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## FELLOWS LECTURE

# Applying Science in the Uplands: Time is not on our side

Professor Robert Marrs, FIEEM

### Introduction

The uplands are a special place; they evoke emotions and comment more than any other habitat in the UK. This is partly because as an offshore island with a largely oceanic climate, coupled with a long-history of vegetation management, Britain's landscape comprises many high-quality biotopes. As such, many of these biotopes have a degree of protection under European legislation, even though many of them are deemed to be in unfavourable condition. The UK is obliged to protect these biotopes, maintain them in good condition and hopefully bring damaged ecosystems into better condition (Backshall, *et al.*, 2001). To implement these policies a range of measures has been identified to a large extent based on the *status quo*, i.e. existing vegetation and land use present on a site, usually through some form of Agri-Environment Scheme. Little attempt has been made to develop more wide-ranging policies based on potential biotopes that could be present under different scenarios.



Here is it worth revisiting a thought-provoking paper written by Professor Charles Gimingham, who after a lifetime of working on upland vegetation, produced a series of forward-looking glimpses (Gimingham, 2002). This view was to some extent started off by a schism. There is the view of

Fraser-Darling that, "the Scottish Highlands are largely a devastated terrain", offset against the contemporary views of many people (taxpayers) within the UK who like the existing landscapes. What has become apparent is that the uplands are, and have been since 3000 BC (Gimingham, 1972), a cultural landscape where man has shaped the land. Over the last three hundred years there has been a change from extensive and sympathetic management to more intensive sheep grazing, forestry and game management, with a consequent change in vegetation.

The landscapes currently present in the uplands are the product of this relatively new management, and the current Agri-Environment schemes have been developed to maintain them. I think we are however, at a point where, at least in some places, we are in a position to take a more enlightened view, and attempt to implement more radical approaches, designed to develop different types of upland biotopes, based perhaps on historic management systems that might promote a more diverse upland landscape. Gimingham's glimpses give us some clue to what such an enlightened strategy might produce.

- **Glimpse 1:** At high altitude, the priority for the montane grasslands, heaths and tundra-like vegetation should be to conserve these biotopes in as near a natural state as possible, recognising that there will almost certainly be potential recreational damage. Continued implementation of a "long walk in policy" should be encouraged with development of appropriate restoration strategies for vegetation sensitive to damage.
- **Glimpse 2:** At the mid- and lower-altitudes, better and presumably different management is needed, which might include increased cattle grazing. If local communities are to be maintained and/or revitalised then there may have to be a change in lifestyles of those who make their living managing the land. This may mean that the skills of the traditional farmer, gamekeeper and forester may be combined in one individual along with ranger and nature conservation warden duties. To some extent this change can be predicted from the change in emphasis of land-based training, with fewer graduates in recent years from agriculture and forestry and more in conservation-, wildlife- and rural resource-management.
- **Glimpse 3:** The changing management in many places would perhaps allow a countryside with more woodland, probably of small woods mainly of native species and would include more scrub. There would of course be a need for commercial forestry in appropriate places.
- **Glimpse 4:** On the open sheep walks and grouse moor, the current over-grazing problem in many parts of the country would be tackled. Sheep stocks would be reduced and the current trend of moving to a mixed sheep/cattle strategy would continue. The grazing units might, however, become much larger and the open land would be linked into mosaics with woodland.
- **Glimpse 5:** The uplands would be increasingly viewed as important for provision of ecological services to the populace as a whole; this is especially

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### Contents

- 1, 3 - 8 Applying Science in the Uplands**  
*Robert Marrs, FIEEM*
- 9 - 12 Environment, Weather & Climate Information in the Financial Services Sector**  
*Monica Hale, FIEEM*
- 13 - 15 Ramsar: a Convention from the Past, for the Future**  
*Peter Bridgewater, MIEEM and Sebastia Semene Guitart*
- 16 - 18 The Skills-Gap Debate**  
*Samantha Hillcox*
- 19 The Perfect Identification Guide**  
*Basil O'Saurus*
- 20 - 22 The Future for British Farming and the British Countryside**  
*Lord Christopher Haskins*
- 23 - 26 In the Journals**
- 27 Scottish Section Conference Report**  
*Kathy Dale, MIEEM and James Lewis*
- 28 Institute News**
- 29 Recent Publications**
- 30 News in Brief**
- 31 New Members**
- 32 Diary**

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IEEM Office: 45, Southgate Street, Winchester, Hampshire, SO23 9EH.

Tel: 01962 868626, Fax/Ans: 01962 868625.

Email: [Enquiries@ieem.demon.co.uk](mailto:Enquiries@ieem.demon.co.uk)

Website: [www.ieem.org.uk](http://www.ieem.org.uk)

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## The Queen's Speech

The new session of Parliament is underway - At first sight environmental issues are low on the agenda but there are some areas which will be of interest to IEEM.

Firstly there is the growing recognition of the implications of climate change – there is to be a bill creating a long-term foundation for civil contingencies related to climate change. There are to be changes to the planning system and there is to be legislation on sustainable energy supplies and a safer environment. In relation to events reported in Institute News – the IEEM Charity application, there is to be a bill to modernise charity law and a bill to introduce Community Interest Companies. Finally there is a commitment to reduce world poverty and for the achievement of the Millennium Development Goals including increased aid flows and effective debt relief. There is also a commitment to press for a fairer trade system and to work to strengthen the United Nations in responses to challenges such as climate change. These latter points are perhaps the most interesting and they imply a welcome commitment to sustainability.

At the recent Durban Congress Nelson Mandela stated that protected areas have a key role in global poverty alleviation. President Mbeki stressed the need to preserve biodiversity and ensure sustainable livelihoods and identified poverty and under development as major threats to nature conservation. Involving local communities worldwide will be vital. One of the major outcomes of the conference was to identify that there will have to be a major capacity building exercise in the next ten years to ensure that the many protected areas worldwide are appropriately managed. This needs to be underpinned by a substantial financial commitment. The congress put this at \$20 - 30 billion annually over the next 30 years to establish and maintain a comprehensive protected area system including terrestrial, wetlands and marine ecosystems. In Western Europe there is a relatively well developed history of involving local communities in protected areas and a substantial pool of expertise potentially able to be applied and, in fairness, already being so, albeit in limited fashion. As part of this capacity building process there is surely a substantial role for DFID in conjunction with others although in the face of \$20 billion the DFID budget looks a little thin! But statements in the Queens speech, if they are to mean anything, must be backed up by financial commitment. On that we shall have to see.

Another point to come out of the congress was the fact that less than 1% of the marine surface of the globe is covered by protected areas. Marine areas have substantial sustainability issues and one has only to think of the destruction of the cod industry in Newfoundland as an example. There was no specific reference to marine protected areas in the Queens Speech. We need to raise awareness of the linkages between reduction of poverty and climate change alluded to at the end of the speech and issues of biodiversity conservation especially in marine areas and raised at the Durban Congress.

Jim Thompson



true for water. Water catchment management, which will be increasingly highlighted in the Water Framework Directive, will be a major driver of uplands management to ensure high-quality, cheap, drinking water. This means that techniques to reduce soil and peat erosion will be a priority, and a consequence will also be high quality rivers with improved fish stocks. A by-product may be increased broad-leaved woodland river margins.

• **Glimpse 6:** The uplands would increasingly be viewed in an holistic way; as a mosaic of habitats within a landscape panorama with integrated land use. Managed ecotourism would be a major economic driver within this strategy. This vision could not, and indeed should not be delivered, using hard and fast rules, rather through the development of exemplar sites, or schemes, where others could follow, or not, as their individual circumstances dictate.

I like this vision presented by Gimingham where there is an integrated approach to management towards a cultural landscape with various endpoints. However, it is well known that vegetation response in the uplands is slow, because the climate is wet, cold and windy. The harsh climate impacts on our ability to deliver this vision, because for the most part, there is very little information on either how to achieve an increased native woodland cover to produce mosaics with other biotopes, or to develop the necessary cultural change within the upland populations to accommodate and indeed thrive with this vision. To deliver this vision there is a need to formulate the necessary questions, and because of the slow speed of response in upland systems, to carry out research to answer these questions will take a minimum of 10 years.

In this paper I will consider two examples of our current research that unfortunately do not provide the answers. However, they do indicate some of the issues that might confront such research and provide some of the methods that might assist us deliver such a revised research agenda

**The study of land use structure (composition & configuration)**

Recent developments in landscape ecology include the integration of vegetation mapping, GIS and statistical software to assess amounts of the vegetation types in the landscape, and as important, the degree of complexity – the complexity of patch shape and patch interspersion with other patches (O’Neil & Krummel 1988; Turner & Ruscher 1988; Wu & Levin 1994; McGarigal et al. 2002). My group has recently used this general approach to consider the relationship of vegetation produced in a 10-year long restoration experiment at Hodron Edge (Plate 1), Derbyshire to the vegetation in the surrounding landscape. The experiment was part of a series of 7 experiments designed to control bracken and restore upland moorland vegetation. The experimental details are published elsewhere (Le Duc et al., 2000, 2003).

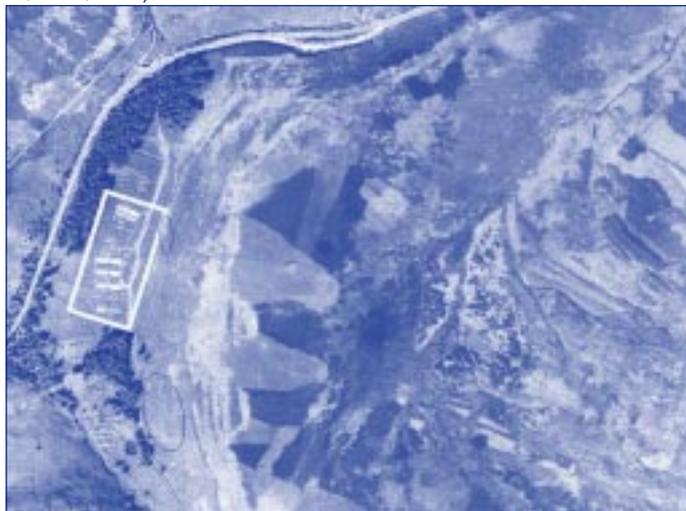


Plate 1.

**Table 1.** The types and proportion of land covers in vegetation map of the Hodron Edge, Derbyshire, UK; data were derived from the polygon attribution table of the vegetation.

Community \ cover type	Number of patches NP	Area (ha)	Interspersion & juxtaposition index IJI
<i>Pteridium aquilinum</i> - <i>Agrostis capillaris</i> - <i>Festuca ovina</i> community	63	34.61	86.9
Dense <i>Calluna vulgaris</i> moorland (not burned)	67	19.50	71.5
Dense <i>Calluna vulgaris</i> moorland (burned)	8	8.45	59.4
<i>Agrostis capillaris</i> - <i>Nardus stricta</i> - <i>Festuca ovina</i> grassland	38	15.10	72.2
<i>Eriophorum vaginatum</i> mire	10	14.83	62.9
Mixed <i>Eriophorum vaginatum</i> - <i>Juncus effusus</i> mire	3	9.05	46.4
Mixed <i>Calluna vulgaris</i> - <i>Eriophorum vaginatum</i> community	21	6.80	66.5
<i>Pinus sylvestris</i> plantation	11	4.18	20.5
<i>Juncus effusus</i> flushes	6	3.66	62.1
<i>Quercus</i> - <i>Betula</i> woodland	7	1.88	30.7
Road	2	1.51	
Experimental site	1	1.03	
Bare rock	3	0.27	

The 1.2km x 1km area surrounding the existing experiment was selected out (Plate 2) and a vegetation class map produced. This was done using 4 colour aerial digital images (from Simmons Aerofilms), these were geo-referenced to UK National Grid using the ERDAS IMAGINE 8.6, and then combined into a single map using the MOSAIC function. The final map was developed in ARCVIEW 3.2 GIS using several iterations of visual interpretation and field survey (methods in Chuan et al, in press). Then landscape characteristics were calculated using FRAGSTATS v 3.0, to quantify:

- (1) The composition of the vegetation map, indices used were: (a) Land-cover type and proportion of each land cover type in the landscape, and (b) Patch richness, the number of different patch types (NP).
- (2) The configuration of the landscape: Here a range of indices were used, the mean, minimum and maximum size of patch and mean perimeter length for each land cover type, and a range of indices of landscape complexity: Shape, Fractal dimension, Division, Contagion and Interspersion & juxtaposition (IJI). Only the IJI is discussed as it proved particularly useful.



Plate 2.

In the field survey 50 points were selected randomly from a 50 x 50 m grid overlying the area and both vegetation and seedbank assessments made at each point. Similar data were available from each of the treatment units within the experiment (Chuan et al, in press).

**Land-cover composition and landscape texture**

Thirteen land-cover types were identified (Fig. 1, Table 1). There were 240 land-cover patches in the landscape, with a mean patch size of 0.504 ha. At the landscape scale, the various indices indicated that the landscape texture of the study area has a relatively fine and intermixed grain texture, typical of moorland edge (e.g. mean shape index = 1.97, > 1; IJI = 73.1).

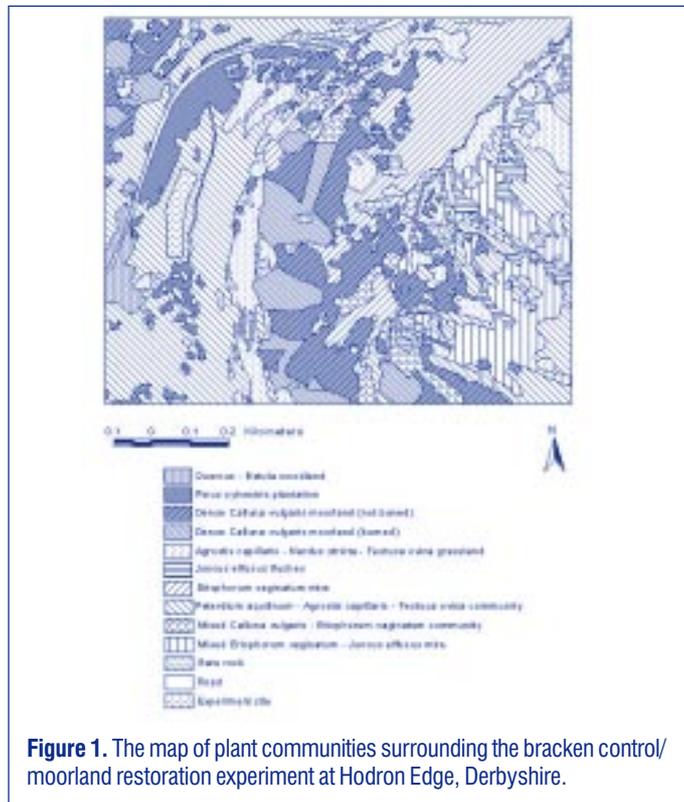


Figure 1. The map of plant communities surrounding the bracken control/moorland restoration experiment at Hodron Edge, Derbyshire.

**Patch shape complexity**

The mean patch size of the individual land classes varied between 0.35 and 3.0 ha, the land class with the largest mean patch size was the mixed *Eriophorum vaginatum*-*Juncus effusus* mire, followed by the *Eriophorum vaginatum* mire. The next largest community was the dense *Calluna vulgaris* moorland, the others had relatively small mean patch sizes (< 0.6 ha). The greatest patch found was of the *Pteridium aquilinum*-*Agrostis capillaris*-*Festuca ovina* community at 16.9ha. The minimum patch size was relatively small for all communities. The configuration indices showed that the vegetation communities had moderate complexity. Moreover, the wetter mires had a greater complexity than communities of drier soils.

**Comparisons of the species pool and community types produced in the experiments compared to the wider landscape**

The species found reflect the communities identified previously but species of the wetter parts were under-represented in both the seed bank and vegetation relative to the spatial area they cover, e.g. *Eriophorum vaginatum*. The species have been grouped on the basis of their presence in the seedbank and vegetation (Table 2). Thirteen species were present in reasonable amounts in the seed bank and in the vegetation, although 4 of these had only limited presence in the vegetation. These are common moorland species and represent the major species available for restoration.

Eight species were present in the vegetation with only a very small seed bank. Of these, *Agrostis canina* and *Stellaria uliginosa* and perhaps also

*Poa trivialis* are plants commonly found in flushes. The others are mainly acid grassland species and their colonisation within the experiment was relatively limited (3 of the 8) However, some colonisation of the experimental area has occurred. For example, of the 8 species found only in the vegetation, three were found in the wider landscape at low abundance, and four were found on the experiment but not detected in the wider landscape.

Several species were more or less restricted to the seed bank, and this is a common result. Most have long lived spore banks. *Juncus effusus*, *Luzula* spp, *Carex* spp., *Urtica dioica*, and *Rumex acetosella* also have long lived seed banks.

The NVC communities produced by restoration treatment compare favourably with those detected in the wider landscape (Table 3). Twenty NVC communities/sub-communities were found in the study within five broad categories: Woodland (4), Calcifugous grassland (7), Open habitats (2), Mires (4) and Heaths (3) were detected. However, of these only seven NVC classes were found at both the experiment and landscape scale, only four were unique to the experiment with the remainder found in the landscape.

These results are pleasing in that community types have been created in the bracken control/moorland restoration experiment that are similar to types already present in the surrounding landscapes. For example U and U2a were found in the experiment and a similar community U2b in the wider landscape, the differences between these is a matter of minor species complement. However, there are some cautionary points. First, no mire communities were found in the experiment although they are abundant in the wider landscape. Second, within the woodland there is a preponderance of W16 in the experiment, reflecting the ground flora and the presence of *Betula* trees. Whilst W16 is the most common woodland community in the experiment, there was less proportionately of it in the wider landscape, and three other woodland types were also present, two of which were not found in the experiment.

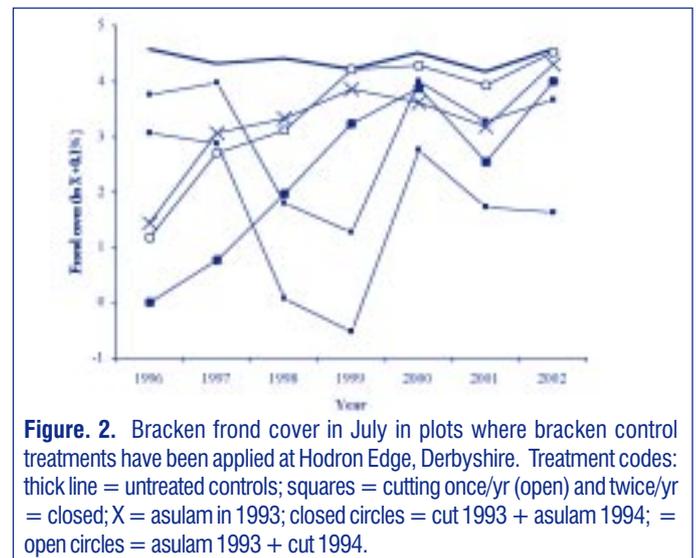


Figure 2. Bracken frond cover in July in plots where bracken control treatments have been applied at Hodron Edge, Derbyshire. Treatment codes: thick line = untreated controls; squares = cutting once/yr (open) and twice/yr = closed; X = asulam in 1993; closed circles = cut 1993 + asulam 1994; = open circles = asulam 1993 + cut 1994.

**Linking scales – restoration of landscape**

This study has attempted to set a restoration project within the surrounding landscape. The use of high-spatial resolution aerial photographs were useful in providing maps of moorland communities. The map combined with landscape structure analysis showed that the landscape was a mosaic of several community types and suggested that most vegetation types were present in a highly fragmented mixture. This result in itself calls into question the wisdom of attempting to define a single target vegetation for a restoration scheme.

