Bulletin of the Chartered Institute of Ecology and Environmental Management

CIEEM

inpractice

Issue 98 | December 2017

Nature Conservation on a Shoestring

In this issue

Welcome

Nature Conservation on a Shoestring

Most CIEEM members will agree that a healthy, wildlife-rich natural world is valuable in its own right as well as being the foundation of our wellbeing and prosperity; we depend on it and it depends on us. Yet too many forces in the world are pulling wildlife and people apart, unnecessarily damaging natural systems, disrupting ecological processes and reducing biodiversity. The turbulence of the political climate opens up major risks but also presents new opportunities for nature conservation. We have our work cut out to turn this chaos to the advantage of the natural world.

The Wildlife Trusts believe that everyone deserves to live in a healthy environment, rich in wildlife and full of opportunities to enjoy the natural world. By working together, in the places that are closest and most important to us, people can change the natural world for the better – whoever and wherever we are – for ourselves and for future generations. By channelling the energy of more than 800,000 members, 40,000 volunteers and 2,000 staff, and by pooling funds and other resources, the Wildlife Trusts are committed to making a difference in the UK. We have big ambitions and face many challenges, and so there is a huge incentive to achieve more with less. As the charity equivalent of small businesses, it's in the DNA of Trusts to make the most of what we've got, and there are many ways we do that.

Our 40,000 volunteers are pivotal. Across the UK, volunteers not only look after nature reserves, run education initiatives, do ecological research and raise funds; they have even built visitor centres. They also comment on planning applications, and talk to MPs and other politicians and so are key to informing, educating, guiding and influencing. In this way, plumbers, electricians and designers; professors, lawyers and teachers; tree surgeons, gardeners and journalists all pitch in.

And because each Wildlife Trust covers a specific patch, we're close to the ground. If you share an office with the person who recruits members and raises funds, you respect how much each pound matters. People feel responsible and accountable not just to their boss, but to their colleagues, the wildlife and wild places near to where they live and the people in the communities where they work.

Beyond that, of course, necessity is the mother of invention, so we constantly look for new and better ways of working. Having less hierarchy releases creativity. And if an innovation goes wrong the risk is innately managed as it affects only that patch.

And that brings us to probably the most important thing: if you believe that nature matters, the best way to achieve more with your limited resources is to spread the load and share the task with others who believe as you do. If you can inspire, empower and enable others to work alongside you, by demonstrating what can be done and establishing common cause with them, then every challenge becomes easier to overcome.

Stephanie Hilborne OBE
Chief Executive, The Wildlife Trusts

Information

In Practice No. 98
December 2017
ISSN 1754-4882

Editor
Dr Gillian Kerby (gillkerby@cieem.net)

Internal contributions coordinator
Mr Jason Reeves (jasonreeves@cieem.net)

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

T: 01962 868626
E: enquiries@cieem.net
W: www.cieem.net

In Practice is printed on paper using 100% post-consumer, de-inked waste. This is manufactured by an ISO14001 and EMAS accredited company. The polybags used to mail *In Practice* are made of Oxo-Degradable Low Density Polythene which will break down and degrade faster than standard polythene products.

Front cover image:
Hiking in Scotland

Contents

Conservation on a Shoestring: The Mutualistic Benefits of University – Nature Reserve Collaborations
Sarah L. Taylor, Andrew J. Hunt and Khaled de Jesus

Working for Wildlife – Environmental Partnerships between Water Companies and Wildlife Trusts
Stuart Pudney, Anne Porter and Charlotte Bradbury

Network Rail's Strategic Approach to Net Positive Biodiversity and UK Conservation Benefit
Octavia Neeves

Saving the Small Things that Run the Planet – Conservation on a Shoestring
Paul Hetherington

Pantheon: A New Resource for Invertebrate Survey Standards and Analysis
David Heaver, Jon Webb, David Roy, Hannah Dean, Martin Harvey, Craig Macadam and Jon Curson

Bat Guano Fertiliser: A Novel Method of Encouraging Conservation of Tropical Bats on a Shoestring
Kathy Halsall

Practicalities and Problem Solving: Orchid Translocation in Oxfordshire
Samantha Hursey and Katrena Stanhope

How Many Great Crested Newts Can Terrestrial Habitats Support?
John Box

CIEEM Medal 2017

Professor Sir John Lawton was awarded the Medal at the Autumn Conference on 21 November 2017. The Medal was presented in recognition of his outstanding, highly influential and life-long contribution to ecology and environmental management. To read the full citation please visit www.cieem.net/medal-winners.

New Guidance

The **Guidelines on Preliminary Ecological Appraisal** (GPEA) have been updated and the new version was published recently (www.cieem.net/guidance-on-preliminary-ecological-appraisal-gpea-). Lead author Mike Dean CEcol CEnv FCIEEM will be giving a short webinar presentation later this month to highlight the main changes in the revised version (www.cieem.net/training-events).

Some minor changes have also been made to the **Guidelines for Ecological Report-writing** to ensure they are aligned with the revised GPEA. Again, the most up-to-date version is on the CIEEM website.

The Professional Standards Committee (PSC) has also produced a new webpage **glossary of ecological surveys, reports and their purpose in the planning system** (in the members' area of the website) to assist all stakeholders with understanding the complexity of ecological survey types and their associated reporting. A downloadable summary is also available. PSC is continuing to work closely with ALGE on an EcIA protocol for consultants and local authority planners to enable them to assess whether an EcIA is fit for purpose. It is hoped that this protocol will help to address proportionate EcIA approaches in cases of low biodiversity impact.

Finally, as reported on page 45, PSC has produced a major new resource for members to replace Sources of Survey Methods. **Good Practice Guidance on Survey, Mitigation, Management and Monitoring** is only available in the CIEEM members' area of the website. The intention is to turn it into a searchable database resource early in 2018.

Consultants Portal – An Update

We have recently been having further discussion with NBN and ALERC regarding some improvements to the Consultants Portal which has been developed to facilitate the uploading and sharing of data. Whilst there are still some issues with the usability of aspects of the Consultants Portal, we believe that this is still the most appropriate channel for sharing your data. Using the portal ensures that data enters the verification system and is shared with LERCs, National Schemes etc. in the most efficient way.

Dr Jo Judge, CEO of NBN, has reported that NBN will be working on improvements to the portal and its integration with the NBN Atlas in the coming months. NBN will also be providing more detail on data licencing and verification, as these are handled differently in the NBN Atlas compared to how they worked in the NBN Gateway. Jo and her team would like to thank you for bearing with them while they have, by necessity, concentrated on the NBN Atlas over the last year.

Amendment to the Code of Professional Conduct

Members should please note that there has been a minor amendment to the Code of Professional Conduct. The Supplementary Information for Clause 4 has been added to make it clear that this clause includes complying with all *relevant* laws – i.e. laws relating to the conduct and competence of a member acting in their professional capacity.

Social Media

We are now on Facebook! Find us @CIEEM91 where we share news from the sector, latest jobs and training and photos from our various events throughout the year.

Please note we have recently changed our Twitter handle to @CIEEMnet.

And don't forget to join us on LinkedIn too – just search for "CIEEM" in groups.

CIEEM Conferences 2017 – presentations available

The CIEEM Summer Conference 2017 – *Making Nature Count: Natural Capital in Policy and Practice* – and Autumn Conference 2017 – *Mitigation Monitoring and Effectiveness* – presentations are now available at: www.cieem.net/previous-conferences

Future *In Practice* Themes

Edition	Theme	Submission deadline
99 - March 2018	Genetic Techniques and Technologies	27 November 2017
100 - June 2018	Centenary Edition: Big Ideas	26 February 2018
101 - September 2018	Environment and Pollution	28 May 2018
102 - December 2018	Data and Information Management	27 August 2018

If you would like to contribute an article to a forthcoming edition of *In Practice* please note the submission deadlines above. Please also note that early submission is appreciated.

Articles for the specific editions below could address, but are not limited to, the following:

- **Genetic Techniques and Technologies** – including eDNA and metabarcoding, etc.
- **Centenary Edition: Big Ideas** – innovation and new ideas in ecology and environmental management
- **Environment and Pollution** – all aspects of pollution impacts on the natural environment including water, air quality, eutrophication and enrichment, agriculture, transport, etc.
- **Data and Information Management** – including big data, sharing, storage, management and analysis, etc. in relation to the natural environment

For further information please visit the website (www.cieem.net/in-practice) or contact the Editor (gillkerby@cieem.net).

Environmental scrutiny body consultation announced

Environment Secretary, Michael Gove, has announced plans to consult on a new, independent body for environmental standards. A consultation on the specific powers and scope of the new body will be launched early 2018.

https://www.cieem.net/news/444/environment-secretary-promises-to-consult-on-new-scrutiny-body

Environment Secretary questioned by Select Committees

Michael Gove has been questioned on Brexit and the environment by the Environmental Audit Committee and by the Lords EU Energy and Environment Sub-Committee. Issues covered included the future of environmental protection after leaving the EU, agri-environment funding outside the Common Agricultural Policy and the Government's 25-Year Plan for the Environment.

http://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/news-parliament-2017/governments-environmental-policy-michael-gove-evidence-17-19/

http://www.parliament.uk/business/committees/committees-a-z/lords-select/eu-energy-environment-subcommittee/news-parliament-2017/gove-brexit-environment-energy/

UKELA publish new Brexit reports

The UK Environmental Law Association has published new reports on Brexit:

- Brexit and Nature Conservation Factsheet – https://www.ukela.org/blog/Brexit-Task-Force/Brexit-and-Nature-Conservation-Factsheet
- Brexit and Environmental Law: The UK and International Environmental Law after Brexit – https://www.ukela.org/content/doclib/320.pdf
- Brexit and Environmental Law: Brexit, Henry VIII Clauses and Environmental Law – https://www.ukela.org/content/doclib/319.pdf

Food, Farming and Countryside Commission launched

The RSA has launched a new, independent body to scrutinise the government on the future of food, farming and the countryside.

https://www.thersa.org/action-and-research/rsa-projects/public-services-and-communities-folder/food-farming-and-countryside-commission

NCC publish advice on Defra 25-Year Environment Plan

The Natural Capital Committee has published its advice to the UK government on its 25-Year Environment Plan. The Plan is due to be published by early 2018.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/650314/ncc-advice-on-25-year-environment-plan171009.pdf

Rabies in bats guidance

Defra has published guidance on signs that may suggest rabies in bats, what to do if you spot them, and measures to prevent exposing yourself to the disease.

https://www.gov.uk/guidance/rabies-in-bats

Welsh national priorities announced in Natural Resources Policy

The Welsh Government has published its new Natural Resources Policy (NRP), the second major milestone in the implementation of the Environment (Wales) Act. The priorities are: the delivery of nature-based solutions; increasing renewable energy and resource efficiency; and taking a place-based approach.

http://gov.wales/newsroom/environmentandcountryside/2017/170821-national-priorities-announced-natural-resources-policy/?lang=en

UK omits climate change from post-Brexit foreign policy plan

The UK government's proposal for its future relationship with the EU calls for cooperation on energy security, but makes no mention of the Paris Agreement, a stated priority in Brussels.

http://www.climatechangenews.com/2017/09/12/uk-omits-climate-post-brexit-foreign-policy-plan/

Ireland launches 3rd National Biodiversity Action Plan

Minister Heather Humphreys has launched Ireland's 3rd National Biodiversity Action Plan. The Plan sets out actions through which a range of government, civil and private sectors will undertake to achieve Ireland's 'Vision for Biodiversity'. CIEEM responded to the plan consultation earlier in the year.

https://www.npws.ie/news/minister-heather-humphreys-launches-3rd-national-biodiversity-action-plan

Phenology supplement to State of UK Climate 2016 report

This supplemental report has been released to complement the annual State of the UK Climate 2016 report. The supplement discusses variations in the budburst timing of 11 tree species across the UK in 2016 relative to longer-term variations.

http://www.metoffice.gov.uk/news/releases/2017/phenology-report

http://www.metoffice.gov.uk/climate/uk/about/state-of-climate

Natural England consult on new approach to bat licensing

Natural England has recently launched a consultation on a potential new scheme for EPS licensing based on developing their current Earned Recognition approach. More information and link to the short consultation survey via the link below.

www.cieem.net/news/445/natural-england-consulting-on-earned-recognition-for-bats

Conservation on a Shoestring: The Mutualistic Benefits of University – Nature Reserve Collaborations

Keywords: academic research, employability skills, evidence-based approach, study skills gap, volunteering, work placements

Sarah L. Taylor MCIEEM
Lecturer in Ecology, Keele University

Andrew J. Hunt
Ranger, Groundwork West Midlands

Khaled de Jesus
Master's student, Kings College London

This article uses the Silverdale Country Park – Keele University partnership as a case study to outline the positive outcomes and potential pitfalls of collaborations from the perspective of the conservation body, academic institution and student. Collaborative university projects enable students to gain practical experience while generating research and monitoring data that would otherwise be too costly to the conservation body. They are an addition, not a replacement to professional ecological surveys.

Figure 1. First year ecology students on a Country Park tour focusing on raising environmental awareness, access issues and availability of the park for volunteering and study. © Andrew Hunt.

Introduction: why do we need collaboration?

Limited budgets for nature reserve management means that funding must be targeted at resources (tools, tree plugs, biscuits for volunteers, etc.), and installation and management costs (labour, machine hire, etc.). The result is a landscape full of supposed habitat improvements (nesting boxes, meadows sown with wildflower seed mixtures) but limited resources to determine if they have been successful. Such evidence-based data is a necessary element of the adaptive ecosystem approach to management that is now being advocated to land managers, but is time consuming and costly to implement. Collaborations between conservation bodies and academic institutions provide a means of gaining quality data that can be fed into management plans. It also provides students with an opportunity to gain vital experience through volunteering, placements and research that plug skills gaps and increases employability. Growing numbers of graduates mean students now need to arm themselves with additional skills that go beyond their academic studies in order to be competitive in the job market, and this pressure is further compounded by rising student debt. In response to increases in university fees (£9,000+ per annum), institutions are seeking unique learning experiences that provide value for money and ensure student satisfaction. Students have high expectations and want to do meaningful projects that go beyond just satisfying the requirements of their degree, actively seeking out opportunities to work with outside organisations and tackle real-world problems that produce meaningful data. In this article, we report the value of project provision between Silverdale Country Park and Keele University.

Silverdale Country Park – Keele University partnership (2012-present)

The 87 ha Silverdale Country Park in Staffordshire is owned by the Land Trust and managed by Andrew Hunt of Groundwork West Midlands, both of which are charities. Andrew took up the post of ranger in 2011 when the park first opened following its restoration from a former colliery after campaigning saved it from the usual repurposing for landfill. In 2015, the park was designated a Site of Biological Importance for its mosaic of early successional habitats and associated species; a legacy of past industrial use that a landfill development would have destroyed. The park protects priority bird species listed on the former UK Biodiversity Action Plan (16 red, 41 amber), and the largest colony of dingy skipper butterfly *Erynnis tages* in the county. Local schools, universities and community groups (scouts, youth offenders) utilise the park for educational activities and engage in conservation work parties (Figures 1 and 2). An audit in 2017 valued these educational services at £700,000 a year (Land Trust 2017).

Reaseheath College in Cheshire brings students to learn practical skills at the park, such as fencing and woodland management. Students from Staffordshire University, Harper Adams University and Chester University have also carried out projects at Silverdale. In 2012, formal collaboration was established with Keele University to facilitate student projects and data sharing, as well as fostering key graduate attributes such as *"the ability and motivation to participate responsibly and collaboratively as an active citizen in the communities in which you live and work"* (Keele University 2017). Keele University is located three miles from the park and is home to 10,000+ students with over 900 students registered on a volunteering portal through the students union. Between 2012 and 2017, eight students conducted work placements, 177 students attended fieldtrips, 147 students participated in volunteering events, and 14 students carried out undergraduate projects at the park. To increase the visibility of volunteering and project opportunities at the park, in 2015

Table 1. Flow of benefits (black solid line) and challenges (red dashed line) between Silverdale Country Park and Keele University.

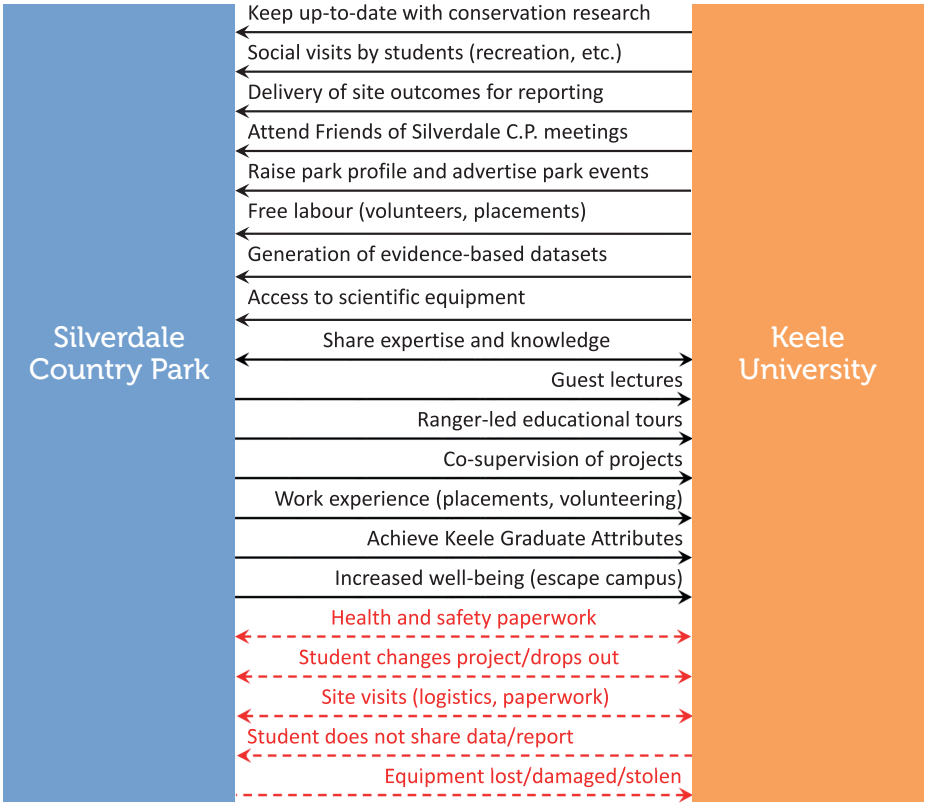


Figure 2. Volunteers constructing artificial wildfowl nests while water levels have been dropped. © Andrew Hunt.

a field tour was embedded into a first-year ecology module (Figure 1) and a case study featuring the park was published in the core biology textbook in 2017. Table 1 summarises the flow of benefits and challenges arising from the collaboration.

What is the value of student undergraduate projects?

Since 2011, 20 students have completed final year, independent research projects at the four institutions. Table 2 lists examples of projects and Box 1 gives an example of a project that generated valuable data on wildfowl nesting structures.

Doing research can be daunting for students and time consuming for supervisors, especially at the project development stage, but students often relish the opportunity to contribute to evidence-based conservation and report positive impacts on their future careers (Box 2).

Figure 3. Nesting sites at Silverdale Country Park: (a) natural sites at the base of flooded willow trees, and (b) man-made structures of stakes and brash. © Sarah Taylor.

Table 2. The economic value of student projects based on the cost of equivalent professional ecological surveys where data/reports were provided to the ranger.

Project *	Year	Institution	Topic	Cost equivalent **
1	2017/18	Keele University	Does presence of yellow rattle improve meadow diversity?	£1900 for Phase1 survey
2	2017/18	Keele University	Does meadow management at Silverdale Country Park promote butterfly biodiversity?	£2952.50 for butterfly and dragonfly survey
3	2016/17	Keele University	Do wildfowl birds prefer man-made or natural nesting structures at Silverdale Country Park?	£2850 for breeding bird survey
4	2016/17	Keele University	The effect of habitat management on the relative abundance of small mammal populations in Silverdale Country Park.	£1600 for bat survey
5	2016/17	Keele University	Characterising the ecology of Silverdale Country Park and quantifying its spatial variation.	£1900 for Phase1 survey
6	2014/15	Chester University	Does land management affect bird populations and communities? A comparison between farmland and country parks.	£2850 for breeding bird survey
7	2014/15	Keele University	Do seasonal pools at Silverdale Country Park have a secure future?	£2910 for invertebrate survey
8	2014/15	Keele University	Has the development of Silverdale Country Park impacted badger *(Meles meles)* sett territories and latrine use?	£6500 for bait marking survey
9	2013/14	Keele University	Do drainage ditches act as wildlife corridors in Silverdale Country Park?	£1570 for amphibian survey
10	2013/14	Chester University	Bait tube survey of small mammals on Silverdale Country Park, which will contribute to the National Atlas.	£1350 for Reptile survey
11	2012/13	Keele University	A review of active and passive remediation methods including a biological wetland system used at an ex-colliery in Silverdale.	£665 for water systems and quality surveys
12	2011/12	Reaseheath College	Waders distribution on the Void.	£2850 for breeding bird survey

* Further information available from the lead author if required

**Based on costings for equivalent surveys from Staffordshire Ecological Services, a non-profit making professional arm of the Staffordshire Wildlife Trust.

Box 1. Evidence-based data generated from a student project on wildfowl usage of artificial nesting structures.

Andrew Hunt and his park volunteers constructed man-made wildfowl nesting sites on the lake at Silverdale Country Park between 2013 and 2015 in an attempt to boost breeding habitat. Structures were constructed when the lake levels were low to emulate natural sites beneath flooded willow trees by weaving brash around stakes (Figures 2 and 3). It was important to evaluate effectiveness by checking whether wildfowl were using the man-made structures, and which of the design variants was better for breeding success. In the spring of 2016, a student from Keele collected data on the use of natural and man-made nesting sites under the supervision of the authors (SLT, AJH) (Figure 4). The study was designed to fulfil the scientific requirements of a biology undergraduate thesis, while generating much-needed, evidence-based conservation data on nesting preferences that would inform future management at the Park.

A review of the provision of artificial nesting sites for wildfowl using artificial/floating islands by the team at Conservation Evidence (Williams *et al*. 2017) highlighted the gap in evidence-based data: three studies were reviewed, two carried out in the 1970s in the USA and one in the 1990s in the UK. Methods were adapted from the British Trust for Ornithology breeding survey guidance (Robinson *et al*. 2016) to gauge nest occupancy and wildfowl activity around the nest (within 0.5 m radius) in a 5-minute observation period over nine visits. Fifteen nests were surveyed, of which 10 were man-made. A total of 144 wildfowl were observed within and around the nests, comprising 55 (38%) coot *Fulica atra*, 50 (35%) mallard *Anas platyrhynchos*, 26 (18%) moorhen *Gallinula chloropus*, and 13 (9%) other species. All nesting structures had wildfowl activity in their vicinity but some were more popular than others. Preference differed by wildfowl species, with coots preferring the base of naturally occurring willow trees and moorhen the man-made structures (Figure 5). However, only six nesting structures were observed to be in use during the observation period (i.e. bird sat on eggs), which were split equally between the man-made and natural structures, and were occupied by coots (3 natural, 2 man-made) and moorhen (1 man-made), while mallards were not seen on any of the nests. The study confirmed the usefulness of man-made nesting structures, although other variables, such as human disturbance levels (dogs, walkers, etc.) and vegetative ground cover (shelter) also play an important role and require further study. The study highlighted the presence of well-defined territories, which had not been known and will inform management of the site. The knowledge that artificial nests enabled the once scarce moorhen to flourish in the park was a great way of demonstrating to the regular band of volunteers the worthiness of their efforts.

Practical conservation experience that addresses the skills gaps and increases employability of graduates is a clear selling point for students, but what about the value to land managers? One way to put an economic value on student project outputs is to compare them to the cost of an equivalent ecological survey. Not all the projects that took place at Silverdale can be assessed in this way, but those that were comparable had a combined value of nearly £30,000 (see examples in Table 2). Such an evaluation can be used as a means of demonstrating to land managers the worthiness of supervision time.

Research data gained from student projects doesn't replace the need for professional ecological survey but, in times of austerity, many sites only commission ecologists to meet planning requirements, etc. Student data may be 'free' in a financial sense but Silverdale has found that the usefulness of student data is directly dependent on excellent communication between site

Figure 4. Keele University student and Silverdale CP ranger discuss the proposed wildfowl nesting study. © Sarah Taylor.

Box 2. Student perspectives – reflections and outcomes.

"*My research of yellow rattle* Rhinanthus minor *will allow the park to use tangible data in the future management decisions of its grass meadows."* Nev Bradshaw, project in progress (Table 1, Project 1).

"Provided me with invaluable field experience." Nyall Goodwin, project in progress (Table 1, Project 2).

"My project has completely influenced my career path." Khaled de Jesus, graduated 2017 (Table 1, Project 3).

"I could use the expertise of the park ranger. My field work experience helped set me apart from my peers and helped me secure work at a RSPCA wildlife centre." Ashleigh Begg, graduated 2015 (Table 1, Project 8).

"Working on this project, I was able to appreciate the importance of collaborative working relationships, as well as developing applied skills that I have gone on to use in my career." Emily Heades, graduated 2014 (Table 1, Project 9).

manager, student and academic supervisor so that everyone's needs are met. This can be time consuming for a site manager and frustrating when a student does not forward the data or report outputs, which was the case for eight out of 20 of the project students. Output quality is directly related to enthusiasm for the research topic, therefore student interests are a primary consideration when deciding on a project brief rather than which survey is most needed for management plans. In addition, survey times of year and student academic holidays often conflict so careful subject choice is important here too, as is the availability of materials and equipment at the site or academic institution. Weather variations can also dramatically impact studies necessitating project redesign.

Like many sites, Silverdale Country Park must report to its funders across several outcomes: Environment & biodiversity, Community engagement, Health, Economy and Education. The range of student activities (research projects, work placements, volunteering, visiting the Park socially) means that the partnership with Keele is one of very few relationships that achieve all outcomes simultaneously. In addition to this, site managers can become entrenched in ways of working and tend to follow documented management prescriptions; the fresh eyes and energy of students is vital here because it provides an opportunity to keep up-to-date with the latest research, as well as re-energising site staff with new perspectives.

Conclusions

Collaborations provide many benefits that go above and beyond obtaining data and writing reports. It is a process that requires engagement by all stakeholders to produce useful results. The collaborative approach gives students experience of field techniques in a real-life environment, academics can explore research ideas on a real field site and rangers keep fresh with current research. The quality of student research data can be variable and therefore should supplement not replace professional surveys. Student research can be used to flag up areas where targeted, specialist ecological expertise is needed, helping to target limited resources, whilst also giving students practical experience that narrows the graduate skills gap and fosters ecological careers.

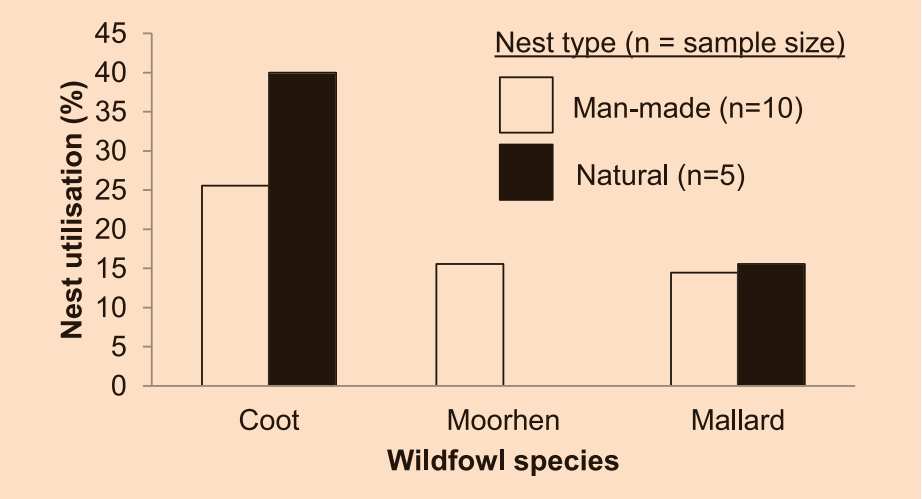


Figure 5. Nest utilisation: percentage of man-made and artificial nest sites that were occupied by coot, moorhen or mallard and/or where wildfowl activity was recorded within 5 m of a nest.

