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Soil Ecology and Biodiversity

In this issue

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Welcome

In the 16th century Leonardo da Vinci observed that *"we know more about the movement of celestial bodies than the soil underfoot"*. It may well be true some 500 years later that we have a better understanding about the physical structure of the universe than we do about soil functions and soil biodiversity. Nevertheless, soil ecology has received considerable scientific attention for many decades which is important, given that healthy soils are critical for the provision of ecosystem services and, in turn, soil biodiversity is the fundamental component that drives soil functions. Thus the enhancement of soil biodiversity is a key priority for the environment sector generally and a key policy objective for the Environment Agency and Defra.

Soils are undervalued by society generally in the UK (except by some farmers, foresters and keen horticulturalists!) and even within the communities of planners, environmental professionals and landscape designers, probably too few people recognise the importance of soils for the provision of services such as clean water and flood regulation, habitat for fauna, flora and microbial communities and green infrastructure for social uses. Thus the IEEM summer conference 'Enhancing Biodiversity through Soil Management' organised in collaboration with the British Society for Soil Science and the Institute of Professional Soil Scientists was a timely opportunity for attendees to learn about current directions of research in soil ecology and innovative techniques in soil management.

The presented lectures clearly demonstrated why we as members of IEEM should pay more attention to soils and why we should seek to influence professions that mainly specify the design of new developments and new infrastructure, including master planners and landscape designers, and also engage effectively with civil engineers, regulating agencies and land managers generally. This approach will help to ensure that correct soil management and the conservation of healthy functioning soil ecosystems are high on the agenda whenever development of greenfield or brownfield sites and creation of green infrastructure occurs.

There is a problem with this proposition because many environmental practitioners have a poor understanding of soils and if we seek to influence others then there is a skills gap that needs attention. The Ecological Skills Project Research commissioned by IEEM and delivered in July 2011 identified soil science as a skills gap for the environment sector. In view of this please consider adding enhanced knowledge of soils and the ecology of soils in particular, to your suite of specialist professional development requirements.

Considering soils from a personal perspective, one of my interests relates to the creation of new green infrastructure on development sites, degraded post-industrial land and restored mineral workings. Brownfield soils are frequently deficient in soil organic matter and sometimes almost devoid of biological activity. Nevertheless, it is essential for the long-term functioning and sustainability of the soil ecosystem that establishment and retention of a nutrient cycling regime is achieved through the activity of soil micro-organisms and soil fauna. This issue has been addressed by WRAP (Waste & Resources Action Programme) over the past six years through a funded research and development programme which investigates the benefits of utilising organic materials to enhance soil ecosystem development on brownfield land. There is an important role for imported organic materials in the form of PAS 100 composts and PAS 110 anaerobic digestates for the improvement of existing poor soils, or in the genesis of manufactured soils, designed to accommodate particular green end-uses. Using these materials can create properly functioning soil ecosystems that support above and below ground biodiversity. An additional benefit is that in low carbon brownfield soils and soil-forming minerals that initially contain very small amounts of soil organic matter, significant quantities of carbon can be sequestered for at least hundreds of years.

The UK National Ecosystem Assessment has emphasised that soils are at the core of ecosystem services, conveying multiple benefits to society. Please disseminate this sentiment widely.

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Information

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Correction

The opening article of the June 2012 edition of *In Practice* (by David Goode) refers to the ITE as the 'Institute of Transport Engineers'. This is an error and should refer to the 'Institute of Terrestrial Ecology'. This was an editorial error and not the fault of the author. Our apologies for any inconvenience caused.

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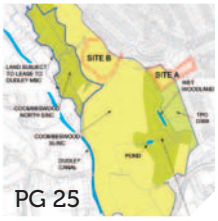

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Defra report on business opportunities to protect nature's services

Defra has released *Opportunities for UK Business That Value and/or Protect Nature's Services*, the final report of the *Review of UK National Ecosystem Assessment (NEA) Evidence to Assess Scope for Business Related Ecosystem Market Opportunities in the UK and Tools for Business Sector Uptake*. The report identifies reasons for which business should value and protect nature's services, including the business risks caused by degradation and scarcity, consumer expectations, and the competitive advantage of developing sustainable supply chains, procurement and production. The report ranks 12 opportunities demonstrating market potential: biodiversity offsets, including conservation banking; a peatland carbon code; woodland enhancement through markets for wood fuel; developing an ecosystems knowledge economy; layered payment for ecosystem services (PES); carbon sequestration; expanding the value of sustainability certification; optimising the benefits of sustainable tourism; establishing a global centre of excellence for ecosystem services certification; water re-use technology; investment in green infrastructure to reduce risk for insurers; and developing environmental bonds for investment in nature.

http://www.defra.gov.uk/ecosystem-markets/2012/06/27/vnn-report-published270612/

New advice services for planning proposals from Natural England

Natural England is piloting two new chargeable services to give those developing planning proposals greater access to the advice of its case officers and wildlife advisers at the pre-application stage. Natural England has informally consulted a cross-section of stakeholders, customers and statutory consultees on options for chargeable services to develop its proposals and as a result is now introducing the following new and improved services, initially on a limited pilot basis:

- **Pre-application advice for planning applications**
  Known as the Discretionary Advice Service (DAS), this is geared towards cases with the potential for significant impact on protected sites, landscapes and species, or which could bring environmental gain. Natural England will offer an initial level of advice – free of charge – to help identify key issues and opportunities on a development proposal. The developer/consultant would then have the option of paying for further access to Natural England's expert advice to help in the further development of their proposals.
- **Pre-submission screening service for wildlife licences**
  A large number of developments involve the need to obtain a licence to disturb protected species and normally this can only happen once planning permission has been granted, which can cause uncertainty and delay for the developer. Natural England will offer a new chargeable screening service for European Protected Species mitigation licence applications, enabling the applicant to find out at an earlier stage whether their plans are likely to meet licensing requirements, thus potentially saving them time and money.

From 18th July onwards, Natural England has been offering these new services on a limited number of development proposals under the Town and Country Planning Act to help trial, test and refine the offer and the service standards that support it. The aim is to launch these services fully later in the year, extending the Discretionary Advice Service to cover other case types such as offshore work and Nationally Significant Infrastructure Projects (NSIPs).

www.naturalengland.org.uk/ourwork/planningdevelopment/spatialplanning/adviceservices.aspx

Nearly 2,000 non-native species established in Great Britain

A new CEH-led report, *Non-Native Species in Great Britain: establishment, detection and reporting to inform effective decision making*, shows a dramatic increase over time in the number of non-native species arriving in Britain. In the 60 years since 1950, more than 600 non-native species have arrived in Britain. The invasive non-native species have been estimated to cost the UK economy £1.7 billion per annum.

http://www.ceh.ac.uk/news/news_archive/Nearly-2000-nonnative-species-GB_2012_39.html

State of Environmental Law 2011-2012

The UK Environmental Law Association (UKELA) published a report in May entitled *The State of UK Environmental Law in 2011-2012: Is there a case for legislative reform?*, which sets out key findings from a major research project into the state of environmental law, as well as UKELA's recommendations for reforms and further research. There is also a *Business Perceptions of Environmental Legislation* report which sought to capture business views of environmental legislation.

http://www.ukela.org/rte.asp?id=143

New practice guide for deadwood in British forests and woodlands

To help improve the condition of woodlands and benefit wildlife, the Forestry Commission has written a new guide for woodland owners and managers who want to know where and how to manage woodlands for deadwood. The 32-page guide costs £6 and printed copies can be ordered from Forestry Commission Publications or downloaded for free as a PDF from the Forestry Commission website.

http://www.forestry.gov.uk/PDF/FCPG020.pdf/$FILE/FCPG020.pdf

Good practice guidance for green infrastructure and biodiversity

The Town and Country Planning Association and The Wildlife Trusts have published *Planning for a Healthy Environment – good practice guidance for green infrastructure and biodiversity*. The guidance is designed to offer advice to planning practitioners on how green infrastructure and biodiversity can be enhanced and protected through the planning system. It is primarily intended to inform local plans and summarises the latest policy drivers and distils the best of our current policy responses. It also sets out practical examples of successful projects and sources of further detailed information.

http://www.tcpa.org.uk/data/files/TCPA_TWT_GI-Biodiversity-Guide.pdf

http://www.wildlifetrusts.org/news/2012/07/06/planning-healthy-and-natural-environment

Independent Panel on Forestry report

The Independent Panel on Forestry has published its final report. The report calls for England's woods and forests to be re-valued for all the benefits they provide and for a revival of a woodland culture that appreciates how important trees are for people, nature and the economy. The report also makes clear that the Panel believes the public forest estate is a national asset, which should remain in public ownership. The Panel recommends an evolution of the Forestry Commission, allowing greater financial freedoms and investment to generate even greater benefits for people, nature and the economy.

http://www.defra.gov.uk/news/2012/07/04/publication-of-the-independent-panel-on-forestry-report/

Feeding the nation and enriching the environment

Defra has announced a major new study into how Britain's entire food system must change to keep food affordable without destroying nature at a time of soaring world population growth. Government has brought together representatives of farmers, manufacturers, retailers, caterers, environmentalists and scientists to work out how to reconcile the competing demands of producing more food and improving the environment. The initial report of the Green Food Project sets out the first steps on the road to: using less energy and water in food production; increasing crop yields; introducing more innovative technology; improving conservation management; and boosting numbers of talented, entrepreneurial young people making careers in the food industry.

http://www.defra.gov.uk/news/2012/07/10/green-food-project/

Training and skills vital for agri-environment schemes

Researchers have found that a relatively small amount of training for farmers engaged in agri-environment initiatives could significantly enhance their outcomes. The research showed that agri-environment schemes do have the potential to provide good resources for wildlife. However, not only are the experience and skills of the farmer very important in ensuring that the schemes are implemented as effectively as possible, but their attitude and engagement with the scheme's objectives also play a major role in their level of success. The scientists concluded that a relatively small investment in training, with some follow-up advice, could provide good value for money by enhancing the environmental outcomes.

http://www.bbsrc.ac.uk/news/food-security/2012/120709-pr-training-agri-environment-schemes.aspx

Photo by C. Webster

Making it easier to understand European Site Conservation Objectives

Natural England and the Joint Nature Conservation Committee (JNCC) have set out a proposal for a new approach to Conservation Objectives for European protected sites making them clearer and more understandable. This initiative is a response to the recent Report of the Habitats and Wild Birds Directive Implementation Review (HWBDIR). As part of this new approach Natural England is proposing that clear baselines and targets are added to the recently published revised Conservation Objectives for all terrestrial Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and European marine site conservation objectives.

http://www.naturalengland.org.uk/ourwork/conservation/designatedareas/sac/conservationobjectivesfeature.aspx

Glastir to remain until 2020

The Welsh Government has announced that Glastir will remain as the *"settled scheme"* for Wales until 2020. In making this announcement it was made clear that there will be no further extended reviews of the scheme and that reduced administration, increased support for farmers and improved communication of the scheme would be delivered with immediate effect. There will be a significant number of changes to the scheme which will streamline application and management of the scheme. And to encourage a wider understanding, the names of each element of the Glastir scheme will be simplified. The All-Wales Element of the Glastir name will be abolished and will now simply be known as Glastir - Entry. In future the Targeted Element will simply be known as Glastir - Advanced.

From 2014, the application window will be abolished, so farmers can apply for the scheme at a time that suits them. The application will also become available as an online process.

http://wales.gov.uk/newsroom/environmentandcountryside/2012/120703glastir/?lang=en

Badger cull ruled legal in England

The Badger Trust has lost its judicial review of the Government's controversial plan to allow the culling of badgers in England. This decision means that badger culls, intended to reduce the incidence of bovine TB, could begin in the autumn in Gloucestershire and Somerset. The judicial review considered only legal arguments and not scientific ones.

http://www.badgertrust.org.uk/_Attachments/Resources/677_S4.pdf

Photo by www.wildstock.co.uk

Natural England survey underlines importance of local greenspaces

Natural England has published its third year of findings in the definitive survey of the way people enjoy the great English outdoors. The *Monitor of Engagement with the Natural Environment* (MENE) survey, which sampled 47, 000 people in 2011/12, provides a unique data set on long term trends in countryside usage. The increase in visits to urban parks in particular made a contribution to the overall increase in the volumes of visits across England between 2010/11 and 2011/12.

http://www.naturalengland.org.uk/about_us/news/2012/020712a.aspx

Badger vaccination in north Pembrokeshire underway

The Welsh Government has announced that vaccination of badgers against bovine TB formally began on Monday 11 June 2012 and will continue throughout the summer and early autumn. The Intensive Action Area (IAA) is primarily located in north Pembrokeshire, but includes small parts of Ceredigion and Carmarthenshire. The IAA covers approximately 288km^2.

http://wales.gov.uk/newsroom/environmentandcountryside/2012/6367044/?lang=en

NBDC develops online data submission forms

The National Biodiversity Data Centre has announced the launch of its new Online Record Submission Form which it hopes will encourage the submission of casual records by members of the public. The form will also provide statistics on the number of records received by group, county and day. A presentation tutorial is also available on how to use the new submission forms.

http://www.biodiversityireland.ie/on-line-data-submission-forms-developed/

New non-native species legislation came into force in Scotland on 2 July 2012

The Wildlife and Natural Environment (Scotland) Act 2011 (Commencement No. 4, Savings and Transitional Provisions) Order 2012 was laid before the Scottish Parliament on 31 May 2012. This is the final commencement Order for the Act and principally deals with its non-native species provisions. Two further Orders, dealing with non-native species were also laid on 31 May 2012:

The Wildlife and Countryside Act 1981 (Keeping and Release and Notification Requirements) (Scotland) Order 2012 maintains the restrictions that were previously in place on the keeping and release of certain invasive animals and the requirement to report the presence of certain invasive animals. The Wildlife and Countryside Act 1981 (Keeping and Release and Notification Requirements) (Scotland) Amendment Order 2012 makes some changes to the terms used in describing the species listed. The Wildlife and Countryside Act 1981 (Exceptions to section 14) (Scotland) Order 2012 creates exceptions to the new non-native species offences where they are required – it does so in relation to the planting of certain species of plants and catch and release by anglers. The Wildlife and Countryside Act 1981 (Exceptions to section 14) (Scotland) Order 2012 makes some changes to the terms used in describing the species listed and clarifies a reference in the original Order.

Lastly, the first *Code of Practice on Non-Native Species* was approved by Parliament on 28 June 2012.

http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/InvasiveSpecies

Soil Biodiversity, Soil Management and Ecosystem Services

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Soil management and inspection. Photos by Sheila Ross.

Introduction

Soil is a valuable yet non-renewable resource. While soils have taken thousands of years to develop, recent human activity and mismanagement is causing soils to change at an unprecedented rate. Soil degradation through, for example, contamination, compaction, erosion or loss of organic matter causes soil to lose its 'quality' and to become less productive and less capable of providing the 'functions' that we have in the past taken for granted. Global issues of the 21st century like food security, demands for energy and water, climate change and biodiversity are dependent on the sustainable use of soils. Governments are waking up to the need to manage soils sustainably because the environmental and economic costs of not doing so would have very significant implications for our livelihoods in the future.

Soil science is growing up and becoming mainstream. It has evolved from describing and classifying *'what soils are'* through a research phase focused on discovering *'how soils work'* to a current increasing emphasis on understanding *'what soils do'*. It is now recognised worldwide, both in scientific and policy thinking, that soils have valuable functions and provide services which support nature and society. This has highlighted the need not only for remediation of degraded soils but also for better soil management to maintain soils in good condition.

So How Do We Define *What Soils Do?*

Daily *et al*. (1997) defined soil ecosystem services as *"the conditions and processes through which soils, and the organisms that make them up, sustain and fulfill human life."*

In the UK the ecosystems services way of thinking about soils is represented in various research and development programmes and policy documents, including Defra's (2010) Ecosystems Approach Action Plan (EAAP) *Delivering a healthy natural environment* and the 2007 cross government Natural Environment PSA28 target which aims *'to secure a diverse, healthy and resilient natural environment, which provides the basis for everyone's well-being, health and prosperity now and in the future; and where*

the values of the services provided by the natural environment are reflected in decision-making'. In each case soils are inferred via agricultural land management rather than explicit reference to sustainable use of soils.

Examples of the vast array of ecosystem services provided by soils are given in the table below based on the structure of the Millennium Ecosystem Assessment (MEA 2005) which identifies four major categories of ecosystem services that directly affect human well-being.

Soil Ecosystem Services (based on: Defra 2007; MEA 2005)

SUPPORTING (role of soil in the ecosystem)	REGULATING (soil processes)
Soil formation	Weathering of minerals and regulation of elemental cycles
Physical stability and support for plants	Decomposition of organic matter and regulation of nutrient supply
Nutrient cycling, retention and delivery to plants	Buffering, filtering and regulation of the hydrological cycle and flooding
Moisture retention and supply for plants	Decomposition of dead organic matter (leaf litter) and wastes
Habitat and gene pool (microbial population)	Soil organic matter and storage/release of carbon
	Regulation of pests and diseases
PROVISIONING	**CULTURAL**
Building material	Heritage sites, archaeological preserver of artifacts
Genetic resources / pharmaceuticals / biochemicals	Spiritual value, religious sites and burial grounds
Indirectly sustains food production	Indirectly contributes to recreational activities
Indirectly influences fresh water quantity and quality	Indirectly contributes to education
Indirectly sustains fuel wood and fibre production	Indirectly contributes to landscape aesthetics

Roles of Soil Organisms and Soil Organic Matter in Ecosystem Services

Soils are dynamic, heterogeneous and extremely complex systems with a massive number of ecological niches which give rise to a staggering array of biodiversity. Using a taxonomic approach to measure biodiversity, it is often said that more than half of the world's estimated 10 million species of plant, animal and insects live in the tropical rainforests. If this approach is applied to the soil, the level of diversity is often quoted as being in the range of hundreds of thousands to possibly millions of species in just one handful of temperate grassland soil (*e.g.* Gardi and Jeffery 2009). Bacterial biomass is particularly impressive and can amount to 1-2 tonnes/ha in temperate grassland soil. This large abundance of organisms can be found in such a small quantity of soil because the pore space, which consists of either soil or water and is the habitat of soil microorganisms, can be large, making up to 50% of the total volume of the soil, depending on soil texture. The pore space has a massive particle surface area where microbial process take place that can exceed 24,000m^2/g in clay soils, decreasing with increasing silt and sand content.

Soil organisms and biodiversity are central to the majority of soil's functional roles. Their activities, as defined by Torbe *et al*. (2010), include:

- **chemical engineering**, by microorganisms such as bacteria, fungi and protozoans, which are responsible for the decomposition of plant organic matter and the conversion of nutrients into forms that can be readily taken up by plants;
- **biological regulation**, by a large variety of small invertebrates, such as nematodes, pot worms, springtails, and mites, which act as predators of plants, other invertebrates or microorganisms, by regulating their dynamics in space and time; and
- **ecosystem engineering**, by earthworms, ants, termites and some small mammals which modify and create soil structure, and help to develop the matrix architecture, including pore space and hence habitats for smaller soil microorganisms.

Although most of the functions of soil organisms are not *directly* used by humans, their activities underpin the majority of soil ecosystem services.

Soil biodiversity influences all of the main regulatory services, including the regulation of atmospheric composition, via emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Soil organisms indirectly affect the infiltration and distribution of water in the soil, by creating soil aggregates and pore spaces. It has been observed that the elimination of earthworm populations due to soil contamination can reduce the water infiltration rate by up to 93%. Soil organisms regulate pest and disease incidence in agricultural and natural ecosystems, and they may also control, or reduce, environmental pollution (through bioremediation). Soil organisms also contribute to provisioning services that directly benefit people, providing an important source of chemical and genetic resources for the development of new pharmaceuticals. Many antibiotics used today originate from soil organisms, such as penicillin, isolated from the soil fungus *Penicillium notatum*, and streptomycin, derived from a bacteria living in tropical soil.

Many problems in conserving soil biodiversity are associated with the lack of recognition of the importance it plays in both agricultural production and in natural ecosystems. Although many farmers have a profound knowledge of their soils, training and education is often needed to highlight the roles of the soil biota at various levels of the ecosystem/landscape. A key indicator of soil quality is its 'ecological health' and the purpose of good soil management is to protect the soil conditions that support soil organisms (soil structure, pore space, aerobic conditions, *etc*.). In this respect, soil management is analogous to, and should be considered to be as important as, other types of ecological habitat management.

Focusing on just one role that soil organic matter plays in ecosystem services, the

Country	Soil carbon store (billion tonnes)	Carbon stored in peatland (billion tonnes)
England and Wales	2.8[a]	0.6[c]
Scotland	6.9[a]	4.5[c]
Great Britain	9.8[a]	5.1[c]
Northern Ireland	0.4[b]	0.17[b]

[a] Dawson and Smith (2007) [b] Cruickshank *et al.* (1998) [c] Smith *et al.* (2007a, b)

sequestering of atmospheric carbon, particularly in peat and peaty soils, is becoming more widely recognised. The soil organic carbon pool is the second largest carbon pool on the planet and is formed directly by soil biota that produce humus out of leaf litter and aboveground residues. Every year in a temperate grassland soil, it is estimated that soil organisms can process around 25 tonnes of organic matter in a surface area equivalent to a football field. In Britain, the soil, not vegetation, is the largest carbon pool, particularly peatland (see table above). The soil carbon stock is over one hundred times the total carbon stored in woodland vegetation (92 million tonnes) (Milne and Brown 1997).

Soils function as a *sink* for CO_2 where more carbon is put into the soil system through photosynthesis than is removed via respiration. Soils function as a *source* of atmospheric carbon where soil disturbance causes decomposition or oxidation of soil organic carbon (SOC). It has been estimated that around 13 million tonnes of carbon are lost from UK soils annually (Bellamy *et al*. 2005), amounting to around 8% of total UK carbon emissions. The positive feedback loop of increased global temperatures as a result of climate change will inevitably speed up soil organic matter decomposition rates and hence rates of carbon emissions from soils.

Soil organisms respire CO_2 during aerobic decomposition of soil organic matter, they generate CH_4 under anaerobic soil conditions, such as waterlogging, and produce N_2O during nitrification and denitrification. Of the totals emitted, around 80% of N_2O and 50% of CH_4 emitted are produced by soil processes in managed ecosystems. Whilst these gases are potentially more potent greenhouse gases than CO_2 (CH_4 about 21 times and N_2O is 310 times more potent than CO_2), only approximately 8% and 5% of emitted greenhouse gases are CH_4 and N_2O respectively, with CO_2 making up approximately 83% of the total greenhouse gases emitted from soil. These figures indicate the soil's important role in either causing or helping to mitigate the effects of climate change. One focus for future soil management must be to devise practices which minimise carbon transformations and reduce losses of soil organic matter.

Just How Degraded are Soils and What Regulation is in Place to Protect Them?

Soil degradation involves both the physical loss (erosion, compaction and loss of soil structure) and the reduction in quality of topsoil associated with loss of organic matter, nutrient decline, contamination and reduction in soil biomass and biodiversity. Sourcing statistics to illustrate the degree to which the soils of the UK and Europe are degraded is difficult, mainly because of the lack of appropriate raw data, particularly on soil organism biomass and biodiversity. However, Grimm *et al*. (2002) estimated that some 16% of European Community (EC) soil is affected by some form of degradation, with 45% of soils showing a low organic matter content. In England and Wales, the Parliamentary Office of Science and Technology (2006) noted that around 18% of the organic matter present in arable topsoils in 1980 had been lost by 1995.

In terms of soil erosion, the Environment Agency (EA) (2004) reported that 2.2 million tonnes of topsoil was being eroded annually in England and Wales and over 17% of arable land showed signs of erosion. Towers *et al*. (2006) estimated that around 6% of upland soils in Scotland were affected by erosion, identifying peat erosion as a particularly important issue due to the carbon storage function of peaty soils (Scottish peat soils contain around 46% of the total British soil carbon stock). The EA (2002) estimated that the costs of damage to agricultural soil due to erosion in England and Wales was around £264 million a year and the costs of treating water contaminated with agricultural pollutants as £203 million a year. The EA has also estimated that the combined pressures from diffuse pollution caused by soil erosion may put over 80% of rivers, over 50% of lakes, around 25% of estuaries and coasts and 75% of groundwaters at risk of not achieving Water Framework Directive objectives.

While the EC and the UK have *policies* in place to protect soils and to encourage good soil management, and Defra (2009) and MAFF (2000) provide *guidelines* for the good management of soils during soil handling and storage on construction projects, there is no *legal framework* to explicitly protect soils or soil biodiversity, apart from that relating to contaminated land (*i.e.* Part 2A of the Environmental Protection Act 1990 and the Contaminated Land (England) Regulations 2006 and 2012).

National policies on soil protection, provided in the Soil Strategy for England (Defra 2009), the Scottish Soil Framework (The Scottish Government 2009) and the Welsh Soils Action Plan (Welsh Assembly 2008), followed the adoption by the European Commission (EC) of the Soil Thematic Strategy (COM(2006) 231) and a proposal for a Soil Framework Directive (COM(2006)

Desiccated soil. Photo by Sheila Ross.

232) in September 2006 which has the objective to protect soils across the EC. The strategy addresses soil *"pollution, erosion, desertification, land degradation, land-take and hydrological risks"*. The European Parliament recognised that soil has a major role with respect to long-term European sustainability and stated *"the urgent need to regulate its (soil) use and assess and mitigate the impact of external actions"*. It identified the need for both soil protection and remediation. Six years later the EC has still not reached a majority on this legislative proposal, due to the opposition of a number of Member States, including the UK, so the UK still has no legislative soil framework in place. The recently published, much condensed, National Planning Policy Framework makes little specific mention of the protection of soils for the delivery of food and other ecosystem services.

Rural soils in the UK are indirectly protected to a degree through compensationary payments to farmers to adopt environmentally sound agricultural practices and regulation on the management of agricultural land. Anyone who receives support under the Single Payment Scheme (SPS) or certain schemes under the Rural Development Programme for England (RDPE), the Scotland Rural Development Programme (SRDP) or the Rural Development Plan (RDP) for Wales must meet the Good Agricultural and Environmental Conditions (GAEC) standards for soil management and protection. Farmers receiving direct payments are expected to maintain their land in GAEC as described in Defra's (2006) Cross Compliance Notes for Guidance and the Defra (2010) Soil Protection Review (SPR) and to provide Defra with an annual SPR for their land which identifies its soil types and condition and records positive measures they currently take or will take to minimise any soil problems.

Soil management. Photo by Sheila Ross.

Valuing Sustainable Soil Management

Since around 70-80% of land in England, Wales and Scotland is agriculturally managed, implementing annual SPRs to ensure that land is maintained in GAEC and penalising farmers who fail to comply will go some way to conserving soil quality and restoring damaged soil conditions. However, without direct legislative powers, regulators must rely on practitioners to insist on sound soil management practices for development projects, including:

- avoidance of construction or disturbance of best quality soils and protection of their soil structure and organic matter;
- adoption of appropriate and careful methods of soil stripping, handling and stockpiling for all construction projects and preventing the loss of soil as 'waste';
- minimising disturbance to peatland, to reduce CO_2 emissions, for developments such as wind farm or pipeline construction;

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- ongoing prevention of over-fertilising and adoption of field margin buffers to protect surface water quality;
- putting measures in place to avoid unnecessary trafficking and compaction of topsoils;
- recommending novel use of organic soil amendments to offset and replace lost soil organic matter; and
- prescribing innovative soil manipulation and management practices to support ecological habitat restoration and creation.

Soil practitioners must raise awareness of the value of soil biology in regulating many ecosystem services, only a few of which have been illustrated in this paper, and to recognise the purpose of good soil management – which is ultimately to protect the soil environment for the soil biota. Soil is a precious asset which should be treated kindly.

This paper has not touched on the tricky issue of payments for soil ecosystem services. However the costs of good soil management and of remediating damaged soils are relatively well known. What is less well understood is the likely cost to society of the failure to implement sustainable management of our soils.

About the Author

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1. Agricultural soil.
2. Soil inspection.
3. Soil exposed at quarry.
Photos by Sheila Ross.

Heathland in favourable condition, with bare ground and diverse vegetation structure. Dersingham Bog, Norfolk. Photo by I Alonso/Natural England.

Restoring Heathlands While Minimising Damage to Soils: A Review and Recommendations

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Heathlands are habitats of great conservation value and much effort has been devoted to their restoration and expansion over the last few decades. However, due to the scale of the interventions commonly used, the potential negative impact of restoring heathland on the conservation value of the underlying soil should not be forgotten.

This article highlights the importance of heathland soils and reviews and classifies the most common management, restoration and expansion techniques used on heathlands across Europe. It then goes on to consider their potential impact on soils and recommends a series of steps to prevent, or significantly reduce, the risk of damage to soils on heathland sites in future restoration or expansion projects. The same advice is likely to be useful when restoring other habitats using similar techniques, such as grasslands.