The species and plant communities produced during 10 years of restoration showed promise, in that some targets were being achieved. However,

**Table 2.** Cover (%) of above-ground vegetation and density of seeds in the diaspore bank in the experimental site and in the around landscape at Hodron Edge, Derbyshire in 2001. Species have been categorised into response groups. Data are geometric means for cover values (%) and back-transformed means ( $Y = (Y + 0.5)^{0.5}$ ) for density (seeds m<sup>-2</sup>): + = < 0.01 % and \* shows the presence of trees and the total basal area of trees was 152 m<sup>2</sup>·h<sup>-1</sup>. Minor category: Both = found in experiment and landscape studies; Exp and Land = restricted to experiment and landscape study respectively.

Major category	Minor category	Species	Experiment (n=100)		Landscape (n=50)		
			Seed bank	Vegetation	Seedbank	Vegetation	
Species found in both seed bank and vegetation		<i>Agrostis capillaris</i>	149	0.13	218	2.7	
		<i>Agrostis ssp.</i>	22	-	27	5.1	
		<i>Calluna vulgaris</i>	4560	0.04	10500	14.5	
		<i>Deschampsia flexuosa</i>	23	9.5	1	6.9	
		<i>Galium saxatile</i>	39	4.77	52	1.1	
		<i>Juncus ssp.</i>	5	0.02	2	5.7	
		<i>Panicum ssp.</i>	27	0.18	3	0.04	
		<i>Festuca ovina</i>	2	0.01	78	0.03	
		<i>Veronica nigrescens</i>	1	0.11	8	0.0	
Species that were abundant in both seed bank but less common in vegetation		<i>Berula pubescens</i>	1	*	129	*	
		<i>Carex pilulifera</i>	52	0.02	17		
		<i>Sida acuta</i>	43	0.01	56		
		<i>Juncus ssp.</i>	1441		758	0.13	
Species scattered in vegetation with limited seed bank		<i>Festuca ovina</i>	19	0.64		0.0	
		<i>Trifolium pratense</i>	2	0.02		0.00	
		<i>Anthoxanthum odoratum</i>		0.0	1	*	
		<i>Agrostis ssp.</i>			4	*	
		<i>Epilobium montanum</i>			17	*	
		<i>Juncus ssp.</i>			4	*	
		<i>Ranunculus</i>			3		
Species restricted to the vegetation	Both	<i>Salix ssp.</i>		*		4	
		<i>Leopoldium</i>		0.1		0.02	
		<i>Woodsia ssp.</i>		20.5		28	
		<i>Matricaria ssp.</i>		0.0		*	
	Exp	<i>Agrostis ssp.</i>		0.1			
		<i>Chamaedryas</i>		0.1			
		<i>Festuca ovina</i>		0.01			
		<i>Fragaria vesca</i>		*			
		Land	<i>Molinia caerulea</i>				0.02
			<i>Poa trivialis</i>				0.04
Species with or less restricted to the seed bank	Both	<i>Achillea Millefolium</i>	5		4		
		<i>Ranunculus ssp.</i>	100		40		
		<i>Oxycorymb</i>	0.1		11		
		<i>Juncus ssp.</i>	2		3		
		<i>Juncus ssp.</i>	59		13		
		<i>Diapentia ssp.</i>	19		136		
		<i>Empetrum nigrum</i>	2			0.05	
	Exp	<i>Carex ssp.</i>	0.1				
		<i>Loiseleuria</i>	1				
		<i>Panicum ssp.</i>	1				
	Land	<i>Agrostis ssp.</i>			11		
		<i>Carex ssp.</i>			2		
		<i>Trichostema</i>			4		
<i>Urtica ssp.</i>				4			

Additional species restricted to the vegetation of landscape with < 0.01% cover and trees: *Carex echinata*, *Carex nigra*, *Cirsium palustre*, *Dactylis glomerata*, *Empetrum nigrum*, *Epilobium palustre*, *Eriophorum angustifolium*, *Eriophorum vaginatum*, *Fagus sylvatica*, *Fraxinus excelsior*, *Galium palustre*, *Geranium robertianum*, *Hydrocotyle vulgaris*, *Juncus conglomeratus*, *Oxalis acetosella*, *Picea abies*, *Pinus sylvestris*, *Quercus petraea*, *Ranunculus acris*, *Salix caprea*, *Sorbus aucuparia*, *Veronica chamaedrys*

**Table 3.** The distribution of National Vegetation Classes found in the experiment and the landscape at Hodron Edge De-Blyshro, expressed as a % of sites sampled. Note two Landscape quadrats contained only bracken and could not be allocated a NVC class.

NVC class	Type of community	Experiment scale (n=106)	Landscape scale (n=50)
<b>W</b>	<b>Woodland</b>		
W10e	<i>Acer pseudoplatanus</i> - <i>Oxalis acetosella</i> sub-community of <i>Quercus robur</i> - <i>Pteridium aquilinum</i> - <i>Rubus fruticosus</i> woodland	0	2
W15	<i>Quercus Betula</i> - <i>Deschampsia flexuosa</i> woodland	28	4
W16b	<i>Vaccinium myrtillus</i> - <i>Dryopteris dilatata</i> sub-community of <i>Quercus</i> - <i>Betula</i> - <i>Deschampsia</i> woodland	1	2
W24a	<i>Cirsium arvense</i> - <i>Cirsium vulgare</i> sub community of <i>Rubus fruticosus</i> - <i>Holcus lanatus</i> underscrub	0	2
<b>U</b>	<b>Calcifugous grassland</b>		
U2	<i>Deschampsia flexuosa</i> grassland	24	16
U2a	<i>Festuca ovina</i> - <i>Agrostis capillaris</i> sub-community of <i>Deschampsia flexuosa</i> grassland	19	5
U2b	<i>Vaccinium myrtillus</i> sub-community of <i>Deschampsia flexuosa</i> grassland	0	6
U4e	Typical sub-community of <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland	5	0
U16c	Species-poor sub-community of <i>Luzula sylvatica</i>	0	2
U20	<i>Vaccinium myrtillus</i> tall-herb community	0	6
U20c	Species-poor sub-community of <i>Pteridium aquilinum</i> - <i>Galium saxatile</i>	18	20
<b>OV</b>	<b>Open habitats</b>		
OV27	<i>Chamaenerion angustifolium</i> community	2	0
OV27b	<i>Urtica dioica</i> - <i>Cirsium arvense</i> sub community of <i>Chamaenerion angustifolium</i>	1	0
<b>M</b>	<b>Mires</b>		
M2	<i>Sphagnum cuspidatum</i> - <i>Heucyrum</i> bog pool	0	6
M20	<i>Eriophorum vaginatum</i> blanket and raised mire	0	2
M20a	Species-poor sub-community of <i>Eriophorum vaginatum</i> blanket and raised mire	0	8
M23	<i>Juncus effusus</i> - <i>Acutiflorus</i> - <i>Galium palustre</i> rush-pasture	0	6
<b>H</b>	<b>Heaths</b>		
H9e	<i>Molinia caerulea</i> sub-community of <i>Calluna vulgaris</i> - <i>Deschampsia flexuosa</i> heath	0	2
H10	<i>Calluna vulgaris</i> - <i>Erica cinerea</i> heath	2	2
H10a	Typical sub-community of <i>Calluna vulgaris</i> - <i>Erica cinerea</i> heath	1	2

although it was possible to restore *Calluna* moorland, this was only one of the vegetation types produced, with several other options possible. Thus, this throws up questions over policy and practice, it may be that different objectives might be easier to achieve, and there is also the possibility of deliberately restoring towards a preferred mosaic landscape. These issues will only be resolved by additional testing and application of the methodology demonstrated here in a wide range of restoration and landscape situations.

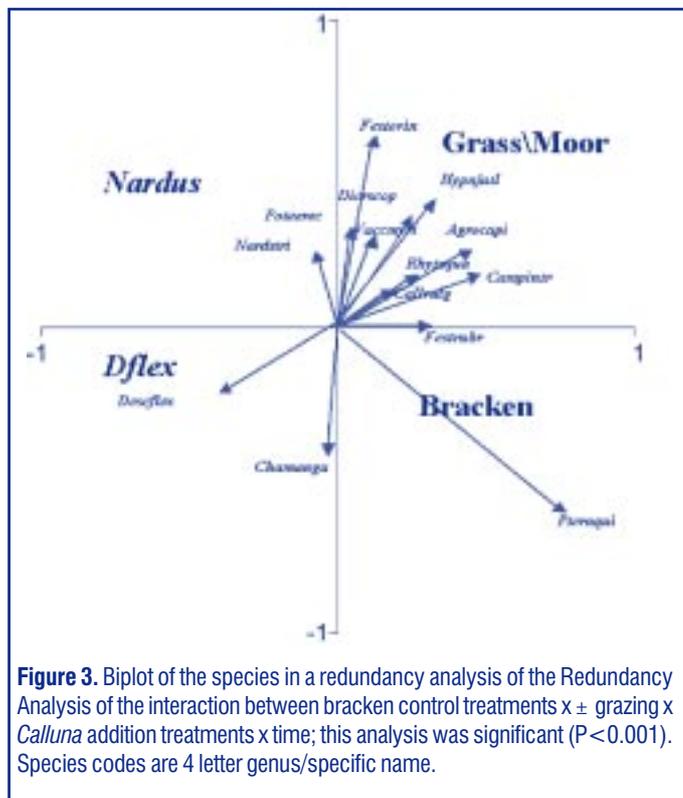
**Restoration to various endpoints – is choice possible?**

Here the vegetation change in the Hodron Edge experiment noted above

shows quite distinct treatment responses.

Bracken frond cover in August shows clear significant differences through time (repeated measures,  $F_{5,10} = 20.89, P < 0.001, 2^{nd}$  order polynomial). Initially the most effective treatments were (1) cut in 1993 + a spray asulam in 1994, (2) spray with asulam in 1993 and (3) spray with asulam in 1993 + cut in 1994. At the start cutting on an annual basis reduced the bracken cover but were not as good as the treatments involving asulam. However, after 4 years the cutting twice per year treatment consistently performed better than all other treatments (Fig. 2) (see p.4).

The combined vegetation data (June) from all 108 experimental plots have been analysed using a multivariate analysis of variance using constrained ordination. The lowest level treatment interaction (bracken control x grazing x *Calluna* application method x time) was significant ( $P < 0.001$ ). The resultant RDA biplot (Fig. 3 shows 14 of the 92 species) indicated that bracken is in the bottom right quadrant, *Deschampsia flexuosa* is in the bottom left, *Nardus stricta* is in the upper left and most typical moorland species are in the upper right quadrant.

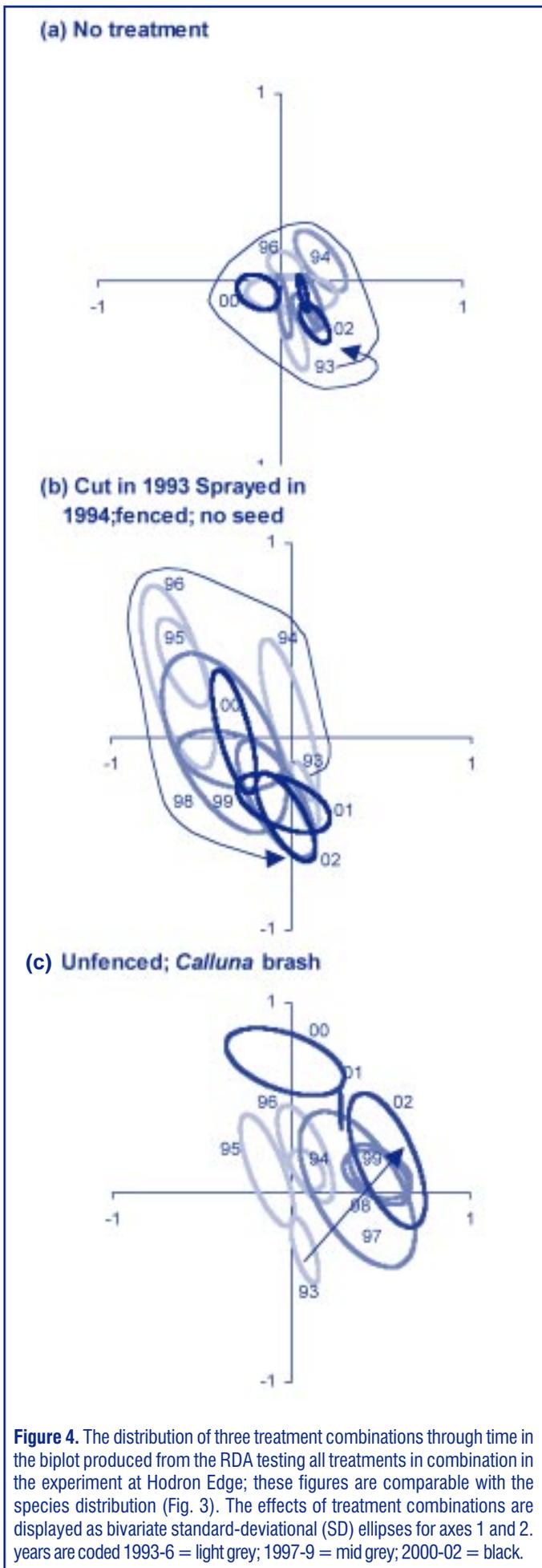


The response of individual, experimental treatment-combinations show different types of trajectory. The control plots with no treatment (controls) circle around the bracken-dominated area effectively showing stasis (Fig. 4a). Cutting in 1993, followed by spraying with asulam in 1994 with no grazing and no *Calluna* seeding showed an initial good response, i.e. a move away from the bracken position. However, the vegetation change is towards a *Nardus*-dominated community and there is a recovery through time to a bracken-dominated position – effectively high resilience (Fig. 4b). A more effective treatment was where the bracken has been cut twice per year over 10 years, light grazing allowed at ESA prescription levels ( $0.5 \text{ sheep ha}^{-1}$ ) and *Calluna* applied as brash. Here, there is a response that moves, and continues to move, into the quadrant with the moorland species – an enforced change (Fig. 4c).

Whether this change can be maintained is of course open to question – with the cessation of cutting there could either be medium-term stasis or a rapid recovery of the bracken indicating high resilience of the initial bracken-dominated vegetation even when high-quality moorland vegetation has been restored.

**Conclusions**

One of the main thrusts of this paper is that the future for the uplands may be more complicated than we have planned for at present. Gimingham’s vision, to which I ascribe, has a multi-biotope landscape with many mosaics and an increased native wood/scrub cover. Research to achieve this vision has not been implemented and accordingly it will either have to be derived from a laissez-faire approach where ‘things’ happen in an unplanned and uncoordinated way. If implementation is to be done in a planned way then research program need to be implemented immediately so that we can



start work addressing these issues, so that future policies can be modified with some degree of confidence.

Our work linking experiment to landscape showed that the restoration work had been partially successful in that species and vegetation types similar to the surrounds were restored, although some wetter communities were not present. Further studies (Chuan *et al.*, in press) has used this baseline survey to simulate the impact of successful restoration, and different results occur depending on the restoration objective.

First, *Pteridium*-dominated vegetation was changed to *Calluna* and acid grassland, the favoured scenario under the North peak ESA scheme. There were increases in the target communities but also a large reduction in the overall number of patches. On the face of it this would be viewed as positive in that there was patch coalescence and presumably a greater conservation and landscape value. However, different results were obtained for the complexities of the two target communities. The mean patch size and the complexity (judged using the IJI index) increased for the *Calluna* moorland and decreased for the acid grassland. Second, some of the *Pteridium*-dominated vegetation was changed to native woodland. Here, there was not the same reduction in overall number of patches, but there was an increase in both woodland cover, the mean woodland patch size and the complexity of the woodland configuration in the landscape. The IJI index for the woodland increased from a very low value to a more complex configuration, typical of other communities in the area.

These results, therefore, indicate the power of this approach in landscape planning. It should be possible to sit with a manager and simulate "what-if" scenarios assuming various successful restoration/conservation outcomes. Essentially this boils down to a subset of the SLOSS debate – whether a single large nature reserve is more efficient for conservation than several small ones. Larger areas are more likely to contain the complete range of habitat heterogeneity with an age-structure to allow regeneration through time (Pickett & Thompson, 1978). At the nature reserve scale there is usually little that can be done to affect the outcome, but in a managed landscape like the one discussed here, distinct choices can be modelled.

When it comes to implementing restoration work in such a context, it is important to realise that there are a variety of treatment combinations, which may or may not provide a long-term solution. In our example, I illustrated only 3 of the 36 combinations we have tested in the North Peak experiment. The control showed stasis, resilience in that there was a return to near the start point within 10 years, and only the treatment with continued treatment over the 10-year period was still judged successful after 10 years.

Thus, if we are to obtain the vision outlined by Gimingham with matrices of communities in a wider landscape, we need to start developing the tools to implement this, and make sure that there is a good technology transfer between scientists and practitioners. This will take a good programme of CPD, a major initiative in IEEM, for which it should be applauded. This unfortunately will take time, but alas, time is not on our side here.

### Acknowledgements

Most of the work presented here represents work done in my laboratory by Dr Mike Le Duc, Professor Tong Chuan and Mr Jamshid Ghorbani. It is a pleasure to thank them and Professor Robin Pakeman for the hard work, enthusiasm and encouragement that they have provided to our various bracken projects over the years. In addition our work has benefited from sustained long-term financial support for out bracken work from Defra. The UK Royal Society China Royal Fellowship Programme helped fund the landscape work presented here though the provision of a fellowship to Professor Tong Chuan. The views expressed in this paper are mine, and mine alone and do not necessarily those of my funders, partners or colleagues.

**Robert Marrs is Professor of Applied Plant Biology and Chair of the Ecosystem Structure and Function Division within the school of Biological Sciences, University of Liverpool.**

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# Environment, Weather & Climate Information in the Financial Services Sector

Monica Hale, FIEEM

## Introduction

Over the past four years Science Applications International Corporation (SAIC)<sup>1</sup> has been assessing the current uses of weather, climate and ocean information in different economic sectors through a number of investigative research projects for the U.S. National Oceanic and Atmospheric Administration (NOAA). The projects have used stakeholder analysis and case studies to demonstrate the financial benefits of observing system derived environmental information; in particular weather and climate forecast data application, the optimisation of the use of this information, and identifying where enhanced data confers business and operational advantages.

The following describes recent developments in the financial services sector and environmental information assimilation focusing on the effects of weather and climate and highlights the need for economic sectors, particularly the financial services sector, to use this information more proactively to inform decision-making.

Virtually *all* industries are underpinned in some way by the financial services sector, through loans, debt financing, insurance or pension provision. The majority of these industries are prone to weather variability but to date observing system information (weather, climate and ocean data), has been under-utilized in analyses on asset value, stock valuation, portfolio management, and project evaluation. Banks' due diligence, environmental impact analyses (EIA) and risk assessments do not generally include thorough evaluation of the impacts of weather and the potential risks of climate change on investments (for example, the costs of the recent hurricane/tropical storm Isabel on the eastern U.S. in September of 2003 resulted in billions of dollars in environmental damage and damage to property and other assets as well as loss of economic productivity and revenue). Due diligence assessment will increasingly have to incorporate projected climate and weather impacts, particularly on long-term investments.

Financial due diligence is carried out to a greater or lesser extent on all loans and similar transactions: environmental due diligence is part of this evaluation. This generally includes a review of the environmental regulations and requirements a loan requesting industry may be subject to, or may incorporate wider ranging environmental impacts assessment (EIA). The impact of weather and climate is generally under-reported by most of the financial sector, with the exception of the insurance industry, which has invested considerable resources in understanding weather systems and modelling future scenarios.