References

Keele University (2017). *My Keele Journey – active citizenship and graduate attributes*. Available at https://www.keele.ac.uk/journey/activecitizenship/. Accessed 4 October 2017.

Khaled de Jesus (2017). *Do wildfowl birds prefer man-made or natural nesting structures at Silverdale Country Park?* Unpublished undergraduate thesis, Keele University.

The Land Trust (2017). *The hidden value of our green spaces*. Available at www.thelandtrust.org.uk/thebenefits. Accessed 4 October 2017.

Robinson, R.A., Leech, D.I., Massimino, D., Woodward, I., Hammond, M.J., Harris, S.J., Noble, D.G., Walker, R.H., Eglington, S.M., Marchant, J.H., Sullivan, M.J.P. and Baillie, S.R. (2016). *BirdTrends 2016: trends in numbers, breeding success and survival for UK breeding birds*. Research Report 691. British Trust for Ornithology, Thetford. Available at https://www.bto.org/about-birds/birdtrends/2016/methods/breeding-bird-survey. Accessed 4 October 2017.

Williams, D.R., Child, M.F., Dicks, L.V., Ockendon, N., Pople, R.G., Showler, D.A., Walsh, J.C., zu Ermgassen, E.K.H.J. and Sutherland, W.J. (2017). Bird Conservation. In: W.J. Sutherland, L.V. Dicks, N. Ockendon and R.K. Smith (eds), *What Works in Conservation 2017*, pp. 95-244. Open Book Publishers, Cambridge. Available at http://www.conservationevidence.com/actions/483. Accessed 4 October 2017.

Acknowledgements

Thanks go to past and present students who carried out their studies at Silverdale Park, and particularly those who supplied comments for this article (Box 2).

About the Authors

Dr Sarah Taylor joined Keele University as an ecology lecturer in 2008. Sarah received a teaching grant in 2014 to promote field-based learning and a student-led teaching award in 2015 for impact in education. Sarah is currently undertaking a Master's degree in Teaching and Learning in Higher Education.
Contact Sarah at:
s.l.taylor@keele.ac.uk

Andrew Hunt has been ranger of Silverdale Country Park since 2011. Andrew has a Master's in Habitat Management and Conservation, has taught on the Countryside Resource Management degree at Reaseheath College and was short-listed for the Land Trust's ranger of the year in 2017.
Contact Andrew at:
Andrew.Hunt@groundwork.org.uk

Khaled de Jesus carried out a Keele University final year biology project at Silverdale Country Park, graduating in 2017. Khaled is doing a Master's in Environmental Monitoring, Modelling and Management at King's College, London, and aspires to a career in environmental consultancy.

Working for Wildlife – Environmental Partnerships between Water Companies and Wildlife Trusts

Keywords: cost-effective conservation, Northumbrian Water, partnership, Wildlife Trust, volunteers

Stuart Pudney CEnv MCIEEM
Northumbrian Water Conservation and Land Manager

Anne Porter
Heart of Durham Project Officer for Durham Wildlife Trust

Charlotte Bradbury
Essex Wildlife Trust Warden

Scything a meadow at Wear Valley Water Treatment Works.

This article reflects on the benefits of an Environmental Partnership between the Northumbrian Water Group and the Wildlife Trusts from a company perspective, Wildlife Trust and a volunteer perspective. These long-standing partnerships have been established as a means for the Northumbrian Water Group to manage sites of ecological interest, including designated areas and sites with protected species, in a climate of reducing budgets.

Based on shared values and objectives in conservation management, these partnerships really do work; crucially, this is down to the Trusts' volunteer base. Volunteers gain in many ways, including learning new skills, making new friends and gaining health benefits from outdoor work, and the Wildlife Trusts gain by having the financial stability to employ project officers who can also help in other Trust-related activity. In turn, Northumbrian Water gain from professional conservation management of their important sites by local experts.

The following sections are written from the perspective of the Northumbrian Water Group and two of our Environmental Partnerships, with additional comments from volunteers.

Northumbrian Water Group perspective

(Stuart Pudney, Northumbrian Water Conservation and Land Manager)

The Northumbrian Water Group (NWG) operates in the north east of England as Northumbrian Water (NW), a water and sewerage undertaker, and in the south east as Essex and Suffolk Water (ESW), a water only company. In both areas, we have a variety of reservoir sites and treatment works, some of which contain important habitats and protected species.

Surveys in both NW and ESW areas have helped to identify those parts of our landholding with ecological interest, including ancient semi-natural woodland, semi-improved or unimproved grassland, wetlands and heathland. These sites all require some form of management to maintain their interest, which would be quite costly if we had to rely purely on contractors.

This led to an approach to establish seven environmental partnerships with Wildlife Trusts including Durham, Northumberland, Essex, Suffolk and Norfolk. NWG provides funding to enable the Trusts to employ project officers who then undertake site management using trust volunteers. Management includes some fairly labour intensive work such as thistle pulling, ragwort control, invasive non-native species control and scrub management. In some cases we have also leased areas of our landholding to the Wildlife Trusts so that they have more direct control and can secure grants such as stewardship agreements.

At a practical level, Trust volunteers receive appropriate training and are covered by the Trust's risk assessments and insurance. The Environmental Partnership project officers prepare six-monthly reports on management activities, which are used for internal reporting within NWG as part of the process to guarantee future funding.

Some impressive statistics from 2016 include 6238 days of volunteer labour (calculated as number of days x number of volunteers) across all sites, which, at a conservative value of £60/day, adds up to £374,000 worth of work. In addition, these partnerships brought in external funding (various grants) which amounted to £183,000. Set against a financial contribution to the Wildlife Trusts of £350,000, the net saving is £207,000.

Essex Wildlife Trust perspective

(Charlotte Bradley, Essex Wildlife Trust Warden)

There is a very strong working partnership at Abberton Reservoir in Essex between the Essex and Suffolk Water (ESW) Conservation Team and the Essex Wildlife Trust (EWT) wardens based at the site. They meet regularly and have an ongoing seasonal work plan to agree what tasks the EWT wardens and their team of up to 20

Volunteers at Northumbrian Water's Head Office.

Hedge planting at Abberton Reservoir.

or more volunteers can achieve throughout the year. Over the last few years EWT staff and volunteers have planted 70,000 trees around the Abberton reservoir site, 30,000 on the nature reserve and another 40,000 around the wider site. This includes creating sections of new hedge to link to mature hedgerows and to provide screening along new permissive footpaths around the reservoir to prevent disturbance to waterfowl. Blocks of woodland and scrub have also been added in line with the ecological management plan that was drawn up by a partnership including Natural England and Essex Wildlife Trust as part of the recent reservoir enlargement and enhancement project. The Abberton Reservoir top water level was raised by 3.2 m to generate an extra 58% in holding capacity, the concrete walls were removed and the reservoir shoreline re-profiled to create low-gradient, muddy margins. This created important habitat for the waterfowl species which form the main part of the site designation as a SSSI, SPA and RAMSAR.

The wardens and volunteers maintain the trees and hedges they have planted by weeding and pruning them in the first few years. All this work saves paying contractors and as many of the volunteers have an individual link to the trees and hedgerows, they take great pride in caring for what they have created. This personal and manual style of work produces high-quality results and excellent tree survival rates. Volunteer satisfaction is also high as they see their hard work come to fruition. It also a very cost effective method of habitat creation for ESW. Seventy thousand trees planted at a contractor rate of £2.30/tree would have cost approximately £161,000 without the ongoing maintenance costs needed to ensure tree survival. This gives a good indication of the financial value of using volunteers for habitat management work.

The volunteers have also assisted with collecting seed for aquatic planting, including common reed *Phragmites australis*, then growing-on and transferring to new reed-beds that ESW are creating, and also in preparation for a new EWT designed and managed reed-bed on the edge of the nature reserve.

"It is great to work as part of an enthusiastic team. We are looking forward to more new projects, such as the establishment of reed-beds."
Peter Grieg-Smith – volunteer

Volunteers also help with a wide range of other tasks from maintaining boardwalks to coppicing, water vole translocation projects, maintaining great crested newt ponds and grassland areas. The partnership works exceedingly well as all parties involved share the same aims to make the site as beneficial to wildlife as possible.

"Communication is good, mainly through regular progress meetings but also on an ad-hoc basis, which means everyone involved agrees on what a particular project entails, and there is trust between the two organisations' staff, that the work committed to will happen and to the required standard."
Charlotte Bradley – warden

The sharing of experience and knowledge between ESW and EWT is also invaluable. The volunteers themselves provide huge benefit through their time, hard work and wide-ranging expertise. They range in age from retirees to younger people looking for employment in the environment sector and, among other things, they gain new skills and the satisfaction that comes from developing amazing habitats and new friendships.

Durham Wildlife Trust perspective

(Anne Porter, Heart of Durham Project Officer for Durham Wildlife Trust)

The Durham Wildlife Trust (DWT) partnership with Northumbrian Water (NW), known as Heart of Durham, operates in County Durham and covers a large geographical range of sites and habitats, from Derwent Reservoir and land adjoining Wear Valley Water treatment works within the North Pennines Area of Outstanding Natural Beauty to a number of smaller but still diverse habitats at Horden and Seaham on the east coast and Witton Gilbert and Tudhoe near the city of Durham. Meetings between DWT and NW once every two months coordinate an efficient programme of management and allows discussion and feedback on work achieved.

The Heart of Durham project officer leads a weekly group of 15 or more volunteers from a dedicated list of about 50 individuals. These people provide the "manpower" to carry out large-scale management, repair and maintenance tasks, offering flexibility that contractors cannot always provide. Small immediate jobs, like tree removal from a footpath, step repairs and sign installation, to give a few examples, can be done quickly with very little cost.

Heart of Durham volunteer perspective

"Going out on Fridays with Heart of Durham is always interesting as we visit so many different sites connected with Northumbrian Water – it has really helped to spark my developing interest in botany and provided opportunities to carry out botanical surveys on their various sites. Who would have thought that sewage and water treatment works could be such rich natural environments? In addition I'm always guaranteed a good work-out (far better than a boring gym) as well as a good laugh."
Krys Stenhouse

"I had been a member of Durham Wildlife Trust for several years, visiting Low Barns, reading the magazine but nothing more. Finding I had some spare time, I was encouraged to volunteer and to join Heart of Durham by a group member. Starting in October, I joined just as the weather was turning to winter and it became clear that lots of layers were needed. The group were most welcoming and I was encouraged to see how working parties would form, split and then perhaps merge again to tackle the tasks at hand. Group members quickly appraise that week's proposed task and decide the best method and manpower needed. It is evident that the group has a wide range of skills that can be applied and taught. The work and the places visited vary from NW sites to farms, pathways and walled gardens. After nearly a year with the group, I imagine I have been to all 'our' sites but yet another appears. There is a strong sense of doing a good job, for you, the group and for the conservation aims. Heart of Durham is what volunteering is about: people from different backgrounds working towards a defined, worthwhile goal that all parties benefit from."
Roger Dockray

"A change of perspective comes with countryside volunteering. A keen awareness and interest in the varied plant life I am now seeing led me to take basic Botany training with DWT. Through this new understanding of botanical key features I am now able to satisfy my growing curiosity and identify what I see around me. This is one of the many learning opportunities offered to me, others include: butterflies, bumble bees, bird song identification, reptiles, trees, grasses, fencing, path making, stiles, planting, learning about native species and how nature interacts. I have also been provided with training courtesy of Northumbrian Water, to enable me to become City and Guilds certified in Pesticide Application, so that I can help with the eradication of invasive species on the sites we work on." Ann Walsby

Heart of Durham volunteers have planted hundreds of native trees and created new hedgerows to provide connectivity and increase biodiversity. Initial costs of the tree whips, guards and stakes are offset by the volunteer hours that are invested in the planting.

Ongoing management is also carried out by volunteers including weeding, re-staking (in very windy sites) and eventually removing the guards when the trees have outgrown them. This ensures high tree survival, which contributes to the satisfaction felt by all volunteers as they see their trees grow, and represents a positive and fulfilling aspect of their work.

DWT volunteers admiring their handy work.

Grassland cutting is an important late summer conservation task that is carried out on many of the sites each year. Volunteer power has replaced the use of contractors on many NW conservation sites, helping to reduce operational costs.

A new approach to cutting has seen traditional brush cutters replaced with hand scythes. In 2016, six volunteers were trained to use Austrian scythes for cutting grassland sites. The outlay for the course and the purchase of scythes returned some very positive benefits. Grass cutting became a much more enjoyable activity for the whole volunteer team, sitting well with their conservation values as an environmentally friendly method of grass cutting. Scything is inclusive, allowing every volunteer the opportunity to have a go after training from a member of their team. This positive feedback has resulted in further purchases of scythes so that much more grass can be cut in a shorter time with low equipment costs, no breakdown repairs and no high-cost training. A field of volunteers using scythes has also generated free publicity, not only helping to engage more volunteers but also stimulating interaction with the public, providing an ideal opportunity to explain the partnership between NW and DWT.

DWT has the expertise to provide in-house training on all aspects of conservation management from planting trees, repairing fences, constructing countryside furniture and using tools. They can also offer more detailed training on species surveying skills. The Heart of Durham Project has been involved in surveys of reptiles, dormice and small mammals, which has all contributed to NW's conservation management plans.

In 2017, NW organised a grassland monitoring workshop where several volunteers were introduced to methods of setting up and carrying out grassland monitoring. This, along with the DWT in-house training and membership of the DWT botany group, has enabled volunteers to greatly improve their plant identification skills and will save NW money on ecological survey fees in future as volunteers take over the grassland monitoring at certain sites. This training, combined with the physical conservation management of grass cutting, wildflower plug planting and seeding, provides a much more fulfilling role for volunteers and reinforces their commitment.

Up-cycling and recycling has also saved money by re-using tree guards, old fence posts, timber and wire, which can be used on repair jobs and other projects. It would be expensive to use contractors to reclaim such materials but it is possible with a large team of volunteers. Heart of Durham volunteers have become very adept at creating new structures such as compost bays and bug hotels using waste pallets! These have provided new wildlife habitats as well as being a forum for community engagement and a way of disseminating positive publicity about the NW/DWT partnership.

Volunteers out in all weather!

Useful Links

Heart of Durham – http://durhamwt.com/heart-of-durham/

Abberton Reservoir – https://www.eswater.co.uk/your-home/leisure/Visitor-Centre.aspx

About the Authors

Stuart Pudney MCIEEM CEnv has worked at Northumbrian Water in a land management role for over twenty years having previously worked for environmental consultancies. He recently completed a foundation degree in forestry with the University of Cumbria and has a keen interest in wildlife and more recently in photography, specifically trying to master the art of macrophotography.

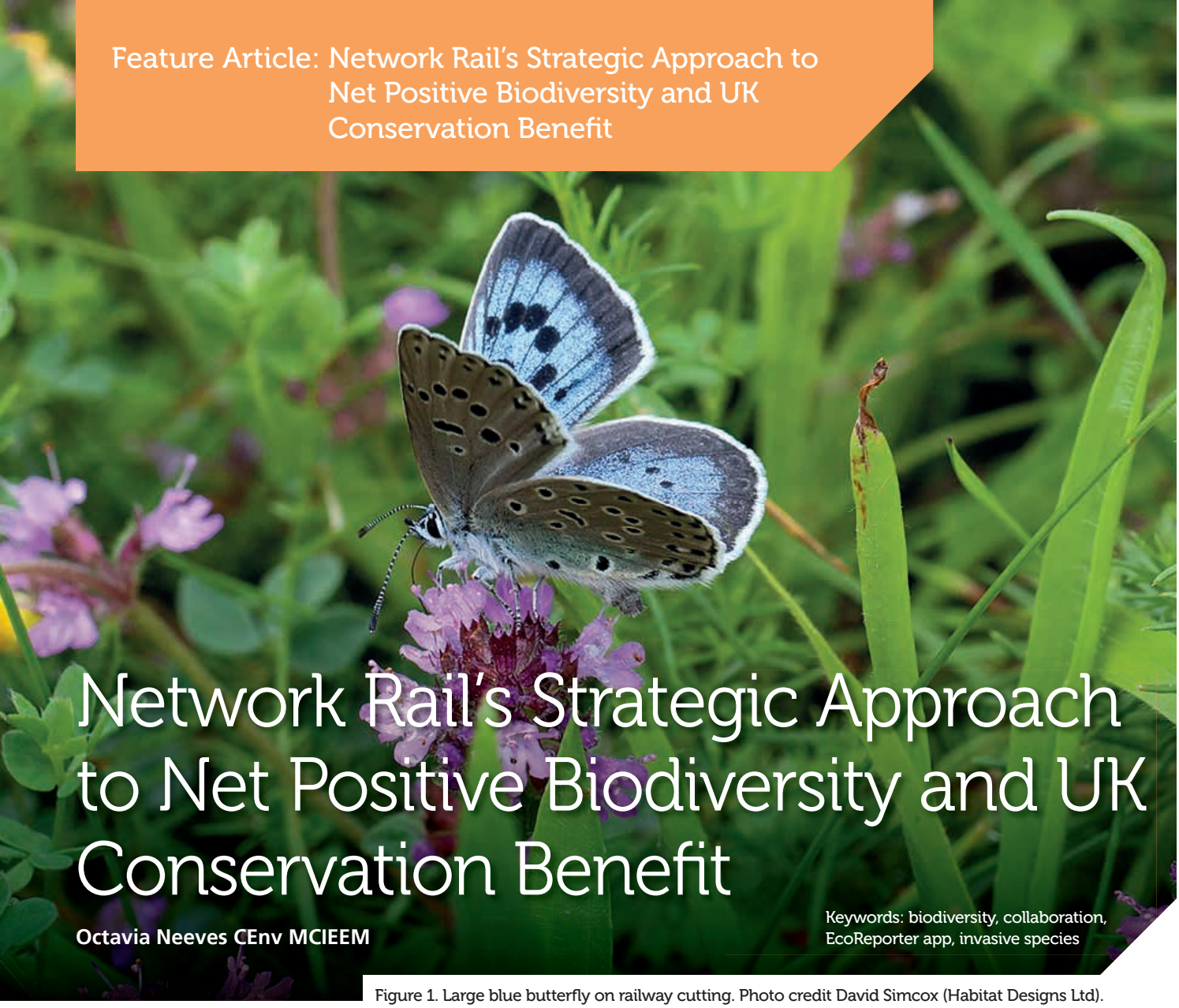
Contact Stuart at:
stuart.pudney@nwl.co.uk

Anne Porter's former career was in midwifery and she then went on to spend six months working for Save the Children in Sudan. She recently completed an MSc in Environmental Management at Sunderland that included a placement with Durham Wildlife Trust leading to various volunteer roles and eventually a full-time paid role as the Heart of Durham Project Officer.

Contact Anne at:
aporter@durhamwt.co.uk

Charlotte Bradley achieved a HND in Agriculture followed by nearly 10 years as a herdsperson working on a dairy farm. She returned to study and achieved a BSc (Hons) in Rural Resource Management whilst volunteering in the conservation sector. Charlotte then spent three years as a ranger for ESW based at Hanningfield Reservoir before joining EWT as a warden at Abberton Reservoir.

Contact Charlotte at:
charlotte.bradley@nwl.co.uk



Network Rail's Strategic Approach to Net Positive Biodiversity and UK Conservation Benefit

Octavia Neeves CEnv MCIEEM

Keywords: biodiversity, collaboration, EcoReporter app, invasive species

Figure 1. Large blue butterfly on railway cutting. Photo credit David Simcox (Habitat Designs Ltd).

This article sets out how Network Rail has approached biodiversity conservation strategically through more effective data management, working closely with external partners and using the eyes, ears and enthusiasm that Network Rail has on the ground in their own staff. Network Rail is committed to contributing towards UK targets for biodiversity but needs to do so in a way that still demonstrates value for money for the customer. Balancing these two targets means Network Rail has had to become smarter and more efficient, providing the opportunity to innovate. Halting the loss of biodiversity in the UK is a huge challenge but Network Rail is fully committed to supporting this.

Introduction

The habitat alongside railways is important for wildlife within the modern landscape and offers a corridor for wildlife movement across Britain at local and much bigger scales. The railway soft estate offers a relatively undisturbed 20,000 mile (>32,000 km) length of habitat that provides many wildlife resources such as space, food, hibernacular and refuges for a wide range of species. This includes but is not limited to cable troughs and log piles for amphibians and reptiles; roosts in bridges for bats; woodland habitat for dormice *Muscardinus avellanarius;* open grassland habitats and nectar-rich wildflowers for many insects, including the internationally rare large blue butterfly *Maculinea arion* (Figure 1); and a variety of soil conditions that support rare plants, such as the Deptford pink *Dianthus armeria* (Figure 2). The railway therefore plays an important role in helping the UK to achieve targets for biodiversity at a landscape scale (Lawton *et al*. 2012). The connectivity of the linear habitats provided by the railway will help to give the coherence and resilience that Britain's ecological network needs in the face of challenges such as climate change.

Network Rail is divided up geographically into Routes, within which there is a Route Business managing the day-to-day operation of the railway to enable train companies to run trains safely. In addition, Infrastructure Projects operates nationally and delivers major programmes such as Crossrail and Thameslink, as well as a wide range of enhancements and renewals, such as bridge replacements, embankment

Figure 2. Network Rail Chief Executive Officer, Mark Carne, with other volunteers carrying out habitat management for the Deptford pink in Saltash.

stabilisation, new stations, re-signalling and track renewals. All these projects ensure that the rail network is becoming better every day. Network Rail Infrastructure Projects is committed to having a positive contribution to biodiversity through the delivery of projects, but also needs to ensure that every project delivers value for money for the customers. In order to make the most efficient use of public money and to achieve maximum conservation benefit through project delivery on the railway, it is vital that Network Rail has a well-developed, internal data management system and excellent relationships with external conservation organisations.

EcoReporter app

The award-winning EcoReporter app (Figure 3a, 3b) provides the first layer of information for this internal database. The app engages the entire workforce in a citizen science programme of ecological reporting. Anyone within Network Rail who has the app downloaded onto their mobile device can submit records of what they see when they are out on the railway. Figure 4a illustrates the range of people using the app across the country. When downloading the app the user must first fill in some registration information, which includes what part of the business they work for. To date, the greatest number of submissions come from Route Businesses, whose personnel complete regular walkouts for asset assessments. This was one of the key target groups in the creation of the app so it is a huge success that this demographic is contributing the most submissions. A large number of submissions also come from the Infrastructure Projects part of the business and the Safety, Technical and Engineering (STE) group. In order to supplement these records further on the database, a standard template submission form has been created to enable ecologists carrying out surveys on the network to submit records. (These records have not been included in the count in Figure 4a and Figure 4b).

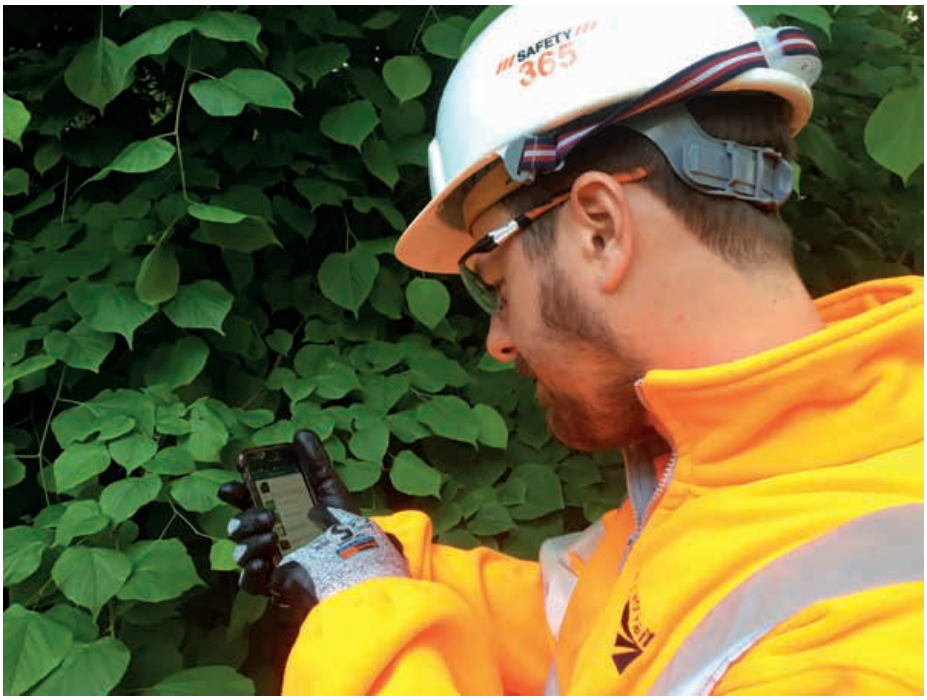


Figure 3a. Network Rail employee on site using the EcoReporter app.

Figure 3b. Record of a slow worm *Anguis fragilis* in Surrey, submitted through the app and demonstrating the app functionality to annotate photographs.

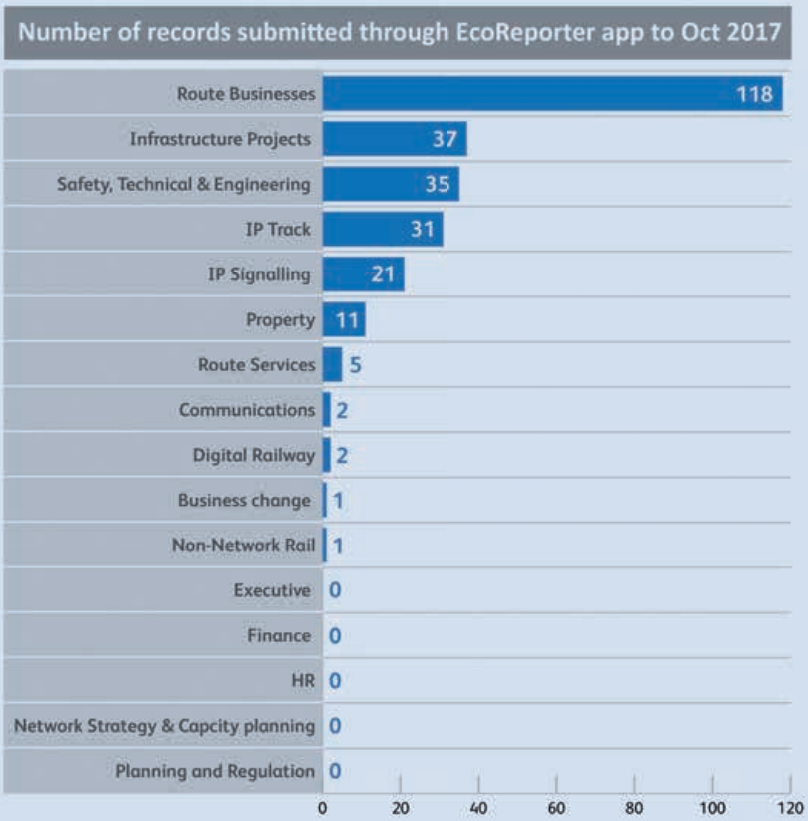


Figure 4a. The number of records submitted through the EcoReporter app to date (at October 2017) by business function.

