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Issue 95 | March 2017

Rewilding and Species Reintroductions

In this issue

Rewilding

Politics used to be sooooo boring. For me it was somewhere between clothes shopping and watching paint dry on World Go-Slow Day. Not anymore. Now, thanks to the radical Brexit decision, we have this once-in-a-lifetime opportunity to change the most important set of rules affecting the UK's natural environment – namely how we fund the management of our rural land and for what purposes.

This is where rewilding has a key role to play. We now have steadily growing evidence that localised restoration interventions deliver significant measurable benefits at a small- to medium-scale for flood risk management, water quality, biodiversity, etc. But I can still hear the sceptics muttering: *"Yes, but there's no evidence all this stuff works at scale."* Well, I am certain that it is largely a case of multiplying up interventions across a larger area and joining them up – i.e. doing lots of small to medium-sized things a thousand times over. And this is why rewilding now needs to be a key part of the rural debate, because it takes catchment restoration to another level, both in terms of scale and the extent of re-naturalisation.

My own working definition of rewilding, shamelessly constructed to fit in a tweet, is: *"The large-scale restoration of naturally functioning ecosystems to the point where nature can flourish unmanaged for the benefit of people and wildlife."* However, rewilding is a process and various elements of that process apply across a wide spectrum of activity, with scale and impact generally increasing as you move along that spectrum, with everyone having a role to play.

I am currently toying with the idea of promoting a grading system for rewilding, with my pocket handkerchief garden wildlife pond being at the bottom end of the spectrum at say Grade 4, and Grade 1 being the Holy Grail where it basically means 'hands-off' across a very large area. In scale terms, for now at least, this probably means blocks of 10,000 ha plus in England, Wales and Northern Ireland, and 100,000 ha plus in Scotland. Rewilding at this scale should also involve the reintroduction of key species such as beaver, pine marten, lynx and wild boar, where necessary to help achieve and sustain the naturally functioning ecosystems. And yes, at the largest end of the scale it could even ultimately mean wolves and elk. But right now we have a long way to go before we have anywhere in the UK of that Grade 1 standard, so we should focus hard on the journey, not the destination, and we must make that journey with local communities on board. We cannot and should not attempt it without them.

So how can members help? Well every one of us has a role to play, that's for sure. My plea would be for us all to take every opportunity to promote, enthuse, nag and inspire the delivery of multiple benefits through every organisation, project, plan and strategy we deal with, whether we are drafting the next agri-environment funding rules or designing a stream diversion for a road bypass. If we all do this, we will build a societal land management culture where joined-up thinking becomes the norm, moving governments towards valuing rural land for the full range of societal benefits it can provide and not just for food and birds. This will, in turn, lead to the acceptance that in some parts of the country 'Grade 1 rewilding' is in fact the best socio-economic option for local communities. Our time is now, but we need to act fast.

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Front cover image:
Wild Konik horses at Oostvaardersplassen in the Netherlands. Oostvaardersplaasen has become an icon of rewilding in western Europe.

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CIEEM Spring Conference 2017

Mainstreaming Biodiversity into Future Cities

22 March 2017, London

The CIEEM Spring Conference 2017 will explore the wider benefits of including biodiversity in designing and planning our sustainable cities of the future. Speakers will make the business case for creating opportunities for biodiversity, resolving the conflicts that can arise and demonstrating how architects, engineers, landscape designers and ecologists can work together to deliver biodiverse urban environments.

Our keynote speaker is Tony Juniper. The full programme of speakers is available on the website.

Book your place now: www.cieem.net/spring-conference-2017

Review of Biological Recording Infrastructure in Scotland

The Scottish Biodiversity Information Forum (SBIF) is currently undertaking a review of the biological recording infrastructure in Scotland in order to inform any realignment of structures and resources necessary to achieve the Forum's original vision.

As part of the information gathering stages of the review SBIF has issued a survey and would like to hear from anyone interested in any aspect of biological data handling and usage whether in Scotland or elsewhere. By completing the survey you will be informing the review of your requirements for the biological recording infrastructure, which will enable SBIF to develop a high level business case setting out the need for change. If sufficient responses are received from beyond Scotland, we will summarise our findings by country.

The survey can be accessed at: https://nbn.org.uk/about-us/where-we-are/in-scotland/review/

For further information please contact Christine Johnston, NBN Scottish Liaison Officer: c.johnston@nbn.org.uk

CIEEM and Brexit

CIEEM's new Brexit Task Groups have all been reformed and are now working on policy papers for each of their specific topic areas:

- Marine Environment and Resources
- Habitats and Species
- Land Management and Funding
- Air Quality
- Water

Over the first six months of 2017, the groups will work on producing a briefing paper or advisory note, develop collaborations for working with other organisations, plan and deliver an event, and respond as necessary to the consultations on the Defra 25-Year Plans and the Great Repeal Bill.

If you are interested in contributing to one or more of the Brexit Task Groups please contact policy@cieem.net as soon as possible.

CIEEM has begun a collaborative partnership with the British Ecological Society (BES), Chartered Institution of Water and Environmental Management (CIWEM), Institution of Environmental Sciences (IES) and Landscape Institute (LI) to work together on responding to the Defra 25-Year Plans, share relevant information as produced or received, meet on a monthly basis, and agree some overarching shared principles for future external communications.

We have also engaged with a number of other organisations to work collaboratively and share information as relevant, including DAERA (Northern Ireland), DEFRA, Environment Agency, Environmental Audit Committee, Green Alliance, The Law Society, Natural England, Scottish Government, UK Environmental Law Association, Welsh Government, and Wildlife and Countryside Link.

Keep up to date with CIEEM's Brexit activities: www.cieem.net/eu-referendum

CIEEM joint letter to Environment Minister

CIEEM – jointly with the British Ecological Society, the Institution of Environmental Sciences and the Landscape Institute – has identified a number of principles for future policy relating to land management and the natural environment, and has issued a joint letter to the Secretary of State for the Environment, Food and Rural Affairs setting out our ideas in greater detail.

Read more: www.cieem.net/news/369/select-committee-recommends-new-environmental-protection-act

New accredited degree programmes

We are pleased to announce that the following university degree programmes have now been accredited by CIEEM:

- University of South Wales – BSc Natural History
- University of South Wales – MSc Wildlife and Conservation Management
- Harper Adams University – BSc Wildlife Conservation and Natural Resource Management

CIEEM accreditation means that the course has been assessed and recognised for the quality of teaching and delivery of learning outcomes that meet the needs of employers in the sector. Congratulations to the programme leaders and our thanks to the assessors.

More information: www.cieem.net/accreditation

CIEEM position on Natural Capital

A working group has been set up to develop a CIEEM position on natural capital. The group had an initial teleconference on 27 January 2017 and is now working on the initial draft position paper.

The group agreed that CIEEM must play a part in the Natural Capital debate, given that it is becoming more important in policy (e.g. Defra's 25-Year Plans) and is increasingly being picked up by other sectors (politics, economics, business etc.).

CIEEM Awards 2017

Each year, CIEEM presents a series of Awards to celebrate the achievements of both the profession and of individual practitioners, and to raise the profile of CIEEM by highlighting our role in championing the importance and practice of ecology.

The 2017 CIEEM Awards have now closed and we would like to thank all those who submitted an entry or made a nomination. We are now in the middle of the judging process and will be announcing the finalists in the near future.

Tickets for the Awards Lunch, which will be held for the first time in London, will also be available shortly. The Awards Lunch 2017 will be held at Drapers' Hall, London on Wednesday 21 June 2017.

More information: www.cieem.net/cieem-awards-2017

Accredited ECoW Project Launched

Work is now underway to develop an accredited Ecological Clerk of Works (ECoW) scheme in response to feedback from ECoWs, developers and construction contractors. Representatives of all of these groups are part of a project partnership currently working on defining roles, competencies, training and assessment methods for this new accreditation scheme which aims to raise the profile of the ECoW role, to raise the standards of ECoW delivery, to upskill those taking on the role for the first time and to ensure an adequate supply of ECoWs in relation to an anticipated increase in demand in the coming years.

Revision to CIEEM Membership Regulations

Members' are advised that CIEEM's Membership Regulations have undergone a minor revision in February 2017. A new version is now available to download from the CIEEM website. New and upgrade applicants will no longer have their names advertised for 30 days in advance of admission via our eNewsletter. Applicants successfully admitted to the Institute will still be listed in the next available edition of *In Practice*. Any member considering raising a complaint against a newly admitted member should do so via the standard complaints process.

CIEEM Conferences 2017		
Date	Title	Location
22 March 2017	Spring Conference 2017 – Mainstreaming Biodiversity into Future Cities	London
4 July 2017	Summer Conference 2017 – Integrated Management of the Marine Environment	Southampton
21-22 November 2017	Autumn Conference 2017 – Mitigation, Monitoring and Effectiveness	Manchester

In Practice themes 2017

Edition	Theme	Submission deadline
June 2017	Grassland Ecology and Grazing	n/a
September 2017	One Year on from the EU Referendum	29 May 2017
December 2017	Nature Conservation Approaches with Reduced Resources	28 August 2017

If you would like to contribute to *In Practice* please contact the Editor at GillKerby@cieem.net. Contributions are welcomed from both members and non-members.

Wildcare offers new members-only benefits!

CIEEM aims to continually improve the membership benefits package we offer, ensuring it is valuable and relevant for you, our members. As part of this, we are eager to launch our brand new partnership with equipment supplier Wildcare, to offer CIEEM members-only discounts on some of their most popular and useful products.

Wildcare has been supplying equipment to ecologists and environmental managers for over 15 years and offer UK next day delivery wherever you are! Their staff, with a wealth of knowledge and advice, are on hand to take orders over the phone or via email Monday to Friday (7:30am-5pm).

Mailed with this issue of In Practice you will find the CIEEM members-only discount catalogue, collated specifically for our membership, with instructions on how to access the CIEEM members-only portal through the Wildcare website.

We are looking forward to our partnership with Wildcare bringing an exciting new benefit to our members.

Need a reminder of your membership benefits? Find out more here: www.cieem.net/why-join-ieem-benefits-of-membership-

Consultation responses in 2017

CIEEM has responded to the following consultations and inquiries in 2017:

- Environmental Impact Assessment – Joint Technical Consultation (planning changes to regulations on forestry, agriculture, water resources, land drainage and marine works) (Defra, Welsh Government, Scottish Government, DAERA)
- Environmental Impact Assessment: Technical consultation (regulations on planning and major infrastructure) (Department for Communities and Local Government)
- Review of Draft 3rd National Biodiversity Action Plan (National Parks and Wildlife Service)
- Closing the STEM Skills Gap (Science and Technology Select Committee)

To read the full responses please visit: www.cieem.net/past-consultation-responses

Prime Minister sets out vision for Brexit

Prime Minister Theresa May has set out her Plan for Britain, including the 12 priorities that the UK government will use to negotiate Brexit. There was no mention of the environment in her speech.

www.cieem.net/news/371/prime-minister-sets-out-vision-for-brexit

UK Government publishes Brexit White Paper

The UK Government has published a White Paper – *The United Kingdom's exit from and new partnership with the European Union* – intended to provide Parliament and the country with a clear vision of what they are seeking to achieve in negotiating the UK's exit from, and new partnership with, the European Union.

www.cieem.net/news/380/uk-government-publishes-brexit-white-paper

Welsh Government publishes White Paper on Brexit

The Welsh Government has published a white paper entitled *Securing Wales' Future – Transition from the European Union to a new relationship with Europe*.

www.cieem.net/news/376/welsh-government-publishes-white-paper-on-brexit

Leaving the EU: implications and opportunities for science and research

The Commons Science and Technology Committee has published its report on the implications and opportunities for science and research from leaving the EU.

www.parliament.uk/business/committees/committees-a-z/commons-select/science-and-technology-committee/news-parliament-2015/leaving-the-eu-report-published-16-17/

www.publications.parliament.uk/pa/cm201617/cmselect/cmsctech/502/502.pdf

Select Committee recommends new Environmental Protection Act

The Environmental Audit Committee has called on the Government to introduce a new Environmental Protection Act during Article 50 negotiations to maintain the UK's strong environmental standards.

www.cieem.net/news/369/select-committee-recommends-new-environmental-protection-act

Brexit fisheries report published

The EU Energy and Environment Sub-Committee has published its report highlighting some of the opportunities and challenges related to managing shared fish stocks following the withdrawal of the UK from the EU.

www.parliament.uk/business/committees/committees-a-z/lords-select/eu-energy-environment-subcommittee/news-parliament-2015/brexit-fish-rpt/

European Commission to retain Nature Directives

European Environment Commissioner Karmenu Vella has announced that the EU will keep the Habitats and Wild Birds Directives intact.

www.cieem.net/news/365/european-commission-to-retain-nature-directives

New POSTnotes

The Parliamentary Office of Science and Technology has published three new POSTnotes that will be of interest to members:

- Research Integrity
- Reform of Freshwater Abstraction
- Environmental Crime

www.parliament.uk/mps-lords-and-offices/offices/bicameral/post/publications/postnotes/

Ireland State of Environment Report

Ireland's Environment – An Assessment 2016 report provides an integrated assessment of the overall quality of Ireland's environment, the pressures being placed on it and the societal responses to current and emerging environmental issues.

www.epa.ie/irelandsenvironment/stateoftheenvironmentreport/

Review of PES pilot projects

This review sets out the main findings, achievements, challenges and lessons learned from Defra's payments for ecosystem services (PES) pilot projects between 2012 and 2015.

www.gov.uk/government/publications/payments-for-ecosystem-services-review-of-pilot-projects-2011-to-2013

Consultation on Scottish Planning System changes

The consultation paper *Places, People & Planning* sets out 20 proposals for change which aim to strengthen the planning system and support sustainable economic growth across Scotland. The consultation closes on 4 April 2017.

www.cieem.net/news/373/scottish-government-consulting-on-scottish-planning-system-changes

NBN Gateway to become NBN Atlas

The NBN Gateway will permanently close on 31 March 2017; the NBN Atlas will supersede the NBN Gateway and will be live from 1 April 2017.

UK Climate Change Risk Assessment 2017

The UK Committee on Climate Change has published the *UK Climate Change Risk Assessment 2017 – Synthesis report: priorities for the next five years*.

www.cieem.net/news/379/uk-climate-change-risk-assessment-2017

Natural Capital Committee publishes fourth report

The Natural Capital Committee has published its fourth annual report on the state of natural capital. The report makes a series of recommendations to government on developing the 25-Year Environment Plan.

www.cieem.net/news/377/natural-capital-committee-publishes-fourth-report

Dáil votes to divest from fossil fuels

Ireland may soon become the world's first country to fully divest from all fossil fuels. The Government was defeated as the Fossil Fuel Divestment Bill passed the second stage 90 votes to 53.

http://greennews.ie/dail-votes-to-divest-from-fossil-fuels-in-move-that-could-see-ireland-become-world-leader-in-divestment/

Diverse fish communities have greater resistance to climate change

Researchers have found that the greater the diversity of fish in an assemblage, the less vulnerable that assemblage is to climate change.

http://ec.europa.eu/environment/integration/research/newsalert/pdf/diverse_fish_communities_greater_resistance_climate_change_469na3_en.pdf

New UK marine protected sites for harbour porpoise submitted to Europe

As part of the UK's commitment to implementation of the EU Habitats Directive and development of the Natura 2000 network, five harbour porpoise Special Areas of Conservation (SACs), proposed and consulted on in 2016, have been approved by relevant UK Governments. These sites have been submitted to the European Commission (EC) and are now candidate SACs (cSAC), pending EC approval.

http://jncc.defra.gov.uk/page-7369

World's largest MPA declared in Antarctica

Delegates from 24 countries and the EU have agreed that the Ross Sea in Antarctica will become the world's largest marine protected area (MPA). Some 1.57 million square kilometres of the Southern Ocean will gain protection from commercial fishing for 35 years.

www.marine.ie/Home/site-area/news-events/news/worlds-largest-marine-protected-area-declared-antarctica

Marine Protection Areas Revisited

The Environmental Audit Committee has explored the lessons learnt from the designation and implementation of the first two tranches of Marine Protected Areas.

www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/news-parliament-2015/marine-protection-areas-revisited-ev1-16-17/

New Northern Ireland MCZs designated

Environment Minister Michelle McIlveen has announced that four Marine Conservation Zones (MCZs) have been designated in Northern Ireland's in-shore region: Rathlin, Waterfoot, Outer Belfast Lough and Carlingford Lough.

www.daera-ni.gov.uk/news/new-marine-conservation-zones-designated

Natural England to roll-out new national approach to GCN licensing

Following a pilot by Woking borough council, Natural England is to implement a new approach to the conservation of great crested newts, which will bring greater benefits to the newts whilst streamlining the licensing process for developers. The approach will now start to be introduced across the country after its roll-out was announced in the Housing White Paper.

www.cieem.net/news/382/natural-england-to-roll-out-new-national-approach-to-gcn-licensing

Welsh Beaver Project

The Welsh Beaver Project has been investigating the suitability of potential release sites across Wales, and will be submitting a licence application to reintroduce beavers to Wales in 2017. The project has also been investigating the possibility of reintroducing beavers to enclosed sites where they can be used as a habitat management tool.

www.welshbeaverproject.org/home/

Ireland Curlew Taskforce established

Minister Heather Humphreys has announced the establishment of a Taskforce to reverse the decline of the curlew as a breeding species in Ireland. Ireland is home to thousands of Curlew each winter, yet the national breeding population has declined to below 150 pairs – a decline of 97% since the 1980s.

www.ahrrga.gov.ie/minister-humphreys-announces-establishment-of-curlew-taskforce/

NPWS publish 5th annual report on threats to birds of prey

The Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs has published the fifth annual report on threats to birds of prey. The report is the product of a joint Departmental initiative to investigate bird of prey deaths in Ireland.

www.npws.ie/sites/default/files/publications/pdf/2015%20RAPTOR%20report%20final.pdf

Bats and churches set for a harmonious future

A new project bridging the gap between bat conservation and the protection of historic English churches has received £3.8 million of National Lottery support. The five-year Bats in Churches partnership is set to trial new techniques to enable bats and church congregations to live together more harmoniously.

www.cieem.net/news/381/bats-and-churches-set-for-a-harmonious-future

Rewilding – An Idea Whose Time Has Come?

Helen Meech and Mick Green CEnv FCIEEM
Rewilding Britain

Keywords: nature, restore, rewilding

'Rewilding' has suddenly become a word which has entered the mainstream conservation debate, although the idea is not new. It has many definitions but in a UK context it has been relatively well defined for some time and is now being further developed both as a concept and as a major part of European nature conservation.

The key rewilding principles and definitions have been developed by Rewilding Europe (rewildingeurope.com):

1. Restoring natural processes and ecological dynamics – both abiotic such as river flows, and biotic such as the ecological web and food-chain – through reassembling lost guilds of animals in dynamic landscapes.
2. A graduated and situated approach, where the goal is to move up a scale of wildness within the constraints of what is possible, and interacting with local cultural identities.
3. Taking inspiration from the past but not replicating it. Developing new natural heritage and value that evokes the past but shapes the future.
4. Creating self-sustaining, resilient ecosystems (including re-connecting habitats and species populations within the wider landscapes) that provide resilience to external threats and pressures, including the impact of climate change (adaptation).
5. Working towards the ideal of passive management where, once restored, we step back and allow dynamic natural processes to shape conservation outcomes.

Lynx

6. Creating new natural assets that connect with modern society and economy and promote innovation, enterprise and investment in and around natural areas, leading to new nature-inspired economies.
7. Reconnecting policy with popular conservation sentiment and a recognition that conservation is a culturally dynamic as well as a scientific and technical pursuit.

The rewilding movement in Britain has been stimulated in response to the fact that Britain is one of the most ecologically depleted nations on earth. We have lost all our large carnivores and most of our large herbivores. While the average European forest cover is 37%, ours is just 12%. Our ecosystems have almost ceased to function. Because of the absence of trees and loss of soil, our watersheds no longer hold back water, with rainfall flashing off the hills and causing flooding downstream. The latest State of Nature report reveals that 56% of the species studied for the report have declined over recent decades, and that more than one in 10 species are under threat of disappearing from our shores altogether (State of Nature partnership 2016).

Rewilding offers a chance to reverse that; a chance to bring nature back to life and restore the living systems on which we all depend. A chance to work with communities to restore to parts of Britain the wonder and enchantment of wild nature; to allow magnificent lost creatures to live here once more; and to provide people with some of the rich and raw experiences of which we have been deprived.

Rewilding is not a new idea. And it's not just about bringing back wolves as the media might have you think. And it's not about going back in time, but about going forward by embracing a realistic, resilient ecology. It can occur at a range of scales, from small-scale habitat restoration within cities, to the development of large-scale wild, and even wilderness, areas on land or at sea. What is common to all rewilding projects is a focus on process-led conservation – restoring natural processes, then standing back as much as possible – rather than any goal-orientated focus on the conservation of certain species or habitats.

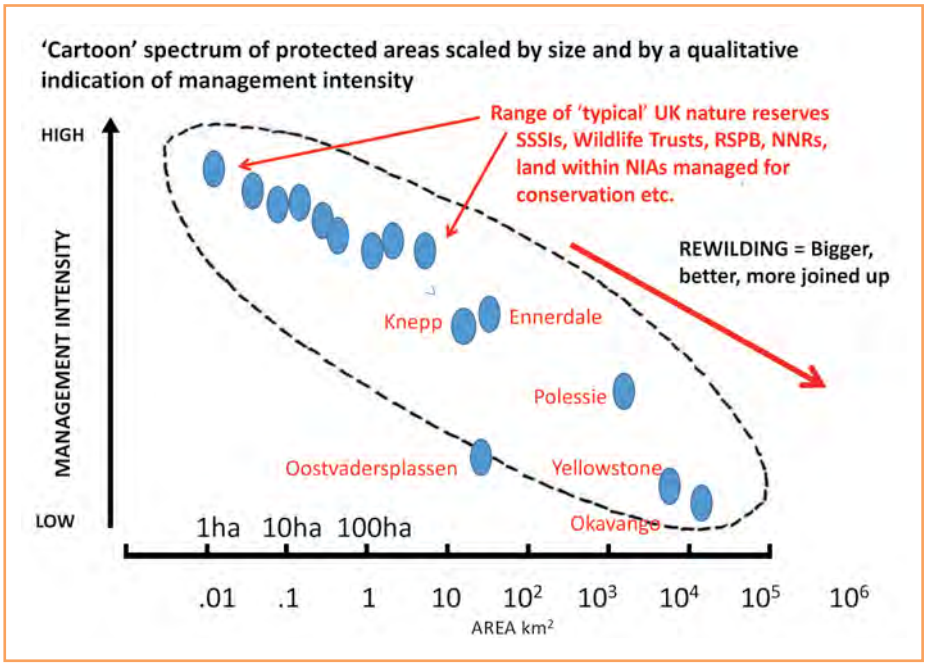

Figure 1. 'Cartoon' spectrum of protected areas scaled by size and by a qualitative indication of management quality. Diagram courtesy of John Lawton (Lawton 2016).

This is not to suggest that rewilding seeks to ditch traditional nature conservation management. That approach often works, but nature will not thrive if restricted to small reserves that are disconnected from each other and the natural systems that should support them. It's clear that we need to move from a focus on protection of nature, to a system that promotes both protection and restoration of nature across landscapes and at sea.

Rewilding is essentially an extension of the "Making Space for Nature" approach of "bigger, better, more, joined up" (Lawton 2010). Figure 1 is borrowed from Sir John Lawton. He argues that rewilding is about the process of moving conservation from the top left of this diagram towards the bottom right – about making space for nature at a larger scale, and reducing management intervention (and costs) as a result.

Rewilding can be transformative for nature, by increasing connectivity, creating diversity and making room for species to move through landscapes as they adapt to environmental change. It puts nature's processes, structures and species back into our landscapes to enable them to become more self-sustaining, biologically richer and better able to support society and the economy.

The current policy framework largely works against rewilding. Farm subsidies through the Common Agricultural Policy (CAP) create a powerful incentive to prevent ecological restoration: wherever land ceases to be in 'agricultural condition' it is disqualified from payments. Conservation designations often insist that ecosystems are kept in a state of arrested development, and attempts to allow trees or missing animal species to return are usually deemed unlawful. Regulations around wild animals, livestock movement and species reintroduction can also be major impediments.

However, Defra's forthcoming 25-Year Plan for the Environment and the development of a land management policy to replace CAP post-Brexit both provide excellent opportunities to advance and expand policy in relation to the natural environment. Rewilding Britain is calling for a more progressive land management policy based on public payment for delivery of public benefit. This should reward farmers and land managers for the delivery of ecosystem restoration and associated benefits, such as improvement of water quality at source, natural flood risk management and carbon storage in soils and biomass. Within the devolved administrations there are also many

opportunities to develop policy, for example the Environment (Wales) Act 2016 requires the Welsh Government to develop 'resilient ecosystems' – this is after all what rewilding is about. Fully restored and functioning ecosystems are by definition more resilient than the damaged and scattered sites we now have.

Rewilding Britain also believes that communities should be given a far greater role in environmental decision-making, informed by open data and expert facilitation. There are some great examples of projects involving communities in flood risk management. In Pickering, North Yorkshire, rather than building a £20 million concrete flood wall through the centre of town, the community planted 29 hectares of woodland upstream to naturally soak up water, and created hundreds of natural obstructions in the river made of logs, branches and heather to restore its natural flow. The flood risk has now fallen from 25% to just 4%, and at a fraction of the cost of hard defences.

Policy debate is also needed to support a more strategic approach to species reintroduction. The animals we lack over most of Britain such as beavers *Castor fiber* and boar *Sus scrofa*, and those missing completely such as lynx *Lynx lynx*, and wolves *Canis lupus lupus*, are not just ornaments of the ecosystem – they have a role as ecosystem engineers and are essential to an effectively functioning environment. They drive ecological processes and are crucial components of flourishing ecosystems. Yet the current approach to species reintroduction in Britain is rather piecemeal, with individual landowners and organisations making applications for localised reintroductions. Rewilding Britain believes that a national forum should be established to bring stakeholders together to discuss the potential benefits and disbenefits of different approaches. International experience has shown that stakeholder engagement plays a key role in the success of species reintroductions, which with the right planning and execution can benefit the species concerned, wider biodiversity, local communities and the general public.

We also believe this is more than just a policy debate: the principles as a whole can be utilised by CIEEM members – in policy or consultancy positions – to strengthen ecosystems and promote joined-up thinking.

The principles of rewilding, given above, can be developed into practical projects on the ground. For example, one of the authors (MG) has been involved in writing many management plans for windfarm sites – these tend to be large sites where the principles of rewilding can be applied, and opportunities for joining up with adjacent sites can be explored. The income from turbines can offset loss of income from intensive agriculture. Likewise, the development of flood control programmes should start upstream and look at water retention, not flood barriers. In policy development, rewilding as a principle (whatever you call it) should be included as an option, and barriers to an ecosystem-based approach – such as over-prescriptive outcomes for sites – should be avoided. There is no 'one-size-fits-all' prescription and, by its nature, rewilding does not have a defined end point.

The rewilding movement in Britain is in a design and innovation phase. We believe any new policy framework should embrace this, and create tax incentives and innovation funding to support the development of new nature-based economic models for land use in different regions and at a range of scales.

We hope rewilding will both inspire and revitalise communities across Britain, by offering a positive environmental vision and by bringing in new sources of income and jobs. Examples from around Europe show that this offers great potential for the recovery of the human economy as well as the natural world.