Financial institutions need to assess the extent of their consolidated financial liabilities throughout all sectors of the economy and in all regions of the world, to fully inform their activities in investment banking, asset management, equity research and portfolio risk management. The application of risk management fundamentals, such as in risk avoidance, reduction, transfer, and retention, can apply across the financial services sector when dealing with financial property damage, liability risk, and environmental initiatives<sup>2</sup>.

Ascribing a 'value' to weather forecast information and optimising its application in business practices and financial analysis presents a number of challenges. The monetized value of forecasts needs to be enumerated in order to raise awareness within the financial and commercial community of how the assimilation of forecast data can provide tangible business and economic benefits to investors and their clientele; to catalyse changing practices in business; and for organizations and businesses to establish effective mitigation and adaptation scenarios to the effects of climate change. Demonstration of the economic value of forecast information is also necessary to ensure continued investment in further improving and enhancing environmental monitoring, observing and forecast systems both public and private services. A number of SAIC research efforts have advanced the understanding and assessment of the 'value' of weather and climate forecasts in this regard. These studies have included analysing the current use of weather, climate and ocean information in business decision-making processes. These studies have also included information on the extent to which the data is assessed and manipulated and skills gap assessments<sup>3</sup>.

An important element of the SAIC investigations were interviews with financial services sector personnel in a range of operational positions, including equity analysis and stock valuers, portfolio managers, risk assessors, insurance brokers and underwriters, environmental risk officers and loan and investment staff. This process yielded a unique assessment of the use of weather, climate and ocean data and identified barriers to the further optimisation of its use in the financial services sector.

## The Economic Significance of Weather and Climate

Notwithstanding the effects of weather and climatic conditions on ecosystems and the environment in general, as much as 70 percent of all business activity is affected by the weather<sup>4</sup>. Worldwide economic losses due to natural disasters (many of which are weather induced), are doubling every ten years, and have totalled almost US\$1 trillion over the past 15 years. If current trends persist, the annual loss amounts will approach US \$150 billion within the next decade. As the potential economic consequences of climate change become clearer, company directors, executives, pension fund trustees, and institutional investors will increasingly have to adopt measures to mitigate these costs.



Damage in the 1999 storm, Northern France

The economic impact of non-catastrophic climate change related weather events includes droughts, snowfall changes, sea level rise, and variations in seasonal periodicity which impact on industries as diverse as agriculture, fishing, construction, transport, and tourism.

## Recent SAIC Financial Services Sector Assessment Studies Overview

The U.S. National Oceanic and Atmospheric Administration (NOAA) has instigated a series of studies to define how data derived from the present and future ocean, coastal and terrestrial observing systems network, both national and regional, can be better utilized to meet societal needs; to

enhance the economic viability of all business sectors; inform natural resource management; and aid community planning. Weather and climate data users include government, commerce/business, academia, and individuals. These data are available from a variety of sources and are utilized for many different applications and purposes. The challenge to data providers such as the U.K. Met. Office and the U.S. National Oceanic and Atmospheric Administration (National Weather Service & National Ocean Service), is to build a system that meets the multiple needs of a wide array of users, including the financial services sector.

Meteorological services need to know the current uses being made of weather forecast data; the 'gaps' in information currently provided; the models being populated by this data; and the future needs of users, in order to provide relevant information and to ascertain where investments need to be made in observing and monitoring systems to improve environmental forecasts of conditions (precipitation, wind speed, temperature, sea swell, etc.), at specific temporal and spatial scales.

### **The Move from Historical Analysis to Forecast Data**

Weather and climate impacts the financial services sector businesses and operations, not only in the form of severe events such as natural catastrophes (typhoons, tsunamis and hurricanes), but from exposure to conditions such as higher or lower than average precipitation, extreme temperature swings, high winds and severe sea state. These conditions present financial risks affecting the insurance liability, stock valuation and commodity markets as well as other financial sector interests and functions. SAIC/NOAA research has demonstrated that weather assessments are a crucial element in the financial services sector's efforts to reduce financial exposure and control risk particularly from severe events as well as longer-term variability.

The consequential effects of weather range from problematic environmental conditions including poor air quality, growth of moulds, and harmful algal blooms (HABs), to perils such as damage to property, higher incidence of personal injury through accidents, and adverse impacts on population health. These have considerable financial ramifications in the insurance and reinsurance industries, investment and loans businesses, as well as on asset management and stock stability. Increasing financial volatility as a result of climate change translates into both long-term and short-term risk to investments. Sea level rise, increased severity of coastal storms, and the impact of storms further distances inland, in part as a consequence of climate change, are examples of issues the financial services sector needs to evaluate in terms of financial exposure.

The hitherto standard methodology of extrapolating from 'historic' climate data to establish environmental trends over time, traditionally employed by the insurance industry and other financial sectors as a basis for future scenarios and conditions, is an increasingly unreliable way of assessing probable exposure to severe impact events as well as vulnerability to day-to-day changes in weather conditions. This can be demonstrated by reviewing the incidence of generally accepted "50-year" flood events that are recurring with much greater frequency, i.e. more regularly than once in every 50 years in many areas. Inter-annual extreme and severe weather events, such as intense periods of heavy precipitation, high temperatures, floods, and droughts, are occurring with increasing frequency in many regions of the world. It is not yet clear whether changing weather patterns signal long-term trends or if they are temporary perturbations in relatively stable regional climate patterns.

If the prediction of climate-related events can be achieved at a higher level of confidence by using dynamic forecasts in conjunction with historic information, the assessment of financial impacts of environmental conditions will be greatly enhanced, which will in turn lead to a reduction in business and investment risk.

Recent developments which have led to improvements in the accuracy of weather forecasts include advances in monitoring and observing systems, densification of observing systems, technical improvements in monitoring equipment, coupled with advances in forecast modelling and the development and application of 'ensemble' forecasting<sup>5</sup>. It is now possible to predict severe events with a higher level of accuracy at longer lead times. However, the financial services sector, for a number of reasons - lack of awareness, internal barriers to change, skill gaps, and lack of rigorous exemplar case studies using environmental information - is not fully utilizing this information in critical decision-making.

### **Climate Related Financial Instruments**

'Weather Risk' is the uncertainty in cash flow and earnings caused by weather volatility (Surowieck 2001)<sup>6</sup>. Many energy companies, for example, have a natural interest in weather, which is their largest source of financial uncertainty. Weather forecast information on a day ahead basis and up to 4 days out is used in energy load forecasting and other models to estimate power demands, and generation and distribution capacity requirements. As well as aiding efficiencies in the power markets, these applications lead to environmental benefits in terms of resource management, lower pollution levels and improved air quality. Thus:

- in the U.S. where much of the power load is created by cooling requirements, colder than normal summers reduce electric power sales for residential and commercial space cooling. Cooler temperatures lead to idle capacity, raise the average cost of power production, and reduce demand for natural gas and coal energy feed stocks
- above average winter temperatures reduce natural gas and electric power sales for space heating
- lower than normal precipitation upstream of hydropower facilities reduces power production - this reduces revenues to the facility and diverts buyers of hydropower to higher cost power alternatives.

Independent power producers usually have weather adjustments built into their fuel supply contracts. When weather events trigger these adjustments, fuel supply costs can increase considerably. In extreme cases, fuel supply and business operations are temporarily interrupted.

Over recent years a sub-sector of the financial services sector industry has developed specializing in products tied to environmental conditions. These include weather derivatives, catastrophe bonds and rating schemes based to a large extent on assessment of companies' abilities to address environmental externalities (e.g. Dow Jones Sustainability Index, Safety and the Environmental Management Risk Rating Agency rating). In addition, financial analysts increasingly have to assess the actual and potential impacts of environmental conditions to investments in a broad range of sectors.

The application of risk management fundamentals (risk avoidance, reduction, transfer, and retention) can be applied when dealing with environmental consequences, financial property damage or liability risk (UNEP 2003)<sup>7</sup>. In the late 1990s, trading companies, primarily in the energy sector, recognized this risk management opportunity and began offering solutions to help companies manage natural hazard risk. Structured either as derivatives or as insurance contracts, weather transactions typically cover local or regional variations in temperature, precipitation, or other weather features over a period from one week to a full winter or summer season.

### **Weather Data Use**

Decision-making in virtually all areas of the financial services sector is based on the evaluation of risks to equity and expected returns on investment. Recent studies completed by SAIC have demonstrated how the application of weather, climate and ocean forecast data can improve business practice models used to inform the decision making process. Increased forecast

accuracy, combined with longer lead times, facilitates better preparation for weather events, and hence reduced consequential financial loss.

The current application of weather, climate and ocean data varies greatly across individual financial services sector operators. For example, some banks have specialist meteorology departments (customizing climate and weather information to the needs of equity analysts and risk assessors); others have no internal facilities and rely on external data sources; while some do not use weather and climate information at all.



Didcot Power Station Plume

Utilities industries are a major investment sector where weather data is increasingly important to manage diverse aspects of the business, ranging from transmission facilities to fuel management. A recent SAIC study demonstrated that temporal and spatial improvements in weather forecasts on the 2-4 days-out and the 2-7 days time scales can lead to improved energy load forecasting, greater control over emissions, and consequent financial savings (often in millions of dollars – particularly where weather events such as cold fronts and sea breezes affect energy consumption and efficiency of transmission lines).<sup>8</sup> On a longer-term time frame, informed decisions relating to climate change will facilitate improved energy planning and procurement, resulting in less wastage and more efficient generation, improved resource management, lower levels of pollution, and will provide more reliable power supplies leading to considerable economic benefits.

Equity research analysts in the energy sector depend on weather data to assess the fuel markets and the efficiency of power generators. Essentially a stock rating assessment is carried out on the basis of buy/sell decisions dependent on temperature. Accurate load forecasting, determined by the analysis of weather data, facilitates the purchase of gas and other fuels at the most favourable price at the optimum time in the market place. Weather information therefore helps to inform energy marketing/purchasing decisions impacting the balance sheet of energy companies and the markets in which energy futures are traded (such as the American Mercantile Exchange, AMEX).

Following developments in Europe, a potential major growth area in the United States is renewable energy, including solar, wind, and wave generation. Interest in this area is increasing not just because of economic factors, but for political reasons, particularly as it affects energy security. New areas for investment in the renewable energy arena are totally dependent on natural resources and their viability and profitability is reliant on the accuracy of long-term weather trend analysis. If renewable power generation is to increase to any significant extent it must be profitable for investors. There are therefore both economic and political factors creating an impetus for the development of weather data resources targeted at renewable power generation.



Wind Power, Indio, California

### Climate Change and Economic Well-being

A number of financial sector functions utilize a well-established assessment of weather, usually for severe events; the insurance industry in particular has a considerable interest in long-term weather assessments. Insurance premiums and deductibles are generally calculated on the basis of the analysis of large data sets of historic environmental data. However, recent climatic perturbations, the shifting large-scale air and ocean circulation patterns, as well as other factors, have reduced the effectiveness of historic data analysis as an information source on which to base future scenario assessments, although the reasons for climate change are not fully understood and the extent of anthropogenically-induced change is not clear.

While research has been carried out on how climate change is affecting the financial services sector and how this is likely to increase in the future, insufficient attention has been paid to how the financial services sector should **use** weather, climate and ocean data to help the management and mitigation of what are expected to be significant effects on the industry in the future. In 2002 UNEP drew attention to the areas and activities that will be impacted by climate change and the barriers and current measures that the financial services sector are currently implementing, as well as the barriers to change, and presented areas for action<sup>9</sup>.

Long-term climate change is expressed in short-term extreme weather events and changes, driven largely by shifting global circulation patterns. Early detection of these circulation pattern changes serves as an 'early warning' of the likelihood of specific weather conditions which will impact geographically defined areas, regions and locales. This information is of tangible benefit to the financial services sector in terms of predicting where, for example, heavier than seasonal average precipitation may occur leading to an increased risk of flooding. The impacts of flooding range from economic disruption and unemployment at the macro level to disrupted trading and damaged assets at the micro level, resulting in considerable claims being made on insurance.

Climate change represents an unprecedented and highly complex threat to long-term economic interests across the spectrum of finance and insurance industry activities. The Intergovernmental Panel on Climate Change (IPCC) has confirmed that the combined effect of increasingly severe climatic events and underlying socio-economic trends (such as population growth and unplanned urbanization) have the potential to undermine the value of business assets, diminish investment viability and stress insurers, reinsurers, and banks to the point of impaired profitability and even insolvency. In extreme cases, whole regions may become unviable for commercial financial services<sup>10</sup>.

Politically, government support for mitigation has been forthcoming and the negotiations around the Kyoto Protocol have begun to accelerate the creation

of climate-friendly markets. Looking towards the long-term, agreement of an international policy framework that addresses the fundamental social, environmental, technological and economic issues at stake, and based on the principles of precaution, equity and economic efficiency is clearly critical. Economically, there is a growing realization that solutions exist that need not cause the dislocation initially feared by some economists. Indeed, there is strong belief that the right blend of policies, if skilfully introduced, can substantially reduce the direct and indirect costs of mitigation and perhaps even produce a net economic benefit.

Creating the conditions that are conducive to sound environmental management and the kind of clean technology futures that bring about substantial greenhouse gas (GHG) emissions reductions is a concrete step that all major market participants – investors, industrial companies, policymakers, consumers – can make together now. Commercially viable technologies exist today whose introduction could go a long way towards reducing GHG emissions in the short term, while more developmental clean technologies are brought to the market.



Old Industries, Erie, USA

The markets for catastrophic event (CAT) bonds, weather derivatives and microfinance / microinsurance hold promise for forward-looking finance and insurance companies. Several leading insurance and fund management companies have adapted to these changing business conditions. Companies are developing a range of risk management programs and innovative new solutions that not only promote GHG emissions reductions but also provide new business opportunities. The facilitation of emissions trading markets, and the renewables and clean power technology sectors represent the key strategic theatres. The latter, for example, could generate turnover in the range \$234 to \$625 billion by 2010, and as much as \$1,900 billion by 2020 (UNEP 2002)<sup>11</sup>.

In this transition to a cleaner economy, it is becoming increasingly clear that institutional investors have a crucial role to play. With over \$26 trillion in assets under management, these investors wield significant influence over future economic development and industrial and environmental management pathways and therefore, the pattern of future global GHG emissions. Aligning the interests of the political and investment communities to spur corporate GHG mitigation activities backed up by sound environmental information and to expedite the development and distribution of cleaner technologies would accelerate this process to the benefit of all.

In a number of states in the mid-west and northeast U.S. GHG registries have opened up, which will evolve into viable trading markets. Observing system information in air quality and pollution tracking, whether by detection or by extrapolation of air masses and the application of dispersion modelling is likely to increase in use.



Modern city – New York

### Conclusion

The promotion of sustainability and sound environmental practices in the banking and financial services sector has to date, largely been based on the screening of investment portfolios and direct investment in environmental initiatives or programs of societal benefit (e.g. developing sustainable tourism, renewable energy, etc.). However, by increasing the skill of weather forecasting and reducing error, in conjunction with improving climate and business models to assimilate improved observing system and forecast information, substantial financial as well as environmental and community benefits will accrue. Improvements in climate modelling will lead to more accurate long-range weather predictions and a better understanding of the impact of human activities on climate.

The overriding challenge is to get the financial services sector to increase the uptake, skill, and application of weather, climate and ocean information for asset management, risk assessment and mitigation and financial decision-making.

**Monica Hale is the Senior Sustainability Specialist in the Energy Solutions Group of Science Applications International Corporation (SAIC), based in McLean, Virginia, USA.**

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- <sup>1</sup> SAIC is the largest environmental and weather information and applications provider in the U.S
- <sup>2</sup> UNEP (2003) 'Risk, the Environment and the Role of the Insurance Industry', Prepared by the UNEP FI Australasian Advisory Committee on Insurance, January 2003, EPA Victoria & UNEP-FI.
- <sup>3</sup> Regional Market and Policy Imperatives as Drivers for the U.S. Coastal Global Ocean Observing System Design, draft Phase I Report to NOAA, SAIC, (August 2003).
- <sup>4</sup> Risk Management Solutions, Inc.: <http://www.rms.com/Weather/>
- <sup>5</sup> As the atmosphere is a chaotic system, errors occur in the estimation of current states which can have major impacts on subsequent forecasts. As there are a limited number of observations available for any location coupled with the uneven spread of monitoring sites there is always uncertainty in the determination of the state of the atmosphere at any one point in time. A set, or ensemble, of predictions from different but similar initial conditions is now often run in parallel to reduce the error on forecasts. Ensemble prediction systems are increasingly being employed as a quantitative tool for risk assessment in a range of weather-sensitive commercial and other applications.
- <sup>6</sup> Surowieck, James (2001) 'What Weather Costs', The New Yorker, July 23, 2001.
- <sup>7</sup> Op cit.
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- <sup>9</sup> UNEP-FI (2002) *Climate Change and The Financial Services Industry: Modules I & II*, UNEP Geneva.
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- <sup>11</sup> op cit

# RAMSAR: A CONVENTION FROM THE PAST, FOR THE FUTURE.

*Peter Bridgewater, MIEEM and  
Sebastià Semene Guitart*

## The past: origins

The Convention on Wetlands of International Importance especially as Waterfowl Habitat, more generally abbreviated now as the Convention on Wetlands (Ramsar, Iran, 1971), or even more simply the Ramsar Convention, was one of the first international rights documents on the environment. Adopted in 1971, in Ramsar (Iran), the convention first came into force on the 21<sup>st</sup> of December of 1975. As of November 2003 has 138 Contracting Parties, with 3 more in an advanced stage of adhesion, and more in the early stages.

Although initially the Convention had, as its main objective, the conservation of waterfowl through the preservation of their feeding and breeding habitats, this priority has slowly shifted to a wider focus on wetlands as a special ecosystem. This shift is partly because of the adoption of the Convention on Migratory Species (CMS, Bonn) in 1983, and partly because of increasing global concern on the availability and purity of the world's water supplies. The Ramsar Convention has thus progressively evolved toward a more generic management of water and ecosystems. Even the wetland types actively considered by the Convention have become more extensive, including ecosystems ranging from peatlands, to swamps, to marine coastal ecosystems up to a depth of 6m, and even the ice fields, from melting glaciers.



Norfolk Broads

The Ramsar Convention is currently one of a group of international agreements engaged in biodiversity conservation and use, and especially in promoting integrated management of ecosystems. The Convention has 3 pillars: listed sites, the wise use of wetlands and international co-operation.

## 1. Listed sites

The first obligation under the Convention is to designate at least one wetland for inclusion in the List of Wetlands of International Importance and to promote its conservation, including, where appropriate, its wise

use. Selection for the Ramsar List should be based on the wetland's significance in terms of ecology, botany, zoology, limnology, or hydrology. The Contracting Parties have adopted specific criteria and guidelines for identifying sites that qualify for inclusion in the List of Wetlands of International Importance. More than 1310 wetlands have been designated for inclusion in the List of Wetlands of International Importance, covering over 111 million hectares (1.11 million km<sup>2</sup>). In fact, the United Kingdom and its dependant territories have by far the largest number of sites, currently at 169. But of course in area other countries pass the amount of over than 760,000 ha for the UK – the largest site being over 6 million ha for the Okavango delta in Botswana.

## 2. Wise use

Under the Convention there is a general obligation for the Contracting Parties to include wetland conservation considerations in their national land-use planning. They have undertaken to formulate and implement this planning so as to promote, as far as possible, "the wise use of wetlands in their territory" (Article 3.1 of the treaty). The Conference of the Contracting Parties has approved guidelines and additional guidance on how to achieve "wise use", which has been interpreted as being synonymous with "sustainable use".