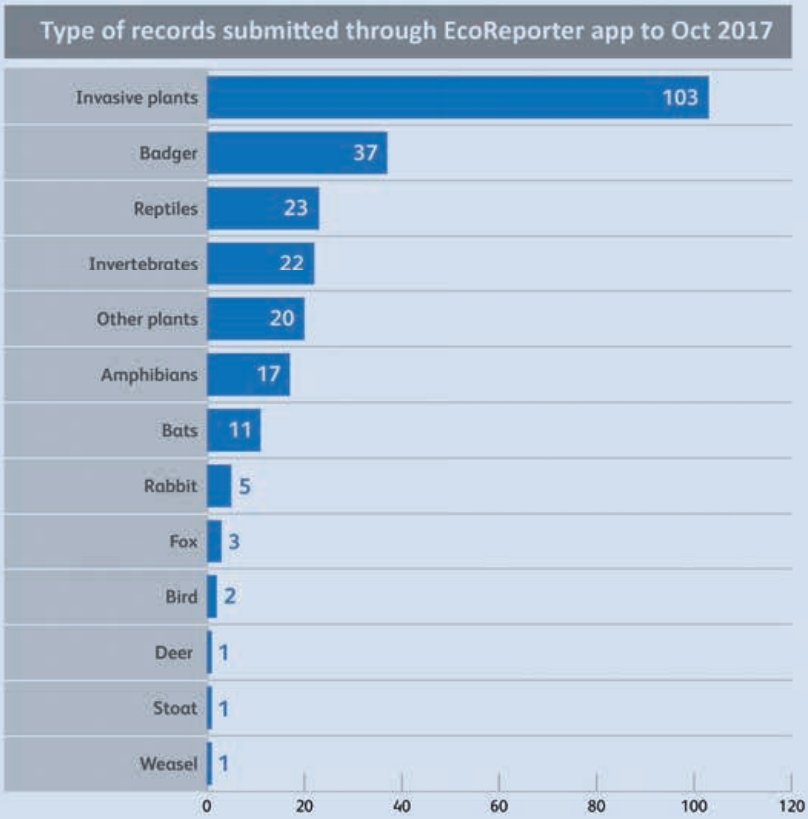


Figure 4b. The type of records submitted through the EcoReporter app to date (at October 2017).

The records being generated by the app are broad, as shown in Figure 4b. The greatest number of records submitted are in relation to invasive plants (mainly Japanese knotweed *Fallopia japonica* and Himalayan balsam *Impatiens glandulifera)*. Other common records include badger *Meles meles* setts and signs; reptiles and amphibians, including reptiles seen basking on logs and cable troughs during routine walkouts; and bats, which are mainly roost sightings during bridge inspections. With many of the records, the use of the guide function on the app has been invaluable in helping workers to identify what they have seen themselves. The guide contains key invasive species and protected species likely to be encountered on the railway. It does not include invertebrate species and, interestingly, the high number of invertebrate records mostly concern identification queries by interested recorders. All records submitted through the app go into a verification portal where suitably qualified ecologists at Network Rail check photographs and descriptions submitted and ensure every record in our database is correct. They can also give feedback to recorders where requested.

The output and real power of the database generated by the app is that Network Rail has been able to develop an interactive Geographical Information System (GIS) map based on the data, to which new records can be added (Figure 5). Network Rail has recently expanded this to include records from ecology surveys, development licence information, Japanese knotweed treatment schedules and site management statements for Sites of Special Scientific Interest (SSSIs). This transformation in data management is helping us to better understand what Network Rail has and where, which leads to greater ability to influence projects earlier in design. Both the early identification of protected species and more strategic planning of mitigation are leading to huge cost savings for Network Rail.

Building partnerships

As part of the Cornwall re-signalling project, Network Rail sought to work closely with Cornwall Wildlife Trust. Cornwall is one of the most well-recorded counties for biodiversity in Britain, with significant coverage of survey data

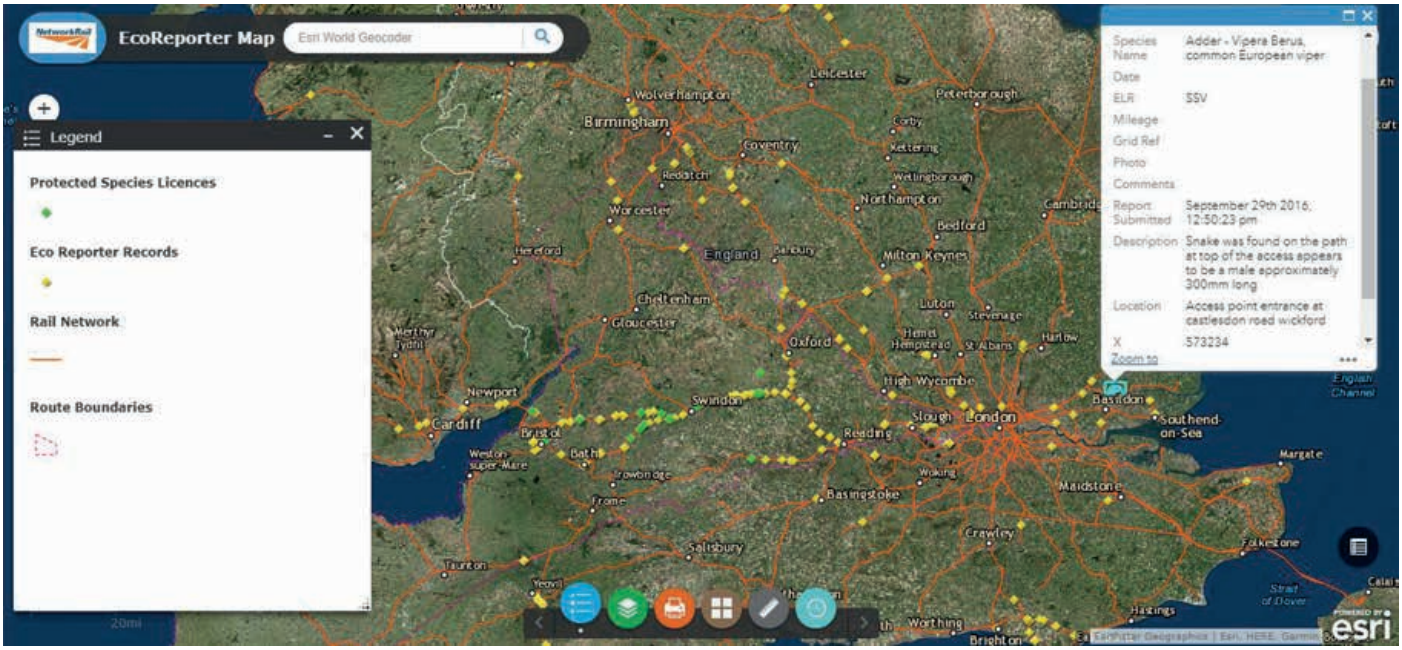


Figure 5. Example output from the EcoReporter map.

information, and Network Rail was advised that the volume of data for the entire length of the railway in this county would be overwhelming. By working pragmatically with the Wildlife Trust, areas known to support dormice and bats, for example, can be highlighted on a map, rather than obtaining all the individual records. In addition to being cost-effective, this meant that there was a more strategic overview of the ecology of that county at an early stage, giving Network Rail a better idea of the design risks, in relation to ecology, across the whole project. Typically for a re-signalling project there is cabling for the length of the scheme, there is new installation of signals and electrical equipment cases, and there can be the removal of signal boxes. An example of the advantages of this overview approach would be where a section of the railway passes through a known dormouse area, the risks of activities such as vegetation clearance would be known in advance and could be better prepared, timed and costed for. Similarly, where a valley is known for particular bat species, Network Rail can identify opportunities to enhance the railway for the target species such as through retention of building assets for bat houses (i.e. small railway buildings such as relay rooms or signal boxes that are converted into bat roosts). At the later stages of design for a re-signalling project, where specific locations for asset installation are identified as within the known range of a particular species, then more detailed records can be requested from Cornwall record centre (part of Cornwall Wildlife Trust) for that specific area, to understand the more localised distribution. Network Rail is building on this relationship by providing Cornwall Wildlife Trust with ecological data from the railway, which in terms of records has been a blackspot in the county due to access restrictions for safety reasons. Both partners therefore benefit and cost savings are made in data acquisition and by focusing conservation effort where it is most beneficial.

Similar strategic conversations are also taking place with organisations such as Butterfly Conservation and the Amphibian and Reptile Conservation Trust. In the same way that Network Rail can use its mapping records to understand its role in habitat connectivity, these organisations are mapping their species-specific records to understand distributions at a landscape scale. By sharing our data, we can better understand where the railway is providing important connectivity functions for specific species groups in the wider landscape. Equally, and importantly, these partnerships help to identify where the railway could be improving connectivity by modifying habitat management on the railway in key areas and by focusing effort in different places.

Initially, Network Rail is seeking to work with Butterfly Conservation to develop hot spotting maps for the Western Route (London Paddington to Penzance). This mapping exercise will highlight areas of the railway which are within or adjacent to priority butterfly habitat and where there is potential to develop connecting habitat. This will make discrete populations of butterfly species more robust to the challenges of habitat fragmentation and climate change. A good example would be where Network Rail has projects such as embankment stabilisation, with a requirement for re-planting following work. In such cases, Network Rail can work with Butterfly Conservation to ensure that the planted species mix provides maximum conservation benefit for the priority species.

Partnering with conservation organisations also means that Network Rail staff can use their allocated volunteer days each year to deliver important habitat management for priority species. This is well illustrated along a section of railway which has an important population of large blue butterflies. This species has very specific habitat requirements, which has led to previous extinction in 1979 when its habitat was

Figure 6. Volunteer team at the large blue butterfly site supported by Butterfly Conservation, Habitat Designs Ltd. and Somerset Wildlife Trust.

degraded (see Butterfly-Conservation.org). Network Rail staff are using their volunteer leave to clear back scrub and maintain the open grassland habitat with wild thyme *Thymus polytrichus* and marjoram *Origanum vulgare*. Due to access difficulties and the large number of high priority sites that Network Rail needs to manage for safety critical reasons, there is a risk that a site like this would be neglected. By using staff volunteer days, not only do Network Rail ensure the work to conserve this important species gets done but it also gives staff, including those that are office-based, the opportunity to learn about biodiversity on the railway and to support the local environment (Figure 6) in a cost-effective manner.

Licencing

A further benefit of better data management and strategic approaches to ecology is that Network Rail has become more aligned with the statutory nature conservation organisations. Natural England released their new policies for European Protected Species Licencing in January 2017. Oakley *et al*. (2017) provide case studies of how Network Rail has used

Figure 7. Japanese knotweed on the railway.

strategic mapping to apply for a licence under these policies, demonstrating how costs per project can be reduced while increasing the benefit to the conservation of protected species – swapping miles of fencing for more meaningful mitigation.

Network Rail is also currently working with Natural Resources Wales on organisational licences. Having a map showing where the organisational licence is being used across Wales provides the visibility required to manage the licence and also provides a helpful tool for assurance of the organisational licence use.

Invasive species management

Finally, as well as being an excellent conduit for protected species, the railway can also provide connectivity for the spread of non-native invasive species. One notorious species found on the railway is Japanese knotweed (Figure 7) and it is a common record submission through the EcoReporter app (Figure 4b). Every Route within Network Rail has a maintenance plan for the treatment of Japanese knotweed, but the scale of the problem is large and expensive.

In order to help manage the cost of treating Japanese knotweed, Network Rail is looking at a range of options including combining the targets for net positive biodiversity with the targets for Japanese knotweed treatment. To achieve net positive biodiversity gain on projects, it is common for Network Rail to carry out biodiversity offsetting, particularly where installation of a new asset may mean the permanent loss of an area of habitat. Network Rail Infrastructure Projects and our Route Businesses colleagues are looking for opportunities to use areas blighted by Japanese knotweed to complete biodiversity offsetting. This would mean the project would fund the clearance of areas of Japanese knotweed on the railway network and then plant the cleared and treated land with species of high biodiversity benefit to that area. This initiative will help our projects to achieve biodiversity targets and contribute to the management of Japanese knotweed on Network Rail land, whilst also maximising the return from conservation budgets. The treatment plan, replanting and monitoring of the area will be handed over to Route Businesses from Infrastructure Projects, along with the required funding. All sites used for biodiversity offsetting on the rail network will be added to the GIS map to help ensure longevity of the offset.

Conclusion

Property and asset owners such as Network Rail need to better understand the environment within which they are operating. Better understanding of species distributions enables us to maximise opportunities to improve connectivity of habitats and increase wildlife populations across Britain. Only by operating through partnerships, will Network Rail be able to fulfil the conservation objectives of conservation partners as well as Network Rail's own project requirements. Network Rail seeks to work with other organisations to bring data together in order to better identify mitigation opportunities of genuine conservation benefit. As pressure on land in Britain continues to increase, the safeguarding of natural assets such as those found along the railway, through protection and enhancement, has to be a priority. Understanding where actions will have the greatest benefit is a key consideration for the sustainable management of the railway now and into the future, especially where the costs of delivering value to customers need to be considered.

Acknowledgements

As the article demonstrates, tackling biodiversity targets cannot be done in isolation. I would like to acknowledge contributions from colleagues at Network Rail and the fantastic collaborative work ethic of organisations such as Somerset Wildlife Trust, Cornwall Wildlife Trust, Habitat Designs Ltd, Butterfly Conservation and the Amphibian and Reptile Conservation Trust, along with the large number of other organisations with which Network Rail works closely.

References

Butterfly Conservation (2017). See Butterfly-Conservation.org. Accessed 20 October 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 network*. Report to Defra. Available at http://webarchive.nationalarchives.gov.uk/20130402151656/http:/archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf.

Oakley, M., Gorman, L., Neeves, O. and Wansbury, C. (2017). Accepting Little Losses to Allow Genuine Gains – A New Approach to Great Crested Newt Mitigation Licensing. *In Practice – Bulletin of the Chartered Institute of Ecology and Environmental Management*, **97**: 35-39.

About the Author

Octavia Neeves is an environment manager at Network Rail. Her role covers the Infrastructure Project Region of Western, Wales and Crossrail. Octavia has over seven years' ecological and environmental experience with the last four and a half years specialising in rail infrastructure projects.
Contact Octavia at:
octavia.neeves@networkrail.co.uk

Saving the Small Things that Run the Planet – Conservation on a Shoestring

Paul Hetherington
Buglife

Keywords: budget priorities, citizen science, collaboration, invertebrates, volunteers

It is estimated that there are in the region of 40,000 terrestrial invertebrate species in the UK alone – before we even consider those in the marine environment surrounding our islands – and two thirds of them are known to be in decline. Looking after all these species is a massive job and something that could soak up an incredible amount of resource. Unfortunately, lacking the 'cute and furry' appeal of some other species, budgetary resources are limited. Working on a shoestring, Buglife – the Invertebrate Conservation Trust is the only organisation in Europe devoted to the conservation of all invertebrates. Buglife's aim is to stop the extinction of invertebrate species and to achieve sustainable populations. Ultimately, all ecology and environmental management is underpinned by what happens at the invertebrate level.

Figure 1. Mediterranean oil beetle *Meloe mediterraneus*. © John Walters.

Introduction

Buglife was founded in 2000 as the Invertebrate Conservation Trust after work to produce the UK Biodiversity Action Plan in 1994 had highlighted the absence of an advocate for invertebrate conservation, apart from butterflies. The new charity was supported and welcomed by all the leading UK conservation organisations and it is governed by a board of trustees elected by 30 conservation-based member organisations. From these small beginnings, with just one staff member in 2002, Buglife has grown steadily to the point where today there are 30 full-time equivalent employees and over 4,000 volunteers (2016 figures). It is this volunteer power that helps delivery of invertebrate conservation on a shoestring.

Although still a young organisation, Buglife has gone from strength to strength in the years since its formation. It has gathered much-needed support for invertebrate conservation across the UK and has drawn attention to the importance, beauty and fascination of all forms of bug life. Buglife opened a Scottish Office in Stirling in February 2007, in partnership with the Initiative for Scottish Invertebrates, and currently has further offices in Wales, Northern Ireland and England, and is also active overseas, with a seat on the European Habitats Forum. Buglife raises funds from a variety of sources, predominantly grant funding for projects topped up by membership subscriptions, public donations and some corporate giving.

Budgets, priorities and strategies

In terms of species, it is informative to see how the conservation grant funding breaks down across the UK for global species work. Based on figures taken from a report by the Environmental Funders Network (Murray *et al*. 2014), if you divide the amount of money coming into the sector by the total global species in various taxa it presents a telling story: mammals receive £578.50 per species, birds £55.07, amphibians and reptiles a combined £28.08, fish £7.59, butterflies and moths a combined £5.98 and all other invertebrates a paltry £0.04 per species. Why are invertebrates so overlooked for funding when every ecosystem world-wide depends on their survival? Clearly it pays to be cute and cuddly but how can you

spin out a shoestring budget of just 4p per invertebrate species? Four pence per species barely covers the time cost of typing out its scientific name.

First and foremost, there is a need to prioritise; it is simply not possible to do all things for all species simultaneously but how can such discrimination between species be determined? Having learnt lessons from early attempts at all-encompassing strategies, Buglife prioritised species and invertebrate groups through a broad consultation process involving staff, trustees and member organisations. Those species in greatest need were identified and an assessment was made of potential impact for a given level of funding. The prioritisation is set out in a ten-year strategy, *Bugs United*, running until 2020. This overarching strategy is underpinned by a series of three- to four-year business plans that set out transitional goals and milestones on the way to delivering on the main strategy.

Buglife's objectives are prioritised in the strategy by focusing on those species at risk of extinction, and important or rare habitats at risk of being lost. Much of this work tends to centre on fighting planning applications and planned development that threatens endangered species, such as the recent successful blocking of construction work at Radford Quarry in Plymouth, one of only three known sites for the endemic horrid ground-weaver spider *Nothophantes horridus*. In this case, over £10,000 was raised by a successful Crowdfunder appeal to support surveys for this elusive species across Plymouth and South Devon.

Buglife works with policy makers to protect species and habitats not only from being destroyed by development but also from the ever-increasing array of invasive non-native invertebrate species that come into the UK (e.g. in soil as part of the horticulture trade in potted plants), and threaten the survival of our native species.

Working to prevent invertebrate extinctions also involves timely interventions or the establishment of new colonies, as with the ladybird spider *Eresus sandaliatus* on the Dorset heaths. This can mean ambitious funding initiatives such as the recent, successful eight-agency bid (Buglife, Amphibian and Reptile Conservation Trust, Bat Conservation Trust, Bumblebee Conservation Trust, Butterfly Conservation,

Figure 2. Citizen science plant hunt in Scotland. © Craig Macadam.

Natural England, Plantlife and the RSPB) to the Heritage Lottery Fund called *Back from the Brink*. Awarded £4.6 million from HLF in March 2017, *Back from the Brink* is all about conservation organisations working together to take 20 of the most vulnerable species off the at-risk register and to improve the lot of over 100 other species. The project will address the needs of threatened species in 150 key habitats and landscapes across England and will focus on saving some very rare and elusive species from extinction.

These same priorities also underpinned a large, funded project to map Important Invertebrate Areas across the UK based on historic data and local-level consultation. This mapping work, now completed, will support future interventions by Buglife and will help to influence planners when making decisions. Building on this information, Buglife has produced a downloadable advice sheet providing *Good Planning Practice for Invertebrates: Survey.*

Other priorities identified in the 10-year strategy are pollinators and freshwater, selected because of the urgent need for action and the dearth of others acting in these areas. The National Pollinator Strategy has focused on influencing policy makers and is complimented by practical on-the-ground work to create flower-rich habitat for pollinators (*Urban Buzz*) and recreating the connectivity they need to move around the UK (*B-Lines*). Freshwater invertebrate conservation to date has involved extensive work to create ark sites for native white-clawed crayfish *Austropotamobius pallipes* across the south west and also peat bog restoration across the Scottish lowlands.

Conservation delivery

Practical invertebrate conservation on a shoestring depends on public engagement to harness the power of volunteers. This can be achieved in several ways including: i) citizen science, ii) activity in their own space and iii) working on conservation sites. Working in partnership with other organisations is also important.

i) Citizen Science is a great way to engage the public in conservation activities although it is important to design initiatives carefully so that they produce useful and potentially verifiable data. This moves the work from being purely an engagement tool to fulfilling a practical conservation role. An excellent example of worthwhile citizen science is Buglife's oil beetle *Meloe* spp. hunt. This survey has been running for over five years and has led to the rediscovery of the believed-extinct Mediterranean oil beetle *Meloe mediterraneus* (Figure 1). Because there are only five species of oil beetle in the UK, each relatively distinctive, by providing identification guides it is possible for the public to find and identify them. The survey also allows for uploading photographs to the survey website, which trained volunteers then verify and provide important feedback to the citizen scientist. Once areas of high concentration or rarity have been identified, the way is open for dialogue with land owners to ensure sympathetic land management to support these charismatic beetles and their host solitary bees.

Figure 3. Volunteers engaged in *Urban Buzz* planting in Birmingham. © Nick Packham.

Citizen science has also been used at a broader level to report on pollinator species and numbers along stretches of newly enhanced or created meadows. This wide-scale monitoring allows Buglife to verify whether work undertaken has indeed led to a positive benefit for target species groups and is a good example of how this kind of citizen science can help to record the effect of positive interventions at low cost. For example, the SNH-funded *John Muir Pollinator Way* survey encourages people of all ages to look for pollinating insects and the flowers they are foraging from. By providing a pollinator spotting sheet and recording form, Buglife is able to improve the recording of species and ultimately to monitor the long-term trend of populations of several invertebrate species at a fraction of the cost of professional survey (Figure 2).

Most citizen science activities can easily be supported by developing and sharing on-line materials. The Buglife website was specifically designed to support such survey activity including an ability to automatically transfer relevant data into the NBN Gateway. Once a survey has been initiated, social media channels and targeted press releases are used to promote participation.

Other, more basic citizen science activity may have little conservation value per se but can act as a conduit for the deeper engagement of some participants who may go on to become species recorders.

ii) Activity in your own space is one area where invertebrates have an advantage over other animals: whilst most gardens are too small to fully support even a hedgehog *Erinaceus europaeus*, they can provide permanent dwellings for innumerable invertebrates. Collaboration with neighbours can create sizeable areas that are rich in wildflowers or other plants. The webpages encouraging and informing people on how they can attract invertebrates and what habitat they can create in their own space are the most visited areas of the Buglife website. This theme is also the main emphasis on stands at public events or exhibitions attended by Buglife. This is a great, cost-effective way to create small-scale conservation gains even if it may just be the equivalent of a motorway service station for pollinators passing between sustainable habitats.

iii) Working on conservation sites. Creating new meadow habitats, restoring damaged and fragmented habitats, and scrub clearance are all large-scale, practical activities of importance for invertebrate conservation. This work requires hiring contractors or using people power. On a shoestring budget, mobilising volunteers is the best approach. In the first 18 months of the *Urban Buzz* project, 5,700 people volunteered to assist meadow creation by sowing seeds or planting plug plants creating 138 hectares of flower-rich habitat (Figure 3). This demonstrates the power of engaging with and supporting volunteers.

Working in partnership

Buglife works in partnership to deliver its objectives wherever possible. As shown by the *Back from the Brink* project, this approach can open access to different sources of funding, enabling far more to be achieved than with limited internal resources. Demonstrating the effectiveness of partnerships at a practical level, Buglife has restored or created 250 ha of wildflower habitat through *B-Lines* whilst partner organisations have delivered a further 200 ha, effectively doubling the output.

By utilising a variety of different approaches, Buglife is able to deliver far more conservation action than the four pence per species would imply. Engaging with people and partner organisations in innovative ways and using the power of the internet has allowed Buglife to make great strides for invertebrate conservation on a shoestring budget.

References and information

Murray, P., Cracknell, J., Godwin, H. and Scholfield, K. (2014). *Where the Green Grants Went 6: Patterns of UK Funding for Environmental and Conservation Work*. Environmental Funders Network. Available at www.greenfunders.org. Accessed 23 October 2017.

Good Planning Practice for Invertebrates: Survey. Available at https://www.buglife.org.uk/sites/default/files/Good%20practice%20planning%20-%20surveys.pdf. Accessed on 23 October 2017.

Brownfield Hub. Available at https://www.buglife.org.uk/brownfield-hub. Accessed on 23 October 2017.

Bugs United. Available at https://www.buglife.org.uk/sites/default/files/Bugs%20United%20Strategy%20Summary.pdf

Important Invertebrate Areas. Available at https://www.buglife.org.uk/important-invertebrate-areas-map

Back from the Brink. Available at http://www.naturebackfromthebrink.org/

About the Author

Paul Hetherington is the Director of Fundraising and Communications at Buglife and Managing Director of their trading arm Buglife Services. Paul has worked in the nature conservation sector for the past ten years and is a regular media interviewee and public speaker on the work to save invertebrates.

Contact Paul at:
paul.hetherington@buglife.org.uk

Pantheon: A New Resource for Invertebrate Survey Standards and Analysis

Keywords: analysis, database, invertebrates, standards, survey

David Heaver
Natural England

Jon Webb
Natural England

David Roy
Biological Records Centre

Hannah Dean
Centre for Ecology & Hydrology

Martin Harvey
Biological Records Centre

Craig Macadam
Buglife

Jon Curson CEcol MCIEEM
Natural England

The Pantheon database seeks to set a new standard in the analysis and reporting of invertebrates to achieve an approach comparable to that in use for other elements of biodiversity. This will facilitate simple analyses of invertebrate site survey data thereby helping ecology practitioners to produce site reports more quickly, with greater ecological breadth and deeper insight. The database is a free resource, which readers are invited to explore and use. Observations on functionality and design are welcome with a view to improving the first full version, scheduled for release in Spring 2018.

Caucasian green leafhopper *Cicadella viridis*

Introduction

For decades, the analyses of the results of invertebrate survey have been variable. Site survey reports, commissioned for a whole range of purposes, typically feature long lists of species with an ordering and highlighting by national rarity, and a few pen pictures of the rarer taxa. More extensive reports include further context to the list of species, providing interpretation of site quality and options for mitigation. This is a long way behind the botanists, who can produce plant community assessments and community context maps.

Ecologists and others wishing to compile more useful and insightful invertebrate survey reports have had an uphill struggle. Some biological recording databases allow interrogation of the data held within them, allowing users to process their records and sort and select by various criteria. Some allow advanced mapping and interrogation of records and record sets, with some conservation status output. But any attempt to pull together contextual and ecological data on the invertebrate species in a sample can involve long and laborious searches through dispersed information sources.

The Pantheon database, a joint venture between Natural England and the Biological Records Centre (within the Centre for

Ecology and Hydrology), addresses this gap. At its core, it is a set of database tables relating invertebrate species to ecological traits, assemblages and taxon associations, with in-built metrics to reflect the quality of the sample analysed. It has the potential to connect to other datasets online, as well as allowing system updates to be delivered to all users at once. The database currently holds 11,771 species, covering key invertebrate families that are both widely sampled in site surveys and for which enough meaningful and easily accessible information exists to allow reporting back.

The information used to assign species to habitats and resources was gathered from an extensive range of sources (the principal of which are listed in Pantheon under *About/Bibliography*). These ranged from field keys, family monographs, taxonomic databases and the scientific literature. This information was initially compiled within spreadsheets on a broad habitat basis (e.g. wetland), populated by the pre-existing invertebrate assemblage species lists, and then filled in species by species against traits and resources as they were encountered. Field layer species, for example, were checked against the substrate type they are typically found on, with entries against sand or chalk being the most commonly entered. These main spreadsheets were then subjected to rationalisation and compression to arrive at resource lists that are both useful and retain appropriate levels of detail, but do not succumb to information overload.