References and Further Reading

More information and debate can be found at www.rewildingbritain.org.uk

Forest Research (2016). *Slowing the Flow at Pickering*. Available at http://www.forestry.gov.uk/fr/slowingtheflow. Accessed 2 January 2017.

Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J. and Wynne, G.R. (2010). *Making Space for Nature: a review of England's wildlife sites and ecological networks*. Report to Defra.

Lawton, J.H. (2016). *Making Space for Nature and Ecological Restoration: Some thoughts about the future*. Presentation to Nature Improvement Areas National Event, 23 February 2016. Available at http://publications.naturalengland.org.uk/file/6217361634885632. Accessed 9 January 2017.

State of Nature partnership (2016). *The State of Nature report 2016*. Available at http://www.rspb.org.uk/our-work/conservation/centre-for-conservation-science/research/projects/363867-the-state-of-nature-report

About the Authors

Helen Meech joined Rewilding Britain as Director in September 2015. Helen has worked in the natural environment policy and campaigns sector for the last 10 years, most recently leading the National Trust's public engagement on nature, including the award-winning '50 things to do before you're 11 3/4' campaign. Helen is currently on maternity leave.

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Are There Too Many or Too Few Large Herbivores in Our Woods?

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Keywords: rewilding, Vera Hypothesis, woodland grazing, wood-pasture

My first proper job was doing a Phase 1 woodland survey in the Lake District National Park in 1977. A widespread concern then was that the oakwoods *Quercus petraea* were being damaged because of overgrazing, a particular issue being the lack of oak regeneration. Had George Monbiot's term 'sheepwrecked' been around it would have undoubtedly been used!

However, there were more positive views on grazing as well amongst my bosses: some pointed out that when areas were fenced the distinctive alder A*lnus glutinosa* parkland above Ullswater turned into rather ordinary young ash *Fraxinus excelsior* woodland, that the mossy carpets of the oakwoods tended to be reduced under the dense grass or bramble *Rubus fruticosus*.

In the mid-eighties, by then with the Nature Conservancy Council (NCC), we let a contract to explore this 'positive' effect on woodland conservation through an experiment with different levels and seasons of grazing in an oakwood by Haweswater. It proved more difficult than we envisaged but the results confirmed that permanently fencing all stock out of upland woods was seldom likely to be the optimum solution from a conservation perspective (Kirby *et al*. 1994, Mitchell and Kirby 1990).

During the early 1990s, when NCC had become English Nature, I was involved with setting up the Veteran Tree Initiative, a project to raise awareness of the conservation importance of wood-pastures in all their various forms. Two issues tended

Distinctive habitats created/maintained by stock grazing – not necessarily 'sheepwrecked'. Photo credit Keith Kirby.

An old pollard at risk from too little grazing in a wood-pasture (above); and woodland ground flora and understorey hammered by too high deer pressure (right). Photo credit Keith Kirby.

to dominate such management discussions – getting a new generation of trees underway in those sites which were mainly open with just scattered veteran trees, typically lowland grazed parkland; and dealing elsewhere with the sites (frequently former common land) where grazing had long stopped and any surviving veteran trees were being overtopped by too much young growth (Kirby *et al*. 1995).

Meanwhile, in many ancient woods the spread and increase of the lowland deer population, largely unnoticed up to that point, was making itself felt in terms of shifts in the ground flora, widespread failure of coppice regrowth following cutting, and reduced density of shrub layers with consequent impacts on breeding bird populations (Fuller and Gill 2001).

One thing here and another thing there?

One answer to the question posed by my title is thus that it is 'contingent on the objectives set for a site' or more prosaically 'it depends what you want here'. Many expressions of a wildlife-rich countryside are based on what the founding mothers and fathers of modern British conservation movement were familiar with – heathland, coppice woods, meadows, parks, etc. These landscapes had survived, if not actually developed, under the farming and forestry prevalent in the late nineteenth and early twentieth century. During that period (c1850-1950) over much of England, where the most broadleaved tree cover survived, deer were scarce, if not totally absent. Domestic stock were generally kept out of woods or at least from those areas where regeneration/stool regrowth was happening, by fences and hedges, or herding. In the wood-pastures fallow deer tended to be confined at high densities in parks so would keep the ground between trees open; common grazing of livestock was still sufficiently valuable (and without the problems of too much traffic on roads) to be worth maintaining on commons and in the remnants of the Royal Forests, as at Epping.

Thus, if we base our conservation expectations on the past, we do need to keep most ancient woods largely ungrazed (but regularly managed to create openings) but wood-pastures with quite an intensive level of grazing to keep the veteran trees free of competition from too many younger trees (but with a low number of open-grown successor trees). Both are difficult with our relatively small conservation sites that are now largely divorced from the modern farming and forestry that surrounds them.

Natural grazing in the pre-Neolithic period – a useful guide or not?

The pre-Neolithic landscape (i.e. before widespread farming) is often taken as the last time the British countryside was largely 'natural' (although the increasing evidence for impacts from Mesolithic peoples complicates such an idea). The conventional view on this landscape, prior to 1990, was that it was largely tree-covered, but there were dissenters such as Frances Rose who argued: *"it is interesting that the great majority of epiphytic lichens ... are light-demanding species. ...If the primeval forest were uniformly dense, where did all these species grow? ... These facts suggest that the primeval oak forests were not uniformly dense and that numerous glades were a feature, perhaps maintained by large herbivores present"* (Rose 1974). Oliver Rackham gave a keynote talk entitled 'Savanna in Europe' at a woodland conference in 1996 in Nottingham (Rackham 1998). This happened to coincide with the completion of a thesis in the Netherlands *Metaforen voor de wildernis: Eik, hazelaar, rund en paart*, which reached a wider audience in Britain when a book based on it was published in 2000 as *Grazing ecology and forest history* (Vera 2000).

Two modern landscapes sometimes used as models of 'natural' forest – Bialowieza Forest, Poland (left), and the New Forest, England (above) – although both, of course, have a long history of human management. Photo credit Keith Kirby.

Vera argues for a much greater role for large herbivores in the pre-Neolithic period than previously allowed: he presents them as the main determinant of vegetation structure and composition across large areas of at least the lowlands of central and north-western Europe. Their impact, he believes, would have resulted in a half-open landscape (Vera 2000).

I first read his book while stuck on a train between Manchester and Glasgow (it was a long delay!) and I took part in the subsequent debate generated by his arguments. The case for proposing a half-open level of openness has nowhere to my knowledge been justified. Even if large herbivores such as aurochs *Bos primigenius* and bison *Bison bonasus* were the dominant drivers of vegetation pattern, why would a half-open landscape automatically result: it could be more open, or less open? Thus, I do not accept all of the case put forward by Frans Vera, but I would agree that we probably underestimated the role of grazing and openness in the pre-Neolithic forest, even if not going as far as the half-open state (Sandom *et al*. 2014, Whitehouse and Smith 2010).

Would such landscapes have contained analogues of, for example, modern coppice woodland floras? We can see from the pollen record that at least some of the species were present. However, wild boar *Sus scrofa* might make the formation of large uniform stands of bluebells *Hyacinthoides non-scripta*, ramsons *Allium ursinum*, or anemones *Anemone nemorosa* unlikely because their rootling would break them up and reduce flowering. Short periods (c.10-15 years) of heavy grazing can lead to major shifts in the structure and the composition of the flora, favouring species such as wood false-brome *Brachypodium sylvaticum* and pendulous sedge *Carex pendula* at the expense of the abundance of other woodland herbs.

Large areas with scattered, open-grown veteran trees amongst grass-heath type vegetation seem equally unlikely to me. For such a landscape to be stable in the long term a succession of younger trees coming along would be required. However, the grazing level has to be fairly finely balanced such that a few trees get away from time to time, but not so many (e.g. no more than about 10 per hectare per decade) that they can close the canopy and overshadow existing veterans. Yet, on downland following the collapse of the rabbit *Oryctolagus cuniculus* population in the 1950s, on lowland commons such as at Odiham in Hampshire, or Ebernoe in West Sussex where cattle grazing ceased post-war, and at Wytham Woods where I have worked near Oxford, even short periods (a couple of decades) when the grazing level is reduced (not always eliminated completely) can allow a dense cohort of young trees and scrub to establish over large areas.

I do not think we know enough about the pre-Neolithic landscape structure and functioning to assume that they will also maintain the sorts of habitats and landscapes that we have inherited and which we value from more recent managed times (Hodder *et al*. 2009).

Rewilded grazing?

Extensive or naturalistic grazing is generally a component of rewilding proposals, under the assumption that it will produce interesting mosaics of habitats and provide conditions that favour a wide range of wildlife. The Knepp Estate in West Sussex has, for example, attracted significant populations of turtle dove *Streptopelia turtur*, nightingale *Luscinia megarhynchos* and purple emperor butterfly *Apatura iris* (www.knepp.co.uk). However, the essence of rewilding is that the outcomes are indeterminate: the nightingales may move on somewhere else as the current scrub

areas mature and we cannot be sure that equivalent areas will develop neatly in succession elsewhere on the estate. The wildlife is likely to be much more dynamic, both spatially and temporally.

On current evidence, therefore, I back some further large-scale trials of rewilding with associated naturalistic grazing because I believe these will produce rich and exciting landscapes. They may not accommodate – at least in the short term – all the species that we currently value and maintain through managed grazing (including grazing exclusion). Rewilding thus needs to be seen as a complementary approach to trying – however difficult this can be – to maintain both high and low grazing levels elsewhere in our woods through management.

So, are levels of large herbivores too high or too low? – BOTH.

Scattered bluebells showing in an area rootled by pigs (top); a sward of wood false-brome developed from a more mixed flora under heavy deer pressure (bottom). Photo credit Keith Kirby.

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Keith has extensive experience of the ecology, conservation and management of British broadleaved woodland derived from over 30 years as national advisor on forestry and woodland matters with Natural England and its predecessors. He maintained an active research interest during this time, particularly in the drivers of long-term change in woods and has published extensively on the subject. For the last five years he has continued that research, based in the Department of Plant Sciences in Oxford, both individually and in collaboration with groups based elsewhere in Britain and on the Continent.

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Anthropogenic Rewilding: An Oxymoron?

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Keywords: anthropogenic, dormice, management, rewilding

This article examines the supporting role that anthropogenic habitats can play in rewilding. Using a study of hazel dormice *Muscardinus avellanarius* as an example, we outline how, and in what circumstances, ecologically rich, managed habitats can be identified and then ultilised to accelerate efforts to rewild the British landscape. We also consider how historical ecology can inform this approach to rewilding, so that the biodiversity we still have is protected and utilised to best advantage.

A grazing exclosure maintained for over 40 years at Cwm Idwal, Snowdonia. Photo credit Ben Kite.

Introduction

Engendered by a stream of statistics about habitat loss and species decline, there has been vigorous debate in recent years about how to 're-wild' the British countryside to create benefits for biodiversity and ecosystem services. Rewilding proponents such as George Monbiot point out that Britain has lost its mega-fauna and most of its meso-fauna including bison *Bison bonasus*, boar *Sus scrofa*, bear *Ursus arctos arctos*, wolf *Canis lupus lupus*, and lynx *Lynx lynx* (Monbiot 2014). This version of the rewilding vision is a landscape at least partly free of human interference where these predators and their prey may once again live wild in Britain.

Aligned to this, there has been criticism of the way in which some nature reserves and Sites of Special Scientific Interest (SSSIs) are managed using tools such as controlled grazing to preserve particular assemblages of species that would otherwise no longer be viable. These sites are labelled 'cultural reserves' by Monbiot (2014) in which nature is kept in 'arrested development'. The September 2016 POSTNOTE by the Parliamentary Office of Science and Technology (POST PN 537) explains that rewilding *'…generally refers to reinstating natural processes that would have occurred in the absence of human activity'*. This begs the question whether those 'natural processes' *require* the absence of human activity, and challenges whether 'managed' habitats have value as part of the rewilding agenda.

A Diversity of Landscapes

The British landscape has been shaped by innumerable decisions made by farmers and landowners over thousands of years. Reversing biodiversity loss, or creating new habitats from scratch, will involve many more decisions by many more people; where should we as professional ecologists aim to exert influence?

Present-day landscapes have been fragmented by agricultural clearance and intensification, and by development. Major changes took place in medieval times, but the Inclosure Acts of the 17th to 19th centuries destroyed much common and other unenclosed land, erasing its ancient features and habitats in the process. More recently, the World War II War Agricultural Committees were responsible for the loss of many flower-rich meadows. Oliver Rackham's *History of the Countryside* (1986) consequently identifies a fundamental difference between 'ancient countryside' and 'planned countryside'. Different landscapes need different approaches to rewilding.

Ancient countryside harbours relics of formerly extensive biodiversity, reflecting what George Peterken (1993) called 'original' or 'past' naturalness – complexity that developed in times when sources of seed and spores were widespread and agrochemicals were unknown. In the lowlands, this also reflects complex human responses to topography, geology and soils, exemplified by organic patterns of lanes, pastures, woods, meadows and droveways, often on poorer soils and commons. A high number of SSSIs are commons, ranging from the New Forest to coastal grazing marshes and hill pastures.

In planned countryside, by contrast, typified by the former Danelaw where open field farming has held sway since medieval times, woods and droves are few, most land has been arable for centuries, and there are far fewer fragments of high biodiversity.

Where to Start Rewilding?

Besides the land itself, it is useful to have information on what is theoretically possible, and in this respect historical topographical maps, and information on geology and soils, are helpful guides. Biodiversity is often highest where agricultural productivity is lowest, and soil type and structure is an important determinant of what can be achieved – ploughsoils may mean that we need to recreate biodiversity from scratch as the process of repeatedly turning soil eradicates its accumulated seed bank. Tithe maps and records of Enclosure Awards for a parish give a useful indication of which areas have remained pasture or droveway for longest.

Historical Ordnance Survey (OS) maps are also helpful – the 1870 6" series was the most accurate rural mapping ever undertaken, and one can still find individual trees growing today that are shown on those maps. The maps can also tell us about commons and detached portions of parishes, but they mainly show the countryside after the Victorian re-organisation into Civil Parishes. The 1st Edition OS 1" engravings, and the Surveyors' drawings at 2" or 3" – the latter in the British Library – are more informative about places pre-Inclosure. Proprietary maps made for county landowners, or estate maps, sometimes provide landscape information from even earlier.

Field evidence is critical in verifying what maps tell us, whether from the distribution of 'indicator' species, or from records of rarities and their former distribution. Antiquity of habitats can be a proxy measure of biodiversity, as new species typically arrive and establish over a long period of time. However, harmful management or negative stochastic events, such as the application of artificial fertiliser, will interfere with this trend. Vegetation surveys are essential but clues to the existence of relict biodiversity-rich places can come from particular species, such as the hazel dormouse *Muscardinus avellanarius*.

Importance of the dormouse as a historical indicator species

The distribution and abundance of dormice is correlated with 'old' arboreal habitats such as ancient woodland, particularly those with a history of coppice management (Bright and Morris 1996). This may be partly because the dormouse lacks a caecum (an organ helping mammals to digest green matter), so it relies on a succession of different flowers, soft and hard mast fruit, and insects to get through the year, meaning that it survives better in biodiverse habitats. Consequently, dormice are generally more abundant in 'ancient countryside' than in 'planned countryside'.

By looking at dormouse distribution over wide areas, we can examine the link to biodiverse habitats, which might prove to be valuable source populations of species for rewilding projects. The left-hand pane of Figure 1 shows dormouse distribution in northern Surrey, overlaid

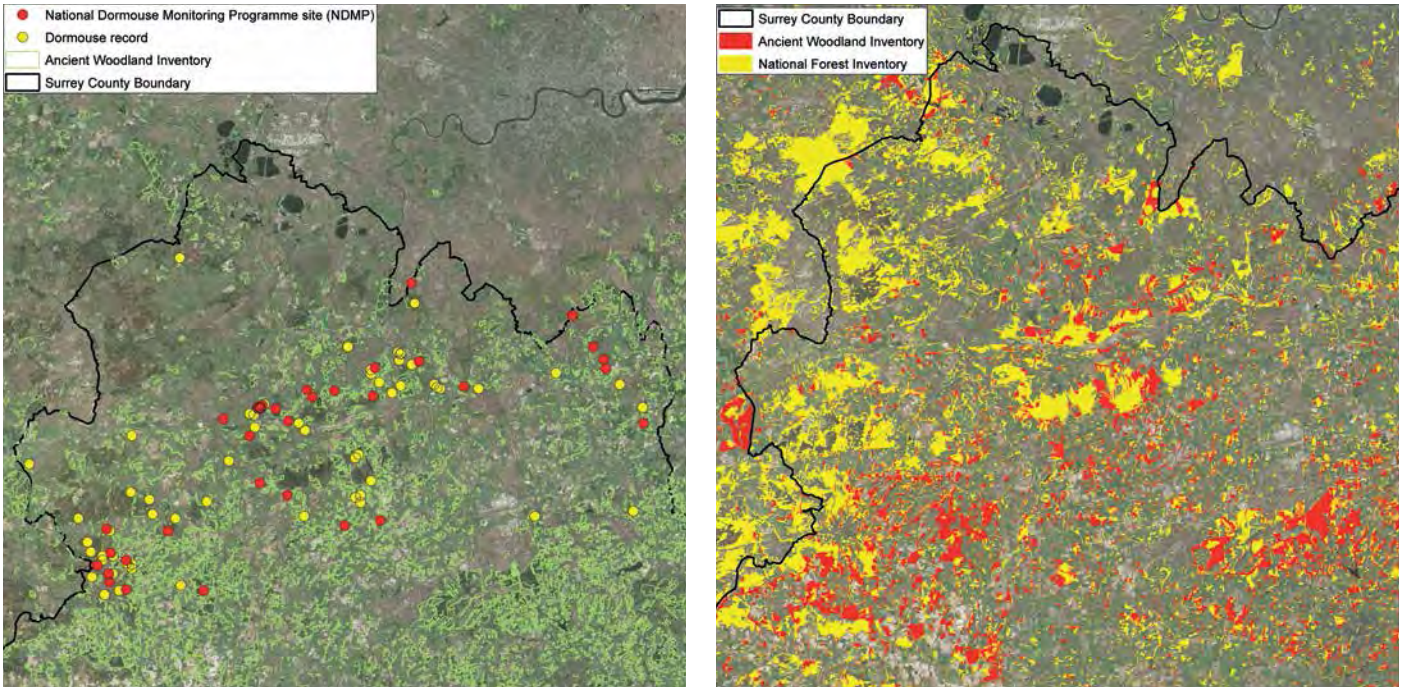

Figure 1. Dormouse Distribution and Ancient/Recent Woodland in northern Surrey. Data provided courtesy of People's Trust for Endangered Species. OS Data © Crown Copyright 2017. All rights reserved. Licence number 100005596.

onto Natural England's Provisional Ancient Woodland Inventory (lime green). Red dots indicate National Dormouse Monitoring Programme (NDMP) sites and yellow dots are National Dormouse Database (NDD) records. Dormouse distribution appears well related to ancient woodland, with the northernmost part of the County sparsely populated. The right-hand pane on Figure 1 shows Ancient Woodland in red and more recent woodland from the National Forest Inventory in yellow. The northern area is clearly well wooded today but lacks dormouse records. This confirms that dormouse distribution is well related to ancient woodland, but less so to more recent (less diverse) woodland.

The 1820s 2" to 1 mile Ordnance Surveyor's Drawing shows the northern part of Surrey mainly as heathland, with very sparse woodland cover. Much woodland in this area today is conifer plantation or pioneer species such as silver birch *Betula pendula*, Scots pine *Pinus sylvestris* and oak *Quercus* spp. developed over former heathland. It is not known whether dormice have not yet had time to colonise these more recent woods or whether the woodlands are not yet sufficiently diverse to provide the resources they need.

The Weald of Kent offers another example of how dormouse distribution reflects woodland antiquity. This once vast woodland known to the Saxons as 'Andreada's Wald' now comprises two landscapes with distinct histories: the 'High Weald' retains much of its old woodland cover but the 'Low Weald' was largely deforested from around the 12th century because it could be converted to fertile farmland.

In 1819, the town of Paddock Wood was indeed a wood (see Figure 2). The east-west line of the railway roughly demarcates the division between the High Weald (south) and Low Weald (north) on the modern map – topographically clear on the 1819 OS map. Most dormouse records are in the High Weald, where there is greater woodland cover and where much more woodland is presumed to be ancient.

The suggestion that dormice fare better in ancient woodland has been challenged by instances of the animal subsisting well in habitats that, ostensibly, appear neither old nor biodiverse (Eden and Eden 2001, 2003). However, where such places are not obviously embedded within 'ancient countryside', (as with much of Dorset), research using historical maps and in the field sometimes reveals a hidden history that helps to explain how dormice got there.

For example, surprisingly, a population of dormice live around Segensworth Industrial Estate in Hampshire, surrounded by residential and commercial development and roads, between the M27 and the coast. Contrary to suggestions that dormice prefer large, well-connected networks of species-rich habitats, here they also live in scrub, roadside hedgerows and even laurel *Laurus nobilis* in gardens. However, old maps provide clues to how the animals came to be living in sub-optimal habitat. Possibly the earliest reasonably accurate map of the area is Milne's Map of Hampshire (1791), shown in Figure 3 alongside a modern OS map. Other maps show the intervening time-period, including Greenwood (1826) and the 1" and 6" OS maps from the early to mid-1800s.

The dormouse population centres on Lambert's Coppice, a small ancient woodland with an intriguing history. In Milne's day, the area was far less populated and built up. West of Lambert's Coppice was Titchfield Common, the rump of a vast unenclosed area of heathland, grassland, scrub and trees, grazed by commoners and similar to the New Forest today. It stretched from the River Hamble to the River Meon, around which lay patches of unenclosed woodland, including Lambert's Coppice. Beyond this, Milne's map shows enclosed land in a lighter shade, but unfortunately does not show boundaries of enclosed fields.

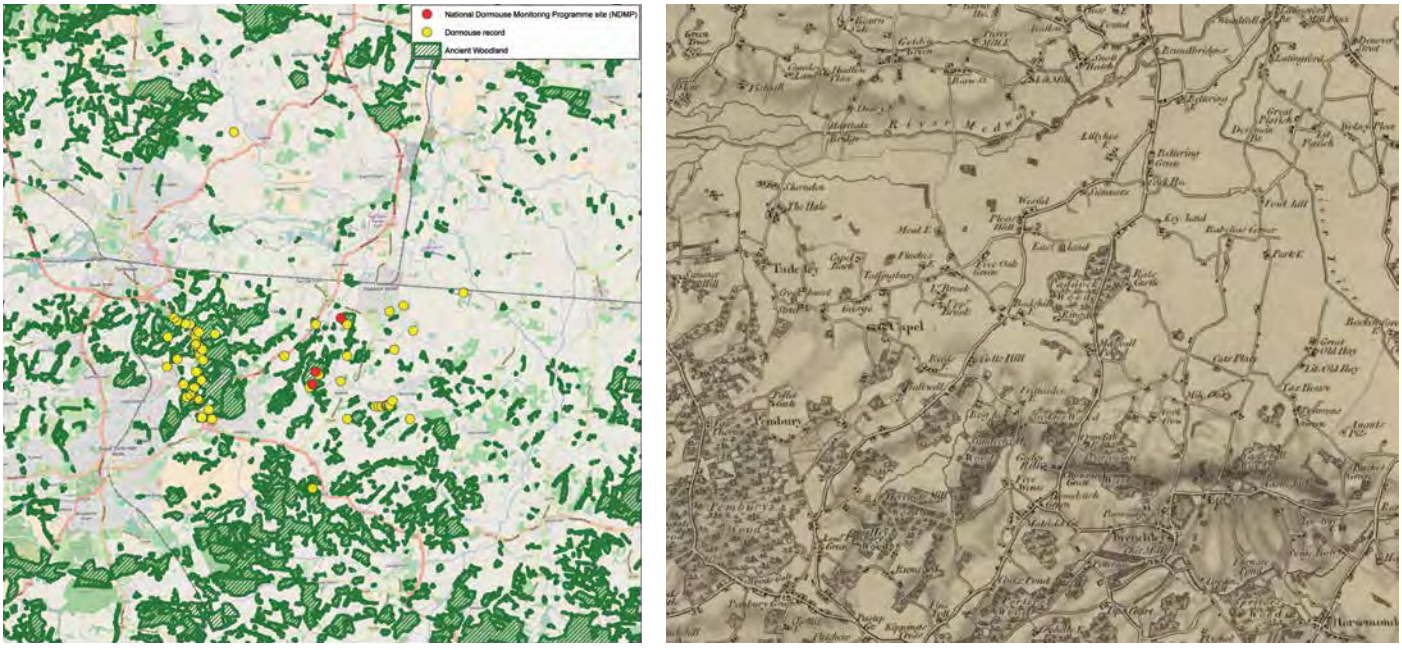

Figure 2. The Kentish Weald around Paddock Wood. Left-hand pane shows modern OS Mastermap with Provisional Ancient Woodland Inventory (green) and dormouse records (red and yellow dots). Right-hand pane shows 1st Edition 1 inch to the mile OS Map (1819). Data provided courtesy of People's Trust for Endangered Species. OS Data © Crown Copyright 2017. All rights reserved. Licence number 100005596.

Figure 3. Segensworth Past and Present: Left pane shows modern OS map with Lambert's Coppice encircled. Right pane shows Milne's Map (1791) with Lambert's Coppice encircled. Map courtesy of Old Hampshire Mapped, University of Portsmouth. OS Data © Crown Copyright 2017. All rights reserved. Licence number 100005596.

Nevertheless, we can infer from more recent maps that this enclosed area was criss-crossed with hedgerows that were later reduced and simplified. Later maps from the 1800s show the encroachment of enclosure, the disappearance and ultimate development of Titchfield Common, and the formalisation of woods like Lambert's Coppice into enclosed land with rectilinear boundaries.

This historical evidence reveals how a relict population of dormice, established when the landscape offered a much more favourable habitat, found itself isolated in a small fragment of biodiverse ancient coppice, and which today is spilling out into surrounding areas. Lambert's Coppice today is a beautiful and diverse little woodland, rich in flora.

When Management has Merit

The dormice at Lambert's Coppice have avoided paying their 'extinction debt', unlike others isolated in small woodlands, apparently by an accident of chance. After World War II, electricity pylons were routed through the wood, since when contractors have periodically cleared the wayleave. The trees here are notably productive in terms of mast fruit, probably because they receive more light. In effect, wayleave clearance appears to be imitating the ancient practice of coppicing, which is reported to favour dormice (Bright and Morris 1990).

Coppicing is also beneficial for other species such as woodland butterflies. It lets in light and allows ground flora to flourish, including the guild of coppice plants that remain dormant in the seed bank waiting for the opportunity to germinate after clearance. The biodiversity merits of coppicing are so well documented that Natural England (2008) state that *'The cessation of traditional woodland management practices such as coppicing is the most important factor affecting the condition of our woodlands and the biodiversity they support'*.

There are other examples of the positive effects of management on biodiversity. Cricklade North Meadow National Nature Reserve (NNR) (Figure 4) and Special Area of Conservation (SAC) has been preserved in an ecologically rich condition through sustained hay meadow management and seasonal grazing by a 'Court Leet' since Saxon times. Because of this management, the NNR is reported to support some 240 species of vascular plants (approaching one third of the British flora).

