however, that I should like to utte, and this applies every bit as much to environmentalists in this country as it does worldwide. This concerns truth and can pose problems over applying the precautionary principle. It is possible, and indeed is understandable and commendable, in wishing to bring an environmental problem to public attention in as forcible way as possible, to overstep through exaggeration what are the boundaries of truth. If a case or cause is seen to be supported by statements and evidence which are less than truthful, and indeed are later found to be false, the cause and the organisations and individuals supporting it will be discredited. There are many persons sadly who resent the stand that environmentalists and nature conservationists are making. They, therefore, relish the chance of weakening us at every opportunity. Undermining our credibility can be the name of their particular game.

Returning to Rio, we in the developed countries have to show the way. The more we may have transgressed in the past, the more important it behoves us to set a good example by putting our own house in order and showing to others, both through the past how not to do these things, but more important for the future to show how things can and should be done.

This conference provides a real opportunity of drawing up policies and programmes for conserving an internationally important type of habitat. The ingredients for doing this are all present. There is Government and local government involvement. There is great concern and activity on the part of voluntary organisations, with the Surrey Wildlife Trust, the World Wide Fund for Nature, the Herpetologists and others all making their special and positive

contribution. What is needed from this conference is a clear message indicating how best to build on foundations, so successfully laid. In succeeding, the blue print will be provided for others within this country striving to overcome similar difficulties. Because we all inhabit one planet, these lessons will extend far beyond the boundaries of Surrey. The message that will go out is that today, and indeed every day, is the day for action.

# INTRODUCTION TO SURREY HEATHLAND AND THE HEATHLAND PROJECT

**Dr Robert McGibbon**
**Project Officer Heathland Countryside Management Project**

In Surrey, heathland occurs in two main areas: the London Basin ( on Bagshot, Barton and Bracklesham Beds) and the Weald (on various beds of the Lower Greensand). These are separate and quite distinct areas in their geology and also in their natural history.

Heathland - an ancient landscape. In a strange way this leads into one of the themes of Sir William's address - partnership- because it can be said that heathland itself is the result of a partnership between man and nature. It is one that has been going on for about 6000 years as it is thought that it was in the late Stone Age that heathland began to appear. Clearance of the forest, we think, started the processes of soil fertility loss which created heathland, something perpetuated by thousands of years of use as grazing land and as a source of raw materials and fuel for the people who lived around it.
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Only in this century has this partnership of man and nature broken down. We have ceased needing heathland to sustain *us* but it continues to need us to sustain *it*.. As a result, we see, in Surrey, heathland in retreat - being swallowed by a tide of scrub, trees, bracken and grass.

As heathland managers, we are here to revive that lost partnership between man and nature because we feel that heathland should be conserved, that it is intrinsically valuable, perhaps for the wildlife it supports but also because it is part of *our own* history and because it can give us the opportunity to experience a wild place in an increasingly tamed countryside.

Continuing the theme of partnership, I should go on to mention how our Project - the Heathland Countryside Management Project - was born. In 1988, a document entitled 'A Strategy for Surrey Heathland' was published, the result of a cooperative effort between Surrey County Council and the then Nature Conservancy Council.

It was in the Stategy that the threat which Surrey heathland was facing from neglect was most forceably put. It was stated that since the late 1700's we had lost over 85% of our heathland. It put forward ways of responding to the continuing loss of heathland and one suggestion was the setting up of the Project. Our Project came into being at the end of 1989 and is funded by a partnership of local authorities - Guildford, Waverley and Woking Borough Councils and Surrey County Council together with the Countryside Commission and English Nature.

Our Project Area is large - some 6000 $Km^2$ and we are a small team - just two members of staff: myself and Marcus Turley, the Assistant project Officer. This means that if we are going to have any impact, we have to link in with the work that is already going on, try to fill the gaps and, in a way, act as a catalyst so that a momentum can be built up.

It is happening! Meeting such as this are most valuable opportunities to exchange information and inspire further work so we regard our involvement in this conference as most important. We are well equipped for larger scale heathland management work so can intervene directly where there is an opportunity and a need.

Frequently our work is experimental. For instance, we have been cooperating with site staff at Thursley National Nature Reserve to harvest bracken litter and try to regenerate heather stands.

Our tractor has proved useful in construction of the Easy Access Path on Horsell Common near Woking. Here again, our aim was to bring together several groups: the owners of the land (the Horsell Common Preservation Society), Ruddles Brewery and Woking Borough Council who

together provided finance, the local Access Group, who advised on design, and some Surrey residents who gave up their free time to help us. The result is a path which has blended into the landscape and is appreciated by both able-bodied people and those with disabilities and has been integrated with some valuable habitat management.

One of the most exciting aspects of our work is the reintoduction of grazing to Surrey heathland. Reviving traditions of yesteryear in modern Surrey is not without its difficuties but when people collaborate the result can be rewarding. At Horsell Common, we introduced our first grazing trial - something that involved finance from National Westminster Bank through the MAFF Farm and Countryside Initiative, practical assistance from Merrist Wood College students and continued involvement from the Horsell Common Preservation Society who own the land. We have also been helped by a local smallholder who has provided livestock.

Of course the support of local people is vital throughout all our work. Without their support our job would be difficult indeed. We try to inform local residents as much as we can but we also want to *involve* them. We endeavour to organise our work so that they can participate because we hope that in some areas we can devolve some of the care of heathland to them or at least develop an understanding of the heathland on their doorstep which will make them want to take custody of these areas.

As a project, we recognise that golf courses are important heathland owners and we are working with them whenever we can. At Hankley Common there is much heathland management taking place as a result of initiatives from staff and members. We are joining with the staff on some trials which are attempting to tackle grass invasion.

Turning to land owned by the Ministry of Defence, good dialogue between groups and inviduals of many interests has grown up at their Conservation Groups. These meetings, held twice a year, allow discussion of management on sites like Pirbright and Ash Ranges and Hankley Common and are a real positive influence. As Sir William so clearly indicated, with so much heathland in defence ownership in Surrey, *its* future is also very much the future of Surrey heathland.

I hope that, by these examples - and there are many more that I can give, I have been able to illustrate a cooperative approach to heathland management. The good news is that it is happening everywhere and this Conference is part of it.

Returning to the subject of the Conference, as many will know, we in Surrey picked up the torch from the Dorset meeting of two years ago. I have to say that when I thought that the Project would have to organise it by itself, I wondered how it could happen. Well, it has happened and that is because it has become a co-operative effort involving Surrey County Council, Surrey Wildlife Trust, English Nature and the Project.

I think that we have a range of interesting topics which should stimulate discussion, even argument. We have people from many backgrounds and specialisations and far-flung parts of Britain and even Europe. One thing is certain. We all care about heathland and that is part of the way to conserve it for future generations.

# SURREY HEATHLAND: ITS HISTORY

**D G Bird**
**Principal Archaeologist, Surrey County Council Planning Department**

The space is not available here for a detailed history of heathland in Surrey, but in fact it would not yet be possible to write such a history as there has not been sufficient research. This is especially the case for the earlier periods, those studied by archaeological methods, but so far as I can tell it is also true that full use has not yet been made of the available documentary evidence.

Our evidence is restricted to a very few studies of ancient pollen and buried soils, the distribution of archaeological finds, place-name meanings, documentary evidence, early maps and agricultural soil studies. In each case the use of this evidence is hedged about with provisos.

It is generally accepted that heathland comes about as a result of human intervention on acid subsoils. The removal of trees and other disturbances leads over time to serious impoverishment of the soil, usually involving the formation of a podzol. In some cases the effect on ground drainage brought about by the removal of trees leads to the development of mires. It is also accepted that if heathland is left alone it will quite rapidly revert to woodland and this is of course a recognised problem today. The implications have perhaps been insufficiently considered in most studies of past land use.

In Surrey, the most relevant subsoils are the Bagshot series, the Lower Greensand and some of the superficial deposits on the Downs. Soil studies and the agricultural writers of around 1800 are very useful in providing more detail about what this might mean in practice (see for example Hall and Russell, 1911 and Stamp & Willats, 1942, and references given by them). It is clear for example that the soils produced on the Lower Greensand are not all the same. The Hythe Beds and the Folkestone Beds are recognised as the worst except where they are subject to hillwash, especially if this is clay. The Bargate Beds on the other hand are apparently good for agriculture (Cobbett, who hated heaths, approved: 1830, 155). The deposits on the Downs also show variation, as do the Bagshot series, although the effect on soils seems to be less marked. In all cases very local variations can be brought about by differences of relative height and presence or absence of water.

We are fortunate in that the ancient environment in Surrey has recently been studied by Macphail and Scaife (1987). It is generally accepted that following the last Ice Age there was a period of rapid warming, and the retreating ice cap was followed by the development of tree cover across the whole of Surrey. It was followed also by human beings (of modern type), of the Upper Palaeolithic (not much represented in the county) and then the Mesolithic (say 8000 to 4000 BC), who led a hunter-gatherer way of life. Analysis of ancient pollen from Elstead Bog shows the development of this cover from herb and heath communities through birch and pine and on to oak and elm, with finally lime and alder appearing early within the Mesolithic period.

McPhail and Scaife suggest that across the county different trees formed the main component of the climax vegetation on the different subsoils, for instance lime on the Greensand. There is, however, some evidence for the persistence of heath in isolated pockets in southern England, and rather more evidence for the apparently deliberate creation of clearances by Mesolithic people, as for example at Iping Common and West Heath, (both on Lower Greensand). This is thought to have been done to encourage game and the growth of hazel.

Surrey is rich in finds of Mesolithic worked flints, especially on the Lower Greensand (Bird & Bird 1987, fig 3.4). In some cases areas of noted heathland have produced very little other archaeological evidence and it is possible that they have remained more or less as heathland since the Mesolithic. This is particularly the case with Hankley Common and its surrounding area, and perhaps also Headley Heath.

The Mesolithic period was followed by the Neolithic (say 4000 to 2000 BC), which is conventionally marked by the introduction of agriculture, but the Surrey evidence for this is weak except in the Thames gravel areas. It seems likely that the Mesolithic way of life continued to perhaps quite a large extent. It is interesting, however, to note that although finds on the Lower Greensand are again marked, they are rare in the areas just noted but occur in one region, around Witley and Godalming, where Mesolithic finds seem to be very uncommon. Compare the distribution maps (Bird & Bird 1987, figs 3.4; 4.7); in this case the distribution evidence may be meaningful, because archaeological fieldworkers who collect flints do not usually restrict their activities to only one period and are very unlikely, for instance, to have recorded only Mesolithic finds in an area producing also Neolithic material).

It is difficult to be sure what this might mean, but it does seem to imply that if we are right to assume heathland developed around Hankley Common and perhaps some other areas in the Mesolithic, then it was maintained in the Neolithic, presumably by grazing and perhaps burning or other activities such as fuel gathering. Were the areas kept clear for domesticated or half domesticated animals, for hunting and for the hazel crop?

The Neolithic was succeeded by the Bronze Age (say 2000 to 600 BC), which is usually held to be the period of the main impact on the sandy soils of southern England. If so, the evidence seems to relate to the Early Bronze Age in particular. In fact this evidence, mostly from soils and pollens buried under round barrows, often suggests that heathland was in existence before barrow construction. In our area such evidence comes from Iping Common and West Heath again, plus West End Common, Chobham, and Ascot, Berkshire, and possibly Deerleap Wood, near Wotton. Barrows are noticeable on many current and recent Surrey heaths (eg Frensham Common, West End Common, Horsell Common, Wisley Common, Reigate Heath). These barrows imply nearby settlement, but they seem to have been constructed on land already or becoming heathland.

Certainly most of the Surrey heaths which have Bronze Age barrows have little or no later archaeological evidence and this is usually taken to suggest that they had become heathland during the Bronze Age. It is noticeable that in the Roman period, when finds are relatively easily recognised, there is very little evidence from the Lower Greensand or the Bagshot series. On the latter it is particularly marked that there are several barrows (which should date to the Early Bronze Age) and a scatter of Middle Bronze Age artefacts, but no Late Bronze Age (or Iron Age) and very little Roman material (see distribution maps in Bird & Bird 1987, figs 5.6; 5.9; 5.16; 7.7). Preliminary studies in this area have suggested that field systems can still be traced and it may be that enclosures such as the so-called Bee Garden in Albury Bottom on Chobham Common can be dated to this period. There is a distinct possibility that elements of a Bronze Age landscape, little altered by subsequent land-use, may still be recognised on some of the heathland areas. It would be of great interest for these theories to be confirmed for we may be able to establish a picture of slowly accumulating agricultural disaster, creating much of Surrey's heathland some 3000 to 4000 years ago.

It should again be stressed that once the heathland was created it must have been maintained in some way in the succeeding periods or it would have reverted to woodland. At present we do not have the evidence to be able to say what happened. In this connection it is of interest that most of Surrey's hillforts, established in the Late Bronze Age and the Iron Age (say 600 BC to, conventionally, AD 43) were sited on marginal land much of which could have been heathland. There is, for instance, a notable series on the Lower Greensand of south-west Surrey (Bird & Bird 1987, fig 6.1). The purpose of the hillforts is not fully understood; perhaps one function was to serve as a control and refuge for grazing on the Lower Greensand as well as exploitation of the Weald proper.