The database's focus is primarily England but only insofar as it does not yet include the few taxa only found in the other UK countries, and will poorly represent some assemblage types in Scotland. Outside of the UK it should be useful in Eire but will not be able to handle a significant fraction of species found in, for example, the western parts of Holland and Belgium.

Currently, the database is in a beta build phase to incorporate user testing, error correction and development. It has a simple user registration requirement and account management system and is free to use.

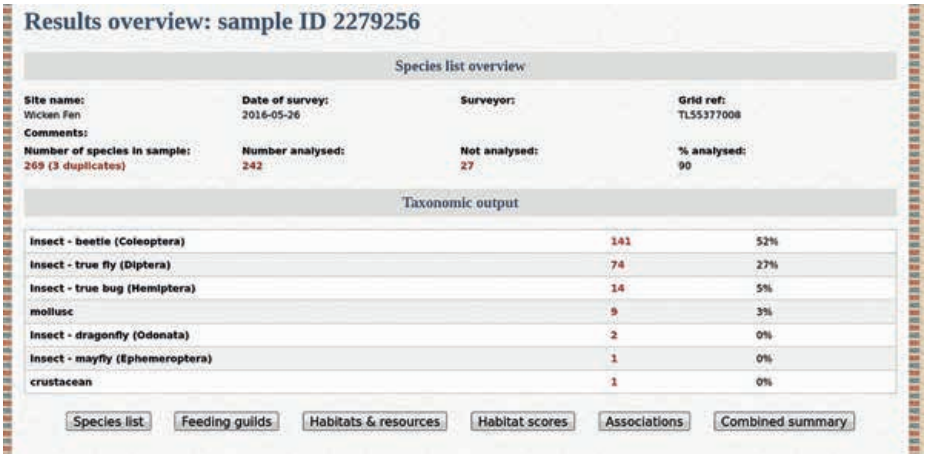


Figure 1. The Pantheon Overview screen.

Using Pantheon

Pantheon can perform simple analyses of invertebrate site survey data replacing time-consuming manual assessment or the use of non-specific software. Analyses in Pantheon have greater scope, enabling site reports to be produced quickly, with wider ecological breadth and deeper insight.

Beyond this, Pantheon can work on other data such as an abstract list (insects from ash trees, for example), or a taxonomically-focused list (such as a data from a moth trap).

Pantheon requires a species list from your site assessment or data review. A range of options are provided for data input (e.g. paste species lists, import CSV file, or enter records). With a CSV file upload the non-matched species are placed in an output file; the paste species lists method matches the species in your list with those in the taxon dictionary, highlighting uncertainties with species name options for you to select (potentially requiring assistance from an invertebrate specialist). Once a sample has been input into the system, a basic summary report provides a taxonomic order breakdown. An example from Wicken Fen is shown in Figure 1. This taxonomic

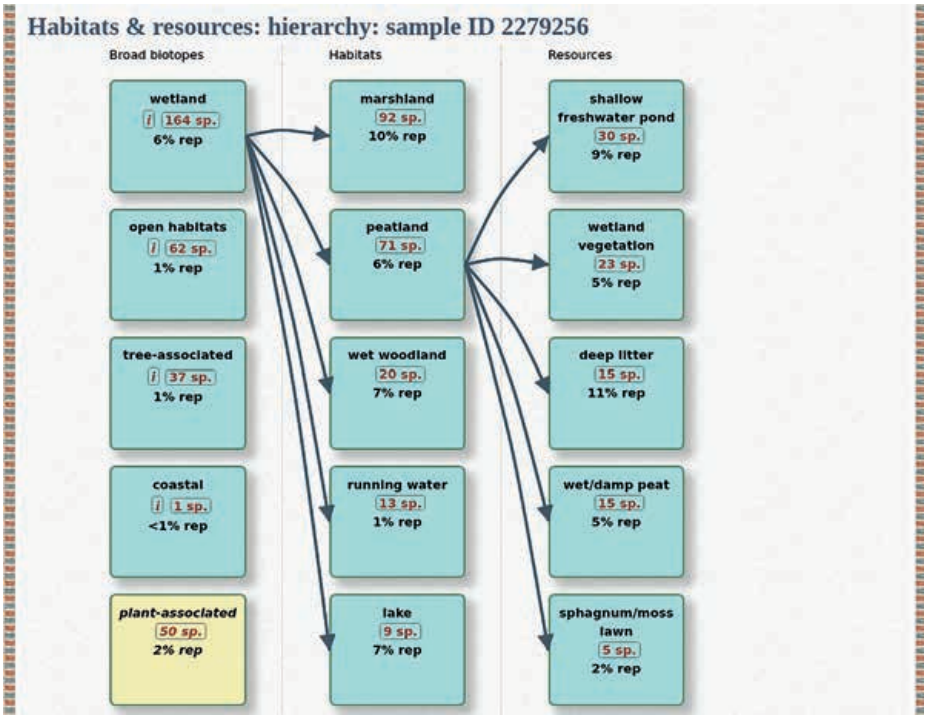


Figure 2. Hierarchy view of the habitats and resources of the Wicken Fen sample.

overview is useful when considering how robust a sample might be as a reflection of the sample site's invertebrate fauna, e.g. to highlight any taxonomic skew, such as a species list with much more moth data than from other groups.

At the bottom of the Overview screen are further options, e.g. *Feeding guilds* for adults and larvae; *Associations* with other species such as prey or host plant; or *Habitat scores*, which holds not only the rarity and threat status of the species, but also their habitat fidelity scores. This allows you to see, for example, which tree species on a site is associated with the most invertebrates in your sample, but also which is of the greatest conservation value for invertebrates.

Deeper insight is provided under the *Habitats & resources* button. This gives two principal viewing options, an unfolding hierarchy or a tabular listing. Both display your sample species list in terms of the habitats and resources used by those invertebrates. Some of these categories will be quite familiar to ecologists (e.g. 'marshland') whilst others may be less so (e.g. 'riparian sand'). The accuracy of habitat and resource associations is likely to improve and achieve tighter resolution with more field research and autecological study.

Figure 2 shows a hierarchical expansion of part of the wetland fauna from the Wicken Fen sample shown in Figure 1. The number of species matched to each habitat and utilising particular resources is shown, and gives an indication of the resources used. One species can, of course, utilise a number of resources. At Wicken Fen, the report indicates that the shallow freshwater pond resource is used by the highest number of species, with wetland vegetation, litter and peat resources also being used. The percentage representation (% rep) shows the percentage of the, say, shallow freshwater pond resource species group that is discovered in the sample under analysis.

Figure 3 shows part of the same sample but in tabular view. This view shows the *Conservation status* against the habitats and resources as well as *Species Quality Index (SQI)* for that element of the sample. We can now start to see the conservation value in the sample, and where and what supports the main

Wicken Fen wetland

interest. The conservation status values given are derived from the list currently maintained by Natural England, and utilise the new Species Status project volumes for both IUCN and Great Britain Rarity Score (http://publications.naturalengland.org.uk/category/4707656804597760), as well as the older published statuses for those families that have not yet had status review updates.

The database can be interrogated further on 'habitat hierarchy'. This is a nested reflection of the habitat from which the species were collected as revealed by the animals themselves, although it is not necessarily framed in terms familiar to non-invertebrate specialists. The hierarchy starts at the *Broad biotope* level (e.g. wetland), then *Habitat* (e.g. peatland, or shaded woodland floor), and then as some of 168 utilised *Resources* (e.g. variable humidity, exposed sand, or dung). The robustness of the system can be tested by 'reconstructing' site habitat descriptions based just on these output resource lists. The results have been quite accurate, which is encouraging, though this sometimes results in habitats outside of the survey site being 'pulled into' the site descriptions.

Importantly, Pantheon allows us to move away from uninformative and often-encountered statements such as 'good for insects' or 'has a deadwood fauna' to a quantified understanding of the habitats and resources used by the species found at a site. However, it is important to pay close attention to the definitions used (found under *Help/Glossary*), as many of the terms have different usage elsewhere.

Pantheon also provides information on the invertebrate *Specific Assemblage Types (SATs)*. These Invertebrate Species-habitat Information System (ISIS) invertebrate

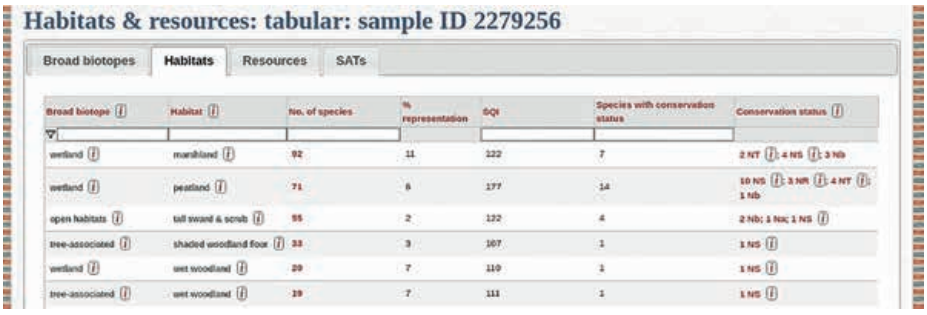
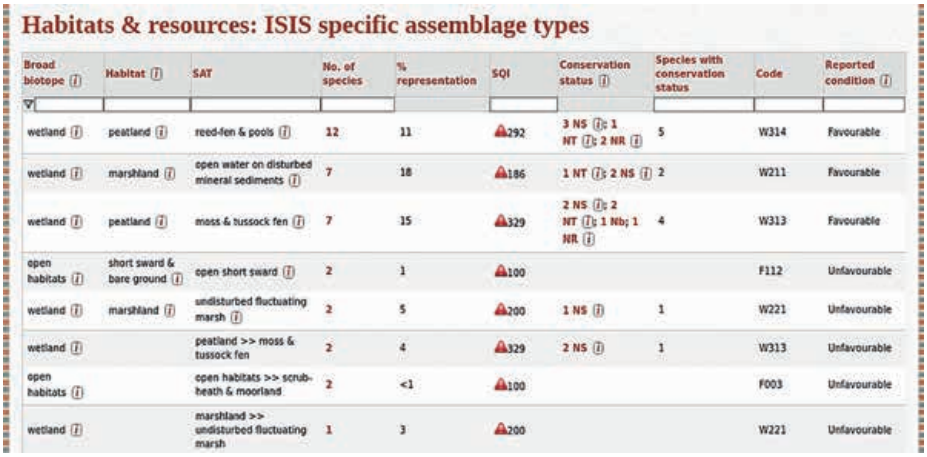


Figure 3. Tabular view of part of the habitat analysis of the Wicken Fen sample. Conservation Status Key: NT = Near Threatened, NR = Nationally Rare, NS = Nationally Scarce, Nb = Notable b, Na = Notable a.



Habitats & resources: ISIS specific assemblage types

Broad biotope	Habitat	SAT	No. of species	% representation	SQI	Conservation status	Species with conservation status	Code	Reported condition
wetland	peatland	reed-fen & pools	12	11	▲292	3 NS; 1 NT; 2 NR	5	W314	Favourable
wetland	marshland	open water on disturbed mineral sediments	7	18	▲186	1 NT; 2 NS	2	W211	Favourable
wetland	peatland	moss & tussock fen	7	15	▲329	2 NS; 2 NT; 1 Nb; 1 NR	4	W313	Favourable
open habitats	short sward & bare ground	open short sward	2	1	▲100			F112	Unfavourable
wetland	marshland	undisturbed fluctuating marsh	2	5	▲200	1 NS	1	W221	Unfavourable
wetland		peatland >> moss & tussock fen	2	4	▲329	2 NS	1	W313	Unfavourable
open habitats		open habitats >> scrub-heath & moorland	2	<1	▲100			F003	Unfavourable
wetland		marshland >> undisturbed fluctuating marsh	1	3	▲200			W221	Unfavourable

Figure 4. Tabular view of the invertebrate assemblages present in the Wicken Fen sample. Note. In the SQI (Species Quality Index) column, warning triangles are displayed when the Index has been calculated from 15 species or fewer, and is therefore unlikely to be a robust measure.

assemblages (Webb and Lott 2006) are defined entities analogous to the National Vegetation Classification of plant communities, and represent ecological groupings derived from statistical ordinations from large, standard-effort survey datasets. They were developed to establish site condition across the SSSI series and are the core of Common Standards Monitoring within Natural England, but have wider currency and have been adopted by a number of other users. Their power is to move discussion from individual species to a community level.

Samples can be analysed against their assemblage representation (Figure 4). In addition to the *Specific Assemblage Types (SATs)* present, Pantheon also calculates the *Species Quality Index (SQI)* and the assemblage *Code*. For example, the *W314 reed-fen & pools* assemblage is strong in the Wicken Fen sample (12 species from the assemblage are present), with representation from both *W211 open water on disturbed mineral sediments* and *W313 moss & tussock fen* assemblages (each with 7 species present respectively). Whether it is <u>really</u> in *Favourable* condition critically hangs on whether the sampling protocols were followed correctly (the notion of 'ISIS-compliance'), something we hope to emphasise and highlight. The site report has now moved from an unstructured long list of species to one of defined assemblages.

Online troubleshooting and additional information

A *Help* function, in the form of an A-Z Glossary, explains the terms used in the system, with the *'i'* icons at the end of many displayed entries giving shortened 'mouse-over' informatives. The *Species Assemblage Type (SAT)* tags on the assemblage entries in the A-Z take the user to illustrated descriptions of those assemblages, with the generic default scores, and some information about their species composition.

The *Help* tab also includes *User Guides*, though this is sparsely populated at present. The *About* tab holds the project detail on Pantheon, a disclaimer, acknowledgements, bibliography and contact address. The *Species Index* is the portal to the underlying data and is found under the *Data* menu. It shares this space with a *Traits* menu listing the traits and the number of species matched to them, and *Taxon* groups, which give detail of the database's taxonomic breakdown.

Many of the key outputs within the database can be quickly accessed through the *Combined Summary* option list which allows users to select outputs in combination for a faster and more bespoke workflow.

Pantheon is currently able to delve into invertebrate samples and retrieve other sorts of information. The *Associated Species* table lists those species with some direct linkage to the main invertebrates in the database. These associated species may be prey items, food plants, or parasite hosts. Their presence on a site is thus suggested rather than confirmed by the species in the sample. Sometimes use of more generic association categories from the literature are used to code species to 'trees' or 'grasses', these being reported as *Fagales* or as *Poaceae*. In addition, there is a basic *plant architecture* module showing which parts of food plants are used by the species in the sample, i.e. leaves, stems or seeds.

Extra quality measures are being added, derived from some well-known and widely used measures (such as the calculation of the Revised Index of Ecological Continuity, Alexander 2004) to habitat fidelity indices such as that for calcareous grassland (Alexander 2003). These are useful qualifiers in reports, since the notion of fidelity to site is an important one, and can act alongside the more traditional Great Britain conservation rarity score.

In summary, for any sample Pantheon can show:

- The invertebrate ISIS assemblages present
- The habitats utilised by the species in the sample
- The resources upon which those species rely
- Which other species there is a dependency on (essentially seeing other species as a resource)
- The taxonomic breadth of the sample
- The conservation status of the species in the sample, by resource and habitat
- The Species Quality Index assessment by resource and habitat.

Future aspirations

Whilst still in a testing stage en route to a Version 1 release, there are a number of future aspirations to improve the database function. Feedback from a workshop of ecological consultancies, Environment Agency, Natural England and other Agency staff, entomologists and field ecologists held in December 2016 raised many development issues and goals, the principal ones of which were:

- Addition of Regional Score thresholds to take into account faunal changes over

longitude and latitude, so that quality measures truly reflect regional variation

- More aquatic quality measures, to bring analysis of ditch, stream and lake samples more into the core of Pantheon.

Conclusion

Readers can find Pantheon at http://www.brc.ac.uk/pantheon/. We welcome comments on layout, coding accuracy, and clarity of terms and their use. We hope that CIEEM members will use, advocate and value Pantheon's freely available outputs, and that we can collectively drive improvement to the standards and analysis of invertebrate surveys in the UK.

Acknowledgements

The authors are especially grateful for the skill and dedication shown by John van Breda in building the Pantheon database, and to CEH for hosting it. Also to the many entomologists, ecologists, consultants and Agency staff who provided the core data for the assemblages; tested and commented on the Pantheon layout, outputs and data tables; and who participated in the workshops and other associated events. The ongoing beta development phase relies heavily on such engagement and participation, and the authors are most grateful for such involvement from across a broad spectrum of the environmental community.

References

Alexander, K.N.A. (2003). *A review of the invertebrates associated with lowland calcareous grassland*. English Nature Research Report 512. Available at http://publications.naturalengland.org.uk/publication/132019. Accessed 12 October 2017.

Alexander, K.N.A. (2004). *Revision of the Index of Ecological Continuity as used for saproxylic beetles*. English Nature Research Report 574. Available at http://publications.naturalengland.org.uk/publication/133006. Accessed 12 October 2017.

Webb, J.R. and Lott, D.A. (2006). The Development of ISIS: a habitat-based invertebrate assemblage classification system for assessing conservation interest in England. *Journal of Insect Conservation*, **10**: 179-188.

About the Authors

David Heaver has been Senior Invertebrate Specialist at Natural England for 10 years, having worked with species and surveys in the legacy bodies since 1986. He leads Common Standards Monitoring for invertebrates on SSSI in England, and has an interest in assemblages and what you can do with assemblage data. He is also involved in Species Recovery projects, and worked on the ladybird and fen raft spider projects.

Contact David at:
David.Heaver@naturalengland.org.uk

Jon Webb has worked in the field of ecology since 1996, ranging from botanical surveyor, working in a museum, as climate change specialist, and, for the most part, as an entomologist for Natural England. Tasks included field work, training, protected sites casework, red listing and leading the Pantheon project. He is now Principal Specialist – Resilient Landscape and Seas. Jon studies beetles (Coleoptera) and has a special fondness for rove beetles (the Staphylinidae), parklands and rivers and has also undertaken fieldwork abroad, in Slovenia, France, Romania, Latvia and Honduras.

Contact Jon at:
Jon.Webb@naturalengland.org.uk

David Roy is an ecologist who specialises in biodiversity monitoring through citizen science. He leads UK programmes for monitoring butterflies and plants, and has worked within the Biological Records Centre for over 20 years. His research has spanned a number of high impact themes, including urban ecology, genetically-modified crops, climate change, invasive species and ecosystem services and he has authored over 135 scientific papers.

Contact David at:
dbr@ceh.ac.uk

Hannah Dean is a data management and informatics specialist at the Centre for Ecology & Hydrology. For the last 9 years, she has been working with complex biodiversity datasets to improve the accuracy and efficiency of data capture, storage and accessibility. She also works within the Environmental Information Data Centre where she supports researchers in making their datasets publicly discoverable and accessible.

Contact Hannah at:
hajd@ceh.ac.uk

Martin Harvey is an entomologist and biological recorder, working part-time for the Biological Records Centre at CEH Wallingford. In 2016 he coordinated a review of Pantheon for Natural England, liaising with other entomologists to steer its development, and he is a member of the Pantheon steering group. He also uses Pantheon for entomological survey analysis.

Contact Martin at:
kitenetter@googlemail.com

Craig Macadam is an invertebrate ecologist with over 25 years' experience of studying freshwater species and their habitats. As Conservation Director with Buglife – The Invertebrate Conservation Trust, he oversees the charity's conservation projects and policy work across the UK.

Contact Craig at:
craig.macadam@buglife.org.uk

Jon Curson is an ecologist, specialising in the study and conservation of insects. He currently works for Natural England as a Senior Specialist for Invertebrates and leads several projects countrywide to conserve some of our rarest insects.

Contact Jon at:
jon.curson@naturalengland.org.uk

Colonies of free-tailed bats often roost in homes in tropical countries.

Bat Guano Fertiliser: A Novel Method of Encouraging Conservation of Tropical Bats on a Shoestring

Keywords: agriculture, bats, conservation, developing countries, human-wildlife conflict, public health

Kathy Halsall GradCIEEM

Based on observations made during a period of work overseas for African Bat Conservation studying bat ecology and human-wildlife conflict, this article discusses a novel means of reducing prejudice against bats in countries where they have no legal protection. Although huge bat roosts are common in many tropical countries, people in rural communities are often misinformed or frightened of them, resulting in the persecution and extermination of bats as 'pests'. If, instead, people were educated to understand the benefits that bats bring and were encouraged to harvest bat guano and use it as a low-cost fertiliser for their crops, perhaps the benefits would outweigh the disadvantages and successful bat conservation could become a reality.

Introduction

Wildlife in tropical countries is under increasing pressure from human development. Mass deforestation and loss of habitat threatens many species, whilst people struggle to make a living. Wildlife, including bats, are forced to seek new habitat and often can be found living alongside humans in homes. Whilst bat roosts in homes in the UK are generally very small and usually not even detected, bat roosts in the tropics can number several hundred. In these cases, bats create issues of noise, smell, disease,

and in very large roosts, a risk of ceiling collapse from the build-up of bat guano. Often the homeowners will have the bats exterminated as they perceive them as pests and are not aware of the benefits bats can provide to humans.

In order to be effective, conservation in these regions needs to incorporate the needs of communities whilst keeping management interventions or conservation methods straightforward and low cost. Bats provide important ecosystem services including controlling populations of disease-carrying insects and agricultural pests. Guano produced by bats is an effective agricultural fertiliser that could be used to boost crop yields in countries where food shortages are common. At present, with the exception of large guano mining companies such as Guanomad in Madagascar, small-scale harvesting of bat guano has only been recorded as novel observations. There is therefore capacity for wildlife conservation and humanitarian aid organisations to encourage people in rural communities with large roosts in their homes in regions such as Sub-Saharan Africa, Latin America and the Caribbean, to harvest bat guano and use it to fertilise their crops. Collection and production 'on a shoestring' is possible, particularly if a means could be found to provide the basic necessary equipment of shovels, empty grain sacks, facemasks and access to water, perhaps through aid from charities or international development projects. Using guano from bats would assist in reducing human-wildlife conflict by changing attitudes as a result of people receiving direct benefits to their health and livelihoods from having bats in their homes.

Bats, agriculture and public health

Bats consume around 25% of their body mass in insects each night on average (Coutts *et al*. 1973). In many tropical countries, insects such as mosquitoes carry deadly diseases including malaria. Insect-borne diseases are high risk in developing countries where many people either cannot access or afford health care. In 2015 there were an estimated 212 million incidences of malaria worldwide with over 400,000 deaths (World Health Organisation 2016). Set against this, consider the report that a colony of 150 big brown bats *Eptesicus fuscus* can consume nearly 1.3 million insect pests each year (Whitaker 1995). It is possible that bats in developing countries could have a role in mosquito control, and might even help to prevent disease outbreaks at a local scale. Large bat roosts in homes may offer some protection against the risk of contracting insect-borne diseases by reducing insect populations.

Many rural people rely on subsistence farming and cannot afford pesticides for their crops, lowering their ability to produce enough food in drought years. Encouraging conservation of bats and protecting bat roosts could boost the numbers of bats feeding on insect pests, thereby delivering significant benefits to agriculture. Brazilian free-tailed bats *Tadarida brasiliensis* in North America are known to consume agricultural pests including tobacco budworm *Heliothis virescens* and cotton bollworm *Helicoverpa zea* (Federico *et al*. 2008). Cash crops such as these are an important source of income for farmers in developing countries and bats provide an invaluable and free service by reducing pest populations. It has been estimated that in the United States the value of bats to the agricultural industry is around $22.9 billion per year (Boyles *et al*. 2011).

Conservation of bats is therefore not only necessary to protect wildlife and ecosystems but also to protect people's livelihoods and to control insect-borne disease. Educating rural communities on the benefits of bats to public health and agriculture could be an important step in changing attitudes and reducing human-wildlife conflict. If people are made aware of the wide range of services that bats provide, they may be more willing to tolerate bats in their homes and be encouraged to experiment with producing bat guano fertiliser.

Bat guano

In countries where many people struggle to make ends meet, encouraging wildlife conservation can be a very challenging task. Conservation management must consider how both wildlife and humans can benefit whilst keeping costs to a minimum.

Bat guano can be used as an agricultural fertiliser and is already a novel means of fertilising crops around the world. A company called Guanomad in Madagascar has pioneered guano harvesting with the support of local communities and provides a useful model. Guanomad is valued at $10 million and produces 11,000 tonnes of bat guano a year which it collects from bat caves around the country. The company mines guano from caves in partnership with ancestral communities for whom some of these caves are sacred. Guanomad has sought to engage with local communities to dispel the negative image of guano as being unsafe and causing disease by holding seminars and workshops. The company also encourages local agricultural communities to use guano on their crops. To ensure Guanomad benefits the communities from which bat guano is mined, an amount agreed with the local councils is given away for free to local farmers for each kilo of mined guano. Other countries including Jamaica, Mexico and Indonesia have also begun to promote bat guano as a fertiliser and there are over 950 bat guano products available on the international market. Bat guano contains higher nitrogen levels than other manures such as cow and sheep dung and as it is only required in small quantities, it is a very cost effective means of crop fertilisation.

Presently, most bat guano comes from large-scale operations mining guano from caves. This can cause significant disturbance to roosting bats and be detrimental to conservation. The IUCN has issued guidelines on extraction methods to minimise disturbance to bats but the guidance is not currently enforced (IUCN Species Survival Commission 2014). Small-scale production of bat guano from roosts within rural communities could be of

Large quantities of bat guano can build up from bats roosting in homes, harbouring parasites and creating bad odours unless frequently removed.

Use of bat guano on crops could bring great benefits to farmers in developing countries and help to increase food security whilst helping to conserve local bat populations.

great benefit to agriculture in developing countries without the conservation concerns around disturbance. Many homes in tropical countries contain bat roosts and with basic, low-cost equipment, it would be possible to collect bat guano from these roosts. Removing the guano would also resolve common conflicts with bats by reducing unpleasant smells, the risk of structural damage and preventing build-up of parasites in the home.

However, there are some health risks associated with the collection of bat guano, which would need to be highlighted to ensure that people didn't suffer any illness or injury. These include respiratory illnesses, rabies and parasites.

Many people in rural areas in developing countries do not have access to healthcare and are not aware that bats can carry rabies. Bats infected with rabies are often found on the floor of roosts and anyone collecting guano by hand is at risk of being bitten by sick and injured bats. When encouraging people to collect bat guano it is important to make them aware of the risk of contracting rabies and to ensure they cover their hands with gloves and wear shoes to prevent bites breaking the skin.

Bats also carry the histoplasmosis fungus which can cause respiratory illnesses in humans when breathed in. The mycelia are fertilised in bat guano and can reach high concentrations inside roosts. Histoplasmosis is normally asymptomatic in humans but in people with low or compromised immune systems, as a result of malnutrition or HIV, it could cause pneumonia. Anyone collecting bat guano should wear a mask capable of filtering the fungal spores. Over time, the regular collection of guano would prevent the build-up of fungal spores and would also remove suitable habitat in which parasites could spread, reducing the health risks.

Bat guano fertiliser is very simple to prepare. A gallon of water is added to each cup of guano and soaked overnight to produce a 'tea' which can then be added directly to the soil. Essentially, with just a shovel, an empty grain sack, a face mask and access to water, a rural agricultural household could produce valuable fertiliser. This initiative would also challenge the common assumption that bats are pests which infest the home and spread disease, and would instead encourage homeowners to value bats and help to protect them.