The management of these ecologically rich habitats often imitates natural processes

Figure 4. Cricklade North Meadow in bloom. Photo credit Ben Kite.

that no longer operate. We know, for example, that open grassland habitats existed in the interglacial periods prior to human clearance (Colebourn and Gibbons 1990). In the absence of large fauna to create and sustain such places naturally, management must mimic these processes to preserve these specific assemblages of species artificially.

Conclusions: How to Rewild

It is clear that restoring a species-rich landscape will require more than simply reintroducing species and allowing nature to take its course. The preservation of some species, like dormice (and by extension the rich ecosystems that they act as 'indicators' for), may need ongoing, regular habitat management. Different landscapes require different approaches to rewilding.

In 'planned' countryside, biodiversity is already impoverished but this offers the opportunity for more radical approaches to restoration. This has been done to great effect on the Knepp Estate in West Sussex (see www.knepp.co.uk) where biodiversity has dramatically increased over the last 10 years. Land has been taken out of intensive agricultural production and turned over to extensive grazing by cattle, pigs, ponies and deer, simulating the effects of large herbivores that would have grazed the landscape in the distant past. With minimal intervention, these herbivores have recreated a variety of habitats including scrub, wood pasture and grassland, each supporting different species assemblages.

In 'ancient' countryside, however, we should focus on reconnecting the many small, rich habitat patches isolated by farming or development, linking them into functional networks where species can disperse more easily. The 'Nature Improvement Areas' advocated by the National Planning Policy Framework (Department for Communities and Local Government 2012) could provide a policy basis within Local Plans, if authorities could be persuaded to adopt the approach. Areas like the Cotswolds, where unimproved habitat already stretches almost seamlessly across limestone valleys and ridges, might be good places to start.

Many such areas are already 'designated', and whilst their management is not always well informed or executed, it has played a vital role in sustaining assemblages of species that otherwise might not have been able to persist so far into the Anthropocene. Monbiot (2014) suggests that such places preserve nature like 'jars of pickles', but they could more correctly be seen as 'the pantry cupboards', providing the ingredients for a rewilding renaissance in the ancient countryside. The many small relicts of biodiversity could become reservoirs for restoration, contributing their own hitherto 'preserved' complement of species to linked networks of rewilded areas. Where else would we find the many species that are envisaged as drivers of the trophic cascades that rewilding hopes to unleash?

Understanding what is *appropriate* management, identifying the places that have been and are subject to it, and distinguishing these from places where management has been harmful to biodiversity is therefore key to maximising the prospects of a successful national rewilding programme.

Ultimately, our proposition is that the extent to which a landscape might be described as 'wild' is clearly a question of degree. Making a landscape 'more wild' (through rewilding) need not require the abandonment or absence of human management where it has demonstrably exerted a positive effect on biodiversity and can pump-prime rewilding projects with a range of species no longer common in the wider countryside. Anthropogenic rewilding can be real and need not be an oxymoron.

What seems clear to us, given the complexity of the issues and the current uncertain policy backdrop, is that ecologists must step forward and lead the way in helping to decide which of the above models (or mix of models) best fits the landscape in which rewilding opportunities arise. We must be willing to help build the collaborative coalitions of farmers, landowners, conservationists, politicians, regulators and the general public, that are needed both to initiate and then sustain the significant effort required to make rewilding fulfil its tantalising potential.

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Rewilding in a Managed Landscape – The Swindale Beck Restoration Project

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Keywords: geomorphology, restoration, rewilding, river, uplands, water

Figure 1. Swindale Beck before restoration. Photo credit RSPB Images.

This article describes the work carried out to restore a meandering profile and natural processes in a section of the Swindale Beck, a tributary of the River Eden in Cumbria. It outlines the need for the project, the restoration methods employed and the anticipated benefits, and discusses some of the challenges of delivering a rewilding project within a managed landscape.

The Setting

Swindale Beck is a tributary of the River Eden in the Eastern Lake District that runs through Swindale Farm, where the RSPB is working in partnership with landowner United Utilities to demonstrate sustainable land management. Like a great many watercourses in the UK, Swindale Beck has been heavily modified. It was straightened at least 160 years ago, as evidenced by the 1859 Ordnance Survey map, in order to create useable meadows that would allow the valley's people to farm more effectively. Evidence of the fact that the river had not always occupied its straightened route can be seen in the land either side of the river in the form of paleochannels. These are visible on the ground as lower lying, wetter areas.

Figure 1 shows the state of the river in 2015. Rock armoured on both sides, a straight route with almost no variation in width, depth or flow, the beck had little of the in-channel habitat features that a river of this type should support, with no gravel bars or deep pools and very few riffles. Historic management of the channel had resulted in the creation of levees running along a 2 km length through the middle of the valley. Grazing had prevented tree regeneration so that this section had only a handful of bankside trees.

Decades of natural deposition of gravel from upstream meant that most of the straightened length was perched above the surrounding land. Had the river not been constrained, it would most probably have moved into a different, lower lying part of the valley. At times of moderately high flow, water would be carried through the leveed, armoured channel at high velocity, typically carrying with it a bedload of gravel. Much of this would be deposited downstream at the United Utilities drinking water intake, necessitating regular maintenance. The lack of slower flowing areas within the channel meant that smaller sized gravel had little opportunity for deposition, resulting in the channel bed being made up of fairly uniform larger sized gravel. The lack of smaller substrate meant there was little suitable habitat for Atlantic salmon *Salmo salar* or brown trout *Salmo trutta* to spawn.

The upper catchment of Swindale is enormous, meaning that flooding of the valley bottom will always be a regular occurrence. Before restoration, the levees prevented water flowing back into the river once flooding had subsided, creating stagnant pools on the meadow to either side, reducing both the botanical interest of the meadows and their agricultural value.

Some of the hay meadows and rush pastures on the valley bottom are

Figure 2. Swindale Hay Meadows. Photo credit RSPB Images.

designated Sites of Special Scientific Importance (SSSI) and Special Areas of Conservation (SAC) (Figure 2). Under RSPB management, with zero fertiliser inputs and carefully timed grazing, their botanical interest has been improving. They are also an important part of the RSPB farming operation, providing winter fodder for sheep.

Swindale Beck Restoration

As part of the RSPB management planning process for Swindale, consultation with the Eden Rivers Trust helped to identify the potential to restore sinuosity and enhance the biodiversity value of the beck. In 2015, the project began in earnest, with geomorphologists from the Environment Agency (EA) using a digital elevation model and the locations of paleochannels to design a new sinuous channel.

The Cumbria River Restoration Strategy (CRRS) was originally developed to help deliver the government's obligation to improve the quality and function of Cumbria's SAC/SSSI rivers but has since expanded to support all river restoration across the county. The resulting projects have helped the CRRS partnership to gain recognition as national leaders in the field of river restoration. The CRRS contributed significantly to the work in Swindale and lessons learned from previous projects helped to inform the design and delivery of the scheme. The value of this expertise and the partnership between RSPB, United Utilities, Environment Agency and Natural England on this project cannot be underestimated.

Previous river restoration schemes had shown that there is little need to do much detailed design work and that once a river is connected into a restored channel, natural processes rapidly take over and the desired in-river features (gravel bars, riffles, pools) all form spontaneously. This approach was taken with the design for Swindale, and contractors were asked to create a simple channel profile based on a basic two-dimensional design.

Figure 3. Swindale Beck restoration work in progress. Photo credit RSPB Images.

A large part of the new channel needed to be dug through the SSSI/SAC hay meadow and rush pasture. Following an Appropriate Assessment under the Habitats Regulations, Natural England concluded that the overall impacts on the ecology of the SSSI/SAC meadows and pastures would be positive and it was able to support the project. The new channel to be dug ran mostly through an area that was almost permanently wet, with less botanical and agricultural value than other areas of the meadow. Some small areas of reasonably species-rich grassland would be lost in the short term but by reinstating hay meadow on the straightened channel after it had been in-filled, the project aimed to increase the extent of species-rich and agriculturally utilisable hay meadow. The increase in dynamism in the system was also felt to be a positive factor, with a more natural flooding regime and new niches being continually created for plants to colonise. The fact that the RSPB are managing hay meadows across the whole of the valley bottom in a way that is increasing the extent and quality of species-rich habitat, means that there will be a good source of suitable seed for recolonisation.

A specialist environmental contractor, OpenSpace, won the tendering process and started work on site in March 2016 (Figure 3). Weather proved challenging at times, as did the presence of a large number of land drains, which in combination regularly inundated the work area. Insufficient gravel found in some parts of the new route added extra complications and raised concerns that the restored river may be more dynamic than was desirable, which could have negative consequences for surrounding land. To help provide some stability, a number of embryo gravel bars were constructed in locations where these would be most likely to form naturally.

After electro-fishing to remove fish from the straightened route, connection into the new sinuous channel took place in August 2016 (Figure 4). A very heavy rainfall event occurred two days later, flooding the whole valley bottom. Concerns about what this might have done to the unconsolidated banks of the new river proved to be unfounded once the flood water subsided. The high flow had brought down large amounts of gravel and in-filled areas that were lacking in suitable bed material, reshaped and increased the size of the embryo bars, and formed new bars, riffles and pools, resulting in a new channel that was instantly more diverse than the old straightened route.

The restored channel at 891 m is 140 m longer and around 2 m wider than the old route and, without the levees, is much better connected to the flood plain. In-channel deposition is visibly occurring in several places, which should reduce the quantity of material ending up at the United Utilities intake, saving on maintenance costs. Gravels are naturally sorted within the channel resulting in areas of fine sediment distinct from larger substrate. As the new river beds in, and aquatic organisms recolonise, this enhanced morphological diversity will almost certainly result in the beck having much more wildlife than it has supported for decades. We will be carrying out a range of different monitoring activities

Figure 4. Aerial photo showing the straightened route and the restored route before connection. Photo credit RSPB Images.

Figure 5. Annotated aerial photo showing river restoration and other Swindale projects. Photo credit Glasgow University.

to document these changes. These will include periodic fish, invertebrate and bird surveys and drone flights to capture morphological change. Water flow and water quality data will be recorded at the drinking water intake just downstream of the project area. Additional research into the impacts of vegetation cover on water flows in the surrounding valley will be carried out through a postgraduate research project in a partnership between the RSPB and the University of Leeds, commencing in 2017.

Around 4,000 trees were planted along the river corridor during winter 2016/17 as part of the project. As these mature, they will add shade and woody debris to the river as well as enhanced habitat alongside. Part of the restored channel will be fenced out to result in a wooded section, while the section running through the SSSI will be left open.

Swindale Beck restoration is nested within a programme of complementary projects to improve ecosystem services in the Swindale catchment, including 40,000 trees being planted around the valley over the last four years, large-scale moorland restoration, a renewed drinking water intake and fish pass, and plans for two flood attenuation areas. (Figure 5).

Rewilding?

While we haven't generally referred to Swindale Beck restoration as 'rewilding' it can clearly be considered in these terms. The aim of the project was to restore natural dynamic river processes in order to enhance the biodiversity, water quality, flood alleviation and aesthetic benefits that have been shown to result from similar projects.

The RSPB/United Utilities partnership responsible for the management of Swindale Farm could have opted for a fuller rewilding scenario. All livestock could have been removed, or naturalistic grazing by large herbivores introduced. Land drains could have been blocked to reinstate more natural hydrology and create areas of wet woodland and fen alongside the restored river. A more intensive programme of tree planting, or natural regeneration of trees, could have been planned. We could have been less prescriptive about the route of the restored channel and allowed the new river to have found its own way. We took the conscious decision not to follow this 'wilder' route for the following reasons.

Protection and enhancement of hay meadows

Hay meadows are a diminishing resource in the British countryside, having declined by an estimated 97% over the last century (Burns *et al*. 2013). While supporting significant species richness, hay meadows are essentially artificial habitats, managed through low-intensity agricultural practices. While a rewilded Swindale valley bottom would still have retained a high degree of botanical richness, natural succession would probably result in a transition from hay meadow communities toward wetter, richer, taller fen habitat and later into wet woodland. To say that hay meadows are worth more than a fen or wet woodland would be completely subjective, but hay meadows do have a particular place in

our cultural consciousness, and their diminishing national presence seemed significant enough to attempt to retain them in Swindale.

Maintenance of culturally valuable traditional farming practices

The Lake District has a long history of pastoral hill farming. While it could be argued that in the main this has not been good for the region's ecology (Ratcliffe 2002), this is at least in part due to government policies following the Second World War which encouraged farmers to graze with unsustainably large numbers of livestock. The aim of our work at Haweswater is to assess if it is possible to deliver environmental benefits within an extensive hill farming operation (RSPB 2015). The restoration of Swindale Beck is an important project within this landscape-scale programme of trial management. If this type of rewilding project and the benefits that accrue from it can be delivered within a farmed environment, then there is a stronger case for continued support for hill farming which at present is heavily dependent on government subsidy.

Demonstration value

Showing that river restoration can be delivered within a farm without negative impact on production may help to inspire other farmers and land managers to carry out similar projects elsewhere. The CRRS has been very successful at delivering a range of river restoration projects in Cumbria in recent years, but to have a really meaningful flood alleviation impact to protect communities at risk from flooding, a great many more need to be carried out. The IUCN has recently published 'River Restoration and Biodiversity' calling for a national programme of river restoration (Addy *et al*. 2016), which highlights the value of rivers and their potential to help mitigate some of the effects of a changing climate.

There is understandable concern from farmers that river restoration may result in land in the flood plain becoming unusable. We hope that Swindale will contribute to the growing body of evidence showing that this doesn't have to be the case. Many hill farms in the Lake District will be similar to Swindale in that, following hay cutting and aftermath grazing, there is little to keep livestock in the valley bottom. In current hill farming practice, it is not uncommon to send livestock to other farms for the winter, or keep them inside. So why not allow these fields to flood? As long as the land in the valley bottom is able to dry out again, producing a hay crop and/or useable pasture in the summer months should be perfectly feasible. Swindale has probably flooded every winter since time immemorial, but this has not impacted on the production of hay and summer grazing.

What if?

Now the Swindale Beck is flowing through its restored, sinuous channel, we don't expect it to stay where it is. There has already been bank erosion and the possibility that the river may decide to create a new channel for itself is one that we were fully aware of from the outset of the project. The river could become wandering, it could cut off access to the meadow or the farm track that runs along the valley bottom. It could affect soil hydrology so that hay meadows become wetter and dominated with rush. While there are steps that we could take to lessen the likelihood of these impacts (land drainage, bunding, bank reinforcement), we are keen to avoid taking them if we can. While our aim is to try to integrate rewilding with management, if nature tells us that this isn't possible, then that will be a valuable lesson learned.

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Getting It Right With Reintroductions: What Conservation Evidence Tells Us About Bringing Back Birds

Claire Wordley
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Keywords: Conservation Evidence, grey partridge, red kite, species reintroductions, white stork

Red kite *Milvus milvus*.
Photo credit Silviu Petrovan.

Reintroducing species back to our industrialised island nation can be tough. Gathering, sharing and using evidence at every step of the way, from captive rearing animals to preparing the public for their release, is critical to maximising the chances of success. This article illustrates some of the lessons learned from bird reintroductions, which have been collected on the evidence-sharing platform www.conservationevidence.com.

Introduction: Flying high

I remember clearly the first time I ever saw a red kite *Milvus milvus*. I had just moved to Leeds and was heading out to the outskirts of Roundhay, to visit Tropical World, when my eye was caught by an unfamiliar silhouette in the sky. With its distinctive forked tail and cool, effortless glide I knew what it was right away. My heart started pounding, I gasped aloud, and I stopped dead in my tracks to watch it lazily rise on the thermals until it was just a speck in the distance. Nothing I saw at Tropical World gave me anywhere near the aching thrill that wild, soaring kite did. Watching an animal that had been persecuted to extinction in England and Scotland sweeping over suburban parkland felt like one of the best conservation experiences possible – a scrap of untamed nature elevating the mundane surroundings into something breathtaking.

Six years later, I've seen red kites increasingly frequently across England – most recently over Hampstead Heath in London. If they can make it there, they can truly make it anywhere. But why did these birds disappear, and why are they coming back when so much of our wildlife is struggling?

In the Middle Ages the red kite was protected in the UK due to its useful role as a scavenger, clearing up rubbish and carcasses. However, by the 16th century it was decided that the kite was 'vermin' and it was poisoned, trapped, shot and persecuted by egg-collectors until it disappeared from England in 1871 and Scotland in 1879 (RSPB 2016). A handful of birds remained in central Wales, which DNA analysis showed were all descended from a single female. The cool, damp climate and limited food supply in the bird's last stronghold appeared to hinder its productivity and the chance of it spreading back across the UK, so attempts were made to reintroduce this bird to England and Scotland. Between 1989 and 1994, red kites from Spain, Sweden and Wales were released in the Chilterns, and kites from Sweden were released in the Black Isle in Scotland (Williams *et al*. 2012a). Due to the successes seen at these sites more birds were released across the UK, and there are now over 2,700 pairs in the UK, despite indications that illegal persecution has slowed the growth of the population in Scotland (Orros and Fellowes 2015, Smart *et al*. 2010).

Building an evidence revolution

This is a clear reintroduction success story. But what are the elements that add to the success, and what are the potential stumbling blocks faced by other attempts to reintroduce species lost from these isles? Gathering data on the success (or otherwise) of reintroduction attempts, and experimenting with different ways of translocating, captive breeding or releasing animals, is key to maximising the chances that a reintroduction attempt will succeed – as emphasized by the guidelines for reintroduction produced by the Re-Introduction Specialist Group of the IUCN Species Survival Commission (IUCN 2013). The *Conservation Evidence* project (www.conservationevidence.com) is working to do this, as part of its wider remit to collect together all the evidence on interventions undertaken in the name of conservation. While the database of evidence is still growing, this is a fantastic – and free – resource for anyone planning a conservation or mitigation project. The aim of the project is simple: to revolutionise the way we do conservation, by liberating evidence from papers behind paywalls and making it available to the people who need it most.

The *Conservation Evidence* project tackles the task of gathering evidence by breaking it into sections for particular species groups (such as amphibians, bats or birds) or habitats (such as forests or farmland) in 'synopses'. A range of conservationists are consulted to draw up a list of all possible conservation actions for that species group or habitat. Systematic searching is employed to find all the direct tests of that action, and each scientific paper or report is summarised in a paragraph, with 'key messages' summarising all the paragraphs. Next, experts are asked to look at the evidence and score each action for how beneficial (or otherwise) it is, how strong the evidence is and whether there are any harms resulting from this action to the target species group or habitat. This ensures that anyone searching for the evidence can see it all at once, and get an immediate feel for how well the action is likely to work; then dive in to look at the details that are relevant to them.

Red kite *Milvus milvus*. Photo credit Silviu Petrovan.

Getting it right for kites

For example, looking at *Conservation Evidence* it is clear that the way the kite reintroduction was managed met a number of important criteria, even if it could not completely eliminate all problems. In the red kite reintroduction programme, birds were translocated rather than captive bred. Translocation has been successful for a range of raptors: red kites and sea eagles *Haliaeetus albicilla* in the UK, ospreys *Pandion haliaetus* in the USA and Montagu's harrier *Circus pygargus* in Spain (Williams *et al*. 2012a). An alternative approach would have been to release captive-bred birds, which has worked in some raptor release programmes but not in others (Williams *et al*. 2012b). Decisions about the appropriateness of translocation versus captive breeding must be taken for each species based on the best available evidence.

While there are only a few studies that have looked at the effects of where birds for release are sourced from, there are indications that birds sourced from closer to the release site do better than those from further away in the species where this has been tested (Williams *et al*. 2012c). Red kites were genetically tested to check for differences in populations before release; birds from Spain and Sweden were deemed genetically similar enough to those from Wales to be likely to be viable in the UK (the species ranges from Morocco to Moscow). However, the red kites from Sweden released in Scotland appear to have retained the migratory instincts of this species at higher latitudes, while the Spanish and Welsh birds in southern England did not migrate from their release site (Olsson 2007). This may have had some implications for the relative success of red kite releases in the two countries, and sourcing individuals with appropriate migratory behaviour may be as important or more important than ensuring that they are from a genetically similar population.

The red kites were collected from across Europe as four- to six-week-old nestlings, and kept in aviaries at the holding pen with minimal human contact for eight weeks before release. This mimics some of the techniques used to release captive-bred birds without them becoming used to humans in terms of preconditioning them to the local environment and familiarising birds with local food. These techniques have worked to increase survival in some programmes, but more evidence is needed to determine the overall effectiveness of this method (Williams *et al*. 2012d).

Changing the perception of a species, and reducing persecution towards it, are critical in any release programme. The RSPB and other groups involved in the red kite release worked hard to reassure landowners that the kite was not a threat to livestock, and this appears to have had

positive results in England (RSPB 2005). However, in Scotland the population is still somewhat limited by poisoning, shooting and trapping, indicating that the education and outreach programmes have not been universally successful (Smart *et al*. 2010). This reflects the overall mixed success of education programmes and local engagement to help reduce persecution or exploitation of species worldwide, as seen by data gathered by *Conservation Evidence* (Williams *et al*. 2012e).

It can be difficult to design education and engagement programmes that are effective in any given community and cultural context; people's beliefs and attitudes towards wild animals are often bound up in wider identities and may not change easily. It can also be difficult to measure the impacts of education programmes on species populations. However, both the success of kites in England and several other programmes documented by *Conservation Evidence* give hope that this is not a fruitless endeavour; gathering more evidence on such programmes will hopefully enable the analysis of whether particular approaches are more successful than others, or whether these programmes are more likely to be successful in some contexts than in others.

Data on supplementary feeding gathered by *Conservation Evidence* shows that this appears likely to benefit populations of raptors, including red kites (Williams *et al*. 2012f). The provisioning of red kites over several years in Scotland may have been a contributory factor to their persistence north of the border, where conditions were harsher than in southern England (Evans *et al*. 1999).

Flapping about

Unfortunately, not all species reintroduction programmes are as successful as that of the red kite. Grey partridge *Perdix perdix* have declined drastically in the UK, probably due to herbicide application, the removal of hedgerows, shooters mistaking it for red-legged partridge *Alectoris rufa* and infection with caecal nematodes from farm-reared pheasants. There have been numerous attempts to re-establish populations through releases of captive-bred birds, with low success rates (BTO 2010).

A study from Finland found that hand-reared grey partridges did not take off to fly as effectively as wild-caught birds, which could potentially make them more vulnerable to predation from ground predators (Williams *et al*. 2012g). Another Finnish study found that releasing hand-reared female grey partridges had little positive impact on the local wild population, due mainly to poor survival and low reproductive success in hand-reared birds (Williams *et al*. 2012h). Similarly, in Scotland commercially reared and released grey partridge had very low overwinter and breeding-season survival, mostly due to predation. Of the few captive-bred birds in Scotland that survived to breed, none fledged chicks in their first breeding season, and only one released female survived to breed in her second year (Williams *et al*. 2012h).

There are hopes that success can be improved in grey partridge reintroduction projects by testing different ways of breeding and releasing the birds, and publishing the results. A study in Gloucestershire and Oxfordshire, England, found that partridges released in family groups or 'coveys' in autumn had much higher survival (over 13 days) than birds released in pairs in spring (Williams *et al*. 2012i). There are also some indications from France and England that feeding wild grey partridge can increase local abundance, and perhaps increase population sizes (Williams *et al*. 2012j). Experimenting with these methods can help to develop evidence-based guidelines for optimal reintroduction.

Grey partridge *Perdix perdix*. Photo credit Silviu Petrovan.

Storks of the future?

White storks *Ciconia ciconia* have been touted as another possible candidate for reintroduction in the UK, as they lived in the UK until medieval times (the last known breeding was in Edinburgh in 1416) and roughly 20 migrant birds are spotted each year. It is thought that these impressive birds, with their distinctive plumage and seven-foot wingspan, could be great ambassadors for the concept of reintroducing lost species as they will not pose a threat to livestock (although they may build unwanted nests on chimneys) (Rewilding Britain 2016). It is not entirely clear why storks were lost from the UK, but they are unlikely to recolonise naturally; the young imprint on the area in which they are born, and we are relatively far from continental populations, so it is unlikely that any of the few passing migrants will choose to breed here (although there are touching pictures of lone Larry building a nest on his own in Mansfield (RSPB 2012)).

White storks *Ciconia ciconia*. Photo credit Tim Kasoar.

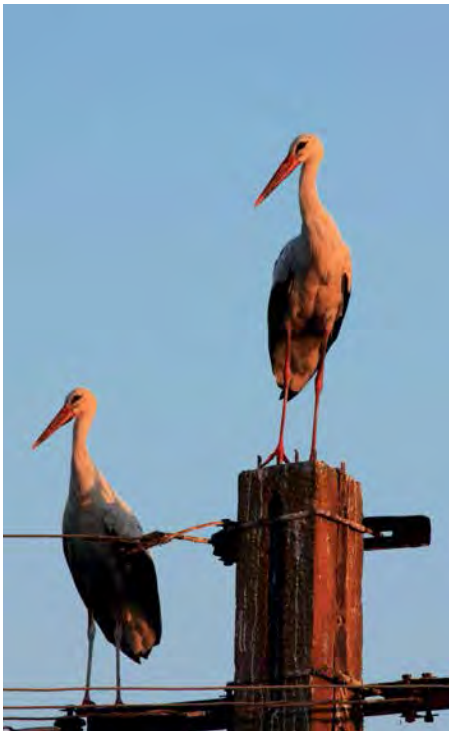
If stork reintroductions are to work, it will be important to look at evidence from other stork reintroductions, and from introductions of similar species, to make sure we get it right. As storks migrate, it will be especially important to source appropriate populations from which to take birds for release in the UK, as migratory behaviour appears to have a genetic component. In Sweden, white storks released from North African birds (from a captive breeding facility in Switzerland) produced fewer than half the number of chicks of naturally recolonising birds from nearby areas of north-east Europe, and were less likely to migrate than naturally recolonising birds (Williams *et al*. 2012b). Eastern European white storks migrate to East Africa, while North African white storks make a shorter, later migration to eastern sub-Saharan Africa, although stork migration routes appear to be altering across Europe (Shephard *et al*. 2015).

A stork reintroduction programme may choose to translocate individuals as chicks, as was done with kites, or to establish a captive breeding population, as seen with white storks in Switzerland. So far white storks, unlike some other storks, have been shown to breed well in captivity (Williams *et al*. 2012k), so this may be a viable option. Decisions would have to be taken about the best age to release the captive-bred birds, for which different species have shown different patterns (Williams *et al*. 2012l); on whether to soften the release using a holding-pen on site (Williams *et al*. 2012d); on whether to try and train birds to migrate with a microlite (Williams *et al*. 2012m); and on a variety of other factors.

One of the major issues in planning a stork reintroduction would be trying to figure out whether they would survive once reintroduced. We know kites were hunted to near-extinction, so engaging people to see the positives of kites was a key approach; corncrake *Crex crex*, which almost went extinct in the UK in the 1990s, can be successfully reintroduced to areas from which they have been lost but they need grassland mowing patterns to be altered to reduce chick mortality (Williams *et al*. 2012n,o,p). But would storks need a

White stork. Photo credit Tim Kasoar.

public engagement campaign to prevent irate homeowners from chasing them from their chimneys? Is there sufficient habitat for them? Their successful reintroduction in other industrialised countries such as the Netherlands in recent years suggests that with public engagement storks could boom in Britain (Euronatur 2016), but careful monitoring of any reintroduction process and gathering of detailed data would be needed to maximise the chances of success.



White stork. Photo credit Silviu Petrovan.