The comparative lack of evidence for activity on likely heathland areas in the Romano-British period (AD 43 to around AD 410) has already been remarked, but it is noteworthy that three heaths do have evidence for Roman buildings: Puttenham Common, Walton Heath and Farley

Heath. The first two were specifically settlements; indeed Walton Heath had a villa of very high quality. It therefore seems unlikely that these two areas had yet become heathland. The Farley Heath site was a rural temple which could have been deliberately placed in an isolated area so this could already have been heathland.

The end of the Roman period in Surrey probably saw a relatively peaceful transition to Saxon England and certainly elements of the Romano-Briltish population survived; they are recognised specifically in place-names such as Walton on Thames for instance. It is, however, likely that there was considerable population decline at this time, and it seems reasonable to assume that in at least some areas there will have been woodland regeneration on heathland. We may note names like Bisley ('clearing overgrown with bushes') and Ribsden near Lightwater ('hill overgrown with shrubs or briars') but obviously these could just be local. A study of place-names indicating Saxon and medieval clearings and later woodland in north-west Surrey does however support the general picture of considerable tree cover on the Bagshot Beds in the Saxon period (see names recorded in Gover et al 1934).

There are place-names suggesting early Saxon settlement on the Bagshot Beds, but they are few; Woking and Wokingham are usually held to refer to the same group of people and as such are taken to indicate a sparse population. It is noteworthy that there are no known pagan Saxon cemeteries on the Bagshot Beds or the Lower Greensand (Bird & Bird 1987, fig 8.1). Various place-names recorded before and in Domesday Book indicate Saxon period heathland: Cow Moor near Pirbright, Pudmore near Elstead, Churt (from ceart, a Surrey and Kent word meaning 'rough ground overgrown with gorse, broom and bracken etc'), Farnham, Farncombe, Bramley, Headley, and Farleigh. It is difficult to know how representative these names are. By the end of the Saxon period analysis of Domesday Book suggests that the south-west and north-west of Surrey were the poorest areas in the County. This is clearly a reflection of the poor soils, but not necessarily an indication of heathland as such.

Place-names recorded by Gover et al (1934) suggest a medieval heathland distribution as might be expected, although exceptions such as Blindley Heath and Lowfield Heath (on Weald Clay but perhaps affected by superficial deposits) may be noted. Unfortunately this evidence cannot tell us how extensive heathland was in the medieval period.

There is little sign of medieval occupation in areas later known to have been heathland but current fieldwork, for instance in the Devil's Punchbowl is showing that this may be misleading. Many documents record people whose names indicate that they were living on the heath and they presumably gained their livelihood there. Earthwork enclosures, such as those on Banstead Heath, are usually taken to be medieval and relate to stock control. There is some evidence for medieval agriculture on later heathlands, for example on Ockham Common, near Leith Hill and on Wotton Common (Macphail & Scaife 1987, 48-50). It would be reasonable to postulate some sort of decline after the Black Death, again perhaps leading to woodland regeneration on heathland. We seem to have no evidence to test this, or to decide what effect the later medieval and early post-medieval woollen trade may have had. Was there more extensive use of grazing on the heaths and perhaps more clearance leading to the development of more heathland?

No doubt much of the heathland was commonland (but not all), subject to a variety of common rights including some or all of: common pasture, in some case time limited; the gathering of fuel (scrub, turf, peat, gorse); material for roofing and bedding (turf, bracken); fishing in common waters. These rights are always assumed to go a very long way back in time; it is interesting to speculate on their significance for the long term maintenance of heathland. Did they develop in conjunction with the establishment of the land as heathland and thus serve to maintain it thereafter?

Many Surrey heaths seem to have associated ponds. Some perhaps are the result of peat digging; others were made to provide power (e.g. Pirbright, Wisley); but some were certainly for fish (e.g. Fish Pool on the southern edge of Chobham Common, recorded as Fysshepole,

1536). It is difficult to date such ponds but they are most likely to be medieval. Possibly bees were kept to provide another use of the heather; Henley (north-west of Guildford, known as Henlee on le Heth in 1399: Gover et al 1934, 136) was held in part for 12 gallons of honey annually (Barnes 1963, 381: the manor had 200 acres of heath which was valued much lower than other types of land). The keeping of rabbits would perhaps have provided another food source, and hunting will have had some value in these ares. North-west Surrey, including therefore Bagshot Heath, was, however, in Windsor Forest, where hunting was restricted to the Crown.

It would be very interesting to know more about the animals put to graze on the heaths. Hall and Russell writing in 1911 could still record a few remnants of a race of heath sheep in Surrey ("black or brown faced, thin and high on the leg'; Hall & Russell 1911, 44). A century earlier Stevenson noted that a "singular breed of small ill-formed sheep then entirely occupied the extensive heaths in the west of the county," adding "a pure heath sheep is a very ugly creature, with very large horns; it seldom weighs more than 8lb per quarter" (quoted in Marshall 1817, 408-9). James and Malcolm (1794, 23) called the sheep of the Bagshot area "a few starved animals, unworthy the name of sheep" and were therefore puzzled by the implied quality in "the title of Bagshot mutton". Does this suggest the effects of overgrazing?

Conclusive evidence is lacking but some consider that heathland in the county reached its maximum extent by about 1800, by which time it was about 1/5th or 1/6th of the total area (of the historic county). ames and Malcolm writing in 1794 noted that there were few woods; Rackham calculates about 20% heathland and 4% woodland (1986,297); now 3% heathland and 16% woods and plantations according to him. The location of this heathland is generally taken from Rocque's maps (published in 1768) by matching open areas to the appropriate subsoils.

The agricultural writers of around 1800 were not very complimentary about Surrey's heathland. According to Stevenson: "It is difficult to conceive a character of soil worse than that of the heaths of Surrey: it is a barren sand, soft, deaf and duffy, mixed with a hungry poor gravel, and with the remains of the decayed heath: it is very thin, lying on small stones of dead white colour" (quoted in Stamp & Willats 1942, 390). Cobbett hated the "miserable heaths of Hounslow, Bagshot and Windsor Forest' and the "rascally heaths" of the area including Hindhead, which he described famously as "certainly the most villanous (sic) spot that God every made" (1830, 81; 71). They were obviously wild places and of course Bagshot Heath was notorious for its highwaymen; smuggling stories abound on other Surrey heaths between London and the coast though they are, perhaps inevitably, difficult to authenticate.

James, Malcolm, Stevenson and others wrote with 'improvement' in mind; Surrey seems to have been behind other counties in large-scale enclosure for this purpose. It did occur after about 1800, and the major areas seem to have been around Bagshot, Woking and Farnham, in short the main heathland areas. By now mixed farming was being practiced in favourable parts of these areas and it was extended onto the newly enclosed land which was deep ploughed and burnt and then put to sheep and root crops. Sheep manure was an essential part of the process in an attempt to increase soil fertility. Progress was, however, uneven and much remained unimproved: Parton notes that "the Enclosure Award for Windlesham was made in 1814 but fifty years later a few nursery grounds occupying a small acreage and some coniferous plantations were the only signs of improvement. Much of the 4000 acres included in the Award remained under heath with scattered conifers, much as it was in 1800" (1973, 190). As this indicates, some landowners tried trees as a means of getting a return from their land and some areas of heathland were taken over for nurseries. In fact major nurseries were started on Surrey heathland before the end of the 18th century, for instance Knaphill, Bagshot, and Goldsworth (Willson 1989). Although they covered a relatively small area they were of national importance for around 200 years. "With 1,585 acres of hardy nursery stock in 1938, Surrey had 15 per cent of the country's acreage and more than twice as much as any other county in Britain" (Stamp and Willats 1942, 371). It is also appropriate to note the creation of major historic landscape gardens like Painshill; according to Horace Walpole Hamilton made a 'fine place out of a most cursed hill', though it has been suggested that some work had been done before

Hamilton acquired the estate (lindus Forge & Collier, 1986, 14); nevertheless it must have been created out of heathland at some point and he extended the area. The same might be true of others on appropriate subsoils, such as Albury, Wotton, Deepdene, and the current headquarters of the Royal Horticultural Society at Wisley.

An interesting late use of heathland was the purchase made by the London Necropolis Company from Lord Onslow of over 2000 acres, running from around Woking station to the now Brookwood Cemetery (Clarke 1988). The intention was to create a single cemetery for the whole of London, served by train. It was first established in about 400 acres at the west end of the estate and opened in 1854, but did not spread further. The area around Woking station was thus left free to take on a rather different role!

The large open areas remaining in west Surrey proved attractive to the army in the 19th century, and Chobham Common was the scene (in 1853) of the first large military camp of exercise in England since the Napoleonic Wars; it was the immediate precursor of Aldershot (Macfarlane 1853). There were, and still are of course, important ranges established in Surrey, still with much surviving heathland. Other areas, such as Puttenham Common and Hindhead, featured in 19th and early 20th century camps and manoeuvres.

A major part of the change from heathland to woodland seems to have come about naturally as a result of the decline of practices which would have maintained the heath cover. Rob McGibbon has begun to record the memories of people who can still remember something of the old life on the Surrey heathlands, and how they have changed in a lifetime (e.g. McGibbon 1991). Presumably, much of the reason for this can be laid at the door of the railways, and the possibilities they brought for greater mobility. Paradoxically as the County's population soared the number of people working on the land, and especially on marginal land, declined. I suspect that the 'broom squires' and their like should be seen as representing the end rather than the mainstream of heathland management.

By the 19th century perception of the heathland was changing, and Surrey's 'wild' countryside became a favourite subject for landscape painters, many of whom established themselves in the south-west of the county. This change in attitude produced a a desire for preservation of the 'natural' landscape. As a result much of the area which contained Surrey's heathland has survived the pressure for development (with major exceptions around Camberley and Woking), although of course in many places it has become woodland, often in less than 100 years.

In conclusion it will be obvious that since heath only survives by the continuation of a suitable management regime there are likely to have been local fluctuations at all times, and no doubt many heathland areas in Surrey went through cycles of woodland regeneration and then reversion to heath. Our evidence is not good enough to be able to trace these events as yet. What is needed is a programme of pollen sampling and soil studies, careful recording of earthworks, and more work on historical documents. Only then will it be possible to write a proper history of Surrey's heathlands.

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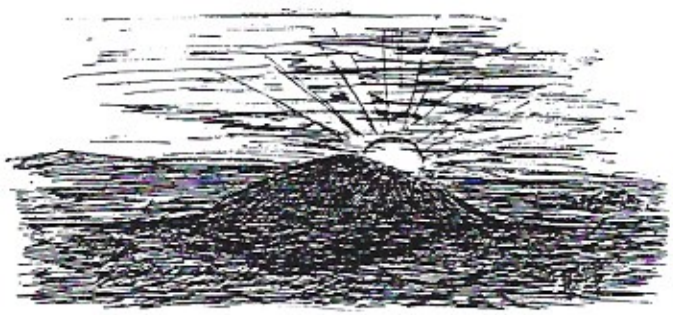

# GRAZING ON HEATHLAND: THE NETHERLANDS EXPERIENCE

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## Introduction

Heathland in North Western Europe is an old historical landscape. In former days, heathlands were part of an agro-ecological system. Nowadays, they have lost this function and nature conservation bodies have bought heathlands for nature and landscape conservation purposes. Grazing is one of our most important tools for managing heathland, and is applied in several management strategies, depending on the conservation objectives. In this lecture, I will start with a rough historical analysis to explain how this ecosystem works on a landscape-ecological scale. Secondly, I will briefly mention the present threats to heathland. Thirdly, I will deal with management goals and strategies. Fourthly, I will consider grazing as a management tool, practical aspects of grazing with cattle, horses and, of course, sheep. We have learned much about heathland management from the the United Kingdom, and during the last decade we have visited the New Forest on a number of occasions. There we saw the influence of extensive grazing on heathland and woodland. It is an honour to me to speak here about our experience in the Netherlands. I hope we are able to come to some useful conclusions.

## Historical sketch

First, a historical sketch of the heathland system in the Netherlands. Heathland is the result of agricultural land use over more than two thousand years. Geographically, in the Netherlands heathland is restricted to the higher and sandy soils. Here the first inhabitants made clearings in the original forest. With the increasing number of cattle and sheep, the area of open space grew. Farmers mainly kept livestock on the heathland. On the highest ground, close to the settlements, there was arable land and often in the valleys of the little rivers, hayfields. Livestock included sheep as well as cattle and horses in various numbers (Bieleman, 1987).

This figure, based on historical research, shows an estimation of the number of cattle and sheep in the last four centuries. Two important points come from this figure. First, the ratio between cattle and sheep fluctuates during the whole period from 1600, mainly due to periods of disease and wars but secondly, from the middle of the last century onwards, there is a change in the structure of agricultural landuse. Production of meat, till then the main objective of grazing cattle and sheep on heathland, diminished; on the other hand dairy production became important. Cattle were no longer grazed on the heath, but more and more on meadows. At the same time, the market for wool, the main product of sheep, collapsed with a consequent decline in the number of sheep.