Future

There is capacity for humanitarian organisations working to improve agricultural practices and public health in developing countries to raise awareness of bat guano as an agricultural fertiliser. Charities such as Farm Africa (www.farmafrica.org) and One Acre Fund (www.oneacrefund.org) already have links and projects in rural communities in developing African countries and are well placed to provide information and basic equipment. Wildlife conservation charities and research organisations could greatly benefit from educating people about bat guano in areas where human-wildlife conflict is an issue and could find it to be a useful means of developing positive attitudes towards conservation.

With minimal capital investment, harvesting bat guano could have a significant impact on rural communities by helping farmers to become more self-sufficient and increasing their food security. Wildlife conservation is often considered an unaffordable luxury in developing countries where the needs of people living at subsistence levels are considered greater than the needs of wildlife. Encouraging the use of bat guano would be a novel means of helping both people and wildlife by encouraging a positive perception of bats as a valuable natural asset as opposed to persecuting them as pests. Managed appropriately, conservation of bats could improve public health and offer a low-cost means of producing agricultural fertiliser. Encouraging rural agricultural communities in developing countries to use bat guano as a fertiliser is one possible and appropriate method of conserving tropical bats on a shoestring.

Acknowledgements

The author would like to acknowledge the ongoing work of African Bat Conservation to promote bat conservation in Malawi and would like to thank the organisation for the opportunity to work with them and support their research in Africa.

References

Boyles, J.G., Cryan, P.M., McCracken G.F. and Kunz, T.H. (2001). Economic Importance of Bats in Agriculture. *Science*, **332(6025)**: 41-42.

Coutts, R.A., Fenton, M.B. and Glen, E. (1973). Food intake by captive *Myotis lucifugus* and *Eptesicus fuscus* (Chiroptera: Vespertilionidae). *Journal of Mammalogy*, **54**: 985–990.

Federico, P., Hallam, T.G., McCracken, G.F., Purucker, S.T., Grant, W.E., Correa-Sandoval, A.N., Westbrook, J.K., Medellín, R.A., Cleveland, C.J., Sansone, C.G., López, J.D., Betke, M., Moreno-Valdez, A. and Kunz, T.H. (2008). Brazilian free-tailed bats as insect pest regulators in transgenic and conventional cotton crops. *Ecological Applications*, **18**: 826–837.

IUCN Species Survival Commission (2014). *Guidelines for Minimizing the Negative Impact to Bats and Other Cave Organisms from Guano Harvesting. Version 1.0*. IUCN, Gland.

Whitaker, J.O. (1995). Food of the big brown bat *Eptesicus fuscus* from maternity colonies in Indiana and Illinois. *American Midland Naturalist*, **134**: 60.

World Health Organisation (2016). *World Malaria Report*. World Health Organisation, Geneva.

About the Author

Kathy is a Graduate Ecologist at Mott MacDonald and a Graduate member of CIEEM. She has previously worked overseas assisting the New Zealand Department of Conservation with a radio-tracking study of long tailed bats in Fiordland and in Malawi with African Bat Conservation.
Contact Kathy at:
Kathy.Halsall@mottmac.com

CIEEM

Spring Conference 2018

The Nature of Buildings: Designing effective mitigation and enhancement

20 March 2018, Birmingham

Join us for this one-day conference exploring innovative and effective strategies for biodiversity mitigation and enhancement in and on buildings.

In addition to showcasing novel approaches, we will also explore the relationship between the architect and the ecologist in incorporating biodiversity features in good design.

Bookings now open

Visit: www.cieem.net/spring-conference-2018

Interested in sponsoring or exhibiting at the conference? Contact emmadowney@cieem.net for more information.

Practicalities and Problem Solving: Orchid Translocation in Oxfordshire

Keywords: orchid, salvage, translocation, turf cutter

Samantha Hursey GradCIEEM **Katrena Stanhope CEnv MCIEEM**

Habitat translocation can be used to retain biodiverse habitats that would otherwise be damaged or destroyed due to development and to incorporate these habitats into the design of a mitigation scheme. It can take a considerable number of years for newly created habitats to attain the same level of biodiversity as those habitats lost. Translocating ecologically rich features that would otherwise be lost is a practical way of retaining biodiversity. This article describes the translocation of orchid species within grassland habitat due to a road project in Oxfordshire. It highlights the need for pre-works investigations; an onsite presence and rapid decision making; the importance of good communication between the ecologist and the contractor; and the importance of problem solving to improve the likelihood of success.

The scheme

The scheme involved road improvement works to the A34 near Chilton including the provision of new slip roads by Oxfordshire County Council. Both the on- and off-slip road were to be constructed through mesotrophic grassland which

Figure 1. Mesotrophic grassland with orchid species in June 2014.

supports areas of orchid species: pyramidal orchids *Anacamptis pyramidalis*, bee orchids *Ophrys apifera*, white helleborine *Cephalanthera damasonium* and broad-leaved helleborine *Epipactis helleborine*.

White helleborine are a UK Biodiversity Action Plan species and have a restricted distribution across England (Preston *et al*. 2002). Broad-leaved helleborine are uncommon though widespread throughout England (Preston *et al*. 2002). Bee orchids and pyramidal orchids are common, being found throughout the UK but restricted by habitat type (Preston *et al*. 2002). Both species are important indicator species for lowland calcareous grassland. Regardless of status, orchids are attractive and highly distinctive with eye-catching colours and shapes, often enjoyed by members of the public.

It was considered that there was no alternative to the works that would avoid the loss of orchids. Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 sets out the duty for public authorities to conserve biodiversity in England. Therefore, in order to conserve the grassland supporting the orchids, turves from approximately 2,000 m^2 of grassland supporting orchids was salvaged from the working area and translocated to a suitable receptor site within the land-take of the scheme.

The donor site

A sizeable population of 50 spikes of broad-leaved helleborine were found during the initial extended Phase 1 Habitat Survey in late August 2013. A report provided from the local biodiversity records centre from 1999 also highlighted the presence of pyramidal and bee orchids.

Botanical surveys were carried out in June 2014 during the optimal survey season to identify potential donor sites for translocation. The survey area included two triangular unmanaged fields adjacent to the scheme. All plant species within each of the two fields were recorded using the DAFOR scale (Hill *et al*. 2005). The floristic composition and structure of the donor sites most resembled the mesotrophic grassland MG1 *Arrhenatherum elatius* community, *Festuca rubra* sub community (false oat grass community, red fescue sub community) (Rodwell 1992). This grassland type is generally unmanaged with poor species diversity and is characteristic of neutral soils throughout lowland Britain (Figure 1).

Three areas were identified for salvage translocation based on the results of survey. Donor site 1 was 80 m^2 within mixed plantation woodland on an embankment which supported white helleborine and broad-leaved helleborine and would be destroyed during the re-grading of the embankment. Donor site 2 (160 m^2) and donor site 3 (1820 m^2) were areas of grassland within adjacent fields that would be lost due to the construction of the slip roads. As the translocation was scheduled for autumn 2014, when most of the orchids would not be growing above ground, the exact limits of the grassland to be translocated were marked out with canes at the three donor sites. Maps were made of these areas with GPS references of the edges of the donor sites.

Geotechnical ground investigations were also carried out in June 2014 at the donor site to inform the scheme engineering design. The borehole logs from the ground investigations showed topsoil at a depth of 0.2 m consisting of sandy clays with some chalk and flint gravel within subsoil and made ground. Soil readings of pH 8.4 and 8.8 were recorded, indicating alkaline conditions; some of the plant species recorded are calcareous grassland indicator species such as the white helleborine and broad-leaved helleborine. The grassland identified during surveys is characteristic of a range of soils. It is possible that ground disturbance during previous works to build the existing road or through ploughing, had brought chalk gravels closer to the soil surface, locally influencing soil conditions and giving rise to patchy occurrences of calciphilous plant species.

The receptor site

The receptor site needed to be close to the donor sites to ensure similar soil conditions, minimise transportation of turves, and to be within land owned by Oxfordshire County Council to allow for future maintenance. The logistical requirements for access of suitable plant and machinery required for the translocation also had to be taken into consideration.

The chosen receptor site is located approximately 200 m from the furthest donor site, is approximately 2,000 m^2 in area and was selected to match the donor sites as much as possible in terms of soil pH, drainage, topsoil depth (0.3 m) and aspect. Although there was no borehole information within the receptor site (as there was no engineering requirement for geotechnical information at this location), there were borehole logs for locations immediately adjacent to the receptor site and it was assumed that the soil conditions of the receptor site were similar to the donor sites.

The receptor site was surveyed during the botanical survey in June 2014 and supported mesotrophic grassland absent of orchid species.

Method for translocation – practicalities and problem solving

Atkins produced a translocation method statement on behalf of Oxfordshire County Council for contractors who would carry out the work. The key parts of the methodology are discussed below together with the practicalities of implementing the methodology and solutions to challenges faced on site by the ecologist and contractor during the translocation.

Timing

The translocation was due to be undertaken in autumn 2014, prior to the winter period, when the soils should be warm and moist and new root growth of the grassland is possible before winter.

Turves were removed from the donor sites and installed at the receptor site on the same day with minimal time between cutting and laying to reduce the risk of turves drying out or disintegrating.

Due to unforeseen delays in the timing of the translocation, works took place from late November to mid-December 2014. Works could not be delayed to the following spring due to start of construction dates. In early December, temperatures dropped to below freezing during the translocation. To protect the remaining areas of grassland within the donor sites to be translocated and the turves that were already at the receptor site, exposed edges were covered in hessian to prevent frost damage (Figure 2).

Figure 2. Hessian used to protect exposed edges of turves at receptor site in November 2014.

Figure 3. Addition of chalky subsoil to improve conditions for calcareous species at the receptor site in November 2014. (Top right)

Figure 4. Modified method, placing turf on to plywood to reduce breakage, November 2014 (Right)

Preparation of the donor and receptor site

The topsoil depth at the receptor site was assumed but unknown prior to the translocation works. Topsoil depth was investigated once the translocation contractor was on site and then removed to a depth of 0.3 m using an 8-tonne tracked excavator to expose the subsoil. This topsoil was no longer required and was stored onsite for later use in landscaping for the scheme. Topsoil removal was conducted when ground conditions were not too wet and care was taken to avoid compaction or damage to the subsoil, which can affect growth of the root systems once translocated.

The exposed subsoil was inspected by the ecologist to determine its condition and characteristics. When the subsoil at the receptor and donor sites were exposed, it was obvious that there was variation between the sites. The subsoil at the donor sites was light brown and sandy with chalk whilst the subsoil at the receptor site was orange/brown, very clayey materials with gravel. To improve the subsoil conditions for the orchid species, further excavation was required to enable chalky subsoil from the donor sites to be excavated and laid across the receptor site at a depth of 0.3 m to 0.25 m prior to translocation of the turves (Figure 3).

Due to the shape of the receptor site and its location (bordered on two of three sides by mixed plantation woodland), access was only available from one side. To use the site in its entirety, the turves were placed in the far corner of the receptor site first and then placed in rows to avoid machinery needing to track over the translocated turves for access. Although a set route was used to minimise the effects, this meant that some areas of the exposed subsoil at the receptor site were tracked over by machinery, potentially causing compaction. To counteract any compaction, the subsoil was loosened using the teeth on the excavator bucket before the translocated turves were positioned.

Turf cutting and laying

The size and depth of turves at the donor sites were determined on site by an ecologist during the translocation operation. The topsoil at the donor sites was relatively shallow, coarse and of a chalky nature, the flint and chalk making it too difficult to cut 'clean' turf, so the maximum depth of the turves was approximately 0.25 m.

The surface area of each of the turves was as large as practically possible, taking into account the friability of the soil, the size of the machine bucket, transportation and ease of positioning at the receptor site.

To ensure that the turves would be closely abutted, the contractors constructed a turf-cutting box guillotine, 0.5 x 0.5 m, which was used to cut the edges of the turves neatly and vertically. The turf-cutting box guillotine was positioned and inserted using the bucket of an 8-tonne tracked excavator. When the bucket was removed, the turf remained within the turf-cutting box guillotine and could be directly positioned on to pallets on the back of a flatbed vehicle at the donor site. The turves were carefully removed off the pallets by hand at the receptor site.

Initially the turves were placed on pallets on a flatbed vehicle; the pallets were then positioned on the ground using a forklift. An excavator bucket was used to slide the turf off the pallet and into position at the receptor site. However, moving the turf from the pallet to the ground caused some of the more friable turves to break. Accordingly, the contractors modified their methods to use a sheet of plywood instead of a pallet. The turves were placed on the plywood from the turf-cutting box guillotine, with the plywood positioned on two planks of timber on the flatbed vehicle (Figure 4). The forklift then picked up the turf on the plywood which was placed directly on the ground. The excavator bucket then carefully slid the turf directly off the plywood on to the ground which avoided breakage of the turves.

The following procedures were followed when laying turves to improve establishment and prevent drying out and damaging of the root hairs:

- Turves were abutted tightly to each other without any gaps to improve adhesion;
- Turves were laid as evenly as possible to create a level surface (allowing for settling);
- All turves were in full contact with the subsoil surface beneath and compressed gently with the bucket of the excavator; and
- Any gaps between turves were filled with subsoil taken from the donor site.

Translocation of orchids

Helleborine species are deep rooted and form a tripartite relationship with a tree and a fungus to supply the small seeds with carbon to enable germination and growth. The helleborine species were located within an area of mixed plantation woodland at the top of an earth embankment and access for the excavator and turf-cutting box guillotine was not possible. The risks of root compaction to the trees to be retained at the edge of the scheme also prevented the use of this method. As an alternative, a mini-digger and hand tools were used to excavate the soil containing the helleborine orchids and transport it to the donor site using a 'dig and dump' methodology (Helliwell 1996).

Contractors removed the helleborine spikes that had been identified together with as much topsoil as possible; additional topsoil and subsoil were excavated to enable sufficient helleborine root materials, decided by the ecologist on site, to be translocated to sustain the helleborine species at the receptor site. The excavated soil was placed along one edge of the receptor site adjacent to mixed plantation woodland of similar age and structure from which it was removed. The material was spread uniformly at the receptor site to the same depth as it was before removal from the donor site (0.3 m), covering the exposed subsoil of the receptor area. The spread soil was firmed down using the back of a digger bucket, ensuring the soil was not compacted too much. Though there are limitations to this method, such as slower establishment and success rates in comparison with translocating turves, it was considered to be better to do this than lose the species from the area.

Aftercare management and monitoring

Following the translocation, the receptor site and the surrounding grassland area is to be managed for a period of ten years by Oxfordshire County Council. This management will include maintenance (to include hay cutting, scrub removal and invasive weed species control) to ensure successful establishment of the grassland supporting orchids and to maintain the extent of the grassland within the receptor site with no reduction in biodiversity value. Monitoring of the receptor site will be carried out annually by Oxfordshire County Council and will inform an adaptive management regime.

Flexible methodologies to improve the likelihood of success

Translocation is a method that can be used to retain ecologically diverse features that would otherwise be lost to development. This article outlines the need for the translocation methodologies to be flexible to allow for new solutions to be implemented to address the inevitable challenges faced during the actual translocation process. This requires good communications with the contractor and working with the onsite conditions to solve practical problems to improve the likelihood of success. Monitoring and adaptive management are the keys to the long-term success of the receptor site.

Acknowledgements

The authors would like to thank Drayton Construction for their work on the orchid translocation and Oxfordshire County Council and Skanska for permission to use results from this project.

References and further reading

Anderson, P. (2003). *Habitat translocation – A best practice guide: C600*. Construction Industry Research and Information Association (CIRIA), London.

Box, J. and Stanhope, K. (2010). Translocation of wildlife habitats: a guide for civil engineers. *Civil Engineering*, **163**: 123-130.

Helliwell, D.R. (1996). *Case studies in vegetation change, habitat transference and habitat creation*. Reading Agricultural Consultants, Reading.

Preston, C.D., Pearman, D.A. and Dines, T.D. (2001). *New Atlas of the British & Irish Flora*. Oxford University Press, Oxford.

Rodwell, J.S. (ed.) (1992). *British Plant Communities. Volume 3. Grassland and montane communities*. Cambridge University Press, Cambridge.

Hill, D., Fasham, M., Tucker, G., Shewry, M. and Shaw, P. (2005). *Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring*. Cambridge University Press, Cambridge.

About the Authors

Samantha Hursey (née Ireton) is a qualified Ecologist previously working within the Cambridge office of Atkins Ltd. Samantha has been working professionally for over five years with experience on a range of development schemes including roads, rail, water and habitat creation. Samantha now works for Meadfleet, providing ecological advice on housing developments throughout England and Wales, ensuring effective habitat management for protected species and promoting biodiversity.

Contact Sam at:
sjireton@gmail.com

Katrena Stanhope is an Associate Director of Ecology at Atkins Ltd. Kat has been a professional ecological consultant for over fifteen years, with experience relating to biodiversity issues in the context of environmental management and assessment, and the land use planning system including translocation of habitats and species. Kat is currently on secondment with HS2 Ltd as a Senior Environment Manager.

Contact Kat at:
Kat.Stanhope@hs2.org.uk

How Many Great Crested Newts Can Terrestrial Habitats Support?

John Box CEcol CEnv FCIEEM

Keywords: compensation, European Protected Species, favourable conservation status, great crested newt, mitigation, terrestrial habitats

The design, planning and regulation of mitigation and compensation schemes for great crested newts require evidence-based rationales in relation to how many newts can be supported by different terrestrial habitats. This literature review demonstrates the paucity of published data on this key factor. Schemes based on evidence rather than opinion will give developers the confidence to invest in land purchase, habitat creation and long-term maintenance and monitoring. This will complement the reductions in time and financial burdens expected from the new Natural England policies for European Protected Species. The challenge to those involved in such schemes is to publish relevant data.

Figure 1. Upper Woodland Pond, one of four main great crested newt breeding ponds at Little Wittenham SAC. Photo credit Earth Trust.

Introduction

New licensing policies for European Protected Species (EPS), principally for great crested newt *Triturus cristatus*, have been introduced in England (Natural England and Defra 2017, Oakley *et al*. 2017). The policies aim to achieve better outcomes for EPS and reduce costs, delays and uncertainty for developers. The policies seek to move away from protecting individual animals on development sites and towards encouraging greater investment in compensatory habitats to maintain the favourable conservation status of the local population. The term 'local population' that is used in the summaries for the new policies can be found in guidance from the EU Commission (EU Commission 2007, page 61, paragraph 46). Woking Borough Council and Natural England have been developing and trialling a new approach to development and great crested newts that involves an integrated, landscape-scale approach (Woking Borough Council 2016a, 2016b).

The new licensing policies and the Woking trial will result in changes to the provision and funding of compensatory habitats for great crested newt populations affected by built development projects following application of the avoid-mitigate-compensate hierarchy (e.g. para 118, National Planning Policy Framework in England). Developers, regulators and voluntary organisations will want to be able to estimate the numbers of great crested newts that can be supported by terrestrial habitats, in conjunction with the provision of suitable waterbodies for breeding, because greater investment will be expected in relation to compensatory habitats.

Material attributes of favourable conservation status for a population or metapopulation of great crested newts include the distances that great crested newts travel for different activities, the extent of the habitats supporting this population, the connectivity between these habitats, the long-term future of these habitats, as well as the attribute of habitat quality. The quality of the water bodies that form the breeding sites for great crested newts, their size and their density is a major factor in the size of a great crested newt population. The terrestrial habitats and the waterbodies need to be fully integrated and well connected to the surrounding landscape.

There is guidance on the suitability of waterbodies for great crested newts (Oldham *et al*. 2000, English Nature 2001, Langton *et al*. 2001, Baker *et al*. 2011, Jehle *et al*. 2011). Jehle *et al*. (2011, page 92) cite references to 0.17-6.7 newts/m^2 and 0.2-0.6 newts/m^3 for the density of adult great crested newts in ponds, and

Table 1. Comparative densities of adult great crested newts in different habitats in association with breeding sites.

Habitat	Location	Density (newts/ha)	Reference
Deciduous woodland	Little Wittenham, Oxfordshire	100 – 1500	Oldham 1994, Figure 16
	Shillow Hill, Cambridgeshire	25 – 1250	Oldham 1994, Table 2; Latham *et al*. 1996, Table 4
	Little Wittenham, Oxfordshire	62 – 1036	Latham *et al*. 1996, Table 3
Coniferous woodland	Little Wittenham, Oxfordshire	150 – 400	Oldham 1994, Figure 16
	Little Wittenham, Oxfordshire	113 – 364	Latham *et al*. 1996, Table 3
Open scrub over grassland	Little Wittenham, Oxfordshire	100 – 870	Latham *et al*. 1996, Table 3
Hedgerow	Site A, Leicestershire	250	Latham *et al*. 1996, Table 4
Pasture	Site A, Leicestershire	95	Latham *et al*. 1996, Table 4
Pasture and post-industrial	Lomax Brow, Greater Manchester	20	Oldham 1994, Table 2; Latham *et al*. 1996, Table 4
Arable	Site A, Leicestershire	20	Latham *et al*. 1996, Table 4
Arable with hedgerows	Marnel Park, Hampshire	96 – 137	Redgrave 2009, page 25
Agricultural: non-woodland	Site B, Leicestershire	<20	Latham *et al*. 1996, Table 4
Agricultural: woodland	Site B, Leicestershire	50	Latham *et al*. 1996, Table 4
Gardens	Site A, Leicestershire	175	Latham *et al*. 1996, Table 4

Oldham *et al*. (2000) suggest four or more ponds/km^2 as an optimal pond density for great crested newts.

Existing guidance either offers no guidance on how many great crested newts can be supported by different terrestrial habitats (English Nature 2001, Baker *et al*. 2011) or states that great crested newts *'…have rarely been found to exceed 400 adult newts per hectare, but 100-300 per hectare is perhaps more typical.'* (Langton *et al*. 2001, page 29). This paper summarises information in the scientific and technical literature on the numbers of great crested newts that terrestrial habitats can support.

Population estimates for terrestrial habitats from the literature

Good terrestrial habitats for great crested newts include woodland (deciduous and coniferous), scrub, unimproved grassland and gardens rather than improved pasture, arable and urban land; hedges and ditches enhance the suitability of habitats for newts (Oldham 1994, Oldham *et al*. 2000, English Nature 2001, Langton *et al*. 2001, Baker *et al*. 2011, Jehle *et al*. 2011). The number of great crested newts that terrestrial habitats can support can be difficult to establish because the environmental requirements of a newt population are difficult to assess. This is due to several elements of their ecology including fluctuating population size over short periods; seasonal breeding behaviour and movements; and seasonal use of different habitats.

A review of the scientific and technical literature reveals a paucity of published studies of the numbers of great crested newts that can be supported by terrestrial habitats in association with breeding sites (Oldham 1994, Latham *et al*. 1996, Redgrave 2009). The available data for various habitats at six sites involving fencing and trapping of newts is summarised in Table 1. Marnel Park was being cleared for residential development; Lomax Brow was the subject of experimental research before being cleared for opencast coal extraction; experimental research was being undertaken at Site A and Site B in Leicestershire, Shillow Hill and Little Wittenham (now a Special Area of Conservation for great crested newts) (Figure 1).

In addition, estimates of 250-350 adult great crested newts/ha were used during the establishment of Hampton Reserve, Peterborough (now Orton Pit Special Area of Conservation) (Figure 2) as a receptor site for the translocation of a very large population of great crested newts, although the numbers of newts trapped in defined areas is not given (Herpetofauna Consultants International 2007).

Discussion

This review of how many great crested newts can be supported by terrestrial habitats, in association with suitable waterbodies, will be of value to those involved with planning, designing and regulating mitigation and compensation schemes. These published data can be used as an evidence-base for creating sites to accommodate great crested newts based on population surveys of the breeding sites. That there are few published studies confirms the comment by Oldham *et al*. (2000) on the paucity of information on this species in the terrestrial habitat and therefore the emphasis placed on aquatic habitats in their model for the Habitat Suitability Index.

Oldham *et al*. (2000) used 4 ha as the lower critical limit of 'newt friendly' habitat within 500 m of a breeding site, taking account of barriers to terrestrial dispersal, that is needed to sustain a thriving population of great crested newts. The application of such a lower limit is crucial to the planning and design of mitigation and compensation sites and should be applied in conjunction with an assessment of the suitability of the 'newt friendly' habitat (e.g. habitat types, habitat structure and heterogeneity) and a population viability analysis (Griffiths 2004).

Such evidence-based planning and design for schemes for great crested newts will provide developers and regulators with confidence in the outcome and may result in financial savings in relation to land purchase as well as the scheme and its programme. Projects involving the planning

Figure 2. Orton Pit SAC looking south across Hampton Reserve. Photo credit Froglife.

and design of sites for great crested newts associated with scheme-wide strategies (Oakley *et al*. 2017) and the 'Woking approach' (Woking Borough Council 2016a, 2016b) are likely to benefit from reductions in intensive and costly field surveys.

The numbers of great crested newts that can be supported by different terrestrial habitats should be considered as one of the component attributes of current conservation status and favourable conservation status of the population or metapopulation. Account needs to be taken of all the material attributes of conservation status in respect of the population or metapopulation of great crested newts both in the short-term and in the long-term over multiple generations (Bormpoudakis *et al*. 2016, in particular Appendix 2).

There is a challenge for ecologists and environmental managers involved with the planning and design of mitigation and compensation sites for great crested newts to publish data on how many newts can be supported by different terrestrial habitats. The new Natural England policies seek to increase investment by developers in compensatory habitats. Because of the costs of land and subsequent habitat management and monitoring, developers will want to know with certainty how large a site needs to be for mitigating or compensating negative effects from built development on a population of great crested newts. Our solutions should be based on the available evidence and sound ecology.

Acknowledgements

I am extremely grateful for the advice I have received on drafts of this paper from those with real expertise with great crested newts: Matt Ellis & Liz Howe (Cyfoeth Naturiol Cymru/Natural Resources Wales), Paul Edgar (Natural England), John Mckinnell (Scottish Natural Heritage), Tony Gent (Amphibian and Reptile Conservation Trust), Jim Foster (Amphibian and Reptile Conservation Trust), Richard Griffiths (Durrell Institute of Conservation and Ecology, University of Kent) and Dorian Latham (JBA Consulting). Kat Stanhope and Victoria Sloan, both from Atkins, made very helpful and incisive comments. The Editor of *In Practice* (Gill Kerby) and the Editorial Board have challenged the content and the outcome is a significantly improved paper. I am grateful for the photographs of two sites with very large great crested newt populations: Hampton Reserve, Orton Pit SAC (Froglife, with the agreement of O&H Value Nature Ltd.) and Little Wittenham SAC (Earth Trust).

About the Author

John Box has been involved in many projects involving great crested newts. Iterations of this technical paper have been used since 2009 to guide the planning and design of receptor sites for the capture and translocation of great crested newts.

Contact John at:
john.box@knowlebox.co.uk

References and further reading

Baker, J., Beebee, T., Buckley, T., Gent, A. and Orchard, D. (2011). *Amphibian Habitat Management Handbook*. Amphibian and Reptile Conservation, Bournemouth.

Bormpoudakis, B., Foster, J., Gent, T., Griffiths, R.A., Russell, L., Starnes, S., Tzanopoulos, J. and Wilkinson, J. (2016). Developing models to estimate the occurrence in the English countryside of Great Crested Newts, a protected species under the Habitats Directive. Defra Project WC1108. *The identification of models to improve decision-making processes relating to the impact of developments on great crested newts.* Available at http://sciencesearch.defra.gov.uk Accessed 16 September 2017.

English Nature (2001). *Great crested newt mitigation guidelines*. English Nature (now Natural England), Peterborough. Available at http://webarchive.nationalarchives.gov.uk/20140605090108/http://publications.naturalengland.org.uk/publication/810429?category=30014. Accessed 16 September 2017.

EU Commission (2007). *Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC.* http://ec.europa.eu/environment/nature/conservation/species/guidance/pdf/guidance_en.pdf. Accessed 15 September 2017.