Conclusions

The *Conservation Evidence* team is working hard to bring out new synopses covering reintroductions on more species, from reptiles to carnivores, and on more habitat restoration programmes, from wetlands to heathlands. As the number of reintroduction and habitat restoration programmes grows, it will be even more important to publish new evidence on what works (and what doesn't), and to make sure that evidence is easily accessible so it can inform other conservationists. Evidence-based conservation needs to be more than just a buzzword; it should be the start and end point of all we do.

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e) Use education programmes and local engagement to help reduce persecution or exploitation of species, http://www.conservationevidence.com/actions/274

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l) Release birds as adults or sub-adults, not juveniles, http://www.conservationevidence.com/actions/636

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Pine Marten Translocations: The Road to Recovery and Beyond

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Keywords: feasibility study, monitoring, pine marten, research, stakeholders

Female pine marten fitted with a combined radio and GPS collar. © Nick Upton/naturepl.com.

Summary

Translocation is an increasingly common method used to re-establish wildlife populations in situations where natural recovery or recolonisation is unlikely. However, conservation translocations need to have clear goals from the outset and be very carefully planned and resourced.

The Vincent Wildlife Trust is currently carrying out conservation translocations of pine martens *Martes martes* from Scotland as part of its Pine Marten Recovery Project for England and Wales. This article describes the background to the project and discusses the long-term commitment and partnerships that are contributing to its success.

Introduction

The Vincent Wildlife Trust (VWT) has been carrying out research and monitoring of the pine marten for thirty years. After a long period of decline, pine martens are now making a good recovery across Scotland, but in England and Wales the numbers are so low that recovery is unlikely without intervention. Based on extensive data gathered over many years, the VWT's Pine Marten Recovery Project began in 2014. The long-term objective of the project is to help re-establish pine martens in suitable areas throughout England and Wales.

Feasibility study

Before considering translocations of pine martens, a feasibility study and background research was completed (MacPherson *et al.* 2014) in accordance with IUCN guidelines (IUCN 2013) and following the Scottish Code and Best Practice Guidelines for Conservation Translocations (National Species Reintroduction Forum 2014).

Habitat modelling, along with a database of reported pine marten sightings and other evidence, was used to identify a number of potential reinforcement regions. These are areas of predicted high habitat suitability in regions where reports

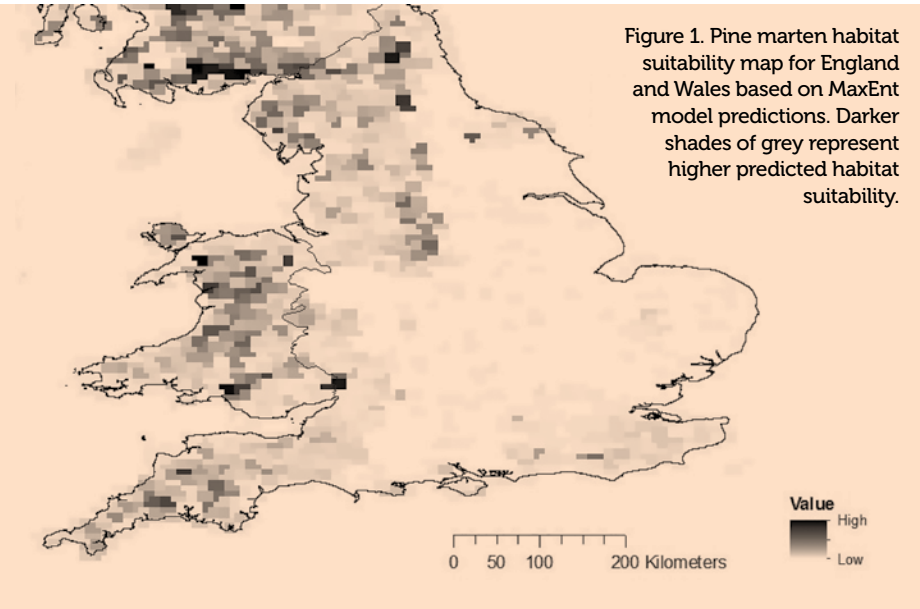

Figure 1. Pine marten habitat suitability map for England and Wales based on MaxEnt model predictions. Darker shades of grey represent higher predicted habitat suitability.

of recent sightings and other evidence suggest pine martens are still present albeit in extremely low numbers. For each of these regions, analysis was carried out of variables that are likely to have an impact on establishment and spread, such as woodland patch size, connectivity, and prey availability. Even a low rate of additional mortality (in addition to natural mortality) will increase extinction risk and jeopardise the establishment of a population while numbers are still small. Roads are likely to be a significant cause of additional mortality for pine marten populations. Therefore, the total length of roads in each potential reinforcement region and the percentage of those within woodland, combined with the annual volume of traffic, were used to evaluate the relative likelihood of marten mortality due to road traffic accidents.

The results of the feasibility study suggested that the large expanse of well-connected woodland throughout the Cambrian Mountains in central Wales provides a suitable habitat network with the potential to support a viable population of pine martens (Figure 1). The total area of woodland combined with the low density of roads and traffic in this region make central Wales ideal for conservation translocations of pine martens. This is also a region from which there is recent DNA-confirmed evidence of pine martens (in 2007 and 2012), so releases here constitute reinforcement rather than reintroduction.

Stakeholder and community engagement

Alongside the biological feasibility of translocations, it was essential to evaluate the social feasibility, and the potential human impacts and consequences of translocating pine martens to Wales. Effective and sustainable conservation, particularly of predators, needs the full support of local people (Linnell *et al*. 2010) and all groups should be listened to in a participatory process from the earliest stage. The results of a wide-scale public opinion survey suggested that the majority of people would be in favour of action to prevent the pine marten from becoming extinct in Wales. More detailed consultations with stakeholders and other land users in the prospective release areas were carried out in order to gauge local levels of support for the project and identify any specific issues (Figure 2). All the information gathered during this stage was used to inform the final decision regarding if and where releases should take place.

Field surveys

GIS data were used for the initial habitat suitability assessments followed up with ground-truthing of the results. The pine marten is a generalist predator and in Britain its diet includes small mammals, fruit and berries, birds, invertebrates and carrion. Pine martens preferentially den above ground in tree cavities, birds' nests and squirrel dreys, but they will also den in cairns, burrows, tree roots and brash piles. Extensive field surveys were carried out to evaluate both structural and species diversity of woodlands in the proposed release area, and to look at the extent of ground cover and denning sites and the availability of prey and other food.

Risk assessments, licences and landowner permission

As well as ensuring that the proposed release area was suitable and there were enough resources to support sufficient numbers of pine martens to establish a viable population, it was necessary to find a suitable source

Figure 2. One of the community consultation events that were held in villages throughout the release area. Photo credit Henry Schofield.

of animals for translocation. For any wild population, it is also important to assess the risk to the source population of removing individuals for translocation. Results of the population viability analyses, supported by experience from translocations of other *Martes* species elsewhere, suggested that, to maximise the likelihood of establishment, a minimum of 30-40 pine martens would need to be released into an area of woodland sufficient for this number of contiguous marten territories (c. 10,000 ha).

Wherever possible, wild-caught animals should be used for carnivore reintroductions because they generally show higher survival and better adaptation to new environments than captive-bred animals (Jule *et al*. 2008). The genetic provenance, morphology, physiology and behaviour of source populations should show similar characteristics to any remaining wild populations. Ideally, animals should be sourced from areas with similar prey species, competitors, predators and habitats because they have been shown to demonstrate higher rates of post-release survival and reproduction (Aber *et al*. 2013). A study comparing the haplotype composition of historical and current pine marten populations in England, Scotland and Wales found no differences between the main haplotype of contemporary (post-1950) populations across the UK (Jordan *et al*. 2012). Therefore, the increasing and expanding population of pine martens in Scotland was thought to be a suitable source of animals for translocations to Wales.

Field surveys were carried out to identify sites and source populations where the removal of two to four individuals at the end of the breeding season was unlikely to have an impact on population viability (based on site-specific marten density estimates and population modelling). Following initial discussions early in the project, formal applications were submitted to Scottish Natural Heritage (SNH) and Forestry Commission Scotland (the landowner) for the relevant licences and permissions to remove animals from these sites.

An essential element of the planning and preparation for any translocation is a detailed Disease Risk Analysis (DRA). When wild animals are moved from one place to another, there are potential associated disease risks: principally, that the animals will carry new parasites or pathogens with them that will cause harm to other animals or humans at the new location. There is also a risk that the animals being moved will encounter new diseases in the destination ecosystem and be harmed by these, or that the translocated animals will alter the disease ecology at the release location in some way. Disease risk analysis determines the extent of these risks, and the magnitude of any potential consequences, should they occur. The results can then be incorporated into the final decision of whether or not to proceed with the translocation. If the decision is to proceed, a mitigation strategy that is proportionate to the risks identified in the Disease Risk Analysis can then be designed and implemented.

The Disease Risk Analysis for the project was carried out by a wildlife health and veterinary consultant and specialist in wildlife population health. It was reviewed by a panel of experts in this field and then presented to a wider group of stakeholders in order to reach consensus on the disease risks associated with the translocation and appropriate mitigation measures.

The possible ecological roles that the translocated species will have in their new environment must also be considered, and care taken that the conservation interests of other species and habitats are not likely to be jeopardised by the translocation. An evaluation of potential impacts of pine martens on the conservation interests of other species already present in release areas was undertaken as part of the feasibility study and for a Habitat Regulations Assessment preliminary screening report. These documents, with the feasibility study, translocation and monitoring plan and the Disease Risk Analysis, were submitted to Natural Resources Wales in early 2015 in support of a formal application for permission to release pine martens on land that was owned and managed by them.

Capture, translocation and release

As part of the feasibility study and associated translocation plan, an assessment was made of the number, age class and sex ratio of individuals required to maximise the chances of the translocation achieving its goals. Capture methods, holding, transportation and release protocols were all designed to minimise stress to the animals and maintain the highest standards of animal welfare. The health and safety of the staff involved was also a major consideration.

In early September 2015, trapping, under licence from SNH, began in a number of areas selected as suitable donor sites. By September, young of the year are independent and adults have mated. Post-translocation releases were scheduled for late autumn when fruit is most abundant and small mammals are at their highest densities, and were completed well before February, when blastocysts implant.

Captured animals were initially evaluated in the trap and those that appeared to be

Figure 3. Pine marten leaving a soft release pen. © Nick Upton/naturepl.com.

Table 1. Summary of success criteria and target timescale for pine marten translocations to Wales.

Milestone	Target timescale	Progress
Have trapped, transferred and released 30-40 adult pine martens (equal sex ratio) at the first sites with no loss or injury	September to November (2015 and 2016)	39 adult martens (20 males, 19 females) translocated and released by October 2016
Post-release – animals using supplementary feeding and most remaining within 10 km of release sites	September to November (2015 and 2016)	All but 2 remained within 10 km; 1 male and 1 female have settled c.100 km and 44 km north of release sites
Evidence of successful breeding by at least some translocated females	March-June (2016 and 2017)	Breeding confirmed by 4 females in May 2016
Stable home ranges established and overall annual survival rates at least 70%	August (2016 and 2017)	Mortality of 6 martens (30% releases) by the end of August 2016
Survival of site-native young from year 1 and year 2	August (2017 and 2018)	Kits have been genotyped for non-invasive monitoring (scat, hair tube and camera trap surveys)
No evidence of a significant effect of removals on donor site populations 1-2 years post-removal	September 2017	Re-surveys of donor sites carried out in March 2016 and 2017
Establishment of site-native population	2019 onwards	
Production of second generation animals	2019 onwards	
Increase in population size in release area	2020 onwards	
Colonisation of surrounding suitable habitat and population spread	2025 onwards	

adults in good condition, and therefore candidates for translocation, were taken to a mobile veterinary unit nearby. Here the martens were anaesthetised by a wildlife veterinarian, given a full health check and samples (blood, hair and ectoparasites) were taken for further screening and surveillance. Animals not suitable for translocation (not of breeding age or a surplus of either sex) were released at their capture site after recovery. Pine martens selected for translocation were microchipped, the throat patch photographed for subsequent visual identification and a hair sample taken for genotyping. All animals were fitted with a radio collar incorporating a mortality sensor to monitor post-release survival. Larger animals were also fitted with a GPS logger (as seen in main image on page 32) to gather more detailed movement data. Combined collar/transmitter weights did not exceed 5% of the weight of the animal. Once the animals had fully recovered, they were transported to the release area overnight by road in a modified vehicle.

The release protocol itself was carefully considered to reduce stress and maximise post-release survival. The options were soft release, where animals are confined temporarily at the release site, or hard release, where they are released immediately on arrival. Soft release allows animals to acclimatise to a new site and recover from the translocation process before being released. It can also reduce any homing instinct and allow for the development of social relationships in some species. However, being kept in temporary captivity can induce additional stress and increase the risk of injury if animals try to escape.

Martens were all soft-released, as it has been shown that animals acclimatised to a release site in this way are less likely to move long distances following release (Davis 1983). Large (3.6 x 2.3 x 2 m), temporary, pre-release pens were constructed at release sites by staff from Chester Zoo, one of the project partners. Whilst in a pre-release pen, each animal was monitored remotely by camera for any visible signs of stress, including stereotypic behaviour or loss of appetite. Each pen held only one animal, and pens were located so that each male's pen was within 500 m of a female but at least 2 km (the approximate diameter of an average home range) from the nearest male. Pens were sited in large, open-canopy areas of woodland near habitats rich in voles *Microtus agrestis* such as rough grassland, and den boxes were put up within 50 m of each pen. After a maximum of seven days in the pre-release pen, the pen was left open before dark so the animal could find its way out during the night (Figure 3). No more than two animals were released on any one night. Supplementary food was provided at each release site for two to six weeks (as long as it continued to be taken).

Monitoring and adaptive management

Significant amounts of time, money and effort go into planning and conducting translocations, including consideration of the ethical and welfare considerations of the released animals. Therefore, it is important to establish clear criteria for both short- and long-term success, and to monitor what happens after the translocation. Some of the success criteria for the VWT project are summarised in Table 1.

If a translocation results in establishment, followed by reasonable population growth and long-term persistence, then further intervention may not be necessary, although long-term monitoring is critical to check for unexpected problems. Alternatively, if monitoring reveals low post-release survival and low population growth, then further action may be needed to achieve establishment and long-term persistence. This might include refining the translocation protocols and release site selection for future translocations and further "top-up" translocations. Finally, if a translocation fails, it is essential to know when and why it failed in order to establish what else

Figure 4. David Bavan and Josie Bridges locating one of the radio-collared martens. © Nick Upton/naturepl.com.

could be done to increase the likelihood of success before deciding whether further translocations should be attempted.

Twenty pine martens (ten male and ten female) were translocated to mid-Wales and released in autumn 2015, with a further ten males and nine females between September and early October 2016. Following release, all the animals were intensively radio-tracked (Figure 4) until they had established home ranges, after which they were located daily and then weekly. From the following March onwards, there is a further period of intensive radio-tracking to locate denning sites of breeding females. Hair tubes and camera traps are also used to monitor breeding success. In the first year, we were able to confirm that at least four females successfully reared kits. Pine martens are re-captured approximately 10-12 months after release to remove radio collars and check the animals. So far, all have been in good condition at re-capture.

Lessons learned and the way forward

The Vincent Wildlife Trust and partners continually review the translocation process to determine if protocols can be refined or improved. All mortality is monitored and carcasses are retrieved immediately and sent for post-mortem as part of an ongoing health surveillance programme. Six martens died during the course of the year following the first releases. The cause of death for four martens was natural (likely fox *Vulpes vulpes*) predation; however, two martens died just two weeks after release of an acute fungal encephalitis not previously seen by the wildlife pathologist who performed the post-mortem examinations. Likely sources for the mould could have been natural vegetation in release pens, or uneaten food items. These two martens were among the last translocations, in late November 2015, when wet conditions were optimal for fungal growth. In response to this, the translocation window was shortened in 2016 to ensure that all animals were released by the beginning of October. Hiding food items in the enclosures as enrichment was also discontinued and all uneaten food was removed each day. There have been no recurrences of the fungal encephalitis at the time of writing (January 2017).

Research is key to improving the science of reintroductions and translocations. It has been suggested that this has been a missed opportunity in many past reintroductions. In future, the best progress will be made by multidisciplinary teams of resource managers and scientists working in close collaboration. The Vincent Wildlife Trust, in partnership with the University of Exeter, has a rigorous programme of research associated with the Pine Marten Recovery Project. This is focussed not only on the ecology of the translocated animals, but also on other species at the release sites as well as the socio-economic impacts of the project.

Engagement with communities in the project area continues and, in addition to attending events and meetings, many local volunteers are directly involved in the project by radio tracking the martens, monitoring camera traps and providing assistance in the field. Ultimately, this local support will be as important to the long-term survival of pine martens in the Welsh Cambrian Mountains as the science that underpins the project.

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Pearls in Peril – Conserving and Reintroducing Freshwater Pearl Mussels

Keywords: Atlantic salmon, encystment, glochidia, Margaritifera margaritifera, river restoration, trout

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Freshwater pearl mussels *Margaritifera margaritifera* are one of the longest-lived invertebrates in the world and are critically endangered in Europe. The Pearls in Peril LIFE+ project has been working since 2012 to improve conditions for pearl mussels in 21 Special Areas for Conservation in Scotland, England and Wales. A range of techniques have been employed to restore suitable habitat, as well as reintroduce and reinforce the species in river reaches where it has become scarce.

Introduction

The Pearls in Peril (PIP) LIFE+ project is a four and a half-year initiative, led by Scottish Natural Heritage, that is raising awareness of the freshwater pearl mussel in order to secure and conserve our most important remaining populations (Figure 1). The project aims to improve riparian habitat, undertake in-stream habitat restoration, raise awareness of wildlife crime and restore some populations by moving larval pearl mussels.

Freshwater pearl mussels have a complex and long life cycle. In the summer, female pearl mussels release millions of microscopic

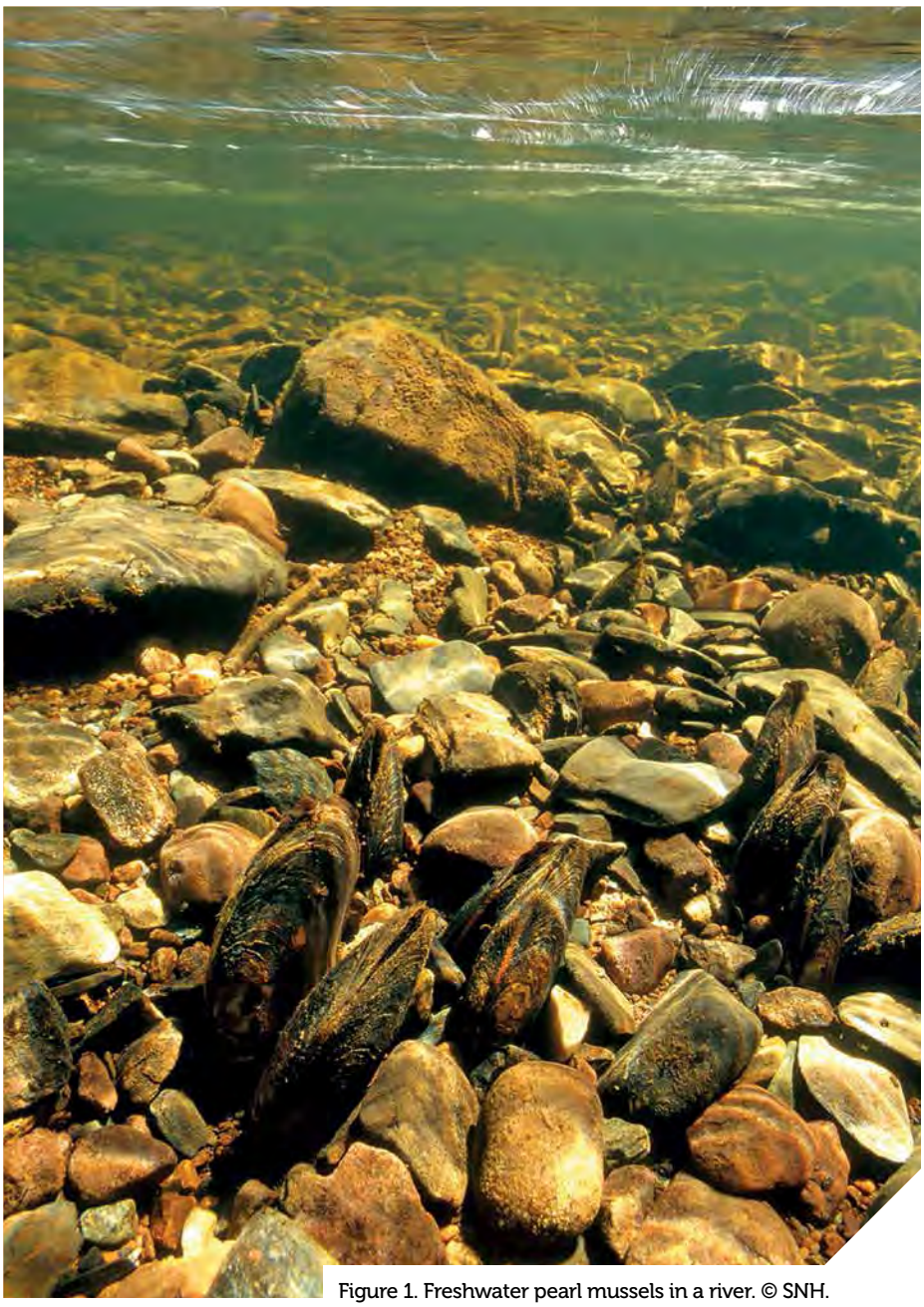

Figure 1. Freshwater pearl mussels in a river. © SNH.

larvae, called glochidia, into the water column. In order to complete the first stage of their lifecycle these glochidia must attach to the gills of a young Atlantic salmon *Salmo salar* or brown trout *S. trutta*. The glochidia may preferentially use a salmon and/or a trout as the host, depending on the preferences of particular populations. The glochidia grow harmlessly on the fish gills over the following winter. The following spring, the glochidia drop from the fish's gills and attempt to establish on a suitable clear gravel or coarse sand area of the riverbed. They can take 12-15 years to reach sexual maturity and can live for 100 years.

Due to pressures such as pearl fishing, river works and pollution, pearl mussels have declined or become absent from many rivers in Britain. In many cases, the juvenile mussels struggle to survive to adulthood, resulting in populations that are dominated by increasingly old adult animals. These aging populations often die out over time as a consequence. The species has declined globally by 61.5% and by 87% in Europe (Moorkens 2011). It is estimated that the freshwater mussel is now present in just 5% of its former range compared to the beginning of the 20th century (Mollusc Specialist Group 1996). Despite recent improvements to freshwater environments in the UK, the demanding water quality requirements of pearl mussels (Skinner *et al*. 2003) mean that problems persist for the species, with population losses continuing (Watt *et al*. 2015). This article describes a range of techniques being used to help restore several of our struggling pearl mussel populations.

Artificial encystment

The Pearls in Peril project includes work to help reintroduce and reinforce pearl mussel populations in areas where very few individuals were left but where negative impacts have been, or are being, addressed. A range of translocation techniques can be used, including moving adult mussels, rearing juveniles in captivity, and infecting wild or hatchery reared fish. The success of these techniques has recently been reviewed by Killeen and Moorkens (2016). Within the PIP project, techniques first developed in Germany (Altmüller and Dettmer 2000) have been adapted to devise a protocol for artificially encysting wild fish in the UK.

Figure 2. Well developed glochidia under the microscope. © Freshwater Biological Association.

The first step was to determine when gravid female pearl mussels were about to release their glochidia. Starting in July, and working under a protected species licence from Natural England or Scottish Natural Heritage, a small number of pearl mussels were examined to determine if there was development of any glochidia. The pearl mussel shells were opened using specially designed tongs and the mussel's gills were either examined directly by eye or an otoscope was inserted to allow the surveyor to identify if glochidia were present, evidenced by a pale creamy, brown colour on the mussel's gills. A small sample of glochidia was collected from inside the swollen gills using a syringe and needle. Trained staff carried out the work carefully to ensure no harm came to the pearl mussels.

Five stages of glochidial development have been identified (Scheder *et al*. 2011) allowing the best date for undertaking artificial encystment to be estimated as the glochidia progress through these stages. Only a very small number of pearl mussels need to be checked at any one time as the individuals in a population in a particular river tend to release their glochidia at the same time (Degerman *et al*. 2009).

Glochidia were sampled approximately every two weeks and when fully developed glochidia were seen, and were actively "snapping" (the shell valves were opening and closing) under the microscope, this indicated that their release was imminent (Figure 2). At that stage the glochidia were collected, under licence, by placing a small number of adult mussels in a bucket of river water. After a few minutes, as the dissolved oxygen concentration dropped and the temperature rose, the female mussels were induced to release their glochidia into the water. After the glochidia were released the adult mussels were returned to the river unharmed.

The glochidia were then transported, if necessary, to the donor location. During transportation, the water had to be kept cool and aerated to ensure the glochidia remain viable. At the donor site, juvenile salmonids were collected using standard electrofishing techniques (e.g. Scottish Fisheries Co-ordination Centre 2007). These fish were held in an aerated holding tank into which the glochidia had been introduced. The enclosed nature of the tank maximised the potential for the glochidia to attach to the gills of the fish. In order to ensure that the fish did not receive too high a glochidial load, fish were left in the tank for only a few minutes. The fish were carefully removed using nets and returned to the river. The process was repeated throughout the day in order to maximise the number of fish carrying glochidia.

This work has taken place over two to three years at three rivers so far. At this relatively early stage (in the lifecycle of such a slow growing animal) it is not possible to confirm that the work has resulted in increased production of juvenile pearl mussels as the mussels are still microscopic when they excyst from the fish. However, fish carrying heavy glochidial loads have been recorded in areas where adult pearl mussels are scarce, perhaps indicating this work has been a success. With the right habitat conditions, evidence suggests that this approach can ultimately help populations re-establish.

Host fish surveys

An important pre-requisite is to confirm the host salmonid species before artificially encysting glochidia to wild fish (of relevance to many other reintroduction efforts for pearl mussels). Although freshwater pearl mussels can use Atlantic salmon and/or brown trout, the specific host fish species can vary between rivers. A straightforward identification of the host species can be made when the glochidia have formed small characteristic white cysts on the fish gills, which are obvious to the naked eye in spring time (Figure 3).

In order to identify the host species, junvenile salmonids were collected using standard electrofishing techniques. When doing this work during spring, care needs to be taken not to disturb any salmon or trout redds in the river. The fish were anaesthetised and the operculum was lifted with a blunt instrument so that the exposed gill filaments could be examined for the presence of encysted glochidia. Care was taken not to make contact with gill filaments or gill arches in order not to damage host fish. Only the most anterior gills were visible and, therefore, counts of glochidia were probably an underestimate.

