

inpractice

Issue 87 | March 2015



Innovation and New Technologies

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practical application to
ecological surveys

An ecosystems approach
to transport soft estate
management

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method for detecting great
crested newt presence in ponds

Welcome

Innovation and new technologies to deliver biodiversity gain

This issue of *In Practice* includes articles on mobile GIS data capture, environmental DNA as a survey tool, automated detection of bat flight paths, linking bat surveys with meteorological data, a Natural England tool to determine development risks to SSSIs, the application of the ecosystem service approach to environmental assessment and to soft estate management, and a challenge to the profession to help develop a new habitat classification. I am reminded of the business adage that says, "Change is inevitable, how do we make the most of it?"

At our autumn conference in Edinburgh, I was struck by a common theme of environmental change. Changes from small developments, changes from big infrastructure projects, changes from new ways of managing river catchments, and finally for me the huge change from analysing the many species in an insect trap using just a DNA analyser and then being told that this DNA analyser was from the dark ages and was already out of date. I am certain that this year will see further change once the dust from the general election has settled, more about biodiversity offsetting, more about natural capital and ecosystem services, and more about no net loss of biodiversity and net gain in biodiversity.

The current environmental challenge is to deliver 'no net loss of biodiversity' and this simple phrase has the power to catalyse change. But in my view, the real environmental challenge for the future is how to deliver 'net gain in biodiversity'. Net gain in biodiversity is sustainable development in action. The famous three-legged stool of economic growth, social equality and environmental protection was first propounded by the Brundtland Commission in *Our Common Future* way back in 1987. To do this successfully needs innovation and new ecological methodologies and techniques.

No net loss of biodiversity and net gain in biodiversity are very powerful concepts. These concepts will, in my view, soon become policies that will regularly generate green bridges, green walls and green roofs; blue and green infrastructure; sustainable urban drainage systems (SUDS); and so much more. Engineers and architects, planners and urban designers will then have a real goal to aim at. Landscape designers and ecologists will have to understand the language of engineers and architects. All projects will have to have biodiversity gain built in from the start. What a game changer!

The public will benefit from such dramatic changes. The public that includes you, me and everyone who needs a daily dose of nature for our health and well-being. Let's have more business plans that commit to no net loss of biodiversity – and that go further to commit to making a positive contribution to biodiversity.

The overall way forward is set out in John Lawton's *Making Space for Nature* report for Defra. Everyone should read this beautifully written report at least once a year. It deals with England but the principles can be applied internationally. The vision and strategy prioritise biodiversity networks and sites that are 'More, Bigger, Better and Joined-up'.

We need more innovation in ecological methodologies and techniques for survey, mitigation measures and environmental management – this is 'smart ecology' – and we need biodiversity gain to achieve John Lawton's vision. We need ecologists and environmental managers who really use our Competency Framework to plan their professional development and their progression to becoming Chartered, which requires a holistic approach with a focus on sustainable development.

No longer content with accepting environmental damage, I am convinced that society is moving on from just trying to repair the environment to generating biodiversity gain. Ecologists and environmental managers should respond to these changes and turn policies into concrete actions.

John Box CEcol CEnv FCIEEM
CIEEM President

 @Johnbox_ecology

Information

In Practice No. 87,
March 2015
ISSN 1754-4882

Editor

Dr Gillian Kerby (gillkerby@cieem.net)

Internal contributions coordinator

Mr Jason Reeves
(jasonreeves@cieem.net)

Editorial Board

Mr Jonathan Barnes, Mr Matthew Chatfield,
Dr Andrew Cherrill, Mr Dominic Coath,
Dr William Latimer, Mrs Allison Potts,
Mr Paul Rooney, Mr Paul Scott,
Miss Katrena Stanhope, Miss Emma Toovey,
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CIEEM Office

43 Southgate Street, Winchester,
Hampshire, SO23 9EH, UK

T: 01962 868626

E: enquiries@cieem.net

W: www.cieem.net

In Practice is printed on paper using 100% post-consumer, de-inked waste. This is manufactured by an ISO14001 and EMAS accredited company.

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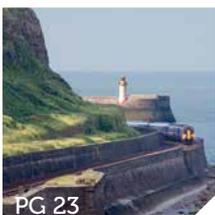
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Third State of Natural Capital report

The Natural Capital Committee's third report recommends that the Government, working closely with the private sector and NGOs, should develop a comprehensive strategy to protect and improve natural capital.

<https://www.naturalcapitalcommittee.org/state-of-natural-capital-reports.html>

Consultation on the Second Tranche of Marine Conservation Zones

This consultation seeks views on whether it would be appropriate to designate each of the 23 proposed Marine Conservation Zones (MCZs) in the second tranche and to add new features for conservation in 10 of the first tranche MCZs. The consultation closes on 24 April 2015.

<https://consult.defra.gov.uk/marine/tranche2mczs>



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Marine Strategy Framework Directive (MSFD) Proposals for UK Programme of Measures

Defra, the Northern Ireland executive, the Scottish government and the Welsh government are seeking views on the UK's proposed programme of measures to maintain or achieve Good Environmental Status (GES) in their seas by 2020. The consultation closes on 24 April 2015.

<https://consult.defra.gov.uk/marine/msfd-programme-of-measures>

Wales takes the plunge into protecting our seas

The Welsh Government has designated its first Marine Conservation Zone (MCZ) – the seas around Skomer Island off the coast of Pembrokeshire.

<http://www.wildlifetrusts.org/news/2014/12/12/wales-takes-plunge-protecting-our-seas>

New publications from Marine Scotland Science provide new information needed for marine planning and licensing

Two new publications in the series 'Scottish Marine and Freshwater Science' have been released to provide new spatial data adding to the evidence base for the development of marine planning in Scottish waters.

<http://blogs.scotland.gov.uk/coastal-monitoring/>

National Marine Plan

The first National Marine plan laid in Parliament in December 2014 sets out the Scottish Government's vision for the sustainable development and use of the marine environment. The Plan will ensure sustainable economic growth of a range of marine industries and protect and enhance the marine environment.

<http://news.scotland.gov.uk/News/National-Marine-Plan-1367.aspx>

Scientists soak up new deep sea discovery

A major deep-sea sponge reef ecosystem has been discovered hundreds of miles off the north west coast of Scotland at Rosemary Bank. Marine Scotland visual surveys have uncovered the most extensive and pristine sponge reefs to have been reported in UK waters.

<http://news.scotland.gov.uk/News/Scientists-soak-up-new-deep-sea-discovery-1400.aspx>

Animal and plant health in the UK: building our science capability

The Government Office for Science and Defra have published this report to determine the UK's future needs for science capability to predict, detect and respond to animal and plant pests and diseases.

<https://www.gov.uk/government/publications/animal-and-plant-health-in-the-uk-building-our-science-capability>

Pine marten guide published

The Vincent Wildlife Trust has published 'The Pine Marten in Ireland: A guide for householders'.

<http://www.mammals-in-ireland.ie/docs/pine-marten/pine-marten-in-ireland.pdf?sfvrsn=4>

Wildcat Action receives massive boost from Heritage Lottery Fund

A co-operative conservation project to help the threatened Scottish wildcat – Wildcat Action – is celebrating a Heritage Lottery Fund grant of £973,100.

<http://snh.presscentre.com/News-Releases/Wildcat-Action-receives-massive-boost-from-Heritage-Lottery-Fund-157.aspx>

New atlas reveals spread of British bryophytes in response to cleaner air

Analysis in the atlas shows that many bryophyte species growing on the barks of trees have spread across Britain in response to a decrease in sulphur dioxide pollution over recent decades.

http://www.ceh.ac.uk/news/news_archive/atlas-british-irish-bryophytes-reveals-response-to-cleaner-air-2015-01.html

Biodiversity in 2014: A Year in Review

The International Institute for Sustainable Development has published a review of biodiversity policy in 2014.

<http://biodiversity-l.iisd.org/policy-updates/biodiversity-in-2014-a-year-in-review/>

New evidence for children's visits to the natural environments

A new report reveals the scale and scope of the visits children in England make to natural environments, including parks, playgrounds and woodlands.

<https://www.gov.uk/government/news/childrens-visits-to-natural-environments-new-evidence>

Wetlands as a systemic solution to manage land and water quality

A growing emphasis on the value of 'natural capital' and rising concern about the need to protect water at source, rather than cleaning up abstracted supplies with chemical inputs, could be major drivers for public and private organisations to look for more systemic solutions such as wetlands.

http://www.lwec.org.uk/sites/default/files/attachments_biblio/LWEC_P%26_Note_15_WEB_0.pdf



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Seabirds steer to avoid collision course with offshore wind farms

A new review by the British Trust for Ornithology and the University of Highlands and Islands' Environmental Research Institute has provided better estimates of the proportions of seabirds that alter their flight paths to avoid colliding with turbines.

<http://www.bto.org/news-events/press-releases/seabirds-steer-avoid-collision-course-offshore-wind-farms>

Wind turbine risks to seabirds: new tool maps birds' sensitivity to offshore farms

A new tool has been developed to map the sensitivity of seabirds to offshore wind farm development.

http://ec.europa.eu/environment/integration/research/newsalert/pdf/wind_turbine_risks_seabirds_395na2_en.pdf

Wind turbines have minor impact on small-bird populations

Only about two or three small birds are killed by wind turbines each year for every 225-300 houses supplied with renewable energy, new North American research suggests.

http://ec.europa.eu/environment/integration/research/newsalert/pdf/small_birds_wind_turbines_minor_impact_395na4_en.pdf

WWT launches Wetland Manifesto

WWT's Wetland Manifesto is a 10-point plan to look after the UK's remaining wetlands.

<http://www.wwt.org.uk/news/all-news/2014/12/wwt-news/wwt-launches-wetland-manifesto/>

Natural England reports identify areas where wildlife can survive in a changing climate

Two recently published reports will help to target future conservation management by identifying climate change 'refugia'.

<http://publications.naturalengland.org.uk/publication/6659217335255040>

<http://publications.naturalengland.org.uk/publication/5106575047917568>

New report on beaver effects on salmon and trout

A report looking at how salmon and trout populations might be affected, if beavers are reintroduced to Scotland has been published.

<http://snh.presscentre.com/News-Releases/New-report-on-beaver-effects-on-salmon-and-trout-167.aspx>



Research suggests testing for bTB is more effective than badger culls at controlling the disease

Modelling produced by researchers at Queen Mary University of London (QMUL) has found that in a region containing about 1.5 million cows, of which 3,000-15,000 might have TB, badger culling could account for a reduction of 12 in the number of infected cattle. While reducing the testing interval by one month could reduce the number of those infected by 193.

<http://www.qmul.ac.uk/media/news/items/se/145991.html>



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Cairngorms outdoor access strategy consultation

The 'Active Cairngorms' draft strategy is now available online for comment. It outlines the types of actions to be taken to promote healthy lifestyles through being active in the outdoors, while also ensuring that recreation does not impact negatively on the Park's special species and habitats. The consultation closes on Friday 10 April.

<http://cairngorms.co.uk/media/news/active-cairngorms-get-involved>

DAHG submits Article 17 Report to EU Commission

The Department of Arts, Heritage and the Gaeltacht has submitted the latest 6-year report on the status of Habitats Directive protected habitats and species.

<http://www.npws.ie/publications/article17assessments/>

[article172013assessmentdocuments/](http://www.npws.ie/publications/article172013assessmentdocuments/)

<http://www.npws.ie/publications/PAF/>

Natural England approves trial release of beavers

Natural England's Board has confirmed that a licence will be issued to Devon Wildlife Trust, permitting the managed release into the wild of beavers currently resident in the River Otter catchment in Devon, on a 5-year trial basis.

<https://www.gov.uk/government/news/natural-england-approves-trial-release-of-beavers>

IUCN publish review of impact of pesticides on biodiversity

An IUCN Task Force has completed its synthesis of 1,121 published peer-reviewed studies of the impact of systemic pesticides on biodiversity, which has been published in a special issue of *Environmental Science and Pollution Research*.

http://www.tfsp.info/assets/WIA_2015.pdf



Scottish Wildlife Trust CEO calls for lynx reintroduction

The Scottish Wildlife Trust's Chief Executive, Jonny Hughes, has called for the reintroduction of the once native Eurasian lynx to Scotland.

<http://scottishwildlifetrust.org.uk/article/trust-chief-executive-calls-for-lynx-reintroduction/>

Europe is wilder than we think

A new study published in *Science* finds that large carnivores such as wolves, brown bears, Eurasian lynx and wolverines have made a comeback in one-third of mainland Europe's surface area, often sharing landscapes with humans. This development is widely hailed as a major conservation success.

http://www.iucn.org/news_homepage/news_by_date/?18745/Europe-is-wilder-than-we-think

New report on improving Natura 2000 awareness

The European Commission has published a report following the LIFE Information and Communication (LIFE INF) platform meeting about raising awareness of Natura 2000.

<http://ec.europa.eu/environment/life/news/newsarchive2015/january/index.htm#nat2000report>

EU governments to begin invasive species action

Member states have until 2 January 2016 to put in place "fully functioning structures" to prevent the intentional introduction of invasive alien species into the EU when the European Commission introduces its first list of species to be banned. Those species that are causing the most damage will be prioritised under regulation 1143/2014, which entered into force on 1 January 2015.

<http://www.cieem.net/news/219/eu-governments-to-begin-invasive-species-action>

European Commission Green Infrastructure and Restoration Group

ENEP took part in the Green Infrastructure and Restoration Working Group that was held on 19 November 2014 at DG Environment. The meeting took stock on the developments throughout the Commission since the publication of the Communication.

<http://www.efaep.org/event/european-commission-green-infrastructure-and-restoration-group>

IPBES-3 Adopts Stakeholder Engagement Strategy and 2014-2018 Work Programme

The third session of the Plenary of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES-3) has adopted the revised draft stakeholder engagement strategy (SES) and implementation plan.

<http://biodiversity-l.iisd.org/news/ipbes-3-adopts-2014-2018-work-programme/>
<http://biodiversity-l.iisd.org/news/ipbes-3-adopts-stakeholder-engagement-strategy/>

SNH publish Scottish Beaver Trial reports

Scottish Natural Heritage (SNH) has published six scientific reports by the partner organisations behind the Scottish Beaver Trial (SBT) on the first ever licensed mammal reintroduction in the UK.

<http://www.cieem.net/news/217/snh-publish-scottish-beaver-trial-reports>

CBD announces 2015 IDB theme

The Secretariat of the Convention on Biological Diversity (CBD) has announced that the 2015 International Day for Biological Diversity (IDB) will convene under the theme 'Biodiversity for Sustainable Development'.

<http://biodiversity-l.iisd.org/news/cbd-announces-2015-idb-theme/>

Update from Natural England on great crested newt and bat licence applications

The December 2014 issue of *In Practice* referred to immediate actions needed to deal with the high volume of great crested newt and bat licence applications. This short note provides an update on actions Natural England has put in place to manage a backlog of licence applications which exceed our customer service standard of 30 days to assess the licence.

Overall it has been a difficult season both for Natural England and for some applicants and continues to be so, especially for applicants for bat licences. We have benefited from discussions with CIEEM.

The situation is improving, with the number of decisions being issued within 30 days as follows in September 45.93%; October 51.52%; November 45.93% and December 67.3%.

We recognise that for many applicants knowing that there will be a delay in gaining a licence and ideally when they can expect a response is really important. So our Area Teams are contacting applicants whose licences are going to be delayed to advise of our current turn-around time. We are putting in place a number of measures to ensure that this situation is not repeated; we will publish these when they are finalised.

EC Fitness Check of the Nature Directives

The European Commission has announced its review of the EU Habitats and Wild Birds Directives. This new review will be looking at the Directives themselves and how they have been working across the EU. It forms part of a wider Commission better regulation project called REFIT which is looking at a range of EU legislation. CIEEM is already engaging in the process at both national and European levels. We have put together a working group to pull together evidence and to help with our response to the consultation in the UK. In addition, we have set up a new Thematic Task Force within the European Network of Environmental Professionals (ENEP) to respond to the consultation at the European level.

Policy Working Group

CIEEM is currently in the process of putting together a Policy Working Group.

The group will provide strategic support on the development and delivery of CIEEM's policy positions and activities; advise on UK, European and international policy issues; guide the publishing of research reports or position briefings that inform policy-making and the public; provide strategic horizon-scanning and monitor external issues relevant to CIEEM in order to identify areas of policy that CIEEM needs to be proactive in; help represent the views of CIEEM concerning relevant policy issues to government, other bodies and the public; and provide strategic oversight for partnerships and liaison with appropriate bodies and organisations across the UK, Ireland and Europe.

The group will meet virtually around six times per year.

If you are interested in joining the group please contact Jason Reeves (jasonreeves@cieem.net).

Revised Ecological Impact Assessment Guidelines

Members have been waiting patiently for the publication of revised Guidelines on Ecological Impact Assessment (Terrestrial, Freshwater and Coastal). They are not ready yet but we have made substantial progress in recent months. They have now reached the stage where there are some final checks being done and points of clarity teased out. They will then be sent back out to external stakeholders so that they can see how their feedback has been addressed and for (hopefully) endorsement. We do not know how long this might take but once we have concluded this process the Revised Guidelines will be reviewed by the Professional Standards Committee who will decide whether to recommend their approval by the Governing Board.

We do appreciate that there is some frustration at the length of time taken to undertake this revision. However, given the extent to which these Guidelines have been referred to at Public Inquiries and the increasing complexities of ensuring consistency with the environmental legislation and policies in devolved countries as well as in Ireland we have taken the view that it is important to get it right rather than risk replacing some Guidelines that are doing a good job with something that is less useful.

Members' Diversity Survey

Thank you to everyone who responded to the members' diversity survey last autumn. Over 400 members responded and between them they supplied over 100 pages of additional comments, examples and suggestions. Clearly the survey touched a chord with many of you with gender discrimination and the problems of those with carer responsibilities being key issues. In terms of CIEEM's priorities the respondents felt that tackling the lack of ethnicity within the profession, age discrimination and gender discrimination should be the main issues.

There will be a full report, together with the Diversity Working Group's proposed actions, in the next issue of *In Practice* in June.

CIEEM encourages members to nominate themselves as IPBES experts

The IPBES Chair is calling for nominations of experts. Interested experts are requested to fill out their application online no later than 31 March 2015. All necessary information related to the nomination procedure can be found online. CIEEM encourages members who feel that they have the appropriate expertise to put themselves forward.

www.cieem.net/news/232/cieem-encourages-members-to-nominate-themselves-as-ipbes-experts

Smarter Guidance Review

As part of Defra's Smarter Guidance initiative we have been discussing ways in which CIEEM can help ensure that a) valuable guidance is not 'lost' (including hosting on the CIEEM website if required) and b) how new guidance will be produced going forward. As always we would be very pleased to hear from members as to guidance that is not being transferred to the gov.uk website and is being 'archived' but that you feel it is imperative is made more accessible.

Please contact Jason Reeves (jasonreeves@cieem.net) with your suggestions. Many thanks to those members who have already provided feedback.

Videos

If you are thinking of applying for either Chartered Ecologist or Chartered Environmentalist status, then please check out the short films now featured on the Chartership pages of the CIEEM website. They contain details and guidance of the application processes, how to prepare for application and how to improve the quality of your application form.

Professional Standards Committee Update

The Professional Standards Committee (PSC) works to promote good practice standards amongst CIEEM's members, as well as outside of the membership where relevant, by:

- Meeting quarterly to discuss issues of professional standards and related matters
- Developing advice and guidance for the membership, where needed
- Being involved in guidance or new initiatives being promoted by other organisations, where this has an impact on members' activities
- Reviewing cases of alleged breaches of the Code of Professional Conduct by members or applicants

The PSC recently set up a working group to review the Professional Guidance Series note on Ecological Report Writing. This led to the publication of a new and updated guidance document on 'Ecological Report Writing' as part of the Technical Guidance Series, which is discussed in the article by Mike Oxford, Mike Dean and Pauline Holmes in this issue.

The PSC has also set up a working group to investigate how CIEEM members currently share successful (and unsuccessful) survey and mitigation strategies, and to explore the need for a dedicated online resource for this purpose. A summary of the work undertaken so far on 'information sharing' is provided below.

The revised Guidelines for Ecological Impact Assessment are currently being developed by a technical review group set up by PSC and supported by an external ecological consultancy, in consultation with a range of stakeholders. The PSC will be reviewing the proposed revisions to the Guidelines at a forthcoming meeting with a view to publishing them in the first half of 2015.

The PSC are also involved in current discussions about bat surveys of buildings in relation to planning applications, being led by the Association of Local Government Ecologists, approaches to low impact licensing, with Natural England, and the proposed revision to the guidelines on survey and mitigation for water voles.

Mick Hall and Martin Fox recently stepped down from the committee (formerly Chair and Vice Chair respectively) after many years of dedicated service. The committee is now jointly chaired by Ellie Strike and Mike Dean and has welcomed two new members: Penny Lewns and Bob Edmonds.



Meeting with the Bank of England

On Thursday 29 January 2015, the Environmental Policy Forum (EPF) met with representatives at the Bank of England to discuss environmental degradation and the financial sector. CIEEM was represented by John Box (President) and Jason Reeves (Policy and Communications Manager).

We were heartened by how engaged, interested and receptive to the issues the Bank representatives were. However, they seemed to be overly fixated on climate change and we were disappointed at their lack of understanding, or even awareness, of wider environmental issues.

EPF members are now taking forward actions to provide relevant information and evidence to the Bank and follow up potential joint activities.

Degree Accreditation

CIEEM's Training, Education and Careers Development Committee undertook a planned review of the degree accreditation scheme last year and as a result some minor changes have been made to the guidance contained in the accreditation handbook for higher education institutes. The key change is that separate handbooks have been produced for undergraduate degree programmes and taught Masters programmes. In addition, an accreditation process for more specialised taught Masters programmes has now been developed.

Further details are available on the website at www.cieem.net/accreditation

People, Politics and the Planet Debate

In May 2015, citizens of the United Kingdom will take to the polls and cast their vote for the party that they would like to see run the country for the next five years. But how would the largest political parties seek to secure a sustainable future for the natural environment?

CIEEM, the British Ecological Society and the Sibthorp Trust have jointly organised the 'People, Politics and the Planet – Any Questions?' debate to be held on 9 March 2015 at The Light in Euston, London. The event will be chaired by leading broadcaster Jonathan Dimbleby.

The debate will give members of the BES and CIEEM, invited guests, and the general public a unique opportunity to question representatives of the UK's major political parties on the environmental commitments in their election manifestos.

At the time of writing preparations for the event are well underway, however it is likely that the event itself will happen at about the same time you receive this copy of *In Practice*. We will have a full report in the June edition.

Information Sharing

Thank you to all those who responded to PSC's brief survey designed to elicit a view from the membership of what is happening and what should be happening with respect to sharing of survey and mitigation experiences. The survey was timed to coincide with the conference in Edinburgh on 'Progress in Effective Habitat Restoration, Translocation and Creation' which served as a reminder of how much innovative and progressive work we are undertaking as a profession, and how little of it is being shared within the industry outside of the conference circuit. Professor Bill Sutherland's address provided a clear view as to what could be possible if we were able to collate, review and analyse the data collectively, and how useful this could prove to us all.

The results of the survey were unequivocal. There is an appetite amongst members for a more structured and systemic approach to sharing information, and that there is no one clear mechanism that is currently favoured for the interchange of ideas and information. There is a need within the industry not only to identify a suitable platform for sharing information, but also a need for leadership to create a cultural shift in attitude towards how this sharing of information is to be undertaken, perhaps using more than one form. A system should be time-efficient for contributors and must recognise that sometimes issues of client confidentiality/development timelines may restrict when information can be shared, but that information is still likely to be useful in terms of outcomes even years after the mitigation action is completed. To be most useful, the system must also be searchable, and preferably web-based.

Although I sense it may not be straightforward, it is clear that the challenge has been set (who doesn't like a challenge?!). PSC will be taking this issue forward: the next steps will be to explore the existing tools (such as Conservation Evidence) to see if these currently meet the needs of members or whether they could be adapted to do so. We will also consider whether a CIEEM (or other) online resource library would be more accessible and used. From the survey it is clear that there are passionate and knowledgeable members, many of whom are technologically savvy who could really help PSC with the next stages: please do contact the Secretariat if you feel you have something to contribute.

Mick Hall CEnv MCIEM

Earned Recognition Licensing Project

As part of CIEEM's work with Natural England to support improvements to the Protected Species licensing system we have been exploring various aspects of earned recognition for consultants who are able to demonstrate the required level of competence. One manifestation of this has been the rolling out of the low impact class licensing scheme for bats that was piloted last year.

Over 50 consultants have been registered as eligible for a low impact class licence and are now able to access the necessary training and assessment required before a class licence can be awarded. CIEEM has assisted with the development of the training course and overseeing the delivery of the training on Natural England's behalf.

We will also help to review the scheme. Natural England hope to open the scheme up to more consultants later this year.

Alongside this we are supporting the development of approaches to managing bats in churches which may also lead to a limited number of class licences being available to those able to demonstrate the required understanding and competences required for this more complex situation.

We are also discussing with Natural England ways in which CIEEM can help with the development of a proficiency test for eDNA testing services currently coming to market and with the production of appropriate industry guidance and standards on this technique (see page 39).

Jane Walsh MCIEM Obituary

We are sad to report that CIEEM member Jane Greaves (known professionally as Jane Walsh) died in November last year after a bicycle accident involving a lorry on the B5428, Denbighshire, Wales. We offer our sincere condolences to Jane's family and friends.

"More than anyone I know Jane lived her life to the full. She packed as much as possible into every hour, most of it relating to animals whether at work or at home with husband Nigel and their horses and dogs. She was an adventurous and inspirational woman who was very close to her family and husband."

"Jane was both a friend and a mentor to me. She was very inspirational to me as I started my career in ecology when she was my first boss. She was passionate about all animals and wildlife. She ran a successful ecological consultancy and was well liked and respected by many people both within and outside of the ecological community. Her enthusiasm for her work and hobbies was infectious to those around her."

Lois Fuller ACIEEM



Jane and Lois's mutual friend and ecologist Chris Hall ACIEEM took this photo of Jane when they were in Bavaria approximately 10 years ago on a beaver reintroduction feasibility study. The photo captures Jane's love of animals perfectly.

Do recent developments in mapping technology and assessment demand a comprehensive new habitat classification?

Keywords: Annex 1 habitats, botanical survey, data translation, Geographical Information Systems (GIS), Habitats of Principal Importance, Phase 1

Bob Edmonds CEnv MCIEEM

SLR Consulting Ltd

Bill Butcher MCIEEM

eCountability Ltd

Peter Carey

Bodsey Ecology Ltd

Lisa Norton

Centre for Ecology and Hydrology

Jo Treweek CEcol MCIEEM

eCountability Ltd

In the UK, we have a long and venerable history of describing and classifying habitats stretching back over 100 years to A. G. Tansley (1911), one of the founding fathers of modern ecology. However, this history has left us with a complex set of overlapping habitat classification systems that are used by different organisations for different purposes and subsequent translation difficulties mean that the majority of information collected cannot be shared effectively.

In this article we propose that the benefits of recent developments in technology, policy, data management and information exchange for habitat management cannot be fully realised without the development



GIS data capture in the field is now widely accessible

of a new comprehensive classification system for UK habitats. Problems with the current systems are discussed briefly and a solution presented. Support from CIEEM and its membership is critical to the success of such an ambitious project. Only with commitment from the profession to embrace change, facilitate training and enable new systems built on shared data protocols, can any such new classification succeed.

Is it time to put down the colouring pencils?

The standing joke for other scientists wishing to undermine our profession is that we still rely on our colouring pencils. JNCC Phase 1 Habitat Surveys have been the standard map-based classification used by ecologists for more than 30 years and it is still the approach that is most widely recommended in our industry. Phase 1 is much loved and has many great attributes: it is simple, intuitive and quick, and a reasonable map can be completed with only the minimum of botanical experience. However, it was developed in the age of paper maps and devised for county-scale surveys and is now used in a wide range of circumstances where it is not fit for purpose. Important examples are vegetation monitoring (Headley 2014) and mapping “habitats of principal importance” or Annex 1 habitats. The classification is too broad and mis-classifications are too prevalent (Cherrill and McClean 1999, Cherrill 2014) for it to be the ideal tool for these uses. Furthermore, Phase 1 does not have any scope for reference to habitat condition, origin or management regime, which limits its effectiveness in more detailed studies. The ability to define habitat types consistently and to assess their condition is especially important for informing meaningful biodiversity offsetting calculations and habitat monitoring, where changes in quality need to be tracked using consistent and rigorous methods. In addition to these issues, Phase 1 does not lend itself to electronic mapping systems because of the classification’s architecture.

Who uses what?

- Survey for planning and development impact assessments – ‘Extended’ JNCC Phase 1¹
- Detailed vegetation surveys in protected and designated areas and upland habitats – National Vegetation Classification (NVC), Phase 1
- Land cover mapping and earth observation – UK Broad and, in some cases, Priority Habitats
- Countryside Survey – unique system that pre-dates Broad and Priority Habitats but translates exactly
- Biodiversity Offsetting – Defra recommends use of Integrated Habitats System (IHS); the Warwickshire, Coventry and Solihull Pilot uses Phase 1
- Local Records Centres – IHS, Priority Habitats, Phase 1
- Statutory agency reporting – Priority and Annex 1 habitats
- Farm Environment Plans for Higher Level Stewardship (HLS) of Environmental Stewardship in England – bespoke coding system that translates broadly to Priority Habitats
- Environment Agency – IHS, Priority Habitats, Phase 1
- Local Authorities – Phase 1, IHS

¹ There is no formal definition of ‘extended Phase 1’, although it is most usually interpreted as being a habitat survey with the scope broadened to consider protected and notable fauna (See former IEA 1995 Guidelines for Baseline Ecological Assessment).