## 3. International cooperation

Contracting Parties have also agreed to consult with each other on matters related to the implementation of the Convention, especially in regard to trans-frontier wetlands, shared water systems, and shared species. Over the years, the Conference of the Contracting Parties has interpreted and elaborated upon these three major obligations included within the text of the treaty, and it has developed guidelines for assisting the Parties in their implementation.

Because of its establishment before the Stockholm Global meeting on the environment, Ramsar has never been formally part of the UN system. However, UNESCO is the legal depositary of documents of adhesion of all contracting Parties. By agreement of all Contracting parties the World Conservation Union (IUCN) provides financial and human resource services, for the secretariat, in consultation with the Secretary-general, as well as the Secretariat Headquarters space.

## The present

In recent years, and particularly after the World Summit on Sustainable Development (Johannesburg, 2002), it has become clear that water is one of the most important resources of the planet, yet also one of the most under pressure. There is thus a necessity for a more co-ordinated global management of water resources - and the Ramsar Convention appears as the most relevant existing international agreement to deal with this new and increasing responsibility.

The search for integrated management has emphasised the need to ensure equilibrium between people and the environment, but placed less emphasis on the creation of protected areas in a traditional way. As the World Network of Biosphere Reserves (UNESCO-MAB) or the Cultural Landscapes of the World Heritage Convention, the Ramsar Convention tries to promote wise use of natural resources, so as to ensure sustainable development. Ramsar is thus a very flexible convention that doesn't impose strict management regulations, or insist on legal protection of listed sites – rather relying on the driving force of the Contracting Parties.

The secretariat, working with bi- and multilateral funding agencies, aims to provide support for capacity building in developing countries. While Contracting parties are the "owners" of the Convention in every sense, Ramsar is unusual in that historically the scientific community and the key NGO's WWF, Birdlife International and Wetlands International, as well as the IUCN, all played a central role in the creation and early development of

the Convention. Even today they are regarded as key partners in areas of capacity building, and the provision of objective advice on the prosecution of the Convention.

Contracting Parties are obliged to designate one wetland of international importance as part of the process of adhesion, although many contracting parties list rather more. They also agree to try to ensure in their national management and development plans equilibrium between human development and conservation of wetlands - and more broadly, of water as a natural resource; in other words: sustainable development.

This is why the Ramsar Convention recognizes and promotes economic and cultural values of wetlands, either through direct exploitation (fisheries, hunting, pharmaceutical use of some plant species, extraction of mineral water or of salt in coastal ecosystems, etc.) or indirect exploitation (through the use of water for energy generation, for example). Finally, the Ramsar Convention recognizes the importance of the Ecosystem Approach adopted by the Convention on Biological Diversity – and works very closely with that Convention to deliver globally important outcomes for wetland biodiversity.

The Ecosystem Approach recommends an integrated management of the environment, including social, cultural, institutional or economic aspects, often as, or more important than, purely ecological factors. As part of its commitment to implementation of the ecosystem approach, the Ramsar Convention has promoted extensively integrated management of river basins (including ecosystems and aspects not specifically included in the Convention Text, such as riverine forests, and promoting linkages between uplands and lowland ecosystems), rather than promoting the potentially stronger legal protection of specific areas.



Not all Ramsar Sites are wet! – New Forest Pig

A very important area for the Convention is outreach and communication. The last meeting of the contracting parties identified Communication, Education and Public Awareness as an issue to be pursued by the Secretariat. Our web site ([www.ramsar.org](http://www.ramsar.org)) has much information in it, but we will be working on a better design for it in the coming months. Nevertheless it is a good source of background information. One major source of outreach possibilities is the network of Wetland centres developing around the World – the London Wetlands Centre is an excellent example here (see also their site <http://www.wwt.org.uk/visit/wetlandcentre/>). This centre and others put a key focus on World Wetlands Day - celebrated the 2nd of February each year – remember that in 2004, and join in the celebrations!!

**The future**

In 2002 UN secretary general Koffi Annan identified a set of 5 key issues as needing special focus at the WSSD in August 2002. These issues were known as WEHAB, for Water, Energy, Health, Agriculture and Biodiversity. Wetlands actually “open and close” this set of key issues, and logically have

a great importance in any and every one of these 5 issues. Ramsar thus has clear responsibility to help deliver positive outcomes globally, and is now centre stage in the suite of mechanisms for global environmental governance involving water and biodiversity.

So, what is important about the key WEHAB issues? Some statistics:

Four out of every 10 people currently live in river basins experiencing water scarcity. By 2025 nearly 50% of the world’s population will face water scarcity; Over-pumping by farmers of groundwater exceeds natural recharge rates by at least 160 billion cubic metres a year; Water losses in irrigated agriculture account for 25 – 40% of the water used; At any one time half the worlds hospital beds are occupied by patients suffering from water borne diseases; More than 50% of the world’s wetlands have been drained, and populations of inland water and wetland species have declined by 50% between 1970 and 1999; Roughly one-third of the world coral reef systems have been destroyed or highly degraded;

These statistics underline the interlinkages between all elements of WEHAB. And although the traditional view of the Ramsar Convention is that it is about keeping places for migratory waterfowl, it is now seriously addressing all of the issues.

How? Well, Water is clearly a focus for Ramsar. Through the listing and management of sites of international importance, production, protection and purification of freshwater will be ensured. Fresh and tidal waters are involved in almost all forms of energy generation, so much so that last year energy supplies were threatened in Europe by too low flows in many rivers supplying cooling waters. And of course, water is used increasingly for hydroelectric generation, and thus a power source in itself.

As for health, it is clear that healthy populations need an adequate supply of freshwater, as well as adequate sanitation. But wetlands can also be seen as sources of diseases, especially those borne by vectors that rely on water for reproduction. Thus effective management of wetlands, including management of the potential for disease propagation, is essential in national wetland strategies.

As for Agriculture, this was the subject of considerable discussion at the last Conference of the Parties, with a spectrum of different views being expressed. It is an area where the scientific resources available to the Convention will need to be mobilised to reach sensible political decisions. Certainly the need to ensure ecological water is available for ecosystems as well as water for agriculture and water for basic human needs is clear yet is often ignored!



Camargue Cattle

Global change, including climate change, is not new - nor is the role of people in this change. What’s new is the role of people in rates and directions

of change and the inability of ecological systems to cope with, especially, climate change. Climate change will obviously have effects at various scales on wetland biodiversity. Managing the consequences of climate change, therefore, is a major challenge for all involved with management and use of wetland biodiversity. As a first step, monitoring is essential. Such exercises as the Millennium Ecosystem Assessment will be an indispensable baseline for understanding the present, and thus managing the future.

Of all global change, climate change is the most insidious, and the most likely to devalue wetlands. Such impacts will lead to changes in species composition and dominance, ecosystem structure (especially length of growing season) and in the distribution and abundance of species. But the value of wetland systems in the coastal environment, as a key buffer against change is undisputable, and makes a clear case for conservation and management of ecological systems, not the building of evermore improbable defences.

A particularly important point to make at the outset is that climate change is but one component of global change. It may well be that climate change is actually less of a concern for biodiversity management than other components of global change, such as eutrophication, change in hydrological balance and poor land-use practice. It is likely that exotic species already present in restricted sites, or not yet established, will achieve range extensions. This gives greater emphasis to management of exotic species as part of biodiversity strategies. New species interacting with existing communities will give rise to novel communities for which effective management measures will need to be defined.

For all of these reasons the Secretariats of the Ramsar convention and the UNFCCC are developing joint programmes and activities, as endorsed by the Parties to the two conventions. This is one area where the development of synergies at all levels from national to Global is key to helping manage the most serious issue of this century.

To resolve some of these problems we will need better management of both water resources, and the ecological systems that nurture them. But we should not forget either that ecological systems also need water for survival, or that this need for “ecological water” must be factored into balancing the global water bill.

For we cannot supply water for people effectively if the basic ecological infrastructure is degrading, disappearing and becoming ineffective. The Ramsar link between conservation and wise use, and its focus on wetlands from mountaintop to coral reef, positions it well amongst the suite of multilateral environmental agreements to deliver here.

The last CoP, held in Valencia in 2002, was a critical meeting for the convention, as it sought to realise its role in the challenges ahead. In effect the Convention changed gear and moved to a new paradigm, where wetlands were seen as part of the interlinked issues including the production, protection and purification of water sources for the world. And the designation of new wetlands of international importance is relevant only if part of a better wetland management strategy for the whole of the Countries wetland resources.

In a world with such a paradigm shift, the task for wetland managers will be not only to manage carefully their wetlands, but also to ensure the surrounding land or seascape is managed appropriately – which means managing people as part of the management of water and biodiversity. A new challenge that will certainly shape the future of the Ramsar Convention, its Secretariat and its Contracting Parties.

**Peter Bridgewater is Secretary General and Sebastia Semene Guitart is Special Assistant, Ramsar Secretariat.**



## Ornithologist and Invertebrate Ecologist

We are looking for up to two people to work in a busy and successful consultancy based in Buxton in the Peak District. PAA is the longest established and one of the largest specialist ecological consultancies in the UK.

For the **Ornithologist** post we are looking for someone with skills and experience including the ability to undertake fieldwork. In addition, you must have knowledge of field ecology and behaviour and experience of evaluating and assessing impacts on bird assemblages. Of course we would also expect you to be able to write reports, give oral and written presentations to clients and to be able to test and improve other people's work up to standards to global standards. You will be working with birds.

For the **Invertebrate Ecologist** post we are looking for someone with a genuine interest, and at least some experience, working with invertebrates, including freshwater invertebrates. Depending on experience and the level of study, training could be provided for the right candidate.

The Ornithologist post will be covered as an Ecologist and the Invertebrate Ecologist as either an Ecologist or Assistant Ecologist. The overlap between the two posts makes it hard to put a firm limit on experience with so-called field and amenity work, including a laboratory. Your work is critical and will include a blend of research, conservation and development of guidelines in place throughout the UK and Channel Islands.

We offer a basic salary for an Assistant Ecologist of £14,000 and for an Ecologist of £16,000. Basic salaries are subject to additional performance related bonuses and benefits. We also offer a contributory pension scheme and other work benefits including a generous provision for training. Candidates selected for interview as an Ecologist are likely to have a relevant degree and possibly a postgraduate qualification, together with at least two years relevant field experience and for an Assistant Ecologist a relevant degree and some experience, including at least relevant voluntary work or activities as an amateur ornithologist.

Interested applicants should apply via e-mail, either and/or by a covering letter in a stamped envelope, to our HR team at one of the above premises closing date Friday 17 January 2004. Interviews are likely to be held on Tuesday 20 January 2004. Applications and internal queries go to: Dr Mary Smith, Penny Anderson Associates, 16 Park Lane, 10 Park Lane, Buxton, Derbyshire S8 2PL, Tel: 01298 20286 or apply via web page: [www.paa.co.uk](http://www.paa.co.uk)

# The Skills-Gap Debate.

Samantha Hillcox

What knowledge, skills and experience should be in the graduate ecologist's basic 'tool kit'? Should IEEM support course accreditation for post-graduate ecology-related courses?

## Introduction

Have you taken part in coffee-time debates over the 'dumbing-down' of ecology-related degree courses or the decline in popularity of 'pure' botany, zoology and ecology degrees? Are you frustrated by poring over CV's from recent graduates with little or no practical experience and non-existent surveying skills? Fed-up with interview candidates who don't know their hawthorn from their hazel, or comprehend the significance of their presence? Members of the Institute of Ecology and Environmental Management and the British Ecological Society have long-identified a growing skills-gap between students graduating from post-graduate ecology degrees and the basic requirements of a professional vocational career in ecology (IEEM, 2002; IEEM, 2002).

To support the extensive anecdotal evidence that already exists, a study was carried out during July and August 2003, to begin to understand the perceived skills-gap and determine whether it is a genuine problem in the environmental consultancy and statutory and non-statutory environmental sectors. Over 80% of respondents to a recruitment and skills-base questionnaire reported difficulties in staff recruitment during the last five years particularly of junior staff. Almost all of those cited a lack of training and experience in basic field surveying techniques and a lack of species identification skills as major reasons for the lack of high calibre graduate ecologists wishing to enter the profession.

The study sought to establish the theoretical knowledge, practical skills and areas of experience which are required in the ecologists' basic 'tool kit', particularly in ecologists entering the profession as recent graduates, after obtaining a post-graduate qualification. By investigating the mismatch between the demand for and supply of essential skills, the study may enable course providers to identify how they could better meet the needs of the major employers of professional ecologists.

Respondents highlighted the need for graduate ecologists to be able to identify and survey a wide range of plant and animal species; in particular higher plants used to identify habitat type and condition, and protected species. The survey highlighted the need for *practical experience* of a wide range of surveying techniques and an understanding of basic plant taxonomy. A sound theoretical understanding of UK wildlife law and European legislation underpinning conservation and development were considered vital by most respondents.

Time and again, respondents to the survey flagged-up excellent report writing and communication skills as essential in those entering the profession, along with computer skills and an ability and enthusiasm and ability to learn. Wouldn't we take this for granted in a university graduate – apparently not. Even more worrying, some respondents reported interview candidates with no obvious love of natural history and no interest in the natural world beyond their degree.

In an article in the New Scientist in July 2003, Liz Trew of ENDS suggests that, 'There is no shortage of graduates, but people with a few years of experience are in extremely short supply... The industry is crying out for experienced people, but is not prepared to invest in the training of graduates'. Who is responsible for providing ecologists with the basic training they need

to begin a career in professional ecology? Some of us may sympathise, even empathise with the words of Clare Pugh, a student at Cardiff University, "...I think it is also a university's responsibility to produce graduates who have a good chance of finding work. After all, most students attend university to improve their opportunities of finding a good job" (IEEM, 2002). The study makes a series of suggestions that could enable universities to train students studying for higher degrees in ecology to better meet the needs of recruiters of professional ecologists.

Where should IEEM go from here? The study also explored the level of support for the Institute becoming involved in the accreditation of degree courses, in effect, recommending course-content and offering universities the IEEM 'kite-mark' for degrees which packed-in the requirements of a new ecologists basic 'tool kit'.

## Scope of the Survey

David Hill and Sue Bell have suggested that the skills-gap can be divided into three broad categories (BES Bulletin, May 2003):

- Background knowledge in natural history;
- Understanding of environmental legislation;
- Experience in a business/office environment.

This study addressed the skills, knowledge and experience ideally required of graduate ecologists in each of these three areas.

## Who contributed to the Survey?

Sixty organisations were invited to contribute to a questionnaire circulated during July and August 2003. Organisations were selected to reflect the overall distribution of consultancies in the UK, taking into account geographical location, years in operation and number of employees. Organisations were also selected on a basis of one or more staff members having IEEM membership (considered an independent measure of professional standing).

A high response rate of 75% was obtained indicative of the level of interest in the skills-gap issue within the ecological profession. The final database was made up of responses from 27 environmental consultancies in the private sector, 9 from the non-statutory sector (The Wildlife Trusts) and 8 from the statutory sector (English Nature Area Offices and local authority ecologists).

## Results of Study.

### 1. Recruitment issues.

Overall, 80% of the organisations which contributed had experienced difficulties in recruiting staff during the last five years. This was most pronounced at a junior level, but 70% of respondents also reported difficulties in recruiting senior staff. Whilst this study did not concentrate on the reasons for difficulties in retention and recruitment of senior staff, clearly this figure is alarming and would welcome further investigation.

The majority of respondents reported that the difficulties experienced in acquiring sufficiently high calibre graduates was due to applicants' lack of field skills, (surveying techniques and practical surveying experience), and one third of respondents specifically cited poor identification skills. A worrying number of respondents said that candidates lack a 'love of, a feel for ecology and the environment'.

The number of applicants for graduate posts has decreased or remained the same for the last five years according to half of the respondents, although most respondents did not know the underlying trend.

For staff recruitment, the importance of the internet, through the company web site, IEEM or ENDS, came across very strongly, being the most commonly used form of advertising media used for staff recruitment. The

Countryside Job Service remains an important recruitment media, particularly for the statutory and non-statutory sectors.

**2. Theoretical knowledge sought by consultancies in graduate recruits.**

To determine the relative importance of different areas of theoretical knowledge needed by graduating ecologists looking to work in the professional sector, respondents were invited to score the following from 5 (vital), through 3 (desirable) to 0 (not important):

Theoretical knowledge area	% of respondents scoring area 'Vital', 'highly desirable' or 'desirable'.
Ecological principals	95.3%
Surveying techniques	97.7%
Wildlife Law	97.8%
European legislation	86.1%
Regulatory mechanisms (eg. EIA, planning.)	83.8%

Respondents were invited to suggest any additional areas of theoretical knowledge would be useful in their graduate recruits. Those most frequently suggested included an understanding of the process of report writing, knowledge of the Town and Country Planning process and knowledge of habitat management and mitigation techniques.

Further emphasising the importance of an understanding of ecological principals many respondents suggested that students needed to learn how to interpret ecological data and the significance of the presence of particular species and assemblages presented within reports such as Environmental Statements.

**3. Experience sought by consultancies in graduate ecologists.**

The same scoring system was used to elicit information on the desirability of *experience* in different areas:

Area of experience	% of respondents scoring area 'Vital', 'highly desirable' or 'desirable'.
Phase 1 and NVC surveying	97.7%
Animal and plant surveying techniques	100%
Interpretation of ecological data	97.7%
Preparation of management and monitoring plans	83.8%

Again, respondents were invited to add their own suggestions of tools for the kit bag. Suggestions included experience of working in a consultancy environment, again, report writing and interpretation of ecological data and experience of dealing directly with land owners, agencies and local authorities. Many respondents suggested experience of surveying specifically for protected species, as was experience of the practical application of EIA, the European guidelines, and protected species constraints and conservation legislation.

**4. Identification skills sought by consultancies in their graduate ecologists.**

Respondents scored the importance of identification skills for 12 groups of organisms, from higher plants to arachnids. Consultancies prioritised the possession of identification skills for higher plants, used in overall habitat assessment, and protected species, rating these as more important than an ability to identify, for example, lower plants, and arachnids.

An 'Index of importance' for each broad group was calculated by summing the scores allocated to categories of organisms by each respondent. Each group was allocated a score of 5 if the ability to identify this group was considered vital, 3 if this was desirable, and 0 if this skill not required. This

system produced the following result:

Group	'Index of Importance'	Rank order of importance
Higher plants	194	1
Mammals	146	2
Birds	145	3
Amphibians	144	4
Reptiles	136	5
Lower plants	111	6
Lepidoptera	106	7
Freshwater invertebrates	99	8
Fish	79	9
Coleoptera	75	10
Diptera	70	11
Arachnids	68	12

Not surprisingly, the top five contain the highest proportion of protected species and represent the types of surveying work the majority of consultancies find themselves attracting. Respondents indicated that surveying work which involved groups for which expertise was not held in house was sub-contracted out to experts in their field. This was the case with much invertebrate work. Consultancies would not prioritise this expertise when recruiting junior staff.

Interestingly, one respondent suggested that if a candidate came with a specific expertise in, say, spiders, they may well be considered for employment as this would indicate a high degree of skill and patience – and potential for training in other areas.

**5. Other skills sought in junior staff.**

88% of respondents looked for experience of working in a small team environment, although only 40% looked for a basic training in business management. 80% of consultancies which responded looked at the possession of English Nature surveying licenses as an advantage (although none of the English Nature respondents did!).