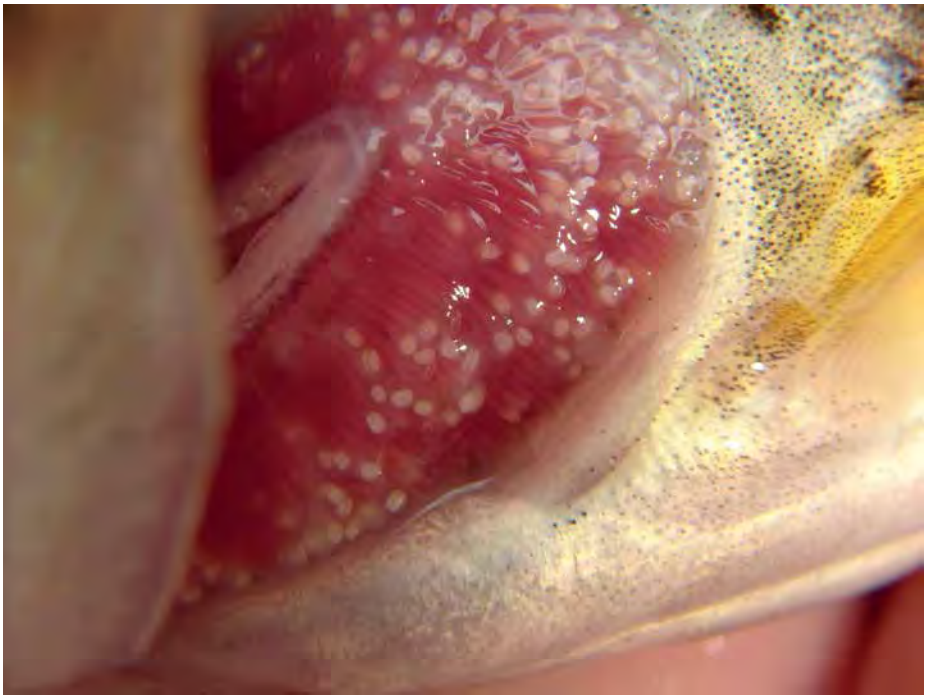

Figure 3. Glochidia (white spots) on salmonid gills. © Jon Watt/Waterside Ecology, SNH.

Of the four rivers where host salmonid species were confirmed within the PIP project, the pearl mussels were found to be utilising brown trout in two rivers and Atlantic salmon in two rivers. This reflects recent findings elsewhere in Scotland. The reason behind the host specificity is unclear but it is thought to reflect local adaptation.

Figure 4. Clean gravel being seeded into the Afon Eden SAC. © Natural Resources Wales.

Habitat restoration

The importance of understanding host specificity has been of particular importance in some of the habitat restoration works during the PIP project. In Wales, on the Afon Eden Special Area of Conservation (SAC), surveys showed that not only are brown trout the local host fish species but that they were also the least abundant salmonid species in the catchment. To tackle this important issue the Pearls in Peril project restored 2.4 km of riverbed habitat, particularly targeting reaches that could provide spawning areas for trout. This work included placing locally sourced, clean gravels in tributaries (Figure 4) and placing large boulders with woody debris in the main river.

Elsewhere, hard bank protection works that have been contributing to poor riverbed habitat for pearl mussels have been removed. In the River Ehen SAC in Cumbria, in river reaches where boulder protection has been removed or has deteriorated, softer techniques including willow spiling has been used as an alternative. Willow spiling is a technique where live willow rods are woven between live willow uprights driven into the bank of a river. This has resulted in improved instream habitat (by controlling fine sediment erosion) and has helped to

Figure 5. Croys being dismantled on the River Dee. © River Dee Trust.

prevent the loss of valued neighbouring farmland. In addition, sections of willow spiling can be used subsequently as a local source of further willow rods. When rods are being harvested any necessary maintenance can be done, helping to ensure the river bank's longevity.

Despite the difficulties of measuring the benefits of restoring river and riparian habitats to a long-lived and slow-growing animal like the pearl mussel, some successes have been quantified already. Around the Afon Eden SAC, drainage ditches have been blocked and settlement ponds constructed on an 88-ha former forestry block that is being restored to a wetland. The success of these actions has been monitored in the Afon Eden by measuring the loss in redox potential in the surface layers of the riverbed near the former forest block. This technique measures the quality of the riverbed habitat for pearl mussels (Geist and Auerswald 2007). In 2013, prior to the restoration work, redox results at eight locations in the river indicated conditions were too poor to support juvenile pearl mussels. By 2015, after the works were complete, only one site remained unsuitable.

Other interventions have included the removal of redundant deflector structures that had been installed in the past as an attempt to enhance habitat. However, they have instead acted as partial impoundments, preventing the maintenance of naturally diverse river habitat. In the River Dee SAC in Grampian several such structures constructed from large boulders have been disrupted and the boulders distributed in the main river channel to restore the diverse habitat required by pearl mussels. The importance and value of good design and build in such a large river was evidenced by the fact the restored reaches survived near-unprecedented floods during early 2016.

In the upper reaches of the River South Esk SAC in Angus nearly 1 km of boulder bank protection was removed by the PIP project during 2015. Since then the river channel has widened in many places and increased the availability of salmon spawning and juvenile habitat. This area represents the current upstream limit for pearl mussels, which rely on salmon as their host. The changes will help support pearl mussel recruitment by increasing the availability of their hosts, as well as improving habitat. The work in the South Esk and River Dee has also included substantial riparian woodland creation, extending along more than 80 km of riverbank, to provide shade, reduce erosion and reinstate characteristic vegetation communities (Figure 5). In future years, as the benefits of these changes take effect, it is envisaged that pearl mussels may be translocated upstream to help reinforce the outcomes of the physical restoration work. Such restoration actions will also help to buffer the pearl mussels and their habitat against future extreme weather events, including low flows, elevated temperatures and flooding.

Further conservation translocations and actions

Future pearl mussel translocations to reinforce the outcome of habitat restoration measures will need to be carefully planned. Recent guidance and information such as the IUCN and Scottish translocation guidelines (Hollingsworth and Gaywood 2015) will be an important source of advice. In addition, reviews of past pearl mussel translocations will be important reference documents (Killeen and Moorkens 2016, Watt *et al*. 2017).

More generally, the experience of the PIP project reinforces the need to understand the habitat and ecological requirements of pearl mussels, particularly their host specificity. By working to improve the conservation of pearl mussels, and because of the pearl mussel's extremely demanding habitat requirements, river restoration actions for the species will also benefit biodiversity in general. Similarly, many of the recognised methods for restoring rivers, such as those recently published by the IUCN (Addy *et al*. 2016) will help further the conservation of pearl mussels.

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The authors would like to acknowledge the extremely wide partnership that has implemented the Pearls in Peril LIFE+ project. It is co-funded by 22 organisations across Britain and the European Commission and has received great support from partners, stakeholders and many volunteers. More information is available from the PIP website at www.pearlsinperil.org.uk.

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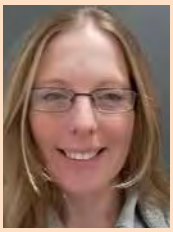

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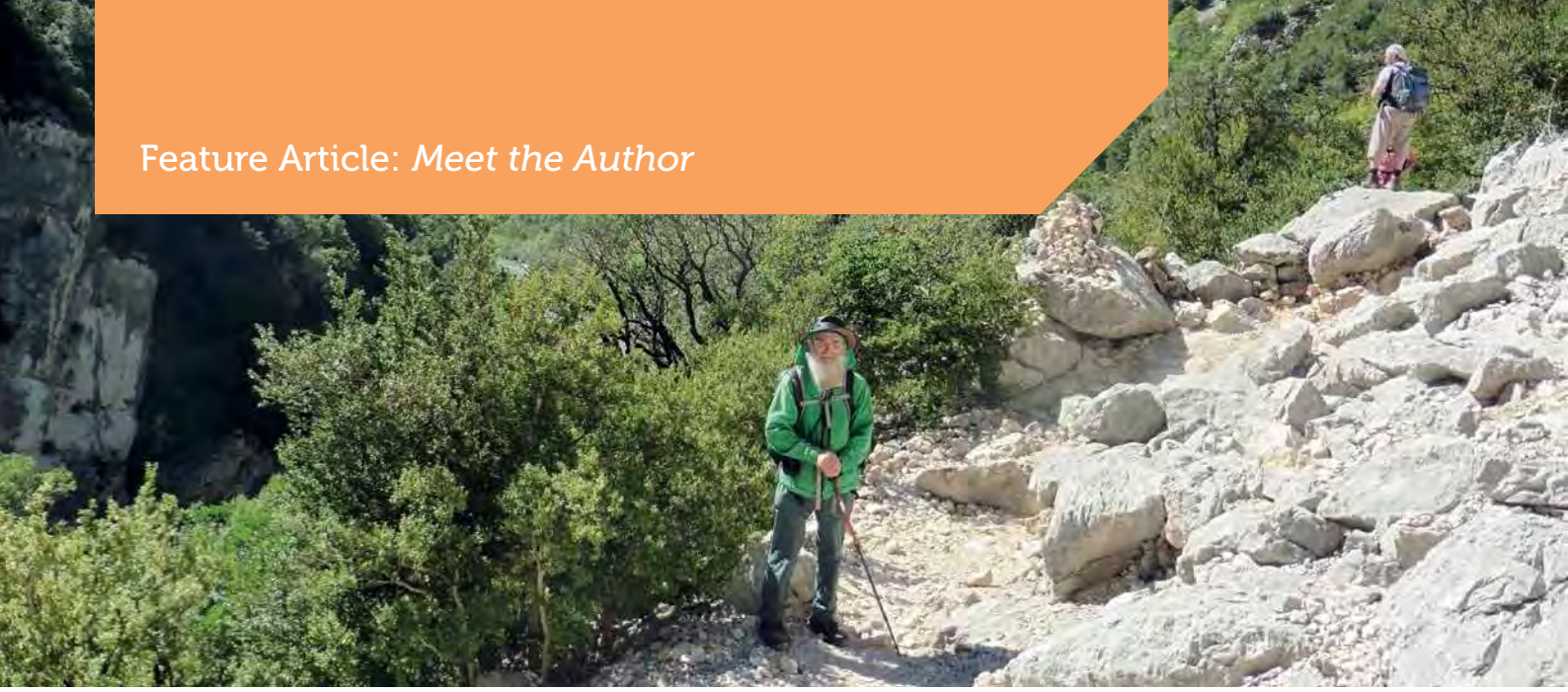


Meet the Author – Keith Kirby

What do you do?

After 33 years as a woodland ecologist with the conservation agencies I am officially retired, but have a loose association to the Department of Plant Sciences in Oxford as a visiting researcher.

What or who first inspired you to make a career in ecology or environmental management?

David Attenborough's Zoo Quest series in the 1950s set me off on wanting to do something with wildlife. My biology master encouraged an interest in natural history, while my maths master, Bill Dawkins, had a small new wood growing Christmas trees; my first 'job' was weeding these at weekends.

How did you get to where you are today?

I did Agricultural and Forest Sciences at Oxford and a D.Phil on bramble growth, which left me unemployed. A letter to the Lake District National Park got me taken on as a temporary woodland surveyor, then another temporary post with the Nature Conservancy Council. The permanent post as woodland ecologist came up and I managed to get it.

What have been the most important steps along the way?

During my subsequent career I had to maintain links and (I hope) credibility with research, practitioner and policy sectors which meant becoming aware that each of these communities has their own valid but distinctive perspective.

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

For specialised posts a relevant degree and post-graduate qualification may be required, but good technical skills, an ability to get on with people, and evidence that you can deliver work on time are attributes that will be valuable in a wide range of situations.

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

If you want to influence how land is managed some knowledge/experience of the practical factors (ownership, economics, weather, regulations….) that determine what gets done can be as useful as the sorts of ecological insights you get from a Ph.D or MSc course. Look at *Farmers Weekly* regularly as well as *Journal of Ecology*!

What was the best thing about your job?

It was the variety, e.g. from advising a local landowner to contributing to a parliamentary committee, with the chance also to keep some research projects going. And seeing situations where you could say you had made a positive difference to conservation.

What's the downside?

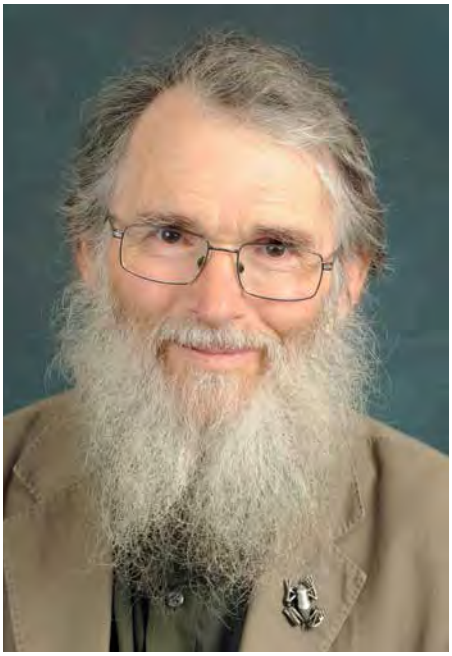
As the conservation sector has got bigger and more influential (it really has!), opportunities for an individual to work through a project on their own have declined. There is less chance to feel personal responsibility for achievements.

What's next for you?

Working through various sets of long-term ground flora data to assess change in woodland assemblages.

What is your top tip for success?

Be prepared to listen and help others; you never know when you will need to call in a favour.



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Wind turbines. © David Kilbey.

Data Reliability, Data Provision, Professional Judgement and Assessing Impact Assessment for Planning Purposes

Tim Reed MCIEEM
Tim Reed Ecological Consultants

1. Introduction

The reliability of ecological material used for planning purposes is fundamental (Thompson *et al*. 2016, CIEEM 2016). For Planning Authority and third party assessment of development proposals, it is critical that methods are suitable, are as claimed, are supported by detailed data, and can be assessed by independent scientists (Cherrill 2015, Thompson *et al*. 2016, CIEEM 2016).

Problems with data reliability are not just a UK issue. Larsen (2016) noted that rapid assessment surveys are very variable, lacking minimal best-practice standards, meaning that they cannot be used to track sustainability and delivery of claimed no-net-impact objectives.

The CIEEM (2016) review on pragmatism, proportionality and professional judgement set out some of the basic tenets. Whilst noting the 'subliminal' approach sometimes used, they emphasised the need for justifying and demonstrating how a judgement was arrived at. Where clarity and transparency are especially critical, such as in public inquiries, reasoned arguments need backing with adequate evidence. If one or both are missing, there are problems in assessing a planning application.

Thompson *et al*. (2016) and CIEEM (2016) looked at the list of good practices expected by CIEEM. They form the basis of this current short review of methods, material and interpretations presented in planning applications for a range of sites, assessed on behalf of planning authorities and third parties.

Thompson *et al*. (2016) saw clarity and objective reporting as the basis for all reports – supported by clearly expressed limitations, reasons for variance from standard methods, clarity on the use of professional judgment, and explanatory support for the report's conclusions.

Adequate, properly reported, desk searches are a basic requirement of expected standards. The suitability of claimed survey methods is essential: these should be stated, and the data made available. Often, departures from standard methods are unsupported by cogent professional justification (CIEEM 2016). Most reports have senior CIEEM member sign-off and this should act as a quality check.

Thompson *et al*. (2016) were concerned about the absence or inadequacy of analyses (or data), and unjustifiable conclusions. Within the planning process, selective data interpretation or inclusion, and unsupported assertions, add to the difficulties of over-stretched planning staff attempting to provide professional scrutiny at times of diminishing resources. Missing data do not help third party evaluation.

Here I look at the data, methods and claims made for a range of site proposals for planning purposes. Most were renewable energy developments (wind turbines), but included transport service areas, housing and intensive chicken farms and the main focus was birds and bat species. In some cases, reptiles and invertebrates were also covered. Cases are anonymised.

2. The Data: Background Information

Every planning application should be accompanied by appropriate ecological information for the site. This allows a Planning Authority and the public to assess potential impacts of a proposal. The suitability and probity of the information is fundamental.

CIEEM (2016) expects sufficient information to be provided such that experienced ecologists with no connection to, or experience of, the project can understand the professional judgements made in reaching conclusions, especially where good practice guidelines are quoted for each survey type. Deviations from the guidelines must be clear and capable of robust justification.

For 17 sites the methods used, data provided, and conclusions reached were examined for birds (15 sites), bats (15 sites) invertebrates (1 site: 2 separate surveys), reptiles (2 sites), as well as accompanying Phase 1 survey data (JNCC 2010). All sites were in England and submitted for planning approval between 2010 and 2015. In all but two cases, the qualifications of at least the surveyor/report author and signatory included membership of CIEEM. One case lacked authorship and sign-off details.

For applications involving wind turbines the standard for bats was Hundt (2012), and for birds Natural England's TIN069 (2010). For other types of development (housing, motorway service area, chicken sheds) and taxa/groups the planning applications stated the methods used. All stated the use of standard methods in site Environmental Statement (ES) reports.

3. Methods

For all 17 sites, the following topics were examined in each ecological chapter/ section: the objectives, methods stated, the data presented and supporting data, and the conclusions reached. In line with

Site no	Group	Proposed development	Limitations recognised & stated Y/N
1	Bats	Housing	N
2	Birds	Wind Turbines	N
3	Bats	Wind Turbines	N
4	Birds	Wind Turbines	N
	Bats	Wind Turbines	N
5	Bats	Wind Turbine	N
	Birds	Wind Turbine	N
6	Birds	Wind Turbines	N
	Bats	Wind Turbines	N
7	Bats	Wind Turbines	N
	Birds	Wind Turbines	N
8	Birds	Wind Turbines	N
	Bats	Wind Turbines	N
	Reptiles	Wind Turbines	N
9	Birds	Wind Turbines	N
	Bats	Wind Turbines	N
10	Birds	Wind Turbines	N
	Bats	Wind Turbines	N
11	Birds	Wind Turbine	Y/N
	Bats	Wind Turbine	Y/N
12	Birds	Chicken sheds	N
	Bats	Chicken sheds	N
13	Birds	Wind Turbine	N
A	Bats	Wind Turbine	N
14	Birds	Wind Turbine	N
15	Birds	Wind Turbines	N
	Bats	Wind Turbines	N
16	Birds	Service area	N
	Birds	Service area	N
	Bats	Service area	N
	Bats	Service area	N
	inverts	Service area	N
	Inverts	Service area	N
	Reptiles	Service area	N
17	Birds	Wind Turbines	N

	Data available?	Comment
	N	Serious methodological problems; claims on methods & data unsubstantiated. Data sources break NBN policies.
	Partially	Methodological issues; limited data; limitations not recognised or justified. Collison Risk (CR) calculations unsafe.
	N	Methodological issues & data amalgamated from different years.
	N	Major methodological issues; limitations not recognised & claim of "data accurate" unsafe. Data missing.
	Partially	Partial data set; no recognition of methodological problems; data "within acceptable parameters"– not defined.
	Partially	Partial data availability; no recognition of serious methodological constraints on sampling & data collection or analysis.
	N	Desk surveys missing; no field surveys; reliance on inappropriate data source.
	Partially	Partial data availability; major methodological issues unrecognised; CR results unsafe & data missing.
	Partially	Partial data availability; major methodological limitations not recognised.
	Partially	Partial data availability; major methodological limitations not recognised.
	Partially	Partial data availability; major methodological issues unrecognised; CR results unsafe & data missing.
	Partially	Partial data availability; Collison data & CR estimates unsafe; professional judgement stated but unsubstantiated.
	Partially	Partial data availability; methodological issues; estimates unsafe; professional judgement stated – unsubstantiated.
	Y	Methodological issues not in line with claims.
	N	No field surveys; partial data lists; Phase 1 not a bird technique – wrong season.
	Partially	Phase 1 & desk survey; unsuitable to state no limitations; no field data; some limits to approach noted.
	N	Phase 1 & desk survey; unsuitable to state no limitations.
	N	Phase 1 & desk survey; unsuitable to state no limitations.
	N	Major methodological issues; data missing. CR unsafe. Data stated as "adequate" – no supporting material.
	N	Serious methodological issues; claim data good enough to "inform" assessments – unsubstantiated.
	N	Serious methodological issues; no data provided; no recognition of limitations. Bird survey methods unknown.
	N	Serious methodological issues; no recognition of limitations. No known bats survey methods used.
	N	Serious methodological issues; no species data; no numeric data; limitations not recognised.
	N	Serious methodological issues; no species data; no numeric data; limitations not recognised.
	N	Limitations of actual data not recognised; mis-use Bright *et al.* (2009).
	N	Major methodological issues; data are for a different site; limitations not recognised.
	N	Major methodological issues; data are for a different site; limitations not recognised.
	N	Serious methodological changes unsupported; limitations unrecognised. Data missing.
	N	Serious methodological problems; limitations not recognised; not in line with BS42020 as claimed.
	N	Serious methodological problems; claims on data set unsupportable. Data missing; limitations unrecognised.
	N	Serious methodological problems; claims on data set unsupportable. Data missing; limitations unrecognised.
	N	Serious methodological problems; data missing; limitations unrecognised.
	N	Serious methodological problems; limitations unrecognised; data not comparable between years; data missing.
	N	Serious methodological problems; data missing; limitations unrecognised.
	N	Serious methodological issues; full data sets not available; CR results unsafe. Limitations not acknowledged.

Thompson *et al*. (2016) and CIEEM (2016) note was taken of:

- CIEEM membership grade of author/ fieldworker and counter-signatory;
- stated standard(s) used for birds, bats, or other taxa;
- whether the standards were applied as claimed, and where there were errors/ differences from the standard, and what these were;
- whether any differences or limitations to the surveys undertaken were recognised, if these were discussed or justified in the text, and how these affected the data and conclusions in the report;
- whether professional judgement was claimed as the basis for variation, and was backed up with details and explanations, and if this was consistent with the claimed standard;
- whether the data from surveys were presented in tables or appendices in sufficient detail, for third party assessment;
- whether the data collected were suitable for the estimates of population impacts, such as in estimating bird collisions at wind turbines;
- whether appropriate statistical analyses had been undertaken in support of claims or conclusions for impacts on various species; and
- whether the overall conclusions of the reports could be justified based on the approach, materials, justifications, or data provided in the application.

4. Results

4 .1 CIEEM membership and authorship/sign-off

In all but one case authors were CIEEM members. This applied also to sign-off.

4.2 Standards

Whilst at least half of bird and bat cases mentioned the appropriate standards, many then stated that surveys were *"based upon"*, *"adapted from"*, *"designed with reference to"* or *"within acceptable parameters"*, but without showing how, or if, this affected the data collection or results. In practice, survey limitations were not recognised. None were consistent with BS 42020 (BSI 2013).

4.3 Application of standards

If claiming use of the appropriate standards, it would be expected that they were applied. If not, there should be clear supporting rationales for variations. In all cases, there were clear unsupported differences from standards, sufficient to affect the reliability of the data set.

For birds, differences included:

- incorrect months for surveys;
- incorrect total hours of Vantage Point (VP) surveys for potential wind farm areas (with sometimes large errors, especially for raptors);
- geographic mis-coverage;
- absence of winter data, incorrect seasons;
- placing of VPs within wind farm boundaries (without assessing the consequences of this);
- failure to apply Common Bird Census or other techniques as claimed;
- multiple cases of data omissions; and
- repeated mis-matches between data collected and data entered in Collision Risk (CR) calculations.

For bats, differences included:

- major errors in desk searches;
- large gaps in seasonal coverage;
- weather effects ignored;
- mis-location of recorders;
- data missing or only in summary form; and
- unsupported assertions of professional judgement.

4.4 Recognition of differences or limitations related to claimed standards

Thompson *et al*. (2016), CIEEM (2016) and British Standards Institute (BSI) Biodiversity Standard BS 42020 (2013) require that departures from standard methods are recognised, and reasons presented and justified. This requires clearly presented limitation sections, or identifications of constraints. Ten of the 15 bird cases omitted recognition of limitations, including one that stated *"the data provided... is accurate"*, without stating why, or how, and contradicted by their field methods.

Sites that did discuss possible effects included statements such as: *"no significant gaps"* for a site with major methodological shortcomings, and a site where *"no significant limitations to the assessment were encountered"*; this site made year-round value judgements on a single April Phase 1 visit and limited desk data.

For bats, in 10 out of 15 reports no limitations or constraints were noted. In the remaining five cases, comments included *"no significant constraints"*. None were supported by suitable material or justifications.

4.5 Justification and report conclusions

For the 10 cases where bird methods were based upon, or adapted from, wind turbine guidance TIN069, or other documents, but did not apply them, there was no justification or discussion of the implications of non-application. These included two cases where the geographical risk categories in Bright *et al*. (2009) were used as the basis for not surveying – whilst not understanding the meaning of that study. Others based year-round conclusions from single out-of-season visits, or on desk data that TIN069 recognised as anecdotal and unsuitable for use.

Hundt (2012), the standard bat reference cited by most bat studies, is explicit on needing justification when departing from the standard. As so few cases recognised any form of limitation, it was unsurprising that justifications were rare. One case stated that *"all surveys were carried out within acceptable parameters as outlined in the guidance"*. Hundt (2012) was the guidance, but how acceptability was defined was not clarified.

For the two invertebrate cases the position was similar: claims were made without justification, and contrary to the data provided and to the standards apparently used. For the two reptile surveys justifications were inconsistent with the stated objectives and standards cited.

4.6 Professional judgement and standards used

Only in two of the cases was professional judgement mentioned: for birds and bats on the same site. In both, the scale of deviations away from the standards were not agreed in advance, nor were the variations justified in the documents submitted with the planning application. In both cases, the data needed to evaluate claimed judgements were also deficient.

In all other cases, variations from claimed standards were made, with few attempts to explain the changes, or their impacts on the conclusions for the proposed development's impacts.

4.7 Data, details, and evaluation

All data for surveys and statistical calculations should be available as tables, detailed appendices, or as downloadable data sets. No bird or bat data were readily available, some ES omitted all data and for the invertebrate sites, detailed numeric data were omitted. In one of the two reptile cases no data were tabulated.

For birds, most of the missing data were critical to impact assessment, such as collision risk (CR) estimates, to assess potential wind turbine impacts. Missing data and methodological problems meant it was impossible to evaluate claimed levels of impacts. The same applied to other taxa.

5. Discussion

If the material in an ES forms the basis for planning decisions, it must use correctly carried out desk and field surveys, supported by all appropriate data.

There was no recognition of any limitation to the desk searches for bats, even when the search distances were incorrect and not reported in full. Most desk search data lacked quantification, dates, and distances for species records. TIN069 is very clear on the essential anecdotal quality of bird desk study data, and the need for full disclosure, so that *"the basis for any conclusions is clear and subject to scrutiny"*. SNH (2005) is equally clear. Recurrent failure to provide data is not in line with CIEEM standards or BS 42020, and precludes assessment of the site. In one case the bat data were taken directly from the NBN Gateway, not from the Local Record Centre (LRC) – breaching licence conditions (Thompson *et al*. 2016).

Normally, a Phase 1 survey forms the backdrop for understanding the site. Along with photographs (absent from many documents), Phase 1 surveys provide a habitat baseline. The reliability of the Phase 1 surveys is uncertain. Cherrill (2016) noted misidentification of habitat types in some 20% of reports over a 5-year period. Forty percent of those who reported errors suggested that this had led to inaccurate initial site assessments, and in some cases this led to biodiversity loss.

Noctule bat.

The use of Phase 1 visits for other biodiversity elements is also a concern. For example, an early March Phase 1 field visit in northern England was used to determine the year-round value of the site for birds. Undertaken two months too early for botanical purposes (JNCC 2010), the report omitted the route walked, time, methods (other than noting recording of incidental observations), yet felt safe to conclude that the site would not support significant local bird populations. The report omitted desk search data, but stated it was produced with reference to BS 42020. It failed to meet the requirements of BS 42020 for openness and transparency.

Thirty-three percent of the ES documents used Phase 1 for assessing the value of the site for birds. One site relied solely on Bright *et al*.'s (2009) bird sensitivity map for bird records, rather than undertaking a desk search. Data in Bright *et al.* (2009) are at least seven years old, and shown at an inappropriate resolution for individual site examination; this was not recognised as a limitation.