Advances in technology

In an age where the use of Geographic Information Systems is widespread and most ecologists have access to hand-held electronic mapping tools using in-built GPS, paper-based mapping seems anachronistic. Most of us now carry the capability for accurate electronic mapping on the smart phone in our pocket, while GPS-enabled tablets can be bought for little more than £100, not much more than a Weatherwriter™ and set of Derwent™ colouring pencils!

Using a specifically designed system for electronic mapping in the field has many advantages, as has been shown by the Countryside Survey, which moved from paper to digital recording for CS2007 (Norton *et al.* 2007). Translation errors are minimised and additional time for digitising post-survey is eliminated; areas of specific habitats can be calculated accurately; pre-existing broad habitat data, OS data and aerial photographs can be imported and used/reviewed in the field. System rules can be set up to minimise surveyor and mapping errors, for instance by ensuring that only one habitat category is assigned to each feature and that the mapped habitats do not add up to >100% of the site area.

Best practice and policy shifts

The need to quantify losses and gains of habitat is increasing in ecological impact assessment (e.g. BSI 2013) and is mirrored in the fields of ecosystem services and natural capital accounting (UK National Ecosystem Assessment 2011). The classifications that we have at our disposal for measuring habitats in this way were not developed with this in mind and their application for these purposes is not ideal. In England, the National Planning Policy Framework (NPPF), released in 2012, strongly recommends that consent should only be granted for development that leads to “no net loss” of biodiversity. This can be achieved by following the mitigation hierarchy, which can include biodiversity offsetting to deal with residual impacts (ten Kate *et al.* 2004). Offsetting, and calculating whether an offset is required, in the sense espoused by most industry and NGOs, demands a quantitative approach (Quétier and Lavorel 2011). This has prompted a shift towards calculating development impacts on biodiversity in terms of hectares of habitat affected and taking into account the condition of habitats damaged or enhanced by development activities (DEFRA 2012). The policy context in devolved administrations is not as clear-cut, but the fact remains that there is a general shift towards the quantification of biodiversity resources. A robust and universally understood habitat classification, with ecosystem links designed in explicitly, will support these new requirements.

Lost in Translation – information exchange and statutory reporting

Ecologists from different sectors typically use different classification systems and the benefits to be gained from sharing data between sectors are often lost because of translation errors and costs. All biological data centres, government agencies, consultancies and NGOs know that useful information is locked up and is still being collected in incompatible habitat systems; but the cost and limitations of translation mean that these data remain largely inaccessible. A widely adopted comprehensive classification system would benefit all ecologists in all sectors.

The UK and devolved administrations all have requirements to report on the quality and extent of EU Habitats Directive Annex 1 habitat types. This represents a very specific problem for habitat classification. Under the INSPIRE directive, in force from 2014, all habitat data must be reported as either a EUNIS category or an Annex I habitat. However neither Annex I habitats nor EUNIS correspond satisfactorily with the classifications widely used in the UK. It is proposed that any new system would specifically include all Annex 1 habitat types to facilitate easier recording and reporting on these EU objectives.

It is a similar situation in England and Wales for reporting on NERC Act 2006 Habitats of Principal Importance, formerly known as Priority Habitats. None of the current classifications map accurately to these definitions. Although significant resource has been invested in habitat survey, inventories of many of these habitats remain of poor quality.

What would a new habitat classification look like?

The perfect habitat classification system would be a habitat key embedded within a digital system, easy to use in the field and office; robust enough to avoid common data capture errors; hierarchically consistent and meaningful; designed for GIS; and able to generate datasets that are easily analysed and translated without ambiguity. The system would include ecosystems, habitats of principal importance and Annex 1 habitats, and would cover the complete range of terrestrial, freshwater

and marine habitats of the UK in a clear definitive (digital or otherwise) key. Habitat nomenclature would remain as close as possible to existing schemes so that its adoption would require little new learning. The ideal system would also be capable of capturing habitat condition, origin and management data in a rigorous and repeatable fashion, which would assist with monitoring habitat change.

Who would benefit?

We believe that all sectors of our profession (and our customers) could benefit from a new system of habitat classification.

- Consultancies could access a basic habitat inventory of a potential development site and its vicinity prior to fieldwork commencing, enabling better prioritisation of resources and project design. Supplemented by case-related surveys of habitats and habitat condition, using the same classification, it would be possible to provide a robust and defensible quantitative impact assessment, target habitat mitigation and, where required, offsetting to deliver wider benefits that are in context with the local landscape and reflect local conservation priorities. Consultancies could also feed back the outcomes of their interventions to a conservation evidence collation system (Sutherland 2014), based on a rigorous and widely used and understood habitat classification.
- Business users of consultancy services would benefit from a clearer and more streamlined habitat reporting system.
- Local Records Centres would benefit by moving from repositories of species records to information management centres that integrate and interpret habitat and species data from a wide range of sources.
- NGOs would benefit through improved systems to survey and monitor the habitat resource that they manage.
- Government agencies would benefit by being able to directly use more widely available data, including consultants' data, to report to national government and the EU, potentially streamlining their own survey requirements.
- Research organisations would benefit by being able to access higher quality comprehensive habitat datasets.

Next steps

There does seem to be a groundswell of opinion that professionals are ready for a change. Informal conversations with experts across all sectors suggest that there is broad agreement on the scope of the problem and the need for a solution. The technical aspects of designing and implementing a new habitat classification need refinement, but the principle and need for a new system is clear. We are hoping that CIEEM and its members will take an active role in moving this forward. Initially we would welcome comments on the general concepts through a LinkedIn discussion forum active from the date of publication.

Whilst developing and testing a new classification system will be challenging, the real hard work will be in its implementation and widespread adoption within the profession. Changing systems that have been embedded for a generation will not be easy, even where the benefits are clear. Field ecologists and biological data managers will need training and this may be an opportunity to develop a surveyor accreditation system, especially as the results of surveys may be used to justify in lieu payments for biodiversity impacts through offsetting or other compensation systems.

To develop a new system we envisage a development process broadly based on that used by the International Organisation for Standardisation (ISO 2015). This entails six stages – Proposal, Preparatory, Committee, Enquiry, Approval and Publication. The authors of this article are prepared to act as the working group, preparing the technical content and managing the consultation processes. To achieve a sufficient level of engagement with practitioners, the involvement of CIEEM and its members will be key. This could be through a small implementation group, led by CIEEM, of habitat practitioners and representatives from organisations involved in habitat research and recording such as CEH (Centre for Ecology and Hydrology), ALERC (Association of Local Environmental Records Centres) and ALGE (Association of Local Government Ecologists). This implementation group would review the initial draft technical content, and later approve a final draft, after wide consultation at the enquiry stage with governments and their agencies, NGOs

and the CIEEM membership. We propose a fifteen-month process, including field-testing of a draft in 2015 and publication in time for the 2016 field season.

CIEEM could have a further important role in practitioner training if this process is successful, perhaps assisting with the development of a field manual, training, competencies and accreditation. But CIEEM will only take this on where the membership shows a commitment to change. Is it finally time to put down the colouring pencils and join the 21st century?

Comment from CIEEM

CIEEM believes that, as practising professionals, it is right and proper that we take a lead in challenging existing approaches and processes where they can be improved, and developing alternatives. We welcome the authors' initiative in raising this issue and the work that has clearly gone into developing their ideas. The proposal is being discussed by the Professional Standards Committee and we would welcome members' views on the need for such a new classification.

About the Authors



Bob Edmonds CEnv MCIEEM has worked as an ecological consultant for 15 years and is currently a Principal Ecologist at SLR Consulting Ltd. Bob is a member of CIEEM's

Professional Standards Committee

Contact Bob at:

bedmonds@slrconsulting.com



Bill Butcher is a Director at eCountability Ltd, specialising in habitat information management and ecological impact assessment in the UK and overseas. Bill is a former Trustee of the

National Biodiversity Network and has led many site, county and regional habitat surveys and inventories in a 30-year career in the Wildlife Trusts and Local Records Centres.

Contact Bill at:

bill.butcher@ecountability.co.uk



Pete Carey is an affiliated lecturer in the Department of Plant Sciences of the University of Cambridge and is the Director of Bodsey Ecology Limited. He worked for ITE and CEH between 1990

and 2009 where he managed the 2007 Countryside Survey field campaign. He has worked across Europe on evaluation of agri-environment schemes and has recently been working with Natural England to produce habitat mapping and condition protocols.

Contact Pete at:

bodsey.ecology@btinternet.com



Lisa Norton currently manages the Countryside Survey, a national survey incorporating habitats, landscape features, vegetation, soils and water. She leads the

Land Use Group at CEH Lancaster, and is particularly interested in the relationship between agriculture and plant and landscape diversity.

Contact Lisa at:

lrn@ceh.ac.uk



Jo Treweek, a Director of eCountability Ltd, is an ecologist specialising in assessment of impacts on biodiversity and ecosystem services.

She has worked with a range of clients in the UK and overseas and is currently involved in a series of projects involving the restoration of habitats for purposes of biodiversity offsetting. Jo is co-chair of the Biodiversity and Ecology Section of the International Association for Impact Assessment and audits large infrastructure projects to review their compliance with International Finance Corporation Performance Standards.

Contact Jo at:

jo.treweek@ecountability.co.uk

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Mobile GIS Data Capture: Practical Application to Ecological Surveys

Keywords: ecological survey, GPS, mobile mappers,
survey standardisation, survey technology

Joe Franklin CEnv MCIEEM, Emily Castel MCIEEM, Amy Harris and David Hume
AECOM

The use of mobile GIS data capture allows practitioners to collect more robust and consistent survey data (in line with BS42020; British Standards Institution 2013). The potential advantages of using mobile GIS to capture field data include less double-handling of data (with time/cost efficiencies and less scope for errors to occur), improved accuracy in the field and the standardisation of survey proformas and deliverables. Although this technology is initially more expensive than traditional clipboards and notebooks, the potential gains in quantity and quality of information far outweigh the practical constraints.

Introduction

A Geographical Information System (GIS) allows ecological survey data to be geo-referenced to the correct location in the world. This enables habitat data to be easily overlain with other GIS datasets (e.g. basemapping, designated site boundaries or protected species records), and allows coordinates and areas to be calculated. In addition, GIS incorporates a database element allowing important tabular information to be attached to a habitat or survey point, creating a single source of information.

Mobile GIS data capture is a powerful tool for the field ecologist. This article discusses an approach to the development of a mobile GIS data capture solution for ecological surveys, and highlights some of the lessons that were learnt along the way.

Development of the mobile data capture solution

The use of mobile GIS to capture Phase 1 habitat information at over 250 locations in southern England was demonstrated successfully by AECOM in a commission from Thames Water in 2011 (see case study, Box 1). Following from this experience, AECOM began a project in 2013 to trial and subsequently implement the use of mobile GIS data capture for a suite of ecological surveys. Led by members

of the Ecology and GIS teams, this project set out to explore the best way to realise the benefits of using this technology.

Hardware

At project inception, the AECOM Ecology and GIS teams discussed which features of a mobile device were the most important to improve efficiency over the current paper-based approach to surveying. These were identified as cost, battery life, camera resolution, GPS accuracy, connectivity, ergonomics (including size and weight) and ruggedness (in terms of resistance to water and dust, and ability to survive drops from height).

As a first step, several larger tablet and smaller mobile phone sized devices were trialled to see if they suited the needs



Handheld Algiz 7 tablet was selected by AECOM in 2013 as the preferred tablet PC having the most suitable combination of ruggedness, weight, camera and connectivity options. Photo: Joe Franklin

of different ecological surveys. A tablet with a seven-inch screen size was found to be the most suitable, as it was large enough to digitise Phase 1 habitat polygon data but still had good ergonomics. Most of the smaller units had the same specifications in relation to screen size, weight and functionality so achieving adequate GPS accuracy together with ruggedness were the main focus of the trials. Whilst there was an expanding number of suitable Android and iOS units coming to market during the trial period, the hardware selected by AECOM was restricted to devices running a Microsoft Windows operating system (in order to be compatible with company IT policy).

However, it was noted during the trial period that, despite an inherent lack of ruggedness, units with an iOS (i.e. iPads, iPhones) or Android operating system (i.e. the majority of non-Apple tablets and smartphones) presented a cheaper option to the tablet PCs adopted by AECOM. These units can be protected with a rugged case (such as an Otterbox™), which for some ecologists may provide enough protection for use in the field.

Software

GIS software ranges in price (some of it is open source and free) and functionality. AECOM corporate IT policy meant that software choices were limited to those that could run on a Windows-based operating system. Open source and iOS software alternatives were therefore not suitable for our project although they may offer a cost-effective way for other firms to adopt mobile GIS data capture.

Esri ArcGIS software (<http://www.esri.com/software/arcgis>) is one of the most commonly used in the UK, and has been used by AECOM (along with the majority of its clients) for several years. ArcPad software (<http://www.esri.com/software/arcgis/arcpad>) is specifically designed for mobile GIS data capture and runs on a Windows-based operating system. It is easy to customise without advanced programming knowledge, which is a disadvantage of more recent Esri ArcMobile software (<http://www.esri.com/software/arcgis/arcgismobile>). In addition, ArcPad allows the user to deploy the data at the start of a survey and synchronise data back to a central database via



Trimble Juno 3D used for point and line data. Photo: Joe Franklin

wireless technology (3G, 4G and Wi-Fi connections). Data can also be stored on the unit, thus providing solutions that can be adapted to the scale of the project and available communications. As such, Esri ArcPad software was the most suitable option for AECOM.

Five types of ecological survey that generate spatial data and typically require a mapping output, were selected to trial the mobile GIS solution. The type of spatial data (point, line or polygon) that needed to be captured for each survey was specified (e.g. points to indicate bat activity and lines to indicate bat flight lines) along with the associated information needed for each feature. Based on these requirements customised data entry forms were designed for each individual survey. In ArcPad, when a point, line or polygon

feature is digitised by the surveyor, the customised data entry form pops up for the associated survey information to be recorded. To speed up data collection these forms included drop-down menus, tick boxes, free text fields where necessary and buttons to automatically populate time / date. The speed and ease of use of the forms was tested by ecologists in the field to ensure it met their needs efficiently.

Training & Trials

Around a dozen staff at AECOM were trained to use the devices and the ArcPad software. They then took responsibility for championing adoption of the mobile GIS solution in their local teams. Face-to-face training was given along with a detailed, written user guide. A point of contact was identified for queries, which proved useful to surveyors requiring assistance.



Clipboard, digital camera and GPS are all combined in one unit in the Trimble Juno 3D. Photo: Joe Franklin

Box 1: Project Case Study – Thames Water Biodiversity Assets Project

As the UK's largest water and wastewater service provider, Thames Water owns and manages a large network of land parcels across southern England. As a landholder and manager, the company is required under section 40 of the Natural Environment and Rural Communities Act 2006 to have regard to the conservation of biodiversity in England when carrying out its normal functions. Key to managing this duty is a thorough understanding of the type and location of biodiversity within their landholding.

Between 2011 and 2013 AECOM undertook extended Phase 1 habitat surveys at 253 of the Thames Water sites previously identified to be of biodiversity value. The surveyors utilised GPS-enabled tablet PCs with ArcPad software to capture point, line and polygon habitat data along with the associated species lists for each habitat type, straight into an ArcGIS format. At each site, surveyors digitised the detailed Phase 1 habitat data onto OS MasterMap base mapping preloaded into ArcPad. Target notes and photograph locations were accurately mapped using the GPS with descriptions and species information captured in the survey form. Upon completion of a site, the survey data were quality checked by the GIS team to ensure it was topologically correct and snapped to OS MasterMap where applicable. The project GIS data were provided to Thames Water as an Esri Geodatabase for incorporation into the company's corporate GIS. The data have since been used by Thames Water to help understand the potential impact of climate change on its most ecologically important sites.

Lessons learnt and efficiencies

Based on AECOM's experiences since 2011, we have found that mobile data capture works well on large-scale projects (i.e. larger sites, or sites with repeatable visits such as reptile surveys or bat activity transects). However, the type of survey influences cost efficiencies. Table 1 summarises the practical advantages and disadvantages encountered using mobile GIS for ecology surveys.

An initial research and development period was required to implement the mobile GIS solution, which had associated costs for time, equipment and software. The costs of this initial period were, however, recouped through efficiencies in the field and in reporting. Overall, we achieved up to an approximate 10-15% cost saving (in terms of mapping and reporting) per survey.

Human factors

There was a clear need for engagement from practitioners using the devices, as well as an initial time investment. Initial training and clear help and support resources were important along with 'champions' promoting the use of the devices to local teams. In our experience, successful use of the technology in the field required confidence, gained within a safe test environment. After the initial training days, additional support by staff experienced in using the technology was provided either by troubleshooting or through increased training in the field.

In searching for consistency we became more aware that even using the same technology, outputs from the same site can be different, depending on the surveyor (see also Cherrill 2013, Cherrill 2014). Technology does not replace the core competencies of survey skills, field craft and clear thinking about the purpose of the survey. However, it can assist in quicker and easier survey reporting and more robust deliverables.

Feedback from ecologists who have used mobile data capture

Some ecologists were initially sceptical about the use of mobile data capture. These views have largely changed since roll-out of the mobile devices across the company for Phase 1 surveys and a suite of protected species surveys, see Box 2.

Box 2: Quotes from AECOM ecologists using the mobile data capture solution

"It reduced the amount of paper on my desk – important for hot-desking, clear desk policies, data control."

"Using the GPS helps me to find the reptile refugia on site in complicated habitat."

"Initial training time was longer than expected."

"It was great on a bat activity survey – greater location accuracy in the dark and much less data handling for the maps and raw data tables."

"GPS accuracy can vary, so common sense needs to be used to know when it should be ignored and data plotted manually instead."

"No more hand colouring in Phase 1 habitat maps!"

Conclusions

When looking back it is easy to see the efficiency and quality benefits of using this technology for ecology surveys, but there are other factors to consider. Ensuring that the initial start-up and future update/upgrade costs – which can range from thousands to tens of thousands of pounds – can be justified and recovered in some form is vital for a company.

In addition to the financial side, user buy-in is crucial to ensure that surveyors are motivated and adequately trained to use the technology effectively. This will determine if the approach is a success or an expensive failure.

It is clear that benefits are not always that tangible (i.e. savings to time input) but instead can come in the form of more accurate ecological survey outputs and more highly skilled staff.

Acknowledgements

We would like to thank Rebecca Elliot at Thames Water and Ryan Mellor at AECOM for their support during the preparation of this article.

Table 1 Practical advantages and disadvantages encountered when using mobile GIS on specific ecology surveys

	Advantages	Disadvantages
Bat activity surveys	<ul style="list-style-type: none"> • Backlit screen is helpful in the dark. Screen brightness adjustable. Some surveyors reported better night vision during survey as recording did not rely on use of a torch. • GPS allows surveyor to rapidly and accurately determine location in the dark. • Raw observation field data can be exported to a table for inclusion in a report (no need to type up field notes). 	<ul style="list-style-type: none"> • Some surveyors reported backlit screen may reduce night vision. Dimming options vary with devices. A tinted screen may be required for survey work at night by some surveyors.
Reptile surveys	<ul style="list-style-type: none"> • GPS makes it easier to relocate refugia in the field. 	<ul style="list-style-type: none"> • Attention may be focussed away from surroundings. Reduces with site and device familiarity.
Phase 1 habitat surveys	<ul style="list-style-type: none"> • Ability to zoom in and view at various scales means more detail can be captured – less paper taken to site. • Greater accuracy, especially for target notes. • Assists with mapping features not on base mapping (such as complex habitat mosaic boundaries). • Easy for the surveyor to know location and completed areas. • Target note information can be exported straight into a table for inclusion in a report. • Rugged mappers work better in the rain than paper-based survey. 	<ul style="list-style-type: none"> • Phase 1 habitat survey requires larger screen size, which favours tablet devices. • Tablet device can be heavier than a Weatherwriter™. • Speed of site recording depends on habitat complexity.
General – mobile GIS data capture	<ul style="list-style-type: none"> • Time savings. No need to write up field notes or redraw field maps to make them legible for digitising. • Less double-handling of data reducing errors and saving time. • GPS allows locations to be plotted more accurately. • Standardisation of survey information captured, increasing consistency of presentation and interpretation. • Single device. No need to carry pencils, separate camera and Weatherwriter™. • Photos attached to a plotted point, no need to match up photos and locations post-survey. • WiFi/3G connectivity gives ability to send completed data back to office (or when a connection is next available) so others can work on it sooner. 	<ul style="list-style-type: none"> • Cost (including devices, software and initial set up time, including IT security). • Training time. • Camera resolution varies between devices. • Device failure (rare in our experience) may mean survey needs to be abandoned. • GPS accuracy can vary.

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Note

AECOM is a global, fully integrated infrastructure firm with nearly 100,000 employees operating around the world, with ecologists and environmental specialists across the UK and Ireland. The company's Ecology and Geographical Information Systems (GIS) teams have a strong working relationship, as Phase 1 habitat maps and other representations of spatial data have been prepared using Esri GIS software for over a decade. This collaborative culture between the Ecology and GIS teams has developed further on projects where there has been a requirement to use mobile devices to capture ecological data from repeated/replicated surveys on multiple sites in a user-friendly format.

About the Authors



Dr Joe Franklin is a Principal Ecologist at AECOM and helped establish the company's mobile data capture solution.

Contact Joe at:

joe.franklin@Aecom.com

Emily Castel is a Consultant Ecologist at AECOM working with the company's ecologists on further developments using mobile data capture, including delivering training to colleagues on use of the units.

Amy Harris is a Senior GIS Consultant at AECOM, who has led the GIS input to the mobile data capture solution as well as providing training.

David Hume is an Associate in the GIS team at AECOM, responsible for the use and development of GIS.

Ecosystem Services and Environmental Assessment

Gemma Bell MCIEEM and Neil Parker MCIEEM
Environment Systems

Keywords: Environmental Impact Assessment (EIA), geospatial, GIS, mapping, planning

Ecosystem services are the goods and services the land provides to the human population. They can be grouped into four categories: provisioning, supporting, regulating and cultural. Ecosystem services can be mapped to reveal the hidden value of our landscape and habitats, providing evidence to guide and support sustainable land use and management.

The integration of biophysical and socio-economic aspects to identify previously unforeseen environmental effects in Environmental Impact Assessment (EIA) is likely to result in a more comprehensive outcome compared to solely assessing the effects on, for example, protected and priority sites habitats and species (Landsberg *et al.* 2011). Therefore, it is necessary to assess how ecosystem services are affected as well as the opportunities to enhance these services for community benefit through development planning.

The ecosystem approach

The ecosystem approach recognises that our environment is an open, dynamic system that is influenced by a multitude of physical, biochemical and ecological flow pathways. It works on the principle that land, water and biodiversity are interconnected, therefore sustainability of one aspect depends on the sustainable management of all. The ecosystem approach has been identified by the Convention on Biological Diversity as the primary framework for action on biodiversity¹; research implementing the ecosystem approach in policy and land-



Fig. 1: Four key factors of ecosystem service modelling

use management is being undertaken in Northern Ireland (Northern Ireland Environment Link 2014), Scotland (Scottish Government 2011) and England (Natural England 2014), and the Welsh Government has adopted the approach as a guiding principle for natural resource management in Wales (Welsh Government 2013).

Ecosystem services can be described as the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life (Daily 1997). Some ecosystem services are easy to visualise (e.g. fields of crops), but many others are not obvious, as the underlying processes often occur out of sight (e.g. the activity of soil biota in recycling soil nutrients and making them available to plants). It is important to recognise and value the full suite of ecosystem services that our environment provides in order to make informed decisions about where to locate urban development, which parcels of land are most important to protect, and how our environment can be enhanced for both biodiversity gain and social health and

well-being. The concept of ecosystem services has been incorporated into the National Planning Policy Framework (Department for Communities and Local Government 2012), acknowledging that truly sustainable development must consider a wide range of biotic and abiotic factors.

Ecosystem services and environmental assessment

Ecosystem services have the potential to provide unrivalled insight into how the environment supports project delivery. Rather than become a constraint to development, ecosystem services recognise the environment as an asset that can lead to a more resilient project (Baker and Scott 2013). The Town and Country Planning (Environmental Impact Assessment) Regulations 2011² and associated best practice guidance (Scottish Natural Heritage 2013, IEEM 2006) discuss the need for considering effects on the integrity of an ecosystem, but lack consideration of hidden services offered by ecosystem services that may be inadvertently affected by development.

The EIA Regulations provide selection criteria for development. Within the criteria it is stated that where there is potential for significant effects, consideration must be given to the magnitude and complexity of the potential impact in addition to consideration of the absorption capacity of the natural environment. Furthermore, Regulation 2 provides a schedule (Schedule 4) which includes a requirement to provide a description of the forecasting method used to assess the effects on the environment, with consideration given to varying impacts of development, e.g. direct and indirect, secondary, short, medium- and long-term.

It is therefore necessary to consider the potential effects on ecosystem services provided and their inter-relationships (i.e. relationships between EIA topics within the project rather than cumulative impacts associated with other developments) within traditional EIA topics (e.g. ecology, geology and hydrology). These inter-related effects can often be difficult to assess once the EIA scoping process has been completed. By accounting for and integrating priority ecosystem services at the scoping stage, it is possible to provide direction to a more inclusive stakeholder consultation process; assess project impacts as well as dependencies of ecosystem services; and identify measures to manage dependencies on those services affected by development, i.e. application of the mitigation hierarchy (Scott *et al.* 2014). Table 1 provides examples of ecosystem services that can be mapped to aid environmental assessment.

Mapping ecosystem services

Spatial variation in levels of ecosystem service provision can be visualised by scoring individual elements of the landscape according to how much they contribute to a service, and whether that contribution is positive or negative; for instance, broadleaved woodland positively contributes to slowing down surface water run-off by intercepting rainfall and promoting infiltration through the soil (Nisbet 2011), while sealed surfaces such as roads and buildings increase run-off. However, ecosystem services are influenced by a multitude of biological, chemical and climatic processes, and so the scoring model must consider as many of these aspects as possible.

Ecosystem services can only be mapped if appropriate spatial datasets are available for an area, and if our scientific understanding of how the service works allows us to make a link between the data and service provision. For example, research has shown that peat soils contain more carbon than other soil types. Acidic, waterlogged conditions promote carbon retention in the soil, while intensive agriculture, soil drying and aeration encourages carbon loss; therefore wetland systems in good condition can be scored as making a positive contribution to soil carbon storage, while arable fields could be scored as making a low contribution, or causing carbon loss.

A huge variety of datasets and data types can be incorporated into ecosystem service maps; with such high volumes of data

available, it can be difficult to select the most appropriate data to effectively model a service, whilst avoiding over-scoring certain aspects, which can occur when more than one dataset represents the same biological process. The datasets must first be analysed and structured; a spatial framework has been produced which presents a methodology for assessing the suitability of datasets for modelling, and how they can be grouped into key factors (Medcalf *et al.* 2012a).

Grouping datasets into key factors makes the data scoring process more transparent, and can make the maps easier to understand. The four key factors underpinning ecosystem service mapping are land cover, soil and geology, position within the landscape (e.g. elevation, slope), and land management type (Fig. 1). Once a dataset has been classified as to which of the key factors it represents, it is possible to score each factor based on: habitat importance and vulnerability; consideration of existing knowledge on how the variable factor influences the ecosystem service; and the quality and availability of data used. Detailed tables explaining how the key factors can be scored for different ecosystem services are presented in the JNCC spatial framework document (Medcalf *et al.* 2012b). When each of the available datasets has been analysed they are combined to produce the final map, which considers all key factors (Fig. 2).

Land cover is a key factor because vegetation has a large impact on many ecosystem services. Vegetation characteristics can also be used to infer information about other factors such as hydrology, geology and management, e.g. wetland vegetation could be associated with higher soil organic matter content and lower livestock production potential, compared to dry grassland vegetation. In addition, vegetation can help to slow down surface water flow, promoting water infiltration through the soil and reducing downstream flood risk.

Land cover datasets usually take the form of habitat data; for many ecosystem services only broad habitat classification is necessary as the landscape can be divided into a small number of functional groups according to their influence, e.g. woodland, grassland, wetland, urban.

Table 1: Selection of ecosystem services that can be spatially mapped.