This section revealed much about the 'soft skills' thought to be lacking in ecology graduates. Other skills sought included: written language and report writing skills; a strong personal work ethic (an ability to multi-task, meet deadlines, etc.); interpersonal skills and a sense of humor; and a love of natural history.

**6. Support for IEEM / BES course accreditation.**

There was a high level of support for course accreditation by BES and IEEM at MSc level. The vast majority of respondents felt that it would raise the professional standing of people who attended them, and that possession of such a qualification would be an asset to candidates during recruitment.

However, several respondents attached a proviso to their support – that should such accreditation take place; the course content would need to be highly relevant, and carefully planned. Some respondents questioned the ability of IEEM and BES to become successfully involved in such a scheme – feeling that perhaps the Institutes' resources were already significantly stretched.

Only 14 respondents had recruited graduate staff who had attended courses the content of which they had been particularly impressed. Those most frequently cited were courses run by the Field Studies Council, Somerset Environmental Records Centre, and IEEM professional development courses.

**Conclusions and suggestions.**

Less natural history teaching to fewer applicants?

Some universities report falling roles for ecology-related degrees at both under and post-graduate levels. Can we identify reasons for this decline?

In 1992, the House of Lords Science and Technology Select committee under Lord Dainton produced a report on the status of systematic biology in the UK. Concern was expressed that systematic biology research was decreasing in the UK, and was in steady decline in Universities generally. A follow-on report conducted under Baroness Walmsley in 2002 reported little improvement. As systematic biology does not attract large research grants into universities, and that an ability to attract funding drives staff recruitment, it has been suggested that there has been a decline in the number of taxonomists in universities, which has led to a decrease in the amount of taxonomic teaching.

But does the problem pre-date university teaching? The Field Studies Council recently conducted a survey of environmental literacy amongst A-level students and found that, on average, fewer than two out of ten common plant species could be recognised. Anecdotal evidence suggests that, whilst big issues such as loss of rain forests still register with younger students, there is a lack of connectivity with the environment at a local scale. Increasingly children have passive lifestyles and spend less and less time outside – is all this leading to a reduction in the number of students with an intrinsic interest in natural history and in continuing their studies in the natural world.

#### **What's in the bag? The ecologist's basic 'tool kit'.**

This research aimed to determine, from professional ecologists themselves and from the recruiters of ecologists working for the major employers, what skills and areas of experience are required in the ecologists basic 'tool kit', particularly in ecologists entering the profession as recent graduates, after obtaining a post-graduate qualification. Through investigating the issue of mismatch, the data provided could enable course providers to better identify how best to meet the needs of the major employers of professional ecologists.

This research has clarified and confirmed areas of theoretical knowledge, skills and experience which are looked for by ecological consultancies when recruiting graduate ecologists and provides a comprehensive list of areas which should be taught to students in order to better meet the needs of their future employers. Teaching priorities need to be:

- Surveying techniques – in particular Phase 1 and extended Phase 1, NVC and protected species surveying procedures;
- Species identification, with priority for higher plants and protected species;
- Knowledge of wildlife law and the UK and European legislation and regulatory mechanisms linking conservation and development;
- Understanding the significance of ecological data and its implications for development and conservation;
- An understanding of the production of management plans, post-developmental habitat mitigation, and monitoring.

These skills and areas of theoretical knowledge need to be underpinned by experience in writing reports and communicating ecological information effectively.

#### **Opportunities and suggestions.**

The needs of the employers of professional ecologists could be better met by University MSc courses. This will require a range of co-ordinated approaches as suggested below:

- **Increased collaboration:** Ecology MSc courses need to be tailored to the key competences sought by employers of professional ecologists. The IEEM and BES could become involved in drawing up a recommended syllabus for ecological courses, in consultation with a selection of representatives from the major employers, designed to teach vocational

content. This could lead to the creation of MSc (voc) qualifications, in which the vocational aspects of professional ecology are prioritised. These courses would receive specific accreditation from IEEM and/or BES;

- **Raise professional profile:** Raise the profile of the professional bodies and learned societies amongst undergraduates. Increase awareness of the robust professional standing of ecologists. By supporting the movement towards chartered environmentalists status (Thompson, BES, 2003), the professional credibility of ecologists along the lines of that enjoyed by chartered architects could be achieved. This will raise salaries and make the profession more attractive to students needing to pay off loans – and ultimately to students choosing which degree to pursue.

- **Promote involvement in voluntary work and conservation programmes:** It is essential that graduates are able to demonstrate interest beyond their formal training;

- **University Liaison:** Increase under-graduate awareness of courses on offer that provide vocational training. Achieve through attendance of the professional bodies at university careers fairs. IEEM could consider the appointment of a university-liaison officer, responsible for promotion of ecology careers to undergraduates. Include this role within the remit of the new BES education officers' role;

- **Use professionals to deliver course content:** Increase the number of courses which use professional ecologists to deliver the course aims. Several universities now teach MSc courses which are largely delivered by professional ecologists (eg. Bristol University and Cresswell Associates; University of Reading and Carter Ecological);

- **Careers advice and selecting the right course:** Improve the marketing of the careers advice packages which are already produced by the IEEM and the BES. Involve the trade and professional bodies in producing under-graduate course modules which include careers advice, enabling students to make an informed choice about vocational post-graduate courses;

- **Create an informal pool of trainers:** IEEM and BES have a wealth of natural history knowledge internally, and particularly in the case of BES, an active retired membership. There is potential for creation of a training core team, who could offer services to universities to deliver modules when in-house expertise is lacking, such as identification skills and core field techniques;

- **Create the opportunity for MSc courses, which include an element of professional development:** collaboration between universities and environmental consultancies to create work placements/internships within environmental consultancies.

#### **Conclusion**

This study demonstrates that, in the opinions of those who contributed to the survey, there are an insufficient number of high calibre post-graduate ecologists available in the job-market place to carry out the work available. In an economically buoyant time for the industry, this is inexcusable. This report tentatively suggests some ways in which the skills-gap issue can be addressed. The movement towards 'Chartered Environmentalist' status may help to raise the profile of ecology as a profession, and the Field Studies Council is involved in lobbying the government to increase the ecology content of AS/A2 syllabuses taught in schools. The extent to which IEEM and the British Ecological Society become involved in course accreditation remains to be seen.

**Samantha Hillcox is Course Director at the Eagles Nest, in the Cevennes National Park, France.**

# The Perfect Identification Guide

## Basil O'Saurus

In this edition of 'In Practice' we are delighted to welcome back Basil O'Saurus, Professor of Tauro-Scatology at University College, Neasdon, to explain how to write the perfect identification guide.

### First of all, Professor O'Saurus, what are the essential attributes of the author of an identification guide?

Well, obviously, he or she must be an expert in the taxonomy of the group of organisms that they are writing about. That and an old tweed jacket with patches on the elbows.

### And how would you define 'expert'?

Simple: an expert is someone who has been studying a group of organisms for so long that he or she has totally forgotten what it is like for someone who has never tried to identify them before. The merest hint of empathy with a beginner would be totally catastrophic.

### Why is that?

Demystifying taxonomy would be a disaster for those of us who earn our crusts as experts. We need to maintain an aura so that people trust us. If we were seen to be fallible like the rest of you, then you would lose confidence in the names that we give you.

### And how do you maintain this aura of infallibility?

A liberal scattering of references to obscure foreign journals helps. Ideally, you should quote papers written in at least two languages other than your own – typically one should be German, for the good reason that Germans have done loads of thorough taxonomic work over the years. But there is the bonus that your readers think that you are multi-lingual and awesomely clever. It works particularly well in the UK because of our island mentality and lack of language skills. Occasional references to papers in a Slavic languages also help: nothing impresses the British mind more than quoting a journal written in a language with a high consonant:verb ratio. It increases the reader's awe of you and, thus, reinforces the aura of infallibility.

### But suppose you can't read all these languages?

Not a problem. Just look at the pictures and guess the rest. That's what I do. If you really can read German fluently, then you run the risk of getting bogged down by complicated taxonomic arguments and lose faith in your own ability. And, by the way, I tend to steer clear of papers written in Cyrillic script.

### Why? Because you can't read them?

I'm not going to admit that. No, it's because us experts tread a fine line between appearing awesomely intelligent and downright pretentious. And there is one other thing: it is a good idea to rename at least one common organism.

### Doesn't that confuse everyone?

Probably, but it is a necessary step if the common reader is to remain in awe of us taxonomists. There are two ways of doing this: the first is a detailed taxonomic study which, these days, will probably involve DNA sequencing and labcoats. Which is why I prefer the second approach: delving through the Rules of Botanical and Zoological Nomenclature until I find an arcane rule that was violated when the original description was written. One of the easiest is the rule that every genus and species must have a unique name. If you look long and hard enough you can almost always find that the name of the genus you're working on was previously used by a Victorian naturalist to describe a group of Javanese cockroaches. Bingo!

### Do you have any advice for people who are writing keys?

I work on the sound principle that most people avoid keys like the plague and simply flick through the pictures until they find one that matches their specimen. So there is really no need to spend lots of time honing a key. In my opinion, the main purpose of a key is to keep the reader humble. They only start using the key when they are stuck, so why not rub it in?

### Can you give our readers any examples?

There's an example that I particularly like, where a couplet in a key to a group of algae suddenly tosses in a characteristic visible only under the scanning electron microscope. And then, of course, there is the obligatory oxymoron.

### Explain yourself, Professor

It comes back to the need to maintain our aura as experts. Nothing confuses the lay reader more than combining a vague phrase such as 'more or less' with a categorical statement such as 'continuous'. It opens up all sorts of possibilities. When someone asks what you mean, you just give him or her a withering look.

### This doesn't sound very scientific

On the contrary ... only after a lifetime of study does one properly appreciate the extent to which some species exhibit variation within and between populations. Only then can one fully appreciate how important it is to scatter conditional words like 'usually' and 'generally' in front of any statement that a beginner is likely to treat as categorical.

### Can you give us an example?

Well, take the elephant ... most people would say 'it has got a trunk.' The correct form of words for an identification guide would be 'typically exhibits a more-or-less elongate olfactory organ'.

### But surely, many of the problems with keys are eliminated by thorough testing?

I expect that you're right, which is why we prefer to opt for peer review rather than thorough testing by end-users.

### What's the difference?

Well, end-users raise all sorts of awkward questions like the ones that you've just raised. Us expert taxonomists have spent a lifetime acquiring our skills, and I'll be damned if I'm going to let some bunch of young whippersnappers have it all on a plate. No, there is a lot to be said for peer review.

### What are the advantages of 'peer review' in this case?

It is so much easier for the poor author. We simply send the draft to another expert ...

### ... By which you mean someone who has studied the group for so long that they have forgotten what it is like to be a beginner?

Exactly. And they make a few minor changes to the lists of synonyms, type locations and so on and send it back with a note congratulating the author on his seminal work.

### But don't people notice if a key hasn't been properly tested?

Possibly, but only after they've shelled out the cash to buy it. And, in any case, most of them don't use the key except when they're stuck, and they don't like admitting that they're stuck, so it is 'win-win'. What is more, we usually get good reviews in the academic journals because ...

### Let me guess ... because the journal editors send the keys to experts for review

... Exactly. Who has ever heard of a rank beginner being asked to review a major taxonomic work?

### So the whole system exists to keep taxonomists in jobs and to confuse the great mass of field ecologists?

And why not? Let's face it: proper taxonomists are a shrinking band, almost to the extent of being an endangered species. The few of us that are left need to cling on to our prestige.

### Well, thank you, Professor O'Saurus. Once again, you have been most illuminating.

Any time!

# The Future for British Farming and the British Countryside.

## Lord Christopher Haskins

**Editors Note.** *This lecture was given as the University of Reading's 2003 Edith Mary Gayton Memorial Lecture and is reproduced with the permission of the University. Lord Haskins spent only a short time on his proposals for reform which were due to be published formally the following day. The insights into farming and the countryside make for fascinating reading and can certainly be considered separately from the recommendations in his report, towards which a government response is still awaited.*

The British Countryside appears to be emerging from yet another period of gloom and despondency, although few of the players are prepared to admit it.

Farmers having experienced five years of trading difficulties, are for the most part enjoying a highly successful year thanks to an excellent harvest, high prices caused by weather problems elsewhere, a weaker pound against the Euro and much improved productivity. The Dairy industry remains the exception, caused by over supply into the once lucrative but now declining fresh market. BSE is a rapidly receding threat. Compensation for Foot and Mouth was more than sufficient and reform of the CAP though radical will be much more benign than feared.

Other rural economic activities benefit from a resurgence in farming prosperity, and the tourist industry is booming thanks to the wonderful summer, due to a still positive reaction after the end of Foot and Mouth outbreak, a reluctance of people to travel after 9/11 and the growing trend towards all year round "half term" short break holidays.

The rural environment is also improving as regulation becomes more effective and farmers become more responsive to the need for a "sustainable" approach to farm management. Our rivers are cleaner than they have been for two centuries and many of the indicators on habitat and species are beginning to be positive for the first time in generations. Proposed changes in the CAP will accelerate this trend, as farmers are given incentives to tackle various environmental concerns.

The centuries long decline in rural population has been arrested even though the numbers directly engaged in farming continue to reduce, as farms amalgamate and more sophisticated machinery reduces labour and speeds up the process of cultivating and harvesting.

The reverse in rural decline has arisen because the countryside is much more accessible, enabling people to live there and commute into towns for work. Half of Britain farms rely on some element of non farming income, as farmers diversify into other economic activities, and as members of farm families, more broadly educated and skilled than their predecessors, find rewarding work outside the farm whilst continuing to live on it.

On practically every social measurement, rural people are doing better than their urban counterparts - better health, better educated, less unemployed, less exposed to crime.

But of course, as in any social group there remain great disparities. If you live in a remote rural area, where the land is unproductive and the landscape unattractive, life is impossible without an overwhelming reliance on subsidies, which are being increasingly questioned. These are real problem areas,

but Britain has proportionately much fewer people in this situation than, for example, France where there is a real threat of depopulation in some of the remote "rural/rural" parts of the Massif Central.

And the arrival of large numbers of urban commuters and second homeowners in the English countryside has inflated house prices beyond the capacity of many, especially young people, who want to maintain an essentially rural way of life and income.

And somewhat surprisingly the greatest problem facing farming in affluent countries like Britain Ireland and the Netherlands is labour shortage. Much of the work in modern agriculture is unattractive to today's young people who can find more remunerative, less physically arduous work elsewhere, partly because, unlike previous generations they now have the skills to take on such work.

Against this picture of the "English" countryside of 2003, I thought it might be interesting to look at the way it has evolved to its present situation and where it might be heading in the future. I might also have a brief look at the situation across Europe, which I have had to do in the course of three projects I have undertaken during the past two years - providing the government with a plan for recovery from Foot and Mouth disease, an independent piece of research on options for CAP reform, and a government commission to review the way Defra delivers its ambitious and complicated policy agenda.

Farming and the country side have been subject to constant change for nearly two centuries, driven originally by the industrial revolution which really took off in the first half of the 19th century.

Until the repeal of the Corn Laws in 1846, British farming enjoyed substantial protection through formidable tariff barriers. But as the Industrial Revolution got underway, and millions started emigrating to the big towns and cities, it became clear that Britain could not be self-sufficient in food.



Yesterday's Farming – threshing machine

Furthermore food scarcity and high food prices were playing a big part in fuelling revolution across Europe. So when Peel repealed the Corn Laws he opened the British market up to the farmers of North America and Australia.

### This action had historic consequences

- The British public were able to enjoy an abundant supply of cheap food, which was a factor in avoiding social unrest (unlike elsewhere).
- This surge in demand opened up the economies of the supplying countries.
- But British farmers were faced by recurring economic problems.
- And the Tory party split for nearly 30 years.

And in other ways the British countryside remained economically and socially unique.

- Unlike elsewhere, the aristocracy held on to their great estates and the vast majority of farmers remained as tenants who unlike elsewhere in

the world, were discouraged from cooperation. (This has badly affected the competitiveness of British farming.)

- A mixture of enlightened paternalism and unscrupulous feudalism prevailed.
- And the landed gentry maintained the countryside as a gigantic playground for themselves, excluding outsiders and creating barriers between town and country.
- British farmers found it hard to compete against the new agricultural Countries whose size and climate enabled them to produce cereals and meat at much lower costs than they could.
- And a revolution in transportation enabled the prairies to access the markets of Europe without difficulty.
- As a consequence domestic production collapsed, from near self sufficiency at the time of the Battle of Waterloo, to not much more than 30% at the outbreak of the 1st World War.
- The protectionist barriers created by the U boats revived British farming fortunes of the 1st World War.

But with the end of the war, the vast, mechanised American farm industry plunged British farming into unprecedented crisis.

By 1932 prime Lincolnshire land had sunk to £10 an acre.

- The second world war, and Hitler's U boats once more restored farming fortunes and land which had been pasture for generations was ploughed.
- And when the war was over the government determined to raise domestic farm production to ensure that such shortages would never occur again.
- A system called "Standard Quality" was introduced which guaranteed high prices up to a certain strategic level of supply.
- Above that there were no subsidies, leaving those markets (for butter and milling wheat, for example) to be supplied from North America and Australasia.
- British farming began to prosper, as a result, spurred on by substantial growth in productivity due to spectacular scientific and engineering innovation.
- Growth markets such as liquid milk were a further bonus.
- Britain's entry into the EEC gave a further boost to her farmers as protectionist barriers increased to virtually exclude cheap competition from outside the Common Market.
- By 1982 British farmers provided 75% of the domestic market, double what it had been in 1939.
- But the cost of oversupply and high guaranteed prices was unsustainable.
- In the 1980s and 90s production restraints were imposed on dairy and arable farms.
- However subsidies remained high, paid more by taxpayers and less by consumers.
- Since 1993 farm prices in Europe with some notable exceptions, (sugar beet) have come more into line with world prices.
- And a change in the way subsidies were calculated meant that British farm prices would be vulnerable to exchange rate fluctuations.
- In 1992, just before Britain fell out of the ERM, British farmers were struggling when the pound was D2.90
- By 1994 they experienced unprecedented prosperity when the pound slumped to D2.20.
- And by 1999 farmers were experiencing their worst post war problem when the pound soared to D3.35.
- Today prosperity has returned with the pound steadying at about a D2.90 equivalent in Euros.

So much for the history of farming over the past 2 centuries. Let me now spend a little time looking at rural social and environmental history.

Rural populations have declined steadily for the past two centuries until the last decade. The awful industrial jobs in towns were nevertheless more attractive than the wretched misery of life in the countryside. The progress of mechanisation dramatically reduced the need for millions of manual farmworkers. Farms became bigger and fewer. The aristocracy, astonishingly retained their dominance as landowners, and exerted a huge political influence on rural policy designed for their benefit. Land prices remained stable and land was a sound investment.

British farming was largely organic until Sir John Lawes at Rothamstead in the mid 19th century found ways of vastly increasing yields through the use of artificial manures.

But, for the most part, mixed farming techniques were not intensive.

Much environmental damage was done when pastures were ploughed up to feed the country during the 1st World War, an understandable "trade-off" which was repeated in the 2nd World War.

Intensification really caught hold after the 2nd world war.

- High levels of cultivation were maintained.
- A chemical revolution brought weeds and pests under control, but at a huge cost to habitat and species.
- The EEC subsidy system accelerated these trends.
- It was only in the 80s that these problems began to be tackled.
- Regulations were introduced to restrict the use of dangerous chemicals, to outlaw bad practices such as stubble burning, to reverse trends such as hedge destruction and unnecessary drainage schemes and efforts were made to persuade farmers to behave in a more environmentally friendly way.