Data in a report should be for the *actual* site under discussion. In one case, the Phase 1 survey was the only element that related to that site. All desk and other field survey data came from a site 800 m away. As the report omitted any formal assessment of limitations, its unreliability was not obvious to any cursory review of the planning submission.

Reports either stated the use of a standard for field surveys, and then departed from this in practice, or claimed that standard methods were used without specifying which methods. In two cases, it was stated that methods were *"designed with reference to"* Hundt (2012) and that *"standard methods have been used"*. Both cannot be right; neither was. Both had significant spatial and temporal departures from Hundt (2012).

Most reports either omitted limitations, or included foreshortened discussion of methodological or related issues, and stated for example that the *"results are…. representative at the time of surveying"*

without support or clarification. Others stated data as *"accurate"*, or without *"significant constraints"* – whilst omitting any explanation, and contrary to a detailed examination of the surveys undertaken.

One study used nine nights that were on average 26.2 hours long to estimate bat pass rates, yet contended that errors were unimportant. Other bat data were also in error. On the same site, the bird Vantage Point (VP) was at the bottom of a sharp slope (personally checked by field inspection) – obscuring the site. These unsafe VP data were used in collision estimates and impact assessments. The same study refused to apply TIN069, without acknowledging or justifying these departures, apart from stating that the risk of fatigue from over-long VP sessions that TIN069 explicitly blocks *"is simply not true"*.

CIEEM (2016) noted the need for close scrutiny and a critical assessment of ecological evidence and information submitted to consultees. Consultees assume that the data, methods, and processes in an ES are correct, especially as authors/sign-off signatories are CIEEM members. Consultees are typically overstretched, making it hard to validate ES statements, especially if data are missing or over-summarised. Data should be trustworthy.

Thompson *et al*. (2016) noted that ES data analyses are commonly based on few or insufficient data, and often, as indicated above, they are not supported by full data sets.

Where data are provided, it is often possible to controvert claims. For example, both invertebrate surveys stated they *"were in line"* with Drake *et al*. (2007). Neither met the stated objectives, survey times for individual groups were unsuitable, spatial coverage was incomplete, different groups were surveyed in different years – the adding together of data from two years raised more questions than the study answered. Most numeric data were missing. Statistical examination of data contradicted claims. Nonetheless, there was no mention in the ES of limitations to their surveys.

If the methods used, and data do not agree with stated objectives and claims, there are problems interpreting an ES and agreeing with conclusions; objectivity can be a serious issue (Thompson *et al*. 2016). Ideally, errors should be picked up in the signatory/internal peer-review stage.

In all but one case, the authorship or sign-off was by a member of CIEEM. That a CIEEM signatory or counter-signatory is not a consistent indication of quality is a potential problem.

If neither Phase 1 nor NVC data are robust (Cherrill 2016, Hearn *et al*. 2011), and more detailed ES data sets are equally uncertain, then there is a real risk of accepting claims of no impact in an ES; when there may well be a significant difference on development and a consequent impact. Whether this is true or not can only be shown with proper data, methods, and material; the very data that are often missing from an ES.

It should not be up to reviewers to show that what was claimed has not been done. The risk appears to be that the essentially adversarial approach underpinning the development planning process, and which requires statements of apparent compliance with standards, is compromising the material that is being produced. Consequently, biodiversity, scientific integrity, and CIEEM's reputation are at risk of being compromised.

What should be done to improve the situation? At the very least, authors should state what was done, if and how this varied from standards, how this affected the reliability of the data and results, and provide data as a matter of course: either in appendices or supplementary material. Signing off reports should be a more rigorous process, requiring revision or stating of gaps and limitations in the text. For now, much of this remains inconsistent.

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About the Author

Tim Reed worked for the UK Statutory sector for a long time, including heading ornithology, site management and common standards areas. Over the last 17 years he has been closely involved in developing site baseline and monitoring approaches to assess potential site impacts, both in the UK and around the world for corporate clients, but has moved increasingly into fieldwork and ecological data quality problems in planning submissions and public inquiries in the UK.

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Using MAGIC to Locate European Protected Species Licences

Richard Clarke
Natural England

One question anyone applying to Natural England for a European Protected Species (EPS) Mitigation Licence needs to answer is whether *"the site being applied for is subject to any recent, concurrent, pending or future applications for the same or other European protected species or other protected species"*. This question had always been difficult for applicants to answer because the information required to answer it was held only by Natural England. In 2013, Natural England started making information on licences publicly available using MAGIC, an online interactive mapping tool that holds geographic information about the natural environment from across government. MAGIC allows you to quickly and easily identify where licences have been granted.

Starting in 2017, Natural England will now update the MAGIC dataset on a six-monthly cycle, with updates scheduled for February and August each year.

The MAGIC dataset for licensing covers all the European Protected Species licences issued by Natural England, including bats, great crested newt, dormouse, and reptiles, as well as less commonly licenced species, such as cetaceans. The dataset now includes all granted licence applications received since October 2008.

The primary driver for making these data available via MAGIC was to ensure anyone applying for a licence affecting a European

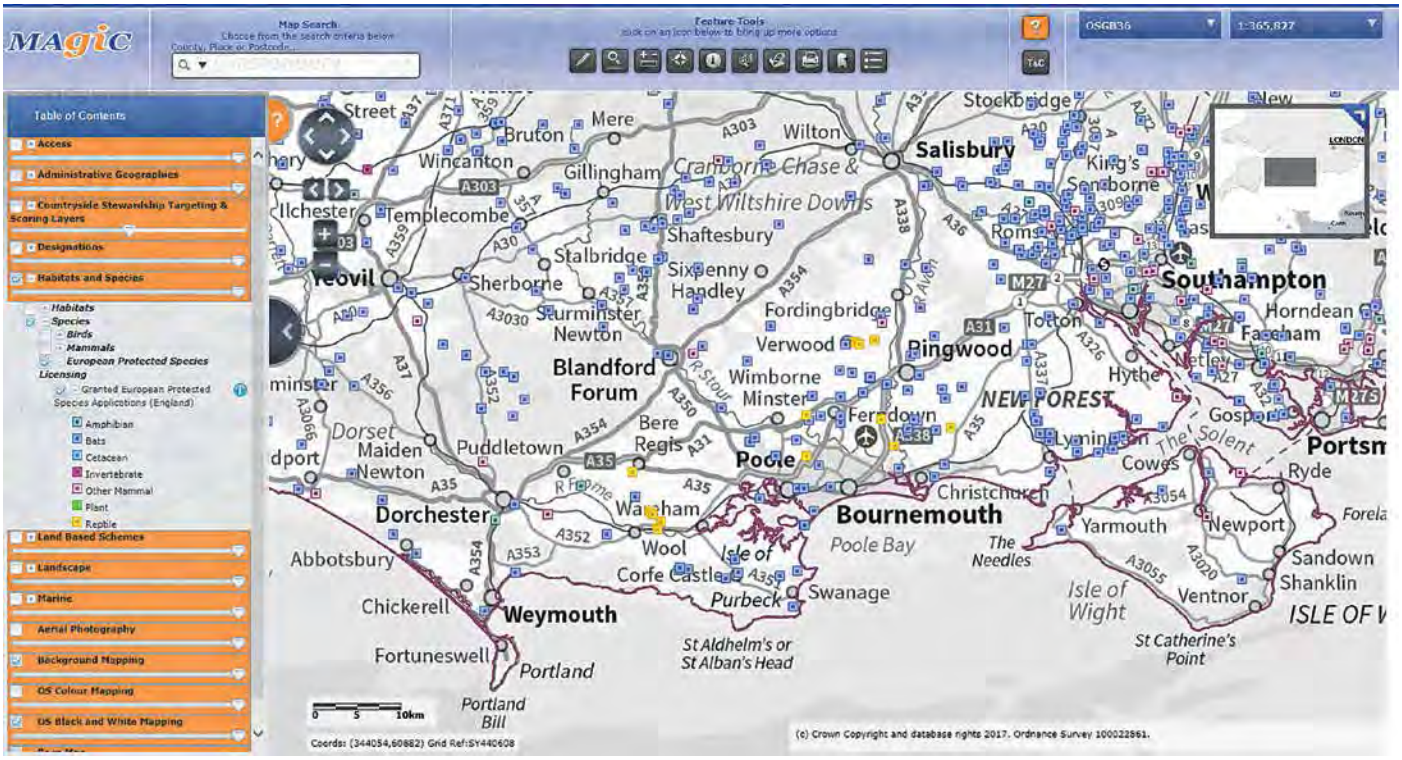

Figure 1. Example of how Granted EPS-MIT Licences appear as points on MAGIC.

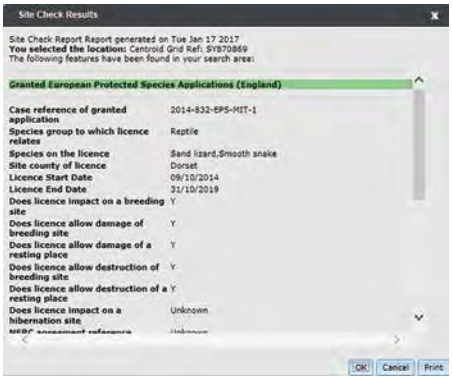

Figure 2. Results displayed when 'Identify' tool is used on Granted EPS-MIT Licence point.

Protected Species is aware of other licences granted in the vicinity of their site so they could take account of the potential cumulative impact of different licensed activities. The data may also be useful for other purposes, for example in planning ecological survey work.

How to use MAGIC

To find out where licences have been granted you need to follow these simple steps:

- Visit the MAGIC website: www.magic.gov.uk
- At the top right of the page hover over the 'Maps' button and click 'Interactive Map'.
- In the orange section to the left of the screen expand 'Habitats and Species' by clicking the small '+'. Then expand 'Species' in the same way. Then expand 'European Protected Species', and finally expand 'Granted European Protected Species Applications (England)'.
- Add a tick to the 'Granted European Protected Species Applications (England)' checkbox. The data should now be available on the map as a series of coloured squares.
- Use the Map Search box to navigate to an application site using a place name, post code, or grid reference.

Once the dataset is displayed, individual data points can be interrogated using the 'Identify' tool located in the 'Feature Tools' box directly above the map. Clicking on this tool and then on any point visible on the map will cause a new window to open up containing details about the specific granted licence represented by that point. This will tell you the case reference number, species, species group, licence start and end dates, and (for licences granted since 2014) whether the licence allows damage or destruction of breeding or resting places.

MAGIC includes a number of other useful tools to help interrogate the dataset. The 'Site Check' tool identifies all the licences granted within a defined area or within a user-selected distance of a point on the map. You can add other environmental datasets to the maps, such as the location of Sites of Special Scientific Interest (SSSI), and include these in checks.

There is one important restriction on the licence dataset. Data points are not displayed on the map if the zoom resolution exceeds 1:25,000. This is to ensure that individual dwellings that may support European Protected Species cannot be identified.

Natural England is committed to the continued update and improvement of this dataset and may in future extend it to cover other species. We have done all we can to ensure that these data are accurate, but if you spot an error please contact Richard Clarke (richard.clarke@naturalengland.org.uk). Please note that we are unable to map data for licences granted prior to October 2008.

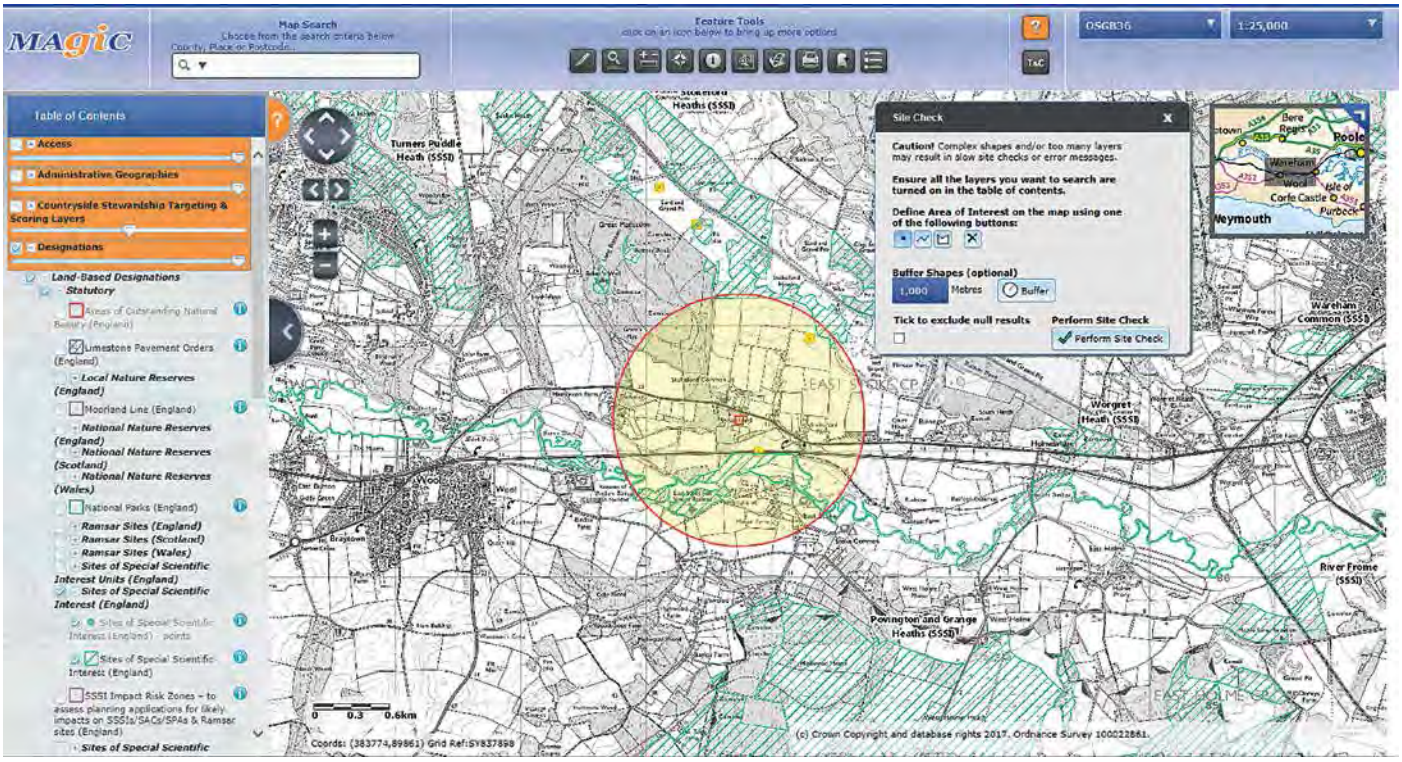

Figure 3. Example 'Site Check' set to include Granted EPS-MIT licences and SSSIs within 1 km of user specified point of interest.

CIEEM

Summer Conference 2017

Integrated Management of the Marine Environment

4 July 2017, Southampton

Call for Papers

This one-day conference will look to:

- understand the external impacts on the marine environment and how an integrated management approach can deliver multiple benefits;
- explore effective approaches to Ecological Impact Assessment in the marine environment; and
- discuss the required elements of a post-Brexit integrated marine management policy and legislative landscape.

Further details and a pro-forma for submitting proposals for papers are available by contacting:

KarenHood-Cree@cieem.net

The deadline for offers of papers is 21 April 2017.

Projects Set to Benefit Through Pioneering and Collaborative Strategic Ecology Framework

Communication and engagement lies at the very heart of the development of every BREEAM scheme. Working with CIEEM and others, BREEAM have taken a pioneering approach to the strategic development of its assessment of ecology and its links to other issues covered by BREEAM. This work resulted in the publication of a BREEAM Strategic Ecology Framework (SEF) in Spring 2016 which is now being implemented through the current updates that BRE are carrying out for its UK schemes. These are due to be released from 2018.

What is BREEAM?

BREEAM®

BREEAM is the world's leading sustainability assessment method for masterplanning projects, infrastructure and buildings. It addresses a number of lifecycle stages such as New Construction, Refurbishment and In-Use. Globally there are more than 556,600 BREEAM certified developments, and almost 2,260,100 buildings registered for assessment since it was first launched in 1990.

BREEAM inspires developers and creators to excel, innovate and make effective use of resources. The focus on sustainable value and efficiency makes BREEAM certified developments attractive property investments and generates sustainable environments that enhance the well-being of the people who live and work in them.

How BREEAM works

The BREEAM assessment process evaluates the procurement, design, construction and operation of a development against targets that are based on performance benchmarks. Assessments are carried out by independent, licensed assessors, and developments rated and certified on a scale of Pass, Good, Very Good, Excellent and Outstanding.

BREEAM measures sustainable value in a series of categories, ranging from energy to ecology. Each of these categories addresses the most influential factors, including low impact design and carbon emissions reduction; design durability and resilience; adaption to climate change; and ecological value and biodiversity protection. Within every category, developments score points – called credits – for achieving targets, and their final total determines their rating.

The work in developing an overall framework has involved collective input in a collaborative way from a wide range of stakeholders, including ecologists, landscape architects, policy-makers, architects and contractors.

A Strategic Approach to Ecology Assessment

The BRE team behind BREEAM have developed an overall framework to encourage best practice consideration of ecological impacts and enhance the ecological benefits arising from development or management of existing assets. As a result the treatment of ecology in UK BREEAM schemes has been extensively reviewed in order to develop the Strategic Ecology Framework (SEF) so that it maximizes the opportunities to evaluate and improve the ecological performance of buildings and infrastructure assets. The key aims of the SEF are to help project teams to:

- understand the existing ecology of a site to identify the best approach;
- identify, protect and enhance key ecological features;
- remove or limit existing features that are negatively affecting the site's ecology;
- mitigate unavoidable impacts and compensate against residual impacts; and

- enhance the ecological value of the site and surrounding areas by encouraging other ecological features.

Consensus of Knowledge

The SEF was developed with input and support from CIEEM and a range of other stakeholders including landscape architects and managers as well as client organisations.

Sally Hayns, Chief Executive Officer of CIEEM, said: *"Inter-disciplinary collaboration is vitally important if we are to develop tools and techniques that add value to the development process. The publication of the SEF marked a step forward in the approach. The challenge now is for those delivering the framework to work together to design methods of implementation that are meaningful and effective. We welcome the partnership approach."*

Before drafting the SEF, the BREEAM team extensively consulted with a wide range of stakeholders, including ecologists, landscape architects/managers, policy-makers, specifiers, contractors, BREEAM assessors and client organisations. More than 150 responses to an online survey were received and carefully considered in preparing the SEF's draft scope, which was then refined by stakeholder focus groups before being sent to the BREEAM assessor network for comment.

Ben Kimpton, a Principal Ecologist with The Ecology Consultancy, which has been working with BRE since 2007 as part of the task groups set up to advise on biodiversity, said: *"The launch of the SEF provides a significant shift in how future BREEAM methodologies will be updated. The development of the framework has been correctly designed in consultation with a broad range of stakeholders in both the landscape and ecology sectors. As a result, it promotes more collaborative work within design teams and takes account of current approaches on how to deliver high quality environmental and sustainable features in a robust yet pragmatic way. The construction industry and our clients are set to benefit from these changes."*

How the BREEAM Strategic Ecology Framework Works

Whilst the SEF does not itself present ecological assessment criteria for use within BREEAM schemes, it provides a framework of common objectives and actions to guide and align their development.

All BREEAM schemes are regularly reviewed and updated to ensure that they remain in line with current knowledge, evolving solutions, revised legislation and feedback from users, so ensuring that they continue to drive higher sustainability standards. The SEF will now form a part of this process. It will guide the development of balanced ecology-related assessment criteria which better account for current real-world practicalities and the functionality of the building/asset or other development being assessed. The SEF will form part of the new updates of all key BREEAM schemes. Over the coming few years these are expected to include BREEAM UK Communities, BREEAM UK New Construction (Non-Domestic), Home Quality Mark (new-build domestic), BREEAM UK Refurbishment (Domestic and Non-Domestic), BREEAM In-Use and BREEAM Infrastructure/CEEQUAL.

The SEF has been designed to deliver assessment criteria which encourage project teams and clients to consider ecology issues throughout a project's design, construction and operational life cycle stages. Some aspects of the SEF will not be appropriate to all life cycle stages but relevance will be considered as each scheme is updated. To download the SEF and review the external consultation feedback response please visit: http://www.breeam.com/resources

Process of Implementation

Following publication of the SEF last year, the process of implementing this in the form of scheme criteria is now underway. BRE, working with the CIEEM and the Landscape Institute, formed a group of ecologists and landscape architects to advise on the development of a methodology for implementing the SEF which could be used across all BREEAM schemes. These individuals span all of the BREEAM schemes including those in development and comprise industry practitioners with extensive experience of ecology/landscape work on projects that are BREEAM assessed. The work will be carried out in three stages as follows:

- Stage 1: SEF Advisory Group set up and working group meeting
- Stage 2: SEF Implementation – focus on ecology links to wider sustainability activities
- Stage 3: SEF implementation – practical application considerations and wider stakeholder involvement

A workshop was held in December 2016 as part of Stage 1 with key stakeholders reviewing and agreeing key areas to pursue as part of the implementation of the SEF. This will support the development of a viable, relevant methodology and set of scheme development guidance to drive the SEF's implementation across the BREEAM family of schemes. A strong driver of this work is to promote alignment across schemes.

Stage 2 – centered on Task 2 of the SEF (Strategic outcome identification and preliminary selection) – focuses on working with the stakeholders to identify opportunities for integrating ecology with wider sustainability activities and benefits. This might be through closer alignment with industry practices and procedures or the promotion of multifunctional approaches to maximise cross benefits and minimise conflicts in a range of areas and activities including landscape design, green infrastructure, air and water quality and noise mitigation measures flood risk management, climate change mitigation, life cycle costing and service life planning and more.

Commenting on Stage 3 of the SEF implementation process, Alan Yates, Technical Director Sustainability at BRE Global, said: *"A lot has changed since the current approach to assessing ecology in BREEAM was developed in 1998 and current work on ecosystems services and natural capital will keep these changes happening over the next few years. It is good to see a high degree of consensus forming on the best way for BREEAM to drive improvements in this important area through the recognition of environmental social and economic benefits that ecological protection and enhancements can bring. BREEAM is responding to these changes and will continue to monitor and engage with the ecological sector to ensure that we are all driving enhancements in the same direction."*

It is vital that we aspire to a built environment that is optimal in terms of ecology, and not only in terms of technology and costs. Of course not all projects can be ecological high fliers, but all can take steps to protect and enhance the ecological value of our natural and urban environment. This might be through the preservation of natural/semi-natural areas, maintaining and enhancing ponds and watercourses, promotion of bee and other insect-friendly planting or in the design of buildings and infrastructure assets themselves.

Protecting and improving the ecology can contribute greatly to the environmental quality of our increasingly urbanised world and – as a growing body of evidence shows – improve the health, well-being and even productivity of users. The new and comprehensive Strategic Ecology Framework developed by BREEAM and the assessment criteria that flow from this will be key to both promoting and rewarding this in projects in the UK, bringing a wide range of benefits and value to those involved in the development and operation of buildings and infrastructure.

Further information on BREEAM's new Strategic Ecology Framework can be found at:
www.breeam.com/sef

Career Advice: What Are We Looking For in a Graduate Ecologist?

Owain Gabb CEnv MCIEEM
Director, BSG Ecology

At BSG Ecology we are regularly approached by students and recent graduates keen to understand the skills they need to pursue a career in consultancy work.

The following short article summarises, from our perspective, areas in which some basic experience is likely to be advantageous in securing an ecologist (entry-level) position.

Background

Ecological consultancies vary in the way in which they are structured. BSG employs a relatively high proportion of senior staff, and there is little variation in our workforce over the year. Staff co-ordinate survey work, build survey teams (often including experienced sub-contractors), and are responsible for client liaison and written outputs.

It follows that we tend not to take on large numbers of ecologist-grade staff. Typically, however, we do recruit a small number of ecologists each year, and look to integrate them into our team so that they can rapidly start to contribute to the delivery of project work.

What are we looking for?

There are few pre-requisites for an ecologist-grade recruit other than a good, relevant first degree and (preferably) a Masters degree, a clear interest in his or her subject, some broad-brush field skills (or an emerging relevant technical specialism), motivation and an ability to communicate well. We are not looking for the finished article, but we are looking for someone who has an aptitude for problem solving, is likely to develop quickly (given training and mentoring), and will fit into our team.

While our expectations are not prohibitive, there are lots of enthusiastic, well-qualified ecologists looking for a career in consultancy: job advertisements tend to elicit a very large response. It follows that to set themselves apart, candidates need to find ways to stand out from their peers. The best candidates tend to start thinking about positioning themselves for consultancy work during their academic studies, and many degree courses have evolved to help meet their needs.

Phase 1 Survey

The staple survey technique for many ecological consultancy projects is the 'extended Phase 1.' The Phase 1 is typically the first survey undertaken on a site, and provides the foundation (along with desk study) for determining the scope of ecological survey work that is recommended.

A Phase 1 survey involves broadly classifying habitats based on their dominant and abundant plant species and communities. The survey is 'extended' to assess the potential of these habitats to support protected species (and invasive plants), a consultancy industry bolt-on to the original method which only concerned habitat mapping.

With an awareness of the Phase 1 survey method – and more importantly an ability to identify common plants (including invasives) and understand the typical habitat types they occur in – an incoming ecologist should be able, with some training and support, to accurately execute a Phase 1 survey. Basic botanical skills are therefore very attractive in a potential recruit, as is familiarity with field signs of a range of protected species.

Protected (Animal) Species

Much commercial consultancy work is driven by the legal and policy protection afforded to a relatively limited number of fairly widespread species/species groups. These include species protected under European law, such as hazel dormouse, great crested newt, otter and bats; and species subject to domestic protection including badger, common reptiles and water vole.

Graduates who are familiar with aspects of the ecology of these species, have experience surveying for them, and in the case of bats the use of data analysis

Great crested newt. © David Kilbey.

software, have an advantage over their peers. Demonstrable experience can be gained through the selection of applicable research projects during academic studies, membership of mammal, bat or other special interest groups (which actively undertake field recording), and through completing seasonal work at consultancy companies. Some applicants for ecologist roles have already secured European Protected Species survey licenses: to have done so is a clear advantage, albeit some licenses are more difficult to obtain than others.

Experience with more regionally restricted and/or habitat-specific protected species, such as red squirrel, sand lizard, pine marten, white-clawed crayfish or marsh fritillary will be valued differently by different practices depending on the nature of their work and the areas of the country they are most active in.

Ornithological Experience

The ability to identify birds by sight and sound is very useful in an ecologist grade recruit, as an element of bird survey work is typically required to inform all large-scale developments. The most detailed and long-running (onshore) bird survey work is usually conducted to inform wind farm applications, or developments that require significant land take such as major residential projects or new power plants. Survey work tends to be most detailed where these large schemes could impact upon statutory designated sites, particularly Special Protection Areas (SPAs), Ramsar Sites, and Sites of Special Scientific Interest (SSSIs).

At present, despite the fact that they are very useful, ornithological field skills are probably less advantageous in a potential recruit than an equivalent level of proficiency in botanical or protected species survey. This reflects a number of factors: the onshore wind industry has declined due to unfavourable renewables policy; there are numerous regionally-based ornithological contractors with a high level of expertise and local knowledge; and the locations of jobs requiring significant ornithological work in relation to office locations are inherently unpredictable. It follows that outsourcing of ornithological work is common in the industry.