Provisioning	
Areas contributing towards food provision	Areas that are important sources of drinking water
Areas contributing towards energy provision	
Regulating	
Areas important for carbon storage in soils	Areas important for mitigating urban heat island effects
Areas important for carbon storage in vegetation	Areas important for regulating surface water run-off
Areas important for preventing land erosion	
Supporting	
Areas important for biodiversity resilience and networks	Areas likely to support pollinating insects

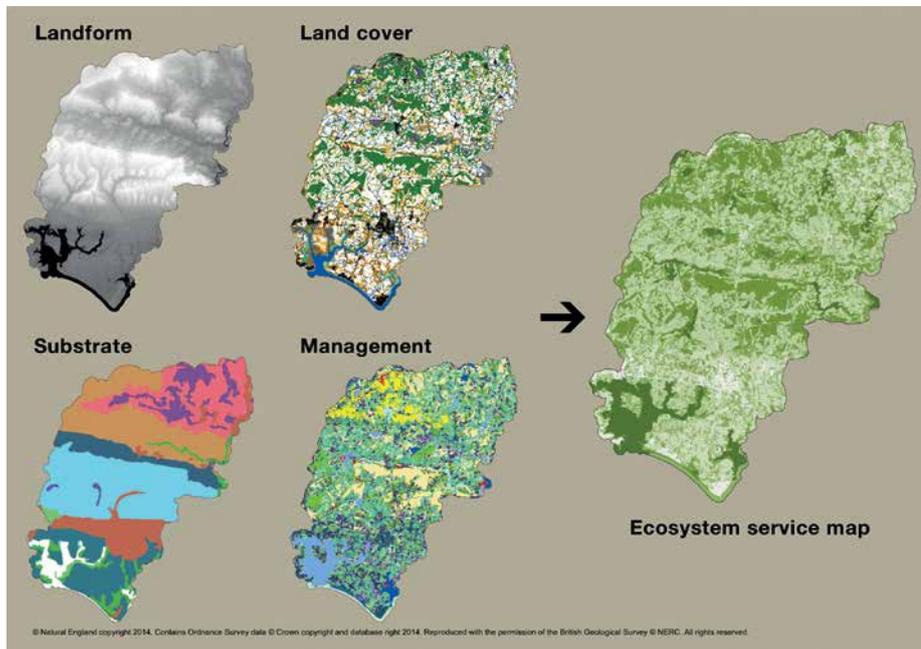


Fig. 2: Ecosystem service maps are produced from the combination of scored multiple spatial datasets.

However, the more detailed the input dataset available, the more detailed and reliable the output. Multiple land cover datasets can be incorporated if available; for example a broad, Phase 1 habitat dataset can be supplemented with fine-resolution data relating to street trees and hedgerows.

The substrate is a key factor because soil type and underlying geology exert a huge impact on the type of vegetation that can be supported, suitability for agriculture, erodibility and water-holding capacity. Some information about substrate characteristics can sometimes be inferred from the position within the landscape, which relates to landform and hydrology; this key factor is commonly modelled using elevation data. Landform characteristics such as slope determine whether the land will hold surface water (as in flat ground or depressions) or shed it (as on steep slopes). Elevation and other topographic features can also be used to model climatic variation.

Land management type can alter the way or extent to which land parcels contribute to an ecosystem service. For example, heavy soil disturbance and drainage associated with intensive agriculture can deplete soil carbon reserves relative to what would be expected under natural soil- and vegetation-forming processes.

Conversely, management actions such as establishing field margins, restoring hedgerows and reducing soil erosion may see increases in ecosystem services such as biodiversity, soil carbon storage and run-off regulation, relative to more intensively farmed areas.

A wide range of datasets can be used for ecosystem service mapping, but each must be checked for accuracy and applicability. The number and type of datasets required to build a map depends on the service to be analysed and the level of accuracy required. At the simplest level, strategic scale maps can be produced using a single dataset (Natural England 2014). However, more detailed and locally applicable models incorporate several datasets, providing good coverage of all key influencing factors. The expanding library and improving quality of open access datasets provides opportunities to gain a strategic overview of some ecosystem services at low cost.

An ecosystem service model and associated map can be produced in as little as two days. After production of the first draft map, stakeholder input is required in order to validate and modify the model, allowing as much local knowledge and scientific expertise to be built into the final map as possible.

How ecosystem service maps can aid understanding of inter-relationships

Identify areas currently providing high levels of service

Ecosystem service maps are a rapid method for assessing the value of the ecosystem services currently provided in a given region. By bringing together all of the key factors and unseen processes the maps provide an inter-relationship assessment of the value of our environment, and can reveal the significance of previously undervalued areas; once identified, this can provide opportunities to apply the mitigation hierarchy.

A recent ecosystem services assessment commissioned by Winchester City Council produced a suite of ecosystem service maps to be used to inform and support the local development plan. Services mapped included food production, non-motorised recreation, and soil carbon storage.

New Forest National Park Authority is also investigating ways in which ecosystem services can be incorporated into decision-making processes, and how ecosystem service maps can be used to engage with a wider audience to communicate the value of our environment. A suite of ecosystem service maps covering the New Forest National Park and 20 km surrounding area, including service maps for biodiversity and water run-off regulation (Fig. 3) were prepared. The maps demonstrate the high value of services provided within the National Park area, but also show how the National Park is intimately connected to its surroundings in terms of service demand and supply.

Both of these case studies demonstrate how a wide range of partner organisations can combine their local knowledge and expertise, and a wide range of data sources, to increase our understanding of how ecosystem services are currently being delivered. Such projects also create a platform for cross-border dialogue and opportunities for forming new collaborative partnerships.

Identify areas where service enhancement is possible

Although the initial objective of a mapping exercise is often to facilitate identification of high service provision areas, they can be

further used to identify areas at risk from increasing pressure from development, and areas showing potential for enhancement. Spatial visualisation of environmental assets can reveal patterns and possibilities that were previously unrecognised. For example, habitat network analysis can be used to map existing functional networks, and identify where networks can be expanded, or new networks established. This type of analysis can help to create more resilient ecological communities, working towards Biodiversity 2020 targets (Defra 2011).

An example of this type of opportunity mapping is the Cordiale project on sustainable landscape management (Environment Systems 2012), where geoinformatic techniques were applied to calculate landscape permeability, highlighting areas of greatest opportunity for enhancing habitat connectivity and ecosystem resilience.

Opportunity mapping can be applied to a variety of ecosystem services such as biodiversity, carbon storage and water

regulation. For example, spatial mapping can reveal areas where changes in habitat cover could be implemented to slow water movement and reduce flooding. They may also reveal opportunities to enhance multiple ecosystem services in the same location; for example, restoring a hedgerow network provides multiple benefits to biodiversity value, carbon storage and surface water regulation. The prospect of simultaneous enhancement of multiple ecosystem services is especially attractive during the current climate of restricted resources, where prioritisation and return on investment are increasingly important.

Barriers to implementation

The concept of ecosystem services is relatively new, and as a result may not be easily understood by non-specialists; this is understandable, as in many cases our knowledge of how ecosystem services are regulated is incomplete, and subject to ongoing research. It is important that ecosystem service maps are accompanied

by a clear, non-technical guide on how to interpret the results, to ensure that the information presented is correctly understood and can be disseminated as widely as possible.

Two main scenarios can restrict the integration of ecosystem services into EIA as well as other forms of environmental assessment. The first relates to ecosystem services for which the underlying processes are poorly understood. In these cases, no proxy datasets for modelling can be identified and applied in confidence without necessary experience of ecosystem service modelling by the user, i.e. appointment of a scientist with sufficient experience in modelling and detail assessment criteria. The second relates to services that, despite being well understood, are supported by little or no spatial data.

Ecosystem service maps can only be produced if suitable datasets are available relating to the key contributing factors; incomplete dataset coverage may lead

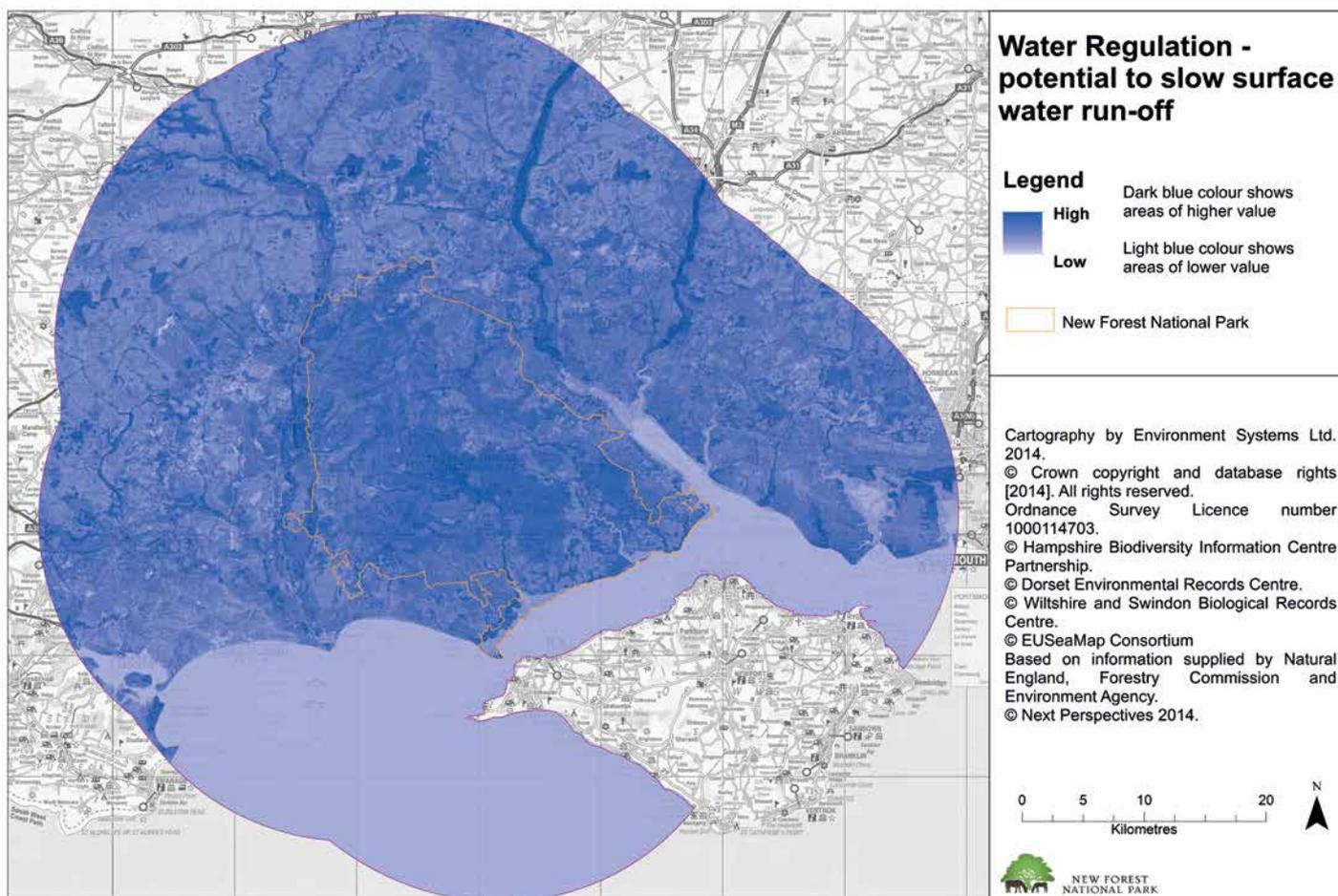


Fig 3: Water Regulation Map for New Forest National Park and 20 km Surrounding Area (excluding Isle of Wight)

Feature Article: Ecosystem Services and Environmental Assessment (contd)

to service provision being disvalued in a particular area, or may even prevent the service being mapped at all. For example, genetic diversity is an ecosystem service of potentially great importance for maintaining resilient populations of wildlife that are resistant to disease or tolerant of changing environmental conditions. However, without a large supporting dataset this service cannot be mapped effectively, and so accurate assessment of impacts are currently undertaken without full (if any) consideration of the value of the genetic diversity present.

The key, therefore, may be to continue field surveys as part of traditional EIA practice but to collate the information in such a way as to provide accurate and local-scale data. These field data can then be used to interpret the priority ecosystem services that need to be identified within the scoping stage of EIA. These data can also be fused with publicly available datasets and other readily available datasets to provide a more comprehensive ecosystem model.

The ecosystem approach is unlikely to require a change to the EIA process but may require a step-change in the way EIA is presented, ultimately providing holistic and robust evidence of the inter-related, multiple benefits provided by a development site before and after construction work. By spatially mapping environmental assets we can identify areas of risk and opportunity, allowing for more effective targeting of resources through design evolution and for mitigation.

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Notes

1. Convention on Biological Diversity: <http://www.cbd.int/ecosystem/>
2. The Town and Country Planning (Environmental Impact Assessment) Regulations 2011: http://www.legislation.gov.uk/uksi/2011/1824/pdfs/uksi_20111824_en.pdf

About the Authors



Gemma Bell is an Environmental Consultant at Environment Systems, specialising in geospatial analyses including ecosystem service and habitat suitability modelling, and habitat classification by remote sensing image analysis. She received her PhD at Aberystwyth University where she studied aspects of rhos pasture ecology through integration of field survey and remote sensing techniques.

Contact Gemma at:
Gemma.Bell@envsys.co.uk



Neil Parker is an experienced environmental scientist having worked for global multi-disciplinary engineering companies before joining Environment

Systems. Neil is experienced in EIA having written various ES chapters for renewable energy, industrial and road projects.

Contact Neil at:
Neil.Parker@envsys.co.uk

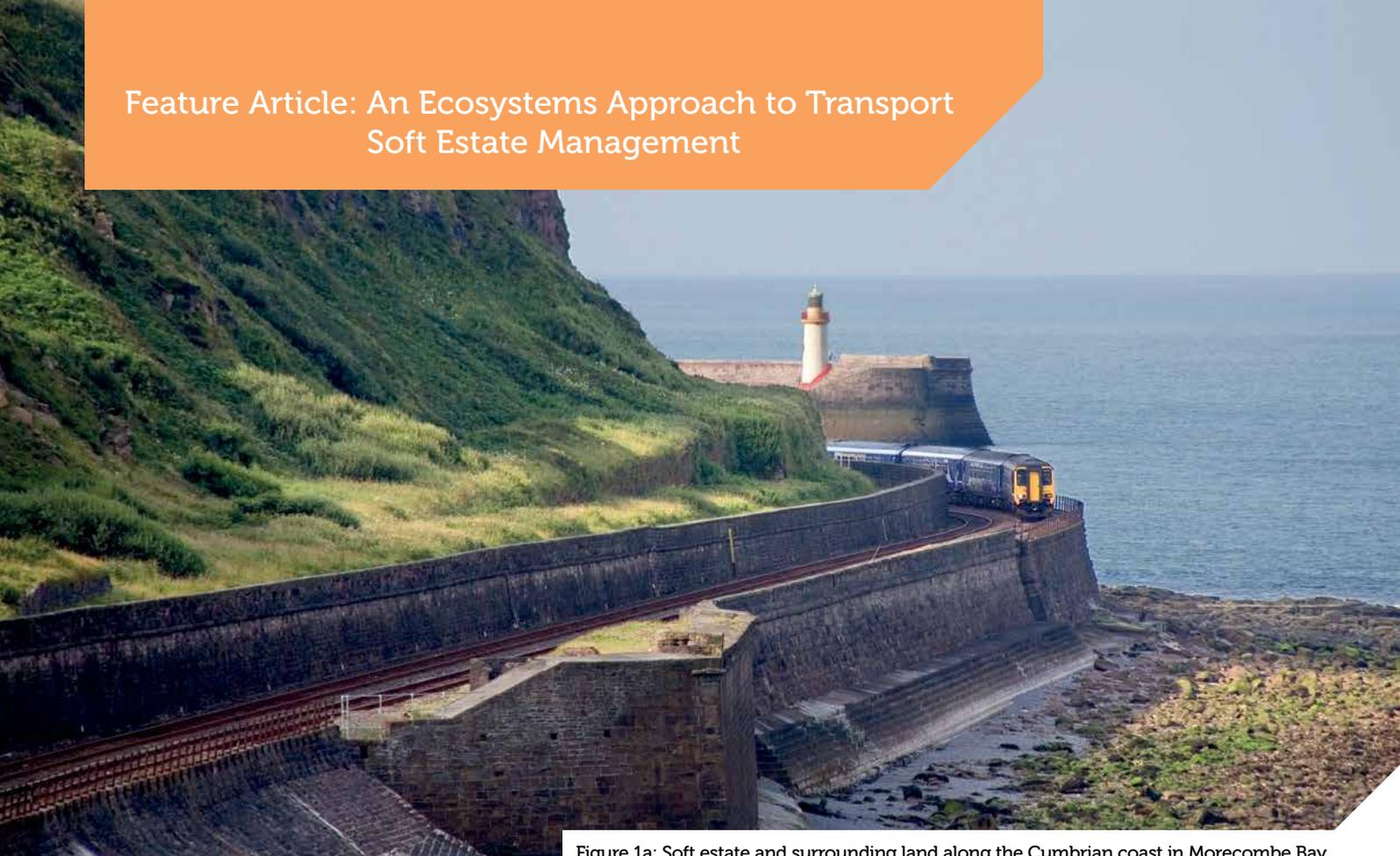


Figure 1a: Soft estate and surrounding land along the Cumbrian coast in Morecombe Bay

An Ecosystems Approach to Transport Soft Estate Management

Marion Frandsen, Helen Davies CEnv ACIEEM and Mike Image
ADAS

Keywords: biodiversity gain, ecological connectivity, climate resilience, green infrastructure, science-policy-practice interface, transport corridor

An innovative research project developed in response to the Government's Natural Environment White Paper, could change the way vegetation adjacent to rail tracks and highways is managed, delivering biodiversity gain and ecological connectivity as well as improving the resilience of transport infrastructure to climate change.

The existing transport network includes a significant area of 'soft estate' – a term used to describe natural habitats and areas of green space along the verges of roads and railway lines within the ownership of the Highways Agency and Network Rail (see Figure 1). Considerable research has been undertaken to investigate the role that this area of land plays in biodiversity, ecological connectivity, delivery of ecosystem services, and climate change resilience. Yet until recently, this knowledge base had not been fully assessed or

assimilated into transport corridor management plans.

However, this approach is now changing, thanks to a UK Government commitment in the Natural Environment White Paper to "...work with transport agencies and key delivery partners to contribute to the creation of coherent and resilient ecological networks..." and to "...host a forum with environmental stakeholders to inform future priorities for the enhancement of these green corridors." (HM Government 2011, p.70).

This commitment led to a project commissioned by Natural England in partnership with Network Rail and the Highways Agency, and delivered by ADAS (Davies *et al.* 2014a). The project was piloted in the Nature Improvement Areas (NIAs) of the Humberhead Levels and Morecambe Bay. It takes a holistic approach, considering the delivery of multiple ecosystem services and ecological considerations in the management options. The approach is innovative in several ways, not least by taking into consideration surrounding land use and habitat type, which then become critical factors in determining which management option is selected. As such, it has the potential to transform the role that soft estate plays in maintaining biodiversity, improving ecological connectivity, and delivering ecosystem services.

Feature Article: An Ecosystems Approach to Transport Soft Estate Management (contd)



Figure 1b: Soft estate and surrounding land along the M6 in Cumbria. Photo Visitcumbria.com

Stakeholder consultation with regional Network Rail and Highways Agency staff (covering the area of the two NIAs in northwest and northeast England) revealed that both organisations are committed to improving the biodiversity value and ecosystem services of the soft estate and both have previously had Biodiversity Action Plans (BAPs) in place and are working to update these. These commitments are to a certain extent reflected in existing vegetation management plans, but the overriding objectives are to minimise operational and safety risks in the most cost effective way. In recent years management of roadside vegetation has been scaled-back in order to reduce costs, but this has resulted in problems of scrub encroachment. Vegetation management operations typically comprise controlling and limiting the growth of vegetation to avoid obstructions, minimising tree and branch fall risk, reducing leaf litter problems, maintaining bank or verge stability and cutting of roadside verges, and this vegetation management has largely been considered in isolation from the wider green infrastructure.

The literature review undertaken as part of this project (Davies *et al.* 2014b) brought together a wealth of previously disparate information from the UK and beyond on vegetation management and provision of biodiversity, ecological connectivity, ecosystem services, and resilience within transport corridors. The key findings which have gone on to influence the management approach were:

- The soft estate can provide a range of regulating, provisioning, supporting and cultural ecosystem services including: biodiversity, biomass, air quality regulation, carbon sequestration,

water management, pollination, noise regulation, landscape, and visual amenity, access, and health goods.

- Provision of biodiversity gain, ecological connectivity, ecosystem services, and resilience improves if the surrounding land use is taken into consideration.
- Transport corridors can create both ecological networks and barriers. GIS methodologies are effective ways to identify points along transport corridors where management change would best promote connectivity across landscapes.
- Creating greater structural diversity on the soft estate through thinning, coppicing and removal of trees to create glades and reintroducing species-rich grassland management could deliver win-wins for the natural environment, people and the economy. It promotes plant and pollinator species diversity, increases the transport network's resilience to climate change by reducing safety/operational risks from leaf and tree fall, and potentially provides a sustainable source of biomass for local communities.
- Implementing Sustainable Drainage Systems (SuDS) offers potential to provide climate change resilience, and appropriate choice of bankside vegetation can also improve slope stability and minimise leaf litter.

This knowledge was further refined through stakeholder workshops with local

wildlife organisations within each of the two NIAs, as well as local representatives from Network Rail and the Highways Agency. Natural England chose to pilot this project in the Humberhead Levels and Morecambe Bay NIAs as both have well-established, landscape-scale partnerships with an excellent delivery record. The two areas represent two very contrasting landscape-scale environments with differing ecological and ecosystem service challenges and opportunities. However they both contain significant road and rail infrastructure (both being on the main North-South transport corridors) and have the potential to then be replicated and used to inform activity elsewhere in the country.

Spanning the counties of Yorkshire, Lincolnshire and Nottinghamshire, the Humberhead Levels NIA covers 49,700 hectares of a predominantly low-lying, flat landscape. The wetland habitats in Humberhead Levels are intimately interspersed within some of the most productive arable land in the UK, mostly below sea level and vulnerable to the effects of climate change. The area offers the best opportunity in England to develop a major multi-functional wetland landscape in a largely unrecognised biodiversity hotspot. Other aims include more integrated land management, which in the long term will improve resilience to climate change, and closer partnership working to align farming with more sustainable flood defence, water supply and enhanced

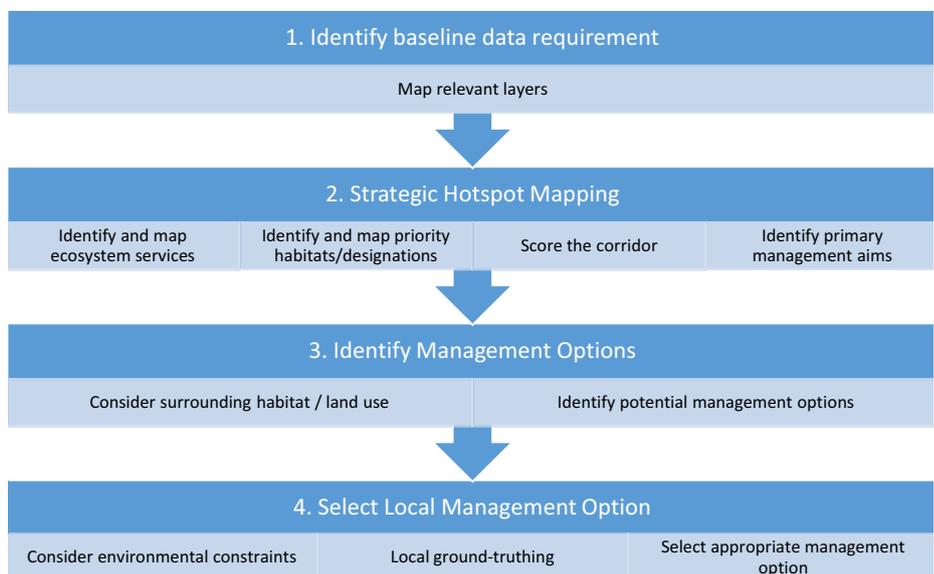


Figure 2: Site Selection Approach

biodiversity. Morecambe Bay Limestones and Wetlands NIA covers approximately 49,000 hectares across Cumbria and Lancashire. The area is one of the UK's most important biodiversity hotspots with a unique transition of priority limestone pavements, grasslands and woodlands, and coastal and freshwater wetlands, diverse geology and internationally important populations of birds, flora and invertebrates. One of the aims of the NIA is to work closely with land managers to buffer, connect and create 'stepping stones' between high quality sites to allow development of a coherent ecological network that is resilient to climate change and delivers a range of ecosystem services. The findings from the literature review and stakeholder workshops led to the development of a new methodology that was trialled within these two pilot NIAs. It follows the four stage process shown in Figure 2.

The baseline mapping in Stage 1 assimilated data on a number of factors deemed relevant to the two NIAs. This included national and European designations, priority habitats, land cover, flood warning areas, river ecological status, agri-environment schemes, Highways Agency EnvS data (digitised man-made and natural assets within and surrounding the Strategic Road Network), and Network Rail tree survey data. This information was further analysed to map the provision of biodiversity, ecosystem services, and resilience.

The process in Stage 2 involved a GIS methodology where a 200 m buffer was analysed for every 100 m segment of transport corridor to identify the presence of biodiversity provision, ecosystem service

Table 1: Management Aim Selection Criteria

Soft Estate Woodland Cover	>50%			<50%	
Surrounding Land Use	Woodland	Wetland	Grassland	Wetland	Grassland
Management Aim	A	B	C	D	E

and resilience indicators in the vicinity. Each site or indicator was then itself subjected to a 200 m buffer analysis to identify nearby 100 m segments of corridor, as illustrated in Figure 3. This then enabled each 100 m segment to be scored based on the number of sites and indicators with which it could potentially interact. Segments with higher scores represented the strategic hotspots where targeted management would be most meaningful.

Drawing on the findings of the literature review and discussions with operators, five broad Management Aims (A to E) were developed. These reflected the extent to which the soft estate was wooded (either >50% or <50% woodland cover) and whether the surrounding land itself was predominantly woodland, grassland or wetland. The selection method for determining Management Aims is shown in Table 1.

These Management Aims A to E are high level and incorporate many potential specific options. The range of potential options for Management Aim D and Management Aim E are shown in Table 2.1 and 2.2 as examples, and serving to highlight some of the key features of this novel approach to vegetation management.

For both Management Aims D and E, the soft estate cover is the same – a mix

of grassland and scrubland where tree cover is less than 50%. However, the surrounding land use and constraints are different, leading to a divergence in the management of the soft estate. For Management Aim D, at locations where flood risk is a potential issue and surrounding habitats are wetland, there may be a need for retention ponds and for retaining woody vegetation or additional tree planting (where safety constraints allow) to intercept run-off from roads or track. By contrast, in Management Aim E, where surrounding habitats are predominantly grassland, the focus is on managed thinning of tree cover to promote the development of grassland habitats.

Aligning the management of the soft estate with the surrounding land management is particularly important. In Management Aim D, the soft estate itself may not be wide enough to facilitate the creation of SuDS within the transport corridor alone. Entering into management arrangements with surrounding landowners to install such green infrastructure is encouraged in this situation. These arrangements could potentially be funded through the new government-backed environmental land management scheme 'Countryside Stewardship' or else private Payment for Ecosystem Services (PES) schemes.

The choice of options also reflects the objective to maximise delivery of multiple ecosystem services: regular cutting of verges can improve biodiversity, pollination services, aesthetics, and even potentially provide a source of biomass; SuDS can improve both water quality and reduce flood severity. The management options identified along a section of the M62 in the Humberhead Levels NIA are shown in Figure 4.

The project is currently at Stage 4, where 'ground-truthing' is being carried out at selected 'hotspot' locations to identify the preferred local management option, taking

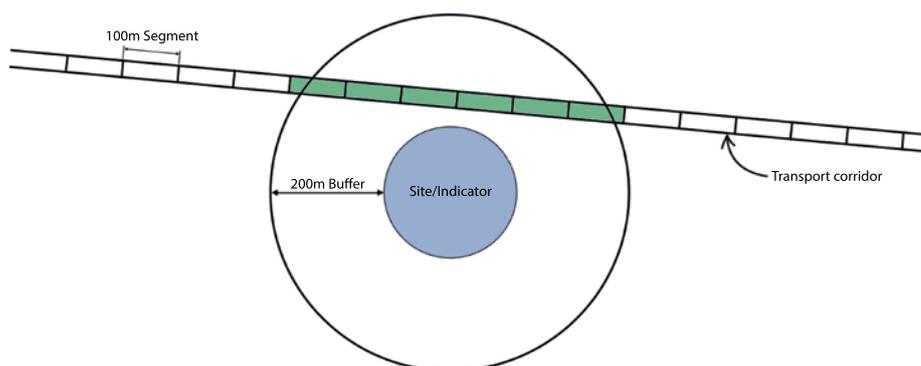


Figure 3: GIS Mapping Methodology

Feature Article: An Ecosystems Approach to Transport Soft Estate Management (contd)

into account other safety, operational and cost constraints. Agreements will need to be negotiated with surrounding landowners where applicable. Once this has been done, the management option will be applied on a pilot basis for three years and evaluated. If successful and cost-effective, the approach could be rolled out on a wider scale. The Highways Agency manages 30,000 hectares of land and Network Rail manages over 32,000 km of track, so the potential benefits are material at a national level.