Griffiths, R.A. (2004). Great crested newts *(Triturus cristatus)* in Europe: effects of metapopulation structure and juvenile dispersal on population persistence. In: H.R. Akçakaya, M.A. Burgman, O. Kindvall, C.C. Wood, P. Sjögren-Gulve, J.S. Hatfield and M.A. McCarthy (eds), *Species Conservation and Management: Case Studies,* pp. 281-291. Oxford University Press, New York.

Herpetofauna Consultants International (2007). *Hampton Western Periphery Road, Stages 2 &3: a review of the protection of great crested newt* Triturus cristatus *at Hampton Reserve, with particular reference to land adjoining the identified route for WPR Stage 2 & 3*. Herpetofauna Consultants International Ltd., Halesworth, Suffolk. Available at http://herpecology.co.uk/wp-content/uploads/2009/04/history-report_part1.pdf http://herpecology.co.uk/wp-content/uploads/2009/04/history-report_part2.pdf. Accessed 16 September 2017.

Jehle, R., Thiesmeier, B. and Foster, J. (2011). *The Crested Newt: A dwindling pond-dweller.* Laurenti-Verlag, Bielefeld, Germany.

Langton, T., Beckett, C. and Foster, J. (2001). *Great crested newt conservation handbook*. Froglife, Halesworth, Suffolk.

Latham, D.M., Oldham, R.S., Stevenson, M.J., Duff, R., Franklin, P. and Head, S.M. (1996). Woodland management and the conservation of the great crested newt *(Triturus cristatus). Aspects of Applied Biology*, **44**: 451-459.

Natural England and Defra (2017). *Wildlife licensing: comment on new policies for European protected species licences* (originally published February 2016; revised January 2017). Available at https://www.gov.uk/government/consultations/wildlife-licensing-comment-on-new-policies-for-european-protected-species-licences. Accessed 15 September 2017.

Oakley, M., Gorman, L., Neeves, O. and Wansbury, C. (2017). Accepting little losses to allow genuine gains – a new approach to great crested newt mitigation licensing. *In Practice – Bulletin of the Chartered Institute of Ecology and Environmental Management,* **97**: 35-39.

Oldham, R.S. (1994). Habitat assessment and population ecology. In: Tony Gent and Robert Bray (eds), *Conservation and Management of Great Crested Newts: proceedings of a symposium held on 11 January 1994 at Kew Gardens, Richmond, Surrey,* pp. 45-67. English Nature, Peterborough. Available at http://publications.naturalengland.org.uk/publication/2282691. Accessed 16 September 2017.

Oldham, R.S., Keble, J., Swan, M.J.S. and Jeffcote, M. (2000). Evaluating the suitability of habitat for the great crested newt *(Triturus cristatus). Herpetological Journal,* **10**: 143-155.

Redgrave, L. (2009). Marnel Park – accommodating great crested newts within a residential development. *In Practice – Bulletin of the Chartered Institute of Ecology and Environmental Management*, **64**: 23-26.

Woking Borough Council (2016a). *Great crested newts*. Available at https://www.woking.gov.uk/environment/greeninf/newt. Accessed 15 September 2017.

Woking Borough Council (2016b). *Natural Woking Biodiversity and Green Infrastructure Strategy Supporting Information, Appendix 9 (Favourable Conservation Status) and Appendix 10 (Great Crested Newt).* Available at https://www.woking.gov.uk/environment/greeninf/naturalwoking/nwsuppinfo. Accessed 15 September 2017.

CIEEM Featured Training

Technologies

Camera Trapping for Survey, Monitoring and Public Engagement

Totnes, 31 January – 1 February 2018

NEW

Over two days this course offers detailed coverage of camera set up and programming options, collecting, sorting and interpreting results and avoiding common pitfalls. The trainers will highlight how to embed camera trapping in public engagement and citizen science projects. The course includes comprehensive field elements, including evening and early morning field sessions.

An Introduction to SUAVs for Ecological Practice

Preston, 6 March 2018

NEW

This new training course will assist practitioners in understanding the potential uses and application of Small Unmanned Aerial Vehicles (SUAVs) for producing orthophotographs, site mapping, inspection of buildings or trees and more detailed site modelling. Sessions include an overview of the types of SUAV currently available, advice on the selection of suitable equipment and software as well as the relevant rules, regulations and recommendations for their safe operation.

Intermediate QGIS for Ecologists and Environmental Practitioners

Co. Westmeath, 13-14 March 2018

NEW

This two-day course focuses on using QGIS as a tool for data analysis and producing more complex maps accurately and efficiently. Pitched at intermediate level, the course offers ideal progression from our entry level QGIS training.

Transferable Skills

Effective Communication Skills

Birmingham, 8 February 2018

NEW

Our recent Skills Gap survey highlighted the importance of communication skills across the sector, leading us to develop a new course to support practitioners in developing their professional communications with clients, home-owners, contractors, colleagues and other professionals. A range of participative activities will help develop skills in verbal and non-verbal communication, presentation and listening and build confidence in dealing with difficult situations / resolving conflict.

Assessment & Reporting

Habitats Regulations Assessment / Appraisal (HRA)

HRA of Projects (England and Wales): London, 25 January / Birmingham, 21 March

HRA of Plans (England and Wales): Birmingham, 22 March

HRA of Projects and Plans (Scotland): Glasgow, 27 February

This one-day course provides a thorough understanding of the overall purpose, process and methodology of the HRA of projects. As well as covering relevant policy and legislation, practical workshops and presentations will be used to explore the key stages of the HRA process, with professional tips and hints on compliance and best practice.

Ecological Impact Assessment

Level 1: Leeds, 23 January 2018

Level 2: Newcastle, 30-31 January

Level 3: Birmingham 21 February

Our suite of EcIA courses are designed to offer support to practitioners involved in undertaking or reviewing EcIAs. An Introduction to EcIA (Level 1) offers an overview of the EcIA process and understanding of the key terms and steps involved. Developing Skills in EcIA (Level 2) is suitable for those with some existing knowledge of undertaking EcIA and the legislation and policy drivers behind the process. Understanding is developed using extensive case studies and examples. The Advanced Course in EcIA (Level 3) focuses on getting to grips with some of the more difficult topics including: identifying important ecological features, characterising impacts and determining significance.

Report Writing

Ecological Report Writing: Leeds, 24 January 2018

Report Writing for EcIA: Birmingham, 22 February 2018

Our report writing training focuses on producing good quality reports following CIEEM's *Guidelines for Ecological Report Writing*. The training will explore the challenges faced in producing ecological reports, offer generic guidance on report structure and content and highlight common pitfalls and how to avoid them. Guidance on writing 'Species and Habitat Survey Reports' and 'Preliminary Ecological Appraisals (PEAs)' is covered by the 'Ecological Report Writing' course. Guidance on presenting the outcomes of an EcIA is covered in 'Report writing for EcIA'.

Planning & Development

British Standard BS42020 Biodiversity – Code of Practice for Planning and Development

Bristol, 8 February 2018
Newcastle, 29 March 2018

This training aims to provide professionals with the confidence to ensure ecology work is compliant with all aspects of this new British Standard by familiarising them with the content and structure of BS42020 and its application within the planning process. Led by Mike Oxford, Chair of BSI Technical Committee on Biodiversity and principal author for BS42020.

Book Early for Discounted Course Fees on all our Training Events Early Bird Discounts are available for bookings made up to 6 weeks in advance. **http://events.cieem.net/Events/Event-Listing.aspx**

ALERC Accreditation: Quality Assurance for Local Environmental Records Centres

Tom Hunt, Camilla Burrow and Hannah Cook
Association of Local Environmental Records Centres Accreditation Working Group

Keywords: accreditation, ALERC, Local Environmental Records Centres, quality assurance

Gary Lewis (right), Manager of the Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS), receives an accreditation certificate from George Eustice, Minister of State for Agriculture, Fisheries and Food. © ERCCIS.

This article briefly describes the Association of Local Environmental Records Centres (ALERC) accreditation system and shows how it provides assurance that LERCs meet certain standards. It is based on assessing the processes and working practices of individual LERCs. The assessment is made against a number of key criteria including data security practices and output content, with the full list viewable via the ALERC website. Whilst this is an ongoing process and will take some time to complete across all UK LERCs, it ultimately gives them a formally recognised mechanism with which to demonstrate the high quality of service that they are providing to environmental recorders, partners and clients.

Many CIEEM members will know Local Environmental Records Centres (LERCs) as collectors, managers and suppliers of local information on the natural environment. They analyse complex data and make it understandable and available (often for a fee, depending on circumstances) to all who need it. The Association of Local Environmental Records Centres (ALERC) can accredit LERCs, providing environmental recorders, partners and clients with a high quality service to demonstrate this high standard formally. LERCs work on a not-for-profit basis, meaning they cover their operating costs, but do not "make money" as such. They are steered by local partnerships for the benefit of data providers and users, including their paying customers. Accreditation is an important way of showing how LERCs meet high standards for their users, and offer value for money to customers, which is even more important for those with restrictive budgets.

The accreditation system for LERCs was developed in 2011 by WGB Environment following a commission from Natural England and with support from ALERC. The remit was '[to enable LERCS to demonstrate] a minimum level of standards, to build confidence in [LERCs] as bodies which hold biodiversity information in trust for society and manage public resources well, and to encourage improvement' (Butcher 2010). By 2011, the first two pilot LERCs, Lincolnshire and Cambridgeshire, had successfully achieved accredited status.

The ALERC strategy 2015 – 2020 commits all member LERCs to achieving accredited status by the end of 2020. To date, 15 LERCs, from a total of 44 ALERC members, have successfully shown they meet the standards required for accreditation.

The assessments themselves are conducted either by the ALERC National Coordinator or another member of ALERC's accreditation committee. ALERC increased the number of people able to conduct assessments in 2016 in order to expedite the whole programme. The process shares similarities with a driving test, with LERCs encouraged to apply for an assessment only when they are reasonably confident that they will pass. Mentoring by an appropriate representative from a previously accredited LERC can provide a very effective support mechanism to help them achieve this. During the accreditation process, any LERCs who do not fully meet the requirements of specific quality criteria are given support and guidance as to what additional evidence they might provide. This usually takes the form of documents covering policies, procedures, reports and webpages.

The value of accreditation

The main purpose of the accreditation scheme is to enable LERCs to demonstrate that they meet the standards specified in 20 criteria covering three key areas: i) Organisation Fundamentals, ii) Data Custodianship, and iii) Products and Services. LERCs are local organisations and it is accepted that they need to be flexible and able to respond to different on-the-ground circumstances (e.g. presence or absence of natural history groups or county ecologists). However, it is also important that their users and stakeholders know what to expect from them and are assured that they are meeting nationally accepted standards.

i) Organisation Fundamentals: the criteria largely cover LERC constitutions and how they ensure that they engage with and are steered by their major stakeholders, including local authorities, naturalists and environmental consultants. LERCs also have to provide evidence to demonstrate that they are transparent and impartial, operating to defined and documented processes and procedures.

ii) Data Custodianship: these criteria relate to the ways in which LERCs handle the data they receive. This is of particular importance when we consider that many naturalists send their data to LERCs specifically because they want it to be looked after by a local organisation dedicated to curating biodiversity data in an appropriate, secure and sustainable way. There are criteria dedicated to data backup and disaster recovery, alongside quality assurance. Currently, there is no nationally adopted system or protocol for the verification of biodiversity records, although this is something that ALERC is working to change through ongoing liaison and discussions with other partners in the National Biodiversity Network. Through the accreditation process, LERCs are required to provide clear evidence that their own local quality assurance procedures are effective and robust. Often this involves data being verified by local experts such as the relevant county recorders or, if necessary, seeking expertise from national experts and recording groups.

iii) Products and Services: this is where many CIEEM members will interact with LERCs. These criteria seek to ensure that LERCs have the capacity to offer the basic suite of products, including priority species and habitat lists and maps. LERCs are expected to provide clear evidence that they have access to the relevant data and that the data are being continually curated and updated in order to provide high quality information to end users. Service delivery standards are also covered in response to the legal requirements set out in the Environmental Information Regulations (2004). The ALERC accreditation working group has reviewed the original wording of the criteria, which now specify a maximum 10-day turnaround time for delivery of biodiversity data to all clients, faster than the mandatory 20 days stipulated by the Environmental Information Regulations. Most LERCs are able to provide a much faster service than this but in setting the standard we can provide end users with a documented level of consistency that will be delivered by any accredited LERC.

ALERC accreditation does not have a specific criterion that dictates what LERCs charge for their services as this varies due to circumstances such as hosting arrangement or simple geography (premises costs, for example, vary widely between north and south). But it does set out what the minimum products and services are that

paying customers will receive. Charges are specifically covered by ALERC's position statement on LERC charging, which advises that all LERCs publicise their full running costs and how their charges are derived. Typically, LERC costs will include staff time spent on data management (such as validation and verification), engaging and training recorders and managing volunteers. Costs are covered by funding partners (such as local authorities) through annual funding agreements, and charges to the private sector. Currently the only way for private sector organisations to contribute is by paying for data services at the point of use, when they request a data search.

LERC accreditation provides assurance that they are operating to accepted standards, where they exist, and are following best practice. Importantly, it also provides confidence in the LERC movement as a whole. Whilst this is of great value in itself, there are also many individual benefits of participating in the accreditation process. For example, some LERCs have commented that there was real benefit in reviewing and updating their policies and procedures as it made them take a much more objective and critical view of their day-to-day management practices. Accreditation has also proved very beneficial to the internal review process for more established LERC teams (Box 1).

The accreditation criteria are minimum standards and many LERCs go far beyond them already as they strive for ever higher standards. In time, it is likely even more ambitious accreditation criteria will be required. LERCs are not-for-profit organisations run by a partnership so all those contributing data, information and expertise are helping to ensure that this resource is available in the future and that environmental management can benefit from evidence-based decisions.

More information is available at www.alerc.org.uk

Box 1.

Charlie Barnes of Lincolnshire Environmental Records Centre said *"with both of the staff members involved in the running of the LERC being relatively new in post, accreditation provided an excellent opportunity to become fully accustomed with the systems, processes and procedures involved in running a Record Centre"*.

Mark Wills of North and East Yorkshire Ecological Data Centre said *"accreditation helped us become a more efficient, more streamlined LERC; one that is not afraid to stand back and critically look at ways it could improve – or to have a third party outside of the LERC community look at how it could improve"*.

About the Authors

Tom Hunt is ALERC's National Coordinator. Tom's work is to facilitate ALERC projects, communicate with LERC partners, encourage exchange of ideas and promote collaborative working between LERCs.

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

Camilla Burrow is Director of Thames Valley Environmental Records Centre (TVERC) and a member of ALERC's accreditation committee. Hosted by Oxfordshire County Council, TVERC was one of the first LERCs to be accredited (2013). It covers the counties of Oxfordshire and Berkshire.

Contact Camilla at:
Camilla.Burrow@oxfordshire.gov.uk
www.tverc.org

Hannah Cook is Chief Executive of Kent and Medway Biological Records Centre (KMBRC) and a member of ALERC's accreditation committee. KMBRC are an independent LERC and achieved accreditation in 2014.

Contact Hannah at:
hannah.cook@kmbrc.org.uk
www.kmbrc.org.uk

A Guide to Good Practice Guidance:

A new resource for CIEEM members

Sally Hayns CEcol MCIEEM
Chief Executive Officer, CIEEM

To support the work of its members the Professional Standards Committee, supported by additional CIEEM members, has produced a new resource to replace *Sources of Survey Methods.*

A Guide to Good Practice Guidance, now available in the members' area of the CIEEM website, provides a list of key references for species and habitat survey, mitigation, management and monitoring in the UK and Ireland. The list is intended to signpost members to the most up-to-date guidance documents, where they exist.

The Institute's *Code of Professional Conduct* specifically requires members to maintain professional knowledge, work to expected standards, and have *"regard to the relevant published technical guidance and standards"*. Members working with any given habitat or species should therefore be fully conversant with the documents listed in those sections. However, it is not an absolute list of all relevant references; it is expected that, depending on the specific nature of the work, species or habitats involved, other guidance documents and reference sources may also be relevant.

The list references what the Institute regards as good practice guidance. Where members depart from good practice guidance in their work, or use alternative guidance to that listed, they should clearly state that this is the case and justify why they have done so.

The list for each habitat or species/species group has been compiled by individuals with appropriate expertise in the relevant areas. In compiling the list, consideration has been given to CIEEM's *Principles of Preparing Good Guidance for Ecologists and Environmental Managers*. It should be noted that many of the guidance documents listed were produced before these principles were published and not all will fully comply with them; documents have been listed in such circumstances in the absence of alternatives.

Barn Owl

CIEEM intends that the list will develop, change and evolve over time, as new or updated guidance documents are published. The Professional Standards Committee would welcome written representations from members to add, change or update the list to keep it current and relevant. This would be especially valuable for those species and habitats where the list identifies only limited or no relevant guidance. A form has been provided in the members' area of the CIEEM website for this purpose.

The Professional Standards Committee would like to thank all those involved in producing the list, and especially Claire Smith CEcol MCIEEM who coordinated the publication.

Level 7 Apprenticeships on the Horizon: Are You Ready to Embrace Them?

Max Wade CEcol CEnv FCIEEM
AECOM

Debbie Bartlett FCIEEM
University of Greenwich

Level 7 Degree Apprenticeships in Ecology and in Environmental Management will be important new routes for training and recruiting to our professions as well as for providing training for graduates already in post.

For the apprentices, it is a valuable way of achieving an MSc level qualification whilst benefiting from a salary. CIEEM is taking a key role in the development of these apprenticeships and the target is to have applications available to students graduating and other applicants in 2018 (i.e. starting in employment and training in late summer to early autumn 2018). In order to make the most of this opportunity, we need to be planning and preparing now. There is a lot that needs to be done.

So, what is an apprentice and why should we bother now about something that's almost a year away? Let us stick for the moment with Level 7 Degree Apprenticeships (reference will be made to Level 6 towards the end of this article

and there's good information on the gov.uk website www.gov.uk/education/apprenticeships-traineeships-and-internships). A Level 7 Degree Apprenticeship can be taken up by an individual with an undergraduate degree or relevant work experience. This is not just an opportunity for graduates but could be very interesting to mature professionals (e.g. rangers) who cannot progress as they lack a formal qualification. When successfully completed after 3-4 years, the apprentice will receive an MSc and will need to successfully complete the endpoint assessment for the apprenticeship. All apprenticeships are based on the principle that they receive a full-time salary and that 20% of their time must be spent on training off-the-job. In the remaining 80% of their time they would be undertaking day-to-day/fee-earning work. If the employer has a turnover of £3 million or more, most of the payment for the training comes out the payment that has been levied by the English Government. Smaller companies may also access Government contributions to help to fund the training. The apprenticeship is assessed at the end of the training independently of the trainer. (Apprenticeships are currently only available in England.)

At this point in time, employers need to be thinking about:

- whether or not to advertise apprenticeships and, if so, how many for ecologists and how many for environmental managers;
- how to communicate these vacancies to students and other potential applicants, universities and their own staff;
- how Level 7 Degree Apprentices will be integrated into the business, team or section;
- whether there are any graduates or experienced workers already in the business, team or section who would benefit from a Level 7 Degree Apprenticeship;
- where the apprentice(s) will be able to receive their training;
- whether current staff need any additional support, for example, in understanding more about apprenticeships and in mentoring; and
- what the financial implications are of an employee or employees who will not be on the job for 20% of their time.

These two apprenticeships are being developed by what is termed a 'Trailblazer Group' which comprises at least 10 employers of ecologists and environmental managers, at least two of which must be small to medium-sized enterprise/employers (SMEs). The Trailblazer Group also includes representatives from the Environment Agency and Natural England as employers of large numbers of ecologists and environmental managers, and CIEEM. To date the Trailblazer Group has produced an Expression of Interest in developing a standard for each of the apprenticeships which have been approved and standards are in the process for approval. The Group is currently developing the assessment plans. Later this year or early 2018, the Group will be seeking/approaching universities or any other appropriate trainers to encourage them to register as training providers and provide proposals for delivering the training. To inform this, the Trailblazer Group will have undertaken a survey of employers to identify the numbers of likely apprenticeships and locations around the country where training would be best located. Do keep a look out for this survey.

There is another Trailblazer Group which is developing a Level 6 Degree Apprenticeship for Environmental Professionals. This apprenticeship will support employers who are in the business of design, development and delivery of the built environement and infrastructure programmes. The outcome of a Level 6 Degree Apprenticeship is equivalent to a graduate with 2-3 years' experience. Level 6 Degree Apprenticeships therefore combine on-the-job training and development with a degree running alongside, building in the breadth and depth of knowledge expected of any graduate, plus the independent and professional competence of those in their early professional career. Level 6 Degree Apprenticeships could run over 4-5 years and entrants will range from 18-year-olds joining the team straight from school and A Levels to those already in the workplace, carrying out technical work, thereby providing a route for exisitng technical staff to upskill themselves to a higher professional level. This apprenticeship aims to cover the breadth of the environment profession – from Environmental Impact Assessment (EIA) and air pollution to acoustics and ecology – with apprentices developing a specialism over the duration of their training. The implications of taking on a Level 6 Degree Apprentice are that much greater, necessitating potentially significant changes (e.g. considering what work the apprentice would be capable of potentially taking on at the outset of their apprenticeship).

Further Information:
For more information please contact Debbie (D.Bartlett@greenwich.ac.uk) or Max (max.wade@aecom.com).

Implications of Brexit for Devolved Environmental Law in Scotland: Update

Chris Cathrine MCIEEM
Director, Caledonian Conservation Ltd

The implications of Brexit for devolved environmental law in Scotland were considered in a previous article[1], written before the snap general election and in the absence of meaningful responses from 'Westminster' (UK Government and UK Parliament) or 'Holyrood' (Scottish Government and Scottish Parliament). This article provides an update based on new documents and responses received since.

At present, although EU Directives provide a common framework in some areas, environmental law is fully devolved to Holyrood, which has resulted in significant divergence between Scotland and the rest of the UK[1]. References to EU law are integral to the Scotland Act 1998 (as amended)[2], and it is now clear that Brexit will have a significant impact on devolved powers. In its current form, the European Union (Withdrawal) Bill[3] ('Withdrawal Bill') will reserve all powers currently exercised at an EU level to Westminster, who will then decide which may be devolved to Scotland. The Queen's Speech briefing notes[4] indicated that Westminster would provide UK-wide frameworks for agriculture and fisheries post-Brexit, but did not mention the environment.

Requests for information relating to devolved environmental legislation in Scotland in the context of Brexit were made with Westminster and Holyrood bodies in April 2017 (see Box 1), and responses were received from the Scottish Government Directorate of Environment and Forestry, the Department for Environment, Food and Rural Affairs (Defra) and the Department for Exiting the EU (the latter indicating that Defra were the appropriate department to respond) in October.

Box 1. Questions asked relating to devolved environment law after Brexit.

1. What work is currently being done to form wildlife legislation after Brexit at UK Government and Scottish Government? What are the aims of this work?
2. Will wildlife law remain fully devolved after Brexit, or will the UK Government replace the current EU legislative foundation with legislation to be developed by UK Government (partly or fully reserving these matters)?
3. If UK Government is to replace the EU legislative foundation for wildlife laws, will there be a degree of flexibility for devolved administrations to implement this, or will this legislation be fixed by UK Government?
4. If devolved administrations will prepare their own wildlife laws, or at least decide on their implementation, which body will enforce this implantation (currently this is done by the European Court of Justice, which is objective and independent)?

Defra did not address specific questions, but indicated that future protection would be based on the '25-Year Environment Plan', referring to a report by the Natural Capital Committee[5]. However, as this Plan applies to England only, it is difficult to understand how this will relate to Scotland. Reference was also made to Michael Gove's (Secretary of State for Environment,

Food and Rural Affairs) speech on 21 July 2017[6] (which did not address devolved environmental law), and to the Withdrawal Bill. Defra gave no acknowledgement of differences between UK environmental law and devolved law in Scotland post-Brexit.

The Scottish Government provided a detailed response, addressing each specific question. They stated that, in its current form, the Withdrawal Bill reserves control of scope and extent of any UK-wide frameworks required to replace EU laws to Westminster. This includes matters which are devolved at present, such as environmental law. The Withdrawal Bill also imposes new restrictions on Holyrood, and provides Scottish Ministers with limited powers to make corrections to EU law in devolved areas while allowing UK Ministers to make changes in devolved areas without involvement of Holyrood. Scottish Government also highlighted concerns over enforcement of environmental law after Brexit, as implementation of the Withdrawal Bill in its current form would mean various causes of action under EU law will not exist in domestic law – this is a common issue for the entire UK.

It appears likely that UK Government will provide a legislative framework to replace the EU Directives, although their ability to do this depends on the final form of the Withdrawal Bill. UK Government have stated that they intend to seek Holyrood's

consent for the Withdrawal Bill, and Scottish Government have been clear that they cannot recommend that Scottish Parliament give consent to the Bill in its current form. In order to gain consent, Scottish Government have suggested amendments which would:

- ensure powers in devolved areas return to Holyrood after Brexit;
- ensure no new restrictions are placed on Scottish Ministers;
- ensure no additional restrictions are placed on Scottish Ministers compared with UK Ministers with regards to devolved areas;
- prevent Westminster from changing the devolution settlement unilaterally; and
- prevent Westminster from changing retained EU law without agreement from Scottish Government[7].

At present, any changes to devolved powers should be agreed with Holyrood, although this is not a legal requirement and decisions in areas devolved to Scotland have been taken by Westminster without consent before[1]. Therefore, it is conceivable that the Withdrawal Bill could be passed in its current form without addressing Scottish Government's concerns.

Although uncertainty remains until the final form of the Withdrawal Bill is confirmed, it appears highly likely that a UK-wide framework will replace EU environmental Directives after Brexit.

Notes

1. Cathrine, C. (2017). Implications of Brexit for Devolved Environmental Law in Scotland. *In Practice – Bulletin of the Chartered Institute of Ecology and Environmental Management*, **97**: 18-19.
2. *Scotland Act 1998 (as amended)*. Available at: http://www.legislation.gov.uk/ukpga/1998/46
3. *European Union (Withdrawal) Bill 2017-19*. Available at https://services.parliament.uk/bills/2017-19/europeanunionwithdrawal.html
4. *Queen's Speech 2017: background briefing notes*. Available at https://www.gov.uk/government/publications/queens-speech-2017-background-briefing-notes
5. Natural Capital Committee (September 2017) *Advice to Government on the 25 Year Environment Plan*. Available at https://www.gov.uk/government/publications/natural-capital-committee-advice-on-governments-25-year-environment-plan
6. *The Unfrozen Moment – Delivering A Green Brexit*. Speech delivered by Secretary of State Michael Gove on 21 July 2017. Available at https://www.gov.uk/government/speeches/the-unfrozen-moment-delivering-a-green-brexit
7. Amendments to the UK's EU (Withdrawal) Bill proposed by the devolved Scottish and Welsh governments. 19 September 2017. Available at https://beta.gov.scot/publications/eu-withdrawal-bill-proposed-amendments/

About the Author

Chris Cathrine BSc(Hons) MCIEEM FLS FRES is the founder and Director of Caledonian Conservation Ltd. He has 13 years' experience as a professional ecologist, including over 10 years as an ecological consultant. He has worked for NGOs, Local Authorities and as a consultant throughout the UK.