Sheep were often herded in a flock with a shepherd during the day. At sunset, the flock returned to the village and animals spent the night in a pen. The floors of these pens were covered with sods from the heathland, to catch urine and dung. This mixture was used to manure the arable fields. In many places, heathland was very wet and we suppose that there were bogs in many places. These bogs were dug for fuel. Nowadays, in these places there are dry to wet heathlands. The result of this traditional management was that there was a transport of nutrients by husbandry (cattle and sheep) by sod cutting and mowing, from the heathland to the arable land. Heathland became poorer and poorer. On the higher and drier land, the original forest soil was devastated. Ultimately it became a drift sand. Sometimes then there was an opportunity for juniper to seed in.

It should be emphasised that, in the long term, the agricultural system is dynamic, depending on economic and climatic circumstances and also such factors as disease and pests. All these factors and others have determined the pressure of landuse. Periods with a high grazing

pressure were interspersed with periods of low grazing pressure. There is no evidence for sheep grazing purely on heathlands.

## Threats

Nowadays, heathland is not used agriculturally anymore. It has lost its function as a supplier of nutrients. Neglecting management is an important threat in two ways. Firstly, the removal of nutrients which caused enrichment has ceased. The result is an increase of grass species like wavy hair grass *Deschampsia flexuosa*. Secondly, through neglect, the succession continues. It is not supressed any more and this leads to invasion by trees. At the end of the nineteenth century, the area of sand dunes reached its maximum. From the beginning of the twentieth century succession started on the bare dunes, first with lichens and mosses then grey hair grass *Corunephorus canescens* and eventually natural afforestation. We do not have any indication about the occurrence of species on heathland over the last four centuries. We only know from the beginning of this century (when neglect had already started) which species have occured on heathland. In the Netherlands we note a high species richness till the fifties. In recent decades there has been a dramatic fall. I think it is good to recognize that there could be a relationship between neglecting management and the higher number of species at the beginning of this century. Moreover, the pressure of land use of the agricultural land bordering on heathlands increased. These meadows and arable fields are often feeding areas for birds breeding in nature reserves. This intensification should also be taken into account but there is still more.

In this century, the area of so called waste land diminished fast due to land-reclamation, urbanisation and construction of paved roads. Heathlands became smaller and smaller. Secondly, they became more and more isolated from each other.As a result, species richness which, according to McArthur and Wilson (1967), is correlated with the distance to other reserves and the area of the reserve, is under pressure. In smaller reserves, the number of species decreases purely as a result of the small area.

In the first half of this century, our countryside was a landscape with a wide range of ecosystems, from very poor land to enriched agricultural fields with a relative low land use pressure. This landscape has been changed into a highly productive agricultural landscape with, in places, remaining nature reserves managed by nature conservation bodies.

The influence of the modern world does not stop at the boundary of a reserve. Various effects are not stopped by a fence. Everywhere nowadays there is a high input of nutrients, especially nitrogen, originating from agricultural effluent, traffic and industry, all sources of our acid rain. Besides this, the lowering of the water table is another important factor in our wet country. The lowering of the groundwater table causes mineralisation, and in this way also an increase of disposable nitrogen.

These factors - termination of agricultural management on heathlands, intensification of agriculture, input of nutrients by acid rain and drying out - result in a strong increase of wavy hair grass on drier heathland. In the wetter environ ments there is an increase of purple moor grass *Molinia caerulea*. Both species dominate in such a way that there is no space for 'finer species', like *Gentiana pneumonanthe*, *Lycopodium inundatum*, *Arnica montana* and *Drosera* spp.

## Aims and strategies

We are challenged to conserve heathland in itself, as a landscape, but also the typical species of these nutrient-poor environments. In general, therefore, there are two types of conservation goal. Firstly, there is the restoration and maintenance of the traditional landscape with its typical species. Secondly, the idea of giving nature the opportunity to develop by giving scope to natural processes has recently been promoted. However, in both strategies, grazing is an essential tool to reduce the dominance of wavy hair grass and purple moor grass. These maintenance and restoration strategies are a continuation of former agricultural practice.

Grazing with sheep, cattle and horses or ponies is employed on many reserves besides other management tools like mowing and sod cutting. Sod cutting has been applied on a large scale, both on dry and wet heathland. Before starting a grazing regime, we have often removed the sod to impoverish the soil. In this way the nitrogen supply and the grasses are removed.

I will give you some examples of the maintenance and restoration strategy. The Wapserveld is an area containing both dry and wet heathland. Until the beginning of this century it was grazed by a flock of sheep; then management ceased. In 1941, our society bought this heathland. At that time there was no management. In 1974, we started a grazing system with sheep within a fence. Aditionally, each year we mowed a part of the reserve. Shrubs of *Prunus serotina*, an exotic plant from America, were removed and each year sod cutting has been done on 5 to 10 acres a year. Water drainage was reduced, so that the water table was raised to its original level. From 1974 until 1982 sheep grazing in summer was normal on the reserve.After 1982 sheep grazing was diminished and in 1984, we started grazing with cattle, each year about 60 in summer time on about 200 hectares. The reason for shifting from sheep to cattle was because sheep did not eat enough of the large amount of purple moor grass. Cattle are grazing this grass much more. Nowadays, grazing pressure here is about 1 cow on 3 ha.

Changes in breeding bird populations from the beginning of the 1980's were monitored. Black grouse *Lyrurus tetrix* (korhoen) had been extinct since 1972. Yellow hammer *Emberiza citrinella* (geelgors) and wheatear *Oenanthe oenanthe* (tapuit) increased markedly after 1980 and curlew *Numenius arquata* (wulp) decreased a little bit. The structure of the vegetation became much more open and tufted but species like whinchat (paapje) and stonechat (rood borstta puit) did not change.

On another reserve, the Wolfhezerheide, also with a grazing pressure of about 1 animal on 3 ha, vegetation has changed significantly after 10 years. In places with a dominance of 100% wavy hair gras (Van der Ploeg, 1991) ling *Calluna vulgaris* came back very slowly, reaching 20% coverage in ten years. Note that in places, originally with a vegetation dominated by *Calluna*, first there was a decline of *Calluna*, caused by the effect of treading. But note also that wavy hair grass increased here! After ten years, species richness has increased. In 1984 we found 79 species, and in 1990, 119 species. The new species are ruderals, characteristic of dry enriched environments. From these examples, the conclusion can be made that it takes time after introducing grazing before changes happen in the field.

Secondly, changes in vegetation and fauna may be the result of the grazing regime as well as other management activities and external factors. With the maintenance and restoration strategy we aimed to restore or to maintain the open landscape and the vegetation as a typical open heathland. Management pressure is high, often being a combination of grazing, mowing and sod-cutting. However, dry heathland is a transitional stage between sand dunes and woodland, and this management pressure is artificial. In the Netherlands, virtually all the landscapes that we consider to be natural are the result of agricultural activity. In recent years, there has been increasing opposition to this as such restoration and maintenance management can have some characteristics of gardening.

We want to get all types of heathland habitats. In one place we do sod-cutting, in another mowing,and in a third place grazing to try to restore these habitats. We therefore developed a second strategy, in which we only partly repress the succession, working alongside ecological processes. Grazing is applied at low pressure. Locally this leads to very low grazing pressure and so to natural afforestation, in other places to a high grazing pressure and so to sand dunes. Cattle grazing is essential to remove dead material. Deer and small herbivores like rabbits help develop a grass turf. In this management strategy, heathland and its neighbouring forests and arable fields are grazed together in one large compartment. Nutrient transport occurs from richer areas to poorer areas, or in some other places, overgrazing can cause an erosion process. This strategy is now applied only on a few of our Society's reserves. It has still some experimental aspects.

On the Veluwe, the forest area in the middle of the Netherlands, we find a reserve of nearly 5000 ha. The reserve has some small estates on its edges but also contains extensive heathlands and woodlands. It is a part of the Veluwe massive, on stowage hills dating from the glacial period. On some places, you have a magnificant view over the valley of the River Yssel. Many visitors come here each year. The forest consists of beech, oak and, in the poor very sandy places, Scots pine *Pinus sylvestris*. In the past, other conifer species such as Douglas fir *Pseudotsuga menziesi* and larch *Larix kaempferi*.were also planted for timber production There are often very sharp boundaries between the woodland and heath, often accentuated by a fire-break. In the forest there are red deer *Cervus elaphus* and roe Deer *Capreolus capreolus* and also wild boar *Sus scrofa*. The management of deer has been separated from the management of the forest so, for example, when a compartment had to be replanted or seeded, it had to be fenced. After the gales in 1972 and 1973 when the forest was disturbed over a large area, several hundred acres were fenced for reafforestation. As a consequence, complementary feeding of red deer was necessary resulting, in its turn, in a lower grazing pressure on the heath and grass layer in the forest. It is now difficult to see deer because during the daytime they are in large resting areas. They are very shy, partly due to hunting methods, but there is no need for feeding in the daytime. We have several targets to change this management:

1.We wish to change the sharp boundaries between the open fields,heathland,woodland and arable fields into transition zones.

2.We wish to improve the feeding situation of red deer.

3. Deer should become less shy.

After an experiment on a small scale (about 170 ha) at very low grazing density, we started in 1990 with a project of about 1600 ha in the northern part of the reserve, comprising about 600 ha heathland, 1000 ha woodland and about 25 ha former arable fields. In a fenced enclosure we introduced a herd of Scottish Highland cattle, starting with about 20 animals. This year the herd has grown to about 55, including the calves born this year.

First the composition of the area. We have chosen an area with about 70% woodland and 30% heathland. Woodland will be the most sensitive to grazing. We know from other reserves with a grazing regime, the weakest vegetation type should be in the majority. Of course, the composition of the reserve restricts the possibilities but if the weakest vegetation type is in the minority it will possibly be overgrazed. The former arable fields are included, although we know from the New Forest that grazing pressure will be very high on these enriched fields.Another important point is that, in the first experimental years when the grazed area was much smaller and only on very poor sandy soils, cattle suffered from a lack of nutrients, especially lime and phosphate. Inclusion of this richer ground is therefore a must to prevent illness caused by deficiency of these nutrients.

The total number of cows is calculated on the basis of the composition of the grazed area and the production of the different vegetation types, such as the former arable fields, the *Deschampsia* heathland, *Calluna* heathland and forest. Also this woodland, mainly with Scotch Pine and in some places broadleaves, has a grasslayer of *Deschampsia* which is an excellent feeding source for cattle as well as deer. In the woodland, grazing pressure should be low enough to allow regeneration. A further point of discussion is the choice of grazers to introduce. You have to realise that in this case a large area of woodland is included. In Holland, horses have a bad name for grazing trees. As it was revolutionary to graze in a forest, we chose Scottish Highland cattle. These cattle are not very demanding. Although French cows, like Limousin and Charolais, are used for grazing nature reserves, in this case we preferred British cattle. In summer, they lay down a fat reserve for bad times. French cows do not do this.

Another point of discussion is the sex ratio. As you know, in agricultural systems the sex ratio is strongly in favour of females. However, since the sex ratio at birth is nearly 1:1, and our objective is to maximise the natural processes, there is no reason for a sex ratio that is strongly

at variance with equality. Of course, when the herd is completed, ie the advisable grazing pressure is reached, the yearly increase should be removed. If there were more females, of course the yearly production of offspring would be greater, so you could make more money by selling cattle but more management of the herd would be needed. Care for the herd is then more and more necessary; the weaker individuals would need to be cared for if they were to produce calves. This should be carefully tested against the management objectives. Is this wanted when maximising the natural processes is the aim of this strategy? We have made the decision that it is not.

Introduction of cattle is not only essential for removal of the primary production, but affects the ecosystems in many ways. Behaviour of the individuals in the herd is important for the usage of the ground. We do not know if there is a different behaviour in a herd with, say, one bull, compared to a herd with more or less the same amount males as females simply because there is no reference. We have made a very principal decision to maintain an even sex ratio. It is good to state that production is not a management objective.

A point of interest is the weight of the cows. From the experimental years we know that the weight has a regular course (Van Wieren, 1988). In autumn, the cows are heavy, then their weight decreases till in spring, April - May, when the primary production is enough to turn back the loss of weight. The birth of a calf does not matter. I mention this, since we are not familiar with this process any more. A farmer will take care of his cattle in such a way, that this weight loss does not appear. In the beginning, we got questions from the Society for Prevention of Cruelty to Animals because, at the end of a severe winter, the animals are lean but not unhealthy. People were anxious that the animals would be ill but there have been no problems at all! We therefore normally do not provide fodder. Only at the end of a very hard winter with thawing by day and freezing by night will a bale of hay be given, more for reasons of public psychology than necessity for the cattle. With feeding, in a few days a process of habituation which influences the use of the vegetation.develops. We know this also from horses. They wait the whole day for their daily ration and do not use the primary production, their first task. Never give concentrates; this causes a serious illness of the digestive system.

There is yet one other thing to mention here. Following rules of the European Community the government has forced every owner of cattle to mark cattle with awful yellow earmarks. We also have to mark our cows in this way. Each calf should be marked within three days from birth. You can imagine that it is impossible to do this in an area of 4000 acres. Our warden makes an inspection tour once in a week but the reserve is too large to survey effectively. Besides, the cattle lose these marks in shrubs. Now we are in discussion with the government to get an exemption for these situations. Probably we will have to mark the cows when we sell them when they have to be transported to another place. An unpleasant detail is that these earmarks are bright yellow and therefore contain a certain amount of cadmium. This heavy metal in all other cases is rightly used less and less.