Introduction

Heathlands are landscapes of great aesthetic and nature conservation value. They are not 'natural' but a consequence of human interference with vegetation and soils. Grazing, cutting and burning reduced the soil fertility, increased their acidity, and kept the heaths open and mostly devoid of trees for over 5,000 years. Peat was also cut in some areas for fuel or as animal bedding and used as fertiliser. Many heathlands provided sources of sand and/or gravel, and some have been military training grounds, all of which would have disturbed any pristine soils.

Heathlands have suffered great losses in both extent and quality in the last century across Europe. The main causes are development,

afforestation, agricultural improvement and changes in vegetation due to neglect or atmospheric deposition of nutrients such as nitrogen. In the last 20 years, numerous initiatives have aimed to restore (*i.e.* improve the condition) or re-create heathlands *(i.e.* at sites that had been converted to farmland or forestry).

This article refers mainly to lowland heathlands although some aspects may also be relevant for upland sites and other lowland habitats such as grasslands. It summarises the findings of a project funded by Natural England (Hawley *et al*. 2008) whose main aims were: i) to identify the methods adopted in the restoration/ re-creation of lowland heathland in the UK; ii) to provide an analysis of the existing scientific literature on the benefits and problems associated with these practices across Europe; and iii) to recommend guidance for future projects in order to avoid damage to soil features. The original project also looked at the impact of the same interventions on the historic environment.

Conservation Value of Heathland Soils

Britain has a great diversity of soil types, largely because of the variety of soil-forming factors: climate, geology, topography and historical land use. Soil is a multifunctional resource providing a range of ecosystem services such as food, industrial materials, clean water, a means of carbon sequestration and, of course, it is a fundamental component of all ecosystems.

Yet despite its recognised importance, soil is relatively ill-understood. Although soil biodiversity is greater than the aerial biodiversity it plays such an important role in supporting, less is known of the soil ecosystem and its communities of fungi, invertebrates and bacteria.

Podzolised soil in Harbottle Hill, County Durham. Photo by G Hawley.

The importance of conserving geodiversity and our Earth heritage has been recognised for many years. Soils belong to the Earth heritage 'family' but are often overlooked as the poor relative – out of sight and out of mind. Nevertheless, they can have scientific and intrinsic conservation value, containing a record of past environments and human activity. They can act as repositories for durable materials of animal or vegetal origin that can be used in palaeoenvironmental reconstruction, as well as human artefacts. Palaeosols are former soils preserved by burial beneath younger sediments like sand, peat, alluvium and loess. These 'fossil' soils tell a story of when they were formed, which may be very different to the present day climate and vegetation.

In Britain, heathlands have developed on aeolian deposits of sand and loess, glacial till, glaciofluvial deposits and other fairly well-drained substratum. They are also found widely on acid peat where there has been drying of the surface and bog vegetation has been replaced by 'wet heath'.

Heathland soils can vary but they are often associated with podzols and characteristically have a surface acid 'mor' humus layer. One feature of a mature podzol soil is clearly defined horizons in the profile. Rainfall percolating through the organic surface layer picks up organic acids that remove soluble metal-humus complexes in the upper mineral horizon. This leads to a washed-out grey horizon rich in silica but below is a dark brown horizon where organic material, iron and aluminium are translocated (Avery 1990). Soil features such as these can take hundreds, even thousands, of years to develop.

Many heathland restoration or re-creation activities have involved altering the soil structure and/or its chemical composition and pH with the aim of making it more suitable again for characteristic heathland plant species. Some practices such as soil removal and inversion are by nature invasive and radically alter the soil profile. If the soil has already been altered by, for example, farming or construction, little harm will have come by it. But if the soils are 'pristine', exhibiting features responding to natural process and function they may have intrinsic scientific and educational value. A soil may be an excellent example of a soil type, and just as protection is afforded to valued plant and animal assemblages, the soil should also be considered for conservation. The plea here is to simply check in advance of works that important soil features are not being lost or damaged.

Review of Heathland Restoration and Re-Creation Methods

We reviewed heathland restoration and re-creation techniques used across Europe. Some replicated traditional practices, which had little effect on the soils whereas more recent methods involved quite radical disturbance. Soil preparation techniques were classified into four categories (Table 1). Information was gathered from academic and grey sources and through a questionnaire completed by 26 UK restoration practitioners. Figure 1 illustrates the methods being adopted, alone and in combination, based on their responses.

1. Managing Above Ground Vegetation

Grazing is one of the most commonly used techniques in heathland management in the UK and Europe to repress scrub and open up the vegetation, encouraging low-growing plants and promoting growth in dwarf shrubs (Bullock and Pakeman 1997). A net reduction on nutrients can only be achieved if animals are housed or moved elsewhere for the night or by a high grazing pressure, which is not generally recommended. Appropriate stocking densities, however, can produce a mosaic of vegetation structure on a much smaller scale than is achievable by other methods, such as cutting, burning or mowing (Lake *et al*. 2001).

Grazing could impact negatively on soils at high stocking rates through trampling, poaching and erosion. On the other hand, reducing the size of tree seedlings and the rate of scrub invasion could maintain the existing soil characteristics.

Cutting removes part of the above-ground biomass, thus at least temporarily releasing ericaceous vegetation from competition with purple moor grass, bracken or shrubs and trees. It is also often used as an alternative to burning. It is important to remove all cut material to achieve a net reduction of nutrients and to avoid covering the seed bed or smothering smaller growing plants.

As with grazing, cutting tends to be of limited use in heathland restoration as this will not usually kill, remove or control undesirable species adequately, and it does not provide

bare ground. Cutting is reported to be one of the most frequently used techniques in the management and restoration of heathland in Britain and Europe today, whether used in isolation or in combination with other methods. However, cutting and removal was found to be used in only a third of the heathland restoration projects investigated as part of this study.

Heathland regenerating in felled coniferous plantation. Photo by G Hawley.

Prees Heath, Shropshire, heathland re-creation in ex-arable land. Photo by I Alonso/Natural England.

Bere Heath, natural recolonisation from acid grassland in Dorset. Photo by P Anderson.

The use of **herbicides** is a common practice, particularly as a method of bracken control. Cut stumps, or previously cut re-growing shrubs may also be treated with herbicides (Symes and Day 2003). Pywell *et al*. (1995), in comparing methods for re-creating heathland on abandoned farmland, demonstrated that herbicide application, although preserving the integrity of soils, was not an effective treatment in isolation as the dead vegetation inhibited the regeneration of heathland plants. However, when used in combination with cultivation and the addition of harvested shoots results improved. The best results were achieved when topsoil or turves had been added as a source of seed.

Burning is used in Europe for heathland maintenance purposes in the form of controlled winter burns (Bullock and Webb 1995), frequently in combination with other techniques, most often grazing. It results in bare ground and a relatively short, open vegetation structure for a few years, and then an even-aged stand of heather.

A proportion of nitrogen and sulphur from the vegetation and litter is lost in the smoke during the burn; phosphorus is released to the soil. Burning increases the concentration of ammonium in the organic layer but does not significantly affect the A-horizon. However, burning can result in a large input of potash to the soil, which can encourage vigorous bracken growth. Burning is a cheap, useful technique to help keep some soil nutrient concentrations low (Haerdtle *et al.* 2006). Such conditions are essential for the restoration of heathland communities, although severe burns can significantly inhibit recolonisation by destroying the seed bank.

The removal of heathland and scrub vegetation by managed burning is unlikely to lead to the wholesale erosion of the soil as it leaves the root system intact. However, it will depend on the depth of the burn and the resulting rate of heather regeneration. Deeper summer burns, could result in greater incidences of soil erosion because of the damage to upper soil horizons.

2. Changing the Soil pH and Nutrient Status

Heathland podzols are generally inappropriate for productive use because of high acidity, lack of plant nutrients (especially phosphorus) and high carbon:nitrogen ratios. Before the advent of artificial fertilisers some heathlands suffered short, sometimes cyclic, periods of cultivation but were later abandoned when the fertility was exhausted (Hopkins 1980). In other cases the soil profile was never significantly modified. Heathlands that have been cultivated often see drastic changes in soil characteristics and the destruction of soil horizons by mixing them, as well as by the addition of lime to increase the pH, and fertilisers. Therefore, when cultivation is abandoned and there is an opportunity to re-create heathland it is necessary to reverse these changes. As a first step, a soil analysis should be performed to determine the current nutrient and pH status. If the soils have been significantly altered it may not be sensible to consider heathland re-creation as the costs could be prohibitively high and the interventions required could cause further damage.

There has been much research on the ways of decreasing pH, which can be achieved through the addition of sulphur, bracken litter or peat (Marrs 1985).

3. Disturbing the Soil

Many projects have involved the reduction of nutrients; removing unwanted species; or creating bare ground by soil stripping and scrapes. In this study, 73% of the projects reported using some form of soil disturbance.

Nutrient reduction and the control of unwanted species usually take place over large areas. On the other hand, bare ground is usually created in small plots, for example, on areas of a few square meters and to a shallow depth of a few centimetres. It is not suitable where large areas and volumes of soil are involved, unless this is part of an existing planned development such as a mineral working.

The depth of topsoil to be stripped should be kept to a minimum as, once exposed, organic palaeo-environmental remains can decay very quickly and the environmental record lost. The costs are also important. The top 25cm of soil from one hectare is likely to weigh between 3,000 and 4,000 tonnes, which would require the use of heavy soil moving equipment and an appropriate location for disposal. For even small projects, if soil is to be stripped, an evaluation should be completed and the soil should be reused and not regarded as waste or used in landfill.

Full-scale **soil inversion** involves using specialist ploughs to bury the topsoil under some of the subsoil. Normal cultivation is

usually only to 20cm deep, so going deeper is likely to damage the undisturbed soil beneath. From the soil perspective, the best practice is to avoid this technique in most circumstances. Topsoil is treated as a waste material and disposed of by burying. There is also evidence that the results of deep ploughing with conventional machinery only diluted nutrients in the short-term (Allison and Ausden 2004). If nutrient levels are high at the start and other considerations still point towards a good site for heathland re-creation, it should be accepted that it might take many years to achieve good heathland vegetation.

Discussion

Understanding traditional management methods is important for contemporary heathland conservation and management. Most techniques tend to alter the structure or composition of heathland vegetation, but reducing soil nutrients or controlling invasive species such as scrub or purple moor-grass is more difficult. Scrub invasion cannot always be effectively controlled by grazing alone. None of the restoration methods involving the reduction or removal of surface vegetation are effective in significantly removing soil nutrients or reducing soil pH in isolation, although burning, and cutting and removal, serve to reduce soil nutrient loadings to some degree. Most methods work better when used in combination with those that disturb/remove the topsoil. These are prime considerations when attempting to restore or re-create heathland ecosystems, in particular, in the ground preparation stages.

The long-term persistence of acidic podzol soils and seed banks under conifer plantations suggest that this should be the most practical and cost-effective way for restoring lowland heathland. The timber crop can be sold in some cases to offset costs of restoration, and there should be no need to dispose of large volumes of soil. In addition, there would be little need to condition the soils to reduce nutrient levels and pH.

The re-creation of heathland on former arable land can prove more problematic and expensive because of the high nutrient and pH levels that can result in the proliferation of undesirable species at the expense of natural heathland vegetation. In addition, any acidification of the soil using elemental sulphur in particular, could affect soil processes.

Figure 1. Ground preparation techniques as reported in a questionnaire for heathland managers: left side, individual techniques; right side, combination of techniques.

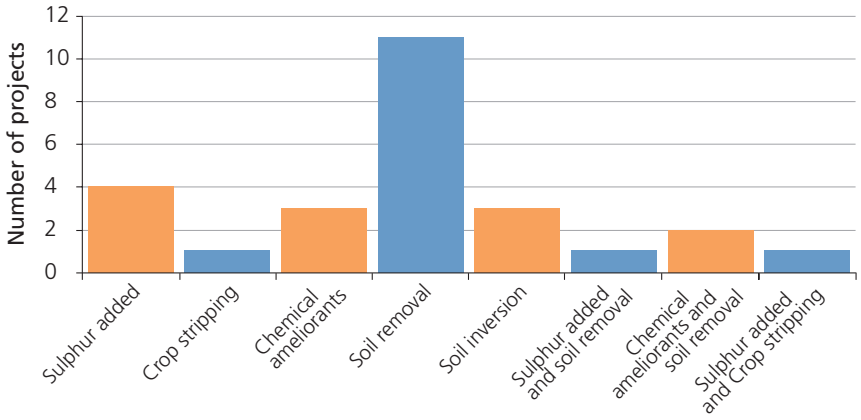
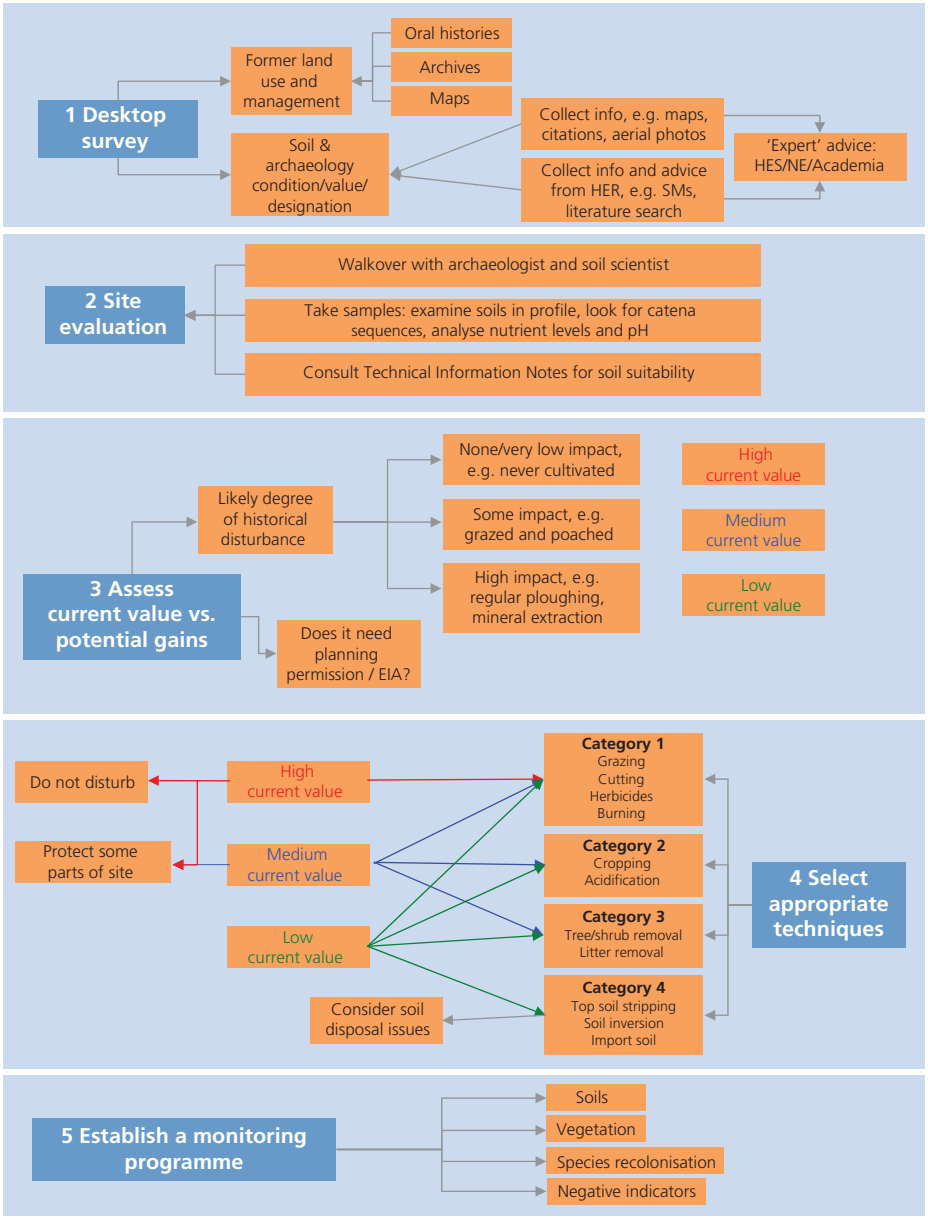


Figure 2. Heathland restoration/re-creation: steps to protect soils and archaeology. Biodiversity surveys are not included here (based on Hawley *et al.* 2008).



EIA = Environmental Impact Assessment; HER = Historic Environment Record; HES = Historic Environment Service; SMs = Scheduled Monuments.

In soils confirmed as having scientific, conservation or archaeological value, non-disturbance methods are the only option to avoid causing irreversible damage to these features. Methods such as cutting, burning, or herbicide application can be successful in restoring former heathland, but their effectiveness in re-creating heathland can be limited where soil nutrients need to be reduced. In these circumstances it may be impractical to consider heathland re-creation on arable land.

There were no examples from the questionnaire where practitioners had considered the soil resource as having intrinsic scientific and nature conservation value. It was also surprising that in a number of projects there was no soil analysis to check on nutrient levels and pH in advance of restoration works commencing.

Recommendations

It is recommended that the steps in Figure 2 are followed for the protection of soils (and archaeological interest) when restoring or re-creating heathlands. Above all, it is necessary to remember that the processes that initially created heathlands were slow and gradual. Therefore, positive restoration results may take time to achieve. Trying to achieve quick gains may be more expensive, potentially damaging and, in the long-term, not so successful.

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Table 1. Categorisation of common methods used in the re-creation and restoration of heathland in Europe.

	Treatment category			
Method	**Category 1** (Herb layer management/ removal)	**Category 2** (pH and nutrient reduction)	**Category 3** (tree/shrub removal)	**Category 4** (soil disturbance & removal)
Grazing	X			
Cutting	X			
Herbicide application	X			
Burning	X			
Cropping (if it implies ploughing)		X		
Acidification		X		
Tree/scrub (incl roots) removal			X	
Litter disturbance/ removal			X	
Disturbance of soil layers				X
Removal of soil layers				X

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Competing claims for valley bottom alluvium in Snowdonia: stock management, water quality, carbon storage or nature conservation?

Soils and Land Capability – Assessing the Capacity of Land to Deliver Ecosystem Services for the National Trust

Dick Thompson
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Katherine Hearn
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Summary

The National Trust is developing a new land capability process to enable sustainable delivery of ecosystem services on its land. A four step process is described with case studies. Soil is a critical component of this process. The Trust is using data from the National Soil Map and an expanded Soilscapes classification, and field soil survey to determine suitable land uses.

Introduction

In the ancient world if, when you dug and refilled a soil pit, all the spoil went back in the hole without too much stamping up and down then the land was thought good. Ideas were little changed until in post-war, food-rationed Britain the need to protect our most productive land from development became a government priority. A simple methodology for assessing the productive capacity of land evolved into the now rigorous Agricultural Land Capability Classification which defines seven productivity classes based on soil, climate and topography.

Feature Article: Soils and Land Capability – Assessing the Capacity of Land to Deliver Ecosystem Services for the National Trust

A range of environmental concerns have now broadened international and national land use policy to include concern for all the services that land and soil supply. The Millennium Ecosystem Assessment (2005), the UK National Ecosystem Assessment (2011) and more recently the alternative approaches to sustainable intensification of food production (Balmford *et al*. 2012) are setting a new and challenging agenda for land capability assessment.

Land Management in the National Trust

National Trust land can deliver ecosystem services in abundance (Box 1). The Trust recognises the increasing demands on land to deliver multiple products while protecting natural resources. *Our Land – for ever, for everyone* (National Trust 2010b) identifies seven major functions for land (production (food and wood); water services; carbon storage; bio- and geo-diversity; landscape and cultural history; access, recreation and experience; and space for development) analogous to ecosystem services and recognises the need for a land capability tool to decide what best to do where.

Box 1. National Trust facts and figures

The National Trust owns and provides:

- 260,000ha of land
- 700km of coastline
- 1,000 farms
- 47,000ha of land over important drinking water supplies
- over 1/3 of the best wildlife sites in England, Wales and Northern Ireland
- 70,000ha of organic soils rich in carbon and 2% of the soil and vegetation carbon store of England and Wales
- 65,000 archaeological and cultural sites
- 100 million visits to the countryside

The Challenge

Land capability highlights the natural constraints of the land, such as topography, climate and soil factors, and helps assess different land use options. The Trust wants to examine constraints and suitability relevant to all the functions of land, not just agriculture – for example, new woods for biofuel, land for flood management or new mountain-biking facilities. There is much relevant work in progress by other organisations, with similar aims (Box 2) but off-the-peg tools are not available. Our work is focused on two areas:

1. Using National Soil Map and Bulletins (Soil Survey of England and Wales 1983), and making the information easier to interpret by developing the 'Soilscapes' classification.
2. The development of a land capability assessment process at levels of input ranging from short desk study through to more detailed assessment based on field investigation.

Box 2. Examples of relevant ecosystem services assessments by other organisations

- Cranfield University's Land Information System site-specific reports describe the interaction between soils and habitats, water movement, the impact of soil on cultural heritage and other topics *http://www.landis.org.uk/services/sitereporter.cfm*
- Analyses in the UK National Ecosystem Assessment (2011), for example *"trade-offs and synergies among moorland goods and services"*. The UK NEA Technical Report. UNEP-WCMC, Cambridge *http://uknea.unep-wcmc.org/*
- Organic Conversion Information System (OCIS) Public Goods Tool Development, Organic Research Centre, Elm Farm *http://orgprints.org/18518/*
- Polyscape GIS tool for mapping and assessing multiple ecosystem services (Jackson *et al*. 2012) *http://mahider.ilri.org/handle/10568/3644*
- Biodiversity Opportunity Mapping – compiled by many Wildlife Trusts and Biodiversity Fora, *e.g.*Yorkshire and Humber Biodiversity Forum *http://www.yhref.org.uk/pages/biodiversity-opportunity-areas-map*
- Catchment walkover surveys for Water Framework Directive River Basin plans (Environment Agency 2012) and Rapid Assessments of River Environments by Association of Rivers Trusts (Dugdale 2006) *www.edenriverstrust.org.uk*
- Pilot evaluation for a Soil Carbon agri-scheme, National Trust and Natural England, based on research carried out on the National Trust's Wallington Estate. (Warner 2011 and National Trust 2010b) *https://connect.innovateuk.org/c/document_library/get_file?p_l_id=830331&folderId=1344097&name=DLFE-14352.pdf*

Box 3. National Trust 'hotspots' for soil carbon and risk of soil erosion

HIGHEST SOIL CARBON

Properties with largest store of soil carbon (tonnes):

- Borrowdale 13,444,203
- Ysbytyy Estate 12,810,019
- Wasdale 9,557,174
- Carneddau & Glyderau 8,633,795
- Hope Woodlands 8,196,174
- Abergwesyn Common 7,222,375
- Ullswater 6,782,554
- Eskdale 5,909,107
- Wallington 4,638,109
- Ennerdale 4,450,364

HIGHEST SOIL EROSION RISK

Properties with largest extent of erodible soil (ha):

- Ysbyty Estate 4509
- Park Hall Moor, High Peak 1885
- Marsden Moor 1561
- Ullswater 1022
- Wasdale 1005
- Killerton 916
- Kinderscout 904
- Kingston Lacy 862
- Trowlesworthy 832
- Orford Ness 634

Soil Mapping and Soilscapes

The properties of a soil reflect the influence of geology, land use and vegetation, climate and topography. Soil maps are therefore critical sources for land capability assessment. The National Trust holds the digital National Soil Map under licence and uses the legend and accompanying

Figure 1. Extracts from a Soilscapes unit description

General properties

This section describes typical properties for these soils. Representative properties are in **orange shading** while less frequent conditions are in **yellow**. *Those in grey do not apply to these soils.*

Topsoil				
texture	Silty clay loam to sandy loam			
Subsoil				
texture	Silty clay loam to sandy loam			
Substrate/bedrock				
	Fine silty or loamy and coarse loamy river alluvium			
Profile				
Drainage	Free	Imperfect (seasonal)	Poor (seasonally wet)	Very poor
Water table	None	Perched, shallow water table	Fluctuating groundwater table	
Land drains	Unlikely	Possible	Likely	
Flow paths	Vertical flow, rapid bypass flow common			
Available water	Small (<100 mm)	Medium (100-150mm)	Large (>150mm)	
Water balance	Very droughty	Moderately droughty	Slightly droughty	Non-droughty
Base status	Non-calcareous but with high exchange capacity – medium base status			
Likely current land use and cropping patterns				
Farming	Grassland with cereals and potatoes where protected from flooding			
Horticulture	None			
Sylviculture	Few woods			
Habitat	Alders and wetland in wet hollows and on river banks			
GAEC soil type	Medium and Sandy and light silty soils			

Risks and constraints

The risks and constrains are described under the principal relevant land uses. Average options and representative text are in **orange** while less frequent conditions are in **yellow**.

Arable farming/horticulture						
Suitability	Well	Moderate	Marginal	Unsuited		
Risks/constraints						
Compaction	High risk		Moderate risk		Low risk	
Type of erosion	Water			Wind		
Erosion	High	Medium	Low	High	Medium	Low
Loss of SOM	High		Moderate		Low	
Loss of nutrients	High		Moderate		Low	
Run off pollution	High		Moderate		Low	
Leaching-related pollution	Extreme	High	Moderate	Low		
Acidification	High		Moderate		Low	

Bulletins for basic land capability information. A soil carbon database has been derived (Gibson 2008) so that the Trust can identify top 'carbon hotspot' properties while recognising that the map's soil associations are heterogeneous (Bell and Worrall 2009). Similarly 'hotspots' for soil erosion risk and other attributes can be used to prioritise survey or management actions (Box 3). Currently no source of map information other than the National Soil Map is relevant to land capability.

The National Soil Resources Institute's Soilscapes soil map and classification are viewable at *www.landis.org.uk*. This scheme amalgamates the 300 soil associations of the National Soil Map to form 27 more generalised soil units, each characterised by a broad soil type and described in simple terms with limited interpretive information.

We have prepared additional information for each unit (Figure 1) covering general soil properties, likely land use and the distribution of the unit on National Trust land. Assessments of the capability and attendant risks for major functions (arable farming, livestock farming, timber, water services, carbon storage) are included along with conservation and scientific interest. This resource is available to Trust staff for scoping land capability.

The Land Capability Process

A staged process has been developed to answer in more detail the questions 'what land-uses (functions or services) are most appropriate, and how sustainable is our land use?' The steps are as follows:

Step 1) Setting objectives and identifying options

Land capability is commonly employed when change (new acquisition or change of tenancy) presents an opportunity for rethinking future land use, or when 'sustainability' is being questioned, especially in the 'hotspots'. Local staff commonly identify a number of options and these form the initial focus of the land capability assessment.

Step 2) Gathering evidence and data

A range of information and map layers are available from the internet and published sources and the Trust has acquired other data sets. The most useful are solid geology including aquifers, boreholes and protection

zones, drift geology, soils, soil and vegetation carbon, slopes, surface water, flood maps, catchment boundaries, climate and climate change information, habitats and designations. These form the basis of desk-based assessments and are augmented by field survey where this can be justified.

Step 3) Assessing vulnerability and risk

Based on the options identified under Step 1, relevant condition and vulnerability assessments are carried out by a land resources specialist. As far as possible the current state of the land including habitat, soil and water condition and local environmental risks are included in the assessment as well as the land's potential for ecosystem service provision. Risks to water are based on discussion with the Environment Agency (*e.g.* Environment Agency 2012). Risks to habitat, cultural landscapes and recreation functions are identified by Trust specialists where necessary.

The most frequently encountered risks include soil erosion, soil compaction and reduced infiltration, loss of soil organic matter, nutrient enrichment, water shortage, habitat fragmentation and loss of access opportunity.

Step 4) Land Capability options analysis

Results from steps 2 and 3 are drawn together at this reporting stage. The identified options are assessed in terms of their suitability, risks, possibilities for mitigation of risks, and sustainability. Threshold values are available for a few ecosystem services. Water quality has many risk parameters set in regulation. Sustainable levels of soil carbon for a particular soil are ill-defined.

Given the lack of threshold values and the partial understanding of the consequences of land use and management change, decisions about the relative benefits and sustainability of competing options are based on professional judgement.

Land Capability Case Studies

The approach has been applied to a number of lowland and upland farms and estates in National Trust ownership.

A livestock farm in the Upper Thames valley

The objective: To examine the sustainability of the farming system.

Key evidence: The soils are mostly seasonally waterlogged and artificially drained; some are lime-rich and impermeable clays others humose groundwater gleys. Most of the land drains to the Thames although there is a small, localised gravel aquifer; information was available on flood risk, biodiversity and the historic landscape.

Vulnerability and risks: Nutrient-enriched run-off; loss of organic matter in lighter but humose soils; and compaction in wet clay soils are the main risks. Most soils are in good condition as is the gravel aquifer

Land capability: The main soils are suited to livestock farming at current levels and arable is not under consideration; the floodplain acts as flood storage; soils are storing significant amounts of carbon but there are opportunities for biodiversity enhancement (Table 1). Nutrient losses from the farm are unquantified.