GIS and Remote Technologies

As a practice we need to keep abreast of available technology and apply it sensibly to the work we do for numerous reasons, not least of which are commercial considerations. Our clients expect us to collect robust data, and to limit their commercial risk.

The use of Geographical Information Systems (GIS) has taken a while to filter into Environmental Impact Assessment (EIA). However, GIS allows straightforward transfer of georeferenced data within EIA teams, and is very useful in multi-disciplinary constraints mapping. GIS is also extremely useful for analysing and presenting large ecological data sets, and the field data for many of our larger sites is now input directly into GIS using tablets (preventing double-handling). It follows that a good understanding of GIS, and some experience using commonly-used programmes is advantageous.

The way in which we capture data on nocturnal and unobtrusive species is also changing. As a practice we are making far greater use of unmanned aerial vehicles (drones), high-specification thermal imaging equipment, and infra-red and motion-activated cameras. Application of these technologies has resulted, in some cases, in more accuracy and confidence in our conclusions. For example: we have filmed the way in which commuting bats respond to breaks in cover; the numbers of bats emerging from boxes; how golden plover behave at night around wind farms; we have collected high resolution aerial imagery of the roofs of inaccessible buildings (to assess bat roost potential); and have monitored whether great crested newts and other amphibians are using purpose-built culverts under new roads for dispersal.

Experience in the design and implementation of survey and monitoring using one or more of these technologies is therefore very useful in a graduate, as they are likely to become more mainstream survey methods over time.

Communication

Field survey is only part of the work of a consultant ecologist. Most consultancies are heavily reliant on repeat work, which in turn requires effective verbal

Knots. © David Kilbey.

Glenmore. © David Kilbey.

communication and positive relationships with clients and consultees, as well as proactive project management and delivery of a final product (usually a report of one type or another) that is of a high standard.

Obviously the main function of a CV is to present relevant experience, while an accompanying covering letter should establish why the candidate feels they are suitable for the post advertised and what they would bring to it. From our perspective, however, in combination they provide a useful initial insight into both the written capability of the candidate and their attention to detail.

Another critical role of a CV is to demonstrate the commitment of the candidate to working in the industry. It should detail how volunteering has been relevant to developing skills for a consultancy role, which professional societies (including CIEEM) and nature conservation groups the candidate is a member of (and how they have contributed to them) and the industry training courses they have completed, along with their learning outcomes. Many graduates will also have undertaken some seasonal work with consultancies (often providing back up for health and safety purposes, for example on bat surveys or for work in or adjacent to water), and the understanding gained from this should be outlined.

While it is reasonable to expect that the interview process (which may incorporate a written exercise) is the best test of communication skills, in a highly competitive job market, spending time refining a CV and covering letter is time well invested.

Conclusions

It is unrealistic to think that any graduate will be proficient in all of the subject areas identified in this article prior to beginning a career in consultancy. This article simply aims to set out a few key areas in which developing experience is a distinct advantage when it comes to competing with peers for a consultancy position.

It is also worth reiterating that different consultancies may have slightly different priorities based on the nature of their core work, and the areas in which their offices are located, and this article is by no means an industry standpoint. However, demonstrable experience of botanical and protected species survey in a UK context is always likely to be advantageous, ornithological field skills useful, and additional experience of GIS and the application of emerging survey techniques may prove the difference (at least in getting to interview) in a highly competitive jobs market.

Finally, while field skills and a drive to learn are extremely important, it needs to be understood that commercial consultancies provide a service. To develop as an all-round consultant, the ability to communicate effectively in writing, as well as verbally, is critical. Your first opportunity to impress is through your application.

About the Author

Owain Gabb is Director at BSG Ecology's Swansea office. His role includes project supervision and management, staff performance reviews and recruitment, business development and marketing. He is also a specialist ornithologist and holds an A licence and training endorsement for bird ringing.

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o.gabb@bsg-ecology.com

Featured CIEEM Training Events

Using eDNA and Traditional Techniques for Effective Great Crested Newt (GCN) Surveys

NEW LOCATION

Nottingham 29 March 2017
Basildon 12 April 2017

Trainers: Jon Cranfield MCIEEM and James Simpson MCIEEM

An intermediate level course exploring the benefits and limitations of the range of accepted methods for surveying GCN populations. Training includes practical sessions covering the protocols for collecting reliable water samples for eDNA analysis and sessions to consider the use of eDNA in the field, some of the pitfalls and its potential future.

Wind Farm Bird Collision Risk Modelling

NEW

Aberdeen 30 March 2017

Trainer: Chris Cathrine MCIEEM

Wind farm bird collision risk modelling is a standard tool used to inform impact assessments for large-scale onshore wind farm development as well as small-scale wind clusters. This course will introduce the Band collision risk model, survey design and data management and provide a worked example to illustrate how flight activity survey data is used to build and run a bird collision risk model. Interpretation of results and limitations of the model will also be discussed.

Eurasian Beaver Ecology and Survey Techniques

NEW

Birnam, Perthshire 2 May 2017

Trainers: Helen Dickinson Grad CIEEM and Roisin Campbell

This training provides knowledge and understanding of beaver ecology to help practitioners deal with enquiries from land managers and interested members of the public. Classroom and field-based sessions will provide opportunities to explore the species' ecology, including behaviour and habitat manipulation, as well as field sign identification and survey methods. CIEEM also offers **'Eurasian Beaver Mitigation and Management'** training at the same venue on 3 May 2017.

Livestock Management in the Uplands

NEW

Malham, Yorkshire Dales 16 May 2017

Trainer: Katherine Tonge MCIEEM

Based on a working upland farm, this training will provide an understanding of how a 'typical' upland farm manages their livestock, exploring farming constraints, opportunities, pressures and the impacts that they have on conservation of the uplands. The course will help improve knowledge of the methods, terminology and economics of upland farming and provide confidence in discussing livestock management and land management solutions with farmers.

Basic Statistics using R

NEW

Dundee 24 May 2017

Trainer: Jim McNicol

This training will help practitioners gain confidence in the use of R open source software for the simple statistical analysis of ecological and environmental data. Through guided tutorials and exercises delegates will practice reading data into R, generating numerical and graphical summaries of their data and carrying out simple t-tests and regression analysis.

Advanced Bat Survey Techniques

NEW

Gloucester 18 – 19 May 2017

Trainer: Jim Mullholland MCIEEM

An intermediate to advanced level course exploring survey design and implementation and covering mist netting, harp trapping, radio-tracking and ringing techniques. The training combines classroom and fieldwork sessions, to include setting up of catching equipment and up to two optional evening catching sessions.

QGIS for Ecologists and Conservation Practitioners

NEW LOCATION

Nottingham 24-25 April 2017
Gloucester 27-28 June 2017

Trainers: Matt Davies / Mark O'Connell

Over two days, delegates will learn how to use free, open source, Quantum GIS software to access a variety of environmental data sources, create their own habitat and species survey data on a map, perform basic spatial analysis and produce maps suitable for inclusion in reports. Prior knowledge of GIS is not required though basic computer literacy (managing files and installing software) is essential.

Beginner's Guide to the National Vegetation Classification (NVC)

Carlisle 8 June 2017

Trainer: Stuart Colgate MCIEEM

An introductory level course covering the theory and practice of NVC methodology for identifying and describing UK plant communities. Classroom and field-based sessions are used to explore the background and use of NVC methods, demonstrate the principals involved and practice recording and sampling plant communities.

www.cieem.net/training-events

Natural England launches Badger Class Licence

Natural England Operations team

The Badger Class Licence will permit Registered Users to monitor sett use by badgers, exclude badgers from their setts by means of one-way gates and destroy setts for the purposes of development (as defined in section 55(1) of the Town and Country Planning Act 1990) and to prevent serious damage.

It does not in any way reduce the protection afforded to badgers under the Protection of Badgers Act (1992), nor is it introducing any new activity or extending existing powers for any group.

It will provide an alternative to the current system of individual licences and offer a reduced level of administration to those who demonstrate a level of earned recognition in excluding badgers from setts using one-way gates.

Natural England is inviting applications to become a Registered User now to allow time to fully assess applications and advise successful applicants before this year's badger licensing season opens on 1 July.

Registered Users will be permitted to monitor sett use at any time of the year, but exclusion of badgers and closure of setts will only be allowed between 1 July and 30 November (inclusive).

To successfully register, applicants will need to demonstrate that they:

- Have produced Method Statements to exclude badgers from setts using one-way gates to a standard that Natural England is able to licence without major modification.
- Have experience at a minimum of four different locations of successfully excluding badgers from a sett, including main setts at two locations.
- Have submitted licence returns in a timely manner to Natural England that include full details of action taken under licence.
- Have not been subject to enforcement action in respect of licences held or acted under.

- Have not been convicted of any wildlife-related or animal welfare offence in the last five years, which is not spent under the Rehabilitation of Offenders Act 1974.
- Are a Full member (or Associate member for at least three years) of a professional body or other organisation that will investigate and penalise improper conduct.

Natural England expects that most applicants will have held at least four badger licences within the last five years for which they have written a Method Statement that involves closing a sett (two involving a main sett).

Applicants will need to provide information to support their formal application (such as previous applications, surveys and proposed mitigation). Individuals who don't meet the above criteria can still apply, by providing alternative evidence for consideration with their formal application.

Natural England will assess the application and advise whether the applicant has provided sufficient evidence which meets the criteria. If they have not done so, applicants can make one further formal application within a 12-month period. Successful applicants will become a 'Registered User' and can then use the Badger Class Licence, instead of applying for an individual licence, in the circumstances previously described.

Applicants can choose to use Natural England's Discretionary Advice Service, where we will retrieve information on previous licences from our files for a standard charge of £220 plus VAT and advise whether we consider the information shows that the applicant meets the eligibility criteria. Where the criteria are met, an applicant can submit this written advice with their formal application. Assuming there is no material change in the applicant's circumstances between receiving Natural England's advice and applying to register, they will receive confirmation that they are a Register User of the Badger Class Licence within five working days.

Following an initial launch in the Midlands during February, the Badger Class Licence will launch nationwide during March 2017. The application forms and further details will be available on GOV.UK.

https://www.gov.uk/government/collections/badger-licences

An Update from the President

Stephanie Wray CEcol CEnv FCIEEM
CIEEM President

As I am approaching the halfway point of my term as President it seems appropriate to review how things are going with reference to my key priorities for the Institute. As I set out when John Box handed over to me in November 2015, I have three main points of focus.

Firstly, I was concerned about the external profile of the Institute, both in political/policy-making circles and more generally in the media. We all recognised that the primary focus of this work at that time would to be around the EU referendum last June. Like many of you, I was surprised by the referendum outcome and this has had a significant bearing on our work in this area. I have formed a Strategic Policy Panel of senior Fellows and members of the Institute whose remit is to proactively look at future policy trends. We have forged, thanks to the work of Jason, Sally and other members of the secretariat, great working relationships with other institutions and professional bodies which has strengthened our voice significantly.

I attended an event at Defra to meet the new Ministerial team and engaged with Therese Coffey MP and George Eustice MP, explaining to them the remit of our Institute and how our members could help in the drafting of new environment policy in the light of Brexit. I've since met with other parliamentarians with an interest in this policy area, including Kerry McCarthy MP, and have a forthcoming meeting with Molly Scott Cato MEP. Slowly we are extending our reach and having more opportunities to influence evidence-based policy. It's a very fine line to tread, as we are governed by Royal Charter and are here to advise Government – and while we may have strong views on some issues, we are neither a lobbying nor a political organisation. I am happy that we are starting to be asked – that people know we are here to advise – and I hope to see that flourish further.

My second focus was around membership. I'm pleased to say that the secretariat membership team and the Membership Admissions Committee have taken huge strides to streamline the processes for joining the Institute and re-think the grades of membership. This sets us in great shape to encourage new members, including those not from a traditional degree route, into the profession. Member retention at the Institute is excellent – so clearly once people join us they feel that it is a benefit to their career. We still need to work on reaching out to those who would be eligible for membership, but are under-represented in our ranks, notably ecologists in local government and (some of) the statutory agencies. We have also been approached by other organisations who would like to work more closely with us and perhaps become affiliated in the future. We will look at all of these opportunities closely to ensure we can maintain our high standards but deliver the benefits of a bigger organisation to members.

Thirdly, my aim was to continue to raise standards in our industry and promote best practice. My personal focus in this area has been around standards for ecologists working on construction sites as advisors and ecological clerks of works (ECoW). I have secured funding from the Construction Industry Training Board in collaboration with the Civil Engineering Contractors Association to research the skills and competences that are needed for these roles, where gaps exist, and the scale of the market opportunity for members given the large increase in construction projects in the UK in the next 10 years. Alongside this, we have raised funding from a variety of organisations to start developing standards and course materials to upskill ECoWs, working with a range of partner organisations, including the Association of Environmental and Ecological Clerks of Works (AEECoW).

Finally, although I've said I'm just reaching the mid-point, we do need to elect my successor at the next annual conference in November, to take over in November 2018. If you are potentially interested in taking on the mantle I'd be very happy to hear from you. You don't need to be on the existing Governing Board to put yourself forward – and if you're not, I can assure you they are a great team to work with. If you would like to know more about the time commitment involved please do get in touch with me directly.

Thank you all for your continuing support of the Institute.

For more information

Contact Steph at:
steph@stephaniewray.com

Meet the Policy and Communications Team

CIEEM's Policy and Communications team is responsible for the Institute's external facing operations. The team is comprised of Emma Downey, CIEEM's Marketing Officer, and Jason Reeves, the Policy and Communications Manager. They jointly deliver on CIEEM's strategic objective of increasing CIEEM's external influence and exposure.

Emma has worked in marketing for over 6 years, previously having worked for a Fiat and Alfa Romeo car dealership in Devon and for a hearing aid company in Cornwall. Emma has been the Marketing Officer at CIEEM since April 2015, moving to Winchester from Plymouth. She is an Associate member of the Chartered Institute of Marketing, and is part of the Professional Associations Research Network's (PARN) Communications Special Interest Group. Emma is responsible for CIEEM's strategic marketing, Twitter, website maintenance, newsletters, advertising and sponsorship. She is also involved with organising the CIEEM Awards and is often part of the conference team.

Emma is a Girl Guide leader, runs the local Winchester Wildlife Watch group and is on the committee for her local Read Easy group as Publicity Organiser. She's hoping to complete a triathlon this year and loves cycling!

Jason joined CIEEM in October 2005 (then IEEM) as an intern, and has since moved through several positions until becoming the Policy and Communications Manager in July 2014. He has a BSc in Biological Sciences and an MSc in Biodiversity Conservation and Management. Between 2008 and 2014 Jason was also the Co-ordinator for the European Network of Environmental Professionals (ENEP), of which CIEEM is a member.

Jason is responsible for leading on the development of CIEEM's policy engagement and ensuring effective delivery of the Institute's communications and marketing. In addition, he is responsible for the delivery of *In Practice* magazine, compiling the monthly Policy eBriefing, and moderating CIEEM's LinkedIn groups. Jason is also part of the CIEEM Management Team which contributes to organisational decision-making. Jason is currently leading, under the guidance of the Governing Board and Strategic Policy Panel, CIEEM's policy engagement with regards to the UK leaving the EU.

Outside of work Jason is a committee member of Winchester Photographic Society, is involved in local politics, and enjoys hiking, camping and CrossFit.

Emma and Jason also work closely with a number of freelance and outsourced services. These include: Dr Gill Kerby, who edits the Feature Articles for *In Practice* magazine; our website developers; a number of graphic designers and printers; and occasional public relations support.

For more information

Contact Emma at:
EmmaDowney@cieem.net

Contact Jason at:
JasonReeves@cieem.net

Chartered Membership

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 following profile highlights the work of Chartered professionals and provides an insight into the kind of roles that these senior ecologists and environmental managers are required for.

New Chartered Members

CIEEM is pleased to announce the following new Chartered members:

Chartered Ecologist
Mr Luke Casey CEcol MCIEEM
Mr Paul Scott CEcol CEnv MCIEEM
Miss Leila Payne CEcol CEnv MCIEEM

Chartered Ecologist application deadlines

CEcol Application due date	CEcol Interviews
3 April 2017	w/c 26 June 2017

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
1 September 2017	24 November 2017	8 January 2018

Kathy Dale

CEcol FCIEEM

Associate Director, EnviroCentre Limited

Why did you join CIEEM?

I joined CIEEM as one of the earliest members in order to raise the profile of ecologists and also to raise standards in ecological practice.

Why did you apply for Chartered status?

I applied for Chartered status because I feel it is important to be on a par with other professions and to show that I have achieved a high level of knowledge in ecology.

How did you find the Chartership process?

The application form was quite complex and took longer than I expected to complete but most of the time was spent on completing the competency framework. Once I had submitted my application the process was easy and quick and my interview was straightforward.

How has achieving Chartered status impacted on the types of work you undertake?

As yet Chartered status has not impacted on the work I undertake but I hope that in time there will be a requirement for elements of Ecological Impact Assessment (EcIA) to be undertaken by Chartered Ecologists. I anticipate that this will increase my involvement in large, complex EcIAs and raise the fees that I am able to charge for my services.

Would you recommend applying for Chartership to your peers and colleagues?

Yes, I would recommend applying for CEcol to my peers and colleagues but not until they have at least 10 years' experience. My employer encourages all staff to aspire to Chartered status.

What is your education background?

I have a BSc in Ecology and an MSc in the Biology of Water Resource Management.

What volunteering experience do you have?

I volunteer for CIEEM and am currently the Vice-President for Scotland. I also volunteer in my community, championing outdoor access.

What training experience do you have?

I am a tutor on training courses, particularly on aquatic ecology and EcIA.

What is the best thing about your job?

The best thing about my job is the variety of work and the opportunity to be involved with experts in different disciplines. I enjoy helping to provide solutions to problems that benefit society and the environment. I also enjoy mentoring the staff in the Ecology Team.

If you are interested in submitting your own profile please contact the Registration Officer, Michael Hornby, at RegistrationOfficer@cieem.net.

British Ecological Society

Richard English
Communications Manager, British Ecological Society

We find ourselves at the start of a year that has already highlighted challenges but we, at the BES, understand the way forward is through collaboration, greater understanding and enabling our community to reach its potential.

During 2016, we established our Equality and Diversity Working Group; its aim is to develop and deliver our work to increase the diversity of people involved in ecology. We achieved a lot during the year, including the creation of an Equality and Diversity policy which will continue to be an important strand of our work.

In 2017, our *Journal of Applied Ecology* will be developing a new online resource to help bridge the gap between academics and practitioners; our vision is to provide a web resource containing a variety of information types relevant to applied ecology, including summaries, reports and journal articles. Look out for more details and different ways for BES and CIEEM members to collaborate.

Fittingly, our first symposium is a joint event with BESS (Biodiversity and Ecosystem Service Sustainability): 'Advances in Biodiversity and Ecosystem Services' in Cardiff on 24-26 April 2017. There is an urgent need to understand how natural stocks are linked to flows of ecosystem services and how these linkages are likely to change in the future – given the environmental challenges of an increasing population, demand for housing and infrastructure, the need to feed a rapidly growing planet and climate change. More information: www.britishecologicalsociety.org/SYMP2017/Cardiff

This will be followed by our symposium on 'The Macroecology of Alien Species: Patterns, Drivers and Consequences of Global Biotic Exchange' in Durham on 24-26 July 2017. The symposium will explore the major drivers behind the mixing of the world's biotas, and the consequences for conservation of biodiversity. More information: www.britishecologicalsociety.org/SYMP2017/Durham

Journal of Applied Ecology's Special Profiles are now called 'Spotlights'. These are groups of papers on a current, important theme in applied ecology accompanied by a post on the Applied Ecologist's Blog. In December 2016 we published a Spotlight on 'Wildlife and renewable energy' and see issue 1 of 2017 for 'Ecosystem restoration under the microscope'. More information: https://jappliedecologyblog.wordpress.com/

The new volume of our *Ecological Reviews* book series, *Enhancing the Resilience of Agriculture: Perspectives from Ecology and Economics* (edited by Sarah Gardner, Stephen Ramsden and Rosie Hails), presents an interdisciplinary perspective to the challenge of maintaining the productivity of both agricultural and renewable natural resources in the face of economic, environmental and social uncertainty. It will be published in early 2017. More information: www.britishecologicalsociety.org/publications/ecological-reviews/

We regularly attend international conferences where we showcase our exciting work in grants, careers, events, policy and outreach. Our journals team showcase our world-class international journals and hold workshops for authors on themes such as how to get published, peer review, open access, open data and reproducibility. We have produced guides to promote research excellence, with subjects including peer review, data management and how to get published. These are free to download and available in hard copy at the conferences we attend. More information: www.britishecologicalsociety.org/blications/guides-to/

BRITISH ECOLOGICAL SOCIETY

This year, we are looking forward to attending Evolution in USA, INTECOL in China, ESA in USA and several other meetings across Europe. If there is a meeting you think we should attend, or if you are organising an event and would like advice on crafting a workshop, please email emilie@britishecologicalsociety.org.

In September last year, our journals team conducted a customer satisfaction survey with over 15,000 authors and reviewers of our journal articles. We are pleased to report that satisfaction with the submission, publication and review process was high amongst the over 2,000 respondents and 79% stated that they were likely to submit to our journals again. The full dataset is currently being analysed and relevant results will be made available later in the spring.

SUBMISSION

Clarity of communication in the submission system

91% SATISFIED

Clarity of guidellines on the Journal website

91% SATISFIED

Ease of use of the submission system

88% SATISFIED

We will be in Dale Fort, Pembrokeshire from 17-21 July 2017 for our third immersive Summer School. We take 50 talented Undergraduates from around the UK, including 10 A-level students from BAME (Black, Asian and Minority Ethnic) and low SES (Socio-Economic Status) backgrounds. We are grateful to CIEEM for providing sessions related to consultancy and supporting students with careers beyond academia.

Our outreach programme includes a number of free festivals, including the Festival of Nature (Bristol) and, fingers crossed, a return to Glastonbury. Look out for us at the RHS Chelsea Flower Show, too!

We will continue to engage with the challenges and opportunities that Brexit poses for environment and science policy, working in collaboration with a number of partners including CIEEM, and are currently establishing a dedicated Brexit working group. Follow the latest at: www.britishecologicalsociety.org/policy/policy-topics/eu-referendum/

Our members can gain first-hand experience of the policy world with our new Fellowship programme, launching in the spring. We will continue to offer our three-month placement at the Parliamentary Office of Science and Technology, as well as the chance to shadow Government Ministers and officials and regular training days. More information: www.britishecologicalsociety.org/policy/opportunities/

Our presence in the devolved administrations continues to grow, with our Scottish Policy Group working in collaboration with NGO partners to host MSPs for a breakfast briefing on the latest ecological science during Scottish Environment Week. We shall also host events with our Wales Policy Group, and work with colleagues in the Irish Ecological Association to build policy connections across Ireland. More information: www.britishecologicalsociety.org/policy/policy-networks/

This year will close in style with our Annual Meeting in Ghent, Belgium on 11-14 December 2017. A year of collaboration finishes with this joint event with the GfÖ (Ecological Society of Germany, Austria and Switzerland), NecoV (Dutch-Flemish Ecological Society) and EEF (European Ecological Federation). We pride ourselves in having world class plenary speakers, science which spans the whole of ecology, and an event that is both inclusive and fun.

Our members are central to our work and our future; we are keen to support the needs of the community and are always open to partner with other organisations. If you are interested in any of the initiatives here, or if you have an idea of how we can work together, email richard@britishecologicalsociety.org or get in touch via Twitter (@BritishEcolSoc).

Arboricultural ASSOCIATION trees.org.uk

Call for papers

Arboricultural Association Conference

10-13 September 2017, University of Exeter

CIEEM

The 51st AA National Amenity Conference and the 1st International Conference on Arboricultural Biosecurity will be held this September. The Conference's middle day will be presented in partnership with CIEEM.

Under the general theme of biosecurity, we are inviting submissions for presentations on the following:

- Tree health
- Biosecurity
- Tree species selection
- Population resilience and management
- Pests and diseases
- Ecological/arboricultural impact assessments
- Trees and development
- Surveying techniques and methodologies
- Bats and trees/woodlands
- Protected species and arboriculture
- Biodiversity
- Veteran trees
- Soil ecology
- Ecosystem services evaluation
- Biomechanics
- Tree risk management

The deadline for proposals is 5pm on Friday, 31 March 2017. Please submit proposals to: enquiries@cieem.net

Member Network News

CIEEM's Member Networks are each run by a Committee of members for the benefit of other members, providing opportunities to network, share knowledge and learn more about the science and practice of our profession.

For further information about Member Networks and how you can get involved, please visit www.cieem.net/get-involved.

Bill Haines explaining black cap characteristics

Mist netting

SOUTH EAST ENGLAND

Bird Ringing and Wetland Species and Management at the London Wetland Centre

14 September 2016, London Wetland Centre

We were lucky enough to be provided with another opportunity to see behind the scenes at the London Wetland Centre, well worth the 6am meeting time! Bill Haines and colleagues provided a fascinating demonstration of bird ringing techniques and we were privileged to see 46 birds up close, with nine species caught, including blackcap and long-tailed tit.

After the ringing demo, Richard Bullock of the WWT provided a talk and tour of the LWC, focusing on wetland habitat management for species, and providing further insight into the issues of managing this highly successful urban habitat creation scheme and very popular visitor attraction.

IRELAND

Irish Section Conference 2017: Advancing Ecological Impact Assessment in Ireland

6 April 2017, Dublin

This day-long conference will focus on the latest developments and challenges in assessing and mitigating ecological impacts. With the launch of the updated CIEEM Ecological Impact Assessment Guidelines in 2016 and the imminent release of the new EIA guidelines in Ireland, the conference will draw on the latest research findings, tools and experiences of professionals to address current topics in ecological impact assessment.

To find out more and book your place, visit www.cieem.net/events/1350/advancing-ecological-impact-assessment-in-ireland.

NORTH WEST ENGLAND

Saltmarsh restoration site visit – Mersey Gateway Project

22 November 2016, Widnes

Ecologists, environmental professionals and students from the MSc Ecology and Environmental Management at Liverpool Hope University (a course accredited by CIEEM) visited the Mersey Gateway Project – a new six-lane toll cable-stayed bridge over the river Mersey between the towns of Runcorn and Widnes. The new crossing will be open in autumn 2017, but it is already starting to bring major environmental benefits to the local area.

Find out more at www.cieem.net/north-west

WALES

Winter bat talks

December 2016, Bridgend

The Wales Section Committee organised several joint winter talks with the Vale of Glamorgan and Bridgend Bat Group in December 2016. These included a talk by Geoff Billington on his bat research in Greece, plus a talk by Rob Colley about horseshoe bats on Gower. Both were well-attended, and provided one way to throw off the blues during dark winter evenings.

Photo by R. Wardle

EAST OF ENGLAND

Guided Walk of Tollesby Wick

8 December 2016

Less than a two-hour drive from central London and you can arrive at the beautiful coastal nature reserve of Tollesbury Wick, a rare freshwater grazing marsh in Essex. This 242 ha enwalled site has a fantastic history with 25% of it ploughed, drained and levelled for agriculture in the 1960s. Essex Wildlife Trust claimed the site in 1993 and began one of the largest restoration projects the Trust has ever been involved with. EWT broke field drains, created a 4.5ha freshwater lagoon, built islands and replaced old water controls with new sluices, and as a result has potentially made it the best site in Essex for breeding waders.