The ecosystem services approach to vegetation management developed in this project is novel and considers transport soft estate from a different perspective, taking into account up-to-date scientific and practical knowledge. Compared to previous approaches to managing biodiversity and amenity value this approach will be more:

- holistic, considering not just one service / habitat at a time, but all the services that can be delivered by the soft estate;
- spatially integrated, considering how the soft estate can contribute to and enhance the services and ecological connectivity provided by the surrounding landscape;
- strategic, focussing management on hotspots where improving ecosystem service delivery and ecological connectivity would be most beneficial, and not just at SSSIs and other designated sites; and
- collaborative, it is being delivered through a partnership between Natural England, Network Rail, the Highways Agency and the Nature Improvement Area (NIA) Partnerships

The approach is also highly systematic, with a clear and transparent methodology that can be easily applied more widely to other areas of the transport network. For example, Local Authorities could apply the technique to select the most appropriate vegetation management options for local roads and other areas of green infrastructure under their control. Through taking an ecosystems approach to transport soft estate management, this project can help to drive change and deliver long-term environmental benefits at a national scale.

Table 2.1: Range of Potential Management Options for Management Aim D

Management Aim D	Support Water Management
Applicable Context	Soft Estate Woodland Cover: <50% Surrounding Land Use: Wetland, freshwater priority sites and/or ecosystem service provision, high flood risk potential.
General Objective	Supporting water management with emphasis away from transport network soft estate and onto the sympathetic management of neighbouring/adjacent sites (through working with and advising neighbouring landowners, and promoting Payments for Ecosystem Services schemes if appropriate) to minimise risk to the network and maximise benefits for biodiversity.
Management Options	
Where waterbodies are a feature of adjacent habitats, the soft estate focus is on pollution control (run-offs/pesticides, etc.) through sympathetic management of grass/scrub, i.e. manual cuts over spraying, extension of catchment-sensitive farming practices.	
Where the corridor is wide enough (and particularly if watercourse is below good ecological quality) also consider creation of SuDS, e.g. soakaways and swales.	
Where soft estate lies in or adjacent to flood warning area, management could involve the provision of additional flood storage areas (e.g. retention ponds, wet grassland/meadow) on adjacent land or tree/woodland planting off the transport network estate in order to reduce run-off (and filter out pollutants) – particularly where slope stability is a concern. This will require agreement with neighbouring landowners and provision via Agri-Environment Schemes (AES) or Payment for Ecosystem Services (PES) schemes.	
On the soft estate retain existing low levels of tree cover if this provides benefits for surface water run-off or pollution control.	
Otherwise managed enhancement of soft estate to appropriate species-rich grassland / grass scrub mosaic type management, i.e. if abutting calcareous grassland aim to establish calcareous grassland communities. Sowing native wildflower seed mix to promote nectar and pollen rich grassland, or an appropriate tussocky grass mix, which may be beneficial for reptiles and invertebrates.	
Look to reduce spraying in these areas, and instead replace with early (May) and late (August) or just late summer (late August) cuts with removal of arisings. If practicable a rotational scheme would further promote insect diversity and abundance, as verges will be without flowers immediately after mowing.	
Investigate the potential for turning verge cuttings (e.g. soft rush, gorse and bracken) into viable biomass fuel.	

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Table 2.2: Range of Potential Management Options for Management Aim E

Management Aim E	Support More Open Species-Rich Grassland / Grass / Scrub Mosaic Habitats
Applicable Context	Soft Estate Woodland Cover: <50% Surrounding Land Use: Grassland, woodland (i.e. non-wetland); high potential for pollination service provision; flooding and bank stability are not risks.
General Objective	Appropriate and managed reduction/thinning of existing tree cover* and managed reversion of site to species-rich grassland. Management to be informed by appropriate mosaic principles and adjacent land.
Management Options	
If abutting species-rich grassland (e.g. calcareous), aim to establish similar grassland communities and appropriate mosaic-type management (i.e. variable sward heights, creation of bare ground). Sowing native wildflower seed mix to promote nectar and pollinator-rich grassland, or an appropriate tussocky grass mix, which may be beneficial for reptiles and invertebrates. Look to reduce spraying in these areas, and instead replace with early (May) and late (August), or just late summer (late August) cuts with removal of arisings. If practicable a rotational scheme might further promote insect diversity and abundance, as verges will be without flowers immediately after mowing.	
If abutting priority woodland habitat, a transitional mosaic habitat of shrubs/scrub will be more desirable than transition straight to grassland, with retention of existing trees where possible and creation of rides/glades.	
Investigate the potential for turning verge cuttings (e.g. soft rush, gorse, and bracken) into viable biomass fuel.	
*with exception of any identified as utilised by bats or where the tree is a recognised veteran/ancient tree, or where trees could be providing a buffer for adjacent habitats sensitive to air pollution such as bogs, heaths, sand dunes or acid grassland.	

Acknowledgements

We would like to thank the steering group, Neil Strong (Network Rail), Tony Sangwine (Highways Agency), Nick White and Clare Warburton (Natural England), for their invaluable contribution to the project.

About the Authors



Marion Frandsen BSc
MSc CMLI

Principal Landscape
Consultant

Marion is a Chartered member of the Landscape Institute and has extensive experience in green infrastructure and open space strategies, landscape and biodiversity management plans, landscape and visual impact assessments, and landscape design. She was the Project Manager for this NEWP 32 project.

Contact Marion at:
Marion.frandsen@adas.co.uk



Helen Davies BSc MSc
CEnv MIEMA ACIEEM

Senior Environmental
Consultant

Helen is a Chartered Environmentalist, specialising in environmental and socio-economic assessment of land use plans. She has a particular interest in promoting the use of green infrastructure in order to increase the quantity and quality of ecosystem service provision, and was the primary contributor to this project's main report.

Contact Helen at:
Helen.davies@adas.co.uk



Mike Image BA MSc
Environmental
Assessment
Consultant

Mike joined ADAS in 2014 after completing an MSc in Environmental Assessment and Management. His expertise is in the evaluation of ecosystem services, and he was a key contributor to the literature review component of this project.

Contact Mike at:
Mike.image@adas.co.uk

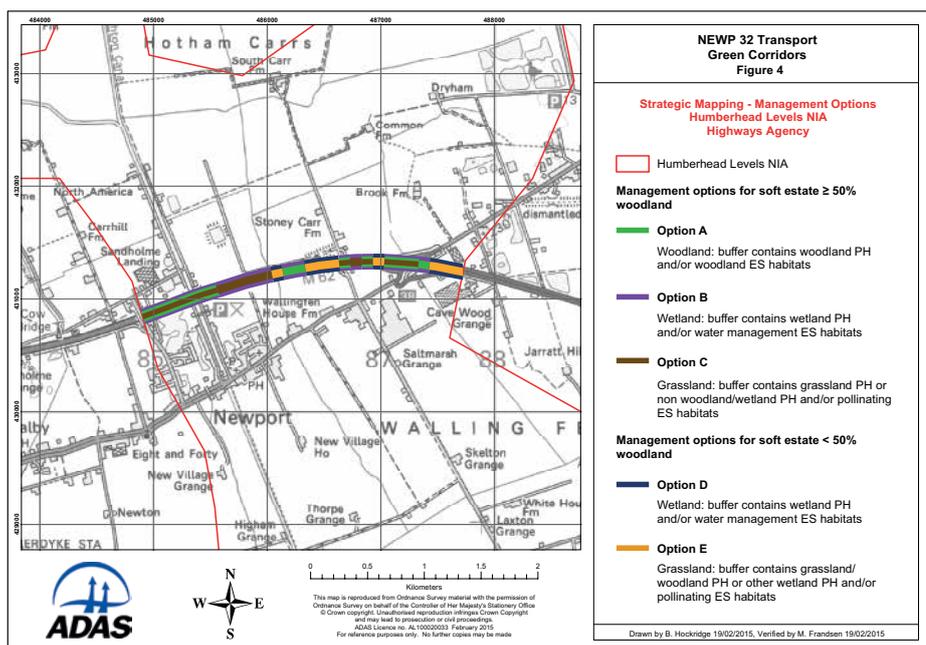


Figure 4: Management Options for a section of the M62

Impact Risk Zones: Natural England's new online tool to assess development risks to Sites of Special Scientific Interest

Sarah Middlehurst & Michael Knight
Natural England

Keywords: advice, biodiversity, consult, GIS, planning, SSSI

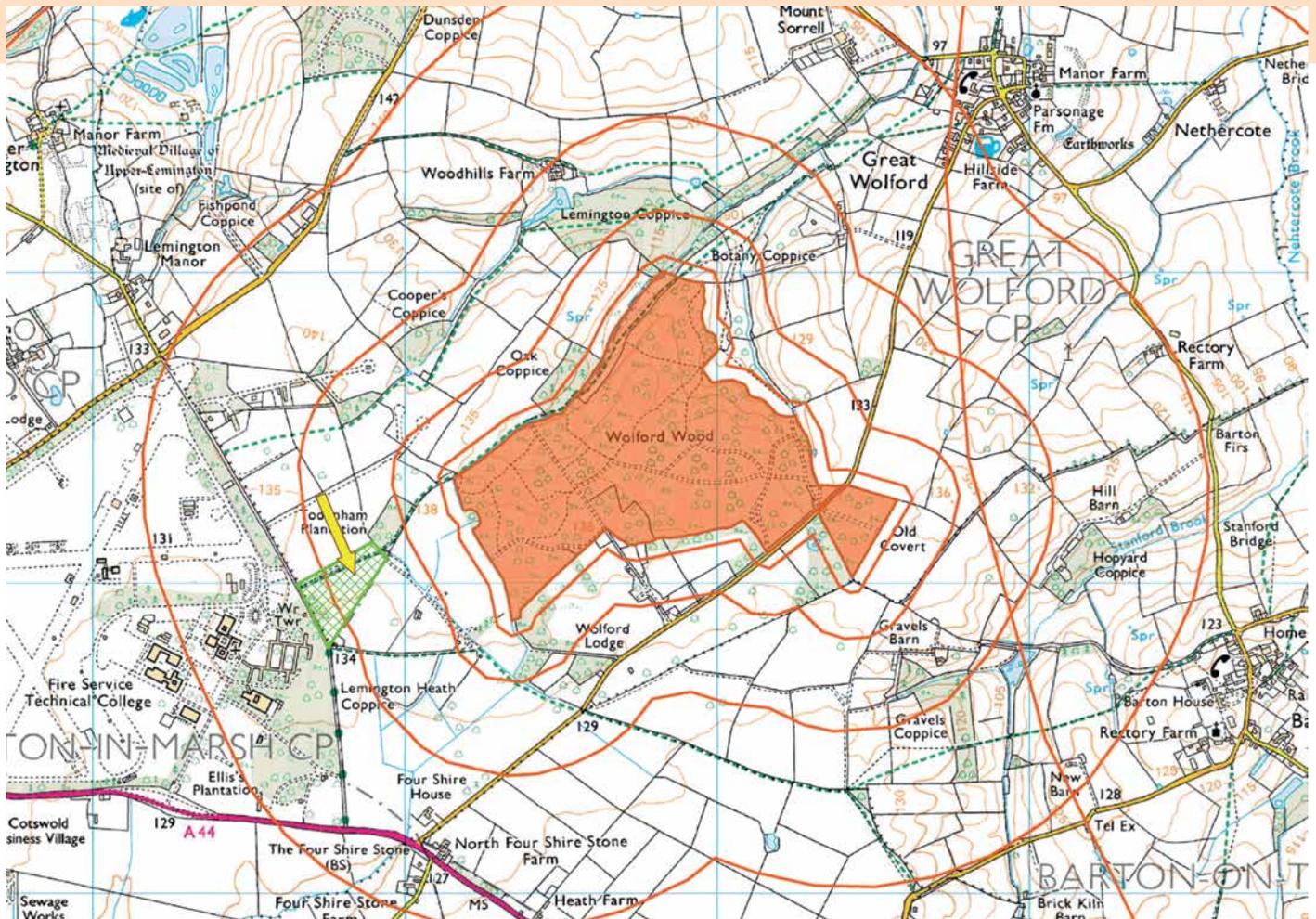


Figure 1. Shows a theoretical development site in green, a SSSI in orange and the IRZs crossing the development site.
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Natural England has developed a new, simple-to-use, online tool to support local planning authorities in England in assessing whether a proposed development is likely to affect any of the country's 4,130 Sites of Special Scientific Interest.

By publishing the Impact Risk Zones (IRZs) tool online, Natural England (NE) is aiming to help planners quickly determine whether they need to consult NE on any particular application. We expect this tool will reduce

Table 1. The results table at the location of the yellow arrow in Figure 1 showing the types of development that are likely to pose a risk.

1. DOES PLANNING PROPOSAL FALL INTO ONE OR MORE OF THE CATEGORIES BELOW?	2. IF YES, CHECK THE CORRESPONDING DESCRIPTIONS BELOW. LPA SHOULD CONSULT NATURAL ENGLAND ON LIKELY RISKS FROM THE FOLLOWING:
All Planning Applications	All planning applications with a new/additional footprint of greater than 500 m ² outside existing settlements/urban areas.
Infrastructure	Pipelines, pylons and overhead cables. Any transport proposal including road, rail and by water (excluding routine maintenance).
Wind & Solar Energy	Solar schemes with footprint > 0.5 ha. All wind turbines.
Quarry	Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions, etc.
Non Residential	Large infrastructure such as warehousing / industry where total net additional gross internal floor space following development is 1000 m ² or more.
Residential	Residential development of 100 units or more.
Rural Residential	Any residential developments outside of existing settlements/urban areas with a total net gain in residential units.
Air Pollution	Pig & Poultry Units. Any other development/ industrial or commercial process that could cause air pollution.
Combustion	All general combustion processes. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.
Waste	Mechanical and biological waste treatment, inert landfill, non-hazardous landfill, hazardous landfill, household civic amenity recycling facilities construction, demolition and excavation waste, other waste management.
Composting	Any composting proposal. Incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management.
Discharges	Any discharge of water or liquid waste that is discharged to ground (i.e. to seep away) or to surface water, such as a beck or stream. Discharges to mains sewer are excluded.
Water Supply	Developments needing their own water supply (e.g. remote rural housing).

the number of unnecessary consultations with NE; allowing both NE and local planning authorities (LPAs) to concentrate resources on higher risk developments and hopefully avoid unnecessary delays in the planning process.

Introduction

Sites of Special Scientific Interest (SSSIs) cover eight per cent of England and safeguard some of the country's most important wildlife and geological sites, including some of the nation's most spectacular and beautiful habitats – ranging from wetlands and chalk

rivers, to flower-rich meadows and remote upland peat bogs. As the government's conservation advisor, NE has both statutory duties and general responsibilities in relation to SSSIs. These include providing advice to LPAs and developers on the potential impacts of development on SSSIs, to ensure the sites' protection and enhancement, in line with the policies in the National Planning Policy Framework and development plans.

Impact Risk Zones Tool

The IRZs are a Geographic Information System (GIS) tool developed by NE to

help make an initial assessment of the likely risk of impacts on SSSIs posed by developments, and to quickly separate those consultations that are unlikely to pose risks from those that require more detailed consideration.

The GIS tool comprises a series of zones around each SSSI extending up to 10 km from the SSSI boundary. Within each zone the tool specifies the types of development which, at that distance from the SSSI, have the potential to impact on the SSSI's notified features.

The extent of the zones and the types of development listed within them are dependent on the sensitivity of the SSSI to the impacts of development such as:

- Changes in air quality;
- Changes in water quality and water supply;
- On and offsite disturbance of notified species (birds, bats, reptiles) and loss or damage of offsite habitat on which they depend;
- Other locally specific sensitivities.

The types of development indicated for each zone are those with the potential to impact upon these sensitivities. The distance over which the risk of impact from each development type extends is determined following evidence-based advice from NE's specialists.

In May last year, NE published the IRZs as a GIS dataset on the GOV.UK website. This dataset is downloadable to the users' own GIS. They are also available to use via the government's interactive mapping website Magic, allowing LPAs, developers and other stakeholders to make use of this key evidence tool.

LPAs have a duty to consult NE before granting planning permission on any development that is within, or likely to affect, a SSSI. The published IRZs are designed to help planners to consider whether a proposed development is likely to affect a SSSI. The IRZs will enable planners to decide during validation whether they will need to consult NE to seek advice on the nature of any potential SSSI impacts, their avoidance or mitigation.

When using the IRZs tool, a click on the location of the proposed development returns a results table. This lists development categories with a description

Feature Article: Impact Risk Zones: Natural England's new online tool to assess development risks to Sites of Special Scientific Interest (contd)



Figure 2. Shows three SSSIs in orange, with orange lines indicating the overlapping IRZs, and the location of a theoretical development site marked by the yellow arrow. © Crown Copyright and database rights 2014. Ordnance Survey 100022021

Table 2. The results table at the location of the yellow arrow in Figure 2 showing the types of development that are likely to pose a risk.

1. DOES PLANNING PROPOSAL FALL INTO ONE OR MORE OF THE CATEGORIES BELOW?	2. IF YES, CHECK THE CORRESPONDING DESCRIPTIONS BELOW. LPA SHOULD CONSULT NATURAL ENGLAND ON LIKELY RISKS FROM THE FOLLOWING:
All Planning Applications	All planning applications outside or on the edge of existing settlements/urban areas (excluding Householder Applications).
Infrastructure	Airports, helipads and other aviation proposals.
Wind & Solar Energy	–
Quarry	Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc.
Non Residential	–
Residential	–
Rural Residential	–
Air Pollution	Pig & Poultry Units.
Combustion	–
Waste	–
Composting	–
Discharges	Any discharge of water or liquid waste that is discharged to ground (i.e. to seep away) or to surface water, such as a beck or stream. Discharges to mains sewer are excluded.
Water Supply	–

of the types of development within that category that are likely to pose a risk at that location. NE should be consulted whenever the nature and scale of the proposed development matches one or more of the descriptions listed in the results table.

The underlying IRZ dataset is very complex, generating multiple tables, as a result of overlaps between zones relating to different SSSIs. Prior to the publication of the IRZs dataset, NE tailored the tool to make it more user-friendly and easier to interpret for its primary audience: LPAs and developers. The published IRZs dataset consolidates the information for all relevant SSSIs into a single table, defaulting to the lowest threshold triggered for each type of development.

The published tool is also used internally, as a primary filter, to identify developments where there are no potential risks to SSSIs. This has significantly reduced the time NE spends screening consultations.

A dedicated Project Team is responsible for regularly updating the IRZs dataset to ensure it reflects improvements in both evidence and understanding of the sensitivities and risks to SSSIs. NE's specialists continue to review the evidence and provide advice to the team on changes required to the IRZs.

Since its launch in May 2014, over 90 LPAs from across the country have downloaded the IRZs dataset from the GOV.UK website. As LPAs start to use the IRZs in their validation process, we expect that fewer applications will require consultation with NE. This should allow both LPAs and NE to concentrate resources on higher risk developments and reduce delays in the planning process for lower risk developments.

Anyone preparing to submit a planning application can use the IRZs tool to help consider whether a proposed development is likely to affect a SSSI. This will provide an indication of whether seeking pre-application advice from NE might be beneficial. Pre-application advice, through NE's Discretionary Advice Service, enables discussion of any potential impacts identified by the IRZs with NE during preparation of the planning application, reducing the risk of delays at the formal planning stage.

What IRZs do and don't cover

The IRZs are a tool designed to help LPAs decide when to consult NE on development proposals that are likely to affect SSSIs under Schedule 5 (v) of the Town and Country Planning (Development Management Procedure) (England) Order 2010 and section 281 of the Wildlife and Countryside Act 1981 (as amended). They do not alter or remove the requirements to consult NE on other natural environment impacts or other types of development proposal under the Town and Country Planning (Development Management Procedure) (England) Order 2010 (as amended) and other statutory requirements.

It is important to note that the IRZs do not provide advice and therefore do not constitute a consultation response. They indicate NE's assessment of likely risk to the notified features of SSSIs. Where they indicate such a risk is unlikely, this does not mean that there are no potential impacts on biodiversity or the wider natural environment.

The LPA is responsible for deciding whether to consult NE to comply with legal requirements. NE reserves the right to provide advice on development proposals that are not specified within the IRZs.

European sites are underpinned by SSSI designation, and their interest features and sensitivities are covered by the IRZs. Where the notified features of the European site and SSSI are different, the IRZs have been set so that they reflect both. The IRZs can therefore be used as part of a Habitats Regulations Assessment (HRA) to help in the assessment of likely significant effects from a particular development on the interest features of the European site.

The IRZs do not currently cover potential risks from coastal schemes such as coastal defences, cliff stabilisation, cross-beach structures, harbour and marina development. NE should be consulted on any such development that is likely to affect a coastal SSSI.

Conclusion

NE is now actively encouraging customers to use the new IRZs tool, as we believe it will:

- reduce the number of unnecessary consultations;
- avoid unnecessary delays in the planning process;
- help to ensure that planning proposals with the potential to impact on SSSIs are identified; and
- focus NE's advice on those consultations where impacts are likely.

Early indications from LPAs suggest that, although there are improvements that can be made, the tool is proving useful and may generate more widespread understanding of environmental risk within planning departments.

In addition to the potential benefits of the IRZs tool at planning application stage, we believe that developers and ecologists can make good use of the tool in the early stages of project development. It could be used to identify potential impacts, and clarify the scale of development likely to trigger them. This can be fed into initial project planning work, but could also enable identification of projects that would benefit from pre-application advice via NE's Discretionary Advice Service, potentially generating further time and cost savings.

NE is seeking feedback on the IRZs tool, in particular with regards to its ease of access, presentation, clarity and effectiveness as a tool in guiding when to consult NE. Feedback, suggested improvements or queries about IRZs should be directed to neirzs@naturalengland.org.uk.

Where to find the IRZs

The IRZs dataset and a user guidance document can be downloaded for use on your own GIS from the following website: http://www.gis.naturalengland.org.uk/pubs/gis/GIS_register.asp

The IRZs are also available to use on the government's interactive mapping website Magic: <http://www.magic.gov.uk/>. The layer is located under 'Designations – Land-Based Designations – Statutory' in the Table of Contents.

If you have any queries regarding the IRZs or would like to provide feedback, please email neirzs@naturalengland.org.uk

Information about NE's Discretionary Advice Service can be found at <https://www.gov.uk/discretionary-advice-service-get-advice-on-planning-proposals-affecting-the-natural-environment-in-england>

About the Authors



Sarah Middlehurst is Lead Adviser for Natural England within the Sustainable Development Team and leads on publication and communications

for the IRZs Project. She has previously worked as a Trainee Engineer for a private environmental/civil engineering firm and as Technical Officer for a Local Planning Authority within Greater Manchester.

Contact Sarah at:
sarah.middlehurst@naturalengland.org.uk



Michael Knight is Senior Adviser for Natural England, leading on the IRZs Project, with the Sustainable Development Team. He has more than 10 years' experience

in developing spatial evidence tools supporting Natural England's advice on the protection and enhancement of the natural environment.

Contact Michael at:
michael.knight@naturalengland.org.uk



Figure 1. Bat3Data microphones arranged in the form of a tetrahedron along a forest ride. Forêt de Citeaux in the Burgandy region of France.

Bat3Data: 3D flight path detection of bats using acoustics

Hippolyte Pouchelle, Martyn Gest & Irène Gest MCIEM
Egis Structures & Environnement

Keywords: bat detection, connectivity, echolocation, flight paths, trajectography, 3D

The ultrasonic bat call identification solutions that are currently available only provide information on presence, absence and identification of bats. They provide limited information on how bats use their habitat. Bat3Data is a non-intrusive monitoring package that has been tested on new bat bridges and flight paths. It consists of a network of microphones linked to a sound card and coupled with a bat call detection algorithm. The intention is to significantly improve our understanding of both the behaviour of bats and the efficacy of wildlife corridor mitigation measures for infrastructure projects.

Bat3Data allows the user to accurately record each passing bat in 3D to a data storage device (along with the sound files). The bat sound signal coordinates can be transferred to a 3D Geographic Information System (GIS) and blended with the client's GIS based infrastructure design or photomontage. This allows a visual representation of bat flight behaviour that can be used in relation to a future project or for monitoring purposes.

How the system works

Imagine that you have been tasked with analysing the environmental impact of a large project such as the construction of a motorway that, according to the design, will bisect an established woodland corridor. Trained bat ecologists, or the intelligent positioning of automated bat recorders, might ensure that an understanding of the ecology of bats in the locality is taken into account. This approach is limited, however. As light fades, the quality of human vision diminishes and we have to rely on ecologists with radios to report back to each other and record

the direction of flight paths. The notes are made in the field, descriptions of flight paths are not always detailed and even the most accomplished ecologist's reports can be limited in terms of spatial awareness. Based on such a survey, errors and dangerous assumptions might be made and the resources required could rapidly reduce profitability. Indeed, the subjectivity of the data can be contested in Public Inquiry meetings. Bat3Data© can assist ecologists in overcoming such difficulties.

Four highly sensitivity, ultra-sound microphones fixed on 1-m metallic rods are arranged in the form of an equilateral tetrahedron. One microphone is located at each "point" of the tetrahedron and placed appropriately within the context of a project (e.g. along a hedgerow, upon a newly installed bat bridge, at the exit of a suspected maternity roost or inside a tunnel), see Figure 1.

The microphones are connected by waterproof cables to a soundcard and a computer (PC, laptop or tablet). A computer program "EcoRecorder" knows (via computer algorithms) the position of

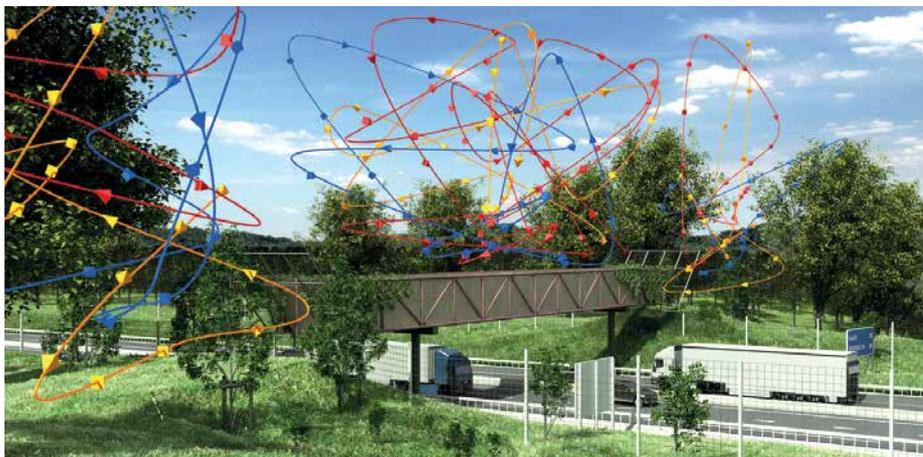


Figure 2. Bat bridge constructed as a habitat severance mitigation measure. Bat flight lines are detected by microphone clusters placed either side and upon the bridge. Different flight paths (denoted by different colours) can be interpreted using a 3D GIS viewer.

each microphone in space and time. It uses these parameters to locate the presence of a bat from its ultrasonic call by comparing the time at which a bat is recorded by one microphone in relation to the other microphones (using an equation relating the speed of sound to geometry). The system can triangulate a bat call outside of the dimensions of the microphones and the range is dependent on the strength of the bat call.

Back in the office, the data can be processed and placed into the context of a project by using GIS software and a graphic design/photomontage to show where bats have been flying, which paths they prefer and where they do not fly. The client's project can be superimposed, allowing ecologists to identify the impacts on flight paths. The montages can show clearly the results of monitoring efforts, which may be required due to the protected species licensing process. The technology can show that bats are, or are not, using a particular area, such as a woodland edge. In addition, ecologists can demonstrate where bat bridges are needed or where newly constructed mitigation features are functioning well, with clear images based on hard data, see Figure 2.

Practical application

The range of the detection is related to the sensitivity of the microphones and the energy of the bat calls. Therefore the system can detect and plot *Myotis* and *Pipistrellus* spp. up to a range of 20-40 metres, *Noctula*, *Eptesicus*, *Tadarida* spp. up to 100 metres and *Rhinolophus*

and *Plecotus* spp. up to 5 metres. The equipment can also be installed at intervals within a survey area to increase the range of detection, for example along a hedgerow or woodland edge. The survey times are limited by the battery power of the associated computer but 3 hours continuous survey is easily achieved and continually improving.

Further development

A research and development phase of Bat3Data currently underway will ensure that not only are bat flight paths recorded but that there is also an automated species identification phase in the computer workflow. Currently the system records bats in a similar way to a 'SM2' (<http://www.wildlifeacoustics.com/products/song-meter-sm2-bat-plus>) or 'Batcorder' (<http://www.ecoobs.com/cnt-batcorder.html>), both of which are trusted digital remote bat call recorders. A sound analysis and audit phase is required by an experienced bat ecologist using analysis software such as 'BatSound' (<http://batsound.software.informer.com>) amongst others. The intention is to make the species determination stage more efficient in future.

At this stage it is stressed that this product is still in development. Modification of the hand-built system is required and the process of making it "consumer-ready" is underway. The survey methodology with species identification is currently available as a sub-contract service where tenders allow. It is the intention to offer the system as a purchasable system in future.

Egis Structures & Environnement is an engineering consultancy based throughout France and internationally. Egis : Egis Structures & Environnement, 15 avenue du Centre, 78286 Guyancourt, France, <http://www.egis-group.com/activites/environnement>.

The Bat3Data monitoring package, designed by Egis Structures & Environnement in conjunction with Cybero in Grenoble, has been created to map in 3D the flight paths of bats. The system was recently awarded a prize for innovation in the environmental sector by the French environmental/sustainable development ministry.

About the Authors



Hippolyte Pouchelle BSc is the principal developer of the Bat3Ddata© tool. He is an experienced bat worker and project manager of environmental engineering projects.