Conclusion: The present management is the most sustainable option.

Hafod y Llan, Snowdonia

(See main feature photograph)

The objective: To identify the best patterns of usage for this upland farm's valuable valley-bottom land. There are competing demands from grass production, water management, carbon storage and nature conservation.

Key evidence: A field survey of the soils and land types was undertaken. The rainfall is high and climate cool and moist. There are many contrasting soil types present from freely drained acid soils to waterlogged silts and peat. The lowest land floods regularly and former drainage systems are neglected. There is a valuable fishery in the river. Although pastures and meadows have been invaded by soft rush many are species-rich and there are areas of high quality valley mire.

Thames floodplain with well-rooted, carbon-rich groundwater gley soil, providing multiple services

Vulnerability and risks: The high rainfall places soils at risk of compaction for much of the year and limits grazing on many soils. Soil acidification and nutrient impoverishment warrant investigation. Improved land drainage is needed on the floodplain and estuary floor if their productivity is to be improved. A more detailed study of the valley and estuary hydrology is needed.

Land capability: The valley sides and better drained areas of the valley floors are the best suited for grass production (Table 2). The estuary soils are capable under a warmer climate of horticultural cropping but the high rainfall and flood risk raise questions about its cost-effectiveness. Under the prevailing

Peat erosion in the High Peak, Derbyshire

Table 1. Functions of land provided by Oxfordshire farm in Thames Valley

pale blue – positive provision; orange – potential not yet realised

Service / function	Main area & soil unit: Gently rising land above floodplain - clayey but not waterlogged soils (Drayton soils)	Main area & soil units: Thames floodplain - groundwater wet gley and alluvial soils (Kelmscott, Thames & Fladbury soils)
Production	Organic beef farming - seasonal grazing on permanent and ley grassland; silage and hay production	Organic beef farming - seasonal grazing on permanent and ley grassland; some hay
Water services	Water catchment via drains to river; flash flooding risk	Major flood storage area; immediate floodplain and banks of R Thames; surface water quality moderate or good; groundwater in gravels – quality poor
Carbon storage	Moderate where soil condition good	Very rich carbon store
Biodiversity	Currently poor	Currently poor, except along river bank which is of some value; potential good
Landscape & cultural history	Field pattern; otherwise no particular interest as yet identified	Medieval village site under permanent grass; buildings of historic interest; farming history of note
Recreation and inspiration	Negligible access; landscape quality could be improved	Good access; walks, river swimming; boating, etc while retaining quiet and peaceful areas too

Table 2. Hafod y Llan Land Capability summary table

Landscape unit	Food production	Support of wildlife	Carbon storage in soil
Hill tops (Very acid, loamy upland soils with a shallow peaty surface)	Moderate	Moderate	Moderate
Valley sides (Freely draining acid loamy soils over rock)	High	Low	Low
Foot slope seepage zones (Naturally wet acid peaty and loamy soils)	Low	High	High
Gravel mounds (Freely draining slightly acid loamy soils)	Moderate	Low	Low
River terraces (Freely draining slightly acid loamy soils)	High	Low	Low
Mires (Naturally wet acid deep peat soils)	Low	High	High
Floodplains (Silty floodplain soils with variable drainage)	Low Moderate if drained	Low	Low
River corridors (Gravelly or sandy soil, some naturally wet)	Low	High	Low
Estuary floors (Naturally wet, slightly acid, silty and loamy soils)	Moderate High if drained	Low	Low

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Table 3. Land Capability assessment for selected land-uses on High Peak Moors

Land unit	HIGH PEAK MOORS			
Functions of Land	**Suitability / capability**	**Risks and potential degradation**	**Combined rating**	**Comments**
Food - livestock	marginally suited	high risks	-	Current damage to mitigate
Managed grouse (on peat soils)	marginally suited	high risks	-	Current damage to mitigate
Surface water catchment	moderately suited	low risks	++	Gullying to continue to address; need to ensure no new structures
Carbon storage in soil	well suited	low risks	+++	One of NT's top properties for this
Carbon capture / storage in vegetation	moderately suited	slight risks	++	Could require more woodland to maximise, with slight risks to habitat, landscape etc without
Greenhouse gas reduction/climate regulation (reduce CO_2 loss)	moderately suited	low risks	++	Gullying (CO_2 emission) to continue to address
Habitats (conserve & enhance existing)	well suited	slight risks	+++	Slight risks regarding loss of access, eg if bogs all very wet when repaired
Key species	moderately suited	low risks	++	Environment sub-optimum due to acidity and geography; sanctuaries and impact on access may be required
Landscape quality (open moor, purple heather, peat, cloughs, rock edges)	well suited	low risks	+++	
Archaeological record	well suited	low risks	+++	
Historic landscape and cultural & traditional land use	well suited	no risks	+++	Note that this is assessed without any particular management regime in mind
Physical access (walking; biking, etc)	well suited	high risks	++	Mitigate with zoning

climate, the peat soils are best suited to nature conservation, and carbon and water storage.

Conclusion: Field scale information on topography and soil has produced valuable information on the capability of the different land types present and will lead to allocation of land to delivery of one or more ecosystem services amongst livestock production, wildlife, carbon and water storage on a field by field basis.

High Peak Estate, Derbyshire

The objectives: To consider all the present functions of the moorland and to analyse risks associated with them.

Key evidence: Included the cover of peat and other organic soils. The carbon store, climatic constraints, bedrock acidity, catchment boundaries, reservoirs and water courses, nature conservation designations and the history and present popularity for recreation were all collated.

Vulnerability and risks: There are significant natural constraints and thirty risks were identified, most frequently peat and soil erosion, peat compaction, habitat damage and the prevention of peat growth, impact on access routes and disturbance to species. The peat is chronically eroded.

Land capability: Table 3 identifies the capability of the high moorland. Management changes and mitigation are needed to continue within the capability of the moors without damage to natural resources.

Conclusion: The high moorland is not capable of continued provision of some services.

Conclusions

There are strong calls in the National Trust for a land capability process. Rapid desk assessments are of value in bringing different specialisms together although the results are often predictable. More in-depth surveys especially those including soil and water resources are providing new insights which should make a material difference to the sustainability of land management in the National Trust.

About the Authors

Katherine Hearn, originally a vegetation ecologist, has advised the National Trust on most aspects of nature conservation for over 30 years. Her current interests are in improving soil quality as well as nature conservation value on Trust properties, and developing the Land Capability approach further.

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Remediation of Contaminated Land: Impacts of Recent Changes to the Law and Guidance

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Student

This article considers the implications of the recent (April 2012) changes to the contaminated land legal regime contained in Part 2A of the Environmental Protection Act 1990. It is of relevance to local authority and Environment Agency staff who enforce the regime, to landowners and industrial operators of sites and to environmental consultants alike.

Introduction

Many readers will be familiar with the contaminated land regime as set out in Part 2A (also known as Part IIA) of the Environmental Protection Act 1990 (EPA 1990). The regime contains the statutory rules for remediation and clean-up of 'contaminated land'. This is land which is judged to cause an unacceptable level of risk as determined through a 'source, pathway and receptor' model. If the land is found to be 'contaminated', local authorities are under a duty to serve a notice to remediate it (under section 78 of EPA 1990). This notice must be served on the 'appropriate person(s)'. As a general rule, liability will first attach to the 'causer' and/or the person 'knowingly permitting' the contamination of the land. In this way, liability is retrospective (*i.e.* a 'causer' who left the site years ago could still face liability). If such persons cannot be identified then liability for remediation passes to the current owner or occupier of the land.

Recent Changes

The contaminated land provisions of Part 2A of EPA 1990 must be read in conjunction with a number of regulations and guidance, which contains both statutory and non-statutory assistance for local authorities and others. Up until April 2012, the guidance for England has been found in Defra Circular 01/2006. For Wales, the guidance was contained in Part 2A of the Statutory Guidance on Contaminated Land (2006) issued by the Welsh Assembly. The new guidance for Wales mirrors the new guidance for England.

However, following a consultation between December 2010 and March 2011 by the Department for Environment, Food and Rural Affairs (Defra) and the Welsh Assembly Government (now the Welsh Government (WG)), the statutory parts of the guidance for both England and Wales on the contaminated land regime have been revised. For England, a new guidance document (Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance) came into force on 6 April 2012, replacing Circular 01/2006. In Wales, a new guidance document (WG: Contaminated Land Statutory Guidance (April 2012)) was also published in April 2012.

It must be noted that this new guidance does not relate to radioactive contaminated land. Separate guidance on radioactive contaminated land in England, drafted by the Department of Energy and Climate Change (Environmental Protection Act 1990: Part 2A, Radioactive Contaminated Land Statutory Guidance) also came into force on 6 April 2012. Similar guidance for radioactive contaminated land in Wales was expected to be published in June 2012.

At the same time a long awaited amendment has been made to section 78A(2) EPA 1990 in which the definition of contaminated land is found.

Purpose of the Changes

It was made clear from the outset in the consultations that the current legislation was still fit for purpose and that significant amendments to the Part 2A regime were not required. However the consultations did ascertain that the statutory guidance needed some adjustment to provide clearer, more effective and more efficient guidance to tackle the ever-growing complications that local authorities (as enforcers of the regime) were facing. In particular there was a need for greater consistency between local authorities; and a lack of clarity in the previous guidance meant unnecessary intervention was occurring on low-risk sites, with not enough focus being placed on sites of higher risk.

Key Changes to the Guidance

Both sets of guidance for England and Wales have been significantly consolidated (the previous Defra guidance of 190 pages has been cut down to 74 pages) to simplify processes and clarify how local authorities should investigate and identify contaminated sites.

The key changes are:

1. The new guidance documents contain a new section describing the broad aims of the contaminated land regime, encouraging local authorities to focus on what is essential.
2. The new guidance documents place greater focus on high risk sites. It includes a new focus on risk assessments and prioritisation of sites for clean up. This is to try and strike a reasonable balance between identifying and removing unacceptable risks to human health and the environment, while ensuring that the burdens faced by individuals, companies and society as a whole are proportionate and sustainable. Consequently, there is a new categorisation test which is intended to assist local authorities in deciding whether or not land is contaminated. The test relates to situations where there is a significant possibility of significant harm to human health or a significant possibility of significant pollution of controlled waters. The starting point for an authority is to assume that the land is not contaminated unless there is clear evidence otherwise. The authority must rank sites as categories 1-4. If it is concluded that the site has a high probability of causing harm it is to be classified as Category 1. If the land is deemed to have a low or no risk, the site is classified as Category 4. Categories 2 and 3 lie inbetween, where there may be insufficient evidence to conclude whether the land is contaminated; or where the classification of the site is unknown because of absence of scientific knowledge. Defra has indicated that assistance would be offered to local authorities to determine whether a site should be classed under Category 2 or 3. Defra has also indicated that it is currently developing technical guidance on what amounts to Category 4 land.
3. The new guidance seeks to address the problem that determining a site as low risk was taking too long. Therefore, as before, if the site is deemed to be 'contaminated', then the local authority is under a duty to serve a remediation notice. Now however, if the site is deemed not to be contaminated, the local authority must *"issue a written statement to that effect to minimise unwarranted blight"*. (s5.2). Thus the process to dismiss low risk sites has been simplified. It should provide more certainty for local authorities and landowners and this in turn should promote development of sites.

Key Change to the Definition of Contaminated Land

Up until 6 April 2012 there have been two limbs to the definition of 'contaminated land' under Part 2A (s78A). It is any land which, by reason of substances in, on or under the land, appears to be in such a condition that either of the following apply:

- significant harm to the environment or human health is being caused, or there is a significant possibility of such harm being caused; or
- pollution of controlled water is being or is likely to be caused.

Since 6 April this has been changed by the coming into force of s86 of the Water Act 2003. Following the change, the first limb remains as it was. But the second limb amends the definition of contaminated land so that the threshold is now higher for local authorities to show that land is contaminated land by virtue of water pollution. Regulators will now need to show that there is *'significant pollution of controlled waters'* or a *'significant possibility of significant pollution of controlled waters'*. The old definition meant that local authorities could theoretically take the view that any water pollution could trigger the 'contaminated land' definition and this has been a cause of concern and uncertainty for many industrial operators and landowners even though in practice local authorities have tended to focus on higher risk sites. The change does however create certainty which will be welcomed.

For the avoidance of doubt there have been no changes to the definition of 'appropriate person'.

Conclusion

Contamination of land is a problem in many areas and is most often addressed through the planning system, by the imposition of planning conditions. This will continue to be the case. However there are circumstances where significant harm or risk of harm is caused by contaminants in a non-development context and this is where the Part 2A contaminated land regime should kick in. For really serious instances of contamination of land, local authorities also have powers (to issue prevention notices and restoration notices) under the Environmental Damage (Prevention and Remediation) Regulations 2009.

The changes to the regime from April 2012 should provide additional certainty for landowners, site operators and local authorities and in so doing should stimulate development of land.

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Luke Mooney has just completed a law degree from the University of Sheffield, and has spent time gaining work experience with DLA Piper UK LLP. Luke hopes to pursue a career in commercial law.

Retrospective Application of the Defra Biodiversity Offsetting Metric to a Development Project in Dudley, West Midlands

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Summary

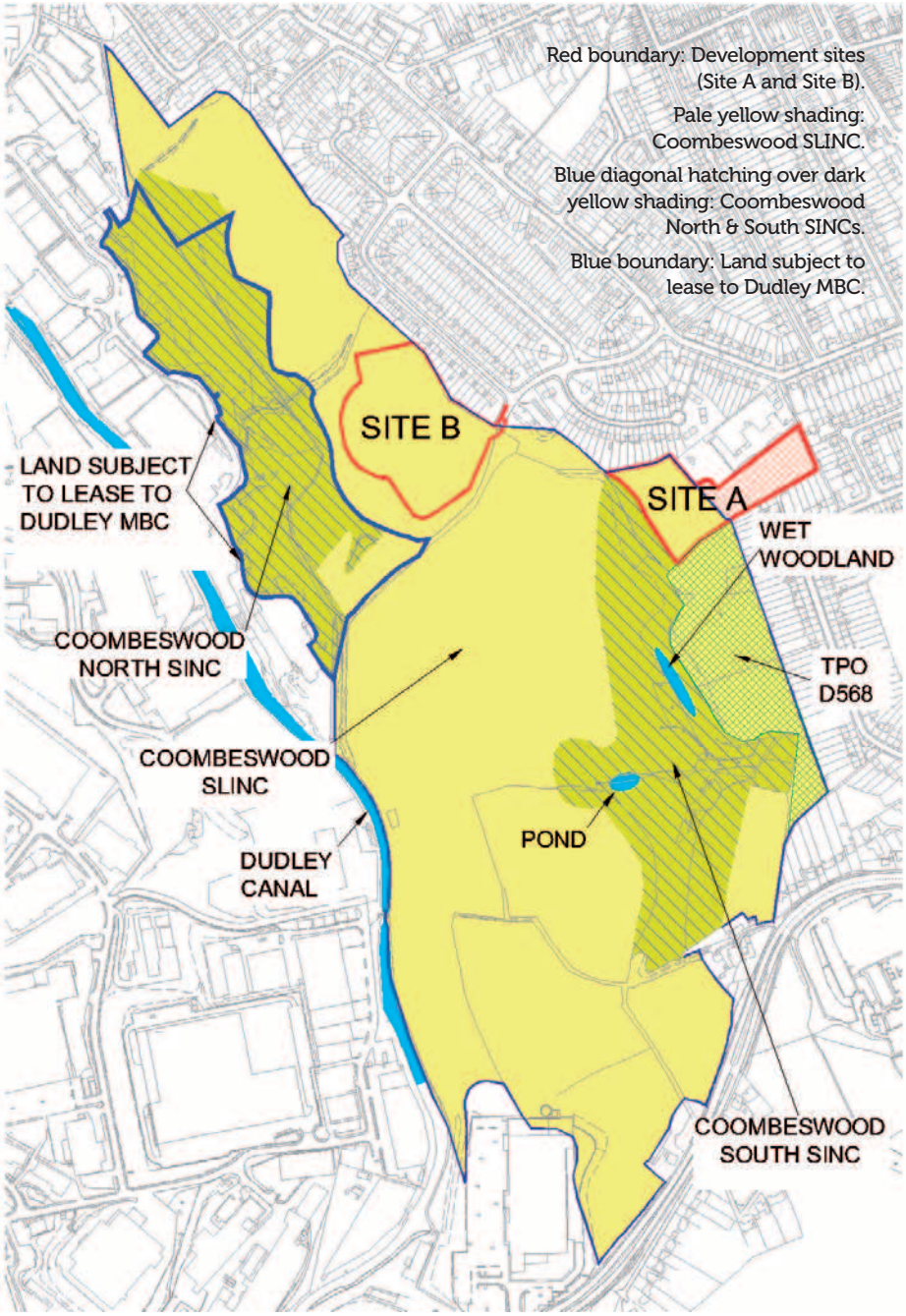
The retrospective application of the Defra biodiversity offsetting guidance currently being trialled in pilot schemes in England to a development project granted planning permission in 2009 demonstrates that the agreed ecological compensation for the loss of semi-improved neutral grassland broadly accords with the current Defra guidance. The exercise raises issues in relation to the process of biodiversity offsetting that need to be addressed.

Biodiversity Offsetting

Biodiversity offsetting is a market-based system for conservation activities involving measurable actions designed to compensate for residual negative impacts on biodiversity from project development after avoidance and mitigation measures have been implemented. The goal of biodiversity offsetting is to achieve no net loss, or preferably a net gain, for biodiversity with respect to species, habitats and ecosystem services (Parliamentary Office of Science and Technology 2011, Tew 2012, the Business & Biodiversity Offsets Program *http://bbop.forest-trends.org.uk).*

Possible methods for comparing losses and gains for biodiversity offsetting purposes were set out in a series of papers in *In Practice* by Treweek *et al*. (2010), Temple *et al*. (2010) and Burrows *et al*. (2011). Their general habitat-based metric has been adopted by Defra for the biodiversity offsetting schemes being trialled in pilot schemes in England from April 2012 (*www.defra.gov.uk/environment/natural/biodiversity/uk/offsetting*). Guiding principles for the

Figure 1



Defra biodiversity offsetting scheme (Defra 2011a, 2011b) include the expansion and restoration of habitats in perpetuity as well as contributing to enhancing ecological networks in England by creating more, bigger, better and joined up areas for biodiversity (Lawton *et al*. 2010, National Planning Policy Framework 2012 para 109).

The Defra Biodiversity Offsetting Metric

A habitat-based metric that is a function of 'distinctiveness' and 'condition' and area is used to derive a biodiversity offset value for each of the habitats lost due to impacts and for the habitats created or enhanced through biodiversity offsetting (Defra 2012). Habitat distinctiveness has three categories: low (*e.g*. intensive agricultural land), medium (semi-natural habitats) and high (habitats in the England Biodiversity List (2010)). Habitat condition can range between 1 (poor) and 3 (good) and is based on the condition assessment tool used for the Higher Level agri-environment Scheme (HLS) (Natural England 2010). Demonstrable biodiversity gains can be generated by creating new habitats, by improving the condition of an existing habitat, or by increasing the distinctiveness category of a habitat (*e.g*. creating habitats on agricultural land).

Table 1 below shows the matrix used by the Defra biodiversity offsetting pilot scheme for calculating the biodiversity offset score for each unit area of a given habitat using the three categories of distinctiveness and condition (Defra 2012).

Retrospective Application of the Metric

This biodiversity offsetting system was applied retrospectively to a case where both on-site and off-site biodiversity compensation measures were used in relation to the impacts on biodiversity of a development project in Coombeswood, near Halesowen in Dudley (West Midlands). The development included a new sports club (with cricket pitch and bowling green) and new school pitches on a separate site. Planning permission was granted by Dudley Metropolitan Borough Council on 16 September 2009 to St Modwen, a developer which specialises in the regeneration of brownfield and urban environments.

The major negative impact on biodiversity from the proposed development was the loss of 3.2ha of species-poor semi-improved neutral grassland within the Coombeswood Site of Local Importance for Nature Conservation (SLINC) (Figure 1). This loss of habitat required compensation measures. The on-site compensation measures comprised the creation of species-rich neutral grassland (1.05ha), the planting of trees and scrub, and the creation of narrow, linear reedbeds as part of a sustainable urban drainage scheme designed to reduce nutrient levels resulting from fertilisers applied to the cricket pitch and bowling green. The off-site compensation measures included: a) the lease by Dudley MBC of the Coombeswood North Site of Importance for Nature Conservation (SINC) (some 6.2ha) from St Modwen for 50 years (Figure 1), b) an understanding that this land would be declared a statutory Local Nature Reserve, and c) a lump sum payment for habitat enhancement measures. This SINC comprises semi-improved neutral grassland, unimproved neutral grassland, unimproved acid grassland, woodland, scrub and a rock exposure.

The loss of habitats within the development sites was predominantly semi-improved neutral grassland with some bramble scrub (total 3.4ha, both habitats are 'medium' distinctiveness as not priority BAP habitats and were assigned to 'moderate' condition). The calculated biodiversity offset value was 26.96 (see Table 2 for workings).

There is a general principle in biodiversity compensation schemes that the biodiversity gains, however measured, should always be greater than the biodiversity losses in order to provide a margin of safety to allow for the uncertainties involved in natural ecological processes (*e.g*. colonisation, natural succession) and in the techniques of habitat creation, enhancement and restoration. The technical guidance for the Defra biodiversity offsetting scheme (Defra 2012) proposes the cumulative application of risk multipliers to the biodiversity offset value to allow for a) the risks in terms of delivery of the offsetting habitats (*e.g*. uncertainty in the effectiveness of the techniques for creating or restoring habitats), b) the spatial risks (*e.g*. changing the location of a habitat may affect its biodiversity value), and c) the temporal risks (*e.g*. time taken for the offsetting habitat to reach the required quality). This risk-adjusted biodiversity offset value for the habitats to be lost will generate a higher offset value to be obtained through the compensation measures.

Only two of the three Defra risk multipliers are required for the Coombeswood case study. Firstly, a delivery risk multiplier of 1.5 is required for the creation of species-rich neutral grassland ('medium difficulty', Appendix 1, Defra 2012) to replace the species-poor neutral grassland that was lost. Secondly, a time multiplier of 1.4 is required on the basis that the compensation measures can reach the desired habitat quality within 10 years. There is no requirement for a spatial risk multiplier as the locations for the offsetting measures are in close proximity to the development sites (Figure 1) and are all within the Coombeswood Green Wedge. The overall risk multiplier in the case study would be 2.1 (1.5 delivery risk multiplier x 1.4 time multiplier).

The biodiversity compensation package comprised on-site and off-site measures. The on-site measures were the creation of various habitats, predominantly species-rich neutral grassland, with a total predicted biodiversity offset value of 16.79 based on the habitats attaining a 'good' condition (Table 2). The off-site measures included enhancement of the habitats within the SINC, including conversion of areas of scrub to acid grassland and neutral grassland, that are predicted to increase the existing biodiversity offset value by 32.80. The total biodiversity offset value of the on-site and off-site compensation measures is 49.59. The overall gain:loss ratio is 1.84 to 1 (49.59 gain to 26.96 loss).

This ratio is less than the overall risk multiplier

Table 1. Distinctiveness and condition matrix

Distinctiveness		Low	Medium	High
Condition	Score	2	4	6
Good	3	6	12	18
Moderate	2	4	8	12
Poor	1	2	4	6

Table 2. Calculation of biodiversity offset value

	Distinctiveness	Condition	Biodiversity offset score/ha	Area (ha)	Biodiversity offset value	Distinctiveness	Condition	Biodiversity offset score/ha	Area (ha)	Biodiversity offset value	Change in biodiversity offset value
Habitats enhanced in SINC											
	Existing state of habitats					Predicted state after habitat enhancement					
Neutral grassland (non BAP)	med	mod	8	2.22	**17.76**	med	good	12	2.22	**26.64**	**8.88**
Unimproved neutral grassland (BAP)	high	mod	12	0.75	**9.00**	high	good	18	0.91	**16.38**	**7.38**
Unimproved acid grassland (BAP)	high	mod	12	0.58	**6.96**	high	good	18	1.07	**19.26**	**12.30**
Woodland (BAP)	high	mod	12	0.64	**7.68**	high	good	18	0.64	**11.52**	**3.84**
Young birch woodland (non BAP)	med	mod	8	1.08	**8.64**	med	good	12	0.70	**8.40**	**-0.24**
Scrub (non BAP)	med	mod	8	0.48	**3.84**	med	good	12	0.44	**5.28**	**1.44**
Other habitats (bracken, ruderal, rock exposure) (non BAP)	med	mod	8	0.46	**3.68**	med	good	12	0.24	**2.88**	**-0.80**
Total				6.21	**57.56**				6.22	**90.36**	**32.80**
Habitats created on development site (predicted state)											
Neutral grassland	med	good	12	1.05	**12.60**						
Scrub & trees	med	good	12	0.31	**3.72**						
Reedbeds	high	good	18	0.03	**0.47**						
Total				1.39	**16.79**						
Habitats lost on development site (existing state)											
Neutral grassland	med	mod	8	3.24	**25.92**						
Scrub (brambles)	med	mod	8	0.13	**1.04**	**Gain to Loss ratio**					
Total				3.37	**26.96**	**49.59 [32.80 + 16.79] to 26.96 = 1.84 to 1**					

of 2.1 derived from the Defra guidance, but this 2.1 multiplier is based on the compensation measures being solely for the creation of species-rich neutral grassland. However, the delivery risk multiplier for habitat enhancement or restoration of the habitats in the SINC is 1 which is lower than the multiplier of 1.5 for the creation of species-rich neutral grassland in this case study (Appendix 1 Defra 2012). In addition, the proposed change from a SINC designation to a statutory LNR and the change in tenure for 50 years from private land to public land as a nature reserve were seen by Dudley MBC as very positive changes for nature conservation. Both were taken into account in the planning agreement reached between St Modwen and Dudley MBC.

Conclusions and Questions

This retrospective application of the current Defra biodiversity offsetting guidance now being trialled in pilot schemes in England (*www.defra.gov.uk/environment/natural/biodiversity/uk/offsetting*) provides an opportunity to look at biodiversity offsetting in a broader context. The Coombeswood case study demonstrates that the agreed ecological compensation for the loss of semi-improved neutral grassland based on professional judgement broadly accords with the present Defra methodology which uses a more quantitative approach. Secondly, the Defra guidance for biodiversity offset value makes use of a surrogate 'metric' that is a function of habitat distinctiveness, condition and area. In this context, habitat distinctiveness and condition are being used as a proxy for the biodiversity value (which takes a range of ecological characteristics into account). A good argument can be made that the biodiversity offsetting process

should take account of the social and community value and the economic value of the ecological resources as well as biodiversity value (*e.g.* section 3 IEEM 2006). Thirdly, the quantification of risks involved with the delivery of habitat creation, restoration and enhancement is particularly interesting because it provides an initial attempt to quantify the subjective judgements that are currently used by experienced ecologists to determine the likely success of ecological mitigation and compensation measures and what ratio of habitat area gained to area lost should be sought (in practice, usually around 3:1). This will provide a focus for ecological research.

This case study has highlighted a number of questions that need to be addressed if biodiversity offsetting is to be more widely applied to compensation measures for development projects:

a) How to take account of species. For example, the valuation of species in biodiversity offsetting, their responses to habitat loss at a development site, their ability to colonise a new offsetting site. Burrows *et al.* (2011) provide an interesting example of using the biodiversity offset system for bats.

b) How to take account of ecological functions such as wildlife corridors. Could the biodiversity offsetting metric evolve into an ecosystem services metric?

c) How to take account of social and community values for habitats and sites that are islands of greenspace in urban areas or well-used local areas of greenspace (and other ecosystem services).

d) How to take account of designations such as SLINCs, SINCs and LNRs. These designations are important in that they provide formal recognition of the nature conservation value of a site. Indeed, the designation of a site used for biodiversity offsetting could assist in a) the generation of the very long term revenue funding for the habitat management that will be required with biodiversity offsetting schemes, and b) the long-term protection of such sites to ensure that previous compensation measures are not lost through new development projects.

e) How to increase the precision of the delivery risks and the values of the risk multipliers.

f) How to ensure the very long-term revenue funding required for the management of habitats and their associated species in any biodiversity offsetting scheme.

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Water Vole Mitigation Guidance: Important Updates for Evidence-Based Good Practice

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Female A with juvenile September 2011. Photo by Derek Gow Consultancy.

"It is still largely unknown how water voles react to 'displacement'…The wide acceptance of the use of 'displacement' as a mitigation technique is therefore based on the belief that it is a successful and cost-effective option, without many scientific trials to support this assumption."