Contact Chris at: chris.cathrine@caledonianconservation.co.uk

CIEEM Policy Update

Jason Reeves MCIEEM
Policy and Communications Manager, CIEEM

Responding to the NERC Act Inquiry

CIEEM has recently submitted evidence to the Lords Select Committee on the Natural Environment and Rural Communities Act 2006 (NERC Act). Sections 40-42 of the NERC Act create a duty to conserve biodiversity. Section 40 places a duty on public authorities in England to conserve biodiversity, Section 41 requires the Secretary of State to publish and maintain lists of species and habitats of 'principal importance' for the purposes of conserving biodiversity in England, and Section 42 required the Welsh government to publish equivalent lists, but this has since been superseded by the Environment (Wales) Act 2016. The NERC Act 2006 Committee will report back to government by 31 March 2018. CIEEM's response to the inquiry can be found on the website (www.cieem.net/past-consultation-responses).

On 31 October, CIEEM President Stephanie Wray, gave oral evidence to the Committee relating to whether Natural England is fulfilling its role; to what extent budget cuts have affected Natural England and others; the role of biodiversity data; the differences between the duties in England, Scotland and Wales; natural capital; capacity in local authorities; the understanding of biodiversity duties; and what needs to happen post-Brexit. See the CIEEM news item (www.cieem.net/news/442/cieem-president-gives-evidence-to-lords-nerc-act-committee) for more information and to watch the video of the session.

25-Year Environment Plan for England

At the time of writing we have not yet seen the Plan, however we understand that it is due to be published imminently. We understand that the Plan will be a final version rather than a consultation, and we will comment on the publication. We hope that, as we have been asking for, the Plan is ambitious in its aims and in particular sets defined targets, enables monitoring and enforcement, and provides the resources required for delivery.

The Plan is also likely to have implications for the Agriculture and Fisheries Bills that are due to be published next year, and which we will be responding to.

Governments and Agencies

CIEEM has also been engaging with the national governments and agencies.

In England, Stephanie Wray (President), Lisa Kerslake (Vice President (England)), Sally Hayns (CIEEM CEO), myself and others have been having ongoing discussions with Natural England regarding changes to protected species licensing including for bats, newts and charging for licences.

In Ireland, Jenny Neff (Vice President (Ireland)) and Paul Lynas (Irish Section Convenor) have been engaging with the Irish Government and National Parks and Wildlife Service (NPWS), both of whom have strong concerns regarding the future relationship between the UK and Ireland post-Brexit. Our new Ireland Project Officer, Elizabeth O'Reilly, will facilitate this ongoing engagement.

In Scotland, Kathy Dale (Vice President (Scotland)) has been maintaining relationships with Scottish Government and I have been engaging with the Brexit discussion in Scotland. Continuing with Brexit, member Chris Cathrine provides a

useful update on the situation in Scotland in his article in this edition of *In Practice*.

In Wales, Sally Hayns and Diana Clark (Wales Project Officer) have met with representatives of Natural Resources Wales and Welsh Government regarding issues ranging from strategic engagement, Brexit, and linking practitioners with academics and policy-makers.

Brexit Activities

In September we signed a contract with a communications consultant to help us refine our Brexit messaging and to develop dissemination materials. The six-month contract also includes providing strategic support, stakeholder mapping, public affairs training, political monitoring, facilitating meetings, and a parliamentary engagement event.

We are very pleased to have four Brexit investors – Arcadis, Biocensus, BSG, and Environmental Planning and Research (EPR) – who have agreed to support our activities over the next two years. In return for their investment these organisations will have a direct role in guiding our Brexit activities.

Our key messages are that the UK government should:

1. Introduce a new Environment Act, envisioned jointly by all countries of the UK, to provide the legislative framework for a new, bold, shared ambition for the environment.
2. Transform land and marine management policies by using 'biodiversity net gain' as the driver to halt biodiversity loss and rebuild our stocks of natural capital.
3. Establish a new, independent scrutiny body – OfEnv – to provide appropriate enforcement of environmental legislation after we leave the EU.

The previous work of the Brexit Task Groups and Strategic Policy Panel will be kept as 'live' documents to be used as supporting evidence and further detail as required.

By the time you read this we will have had several meetings with parliamentarians to discuss our key messages. At the time of writing we have meetings arranged with several MPs and Peers, including chairs and members of relevant Select Committees, party spokespeople for the environment and Brexit, and two former Environment Ministers.

Prior to these meetings we have already been establishing relationships with advisors to the Environmental Audit, Science and Technology, and Environment, Food and Rural Affairs Committees to discuss our key issues regarding Brexit.

CIEEM has written a joint response to the EU Withdrawal Bill – both as a direct response to the UK government and as a response to a Lords Committee inquiry – in which we point out that the current Bill will not achieve Michael Gove's 'Green Brexit' ambitions. We warned that the Bill fails to adequately provide for parliamentary scrutiny of the raft of changes required to make environmental laws function, ensure the fundamental principles which underpin decades of environmental improvement are protected, or provide a meaningful framework for independent scrutiny of future Government performance on the environment. We also warn that devolved administrations should not be constrained from pursuing ambitious environmental policies and targets of their own as a result of the powers that the Bill creates. The responses were written under the banner of the Environmental Policy Forum (EPF). The EPF is an umbrella group that includes the British Ecological Society, Chartered Institute of Wastes Management, Chartered Institution of Water and Environmental Management, Institute of Environmental Management and Assessment, Institute of Fisheries Management, Institution of Environmental Sciences, Landscape Institute, Royal Geographical Society, and Society for the Environment.

Where appropriate we continue to work in partnership with the EPF, Greener UK, Wildlife and Countryside Link, UK Environmental Law Association, and the Law Society.

For more information on CIEEM's Brexit activities please visit our dedicated Brexit webpage: www.cieem.net/eu-referendum

Country Policy Groups

We are setting up Country Policy Groups for England, Ireland, Scotland and Wales. Each group will engage with policy activities specific to the relevant country and also feed into wider activities (such as Brexit) in conjunction with the Strategic Policy Panel, which guides CIEEM's overarching policy activities. For more information on the Country Policy Groups or to express an interest in joining one of the groups please see the website (www.cieem.net/country-policy-groups).

Further Information:
For more information on CIEEM's policy activities or to get involved please contact me at: JasonReeves@cieem.net

CIEEM Awards 2018

How to Maximise Your Chances of Success

Sally Hayns CEcol MCIEEM
Chief Executive Officer, CIEEM

Entries are now open for the 2018 CIEEM Awards and we know that you are probably thinking that you will consider entering one or more categories in the New Year. But with closing dates in January you really do need to be thinking about your entries now.

We have some exciting new categories (Best Practice in Mitigation and Enhancement (large- and small-scale) and Consultancy of the Year (small, medium and large) so please do take a look at the eligibility criteria for all the Awards and, if you haven't done so already, start planning your entries now.

Hopefully this article will help you to maximise your chance of success.

Good Quality Entries

There are two really important principles that apply to all categories (except the *In Practice* and Postgraduate Student Project Awards). Firstly, the judges can only make their assessments based on the evidence that you put in front of them. They cannot bring any pre-knowledge of a project, site, person or campaign to the decision-making process so the quality of the entry is paramount. A project or nominee may be really good but if the evidence isn't there for the judges to see then it won't be shortlisted. This can be very frustrating for judges who often suspect an entry is better than it appears on paper but if the evidence isn't there then they cannot make assumptions.

The judges are looking for a full description of the project or the members' achievements in the context of the category and the criteria, with plenty of strong evidence – sound and objective (not just hearsay or anecdotal). Use the total allowance of words to the full, it is up to you to be sure you have made the best possible case for your submission. Make sure that supplementary material is relevant, focused, fit for purpose and reasonably accessible and readable, in a reasonable period of time, for the judges. Simply attaching material and documents prepared for a different purpose will rarely help the judges reach their conclusions.

2017 Winners and Finalists

Be innovative, bold and ambitious. To the judges, some submissions look much the same as all of the others. They welcome a variety of ways of demonstrating why your entry should be short-listed.

So, the message is clear. Craft your entry carefully, choosing supporting information to maximise the evidence available to judges, and do not be shy about telling the judges why your nomination should win.

Evidence of Impact, Influence or Success

The second important principle is that the judges are looking for evidence of success, influence or impact. They do know that if you have been involved in designing a really good project and it has just been implemented that you will be proud of it and want to celebrate it. But the Awards require evidence of impact – for example, were the intended conservation objectives achieved, was the mitigation effective? Judges would typically expect entries for site-based projects to be submitted 2-3 years post-implementation in order for the evidence of impact to be available.

Remember, it is a competitive process and the judges will only shortlist entries that they feel merit an award on the basis of the information submitted. The judges are eager to select and promote the most deserving entries so it is incumbent upon nominees to show that their entry is not merely run-of-the-mill; or indeed just another example of routine good practice, which we should all be achieving.

Individual Awards

If you are nominating someone for an individual Award (CIEEM Medal, Members' Award, Promising Professional Award) the same principles set out above apply but in a different context. You need to describe what impact or influence the individual has had which sets them apart and makes them outstanding. Nominations should be clear on what it is that the nominee has done, using specific examples from their work. You are their primary advocate so you need to make a strong case for their inclusion in the shortlist.

Supporters

Where required, the supporter's statement should provide the judges with a meaningful endorsement, based on actual knowledge about the person, project or site, which is independent, and relevant to the nomination. The judges need a well-founded professional opinion, with a coherent explanation supporting the views expressed.

Awards Event

Judging takes place during February and March and shortlisted entries are usually notified in late March/early April. The 2018 Awards Event will take place during the day at the Merchant Taylors Hall in London on the 21st June. From previous experience it is always a wonderful day of celebration. Whilst some shortlisted entries will inevitably go away as Commended or Highly Commended rather than a winner, the fact that they have been shortlisted is no mean feat. The standards are high and everyone who attends is there on merit and should be proud of their achievement.

Of course, the Awards only work as a celebration of our success thanks to our wonderful sponsors but also, and most importantly, thanks to you, our members, who make the effort to enter. So why not make 2018 the year that you enter the Awards? Hopefully we will then see you in London on the 21st June to celebrate the achievements of our profession.

Closing Dates

You should note the closing dates for the different Awards categories:

Award	Closing Date
Postgraduate Student Project Award	8 January 2018
CIEEM Medal	9 January 2018
Best Practice Awards • Practical Nature Conservation - Small-scale - Large-scale • Mitigation and Enhancement - Small-scale - Large-scale • Innovation • Knowledge Sharing • Stakeholder Engagement	29 January 2018
NGO Impact Award	29 January 2018
Members' Award	29 January 2018
Consultancy of the Year • Small • Medium • Large	29 January 2018
Promising Professional	29 January 2018

Guests at the 2017 Awards Event

CIEEM

Awards 2018

A chance to be part of something amazing

Join us in celebrating what our profession contributes to a more sustainable future.

Each year, CIEEM presents a series of awards with an overall aim to celebrate the achievements of both the profession and of individual practitioners. The 2018 celebrations will take place on Thursday 21 June at Merchant Taylors' Hall, London.

For information on how to enter the Awards please visit: www.cieem.net/cieem-awards-2018

Changes to CIEEM's Membership Abeyance Processes

Stuart Parks
Membership Manager, CIEEM

Current Full, Associate and Graduate members are able to request to place their membership into abeyance on an annual basis for a maximum of five consecutive years.

The most common reasons given for requesting an abeyance agreement are maternity/paternity leave and childcare, issues related to long-term/chronic illness, or a temporary career break.

Members wishing to reinstate their membership after a period in abeyance have previously been required to submit for assessment a development plan detailing how they will update their skills and knowledge to a level commensurate with their membership grade.

At its September meeting the Membership Admissions Committee (MAC) reviewed the abeyance process, having previously identified a risk that it was too onerous and had perhaps lost sight of its original intention. This review was supported by feedback gratefully received from members that had recently been through the reinstatement process.

A revised approach, proposed by MAC and approved by the Governing Board in October is detailed below.

Members whose subscription is in abeyance for less than 12 months can now resume membership with no requirement to submit a development plan.

- Members whose subscription is in abeyance for between one and three years can resume membership with no requirement to submit a development plan, but will automatically be entered into the CPD audit in the following year.
- Members whose subscription is in abeyance for more than three years (to a maximum of five years) can resume membership, but will be required to submit a CPD development plan within six months of reinstatement. CPD undertaken will then be reviewed as part of the CPD audit in the following year.
- All members in abeyance will now receive selected member benefits to enable them to keep in touch with developments in the sector and undertake some CPD should they choose to (e.g. eNewsletters, policy briefings and an electronic version of *In Practice*). CPD courses may be undertaken at the member rate or at CIEEM's low-income rate (if eligible) to reflect likely reduced income.
- Members in abeyance are not expected to be working, so will not be eligible to use post-nominals or advertise their services through the Professional Directory.

Further Information:
More information about abeyance agreements is available on the CIEEM website at: www.cieem.net/abeyance-and-deferral-

Contact the CIEEM Membership team at: membership@cieem.net

A Modern Tree Charter

John Jackson MCIEEM
Former CEO of the Royal Forestry Society

A Bit of History

Mention the Magna Carta in conversation and most people will have heard of it and have at least an inkling of what the document was all about and the landmark it was in civil rights. But fewer UK citizens may realise that, as a sequel, a second one followed two years on in 1217 – The Charter of the Forest or Carta Florestal. In broad terms, this re-established the rights of freemen to access Royal Hunting Forests and Chases, eroded by William The Conqueror.

Confusingly, in the 13th century such tracts of land were not always wall-to-wall trees or wildwood but were areas over which the King owned hunting rights, backed up by draconian laws. Places such as Exmoor, the New Forest or Sherwood remain important in conservation to this day.

The original Forest Charter paralleled the Magna Carta. It was re-issued with amendments in 1225 and merged with the latter as 'The Confirmation of Charters' in 1297.

The Need for a Modern Charter

Now fast forward 800 years. Trees in 21st century UK are often taken for granted. As the human population is ever more urban, it is easier to ignore the huge threats our woods and trees are facing to their future from pests, diseases, climate change and pressure from development.

If we don't bring trees and woods back to the centre of everyday life here, we risk losing them from our lives and landscapes. Jo and Joe Public need to stop taking trees for granted, to recognise and celebrate their huge contribution to our existence, to protect the right of the people of the UK to the many tangible and intangible benefits provided by trees and woods and take responsibility for their welfare. And that is the essence of a new 'Charter for Trees, Woodlands and People' or 'The Tree Charter' for short.

A New Charter is Born

In a nutshell, a charter is a document that sets out rights for a group of people.

Charter for Trees, Woods and People

Traditionally one would be issued by the government or monarch (as were the Magna Carta and Charter of the Forest). However, the modern Tree Charter has been built from the grassroots up, and should influence policy and practice through people power.

The build up to the production of the new Charter was orchestrated over its two-year gestation by the Woodland Trust, supported and guided by over 70 organisations. That included CIEEM, which was active on the Professional Steering Group through myself. Over 100,000 private citizens in the UK signed a petition in support of the charter and numerous, eclectic organisations have added their weight.

What's in the Charter?

The Charter has 10 main broad threads or principles. They are:

1. **Thriving habitats for diverse species**
2. **Planting for the future**
3. **Celebrating the cultural impact of trees**
4. **A thriving forestry sector that delivers for the UK**
5. **Better protection for important trees and woods**
6. **Enhancing new developments with trees**
7. **Understanding and using the natural health benefits of trees**
8. **Access to trees for everyone**
9. **Addressing threats to woods and trees through good management**
10. **Strengthening landscapes with woods and trees**

The Launch

The main event took place on Monday 6th November in Lincoln, where CIEEM was represented. A candle-lit procession left the Castle for the nearby Cathedral. Lincoln was chosen as the only place where an original 1215 Magna Carter *and* a Charter of Forests can be seen side by side.

Regional celebrations were held too.

As a nice historic touch, the new charter was written using oak gall ink from galls collected by volunteers across the UK. That was the everyday ink in use for writing until about a hundred years ago.

Get Involved

Add your own name to the Charter at: https://sign.treecharter.uk/page/6023/petition/1

The full document is at www.treecharter.uk

CIEEM | Chartered Institute of Ecology and Environmental Management

Sponsorship Opportunities

CIEEM has a number of one-off and ongoing sponsorship opportunities for organisations to engage with and support both the Institute and the wider ecology and environmental management sector.

For more information please contact: EmmaDowney@cieem.net

Bat Mitigation Strategies Research Project

CIEEM is currently working with Professor Fiona Mathews and Dr Paul Lintott at the University of Exeter to undertake research into the effectiveness of common mitigation strategies used to protect bat populations impacted, or likely to be impacted, during development in the UK and Ireland.

More information: www.cieem.net/bat-mitigation-strategies-research-project

CIEEM Awards 2018

Each year, CIEEM presents a series of awards to celebrate achievements of both the profession and of individual practitioners, and to raise the profile of CIEEM, highlighting our role in championing the importance and practice of ecology. Our awards categories honour both organisations and individuals.

More information: www.cieem.net/awards

CIEEM Conferences 2018

CIEEM holds annual conferences in the spring, summer and autumn. These conferences are spread across the UK and Ireland. In 2018, our conferences will focus on ecology and urban design (Birmingham), nature reserves (London), and habitat creation and restoration (Glasgow).

More information: www.cieem.net/training-events

Student Hub:
Boost Your CV and Employability

What Do Recruiters Look For?

We asked Robert Magee Chartered MCIPD, from WYG, what he looks for when he's searching for the right candidate:

"There are a number of things which I would normally look for when trying to identify a graduate who has applied for a role and it's not all experience!

1. ***The Basic CV***
   Title and headings – Ensure font size and paragraph spacing is uniform throughout as it must be easily read. Borders, pictures and formatting can take the focus away from the content.

   Length – Aim for three pages or less and include only what's necessary. Use simple, plain language with clear and concise content, so put important information first, usually employment followed by academic qualifications.

   Spelling and grammar – Always check.
2. ***Personal statements***
   Don't waste space! It is important to understand what a graduate wants from a career, what interests them and why. Someone who is focused and clearly communicates what they want, makes them stand out from the crowd.
3. ***Tailored CV***
   Reviewing a CV that is clearly related to the job someone is applying for is key. Spending time reviewing irrelevant information is pointless – it must be relevant to the job and catch my attention within 30 seconds.
4. ***Examples***
   Relevant employment or work experience is key but it must relate to the role they are applying for.
5. ***Key words and phrases***
   Graduates who mention specific packages, competencies or technical skills on their CV show me that they understand the role/industry and what is required to work in it."

Online Professionalism and Employability

The University of Aberdeen have created a guide on how to use social media to become more employable – read their top tips: www.abdn.ac.uk/careers/resources/documents/5665.pdf

Your 2018 To-Do List

January	Get involved with your local CIEEM Member Network. You're already a CIEEM member and member networks often run free events.
February	Sign up to receive newsfeeds to keep up-to-date with the latest in the sector (e.g. the statutory agencies' newsletters).
March	Start building a portfolio to show an employer examples of outstanding work that you've completed, feedback that endorses essential skills (LinkedIn is a great platform for this), certificates you've achieved or training you've completed. Use CIEEM's Competency Framework to see what technical and transferable skills you can map yours against.
April	Write an article for a publication. Fancy writing for *In Practice*? You can check the themes and deadlines for submissions online (www.cieem.net/in-practice) and if you have any questions you can contact our editor, Gill (gillkerby@cieem.net).
May	Take an active part in online discussions on ecology, conservation and environmental management. You can make a start by joining us on Twitter (@CIEEMnet), Facebook (@CIEEM91) and LinkedIn.
June	Take the plunge and join your first expedition; it can be a life-changing experience and provide you with skills and experience relevant to your career. There are many organisations out there that offer a wide range of volunteer programmes and internships.
July	Volunteer for a relevant organisation. Take a look at whether your university runs a conservation volunteering group or contact a local charity such as a Wildlife Trust to see how you can get involved.
August	Start working towards a species licence. CIEEM Student members receive a discount on all CIEEM training. Our full programme is at www.cieem.net/training-events.
September	Job shadow an expert. Write to local environmental consultancies and see if they run work experience or open days. Once you've joined some online discussions you will be able to expand your network and open up more opportunities.
October	Attend a conference. A great way to meet like-minded professionals and stay in the loop of latest trends in the sector. CIEEM offers 10 free student places for each conference which you can enter via a draw.
November	Enter the CIEEM Awards. Each year we run Student Awards with a prize of £250. A great way to showcase your projects and to add to your CV. Find more information at www.cieem.net/awards.
December	Read, read, read as many publications and journals as you can to keep up to date with the latest research. Use your local library or sign up to free newsletters through organisations online.

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 below 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	Chartered Environmentalists
Mr Guy Miller CEcol MCIEEM	Mr Keith Wilson CEnv MCIEEM
Dr Katy Read CEcol CEnv MCIEEM	Miss Lucy Fay CEnv MCIEEM
	Mr Mark Wingrove CEnv MCIEEM
	Mr James Farrell CEnv MCIEEM
	Mrs Anne Pritchard CEnv MCIEEM

Chartered Ecologist application deadlines

CEcol application due date	CEcol Interviews
5 January 2018	26 March 2018
30 March 2018	18 June 2018

Chartered Environmentalist application deadlines

CEnv application due date	CEnv report submission deadline	CEnv Interviews
2 March 2018	25 May 2018	TBC

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

Our 150th Chartered Ecologist

Stephen Lockwood CEcol MCIEEM

Associate Director, RPS Planning & Development

Why did you join CIEEM?

I joined CIEEM approximately five years ago at an Associate level, as the body is the recognised organisation for professional ecologists. Joining enabled me to assess my career development against standardised competencies, helping me target areas of training to move forwards in my career progression.

Why did you apply for Chartered status?

In all professions Chartered status is the recognition of a high level of professional practice within a chosen career. To gain this status as an ecologist is to exhibit to both colleagues and clients the high level of competency, knowledge and professional standards I have attained through the course of my work.

How did you find the Chartership process?

The initial understanding of the process was reasonably complex due to the number of potential competencies which can be completed. Honing down to the most relevant ones was the most time-consuming process, ensuring I was able to summarise my relevant skills succinctly. The interview process was friendly and straight forward and gave me the opportunity to add to the information I had already provided in my application.

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

The work I undertake has remained the same for the time being, however having achieved CEcol I believe the projects I will become involved with in the future will become increasingly complex as other Environmental Impact Assessment (EIA) disciplines are beginning to recognise the value of including a Chartered Ecologist as part of a project team.

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

I have recommended to a number of my colleagues that they apply for CEcol so that they are able to assess where they are in their careers and target specific continuing professional development (CPD) activities to help them achieve their potential.

What is the best thing about your job?

The best thing about my job is the variety of projects and locations I get to be involved with. My favourite habitat is the upland environment, particularly blanket bog, so getting to assess these areas across the Scottish Highlands is a real bonus. I also enjoy mentoring members of RPS's Scottish ecology team and seeing more junior level ecologists develop their skills.

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

Information Sharing in the Ecological Community

If you attended the recent workshop at CIEEM's Autumn Conference in Manchester, jointly run by our Managing Editor Erika Newton and Conservation Evidence, you'll be aware that we are looking for people to get involved by providing feedback and advice on a new project to facilitate information sharing in the ecological community. Our vision is to create an interactive online platform that allows applied ecologists – researchers and practitioners – to browse and search a wide variety of applied ecological content including grey literature reports, journal article summaries, and open access articles. If you're interested in finding out more, just visit www.britishecologicalsociety.org/infoshare and complete the short online form.

Functional Traits in Agroecology

Meanwhile, take a look at the January issue of *Journal of Applied Ecology* for our latest Special Feature, on Functional Traits in Agroecology. This group of papers, edited by Marney Isaac and Adam Martin, highlights the role of agroecology in key global issues including farm management, food production and nutritional diversity. What's more, this research demonstrates how a trait-based approach can support local ecological knowledge to assess crop-environment interactions and ultimately develop sustainable management solutions. Read the articles here:

http://bit.ly/JAPPL55-1

Treeline Woodland and Scrub: Where Next?

We're excited to announce this joint conference with the Norwegian Ecological Society. This event will bring together practitioners, researchers and NGOs in September 2018 in the UK and Norway. It will use live video links between Perth and Bergen to facilitate communication between the communities.

The symposium will compare and contrast tree- and shrub-line vegetation dynamics across northern Europe, and beyond, in the context of differing land use methods and climate change, and examine the impact of the vegetation dynamics on the biodiversity and ecosystem function of the habitat.

The altitudinal treeline habitat across the boreal zone of Europe shares many plant and animal species. These transition habitats can be some of the most biologically diverse due to their highly variable structure. However, there are differences in the history of land use across Scandinavia and the UK which suggest that the current changes in vegetation dynamics, in response to climate change, may be very different in the separate regions. In turn, this affects other elements of the biodiversity (above and below ground). Generally, there appears to be an upward trend in the movement of tree and shrub species in Scandinavia, while in the UK treeline habitats are very rare and there is conservation concern associated with many montane scrub species.

The land use differences, across the countries, have fostered very different attitudes to the vegetation in this zone and its role in supporting (or not) the interests of extensive agriculture or hunting practice. Comparing and contrasting the vegetation and biodiversity dynamics in these different contexts may inform land use interests and will identify gaps in our understanding of the dynamics that may focus future research effort.

Keep an eye on our website for booking details and how to submit an abstract.

Joint Annual Meeting

By the time you read this, our joint Annual Meeting will be in full swing in Ghent, Belgium (11-14 December 2017). It is a first for us to hold a meeting with *three* international organisations: Gesellschaft für Ökologie (GfÖ) and NecoV, in association with the European Ecological Federation (EEF).

We will welcome 1,500 international delegates and offer 13 parallel sessions covering the breadth of ecological disciplines, two poster sessions, 13 career-progressing workshops and a social programme perfect for networking. We pride ourselves on providing inclusive, friendly events with strong science and renowned speakers. Our plenary speakers this year are Iain Couzins, Sue Hartley, Carlos Herrera and Louise Vet. Catch up on the Twitter conversation with #EAB2017.

Videos of the plenary speakers and general sessions will be online in January, so ensure you watch out for the announcement.

Membership Benefits

Finally, we are currently looking to develop membership benefits for ecologists working outside academia; so, if you have any suggestions, we would love to hear from you: helen@britishecologicalsociety.org

Contact
richard@britishecologicalsociety.org
www.britishecologicalsociety.org
@BritishEcolSoc

Member Network News

CIEEM has two types of Member Networks: Geographic Sections and Special Interest Groups. Each is 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/member-networks.

EAST OF ENGLAND

Serotines in Churches
4 August 2017, Chippenham

This event, led by experienced bat ecologist Chris Vine MCIEEM, began with a talk before dusk on the ecology of serotine bats *Eptesicus serotinus* and their history in this particular church. Chris has monitored this small colony on and off over the last 20 years, but they are not the only species to use the site for roosting; both natterer's bats *Myotis nattereri* and brown long-eared bats *Plecotus auritus* have been detected over the years.

Chris talked the group through his hand-netting technique and this was a great opportunity for attendees to see the distinguishing features of one of our larger bat species up close. Many thanks to Chris for sharing his knowledge and skills at this event!

You can read more about this and other East of England Section activities at www.cieem.net/east-of-england.

EAST OF ENGLAND

Visit to Nevendon Washland Nature Reserve
20 July 2017, Wickford

A small but fairly diverse group parked up on Old Nevenden Road, Wickford, to be met by the group's host for the day, the ever-enthusiastic Jon Cranfield MCIEEM (Principal Ecologist at Herpetologic Ltd), and his equally enthusiastic dog. Participants gathered to learn about how the creation, enhancement and management of habitats at the Nevendon Washland Nature Reserve (as part of great crested newt mitigation) has led to significant biodiversity gains across a range of flora and fauna.

Amphibians and reptiles were incredibly abundant on-site and the afternoon brought an opportunity to look at various types of aquatic funnel trap that Jon has been trialling at the site for monitoring great crested newts.