Intensive agriculture – linseed production

All of this has helped to stop the disastrous decline in the quality of the rural environment which had gone on for half a century.

- The decline in species has been arrested. Rachel Carson in her historic book "Silent Spring" in 1968 forecast that 29 species would be extinct by 2000. Only one was.
- Farmers are behaving much more responsibly in the way they cultivate their land, apply chemicals and look after their hedgerows.
- But public expectation, influenced by powerful pressure groups, have risen faster still, demanding higher standards.
- And, in the light of an unrelated scientific failure in animal husbandry
- the BSE catastrophe - the pressure groups are now challenging most agri-scientific innovations - most notably the admittedly revolutionary application of bio technology to farming.
- The recent disastrous outbreak of Foot and Mouth has traumatised many of those affected and further stimulated concerns, however unrelated, about farming methods.

As if all this wasn't enough, two other big issues are impacting today's British countryside debate.

- At last a radical reform of the CAP to switch subsidies from the market to Environmental support, and to contain the cost in an enlarged Europe.
- And in Britain a fierce argument has broken out about hunting

with dogs, seen by the urban majority as a nasty pastime, reflecting the ascendancy of the landed gentry.

In looking at the future we need to distinguish between myths and realities. The countryside is awash with myths which need to be exploded.

### The Myths.

- The good old days - not the ones I remember
- Persecuted minority. - Rural society gets more than a fair deal.
- Farming doesn't matter - doubled share of the market.
- Cheating foreigners - BSE? FMD?
- Contaminated imports - A red herring in control of FMD.
- European paranoia - Why are we so afraid of them?
- Villainous supermarkets - Tesco contract
- The disappearing family farm. - Farming is still family.
- Local shops and pubs - Nobody uses them
- United on hunting. - At odds.
- Homogenous countryside. - The warring factions.
- Environmental meltdown in countryside. - Most indicators positive
- Organic self sufficiency. - 3-5% of the market.
- Organic marketing. - Supply and demand.
- No swallows, lapwings, skylarks, partridges - 60 sky larks, 12 Lapwing Pairs.
- Frankenstein Foods - Food never been safer
- Productivity doesn't matter - Tudge's economic and social make-believe.

### The Realities - Farming

- Farming goes in cycles, weather, global commodity prices, currency.
- Arable, Sheep, Pigs, Beef recovered after several years depression. (European weather, FMD, Global prices, weaker £/€).
- British farming much more competitive than 5 years ago.
- Continued consolidation into fewer, bigger units.
- Accelerating diversification by those with urban access.
- Continued remarkable technological progress Cultivating and harvesting equipment.
- Growing trend towards cooperation Joint buying to lower input costs. Sharing each others equipment.
- Achieving a market plus on food safety Growing (post BSE) consumer confidence. Benefits of access and easy maintenance.
- Exploiting the growing chilled market. Which relies heavily on "local" supply.
- Increasing market responsiveness (younger farmers), working with supermarkets, developing niches
- Lower interest rates
- Doubled share of domestic food market in 60 years partly due to EU membership and protection, more competitive quality of milling wheat and more competitive price of home grown animal feed.
- There is a growing chilled market albeit with safety concerns.
- Generally more competitive / productive but farming in a strong currency area has its problems: Labour shortages, dairy, horticulture, produce and chaos in the Dairy industry.
- Potential competitive disadvantage from regulation
- High land prices, though relatively no change in 20 years.
- Increasing opportunities for sale of land for development.

### The Realities: The Countryside in general

- Trends in environmental management going in the right direction.
- A further significant positive stimulus coming from CAP reform.
- More environmental regulation on the way.
- Rural population set to grow.  
More commuting, more diversification, broadband.

### The Challenges

- Reconciling the warring factions:  
Large farmers and small farmers.  
Arable and livestock.  
Farmers and environmentalists.

Farmers and animal rights.

Pragmatic vs. evangelical environmentalists.

The acrimony over planning.

- Managing rather than rejecting the science.
- The problem of implacable single issue pressure groups.
- Some concern about evangelical environmental correspondents
- The Daily Mail's scaremongering genius.
- Lack of trust in governments and scientists (CJD).
- The risk-free nature of English middle classes.
- Managing the real problem of GM crops - environmental implications.

Pressing point is GM imports.

The cynical exploitation by the supermarkets.

Peculiarly British problem.

Not much progress until benefits are discernable.

But technological revolution set to continue unchallenged.

- Establishing the right policy priorities. Affordable housing before shops, buses and pubs.
- Making a reformed CAP effective.
- Delivering the new Agenda - The Haskins Review

### What might happen if protection for European farmers largely disappears?

- Competitive problems of labour intensive farming in an affluent, strong currency area.
- Global prices would rise.
- Big chunks of European farming would be able to compete. because of Soil, Climate, Size, Market access, Expertise.
- Increasing trend towards part-time farming and rural diversification.
- Substantial east - west movements of labour.
- Dangers of depopulation in rural/rural areas.
- The challenge of Malthus.



Polish agriculture – note strips in background

### Britain is better placed than most to cope with these changes.

- Social trends long established in English countryside.
- Plenty of good farming land.
- British farmers very close to their markets.
- More opportunities for part-time farming and diversification.
- Few "rural/rural" areas.
- But more influence of single-issue pressure groups.
- Be realistic about niche markets  
GM Booths Asda
- More development land opportunities

### Ahead is a time of great policy change.

- Of great social, economic and environmental change.
- Of controversy (nothing new there)
- Of myths and false trails
- Of excitement and challenge.

### Lord Haskins in a Labour Peer and former Chairman of Northern Foods.

## In the Journals

Compiled by  
Jim Thompson, Joel Bateman  
and Nick Jackson



### British Ecological Society

R. E. Booth and J. P. Grime

#### Effects of genetic impoverishment on plant community diversity.

Journal of Ecology 2003, **91**: 721–730.

Established individuals removed from populations of 11 long-lived herbaceous species coexisting in a local area of ancient limestone pasture at Cressbrookdale in North Derbyshire were subjected to clonal propagation to produce stocks of genetically identical individuals sufficient to create communities identical in species composition but widely contrasted in genetic diversity. Three levels of genetic diversity were imposed. In one treatment, all individuals of each species were genetically unique. The second contained four randomly selected genotypes of each species. In the third, there was no genetic diversity in any of the species. Over a period of 5 years a distinction rapidly developed between five canopy dominants and five subordinates, a process that caused the vegetation structure to closely resemble that occurring at Cressbrookdale.

A gradual loss of species diversity occurred in all three treatments but by the end of the fifth growing season species diversity was higher in the most genetically diverse communities.

It is concluded that, under the conditions of this experiment, genetic diversity within component species reduced the rate at which species diversity declined. This is worth thinking about when constructing seed mixtures for say recreation of herb rich grassland - species components with low genotype variability may be best avoided.

Correspondence: e-mail: j.p.grime@sheffield.ac.uk

K. Verheyen, G.R. Guntenspergen, B. Biesbrouck and M. Hermy

#### An integrated analysis of the effects of past land use on forest herb colonization at the landscape scale.

Journal of Ecology 2003, **91**: 731-742.

This paper proposes a framework that summarizes the direct and indirect effects of past land use on forest herb recolonization, and is used to analyse the colonization patterns of forest understorey herbaceous species in a 360-ha mixed forest, grassland and arable landscape in the Dijle river valley (central Belgium). Fine-scale distribution maps were constructed for 14 species. The species were mapped in 15 946 forest plots and outside forests (along parcel margins) in 5188 plots. Forest stands varied in age between 1 and more than 224 years. Detailed land-use history data were combined with the species distribution maps. The six most frequent species were selected for more detailed statistical analysis. Species frequency in forest parcels was a function of secondary forest age, distance from the nearest colonization source and their interaction. Similar age and distance effects were found within hedgerows. In 199 forest stands, data about soils, canopy structure and the cover of competitive species were collected. The relative

importance of habitat quality and spatio-temporal isolation for the colonization of the forest herb species was quantified using structural equation modelling (SEM), within the framework proposed for the effects of past land use. The results of the SEM indicate that, except for the better colonizing species, the measured habitat quality variables are of minor importance in explaining colonization patterns, compared with the combination of secondary forest age and distance from colonization sources. The results suggest the existence of a two-stage colonization process in which diaspore availability determines the initial pattern, which is affected by environmental sorting at later stages.

Correspondence: e-mail: kris.verheyen@agr.kuleuven.ac.be

M. Andri and K. J. Willis.

#### The phytogeographical regions of Slovenia: a consequence of natural environmental variation or prehistoric human activity?

Journal of Ecology 2003, **91**: 807-821.

Slovenia is a small but floristically diverse country with at least six distinctive phytogeographical regions. The palaeoecological record was used to examine the vegetational history of this diverse landscape, using cores from four of the phytogeographical regions.

All contain records that extend back to at least 9000 cal. bp and indicate that the early Holocene vegetation of Slovenia was rather uniform and that broadleaved woodland containing *Corylus*, *Quercus*, *Ulmus* and *Tilia* prevailed throughout. From 8800 cal. bp, however, distinctive regional differences became increasingly marked, with the onset of intensive forest clearance and burning from c. 3000 cal. bp. The development of the present-day landscape in Slovenia varied considerably between phytogeographical regions and in some regions was a consequence not only of climatic variation but also of the intensity of prehistoric human activity. In practical terms the history of human intervention and subsequent changes need to be taken into consideration in predicting the consequences of climate change.

Correspondence: e-mail: maja.andric@zrc-sazu.si



Slovenia – traditional haystacks

M. Williamson

#### Forum Paper: Species-area relationships at small scales in continuum vegetation.

Journal of Ecology 2003, **91**: 904-907.

This short paper in the Forum series should be considered in relation to the paper in the Journal of Animal Ecology 72: 888–897. The paper points out that Species-area relationships are well known to be variable especially with small areas with low numbers of species. The author suggests that this variability is a consequence of the way that species are recorded and the sampling methods used and this needs to be made clear when research is undertaken.

Correspondence: e-mail: mw1@york.ac.uk

K. E. Stokes, J. M. Bullock and A. R. Watkinson

**Biological Flora of the British Isles No 232 - *Ulex gallii* Planch. and *Ulex minor* Roth**

Journal of Ecology 2003, **91**: 1106–1124.

This is a useful addition to the series and deals with two species of *Ulex*, the western gorse and the dwarf gorse, both of relatively restricted distribution. For those with a specific interest in these two species, it is a valuable source of information - not to be confused with the common gorse - *Ulex europaeus*.

Correspondence: e-mail: k.stokes@qub.ac.uk

N. Schtickzelle and M. Baguette.

**Behavioural responses to habitat patch boundaries restrict dispersal and generate emigration-patch area relationships in fragmented landscapes.**

Journal of Animal Ecology 2003, **72**: 533–545.

The authors studied the consequences of behaviour at habitat patch boundaries on dispersal for the bog fritillary butterfly *Proclossiana eunomia* Esper in two networks of habitat differing in fragmentation and matrix quality. They tested for differences in responses to patch boundaries according to the fragmentation level of the network by analysing movement paths of adult butterflies.

Butterflies systematically engaged in U-turns when they reached a boundary in the fragmented network while they crossed over boundaries in more than 40% of boundary encounters in the continuous one.

We applied the Virtual Migration model (Hanski, Alho & Moilanen 2000) to capture-mark-recapture data collected in both networks. The model indicated (i) a lower dispersal rate and (ii) a lower survival during dispersal in the fragmented network. This latter difference is likely to be the key biological process leading to behavioural avoidance of patch boundary crossings.

On the basis of this behavioural difference, we designed an individual-based simulation model to explore the relationship between patch area, boundary permeability and emigration rate.

Predictions of the model fitted observed results of the effect of patch area on emigration rate according to fragmentation: butterflies are more likely to leave small patches than large ones in fragmented landscapes (where patch boundary permeability is low), while this relationship disappears in more continuous landscapes (where patch boundary permeability is high).

Correspondence: e-mail: schtickzelle@ecol.ucl.be

C. Rodríguez and J. Bustamante.

**The effect of weather on lesser kestrel breeding success: can climate change explain historical population declines?**

Journal of Animal Ecology 2003, **72**: 793–810.

The authors modelled the effect of annual weather conditions on lesser kestrel *Falco naumanni* breeding success in South-western Spain. Models indicate that rainfall is a good predictor of breeding success and has in general, a positive effect on reproduction.

Rainfall and temperature in spring, during the courtship period influenced colony occupancy rate. Mean minimum temperatures had a positive effect on nest occupation while the relationship between occupation and rainfall was curvilinear with an optimum around 84 mm.

Nest success rate was influenced positively by rainfall in winter and negatively by rainfall during the nestling period.

The mean number of chicks per successful nest was positively influenced by rainfall during the winter, arrival, courtship, and incubation periods.

Nestling body condition was affected positively by rainfall during the courtship and incubation periods.

Although rainfall in spring has declined significantly since 1966, retrospective predictions of lesser kestrel population growth rate at the colonies studied indicate that the effect of climate change on breeding success cannot be attributed to the historical population decline.

Correspondence: e-mail: Busta@ebd.csic.es

C. M. Rogers and R. Heath-Cos.

**Effect of experimentally altered food abundance on fat reserves of wintering birds.**

Journal of Animal Ecology 2003, **72**: 822–830.

Current models of adaptive fat regulation make opposing predictions concerning the effect of increased winter food supply on size of the avian winter fat reserve. To distinguish between models, food supply was varied experimentally in nature and two measures of size of the fat reserve were taken at food-supplemented sites and non-supplemented sites.

In two winters, most of the seven species sampled showed slightly higher visible subcutaneous fat class at supplemented than at non-supplemented sites; treatment and species factors were statistically significant. Body mass corrected for wing length showed a similar if non-significant trend. In addition, accipiter hawk attack rate did not differ between supplemented and non-supplemented sites.

These results are consistent with a model of adaptive fat regulation (based on between-day environmental variability caused by severe weather events) that predicts an increase in the winter fat reserve at increased food supply. Other published studies, all from the north temperate zone, showed the same pattern.

Correspondence: e-mail: chris.rogers@wichita.edu

K. I. Ugland, J. S. Gray and K. E. Ellingsen.

**Forum Paper: The species-accumulation curve and estimation of species richness.**

Journal of Animal Ecology 2003, **72**: 888–897.

One of the general characteristics of ecological communities is that the number of species accumulates with increasing area sampled. However, it is important to distinguish between the species-area relationship and species accumulation curves. The species-area relationship is concerned with the number of species in areas of different size irrespective of the identity of the species within the areas, whereas the species accumulation curve is concerned with accumulation rates of new species over the sampled area and depends on species identity.

Data from the Norwegian continental shelf show that extrapolation of the traditional species-accumulation curve gave a large underestimate of total species richness for the whole shelf compared with that predicted by the T-S curve. Application of non-parametric methods also gave large underestimates compared with actual data obtained from more extensive sampling than the data analysed here. Although marine soft sediments sampled in Hong Kong were not as variable as those from the Norwegian shelf, nevertheless here the new method also gave higher estimates of total richness than the traditional species-accumulation approaches.

The data showed that both the species-accumulation curve and the accompanying T-S curve apply to large heterogeneous areas varying in depth and sediment properties as well as a relatively small homogeneous area with small variation in depth and sediment properties.

Correspondence; e-mail: j.s.gray@bio.uio.no

Krista J. Patriquin and Robert M. R. Barclay

**Foraging by bats in cleared, thinned and unharvested boreal forest**

Journal of Applied Ecology 2003, 40: 646 - 657.

Modern silvicultural methods employ various styles of selective harvesting in addition to traditional clear-cutting. This can create a mosaic of patches with different tree densities that may influence habitat use by foraging bats. Use of forest patches may also vary among bat species due to variation in their manoeuvrability. Apart from studies investigating use of clear-cuts, few have tested for differences in use of forest patches by bats, or for differences among bat species.

The authors investigated the influence of various harvesting regimes, which created forest patches of different tree densities, on habitat selection by foraging bats in the boreal mixed-wood forest of Alberta, Canada. We also tested for variation in habitat selection among species related to differences in body size and wing morphology.

Over two summers they assessed habitat use by bats using ultrasonic detectors to count the echolocation passes of foraging bats. We measured activity in three forest types and four tree densities, ranging from intact (unharvested) forests to clear-cuts.

Smaller, more manoeuvrable, species (*Myotis* spp.) were less affected by tree density than the larger, less manoeuvrable, *Lasionycteris noctivagans*. Two *Myotis* spp. differed in their habitat use. *Myotis lucifugus*, an aerial insectivore, preferred to forage along the edge of clear-cuts, while *M. septentrionalis*, a species that gleans prey from surfaces, did not forage in clear-cuts but preferred intact forest.

The largest species in the study, *L. noctivagans*, preferred clear-cuts and avoided intact patches. There were therefore differences in habitat selection by foraging bats among the species in our study area, and these were correlated with size and wing morphology.

The results suggest that, in the short term, thinning has minimal effect on habitat use by bats. They also indicate that silvicultural methods have different immediate effects on different species of bats that may be obscured if the community is studied as a single entity. Management for forest-dwelling bats must take such species-specific effects into consideration. Harvesting that creates a mosaic of patches with different tree densities is likely to satisfy the requirements of more species than a system with less diverse harvesting styles.

Correspondence: e-mail: barclay@ucalgary.ca

G. J. Wilson, A. C. Frantz, L. C. Pope, T. J. Roper, T. A. Burke, C. L. Cheeseman and R. J. Delahay

**Estimation of badger abundance using faecal DNA typing.**

Journal of Applied Ecology 2003, 40: 658 – 666.

Wildlife management and conservation programmes often require accurate information on population density, but this can be difficult to obtain, particularly when the species in question is nocturnal or cryptic. Badger populations in Britain are of intense management interest because they are a wildlife reservoir host of bovine tuberculosis (TB). Attempts to manage this infection in badgers, whether by population control or vaccination, require reliable methods of estimating population size. In addition, such estimates are also required to support research into badger ecology and TB epidemiology. Currently, the most accurate estimates of local badger population size are obtained from labour-intensive and time-consuming mark-recapture studies.

In recent years, DNA has been successfully extracted from the faeces of certain mammals, and used to generate a genetic profile of the defecating individual. Here we report on an application of this technology to estimate badger abundance.

Faecal samples were collected on 10 consecutive days from every freshly deposited dropping at latrine sites close to occupied setts in three badger social groups. Badger DNA was extracted from 89% of samples, and 20 different individuals were reliably identified. The genotypes derived from the faecal samples were compared with those obtained from blood or samples from badgers live trapped at the same setts.

The faecal genotypes from badgers with known trap histories revealed that latrines were used equally by males and females, and by badgers ranging in age from cubs (< 1 year old) to 9 years old. Individual badgers used the latrines on between one and six different nights. Systematic sampling and genetic typing of fresh faeces from badger latrines can provide data that can be used to estimate abundance accurately. This approach requires considerably less human resources than repeated live trapping and mark-recapture. The technique may be valuable for future badger research and management in relation to bovine TB, where accurate estimates of abundance at a local scale are required.

Correspondence: e-mail: g.wilson@csf.gov.uk

S. H. Alonzo, P.V. Switzer and M. Mangel

**An ecosystem-based approach to management: using individual behaviour to predict the indirect effects of Antarctic krill fisheries on penguin foraging.**

Journal of Applied Ecology 2003, 40: 692 - 702.

Changes in species' abundance and distributions caused by human disturbances can have indirect effects on other species in a community. Although ecosystem approaches to management are becoming increasingly prevalent, they require a fuller understanding of how individual behaviour determines interactions within and between species.