(Water Vole Conservation Handbook 2006)

Introduction

The publication in 2006 of the revised edition of the Water Vole Conservation Handbook (Strachan and Moorhouse 2006) provided a valuable update on aspects of the species' ecology and conservation. This publication was intended as a guide based on perceived best practice at the time. It was not intended to be an inflexible technical manual. Although the thrust of the Handbook's chapter on

development mitigation was designed to encourage the retention of the species *in situ* by avoiding impact to their habitat, in many instances this has proven impractical. Natural England conservation licences have been issued to remove water voles where there is no other option. Action under such licences should result in a meaningful nature conservation gain for the species.

Removal by Displacement

The revised 3rd edition of the *Water Vole Conservation Handbook* (December 2011) is quite clear that the removal of water vole populations from development footprints by employing a process of 'displacement' through habitat removal has a limited application as a field technique. Its utility is relevant for a short time in early spring where populations are either present at low densities or seasonally absent from a site. An assumption was drawn that the removal of a limited amount of habitat prior to the main breeding season would initiate movement by individuals to other parts of their wider territory. This process would be assisted by an ecological tendency for over-wintering individuals to disperse naturally at this time to seek new mates (R. Strachan pers. comm.). Displacement by habitat removal was limited in recommendation to lengths of less than 10m and no greater than 50m. Prior to this guidance the displacement of water voles by habitat removal was a commonly utilised technique to clear significant areas of their presence. It has been employed at various times of year and is still widely perceived to be a legal means of removing water voles from a site without recourse to a licence application.

The perception that this technique was actually effective was based on a questionnaire research project (English Nature - No. 415) which was published in 2001. This report made clear that its conclusions were *"subjective and monitoring was not carried out"*. Displacement was defined as a *"method of removing the vegetation cover, thereby persuading water voles to voluntarily leave a site and move to another area"*. None of the case studies in this report identified individual water voles with either transponders (electronic micro-chips) or in any other way. None cited evidence from radio-collared individuals. There were project examples of water voles remaining *in situ* following strimming, turf stripping and sheet metal piling. They were recorded as *"swimming around workmen"* while *"trying to re-enter old burrows"* (English Nature – No. 415).

In July 2003, Cresswell Associates undertook a study using radio-collared individuals to assess their response to displacement after strimming. This study demonstrated that once the vegetation covering their abode was removed they continued to utilise their burrow systems via underwater entrances. They left no visible field signs of their presence and foraged away from their burrows to obtain food in the surrounding environment (Dean 2004). A similar study was undertaken by the London Wildlife Trust at the RSPB's Rainham Marshes Reserve. This project attempted to capture all the water voles in the 100m footprint affected by development prior to strimming for displacement. Twelve individuals were captured, radio collared and then released. After strimming they remained in their burrow systems but were observed sitting on piles of cut vegetation on the bank side. The verifiable recorded mortality for this project was 100% (D. Tansley pers. comm.). In 2006, a large-scale mitigation project on a system of Soke dykes in East Anglia captured more than 470 water voles from over 13km of habitat despite a regime of vegetation cutting designed to effect their displacement (Markwell 2008).

The 2011 *Water Vole Conservation Handbook* itself cites four case studies where the displacement technique has been used (pages 91, 96, 97-98 and 102) and each time has been shown to fail. Natural England has confirmed that there is no robust evidence to suggest that displacement of water vole populations through a process of habitat removal is effective (T. Mitchell-Jones pers. comm.).

Displacement, if considered in its basic elements, is employed to remove a water vole from its place of shelter and rest. To do this, the technique must provide either a positive attraction away from its burrow system or a negative repulsion. This negative repulsion must have sufficient impact to ensure movement from the security of its territorial abode and must involve disturbance of the animal whilst using its burrow. The physical elements of displacement – removal of a food source and cover from predators – are intended specifically to ensure repulsion and sustained effect. Page 14 of the *Water Vole Conservation Handbook* (2011) states that *"riparian vegetation… serves as both their food and shelter"*. The Wildlife and Countryside Act 1981 (as amended) specifically protects any structure or place that a water vole uses for shelter or protection. Therefore displacement, although largely ineffective, seasonally-limited to a very short period in the early spring and only applicable to limited areas, should be covered by a licence. The lack of evidence to support its efficacy, despite its prevalence of use, makes a lack of regulatory control all the more worrying.

Displacement projects have commonly taken little account of the suitability of surrounding habitat. If there is vacant habitat adjacent to an established water vole colony then it is likely to be unsuitable for a reason such as poor vegetation structure, unsuitable

Water vole killed and eaten in territorial fight. Photo by Derek Gow Consultancy.

burrowing substrates, high numbers of brown rats, drought or flooding. Where unoccupied habitat exists in the adjacent countryside, it will largely be due to wider factors such as predation by North American mink *Neovison vison*.

Water voles are highly territorial and demonstrate considerable fidelity to their natal territories. Although males can range more widely through a landscape, females and juveniles tend to remain within a colonial territory until changing weather patterns force movement. As temperatures drop, water levels rise and food availability decreases, water voles will disperse widely into the surrounding environment. High overnight rainfall can often prompt this behaviour (D. Gow pers. observ.). In captive populations maintained in outdoor enclosures, incidences of communal aggression become much more frequent at this time. Water voles can be savage fighters. Where colonies adjoin at high density, habitat removal will at best push individuals directly into areas of already occupied territory leading to significant injuries and deaths.

Other methods of displacement which have been trialled are the forced flooding of burrow systems by the installation of artificial dams and the sectional drainage of water courses using the same methodology. Wild water voles will typically occupy complex burrow systems running from the water's edge up to the bank tops. At times of water fluctuation they will move up through these. In extreme flood conditions they will try to take refuge in rough vegetation on the bank tops or climb up into adjacent shrub cover. While it is very likely that many individuals perish as a result of such events they may also be forcibly dispersed into other areas of the surrounding landscape (D. Tansley pers. comm.). Studies have shown that where they can survive in the vicinity of their original burrows they will rapidly return when the water level subsides (Woodruff 2001).

A recent study - with a degree of verifiable survival - demonstrates that the drawdown of water can prompt water vole populations to move (Markwell 2008). Where the surrounding habitats are limited in extent or more equivocal in quality the impact of this technique on fragmented water vole populations is unverified. It is also known that water vole populations at high density will seasonally occupy dry channels and even embankments that are not directly linked to water bodies. The absence of adjacent water does not therefore preclude their presence in burrows. It may be that this technique, if applied to populations in the spring when densities are naturally low, could be an effective mechanism for clearing limited footprints.

Relocation by Trapping

Relocation of water vole populations by live trapping was originally considered to be an extreme mitigation option and was *"not recommended in most situations"* (English Nature – No. 415). Although little was known regarding its effectiveness in 2001, this was prior to the initial attempts at large-scale reintroduction which commenced at Barn Elms in 2002. The Barn Elms project involved the release of 106 captive-bred individuals – descended from three pairs captured from a single fish farm on the river Itchen – supported by a further population of 36 individuals captured from the Kennet and Avon canal. In 2003, another smaller group of captive-bred individuals were released to reinforce the project and with subsequent minor reinforcements this population is still extant and flourishing. Barn Elms was initially chosen as a result of its highly suitable mosaic of well established wetland habitats; its difficulty of access for mink and for its excellent public awareness potential. Many other similar projects have now demonstrably established large, successful wild-living populations. Where habitat quality has been near ideal the survival rate of released individuals by the end of the breeding season has been as high as 85% (M. Gelling pers. comm.).

Although the long-term survival of re-established populations will be complicated by issues of sustainability such as spatial isolation, mink control, habitat management and community support, the concept of reintroduction is demonstrably successful. The base criteria which govern success are as follows:

- The release of sub-adult water voles in populations of equal sex ratio.
- Their release at the right time of year. In June for over-wintered juveniles from the preceding year and in high summer (late July/August) for juveniles weighing in excess of 120g in their year of birth. For adult wild populations captured in the autumn, release will be best targeted in the spring of the following year at a time of water stability and vegetation re-growth.
- Individuals captured in the autumn which weigh less than 160g are unlikely to survive the winter even in well established receptor sites and will have to be held over for release in the spring.
- The release of substantial numbers from populations which are themselves genetically diverse and their reinforcement in subsequent years.
- The sustainable absence of North American mink from the wider landscape.
- The suitability of the sites for re-establishment. Sites where the main water systems incorporate or are linked to off-line wetlands, complex ditch or stream systems and have rising land round their perimeter - *i.e.* they drain into a landscape bowl and exit via a single point - are likely to be more secure than sites which are strongly linked to other water courses (Strachan and Moorhouse 2011).
- Security of site tenure with a 'lead partner' organisation based on the ground. This organisation should have the long-term will and ability to coordinate mink control and preferential landscape management for water voles.

Historically, many water vole translocations undoubtedly failed due to the small numbers involved, unsuitability of receptor habitat, skewed sex ratios, age of individuals moved, timing of release and the isolation of receptor sites. Where water voles have been captured and then released in the reasonable vicinity of their original habitat there is evidence that they will go to significant lengths to return to their former abode. In one study involving a group of transpondered individuals, a single female returned to her point of capture across a 'football field' sized area daily for a period of three days (C. Strachan pers. comm.).

Trapping Methods

Although the *Water Vole Conservation Handbook* (2011) recommends the use of collapsible Sherman traps due to their ease of transport, their complete construction from aluminium means that they are cold and prone to condensation. They do not afford significant space for dry bedding and, although practicable for experienced

Suckled female showing 8 teats. Photo by Derek Gow Consultancy.

trappers, their employment can result in unnecessary mortality. Several purpose-built water vole traps are now commercially available. The best designs are light, complete units constructed from half-inch weld-mesh with a fixed rear section covered with wood or aluminium to create a water-proofed bedding area. They should not have a spring-loaded locking mechanism to allow a light activation weight for the treadle and must have a simple locking bar fitted to their doors to ensure secure closure. This design allows for air flow and ensures bedding comfort.

Trapping of water voles is best timed for a period in early spring (March) when the species is generally active and before the onset of their main breeding season. This opportunity will however vary according to specific geographic location as breeding occurs progressively later further north. This is the most cost-effective option which will result in relatively low numbers of individuals being taken into temporary captivity. If trapping cannot be accomplished at this time then it is best targeted for the end of the breeding season between late September and early November. Although water voles can breed at any time of year – up to five litters per female per season – their largest litters are generally born in May.

Female water voles exhibit a very strong bond to their blind and naked offspring. In the wild they have been observed rescuing offspring from flood events by moving them in their mouths. *The Water Vole Conservation Handbook* (2011) recommends that trapping programmes which capture suckling females should release them at point of capture and then seek to re-trap them after a period of weeks in the potential company of their offspring. Water voles have eight teats - four between their hind legs and four between the front. The top and lower two of these are not always readily visible. The middle four are generally obvious. On occasion, teats can remain visible after one litter is weaned and before the birth of the next.

Water voles additionally exhibit post-partum oestrus. Once they have given birth they shortly thereafter become pregnant again. If a captured female is suckling large offspring and is released by the time she is recaptured it is quite probable that she will have produced another litter. The best approach to this is to pre-plan mitigation works to ensure no trapping during the main breeding season. Where this is not possible and for relatively short distances of habitat (circa. 50m) then trapping should only occur during the day to avoid overnight captures of suckling females. This process should ensure the checking of traps every two hours. If suckling females are captured, they can be released and their location recorded. It is likely that recapture will confirm their position and once the adjacent males have been captured and removed then perimeter isolation fencing can be erected to contain the females. Any dependent young can then be trapped 3-4 weeks later by which time they should be well-established. The adult females should still be released at this point for recapture after another three weeks by which time any further litter should be mobile and viable.

Exclusion Fencing

As outlined above, water voles demonstrate very high burrow fidelity. This can render effective exclusion difficult and consideration should be given to its practicality. For example, if the impacted water course is to be completely removed it may be more pragmatic to capture the voles *in situ* and destroy the habitat by either scraping or infilling. Trapping without exclusion fencing will however capture greater numbers of individual water voles from outside the development footprint. The installation of subterranean exclusion fencing into an occupied area of water vole habitat is likely to be a licencable activity in many cases (T. Mitchell-Jones pers. comm.)

Teats on suckling female A. Photo by Derek Gow Consultancy.

water voles was suspected from subsequent trapping results. It was presumed that this was through unidentified burrow systems running under the fence. Wire mesh with a hole diameter of a half-inch or less (19 gauge) has been used successfully to contain captive water vole populations for many years. If this type of material is employed as an in-channel fence then the gauge size will need to allow for greater strength. Wire mesh grills in channels with even a limited flow collect detritus and need to be cleaned on a regular basis.

Wherever possible, and particularly where relocation is to adjacent habitats, a sunken weld-mesh out-turn fixed along the base of the fencing is highly recommended to deter undermining of fencing. Water voles are poor jumpers but good climbers. The Derek Gow Consultancy has worked with this species for many years using handling tubs of a depth of 45cm and photography tanks of a depth of 36.25cm. At no time has a wild-captured or captive water vole ever jumped out of either of these structures. However, given that ecologists often have less control of the construction site environment, a greater fence height may be advisable to provide certainty of long-term exclusion. The material utilised

Where exclusion fencing is appropriate it should be set well back from the edge of the watercourse (>5m) to avoid occupied burrow systems. In a recent project on the south coast of England, 1m-high plastic water vole fencing was installed on site prior to trapping to retard the prospects of re-colonisation. As per the *Water Vole Conservation Handbook,* the fencing was buried to a minimum depth of 700mm, and in most cases deeper. Individuals which were released outside the enclosure were subsequently recaptured again on a number of occasions within the fenced area. Initially, re-entry of animals was through the one-inch square weld-mesh barrier across the watercourse (a specification recommended in the *Water Vole Conservation Handbook* to maintain water flow). On two occasions a dead sub-adult was found stuck in the weld-mesh at water level, attempting to re-enter the exclusion area. In both cases the animals had managed to squeeze their heads and front legs through but not their hind quarters.

A smaller mesh size was retro-fitted and although successful in itself, re-entry of

Water vole stuck in fencing. Photo by Dan Bennett)

for fence construction must be sheer and smooth. The supporting posts should have flat surfaces to ensure a level join and must always be positioned on the inside.

Fencing across ditch systems to exclude water voles is commonly difficult to install adequately. Unless the ditch can be drained for installation there can be no guarantee of security. While materials such as interlocking sheet steel piling can be driven into the sides and bottom of a channel to a depth that will deter water vole recolonisation, they will inhibit the flow of the water course. A solution to this can be to allow the main channel to continue to flow while fencing off the banks on either side. The fencing design along either bank where it meets the water must be secure enough to withstand water wash and flood events while the fencing ascending the banks must be deep enough to deter re-access through established burrow systems.

Where this is not possible an alternative option may be to erect fences which traverse existing wet ditches on bunds constructed from stone. These should be 2m wide at their top to allow secure erection of fencing with a pipe culvert fitted below the normal level of the water table. These pipes should not be grilled to allow an uninterrupted flow of water. Although experience suggests that water vole access through these completely submerged culvert structures is uncommon, any remaining areas of suitable habitat within the enclosure should be checked for the species presence before destruction.

Receptor Sites

Water voles are able to rapidly colonise suitable habitat where the source population is strong and where the receptor habitat is suitable. Newly created habitats often require at least two growing seasons in order to allow the establishment of strong root systems with good leaf cover. Many wetland planting schemes fail because the plants are left exposed by unexpectedly low water levels and lack of rainfall during the growing season. Steep banks also present a challenge for topsoil and moisture retention. The failure of initial planting schemes can often necessitate an unforeseen requirement to delay works or hold water voles over a longer period in captivity. This latter process will involve further breeding costs due to their relatively short reproductive life span. Allowing a realistic lead-in schedule for construction works is therefore clearly advisable. Much greater success in rapid vegetation establishment is commonly achieved through transplanting locally abundant emergent plants together with their rhizomes and attached silt/soils. This method can be enhanced by plug planting to further augment the available species range of plants.

Future Focus

Commonly in development-led mitigation projects the prime preoccupation of consultants has simply been to remove populations of water voles from individual sites without any wider vision of the species' longer-term prospects of survival. This is often a recognised compromise based on project timescales and budgets. Importantly the legislative drivers for wider conservation considerations are not as strong as those protecting animals and burrows in the face of development. This is where the issuing of Conservation Licences for the displacement and relocation of water voles can help. Overall the 'success' of development-led mitigations should not be viewed in the context of removal of the presence of water voles from a development site but rather in their successful establishment and long-term survival elsewhere.

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Are Bat Roosts Being Overlooked?

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View of the north east side of the squash court, glass roof (case study 4). Photo by Thomson Ecology.

Summary

British bat species are well known to roost within buildings. However, exactly where and when we expect to find them is strongly influenced by personal judgement. As a consultant, finding the balance between being certain that a building truly has a negligible chance of supporting bats, and recommending potentially costly and time-consuming further surveys can be tricky. This article discusses the question of whether bat roosts are being overlooked as a result of the current screening process.

Introduction

It would appear that there is increasing interest in challenging the misconceptions concerning bats and their behaviour. Following Phil Richardson's article 'Bats and Hedgerows - Are Bat Surveyors on the Right Track?' in *In Practice* December 2011, we wish to discuss the issues relating to bats roosting in unlikely and often unsuspected locations within buildings.

The 18 British bat species are known to have a variety of roost requirements and will each use a variety of different roost types and locations throughout the year, in line with their metabolic and social requirements. However, all species are known to roost in buildings, at least on occasion (Mitchell-Jones 2004). Several species of bat are strongly associated with, and may even be dependent on, buildings. Owing to the legal and planning policy protection, survey work for bats is often required to inform planning decisions and to allow redevelopment or restoration to occur lawfully.

Table 1. Categories of Bat Potential

Type of roost / Level of potential	Summer or transitional roost used by non breeding bats	Maternity roost	Hibernation roost
Confirmed	Presence of bats or evidence of bats. Confirmation of roost status may require further survey.		
High Bat Potential	Feature with multiple roosting opportunities for one or more species of bat. With good connectivity to high quality foraging habitat.	Feature with multiple roosting opportunities for breeding bats (size, temperature). With proximity and connectivity to high quality foraging habitat.	Large site that offers cool stable conditions with multiple roosting opportunities. With proximity and connectivity to high quality foraging habitat.
Medium Bat Potential	Feature with some roosting opportunities. With connectivity to moderate or high quality foraging habitat.	Feature providing some roosting opportunities. With some connectivity and proximity to moderate or high quality foraging habitat.	Medium sized feature with some roosting opportunities. With some connectivity and proximity to moderate or high quality foraging habitat.
Low Bat Potential	Feature with a limited number of roosting opportunities. With poor connectivity to foraging habitat.	Feature with a limited number of roosting opportunities for breeding bats. With low proximity and connectivity to low or moderate quality foraging habitat.	Small sized feature or feature which may be subject to disturbance or environmental variations, with a limited number of roosting opportunities. With poor connectivity to foraging habitat.
Negligible Bat Potential	Feature with no or very limited roosting opportunities for bats or where the feature is isolated from foraging habitat.	Feature with no suitable roosting opportunities for breeding bats.	Feature with no suitable roosting opportunities for hibernating bats.

When assessing the potential of a building to support roosting bats, we all understandably approach the survey based on our experience and knowledge gained from training and relevant literature. We are aware of the apparent preferences of individual species for particular roost sites. For example, pipistrelles have a preference for confined roost spaces such as soffit-boxes or hanging tiles. And long-eared bats prefer large, uncluttered roof voids with a light sampling space. We are also aware of the types of building and associated features and habitats which are typically expected to support roosting bats.

The Bat Conservation Trust (BCT) *Good Practice Guidelines* (Hundt 2012) provide a 'trigger list' of where bats are likely to be present and also guidance for assessing the value of potential development sites for bats, based on the occurrence of habitat features within the landscape. This guidance provides a basis for determining the likelihood of bats roosting within a building, from low to high. Following this preliminary ecological appraisal, which involves a site walkover survey, internal and external inspection of any buildings on site, the type and extent of any future survey work can be determined.

As described above, the initial assessment of a building's likelihood to support roosting bats has the potential to be subjective, requiring a degree of expert judgement. This could mean therefore that the same building could be assigned a different level of potential by different individuals, a situation which we have experienced, on occasions, and is illustrated in one of the case studies presented in this article. The implications of such a decision could have major consequences, as this decision is the start of an iterative process, with each decision having consequences for future decisions, further survey results and outcomes.

At Thomson Ecology we have created our own criteria, specifying distinct categories of potential (see Table 1), which build upon the continuum of potential provided in the BCT *Good Practice Guidelines 2012*. This begins to address the issue of subjectivity and aims to standardise our categorisation of buildings across the company. However, even then the criteria can only function as a guide, requiring interpretation by an experienced individual, and should be challenged when you are faced with a building that doesn't appear to 'fit' where you think it should.

Further issues arise from the interpretation of the guidelines for determining the requirements for further survey. The Natural England Standing Advice (2011) and the BCT *Good Practice Guidelines 2012* provide apparently contradictory although similar guidance. Despite the contradictions, there is a general consensus on the initial screening process, requiring a daytime inspection, which then determines a subsequent hierarchy of further survey level required. Negligible-potential buildings are discounted and low-potential buildings either discounted or subject to a low level of survey effort. This raises the question: *Is it really appropriate to conduct less survey effort on a low-potential building?* As it could be argued that in a low-potential building, a bat roost may be harder to locate, for example, if it was used infrequently and or by a low number of bats. In addition to this, the further complication of roost types and their individual significance may affect an individual's categorisation of the building in question.

We would tend to agree with the need for further survey of low-potential buildings, and often discover bats roosting in buildings initially assessed as such. We have even

discovered roosting bats incidentally, in buildings previously considered to have negligible potential to support roosting bats. Buildings for which the simple definition of the word negligible, *"so small or unimportant or of so little consequence as to warrant little or no attention"* (Merriam-Webster Dictionary), would have ruled out further survey, whereas the discovery of roosts in such buildings clearly suggests we (as ecologists) need to question this category of assessment and its implications for survey and or mitigation requirements. Four case studies of interest have been selected to illustrate this point. However, as a consultancy we have many other examples, and would fully expect other consultancies and bat groups to find, or have found, similar results.

Case Study 1: Office Building, Essex

The large site contains areas of commuting and foraging habitat, including networks of drains and wetland habitats including ponds and ditches. However, connectivity is generally poor and the site is largely exposed. As part of an extended Phase 1 habitat survey of the site, each of the buildings was assessed for its potential to support roosting bats.

The only building on site found to contain a bat roost was initially assigned a low potential to support roosting bats. This building is a single-storey, brick-built office block with a flat roof and is fairly isolated on the site. Only a couple if potential access points were identified from the external inspection, including gaps between brickwork and holes by the porch and metal cladding. No internal inspection was undertaken, as there were no suitable voids. The roost in this building was confirmed by the observation of a common pipistrelle *Pipistrellus pipistrellus* bat returning to roost on the western side of the building to a weep hole above a window. This bat was only observed on a single survey visit. The weep holes (features associated with many modern buildings) in this building were not initially considered as a potential access point for bats. Had there not been other suitable features, this building may have been discounted.

Case Study 2: Farm Buildings, East Riding

The land surrounding the site consists predominantly of very large arable fields with species-poor hedgerows. There is a large block of woodland that adjoins the farm buildings complex to the north and west, and two ponds to the east and south of the complex which are used by foraging bats.

A number of buildings on site were assessed for their potential to support roosting bats, and a full range of results was found, including confirmed roost, high, medium, low and negligible potential. One of the agricultural buildings is of steel-framed construction with cement-bonded (CB) upper walls and roof, and base walls of cement-block construction on a concrete pad. The inner space is entirely open to the pitched roof and is accessed by a large sliding door. This building was assigned a negligible potential to support roosting bats as it was not considered to offer any potential roosting

External view of the office building. Photo by Thomson Ecology.

View of barn showing the access point between cement blocks. Photo by Thomson Ecology.

places. Therefore, no recommendations for further surveys were made for this building.

However, a roost was located incidentally within this building as a result of conducting dusk emergence and dawn return to roost surveys on other buildings on site. One soprano pipistrelle *Pipistrellus pygmaeus* entered during each of the June and July surveys. This roost is situated behind a wooden fuse board fixed to the CB wall, inside the barn, with entry being gained around waist height where mortar is missing between blocks in the single-skin, cement-block base wall.

Case Study 3: Farm Buildings, Surrey

A modern Dutch barn and connected stores are located in a paddock area currently comprising amenity grassland, bare ground and species-rich hedgerows, surrounded by farmland. The barn is built with solid

External view of the barn in which the roost was discovered. Photo by Thomson Ecology.

concrete block walls clad in corrugated steel with a curved tin roof. It has a single-storey extension on the south-western side clad in wooden boarding and two further single-storey sections on the south-eastern side.

This barn was assigned potential to support roosting bats as multiple access points into the barns were identified, such as gaps in roofing and an open doorway. Roosting points were considered to be present, although limited, comprising gaps between elements of the building structure, such as behind wooden boarding.

During the dusk emergence and dawn return-to-roost survey, a single common pipistrelle was confirmed to be roosting within the south-western section of the barn, as it was seen to return to roost within the building behind a metal beam. This feature was not originally considered as a potential roosting point and, had it been the only feature, would have resulted in the barn being assigned a negligible potential.

Case Study 4: Squash Court, Surrey

(See main feature photograph)

The squash court site is situated in a semi-rural environment in Surrey. The roosts in this building were discovered via a rather convoluted route. The original bat survey on site conducted by another consultancy consisted of internal and external inspections of the buildings. The squash court building was not considered to have any potential for bats at the time of this survey. This building is set in a wooded area. To the south lie some residential housing, a road and a river, and to the north lie a wooded area and school fields.

At a later stage, Thomson Ecology was commissioned to undertake a further survey on another building on site considered to have potential to support roosting bats. Whilst undertaking this survey, our surveyor noted that the squash court building did in fact have potential to support roosting bats, and recommended further survey.

Our internal and external inspection of the squash court building described it as a single-storey brick-built building with a lower viewing area made of overlapping wooden planks. It has a sloping, reinforced-glass roof, with metal beams, and some panels missing. There are ventilation gaps in the walls and crumbling brickwork around the building. There is also dense ivy coverage on the west side of the building and access points under the eaves on the south side. During this inspection the building was confirmed as a feeding perch for brown long-eared bats *Plecotus auritus*, as feeding remains were found in a distinct pile in one area of the squash court. During the subsequent dusk emergence and dawn return-to-roost surveys, a single common pipistrelle was also observed returning to roost, entering the squash court building through missing glass in the roof.

Conclusions

As bats and their roosts are fully protected, damaging a roost could constitute an offence punishable by law. As most readers will be aware, damaging or destroying a bat roost is an absolute offence under the Conservation of Habitats and Species Regulations 2010 (*i.e.* it does not have to be deliberate or reckless).

It could be argued that the loss of certain roosts, which may only support small numbers of bats, or may only be used sporadically, whilst being against the law, is not significant in terms of the conservation of bat populations. However, evidence that bat populations have declined significantly in the last century led to bats being given legal protection in the UK (Mitchell-Jones 2004). One major factor contributing to this decline, and thought to have a long-term impact on bat populations, is roost loss (Mitchell-Jones 2004). Development proposals that could result in the loss of roost sites must not be permitted unless sufficient mitigation is provided to ensure no net loss of roosts and no adverse effect on the favourable conservation status of the species involved.

The English Nature (now Natural England) *Bat Mitigation Guidelines* state that *"if there is doubt as to whether a structure is used by bats, further visits during the summer or autumn will be required"* (Mitchell-Jones 2004). So, perhaps the take-home message of this article is that we as ecologists should entertain more *"doubt as to whether a structure is used by bats"*, or said another way, should be less certain that a building is not being used by bats, as this 'certainty' has been proved wrong in case studies two and four above and undoubtedly in an abundance of other situations. In some of these, as in the above examples, the result would still have been positive for bats, and in others, the bats will not have been so lucky!

As consultants we have to be pragmatic in our approach, but we are ultimately governed by the relevant legislation and planning policy. So what is the solution? Can we have a reliable screening process? Can we get better at predicting where bats are going to roost? Or are their roosting preferences too complex for that to ever become possible? In which case, how can we manage the varying levels of risk?

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A Radical Plan to Help the Natterjack?

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With a sparse distribution in Britain, natterjack toads are struggling in many areas, and the last thing they need is breeding pond desiccation. But with recent dry springs, this has been a real concern (Natural England 2012, British Ecological Society 2012). June's downpours should have replenished water levels, but is it time for some radical thinking on natterjack conservation? Should we introduce them to sites outside their known historic range, such as sand quarries, which provide ideal natterjack habitat in abundance? If only we could get round the bureaucracy and the IUCN guidelines...

Despite ardent conservation efforts, the natterjack has a somewhat precarious conservation status in Britain. A resident of this island since the end of the last Ice Age, it was one of the first amphibian species to get here from Europe after the retreat of the ice sheets. Yet today it is marginalised by its restricted habitat preferences, problems with fitness, and weakness against competitors such as the common toad.