You can read more about this event at: www.cieem.net/east-of-england

Adder *Vipera berus*

Participants checking out the pond

A successful great crested newt trapping session

SOUTH EAST ENGLAND

Visit to Ranscombe Farm
5 August 2017, Rochester

A South East Section event visited Plantlife's Ranscombe Farm on a stormy day in August. A guided walk was led by Plantlife's Richard Moyse around the nationally important reserve, which includes wild arable species, extensive ancient woodland and fragments of chalk grassland.

For further information on this and other activities in the South East England Section visit www.cieem.net/south-east

LAUNCH OF NEW SPECIAL INTEREST GROUP: ECOLOGICAL RESTORATION AND HABITAT CREATION

This autumn sees the launch of CIEEM's newest Special Interest Group (SIG) with the new committee being elected as part of the 2017 elections. The new group will be working on events, policy engagement and other initiatives relating to wide ranging aspects of ecological restoration and habitat creation.

To find out more about what this new group will be getting up to as they begin making plans, visit www.cieem.net/special-interest-groups.

15th Century Farmhouse

Lunch stop!

WALES

Visit to Coed Felinrhyd and Llennyrch led by the Woodland Trust
19 September 2017

A truly fabulous day was enjoyed by 10 people who had travelled from as far as Liverpool and Newport to Maentwrog, North Wales. Our expert guide for the day was Woodland Trust Site Manager for North Wales Kylie Jones Mattock who was assisted by her colleague Alastair Hotchkiss, an expert in lichens among other things.

Llennyrch was purchased by the Woodland Trust in 2015 via funds from a legacy, a public appeal which raised £400,000, as well as charitable trusts and £50,000 from Natural Resources Wales (NRW). Together with their existing site Coed Felinrhyd, it makes for a superb day out.

Read more about this fascinating site at www.cieem.net/wales

SCOTLAND

Scottish Section Conference 2018
Wildlife tourism in Scotland:
A wildlife destination or a destination for wildlife
24 January, Aberdeen

For further details and booking information please visit http://events.cieem.net/Events/Event-Listing.aspx

WALES

Welsh Section Conference 2017
Turning Policy into Practice:
realising the environmental potential of new legislation in Wales
5 October, RSPB Newport

Delegates gathered on a stunning October day at RSPB Newport to hear talks about how practitioners are beginning to translate recent Welsh legislation into wildlife benefits on the ground. The day concluded with an unseasonably warm walk around this important wetland site, with sights including wetland birds, dragonflies, a lighthouse that sits below ground level and an unusual collection of electric pylons!

You can find presentations from the day and speaker abstracts at www.cieem.net/previous-conferences.

For further information on this and other activities in Wales please visit www.cieem.net/wales.

ELECTIONS 2017

Thank you to all those who took part in this year's elections – either standing as a candidate or showing your support by voting for the many nominees.

You can find full details of who is on your Member Network Committees at www.cieem.net/member-networks.

You can also find details of current committee vacancies and how you can get involved at www.cieem.net/cieem-committee-vacancies

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.

For information on vacancies in your Member Network committees visit www.cieem.net/cieem-committee-vacancies.

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

Sara Abo El Nour, Mark Burton, Paul Carrier, James Forde, Mike Harding, Roger Herbert, Carys Hutton, Lewis Pate, Tristam Pearce, Josephine Preece, John Taylor, Rachel Whatmore

Upgrades to Full Membership

Elaine Rickman, Dominic Bower, David McNicholas, Laura Holmes, Jessica Andrews

Associate Members

Joanne Daly, Mike Drew, Paul Kennedy, Josephine Lewis, Christopher Mellor, Lloyd Richards, Louise Sherwell, Roisin Tennyson, Sam Thomas, Kerri Watson

Upgrades to Associate Membership

Richard Bates, Katherine Biggs, David Blakemore, Matthew Buxton, Catherine Coton, Nancy Davies, Errol Ibrahim, Nathan Jenkinson, Oliver Mackrill, Joe McLaughlin, Jack Muskett, Scott Roe, Andrea Sarkissian, Catherine Wiseman

Graduate Members

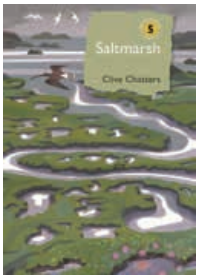
Nicholas Benson, Abigail Case, Zoe Courchene, Thom Erritt, Lauren Fear, Mary Gallagher, Abigail Gazzard, Jack Houston, James Hrynkiewicz, Matthew Kirby, Laura Linsley, Katie Luxmoore, Charlotte Mason, Jonathan Molesworth, Matthew Mott-Dowling, Declan Murphy, Elinor Parry, Jennifer Paterson, Georgina Pike, Joel Rowlands, Madelyn Shikh-Salim, Tonia Webster, Ashley Welch, Alexandra Yates

Upgrades to Graduate Membership

Dean Carroll, Nathan Duszynski, Jake Hill, Philip Maund, Alexander Richardson, Neil Watkin, Ellis Watts, Emma Wayne, Hannah Williams, Deborah Wright

Student Members

Karen Andrews, Joanne Appleby, Leona Baillie, Rhiannon Barton, Mariann Biro, Eilidh Brown, Julie Caldicott, Emma Carney, Victoria Chanin, Jack Childs, Peter Cleghorn, Sophie Connor, Hazel Crossley, Millie Davey, Elizabeth Davis, Steven Davis, Craig Dickson, Christine Duffield, Jacob Elsey, Leanne Engdahl, Jennine Evans, Brishan Finn-Leeming, Edward Font Freide, Samantha Gallimore, Adele Harrison, Abigail Harrison, Alice Harsant, Joseph Horrocks-Taylor, Alex Keen, Nim Kibbler, Joe Laird, Martin Lampert, Harri Lee, Annabel Looker, Alice Maiden, Ian McGregor, Tessa McKnight, Jan Millard, Joanna Newton, Emily Park, Kiani Perera, George Poulton, Sam Pratten, Samantha Ready, Edward Rickard, Rachel Roberts, Tanya Rowlinson, Elisabeth Seymour, Demi Slater, Naomi Smith, Rachel Sore, Samuel Spry, Abigail Strickley, Jack Taylor, Rosalind Tomkins, Lucy Treasure, Rowena Tylden-Pattenson, Deborah Wallace, Sophie Whiting, Matthew Wilcock, Emma Wood



Saltmarsh (British Wildlife Collection Volume 5)

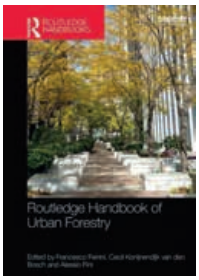
Author: Clive Chatters

ISBN-13: 9781472933591

Available from: www.bloomsbury.com

Price: £31.50

Saltmarshes are among Britain's most diverse and dynamic landscapes. Clive Chatters has a lifetime's affinity with them. In this fifth volume of the British Wildlife Collection, he celebrates their natural history and diversity, from the highly distinctive marshes in the Scottish Highlands to the urban remnants of the Thames estuary now engulfed within the capital. By examining the past of these complex habitats, we can gain an insight into how they have developed, and an understanding of their relationship with people. In addition to their exceptionally diverse natural history, saltmarshes are sources of food and medicine, they play a pivotal role in flood defence and carbon sequestration, and have inspired artistic endeavour.



Routledge Handbook of Urban Forestry

Editors: Francesco Ferrini, Cecil C. Konijnendijk van den Bosch, Alessio Fini

ISBN-13: 9781138647282

Available from: www.routledge.com

Price: £150.00

This comprehensive handbook provides a global overview of the state of the art and science of urban forestry. It describes the multiple roles and benefits of urban green areas in general and the specific role of trees, including for issues such as air quality, human well-being and stormwater management. It reviews the various stresses experienced by trees in cities and tolerance mechanisms, as well as cultural techniques for either pre-conditioning or alleviating stress after planting. It sets out sound planning, design, species selection, establishment and management of urban trees. It shows that close interactions with the local urban communities who benefit from trees are key to success. By drawing upon international state-of-art knowledge on arboriculture and urban forestry, the book provides a definitive overview of the field and is an essential reference text for students, researchers and practitioners.

Grassland Fungi: A Field Guide

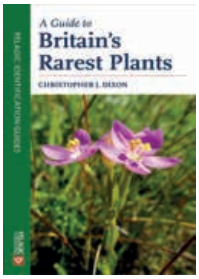
Authors: Elsa Wood and Jon Dunkelman

ISBN-13: 9780957642416

Available from: www.nhbs.com

Price: £19.99

The vital role of fungi in the ecology of grasslands is becoming more widely appreciated, sparking an increasing interest in identification. Compiled from surveys in the Lower Wye Valley, this field guide covers the species that are commonly found in meadows and other grasslands throughout the UK including the colourful waxcaps and many other fascinating species. Designed to be suitable for the beginner and amateur enthusiast, it will appeal to anyone with an interest in grassland mycology.



A Guide to Britain's Rarest Plants

Author: Christopher J. Dixon

ISBN-13: 9781784271466

Available from: www.nhbs.com

Price: £19.99

A Guide to Britain's Rarest Plants describes 66 native species of plants that have the most narrowly restricted ranges in Great Britain. These range from continental, warmth-loving species in the south of England to those found only on the highest Scottish mountains. Each species is shown together with its habitat to allow the reader to better understand the ecological context.

Adventures of a Young Naturalist: The Zoo Quest Expeditions

Author: Sir David Attenborough

ISBN-13: 9781473664401

Available from: any good bookstore

Price: £7.99

In 1954, a young television presenter was offered the opportunity of a lifetime – to travel the world finding rare and elusive animals for London Zoo's collection, and to film the expeditions for the BBC. His name was David Attenborough, and the programme, *Zoo Quest*, not only heralded the start of a remarkable career in broadcasting, but changed the way we viewed the natural world forever. Written with his trademark wit and charm, *Adventures of a Young Naturalist* is not just the story of a remarkable adventure, but of the man who made us fall in love with the natural world, and who is still doing so today.

Basic mathematical errors may make ecological assessments unreliable

P. R. Lintott and F. Mathews

Biodiversity and Conservation 2017 (https://doi.org/10.1007/s10531-017-1418-5)

Environmental impact assessments (EIAs) are used globally as the evidence-base for planning decisions, yet their efficacy is uncertain. Given that EIAs are extremely expensive and are enshrined in legislation, their place in evidence-based decision-making deserves evaluation. The mean is the most commonly used summary statistic in ecological assessments, yet it is unlikely to be a good summary where the distribution of data is skewed; and its use without any indication of variability can be highly misleading. Using bats as an example, the authors show that EIAs frequently summarise these data using the mean or fail to define the term 'average'. This can lead to the systematic misinterpretation of evidence which has serious implications for assessing risk. There is therefore a pressing need for guidance to specify data processing techniques so that planning decisions are made on a firm evidence-base. By ensuring that data processing is systematic and transparent it will result in mitigation decisions and conservation strategies that are cost-effective and proportionate to the predicted degree of risk.

Open access: https://link.springer.com/article/10.1007/s10531-017-1418-5

Correspondence: p.r.lintott@exeter.ac.uk

Comment: Evidence complacency hampers conservation

W.J. Sutherland and C.F.R. Wordley

Nature Ecology and Evolution 2017, 1: 1215–1216

The pernicious problem of evidence complacency, illustrated here through conservation policy and practice, results in poor practice and inefficiencies. It also increases our vulnerability to a 'post-truth' world dealing with 'alternative facts'.

Open access: http://www.readcube.com/articles/10.1038/s41559-017-0244-1

Understorey plant community composition reflects invasion history decades after invasive Rhododendron has been removed

J.E. Maclean *et al*.

Journal of Applied Ecology 2017 (doi: 10.1111/1365-2664.12973)

Little is generally known about what happens to sites following the removal of the invasives and the implicit assumption that the native community will return, unaided, to pre-invasion conditions is often left untested. The authors assessed recovery of the native understorey plant community following removal of the non-native invasive *Rhododendron ponticum* from Scottish Atlantic oak woodland. Cleared sites showed no evidence of returning to the target community, even after 30 years of recovery, and instead formed a bryophyte-dominated 'novel community', containing few of the typical oak woodland vascular plants. The findings demonstrate that native communities may be unable to recover effectively of their own accord following invasive species removal, and will require further management interventions in order to achieve restoration goals.

Correspondence: ruth.mitchell@hutton.ac.uk

Plant, soil and microbial controls on grassland diversity restoration: a long-term, multi-site mesocosm experiment

E.L. Fry *et al*.

Journal of Applied Ecology 2017, 54: 1320–1330 (doi:10.1111/1365-2664.12869)

The authors carried out an 8-year mesocosm experiment across three locations in the UK to explore the relative and interactive roles of various above-ground and below-ground factors in the establishment of target species, to determine general constraints on grassland restoration. The results of this long-term, multi-site study indicate that successful restoration of species-rich grassland is dependent primarily on priority effects, especially in the form of early-coloniser species that suppress establishment of slow-growing target species. The authors also show that priority effects vary with soil conditions, being stronger in clay than sandy soils, and on soils of high nutrient availability. This work emphasises the importance of considering priority effects and local soil conditions in developing management strategies for restoring plant species diversity in grassland.

Correspondence: ellen.fry@manchester.ac.uk

Livestock grazing alters multiple ecosystem properties and services in salt marshes: a meta-analysis

K.E. Davidson *et al*.

Journal of Applied Ecology 2017, 54: 1395–1405 (doi:10.1111/1365-2664.12892)

To investigate how livestock alter soil, vegetation and faunal properties in salt marshes, the authors conducted a global meta-analysis of ungulate grazer impacts on commonly measured ecosystem properties. They also tested stocking density, grazing duration, grazer identity, continent and vegetation type as potential modifiers of the grazing effect. The majority of studies were conducted in Europe or the Americas, and investigated cattle or sheep grazing.

The results reveal that the use of salt marshes for livestock production affects multiple ecosystem properties, creating trade-offs and synergies with other ecosystem services. Grazing leads to reductions in blue carbon in the Americas but not in Europe. Grazing may compromise coastal protection and the provision of a nursery habitat for fish while creating provisioning and cultural benefits through increased wildfowl abundance. These findings can inform salt marsh grazing management, based on local context and desired ecosystem services.

Correspondence: davidsonke@hotmail.co.uk

Density dependence and marine bird populations: are wind farm assessments precautionary?

C. Horswill, S.H. O'Brien and R.A. Robinson

Journal of Applied Ecology 2017, 54: 1406–1414 (doi:10.1111/1365-2664.12841)

The authors reviewed the evidence for compensatory and depensatory regulation of 31 marine bird species, and conducted a meta-analysis to examine the functional shape of density-dependent population growth. The evidence was also evaluated in relation to established species-specific indices of wind farm vulnerability in order to assess whether compensatory mechanisms are likely to offset losses associated with collision or displacement.

The authors conclude that among marine bird species with high vulnerability to wind farms, compensatory regulation is unlikely to offset large and sustained losses from the breeding population. In addition, depensation has the potential to accelerate population declines and generate local or regional extinctions, especially in smaller colonial species. Consequently, density-independent models will not offer a consistently precautionary approach for assessing the potential impact of wind farms on marine bird populations. Instead, assessments should examine the potential population response using a range of density-dependent structures.

Correspondence: catrsw@gmail.com

More than 75 percent decline over 27 years in total flying insect biomass in protected areas

C.A. Hallmann

PLoS ONE 2017, 12(10): e0185809 (https://doi.org/10.1371/journal.pone.0185809)

The author used a standardised protocol to measure total insect biomass deployed over 27 years in 63 nature protection areas in Germany to infer on the status and trend of local entomofauna. The author's analysis estimates a seasonal decline of 76%, and mid-summer decline of 82%, in flying insect biomass over the 27 years of study. This decline is apparent regardless of habitat type, while changes in weather, land use, and habitat characteristics cannot explain this overall decline. This yet unrecognised loss of insect biomass must be taken into account in evaluating declines in abundance of species depending on insects as a food source, and ecosystem functioning in the European landscape.

Open access: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185809

Correspondence: c.hallmann@science.ru.nl

Tree loss impacts on ecological connectivity: Developing models for assessment

R.C. Henry

Ecological Informatics 2017, 42: 90-99

This study modelled the removal of non-woodland roadside trees and the effects on wider landscape connectivity. Removing 60% of roadside trees decreased the number of successful dispersers by up to 17%. Trees outside of woodlands (TOWs) are important for maintaining landscape connectivity. The study says that spatially explicit individual-based models are valuable tools for assessing the loss of TOWs.

Open access: https://www.sciencedirect.com/science/article/pii/S157495411730211X

Systematic searching for environmental evidence using multiple tools and sources

B. Livoreil *et al*.

Environmental Evidence 2017, 6:23 (https://doi.org/10.1186/s13750-017-0099-6)

This paper provides guidance about how to plan, prepare, conduct, report, amend or update a systematic search. It aims to contribute to a new version of the Collaboration for Environmental Evidence (CEE) Guidelines for Systematic Reviews in Environmental Management, and the methods described are likely to be broadly applicable across a wider range of topics. In evidence synthesis, searches are expected to be repeatable, fit for purpose, with minimum biases, and to collate a maximum number of relevant articles. Failing to include relevant information in an evidence synthesis may lead to inaccurate or skewed conclusions and/or changes in conclusions as soon as the omitted information is added.

Open access: https://environmentalevidencejournal.biomedcentral.com/articles/10.1186/s13750-017-0099-6

A national-scale assessment of climate change impacts on species: Assessing the balance of risks and opportunities for multiple taxa

W. Pearce-Higgins *et al*.

Biological Conservation 2017, 213: 124-134 (https://doi.org/10.1016/j.biocon.2017.06.035)

It is important for conservationists to be able to assess the risks that climate change poses to species, in order to inform decision-making. The authors present a national-scale assessment of the risks of range loss and opportunities for range expansion that climate change could pose for over 3,000 plants and animals. Species were selected by their occurrence in England, the primary focus of the study, but climate change impacts were assessed across Great Britain, widening their geographical relevance. A basic risk assessment that compared projected future changes in potential range with recently observed changes classified 21% of species as being at high risk and 6% at medium risk of range loss under a B1 climate change scenario. A greater number of species were classified as having a medium (16%) or high (38%) opportunity to potentially expand their distribution.

A more comprehensive assessment, incorporating additional ecological information, including potentially confounding and exacerbating factors (e.g. dispersal, habitat availability and other constraints), was applied to 402 species, of which 35% were at risk of range loss and 42% may expand their range extent.

This study covers a temperate region with a significant proportion of species at their poleward range limit; the balance of risks and opportunities from climate change may be different elsewhere. The outcome of both risk assessments varied between taxonomic groups, with bryophytes and vascular plants containing the greatest proportion of species at risk from climate change. Upland habitats contained more species at risk than other habitats. Whilst the overall pattern was clear, confidence was generally low for individual assessments, with the exception of well-studied taxa such as birds. In response to climate change, nature conservation needs to plan for changing species distributions and an uncertain future.

Open access: https://www.sciencedirect.com/science/article/pii/S0006320717302859

The threat of invasive species to bats: a review

J. Nicole Welch and C. Leppanen

Mammal Review 2017, 47: 277–290 (doi: 10.1111/mam.12099)

Biological invasions are a major driver of biodiversity loss, but no study has described the scope of threats to bats (Chiroptera) by invasive species.

The authors reviewed the literature for negative effects of invasive species to bats and summarised threats according to four categories: predation, disease, competition, and indirect interactions. They identified threats of 37 invasive species to 40 bat species. Ten bat species were threatened by more than one invasion pathway.

Although appreciable bat population reductions owing to invasive species are often unproven, invasions are likely to exacerbate effects of other vulnerabilities. Multiple invaders and synergistic interactions may ultimately lead to species losses.

Managers should exercise the precautionary principle by taking action against non-native species when first detected, even if new species do not appear to be detrimental.

Correspondence: jwelch14@utk.edu

Environmental management from left to right – on ideology, policy-specific beliefs and pro-environmental policy support

S.C. Jagers, N. Harring and S. Matti

Journal of Environmental Planning and Management 2017, 61: 86-104 (http://dx.doi.org/10.1080/09640568.2017.1289902)

Due to growing environmental challenges, the demand for effective management through pro-environmental policy measures is increasing. The effectiveness is, however, largely determined by the degree to which the policy measures are supported by the actors affected by them. A consistent finding in the literature is that ideology (or subjective positioning on the left–right dimension) affects environmental policy support, with left-leaning individuals being more pro-environmental. A major caveat with previous research is that it seldom makes a distinction between different kinds of policies. The authors investigate how different ideological positions affect attitudes towards different forms of environmental protection. The authors show that ideology is related to conceptions about the fairness and effectiveness of different policy tools, which in turn steer preferences.

Correspondence: niklas.Harring@pol.gu.se

The missing pillar: Eudemonic values in the justification of nature conservation

R.J.G. van den Born *et al*.

Journal of Environmental Planning and Management 2017 (http://dx.doi.org/10.1080/09640568.2017.1342612)

The public justification for nature conservation currently rests on two pillars: hedonic (instrumental) values, and moral values. Yet, these representations appear to do little motivational work in practice; biodiversity continues to decline, and biodiversity policies face a wide implementation gap. In seven EU countries, the authors studied why people act for nature beyond professional obligations. The results show that the key concept for understanding committed action for nature is meaningfulness. People act for nature because nature is meaningful to them, connected to a life that makes sense and a difference in the world. These eudemonic values (expressing the meaningful life) constitute a crucial third pillar in the justification of nature conservation. The paper explores important policy implications are explored, for example, with respect to public discourse and the encounter with nature in childhood.

Open access: http://www.tandfonline.com/doi/full/10.1080/09640568.2017.1342612

Forthcoming Events 2017-2018

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

Conferences		
Date	Title	Location
24 January 2018	CIEEM Scottish Section Conference – Wildlife tourism in Scotland: A wildlife destination or a destination for wildlife	Aberdeen
20 March 2018	CIEEM Spring Conference 2018 – The Nature of Buildings: Designing effective mitigation and enhancement	Birmingham

Training Courses		
23 January 2018	Introduction to Ecological Impact Assessment (EcIA)	Leeds
24 January 2018	Ecological Report Writing	Leeds
25 January 2018	Habitats Regulations Assessment (HRA) of Projects (England and Wales)	London
25 January 2018	Ecological Clerk of Works	Birmingham
30-31 January 2018	Developing Skills in Ecological Impact Assessment (EcIA)	Newcastle
31 January - 1 February 2018	Camera Trapping for Survey, Monitoring and Public Engagement	Totnes
6-7 February 2018	Developing Skills in Ecological Impact Assessment (EcIA)	Birmingham
8 February 2018	Effective Communication Skills	Birmingham
8 February 2018	BS42020 Biodiversity: Code of Practice for Planning and Development	Bristol
12-13 February 2018	Pine marten and wildcat ecology and survey	Perthshire
15 February 2018	Ecological Clerk of Works	Bristol
21 February 2018	Advanced Course in Ecological Impact Assessment (EcIA)	Birmingham
22 February 2018	Report Writing for Ecological Impact Assessment (EcIA)	Birmingham
22 February 2018	Effective Workplace Mentoring	Birmingham
26 February 2018	Designing Biodiversity No Net Loss and Net Gain Projects	London
27 February 2018	Habitats Regulations Appraisal of Plans / Projects (Scotland)	Glasgow
27-28 February 2018	Train the Trainer for Ecologists	Birmingham
28 February - 1 March 2018	Developing Skills in Ecological Impact Assessment (EcIA)	Stirling
6 March 2018	An Introduction to SUAVs for Ecological Practice	Preston
13-14 March 2018	Water Vole Live Trapping, Handling, Practical Care and Re-establishment	Lifton
13-14 March 2018	Intermediate QGIS for Ecologists and Environmental Practitioners	Athlone
15 March 2018	Introduction to Protected Species Law and Policy	Bristol
20 March 2018	Peregrine Falcon – Ecology, Survey and Mitigation	Birmingham
21 March 2018	Habitats Regulations Assessment (HRA) of Projects	Birmingham
22 March 2018	Habitats Regulations Assessment (HRA) of Plans	Birmingham
22 March 2018	Barn Owl: Ecology, Surveying and Mitigation	Tamworth
26 March 2018	Badger Ecology and Survey	Dorchester
27 March 2018	Badger Mitigation	Dorchester
27 March 2018	Otter Ecology and Surveys	Cirencester
29 March 2018	Trees and Bat Roosts	Dorking
29 March 2018	BS42020 Biodiversity: Code of Practice for Planning and Development	Newcastle

With ecology being driven by many seasonal changes in habitat and species, you would be forgiven for thinking that our ecologists also slow down and go into hibernation during winter. On the contrary, we are as busy as ever. This is just one of the reasons we are recruiting for various ecology roles across our UK locations including Belfast, Birmingham and London.

Before you get stuck into Christmas shopping and start winding down for the festive season, why not search and apply for your next new role at WYG.com/careers?

As an award winning professional services firm, underpinned by technical excellence, we help our clients create value, protect value and manage risk.

Now is a great time to join WYG. We believe in a good work life balance and recognise that our employees may need flexible working throughout different stages of their career. We honour this as we acknowledge that every ecologist is different.

Our quality total remuneration package includes a flexible benefits scheme that allows you to choose benefits to support you and your family's needs. From health benefits, such as private medical cover and dental insurance, to travel insurance, childcare vouchers and a cycle to work scheme (to name but a few). We also offer rewards such as a bonus for achieving a Class 2 bat licence, an employee referral bonus and a recognition scheme eabling line managers to recognise individual and team performance. Be remarkable and be rewarded for your efforts.

Become something more. Contact WYG today. Email your cv to ecology@wyg.com

ea AWARDS 2016 WINNER

Best UK Large Firm Award
2016 Environment Analyst Business Excellence Awards

Learn, explore, become something more

www.**wygcareers.com**

ARCADIS

ECOLOGISTS
COME AND JOIN THE ARCADIS TEAM

Bristol / Cardiff / Warrington / Stroud / London

Are you an experienced Ecologist looking to work on some of the biggest projects in the UK alongside some of the best and most committed ecological consultants in the country?

We are recruiting at Consultant, Senior Consultant and Principal Consultant level for all of the above locations. Arcadis can offer a very competitive package along with excellent career prospects.

Arcadis prides itself on not only the quality of work we do for our clients, and the advice we give, but also on our commitment to sustainability and the protection and enhancement of biodiversity.

If you have the experience, energy and enthusiasm to join us please contact Michelle O'Donovan, Talent Acquisition Manager **michelle.odonovan@arcadis.com**

Arcadis. Improving quality of life.

ECOSA
Ecological Survey & Assessment

For more information about these opportunities and how to apply, please use your smartphone to scan the QR code or visit our website.

www.ecosa.co.uk

Ecologist or Senior Ecologist

We are seeking a full-time experienced Ecologist or Senior Ecologist to join our team at our head office in rural Hampshire.

We are also seeking a motivated Senior Ecologist based in the Bristol / Gloucestershire region to support our business in the West Country.

This position is based part-time at home and part-time at our Hampshire head office.

Your enthusiasm for ecology will equip you well as a full-time key member of our consultancy team in supporting us to deliver excellence in ecological survey, reporting and mitigation solutions to our clients.

You will have a minimum of two years (Ecologist) to three years (Senior Ecologist) of relevant experience gained in an ecological consultancy, local authority or planning environment.

You will also hold CIEEM membership, be a skilled project manager and communicator with strong verbal and written skills, and hold a minimum of one Natural England and / or Natural Resources Wales protected species licence.

We are committed to the development of our staff and as part of the team you will have access to a mentoring system, generous training budget, extensive support network and a relaxed rural office environment, as well as a range of other benefits.