CIEEM in practice
Issue 111 | March 2021
Bulletin of the Chartered Institute of Ecology and Environmental Management

Becoming a Better Botanist: Tools for Early Career Ecologists

Why Effective Ecological Reports are Essential

The Ethics of Employing Freelance Ecologists

Data Management Standards on Construction Projects

Ethics and Standards

Editorial

Welcome

I'm writing this, my first Editorial for *In Practice*, in the safety of my home office in Durham. Elsewhere in my house, my family are working and studying too. We are living in unprecedented times that have changed all aspects of life, be they familial, social or professional. Work continues, and I took on the Editorship with the hope of bringing something new to the role, but also with some trepidation as to whether I can do justice to the excellent stewardship of Gill Kerby, from whom I have learned a huge amount in a short time.

Working as a freelance editor in life science and medical publishing, I've always known the privileged position I am in, working with dedicated scholars and practitioners across many fields, and how lucky I am to be involved in helping them disseminate their knowledge. During 2020 and early 2021 I have also become acutely aware of how cocooned I am from the rigours of conducting a job outside my own front door. Ecologists and environmental managers must continue to do much of their work out of doors, in sites of ecological importance, on development sites and in areas under threats of one sort or another. In my short time as Editor I have already made the acquaintance of many clearly dedicated ecology professionals who strive to protect and enhance biodiversity and the environment despite the continuing pandemic. I have learned a great deal already from authors of *In Practice* articles and also the Editorial Board, who have welcomed me warmly and been supportive since my first day. Editing the articles in this issue has developed my understanding of the breadth of the work that CIEEM and its membership do, and each article has taught me something new. I'm excited at the prospect of learning more and contributing to such a valuable ideal as ensuring a healthy natural environment for all.

It's fitting that there is a new Editor for this issue, since we have a new design for the bulletin. It will still feel familiar, but with a fresh new look and an opportunity for full-page images and to present tables and graphs in an appealing and informative way. The theme of Ethics and Standards has brought a diverse selection of articles as well. As a way of introducing myself and the Editorial Board team to newer CIEEM members, we have Meet the Board, where you can read more about your Editorial Board and also who I am.

Looking ahead, we have some equally important and diverse issue themes coming for the rest of 2021. I've already had a lot of interest for June's issue on Biosecurity and Invasive Species, which promises to have coverage of some innovative schemes and projects on this important topic. Likewise, I have high hopes that the Urban and Cultural Ecology issue in December will feature a range of reports on this area of ecology. Arguably the most far-reaching issue this year will be the 30th anniversary edition in September, with the theme of The Next 30 Years. This, I hope, will showcase the challenges, developments and innovations that will arise in the sector in the coming decades, as well as covering ecological and environmental management areas that CIEEM membership will be focusing on in the years to come. Issue deadlines are on the website, and you can always contact me for further information.

It promises to be an exciting year. I am relishing my new role, and the prospect of contributing to the development of *In Practice*. I would welcome readers getting in touch to say hello, and to suggest future article ideas or ways in which we can improve *In Practice* for you, the reader. I am looking forward to getting to know more CIEEM members as time goes on, and – with luck – to meeting some of you in person in the not too distant future.

Nik Prowse
In Practice Editor
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When I'm not editing I like riding in hilly places, like the Lake District.

CIEEM




EcoWorks

Relaunching Spring 2021

A six month trial of a new EcoWorks scheme was launched in February for members of the Ecological Restoration and Habitat Creation Special Interest Group. This scheme provides rapid telephone/online meeting advice from a panel of experienced volunteers on nature-based solutions for mitigation for, and adaptation to, global heating and the changing climate, as well as biodiversity net gain and actions to deal with the biodiversity crisis.

EcoWorks was piloted in 2019 to provide support on habitat creation, restoration and translocation projects in rural, urban fringe and urban locations. Full details of the scheme and how you can take part are available on the EcoWorks webpage: http://events.cieem.net/Portal/VolunteeringwithCIEEM/ERHC_EcoWorks.aspx (Member login required).

"The response I received was exemplary! Way beyond expectations, I was just hoping for some pointers."

"I would definitely recommend EcoWorks: I would say it was an essential service for freelance ecologists."

In this issue

In Practice

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Front cover: Green hairstreak butterfly (*Callophyrys rubi*). Photo: Andy Jukes.

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CIEEM News

Congratulations to CIEEM Awards 2020 Winners and Finalists

It was an unconventional event this year, being virtual rather than our usual in-person summer lunch event. Nevertheless, it was terrific to be able to celebrate the achievements of the sector. Very many congratulations to all the winners and finalists. Many thanks also to our sponsors.

https://cieem.net/about-cieem/cieem-awards/awards-2020/.

COVID-19 Alternative Assessment Guidance

We have published the fourth update to this guidance to help members continue to undertake ecological survey and assessment during the restrictions necessitated by the COVID-19 outbreak.

https://cieem.net/resource/guidance-on-ecological-survey-and-assessment-in-the-uk-during-the-covid-19-outbreak/

CIEEM Patron passes away

We are sad to report that longstanding CIEEM Patron, John Palmer the 4th Earl of Selborne, passed away in February.

https://cieem.net/cieem-patron-john-selborne-passes-away/

Rainbow Places

Have you been involved in Rainbow Places, the LGBT+ network for members of the Landscape Institute, CIEEM, the Institute of Place Management and the Design Council? If so, could you share your experience of the group, together with ideas as to how CIEEM can help to promote the network more widely? Please email diversity@cieem.net with an update.

Member Assistance Programme (MAP)

Members are reminded that CIEEM continues to offer this service and can access an extensive package of support including telephone advice lines, counselling services and a website full of information and practical advice on topics as wide ranging as debt management, stress management and mental health. Their services are available 24/7 and are delivered confidentially. More information is available via the 'My CIEEM' area of the website under 'Member benefits'.

Staff Changes

In February, Siân Kear stepped down as Professional Development Manager and we welcomed Craig Willcock into the post. Diana Clark has stepped down as Wales Project Officer and at the time of writing we are recruiting for her replacement. We thank Siân and Diana for their dedication and enthusiasm while in post and wish them well in their next adventures.

New Members and Upgrades

Keen-eyed readers will note that we have not published a list of new members and upgrades in this edition. We are now publishing this list on the CIEEM website at: https://cieem.net/new-members-and-upgrades/.

In Practice Digital Editions

If you would like to reduce your and CIEEM's carbon footprint and receive only digital editions in the future, please let us know by contacting enquiries@cieem.net.

Response to article in September 2020 Edition

DTA Publications (*HRA Handbook* and *Journal*) has responded to CIEEM regarding the 'A Novel Approach to Quantify and Mitigate for Biodiversity Loss Caused by Nitrogen Deposition' article by Catherine Hibbert. DTAP believes that the approach is inappropriate, stating that the mitigation described – off-site buffer area for habitat creation and improvement – is actually compensation for perceived harm to the habitats in the designated SAC. DTAP is advising that this approach should not be adopted without taking legal advice and consulting Natural England HRA and air quality specialists. A joint article with their legal adviser is planned for the June 2021 edition of *In Practice* to clarify the situation.

Recent Blog Posts

For recent blog posts on the CIEEM website see (https://cieem.net/news/).

CIEEM Conferences

Date	Title	Location
16 March 2021	Spring Conference 2021 – Long-term Ecological Research Projects: Using Evidence to Inform Practice (in partnership with the Ecological Continuity Trust)	Online
20–22 April 2021	Ireland Conference 2021 – Nature-Based Solutions: Opportunities in a time of biodiversity crisis and climate emergency	Online
November 2021	Autumn Conference 2021 – Management, Mitigation and Monitoring	TBC

Find out more: www.cieem.net/events

In Practice Themes and Deadlines

Edition	Theme	Article submission deadline
June 2021	Biosecurity and Invasive Species	n/a
September 2021	30th Anniversary Edition: The Next 30 Years	21 May 2021
December 2021	Urban and Cultural Ecology	20 August 2021

If you would like to contribute to one of these issues, please contact the Editor at nikprowse@cieem.net. Contributions are welcomed from both members and non-members. Further information and guidance for authors can also be found at: www.cieem.net/in-practice/.