After the last Ice Age ended around 11,000 years ago, and climate returned to temperate conditions, the tundra-like landscape left in Britain was ideal for natterjacks, with their preference for sparsely-vegetated places with sandy soils. It took hundreds of years for Britain to scrub over and become forested, and some areas always remained tree-free.

During this interval, natterjacks dispersed widely, either by crossing the Midlands or dispersing around coastal areas (there is still debate on the biogeographical history). They reached as far as southwest Scotland, and must have had a more contiguous distribution than now, at least in coastal areas; today's disjunct distribution being a mere relict.

Conversely, the common toad's post-glacial expansion lagged behind with the development of well-vegetated and wooded landscapes, and it was hundreds of years before it managed to disperse across Britain. When it did, however, it soon out-competed natterjacks in any shady habitats.

Today, the landscape across much of Britain is more suited to the common toad, and the natterjack is marginalised. It still thrives in some coastal areas with extensive sand dunes and upper saltmarshes; but the few remaining heathland populations survive largely through intensive management.

Media attention in April 2012 highlighted the impact of drought conditions (hard to believe as I write this now in stormy June!) on natterjack toad breeding success. Natterjacks breed in shallow sandy pools such as dune slacks, and typically dry up in some years. This is good for keeping predators in check, but with several consecutive dry winters and springs, it poses a serious threat to recruitment.

With fewer than 50 breeding populations in Britain (a number that has struggled to increase despite decades of conservation), the plight of the natterjack seems as difficult as ever. Scrub encroachment is problematic on many sites, requiring constant management. An added worry is the discovery of chytrid fungus in some natterjack populations, which might be causing declines. Couple this with genetic impoverishment in some populations, and competition with common toads, and the natterjack is a little less robust than we would like. So is it now time for some lateral thinking, and perhaps to consider radical action?

With many of Britain's coastal dune systems urbanised, or inhabited by golfers, the potential habitat bank for natterjack introductions is limited. Reintroductions have already been attempted at most of the 'legitimate' candidates, and large dune systems in South Wales, Devon and Cornwall are automatically excluded due to a lack of historical data. Natterjacks may well have been present a few thousand years earlier (I have identified subfossil bones from Devon, Pembrokeshire, Somerset, Kent and Herefordshire), but this prerequisite (which was used in the pool frog reintroduction to Norfolk) has not been used for natterjack reintroductions.

The question is: *Do we need evidence of former presence?* Absence of evidence is not equal to evidence of absence. Nevertheless, it is widely accepted across the ecological discipline that deliberate introductions of species for conservation purposes should be in accordance with IUCN guidelines (IUCN/SCC 1995). There must be evidence of former presence, the reasons for extinction must be known, and the causes of extinction must have ceased.

However, if there simply aren't enough sites available to ensure a viable future for a species, shouldn't we be looking at a wider suite of sites, even if this deviates from accepted wisdom?

One solution could be to introduce natterjacks to locations where they have probably not existed historically, but where the habitat is ideal. I have often pondered this while walking around sand quarries where I've worked. Bare sand, sparsely-vegetated sand, ephemeral pools, plenty of invertebrates – it all seems ideal.

The fact that a quarry's life is normally only 10 or 20 years presents a problem, but we should not get hung up on it. The natterjack is a pioneer-opportunist species; its preferred habitat niches do not last forever anyway. That is why they thrive best in shifting coastal dunes and estuarine habitats.

The problem is that *we don't have enough* ephemeral habitats. So why not use some of the ones that we do have, like sand quarries? During their finite existence, quarries could contribute significantly to the UK's natterjack population; and when they've been worked out, new quarries could take their place.

In fact, there is a persuasive and pragmatic precedent. In Switzerland, sand quarries are the mainstay of natterjacks, and road construction projects are the main corridor of dispersal. Temporary breeding pools are simply hazard-taped off at sensitive times of year, and the quarry operator is allowed to go about their business relatively unhindered. Some natterjacks are killed, inevitably; but the overall result is good population recruitment, requiring minimal proactive habitat management.

This is a truly pragmatic strategy wherein the natterjacks can breed and thrive, and industry is spared ineffectual bureaucracy. Contrast this with the intensive conservation management required to maintain some British populations, and the often-fraught relationship between industry and conservation.

Even with a concerted conservation effort by Amphibian and Reptile Conservation, landowners, country agencies, volunteers and other partners, natterjacks face a constant struggle for survival in many areas. Natural seral succession is one of the biggest challenges, and natterjacks rely upon scrub management and targeted grazing at many sites; not to mention concrete ponds.

Natterjacks are early-stage colonists in nature, and in an increasingly-managed landscape in Britain, there are few places ephemeral enough to suit them. Such early-successional environments only really exist in coastal dunes and estuarine environments – and in sand quarries. Could we not introduce

natterjacks to sand quarries up and down Britain?

Such radical action would require a conscious deviation from best practice. The IUCN Species Survival Commission *Guidelines For Re-Introductions* (IUCN/SSC 1995) state that a reintroduction should be *"within the species' former natural habitat and range and should require minimal long-term management"*. My proposal may fail on the range criterion, but I would argue that it meets the 'natural habitat' requirement. What's more, the minimal management load speaks for itself; the current intensive management situation is neither sustainable nor desirable.

Introducing natterjacks to quarries would need to circumvent some bureaucracy though. Under current legislation, it would require a licence allowing quarry operators to go about their business without worrying about killing individual natterjacks. As long as natterjacks were thriving overall, the introduction would be a success; and if it weren't, the quarry operators should not be blamed.

So how about trialling the introduction of natterjack spawn to several specially-licensed quarries? To make the decision easier, it could be within counties where natterjacks currently reside – such as Dorset or Hampshire – which have plenty of sand quarries but very few natterjack sites.

A key consideration would be to assure the quarry operators that they are not making a rod for their own back. They would need assurances from the statutory bodies that they would not be prosecuted for any of the normal offences regarding this particular European protected species.

I suspect there would probably also need to be a carrot in the form of a positive PR story: 'Quarries step in to save iconic natterjack toad' for example. Quarry operators might be unlikely bed-fellows for a species recovery programme, but with the eye of faith, I can see them lining up for a slice of this PR gold.

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Surveying IEEM Members' Attitudes to LRCs and Biodiversity Data

Tom Hunt
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The collection and use of biodiversity data is becoming increasingly important as more emphasis is placed on wildlife records as a tool for decision- and policy-makers. As the mass of biodiversity data proliferates, it is essential to ensure that records are kept to a high standard, data providers adhere to a good standard of service provision, and that as much data as possible it made available to decision-makers.

In order to investigate this topic in more depth, IEEM and the Association of Local Environmental Record Centres (ALERC) have recently collaborated on a survey of IEEM members. The survey had a special focus on local record centres (LRCs) and data sharing. It received a good number of respondents (473) and produced interesting results, some of which were expected and some of which were more surprising. The overall result of the survey was to show that satisfaction with the data received from LRCs varies greatly. Attitudes to sharing data also vary, although generally people seem willing to share data if a limited number of obstacles can be overcome.

The survey will prove very valuable in focusing future effort in the right places to make sure that useful biodiversity data is readily available to those who need it. As a result of the survey, there is now strong documentary evidence that the consistency of LRC data provision needs to be improved, and that there needs to be an easier system to allow consultants to share their records.

It was important to ascertain how widely respondents used various sources of biodiversity data. The results clearly show that the two main sources of data are LRCs and the National Biodiversity Network (NBN) Gateway. Of the respondents, 69% said that they use data from LRCs either for every job, or for most jobs and 45.1% said the same about data from the NBN Gateway (see Figure 1). There are also several other sources of data used by professional ecologists, although these are usually only used occasionally. This result demonstrates how

Figure 1

Data Usage by Ecological Consultants

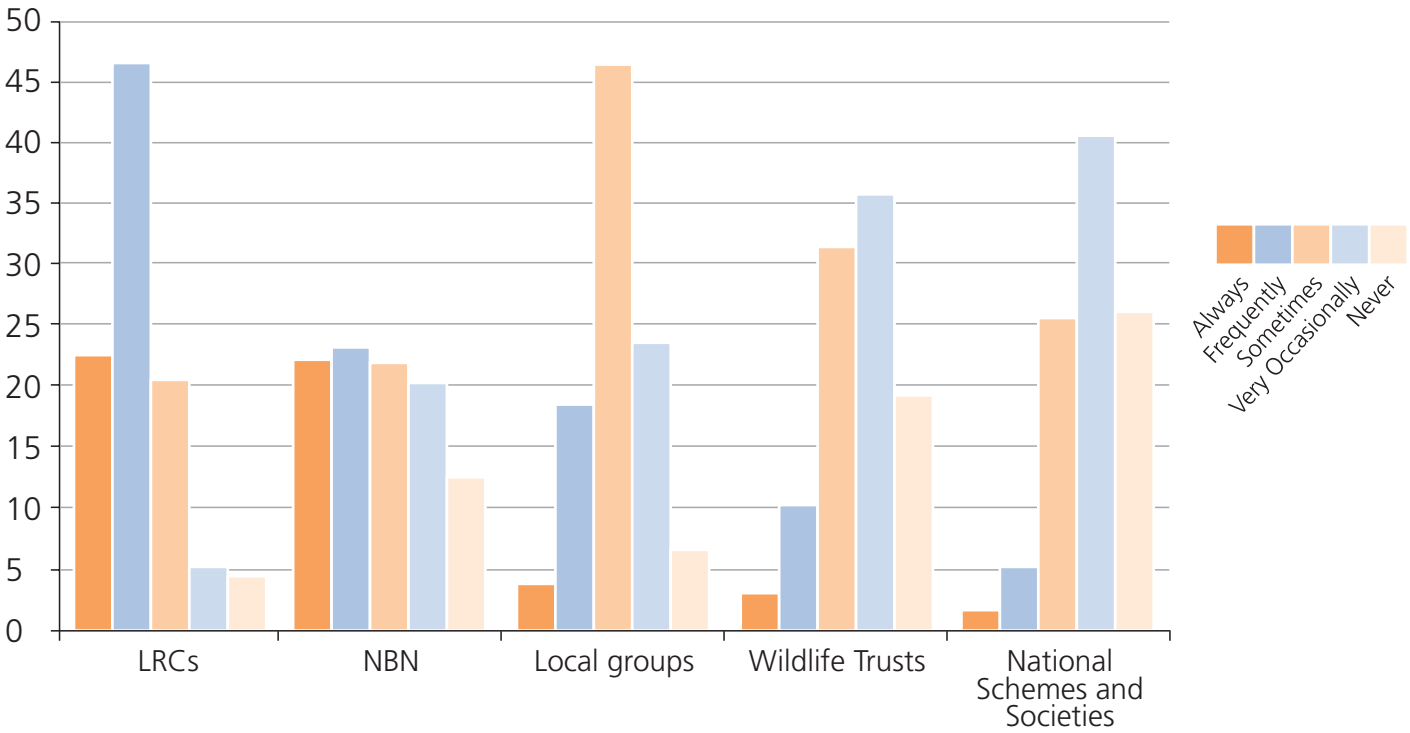
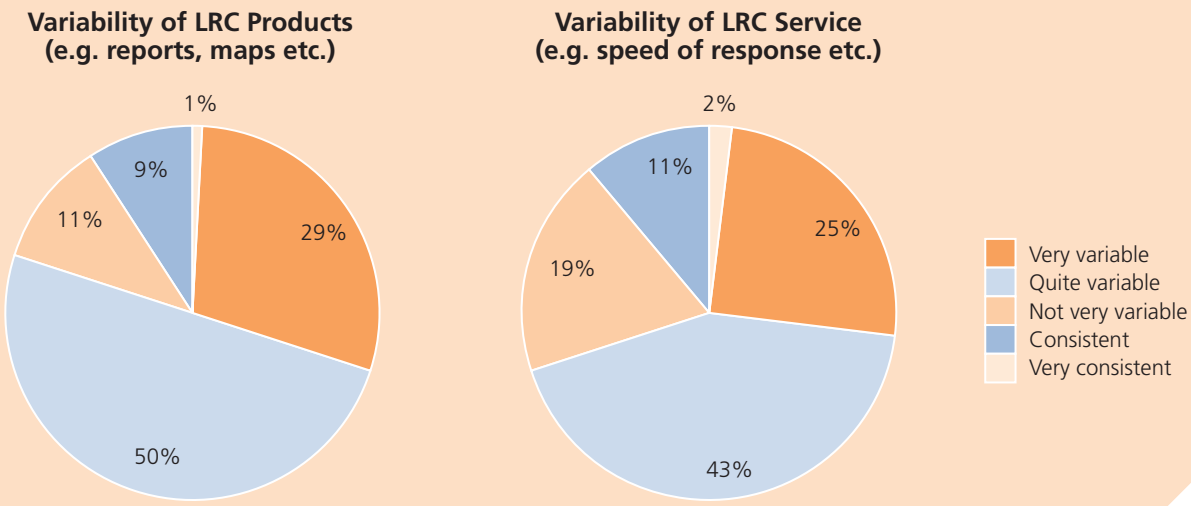


Figure 2



important data from LRCs and the NBN are.

Further questions were aimed at finding out why some people only use LRC data infrequently and what could be done to improve the way in which LRC data is provided. Cost of data provision was cited as a reason for not using LRC data by 57.9% of the 133 people who classed themselves as 'seldom users'. This was also reflected in the comments left on the survey, with many respondents choosing to single out the LRCs that they thought were well priced, and those they thought were over-priced. It is perhaps unsurprising that cost is cited as an issue surrounding the paid-for service from LRCs, especially in times of economic difficulty. Judging by the comments left on the survey, it is the LRCs around the south east of England for whom cost is the biggest issue. Again, this is perhaps not a surprise as the cost of many services increases in this part of the country. However, it is also important to consider the potential for sampling bias, as it is likely that there are a higher proportion of respondents working around the south east of England.

ALERC recognises the variability of LRC costs and the difficulty that this can cause some consultant ecologists. LRCs are not-for-profit organisations and their charges are designed to cover a proportion of their running costs. These costs can vary considerably across the country, as they do for many businesses. The important thing from ALERC's point of view is to spread best practice amongst LRCs and so improve the services that they provide and their value for money. Further results from the survey indicate that this will be an important process as 50.4% of respondents described LRC products as 'quite variable' and 28.8% described them 'very variable'. A similar result was found for LRC service provision (see Figure 2).

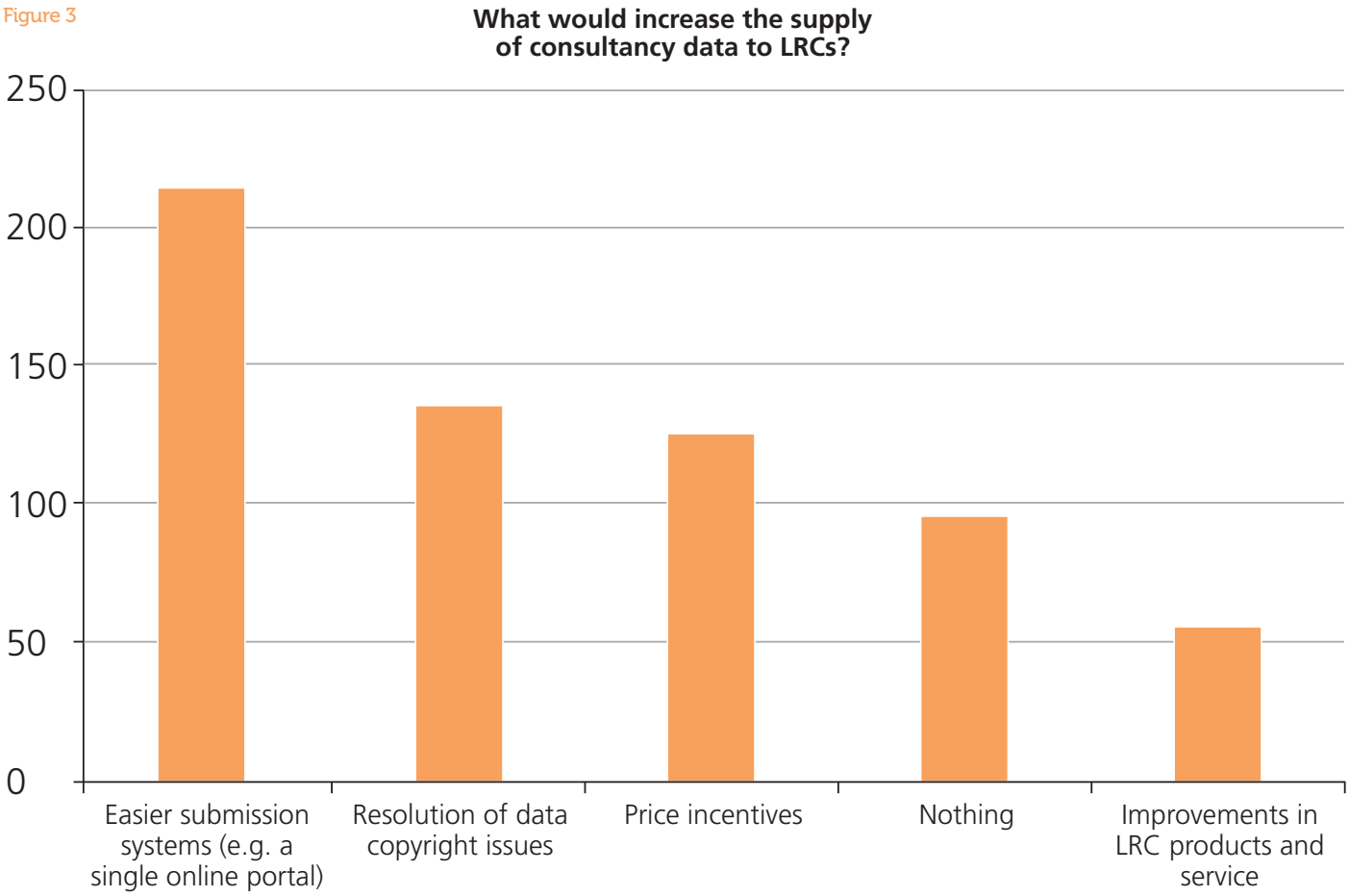
The survey also recorded the specific strengths and weaknesses of LRC data provision, a summary of which can be found in Table 1. This part of the survey backed up earlier conclusions about the variability of LRC products and services with 'sometimes a problem' being recorded against many of them. One of the areas that attracted a lot of criticism as being 'usually a problem', or 'often a problem', was the area of cost. This is not surprising as the earlier part of the survey suggested that the cost of data supply was putting some people off acquiring it.

The good news is that not all cost issues are insurmountable. One such problem is where ecologists have to acquire data from species interest groups and not just LRCs. I am aware of instances where LRCs and local species groups, being faced with this problem, have reached agreements that benefit both sides.

Table 1

	Usually a problem	Often a problem	Sometimes a problem	Not a problem	A strength	Not applicable
Speed of response to initial data request	2.1%	5.4%	36.7%	40.8%	13.7%	1.3%
Inclusion of "express delivery" option for clients in a hurry	1.3%	4.8%	11.1%	23.1%	24.9%	34.7%
Cost when data is required from an LRC and an additional source(s)	13.0%	23.3%	30.5%	13.3%	0.8%	19.1%
Cost when searches are required from more than one LRC	14.2%	22.1%	30.0%	13.4%	1.1%	19.2%
Cost in relation to overall size of your job	12.1%	21.3%	35.5%	22.1%	1.1%	7.9%
Overall value for money	8.9%	18.4%	38.7%	23.7%	6.3%	3.9%
Incentive for consultants to return data to LRC	16.8%	23.0%	19.0%	19.5%	4.5%	17.1%

Figure 3



In one such case, a local ornithological group is working towards providing its database to the LRC, and in return it no longer has to find volunteer time to manage the database and collate the records for the annual report.

Another problem facing ecologists is the cost of acquiring data where the study area crosses the boundary of more than one LRC. Again there is cause for optimism. Some LRCs have been able to reach agreements whereby they reduce their costs to prevent the consultant being charged full price for data from two LRCs. In these instances all three parties share some of the burden of the supply of data, and achieve a more satisfactory outcome as a result.

Spreading these examples of good practice is the key to improving LRC service nationally. ALERC is in a position to do this and July 2012 saw the arrival of ALERC LRC accreditation, a system whereby LRCs who conform to a set of standards are awarded basic accredited status. These are minimum standards that ensure the level of service provided is adequate, and that all of the relevant data management procedures are adhered to. It is hoped that the clients of accredited LRCs will notice an improvement in the services that they receive from LRCs. Not only that, but confidence will grow in the LRC movement as a whole.

One of the more startling findings from the survey was the fact that 16.8% of respondents cited the 'lack of incentive to return data to the LRC' as usually being a problem, making this the most significant problem of those listed in the survey. What makes this even more surprising is that 77.7% of respondents claimed to already share data, and 88.8% of those suggested they send it to LRCs (meaning that 67.8% of ecologists are already passing data to LRCs). This is a surprise to many LRCs, who suggest anecdotally that data from consultants (who made up a high proportion of the respondents) only makes up a very small proportion of their databases. Some LRCs are known to offer inducements for those who are able to share their data. For example, an LRC in Scotland offered consultants a 50% price reduction on the next data search if they were able to provide records back to the LRC. Only three out of approximately 40 eligible enquiries yielded any data.

Whatever the figures from this survey, the evidence from LRCs themselves strongly suggests that data collected by consultants is not being used beyond its original purpose. These records could be useful not only to local naturalists, interest groups and conservationists, but also to local authorities, national policy-makers and ecological consultants themselves.

However, it is obvious that this argument is not strong enough in itself to yield consultancy data, even when economic incentives are applied. There are still barriers to overcome. These barriers have been picked up by the survey, and Figure 3 summarises the attitudes and the main areas for discussion. It is clear from this summary that a lot people feel that a simple system for submission of records would make them more likely to submit data. There are also concerns around copyright issues.

A quick read through the comments left on the survey provides further evidence that ease of submission and copyright are the issues at the fore of most people's minds. There seems to be a lot of uncertainty surrounding data copyright. Some people are prepared to

release data, but they often employ a clause in their clients' contracts that allows them to do this. Other people are less keen to go down this route, keeping client confidentiality in mind. Perhaps one resolution to this issue is to lobby local authorities, explaining to them that if they want the mass of precise, accurate data that comes from consultancy reports to be used in support of general conservation policy in their area, then there needs to be an obligation for those submitting planning applications to allow their ecological data to be shared.

Even where there is willingness to share data, there are still concerns around how much time it takes out of a consultant's day to submit records. There are often worries about what format to submit records in and where to send them. In actual fact, many LRCs will gratefully accept data in any format, although they will probably take longer to get the data inputted into their database, and made available, if they have to re-format it.

The results of the survey should leave people in no doubt that there is a requirement for a simple system that allows ecologists to submit data quickly, and which doesn't result in a slow process of reformatting before it becomes available to inform future projects and developments. NBN, IEEM and ALERC are currently working on how such a system might be developed.

ALERC are also working on the issues surrounding the variability of LRC data supply. The key here, as described earlier, is to be able to share best practice and, where possible, tools and pieces of software that allow for more efficient, more detailed and more useful products to be created by LRCs. There is now a database available that lists tools and systems in use by LRCs, and it is hoped that this will encourage sharing between LRCs. In the future, it will be important to identify the barriers to achieving a higher standard of LRC output. In many cases, LRCs are under-resourced or simply too small. This can be for many reasons, some are historic and some reflect local authorities' attitudes to local biodiversity recording. Where there are LRCs in a position to develop a better output, ALERC is well placed to help them, by putting them in contact with other LRCs and through the accreditation system. ALERC is also working with NBN on achieving greater use of NBN Gateway data by LRCs, meaning that the products that LRCs are able to supply are augmented by data from other contributors to the NBN. The result will be a more informative and seamless supply of data to the consultancy sector.

The theme driving this push for change is one of greater sharing of biodiversity data from all sources, making sure that records are not only available once, for the purpose(s) that they were collected, but also for future conservation work and to add to the collective knowledge of the nation's wildlife and habitats. This means putting into place the software, systems and protocols that allow records to be shared widely and efficiently. It also means eroding away the notion that records themselves are a saleable product, and that they should be hoarded by some and coveted by others. The success of LRCs will be judged on whether they can collect, format, store and share records, applying sensitivity where required and employing useful and innovative methods of presenting those records.

Members who responded to the survey and left their contact details were entered into a draw for a free one-day delegate place at an IEEM conference or the 2012 NBN Conference. Gordon Haycock CEnv MIEEM of Haycock and Jay Associates and Alan Shepherd MIEEM of Worcestershire Wildlife Consultancy were the successful entrants.

Accessing and Using Biodiversity Data

28 November 2012, London

5 December 2012, Manchester

For anyone using biodiversity data in their work, this IEEM course will ground you in many areas of best practice for ecological scoping and desk studies. It will broaden your understanding of the roles of organisations involved in biodiversity data management and the new technologies influencing the flow of biodiversity data and its quality. Specific attention will be drawn to the ALERC accreditation system and the services that consultants can expect from accredited Local Record Centres. You will also gain understanding of the key things to bear in mind when accessing data from the NBN Gateway.

More information at:
www.ieem.net/events

About the Author
Tom Hunt is the National Coordinator for the Association of Local Environmental Record Centres (ALERC). Tom's main objectives are to facilitate the wider adoption of new biodiversity data management technology, improve data flow, encourage the exchange of ideas and promote collaborative working between local record centres and National Biodiversity Network partners throughout the UK.

Contact Tom at:
tom.hunt@alerc.org.uk

Institute News

On 13th June 2012 we held our Extraordinary General Meeting (EGM) in London which marked a very significant step in IEEM's history. Members not only voted on changes to our governance but also formally agreed to petition for a Royal Charter. The result of the voting for the six resolutions, which were all approved, was as follows:

Resolution	For	Against	Abstain
EGM 12-1 Approval of changes to the Institute's Articles of Association	480	7	21
EGM 12-2 Approval of the initial arrangements for establishing the Governing Board	481	8	19
EGM 12-3 Approval of extending the incoming president's term of office from two years to three years	469	20	19
EGM 12-4 Approval of the intention to petition for a Royal Charter and, if successful, to change the name of the Institute to the Chartered Institute of Ecology and Environmental Management	492	16	0
EGM 12-5 Approval of the intention to include within the Charter the authority to create a Register of Chartered Ecologists.	489	16	3
EGM 12-6 Approval of the draft Charter and By-laws	485	11	12

The changes to our governance create new opportunities for members to get involved in influencing the future direction of the Institute. We really do need people to come forward so please do consider whether this is the right opportunity for you to give some time to helping the Institute and the profession move forward. Further details are given on page 64.

The Petition for our Royal Charter was duly signed by our President later that month at the House of Lords reception to award the IEEM Medal and celebrate our 21st anniversary. It is now in the hands of the Privy Council and we await the decision. What this means for the Institute and for members is described on page 65.

Thank you to all those members who took the time to vote at the EGM, whether in person or by proxy.

IEEM Annual Review 2011-12

The latest IEEM Annual Review is available to download from the website. It covers the period from April 2011 to March 2012 and highlights the Institute's work on raising standards, supporting continuous professional development, influencing policy and providing leadership to the profession.

http://www.ieem.net/news/49/ieem-publishes-its-2011-12-annual-review

New Website

Hopefully members have by now had a chance to visit our new website which was launched at the end of June. The website has improved navigation, more online functionality and an improved library of information. Members can also log in to update their contact details and renew their subscriptions.

Eligible members will also have noted that we have a new Professional Directory. In addition to the standard free listing there is also now the opportunity to purchase enhanced listings including use of your company logo and weblinks. Please contact Richard Watts at richardwatts@ieem.net for further information or visit the website.

Higher Education Degree Accreditation

The pilot project to investigate the feasibility of accrediting higher education degree programmes has been completed and Council have approved implementation of the scheme for early 2013. We are very grateful to Project Associate Michael Ramsell for leading this work and to all members of the Advisory Group, which was chaired by Dr Peter Glaves MIEEM, for supporting it. The accreditation scheme is designed to identify degrees which provide students with the knowledge and skills that employers in our profession are looking for in newly-qualified graduates. A mandatory criterion for such degrees is a minimum number of hours of practical fieldwork. Over the coming months we will be recruiting members to assist with the assessment of candidate courses so please look out for this notice or get in touch with the Secretariat to express your initial interest.

Competency Framework

Another of the recommendations of the Ecological Skills Project report was the production of a generic Competency Framework for the profession. HyderCresswell successfully bid for the contract to undertake this project and have been working with a Steering Group chaired by Steve Pullan CEnv FIEEM. This work has now been completed and the Competency Framework will soon be published as a stand alone document. It identifies four competency categories: basic, capable, authoritative and expert. Competencies are divided into 14 themes and 39 sub-themes covering the technical areas of ecological/environmental knowledge and skills as well as 'transferable' knowledge and skills such as business planning, people management and financial management. The Framework will be used by the Institute to help define competency expectations at different membership grades. It can also be used by individual members and by employers as a career planning tool and to define job profiles.