As cattle have only been grazing for two years, vegetation changes have been limited to the creation of patches of bare sand which have come about by trampling by the bulls. Lizards like these open places. In five or ten years time I hope to tell you more.

Finally, Mr Chairman, I told you about diminishing species richness as a result of isolation and reduction of the area of heathland. Isolation by motorways can be solved by construction of bridges between two reserves, especially for wild animals. Such bridges (we call them ecoducts) connect two of our reserves. Red deer and other animals can use them and in this case the cattle can also move from the one reserve to the other. Much more revolutionary, is to buy agricultural ground between reserves and return it to nature. In accordance with the policy of the European Community, our government has a policy to reduce the area of the agricultural land. To help execute this policy, our Society launched a plan, called 'Golden Plover', to construct a new heathland landscape. Already, in the first year, we have bought some hundreds of hectares of arable land between our heathland reserves and last week we just started with removing the top layer, made fertile by long agricultural use. In this way, we hope to make a connection

between the remnants of the old landscape. After surface stripping, grazing will be an essential management tool in shaping the landscape. We initiated a similar experiment about ten years ago on another reserve. Now, the first *Calluna* seedlings are appearing.

Mr Chairman, grazing is an essential tool for heathland management. We are using this in two ways. One is to maintain the old agricultural landscape and here grazing pressure is rather high. Other management methods are used in addition to grazing. In the other strategy, management objectives supplement ecological processes to shape a new landscape.

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# EFFECTS OF ATMOSPHERIC NITROGEN DEPOSITION ON HEATHLAND

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The possible effects of air pollution, especially the increased deposition of nitrogen compounds, on heathlands have become a matter of concern in recent years. Emissions of sulphur dioxide in Europe have decreased over the last 10 years, and this is expected to continue. During the same period, however, emissions of nitrogen oxides and ammonia have increased. Nitrogen oxides are emitted from traffic (35%) and power stations (30%), with most of the rest from other industries. Introduction of catalytic convertors on cars may reduce emissions, but it is possible that an increased volume of traffic may negate any improvement. Emissions of ammonia are mainly from livestock rearing (80%) and most of the rest from use of nitrogenous fertilisers. Some steps are being taken to reduce these emissions, especially in the Netherlands, but a rapid improvement is unlikely. Overall, the nitrogen emissions from human activities are approximately 90% of the total. The rate of deposition of nitrogen compounds is therefore unnaturally high, and is likely to remain so.

Once in the atmosphere nitrogen oxides and ammonia undergo various transformations and can be deposited in a number of different forms. The forms of nitrogen deposited, the amounts and the importance of particular pathways of deposition vary in different regions. For example: the uplands of northern England receive a lot of nitrate in wet deposition, but in the South East dry deposition of ammonia gas is more important. On a European scale the deposition of oxidised forms of nitrogen is highest in and near major industrial regions, especially northern Germany. Reduced nitrogen compounds (ammonia and ammonium) are derived from different sources, and deposition is highest in the Netherlands due to intensive agriculture and livestock production. Ammonia/ammonium deposition in the UK is greatest in the South East and least in the North West. Across the south of England for instance estimated ammonium deposition falls from more than 7 kg $ha^{-1}$ $yr^{-1}$ in East Anglia, to less than half that in Cornwall.

The first step in assessing possible problems with nitrogen deposition on Surrey heathland is to determine what nitrogen compounds are being deposited and in what amounts. Measurement of nitrogen compounds in rainfall is relatively straightforward. Input by interception of fog is more difficult to measure, and dry deposition of gaseous forms of nitrogen is even harder to quantify. Taking ammonia gas as an example the major factors affecting the amount deposited to vegetation are:

1. Concentration of ammonia
2. Aerodynamic roughness of the canopy
3. Surface wetness
4. Windspeed
5. Plant stomatal opening
6. pH of any surface moisture
7. Concentration of sulphur dioxide
8. Plant nitrogen status
9. Soil pH and nitrogen status

Even the first and most obvious of these factors is not usually precisely known because routine monitoring of ammonia gas is expensive and seldom carried out. A further problem is that ammonia concentrations can be greatly affected by local sources, making it difficult to generalise about concentrations over large areas. The figures presented below for dry heathland at Thursley Common are taken from Uren (1992) and are derived from measurements at a nearby site, combined with the best available estimates for deposition rates to heather for given gas concentrations.

| | | |
|---|---|---|
| Wet deposition | $NO_{3-}$ | 3.2 |
| | $NH_{4+}$ | 4.1 |
| | total | 7.3 |
| Dry deposition | $NO_2$ | 1.5 |
| | $NH_3$ | 10.0 |
| | total | 11.5 |
| Combined total | | 18.8 |

There is no doubt that the rate of nitrogen deposition to heathland in Surrey has been greatly increased as a consequence of air pollution, but we need to consider what the biological effects of this might be. Heathlands are nitrogen-poor systems, and changing this could lead to a change in species composition. The simplest case would be that species able to show strong positive responses to increased nitrogen availability would displace by competition the species which respond less well. A lot of work has been done in the Netherlands to investigate the causes of large-scale conversion of heathland to grassland observed in the last few decades, most frequently replacement of *Calluna vulgaris* by *Deschampsia flexuosa* or *Molinia caerulea*. The changes coincided with a large increase in atmospheric nitrogen input, but at the same time traditional grazing and sod-cutting of heathlands declined, so it is difficult to assess the impact of air pollution. It is not easy to summarise the many experiments carried out; in the specific case of dry heathland it is accepted that nitrogen deposition has to some extent accelerated loss of heathland; however, the original idea that nitrogen inputs promote grass growth and the heather is then crowded out appears to have been an oversimplification.

Some experiments have shown that increasing the nitrogen input does not necessarily precipitate conversion of heathland to grassland, at least in the first few years. For example, Aerts *et al.* (1990) applied up to 200 kg N $ha^{-1}$ $yr^{-1}$ for 3 years to a mixture of *Calluna* and *Molinia* but the *Calluna* was not crowded out. Van der Eerden (1992) has conducted a number of experiments with mixtures of *Calluna* and *Deschampsia*. When small shoots of both species were planted together and sprayed with different ammonium sulphate concentrations for one year *Deschampsia* was able to compete more successfully at the higher nitrogen inputs. This does not mean that the *Calluna* was unable to respond positively to the nitrogen; it did better with more nitrogen when in monoculture, but in the mixture any benefit was more than outweighed by increased competition from the *Deschampsia*. In a different experiment in field plots Van der Eerden applied ammonium sulphate sprays over 18 months to a stand of *Calluna* which had been thinned to allow the planting of *Deschampsia* shoots. The highest rates of nitrogen input (46 and 91 kg N $ha^{-1}$ $yr^{-1}$) slightly increased the ratio of *Deschampsia* to *Calluna*, but nevertheless *Calluna* remained dominant. Observations such as these suggest that *Deschampsia* can take advantage of high nitrogen availability to outcompete *Calluna* only when something has occurred to disrupt the *Calluna* canopy so that *Deschampsia* has good access to light. Investigations have therefore concentrated on factors which could produce rapid canopy breakdown and on whether these factors interact with increased nitrogen input.

Frost damage, drought and attack by the heather beetle can all cause canopy breakdown and there is some experimental evidence that susceptibility to these natural stresses can be increased by exposure of *Calluna* to high nitrogen inputs. Demonstration of measurable changes under laboratory conditions is much easier than assessing what effect these interactions may have under field conditions; opinion is presently divided on the importance of such secondary effects of nitrogen deposition. Management to remove nutrients from heathland may ameliorate the effect of nitrogen deposition in terms of nitrogen availability in the soil, but it is possible that effects may still occur due to direct uptake of nitrogen compounds by the foliage, especially in the form of ammonia gas. Expressing nitrogen deposition in terms of total N is usual, but it may prove more useful to consider the different forms separately as more information becomes available on how the form and route of nitrogen input determines the effects.

The next problem is to define the rate of nitrogen input required to produce changes in heathland. The input rate above which changes are caused is known as the **critical load** and a lot of effort is put into defining critical loads for different ecosystems. A recent UNECE meeting in Sweden came to the conclusion that the critical load for conversion of dry heathland to grassland is, on the basis of current knowledge, 15-20 kg kg N $ha^{-1}$ $yr^{-1}$. Thus, Surrey heathland is towards the top of the range above which we expect effects. Since October 1989 Imperial College has conducted an experiment on Thursley Common to examine the effects of small increases in nitrogen deposition, and this is described in a simplified form below.

There are four fenced blocks, each containing 4 x 4m plots of control, low and high nitrogen treatments (one of each). The vegetation is dry heathland dominated by *Calluna,* with very small amounts of *Erica cinerea* and *Ulex* spp. The *Calluna* was 13 years old at the start of the experiment following a severe fire in 1976. The plots are sprayed 42 times per year with ammonium sulphate solutions to give an annual deposition of 0 (control), 7.7 or 15.3 kg N $ha^{-1}$ in addition to the background. The plots are quite small and in most cases contain no grass, so the experiment is not suitable for examining *Calluna* grass competition directly. The purpose of the experiment is to look at the response of the *Calluna* to the nitrogen, especially for any altered stress sensitivity or signs of canopy breakdown which could provide conditions for grass invasion.

To date, plant material removed from the experiment has shown no significant increase in frost sensitivity and no improved performance of heather beetle larvae fed on it. Drought sensitivity has not yet been investigated, but during recent dry summers there has been no obvious damage to plants in the high nitrogen treatment. Shoot growth of *Calluna* showed a small positive response to ammonium sulphate in the first year, and this has increased to 60% extra growth in the high treatment compared to the control this year. Flowering has responded similarly, with the proportion of shoots having flowers in the high treatment being nearly double that in the controls by 1991. The surface (0-10cm) soil had acidified by 0.23 pH units in October 1991, which is a small change, but could become important if continued.

The present situation then is that only positive responses of *Calluna* to ammonium sulphate have been detected. However, other workers have suggested that there may be an initial positive response until the nitrogen status of the plants becomes excessively high, so the next few years should be interesting. Present knowledge suggests that the rate of nitrogen deposition to Surrey heathland is a cause for concern, but we cannot yet predict the long-term consequences of these inputs with much certainty.

Acknowledgements

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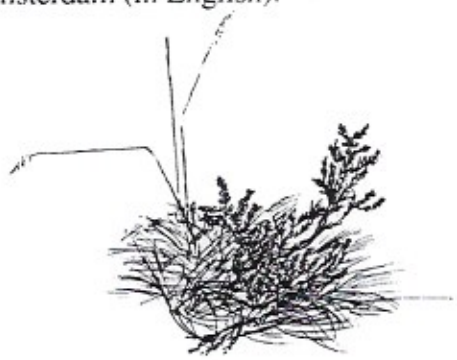

# MONITORING THE HEATHLAND HABITAT

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## Introduction

Obviously, all those attending this Conference are committed to the conservation of heathlands, and I am sure that most of us are aware that only a minority of heaths are stable for any length of time: most are potentially dynamic, liable to change to other types of vegetation. If we wish to conserve them, management - to varying degrees - is essential.

Hence, many of us are engaged in the practical business of managing heathland, but I wonder how many of us are totally confident about our choice of management options - whether they be cutting, burning, grazing or even turf stripping. For example, are we sure we know for certain how often we should apply management, at what season, and at what intensity? Can we predict with certainty the outcome of our management plans? In other words, do we have access to enough previous experience, and is there a body of knowledge on the effects of heathland management on which we can rely? Often we have recourse to those who have gone before and have accumulated wisdom; but what if they are no longer with us? Is not much of our management still in the experimental stage? And is there not a danger that we repeat experiments that others have tried, simply for lack of knowledge of their results?

This indicates that (apart from a few notable exceptions) there is a serious lack of monitoring, and monitoring which is properly recorded and written up. Generally, we much prefer the constructive activity of planning and carrying out management to the lengthy follow-up of monitoring; or we are too busy with managing (on a small staff) to find time for monitoring.

The purpose of our management is one of two things:

- either to maintain an existing community, or
- to initiate change in a desired direction.

Either way, we need to know if we are being successful or not, and if the effort (in terms of time and money) is providing worthwhile results or if we should change our tactics. The results of management are often slow to manifest themselves, so monitoring is a long-term commitment.

Therefore, some form of systematic monitoring is indispensable, and it should be more than an accumulation of impressions in the memory: it must be a properly planned programme which can be recorded for the benefit of others. The question is: what to monitor and how to go about it?

Accordingly, this contribution is partly to emphasise the importance of a monitoring programme, partly to indicate the rationale behind it, and partly to comment on various approaches to it. I will not go into details on methods, which are available in various specialist publications.

## Philosophy of Monitoring

I have just referred to monitoring as a commitment and so it is, an ongoing commitment. It is a complete waste of time to set up a system of monitoring if it is not continued and repeated at appropriate intervals. This has happened too often in the past, when people have, for example, set up permanent marked plots without providing for the necessary time, personnel, etc. to

continue to record them.

Hence, while monitoring is essential, it is important not to be over-ambitious. So it is vital at the beginning:

a) to formulate the exact questions to be asked, and

b) to select appropriate methods to answer them. Thus, if the question to be asked simply concerns the proportion of heather cover in relation to that of shrubs or grasses, a relatively simple monitoring programme is enough; but if the overall species richness of a community is at stake a much more detailed recording programme is needed.