Did you see ...

Brexit changes to the Habitats Regulations for England, Wales and Scotland

Defra has published a new policy document to explain the changes made to the Conservation of Habitats and Species Regulations 2017 (as amended) in England and Wales. Scottish Government has also published a policy guidance document that explains the changes made to the Habitats Regulations relating to Scotland.

https://cieem.net/brexit-changes-to-the-habitats-regulations/

https://cieem.net/eu-exit-habitats-regulations-in-scotland/

MSPs pass bill to form new environmental watchdog

Members of Scottish Parliament (MSPs) have voted to pass the UK Withdrawal from the European Union (Continuity) (Scotland) Bill, setting up a new Environmental Watchdog, Environmental Standards Scotland. The Scottish Government has announced its intention to recommend the former Scottish Public Services Ombudsman, Jim Martin, as Chair of the body.

https://beta.parliament.scot/bills-and-laws/bills/uk-withdrawal-from-the-european-union-continuity-scotland-bill-2020

Dame Glenys Stacey appointed Chair of Office for Environmental Protection

Secretary of State for the Environment, George Eustice, has appointed Dame Glenys Stacey as the Chair of the Office for Environmental Protection.

https://www.gov.uk/government/news/dame-glenys-stacey-appointed-as-chair-of-the-office-for-environmental-protection

Government publishes roadmap for future of farming

Defra has published a roadmap for the transition to future farming systems set out in the Agriculture Act 2020.

https://cieem.net/government-publishes-roadmap-for-future-of-farming/

Updated Natural England Protected Species Standing Advice

Following a review, Natural England has published updated Protected Species Standing Advice on GOV.UK for local planning authorities, as well as revised advice on great crested newts.

https://cieem.net/updated-natural-england-protected-species-standing-advice/

New Scottish Minister for Rural Affairs and Natural Environment appointed

Ben Macpherson has been appointed Scottish Minister for Rural Affairs and the Natural Environment following the appointment of the former post holder Mairi Gougeon as the new Public Health Minister.

https://cieem.net/new-scottish-minister-for-rural-affairs-and-natural-environment-appointed/

Welsh Government launches National Peatlands Action Programme to help lock in carbon and reinvigorate vital habitats

The management and renewal of Wales' environmentally important peatlands has been outlined under a new programme.

https://gov.wales/welsh-government-launches-national-peatlands-action-programme-help-lock-carbon-and-reinvigorate

Ireland's Environmental Protection Agency launches State of the Environment Report

"The overall quality of Ireland's environment is not what it should be, and the outlook is not optimistic unless we accelerate the implementation of solutions across all sectors and society." This is the key message of the seventh *State of the Environment Report* launched by the Republic of Ireland's Environmental Protection Agency.

https://www.epa.ie/newsandevents/news/pressreleases2020/name,69814,en.html

National Development Framework reaches final stage of Senedd scrutiny

Welsh Parliament/Senedd Cymru has completed its scrutiny of the draft National Development Framework, *Future Wales 2040*. The Climate Change, Environment and Rural Affairs Committee has produced a report containing 26 recommendations.

https://gov.wales/future-wales-national-plan-2040

14 key nations commit to protect oceans

A group of 14 heads of state have agreed to sustainably manage 100% of the oceans under their national jurisdictions by 2025. Additionally, they vowed to set aside 30% of the seas as marine protected areas by 2030, in keeping with the United Nations' campaign known as '30 by 30'.

https://www.nationalgeographic.co.uk/environment-and-conservation/2020/12/in-rare-show-of-solidarity-14-key-nations-commit-to-protect

Feature

How Ecological Data Management Standards, Data Automation and a Web-based Mapping Interface Can Transform Ecological Decision-making on Construction Projects

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Keywords: construction, data management, ecological constraints, GIS, mitigation

It is vital to keep the client and personnel on large and/or long-term construction projects up to date with key ecological information. Without robust ecological data management standards in place, identification of new ecological constraints on active construction sites can lead to costly delays (impacting both budget and programme) or accidental breaches of legislation through the client and personnel either misinterpreting new ecological data or simply not having it available. How can ecologists and environmental managers minimise this time delay and prevent misinterpretation of such data without compromising standards or ecological legislation? This article focuses on a case study where robust ecological data management standards, alongside digital solutions for data collection, automated data processing and display in a web-based mapping interface, have transformed ecological decision-making on East West Rail Phase 2 (EWR2), a major infrastructure project.

Introduction

The government remains determined to continue to deliver bigger and better infrastructure in the UK, to grow the economy and improve opportunities for people across the country (HM Treasury 2016). In the last decade we have seen a marked increase in the number of major infrastructure projects being delivered.

Typically, with these large-scale projects, environmental assessments are completed prior to works commencing, the appropriate permissions and protected species licences are granted and then construction commences. But what happens when you start construction and new ecological constraints appear on site? The bigger and more long-term the project's construction phase, the more likely that this issue will occur. This means that ecologists and environmental managers on major infrastructure projects need to be equipped to deal with these occurrences quickly and efficiently to avoid unnecessary programme delays and associated costs, and remain legally compliant. This is where the importance of good ecological data management standards comes into play.

This article focuses on East West Rail (EWR), a major infrastructure project creating a new direct rail link between Oxford and Cambridge. Due to its size, EWR is being delivered in phases. EWR Phase 2 (EWR2), rebuilding the railway between Bicester and Bletchley, is currently in its construction phase. The focus of this article is how EWR2 has adopted robust ecological data management standards, alongside digital solutions for data collection, automated data processing and display in a web-based mapping application, to equip ecologists and environment managers to quickly and efficiently deal with the occurrence of new ecological constraints on construction sites.

East West Rail Phase 2

Enabling works have been underway since 2018 on EWR2 and a Transport and Works Act Order was granted in February 2020, paving the way for the main construction activities to start. EWR2 is being delivered by the East West Rail Alliance, consisting of Atkins, Laing O'Rourke, Network Rail and VolkerRail, who are working collaboratively to deliver this complex rail project.

> **"The interface allows everyone working on the project to identify the location of ecological constraints and required mitigation prior to or during the construction activity."**

Rapid sharing of accurate environmental data has been critical in the delivery of EWR2. Prior to any construction activity commencing, an environmental assessment is completed which considers all known nearby environmental constraints, including data collected as part of the environmental assessment for planning permission. Appropriate mitigation measures are then provided to ensure the proposed construction activity is performed in a legally compliant and environmentally sensitive manner. The construction team needs to be confident that their construction activities are safe, secure and legally compliant to prevent unnecessary programme delays and associated costs.

This is a straightforward task when assessing static environmental constraints, like a tree, but most wildlife is mobile; at any given moment a new badger sett or bird nest can, and often does, establish where construction activities are proposed or even underway. This makes completing environmental assessments during the construction phase of a project traditionally a frustrating process; when a new ecological constraint is identified on site, construction is often paused until all the necessary data are collected. This is then followed by time-consuming data entry, production of maps and updates of environmental permits in the office, before the environmental assessment is re-issued to the client and construction personnel and works re-commence. Environmental assessment must be repeated every time a new ecological constraint appears on site, which causes further delays and costs.

This traditional environmental assessment process can take several days, perhaps even weeks depending on the complexity of the site and number of environmental constraints.

With the increasing use of technology, ecologists now often complete site visits and collect data on a tablet computer. Back in the office, the data will then be processed and map figures will be produced for inclusion in reports. These figures will usually only show the ecological information collected on site during that visit, which makes it difficult for clients and engineers to understand how new ecological constraints relate spatially to the project designs. Despite best efforts, without being able to assess the ecological constraints in the context of the project designs, misinterpretation can lead to accidental breaches of wildlife legislation on site. For example, a client could be provided with a stand-alone badger survey results map without any project designs overlaid on the map. The client must then compare two separate documents (the badger survey map and a project design plan) to work out if a badger sett identified on the badger survey map is within the works footprint on the project design plan. This can be even more problematic when the separate plans to be compared are at different scales. How do we better collect ecological constraints data to avoid these mistakes?