The Competency Framework is a broad overview for the profession and links to other more specialist frameworks such as that for soil science. It also links with the National Occupational Standards for environmental conservation. The next step is to upgrade it into an interactive online tool so watch this space.

Membership Renewals

Membership renewal notices have now been sent out. Please note that membership subscriptions are due **on or before 1 October 2012** and you can now **renew online** by visiting the website. This year we have introduced the option of monthly direct debit payments for Fellows and Full members to help spread the cost and we will be extending this to Associate, Affiliate and Graduate members from October 2013.

If we have still not received your renewal by 1 November 2012 your name will be removed from the Commercial Directory and if you have not renewed by 30 December 2012 your membership will be deemed to have lapsed. Please remember that lapsed members are not able to use post-nominals or take advantage of any other benefits.

Every year the membership team spends many hours chasing members who have forgotten to renew and we really would appreciate your help in reducing the size of this task so please act on your renewal notice now.

Fellowship

Council is keen to encourage more suitably qualified members to apply for Fellowship of the Institute and has established a Fellowship Review Group to consider suggestions of members who perhaps should be given a nudge to apply. If you would like to suggest a member who you think should be encouraged in this way please download the appropriate form from the members' area of the website, summarise briefly why you think the person concerned should be approached and email it in to enquiries@ieem.net.

Future Conference Themes

Council have approved the following themes for 2013:

Spring 2013	Enhancing Biodiversity through Green Infrastructure
Summer 2013	TBC
Autumn 2013	Managing Freshwater Ecosystems

Chartered Environmentalists

A note to all IEEM Chartered Environmentalists, we are getting a steady flow of Chartered Environmentalist applications and we are looking to recruit members to volunteer as interviewers. So if you are already a Chartered Environmentalist and think you may be able to spare a few days per year, then please contact Zacyntha Dunhill zacynthadunhill@ieem.net.

For more information please visit *www.ieem.net/cenv-interviewer-information.*

External Liaison

Liaison with other organisations and government departments is an increasingly important part of our work. In recent months the Chief Executive has given presentations at the annual conference of the National Federation of Biological Recorders, the Rio +20 seminar series organised by CIRIA and the All Party Parliamentary Group on Biodiversity. Institute member Rebecca Collins gave a brief presentation on the Ecological Skills Research at the launch of the Mammal Society's new survey guidance.

We have also been working with Defra on some of the recommendations of the review of the implementation of the European Habitats and Wild Birds Directives in England. Together with the Association of Local Government Ecologists (ALGE) we are helping Defra shape an event for senior local authority planners on good practice in taking account of biodiversity in planning decisions. We are also facilitating a workshop looking at better access to and sharing of terrestrial and freshwater biodiversity data. We have started work with the Law Commission on the review of wildlife legislation in England and Wales. Finally, we are progressing the issue of standards and competence as covered by measure 27 in the summary.

IEEM Professional Directory

IEEM are very pleased to announce that we have now launched a redesigned and much improved 'Professional Directory' which will offer additional functionality and promotion, whilst making it simpler and easier for the end customer to use.

If you are a Full or Associate member, you are now able to register for a free entry in the new directory or subscribe for an enhanced listing, providing additional information and benefits. **If you had an entry in the previous "Find an Expert" directory, please note you will have to re-register for the new directory!**

CONTENT OF LISTING	BASIC LISTING	ENHANCED LISTING
Name, organisation and postal address	✓	✓
Email contact	✓	✓
Telephone contact	✓	✓
Ecological services offered	✓	✓
Habitats	✓	✓
Species	✓	✓
Website address (direct web link)		✓
Company logo		✓
Company profile (up to 350 words)		✓

Costs

Basic listing = free

Enhanced listing = based on the size of your company:

- £100 per year – small enterprise/sole trader (1-3 employees)
- £250 per year – medium size enterprise (4-10 employees)
- £500 per year – large size enterprise (11+ employees)

Eligibility

The Professional Directory is open to Fellows and Full and Associate members who offer their services on a commercial basis. All members registered on the directory **must** have appropriate Professional Indemnity Insurance (PII) (proof of which will be required) and be up to date with the Institute's Continuing Professional Development (CPD) requirements.

Promotion

IEEM directly promotes the Professional Directory to Government and other public bodies, Statutory Nature Conservation Organisations and Local Planning Authorities throughout the UK and Ireland. The Directory is also promoted at national events each year such as the RTPI Planning Convention and Ecobuild conferences.

Sign Up Now!

Signing up for the Professional Directory will mean you (along with your consultancy) are being advertised to the public, developers (and other ecologists/ environmental managers!). Please visit *www.ieem.net/professional-directory-registration-274* for further details and to register yourself on the new Professional Directory.

Reminder: Registration on the Professional Directory must not make false claims of competence.

North East England Section News

Since the last issue of *In Practice* there have been four field meetings in the North East region. In May the Section celebrated the Institute's 21st anniversary and the section's own 10th anniversary as a formal Section. Members heard Prof. David Hill CEnv FIEEM (Chair of the Environment Bank) give a talk on biodiversity offsetting and the Environmental Stock Exchange (a topic also covered by Tom Tew in the June issue of *In Practice*). A planned boat trip to the Farne Islands NNR had to be cancelled due to rough seas, but a coastal walk to Budle Bay NNR (Photograph 1) with fine views of Bamburgh castle (Photograph 2), a fish and chips supper and David's talk more than compensated for the disappointment. Later in the same month the Section visited Marsden Quarry LNR in the company of John O'Reilly CEnv MIEEM (Ptyxis Ecology) to learn about the diversity of bryophytes and lichens recorded at the site (Photographs 3 and 4). June saw a visit to Teesmouth NNR with Mike Leakey to explore the management of this site in the face of impacts from recreation and adjacent industry (Photograph 5). The Section's programme of field activities drew to a close with a visit to Birtley Sewage Works to see at first hand (and nose) the water treatment process, the role of reed beds and the range of bird species recorded at the site. The visit included a demonstration of mist netting by the Northumbria Ringing Group.

As always the Committee extends a huge thank you to all who helped facilitate and deliver a total of 10 events since the AGM in October 2011. Overall there were five field meetings, three evening talks and two longer meetings combining both talks and site visits. Any members with ideas for events in 2012/13 are encouraged to contact any member of the Section Committee.

The North East Section's forthcoming AGM will be held on the evening of 10th October at the North of England Institute of Mining and Mechanical Engineers in Newcastle upon Tyne. We are pleased to announce that IEEM President, Professor Penny Anderson CEnv FIEEM, will be speaking on *Upland peat degradation and restoration: For peat's sake what are we doing?*

To book a place please see the Section webpage in due course.

Andy Cherrill CEnv MIEEM

Convenor, North East England Geographic Section

Photograph 1. A blustery day in Budle Bay – the Farne islands are out there somewhere! Photo by Andrew Cherrill.

Photograph 2. Bamburgh castle. Photo by Kirstin Aldous.

Photograph 3. Members with John O'Reilly (second from right) searching an area of short turf for lichens and bryophytes at Marsden Quarry. Photo by Andrew Cherrill.

Photograph 4. Lichen, *Xanthoria sp.*, growing on elder at Marsden Quarry. Photo by Abi Mansley.

Photograph 5. Members at Teesmouth NNR with Mike Leakey (second from right. Photo by Andrew Cherrill.

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Scottish Section News

Engaging with Students in Scotland

The members of the Scottish Section Committee continue to support the development of student events in Scotland.

We have established close links with several Scottish universities over recent years and are keen to enhance the experiences for Student and Graduate members of IEEM and encourage more students and graduates to join the Institute. The events are geared toward broadening student awareness of the ecological and environmental job market and highlighting useful skills sets that are required to help achieve a career path that appeals to them.

So far this year we have been involved in organising and speaking at several careers events in Glasgow and Edinburgh. These include our regular involvement in the Breaking into the Environment (BITE) event in collaboration with the University of Edinburgh's Careers Service. This event was well attended, with over 100 students coming along to hear speakers from various career paths. These included Andrew McBride (Wetland Ecologist with SNH), Valerie Caldwell (an Environmental Economist with Jacobs Engineering), Kristine Ritchie (Commercial Manager at Sims Lifecycle Services), and David Thomson (a Marine Chemist with SEPA), and to whom we would like to give our sincere thanks.

Many thanks must also go to Catriona Scriven (Greenspace Officer at SNH), Chris Cathrine (Director of Caledonian Conservation Ltd), Marcus Cross (Environment Manager with Scottish Power Renewables and Member of the Scottish Section Committee), and Karen Dick (Director of LittleGreen Environmental and Convener of the Scottish Section Committee) who spoke at a similar event held at the University of Glasgow during their Climate Week. This was the first event of this format to be run in conjunction with the university's Sustainability Society.

Both of these events provided invaluable insight into the variety of careers associated with the ecology and environmental management sector as well as the varied and unusual paths our speakers have taken to get to where they are now. All of the attending students said that they would recommend the events to others.

In March, I attended a new style of event which was held at the University of Edinburgh as part of their Innovative Learning Week. This event was a chance to further promote IEEM as a professional body and expose students to the activities and benefits of being a member of the Institute.

The Scottish Section Committee will continue to attend, support and develop student events and activities in the future and is keen to welcome ideas and feedback from IEEM's Student and Graduate members to enable us to further engage with other current and future new members. For further information please do not hesitate to get in touch with me.

Elaine Anderson GradIEEM

Secretary, Scottish Section Committee

fea144@hotmail.com

The 2012 Integrated Habitat Networks (IHN) Seminars

Four IHN seminars were delivered by Scottish Natural Heritage, in collaboration with IEEM, at Forth Valley GIS in Stirling on 15th March and 27th June. Each session was limited to eight places and were well attended with 27 delegates over the series. Delegates were from the following sectors: private (15), public (six), charity (four) and education (two). A good level of discussion was enjoyed in the sessions and delegates welcomed the opportunity to ask questions and share knowledge. These seminars followed previous events, specifically targeted at environmental non-governmental charities, held in January.

Nicola Tyrrell MIEEM

Acting Convener, Scottish Geographic Section Committee

nicola.m.tyrrell@gmail.com

IEEM Scottish Conference

Delivering Green Networks: From Policy to Reality

23-24 October 2012, Stirling *(including optional study tour)*

Green Networks are firmly set in Scottish Planning Policy and are starting to be delivered. This conference will set the policy context for Green Networks in Scotland, exploring the challenges and solutions, current initiatives and examples of best practice.

Topics will include master planning, mapping, data requirements, urban green infrastructure, public access, brownfield redevelopment and biodiversity, community action and partnerships. Anyone involved in meeting the needs of local communities, wildlife and the environment will benefit from the learning outcomes of this event.

http://www.ieem.net/events/category/57/ieem-conferences

Partnership News

Society for the Environment

SocEnv welcomed a new Chair at its recent Summer Reception. Professor Carolyn Roberts was elected at the AGM on 26th June 2012. Carolyn is the Director of the Environmental Sustainability Knowledge Transfer Network (ESKTN), a Past Chair of The Institution of Environmental Sciences (IES), and a long-standing Board Member of SocEnv. She has great experience in bringing a diverse array of professionals together on environmental issues.

The AGM was followed by the Society's Annual Summer Reception, with guest of honour, Lord Chris Smith, Chairman of the Environment Agency. Addressing a diverse audience from SocEnv professional partners, industry and government, Lord Smith stressed urgent need for professionalism to play its role in reducing and mitigating the effects of climate change and resource depletion.

We are pleased to announce that the following IEEM members have been admitted as Chartered Environmentalists: Mr Jonathan Ayres, Mr Christopher D. Booler, Mr Edward P. Bradbrook, Miss Sarah Cane, Miss Sally M. Cowley, Miss Sarah Gooch, Mr Andy J. Lester, Dr Emma Long, Miss Maral Miri, Mr Thomas M. O'Donnell, Miss Lucy Philpott, Mrs Dawn A. Phythian, Dr James D. Riley, Mr Peter G. Seccombe, Mrs Linda Swankie, Miss Elisabeta Torok, Mr Paul L. Wilkinson

www.socenv.org.uk

CIRIA

On 3rd May 2012, CIRIA held the biodiversity-focused event in its 'Road to Rio+20' series. Speakers included Richard Smith (Principal Environmental Advisor, VINCI PLC), John Newton CEnv MIEEM (Managing Director, The Ecology Consultancy), Oliver Barnett CEnv MIEEM (Arup), Mike Oxford CEnv MIEEM (Project Officer, Association of Local Government Ecologists) and Sally Hayns (CEO, IEEM). The series (which also looked at climate change mitigation and adaptation, water, waste, and materials) focused on the sustainability agenda in relation to the construction industry in the lead up to the Rio+20 conference.

www.ciria.org

European Network of Environmental Professionals

ENEP held its Spring 2012 General Assembly in Basel, Switzerland on 27th April 2012. ENEP welcomed another new member at the event, namely VMx (Association of Flemish Environmental Managers and Consultants). The main discussions from the day revolved around the newly agreed Business Plan. A Communications Plan is now to be drafted to help implement the Business Plan.

ENEP continues to work on an (initially 'light' version) accreditation process for European environmental professionals, which will be discussed further at the Autumn 2012 General Assembly in Brussels, Belgium on 7th September 2012.

ENEP has also recently had an exhibition stand at Green Week, the biggest annual conference on European environment policy, in May 2012.

www.environmentalprofessionals.org

All Party Parliamentary Group on Biodiversity

On 9th July 2012, the APPGB held a meeting in the House of Commons on planning and biodiversity. The speakers included Bob Neill MP (Minister for Planning), Hillary Benn MP (Shadow Secretary of State for Communities and Local Government), Shaun Spiers (CEO, Campaign to Protect Rural England), Nigel Jackson (CEO, Mineral Products Association), Simon March (Head of Planning, RSPB), and Sally Hayns (CEO, IEEM).

www.publications.parliament.uk/pa/cm/cmallparty/register/biodiversity.htm

Building Research Establishment Environmental Assessment Methodology (BREEAM)

IEEM is seeking to work with BRE to bring credibility to the ecological section of BREEAM, which IEEM does not currently endorse. To this end, IEEM and membership representatives, Max Wade and Nick Betson, met with representatives of the Building Research Establishment (BRE) in the third week of July 2012, to discuss the issues and changes to BREEAM that IEEM considers imperative. Any such review will be dependent on agreement from BRE's Governing Board.

Subject to the necessary agreement, in the short-term, we would be working to clarify the criteria on the use of ecologists and non-ecologists for undertaking site assessments and to revise LE03 for the next BREEAM version, which is due to be republished in September 2013.

In the medium-term to 2014 we would be looking to undertake a thorough review of the BREEAM ecological criteria and methods, and in the longer-term to have an established programme for cyclical review.

www.breeam.org

Applicants and Admissions

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 Chief Executive Officer by telephone or letter before 8th October 2012. 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. IEEM is pleased to welcome applications for membership from the following:

APPLICANTS

Applications For Full Membership

Mr Allan Conlin, Mr Andrew Godfrey, Dr Malcolm Grant, Dr Roy Sugoto, Dr Philippa Tomlinson

Applications For Associate Membership

Miss Vanessa Jury

Applications to Upgrade to Associate Membership

Miss Lorna Potts

ADMISSIONS

Full Members

Mr Simon Barnard, Miss Amy Beard, Dr Paul Beckett, Miss Alexia Chapman, Dr Christopher Bell, Mr Simon Cornthwaite, Ms Stacey Cougill, Dr Lindsey Defew, Mr Karl Dentith, Mr Kevin Doidge, Mr Alastair Driver, Miss Vivien Geen, Ms Ciara Hamilton, Mr Martin Harrison, Mr Paul Harvey, Mrs Kathryn Hiseman, Ms Catherine Hosie, Mr Chris Huggins, Miss Rhian Hughes, Mr Alan Johnson, Dr Declan Lawlor, Mr Stephen Leigh, Mrs Rachel Lenane, Dr Maria Long, Mr David Morley, Dr Moira Owen, Mr Edmund Parr Ferris, Mr Matt Perry, Mr Adam Robbins, Mrs Elizabeth Robinson, Mrs Joanna Saich, Miss Susan Traer, Mr Alistair Watson, Dr David White, Mr Andrew Williams, Ms Emily Williams, Miss Jennifer Wilson

Associate Members

Mrs Rachel Barker, Miss Donna Bigsby, Mrs Hannah Boylan, Miss Sarah Brooks, Miss Eleanor Cooper, Mr Leonard Debell, Mr Samuel Griffin, Mr Timothy Kaye, Mr David McCormick, Mr Thomas McQuillan, Miss Nicola Murray, Mr Oliver Richings, Mr Rob Sekula, Mr Michael Sims, Miss Lynsey Stafford, Mr Daniel Wood

Upgrades to Full Membership

Dr Katherine Allen, Mrs Gaelle Bardsley, Miss Joanna Barker, Mrs Holly Bowler, Miss Abigail Bridge, Mrs Hannah Broughton, Mr Jason Brown, Miss Michelle Brown, Mr John Condron, Ms Alanna Cooper, Mr Simon Cope, Mr Tim Crabb, Mr Jack Crump, Mr James Darke, Miss Mary Davies, Miss Sarah Downing, Mr Nathan Edmonds, Mr James Faulconbridge, Miss Rachel Finan, Dr Jessica Frame, Mrs Irene Gest, Mr James Girgis, Mr Jamie Glossop, Mr Edward Godsiffe, Mr Aaron Grainger, Mrs Sharleen Hanlon, Miss Karen Hassard, Mr Michael Hetherington, Mr Christopher Hill, Mr Paul Hiscocks, Mr Andrew Holyoak, Mr Mark Iley, Mr Kevin Johnson, Mrs Catherine Jones, Ms Jackie Kelly, Mr David Kirby, Mr Matthew Lakey, Mrs Polly Luscombe, Mr Lee Mantle, Miss Hazel Marsh, Mr Dean Martin, Ms Hannah Montag, Dr Sian Moore, Mr Christopher Morrell, Mr James Mulholland, Mr Christopher Mungo, Mr Anthony Nickson, Mr Peter Owens, Mr Neil Page, Mr Neil Parker, Miss Christine Parkinson, Miss Tamara Percy, Mr Alex Prendergast, Miss Melanie Pritchard, Mr Robert Revolta, Miss Elizabeth Richell, Mr Paul Roebuck, Ms Gemma Russell, Miss Anna Senior, Miss Tracy Simpson, Miss Natasha Stentiford, Mr Michael Symes, Dr Thomas Tew, Mr Daniel Thomas, Mr Julian Thornber, Mr Paul Turner, Mrs Patricia Vaux, Mr Steven Weber, Dr Robin Welsh, Mr Mark Wingrove, Mr Antony Witts

Upgrades to Associate Membership

Miss Rosalind Atienza, Mr Thomas Austin, Mr Jonathan Bannon, Mr Paul Barnes, Miss Kate Bennett, Miss Natasha Burdis, Mr Richard Carline, Mr Adam Cave, Miss Anna Davies, Ms Sarah Dillon, Mr Sebastian Fitzgerald, Mr Craig Greenwell, Mr Barry Grieves, Mr Matthew Guy, Mr Marten Hall, Miss Anne Marie Hodgson, Miss Sian Jones, Mr Thomas King, Mrs Paula Lightfoot, Miss Rhia McBain, Dr Stephanie McGovern, Miss Lucy Monday, Mrs Alice Murphy, Mr Barry O'Loughlin, Mr Ryan Oakley, Mr Richard Pearce, Mr Andrew Southcott, Miss Elizabeth Stewart, Ms Lauren Stothert, Miss Hannah Wheatley, Mr Nicholas Wright

Recent Graduate Members

Miss Jessica Andrews, Mr Daniel Arnold, Miss Kikelomo O Ayeni, Miss Ella Barnett, Miss Katherine Breslin, Miss Lucy G Brooks-Marchant, Mr Michael Canning, Miss Chloe Chatt, Mr Benjamin Christie, Mr Timothy Clark, Mrs Rebecca Clews-Roberts, Miss Amy Coleman, Miss Ailsa Conibear, Miss Lena Franke, Miss Carolyn Goldie, Mr Douglas W Gordon, Miss Jillian K Hetherington, Miss Sarah E Holman, Mr Alastair Hood, Mr Richard J Howells, Miss Kimberley Jennings, Miss Rachel Johnston, Miss Kelly Jones, Miss Laura Jones, Mr Brendan Keegan, Ms Bronwen Keiller, Mr Simon Knott, Mr Adam P Lewins, Mr Daniel C Llewellyn, Mr Keith W McSweeney, Miss Katie A Mettam, Mr Oliver Moore, Mr James A Morrison, Mr Robert O'Dwyer, Miss Lorna Oldershaw, Mr Patrick O'Shea, Mr Luke Powell, Mr Stuart D I Robinson, Mr Fraser G Ross, Mr Andrew J Selman, Miss Clare H Simm, Mr Christopher Styles, Mr Morgan Taylor, Mr Jack C Ward, Miss Claire Wilson

Recent Student to Graduate Upgraded Members

Mr Michael J Ashford, Miss Erika J Exelby, Ms Gail Rainford

Recent Student Members

Miss Stephanie G Allen, Miss Holly Apps, Miss Katherine E Biggs, Miss Melissa Briers, Miss Janie Burrage, Mr John Cartwright, Miss Julie Day, Mr Robert W Dunn, Miss Janine C Froehling, Mr Craig Jackson, Mr Chris Jones, Ms Eleanor J Jones, Miss Katherine Kavanagh, Miss Sara Lee, Ms Rebekah Mayhew, Miss Sophie E McLoughlin, Mr William H Mills, Miss Emilia Murray, Mr Craig Myatt, Mr Edward Negro, Miss Lauren E Parry, Miss Zarah Pattison, Ms Christine Pentony, Miss Lucinda F Schirle, Miss Joanna Stephen, Miss Claire J Thackwary, Aisling Warren, Mr Samir Whitaker

Recent Affiliate Members

Mr Peter Antrobus, Ms Ria Avery, Miss Alison J Blaney, Miss Stephanie Bryant, Mr Craig A Bulga, Mr James Coope, Mr Richard Edwards, Miss Jennifer Grantham, Mrs Jackie Hayes, Ms Jayne Kelly, Mr Douglas C Mortimer, Miss Amanda Scrivener, Mr John D Wildsmith

Enhancing Biodiversity through Soil Management

IEEM Summer Conference – 13 June 2012, London

Helen Boulden
Training and Education Officer, IEEM

Choosing soil ecology as the theme for this year's summer conference created an opportunity to shed light on this often overlooked science. Soils, as we know, are a vital and non-renewable resource, an integral part of our biodiversity contributing to essential services like drainage and food production. Throughout the day, soil scientists and specialists added weight to the argument that ecologists and environmental managers need to engage in maintaining healthy soil reserves, a view reinforced by **Penny Anderson** who presided over the proceedings.

Left to right are Franciska de Vries, Matthew Shepherd, Clifton Bain, Martina Girvan and Helaina Black

Keynote speaker **Helaina Black** gave context to the conference theme, guiding delegates through the jargon of policy development and theory to come to a practical use for soil science in relation to biodiversity and ecosystem services. Honing in on the diversity of UK soils, Helaina demonstrated how the mapping and classification of soils alongside above-ground habitats has led Cranfield University and Defra to derive a suite of simplified 'soilscapes' to be applied when identifying soil properties and functions on a landscape scale. Helaina finished positively by highlighting the international recognition now being given to soils for their ecosystem services and the many benefits to biodiversity of soil restoration through such high profile international policy as the 2010 Aichi Biodiversity Targets.

Soil diversity was taken up by **Martina Girvan** but this time at the microbial level, with the latest research indicating the genetic resistance of soils and their potential for resilience. Martina demonstrated to dramatic effect the vast extent of genetic diversity found in soil microbe communities and the thousands of soil habitats that support them. These micro-organisms have evolved to exploit very specific niches in their below-ground habitats and we should seek to conserve them whilst further work is done to assess their ecological function.

Moving on to peatland conservation, **Clifton Bain** examined the shift in our awareness of this particular resource, long exploited for agriculture, fuel and forestry, but which has undergone a re-evaluation for its functional benefits as natural drainage and storage of carbon and greenhouse gases. Damaged peatlands now represent a cost to society as major sources of greenhouse gases and compromised resilience to climate change. Their restoration is recognised as a priority conservation action under the Kyoto Protocol. In the UK, organisations such as the James Hutton Institute are leading the way in achieving this. Various mechanisms are now in place to turn around the status of peatlands through the development of policy, through funding and co-ordinated delivery on the ground. A Peatland Carbon Policy Framework is being created and the IUCN UK Peatland Programme is exploring the economics of peatlands - the good news is they are capable of undergoing large scale restoration.

Franciska de Vries specialises in the complex interactions between soil food webs and plant communities. She explained how plant traits can be used to understand microbial communities on a landscape scale and how shifts in their composition can alter an ecosystem's ability to respond to the impacts of climate change. Below ground, plants have a critical role in controlling an ecosystem's responses to drought conditions. This has implications for intensive agriculture, which reduces the diversity and biomass of a soil food web and causes a shift towards more bacterial-based soil types. Franciska went on to examine fungal-based food webs which are more resilient to drought, reducing the loss of nitrogen from the soil and enabling a better recovery rate after drought. This raises possibilities for fungal-based soil communities to be used to create more sustainable agriculture.

How do organisms living in soil respond to environmental change? **Matthew Shepherd** showcased a research programme using integrated monitoring techniques at sites around the UK to observe long-term effects of climate change, air pollution and land management on biodiversity factors that include soil function. The project builds on the Environmental Change Network (ECN) and aims to continue to 2050 and beyond. Research is still in its early stages, however it is hoped that the monitoring will suggest links

between above- and below-ground changes in ecosystems to inform future management of healthy soil ecosystems, such as through the use of organic matter management and crop diversification.

David Gowing from the Floodplain Meadows Partnership drew attention to the ability of grassland habitats to respond to changes in soil hydrology. Meadow vegetation was shown to be highly responsive to changes in water table depth, with different plant species such as the buttercup family, occupying different niche roles. Responses to waterlogging are soil-specific and dependent on soil structure, which when compromised by activities that cause compaction, impacts on biodiversity - such as the ability of birds to probe for invertebrate prey. Porous soils support higher species richness and need to be managed to conserve their structure, not just the direct needs of the vegetation they support. Ways to manage wet grassland habitats to support soil structure include the use of flotation tyres on tractors and the process of 'subsoiling', whereby soil is loosened and broken up at depth.

Methods used for soil translocation can be critical to achieving successful habitat creation and restoration. **Bruce Lascelles** demonstrated some of the techniques used when handling soils for biodiversity which minimise the amount of disturbance caused. There are a host of factors to consider when deciding on the most appropriate method of translocation for any given scenario. Key questions include how possible is it to create the soil conditions needed? What is the value of the habitat being moved? What are the costs associated with specific techniques? Are there seasonal constraints? And are there features of cultural heritage which might be disturbed in the process? Practical examples from different situations were illustrated, from cases of pipeline installation on upland acid grassland and bilberry heath, to translocation of woodland soils. Potential solutions ranged from macro-turfing – the process of moving whole soil profiles – to varying degrees of topsoil stripping.

Enhancing above- and below-ground biodiversity is a key priority for new Green Infrastructure on development sites and reclaimed land. Native topsoil is scarce and often not imported to restored land and development sites due to high economic cost, conservation of undisturbed historic soil profiles, and sustainable development

Penny Anderson, Helaina Black and Bruce Lascelles

best practice. **Philip Putwain** explained how manufactured soils from recycled materials can be used instead to create properly functioning soil ecosystems. Types of organic materials suitable for this process include PAS 100 green compost, PAS 110 anaerobic digestate and possibly the use of recycled paper crumb. The key consideration is to ensure that sufficient organic matter is incorporated where needed into raw substrates so that soil physical and chemical constraints are amended, and soil biological activity is either kick-started or enhanced from an existing low level. Philip demonstrated several case studies where recycled organic materials have been used to create new plant communities and soil ecosystems.

Eco-engineering with soils engages the disciplines of ecology, planning, engineering and landscape design. Bringing all of these areas together can result in conflicting priorities, which is important to understand so that a multidisciplinary approach can be developed. The revision in 2007 of the BS3882 Topsoil standard and the recent creation of a Subsoil Standard were intended to facilitate habitat enhancement and design within development sites while encouraging the recycling of materials. **David Hackett** explored the implications of these standards for ecology and how they fit within the design process, giving examples of how they might most effectively be used to benefit biodiversity. One such case study involved a remediated site near Glasgow where the amelioration of soils by adding organic material and introducing earthworms was used to support local badger populations.