Trained tree and rock climber, Hippolyte is often solicited for bat roost inspections.

Contact Hippolyte at:
hippolyte.pouchelle@egis.fr



Irène Gest BSc MSc MCIEEM is experienced ecological consultant/environmental engineer and project manager. She has worked in the UK and currently works

in France on many protected species licenses both in terms of fieldwork and designing mitigation measures for major infrastructure and industrial projects.

Contact Irène at:
irene.gest@egis.fr



Martyn Gest BSc MSc is an ecologist/environmental engineer who has worked in the UK, France and Africa on bat projects and on varied ecological impact assessments

and major projects. Based in the Paris area, he worked with Hippolyte during the development phase of Bat3Ddata across France.

Contact Martyn at:
martynjames.gest@egis.fr

Linking bat surveys with meteorological data: a way to target operational wind farm mitigation

Greg Slack and Elizabeth Tinsley
Parsons Brinckerhoff

Keywords: Chiroptera, operational cut-ins, survey methodology, temperature, wind energy, wind speed

Ecologists and energy developers are aware that wind turbine operation can result in bat mortality through direct collision and barotrauma. This article considers the use of operational cut-ins to control turbine activity at times when bats are active in order to reduce the likelihood of potential bat mortality. We also highlight the need to consider survey height, wind conditions and temperature within the rotor-swept zone when designing mitigation measures.

Temporal and seasonal variations are regularly used to predict bat activity, hence the guidance available on the suitability of survey timings (Hundt 2012). Studies have identified a link between bat activity and wind speed and some have focused on the amount of bat activity recorded at height in comparison to that recorded at ground level (Collins and Jones 2009, Gray *et al.* 2012, Cryan *et al.* 2014). Building on this work, this study collected bat activity data and the corresponding wind speed and temperature data at both ground level and within the rotor-swept zone at four proposed wind turbine sites across the UK. The results highlight the importance of the elevation at which wind speed and temperature are measured when designing



and implementing mitigation triggers. Targeted mitigation during specific wind speeds and at certain temperatures has the potential to increase the economic viability of problem turbines while minimising potential bat mortality.

Introduction

The potential for wind turbines to cause bat mortality has been established by a range of studies (Baerwald *et al.* 2008, Cryan *et al.* 2009, Ellison 2012). At present, when trying to reduce this mortality, the only effective avoidance measures available are appropriate siting and reductions in the size or number of turbines to be installed (Barclay *et al.* 2007, Mitchell-Jones and Carlin 2012). Inevitably, the cost implications of reducing the number or size of turbines, and the vast number of other constraints on each site, create pressures to install turbines in sub-optimal locations from an ecological point of view. In these cases, there is a need to manage the risk to a range of wildlife. Reducing the risk during the construction phase is usually relatively straightforward because of the small development footprint, short duration of works and wide range of reliable mitigation measures available. In contrast, the risk to wildlife during operation is on-going with few easily implemented mitigation measures available.

Another option is the implementation of operational activity cut-ins, a method whereby a wind turbine is stopped, slowed or started during specific climatic conditions during times when bats are active (Baerwald *et al.* 2009). Recent research has shown that ultrasonic acoustic deterrents or even the addition of aviation lighting can also reduce mortality at test sites in the USA (Arnett *et al.* 2013, Bennett and Hale 2014). However, further research and testing of these novel methods is required to assess their effectiveness in the UK.

Triggers for the implementation of mitigation measures once turbines are operational are usually specific wind speeds but ambient temperature, wind direction or precipitation could also be used. The implementation of operational cut-ins for bats is usually designed to target the times when bats are most likely to be active, i.e. just before sunset and just after sunrise. By correlating meteorological conditions with



Soprano pipistrelle. Photo by Robert Bell

peaks in bat activity during these times, we can identify the periods during which the curtailing of wind turbine operation would be most effective at reducing potential bat mortality while maximising the energy and revenue generated by the wind farm.

This study examined whether wind speed and temperature limit bat activity and whether this is consistent at height and at ground level. This article also considers whether it is possible to design regional or national guidance on thresholds for cut-ins to address the risks caused by high levels of bat activity around a proposed turbine, and whether this guidance needs to be species-specific.

Data Collection

The combined dataset was taken from sites located in South West England, Central England, and two sites in the Scottish Borders. The habitats present within the sites comprised arable farmland, grazed pasture, and clear-fell within actively managed, coniferous plantation woodland.

Meteorological masts (70 m tall) were erected on each site, and rigged with thermometers, anemometers, and an SM2 bat detector with two SMX-US microphones (Wildlife Acoustics, MA, USA), set to record simultaneously. One of the SM2 microphones was mounted at ground level (3 m), with the second mounted at a height that would be within the rotor-swept zone of a turbine (50 m). Data from the recording instruments closest to each SM2 microphone were matched with the bat activity recorded at that height. The thermometers were positioned at elevations of 3 m and 65 – 66 m and anemometers at 25 – 25.5 m and 55 m.

Data were collected over a period of 74 nights with recordings commencing half an hour before sunset and finishing half an hour after sunrise, times when bats could reasonably be assumed to be active. The average temperature and wind speed were logged for each ten-minute recording period then rounded to one decimal place. Any recorded bat activity was matched to the relevant ten-minute recording period, giving a total of 3,538 ten-minute recording periods with wind speed, temperature and species-specific bat presence / absence data. The subsequent analysis included all meteorological data logged during the ten-minute periods when the SM2 was active, irrespective of bats being detected. This allowed analysis of the meteorological conditions when bats were not recorded but had the potential to be active, based on the typical bat activity periods given in the Bat Conservation Trust survey guidelines (Hundt 2012). Therefore any correlation between a lack of bat activity, or a reduction in bat activity, and corresponding weather conditions could be identified.

Limitations

As with most studies of this kind, some limitations should be considered when reviewing the results. Firstly, the dataset is not a comprehensive record of bat activity at each site (i.e. bats were not surveyed on every night of their active season). However, we believe the dataset provides sufficient information from which to draw conclusions for the combined sites.

Bats with quieter calls, for example *Plecotus* species, will not be picked up from as great a distance as bats with loud calls, and may even be completely drowned out by background noise, such as wind. When prospective wind turbine sites are being surveyed, it is likely that wind noise will reach levels that reduce the detection rate of quiet species should they be present during high wind speeds. Conversely, it is possible that bats with loud calls, such as *Nyctalus* species, may be recorded by both microphones at once. Unfortunately, these practical limitations cannot be corrected for when designing the survey or collecting the data and therefore need to be taken into account when analysing the data and designing appropriate mitigation.

Finally, the data used in this study were limited by the geographical location of the

Feature Article: Linking bat surveys with meteorological data: a way to target operational wind farm mitigation (contd)

meteorological masts. The distribution of different species varies across the country, thus the data were skewed towards certain species simply due to their relative abundance at the sampling location.

Analysis

The data were grouped by sampling height into 3-m and 50-m categories for each bat species or group, and combined for all bat activity recorded. The cumulative percentage of bat activity at each 0.1-m/s interval of wind speed and 0.1°C interval of temperature was calculated and represented graphically, together with the frequency at which each 0.1°C temperature interval or 0.1-m/s wind speed interval was recorded.

Results

In total, five species / species groups were recorded during the study, namely *Plecotus*, *Myotis* and *Nyctalus* as well as common and soprano pipistrelle (*Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*, respectively). Although four of the species groups were recorded at both 3-m and 50-m elevations (the *Plecotus* species group was only recorded at 3 m), 84% of bat activity was recorded at the 3-m elevation, see Table 1.

Wind Speed

During the recording period, wind speed was significantly different at the two heights (ANOVA test comparing wind speed at elevations of 25-25.5 m and 55 m), see Figure 1. At an elevation of 50 m, 80% of all bat activity was recorded at wind speeds of 5.4 m/s or below. These wind speeds were logged for 34.6% of the total recording time. All bat activity was recorded at wind speeds of 11.8 m/s or below, corresponding to 99.9% of the recording period. At an elevation of 3 m, 80% of bat activity was recorded at wind speeds of 5.3 m/s or below, corresponding to 69.2% of the total recording time. All bat activity was recorded at wind speeds of 8.3 m/s or below, corresponding to 97.9% of the recording period.

To summarise, Figures 1 and 2 show that bats began flying when there was no wind (0 m/s) and could tolerate most wind speeds. However, the level of bat activity was greatly reduced at wind speeds of around 5.4 m/s and above.

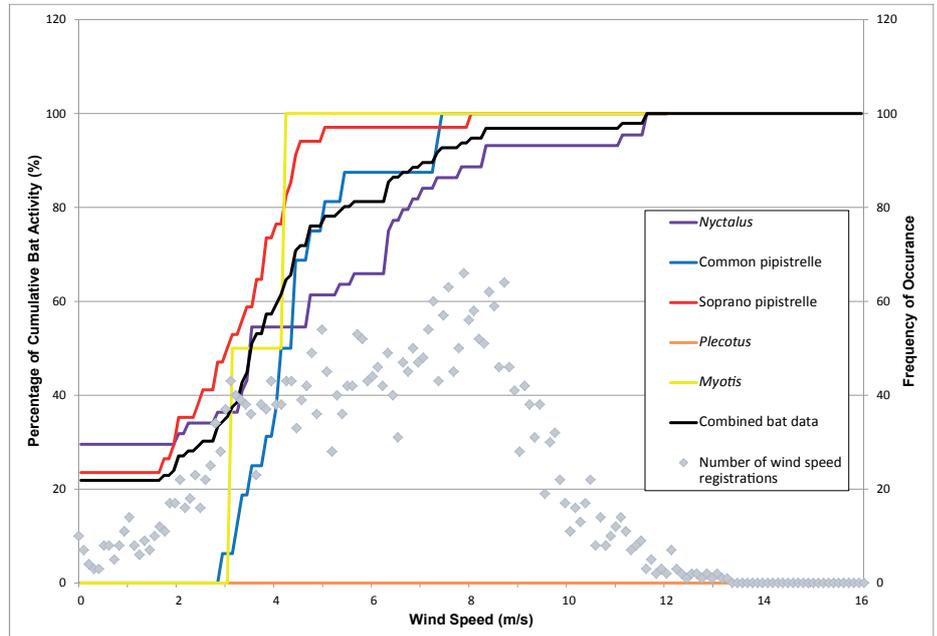


Figure 1. Cumulative number of bat registrations (recorded as a percentage of total bat activity) as wind speed increases at an elevation of 50 m

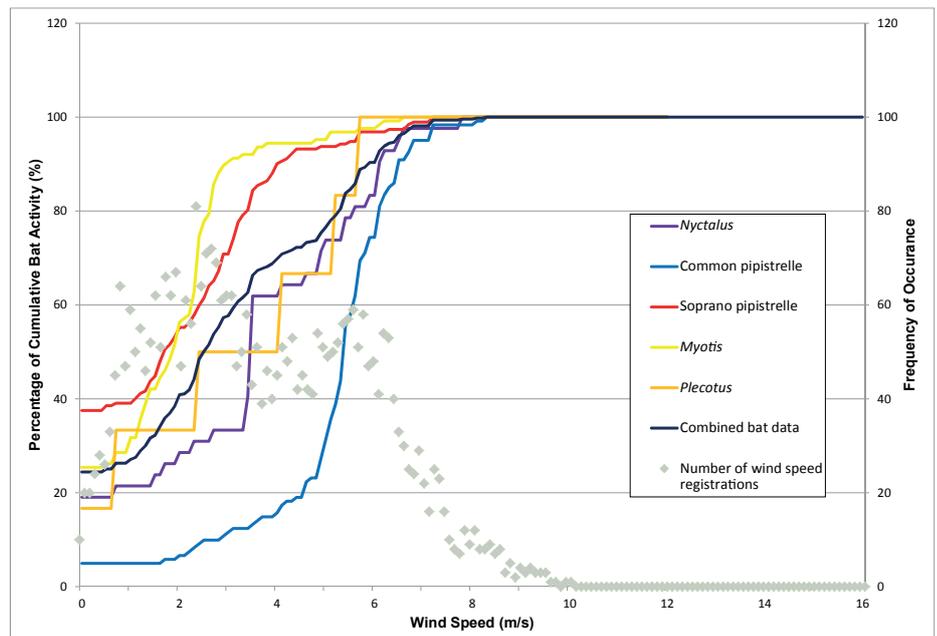


Figure 2. Cumulative number of bat registrations (recorded as a percentage of total bat activity) as wind speed increases at an elevation of 3 m

Table 1. Cumulative number of bat registrations recorded during 3,538 ten-minute recording periods

Species	Number of registrations	
	At 50 m	At 3 m
<i>Plecotus</i> species	0	6
<i>Myotis</i> species	2	126
<i>Nyctalus</i> species	44	43
Common pipistrelle	16	121
Soprano pipistrelle	34	198
Total activity	96	494

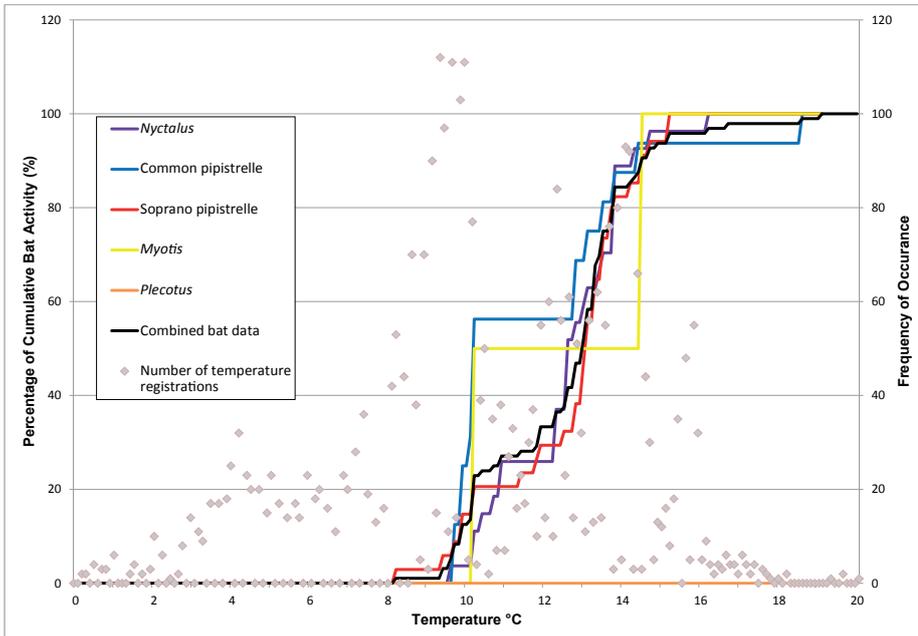


Figure 3. Cumulative number of bat registrations (recorded as a percentage of total bat activity) as temperature increases at an elevation of 50 m

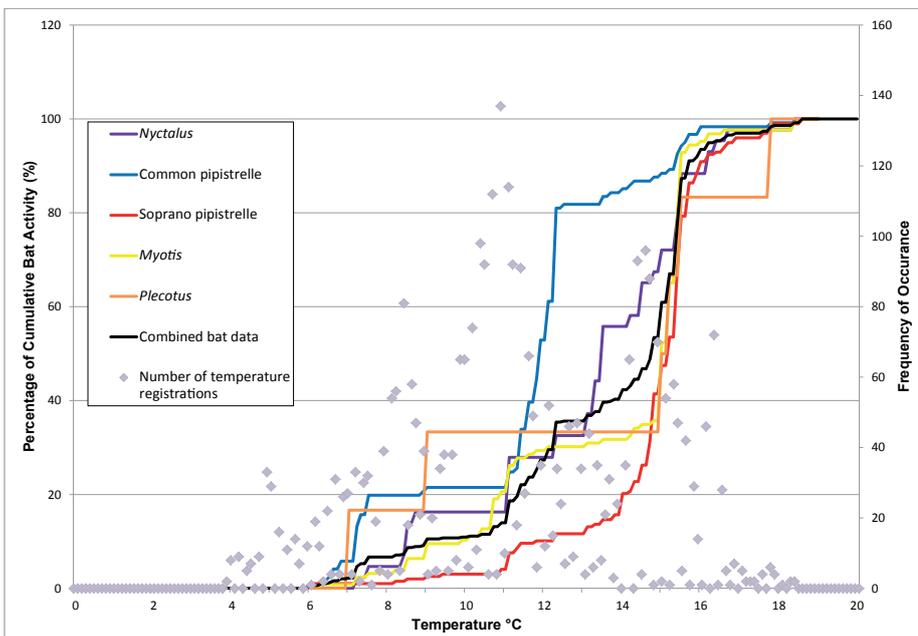


Figure 4. Cumulative number of bat registrations (recorded as a percentage of total bat activity) as temperature increases at an elevation of 3 m

Table 2. Climatic conditions during which 80% of bat activity was recorded

Species	Wind speed (m/s) below which 80% of activity was recorded		Temperature (°C) above which 80% of activity was recorded	
	At height	Ground level	At height	Ground level
<i>Plecotus</i> species	n/a	5.2	n/a	8.9
<i>Myotis</i> species	3.1	2.7	10.1	10.8
<i>Nyctalus</i> species	6.8	5.6	10.8	11.0
Common pipistrelle	5.0	6.1	9.8	8.8
Soprano pipistrelle	4.2	3.4	10.1	13.9
Total activity	5.4	5.3	10.1	11.3

Figures 1-4: Cumulative bat activity (expressed as a percentage) is denoted by the coloured lines. The frequency that each 0.1°C temperature or 0.1 m/s wind speed was logged as the average temperature or wind speed for a 10-minute recorded period is denoted by the grey diamonds.

Temperature

Temperature was significantly different at the two heights (ANOVA test comparing temperature at 3 m and 65-66 m). At an elevation of 50 m, only 20% of bat activity occurred at below 10.2°C; this corresponds to under half (45.1%) of the recording period. No bat activity was recorded at temperatures below 8.2°C, comprising just 17.2% of the recording period. At an elevation of 3 m, only 20% of bat activity occurred at temperatures below 11.4°C, corresponding to 53.5% of the recording period. No activity was recorded at temperatures below 6.1°C, although this comprised a very small proportion (4.2%) of the recording period.

To summarise, Figures 3 and 4 indicate that no bat activity occurred at temperatures below 6°C. Below approximately 10°C, bat activity was extremely limited even though this corresponded to about half of the recording time (i.e. approximately half of the time bats could otherwise reasonably be expected to be active).

Species

Certain species of bat are at higher risk from wind turbines due to their diet, roost preferences and flight patterns (Mitchell-Jones and Carlin 2012). These differences mean that the potential risks posed by a wind farm development may need to be considered on a species-specific basis. Table 2 shows the wind speed below which 80% of each species' activity was recorded, and temperature above which 80% of the bat activity for each species was recorded.

In this study, *Nyctalus* species and common pipistrelle were more tolerant of higher wind speeds than *Myotis* species and soprano pipistrelle. Most species were more active during higher wind speeds at ground level than at the 50 m elevation with the notable exception of *Nyctalus* species. Common pipistrelle and *Plecotus* species were more frequently active at lower temperatures than the other species recorded. See Table 2.

Feature Article: Linking bat surveys with meteorological data: a way to target operational wind farm mitigation (contd)

Conclusions

This study shows that records of species diversity and bat activity were significantly reduced at an elevation of 50 m when compared to those recorded at an elevation of 3 m. Therefore, while surveys undertaken at ground level may not accurately reflect the species composition and level of activity within the rotor-swept zone of a wind turbine, they are likely to provide a figure which can be used as a precautionary value.

When designing operational cut-ins for wind turbines, it is important to note that the temperature and wind-speed thresholds limiting bat activity 'at height' may not be the same as those 'at ground level'. When designing mitigation measures such as a reduction in turbine activity below a certain wind speed or above a certain temperature, it is therefore important to state the height at which the wind speed or temperature will trigger the operational cut-in.

It has long been known that temperature affects the level of bat activity. Bat Conservation Trust guidance recommends that bat transect surveys for wind farm developments are undertaken on evenings with dusk temperatures of 10°C or above (Hundt 2012). However, this is often overlooked when designing operational cut-ins. This study indicates that curtailment of a wind turbine when bats are likely to be active (i.e. from half an hour before sunset until half an hour after sunrise, March and October inclusive) when wind speeds fall below 5.4 m/s and when temperatures are above 10.1°C (recorded at an elevation of 50 m) will be likely to reduce the potential impact to bats (as a group) by 80% during these times. Clearly this is a simplified figure which assumes that bats would neither be attracted to nor avoid an operating wind turbine, and that the climatic variables would not affect the ability of a bat to avoid a collision or barotrauma.

Ultimately, it will not be appropriate to undertake analysis to the level of detail reported in this article for wind farm sites where the impact to bat populations is not expected to be significant. Where it is required, a threshold that balances the need to avoid turbine operation during periods of high bat activity, while keeping

the turbine economically viable, would need to be set. Therefore, at present, this level of detailed analysis is likely to continue to be used primarily to combat species-specific problems at specific turbines and, in general, operational cut-ins are unsuited to a standard, blanket approach. However, as the amount of data and number of recording sites increase, it may be possible to identify species-specific or general guidance in the future. The effects of survey height on the records of species diversity and bat activity have immediate relevance. Linking these data to meteorological data to determine the wind speeds and temperature during which bats are likely to be active should allow effective and targeted mitigation to be designed and implemented.

Acknowledgements

Many thanks to the wind farm developer for the use of their data, without which this article would not have been possible.

Thanks also to Ross Singleton and the Ecology and Renewables teams at Parsons Brinckerhoff.

About the Author



Greg Slack is a Senior Ecologist at Parsons Brinckerhoff, specialising in bat survey and assessment for a wide range of projects, particularly wind farms.

Contact Greg at:
Greg.Slack@pbworld.com



Elizabeth Tinsley is an Ecologist at Parsons Brinckerhoff, with a keen interest in bat ecology and mitigation. Lizy initially began working on the association between

bat activity and climatic conditions for her Master's thesis in 2013.

Contact Lizy at:
Lizy.Tinsley@pbworld.com

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Environmental DNA as a new method for detecting great crested newt presence in ponds

Victoria Stockley and Helen Rees
ADAS

Keywords: development, innovation, PCR, pond management, survey methodology, water sampling

Environmental DNA analysis is a new method for species monitoring in water bodies and has recently been approved by Natural England for the determination of great crested newt *Triturus cristatus* presence or absence. It gives a quick result from an easily collectable water sample.

Environmental DNA analysis has been shown by various laboratories to be a reliable detection method and to correlate well with conventional survey results, in some cases being a more sensitive method of detection. Early indications after the 2014 great crested newt (GCN) survey season are that considerable cost and time savings are possible using this method, especially for projects with long lead-in times. Going forward, the benefits are set to increase with the potential to lengthen the survey window for GCNs as well as a host of other applications for the technique.

How the test works

Environmental DNA (eDNA) is the total DNA found within a particular environment and is most often used in reference to water bodies, e.g. a pond, stream or lake. Some of this material will have originated from the animals present within the water body via their faeces, saliva, urine and skin cells, etc. The analysis of water for eDNA specific to different animal species such as GCN is an emerging technique that will have application to aquatic organism surveys and conservation projects (reviewed in Rees *et al.* 2014a).



Male great crested newt

The technique involves taking a water sample from the pond in question, preserving it, extracting the DNA and using polymerase chain reaction (PCR) techniques to reveal the presence (or absence) of GCN. The PCR technique is used in molecular biology to amplify a single copy or copies of a piece of DNA, thereby generating millions of copies of the DNA sequence of interest. Conceptually PCR is like looking for a needle in a haystack and then using that needle to make a haystack out of the needles. In the case of the GCN test, real-time PCR is used to detect a very small fragment of the 'cytochrome b' gene (part of the mitochondrial DNA). The sequence and method of detection is highly specific to GCN and is not cross-reactive with similar species, such as smooth or palmate newts.

The technique is required to be carried out in accordance with the Technical Advice Note as approved by Natural England (NE; Appendix 5 of Biggs *et al.* 2014) and can be undertaken in as little as two weeks, not including delivery times. Figure 1 illustrates how the process works between the consultant/developer and the

laboratory. In the case of ADAS, kits are sent out by the next available delivery and are couriered back to the laboratory for analysis. Therefore the entire process need take no longer than three weeks (other suppliers may take longer), provided the person collecting the sample can be on site within a day or two of receiving the kit(s).

Water samples are usually taken between 15th April and 30th June. Outside of this survey window samples may still be taken but they will not be accepted as evidence of presence or absence of GCN by NE, e.g. for licensing purposes or where a population estimate is required. ADAS will undertake tests outside of this period as results will still provide a useful indicator for developers and consultants working on long-term projects, especially for long-term planning and budgeting purposes.

Action following test results

Providing the test is undertaken within the approved time period, a negative result means that no further action is required. If appreciable delays occur before any proposed works are undertaken the test

Feature Article: Environmental DNA as a new method for detecting great crested newt presence in ponds (contd)

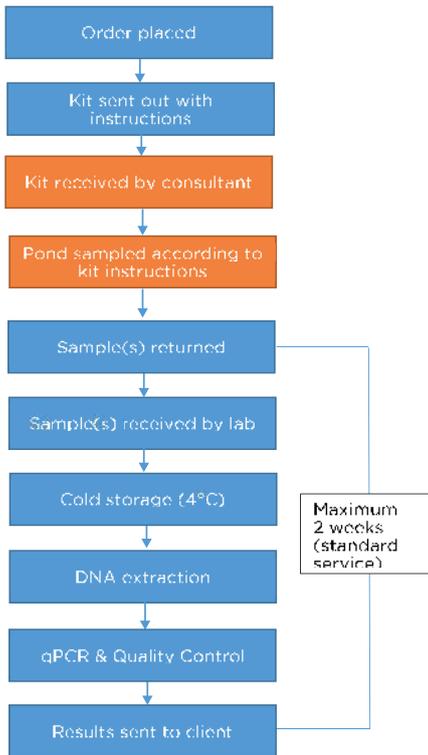


Figure 1 – Summary of the eDNA testing process from ordering a testing kit to receiving results

may need to be repeated (i.e. results only stand for the season in which the test was undertaken).

If GCN presence is demonstrated by a positive result then the conventional survey method will need to be employed to estimate population size class, requiring the full six visits as per NE guidelines.

Effectiveness of the method

During the 2012 and 2013 survey seasons ADAS trialled GCN eDNA detection methods to see if this technique could offer any advantages over conventional survey methods (including bottle trapping, netting, torching and egg searches). Alongside these surveys our ecologists collected water samples, which were sent back to the laboratory for GCN eDNA analysis. Published methods (Thomsen *et al.* 2012a) were followed, which differed slightly from that of the NE approved methodology (published after this work was undertaken). Our data demonstrated that this was a robust method of surveying for GCN with a very similar GCN observation rate to that of our ecologists (Rees *et al.* 2014b). Our investigations also suggest that GCN eDNA analysis has the potential to be more sensitive than

conventional GCN surveys as well as being far more accurate compared to Habitat Suitability Index surveys at predicting the need for full GCN surveys.

eDNA analysis has been approved by NE for the determination of the presence/absence of GCN in ponds in England since 2014 (Natural England 2014). Natural Resources Wales will also accept this technique for licence applications in Wales but Scottish National Heritage have not yet made a formal announcement regarding the use of eDNA to test for GCN presence in Scotland (at the time of writing). The methodology for the newly approved technique came directly from a study commissioned by NE and led by the Freshwater Habitats Trust (Biggs *et al.* 2014), which demonstrated a detection rate of over 99% for eDNA testing, compared to 76%, 75% and 44% for bottle trapping, torching and egg searching, respectively. The test shows a clear advantage over traditional methods for the demonstration of GCN presence or absence. Before now, the only way to predict the likelihood of GCN presence in a pond was with the Habitat Suitability Index (HSI). While a useful tool, its accuracy is limited by its subjective nature and by the fact that GCN are occasionally found in ponds scored as 'below average' or 'poor' for GCN suitability using the HSI method (e.g. see Sellar 2010). Thus, eDNA could provide an accurate method for determining GCN presence or absence in ponds, greatly reducing the uncertainty associated with the HSI method.

Field experience

2014 was the first survey season in which the approved technique was used commercially in the UK. Our experience of this first season was extremely positive; our clients find the technique useful, either for cost saving reasons or for forward planning (and in most cases, both).

We found that the key to achieving cost savings for short-term projects (i.e. where the pond would need to be tested and surveyed within one GCN season) was to test the water as early in the year as possible. As traditional surveys will still be required if a mitigation licence is needed (for population size class assessment), test results are most useful if received well in advance of the mid-May cut off point for the first three survey visits (English

Nature 2001). Since the test is currently only approved after 15th April, the first one or two surveys may need to be carried out while waiting for the test results. If the results come back negative for GCN, there will still be significant cost savings as two or three survey visits will have been prevented. If the test can be undertaken earlier than 15th April in the future, the cost benefits will increase by avoiding the need to undertake any traditional surveys until it has been shown that GCNs are present within the pond.

The future of eDNA testing

The GCN eDNA testing service is currently offered by ADAS, Spygen (via the Freshwater Habitats Trust), and FERA, and as its use becomes more widespread these services are likely to become more efficient and streamlined. ADAS is currently looking into the possibility of testing for GCN eDNA outside of the current survey window. Results are encouraging and will be passed on to NE upon completion of the project.