Digital innovation and environmental risk management

EWR2 has developed a customised, browser-hosted interactive mapping portal, or web map (Figure 1), based on existing open-source technology (MapGuide Open Source) and powered by a cloud-hosted spatial database (PostGIS). Project information such as multi-disciplinary constraints, for example ecological survey results, heritage assets, existing utilities and assets, contaminated land records, etc., and proposed construction activity designs are collated into separate selectable layers on the web map. Having this information stored and displayed in a central location allows environmentalists, engineers and project managers working on EWR2 to engage, interact with and query spatial data relevant within the footprint of a proposed construction activity.

As an example, engineers and project managers on EWR2 are able to use

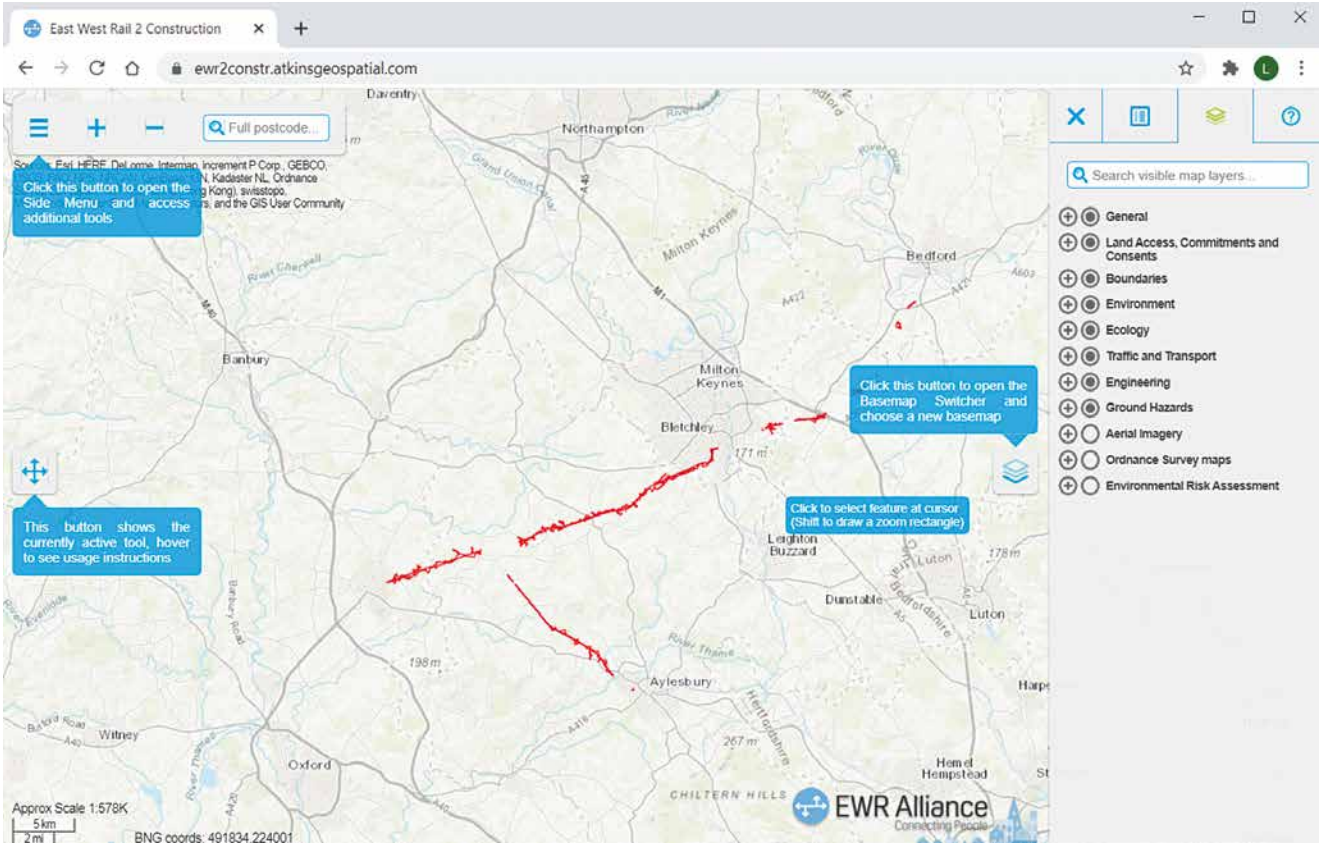

Figure 1. What the EWR2 web map looks like. The layer controls are on the right with several tools available in the top left menu.

the web map to accurately identify ecological constraints by overlaying project design layers with ecological constraints layers. They can work with environmentalists to capture the required environmental mitigation measures in the construction activity's methodology from day one. The web map provides a platform and easy-to-use toolset for non-GIS-trained professionals to highlight spatial relationships for user-defined areas. On EWR2, the web map utilises approximately 5 years' worth of project-specific (both historic and current) and open source datasets that would otherwise be difficult to portray in a static map in written reports, which may not even be consulted by construction managers. As this interface is available to the entire EWR2 team (not just environment professionals), it allows everyone working on the project to identify the location of ecological constraints and required mitigation prior to or during the construction activity in a user-defined location.

As part of EWR2's environment risk management process, a project manager, in consultation with the environment team, must complete an environmental risk assessment (ERA) at the start of planning or designing a construction activity in a user-defined location. The environmental risk assessment considers all known environmental constraints that have been collected on EWR2 to date. This process ensures that project managers consider environmental constraints at the start of the planning phase of a new construction activity. It means that project managers take ownership, and design the required environmental mitigation measures into their construction methodology, as opposed to environmental mitigation being shoe-horned in as an afterthought.

The initial spatial query to determine nearby environmental constraints is conducted using bespoke tools on the EWR2 web map and risk buffer zones around ecological constraints have been set, using best practice guidance, by the EWR2 environment team. This is then assessed by the environment team to ensure appropriate mitigation measures are incorporated into the construction methodologies. The team of environmental and geospatial personnel on EWR2 now record new incidental ecological information on site, enabling new ecological constraints to be found, recorded, shared and considered in the construction planning process within a matter of minutes. This approach is called the Incidental Records Process.

Use of the Survey123 app to update the web map on site

On the ground, EWR2 staff use a mobile app to add new ecological data. Esri's ArcGIS Survey123 application allows EWR2 ecologists to capture 'incidental' records at the point of discovery for multiple species (Figure 2), without the risk of communication issues with the client and construction personnel. Survey123 is a form-based mobile data collection app that can be used on smart devices or desktops, even when disconnected from the internet (Figure 3). This makes it easy to use in the field. It uses standardised questions and answers to facilitate rapid collection of both spatial and species data accompanied with supporting geo-located photographs. Answers are submitted through predefined dropdown menus and spatial data are

Figure 2. EWR2 staff recording and engaging with data on site using mobile devices.

submitted through either the device's GPS location or by clicking a point on the map interface. For example, if an ecologist finds a new badger sett on site, they open the app and input the finding as a 'Mammal' record. The ecologist will then be presented with a dropdown list of mammals, and the ecologist would select 'Badger'. This then presents a list of evidence type for that species, to which the ecologist would select 'Sett'. Further lists then allow the ecologist to put more information, such as the type of sett and level of activity, and then the ecologist must attach a photo of the record before it can be submitted. This ensures that all ecologists on the project collect ecological data in a standardised way, with prompts to ensure all necessary information is recorded.

During an automated post-processing stage, duplication of records and erroneous values are checked for and filtered out, pre-determined exclusion or warning zones set by the EWR2 environment team are automatically generated per species and record type, and the data are uploaded to the web map for additional checking by the ecologists. As the survey is based on dropdowns with set values and is run through the automated process, final checking by ecologists is just to ensure any comments or more qualitative information are clear and concise and to ensure correct species identification. Any alterations are fed back to the GIS team to amend.