The conference was drawn to a lively and inspiring conclusion by soil enthusiast **Ted Green MBE,** who's highly illustrative session evoked the history of our relationship with soils and the wonders of the ecosystems beneath our feet so often overlooked. Ted is passionate about the need for 'soil reserves' to conserve areas where soil communities are of particular rarity for their historic origin and importance to biodiversity. Ted's anecdotes brought to life the stories that are held within soils which will be lost if they are not protected. He hopes to encourage ecologists and environmental managers to join him in raising awareness of the heritage of soil habitats and their intrinsic value to our natural environment.

IEEM would like to thank our conference partners, the **British Society of Soil Science** and the **Institute of Professional Soil Scientists,** along with their respective Presidents Helaina Black and Bruce Lascelles for their contributions to this conference.

The presentations from this conference are now available from the IEEM website.

About the Author
Helen Boulden recently became IEEM's Training and Professional Development Officer. She has previously worked for WWF-UK, IUCN and held biodiversity roles with two local authorities.

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IEEM Autumn Conference

7-8th November 2012, Cardiff

Renewable Energy and Biodiversity Impacts

www.davekilbeyphotography.co.uk

In the face of climate change and targets to reduce carbon emissions, renewable energy technologies are globally recognised as a critical part of the solution and have the potential to deliver huge benefits over more traditional forms of energy production. However, the siting, design and operation of many renewable developments often bring significant conflict with biodiversity conservation objectives.

The conference programme is structured around the UK's planning application process – from pre-application to decision-making, determination and implementation. At each stage we will examine how key biodiversity issues can be addressed and resolved for a range of renewable energy developments.

Who will be speaking?

- Representatives from RSPB
- Renewables UK
- Environment Agency
- Scottish Borders Agency
- Marine Institute
- Marine Management Organisation
- AMEC

Hot topics

- Professional Issues for Ecologists in the Renewables Sector
- Wind Farms & Bird Disturbance including Planning Applications & Consents
- Bat Mortality
- Biodiversity Offsetting & Renewables
- Legal Protection & Biodiversity Conservation Good Practice
- Hydropower Schemes
- Biomass & Green Infrastructure

Meet exhibitors and network with professionals from across industry sectors

Who should attend?

Successful delivery of renewable energy developments and biodiversity impacts involves co-operation from professionals of wide ranging backgrounds - developers, engineers, planners, ecologists, academics and others.

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Watch our website for latest conference news

www.ieem.net/events

IEEM House of Lords Event 2012

Jason M. Reeves AIEEM
Policy and Information Officer, IEEM

Lord Robert May. Photo by Pete Johnstone.

Nearly 100 invited guests and Institute members attended the IEEM House of Lords event on Thursday 28 June 2012 to present the 2012 Institute Medal to Lord Robert May of Oxford and celebrate IEEM's 21st anniversary.

The event opened with Baroness Barbara Young of Old Scone welcoming everyone to the House of Lords. Baroness Young, an IEEM Patron, was kind enough to be the host Peer for the day.

Penny Anderson, IEEM President, started the event by giving an overview of IEEM's 21st anniversary and reasons for us to celebrate. As an IEEM Founder member Penny explained how she has seen the Institute grow and change, to become more professional and influential. The membership is now fast approaching 5,000 and IEEM continues to improve its services and benefits for members and the sector. She briefly outlined the governance changes that IEEM is going through and described how IEEM is applying for Royal Charter and a register of Chartered Ecologists. Lastly, Penny dedicated the day to the late Professor Tony Bradshaw, IEEM's first President and the driving force behind the Institute's creation. Following Penny's talk, she and Robin Buxton, IEEM Vice-President, signed the official petition for IEEM to apply for a Royal Charter.

Professor Sir John Lawton, author of *Making Space for Nature* and one of IEEM's newest Patrons, was kind enough to be the guest

Robin Buxton and Penny Anderson sign the official petition for a Royal Charter

Sir John Lawton. Photo by Pete Johnstone.

Barbara Young toasts Lord May. Photo by Pete Johnstone.

speaker for the event. Rather than give a talk about a chosen ecological or environmental topic, John instead spoke about his personal friendship with Lord Robert 'Bob' May, which stretches back over 40 years. They first met in Oxford in 1970 when Bob asked him what ecologists had learnt about diversity and stability since Charles Elton's seminal publication on animal ecology[1] had suggested that more diverse systems were more stable. The answer unfortunately was *"not a lot"*. Bob and John ended up talking about a Nature article by Gardner and Ashby[2], which seemed to suggest that Elton was wrong and that more complex systems were actually less likely to be stable. It turned out that Elton and Gardner and Ashby were talking about different kinds of stability, but this initiated Bob's first significant ecological publications[3,4]. Bob recast the Gardner and Ashby models and showed that a randomly connected network of interacting species was less likely to be stable than if there were more species involved and that the simplest systems were more stable – in other words, diversity led to instability. This was a bombshell in the ecological world and led to ecologists changing the way that they thought about modelling and stability. This story epitomises Bob's approach to science, where he reduces a problem to its simplest essential elements and then expresses the relationships between these elements in a mathematical form to understand their dynamics. This may sound easy, but it requires phenomenal intuition – and Bob has applied this approach to many fields.

John continued by reciting the story about how, after a workshop in York in 1974, a small group went walking in the Yorkshire Dales. These walks continue 40 years later and have become known as 'Bob's Walks'. The walks involve gossiping, talking about science, sharing ideas, and in doing so building trust and understanding. Bob recognised the value of these relationships, which have contributed to the success some remarkable collaborations across a wide spectrum of ecological and environmental fields. John explained that, both on these walks and professionally, Bob was and still is very competitive and warned: *"Never play croquet with him! Never!"*

John concluded by saying that working and playing with Bob, and the group of people around him, has been a huge personal and professional pleasure for him, how richly deserving Bob is of the IEEM Medal and that he could think of no better recipient.

Penny then read out the citation for Lord May for his outstanding commitment to biodiversity and the natural environment. The full citation can be downloaded from the IEEM website (*www.ieem.net/ieem-medal*).

Lord May responded by explaining how he had started as a theoretical physicist and became *"accidentally involved"* in ecological problems as an epiphenomenon of events in 1968 when Charles Birch was a very influential ecologist and co-author of the international standard ecology text of the 1950s and 1960s[5]. Charles Birch later invited him to give a seminar in the UK and this was how he met John. Bob humbly explained how he had the *"good fortune to blunder"* into ecological problems and then later came across the Gardner and Ashby model that led to the publications described by John.

In the early 1970s Bob moved to Princeton University, but spent the summers in England and this is when 'Bob's Walks' came about – the first being the 'Yorkshire Three Peaks' of Whernside, Ingleborough and Pen-y-ghent. He explained how, from the original five people, the walks have grown to include 'academic' children and grandchildren.

Bob recalled that at the time that Tony Bradshaw was setting up IEEM, he was President of the British Ecological Society and it was suggested to him that he should join the new organistion. He said that he agreed, but then found that due to European legislation he could not as he did not possess a relevant tertiary qualification – and so he is delighted that he has now finally become a 'member' of the Institute – despite still not having a relevant tertiary qualification.

Bob concluded by explaining one area of his enthusiasm for IEEM – this being that graduate students often come to think, often

Penny Anderson presents Medal to Lord May. Photo by Pete Johnstone.

Penny Anderson presents Fellowship Certificate to David Tyldesley. Photo by Pete Johnstone.

through no fault of their own, that unless they go on to do academic research will be deemed to have failed careers. This troubles him and he said that he is very happy that IEEM exists to bring together people from varied backgrounds, including pure research, environmental activism, policy and practical implementation.

Penny then presented David Tyldesley with his recently approved Fellowship certificate.

David is a Founder member of the Institute and is the driving force behind David Tyldesley and Associates, which has a formidable reputation as a planning and environmental consultancy with an enviable client base and a reputation for delivering clear and professional advice in relation to biodiversity and nature conservation. His project list over almost 30 years has taken in some of the most challenging projects involving competition for land use between nature conservation and built development. This is a tribute to his integrity, professionalism and sheer overall ability.

David has been commissioned regularly by statutory bodies to advise and to undertake research into the practical implementation of various pieces of statute. The outcome of much of this work has resulted in the publication of national guidance that has been widely adopted as best practice among both planning and ecological professionals. He has also made a significant contribution to the introduction of new statutes, such as The Marine and Coastal Access Act 2009 and the Marine (Scotland) Act 2010.

David is recognised as a champion of consistently high and uncompromising standards of professional work. His success is especially noteworthy because his expertise is not limited to only one discipline. He has achieved senior planner status as a Fellow of the Royal Town Planning Institute, is a Fellow of the Royal Society of Arts, and is also a qualified landscape architect.

Over the years David has given freely of his time to support the Institute, for example, through many years of service on the Membership Admissions Committee and more recently in reviewing the Institute's guidance and processes in relation to Fellowship applications. Council had no hesitation in approving David as a Fellow (indeed when his Fellowship application was received, several Council members responded with *"Isn't he a Fellow already?"*) and is deserved recognition for one of IEEM's foremost members.

David thanked the Institute for the recognition and said that he hoped that this would inspire other members who should be Fellows to *"get their pens out"* and fill in the application form because the Institute does need a strong Fellowship as it moves forward.

The day's proceedings closed with Barbara asking all of the attendees to raise a glass to toast both Lord May and IEEM's anniversary as Penny and Bob cut the IEEM 21st anniversary cake.

Notes

1 C.S. Elton (1958) *The Ecology of Invasions by Animals and Plants*. Methuen and Co. Ltd. London.

2 M.R. Gardner and W.R. Ashby (1970) Connectance of Large Dynamic (Cybernetic) Systems: Critical Values for Stability. *Nature* **228**: 784.

3 R.M. May (1972) Will a Large Complex System be Stable? *Nature* **238**: 413.

4 R.M. May (1973) *Stability and Complexity in Model Ecosystems*. Princeton University Press, Princeton.

5 H.G. Andrewartha and L.C. Birch (1954) *The distribution and abundance of animals*. University of Chicago Press, Chicago.

About the Author

Jason Reeves is the Policy and Information Officer for the Institute of Ecology and Environmental Management. He edits the Institute's membership bulletin, *In Practice*, and is also the Co-ordinator for the European Network of Environmental Professionals.

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Continuing Professional Development (CPD)

Peter Beale CEnv FIEEM
Sunflower Ecology

I am writing this article from the perspective of a freelance consultant ecologist, who has observed how the work of ecologists and environmental land managers has changed dramatically since the Institute came into being 21 years ago.

Ecological reports that were then considered to be fit-for-purpose might well be regarded as inadequate now. This progress is both necessary and good, but it also makes greater demands on us to keep abreast of the latest developments in our sector.

This is where Continuing Professional Development (CPD) fits in, because the obligations placed on us by national and European legislation and regulation, protected areas, guidelines, data lists, methodologies for survey and data analysis, reporting methods, *etc*. mean that we constantly have to up our game.

The Institute's current annual requirements of 10 hours of structured and 10 hours of unstructured CPD are very modest and should be seen as the absolute minimum to be clocked up by every member. Analysis of members' returns would probably show an average figure of nearer 100 hours of CPD each year.

CPD is about the use of combined knowledge – firstly the acquisition of information and then the application of the knowledge and skills acquired. We all need to keep up-to-date; to hone and then apply our skills. Being professional has to be worked at – from the development stages of our early careers through to maintaining a level of competence that is appropriate to our professional standing and reputation.

This is particularly important as the Institute approaches Chartered status. Expectations will be high and all members will have to think about the need to enhance our knowledge and skills and how best to achieve this.

Whilst the prospect of accessing all the information that we require may seem daunting, much is available online. The Institute's own website has been updated and is an excellent source of information. The publications section provides details of titles in the Professional Guidance and Technical Guidance series and these are invaluable.

The scale and breadth of courses provided under the Institute's Professional Development Programme covers the training needs of all ecologists and environmental land managers – including seasoned old-stagers like myself. Courses are targeted and the costs are modest – they represent good value for money. IEEM workshops and training courses cover a very wide range of training needs, but they 'compete' alongside courses offered by others that can also count towards your CPD requirements.

I receive lists of titles available from publishers and the NHBS and I regard the regular monitoring of publications as an important part of my CPD. I also subscribe to *British Wildlife* and *Conservation Land Management,* both of which provide valuable information, references and briefing notes.

With time, ecology has become more complex, leading some ecologists to specialise in order to be more effective and to reduce the cost of specialist kit. This is fine and specialists cater for what is currently a buoyant market, however it can also be isolating, so it is essential for specialists to keep abreast of what is happening in the rest of the profession. Equally this applies to generalists, like myself, who work with specialists and need to understand what they do and how they do it in order to make effective use of their expertise.

The IEEM Geographic Sections provide opportunities for ecologists and environmental land managers to meet and to network and this is an important part of CPD. As the Institute has grown, there is now scope for 'Special Interest Groups' to be set up, providing networking opportunities for those with mutual interests to share knowledge, ideas and to learn from each other.

To summarise, CPD is not just a 'bolt on extra' but an essential part of the workload of all professional ecologists. The amount of CPD that the Institute requires is far less than is actually needed by all ecologists and environmental land managers to keep up-to-date in a climate of constant change.

About the Author
Peter Beale is the Principal of Sunflower Ecology. A former County Council Ecologist and lecturer in Landscape Planning and Applied Ecology, Peter now specialises in ecological issues related to development and habitat management. He is the co-owner and hands-on manager of an area of heathland outside Poole. Peter serves on MAC and TECDC.

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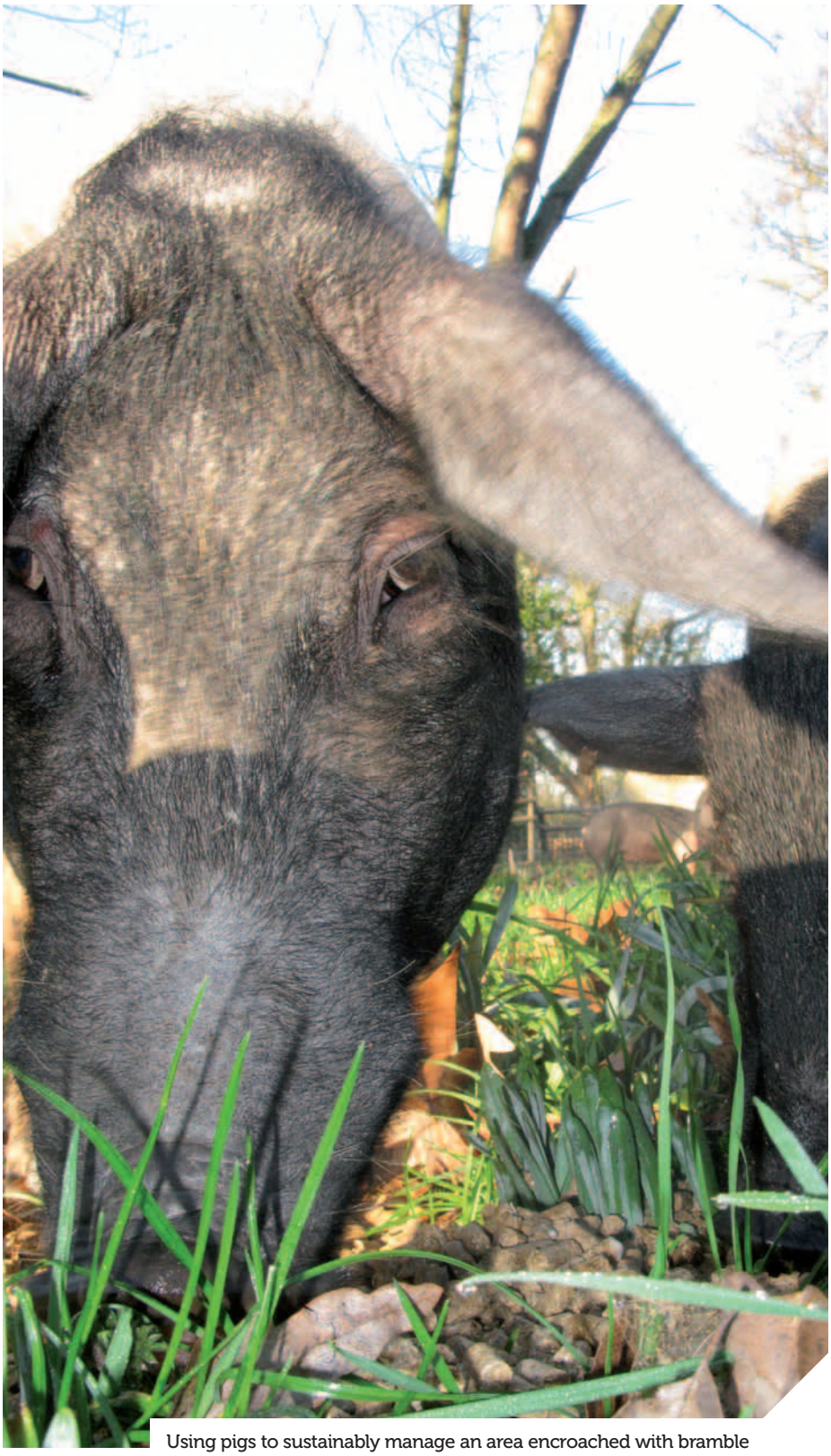
CPD Member Profile

Saskie Laing MIEEM
Ecology Service Manager, Royal Borough of Kensington and Chelsea

Saskie Laing



Using pigs to sustainably manage an area encroached with bramble

Following a BSc (Hons) in Biology and Environmental Science in 2000 I was fortunate to be offered a research assistants post at the Institute of Arable Crop Research; undertaking invertebrate and plant surveys in agricultural environments. This was a great start for my career but sadly after a couple of years the Long Ashton site closed and I moved on and took a seasonal job at Bristol Zoo as an education officer; this role highlighted how vital good education on environmental topics is. When the summer season ended I travelled to Costa Rica and worked on a volunteer-based leatherback turtle conservation project. This was really my first introduction to working with volunteers and was thoroughly enjoyable and highlighted their value and the achievements that can be made using volunteer groups.

Following the stunning coastal rainforest of Costa Rica, I moved to South Africa where I worked on an Earthwatch-funded project looking at multi-taxa invertebrates in the savannah ecosystem. My Research Masters degree was based on the outputs from this project. I also worked as an environmental consultant for SiVEST mainly undertaking Environmental Impacts Assessments and Strategic Environmental Assessments. After five years in South Africa I returned to England where I'm now working for the Royal Borough of Kensington and Chelsea, managing their Ecology Service.

My current role involves managing areas of parks for wildlife, integrating biodiversity enhancements into openspace management, providing input in the planning process, plus managing a popular Ecology Centre which delivers formal and informal education to schools, local groups and other interested residents. This is quite a contrast to working on invertebrates in Kwa-Zulu-Natal's game reserves.

Due to the nature of the densely populated urban environment my job doesn't require me to be a specialist in a particular area. Unfortunately, Kensington and Chelsea does not have any SSSIs or large tracts of natural habitats. We have a lack of open space and constant conflict between development and natural habitats. Furthermore we have urban children who have become increasingly disconnected from the natural environment, as recently termed by Richard Louv as 'Nature Deficit Disorder'. Nevertheless, I am constantly amazed at the biodiversity that small urban spaces can support, and I highly value the larger areas of semi-natural habitat within the Borough. These spaces offer excellent opportunities for residents to engage with nature and provide interesting management challenges. Two recent successful projects have been i) the use of pigs to sustainably managing an area which had become encroached with bramble and ii) the training of the ground maintenance contractors to use scythes to manage wildflower meadows and semi-improved neutral grassland.

Its is important for me within my role to be able to understand a range of topics from detailed species-specific surveys, planning and development processes, environmental policies, environmental education, habitat restoration, invasive species and politics – and it is vitally important for my knowledge to be up-to-date. Biodiversity issues are my key focus but I also need to be able to understand other business process, such as PRINCE2 (PRojects IN Controlled Environments) and MSP (Managed Service Providers), and recent changes in policy/legislation so that I can effectively communicate biodiversity issues to other professionals outside of the biodiversity arena.

Although I have spent a lot of time working with invertebrates I am acutely aware that I am not a specialist, I see my skill set as being 'generalist'. When I am faced with an area I am unfamiliar with, I take on the challenge. I seek advice from specialists, talk with colleagues and attempt to get

up to speed. I attend the London Borough Biodiversity Forum which is a great opportunity to share best practise and discuss changes and approaches with other London borough ecologists and the local records centre (Greenspace Information for Greater London). Fortunately the Royal Borough of Kensington and Chelsea has an excellent staff development programme and offers many short courses to develop staff's management and business skills. In addition, I'm in contact with a number of groups and organisation, many of which offer local training courses.

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Institute of Ecology and Environmental Management

CPD RECORD SHEET

OCTOBER 2010 TO SEPTEMBER 2011

NAME: Saskie Laing | EMPLOYER: Royal Borough of Kensington and Chelsea

EMAIL: Saskie.laing@rbkc.gov.uk | MEMBERSHIP NUMBER:4218

MEMBERSHIP GRADE: Full

Date of Activity	CPD Activity (and Name of Provider for any Structured CPD)	Skill Developed	Number of Hours
DIRECTED (STRUCTURED) CPD - including attendance at short courses, conferences and seminars; project experience (involving a structured learning process); and/or formal home study (distance learning). Don't forget to include non-ecological training that is relevant to your job.			
13/10/2010	New Management for New Challenges (RBKC)	Change management	4
18/01/2011	Introduction to Programme Management (RBKC)	Programme management	8
10/02/2011 – 23 – 25/03/2011	Managing Change (RBKC)	Change management	8
09-11/05/2011	First Aid 3 Day Course (RBKC) (foundation)	First Aid	24
11-13/05/2011	Managing Successful Programmes (Practitioner)	Programme management	24
08/08/11	Mad About Meadows Consensus Seminar (London Wildlife Trust)	Programme management	24
10/02/11 – 06/07/11	Basic Beekeeping – BBKA	Wildflower meadow creation	4
12/01/2011	Delivering successful living roofs from planning to implementation (Livingroofs.org)	Apiary management skills	30
11/03/2011	Creative Conservation: Approaches to Delivering Green Infrastructure Benefits (IEEM)	Green roof – best practice	4
08/05/2011	Bee Health Day (FERA)	Conservation approaches in the urban environment	5
12/07/2011	The Natural Environment White Paper: Protecting our Biodiversity (Westminster Briefing)	Bee disease recognition and management	6
	SUB-TOTAL (NUMBER OF DIRECTED (STRUCTURED) CPD HOURS)	Understanding the white paper	5
			146
Date of Activity	CPD Activity (and Name of Provider for any Structured CPD)	Skill Developed	Number of Hours
SELF DIRECTED (UNSTRUCTURED) CPD - including private reading and study; technical research for practical work; 'on the job' project work; and/or some lecture preparation. Don't forget to include non-ecological training that is relevant to your job.			
14/10/2010	An environmental mascot for Britain-debate	debate on flagship species	2
25/11/2010	Black Poplar LBAP	Biodiversity action: black poplar - Issues, conservation requirements – good & bad practice	3
08- 12/08/11	Biodiversity Planning – legislation, policy, guidance	Understanding planning legislation, policy, guidance to ensure biodiversity enhancements / protection	12
	SUB-TOTAL (NUMBER OF SELF DIRECTED (UNSTRUCTURED) CPD HOURS)		17
	TOTAL NUMBER OF HOURS OF CPD		163

Scything training for contractors.

New IEEM Training Events for Autumn/Winter 2012-2013

European Protected Species Masterclass Series

How Local Planning Authorities should discharge their legal duties

5 October 2012, Birmingham

A one-day course focusing on the legal duties for wildlife and protected species that local authorities are required to discharge, and what this means in practice.

Who should attend?

- Local Authority ecologists and environmental managers
- Planning Officers
- Tree Officers
- Other officers with a wildlife responsibility and/or links with planning.

Legal Training Seminar for commercial ecological consultants

8 Nov 2012, Leeds
23 Nov 2012, London

During the day will be given a detailed explanation of up-to-date law on European Protected Species (EPS) and the implications that this has on providing robust EPS consultancy services to clients.

Who should attend?

- Ecological consultants
- Consultants & developers dealing with wildlife legislation in a planning context.

Introduction to Water Law Seminar

8 Feb 2013, Sheffield
14 Mar 2013, London

Covering key aspects of European and national Water Law, this course is designed as an introduction to abstraction and impoundment; pollution of controlled waters; structures and obstructions in watercourses; nature conservation and the water environment; the implications of the Water Framework Directive.

Who should attend?

- Land managers
- Developers
- Operators on land
- Consultants advising on land-based activities

Trainer (for all the above courses)
Penny Simpson, experienced environmental lawyer, DLA Piper UK LLP, (English and Welsh qualified).

Environmental Assessment Training

Ecological Impact Assessment

Three levels of course delivering training starting with a grounding in the basics of EcIA, to developing skills in presenting the outcomes of EcIA reports, leading to more advanced learning in identifying important ecological resources.

Who should attend?

- Beginner - Recent graduates/junior ecologists - those wanting an overview of the EcIA process
- Intermediate - Ecologists with 2yrs+ experience/limited knowledge of EcIA
- Advanced - Ecological consultants experienced at undertaking EcIA

Trainer Mike Dean CEnv MIEEM
(See website for all dates & venues)

Habitats Regulations Assessment

A suite of courses tailored to professionals with specific responsibilities for HRA, for either projects or plans, in Scotland, England and Wales.

Who should attend?

- Those working in/acting for LAs and competent authorities carrying out assessments
- Professionals involved in project proposals and whose job it is to provide information to competent authorities
- Those working in/for plan making bodies

Trainer David Tyldsley FRTPI FIEEM FRSA
(See website for all dates & venues)

For IEEM's training and professional development programme visit
www.ieem.net/events

Volunteers Wanted!!

Sally Hayns MIEEM
Chief Executive Officer, IEEM

Have you ever been tempted to get involved in how the Institute is governed? Well now is the time to put yourself forward for one of the vacancies created under the changes to the Institute's governance arrangements approved at the Extraordinary General Meeting (EGM) in June.

Nominations for the posts of Vice President, Honorary Treasurer, Honorary Secretary, Governing Board member and Advisory Forum member close towards the end of September. All members have been sent nomination forms but they must be returned by the deadline to be included in the elections.

Honorary Officer Posts

For the first time members will be electing four **Vice Presidents**, one each for England, Scotland, Wales and the island of Ireland. Vice Presidents should be Fellows or Full members who normally reside in the country or countries that they represent and are elected by the members of those countries. They must be able to act authoritatively in dealings with partners and stakeholders. They are also members of the Governing Board (meeting four times a year) and the Advisory Forum (meeting twice a year). Vice Presidents may serve up to two terms of three years.

The **Honorary Treasurer** is a member of the Governing Board and can serve for a maximum of two terms of three years. They should be experienced in sound financial management and investment and be able to advise the Board on the best use of its financial resources as well as ensuring appropriate financial control is maintained.

The **Honorary Secretary** is a member of the Governing Board and can serve for a maximum of two terms of three years. They are expected to be knowledgeable in company law and to have a good understanding of governance issues.

Governing Board Members

The role of the Governing Board is to lead the Institute's strategic performance. It meets four times a year and is composed of the President, four Vice Presidents, the Honorary Treasurer and the Honorary Secretary together with five Fellows or Full members that ideally represent the breadth of the profession in terms of employment sector. Governing Board members also serve as Directors of the Limited Liability Company and effectively perform a Director's role with regard to good governance as well as helping to shape the strategic direction of the Institute.

Governing Board members can serve for two terms of three years although at the first meeting of the Governing Board a draw will take place to assign first terms of one, two and three years in order to ensure a more staggered turnover of Board members in the future.

Advisory Forum Members

The role of the Advisory Forum is that of a consultative body to inform the work of the Governing Board. All Geographic Sections can nominate a member to represent them on the Advisory Forum. The Forum is chaired by the President and is attended by the Vice Presidents and the Chairs of the Standing Committees (Membership Admissions; Professional Standards; and Training, Education and Career Development) although any member of the Governing Board can observe. Additionally there are nine members of the Forum (Graduate, Associate, Full members or Fellows) elected by the members and ideally representing the breadth of the profession.

The Advisory Forum meets twice a year and members are expected to represent the views of the membership, acting always in the best interests of the Institute.

Fellows Forum

The role of the Fellows Forum is to act as a consultative body for the Governing Board. All Fellows of the Institute are entitled to attend the Fellows Forum which will meet once a year.

Standing Committees

Although not elected by the members, the Institute relies on the volunteer help of members who serve on the Standing Committees (currently Membership Admissions Committee (MAC); Professional Affairs Committee (PAC); and Training, Education and Career Development Committee (TECDC)). Standing committees meet 4 times a year and provide vital advisory and operational support to the Institute. There are currently a number of vacancies on TECDC and PAC caused by a number of long-serving members having completed their allowed service. Please contact the Secretariat if you are interested in joining one of these committees.