What, then, are the immediate purposes of monitoring? They are, again, twofold:

a) to get an objective record of changes over time in vegetation and (as appropriate) animal populations, together if necessary with aspects of their habitats; or, alternatively, to establish the absence of such changes, if stability is the aim, and

b) to warn when 'acceptable levels of change' are being exceeded, so indicating if management is failing to meet its objectives or needs to be altered. This means setting down in advance what the 'limits of acceptable change' are: for example, they may be stated in terms of the minimum amount of heather cover in relation to other components of vegetation, or the continued presence of certain 'key species' at stated population levels, or the maximum tolerable areas of invasive species such as bracken or certain grasses.

## Approaches to Monitoring

Monitoring can be carried out at one or more of several levels of input (roughly equivalent to the well-established levels of habitat survey, eg Phase 1, 2 or 3 survey), but, before reviewing these, one essential general principle must be stated:

At whatever level is chosen, the records and results of monitoring must stand up to the normal rigorous requirements of ecological analysis and, where appropriate, data must be obtained in ways appropriate for statistical tests. Thus, while subjective notes furnish an extremely important background, they should wherever possible be supported by proper systematic data recording and adequate replication of samples in space and in time. (Replication in time by means of periodically repeated recording is an obvious requirement for monitoring; replication in space is equally necessary but often poses logistic problems in its achievement.)

Methods of monitoring are often divided into three levels:

Level 1 Providing basic information on the site and its vegetation, such as can be obtained from site descriptions and periodic fixed-point photography.

Level 2 Periodic survey, often including the use of periodic air photo coverage. The aim is to determine and map community boundaries.

Level 3 Detailed examination of vegetation and fauna by rigorous sampling at regular intervals.

Levels 1 and 2 represent monitoring on a fairly broad scale, and may be briefly discussed together. They should provide:

- a record of all management practices, including the areas subjected to treatment (eg burning, cutting, grazing), with dates, best indicated on maps.

- a record of the areas occupied by different vegetation types (eg the NVC categories), and by stands of heather at different growth-phases and of different structure (see MacDonald, 1990). These should be mapped at regular intervals, but it is unlikely to be necessary to repeat the mapping more frequently than, say, once in 3 to 5 years, since only major trends will be shown up. More frequent mapping may be counter-productive by drawing attention to minor fluctuations, or to small technical discrepancies of little significance.

Level 3 is monitoring on a smaller scale but in greater detail. The need for this arises when it is necessary to record the detailed composition and structure of communities in order to distinguish between changes which are a direct result of management and those which are part of natural fluctuations or trends. At this level the commitment becomes much greater and the need for careful planning correspondingly more evident. Again, it is important that the selection of procedures and methods should take into account the questions to be answered and the resources of time and effort available. While detailed and sophisticated recording may in principle be very desirable, it is not always possible. Some monitoring is bound to be better than none, so long as it is properly prepared and sufficient for the purpose it has to serve. To prevent the commitment becoming unmanageable, attention may be focussed on managed areas rather than on the whole range of vegetation and habitats represented in an area, but control (unmanaged) sites must also be recorded for comparison.

Two main options are available:

a) Permanent samples. This is perhaps the most common approach. Periodic records from permanently marked quadrat samples are readily compared and provide an effective means of identifying change. Records may take the form of scale maps of the distribution of plants within the quadrat (though this is often difficult), estimates or measures of cover of species or groups of species (where possible direct measures using point samples are much to be preferred), or measures of local frequency in the small sectors of a gridded quadrat. Such data are especially valuable as an indication of the consequences of experimental management (eg cutting, or turf-stripping followed by reseeding, etc) if taken at intervals from permanently marked samples in the managed areas.

   In any one permanently marked sample, comparisons between data from time 1, time 2, time 3, etc are directly comparable and valid, but they apply to that quadrat alone. If the data are to be used to make statements about a whole area (eg a burnt patch or a grazed paddock), then adequate replication is essential. This may create problems in respect of the time taken to refind and record a number of quadrats, but it is essential if the significance of any changes is to be assessed.

   If the patch being monitored is not too large, this is clearly an appropriate method. It has a further advantage in that if the results from a series of recordings in a set of quadrats at several time intervals are together subjected to an ordination, and the points for each quadrat at the different time intervals on the ordination plot are joined by lines, these lines (trajectories), if parallel, can quickly indicate trends of change.

b) Quantitative analysis of community composition. Instead of using permanently marked samples, heath stands may be analysed quantitatively using random quadrats. This may be a quicker procedure than recording permanent samples and hence may allow a larger number of samples to be taken. However, it does not permit direct comparison of individual samples at different times, and the variation between samples may be such that rather a larger number may have to be taken if a reliable index of change is to be gained. Cover or frequency may be recorded, or where individual plants can be distinguished they may be counted to provide a measure of density. (It should be noted that it is necessary to record all species only where changes in overall community composition are to be monitored. Where interest centres on one or a few species, or categories, data collection can be confined to these.)

Results of this kind of quantitative analysis of a managed area can be compared with those from a control area at any one time, or successive records from the same area can be compared. Given adequate replication (ie numbers of quadrats), these data can be tested statistically.

## Populations

It is not possible in this paper to get into the subject of monitoring the populations of individual species of plants or animals. Particularly in the case of animals, each group requires its own special methods, which are described in specialist literature.

However, because of the importance of heather in heathland reserves and the great current concern about the general decline in the extent of heather stands, something must be said about monitoring heather performance. This is most often required when heather is subject to, or is being managed by, grazing. What is needed is an assessment of heather utilisation by the grazers, in order to detect whether there is over- or under-grazing, and whether there is a risk of long-term damage to the heather stand.

The subject is fully covered by MacDonald and Armstrong (1989), who set out three approaches:

1 A rapid assessment of utilisation on areas known to be vulnerable to over-grazing. The method involves setting out five transect lines per stand, walking these and making counts of the numbers of grazed and ungrazed long-shoots of heather in two $1m^2$ areas on each line.

If over 65% of long-shoots have been grazed this may be taken as a sign of over-grazing.

2 A rapid assessment of grazing over a whole reserve. The method outlined in 1 is repeated on all stands.

3 Estimation of heather utilisation to an accuracy of 10%. This method involves a considerable number of random plots in which measurements are made of the lengths of a large number of grazed and ungrazed long-shoots. Formulae are given to enable a calculation to be made of the amount of offtake, which can then be used as an indication of the level of grazing, in the following bands:

| | | |
|---|---|---|
| Low grazing intensity | Offtake | 0-18.4% |
| Medium grazing intensity | " " | 18.5-40% |
| High grazing intensity | " " | >40% |

This approach furnishes an objective test against which approaches 1 and 2 may be calibrated.

## Conclusions

A case has been made for the view that monitoring of heathland management is vital. Results should be recorded and, if possible, published, or at least made available to others. Therefore, they should be obtained systematically and, as appropriate, be in a quantitative form, subject to statistical analysis.

Monitoring, ideally, should always be done by the same person to avoid observer differences, but this may often not be feasible. To obviate, as far as possible, differences due to different recorders a very clear schedule should be laid down and adhered to.

For certain purposes, it may be necessary also to undertake monitoring of some aspects of the

physical or chemical environment, eg the hydrology (if it is liable to be influenced by surrounding land use practices), or levels of nitrogen in areas subject to atmospheric pollution. These are specialist activities with their own methodology, again available in the literature. My purpose has been to indicate a sensible approach to biological monitoring which all heathland managers should consider.

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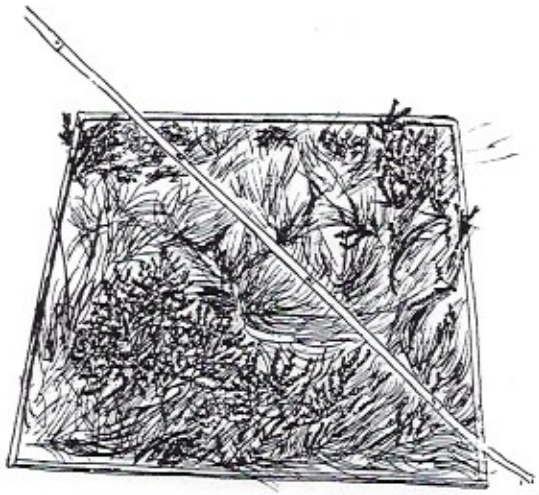


## DISCUSSIONS: THURSDAY MORNING

### Discussion chaired by Colin Tubbs, English Nature

Anon. Dr Prins, what is the reaction of the public to the large scale management work which is taking place in the Netherlands?

Dr. Prins It is necessary to give good information to the public. On every reserve we have information stands where visitors can read about what we are doing. When we explain why there is a fence or why we are cutting trees the public generally accept this. The public have the idea that grazing should take place: they have a mental picture of the shepherd and his flock so it is 'normal' to them. I can think of only one conflict. This is with dogs. People sometimes do not like to be prevented from training them but , with good information, we can usually get over this problem.

Prof. Gimingham A question to Dr Ainsworth. I wonder if he has considered the possibility that the increased nitrogen may not be just be improving the growth of the heather but taking it faster through its normal sequence of growth phases. In other words, one would expect it to be doing good to the heather at its present stage but if it goes faster, then of course, the eventual degeneration phase will come and it may speed up the situation when the canopy opens up and it really does give place to the grasses.

Nigel Ainsworth Yes, I should mention the balance between heather shoot and heather root. Several of the nitrogen experiments have shown that whereas shoot growth is stimulated, root growth is not stimulated or is actually suppressed. If this happens you could end up with a heather plant which looks very good because the shoots are growing faster but under the ground roots are reduced. This is not a stable situation especially if there is drought but I agree with that the effect of nitrogen generally is just to speed the growth of the heather. The consequence for management might be that a management practice that has worked perfectly well before might have to be repeated more frequently in order to cope with the changes.

Clive Chatters Hampshire Wildlife Trust We have heard a lot about heather today and I imagine we are going to see a lot of heather. This is understandable because in heathland where traditional management has lapsed, the *Callunetum*, the heather-dominated heath, is now in the public perception and in our professional perception what heathland is. However, in traditionally managed heathlands such as the New Forest, heather and the *Callunetum*, the dwarf shrub dominated landscape, is only a very small component part of what is a great matrix of habitat. To somebody interested in vascular plants, the heathland habitats which are now the most scarce and most rare and under threat are those which are associated with some of the more grassy trends or even the scrub and bracken habitats. Should we not be looking to maintain the traditional flux of the multiplicity of habitat in our heathlands rather than concentrating our minds on the most obvious of habitats, that one which is most obviously covered by heather?

Chairman I suppose the point which is being made is that heathland is much more than *Calluna*.

Dr. Prins I agree with that. One of our management aims is to get a purple expanse of heather but this is, perhaps, our most extreme management aim. This, from the nature conservation standpoint, is not good: there is not enough structure, no differentiation in the vegetation. Mowing produces a much more uniform vegetation than grazing. We like to graze at low intensity in large compartments. In this way we obtain more differentiation in the vegetation with grass, sandy

places, heather, scrub and even trees - better for more organisms. Also, we do not like to graze with a shepherd although this is traditional.

Anon. Dr. Prins, did you mean that you rotated the sheep, cattle, horses or did you mean that you just put sheep in one area, cattle in one area and horses in one area?

Dr. Prins When we start management on a heathland reserve, often there is no grazing at all. In the 1970s we started with sheep grazing because this appeared to be the tradition. However, I think that grazing by sheep is a 19th Century phenomenon because it was then that cattle disappeared from the heathland to the meadows. From the early 1980s we began to believe that cattle grazing is preferable. Sheep do not eat *Deschampsia* or *Molinia* to such a degree that they can bring about changes to heathland. Sometimes we have a combination of sheep and cattle but mostly we graze cows, sheep and horses separately. I think there is a tendency in scientific thinking to want to know what the influence of a particular grazing animal on the vegetation is. I have the view, however, that a variety of grazers are the 'natural situation' on heathland or grassland. For maximising variety in habitats you need variety in grazing.

Anon. To Dr Ainsworth. You gave us a figure of deposition of nitrogen at Thursley Common of 18.8 Kg per hectare per year. Can you tell me what the variation is on an annual basis - do you get very low years and very high years?

Nigel Ainsworth Many factors affect nitrogen deposition. Nobody really knows what the annual pattern of ammonia deposition is. I would think that if you got an airstream from the Atlantic for a very prolonged period of time, that would tend to reduce deposition because those air masses have less ammonia in them. If you get constant steady airstreams from the east and the south, you would tend to get more. The information is lacking on whether you get very high years and very low years. Many people are working on getting precise mapping on nitrogen - its amounts and also its fluctuations.

Anon. How do you feel that the lack of that knowledge will affect interpretation of your results?

Nigel Ainsworth It is going to make an uncertain situation even more uncertain especially since I am adding a constant amount all the year round because I don't know what the annual pattern should be to reflect ambient deposition. I am also applying it the same every year so I am not having high years and low years. At the time when the experiment was starting, that was our best information and, to date, we really don't have any better information on that. I can tell you weather conditions in which deposition will be higher or lower but I can't tell you seasons or particular years.