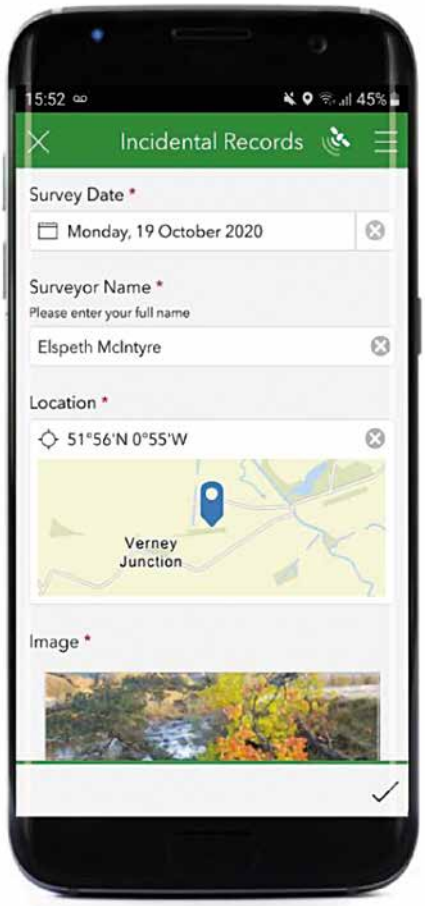

Figure 3. The Incidental Records Survey123 form as it appears on a mobile phone.

Simultaneously, the application shares the new incidental record data with the whole EWR2 team on the web map and integrates with the spatial query aspect of the environmental risk assessment, preventing accidental loss or disturbance of legally protected species and habitats. The newly collected ecological information can then be directly viewed on the web map by the team of Ecological Clerks of Works and construction teams on site prior to that day's construction activity commencing. The availability of any new ecological constraints data on the web map, overlaid with other discipline data such as project design layers, removes any risk of accidental breaches of wildlife legislation on site through not identifying or misinterpretation the location or extent of ecological constraints.

The development of the Incidental Records Process demonstrates that digital data collection processes can ensure construction projects are completed without negatively impacting mobile wildlife or other ecological constraints. It shows that working practices can be adapted to prevent disturbance to newly identified ecological situations.

Pros and cons of the Incidental Records Process and web map interface

Since the Incidental Record Process was implemented on EWR2 in early 2020, it has already ensured efficient prevention of the spread of invasive plant species and the protection of bat roosts, badger setts, bird nests and polecat dens. All of these had occurred in the footprint of the project since baseline surveys for planning permission. For example, an ecologist identified a stand of the invasive non-native plant species variegated yellow archangel (*Lamiastrum galeobdolon* subsp. *argentatum*) in some garden fly tipping in an area where works were proposed for the following day. By submitting the record through the Incidental Records Process, the data were available to view on the web map later that day. When the Ecological Clerk of Works and construction team then checked the web map immediately prior to works starting the next day, they were able to locate the stand of the invasive plant, mark out an exclusion zone and brief the site operatives to ensure no legal offence occurred. Without the Incidental Records Process, and instead using traditional data collection and environmental assessment, the information could have been mis-recorded or recorded too slowly and legal offences could have accidentally occurred on site.

Having a robust ecological data management strategy and automated incidental record data processing has meant that construction teams can be confident that their environmental assessment is based on the most up-to-date information and all required mitigation is put in place prior to construction activities commencing. This enables more accurate construction activity planning and reduced stand-down rates and associated costs, allows the construction project to be more resilient to last-minute changes and ensures the works are legally compliant.

While the web map and the semi-automated Incidental Records Process have had great success in ensuring environmental protection, there are still a few drawbacks and developments that are underway or which could be implemented. First, if an ecologist is going to a remote location with limited phone coverage, they must ensure the Survey123 form is downloaded to their mobile device prior to leaving for site. Second, any records that an ecologist adds will not be uploaded to the web map until they return to an area with mobile coverage. Third, while the web map can be displayed on mobile phones, some alteration is required to ensure functionality is stable and easy to use on the smaller display screen. Fourth, with regards to the Incidental Records Process, it is still reliant on an individual to press 'go' at agreed points throughout the week to ensure the data goes live onto the web map. A development is planned to trigger this whenever a new record is submitted through the Survey123 app, making data sharing even faster and sending out automated emails to key individuals, such as environmental managers and project managers, when a particular constraint of interest (e.g. a protected species) is recorded within the vicinity of their construction works location. Finally, whereas this system was developed with ecological constraints during the construction phase in mind, it could be relatively easily adapted for other disciplines, such as the recording of new heritage assets, the identification of health and safety risks for site teams, and the tracking and management of project consultation responses during both construction and other stages of a project.

Conclusion

It is vital that construction projects ensure development is achieved without compromising the natural environment. The creation of a system that increases the security of legally protected species and habitats and also prevents the spread of invasive species ensures that developments can be constructed secure in the knowledge that wildlife and habitats are being safeguarded in a legally compliant and environmentally sensitive manner.

Robust ecological data standards, automated data processing and a web-based mapping interface have transformed ecological decision-making and safeguarding of the natural environment on EWR2. The Incidental Records Process provides a quick and efficient way of identifying new ecological constraints on site during construction and the use of the web map enables ecologists and environmental managers to easily visualise and communicate these constraints to project managers and the client.

The web map and the Incidental Records Process will continue to be developed and adapted to serve other disciplines and other project stages.

Acknowledgements

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Reference

HM Treasury (2016). National Infrastructure Delivery Plan 2016-2021. Funding and Finance Supplement. Available at www.gov.uk/government/publications. Accessed 19 January 2021.

About the Authors

James Hicks CEnv MCIEEM is a generalist ecologist interested in providing advice and innovative solutions for ecological mitigation on construction projects. James has worked on several high-profile and innovative large-scale infrastructure projects where he has successfully managed large ecological datasets and implemented ecological mitigation solutions while working in multi-disciplinary project teams.

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Lewis Mould CGeog (GIS) FRGS is a Senior GIS Consultant with Atkins. He specialises in creating innovative solutions for data management, analysis and automated processing with a focus on ecology and environment, namely automated biodiversity net gain calculations and automated environmental risk assessments. Lewis works on large-scale infrastructure projects where he is the data management lead and provides consultancy for new ways of working to multi-disciplinary project teams.

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Why Effective Ecological Reports are Essential

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Committee Members of the Association of Local Government Ecologists (ALGE)

Good biodiversity evidence is critical to determining planning applications, so what is it that local planning authorities (LPAs) need to make lawful decisions in relation to ecology?

The LPA ecologist should be a protected species

LPA ecologists are currently surviving in a few isolated pockets, but there is hope for a remarkable recovery with a shift in forthcoming legislation and revised national planning policy. The main role of most LPA ecologists is to ensure that:

- planning decisions are informed by adequate ecological assessment
- new developments protect important biodiversity features and provide enhancements.

Achieving these two aims can be a difficult job, as there are many competing and conflicting priorities that must be weighed in the planning balance. However, the consideration of biodiversity has increased in importance in recent years, not least due to emerging changes in legislation and policy, but also because of the recognition of the climate and ecological emergencies. For these reasons, it is even more important that an LPA receives an adequate, robust and effective ecological report; one that provides all the necessary information, justification and evidence required for the authority to make a lawful determination of a planning application.

This article provides ecological consultants, particularly, with an opportunity to consider their work from the LPA's perspective and to understand the overall benefits of presenting ecological information to the required standard and meet the LPA's needs.

We aim to provide a few pointers on dealing with the competing priorities of the client and the LPA. Ultimately, it is the LPA making the decision and it is all about making everyone's lives easier!

Box 1. Purpose of this article

To make a lawful determination of any planning application, a local planning authority requires adequate details of the proposed scheme along with robust supporting evidence in order to inform their decision-making process. This article explains:

- why adequate ecological information is so important
- the types of report that should be submitted with an application
- the reasons why so many reports fail to be entirely fit for purpose
- what should be included in a report to make sure it is truly effective
- the implications for everyone involved of both good and poor reports
- the longevity of reports
- why good reports lead to substantially better outcomes for biodiversity.