Ecological interactions involving krill are of major importance to many species within the Antarctic. Despite extensive knowledge of the ecosystem that they occupy, there is still incomplete understanding of the links between species and the effect of environmental conditions on these interactions. In this study, the authors extended a behavioural model to understand the interactions between penguins and krill to determine the indirect effect of krill fisheries on penguin foraging success and behaviour in adjacent breeding sites.

Increased fishing pressure offshore is predicted to reduce penguin food intake. Given the documented links between krill and penguins, this also leads to a prediction of decreased penguin survival and reproduction. Krill behaviour is predicted to cause stronger effects of krill fisheries than explained solely by the percentage of biomass removed. Environmental conditions that decrease krill growth rates or cause krill to spend time in deeper water are also predicted to increase the magnitude of the effect of fishing on penguin success. The authors showed that changes in penguin foraging behaviour can be used to assess the impact of local fisheries on penguin reproductive success.



Jackass Penguin

These results demonstrate that an understanding of predator-prey interactions, indirect effects between species, and individual behaviour is imperative to our ability to manage populations. They described a general method to use knowledge about ecological and evolutionary processes with species-specific information to predict the response of organisms to novel situations. They also showed how individual behaviour can be used to assess the impact of human disturbance on ecosystems.

Correspondence: e-mail: shalanzo@ucsc.edu

Purse, G.W. Hopkins, K. J. Day and D. J. Thompson

**Dispersal characteristics and management of a rare damselfly.**

Journal of Applied Ecology 2003, **40**: 716 – 728.

*Coenagrion mercuriale* is a rare damselfly in Britain and mainland Europe and has been declining in the last 30 years. It has specialized habitat requirements and has been viewed, traditionally, as a poor disperser. Knowledge of its dispersal ability was considered in its Biodiversity Species Action Plan as essential for the formulation of appropriate conservation management strategies.

Mark-release-recapture (MRR) studies of *C. mercuriale* in two large UK heathland populations were undertaken. Mature adults had a low rate of movement within continuous areas of habitat (average < 25 m movement), low emigration rates (1.3-11.4%) and low colonization distances (maximum 1 km), all comparable to similarly sized coenagrionids.

Movements were more likely within than between patches of suitable habitat over short to medium distances (50-300 m). Between-patch movements were more likely between patches that were close together. Scrub barriers reduced dispersal.

The probability of dispersal between two recaptures depended on the length of the time interval between them. *Coenagrion mercuriale* performed considerable between-patch movements within a small fraction (1-2 days) of its mean mature adult life span (7-8 days).

Qualitative comparison of field colonization distances measured here and distances between UK sites occupied by *C. mercuriale* revealed that empty sites within large clusters of sites would probably be recolonized rapidly and dispersal events would be frequent.

However, such events would occur rarely within small isolated sites or clusters of sites, leaving local populations prone to extinction.

These data show that management effort should be directed towards maximizing the likelihood of *C. mercuriale* recolonizing sites naturally within 1-3 km of other populations (particularly within large clusters). Scrub boundaries should be removed between existing populations and empty, but suitable, sites to facilitate stepping-stone dispersal movements.

Correspondence: e-mail: beth.purse@bbsrc.ac.uk

B. Moss, D. Mckee, D. Atkinson, S. E. Collings, J. W. Eaton, A. B. Gill, I. Harvey, K. Hatton, T. Heyes and D. Wilson

**How important is climate? Effects of warming, nutrient addition and fish on phytoplankton in shallow lake microcosms**

Journal of Applied Ecology, **40**: 782 - 792.

In this paper the effects of warming by 3 °C above ambient, nutrient addition and the presence or absence of sticklebacks *Gasterosteus aculeatus* were studied in experimental microcosms dominated by submerged plants. I found this research exciting to read. Previous to reading this paper my understanding was that global warming would vastly increase the number of phytoplankton and cyanobacteria found in shallow lakes. With current predictions for at least a 3 °C rise in mean temperature in northern Europe over the next century, I was expecting this paper to support this idea. However, The authors found that warming had a considerably smaller effect on the phytoplankton community than fish or nutrients. It had minor effects on chlorophyll a and total phytoplankton biovolume. It did however,

significantly decreased the biovolumes of Cryptophyceae (a major component in the controls) and Dinophyceae.

Contrary to expectation, warming did not increase the abundance of blue-green algae (cyanophytes). Warming decreased the abundances of *Cryptomonas erosa* (Cryptophyceae) and *Oocystis pusilla* (Chlorophycota) and increased those of two other green algae, *Tetraedron minimum* and *Micractinium pusillum*. It had no effect on a further 17 species that were predominant in a community of about 90 species.

Fish and nutrients, either together or separately, generally increased the crops of most of the 21 abundant species and of the algal groups. Exceptions were for diatoms and chrysophytes, which were very minor components of the communities. Fish, but neither nutrients nor warming, increased the number of species of phytoplankton detected. This is parallel with terrestrial studies that show the presence of top predators, which control herbivore numbers (in this case the zooplankton) lead to increased plant biodiversity.

There was no particular pattern in the taxonomy or biological characteristics of those species affected by the treatments. In particular, there was no link between organism size (a surrogate for many important biological features of phytoplankton species) and the effects of warming, nutrient addition or presence or absence of fish. However, all species were relatively small and potentially vulnerable to grazing.

The results suggest that my initial fears of an increasing abundance of cyanophytes with current projections of global warming may be unrealised, at least in shallow unstratified lakes still dominated by macrophytes. However, the results do emphasize that eutrophication and fish manipulations remain very important impact factors that determine the abundance of phytoplankton and subsequent problems caused by large growths. B. V.

Correspondence: e-mail: brmoss@liverpool.ac.uk

Nina Jonsson, Bror Jonsson & Lars Petter Hansen

**The marine survival and growth of wild and hatchery-reared Atlantic salmon.**

Journal of Applied Ecology 2003, **40**: 900-911.

Catches of Atlantic salmon *Salmo salar* decreased in the 1980s and 1990s on both sides of the North Atlantic. Rearing of juveniles and subsequent release into the wild is a common tool used to increase fish populations, and Atlantic salmon have been reared and released for some 150 years. However, there are questions about their survival and performance relative to fully wild fish. This paper reports on the survival and growth rates of River Imsa salmon released from 1981 to 1999 as 1 and 2 year old hatchery and wild smolts.

Survival was significantly higher for wild fish than for hatchery fish. Hatchery salmon released as 2 year-old smolts had lower survival rates, were captured more in coastal than freshwaters, grew more slowly and attained maturity younger than corresponding 1 year-old smolts. Catches in coastal relative to freshwaters were higher for two than one sea winter fish. Salmon captured in coastal water were greater in length than those captured in rivers. Mean specific growth rate at sea was similar for wild and hatchery salmon released as 1-year-old smolts, and higher than in hatchery fish released as 2-year-olds.

The coastal fishery was size-selective in reducing the size and age of salmon. Releases of 1-year-old smolts were financially more profitable than those of 2-year-olds. Decreasing production of River Imsa salmon since 1981 was chiefly caused by reduced sea-age at maturity and growth rate at sea of both hatchery and wild fish. A counteracting measure would be to reduce the size selectivity of the salmon fisheries. Either way the return to the river is low, and the amount of fish returning to the home river was lower than the weight of the smolts released.

Correspondence: e-mail: nina.jonsson@nina.no

# Environmental Justice - from Rhetoric to Reality

*Kathy Dale, MIEEM and James  
Lewis*

The Scottish Section of IEEM organised an Autumn Members' Day on 1<sup>st</sup> October 2003, at the Strathclyde Country Park Water Sports Centre, Motherwell. Kathy Dale, the Scottish Section Convenor, welcomed over fifty delegates, many of whom had travelled quite some distance to the venue. This was our most successful day yet!

Environmental Justice is a concept that implies that no person or group of people should shoulder a disproportionate share of the negative environmental impacts resulting from the enforcement of environmental laws, regulations and policies. There are two basic premises of environmental justice. Firstly, that every person should have the right and be able to live in a healthy environment, with access to sufficient and appropriate environmental resources for a healthy life, and secondly, that it is mainly the poorest and least powerful people who are denied these conditions. There is growing evidence of links between environmental problems and social injustices. Environmental justice is the idea that brings these together.

Kevin Dunion, formerly Director of Friends of the Earth Scotland (FoES) and now Scotland's new Information Commissioner at the Scottish Executive, gave the introductory talk. Kevin gave an informative and passionate presentation on what the concept of Environmental Justice means in practice and what rights local communities have when challenging planning applications for developments in their area. FoES have recently set up the UK's first educational course in Environmental Justice and so far twelve people, from throughout Scotland, have graduated with a Certificate. These 'Agents for Environmental Justice' have spent the last eighteen months pioneering work in their own communities. In his new role, Kevin is responsible for enabling local communities to gain access to all the information they need from local authorities. Kevin's book 'Troublemakers' is available from most good booksellers.

The main programme was similar to the other Scottish Section Members' Days in that three morning talks were followed in the afternoon by a choice of two field visits to sites in the local area.

Veronica Burbridge (Scottish Natural Heritage) gave a talk on how Environmental Justice is dealt with in her organisation. SNH's vision is for local communities in Scotland to exercise greater influence over shaping the decisions affecting the management, understanding and enjoyment of their local natural heritage and, if they wish, to play a more active role in its practical management. SNH views Scotland's natural heritage as a 'local, national and global asset' and seeks to 'promote its care and improvement, its responsible enjoyment, its greater understanding and appreciation and its sustainable use, now and in the future'. One of the prime objectives is, therefore, to help local communities in caring for and enjoying their natural heritage. SNH wants local communities to take pride in and be aware of the value of their local natural heritage, feel confident in providing an informed community view on matters affecting it, and take positive action to care for it. There are many programmes and initiatives to realise these objectives.

Vanessa Kind (Scottish Environment Protection Agency) then spoke about her organisation's contribution. The Agency does not have a significant role with respect to siting of industrial and waste facilities, but it does have the regulatory tools to control environmental emissions and the influencing tools to improve environmental quality. SEPA's non-regulatory approaches to protecting and improving environmental quality also provide opportunities

to address environmental injustice, for example, the promotion of habitat enhancement opportunities in degraded urban environments, such as urban rivers and ponds.

Finally, Simon Rennie (Central Scotland Forest Trust) talked enthusiastically about practical work on the ground involving local communities and helping them to take ownership of natural areas through the Community Woodlands Initiative.

An open panel discussion chaired by Scot Mathieson gave an opportunity to question the speakers, along with Paula Charleston, also from SEPA, and then Kathy Dale summed up and provided an introduction to the site visits. After lunch in the Centre, two groups convened outside in the surprisingly fine and calm weather to be taken on their respective choice of site visit.

## **Greenhead Moss Community Nature Park, Wishaw**

This park has an area of over 180 hectares and is managed by a Community Trust. The Project Manager, David Greer, showed us around but unfortunately there was only time to see approximately half of this interesting and diverse site. Part of it is an old bing and landfill site which has now been restored to wildflower grassland. In addition, there is an area of open water with fringing reedbed, a raised bog and large areas of woodland. To deal with the problem of landfill leachate polluting the loch, a reedbed treatment system has been installed. Nearby scrape areas have been created for amphibians and Scot found a newt! Another interesting feature was the 'time-stair', which showed the age of the peat on each step up an open face. As well as ecological management, the Trust have also been involved in a series of visitor activities, and they hope to build a new visitor centre in the near future. This site used to be considered semi-derelict and a public liability but now it is a well-managed, thriving resource for the local community, with a network of formal and informal paths. For further information see [www.greenheadmoss.co.uk](http://www.greenheadmoss.co.uk)

## **The John Struthers Nature Area, East Kilbride**

This site was proposed for a new housing development but strong opposition from the local community led to its retention as an area of open space. The site supports one of the most flower-rich meadows in East Kilbride - 122 species of flora have been recorded, as well as a variety of fauna. The management of the site has involved cooperation between Greenspace, the local Countryside Ranger Service, BTCV (British Trust for Conservation Volunteers) and the local community. Russell Hampton guided the walk and described the work undertaken by BTCV. Maureen McCann from the Site Protection Committee, Hamish Neilson from Greenspace, along with two members of the local Ranger Service were also present to provide information on their respective organisations' input. Development of the site was achieved through funding obtained from various organisations and BTCV were employed to undertake the development of path networks, including some with wheelchair access, build playground areas for children, and assist with habitat improvements. Community involvement has, and will remain to be, an essential part of the development and ongoing management of the site. Local children have approached Maureen with the hope of producing murals on garage doors adjacent to the site, whilst BTCV are hoping to continue their efforts with more tree planting and educational trips involving local schools to study the various wildlife habitats present. The delegates were impressed with the organisation and involvement of the community in the management of this area. The future of the site is still uncertain and efforts are continually being made to ensure that housing development will not be allowed.

Kathy Dale (Convenor) and James Lewis (Committee Member)

For further details of the Scottish Section and events, please contact the Secretary, Christine Welsh on (01397) 712499 or [Christine.Welsh@virgin.net](mailto:Christine.Welsh@virgin.net)

# Institute News

## Chris Spray is the New President Elect

At the AGM in Buxton Dr Chris Spray MA, Ph.D, MBE, MIEEM became the new President -elect. He will take over from Sue Bell at the AGM in 2004 and so has a year or so to become familiar with the workings of IEEM.

Chris worked for 7 years as a Research Fellow in Zoology at Aberdeen University, 4 years with Anglian Water as Recreation and Conservation Officer based in Cambridge and 2 years with the NRA (Anglian) as Regional Conservation Officer. He is currently Environmental Director for Northumbrian Water. Chris is a member of the England Biodiversity Group and chairs the Business Strategy Implementation sub –group for DEFRA. He also served on the Government’s Advisory Committee on Releases to the Environment for 4 years advising on conservation implications arising out of possible releases of Genetically Modified Organisms. At present he is Council member of RSPB, BTO, WWT and has past involvement with Tweed Forum, the Durham Wildlife Trust, River Restoration Project and the Industry and Nature Conservation Association. He was awarded an MBE in 2000 for services to environmental improvement and conservation in the Water Industry. Chris was a founder member of IEEM and on Council from 1994 – 1995 and gave papers at the IEEM Conferences in Harrogate and at the Designing Nature into Urban Development and Regeneration Conference in Newcastle last year.

## 2003 AGM and Buxton Conference

The conference proved to be a very successful and well-attended event with about 170 bookings. A further report will be made in the next In Practice.

In the elections most individuals were able and willing to continue for a further year, but Dr Alex Tait was elected as the new Treasurer in succession to Colin Buttery and Dr Janet Swan returned to Council after a break of one year.

## Professional Development Programme

The Professional Development Programme has just been produced and offers the largest number of courses yet. There is the usual mixture of well-tried events but with some new items. Our thanks go to Nick Jackson who has compiled the programme and also to the numerous individuals who have offered to lead the courses. Our thanks go also to the course supervisors who led the very successful 2003 programme. Book early to avoid disappointment and look out for the 2004 programme on the IEEM website.

## In Practice

Regular readers of In Practice will have noted the reviews of the British Ecological Society Journals. Recently these have been undertaken exclusively by the Secretariat and, although this may be good to keep the grey cells of the staff functioning, it slightly misses the point that these reviews are meant to relate to and be useful for those actively working in the areas concerned. In other words some of the practical significance might be missed. Volunteers to take on one of the three journals would be most appreciated but will have to do the work to fit in with the production cycle - any offers please?

## Society for the Environment

The application for a Royal Charter is currently being processed by the Privy Council Office and hopefully there will be more to report in the next In Practice.

## Charitable Status

I am sorry to report that the Charity Commission has declined our application for Charitable status. I attach some brief quotes from a rather lengthy reply,

which will need further consideration by Council. ‘Before an organisation can be accepted as charitable, it must be established for exclusively charitable purpose’. ‘The benefit conferred upon members of the profession by the Institute would defeat any case the proposers might seek to make that the activities of the Institute are directed towards a wider public purpose that is charitable or the advancement of education for the public benefit.’ One wonders how this Institute differs from the Institute of Biology, the Landscape Institute, The Institution of Environmental Sciences, the Chartered Institute of Water and Environmental Management etc.

## Membership Renewals

I am afraid that my call for prompt payment of renewal subscriptions has not been as well heeded as I had hoped. Many reminders have had to be sent out but we are getting there. Don’t forget the easiest way to avoid the embarrassment of further reminders is to pay by Direct Debit. Forms are available from the office.

## New Fellow - Professor Robert Marrs

I am pleased to report that Council approved Professor Robert Marrs as the 11th Fellow of the Institute at its meeting in October.

Rob is Professor of Applied Plant Biology and Chair of the Ecosystem Structure and Function Division within the school of Biological Sciences, University of Liverpool. He has worked on upland ecology for many years and produced a major series of papers on the control of bracken a number of which have been reviewed in the ‘In the Journals’ section of In Practice. He was able to put this wealth of experience to excellent effect in his Fellows Lecture - Applying Science in the Uplands: Time is not on our Side, delivered at the Buxton Conference and reprinted as the lead article in this edition.

## Spring Conference

The date of the Spring Conference is 18th May 2004 and it will be held at Hamilton House, London. The theme will be the ecological effects of alternative sources of energy.

## EFAEP

The general assembly of EFAEP, the European Federation of Associations of Environmental Professionals was held at the site of the Pollutec Exhibition in Paris on 5th December and attended by Mike Barker and Jim Thompson. Considering this is a new organisation, progress has been very positive. Four working groups have been established, the website - [www.efaep.org](http://www.efaep.org) is up and running and the way is being cleared to develop the process by way of influencing the European environmental agenda. The Secretariat in Germany has just produced a list of pending EU legislation, which could be very useful. There are now 13 member organisations with the only eastern European member being the Czech Republic. Interestingly one organisation has used our Code of Professional Conduct as a model.

One of the key objectives is to raise the profile of the organisation and as part of this process; EFAEP participated in the judging of the European Environmental Press for innovative European environmental ideas. The IEEM judge was Mike Barker but due to difficult timing he was unable to attend the ceremony and IEEM was represented by Joel Bateman.

## News of Members

David Stubbs, MIEEM has been appointed to head up the environmental side of the London Olympic Bid. This is a full time assignment based within the Bid Company, London 2012, at Canary Wharf, running until July 2005. This is good news to have an IEEM member so closely involved which such a key project.

John Cortes, MIEEM, Director of the Almeda Botanical Gardens at Gibraltar was awarded an MBE in the 2003 New Year’s Honours List for services to conservation and ecology in Gibraltar.

# Recent Publications

## The insurability of ecological damage



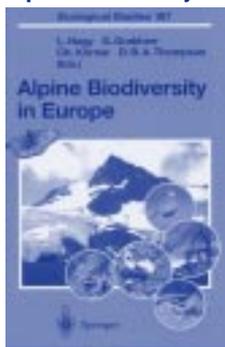
Swiss Re Publication  
Available from: [www.swissre.com](http://www.swissre.com) free of charge in a downloadable PDF

Legislative initiatives within the European Union, as well as at the United Nations, the European Parliament and in various countries are currently aimed at introducing a liability regime for dealing with ecological damage.

Focusing on Europe, the authors describe the political and legal framework for handling environmental losses today, and survey selected insurance markets to present an overview of the insurers' response. The publication goes on to discuss a cover concept which, from an underwriting point of view, might be capable of taming the complex risks associated with ecological damage.

Legal developments are challenging Europe's insurers – and particularly reinsurers – to take a stand as to ecological damage insurability, and to develop concepts for suitable covers. The intention behind this publication is to foster public awareness of the problem, as well as to promote understanding for the position of the insurance industry in general and Swiss Re in particular. This is an informative document, which provides valuable information on insurance for damage liability in both Europe and the USA.