Find out more at www.cieem.net/east-of-england

SCOTLAND

Scottish Section Conference and Annual Members' Meeting 2017

Creating Sustainable Cities using an Ecosystem Services Approach

18 January 2017, Perth

Delegates gathered for an inspiring day looking at the ecosystem services provided by urban habitats and their impact on human wellbeing and economic prosperity.

To find out more and access speaker presentations, visit www.cieem.net/previous-conferences.

Look out for upcoming events in your area and keep up to date with what's been going on at www.cieem.net/member-networks.

WALES

A walk with bryophytes: the mosses and liverworts of Pensychnant Nature Reserve

18 March 2017, Pensychnant Nature Reserve

The Wales Section Committee is reprising the previously popular bryophyte field trip with Lucia Ruffino on 18 March 2017. Come on over to Conwy for a morning of fossicking in damp woods and an afternoon of peering down the odd microscope or two. Places are limited, so please be sure to book in advance at http://www.cieem.net/events/category/59/cieem-section-events.

Participants enjoyed a fine April day for the 2016 bryophyte trip and we look forward to another excellent day for the 2017 trip – photo by Diana Clark

Please get in touch with the Welsh Section Support Officer, Diana Clark (dianaclark@cieem.net), or anyone on the Committee if you have ideas about Section events you'd like to see happen in Wales.

SOUTH WEST ENGLAND

Biodiversity in Urban Green Spaces – how can the ecologist's voice be heard?

7 December 2016, Taunton

The South West England Committee organised a very successful winter seminar in Taunton to inform and inspire members about how we can influence the design and management of urban developments to achieve good outcomes for biodiversity. Six excellent speakers covered a range of topics in the morning and this was followed by site visits to look at sustainable drainage solutions and learn how community involvement in management of a nearby public open space has paid dividends.

Delegates learning from Bob Bray about the design of rain gardens

Further details and speaker presentations can be found at www.cieem.net/south-west.

Jim Jones of Surrey Wildlife Trust rounding up after the field meeting

SOUTH EAST ENGLAND

Harvest Mouse Conservation with the Surrey Wildlife Trust

14 October 2016, Shalford

The elusive harvest mouse receives no formal legal protection and is therefore perhaps overlooked during ecological surveys, yet it is a Species of Principal Importance under the NERC Act and as such should be considered during EcIAs. Eighteen South East England Section members attended this workshop led by Jim Jones, Living Landscapes Project Manager for the Surrey Wildlife Trust (SWT), and Dr Rowenna Baker of Sussex University. Find out more about what they discovered at www.cieem.net/south-east.

New Members

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.

CIEEM is pleased to welcome the following individuals as new members:

ADMISSIONS

Full Members

Jamie Bevan, Dr Emmett Clarkin, Leanne Cooke, Richard Dale, John Day, Dr Arnaud Duranel, Jonathan Goodrick, Steven Heaton, Damien Hicks, Dr Jacqueline Hill, Ruth Oatway, Alexis Pearce, Stephen Preston, Dr Samuel Quin, Jeremy Sabel, Jonathan Ward, Jonathan Wohlgemuth

Upgrades to Full Membership

Sarah Atkinson, Ruth Bramwell, Charlotte Carroll, Stephanie Cottell, Andrea Evans, Lucy Hill, Christopher Jack, Sarah Proctor, Jake Robinson, Julie Smith, Georgina Tayler

Associate Members

David Byett, Nathan Coughlan, Stephen Hewitt, Kevin Heywood, Kirsty Macpherson, Adam Noon, Nicholas Westwood

Upgrades to Associate Membership

Robyn Ablitt, Calum Campbell, Andrea Coyne, Claire Dunphy, Paula Graham, Erin Grieve, Charlotte Hammond, Dr Sarah Mullen, Erik Paterson, Hayley Percival, Samuel Smith

Graduate Members

Matthew Attrill, Sinead Barrett, Vikki Bird, Isobel Bramer, Rory Chanter, Thomas Clements, Sarah Cruickshank, Steven Duncan, David Eves, Marion Gohier, Clara Gonzalez Hernandez, Poppy Hookings, Rosie Jackson, Robin Jennings, Elizabeth Kimber, Kate Moore, Louise Morrison, Katherine Mullin, Nichelle Murray, Kate O'Connor, Sebastian Phelan, Tom Preece, Jake Smith, Emma-Louise Spicer, Hannah Train, Thomas Travers, Jacob Willmore

Upgrades to Graduate Membership

Katherine Halsall, Kaidi Kuusk, Kirstene Stevenson

Qualifying Members

Leigh Cresswell, Harvey Dawson, Sailatha Theagaraj

Student Members

Dominic Allmark, Laurence Allnatt, Daniel Anderson, Richard Angliss, Emma Ashby, Ann Bailey, Chloe Balmer, Samuel Braine, Robert Branch, Benjamin Brown, Helen Butt, Mike Caiden, Sarah Callow, Sian Comlay, Ruth Coxon, Adam Crowther, Bronte Daley, Shannon Davies, Stephanie Davis, Terri Dawson, Claire Evans, Rachael Findlay, Pierre Fleet, Daniel Flint, Thomas Frampton, Charles Gannicott, Samantha Gate, Alex Gazi, Emma Griffiths, Olivia Guindon, Clare Guy, Jacob Haddon, Paul Hammond, Natasha Hannah-Lyons, Rozanne Imaita, Iona Kay, Sarah Kilshaw, Hemmings Kim, Samuel King, Arnon Lokitsataporn, Christopher Long, Nick Marriner, Marco Maxia, Danny Meek, Shonte Miller-Howe, James Oliver, Caollaidhe O'Sullivan, Alex Pelton, Helen Pietkiewicz, Suzanna Platts, John Salisbury, Fiona Shuttle, Cameron Singh-Johnstone, Jack Slattery, Gillian Tetlow, Linzi Thompson, Agness Uhuru, Robert Wakefield, Georgina Watkins, Jake White, Mary-Rose Winter

Britain's Spiders: A Field Guide

Authors: Lawrence Bee, Geoff Oxford & Helen Smith

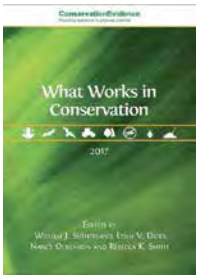
ISBN: 9780691165295

Price: £24.95

Available from: http://press.princeton.edu/titles/10987.html

Britain's Spiders is a photographic guide to all 37 of the British families, focussing on spiders that can be identified in the field. Illustrated with a remarkable collection of photographs, it is designed to be accessible to a wide audience, including those new to spider identification. This book pushes the boundaries of field identification for this challenging group by combining information on features that can be seen with the naked eye or a hand lens with additional evidence from webs, egg-sacs, behaviour, phenology, habitats and distributions. Individual accounts cover 390 of Britain's approximately 660 species, with the limitations to field identification explained.

As the first photographic field guide to British spiders to be published since 1989, this book fills a major gap in the resources available to everyone with an interest in this fascinating, diverse and important group of animals.



What Works in Conservation 2017

Editors: William J. Sutherland, Lynn V. Dicks, Nancy Ockendon, Rebecca K. Smith

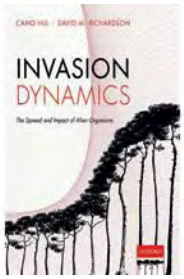
ISBN: 978-1-78374-308-7

Price: £19.95

Available from: www.openbookpublishers.com/product/552/what-works-in-conservation-2017

What Works in Conservation has been created to provide practitioners with answers to this and many other questions about practical conservation. This book provides an assessment of the effectiveness of 763 conservation interventions based on summarized scientific evidence. Chapters cover the practical global conservation of amphibians, bats, birds and forests, conservation of European farmland biodiversity and some aspects of enhancing natural pest control, enhancing soil fertility and control of freshwater invasive species. It contains key results from the summarized evidence for each conservation intervention and an assessment of the effectiveness of each by international expert panels. The accompanying website www.conservationevidence.com describes each of the studies individually, and provides full references.

This is the second edition of *What Works in Conservation*, which is revised on an annual basis. It will also available online as a free-to-download PDF at www.conservationevidence.com.



Invasion Dynamics

Authors: Cang Hui and David M. Richardson

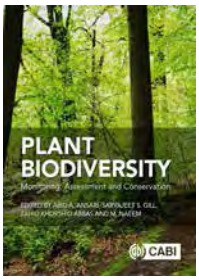
ISBN-13: 9780198745341

Price: £37.99

Available from: www.nhbs.com/title/212135/invasion-dynamics?bkfno=232006

Humans have moved organisms around the world for centuries but it is only relatively recently that invasion ecology has grown into a mainstream research field. *Invasion Dynamics* examines both the spread and impact dynamics of invasive species, placing the science of invasion biology on a new, more rigorous, theoretical footing, and proposing a concept of adaptive networks as the foundation for future research. Biological invasions are considered not as simple actions of invaders and reactions of invaded ecosystems, but as co-evolving complex adaptive systems with emergent features of network complexity and invasibility.

Invasion Dynamics focuses on the ecology of invasive species and their impacts in recipient social-ecological systems. It discusses not only key advances and challenges within the traditional domain of invasion ecology, but introduces approaches, concepts, and insights from many other disciplines such as complexity science, systems science, and ecology more broadly. It will be of great value to invasion biologists analyzing spread and/or impact dynamics as well as other ecologists interested in spread processes or habitat management.



Plant Biodiversity: Monitoring, Assessment and Conservation

Editors: Abid A. Ansari, Sarvajeet Singh Gill, Zahid Khorshid Abbas and M. Naeem

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Results of regular monitoring of the species diversity and structure of plant communities is used by conservation biologists to help understand impacts of perturbations caused by humans and other environmental factors on ecosystems worldwide. Changes in plant communities can, for example, be a reflection of increased levels of pollution, a response to long-term climate change, or the result of shifts in land-use practices by the human population.

Plant Biodiversity presents a series of essays on the application of plant biodiversity monitoring and assessment to help prevent species extinction, ecosystem collapse, and solve problems in biodiversity conservation. It has been written by a large international team of researchers and uses case studies and examples from all over the world, and from a broad range of terrestrial and aquatic ecosystems.

Plant Biodiversity is aimed at those with a strong interest in plant biodiversity monitoring and assessment, plant community ecology, biodiversity conservation, and the environmental impacts of human activities on ecosystems.

Editorial: Solving environmental problems in the Anthropocene: the need to bring novel theoretical advances into the applied ecology fold

M.W. Cadotte, J. Barlow, M.A. Nuñez, N. Pettorelli and P.A. Stephens

Journal of Applied Ecology 2017, 54: 1–6. doi:10.1111/1365-2664.12855

Translating global awareness and concern into effective policies requires sound science to inform management decisions. As a result, applied ecology has increased in prominence and relevance. Ecology needs to be relevant for our human-dominated landscapes and their vulnerable species and functions. Ecologists have spent much effort studying intact and semi-natural systems to understand the basic operations of nature. But now, we are required to develop this understanding further to minimise loss, and to improve ecological integrity and human well-being.

Potential interventions range from designing and prioritising landscape protection, ensuring the delivery of food production and other services, local-scale remediation of chemical contamination and restoration, to global-scale rewilding. Applied ecology indeed provides evidence and tools that can inform management and policy across spatial scales, can lead to new developments in our fundamental understanding of the natural world, and is at the forefront of using ecological knowledge to develop and implement strategies. Yet, despite the multiple advances we see, there is differential success in the transition of some ecological tools and concepts into applied practice. The authors examine how and why some theories, concepts and methods successfully transition to the applied realm and ask if some other areas of research have more to offer applied ecology than has yet been realised.

http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12855/full

Editorial: Biodiversity and ecosystem services in forests: management and restoration founded on ecological theory

A.S. Mori

Journal of Applied Ecology 2017, 54: 7–11. doi:10.1111/1365-2664.12854

The provision of ecosystem services is spatially heterogeneous in forests, and some services can be synergetic or antagonistic with others, and there are often trade-offs between them. Understanding the trade-offs and synergies among different ecosystem services is crucial to inform policy and management. The actual flow of provisioning of goods and services to society from biodiversity preservation has much uncertainty, and this is especially the case in natural forests characterised by high structural complexity, spatiotemporal heterogeneity of resource distributions and the dominance of long-lived organisms. Furthermore, there may be a trade-off and a conflict between biodiversity conservation and some ecosystem services within a landscape, because some ecosystem services of interest are often independent of the diversity measured or of interest. In addition, the increased provision of specific goods and services often requires land conversion and other forms of human intervention that inevitably result in negative impacts on biodiversity at multiple spatial, temporal and biological scales.

Accordingly, there is much to be done to gain a firm understanding of how human-induced environmental changes can affect multiple facets of forests including biodiversity *per se*, the functionality of ecosystems and possible linkages between biodiversity and ecosystem services. Humans and nature cannot be separated and are indeed coupled, and this has been evident for societies living in or near forested regions throughout history. Considering the numerous cases of past failures to tighten this link, further consideration is needed regarding future forest use, conservation and restoration within the context of social-ecological systems.

http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12854/full

Biodiversity and ecosystem services in forest ecosystems: a research agenda for applied forest ecology

A.S. Mori, K.P. Lertzman and L. Gustafsson

Journal of Applied Ecology 2017, 54: 12–27.

The rapid expansion of sustainable forest management (SFM) has resulted in the adoption of various forest management frameworks intended to safeguard biodiversity. Concurrently, the importance of forest ecosystem services has been increasingly recognised. Although some initiatives aimed at conserving both biodiversity and ecosystem services are emerging, knowledge gaps still exist about their relationships and potential trade-offs in forests. Given recent advancements, increasing opportunities and some lags in forest ecology, further research on biodiversity, ecosystem functions and services will play substantial roles in the development of SFM practices.

The authors identified key issues including (i) relationships between biodiversity and ecosystem function as a foundation of ecological integrity, (ii) resilience thinking to better prepare for and adapt to environmental changes, (iii) social–ecological perspectives that facilitate real-world conservation and management and (iv) theory-driven restoration that bridges science and practice. They illustrate priorities and future possibilities in applied ecology studies in forests, which will help society and ecosystems to build capacity and resilience to face uncertainty in the changing environment.

Under substantial human influences, forests are highly likely to be largely altered, potentially leading to the emergence of novel ecosystems or alternative stable states. Management thus needs more flexible, novel measures to address the significant uncertainty this generates. Resilience-based approaches are important to respond adaptively to future changes and cope with surprises, potentially providing multiple options. Although challenges exist, theory should play an important role in managing, conserving and restoring forest ecosystems. The issues discussed should receive further attention in the context of the multiple goals of sustainable forest management.

http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12669/full

Brown bear

Predicting costs of alien species surveillance across varying transportation networks

L. Blackburn, R. Epanchin-Niell, A. Thompson and A. Liebhold

Journal of Applied Ecology 2017, 54: 225–233. doi:10.1111/1365-2664.12754

Efforts to detect and eradicate invading populations before they establish are a critical component of national biosecurity programmes. An essential element for maximizing the efficiency of these efforts is the balancing of expenditures on surveillance (e.g. trapping) versus treatment (e.g. eradication). Identifying the optimal allocation of resources towards surveillance requires an underlying model of how costs and the probability of detection fluctuate with survey intensity across various landscapes. The authors have developed a model, widely applicable across biological systems, for predicating costs associated with varying surveillance intensities across diverse road networks.

The authors assumed that surveillance is conducted across a set of point locations. Resources needed to conduct surveillance include the fixed costs associated with surveying a point (e.g. cost of materials or labour time spent at the survey point) and variable costs that correspond to the expense of the time and distance travelled between points. The authors estimated travel time and distance between points as functions of surveillance intensity and road network characteristics using data from simulated least cost driving routes connecting points located on real-world road networks. Time and distance estimates were then combined with cost data from an actual gypsy moth *Lymantria dispar* surveillance programme in the state of Washington, USA to predict per trap costs of surveillance across varying road network densities and surveillance intensities.

Per point driving time, driving distance and total costs all decline with increasing survey point density and increasing road density. Surveillance intensity (planned point spacing) explains ~94% of the average time driven per point and 97% of the distance driven per point – thus representing the primary explanatory variable. Incorporating road density and dead end road density explains relatively little additional variance in the model, although they improve goodness of fit.

This work predicts costs associated with surveillance of invasive species populations. The authors found that the cost per survey point diminishes with increasing survey point density and also depends on road network characteristics. When combined with maps for the relative risk of alien species establishment across landscapes and measures of surveillance efficacy dependent on effort, these cost predictions can increase efficiency of surveillance and eradication efforts for the gypsy moth and other invasive species.

http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12754/full

Optimizing confirmation of invasive species eradication with rapid eradication assessment

J.C. Russell, H.R. Binnie, J. Oh, D.P. Anderson and A. Samaniego-Herrera

Journal of Applied Ecology 2017, 54: 160–169. doi:10.1111/1365-2664.12753

Confirmation of invasive species eradication following management programmes is typically determined by waiting an arbitrary period of time before determining success or failure based upon the then obvious presence or absence of the target species. Rapid eradication assessment could be achieved more expediently by applying statistical models of the probability of detecting survivors and their offspring, using a grid of detection devices, for a given set of biological and monitoring parameters.

The authors simulate the estimation of the probability of eradication for invasive rodents on islands across a range of monitoring parameters in order to provide guidance to managers on the optimal values, diminishing returns and trade-offs in monitoring to achieve a given level of confidence in successful eradication.

The authors found that monitoring an island for survivors over 15–20 nights is optimal and that waiting longer than a year before commencing monitoring has a negligible impact on the estimated probability of success. The spacing between detection devices has a considerable influence on estimated probability of success but only when it is <60 m.

The authors recommend island eradication managers routinely implement rapid eradication assessment on small islands for the demonstrated cost savings and to accelerate eradication confirmation, ultimately facilitating island restoration.

http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12753/full

Wildlife crossing

Weeds on the web: conflicting management advice about an invasive non-native plant

B.S. Robinson, R. Inger, S.L. Crowley and K.J. Gaston

Journal of Applied Ecology 2017, 54: 178–187. doi:10.1111/1365-2664.12712

Invasive non-native plants (INNPs) can have serious and widespread negative ecological and socio-economic impacts. It is therefore important they are managed appropriately. Within domestic gardens management decisions, which will tend to be made by individual members of the public, are likely to vary depending on (a) understanding of problems caused by INNP, and (b) knowledge of best practice.

Using content analysis, an approach seldom employed in an ecological context, this study analysed variation in internet-based information sources regarding INNP to determine how this collective discourse might influence risk perceptions and management decisions for domestic garden owners/managers. The authors used Japanese knotweed *Fallopia japonica* in the UK, as a case study, as it is one of the most ecologically and economically damaging INNP in the region. Their analysis categorised the types of author disseminating information about Japanese knotweed, the relative frequency of documents between author categories, and variation in content and style between and within author categories.

The authors identified five author categories: environmental NGOs, control companies, government, media and the property market. There was extensive variation in document structure, topics discussed, references and links to other sources, and language style; sometimes this variation was between author categories and sometimes within author categories. The most significant variation in topics discussed between author categories was indirect socio-economic problems, with control companies discussing these most. The number of pieces of legislation referenced and the proportion of militaristic words used were also highly significantly different between author categories. Some documents used neutral terminology and were more circumspect, whilst others were more forceful in expressing opinions and sensational.

The author category returning the highest number of documents was the subcategory local government, the shortest of which contained neither links to other information nor referenced any organisations. Further analysis of local government documents revealed conflicting advice regarding the disposal of Japanese knotweed waste material; confusion about this topic could result in decisions being made that spread Japanese knotweed further and are potentially unlawful.

To help prevent inappropriate management of invasive non-native plants (INNPs), the authors recommend that local and national authorities collaborate and work towards disseminating more consistent messages about (a) the potential socio-economic and ecological problems caused by INNP, whilst avoiding hyperbole, and (b) the most appropriate management techniques.

http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12712/full

Pipistrelle bat

Transition from conventional to light-emitting diode street lighting changes activity of urban bats

D. Lewanzik and C.C. Voigt

Journal of Applied Ecology 2017, 54: 264–271. doi:10.1111/1365-2664.12758

Light pollution is rapidly increasing and can have deleterious effects on biodiversity, yet light types differ in their effect on wildlife. Among the light types used for street lamps, light-emitting diodes (LEDs) are expected to become globally predominant within the next few years.

In a large-scale field experiment, the authors recorded bat activity at 46 street lights for 12 nights each and investigated how the widespread replacement of conventional illuminants by LEDs affects urban bats: they compared bat activity at municipal mercury vapour (MV) street lamps that were replaced by LEDs with control sites that were not changed.

Pipistrellus pipistrellus was the most frequently recorded species; it was 45% less active at LEDs than at MV street lamps, but the activity did not depend on illuminance level. Light type did not affect the activity of *Pipistrellus nathusii*, *Pipistrellus pygmaeus* or bats in the Nyctalus/Eptesicus/Vespertilio (NEV) group, yet the activity of *P. nathusii* increased with illuminance level. Bats of the genus *Myotis* increased activity 4.5-fold at LEDs compared with MV lights, but illuminance level had no effect.

Decreased activity of *P. pipistrellus*, which are considered light tolerant, probably paralleled insect densities around lights. The results suggest that LEDs may be less repelling for light-averse *Myotis* spp. than MV lights. Accordingly, the transition from conventional lighting techniques to LEDs may greatly alter the anthropogenic impact of artificial light on urban bats and might eventually affect the resilience of urban bat populations.

At light-emitting diodes (LEDs), the competitive advantage – the exclusive ability to forage on insect aggregations at lights – is reduced for light-tolerant bats. Thus, the global spread of LED street lamps might lead to a more natural level of competition between light-tolerant and light-averse bats. This effect could be reinforced if the potential advantages of LEDs over conventional illuminants are applied in practice: choice of spectra with relatively little energy in the short wavelength range; reduced spillover by precisely directing light; dimming during low human activity times; and control by motion sensors. Yet, the potential benefits of LEDs could be negated if low costs foster an overall increase in artificial lighting.

http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12758/full

Forthcoming Events 2017

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

Conferences		
Date	Title	Location
22 March 2017	Spring Conference 2017 – Mainstreaming Biodiversity into Future Cities	London
6 April 2017	Irish Section Conference 2017 – Advancing Ecological Impact Assessment in Ireland	Dublin
4 July 2017	Summer Conference 2017 – Integrated Management of the Marine Environment	Southampton
21-22 November 2017	Autumn Conference 2017 – Mitigation, Monitoring and Effectiveness	Manchester

Training Courses		
14 March 2017	Habitats Regulations Appraisal (HRA) of Plans and Projects	Edinburgh
14-15 March 2017	Water Vole Live Trapping, Handling, Practical Care and Re-establishment	Launceston
21 March 2017	BS42020 Biodiversity: Code of Practice for Planning and Development	Cardiff
27 March 2017	Ecological Clerk of Works	London
28 March 2017	Otter Ecology and Surveys	Cirencester
28 March 2017	Badger Ecology and Survey Techniques	Cambridge
29 March 2017	Using eDNA and Traditional Techniques for Effective Great Crested Newt Surveys	Nottingham
30 March 2017	Wind Farm Bird Collision Risk Modelling	Aberdeen
4 April 2017	Badger Ecology and Survey Techniques	Leatherhead
6 April 2017	Barn Owl: Ecology, Surveying and Mitigation	Tamworth
6 April 2017	Habitats Regulations Assessment (HRA) of Projects	Bristol
12 April 2017	Using eDNA and Traditional Techniques for Effective Great Crested Newt Surveys	Basildon
19 April 2017	Great Crested Newt Ecology and Survey Techniques	Coatbridge
20 April 2017	Great Crested Newt Assessment and Mitigation	Coatbridge
24 April 2017	Introduction to Bat Ecology and Bat Surveys	Wareham
24-25 April 2017	QGIS for Ecologists and Conservation Practitioners	Nottingham
25 April 2017	Bats: Impact Assessment and Mitigation	Wareham
26 April 2017	Introduction to Bats and Bat Survey	Dunblane
27 April 2017	Bat Impacts and Mitigation	Dunblane
27 April 2017	Great Crested Newt Ecology and Survey Techniques	Leatherhead
2 May 2017	Eurasian Beaver Ecology and Survey Techniques	Dunkeld
2 May 2017	Water Vole Ecology and Surveys	Cirencester
3 May 2017	Eurasian Beaver Mitigation and Management	Dunkeld
3 May 2017	Water Vole Mitigation	Cirencester
10 May 2017	Badger Ecology and Survey Techniques	Lincoln
11 May 2017	Badger Impacts and Mitigation	Lincoln
11 May 2017	Early Season Grass and Sedge Identification	Salisbury
11-12 May 2017	Introduction to Phase 1 Habitat Mapping and Plant Identification	Newark
12 May 2017	Camera Trapping for Ecologists	Stockton-on-Tees
12 May 2017	How to write an EPS Mitigation Licence application	London
16 May 2017	Extended Phase 1 Survey	Carlisle
16 May 2017	Livestock Management in the Uplands	Skipton, North Yorks
18-19 May 2017	Advanced Bat Survey Techniques	Wooton-under-Edge, Glos
22 May 2017	Grass and Sedge Identification – Neutral and Calcareous Grasslands	Salisbury
23 May 2017	Grass, Sedge and Rush Identification – Heathland, Acid Grassland and Bogs	New Forest
24 May 2017	Using R for Basic Statistics in Ecology and Environmental Management	Dundee
1 June 2017	Otter Impacts, Surveying and Mitigation	Dunblane
6-7 June 2017	Grasses for Phase One Habitat Survey	London
8 June 2017	Beginners Guide to the NVC	Carlisle
8-9 June 2017	Introduction to Phase 1 Habitat Survey	London
10 June 2017	Bat Handling and Identification	Herne Bay
13 June 2017	Otter Ecology and Surveys	Cannock
14 June 2017	Otter Mitigation	Cannock
26 June 2017	Using Indicator Species for Habitat Assessment (Phase I and NVC) – Grasslands	Salisbury
27 June 2017	Water Vole Ecology and Surveys	Ilkeston
27-28 June 2017	QGIS for Ecologists and Conservation Practitioners	Gloucester
28 June 2017	Water Vole Mitigation	Ilkeston

Gaining hands-on experience helped me take a firm grasp of my career

Lucy Perrins is an Assistant Ecologist based in our London office. After graduating from the University of Leeds with a BSc in Zoology, Lucy got a job at WYG as a Seasonal Ecology Surveyor in August 2016 which allowed her to gain practical experience and hands-on knowledge of how a consultancy operates. Her enthusiasm and willingness to learn meant she was soon offered a full time position as an Assistant Ecologist. Lucy tells us more about her role:

I started off as a Seasonal Ecology Surveyor, assisting with bat transect and emergence surveys to make sure housing developers comply with species protection laws.

My role is very varied and I'm presented with new learning experiences each day. I enjoy gaining knowledge about British animals and plants, the legislation that protects them and ways to spot the presence of particular species during field work. Training is key to my role and I take part in regular training sessions to further my knowledge which will eventually lead to me obtaining licences to survey certain habitats and species.

Since joining WYG, I've completed training in how to conduct Phase 1 habitat surveys as well as bat, badger, crayfish, and reptile surveys. I also now know how to use ArcGIS, an essential mapping program used in ecological consultancies and am being supported with my application to become a member of CIEEM.

Career progression is really valued at WYG. My career goals are supported, particularly in terms of the types of animal licences I would like to acquire. I've already attended barn owl training and hope to gain a licence at the end of the year.

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