Species distribution can be determined by presence/absence data and eDNA analysis can be useful in this respect. However, population density or biomass estimation has only been investigated more recently (Thomsen *et al.* 2012a, Thomsen *et al.* 2012b, Pilliod *et al.* 2013, Takahara *et al.* 2013) and results indicate that there is much still to be done to provide evidence that these methods are reliable. The Freshwater Habitats Trust study (Biggs *et al.* 2014) showed that, at present, the relationship between eDNA score and great crested newt abundance is not strong enough to use eDNA as a reliable index of population size.

There is great scope for new applications of eDNA analysis. For example, eDNA has been used to obtain data for other elusive, secretive and/or rare species, including the European weather loach *Misgurnus fossilis*, the large white-faced darter *Leucorrhinia pectoralis* and the tadpole shrimp *Lepidurus apus* (Thomsen *et al.* 2012a), which can often be difficult to survey due to being physically unable to be located. eDNA methods provide a cost-effective way to obtain basic distribution data enabling limited conservation resources to be more efficiently deployed. For example, invasive species could be detected at early stages of introduction

or when they are at low density, thereby making control and eradication strategies more effective. eDNA studies on invasive species have focused on the American bullfrog *Lithobates catesbeianus* (Ficetola *et al.* 2008, Dejean *et al.* 2012), Asian carps, e.g. *Cyprinus carpio*, *Hypophthalmichthys* sp. (Jerde *et al.* 2013, Mahon *et al.* 2013), and the New Zealand mudsnail *Potamopyrgus antipodarum* (Goldberg *et al.* 2013), amongst others, and could be used to monitor their spread or to assess the efficacy of eradication strategies.

Conclusions

The development of a robust, easy method for determining presence or absence of GCN in ponds is a considerable step forward for ecologists and developers in the UK. The technique has the potential to make conservation monitoring more efficient and affordable. In terms of development proposals, the potential for significant time and cost savings for clients also brings the potential to show that ecologists are not there to constrain developers unnecessarily but to facilitate developments in an ecologically sustainable manner.



Sampling a pond for great crested newt DNA (A) and pipetting the mixed pond water into a sample tube containing preservative (B). Photo credit James Simpson.

About the Authors



Victoria Stockley is a Senior Land Management Consultant at ADAS UK Ltd with experience managing both aquatic and terrestrial habitats. Victoria specialises

in stillwater management, including balancing ponds for highways and sustainable urban drainage systems.

Contact Victoria at:
vicky.stockley@adas.co.uk



Helen Rees is a Senior Research Scientist within the Biotechnology group of ADAS UK Ltd. Helen is a molecular biologist who has recently led ADAS research into eDNA analysis techniques. Helen has a PhD in Environmental Microbiology from the University of Leicester and joined ADAS in 2008.

Contact Helen at:
helen.rees@adas.co.uk

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Meet the Author – Sarah Middlehurst

What do you do?

I am a Lead Adviser at Natural England. I am based in the Manchester office and work in the national Sustainable Development Team. I am currently part of a small sub-team responsible for the Impact Risk Zones Project and my role within the team is to lead on publication and communications.

What or who first inspired you to get into ecology?

The first step towards my current role was studying geology at A-Level. I'd always had an interest in earth history and the natural environment and I was drawn to this fascinating subject as it was so different from anything I'd studied previously, and the prospect of getting out of the classroom on field trips was also very appealing!

How did you get to where you are today?

I studied geology at University and after graduating accepted a job at an environmental/civil engineering company to train as an Engineer. This experience of the building/development industry led me to a role at a local planning authority and it was ultimately my planning knowledge and experience that helped to secure my role in the Sustainable Development Team at Natural England.

Are there any 'must-have' qualifications and/or experience?

Ecology is a broad subject and my background proves that there is more than one route into an ecological role. There are many different ways to gain relevant and quality experience, but taking part in field-based work experience through either a degree course or voluntary work will develop the valuable practical skills needed to work in this field.

What have been the most important steps along the way?

This is difficult to answer as I haven't planned my career nor followed a logical career path. The knowledge, skills and experience gained at each step along the way have been invaluable and allowed me to move onto the next, so they've all been as important as each other.

Do you have any advice for someone setting out on a career in ecology and environmental management?

It's good to think about your expected career path at the outset but don't let it constrain you too much. The knowledge and skills you possess will be transferable to various job roles, so keep an open mind and if an opportunity presents itself that isn't quite what you had planned, give it a go as you never know where it might lead.

What's the best thing about your job?

The people I work with. They are all so knowledgeable about their respective fields of work and dedicated to their profession. It feels good to be part of a team/organisation where everybody has a genuine enthusiasm for their work.

What's the downside?

Not having the time to get out and about as much as I'd like. It's useful to get outdoors now and again to see how your work is benefiting the natural environment on the ground. It gives it all a sense of purpose.

What's next for you?

Who knows? I have only been with Natural England for two and half years, and so there's plenty of room for development in my current role. However, you never know what's round the corner and what interesting opportunities might come your way, so I'll take my own advice and keep an open mind.

What is your top tip for success?

Challenge yourself. It can be daunting taking on new responsibilities or changing job roles but it's a good idea to step out of your comfort zone and explore new horizons. You'll discover aspects of your personality you didn't know existed and in my experience you'll rarely (if ever) look back.

For further information

Contact Sarah at:
sarah.middlehurst@naturalengland.org.uk

New Guidelines on Ecological Report Writing

Mike Oxford CEcol FCIEEM
Project Officer, Association of Local Government Ecologists

Mike Dean CEcol CEnv MCIEEM
MD Ecology

Pauline Holmes MCIEEM
Senior Planning Ecologist (Policy), Hampshire and Isle of Wight Wildlife Trust

Introduction

The ability to provide objective, relevant, accurate, fair and impartial information and advice is enshrined in the Institute's Code of Professional Conduct and is an essential requirement if members are to demonstrate their competence and professionalism. Good report writing is therefore an essential skill for professional ecologists and environmental managers.

However, one of the most frequent issues identified through formal complaints submitted to the Institute under the Disciplinary Procedures is the poor quality of ecological reports. In addition, many members will have their own experience of encountering poor quality reports in some form or another.

A well-written report is succinct, fit for purpose, tailored to the requirements of the reader(s) and answers the brief agreed with the client. It should inspire the reader's confidence in the content, it should avoid any misunderstanding, and minimise the risk of unintended financial or legal consequences.

CIEEM's New Guidelines on Ecological Report Writing (2015)

The Institute has recently published new *Guidelines on Ecological Report Writing* (2015) (www.cieem.net/technical-guidance-series-tgs-) and these now replace CIEEM's former *Professional Guidance Series No. 9* on report writing. The new guidelines are intended to provide a framework for the preparation of a good report and, as such, are based on established good practice with the aim of ensuring:

- the purpose of the report is clearly described;
- content and structure are fit for purpose (i.e. contains all necessary information in a logical format);
- ease of access to readily available information;
- transparency and clarity throughout;
- robust justification for appropriate recommendations and conclusions.

The guidelines identify a variety of different types of report and the purpose that they are intended to fulfil. In particular, guidance is provided on the appropriate content and structure of ecology survey reports, Ecological Impact Assessments (see also below) and Preliminary Ecological Appraisals.

CIEEM is aware that many complaints about poor quality reports relate to non-members as well as members. The Institute has therefore decided to make the new guidelines on *Ecological Report Writing* available to non-members as well as members, as part of its drive to improve standards across the profession. Furthermore, not all individuals involved in the review of ecology reports will be a member of CIEEM; the Institute therefore considers it important to make the guidelines available sufficiently widely to raise the awareness of good ecological report writing standards. This will benefit those members already producing good quality reports.

Identifying the Purpose of the Report

Complaints about ecological reports often stem from a lack of clarity over the purpose of the report. This is particularly the case for reports submitted in support of planning applications for development. Prior to the publication of the new guidelines there was no standard approach to what such reports should be called, or what should be included, and this has caused confusion. In some cases Preliminary Ecological Appraisal reports have been submitted with planning applications, making recommendations for mitigation and further ecological surveys, with no evidence that the further surveys have been undertaken or that the mitigation measures have been committed to and/or incorporated into the design of the development. This situation can arise because of a misunderstanding of the purpose of the report on the part of either the author or the client (or their representatives). It is important that the purpose of a report is clearly defined in the introduction, and that the conclusions reflect that purpose. In some cases it can be equally helpful to make it clear what the purpose of the report is not – to ensure that a report is not used for a different purpose to the one that the author intended.

Content and Structure of Ecological Impact Assessment Reports

The ecological reports submitted in support of planning applications, whether part of a formal Environmental Impact Assessment (EIA) or not, should enable the planning authority to determine:

1. the scale and significance of any likely impacts;
2. whether the project accords with planning policy and legislation or not; and
3. what mitigation measures are required and how can these will be secured (by being an integral part of the scheme design, or required through a planning condition or planning obligation).

Where multiple separate ecology reports are submitted it can be difficult for the planning authority to answer these questions. This is particularly the case where each report has different authors. The new guidelines therefore recommend that any planning application requiring some form of assessment of ecological effects should be supported by an Ecological Impact Assessment Report (as is already the case for projects requiring an Environmental Impact Assessment, e.g. in the form of an Ecology Chapter in an Environmental Statement). This report can include numerous separate ecology survey reports as appendices, but should present a single, robust assessment of the ecological effects of a development proposal. Whilst there is room for these reports to follow different styles and formats, CIEEM considers it important that the structure and content of these reports is standardised.

Further details of the recommended content and structure of Ecological Impact Assessment Reports is provided in the new guidelines.

Emphasis on 'Fit for Purpose' and 'Proportionality'

The new guidelines place an emphasis on the importance of:

1. 'proportionality', so that the structure and content of a report is appropriate and proportionate to the predicted degree of risk to biodiversity and to the nature and scale of the proposed development; and
2. ensuring that the report is sufficiently robust for the purpose it has been written to serve.

This can be a difficult balance to strike, and is an area where the Institute is aware that many CIEEM members struggle, particularly in relation to Ecological Impact Assessments (EclAs) submitted in support of planning applications.

Consequently, to help guide report authors, the new guidelines highlight the need to provide information that is relevant, necessary and material to the purpose identified, while at the same time ensuring that adequate details are provided for the intended reader and/or audience e.g. in the case of an EclA, a local planning authority (LPA). Likewise, all decision-makers should apply a proportionate approach to the information that they request and should be aware of the type of information that they require in any given situation.

Future Roll Out of Training Courses for CIEEM Members

As one of its strategic priorities, CIEEM is committed to raising the overall standard of report writing throughout the profession and the publication of the new guidelines is one means by which it hopes to achieve this. In addition, the Institute also wishes to support and encourage consistency with the guidelines through the provision of widely available training on ecological report writing. To this end, CIEEM has commissioned a brand new training workshop, with the intention of this being rolled out around the UK and Ireland to meet demand.

Feedback

CIEEM would welcome your views on the new guidelines so please do let us know if you have any comments – either by contacting the authors or Secretariat directly or by commenting on LinkedIn.

About the Authors



Mike Oxford has over 25 years of experience working with ecology and the planning system. In that time he has reviewed and/or written hundreds of ecological reports of all shapes and sizes. Also, now as part-time Project Officer for the Association of Local Government Ecologist, he regularly hears about the frustrations of other ecologists working in local planning authorities and the inconsistency and quality of some ecological reports.

Contact Mike at:

michaeloxford@btinternet.com



Mike Dean is the joint Chair of CIEEM's Professional Standards Committee and runs his own small ecological consultancy (MD Ecology). He has been involved in revising

the guidelines on Ecological Report Writing, as well as being a member of the group responsible for revising CIEEM's guidelines on Ecological Impact Assessment. Mike delivers training on ecological impact assessment on behalf of CIEEM, along with courses on water voles and otters.

Contact Mike at:

mike@mdecology.co.uk



Dr Pauline Holmes is Senior Planning Ecologist (Policy) with Hampshire and Isle of Wight Wildlife Trust. She works as an advocate in championing wildlife ensuring that local

plans have strong policies and plan that protect and enhance the local biodiversity of Hampshire and the Isle of Wight. Pauline is also a member of CIEEM's Professional Standards Committee.

Contact Pauline at:

Pauline.Holmes@hiwwt.org.uk

Chartered Members

Fellows and Full Members of CIEEM can develop their skills and gain professional recognition from employers, colleagues and clients by achieving Chartered status. CIEEM offers two Chartership awards:

- **Chartered Ecologist (CEcol):** The Register of Chartered Ecologists recognises the effective application of knowledge and understanding of the science of ecology by professionals committed to the highest standards of practice.
- **Chartered Environmentalist (CEnv):** CIEEM is one of 23 professional bodies licensed by the Society for the Environment (SocEnv) to award Chartered Environmentalist status. CEnv is an increasingly recognised standard of good environmental practice.

The below profiles highlight the work of Chartered professionals and provide an insight into the kind of roles that these senior ecologists and environmentalists are required for.

**Mrs Claire Smith CEcol CEnv MCIEEM
Principal Environmental Consultant,
Royal Haskoning DHV**

I am a Principal Environmental Consultant at Royal Haskoning DHV and I decided to join CIEEM as I wanted to become a member of a group of professionals within the ecological and environmental sector. I applied to be a Chartered Environmentalist (CEnv) as I take pride in my professional achievements and wanted to take the opportunity to demonstrate my commitment and knowledge to the environment. The CEnv process was straightforward and despite being apprehensive of the professional review interview, I did find it enjoyable once the discussions were underway. I would recommend my peers and colleagues to apply for their CEnv, particularly if they are similar minded to myself (and other CEnvs) and want to demonstrate their skills and proficiency in the environmental sector.



I studied environmental water management for both my BSc and MSc and modules of which further concreted my aspiration to work within the environmental sector. I first joined the consultancy sector in 2003 as a graduate environmental consultant before moving to RHDHV in 2012 where I am a Principal Environmental Consultant. In order to keep up to date with both the environmental and ecological sectors and maintain my knowledge and commitment to the environment, I attend training courses through CIEEM and other organisations such as the Wildlife Trust and Field Studies Council whenever I can.

The best thing about my job is that no two days are the same, both in terms of the nature of the projects I work on and the cross discipline teams that I work with.

New Chartered Members

CIEEM is pleased to announce the following new Chartered members:

Chartered Ecologists	Chartered Environmentalists
Dr Tim Hounsome CEcol MCIEEM	Mr David Bigden CEnv MCIEEM
Mrs Lyn Jenkins CEcol CEnv MCIEEM	Mr Christopher Catling CEnv MCIEEM
Dr Andy Mackenzie CEcol MCIEEM	Mr Stephen Hancock CEnv MCIEEM
Mr Mike Shewring CEcol MCIEEM	Miss Anna Price CEnv MCIEEM
Mrs Corin Simmonds CEcol MCIEEM	Dr Alex Ramsay CEnv MCIEEM
Mr James Streets CEcol MCIEEM	Mr Andrew Warwick CEnv MCIEEM
Prof Max Wade CEcol CEnv FCIEEM	
Miss Harriet Webb CEcol CEnv MCIEEM	
Mr Gareth Williams CEcol MCIEEM	
Dr Stephanie Wray CEcol CEnv FCIEEM	

**Nigel Smith CEcol MCIEEM
Lilacs Land Consultant LLP**

I run my own land management and conservation consultancy. I also do periodic work a couple of days a week on short-term contracts for Natural England.

I joined CIEEM because I thought it was important to be a member of an organisation that provides access to the latest information and opportunities to network with other professionals. I have seen CIEEM grow in stature over my career, which is well over 30 years. It has an important role in driving up standards, and been the 'voice' of us, environmental professionals. It must be remembered that CIEEM is not just about ecology, but also the wider environmental disciplines.

I applied for Chartered Ecologist status because I felt it was important to set a benchmark that other professions could recognise and hopefully respect.

I found the application process to be as it should be, very thorough and exacting.

This is not about just collecting another piece of paper to put on our walls or letters on our business cards. It's about saying, *"I have been judge by my peers and have been found to be worthy of this Charter."* And yes I am very proud to have reached this status.

Natural England and other organisations and companies can come to me for help on various projects and know that I can hit the ground running and provide quality work.

I would absolutely recommend anyone to apply for CEcol. I know plenty of peers and colleagues who are excellent ecologists, so why not apply and be recognised for what you are; a highly experienced professional. It does make a difference when you walk into a room with other Chartered disciplines.

My education has been long, varied and continuing. I first went to agricultural college and gained a diploma in Countryside Recreation in the mid 1980s.

This was aimed at people who wanted to become countryside rangers. Since

then I have gained qualifications from studying with the Open University. I received a Certificate in Natural Science, a diploma in Environmental Policy, a Certificate of Professional Management, and finally after six years of hard work a degree.

Where do I start in listing the training courses I have attended over my career? Don't forget it's not all about using just structured courses. Full and half day training sessions are just as important in gaining knowledge. Continuous Professional Development keeps you up to date, even though the wide range of environmental disciplines can be daunting.

The best thing about my job is the wide variety of the kind of work I do. While I am a Chartered Ecologist I incorporate this with other disciplines, from Farm Environmental Plans, public recreation and parks and habitat management.



Chartered Ecologist application deadlines

CEcol Application due date	CEcol Interviews	Ratification
12 June 2015	W/c 28 September 2015	Mid-October 2015

Please note, these dates are subject to the availability of assessors and may change.

Chartered Environmentalist application deadlines

CEnv application due date	CEnv report submission deadline	CEnv Interviews
3 April 2015	12 June 2015	24 August - 4 September 2015

Please note, these dates are subject to the availability of assessors and may change.

If you would like to submit your own profile please contact the Registration Officer, Karen Sanderson, at karensanderson@cieem.net.

Professional Conduct – Contractual Processes and Project Management

Katherine Kennedy CEnv MCIEEM

Director, Blue Ltd and member of CIEEM's Professional Standards Committee

Introduction

As members of CIEEM we are all familiar with the *Code of Professional Conduct*, which applies to all of us (see *In Practice* article, June 2014). The Code provides the core standards expected of a professional ecologist or environmental manager, and is supported by the CIEEM Professional Guidance Series (PGS) – most notably the CIEEM publications on 'Contract Advice' and 'Estimation of Fee Rates'. The PGS on 'Good Working Practices' (November 2013; see the CIEEM website) gives a useful overview of good practice for both employees and employers. We must also consider the category of self-employed, which applies to a significant percentage of the CIEEM membership.

In this article I focus on a few specific aspects of professional conduct and working practices, and concentrate on how they relate to contracts and project management for ecological and environmental consultancy services. This is provided to help CIEEM members make sure that contractual and project processes are considered alongside technical services, particularly at proposal stage.

Contracts

Even if a piece of work appears straightforward or small it is always advisable to have, as a minimum, a schedule that sets out:

- the work to be done;
- timescales;
- who, and what the work is for, with an agreed set of terms and conditions; and
- fees (whether this be fixed fee, or based on an agreed daily/hourly rate).

In agreeing to take on a new piece of work, it is important to consider potential pitfalls that might hamper project execution, and in turn risk harming good relations with your client. For example, who is responsible if weather delays field work plans? What if initial survey results prove more complex than anticipated at the proposal stage? If you are able to anticipate these risks, then you should consider how you might account for them in your contractual arrangements in dialogue with your client.

Whilst professional ecological and environmental practice will always require a degree of 'give and take' it is important to make sure that work is valued correctly, contracted professionally and delivered with no surprises for the client. If you have to make updates, or amendments to the contract (in particular any quoted costs), it is important to consider how you are documenting these changes and communicating them to your client. In the worst case, where a complaint is made about the services that you have provided, you should be able to go back to your contract, and any subsequent amendments, to establish what the agreement was.

Good communication relating to the initial scope of your work, and any subsequent changes, is a necessary and easy way to manage expectations and build trust.

Terms and Conditions

If you are a CIEEM member who works in commercial practice, you should ensure that you are contractually protected by Terms and Conditions. You, or your client, may set these out but they should be agreed by both parties.

As an independent consultant, whether a sole trader or limited company, you should seek legal advice to make sure that your Terms and Conditions are appropriate for the level of commercial risk that you intend to take on. CIEEM Insurance Services (through McParland Finn Ltd) offer a free legal helpline service: <http://www.cieem-insurance.co.uk/about-us/>

Contract essentials include limiting the liability of the work (in the case of providing inputs to very large development projects, this means ensuring that you are only accountable for the aspects of the work within your control and not wider financial and technical project obligations); making sure that the contract is covered under UK law; setting out that the work will be carried out according to 'good industry practice', and making sure that you have an agreed schedule of work set and costs. Additional matters for consideration include data ownership and protection, intellectual property rights, and project transferability. It is important to feel confident about agreeing appropriate terms before work commences. The time invested to do this will always be preferable to trying to resolve an issue later on.

As a CIEEM member operating in commercial practice, you should also make sure that you are covered by appropriate Public Liability and Professional Indemnity Insurance and always ensure that your liabilities are limited to, or below, the maximum amount of insurance you carry. If you are working abroad you should check that you have sufficient business travel cover for the countries that you are working in. If you are unsure, check with your insurer before you travel.



Project Planning and Management

Good project planning and management starts at contract bid stage, but should continue through all stages of project delivery. Applying good project management principles, even on straightforward assignments, is a useful and important discipline to maintain.

In simple terms this means:

- identifying and tracking progress on project deliverables;
- setting out the associated timescales, fees and costs; and
- communicating these effectively and regularly with your client.

An agreed project plan and timeline is a good way to ensure clarity and realism regarding deadlines for delivery between you and your customer.

Irrespective of your confidence around delivery of the project, it is good practice to maintain a risk register that runs in parallel to your project plan. This will give you the opportunity to reflect on what could go wrong, and then think about the likelihood that it might happen. Based on the principle that prevention is better than cure, this can help to manage out any risks from early on in the project management process.

This can be shared and where possible jointly 'owned' with the client and kept live through project delivery. Maintaining an up-to-date risk register can also form a useful evidence base that you can use to inform discussions about any changes to your original contract. Clients are likely to be far more comfortable with contractual changes if they can see how it is responding to risk management.

Project management practice and discipline is a useful element of CPD for individuals and employees. There are many project management courses available across the UK. Additional information on accredited courses can be obtained via the Association of Project Management (www.apm.org.uk). Introducing formal project systems on small projects is a good way to embed learning before applying the approaches to more complex projects.

Building Stakeholder Dialogue into Project Delivery

Many environmental projects, especially those concerned with wildlife designations, protected species and planning applications/development control, will require open and constructive engagement with a variety of stakeholders. An engagement plan that runs parallel to your overall project plan (and risk register) is generally considered good practice. This will help you to consider whom you should be talking to. By understanding your key stakeholders you can develop the right communication channels. By engaging with interested parties early on you can show openness and transparency, and can seek their input for any issues that you may identify. However, note that you should always seek client agreement concerning whom you communicate with and how you propose to do it.

An engagement plan does not need to be onerous, and it is important that you keep it proportionate to the size of the project and the level of risk associated with it. It is difficult to retrofit engagement to a project, and if you do not engage well with interested parties, there is a risk they could cause delays later on in the process. Delays can be costly, and will be unpopular with your clients, especially if it could have been anticipated. For some stakeholders it may be necessary to do some expectation management, for example, in situations where they may hold particularly divergent views from your client. In cases like this you may want to think about developing a bespoke engagement or communications plan as a formal project deliverable.

As ecologists and environmental managers we are not necessarily specialists in contract law, risk management or stakeholder engagement, but it is important to remember that whilst our technical skills are important, it is often these things that will mean the difference for our reputation, and for securing repeat business.

For further information

Contact Katherine at:
katherine@blueconsulting.co.uk

Featured CIEEM training events

New – Ecological Report Writing

See website for dates

Good report writing is an essential skill for professional ecologists and environmental managers. This training has been developed in conjunction with the launch of CIEEM's new 'Guidelines for Ecological Report Writing'.

Accessing and Using Biodiversity Data (includes new content)

London 21 April

This course explains the data services provided by Local Environmental Record Centres and the National Biodiversity Network, showcasing the latest technology in biodiversity data management. A demonstration of the new CIEEM Consultants' Portal is now included in this course.

QGIS for Ecologists and Conservation Practitioners

Athlone 23-24 April

Gloucester 19-20 May

Over two days, delegates will learn how to use free, open source, Quantum GIS software to access a variety of environmental data sources.

Vegetative Grass Identification

Donabate 11-12 May

Aimed at professional ecologists and delivered by the lead ecologist of the Irish Semi-natural Grasslands Survey. This course will introduce the key attributes for surveyors identifying grasses all year round, with discussion on how grasses can be used in support of both the Irish and EU Annex I habitat classification systems.

New – Wetland Assessment for Development

Battleby 28 May

The course provides an overview of the planning and legal framework for wetland protection in Scotland, with the aim to promote high quality field assessments and applications received by statutory consultees. It is delivered in collaboration with trainers from SEPA and SNH.

Camera Trapping (new location) Shrewsbury 15 June

This course serves as a thorough introduction to camera trapping, a fast-emerging technique to monitor animals covertly, particularly useful for accurately determining the presence of protected species such as otters, badgers and water voles.

New – Communications and Media Training

Winchester 21 October

Whether discussing an environmental issue, raising awareness about habitats or dealing with a flooding crisis, communicating with the media is absolutely essential. This course is delivered by a former BBC Correspondent who will explore the skills and techniques needed to ensure you say the right things during an interview.

Amphibian and Reptile courses

New dates – Using eDNA and traditional techniques for effective GCN surveys

Boxworth, Cambridgeshire See website for dates

Environmental DNA (eDNA) analysis is a new method for species monitoring in water bodies and has recently been approved by Natural England for the determination of GCN presence or absence. This Intermediate - Advanced level course will discuss the new methodology and demonstrate how to ensure samples results are reliable and robust.

Great Crested Newt Ecology and Survey Techniques (new locations)

Leatherhead 16 April Culross, Fife 16 April

These courses introduce the ecology and identification of GCN, their habitat and survey season. Sessions are provided on survey design and approved survey methods, including water sampling for eDNA.

Reptile Ecology, Survey and Handling

Basildon 9-10 April

This two-day training event will cover all the aspects required to carry out habitat assessments, plan and implement a suitable standard survey for reptiles, interpret analyse, and report results.

Reptile Mitigation

Essex 28-29 April

The course will demonstrate how to plan a reptile mitigation strategy based on current best practice guidance including creating new habitats, safe handling, DWA requirements (adders), monitoring, habitat management and reporting of results.

Barn Owl Surveying and Reporting

Tamworth 21 May

The course will focus very much on surveying methods and protocols, including how to define different roosts of barn owls, active nest sites, and the assessment of habitat quality.

New dates – Train the Trainer

London 10-11 Nov

Want to deliver training? This specially designed course provides ecologists and environmental practitioners with the skills needed to work as a professional trainer, covering techniques for delivering engaging and interactive sessions both in the field and the classroom.

Details of all CIEEM's courses and on-line booking can be accessed at: www.cieem.net/training-events

Complaints Update

Breaches of the Code of Professional Conduct

Case 1

Gerald Longley MCIEEM (Gerald Longley Ecological Consultants) was found to have breached the following clauses of the Code of Professional Conduct: 7.iv and 7.vi.

These breaches related to:

- Lack of clarity in reporting and with particular reference to survey results and the conclusions drawn from these;
- Unwillingness to answer legitimate queries from his client and the tone used in correspondence with his client;
- Demanding immediate payment from his client without prior agreement;
- Failing to include details of the required copyright licences in the report; and
- Failing to assist the Disciplinary Board properly with its enquiries.

Mr Longley has been reprimanded with conditions, including the downgrading of his membership to Associate level for a period of no less than 12 months.

Case 2

Jo Gregory Grad CIEEM (Arbtech Consulting Ltd.) was found to have breached the following clauses of the Code of Professional Conduct: 7.i and 7.iv.

These breaches related to:

- Undertaking a survey and producing a report of insufficient quality for its intended purpose; and
- Failing to undertake adequate data searches.

Mrs Gregory has been reprimanded with advice.

Case 3

Martin O'Connor MCIEEM (Arbtech Consulting Ltd.) was found to have breached the following clauses of the Code of Professional Conduct: 7.iv and 7.vi.

These breaches related to:

- Undertaking a survey and producing a report of insufficient quality for its intended purpose;
- Completing work without undertaking the required data trawls or reflecting the limitations of the work in the subsequent reports; and
- Signing off work of others that was of insufficient quality

Mr O'Connor has been reprimanded with the condition that his membership is downgraded to Associate level for a period of no less than 12 months.

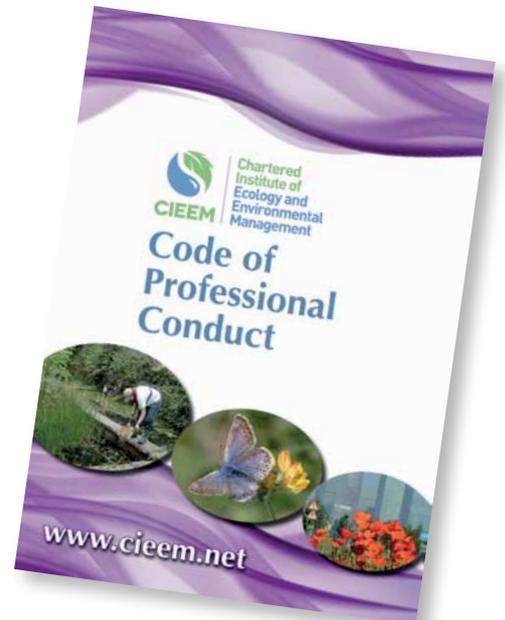
Case 4

Craig Williams Grad CIEEM (Arbtech Consulting Ltd.) was found to have breached the following clauses of the Code of Professional Conduct: 7.ii and 7.iii.