Bill Syratt BP A question to Nigel Ainsworth. Bearing in mind that you have actually seen a drop in your soil pH under your high ammonia and nitrogen levels in your plots, is there any evidence to show that under these conditions perhaps the litter layer is breaking down faster?

Nigel Ainsworth The acidification might actually slow down the breakdown of the litter layer as the soil is quite acid to start with and if it gets more acid it is likely that the litter would decompose more slowly. The other point is that the litter coming down would change in composition. A lot of people find that when they apply nitrogen, they get a high nitrogen litter in a few years coming down and that tends to decompose faster because it is the carbon to nitrogen ratio in the litter which often limits decomposition. At the moment, all we do is to collect litter. We don't measure its decomposition or its chemical composition, we just know

how much there is. That's one thing we might have to look into. The acidification is probably due to the sulphate rather than to the ammonia. It is probably just the leaching of the sulphate out of the soil taking base cations with it which is acidifying things. At the moment there probably is not enough nitrogen in the system to produce nitrate leaching which would make it acid as well.

Some of the soil chemists I have talked to have said that there will be a limit on acidification due to sulphates because eventually the pH will drop such that aluminium compounds begin to absorb any further sulphate and acidification will gradually level out. That is another thing we have to wait for in this experiment but certainly it could turn out that the soil changes have more influence in the end than the direct effect on the shoot which the experiment was set up to look at. We keep an open mind on the subject.

Gordon Flower, NT — You have been talking about a lot of work on aerial deposition. Has any work been done on animal deposition - i.e. dogs?

Nigel Ainsworth — It is certainly a very concentrated deposition. I would think that one dog would put more nitrogen on one of my plots in however long it takes than I would in 42 applications in a year. At Thursley, the plots are fenced. Partly this keeps out rabbits because uncontrolled little patches of rabbit grazing could disrupt our rather small plots. Partly it discourages people walking across the plots to investigate (although fortunately that doesn't seem to be a big problem), but a very important thing is that it discourages dogs.

Nick Baxter — A question for David Bird. You seem to be suggesting that with low population levels the process of heathland creation was very much 'slash and burn' and the people would then move on to a new area. I wonder when, after the woodland was first cleared and it then scrubbed over again, these secondary clearances were most likely to have occurred?

David Bird — Received wisdom at the moment is that heathland was mostly created in the Bronze Age. My own feeling is that you are looking at a very gradual process whereby heathland is created more and more across the county, starting in the Mesolithic and continuing in very uneven progression all the way through to about 1800, gradually getting more and more but always a question of two steps forward and one step back.

Anon. — On application of ammonium sulphate for nitrogen studies, how much of that sulphate is blown off in the wind, how much is very rapidly leached into dry sandy soils under dry heathland, and thirdly what are the effects of soil wetness?

Nigel Ainsworth — The sulphate will not blow off in the wind because it is applied as a mist and we do not apply in dry conditions or very windy conditions. At this time of year (July) we get up at about four o'clock in the morning in order to apply when there is still dew on the heather or at least when it is all still damp so we don't have concentrated ammonium sulphate solutions drying in hot sun onto the heather shoots. A lot of it probably does leach very quickly through a sandy soil. It has a very low capacity for binding sulphate. I do have some methods of measuring the chemical composition of the soil solution which I won't go into but we have had extra sulphate appearing at that sort of depth as a result of spraying. Effects of the soil moisture - I don't know!

Chairman — Before we go - can I thank you for tolerating me and can I say thank you once again to our four speakers because it has been a marvellous morning?

## DISCUSSION: THURSDAY EVENING

### Discussion chaired by Peter Tinning, English Nature

Chairman — Now we go on to the discussion of today's site visits. All the sites we looked at today are part of one SSSI which is the Thursley, Hankley, Frensham complex, an extremely large site, and soon to be a Special Protection Area. I suggest that questions should be directed to the site managers and leaders of various parts of this afternoon's trip.

Pete Gotham RSPB — The first bracken area which we looked at this afternoon at Thursley which was largely grass, do I understand that you didn't spray the bracken there at all?

Ian Davies — We originally sprayed quite large areas but we didn't have a good success rate, partly due to weather conditions. We would get a rainstorm or something and a patchy rate of kill. We had lot more success with smaller discrete areas.

Pete Gotham — I can mirror that experience in the West Country.

David Page — The area that you scraped where you clear felled the pine on Thursley, did you leave a control plot or area which you didn't scrape to see how heather would regenerate on that area?

Ian Davies — We did. There is an area we haven't scraped at all. It was in between the two areas that we have scraped. It is probably not perfect experimentally but we had to do it with the sort of constraints we had with the swing shovel driver.

David Page — And what were the results?

Ian Davies — There has been virtually no regeneration at all on the areas that we have left with just the litter on. Small amounts of *Agrostis* , but nothing of any significance and gorse as well has been reappearing.

Gordon Flower,NT — Regarding bracken, I understand that the short window that we can find ourselves with with Asulam can be got over by using something else. Can you give details?

Ian Davies — The other chemical which has full clearance is glyphosate. This has a much larger window. One of the reasons why we didn't use it much on the areas we were spraying close to *Calluna is that g*lyphosate will kill *Calluna* . We did spray some areas with glyphosate over a number of years but we didn't get such a good kill rate. You have also got to use it it at quite a high concentration - I think it is about three to four litres per hectare.

John Dover Environmental Advisory Unit Liverpool — One of the things we have not heard much about today is the faunal element and someone earlier today mentioned the potential conflicts of managing for different faunal elements. Have you had any trouble with that on the Thursley complex and how have you reconciled them?

Ian Davies — Yes, there have been a lot of problems or potential problems of diametrically opposed management regimes. I think the way to get over that is to juggle it and have specified areas. In the management plan at Thursley we have specified seral or structural stages to each compartment or part of a compartment to provide representative and viable examples of each running from bare sand to degenerate phase *Calluna* becoming invaded by scrub.

John Dover — Have you been able to do some monitoring as well to make sure it's worked?

Ian Davies — Yes, we have done some monitoring, particularly in areas where we have been trying to increase structural diversity. We have been pitfall trapping and looking at coleoptera in particular and we have got one year's set of results. Admittedly monitoring could be better but we are limited by our resources. We have also done net sweeping.

Simon Moss NT — In Surrey, does the Forestry Commission have any involvement in heathland? In Suffolk we seem to have a very good relationship.

Peter Tinning — Yes, there is some: Crooksbury Common is Forestry Enterprise. There isn't very much actually where the Forestry Enterprise (or Authority) is directly involved in the heathland management. Most of the areas are no longer FE and they are now private woodlands.

Ian Davies — The working relationship with the Forestry Authority is very good. They have been very positively responsive to our clearance and once they saw what our management objectives were, they were supportive of the quite large clearfells.

Peter Tinning — It might be worth mentioning for those of you from outside the county, the structure of heathland ownership here. The major heathland owner is the Ministry of Defence with 60% of the resource. Thursley accounts for 8% of the heathland, the National Trust have a similar holding and the local authorities control most of the rest. So private ownership in other bodies is relatively small.

Mike Williams Clint & Devon Estates — Do you have any problems getting felling licences from the Forestry Authority?

Simon Nobes — Following on from Ian was saying, there was an initial hesitancy as to what exactly we were intending. I think when it was presented to them as a properly thought out policy, very much in line with an approved management plan, we seemed to get a very sympathetic response from them.

Nick Baxter SCC — My understanding now is that the Forestry Authority in Surrey will certainly consider clearfelling for restoration to heathland but they require assurance that the site is then going to be managed for heathland for so many years afterwards and that licence decision doesn't just rest within the Hants and West Downs Conservancy area. It actually has to go upwards from there.

Mike Williams — On the same subject, I understand you only require a licence if the woodland has been planted in the first place rather than wild-grown.

Ian Davies — No, it is not the case. If it's above licensable size you need a licence.

Bill Jenman Sussex Wildlife Trust — On licensing, if you have got a naturally regenerated Scots pine stand with a large variety of different ages of tree in it, trying to put your licence application together is difficult. What the Forestry Commission suggested we do is find a hectare to thin under their neglected woodland grant scheme (which is much easier) and fell the other 15 hectares under the grant scheme. That's much easier with much less bureaucracy. They actually suggested it.

John Patmore English Nature — Does anyone has any comments on fencing on common land? It is something I have got to deal with fairly soon - fencing for sand lizards. I wonder if a temporary fence for just part of the year is the solution?

Peter Tinning — We thought we would have more problems with temporary fencing than in fact has proven the case. We felt that there would be a great deal of public opposition to temporary fencing on commons but in fact where this has happened for various purposes - grazing experiments and so on - it doesn't seem to have raised much opposition at all if people have been told what it's purpose is. I'm quite surprised because people are quite defensive and protective of their commons, particularly in this county.

Prof. Gimingham — One thing we have glossed over in the discussion so far is possibly the major problems which is wildfires. Is one just accepting this as a necessary hazard - one that we can't do anything about? Is it an educational problem - that we have to start from grass roots and work up in education? Is there anything we can do in the meantime against this issue?

Ian Davies — I came across the perfect solution when I went onto the Luneberg Heath in Germany. They said, "We do not have fires here - they are forbidden."

Andy Wragg SCC — It's something I hope to cover tomorrow. We have actually managed to reduce the numbers of fires on Chobham so that there have been less over the last three drought years than there were over the two months before I started. Roadside firebreaks, better access for the fire service, liaison with the Fire Service and just having somebody there all the time have all made a difference. Fires are predominantly caused by arsonists and if there's a presence they don't happen. It means that when it is dry there has got to be somebody there.

Ian Davies — Yes I'd reiterate that, but I think you need to take measures to ameliorate the effects of fires. I don't think you are ever going to stop a determined arsonist.

Simon Nobes — We've also found at Thursley that it has been very effective having a close liaising relationship with the Fire Service in the local area. Copies of the fire plan and fire maps are distributed to the local stations that may respond to a call at Thursley. We have had training from the local fire brigade. This was very useful in terms of practical fire fighting techniques but possibly more so in helping us learn the language of the Fire Brigades, how they operate, what sort of information they will find most useful when a fire is reported to them to enable them to take the most effective, most efficient action. It is also very useful to know their command structure so you know whom to talk to quickly to get things done.

Anon. — Has anyone had any experience of the foam that they put out around a fire? At Cannock Chase they have an Argokat which spews out foam behind it and when the fire comes up to it, it stops.

Chris Marrable Ashdown Forest — We expect to get probably 20 fires in a quiet season and we have got the ability to put foam down. We've only found it useful as something to back-burn against. It won't actually stop any sensible sort of fire but what you can do is put it down and light another fire in front of it so that when the two get together the fire goes out - so long as the wind doesn't change!

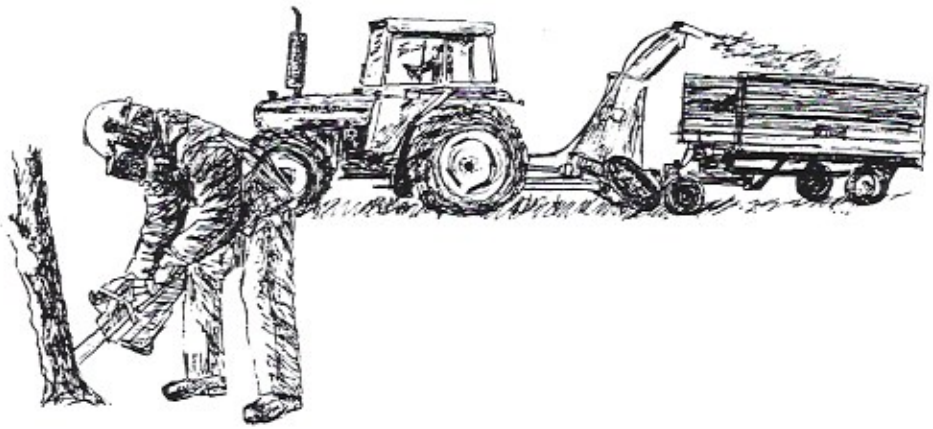
Ian Davies — I've come across a problem using foam on my new site, Goss Moor, which is the catchment area for the River Fal. The NRA are not very happy about the use of foam at all because it contains protein.

Prof. Gimingham — That's rather deflated what I was going to say because we have been thinking of foam as a means of fire fighting but of course it can be a very useful means of planned small patch burning. We've used it near Aberdeen for that purpose

and I was hopeful at the time that this could become more widely used for controlled burning in relatively sensitive areas. Assuming you are burning under good conditions, the foam barrier is quite effective, not against a wildfire I fully admit. For a small planned fire it can be a very useful form of firebreak but I didn't know of course about this protein problem.

Simon Nobes Talking with the Fire Brigade, they gave us the information that if we require to do a controlled burn, they would charge to come out to put foam down, but if we presented it to them as a training exercise for their firefighters we would get it done free!

Prof. Gimingham Of course, the actual equipment is not all that expensive and it is quite possible to equip oneself.



# HEATHLAND INTERPRETATION

**Stewart Dakers**
**Countryside Officer, Waverley Borough Council**

Interpretation, whether of heathland or any other habitat, is not a separate activity nor is it a one-way communication. It needs to pervade management and incorporate not only public reaction but also items which have nothing to do with nature. A brief checklist of characteristics is offered. Ask yourself the question, "Is the heathland interpretation I am offering .....?"