Why is adequate information so important and what happens when it falls short of the required standards?

In 2016, the Association of Local Government Ecologists (ALGE) carried out an online survey of LPA ecologists to establish the extent to which our members believe that ecological reports that are submitted in support of planning applications are 'fit for purpose' (ALGE 2016). While not the only issues, two were highlighted as prominent and fundamental to the determination of any planning application:

- Reports with inadequate or missing ecological survey information and
- Inadequate proposals for necessary mitigation, compensation and enhancement.

These two issues alone mean there can be a huge degree of uncertainty over what biodiversity features are likely be affected by a development proposal and whether the proposed mitigation is adequate to ensure that there are no likely significant residual effects. However, Table 1 provides a more detailed picture of the issues and the associated problems that they can cause.

An applicant will face a range of adverse consequences where uncertainty remains as a result of an inadequate ecological report being submitted to the LPA. The most common is a delay to the determination of the planning application and an additional cost to the applicant while further information is prepared and submitted. Significant delays could result where surveys are seasonally constrained. However, the worst-case scenario would be refusal of the application due to insufficient information. Sadly, this is more uncommon than you might think.

Table 2 identifies the likely outcomes an applicant will face when their application affects biodiversity. As can be seen, submission of adequate ecological information leads to less-negative implications (i.e. risk, delay and cost). In contrast, a poor Ecological Impact Assessment (EcIA) leaves the applicant with greater uncertainty over ultimately obtaining planning consent, at least without substantial extra work and the imposition of more onerous planning conditions.

Table 1. What are the key issues for LPA ecologists?

Examples of common issues	Problems caused (within the LPA)
• A disconnect or mismatch between the ecological findings and the development proposals, e.g. focusing on protected species and not considering wider impacts • The ecological report is out of date (older than 12–18 months) • The ecological report is not based on the current development proposals • No supporting photographs or maps of the site • Multiple referencing of other documents (that may not have all been submitted with the application) • Biodiversity Net Gain summary without the metric calculations, justifications and background details • Reports where large amounts of text are tabulated • No explanation of how the mitigation hierarchy has been followed and why certain impacts cannot be avoided or minimised • Summary documents that do not provide sufficient information to demonstrate compliance with best practice • Saying that further surveys can be dealt with by condition • Inadequate number of surveys carried out • Short reports that do not cover all that is required • Not getting a local data search and reliance on publicly available National Biodiversity Network or Magic data • Habitats Regulations Assessment (HRA) reports submitted • Confidential reports not adequately marked • Too many generic recommendations that are not site-specific	• Significantly longer time to review reports • Limited understanding of the development proposals – further clarification required • Unable to understand site context • Unknown location of habitats and other features on site • Cannot compare existing and proposed development sites (e.g. habitat types, habitat loss/gain) • An actual net gain for biodiversity is not clearly demonstrated • Confusion about features present, likely impacts, what mitigation is proposed, whether compensation is needed • Need to wait for additional or amended documents • Difficult to apply planning conditions because of insufficient clarity over mitigation, compensation and enhancement proposals • Information is hard to read and understand • Time wasted on trying to find relevant information that is not there • Uncertainty over the developer's commitment and the deliverability of proposed mitigation measures. • Stress and anxiety (workload pressure) • Increased tension between LPA and applicants (e.g. more acrimonious due to last minute requests for additional information) • Additional time needed to explain process to planning officer or planning committee, particularly the three derogation tests and the HRA process • Potential formal complaint to CIEEM: additional work, time and stress

Of course, an application may also be refused no matter how adequate the EcIA. Sometimes, an application may be refused because the development is deemed unacceptable due to biodiversity harm; it's simply contrary to legislative requirements and/or planning policies.

Reports recommended as good professional practice

ALGE members expect all ecological reports received by their LPA to be submitted in accordance with acknowledged professional good practice guidance, and especially

Table 2. Types of planning decision affected by ecological information.

Planning recommendation	Reasons	Outcomes
1. Approval	• No ecological issues	• No ecological issues • No requirement for any planning conditions or obligations • No need for a protected species licence
2. Approval with conditions	• Ecological issues have been adequately dealt with as part of the application	• EcIA follows good practice • Adequate mitigation, compensation and enhancements provided • Conditions applied to secure implementation of mitigation, etc. • No pre-commencement conditions needed • No delay to commencement of development arising due to ecology
3. Approval with pre-commencement conditions	• Most ecological issues have been adequately dealt with as part of the application • Minor additional details are required before development can commence	• EcIA follows good practice • Pre-commencement conditions are required to provide additional details (e.g. bird and bat box specifications) • Development delayed until these conditions are discharged
4. Approval with numerous specific pre-commencement and implementation conditions	• Ecological issues have not been adequately addressed • Significant additional details are required before development can commence	• EcIA does not meet requirements of good practice • May only be approved subject to significant pre-commencement conditions • Specific implementation conditions may also be required
5. Deferral/withdrawal	• Inadequate ecological information has been submitted • Ecological issues have not been adequately addressed • Essential additional details are required before determination of the application	• EcIA currently does not meet requirements of good practice and is inadequate • Further information must be submitted prior to determination • Additional details cannot be conditioned (e.g. protected species surveys) • Application cannot be determined • Potentially substantial delays and/or costs inevitable
6. Refusal	• Insufficient ecological information has been submitted • Ecological issues have not been adequately addressed • Inadequate surveys, mitigation and/or compensation details have been submitted • Significant biodiversity harm likely to result	• EcIA very poor and provides inadequate information to inform lawful determination of the application • Additional information cannot be conditioned • Significant delays and costs • Potential additional Planning Appeal costs

guidance issued by CIEEM. Unless there are very clearly justified reasons for why guidance has not been followed, there is little excuse not to adhere to good professional practice (even where a consultant is not a CIEEM member).

To achieve the minimum benchmark for good practice:

1. Ecological reports should follow a consistent approach, and all ecological information should be presented in accordance with the recommended structure and content set out in the CIEEM's *Guidelines for Ecological Report Writing* (CIEEM 2017a).
2. For the majority of planning applications, only an EcIA report should be submitted.

   NOTE: Preliminary Ecological Appraisal reports rarely provide adequate information and will generally be insufficient to inform a lawful planning decision, unless there are no or limited ecological impacts arising from a development proposal or the proposals meet the other exceptional circumstances set out in CIEEM's *Guidelines for Preliminary Ecological Appraisals* (CIEEM 2018a).
3. Work undertaken to inform and prepare any EcIA should be carried out following the CIEEM's *Guidelines for Ecological Impact Assessment in the UK and Ireland* (CIEEM 2018b).
4. Data searches should be undertaken in accordance with CIEEM's *Guidelines for Assessing and Using Biodiversity Data* (CIEEM 2020).
5. All work and recommendations should be set out in accordance with relevant clauses of BS42020, *Biodiversity* (BSI 2013).
6. Where reports state that they have been prepared in accordance with published good practice, demonstrate that this is a legitimate claim (i.e. be specific and reference relevant sections).

   NOTE: Reports should not simply state at the beginning "*prepared in accordance with X, Y and Z guidance*". All too often, this is an easily written flippant statement and rarely does the LPA find that the report has actually been prepared with adequate reference to the cited guidance. Do not just cite references to best practice over and over again. Be concise and use references only where necessary, particularly for deviations from said guidance.

Work from any consultant (who is a CIEEM member) that is consistently not in accordance with good practice guidance runs the risk of being in breach of CIEEM's Professional Code of Conduct. Even where a consultant is not a CIEEM member, they still run the risk of gaining a bad reputation. ALGE knows of several instances where this has meant a consultant's clients have immediately gone elsewhere for a more reliable ecology service.