These breaches related to:

- Working outwith his sphere of competence; and
- Not seeking adequate advice and assistance when involved in topics outwith his sphere of competence.

Mr Williams has been reprimanded with advice.



CIEEM Awards Luncheon 2015

25 June 2015, Birmingham Botanical Gardens

We are proud of what our profession contributes to a more sustainable environment. There is much to celebrate! The 2015 Awards build on the success of our 2014 celebrations. They reflect the scope and success of our profession and those companies and organisations working to deliver better outcomes for nature and for society.

The Awards Luncheon will take place on Thursday 25 June 2015 at the Birmingham Botanical Gardens and we are pleased to announce that our guest speaker will be CIEEM Patron Tony Juniper CEnv MCIEEM and our host will be Pam Nolan CEcol CEnv FCIEEM.



CIEEM Medal

Best Practice Awards

Sponsored by



Tony Bradshaw Award

Promising Professional Award

Sponsored by



NGO Impact Award

Sponsored by



Corporate Achievement Award

Sponsored by



Student Project Awards

Sponsored by



In Practice Award

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Tickets for the event will be available shortly.

www.cieem.net/cieem-awards-2015

Inspiring Future Professionals From All Walks of Life

Helen Boulden

Professional Development Officer, CIEEM

As part of CIEEM's ongoing development of careers guidance, we are expanding our range of online career profiles to highlight how varied the scope is for job opportunities and to actively welcome diversity into our profession.

We know that our members pursue many different pathways to achieve their career goals, with twists and turns along the way, and sometimes overcoming difficult personal challenges. So now we want to share these diverse stories, inspiring others to follow their ambitions, regardless of where they start out.

Celebrating our work and helping others achieve their aspirations

We need to talk more about the rewards of working in ecology and environmental management, and what drives us to do it, so that young people will want to take up the baton. This is not always easy when there are seemingly more lucrative career alternatives and more obvious material benefits to compete with **but** there is so *much more to be gained from working*



with the natural environment – a sense of pride in protecting species for the future, providing access to nature for everyone, having an active outdoor lifestyle and working alongside passionate, dedicated professionals. By sharing your experiences we can bring colour and life to the profession as a truly rewarding career choice.



Tell us your story

We want to share your stories of how you achieved your goals, especially where you faced difficult circumstances or less conventional routes into the profession. Did you start out in a different career? Were you discouraged from following your goal? *Do you combine your work with bringing up a family? Do you come from a background where the environment sector is not seen as a career option?*

If you are interested in supporting this initiative, please visit the students and careers pages of the CIEEM website where you can find more details about the kinds of stories we are looking for, and where you can also access a short questionnaire about you and your career profile. Or simply get in touch.

www.cieem.net/students-careers



For further information

Contact Helen at:
HelenBoulden@cieem.net

Student Feedback from the Edinburgh Conference

At the Autumn Conference in Edinburgh last November, CIEEM Student Members were given the opportunity of applying for a free delegate place. After the conference the winning participants were asked to reflect upon their experiences and to share their advice to other students who may be considering attending future CIEEM events.

What was your overall impression of the conference?

"I thought the conference was very well organised, with passionate and knowledgeable speakers. Edinburgh was a brilliant setting, it was great having a strong Scottish presence at the conference – especially when it came to the re-wilding debate!"

"The presentations were varied and interesting, and the day was organised so that it didn't feel as though you were sitting and listening for long blocks of time."

"Overall, the conference had a warm atmosphere, and I found networking with industry professionals, all of whom were eager to share their knowledge and advice, very motivating."

Did it meet your expectations?

"The conference exceeded my expectation. The standard of the speakers was high and the topics being discussed were of interest to me as I am currently in the process of completing a restoration project as part of my degree."

"It exceeded my expectations! I was unsure if, as a student member of CIEEM, some presentations would be beyond me but they were delivered in a way that was accessible. I also found the speed networking session very useful as I was able to gain expert

advice about placements, careers and how to identify areas for improvement in my knowledge and skill set."

Do you feel you have personally benefited from attending the conference?

"Yes, by seeing people present so passionately about their experiences, I felt inspired to ensure I can follow in their footsteps. Moreover, learning about case studies of different restoration projects, where they succeeded and failed, put what I have learnt in my studies in a real-world perspective."

"Yes, the help from the speakers as well as other people I spoke to has really allowed me to engage further with my course and has helped motivate me to pursue a career in ecology and environmental management."

"I was able to network and make contact with experienced ecologists and I feel I am now more aware of current issues within the industry. I was also able to take away some ideas and thoughts to discuss with my colleagues."

As a CIEEM Student Member, what advice would you give to other students to get the most out of attending a CIEEM conference?

"When first arriving at the conference I felt nervous, but I found the best strategy was to speak to attendees from the beginning and the first people you speak to will be the most nerve wracking. Everybody I spoke to was friendly and welcoming, so do not be too nervous to talk to people."

"I always take notes during the sessions, jotting down key points makes sure I am actively listening, and I can refer back to these if I want to do a bit of further reading afterwards. I also attended the speed networking session and would recommend this. Receiving independent feedback has given me ideas of how to develop my career that I would never have thought of myself."



"I would really encourage another student member to talk to the speakers if they have questions. Also, have a look round the stands and poster displays, there is bound to be something to spark your interest."

"What was also interesting was talking to experienced ecologists in the lunch/coffee queue about what they thought about the talks; this not only gave me a greater insight into the topics presented, but also allowed me to make new contacts."

Our thanks to the following Student Members who contributed to the above conference feedback:

- Philip Brown, MSc Biology (specialising in Bat Ecology) at University of Bristol
- David Morris, Environmental Conservation and Countryside Management at Nottingham Trent University
- Alice Pritchard, BSc Biology and Biochemistry at Keele University
- Alex Saunders, MSc Environmental Consultancy at Plymouth University
- Katie Watson, BSc Biological Science (Ecology and Environmental Management), Nottingham Trent University
- Kate Wright, BSc Natural Sciences at Open University



CIEEM All Ireland Conference 2014

This year's All Ireland Conference was held over two days in Belfast in November 2014 and had the theme 'Wetlands: Managing Biodiversity and Ecosystem Function'. This was a successful conference with over 80 delegates attending. We had a terrific line up of speakers with the Keynote Talk delivered by John McCartney from The Loughs Agency. He provided a very thought provoking illustration of the state of salmon fisheries in Ireland and gave examples of how salmonid management techniques have positive knock-on effects for other species. There was a good mix of talks from both North and South of the border and many of the speakers were involved in cross-border initiatives.

Delegates were provided with case studies and practical presentations on habitats and species including grassland management at the RSPB site at Lough Beg, Breeding Wader status on Irish wetlands, Raised Bog restoration projects at Bord na Mona locations, Northern Ireland Water river management methods and sustainable catchment management techniques. Current hydrological investigation conducted as part of the Tellus Border Project educated delegates on how this complex research is conducted. Delegates who work as consultants were given the opportunity to learn the latest techniques

used to assess the Conservation Status of saltmarsh habitats and also given worked examples of Appropriate Assessments carried out on wetland habitats. As wetlands are central to understanding the impacts of Climate Change the talk on aquatic invasive plants, and what we can expect to see with the occurrence of climate change, was well received.

The second day of the conference was spent out in the field with delegates taken to two field sites to see different applications of ecological methods to manage wetland habitats. We started with a visit to Stoneyford Road Integrated Constructed Wetland (ICW) in County Antrim. Derek Crabbe and his colleagues from Northern Ireland Water kindly showed us around and talked about the species of vegetation used and talked about the topography of the site and how it hopes to function. This is a Northern Ireland Water initiative and is the first municipal ICW in Northern Ireland. It is using the latest research to provide a natural water treatment system for the village of Stoneyford and will be capable of treating up to a population equivalent of 1,200. This site was designed with the approach used by National Parks and Wildlife Service in Southern Ireland. Five treatment ponds have been created and as



John McCartney

the ICW is directly adjacent to the village, Northern Ireland Water hopes to use this site as a recreational facility for the village in the future.

Our second stop of the day was at Portmore Lough RSBP Reserve, also in County Antrim. We were welcomed by Warden Donnell Black who generously gave his time to give a talk and walk around the site. This site provides an example of how a variety of habitats are managed to provide optimal conditions to visiting waders and breeding birds. A herd of Konik ponies grazes to maintain the sward making ideal conditions for breeding birds such as lapwing. On our visit, the walkway to the bird hide was under water so only those of us with wellies could visit the hide. We saw shelduck, mallard, tern and other water birds. The site is also home to Irish hare which we did not see on the day.

This All Ireland Conference was kindly sponsored by Botanical Environmental & Conservation Consultants Ltd. (BEC) and the EPA/DAHG/Irish Ramsar Wetland Committee Initiative.



Fieldtrippers at Stoneyford ICW





Distinguished Recorder Award for Two Irish CIEEM Members

The National Biodiversity Data Centre (NBDC) recently jointly awarded Dr Joanne Denyer MCIEEM and Dr Tom Gittings MCIEEM the 2014 Distinguished Recorder Award at an awards ceremony in the Royal Irish Academy in Dublin. This award acknowledges the outstanding contributions made to biological recording in Ireland. The NBDC was established by The Heritage Council in 2007. It is the National organisation for the collection, analysis and dissemination of ecological information in Ireland.

Jo Denyer is a Bryologist and is the CIEEM Irish Section Committee Treasurer. Jo is the British Bryological Society (BBS) Irish Conservation Officer and is the BBS Regional Recorder for Counties Wicklow and Kildare. Jo founded the BBS Irish Bryophyte Group and helped establish a network of BBS Recorders in Ireland. Data collected through this medium has fed into the *New Atlas of British and Irish Bryophytes*. Over 60,000 records have been collected to date with over 1,000

new Vice County Records. Jo also lectures and recently added motherhood to her list of achievements with the birth of Molly in November 2014.

Tom Gittings has conducted much research into waterbird interactions with aquaculture and shellfisheries and gave a presentation at the CIEEM All Ireland Conference in 2013 on 'The Impacts of aquaculture on protected areas: a case study of the effects of intertidal oyster culture on the spatial distribution of water birds'. Tom studied hoverflies, moths and spiders as indicators of biodiversity. Tom submits vast amounts of data to the NBDC

and provided a full Reference Collection to the Centre in 2014 for public use. Tom collates invertebrate data from Irish Facebook sites and sends these data to the NBDC.



Irish Section Meeting with Minister

On Wednesday, 4 February 2015, members of the Irish CIEEM met with Minister Heather Humphreys TD, Department of Arts, Heritage and the Gaeltacht (DAHG) in her Kildare Street office. CIEEM was represented by: Jenny Neff (Vice President for Ireland), George Smith (Irish Section Convenor) and Mairéad Stack (Irish Section Support Officer).

Níal O'Donnchú (DAHG Assistant Secretary), Lorraine Hall (the Minister's Assistant) and Clíona O'Brien (Head of Ecological Assessment with National Parks and Wildlife Service) were also in attendance.

Following introductions, there was a brief but very useful meeting. Topics discussed

included an overview of the work of CIEEM, its functions, raising standards and the Competency Framework and examples of how CIEEM interacts with Government Departments and Statutory Agencies (SNCOS) in the UK. The Minister asked a number of questions and also enquired if CIEEM's activities extended to Europe. Its involvement with the European Network of Environmental Professionals (ENEP) was then explained.

The CIEEM delegation went on to describe the Irish Section's activities, including its submissions on policy consultations. The Minister asked further questions about CIEEM's membership base, structure, how it might act in an advisory capacity to the

Department and how a relationship could be forged.

The meeting concluded with an agreement from the Minister that senior National Parks and Wildlife Service staff would meet CIEEM within a month to further discuss topics that had been briefly introduced during the meeting. The forthcoming meeting would also address outstanding issues from the meeting with the previous Minister for DAHG (Minister Deenihan) in May 2014. Topics for the meeting will include: the relationship between CIEEM and statutory bodies, Departments and SNCOs in other jurisdictions, and CIEEM training, professional standards and guidance development.



Yorkshire and Humber Section News

Sara Parratt-Halbert GradCIEEM

Project Manager, Stimulating
Enterprising Environments for
Development and Sustainability
(SEEDS)

Since our last update for *In Practice* which covered 2013, published in the March 2014 edition, our Section has continued to be busy with a range of field trips and talks.

Our first event of the year was Habitat Suitability Modelling (HSM), organised by Bernadette Lobo. It was the first of a series of joint events held by the Section, the University of Leeds and the Yorkshire Dales Environment Network. Professor John Altringham and Dr Chloe Bellamy delivered a fascinating presentation on the latest research into habitat suitability modelling for bats. The presentation was based on work carried out by Dr Bellamy since 2011, producing habitat suitability models for eight species of bats within the Lake District National Park (LDNP). Acoustic surveys supplemented by catching, from 30 sites across the LDNP, along with the generation of fine resolution maps were used. Fifteen habitat variables were used for analysis and included amongst others: distance to inland water, distance to woodland edge, cover of roads, cover of buildings and habitat richness. The multi-scale models were found to accurately predict bat foraging at a resolution of 50 x 50m, sufficiently accurate to inform decision-making in a wide range of conservation applications. Further work was then undertaken to determine the transferability of the models to other areas of northern England and in particular the Yorkshire Dales National Park, the North York Moors National Park and several AONBs. It is clear that HSM is of high value to conservation as a very useful prediction tool. However questions remain about how to fund ongoing development of HSM and the availability of the models to those making decisions.

Gordon Haycock arranged a very popular event, 'Roads, Railways and Bats – impacts, mitigation and future practice', which took place at Leeds University and included presentations by Professor John Altringham MCIEEM and Dr Anna Berthinussen. A focus of recent research led by Professor Altringham at Leeds University and funded by Defra, has been assessing the impacts of road and rail schemes on bats and the effectiveness of mitigation measures. As many consultant ecologists spend many hours planning, assessing and delivering road and rail projects with mitigation based on the *Design Manual for Roads and Bridges*, this workshop was very well attended with over 60 CIEEM members. John and Anna presented results from some of the first scientifically robust research on the effectiveness of bat mitigation undertaken in the UK which has far reaching implications for mitigation going forward. Briefly John and his research group looked at the impact of linear infrastructure on bat species at a landscape scale, and also specifically assessed structures and underpasses intended for use by bats to safely cross new roads. Their research indicates that even when gantries are in place close to previous commuting routes, bats are unlikely to use them with 84% bats continuing to cross the road along severed, pre-construction commuting routes at unsafe heights (i.e. less than 5m from the ground). One gantry which has been in place for nine years was largely unused by bats which continued to cross the new road along the pre-construction commuting route largely at heights of less than 5m. Only one out of three underpasses studied was found to be effective; it was not clear why this underpass was successful whilst the others were ignored. Conclusions of their research are that roads do have a negative impact on bat populations, and that current mitigation is failing. This research is likely to have far reaching consequences for how

we carry out mitigation for road and rail projects in the future and sparked a lively debate on the night. Thanks are due both to John and Anna for their generosity in sharing these presentations and fielding questions, and to Dr Anita Glover of the Yorkshire Dales Environment Network for coordinating the event.

Organised by Sara Parratt-Halbert and led by Barry Wright, the Section hosted a field trip on notable trees. On a very cold day the group met in Jacob Scriven Park in Knaresborough. The park has a small but impressive selection of notable trees, each of which has its own management plan contained within that for the park. There have been several surveying techniques over the years, some of which are too simplistic, others that are too complicated, and none of which take into account biodiversity present on the tree which can be a good marker of its age and its importance. Barry has designed a new surveying system, taking the best of the rest and adding his own input, and it was this that he took us through on the day. Attendees worked their way through the surveying form, suggesting a few changes along the way that would help make the form more accurate, user-friendly and comprehensive. The event was very popular – oversubscribed to the point that Barry very kindly held a second session. Clearly there is a lot of interest in our trees and their habitat. General consensus was that it had been a useful event, and those who attended felt the new recording system was a useful addition to every ecologist's battery of surveying tools. The afternoon was nicely rounded off with a social at a nearby hostelry. If you would like more information on the survey tool, please contact Barry at b.wright@bakerconsultants.co.uk.

Following on from the trip to Knaresborough, the Section held its second AGM, followed by a workshop on aquatic invasive species led by Dr Lucy Anderson and her research team. Members

were very interested in presentations on aquatic invasive species; exploring their impacts, bio-control and containment and the need for a strategic approach for our region. The threat to ecosystems from aquatic invasive species is generally only recognised when large species are affected, or ecosystems cease to function effectively. The workshop explored research under way at the University of Leeds, focused on subtler impacts of invasive species on ecosystem processes, biocontrol developments and efficacy of biosecurity measures. Participants then examined the approach taken in the Yorkshire Dales and whether elements of this approach could help to inform a strategic approach for the Yorkshire and Humber region. The event was well attended and thanks are due once again to the University of Leeds for hosting the event and Dr Anita Glover of the Yorkshire Dales Environment Network for co-ordinating the event.

In April 2014, trees were once again in the Section's sights. This time it was with regard to Ancient Woodland Indicators, a field workshop organised by Sara Parratt-Halbert and led by Barry Wright. Again, Barry did a sterling job of taking a group around what was quite a challenging site for leading a guided walk. The event took place in Hack Falls, Grewelthorpe, Masham. A steep valley covered in woodland, with several follies hidden within, Hack Falls is an interesting woodland. Again, demand was high and two separate field visits were held.



An example of the fungi found at Hack Falls. Copyright Sara Parratt-Halbert.

Barry was trying out a new survey form which conveniently fits onto one A4 sheet without compromising the quality of the survey. The new form met with approval, as did the site itself which offered up some interesting flora: toothwort, which is a

parasite of mostly hazel and elm and a very good indicator of woodland continuity; and the gametophyte of Killarney fern (*Trichomanes speciosum*), a protected species under the Wildlife and Countryside Act. Once more the trip was completed with a social at a pub in Grewelthorpe village. Remember to keep a look out for Barry Wright's events for 2015; he has further workshops in the pipeline.

The Dearne Valley between Barnsley and Doncaster provided the setting for a small but enthusiastic bunch to not only hear about green infrastructure (GI) and how it is being delivered in Yorkshire, but to experience it firsthand. Pete Wall, Project Manager for the Dearne Valley Green Heart Nature Improvement Area (NIA) led a bicycle tour of key sites in the valley. His enthusiasm and insight was supported by NIA project Officer Annice Fuller, RSPB Visitor Services Manager Craig Hartley and numbers were boosted by volunteers from the reserve. We set out along the river on a glorious afternoon, stopping to look at woodland planting and grassland creation on old mine workings and wet grassland management on farms under Environmental Stewardship. A stop to view some bird habitat creation from ex-arable land was accompanied by a fly over by a startled glossy ibis, which had been seen around the area in recent weeks. If you would like to know more about the Dearne Valley, please contact Pete Wall Pete.Wall@rspb.org.uk.

Back at the Old Moor visitors' centre we heard from Flora Parkin, previously South Yorkshire Green Infrastructure Manager for the South Yorkshire Forest Partnership (SYFP). She introduced the group to the GI approach, how SYFP developed the South Yorkshire GI Strategy, and how it is now being implemented across the county. The Dearne Valley Green Heart project is an excellent example of GI that helped inform the Strategy, with the NIA taking it further at a local level. The visit and talk provided a great illustration of how GI is being developed on the ground to not only improve the environment of a post-industrial landscape, but also people's access to and enjoyment of it. For more information please contact Flora Parkin at flora.parkin@syforest.co.uk.

A Small Mammal Identification and Live Trapping workshop was organised by



Arable Reversion at Old Moor. Copyright David Martin.

Andrew Halcro-Johnston. A warm and sunny day greeted the 18 ecologists and naturalists who turned up to learn about small mammals and how to survey for them. The workshop was led by Ann Hanson of Yorkshire Mammal Group (YMG) at Askham Bog Nature Reserve near York. The reserve comprises a mosaic of ancient fen, wet woodland, scrub and meadow providing excellent habitat for mice, voles and shrews. The aim of the event was to introduce participants to live trapping techniques for conservation monitoring, including hands-on experience of identifying and recording small mammals. A small band of volunteers helped set 50 pre-baited Longworth traps at strategic locations across the reserve the preceding evening. The traps were checked the following day and everyone was given the chance to handle, weigh and sex the creatures that were retrieved, which for the novice surveyor requires a firm grip of the scruff (the mammal, not the novice!) and a bit of practice. A good range of small mammals was recorded, including 10 bank voles (*Myodes glareolus*), nine field voles (*Microtus agrestis*), five wood mice (*Apodemus sylvaticus*) and three common shrews (*Sorex araneus*), although the harvest mice (*Micromys minutus*) that



A bank vole goes for a wander. Copyright Sara Parratt-Halbert.

are known to be on the reserve remained elusive. Feedback from the day was very positive, with comments including “wonderful, practical, hands-on learning experience”, demonstrating the value of running this type of field workshop.

The last event of our year was a trip to Skipwith Common to take a look at the special flora and fauna of the site. Ten section members met with Craig Ralston, Senior Reserve Manager for Natural England, to explore England’s newest Natural Nature Reserve, occupying 274 hectares within the Escrick Park Estate. The reserve is characterised by a mosaic of wet and dry heath habitats, with ponds, scrub and woodland. This all provides home to a wide range of birds, amphibians, reptiles, insects and uncommon heathland plants. Craig explained the history of the common, and its days as a WWII bomber training base, very much part of the story of the reserve with the old infrastructure

still visible and a monument to the wartime crews present on the site. Community links to the reserve are important, and there is an active Friends group which undertakes a range of practical and educational work. We also heard about the role of the estate in providing grazing management, with Hebridean sheep and shorthorn cattle, with a view to helping control the relentless birch encroachment. Searches of the brickwork of the old bomb bays, and checking under a number of tin sheets failed to turn up any grass snakes or common lizards, probably not helped by the unfortunately dull weather. A slight improvement in the afternoon saw one or two dragonflies on the wing, and numerous spiders, moths and shield bugs which added further interest to the visit. Flowering marsh gentian provided a highlight to a day that demonstrated the importance of National Nature Reserves in protecting our wildlife and explaining its importance to the public.

The Yorkshire and Humber Section is planning its 2015 programme, so please keep an eye out on the CIEEM calendar. We are expecting to hold an evening talk on plantation on ancient woodland site (PAWS) restoration followed by a site visit later in the year, both hosted by the Woodland Trust; an evening talk on sustainable urban drainage systems (SUDS) also to be followed by a site visit later on in the year; and an evening talk on Woodland Archaeology by Mel Jones and Christine Handley.

For further information

Contact Sara at:

sara.parratt-halbert@syforest.co.uk

West Midlands Section News

Photographic Competition

We know that you have all taken some fantastic pictures throughout the last few field seasons, so now here is your opportunity to celebrate your profession and showcase your best photographs... Welcome to our very first photographic competition!

There are CIEEM categories into which you can enter your images. The winning entry into each category will be printed in *In Practice* and displayed at the 2015 West Midlands Section AGM.

The competition is **open to all CIEEM members**. Each entrant may submit a maximum of eight (8) images into the competition.

Categories:

- Ecology in Action
- Habitats
- Plants in the Wild
- Wildlife

Entries must be received by 1pm on Wednesday 1 July 2015. Winners will be notified by Tuesday 1 September 2015. The winner’s names will be available after this date.

The competition will be judged by Andrew McCarthy CEnv MCIEEM. Andrew is a nature photographer and consultant ecologist based in Exeter, Devon. He holds Licentiate (LRPS) and Associateship

(ARPS) distinctions from the Royal Photographic Society, with both awards having been gained with wildlife-related panels of prints. Winning images will be chosen on their technical and aesthetic merit, originality and relevance to category.

The competition is kindly sponsored by Wildcare, who have generously offered a Spypoint HD 7 Trail camera to the photographer of the overall winning image.



**For full details, rules and a submission form please visit
www.cieem.net/west-midlands**



North East England Section News

Grumbling About Grouse at the AGM



Steve Pullan presents CIEEM accreditation certificate to Jane Entwistle of Northumbria University

This past year's North East England Section AGM was hosted by Northumbria University on 23 October 2014. The evening began with a roundup of the Section's activities over the last year and formal election of Committee members at the AGM. Following this the CIEEM accreditation certificate for the BSc (Hons) Environmental Management was presented to Jane Entwistle, Head of Department, Geography at Northumbria University, by Steve Pullan, CIEEM

Treasurer and member of the North East England Section Committee.

The turnout for the evening was such that we had to relocate to a larger room for a fascinating talk by Pat Thompson of the RSPB on the environmental impacts of grouse moor management, whimsically entitled 'Grumbling About Grouse'. Pat began by talking about how intensively the moors are managed through both drainage and burning to benefit grouse, even in areas with national and international protected status. Burning in particular can depress the water table for up to 10 years and significantly increase the dissolved organic carbon (DOC) content of water, which causes discoloration and can be expensive for water companies to remove later.

Predator control, both legal and illegal, also has a significant impact on the population of top predators. This includes iconic protected species such as the golden eagle and hen harrier, which are often illegally targeted because they predate upon the grouse.

The RSPB are now taking a stronger line in relation to the illegal targeting of protected species, which is thrown into stark relief by the fact that we now have just four

breeding pairs of hen harriers in the UK at a time when there are more grouse than at any time since the 1930s – standing at a staggering 358 birds per square km for the UK in 2013!

The increase in grouse population has, in part, been brought about by medication given to treat such ailments as Louping Ill virus (LIV) and parasitic nematode worms. This despite the fact that little research has been done into the effect of this medication on other species that share their habitat.

The RSPB are continuing to attempt to work with game managers to develop a more sustainable model for grouse moor management, whilst at the same time raising public awareness and pushing for stronger regulation to protect the sensitive species that share the uplands.



Pat Thompson of the RSPB talks on management of grouse moors

North East England Section Conference 2015

Advances in Ecological Surveys: Methodologies and Findings

16 April 2015, Newcastle-upon-Tyne

One of the mantras of the ecologist is that you can only conserve a species if you know what it is and where it is. Whether our aim is to write a management plan or assess a planning application the result is only as good as the survey information that informed it.

Many of the advances in survey techniques are driven by improvements in technology and several of our speakers are at the cutting edge of these developments. However, surveys are also about what data are gathered, why the data are gathered and what is done with the data afterwards. This conference is

about how we might gather survey data more effectively and describes some of the new findings of recent survey work.

For further details and details of how to book please visit:

www.cieem.net/north-east-section-conference-2015



South West England Section News

The AGM for the South West England Section was held on a wet and windy evening in Bristol on Tuesday 9 December 2014 at the Atkins offices – thank you to all that turned out for it!

There are several changes to the Committee this year and we are sad to be losing Stephen Holloway as our Convenor and wish to thank him for all his hard work and services to the Section to date. Julian Arthur as Vice Convenor led the AGM which included a recap on the year to date, election of new members onto the Committee, as well as a look to the year ahead. Abigail Smith (Secretary), Carly Goodman-Smith (Treasurer), Tony Sergeant and Hayley Scoffman remain on the Committee for 2015 and James Packer, who was co-opted onto the Committee in 2014, was nominated and voted in. We are very pleased to welcome Jenny Stuart, who was also voted onto the Committee during the AGM and Jon Taylor, Nick Coppin and Marie Moore, who were all co-opted onto the Committee. It is great to have these four new members who have joined us with some great ideas and we are all really looking forward to what looks to be an exciting year ahead in 2015, with a range of interesting events and a drive to encourage more undergraduate and student engagement.



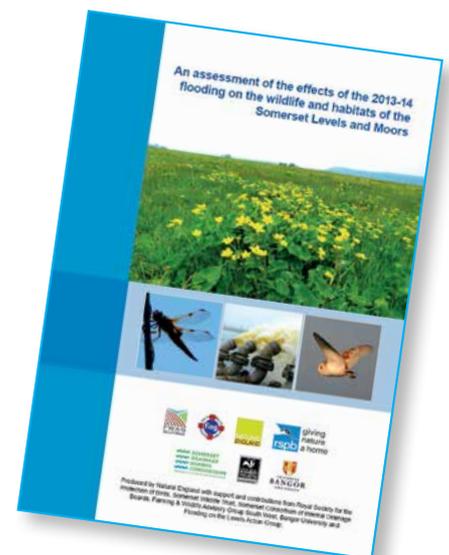
Iconic images from the 2014 flooding.

now managed with a 300 page operating manual. He then outlined the complexity of the associated governance with three Drainage Boards, County and numerous District and Borough Councils, plus a plethora of statutory, non-governmental, charity and community bodies with specific interests. And that was before the media, politicians and royalty got involved! He emphasised the ecological value of the area, not just within the designated areas and protected habitats but across the managed landscape connected by the drains, rivers and other watercourses.

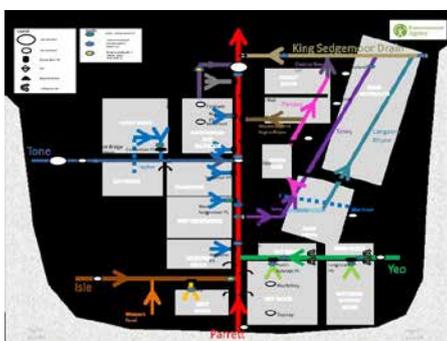


Phil Brewin, Ecologist, Somerset Drainage Boards.