## Alpine Biodiversity in Europe



Editors: L. Nagy MIEEM, G Grabherr, C. Körner and D. Thompson, MIEEM

ISSN: 0070-8356

Price: £105

Available from: Springer Verlag on-line: <http://www.springer.de>

This is the first European wide overview of biodiversity in alpine areas. The volume draws together taxonomic, ecological, historical, functional and climatic studies to develop a holistic understanding of the biodiversity at and above

the treeline. The main themes are plant, vegetation and animal diversity; altitude gradients and spatial patterns; longterm changes; and the effects of herbivores on diversity. These themes are introduced in a geo biological setting and by a novel characterisation of alpine bioclimate. The comparisons between current and long term observations emphasise the historical tradition of alpine biodiversity research in Europe. Analysis of taxonomic and biological assemblage data at the continent wide scale provide insights into patterns and their historical and ecological causes.

At first glance one might wonder about the relevance of this book to members within the UK. But when you consider Scotland's highest mountains are at the very edge of the alpine zone they are therefore important in terms of the geographical range of species covered. However, Scotland's relatively mild (when compared to the Alps), wet climate makes it particularly sensitive to climate change and in this sense the country is an important beacon for changes across mountainous Europe. Species on the southern edge of their range, including birds like the dotterel, ptarmigan and snow bunting, as well as plants such as Scottish scurvy grass, are particularly vulnerable. These species already have fragmented distributions, often due to loss of habitat, and are hampered by a limited ability to move and adapt to new environments.

Alpine Biodiversity in Europe includes research from scientists at Scottish

Natural Heritage (SNH), alongside Europe's leading researchers and conservationists for mountains and tundra. It is the first time Scotland's alpine mountain zone has been recorded within the context of the wider European alpine environment and is therefore very important and will provide valuable information about the mountain habitats found with in the UK.

The book draws together taxonomic, ecological, historical, functional and climatic studies to develop a European-wide understanding of biodiversity at and above the climatic treeline. The comparisons between current and long-term observations emphasise the historical tradition of alpine biodiversity research in Europe.

A companion, illustrated 16-page booklet 'Alpine Biodiversity in Europe: an Introduction' is published by the Joint Nature Conservation Committee. Hard copies are available, free of charge, from Sally Johnson, Scottish Natural Heritage, 2 Anderson Place, Edinburgh EH6 5NP, 0131 446 2400. e-mail: [sally.johnson@snh.gov.uk](mailto:sally.johnson@snh.gov.uk)

## National Vegetation Classification - Ten years' experience using the woodland section



Editor: E Goldberg

ISSN: 0963-8091

Available from: JNCC website [www.jncc.gov.uk](http://www.jncc.gov.uk) in downloadable PDF

National Vegetation Classification - Ten years' experience using the woodland section is a report based on a seminar hosted by JNCC and the Forest Ecology Group of the British Ecological Society, April 2001. The woodland section of the National Vegetation Classification (NVC) has been widely used since its publication in 1991

for the description of semi-natural woodland, in developing prescriptions for the composition of new woodland, and to provide links between UK woods and those in the rest of Europe. Better collation of results from surveys across the country is however needed. Criticisms of the classification have been that it ignores many important variations in the tree and shrub layers and in the woodland structure. These variations can be accommodated as cross-cutting divisions within the NVC framework. While the NVC woodland communities, for the most part, reflect environmental variations, there is increasing evidence that some differences are caused by changes in the level of grazing. The stability of the classes may need to be reviewed in the light of climate change if there are major shifts in species distributions and, hence, in the composition of woodland communities.

The document contains the sections: NVC in semi natural woodland; NVC use in plantations; Interpretation, prediction and modeling with NVC and Review and development of the NVC. I would recommend the report to those who are both interested in and use NVC in woodlands. It would be useful to examine this interesting review of the techniques and lessons learnt over time. '



## Christmas and New Year



*Members of Council, the Directors and Secretariat would like to wish all members a Happy Christmas and a productive and ecologically active year in 2004.*

# News in Brief

## GM Crop Trials confirm concerns

English Nature have given their initial reaction to the scientific results from the Farm Scale Evaluations of GM crops. EN called for the experiments in 1998, because of concerns that commercial growing of GM herbicide tolerant (GMHT) maize, oilseed rape and beet could further damage wildlife on farmland.

Dr Brian Johnson, Biotechnology Advisor to the British nature conservation agencies, said:

"We are pleased that the results of these important experiments have been published. They confirm our long-held concerns that some GM herbicide tolerant crops could further intensify arable farming and harm wildlife. The results show that there were significantly fewer wild plants and seeds in fields of GMHT spring oilseed rape and beet compared with conventionally managed fields. There were also significantly fewer bees and butterflies in the GM fields. If these crops were grown commercially in the UK, we now know that there would be further declines in farmland wildlife."

"The experiments only assess the impacts on biodiversity of herbicides on GMHT spring oilseed rape, beet and maize. There is no general message about the risks from GM crops, and the experiments tell us nothing about gene flow, coexistence with other forms of agriculture and liability if anything goes wrong - all factors that must also be considered before decisions are made about commercial release."

## The Way Ahead - an Environment for Growth

"The Way Ahead - an Environment for Growth", called for the environment to be a key factor in all economic planning at a political and business level in Wales and presented new research which underlines the interdependence of the economy and environment of Wales.

Andrew Davies, Minister for Economic Development and Transport in the Welsh Assembly Government, who addressed the conference, said: "We recognise the links between economic growth and the environment and understand that growth must be sustainable. Our vision for Wales, which is set out in 'Wales - A Better Country', shows that action for social, economic and environmental improvements complement each other to create positive change. The Welsh Assembly Government has a commitment to Sustainable Development and in everything we do we consider its impact on the quality of life for future generations."

Research has already shown that £6bn pounds of GDP and 1 in 6 jobs in Wales are dependent on the environment. Further findings, presented at the conference, measured for the first time the economic impact of the environment in each of the four economic regions of Wales and highlighted the greater economic importance of the environment in the more rural regions of Mid, North and South West Wales. Wales' natural environment was one of the key factors which has motivated companies such as Reynolds Geo Sciences, a leader in assessment of climate change and hazard risk management, to locate to North East Wales

## Wild Bird Population: Headline indicators for Sustainable Development

The UK Government's indicator of wild bird populations has been updated. It records that, following an increase in the 1970s, the overall population of breeding birds in the United Kingdom has been relatively stable over the last two decades.

The latest figures, for 2002, show that the population status of 106 bird species across the UK is 13 per cent higher than it was in 1970, although there has been a small decrease compared to 2000. Within the overall figure, the populations of farmland birds remain at less than 60 per cent of their 1970 level. However, declines have lessened in recent years and the 2002 farmland bird indicator is virtually unchanged from the 2000 figure. The woodland bird indicator remains about 20% lower than in the early 1970s.

Although there were three year-on-year increases during the late 1990s, the indicator fell by 5 per cent in 2002 in relation to 2000. The indicators, which form one of the 15 headline indicators of sustainable development, show changes in the populations of common species of farmland, woodland and all native wild birds. Bird populations are considered to be a good indicator of the broad state of wildlife and countryside because they occupy a wide range of habitats, they tend to be near or at the top of the food chain, and considerable long-term data on bird populations have been collected.

The overall population of wild birds in the UK has risen by 5 per cent over the last ten years. Major winners include scarce breeding birds with mainly southern distributions, such as little ringed plover, woodlark and dartford warbler, that may be benefiting from climate change, and species such as woodpigeon and stock dove, which may be benefiting from current agricultural practices.

## Sudden Oak Death

Confirmation of three new findings of *Phytophthora ramorum* in tree species has raised concerns about the recent spread of the disease to trees in Britain. *Phytophthora ramorum* is the pathogen causing death of oak trees on the west coast of America. Symptoms of disease caused by *Phytophthora ramorum* were first noticed on rhododendron in Europe in 1993, although the causal pathogen was not identified until 2001.

The new cases, at two locations in the south west of England, have been found in beech, horse chestnut and holm oak and are associated with previous adjacent findings of the disease in rhododendron. This follows the pattern set by the first confirmation of *Phytophthora ramorum* in a southern red oak in Sussex earlier in November. All the sites are being closely monitored.

An intensive survey programme of retail outlets, nurseries, gardens and other established planting areas has been underway since the first finding was confirmed in April 2002. Precautionary eradication and containment action will continue, and surveillance will now be increased to reduce the risk of spread of this pathogen into the wider natural environment.

Buyers of host species – mainly rhododendrons, camellias and viburnum – are advised to check plants before purchase for symptoms of the disease and to contact their garden centres if these subsequently develop.

## Biodiversity boom in once-polluted waters

Pollution levels in the Manchester Ship Canal were once so high that there were stories of it catching fire and warning signs advising those on its banks to extinguish any naked flames. It was virtually lifeless, and hazardous to human health. Now a new research survey has revealed that the water quality in parts of the canal is so improved that its biodiversity is booming and that it has some of the fastest growing fish in the country.

For the last three years liquid oxygen has been pumped into a 2km stretch of the canal at Salford Quays at the rate of 15 tonnes a day as part of a multi-million pound programme to bring the waters back to life. The project was funded by United Utilities (£3.5 million), along with a £500,000 Millennium grant through English Partnerships. The oxygenation process and the research are the work of aquatic specialists APEM, working in partnership with the Mersey Basin Campaign, United Utilities, the Environment Agency and the Manchester Ship Canal Company.

Before the programme began, monitoring showed fewer than five species of invertebrate in the waters – mostly leeches and bloodworms. The new survey, conducted for the Mersey Basin Campaign by water quality experts APEM, has revealed more than 30 species of invertebrate in the waters and fish such as roach and perch spawning in the Canal. Examination of fish scales has revealed that growth rates, particularly of roach, are amongst the highest to be found anywhere in the country.

## IEEM is pleased to welcome applications for membership from the following:

If any existing member has any good reason to object to someone being admitted to the Institute, especially if this relates to compliance with the Code of Professional Conduct, they must inform the Executive Director by telephone or letter before 28th January, 2004. Any communications will be handled discreetly. The decision on admission is usually taken by the Membership Admissions Committee under delegated authority from Council but may be taken directly by Council itself.

### Full Membership

Dr John Baker, Mr Jonathan A. Bennett, Ms E. Clare Collier, Mrs Angela M. Darwell, Mr George W. Dodds, Mr Frederick E. Edwards, Mr Alun Evans, Mr Peter D. Greenslade, Ms Joanne Goodyear, Mr James Heslop, Mrs Ann E. Hill, Miss Rebecca Hutchinson, Mr David A. Knox, Mr Edward C. Mackey, Dr Catharine H. Mordaunt, Mr Timothy B. Norman, Mr Damian C.F. Offer, Mr Jonathan Rau, Miss Kerry-Leigh Rhodes, Mr Matthew D. Saxon, Mr Jonathan Shelley, Mr Peter J. Sibley, Ms Debra A. Stickley, Mr Jonathan R. Webb, Mr Nicholas J. Woods.

### Associate Membership

Mr Barry Anderson, Mr Olaf S. Booy, Miss Rachel M. Cowan, Mr Ian W. Craft, Mr Benjamin M. Driver, Mr Paul S. Fisher, Mr Alan B. Foulds, Miss Jennifer A. Gardner, Mr James P. Gilbert, Mr Jonathan Guarnaccio, Mr Mike J. Harris, Mr Gerard J. Hawley, Mrs Patricia Hilton, Miss Sophie I. Hine, Miss Melanie C. Knight, Miss Veronica M.V. Lawrie, Mrs C. Sian Mitchell, Miss Caroline Munns, Mrs Sally Murray, Miss Jackie Nicholson, Mr Andrew R. Perry, Miss Sarah A. Postlethwaite, Mr Keith A.A. Ross, Mr Matthew Vesey, Ms Donna L. Warren, Miss Rosie Whicheloe, Mr Stephen G. Wilson.

## New admissions to IEEM

### IEEM is very pleased to welcome the following new Members:

#### Full Membership

Mr Colin J. Barr, Mr Simon F. Cahill, Mr Maxwell A.S. Carstairs, Mr Gideon M.K. Cheng, Mr Kevin J. Cloud, Miss Debbie Court, Mr Richard Crompton, Ms Elaine Dromey, Mr Gavin Forkan, Ms Susan E. Hogarth, Mr Adrian Knowles, Mr Derek Lord, Mr Joel E. Miller, Mrs Fiona J. Morris, Mr Peter A. Nicholson, Mrs Mary L. Norden, Mr Michael O'Kell, Dr Kate P. O'Neill, Ms Pernille V. Olsen, Dr Sarah Jane Preston, Dr Barry Shepherd, Ms Alison E. Slade, Mr Freddie P.R. Symmons, Dr Barry C. Tranter, Mr James H. Williams.

#### Associate Membership

Mr Vilas Anthwal, Mr Brian J. Armstrong, Dr Jasmin Barwig, Mr Laurence Burrows, Mrs Rupinder Dhillon-Downey, Mr Paul Hudson, Miss Lydsey J. Husband, Miss Caroline Irish, Mr Matthew J. Levan, Ms Cressida Mansfield, Miss Kay Marriott, Miss Bethany G. Marshall, Mr William G. Miles, Mr Michael Muir-Wright, Miss Alison J. Riggs, Miss Victoria M. Rose, Mr Edward Stocker, Mr Samuel Watson, Miss Alison Wouters.

#### Student Membership

Miss Nicola Evans, Mr David D.J. Fisher, Mr Craig A. Greenwell, Miss Sharleen Hanlon, Miss Susan M. Jones, Mr Stuart J. Kato, Miss Victoria A. Lane.

### The following have successfully upgraded their Membership from Associate to Full

Miss Helen F. Ball, Miss Carol A. Bannock, Miss Janine M. Barrow, Miss Katia Bresso, Mr James Couzens, Mr Ian R. Curtis, Mr Roger Featherstone, Miss Joanne Hole, Mr David C. Jackson, Mr Christopher John, Miss Kerry Nicholson, Mr John P. Poland, Dr Robert Rowlands, Mr Richard Wardle.

**The Course programmes for 2004 for the Centre for Alternative Technology, Field Studies Council, Losehill Hall, Plas Tan-y-Bwlch and BTCV are all now available. Each offers a wide range of courses that might be of interest to IEEM members. Information from:**

**Centre for Alternative Technology:** Further details about each course can be obtained from Joan Randle.  
Tel: 01654 703743, Fax: 01654 703605, E-mail: joan@cateducation.demon.co.uk.

**Field Studies Council:** For a copy of the FSC Courses 2004 brochure, contact FSC Head Office, Preston Montford, Montford Bridge, Shrewsbury, Shropshire, SY4 1HW. Tel: 01743 850 674, Fax: 01743 850 178, E-mail: fsc.headoffice@ukonline.co.uk. Website www.fieldstudiescouncil.org

**Losehill Hall:** Details from Losehill Hall, Peak District National Park Centre, Castleton, Hope Valley, Derbyshire S33 8WB  
Tel: 01433 620373, Fax: 01433 620346, E-mail: training@losehill.u-net.com.

**Plas Tan-y-Bwlch:** Details from: Plas Tan-y-Bwlch, Maentwrog, Blaenau Ffestiniog, Gwynedd LL41 3YU.  
Tel: 01766 590324, Fax: 01766 590274, E-mail: Plastanybwlch@compuserve.com.

**BTCV Courses:** - practically based. Details from: BTCV Training Programmes Unit, Red House, Hill Lane, Great Barr, Birmingham B43 6LZ.  
Tel: 0121 358 2155, Fax: 0121 358 2194, E-mail: ETN@ukgateway.net

**14 January. N.E. Section Meeting: The CROW act two years on; where are we now?** Rainton Meadows, Chilton Moor, Houghton-le-Spring, Time 7.00pm. How is EN opening up its major sites and how is it working two years on? How is access working on NNR and SSSI sites and what are the conflicts?

Details from Steve Pullan, MIEEM Tel. 0191 266 1769 or e-mail steve.pullan@virgin.net

**27 January. Roads and Wildlife.** Cardiff. To raise the awareness of the basic background and current issues relating to roads and ecology.

Details from Nick Jackson e-mail: nickjackson@ieem.demon.co.uk at the IEEM Office or on the IEEM website www.ieem.org.uk.

**5 – 6 February. GM Crops and Birds – a BOU scientific meeting.** The Royal Society, London.

Details from Emily Davis email emily.davis@oxon.blackwellpublishing.com

**10 March. Introduction to Aerial Photo Interpretation and Habitat Mapping.** Somerset. Covers API and its application to habitat mapping, covering a range of habitat classifications.

Details from Nick Jackson e-mail: nickjackson@ieem.demon.co.uk at the IEEM Office or on the IEEM website www.ieem.org.uk.

**10 March. N.E. Section Conservation and management of lowland grasslands.** Wynyard Woodland Park (formerly Castle Eden Walkway Country Park). Time 7.00pm. Some personal thoughts on possible approaches to the conservation of this declining and fragmented resource, including a case study of grassland creation on the Northumberland coast. Details from Steve Pullan MIEEM Tel. 0191 266 1769 or email steve.pullan@virgin.net

**18 March Professional Practice: Tendering Guidelines.** Stevenage, Hertfordshire. A practical introduction to tendering, including worked examples of how to respond to and prepare an invitation to tender.

Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk at the IEEM Office or on the IEEM website www.ieem.org.uk.

**25 March. Ecological Evaluation and Impact Assessment.** Scottish central belt – probably Perth or Stirling. Covering EclA and the draft IEEM guidelines.

Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**31 March. Integrating Wetland Hydrology and Ecology in the UK.** London. Details from Dr M. Acreman e-mail man@ceh.ac.uk

**20 April. An Introduction to Translocation of Great Crested Newts.** Moore Nature reserve, Warrington, Cheshire. This practical course will introduce standard survey methods for amphibians with special emphasis on the great crested newt.

Details from Nick Jackson email nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**21 April. An Introduction to Translocation of Great Crested Newts.** Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**22 April. An Introduction to Translocation of Great Crested Newts.**

Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**22 April. Surveying for Reptiles.** North Baddesley at Emer Bog and Baddesley Common, Hampshire. Concentrating on the four 'widespread' UK species namely the Adder, Grass snake, Slowworm and Viviparous Lizard.

Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**22 April Scoping Brownfield Sites for Protected Species.** Buxton, Derbyshire. This course will focus principally on bats and other mammals, black redstarts and herpetofauna, and will cover their habitat requirements and the key features of brownfield sites, which might support them.

Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**22 April Great Crested Newts - Survey, Handling, Licences and the law.** Location: Oxfordshire. This practical workshop will include identification of British amphibians at different life-stages - particularly great crested newts - the ecology of this species, and discussions of relevant legislation, licensing and welfare issues.

Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**23 April. Great Crested Newts - Survey, Handling, Licences and the law.**

Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**28 April. Water Voles – Surveying.** Berkshire. This species is under serious threat from habitat loss, degradation and fragmentation making it vulnerable to invasive species such as mink.

Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**29 April. Water Voles – Mitigation.** Berkshire. This course is similar to the previous day, but focused less on surveying and more on legislation and mitigation.

Details from Nick Jackson email nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.

**29 April. Habitat Management for Reptiles.** North Baddesley at Emer Bog and Baddesley Common, Hampshire. This course follows on from the survey workshop and will look at the habitats where each of the four widespread reptile species are found in the UK. Details from Nick Jackson e-mail nickjackson@ieem.demon.co.uk, at the IEEM Office or on the IEEM website www.ieem.org.uk.