Why non-EcIA reports are rarely fit for purpose

Where good practice recommends that only an EcIA should be submitted (as mentioned above), alas, numerous different types of ecological report are often included in a planning application and are rarely fit for purpose (a few examples are listed in Table 3). As you can see, there is often a degree of overlap between these reports, so it can be unclear to the LPA what the report is trying to achieve. It can be very difficult to unpick what mitigation, compensation and enhancements are needed and to neatly wrap these up conveniently into one or more planning conditions. See also CIEEM's *Guide to Ecological Surveys and Their Purpose* (2017b).

This issue is not laid completely at the door of the ecological consultant and we fully accept that many examples will be due to a lack of understanding on the applicant's part and/or a tick-box exercise carried out by the planning agent. Even reports that are marked as 'draft' often make their way into planning applications. We therefore strongly recommend that you make it abundantly clear when a report is *not* suitable for submission with a planning application by incorporating a warning on the front cover. For example:

- *"Draft – for client only."*
- *"This report cannot be submitted to support a planning application."*
- *"This report is not in accordance with BS42020 Clause 8.1."*

A warning of this type will be visible to the client, LPA ecologist, planning officer and/or validation officer, so that it can be quickly identified and rectified.

The preparation of a Habitats Regulations Assessment (HRA) is the responsibility of the competent authority. Ecological reports submitted by an applicant in support of a planning application that requires a HRA should therefore recognise that they are only providing information to inform the actual HRA carried out by the LPA. To avoid confusion, it is best if such reports are not referred to as "*the HRA*" or the "*Shadow HRA*", etc. It is far better to title them along the lines of "*Report to Inform HRA of Project X*".

What constitutes a report that is fit for purpose?

An EcIA report needs to present technical ecological information in a clear and succinct manner so that it can be easily understood by the client, the LPA ecologist, the LPA planning officer and other interested parties (e.g. local residents affected by the proposed development). This is no mean feat! If the information is thorough, well explained, justified and clear with all limitations identified, then it should stand up to this level of scrutiny.

An executive summary at the beginning is vital as this a particularly useful tool for LPA planning officers/ecologists to scan through to ensure that the necessary information has been provided and that there is no outstanding information (e.g. recommendations for further surveys can be identified quickly).

For reference, *Writing Effective Ecological Reports* by Mike Dean (2021) should be essential reading for anyone involved in writing or reviewing ecological reports.

Table 4 is an extract from the CIEEM and ALGE EcIA Checklist, first mentioned in a previous *In Practice* article (issue 106, December 2019). It summarises the minimum ecological considerations that CIEEM and ALGE recommend *must* be covered in EcIA reports. The use of this checklist is about to be trialled in south east England before being recommended for general release. However, it is freely available from the resources section of the CIEEM website (https://cieem.net/resource/ecological-impact-assessment-ecia-checklist/) and has already proved popular, with some consultancies using it as an internal

Table 3. Types of ecological report received by local planning authorities.

Type of report	Typical content and different titles
Preliminary Ecological Appraisal	• Extended Phase 1 Habitat Survey • Ecological Walkover Survey • Walkover Survey • Ecological Survey Report • Ecological Appraisal • Ecological Assessment • Preliminary Bat Roost Assessment
Ecological Impact Assessment	• Ecological Appraisal • Ecological Assessment • Updated Ecological Survey Report
Individual habitat and species reports (sometimes several are submitted with one planning application)	• Bat survey report • Breeding bird survey report • Reptile survey report • Badger survey report • Dormouse survey report • Great crested newt survey report • Otter and water vole survey report • Hedgerow assessment • Tree roost assessment for bats
Report to inform Habitats Regulations Assessment (HRA) of project	• Habitats Regulations Assessment • HRA report • Screening report • Shadow HRA

quality assurance tool for reviewing reports to ensure that they are fit to be issued. We are very excited about this project and hope that the checklists will be widely used in the near future.

A level playing field is a win-win for everyone

The members of the joint CIEEM and ALGE Working Group who have prepared the EcIA checklist believe it will help establish the minimum acceptable ecological information that must be submitted to support a planning application. It will provide the basis for a level playing field that will have several benefits for all stakeholders. For instance:

- **It will enable ecological consultants to undertake their internal quality assurance process of reports using an established quality benchmark.** It should enable those struggling to consistently meet required standards to identify areas that require improvement. It will offer those already providing adequate EcIAs with the opportunity to demonstrate their expertise against best practice standards – hopefully to be seen as a commercial advantage.
- **It will mean that applicants – from the outset – will have a smoother ride through the planning system, offering them greater certainty that the information submitted will be accepted as adequate by the LPA.** They will also be able to identify and select consultancies with a proven track record of consistently preparing EcIAs that are fit for purpose.
- **Applicants should also benefit from fewer delays, as the LPA should have most of the information they require.** This in turn should lead to the imposition of fewer pre-commencement conditions (see Table 2, planning recommendations).
- **Adequate EcIAs will mean that LPAs will have to spend less time on comprehensive scrutiny of poor reports.** They will instead be able to focus on ensuring that biodiversity mitigation and enhancements are steered towards delivering real improvements on the ground and are therefore consistent with legal and policy requirements (e.g. Biodiversity Net Gain).
- **Finally, where an EcIA is still missing some key information, an established benchmark should enable all parties to identify the outstanding issues quickly and agree what further details should be provided.** With less subjectivity over what constitutes 'adequate' it is also hoped that there will be reduced risk of costly and time-consuming acrimonious disputes between the parties.

When are reports considered out of date?

Despite consultants including a statement in their reports about validity or that of the survey results, many applications are still delayed by the submission of out-of-date ecology reports and survey data.

CIEEM's *Advice Note on the Lifespan of Ecological Reports and Surveys* (CIEEM 2019) is regularly quoted by LPA ecologists where details are older than 12 months and need to be reviewed. This is where ecological consultants can help their clients to avoid delays by clearly stating the 'sell-by date' of their reports to ensure that the LPA knows all likely impacts on biodiversity. This can then avoid challenge by third parties, who can sometimes be other professional ecologists.

As many species are mobile, it is essential to understand whether, after a period of time (e.g. between the production of the EcIA and securing other details ahead of submission), any species have moved onto the site or

Table 4. Extract from CIEEM and ALGE EcIA checklist: considerations to ensure that an EcIA report is fit for purpose.

Stage	Ecological considerations that must be covered
Pre-application scope	1. Where pre-application advice has been received from the LPA, a Non-Governmental Organisation (NGO) and/or a Statutory Nature Conservation Organisation (SNCO), it has been accounted for in the EcIA; 2. The scope, structure and content of the EcIA are in accordance with published good practice guidelines;
Surveys sites, species and habitats	3. Adequate and up-to-date desk study, phase 1 habitat survey and phase 2 ecology surveys undertaken (where necessary); 4. All statutory and non-statutory sites likely to be affected are clearly and correctly identified; 5. All protected and/or priority species and priority habitats are clearly and correctly identified, and adequate surveys have been undertaken to inform the ecological baseline; 6. Any invasive non-native plant species present are clearly and correctly identified; 7. Where a separate PEA report states that Phase 2 ecology surveys are required, these have been undertaken in full at the appropriate time of year and the results submitted as part of an EcIA report with the planning application (or the lack of survey is clearly justified);
Impacts and effects	8. The impact assessment is based on clearly defined development proposals with cross-references to relevant drawings/plans (and any plans used are the same version number as submitted with the application); 9. The residual ecological effects are considered to be not significant at any geographical scale irrespective of the detailed development proposals, and the assessment is based on a worst-case scenario; 10. The report describes and assesses all likely significant ecological effects (including cumulative effects) clearly stating the geographical scale of significance (where relevant);
Mitigation, compensation and enhancement	11. The mitigation hierarchy has been clearly followed; 12. The report clearly identifies the proposed mitigation and compensation measures, and explains how these will adequately address all likely significant adverse effects; includes where necessary proposals for post-construction monitoring; and recommends how proposed measures may be secured through planning conditions/obligations and/or necessary licences; 13. A summary table of proposed mitigation and compensation measures has been provided; 14. The need for any mitigation licences required in relation to protected species is clearly identified; 15. Proposals to deliver ecological enhancement/Biodiversity Net Gain have been provided;
Competence and good practice	16. Limitations of the ecological work have been correctly identified and the implications explained; 17. All relevant key timing issues (e.g. site vegetation clearance or roof removal) that may constrain or adversely affect the proposed timing of development have been identified; 18. All ecological work and surveys accord with published good practice methods and guidelines OR deviation from such guidelines is made clear and fully justified, and the implications for subsequent conclusions and recommendations made explicit in the report; 19. All ecologists and surveyors hold appropriate species licences (where relevant) and /or have all necessary competencies to carry out the work undertaken;
Conclusions	20. The report clearly identifies where the proposed development complies with relevant legislation and policy, highlighting any possible non-compliance issues, and highlighting circumstances where a conclusion cannot be drawn as it requires an assessment of non-ecological issues (such as socio-economic ones); 21. The report provides a clear summary of losses and gains for biodiversity and a justified conclusion of an overall net gain for biodiversity; and 22. Justifiable conclusions based on sound professional judgement have been drawn as to the significant of effects on any designated site, protected or priority habitat/species or other ecological feature, and a justified scale of significance has been stated.