1) **Accessible** - we often fail to display that which visitors wish to know - the location of toilets is good interpretation.

2) **Appropriate** - we often emphasise that which is of no interest - unremitting focus on furry and feathered can be bad interpretation.

3) **Inclusive** - site management and therefore its interpretation must actively promote multiple use and disapprove of exclusivity whether to locals or naturalist interests.

4) **Reconciling** - it is our function to reconcile traditional enemies as honest brokers - peace making is good interpretation.

5) **Memorable** - we are in the entertainment business and, although it can prove risky, exclusion turns off public support.

6) **Opportunist** - all management activity should be an invitation to public dialogue - a bent staple is bad interpretation.

7) **Promotion** - countryside management and its interpretation should be taken to housing estates, recreation grounds and cemeteries.

8) **Professional** - the glitziest interpretation cannot atone for poor land management.

9) **Innovative** - we need to escape from old images - surprise is good interpretation.

10) **Fun** - heathland is an ideal recreational resource - exhausted visitors be good interpretation.

11) **Realistic** - there is no point in emulating Bellamy and Attenborough - amateurism can be attractive interpretation.

12) **Welcoming** - visitors must feel they are wanted and this can be shown through facilities - comfort is good interpretation.

13) **International** - heathland or any other site interpretation cannot occur in a vacuum; it must seek association with the wider world.

# OPPORTUNITIES FOR STEWARDSHIP

**T D Allen**
**Head of Countryside Stewardship Unit, Countryside Commission**

My brief is to outline the background to Countryside Stewardship and to describe its relevance to heathland. Firstly, a caveat, my talk is given from the perspective of a bureaucrat, although I hope a sympathetic and interested bureaucrat, rather than a heathland expert.

## Background

We have seen forty years during which countryside support policies have focused on food production through price support, advice and funding research and development. The result of these policies is a much expanded capacity to produce food but also well documented consequences in environmental terms. Those of most concern to us are:

* direct habitat loss through agricultural improvement;
*the marginalisation of some habitats that no longer form part of modern commercialmanagement systems - heathland is a classic example.

Other pressures have also impacted on our most precious landscapes and their wildlife habitat in particular:

* afforestation, sometimes welcome but sometimes seen as an alternative where agriculture is likely to be uneconomic with unfortunate environmental consequences - again heathland is a classic example;
* urban development pressure.

During the last five to ten years we have seen a progressive reappraisal of agricultural support policies and first steps in what can be seen as a gradual process of readjustment. This has included welcome developments in environmental policies for example through environmentally sensitive areas. However, we still have much to learn about the mechanisms needed to achieve the right balance in our countryside. Current policies and the funding that goes with them are not achieving all that we as environmentalists would wish.

Countryside Stewardship represents one element in this process of adjustment but more importantly through the Countryside Commission's experimental powers it is a vehicle for exploring approaches to the integration of environmental and recreational concerns into the fabric of wider agricultural and countryside support policies. Essentially Countryside Stewardship is a model for a national scheme that targets incentives for environmental and recreational improvement to where positive payments are needed to achieve the desired result.

The scheme owes its origins to a paper published by the Countryside Commission in 1988 called "Incentives for a New Direction for Farming". This took a forward look at the direction of both agricultural subsidies and emerging environmental funding arrangements and envisaged the development of a more comprehensive "menu" orientated approach to supporting the environmental improvement. The immediate sanction for Countryside Stewardship was provided by the environment white paper "This Common Inheritance" published in 1990.

## Where do heathlands fit within Countryside Stewardship?

Heathland represents an important component in the Countryside Stewardship experiment. The Commission selected certain key landscapes and their wildlife habitat as initial targets to explore the approach. Heathland was chosen because it is one of our most threatened habitats supporting a number of national rarities. Lowland heaths also represent some of the last vestiges of what we could describe as "wilderness" in the lowland context and are often valued for their tradition of open access. They are therefore an important recreational resource also. We should not forget their historic and cultural importance - many heaths represent important archaeological sites and also have a place in our cultural heritage, Hardy's "Blasted Heaths" being one example.

Importantly for our experiment they are one of the most extreme examples of where the tradition

of management has disappeared and there is seldom a commercial justification for ongoing management. They therefore represent a real challenge.

**What is Countryside Stewardship seeking to do on lowland heath?**

Our key objectives are:

* improved management - English Nature work indicates that of our 48,000 hectares of remnant heath, something like 85% is threatened through inappropriate management or more likely by neglect and abandonment;
* to link and expand areas of heath into sensible management units and in the medium term to lay a framework for increasing our much depleted resources where this is practical;
* to test the incentives approach under circumstances where it is not possible to prescribe standard management guidelines. The scheme places emphasis on each applicant seeking qualified advice and preparing an individual management plan setting out a programme of operations to sustain and improve the quality of the heath. Heathlands are so individual that very early on we made the judgment in developing the scheme that we should not attempt a standard national set of guidelines for heathland management but rather rely on local expertise and offering incentives to help with the costs of such advice.

**Progress so far**

At this stage I am only in a position to offer the first year results which are as follows:

* management of existing heath - 2,732 hectares agreed:
* heathland recreation - 130 hectares agreed.

**What are we learning?**

I am sure that we have learned nothing that would surprise you as practitioners. However, it is worth listing some of our experiences to date. These are:

* that introducing and sustaining grazing management is frequently difficult and that we need to provide appropriate alternative forms of management such as cutting to secure the future of some heaths. There is an argument in some cases for establishing flying flocks operated on a semi-commercial basis where grazing services are offered within areas containing a concentration of lowland heath. The principle would be that owners receive incentives and can be offered the management service at a charge to enable them to deliver what they have agreed. The value of rare breeds is also something that is highlighted by our work to date;
* management plans provide a good discipline and are essential as a basic framework even if you subsequently have to amend the plan in the light of experience. However, we have learned that conservationists tend to want to operate on a year by year basis in a rather ad hoc way which is understandable but not always in the best interests of the heath;
* commons are part of our heritage. However, they give rise to a number of practical difficulties including the issue of fencing where the reintroduction of livestock is envisaged. The access issue is also important here - where there are long traditions of access people are understandably unhappy at the prospect of fencing even if it has a worthy conservation objectives. The main message to us is clear, where any change in management on the heath is envisaged be it scrub clearance, fencing or whatever then good public relations is essential. Telling people what you intend to do and why is vital and it is important to make sure that they feel their views are listened to. Please also remember that early discussion with interested organisations is important, for example the Open Spaces Society;
* do we pay for access on heathland - in principle we do not offer payments where access already exists but you can imagine the practical difficulties that this faces our advisers with on occasions!
* good advice is essential but I suspect that much of the nation's resource of expertise in lowland heath is here in this room and it is a limited resource;
* history and archaeology - various conservation interests may have a different perspective on what is important within a heath. For example, the restoration of heather may involve cultivation but this could disturb a flint scatter of archaeological importance. In preparing management plans it is therefore vital that all these interests are taken on board and considered.

## Changes for 1992

We have made a number of changes to the Countryside Stewardship heathland option for 1992. One of the most important is to draw a distinction between heathland maintenance, particularly on large sites which may involve little more than rotational cutting on a five year rotation and the more extensive measures needed for heathland enhancement. The payment structure has been adjusted to reflect this distinction.

Shepherding can be essential and we have extended the scope of the supplementary payments to cover the full ten years where shepherding is introduced to regulate grazing management. In addition there are a number of minor changes to capital payments particularly those for scrub and the addition of new access provisions for creating paths and for encouraging links with educational establishments such as schools and colleges.

## Issues Arising

I said at the beginning that this paper was offered from the perspective of a bureaucrat faced with the responsibility of managing and developing an incentive scheme. It has to be said that laymen such as myself are faced with a wide body of experience that can be confusing and sometimes conflicting. It sometimes appears that scientific study tends to relate back to small areas and that this work was not necessarily related to translating such worthy work into advice on how to manage heathlands on a field scale.

There is a clear need to draw together this wide body of experience and to take this a little further to establish best practice and to ensure the recommended techniques are as simple and cost effective as possible. In structuring incentives for heathlands there is a substantial difference between encouraging expensive turf stripping to stimulate seed bank and a simple light cultivation that might in some circumstances achieve the same objective and is less costly. Also, the latter places considerably less burden on the owner or manager of the heath.

Other questions spring to mind. For example is nutrient stripping always necessary? Are not many heathland soils inherently nutrient poor in the first place? Do we know how effective spreading heather brash is in re-establishing heather cover and what are the best practices? For example what rates should we spread at?

What conservation seems to lack is a system of trialing similar to that which has benefited agriculture the last 40 years, particularly through ADAS work. This should not necessarily take the form of long term scientific study but rather a more practical exploration setting the basic husbandry questions that you as practitioners need to answer and I as a bureaucrat need to be clear about in developing a conservation scheme. What is needed is a system that can either draw on a coherent body of available literature or alternatively can set out practical trial plots specifically to answer husbandry questions that cannot be explained by existing work.

## The Future

As I said at the outset we are living through a period of adjustment. The extensive changes in the way that we support our agriculture potentially offer exciting possibilities for environmental protection and enhancement. The agri-environment component who CAP reform seems to offer a sanction for further developing incentive schemes and other mechanisms for this purpose and the Rio conference placed considerable emphasis on bio-diversity. We should not expect dramatic increases in funding in the short term but they do lay the foundation for helping to secure the long term future of our heathlands. We are slowly moving to a position where environmental objectives are becoming an alternative crop to those who manage land and slowly but surely environmental objectives are moving to the centre rather than the periphery of individual landmangers' decisions, provided incentives are offered in support. This augers well for the future of our heathlands.

## DISCUSSION: FRIDAY AFTERNOON

**Plenary session: Chaired by Tim Bines, English Nature**

Bill Syratt B.P. — I'd like to ask a question on interpretation. You said that you ought to get the public to ask questions. Do you find that an equally effective way of getting them involved is actually to ask questions of them, to give the people worksheets and things like that to work to?

Stewart Dakers — The sort of material that we give them and the sort of dialogues which occur with the staff tend, hopefully, to produce the curiosity which gets them to go and find out answers for themselves but we don't set questionnaires.

Gordon Flower — How long do you spend doing interpretation on heathland - setting up all these information boards and sheets, etc?

Stewart Dakers — It's pervasive. I don't think it's timeable. In terms of input, 20% or maybe more, because so many things are interpretive. The Frensham seasonal sheet takes Mike say an hour to write out and that lasts the whole season. And then there are all sorts of other activities besides. This is interpretation - this is management - and get them all totally gelled together. We must recognise, for instance, that whenever we put a staple in a fence we are thinking interpretation; we are thinking "let's get people interested".

Andrew Brockbank Wirrel — I was interested in Tim Allen's comment about the splitting of the H1 payment into a lower figure for the rotational management and a higher figure for creative management. Perhaps you would like to give us an idea what you envisage by the creative side of things? It strikes me that perhaps the rotational management will require a significant payment because of the ongoing work, the need for follow-up treatment, the need for spot treatment, etc. For example, if it's birch that you are treating, there may be need for spot treating a couple of years after the initial treatment within those five years you mention.

Tim Allen — We put in a lower payment because we perceived that there were very substantial areas of heathland being offered to us at £50 per hectare where actually nothing was going to happen in management terms. In one case this was amounting to £50 per hectare over 500 hectares - a lot of money - far more than it costs to take a flail mower or whatever once every five years. In any case, we would still offer the scrub clearance grant on top of that. That's why there is a lower payment.

In a sense what it is doing is drawing a distinction between rescue management (urgent management that we know we cannot introduce long-term) and annual management which is really desirable.

Andrew Brockbank — Yes, so you are influencing the trend in favour of heather-dominated communities or a mixed type of heathland?

Tim Allen — Not automatically, what I'm really doing is making a Treasury (rather hard-nosed) decision on whether I need to pay £50 per hectare or not. In some cases it's quite self-evident that £20 will do. If £20 will do, then it does conservation good because we get a pat on the back from the Treasury and therefore next time we go back to them we are appear to be rather more reasonable.

Tim Bines — And also the other £30 can be used for something else. As you already have it

in hand, you can spread it around a bit

Tim Allen — It also enables me to go and argue to the Treasury that we could raise the payments for upland hay meadows if you really want the truth.

Jim White, English Nature, Dorset — On Stewardship, have you given any thought to any payments to encourage monitoring? I heard your comment about wanting to find out specific pieces of information and the Stewardship scheme seems an ideal opportunity particularly where there is a recreation element. For instance, in Dorset, two or three of the heathland schemes do involve recreation and with one at least we have a participant who is keen to try different techniques. Over a quite limited period, that would seem to be an ideal opportunity for monitoring these.

Tim Allen — I agree, we do have a monitoring evaluation exercise which is a national exercise and which is designed in the medium term to answer the question "are we starting to achieve what we set out to?" That in a sense is one level - to answer Government's questions. I'm rather more interested in answering the specifics about what sort of management techniques work rather than just monitoring *per se*. What I'd like to see is that we set up some sort of system, whereby we can answer some of the specific questions about heathland management. With English Nature as a partner, this is something that I'm interested in our respective organisations pursuing.