Whilst high profile dredging has been completed, the long-term plan for the area including upland management, the potential impact of climate change and how flooding can be managed going forward is still being debated. It is certainly a hot topic, with many questions still to be answered through collaboration across multiple players including a range of professional expertise, local and national government, statutory bodies and local communities.



Joint report on the assessment of the effects of the 2013-14 flooding on wildlife and habitats.



Schematic showing operation of the series of Moors and Levels within Somerset.

The AGM was followed by a fascinating talk on the 'Ecological Impacts of the 2014 Floods in Somerset' by Phil Brewin, the Ecologist for the Somerset Drainage Boards. He explained that the series of levels and moors have been created by man over the last 3,000 years and are

Whilst flooding is a frequent occurrence in the area which is managed to minimise the impact to local people and wildlife, the continuous rainfall in 2014 prevented the controlled drainage of the land leading to the devastating flooding that was witnessed by the world's media. The impact on local communities was immediately clear to all, but the impact on wildlife has been subject to subsequent studies, led by Natural England. These have concluded that well established grassland has recovered well although recently established grassland has suffered badly. Whilst wildlife in the ditches has survived, the flooding has spread aquatic invasive species and anecdotal evidence suggests an impact on terrestrial mammals. Whilst the numbers of waterfowl and waders are considered the same, their composition may have been altered.



Marine and Coastal Specialist Interest Group

Paul Gregory CEcol CEnv MCIEEM and Steve Mustow MCIEEM

CIEEM's Special Interest Groups (SIGs) provide a focus for activity in particular areas of ecology and environmental management. The Marine and Coastal SIG was established on 2 December 2014 to reflect the marine (including offshore), coastal and estuarine environments. The group was established to fill a gap in the 'market' and promote marine-focused environmental professionals within CIEEM. Once established, the group will have the experience to respond to marine and coastal issues as they arise and be CIEEM's voice to help shape the future of our profession, to influence public attitudes and practices and help secure a sustainable future for our marine environment through CIEEM.

The group consists of several members with considerable and diverse experience in areas such as fisheries, marine mammals, marine bio-acoustics, benthic ecology, diving, marine pollution and toxicology, marine parasitology and bio-monitoring. In addition, it also has considerable experience in river catchment management, water quality, marine Environmental Impact Assessment (EIA), marine Habitat Regulations Assessment (HRA) and marine planning, policy and licensing. Members work within the public and private sectors, such as academia and research, consultancies, government authorities, non-government organisations, defence, renewable energy and offshore oil and gas.

The Marine and Coastal SIG has the following members:

Convenor:	Marcus Cross
Vice:	James Wilson
Secretary:	Jon Barnes
Committee:	Rachel Barker, Jessica Breedon, Kim Brown, Kelly Ann Dempsey, Paul Gregory, Claire Lacey, Steve Mustow, David Thambithurai

The aim of the Marine and Coastal SIG is to provide support to CIEEM members with an interest in the maritime environment. The SIG is to be seen as a platform for discussion on marine topics or issues of relevance by forming networks, providing a focus for sharing good practice and collating feedback on relevant issues to be disseminated via CIEEM. One of the group's first objectives is to be involved in preparing a brief for some new marine EclA training and later to look at reviewing CIEEM's marine and coastal EclA guidance to determine whether it is suitable for the full range of marine assessments. There is also a need to consider guidance for HRA in relation to European and national marine designated areas, such as SACs, SPAs and MPAs.

The group will provide support in the form of co-ordinating CIEEM feedback to consultations and facilitate professional development following best practice. It will also organise training opportunities for marine ecologists or people working in the marine sector on a wide range of important issues such as non-native invasive species.

The next few years are an exciting and challenging time for the marine environment with the implementation of the Marine Strategy Framework Directive, which has an overarching goal to achieve 'Good Environmental Status' across Europe by 2020. CIEEM will have an active presence in relation to implementation of best practice in the marine environment and will ensure that our members are well represented.

The Marine and Coastal SIG has a page on the CIEEM website (www.cieem.net/marine-and-coastal) where information on group activities will be made available.



1. *Asterias rubens* & *Mytilus edulis*
 2. *Corynactis viridis*
 3. *Sagartia elegans*
 4. Wrecks & Divers
- (Photos by Paul R. Gregory)

Overseas Territories Special Interest Group Conference Review

Lessons to be Learnt from Invasive Species Mitigation and Management in the British Overseas Territories

Tom Smith CEnv MIEEM

OT-SIG Committee Member and
Principal Consultant, RSK

**16 December 2014,
Royal Astronomical Society, London**

The CIEEM Overseas Territories Special Interest Group (OT-SIG) held a conference at the Royal Astronomical Society on 16 December 2014. The conference theme was invasive species mitigation as non-native, invasive species are known to be one of the greatest threats to island ecosystems and species typical of the UK Overseas Territories. The seminar was attended by 43 delegates from a range of organisations and interest groups and was chaired by Bruce Dinwiddy, former Commissioner to British Indian Ocean Territory and Governor of the Cayman Islands.

Mike Richardson from the South Georgia Heritage Trust (SGHT) gave a presentation on the South Georgia Habitat Restoration Project which looked at 'Beyond Management: Eradication on an ambitious scale'. Rats have been present on the island for over 200 years and were likely introduced by whaling fleets. The rat eradication project is the largest island eradication project being over 10 times any previous island rat eradication at 1,068km² and is complicated by the island's remote location, mountainous terrain and extreme weather patterns. The project is being run in three phases from 2011 to 2015. The eradication involved distributing bait across affected areas by helicopter using GPS tracked routes to ensure complete coverage. The bait used had to be too large to swallow (to minimise non target species ingestion), be a colour that was unattractive to birds, decompose rapidly and also fly well during distribution. The distribution of bait was timed to avoid the main breeding seasons for birds although small numbers of South Georgia Pintail and



Question time with the afternoon speakers

Brown Skua were affected in the short-term, however rapid recovery is anticipated in the absence of rats. Phases 1 and 2 of the project are now complete with no evidence of rats recorded in baited areas and Phase 3 will be completed in 2015.

Katie Medcalf, on behalf of Nicola Weber (Ascension Island Conservation), gave a presentation on 'Ascension Island: Finding the balance between native and introduced vegetation in one of the world's most heavily invaded island ecosystems'. Ascension Island has a history of plant species introductions since 1843 when over 220 species were introduced to create cloud forest in the mountains with the aim of increasing precipitation. In addition, during the 1960s the four main settlements were planted to 'improve' the aesthetics of the island. However, some species were invasive and most notably the Mexican Thorn (*Prosopis juliflora*), which since the 1960s is now present across 75% of the island. With 95% of the island flora introduced, restoring the island's native ecosystem is unfeasible and therefore a holistic approach is needed with the ultimate aim to create stable,

self-sustaining mixtures of exotic and indigenous species.

Giovanna Massei from the Animal and Plant Health Agency (APHA) provided a summary of the challenges and opportunities for lethal and non-lethal management of non-native ungulates in the Overseas Territories. Case studies were presented looking at managing human-wildlife conflicts including 'single shot' contraception on boars, feral goats and feral cattle. A case study on reducing the impact of feral livestock on Montserrat and The Tobagos was also presented. The feral livestock on these islands were degrading forests and encouraging the spread of undesirable species. The project assessed distribution and numbers, identified options for mitigation, implemented an action plan and raised awareness of the impact of feral livestock.

John Kelly from the RSPB Overseas Territories Team gave an introduction to a Darwin Initiative Project in Pitcairn and Henderson Islands. Henderson Island supports over 55 endemic species and is covered by several international designations (Endemic Bird Area, Important

Bird Area and World Heritage Site). The island supports four endemic land birds, is a global stronghold for the gadfly petrel group and is the only known nesting site for the Henderson Petrel. However, rat predation on newly hatched chicks resulted in no successful fledging in Murphy's Petrel. A rat eradication programme was undertaken dropping bait on two occasions. Rats were subsequently recorded in March 2012 after the eradication programme and a rapid response was initiated. An independent review of the failure was undertaken although no clear reason was identified. It is possible the failure was due to weather conditions. Further rodent research is to be undertaken together with chick predation survey and socio-economic survey of the islands.

Lesley King from LTS International gave an introduction to 'Darwin Plus: The Overseas Territories Environment and Climate Fund'. Darwin Plus is a UK Government funding stream dedicated to environmental projects in the UK Overseas Territories (co-funded by the Department for Environment, Food and Rural Affairs (Defra), the Foreign and Commonwealth Office (FCO) and the Department for International Development (DFID). The aim of the Fund is to help deliver long-term strategic outcomes for the natural environment in the UK's OTs. Applications are assessed against the priority funding areas which are set for each round of applications. Details of what makes a good Darwin Plus project were provided together with several examples of projects.

Mat Cottam (on behalf of Cayman Islands Department of Environment) provided a summary of 'Invasive Species in the Cayman Islands: A Tale of Two Iguanas'. There are two native species of iguana on the Cayman Islands: blue iguana (*Cyclura lewisi*) and rock iguana (*Cyclura nubile caymanensis*) although the introduced common iguana (*Iguana iguana*) from Central and South America is found throughout the islands. Various issues with invasive alien species (IAS) were covered including public knowledge, and public and government confusion, resulting in the need for education. In addition, all iguana species were previously protected by law and therefore this included the introduced common iguana. This was rectified with the updated legislation in 2013.



Delegates network over lunch

The final presentation was from **James Millett** of the RSPB Overseas Territories Team who spoke about 'Managing Invasive Alien Species impacting Key Biodiversity sites in the Caribbean Overseas Territories'. Invasive species include rats, cats, mongoose, feral livestock, American iguana and corn snakes. Key outcomes so far include feasibility/operational planning for rat eradication, goat eradication, feral animal control, rodent biosecurity, and rodent and cat control planning with specific examples detailed. Further action is now required to complete restoration of key project sites, develop actions on additional priority islands, strengthen links with nature tourism and protected areas, enhance networking and cooperation, and lever additional resources.

The conference highlighted the threats posed by IAS in the UKOTs and the work being done to combat them. A recurring theme throughout the presentations was the need to raise public awareness through stakeholder engagement and education.

The OT-SIG is committed to promoting the work going on in the UKOTs. Further information on the territories and the Special Interest Group can be found on the CIEEM website at www.cieem.net/uk-overseas-territories and copies of the presentations detailed above are available at www.cieem.net/2014-overseas-territories-conference.

Applicants and Admissions

The decision on admission is usually taken by the Membership Admissions Committee under delegated authority from the Governing Board but may be taken by the Governing Board itself. If any existing member or non-member has any good reason to object to someone being admitted to the Chartered Institute as a Full or Associate Member, based on compliance with the *Code of Professional Conduct*, they should fill in the membership objection form and return it to the Chief Executive Officer before **13th April 2015**. The objection would be referred to the Professional Standards Committee to be considered according to the Disciplinary Regulations. CIEEM is pleased to welcome applications for Membership from the following:

APPLICANTS

Applications For Full Membership

Mr Neil Harris, Mr Philip Oliver,
Mr Daniel Whitby

Applications to Upgrade to Full Membership

None

** Associate members applying to upgrade to Full Membership are not listed here as they have been listed previously for their Associate membership application.*

Applications For Associate Membership

Dr Victoria Nall, Mr Peter Watson

Applications to Upgrade to Associate Membership

Mr Nicholas Chandler,
Miss Casey-Ruth Griffin,
Mrs Clare Nisbet-Czuprynski

ADMISSIONS

Full Members

Mr James Askham, Dr Christopher Cesar,
Dr Robert Enever, Dr Marcus Malley,
Mr Kevin Vigars

Upgrades to Full Membership

Miss Lisa Barlow, Miss Claire Browne,
Mr Martin Burgess, Miss Fiona MacLennan,
Miss Nicola Murray, Mrs Jemma Shoobridge,
Dr Ian Thornhill

Associate Members

Mrs Kristen Liptrot,
Miss Rachel Whatmore

Upgrades to Associate Membership

Miss Caroline Airson, Miss Gemma Longman

Graduate Members

Miss Katherine Bell, Mr Kevin Carolan,
Miss Katharine Carson, Miss Sarah Coulson,
Miss Tegan Fellows, Miss Gemma French,
Miss Charlotte Hammond,
Mr David Harwood, Mr Jack Muskett,
Mr Donald Scott, Dr Lyndsey Stewart,
Mr Michael Young-Drennan

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Miss Emily Traynor, Miss Amanda Wilson

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Mr Tas Adcock, Mr Andrew Barrett,
Miss Georgina Baulcomb,
Miss Lucy Brookfield, Miss Eloise Brown,
Miss Joanne Carnell, Mrs Tina Carter,
Mr Kristian Dana, Mr Patrick Doyle,
Mr Benjamin Draper, Mrs Carol Edmonson,
Mr Ashley Endacott, Miss Lisa Gifford,
Mr Darren Graham, Mrs Katherine Higham,
Miss Ellen Humphrey, Miss Alice Johnson,
Mr Simon Kent, Miss Catriona Kent,
Mr Alexander Mackinnon,
Mr Mark Melville-Taylor, Mr Gareth Morgan,
Miss Mollie Paxford, Miss Sophie Reeve,
Miss Philippa Roberts, Miss Hannah Robertson,
Mrs Margaret Shelton,
Miss Rebecca Thompson,
Miss Amanda Turek, Mr Iain Turner,
Miss Joanna Wawryczek, Miss Emma Wayne,
Miss Hannah Williams, Miss Olivia Winter,
Miss Zoe Worthington

Qualifying Members

Mrs Janet Brogan

Supporter Members

Mr John Harrison-Bryant, Ms Carolyn Smith

Recent Publications



The Eurasian Beaver

Authors: Róisín Campbell-Palmer, Derek Gow MCIEEM, Robert Needham, Simon Jones and Frank Rosell

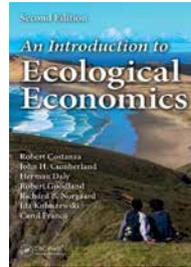
ISBN: 9781784270346

Price: £9.99

Available from:

www.pelagicpublishing.com

This book presents a case for our future coexistence with beavers by providing factual information on this species that has now passed from national memory, covering the biology, behaviour and ecology of the Eurasian beaver in a British context, from their early history in archaeology and folklore to their contemporary field signs in the wild. This book familiarises readers once again, after almost 400 years of its absence, with the Eurasian beaver, providing essential information on its requirements in our human dominated landscape. This book is for those with a specific interest in beavers and their reintroduction, and for anyone with a general curiosity in natural history, ecology or animal behaviour. It can be used as a field guide to identify beaver field signs and observe beavers in the wild by wildlife surveyors or general land users, or as an introductory guide for anyone with an interest in beavers and how to recognise them.



An Introduction to Ecological Economics (2nd Edition)

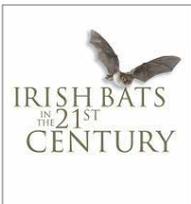
Authors: Robert Costanza, John H. Cumberland, Herman Daly, Robert Goodland, Richard B. Norgaard, Ida Kubiszewski and Carol Franco

ISBN: 978-1566706841

Price: £63.99

Available from: www.crcpress.com

Ecological economics explores new ways of thinking about how we manage our lives and our planet to achieve a sustainable, equitable, and prosperous future. Ecological economics extends and integrates the study and management of both 'nature's household' and 'humankind's household' – this publication, the first update and expansion of this classic text in 15 years, describes new approaches to achieving a sustainable and desirable human presence on Earth. Written by the top experts in the field, it addresses the necessity for an innovative approach to integrated environmental, social, and economic analysis and management, and describes policies aimed at achieving our shared goals.



Irish Bats in the 21st Century

Authors: Niamh Roche, Tina Aughney, Mathieu Lundy and Ferdia Marnell

ISBN: 9780993067204

Price: €30.00

Available from: www.batconservationireland.org

This book, published by Bat Conservation Ireland, summarises the considerable body of bat research and surveillance that has been undertaken in Ireland in the 21st century, much of it by citizen scientists. Introductory chapters provide a background to bat work in Ireland, and methods for identifying and surveying bats. These chapters are followed by detailed species accounts that cover current population trends, distributions, roost selection, habitats and biometric data for Irish specimens. The final chapter summarises conservation threats faced by Irish bats and places these in the context of available trend information. This book is an authoritative guide and reference, illustrated with colour photographs, and it is essential reading for any enthusiast of Irish wildlife.



The Best LIFE Nature projects 2013

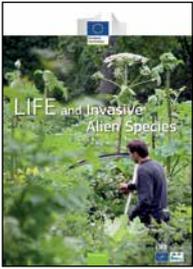
Author: European Commission

ISBN: 9789279401688

Price: free download

Available from: <http://ec.europa.eu/environment/life/publications/lifepublications/bestprojects/documents/bestnat13.pdf>

The *Best LIFE Nature projects 2013* publication highlights the exceptional achievements of nature conservation and restoration projects that were completed before the end of 2013. The 6th edition of the annual awards ceremony for the winning projects was held in Brussels in 2014. And for the first time, the achievements of LIFE Information & Communication (LIFE INF) projects with a nature focus were also recognised. Four projects received the ultimate accolade ('Best of the Best' project), including a LIFE INF project in Greece. In addition, a further nine projects (including two from the LIFE INF strand) were recognised as 'Best' LIFE projects for their excellent work. All 13 outstanding projects – drawn from nine Member States – are featured in this new publication. Together they demonstrate the significant contribution that the LIFE programme can make to nature conservation practice and policy.



LIFE and invasive alien species

Author: European Commission

ISBN: 9789279383076

Price: free download

Available from: http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/life_ias.pdf

The latest LIFE Nature Focus publication takes a timely look at one of the greatest threats to Europe's biodiversity, ecosystem services, human health and economic activities. The 76-page *LIFE and invasive alien species* brochure links the work of LIFE projects with the aims of the new EU Invasive Alien Species (IAS) Regulation. This new brochure examines the lessons learned from the LIFE programme's extensive experience of dealing with the impacts of IAS. As such it is essential reading for policy-makers and practitioners in this field. This will be a valuable support for the implementation of the new EU Regulation on Invasive Alien Species.

Robust study design is as important on the social as it is on the ecological side of applied ecological research

St. John, F.A.V. *et al.*

Journal of Applied Ecology 2014, 51: 1479–1485

Using an example from the current issue of *Journal of Applied Ecology* that investigated how conservation interventions influenced conservation outcomes, the authors discuss the challenges of conducting interdisciplinary science. They illustrate their points using examples from research investigating the role of law enforcement and outreach activities in limiting illegal poaching and the application of the theory of planned behaviour to conservation.

Correspondence: f.a.v.stjohn@kent.ac.uk

On the Front Line: frontal zones as priority at-sea conservation areas for mobile marine vertebrates

Scales, K.L. *et al.*

Journal of Applied Ecology 2014, 51: 1575–1583

Identifying priority areas for marine vertebrate conservation is complex because species of conservation concern are highly mobile, inhabit dynamic habitats and are difficult to monitor. Many marine vertebrates are known to associate with oceanographic fronts (physical interfaces at the transition between water masses) for foraging and migration, making them important candidate sites for conservation. The authors review associations between marine vertebrates and fronts and how they vary with scale, regional oceanography and foraging ecology. Frontal zones are hotspots of overlap between critical habitat and spatially explicit anthropogenic threats, such as the concentration of fisheries activity. As such, they represent tractable conservation units, in which to target measures for threat mitigation. These insights are useful for marine spatial planning and marine biodiversity conservation, both within Exclusive Economic Zones and in the open oceans.

Correspondence: kysc@pml.ac.uk

Movement of Atlantic cod around the British Isles: implications for finer scale stock management

Neat, F.C. *et al.*

Journal of Applied Ecology 2014, 51: 1564–1574

This study used data recovered from temperature and depth loggers attached to 252 Atlantic cod *Gadus morhua* to infer and map their movements around the British Isles. Individual cod showed a range of behaviours including migration, site fidelity and limited home ranging. The authors estimated home ranges and seasonal movements and test predictions based on data from population genetics. Cod from a northern offshore area in the North Sea did not mix with cod from the central and southern North Sea, which in turn did not mix with those from western areas (the Celtic and Irish Seas). This study provides evidence that cod living around the British Isles are comprised of at least one more distinct population unit that is currently recognised for stock management purposes. Failure to recognise this complexity of stock structure in past management plans is likely to have been a contributory factor to the over-exploitation of cod stocks around the British Isles. The results of this study and recent genetic research provide a new and more definitive understanding of movement patterns and population structure of cod around the British Isles. The applied implication of this is that spatially explicit adjustment of exploitation strategies, for example setting a maximum sustainable yield for each of the population units, should be considered to ensure sustainable harvesting of cod in the future.

Correspondence: f.neat@marlab.ac.uk



Do green roofs help urban biodiversity conservation?

Williams, N.S.G., Lundholm, J. and Scott MacIvor, J.

Journal of Applied Ecology 2014, 51: 1643–1649

Green roofs are novel ecosystems that are increasingly common in cities. While their hydrologic and energy saving benefits are well-established, green roofs have also been proposed as having significant value for conserving biodiversity. This study evaluates six hypotheses that describe the purported biodiversity conservation benefits of green roofs. Green roofs largely support generalist species, particularly insects, but their conservation value for rare taxa and other taxonomic groups, especially vertebrates, is poorly documented. Further, their ability to replicate biotic communities in the context of ecological restoration is largely untested, as is their potential to connect ground-level habitats. The authors suggest that green roof proponents should use restraint in claiming conservation benefits and it is premature for policy-makers to consider green roofs equivalent to ground-level urban habitats. Ecologists need to work with the industry to evaluate green roof biodiversity and help design green roofs based on ecological principles to maximise biodiversity gains.

Correspondence: nsw@unimelb.edu.au

Conservation management within strongholds in the face of disease-mediated invasions: red and grey squirrels as a case study

White, A. *et al.*

Journal of Applied Ecology 2014, 51: 1631–1642

The authors develop a general theoretical model framework to assess the impact of disease-mediated invasion on the viability of conserving native species through refuges taking into account explicit spatial and stochastic processes. The model techniques are applied to the red and grey squirrel conservation system in the UK. Model results indicate that in the absence of control of the invading species, native populations are driven to extinction both in the absence of disease (through competition) and more rapidly when the disease is included (through competition and disease processes). When control is applied to reduce the abundance of the invading species, there is a threshold in the level of control, above which the invading population can be prevented from establishing and the native species can be protected. Highly virulent infections – squirrelpox in red squirrels – lead to periodic outbreaks of disease in the native population due to continual invasion attempts from the disease-carrying invader. Infections with low virulence may become established at endemic levels in native populations. Therefore, an important finding is that the disease can spread through the native species even when the invading species is prevented from establishing. The benefits of increased density may be countered by an increased risk of disease outbreaks. Therefore, a critical message is that there is a correlation between native density (and therefore habitat quality) and the impact of disease ‘harmful’ to native species. Control of the invading species to prevent it establishing in strongholds can protect the native species from exclusion, but may not protect it from disease outbreaks.

Correspondence: a.r.white@hw.ac.uk

Assessing trends in biodiversity over space and time using the example of British breeding birds

Harrison, P.J. *et al.*

Journal of Applied Ecology 2014, 51: 1650–1660

Partitioning biodiversity change spatially and temporally is required for effective management, both to determine whether action is required and whether it should be applied at a regional level or targeted more locally. The authors model changes in the spatial and temporal distribution of British breeding birds using generalised additive models applied to count data collected between 1994 and 2011. Their analysis reveals predominantly declining trends in biodiversity indices for farmland and woodland bird communities in southern and eastern England, perhaps signalling environmental deterioration in this part of the country. Conversely, the results also show generally more positive trends in the north of Britain, consistent with north–south gradient expectations from the effects of climate change. The study also reveals predominantly positive changes in evenness for the common species and negative changes in evenness for the rarer species in the communities, consistent with previously documented homogenisation in bird communities. Bird populations are seen as good indicators of ecosystem health, and trends for different communities can be indicative of wider biodiversity changes within their respective habitats. However, temporal trends in biodiversity at the national level may miss opposing trends occurring at different locations within the nation.

Correspondence: phil.harrison@slu.se



Effects of land use on plant diversity – A global meta-analysis

Gerstner, K. *et al.*

Journal of Applied Ecology 2014, 51: 1690–1700

Plant diversity is globally threatened by anthropogenic land use including management and modification of the natural environment. To evaluate the generality and variation of studies’ findings about land-use effects, the authors undertook a quantitative synthesis using meta-analytic techniques. The authors found that direct and indirect effects of land use on plant diversity (measured as species richness) are variable and can lead to both local decreases and increases. Further, they found evidence that land-use-specific covariables mostly determine effect-size variation and that in general land-use effects differ between biomes. This extensive synthesis provides the most comprehensive and quantitative overview to date about the effects of the most widespread and relevant land-use options on plant diversity and their covariables. The study found important covariables of specific land-use classes but little evidence that land-use effects can be generally explained by their environmental and socio-economic context. It also found a strong regional bias in the number of studies (i.e. more studies from Europe and North America) and highlight the need for an overarching and consistent land-use classification scheme. This study provides a new vantage point for future research directions.

Correspondence: katharina.gerstner@ufz.de

Forthcoming Events 2015

For information on these events please see www.cieem.net.

Conferences and Other Events

Date	Title	Location
9 March	People, Politics and the Planet – Any Questions? A pre-election debate on the environmental policies of the UK's major political parties, chaired by Jonathan Dimbleby	London
24 March	CIEEM Spring Conference – Managing Change in Coastal Habitats (Please note optional site visit on the following day)	Bristol
25 June	CIEEM Awards Luncheon	Birmingham
16 July	Habitats Directive: Air Quality and Ecological Impact Assessment Joint CIEEM/IAQM Discussion Meeting	London

Training Courses

9-10 April	Reptile Ecology, Survey and Handling	Basildon
13 April	Badger Ecology and Survey Techniques	Leatherhead
14 April	Introduction to Biodiversity Offsetting	London
15 April	Article and Feature Writing for Environmental Practitioners	Sheffield
16 April	British Standard BS42020 Biodiversity – Code of Practice for Planning and Development	London
16 April	Great Crested Newt Survey and Assessment	Culross, Fife
16 April	Great Crested Newt Ecology and Survey Techniques	Leatherhead
21 April	Accessing and Using Biodiversity Data	London
23-24 April	QGIS for Ecologists and Conservation Practitioners	Athlone, Ireland
28-29 April	Reptile Mitigation	Essex
29 April	Introduction to Bats and Bat Surveys	Dunblane
30 April	Bats Impact and Mitigation	Dunblane
8 May	Extended Phase 1 Survey Techniques	Godstone, Surrey
11 May	Vegetative Grass Identification	Donabate, Ireland
13 May	Early Season Grass and Sedge Identification	Salisbury
14 May	Introduction to Phase 1 Habitat Mapping and Plant Identification	Newark
17 May	Assessing and Describing Architectural Features in Bat Surveys and Report Writing	Warwickshire
19 - 20 May	QGIS for Ecologists and Conservation Practitioners	Gloucester
21 May	Barn Owl: Surveying and Reporting	Tamworth
28 May	Wetland Assessment for Development	Battleby

Geographic Section Events

The table below shows all upcoming section events and activities.

These are also advertised on the Geographic Sections pages of the CIEEM website at www.cieem.net/geographic-sections.

9 March	East of England	East of England Section AGM	Cambridge
18 March	Yorks & Humber	Plantation on Ancient Woodland Sites (PAWS) Restoration Project	Sheffield
24-25 March	North West England	Regen 2015 (CIEEM stand)	Liverpool
25 March	North West England	North West England AGM	Liverpool
25 March	Yorks & Humber	Ancient Woodland Archaeology	Sheffield
16 April	North East England	North East England Section Conference 2015 – Advances in Ecological Surveys: Methodologies and Findings	Newcastle
29 April	Yorks & Humber	Plantation on Ancient Woodland Sites (PAWS) Restoration Field Trip	Barnsley
4 June	South East England	STEMFest Kent and Medway (CIEEM stand)	Greenwich



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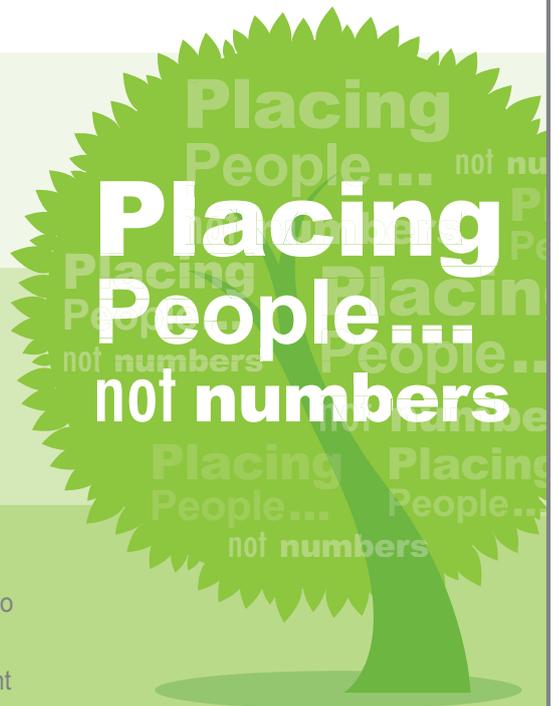
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