the condition of structures or features has changed. If this potential exists, the ecological consultant can help the planning process by clearly identifying the lifespan of each report, and which surveys are likely to need review and under what circumstances.

Out-of-date ecological information can affect the adequacy of reports submitted with planning applications as discussed above. For reports that trigger additional assessment, an addendum to clarify the conditions found, any surveys that need updating and/or a new EcIA will need to be prepared.

The updated report containing any repeat survey results will be needed prior to determination to provide the LPAs with certainty of likely impacts from development and to help the LPA ecologist; bold text to highlight the changes is very much appreciated.

The two options open to an LPA when a report is considered to be out of date are:

- EcIA report triggers an additional assessment – the ecological consultant may be able to revisit the site and prepare an addendum to the report to confirm that the conditions have not substantially changed and that the findings of the original report are still valid.
- A new EcIA is required as the conditions on site have changed substantially and repeat surveys are needed to provide certainty of likely impacts from development. This updated EcIA would have to be submitted before a positive determination of the planning application. It would be really useful if the changes made were clearly highlighted in the updated report.

Implications for biodiversity conservation

Biodiversity conservation is what we are all concerned about; this is why we became ecologists in the first place – because we love nature, we are passionate about wildlife and we want to see a world where the natural environment is respected, appreciated and restored after decades of destruction, fragmentation and decline. The climate and ecological emergencies are a call to action. As ecologists, we all need to consider carefully what we can do differently, how we can improve the way we work and how we can do a better job. We must all be advocates for nature, we must strive to minimise loss, maximise gains and benefits, and get a better outcome for biodiversity; this is for the intrinsic value of nature, but also for human health and well-being. Getting this message across in your ecological reports is fundamental to ensuring that we really are able to 'build back better' and greener.

Writing effective reports will also be increasingly important when the mandatory Biodiversity Net Gain requirement comes into play, but we'll save that story for another time.

What is ALGE?

Established in 1994, the Association of Local Government Ecologists (ALGE) is the only organisation supporting professional officers with responsibility for, and an interest in, biodiversity and nature conservation in Local Authorities and National Parks in the UK. ALGE also provides formal advice to the Local Government Associations in the UK and responds to consultations on biodiversity issues that affect local government delivery. ALGE aims to:

- contribute to the conservation of the UK's biodiversity in the interest of the community and to further public education, understanding and enjoyment of this resource;
- promote and develop good principles and practice of nature conservation and improve professional standards in local government, including National Parks;
- provide a UK-wide forum for the exchange of information and ideas on nature conservation and biodiversity matters, between persons working in those fields within local government;
- act as a voice for Local Government, including National Parks in nature conservation and biodiversity matters;
- provide assistance and advice to Local Government Associations (LGAs), Associations representing other relevant professions working in local government, and professional and statutory nature conservation bodies; and
- assist the Government and any other organisations as is deemed appropriate in the sole discretion of the Executive Committee, by taking part in, and/or responding to consultations on subject relating to nature conservation and biodiversity.

To find out more please visit: www.alge.org.uk.

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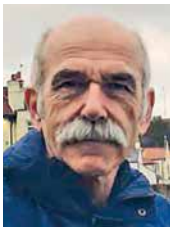
About the Authors

The five authors of this article are all members of the Association of Local Government Ecologists (ALGE). All have worked for or with local planning authorities for a minimum of 20 years and, collectively, they have nearly 130 years' experience of reviewing ecological reports. On the basis that each may have reviewed on average at least four applications and corresponding Ecological Impact Assessments per month, this would mean that together they are likely to have examined at least 30,000 ecological reports during their local authority careers. They therefore have a significant bank of experience to draw upon, a very clear understanding of what constitutes an adequate and robust ecological report and, likewise, they are familiar with the ecological issues that generally result in an application being refused or delayed. By sharing their experience, they hope they can help more reports sail through the system with a light touch.

Feature

Absent from Planning Applications: the Implications of Missing or Poorly Validated Limitations Sections in UK Impact Assessments, and How to Fix Them



Tim Reed FCIEEM(rtd)

Keywords: ecological impacts, planning, transparency, validation

This article looks at the ecological material in Limitations sections of development applications received by planners. Most Limitations sections are short and undetailed, containing unsupported claims. Most rely on statements of professional judgement to substantiate claims. I consider what sorts of data and analyses might be required in documents reviewed by planners, few of whom have any ecological skills or support, to help them make decisions. A simple scoring process is offered to help planners evaluate applications. A system based on transparency and validated assertions would improve planning submissions significantly. Improvements are critical if planning data are to be used to support site-based habitat or species losses and apparent Governmental sustainability policies.

Introduction

In the UK, planning applications are an important part of the open democratic process. They allow consultation on proposals of local or wider interest. Documents normally include an assessment of the potential ecological impacts of the proposed development in a site-specific Preliminary Ecological Appraisal (PEA), Ecological Impact Assessment (EcIA) or Environmental Impact Assessment (EIA) (CIEEM 2018).

UK Government policy expects that individual developments should have a net positive impact on biodiversity and ecosystem services (Defra 2018). This requires that the ecological risks, impacts, and opportunities in an application are clear and can be understood by planning authorities, their advisors and the planning committees themselves (CIEEM 2016, 2018). Hence the material in the PEA, EcIA, Environmental Statements (ES) and EIA should be robust (limitations stated, validated and understood), reliable and available (BSI 2013, Thompson *et al.* 2016, CIEEM 2018). If not, the proposals cannot be assessed for a net positive impact, or planning purposes.

Standard methods are recommended for use when surveying habitats, species or species groups (BSI 2013, CIEEM 2018). As circumstances for undertaking surveys are rarely ideal, some assessment of problems associated with each visit, and their potential effect on the overall datasets, is needed. These are normally covered in the Limitations section, which is one of the standard headings in a PEA, EcIA, ES or EIA document (BSI 2013, CIEEM 2018).

As limitations affect the interpretation of datasets, and decisions about possible impacts, we would expect the Limitations section to be detailed and closely argued. Both the British

Standards Institution and CIEEM expect all comments or claims made for datasets to be substantiated, rather than just stating they had no effect. Otherwise, an ES or EcIA is essentially opinion, unsupported by facts (BSI 2013, CIEEM 2016).

In this short analysis I briefly look at the provision of Limitation sections in a sample of 33 planning applications in the UK. I examine how they are used in ES and EcIA, and the extent to which opinions may predominate in the place of fully supported (evidence-based) analyses of limited impacts for a given planning application (BSI 2013, CIEEM 2018). This is followed by suggestions for scoring documents for their effective use of Limitations sections. This would allow a clear, simple understanding of the extent to which documents submitted as part of a planning application can be relied upon.

The sites

Thirty-three planning applications in the UK were examined. These were provided by clients wishing to understand if the ecological materials accompanying a planning application had been correctly collected and analysed. They included large wind farm proposals, single wind turbines, housing developments, pedal cycle routes and infrastructure plans across England and Wales.