Geographic Sections

In addition to the opportunities described above, members may like to consider supporting their own Geographic Section by joining the Section Committee. Geographic Sections are a vital part of the Institute's support to members and new Committee members are always welcome.

All of the governance roles and responsibilities, including more detailed role descriptions, are explained in the new **Governance Regulations** which are available on the website. If you are interested in standing for any of the available posts you should complete the self-nomination form available on the website, clearly setting out how your experience can contribute to the role that you are standing for. Your nomination will need to be proposed and seconded by two other members.

So Why Get Involved?

During the recent Governance Review a telephone survey was undertaken of those members currently serving on a range of IEEM committees. Amongst the questions was one about the benefits of getting involved in this way. All of the participants were enthusiastic about the role citing the networking, their own professional development and the satisfaction of helping to make a difference as reasons why they valued their involvement.

These are exciting times for the Institute but we can only move forward with the help of volunteers willing to give some of their time, energy and experience. So, if you have been thinking about standing for a governance role, please do. If you haven't been thinking about it yet then perhaps now is the time to take that step.

We look forward to hearing from you.

A Royal Charter and a New Register

Sally Hayns MIEEM
Chief Executive Officer, IEEM

Following the decision taken by members at the Extraordinary General Meeting (EGM) on 13th June to petition her Majesty the Queen for a Royal Charter, the Petition itself was signed by the President, Penny Anderson, at the House of Lords on 28th June and witnessed by the Vice President, Robin Buxton. This follows extensive consultation with a wide range of interested parties, stakeholders, supporters and objectors and the submission of a Letter of Intent to the Privy Council. The Letter of Intent has been circulated to a standing list of consultees and, as no objections have yet been raised, the Institute is free to make its petition.

The Petition, draft Charter, and ByLaws have now been submitted and we await the final decision. This could take up to 12 months to arrive. The documents will be circulated to the standing list of consultees and other relevant organisations. A notice will also be published in the *London Gazette* inviting any representations.

If successful, the Institute will become the Chartered Institute of Ecology and Environmental Management (CIEEM). There will be a transfer of assets from the current company to the new body. Members of the Institute will automatically become members of the Chartered Institute. For those with post-nominals, this will mean changing them to a new format as appropriate: FCIEEM; MCIEEM; ACIEEM; GradCIEEM.

The Charter and ByLaws become the governing instruments of the Chartered Institute, replacing the current Memorandum and Articles of Association. As well as the approval of the members, any future changes to our Charter would require the permission of the Sovereign whilst any changes to our ByLaws would require the approval of the Privy Council.

A New Register

Included within the Petition and draft Charter is a request for the power to establish a new Register of Chartered Ecologists, as approved at the EGM. The creation of new Registers is less common in the modern day, but the Institute has been able to gain the support of the UK statutory nature conservation agencies and Defra as a means of helping to raise standards. If successful, the Institute (or Chartered Institute) would be responsible for determining the competency criteria for the award of Chartered Ecologist (CEcol) and the assessment procedures. A working group led by Dr Eirene Williams CEnv FIEEM is currently looking at this but can, of course, only go so far until the issue of whether a not a new register can be created is decided.

Members of other professional bodies with an active code of professional conduct and a continuing professional development requirement would be eligible to apply for the Chartered Ecologist award should they feel they meet the published criteria.

So now we wait for the decision on our Petition. Regardless of the outcome we will continue to hold a licence to offer Chartered Environmentalist (CEnv) accreditation to those for whom it is the most appropriate award. We play an active part in the Society for the Environment, fully supporting its aspirations and the Chartered Environmentalist family. Members could, in theory, hold both awards should they feel that this reflects their competences and professional role but in most cases members will choose whichever award best suits their professional expertise.

About the Author
Sally Hayns has been CEO of IEEM since June 2010. Prior to joining the Institute she was Head of People and Wildlife at the Hampshire and Isle of Wight Wildlife Trust.

Contact Sally at:
sallyhayns@ieem.net

Strategic adaptive management guidelines for effective conservation of freshwater ecosystems in and around protected areas of the world

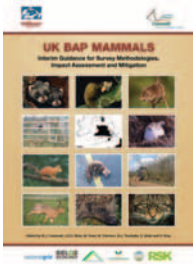
Editors: R.T. Kingsford and H.C. Biggs

ISBN-13: 978-0-7334-3061-9

Available from: *http://data.iucn.org/dbtw-wpd/edocs/2012-017.pdf*

Price: free download

This guide provides a framework for managing the maintenance of flow regimes and water quality to support healthy ecosystem services. The approach follows a structured path adapted for any reserve, whatever the configuration, threat or resources available. Lessons contained here should help both managers responsible for management of environmental flows, which are increasingly important for degraded river systems, and managers of free flowing rivers whose flow regimes remain largely intact.



UK BAP Mammals: Interim Guidelines for Survey Methodologies, Impact Assessment and Mitigation

Editors: Warren Cresswell CEnv MIEEM, Johnny Birks MIEEM, Mike Dean CEnv MIEEM, Marina Pacheco, Will Trewhella MIEEM, David Wells CEnv MIEEM and Stepahnie Wray CEnv FIEEM

ISBN-13: 978-0-906282-73-1

Available from: *www.mammal.org.uk*

Price: £19.90 (£15 for Mammal Society members) plus £2.95 p&p

Intended to be *the* essential publication for consultants and conservationists involved in surveying and protecting the UK Biodiversity Action Plan mammal species, this 130-page book details previously unavailable guidelines for surveying, impact assessment and mitigation techniques. The publication will provide urgently-needed comprehensive guidelines on standard survey protocols and guidelines for impact assessment and mitigation for the following terrestrial mammals that were added to the Biodiversity Action Plan list in 2007: red squirrel; harvest mouse; brown hare; mountain hare; European hedgehog; wildcat; pine marten and polecat. The publication includes an introduction explaining the need for standard survey protocols and guidelines for impact assessment and mitigation in the context of EcIA, and will consider factors for each BAP species, such as their status, background biology and research requirements. The publication also provides a brief summary of existing sources of relevant information for the remaining terrestrial UK BAP mammal species, namely bats, otters, water voles and dormice. As there is the need, in some cases, for further research on appropriate survey methodologies and for assessing the outcome of recommended mitigation strategies, these are intended to be interim guidelines, while this necessary research is carried out and case studies assessed. Updates to the guidance will be posted online at *(http://www.mammal.org.uk/index.php?option=com_content&view=article&id=410&Itemid=424).*

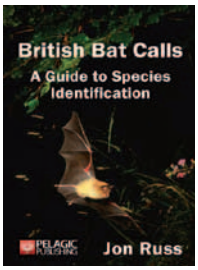
Jewels Beyond the Plough: A Celebration of Britain's Grasslands

Authors: Richard Jefferson CEnv FIEEM and John Davis

Available from: *www.langford-press.co.uk*

Price: TBC

A book celebrating the wildlife of Britain's wildflower-rich grasslands through the paintings of Sussex-based artist John Davis with text by Richard Jefferson. Although this is not a technical book as such, it does contain an introduction to the state of Britain's grasslands, descriptions of the different types, further reading, and a gazetteer of grassland nature reserves in Britain. It has been endorsed by the British nature conservation agencies and has a foreword by Chris Packham.



British Bat Calls: A Guide to Species Identification

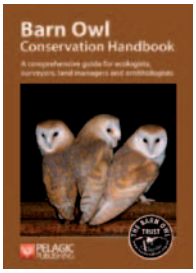
Author: Jon Russ CEnv MIEEM

ISBN-13: 9781907807251

Available from: *www.nhbs.com*

Price: £29.99

Knowledge of bat echolocation, calls and identification using bat detectors and programs such as BatSound has grown significantly in the last decade. This practical guide presents the latest data in a clear and concise manner. The book covers topics such as the properties of sound; how bats use sound; bat detection methods; recording devices; analysis software; recording techniques and call analysis. For each species found in the British Isles, information is given on distribution; emergence times; flight and foraging behaviour; habitat; and echolocation including parameters for common measurements. Calls are described in the context of the different technologies used (heterodyne, frequency division and time expansion). Various spectrograms are displayed for each species using examples from both BatSound and AnaLook. An echolocation key is included with the book.



Barn Owl Conservation Handbook: A Comprehensive Guide for Ecologists, Surveyors, Land Managers and Ornithologists

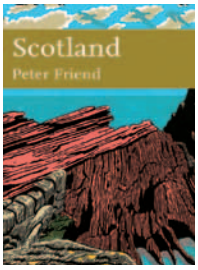
Author: Barn Owl Trust

ISBN-13: 9781907807145

Available from: *www.nhbs.com*

Price: £39.99

A comprehensive handbook covering all aspects of the conservation of barn owls. This book includes in-depth information on barn owl survey techniques, relevant ecology, barn owls and the law, mortality, habitat management, use of nest boxes and barn owl rehabilitation. It is essential reading for ecologists, planners, land managers and ornithologists.



Scotland (New Naturalist Series)

Author: Peter Friend

ISBN-13: 9780007359066

Available from: *www.nhbs.com*

Price: £21.50

Harnessing recent developments in computer technology, the latest New Naturalist volume uses the most up-to-date and accurate maps, diagrams and photographs to analyse the diverse landscapes of Scotland. Peter Friend highlights the many famous and much loved natural landscapes of Scotland, ranging from the rolling, agricultural lowlands of the east to the wild and rugged mountains of the west, from the white-washed villages of Galloway to the traditional fishing ports of the east. He provides detailed explanations for the wide variety of natural events and processes that have caused such an exciting range of surroundings. Setting apart the topography that has resulted from natural rather than man-made occurrences, Friend focuses on each region individually, from the windswept islands that fringe the Atlantic to the sheltered straths of Perthshire, and explains the history and development of their land structures through detailed descriptions and colourful diagrams. Illustrated with detailed photographs throughout, this book comprehensively explores the formation of these wonderful landscapes.

Determination of significance in Ecological Impact Assessment: Past change, current practice and future improvements

S. Briggs and M.D. Hudson

Environmental Impact Assessment Review 2012, in press

Ecological Impact Assessment (EcIA) is an important tool for conservation and achieving sustainable development. 'Significant' impacts are those which disturb or alter the environment to a measurable degree. Significance is a crucial part of EcIA, our understanding of the concept in practice is vital if it is to be effective as a tool. This study employed three methods to assess how the determination of significance has changed through time, what current practice is, and what would lead to future improvements. Three data streams were collected: interviews with expert stakeholders, a review of 30 Environmental Statements and a broad-scale survey of IEEM members. The approach taken in the determination of significance has become more standardised and subjectivity has become constrained through a transparent framework. This has largely been driven by a set of guidelines produced by IEEM in 2006. The significance of impacts is now more clearly justified and the accuracy with which it is determined has improved. However, there are limitations to accuracy and effectiveness of the determination of significance. These are the quality of baseline survey data, our scientific understanding of ecological processes and the lack of monitoring and feedback of results. These in turn are restricted by the limited resources available in consultancies. The most notable recommendations for future practice are the implementation of monitoring and the publication of feedback, the creation of a central database for baseline survey data and the streamlining of guidance.

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Cost–benefit analysis of ecological networks assessed through spatial analysis of ecosystem services

A.C. Newton *et al*.

Journal of Applied Ecology 2012, 49: 571–580

The authors address the knowledge gap in the cost-effectiveness of restoration approaches to develop ecological networks by examining the potential impact of landscape-scale habitat restoration on the value of multiple ecosystem services across the catchment of the River Frome in Dorset, England. This was achieved by mapping the market value of four ecosystem services (carbon storage, crops, livestock and timber) under three different restoration scenarios, estimating restoration costs, and calculating net benefits. The non-market value of additional services (cultural, aesthetic and recreational value) was elicited from local stakeholders using an online survey tool. Flood risk was assessed using a scoring approach. Spatial Multi-Criteria Analysis (MCA) was conducted, incorporating both market and non-market values, to evaluate the relative benefits of restoration scenarios. These were compared with impacts of restoration on biodiversity value.

Multi-Criteria Analysis results consistently ranked restoration scenarios above a non-restoration comparator, reflecting the increased provision of multiple ecosystem services. Restoration scenarios also provided benefits to biodiversity, in terms of increased species richness and habitat connectivity. However, restoration costs consistently exceeded the market value of ecosystem services. Establishment of ecological networks through ecological restoration is unlikely to deliver net economic benefits in landscapes dominated by agricultural land use. This reflects the high costs of ecological restoration in such landscapes. The cost-effectiveness of ecological networks will depend on how the benefits provided to people are valued, and on how the value of non-market benefits are weighted against the costs of reduced agricultural and timber production. Future plans for ecological restoration should incorporate local stakeholder values, to ensure that benefits to people are maximised.

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Environmental conditions associated with bat white-nose syndrome mortality in the north-eastern United States

A.R. Flory *et al*.

Journal of Applied Ecology 2012, 49: 680–689

This study mapped the most likely environmental surface conditions associated with bat mortality owing to white-nose syndrome (WNS) in the north-eastern United States. The top predictors of WNS mortality were land use/land cover types, mean air temperature of wettest quarter, elevation, frequency of precipitation, and annual temperature range. Model results suggest that WNS mortality is most likely to occur in landscapes that are higher in elevation and topographically heterogeneous, drier and colder during winter, and more seasonally variable than surrounding landscapes. The results provide a starting point from which to investigate and predict the potential spread and population impacts of this emerging disease.

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Resilience to climate change: translating principles into practice

M.D. Morecroft *et al*.

Journal of Applied Ecology 2012, 49: 547-551

Ecologists working on the boundary between science and practice have found resilience to climate change to be a slippery concept and translating a strategic commitment to increasing resilience into effective, on-the-ground, action presents many challenges. This is partly because resilience has a range of meanings and is not used consistently and partly because there are substantial uncertainties around the best way of enhancing resilience in any particular situation. It is not enough to know that several different approaches may increase resilience to climate change; we need to know which are the most efficient and effective in particular circumstances if we are to prioritise scarce resources. The authors ask whether 'resilience' is a useful concept with which to frame climate change adaptation and set out an approach to bridging the gap between conceptual thinking and practical action. This is a topic that matters in its own right – climate change is a critical challenge for conservation – but it is also an interesting example of what is necessary to really apply ecological principles to practical problems.

Correspondence: mike.morecroft@naturalengland.org.uk

Managing ecosystem services and biodiversity conservation in agricultural landscapes: are the solutions the same?

S. Macfadyen *et al*.

Journal of Applied Ecology 2012, 49: 690–694

The authors use examples from the literature to examine the relationship between management of agricultural landscapes for the provision of ecosystem services and management for biodiversity conservation. They argue that that focusing solely on one or the other will not necessarily provide reciprocal benefits of the kind we should be seeking in land-use decision-making. The authors identify a number of asymmetries in the relationship between management for maximising ecosystem services and biodiversity conservation. Actions that increase or protect biodiversity in an agricultural landscape will often indirectly help preserve ecosystem services, but actions that focus on enhancing ecosystem services will not necessarily provide good outcomes for biodiversity.

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Social environment affects juvenile dispersal in great tits (Parus major)

M. Nicolaus *et al*.

Journal of Animal Ecology 2012, 81: 827–837

The authors investigated the role of social environment on juvenile dispersal behaviour in the great tit *Parus major*. Two main contradictory hypotheses can be formulated regarding social effects on juvenile dispersal as follows: (i) High fledgling density and sex ratio may enhance the intensity of local (kin) competition and, therefore, reduce individual survival chance, enhance emigration and reduce settlement ('repulsion' hypothesis), or, (ii) high fledgling density and sex ratio may signal high-quality habitat or lead to aggregation and thus increase individual survival chance, reduce emigration and enhance settlement ('attraction' hypothesis). To disentangle positive from negative effects of high density and male-biased sex ratio on dispersal, the authors manipulated the social composition of the fledgling population in 12 semi-isolated nest-box areas (plots) via a change of fledgling density (low/high) as well as fledgling sex ratio (female-biased/balanced/male-biased) across three years. They then tested whether experimental variation in male and female fledgling densities affected variation in local survival, emigration and settlement of juveniles, and whether social effects on survival and dispersal support the 'repulsion' or 'attraction' hypothesis. The results show no experimental effects on local survival and emigration probabilities. However, consistent with the 'attraction' hypothesis, settlement was significantly and positively affected by local experimental sex ratio in each of the study years: both male and female juveniles avoided female-biased plots and settled more in plots that were balanced and male-biased the previous year. The study provides experimental evidence that local sex ratio plays a causal role in habitat selection and the authors suggest that settlers avoid female-biased plots because a high proportion of females may reflect the absence or the low quality of local resources in the habitat. Alternatively, male territory acquisition may be facilitated by a high local density of 'candidate' males, and therefore, juveniles were less successful in settling in female-biased plots.

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Biological Flora of the British Isles

There are two recent papers that may be of interest to members:

Biological Flora of the British Isles: *Dryopteris carthusiana, D. dilatata and D. expansa*

K. Rünk, M. Zobel and K. Zobel
Journal of Ecology 2012, 100: 1039-1063

Correspondence: kai.runk@ut.ee

Freely available at: *http://bit.ly/ODQUQ2*

Biological Flora of the British Isles: *Campanula rotundifolia*

C.J. Stevens, J. Wilson and H.A. McAllister
Journal of Ecology 2012, 100: 821-839

Correspondence: c.j.stevens@open.ac.uk

Freely available at: *http://bit.ly/wGzBfa*

Interactive effects of landscape context constrain the effectiveness of local agri-environmental management

E.D. Concepción *et al*.

Journal of Applied Ecology 2012, 49: 695–705

The authors examined how landscape complexity determined effectiveness of local agri-environmental management in terms of effects on species richness of birds, plants, spiders and bees in 232 extensive and intensive paired fields (112 arable fields and 120 grasslands) from 18 regions located in six European countries. As predicted, landscape complexity enhanced field-scale species richness in a mostly non-linear (sigmoidal) way, with earlier species richness increases in extensive than in intensive fields along landscape complexity gradients. Length of semi-natural boundaries (for arable fields) and proportion of unfarmed habitat (for grasslands) were the landscape features influencing species richness. The relationships between effectiveness of local management and landscape complexity for all taxa were best described with hump-shaped curves, indicating the highest effectiveness at intermediate landscape complexities. The authors conclude that landscape-scale management options should take priority over local extensification measures within agri-environmental programmes. These programmes should follow a hierarchical multi-scale approach directed to address landscape-scale constraints on local diversity.

Correspondence: elenadconcepcion@gmail.com

Understanding of the impact of chemicals on amphibians: a meta-analytic review

A. Egea-Serrano *et al*.

Ecology and Evolution 2012, 2: 1382–1397

The authors conducted a meta-analysis of experimental studies that measured the effects of different chemical pollutants (nitrogenous and phosphorous compounds, pesticides, road de-icers, heavy metals, and other wastewater contaminants) at environmentally relevant concentrations on amphibian survival, mass, time to hatching, time to metamorphosis, and frequency of abnormalities. The overall effect of pollutant exposure was a 14.3% decrease in amphibian survival, a 7.5% decrease in mass and a 535% increase in abnormality frequency across all studies. In contrast, they found no overall effect of pollutants on time to hatching and time to metamorphosis. They also found that the magnitude of the effect differed among experimental venues and among types of pollutants, but only detected weak differences among amphibian families. These results suggest that variation in sensitivity to contaminants is generally independent of phylogeny. The authors conclude that the overall impact of pollution on amphibians is moderately to largely negative.

Correspondence: aegea@um.es

Freely available at: *http://bit.ly/ONiziw*

Climate change, breeding date and nestling diet: how temperature differentially affects seasonal changes in pied flycatcher diet depending on habitat variation

C. Burger *et al*.

Journal of Animal Ecology 2012, 81: 926–936

This study presents data on nestling diets of nine different populations of pied flycatchers *Ficedula hypoleuca* across their breeding range. This species has been shown to adjust its breeding phenology to local climate change, but sometimes insufficiently relative to the phenology of their presumed major prey, Lepidoptera larvae. In spring, such larvae have a pronounced peak in oak habitats, but to a much lesser extent in coniferous and other deciduous habitats. The authors found strong seasonal declines in the proportions of caterpillars in the diet only for oak habitats, and not for the other forest types. The seasonal decline in oak habitats was most strongly observed in warmer years, indicating that potential mismatches were stronger in warmer years. However, in coniferous and other habitats, no such effect of spring temperature was found. Chicks reached somewhat higher weights in broods provided with higher proportions of caterpillars, supporting the notion that caterpillars are an important food source and that the temporal match with the caterpillar peak may represent an important component of reproductive success. The results suggest that pied flycatchers breeding in oak habitats have greater need to adjust timing of breeding to rising spring temperatures, because of the strong seasonality in their food.

Correspondence: c.burger@rug.nl

Harvest selection on Atlantic cod behavioral traits: implications for spatial management

E.M. Olsen *et al*.

Ecology and Evolution 2012, 2: 1549–1562

Harvesting wild populations may contrast or reinforce natural agents of selection and potentially cause evolutionary changes in life-history traits such as growth and maturation. Harvest selection may also act on behavioural traits. The authors used acoustic tags and a network of receivers to monitor the behaviour and fate of individual Atlantic cod *Gadus morhua* in their natural habitat on the Norwegian Skagerrak coast. Fish with a strong diel vertical migration, alternating between shallow- and deep-water habitats, had a higher risk of being captured as compared to fish that stayed in deeper water. There was also a significant negative correlation between fish size and the magnitude of diel vertical migration. Natural selection on behaviour was less clear, but tended to favour fish with a large activity space. On a monthly time scale the authors found significant repeatabilities for cod behaviour, meaning that individual characteristics tended to persist and therefore may be termed personality traits. They argue that an evolutionary approach to fisheries management should consider fish behaviour and would be of particular relevance for spatial management actions such as marine reserve design.

Correspondence: esben.moland.olsen@imr.no

Freely available at: *http://bit.ly/NBAP2h*

Getting the Message Across: Biodiversity Science and Policy Interfaces - A Review

M. Spierenburg

Gaia 2012, 21: 125-134

This paper analyses the difficulties of biodiversity policy-making and the role of science. It addresses biodiversity scientists' struggles to communicate the value of biodiversity to policy-makers, and the tensions between producing policy relevant research and being perceived as too prescriptive. The author argues that it is important for biodiversity scientists to acknowledge and engage with the political aspects of biodiversity policies. A first step is to recognise the diversity of valuations and preferences among various stakeholders of different trade-offs, and the power relations between the stakeholders. A transparent presentation of a broad range of policy options, including an explicit description of the assumptions and models underpinning them, is a further requisite. Such presentations in turn require better understanding of the way institutions governing ecosystems (and ecosystem services) emerge and are established.

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Freely available at: *http://bit.ly/Lo7ovd*

Forthcoming Events

For information on these events please see *www.ieem.net.*

Conferences		
Date	Title	Location
10 October 2012	Joint IEEM and RES Conference: Invertebrates and EcIA	Faversham, Kent
23-24 October 2012	Scottish Section Conference: Delivering Green Networks - From Policy to Reality	Stirling, Scotland
7-8 November 2012	Annual Conference: Renewable Energy and Biodiversity Impacts	Cardiff, Wales
20 November 2012	East of England Section Conference: Reptiles – Research, Survey and Mitigation	Basildon, Essex

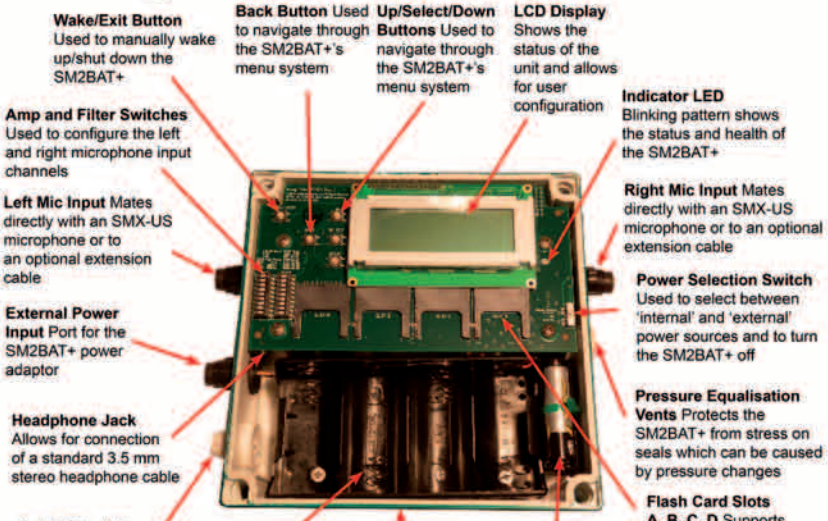
Training Courses		
5 September 2012	Using the Vegetative Key to the British Flora	Southampton
6 September 2012	Crayfish in Britain: Native and Invasive Non-Natives	Rye Meads RSPB, Herts.
11 September 2012	Bat Mitigation	Stamford
24 September 2012	Introduction to Protected Mammal Surveys (Excluding Bats)	Aberfoyle, Scotland
25 September 2012	Protected Mammal Species: Impacts and Mitigation (Excluding Bats)	Aberfoyle, Scotland
26 September 2012	Environmental Advisor for Construction Sites	Birmingham
27 September 2012	Otters: Ecology and Field Survey	Hexham
28 September 2012	Environmental Advisor for Construction Sites	Exeter
3 October 2012	Hazel Dormouse: Introduction to Survey Techniques	Monmouth
4 October 2012	Hazel Dormouse: Handling and Mitigation	Monmouth
5 October 2012	How Local Planning Authorities Should Discharge Their Legal Duties	Birmingham
11 October 2012	Ecological Clerk of Works	Glasgow
15 October 2012	Water Vole Conservation and Development	Devon
17 October 2012	Professionalism and Environmental Ethics Masterclass	Birmingham
17 October 2012	Otters: Ecology and Survey	Jedburgh
8 November 2012	Legal Training Seminar for Commercial Ecological Consultants	Leeds
8 November 2012	Lesser Horseshoe Bats: Roosting and Foraging	Co. Kerry
9 November 2012	Signs of British Land Mammals	Derbyshire
12 November 2012	An Introduction to Ecological Consultancy	Polegate
14 November 2012	Evaluation and Impact Assessment in Ecology	Sheffield
21 November 2012	Public Inquiry Training: What do you need to convince a Planning Inspector?	Basingstoke
22 November 2012	Winter Tree Identification	Dorking
23 November 2012	Legal Training Seminar for Commercial Ecological Consultants	London
28 November 2012	Surveying for Bats and Development - The Consultants' Approach	London
28 November 2012	Accessing and Using Biodiversity Data	London
5 December 2012	Accessing and Using Biodiversity Data	Manchester

Geographic Section Events		
13 September 2012	Welsh Section Event - Visit to Anglesey and Llyn Fens LIFE project	Anglesey
19 September 2012	West Midlands Section AGM	Solihull
10 October 2012	North East England Section AGM	Newcastle upon Tyne
12 October 2012	South West England Section AGM	Cirencester
23 October 2012	Scottish Section AGM	Stirling

Inside the SM2BAT+ bat detector

The Wildlife Acoustics Song Meter SM2BAT+ is a passive ultrasound recorder that can be left out in the field for long periods of time to record ultrasound at frequencies of up to 192 kHz.

Read *Getting Started with the SM2BAT+* on the NHBS blog
www.nhbs.com/hoopoe



Steve Hazell
Wildlife Equipment Manager

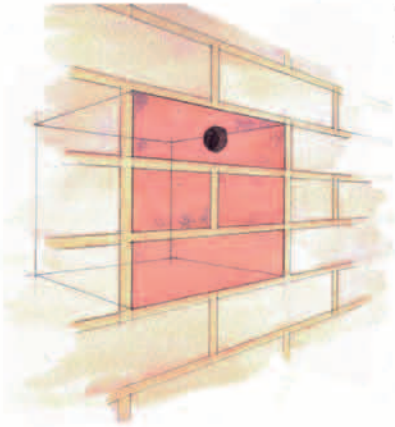
Dormouse Nest Tube: fast, secure placement

We have just released a new and improved model of the dormouse nest tube. What's different? Well, we have tried to tackle two of the most frequently encountered problems with setting up dormouse nest tubes. (1) It can be tricky to attach them securely to a branch and (2) once 'securely attached' they are prone to slipping. To reduce these issues we have added retaining loops to the base of the nest tube to stop slippage and to enable faster placement.

We also supply 71cm cable ties for fast set-up. If you prefer using garden wire to secure your nest tubes then this method will also be easier using the new loops.

Luanne Wilkes
Wildlife Equipment Specialist

New: Sparrow Box with custom brick facing



The Sparrow Box is a solid box made of insulating concrete with an internal nesting space, which can be incorporated into the fabric of a building as it is built or renovated. The box is designed especially to be unobtrusive and aesthetically pleasing.

This box is made to order and faced in brick to match your building. It is supplied unpointed so it can be matched as closely as possible to the building.