Tim Bines — What we really want is some sort of programme which will identify the key elements which we think need working at and then say these are the things we want to see done in the countryside, who is going to bid for them? This seems to be one approach. But we certainly need to clarify the list of things we need information about because that information may already exist and I think conservation really isn't very good about getting the information that we already have out into the open and clearly explained.

Martin Newman, Surrey Wildlife Trust — I think the question about availability of information is important. RSNC, the Wildlife Trusts' partnership, is currently doing an evaluation exercise in conjunction with the University of York to attempt to help you find mechanisms for exchanging information, but you yourselves in English Nature have recently funded the grassland manual which presumably is exactly the same sort of problem. I think we've all seen over the last two and half days that there is a lot of work being done out there. I have never seen all that brought together and that surely should be what we have been aiming for as well as commissioning new research.

Tim Bines — It is not only research in this country. In Holland and Germany there are extensive heathland areas where there has been a lot of work which if you put it together might answer many of these questions.

Martin Newman — It does seem to me that the whole information issue is one that is big in conservation and we haven't yet begun to address it because we haven't perceived it as our problem until very recently.

Tim Allen — In the last forty years, we conservationists have been rather usedto looking at an ever-declining resource in what we are trying to protect. We have been used to very small sums of money and we are not waking up to the fact that Government is now spending about £150 million on conservation-related support. Not all this is nature conservation - it includes landscape conservation and pollution control - but I'm optimistic that over a reasonable length of time we are looking at quite a substantial further injection of cash into conservation. The management information which you have mentioned should therefore

become more and more important.

Anon — In relation to the Stewardship Scheme, if a farmer wants to take up a habitat creation scheme under Stewardship, how much money is available at the start to ensure that, for instance, the ground is suitable or his project has a sound basis from which to proceed? In the case of establishing a habitat on arable land, studies of soil nutrient status and whether soil stripping is going to be necessary needs to be ascertained. This can be quite costly in terms of advisory time and analysis time.

Tim Allen — This year we have changed the structure of the payments but there are two incentives offered for advice: one of which is for straightforward simple advice at £100, and a second higher level of payment of £300 where rather more detailed advice is needed. The latter could legitimately include part of that management advice and soil testing.

Anon — Yes, £300 might cover a number of soil tests but not leave that much over for seeking professional advice on particular aspects of the habitat creation management scheme.

Tim Allen — We are not necessarily giving 100% grants. If somebody is attracted to the idea of making such a change because the annual payments we are making are worth it, then in a sense there is incentive to take professional advice.

Anon — So, with initial advice, the farmer would be expected to top up that with whatever is necessary. Thank you.

Neil Sanderson A consultant from Hampshire — A comment about reverting arable to heathland. We have had quite an interesting site which is on pure sand. It was a carrot field seven years ago and all that has been done to it since then is that it has been swiped. It is next to heathland and is now covered in a lot of heather, *Erica*, *Molinia*, *Orchis morio*, *Linum catharticum* and all sorts of meadow and chalk downland plants. If someone had actually been trying to restore that, it would now be covered with pure heather. There have been lots of arable reversions before. By doing nothing they have all gone through a Breckland grassland stage which is exceptionally interesting. Let's not be too hasty about restoring heather when we can actually get something more interesting which will develop into heather in the future.

Dave Page Elmbridge Borough Council — Can you tell me more about the rumoured money which is available from the European Commission under their Habitats Directive and what is the Countryside Commission's or British Government's attitude to it? Is it being encouraged?

Tim Allen — The Countryside Commission's attitude is very welcoming. My understanding is that the money is now available, but I don't know the details of how you qualify for it but the circumstances are fairly restricted as I understand it.

Dave Page — Could you furnish me with any more details?

Tim Bines — It is a scheme called LIFE. It's recently changed in January of this year from an old scheme. It's in aid of community benefit, community in the European sense. Applications go through the Department of the Environment which acts as a collecting point for Britain and then passes them on to Bruxelles.

Coming back to the information thing, I wonder what happens in Holland. What do you do in Holland about information?

Feiko Prins — We have meetings as you are do here. We also have each year a 'Heathland Study Day' which all heathland managers attend. In the Netherlands we have an institute like Monks Wood. We call it the State Institute for Nature Management Research. Research into heathland management goes on there and the researchers talk about their work at the heathland study day and publish results in a periodical especially for nature management, a bimonthly periodical. Also, a new institution called the Information and Knowledge Centre of the Ministry of Agriculture was set up last year. It is the centre which should translate the results of research institutes into practice. It has been going for a year so it has not produced any reports like the nice ones from your Nature Conservancy Council.

Ann Griffiths West Sussex — A point on getting information across. One of the things we are trying in West Sussex in September on one of our own heathland Stewardship sites is to have an open day. It is specifically aimed at landowners and managers to get over what can be achieved through Stewardship and also the techniques of management which we are employing. Hopefully this might do something on a local level. My question was more in relation to Stewardship and planning. It is whether it is perceived there are any problems in relation to habitat creation as seen as a planning gain as it relates to an application for Stewardship grant. Alternatively, there could be an application for Stewardship grant linked in some way with a planning condition. Are there any quirks in the system which would preclude a developer or landowner actually getting Stewardship grant where it was linked to a planning application in some way?

Tim Allen — I would hope stewardship wouldn't become tangled too much with planning gain. The answer is that we certainly wouldn't want to be offering agreements to the people who receive planning permission and as a consequence of planning permission have a condition imposed that they will carry out certain environmentally friendly activities. If it forms part of a planning condition I see no major justification for adding any money to that unless there is a case for us funding something extra, over and above, that condition. I think there is also a planning issue on the urban fringe where someone really is keeping land semi-derelict in the hope that he convinces someone that planning permission ought to be given for that wonderful industrial estate or whatever. Does that answer your question?

Ann Griffiths — Yes, partly. I think I can see the reason why the Commission would not want to intervene in planning. On the other hand, I think some opportunities might be lost because we can give conditions in planning in the hope that someone will do something if Stewardship can be offered as an incentive in addition. If there is a 10 year agreement there it could achieve rather more than you might anticipate.

Tim Allen — I don't rule it out but I would urge local authorities to make sure as far as they can that these conditions are watertight because there is a public funding issue here. If we can achieve that gain through planning condition without any extra cost it seems to be right and proper that the tax payer shouldn't need to pay any more. I am not ruling out the idea if, given that condition, you want to fine tune that management.

Tim Bines — This raises the question of sustainability over a longer term. Whatever grant aid schemes we are all looking at, there is only, perhaps, a five year profile whereas what we would like to see is two or three hundred years profile. It is only short term measures that we are talking about here.

Nick Baxter I would like to ask a two part question, the first part aimed at Dr. Prins. In his slides yesterday we saw a large number of junipers. I was wondering whether he has any information on how the reintroduction of grazing has affected the regeneration of junipers on the heathland. The second question, which probably needs to be thrown wide open, is why it is that whilst juniper still seems to be fairly common on heathland in Germany and the Netherlands, we seem to have almost lost it totally in southern England, yet we still have populations on the chalk?

Feiko Prins Juniper in the Netherlands only grows on areas of sand-drift where there is an opportunity for juniper to produce seedlings. With grazing it is only when you have a very intensive system that you get damage to juniper and in most places you get some open sandy places. Here there is an opportunity for the juniper to produce seedlings. Another danger for juniper and is acid rain. As the soil becomes more and more acid there is a reduction in the number of juniper seedlings.

Tim Bines There is some work done in northern England - juniper regeneration in relation to seed production, berry production, seed germination and seedling percentage success rate. This was done by Oliver Hill in Teesdale several years ago and published in the British Ecology Society Journal. It has been since done again up in Teesdale but remains unpublished.

The second part of the question was on juniper and why it has declined in southern England.

Clive Chatters Hampshire Wildlife Trust Juniper, where it is in vast colonies still in lowland England, is on places like Porton Down on chalk grassland which was grazed very hard and then grazing was suddenly relaxed. Where one finds it remaining on heathlands it is often associated with broken soil systems or, as on Breckland (where it survives on Stanford battle zone), in what used to be a sand dune complex of Breck grassland. Now our heathlands have become extremely simplified and rather dull in recent decades in lowland England as a result of partially natural, partially intentional, moves towards that nice purple carpet of *Calluna* . Does that not come back to the point that I made two days ago to the audience about heathlands and what *they are* rather than what *we perceive they ought to be* ?

Tim Bines I would add to that my own observations which are exactly the same. Where you have disturbed ground, juniper will do very well. We may be too precious about the heathland resource in the sense of non-disturbance. I think we ought to stop there with the questions, thank you very much for all of those, and move on to Professor Gimingham for a summing up.

## SUMMARY

**Professor C H Gimingham**

Thank you. The value of a conference, I am sure we are all agreed, is to act as a catalyst, to be a stimulus for discussion and thinking, and it has a value which is ongoing and not just finished at 4.30pm when the conference finishes. I am quite sure we shall all agree that this conference has been an excellent catalyst. I cannot, of course, summarise your personal experiences and impressions, I can just give you a small selection of my own personal impressions as a result of these two days.

The first of these is really just an expression of amazement at the enormous firing of interest, sustained interest and enthusiasm for heathland conservation and heathland management. It is not very long ago that there were relatively few people, like Norman Moore and other pioneers,who were campaigning for heaths and drawing attention to the rate of loss of heathland, and who were also making the point that if we are to save our heathlands we must manage them in ways which are appropriate for the objectives. Now we have this very widespread interest demonstrated by the large number of people who have attended this meeting and other similar meetings that have taken place in different places over the past few years. This is an ongoing movement of enormous importance and is most encouraging.

My second impression is a reinforcement of the view that heathland management is really a supreme example of the importance of the practical application of ecological knowledge and research to management; and we could be in danger of forgetting this if we get too wrapped up in the actual day-to-day business of managing heathland. We must always keep in mind the need to back our management plans with good ecology. Now there is a great deal of good ecology but there is still obviously not enough, and there is another aspect we must point to as managers, which is that we need a lot more information about some things. We know quite a lot about managing heather but we do not know nearly so much, for example, about the effect of grazing on *Molinia* or on birch; the questions asked today how quickly can you kill off birch by grazing and the answer was not precisely forthcoming. There is also the whole new question of the effects of atmospheric pollution and nitrogen input which is placing a new emphasis on our approach to management of heathlands, one which we do not yet know the full significance of, and which we must keep in mind very strongly as the years go on with global warming and all its attendant consequences. There are many, many changes which are going to take place which will be brought to light as time goes on. We must be on the ball if we are to make use of them in terms of heathland management.

Thirdly, I think this increased and burgeoning interest in heathland ecology and management is being expressed in association with a better understanding of the history and origins of heathlands, including a better understanding of the traditional ways in which heathlands have been managed. Different heaths have different needs and you can begin to understand these by knowing more about the history and origins of the heaths concerned; it is of particular interest to to see what sort of management is being applied in one particular area so that we can consider it and view it in relation to our own areas which may be similar or may be different. This has led us very directly to the recognition that the traditional land use of heathland in terms of grazing in this country can give us a lot of clues for future management. It is evident that in recent years many more people are seriously considering grazing as a management tool for heathland. In particular, we have heard this time about cattle grazing in the Netherlands and in our own country, and I think this is something we should take away and think about because it is showing a newish trend in our approaches to heathland management and it is one which we are again in the exploratory stage. We have a consequent need to collate the different results obtained by attempting to manage heathland by the use of a variety of grazing animals, whether sheep, goats, ponies or cattle.

Well, I think this has illustrated the effectiveness of the meeting which combines the

presentation of papers on experience from different places with looking at what is going on in one particular place. This leads us to the importance of getting the public on our side, which was presented to us on site this morning and which has been developed during the afternoon session. Involving people is not new, but realising the importance of getting the public on our side, through involvement with the kind of work we are doing and by that means educating them, deseves higher prominence, and this is where interpretation comes in very strongly. I congratulate the Waverley Borough Council on their marvellous presentation and their effective spoof which I think fooled us all for quite a while, and brought home very well the importance of good interpretation.

The whole question of involving, interpreting and educating people came to a neat climax this afternoon in considering the question of Stewardship and the points arising from it. I was very encouraged when somebody said this morning that his conscience had been pricked about monitoring. We have all been talking, both on the field meetings and at mealtimes etc, about the question of monitoring and I would not want anyone to be intimidated by what looks sometimes like a very complicated and time-consuming occupation. Very simple monitoring will give the results of management and, as the last speaker emphasised, we must think about ways of recording and publishing the experiences gained.

We have had a number of themes which came together very well in the last session. This highlights the problem of developing the best mechanism for gathering the results of our experience and getting them recorded in a way which will be available for others to share. The ordinary standard methods of publication may not be suitable for this, and the suggestions that some kind of internal or limited publication devoted to management for conservation, and particularly management for heathland conservation, is something we should seriously consider because there is such a wealth of knowledge stored in everybody here and in many other people. We really need to be able to gather this information together.

In finishing, I would like to say that I think we can be very impressed by the role of local authorities in this part of the world, both district and county, and their input and the way they have contributed, and to the fact that four organisations have been involved in this meeting. It is a very good sign that there is such goodwill and co-operation between people. I think the only remaining thing I can do is to give our very warmest thanks to the organisers for an extremely successful, interesting and worthwhile conference, and I would like to thank Rob and Nick and all the others of the team, they really have done a great job and we are very grateful to them.