Each document was reviewed for its use, and clarity of use, of the standard methodologies cited in their texts, and for problems with factors such as weather, timing, access, visibility and other issues that the standard methods identified as potential limiting factors. Whether or not applicants had applied the standard methodologies was assessed using the texts, tables and data as presented in each case.

After assessing the texts against standards, each document was examined to see whether or not it contained a Limitations section. If it did, the section was examined to see if it included cogently argued reasons why survey limitations, if mentioned, did not influence the standard conclusion of no potential ecological impact. The number of texts citing professional judgement (PJ) were recorded. These were divided into those with and without evidence-based support for PJ, or the presence or absence of statistical examination of datasets to demonstrate no effects or limitations.

Results

Eighteen of the 33 sites (54%) included the heading Limitations in the ecological section of the ES. Thirteen out of the 18 included Limitations headings for either bats or birds, and only five of the 18 ES sections contained Limitations headings for both birds and bats. The remaining 15 out of the 33 site ES chapters (46%) failed to use the term. No reports predicted significant potential ecological impacts from proposed developments.

Of the 18 sites referring to Limitations, five stated that there were no actual limitations to survey methods used and reported in the documents. No testable or evidence-based proof was provided; just an unsupported written statement. The remaining 13 ES chapters that referred to limitations stated that limitations had no significant effect on the impact assessment evaluation. None provided material to confirm this.

Thirteen of the 18 sites that included Limitations headings also indicated that their assessments of no ecological effects were based on PJ. None provided supporting evidence-based material for their use of PJ.

All 33 sites had issues with their uses of standard methodologies that needed to be acknowledged in a Limitations section.

Discussion

Collecting data

If data are collected, then it is critical that the robustness and probity of the data are understood. Otherwise, there is a risk that well-meant decisions and policies will be based on false premises (see Conservation Evidence, www.conservationevidence.com). Contrary to claims made in most applications, the collection and collation of data sources for planning purposes is not error-free (Hill *et al.* 2005, CIEEM 2018).

UK desk data include published sources and data trawls, mainly from Biological Record Centres (BRCs). Although there is a wealth of citizen-sourced data, only a limited proportion of the data collected makes it into them (see National Biodiversity Network, https://nbnatlas.org).

This means that many field records will not be available to data trawls. For bats (Collins 2016) and water voles (*Arvicola terrestris*; Strachan *et al.* 2011) both guides remark that absence of evidence is not evidence of absence, and, as Natural England (2010) noted, BRC bird data are often anecdotal. The result is that few desk-derived data sources provide the categorical data required for definitive statements on impacts. This places an onus on collecting reliable, and contextually defined, data from field surveys.

Methods, reliability and limitations

How to choose the right methods, times and frequency of surveys is covered in guides such as those by Hill *et al.* (2005) and Sutherland (2006). Individual taxonomic groups and species have more detailed guidance (e.g. Gilbert *et al.* 1998, Bibby *et al.* 2000, Strachan *et al.* 2011, Cresswell *et al.* 2012, Collins 2016).

The sorts of problems that might be covered in Limitations sections in planning applications are shown for birds and bats. For individual circumstances, such as onshore wind turbines, there is specific detailed bird guidance setting minima for times, number of visits, seasons and number of survey hours for species and species groups (Natural England 2010, Scottish Natural Heritage 2017).

With this detailed guidance it is clear that survey techniques and technology all have their limitations. For example, when collecting bird data for potential wind farms it is recognised that detectability of birds decreases with distance and survey duration. Beyond a point, all but the largest of birds become essentially undetectable (Natural England 2010) and the longer the survey session, the more likely that birds in the field of view will be missed or confused. Both Natural England (2010) and Scottish Natural Heritage (2017) place limits on times and acceptable distances for bird data in wind farm applications.

Due to the nocturnal behaviour of bats, bat detectors are relied on to record species. Their use comes with a wide range of constraints, most particularly

the distance beyond which calls cannot be detected (Adams *et al.* 2012). For many potential wind farm sites, the distance limitations associated with most detectors are fundamental. Placing a bat detector on the ground, with a detectability limit of 30–40 m for many species, to infer use of the air corridor swept by a turbine blade some 100 m or more above, has basic credibility issues. Likewise, placing detectors in a hedge more than 50 m away from a possible turbine location is also problematic: both occurred on one site in south west England but went unrecognised in the ES.

Bat behaviour varies significantly across the course of the year (Collins 2016, Lintott *et al.* 2016). Consequently, transect surveys undertaken only early or late in the bat activity season will be of limited value in indicating the range of species using the site (Collins 2016, Lintott *et al.* 2016). Lintott *et al.* (2016) showed that short-term 'snapshot' bat data often collected for development purposes poorly represented both species and abundance levels if compared with data collected across the season. In a separate study, Lintott and Mathews (2017) showed that the ways that the data are presented – mainly as the mean number of passes per hour – mis-represented the datasets and obscured their many limitations. Yet, many bat datasets are presented with little or no comment on limiting factors, or state, without support, that bats will be unaffected by a proposed development (Lintott and Mathews 2017).

When undertaking pre-development surveys, for birds, bats and other taxa, there is a temptation to undertake a single season of surveys and use this as the basis for categorical statements. If such surveys are affected by weather, inadequate numbers of visits or runs of days, duration, proximity or disturbance issues, or other factors, then it is important that these issues are addressed in the ES, and longer data runs should be sought (CIEEM 2018). Scottish Natural Heritage (2017) recognised the limits of single-year bird data and require at least 2 years of data for prospective wind farm sites. For bats (Collins 2016), there are cautions against inadequate datasets, and certainly warnings against adding together different seasons from different years as if they represented a full single year's worth of data.

Short or long sections

Given the range of potential problems, it seems odd that Limitations sections are one of the shortest sections in most documents.

If an EcIA or ES is claiming that there will be no impacts, or offers its data as a credible baseline against which positive gain can be monitored, and subsequently displayed, then the limitations of desk and field data need open discussion and evaluation. As a result, the Limitations sections would normally be expected to be extended, and supported by detailed data and tests or attendant material. Otherwise, the EcIA/ES runs the risk of being dominated by the use of unsubstantiated PJ (CIEEM 2016, Reed 2017).

None of the 33 cases noted here were able to show that they had formally tested their statements, even when there were clear data problems (typically weather-related, but also malfunctioning equipment resulting in data losses). Some 78% referred to PJ to support their case of no limitations, but without verification or a reasoned evaluation; PJ was being used as undocumented personal opinion in support of an untested conclusion.

Scoring Limitation sections for planning purposes

When a planner receives an ES or EcIA, there is currently no simple way of categorising the quality of the ecological decision-making provided to them, other than believing the authors. If the conclusions in an EcIA or ES are to be used to determine the scale or absence of impact, then some shorthand way of ranking the submission might help in evaluating the suitability of ecological decisions based on material provided

Table 1. A ranking system for use when reviewing claims of either no significant ecological impact or significant impact in planning applications.

Rank score	Limitations section?	Limitations recognised?	Limitations explained?	PJ cited?	Validated tests of data?	Effectiveness to determine impacts and provide credible baseline
1	No	No	No	No	No	No basis for use in assessing impacts or as a baseline dataset for subsequent monitoring
2	Yes	No	No	No	No	
3	Yes	Yes	No	No	No	No basis for use in assessing impacts or as a baseline dataset for subsequent monitoring due to untestable assertions
4	Yes	Yes	Yes	Yes	No	No basis for use in assessing impacts or as a baseline dataset for subsequent monitoring due to absence of tested data; use of stated PJ provides the basis for testing assertions in a resubmitted application
5	Yes	Yes	Yes	Yes	Yes	A suitable basis for assessing impacts and for subsequent monitoring; if PJ is used, it is tested and validated

1 = least suitable, 5 = suited for planning purposes. PJ, professional judgement.

in planning applications. In Table 1 a simple five-point scale is proposed, along with some of the implications associated with each score.

Score 1, the worst possibility, is the absence of a Limitations section from an ES or EcIA. Without it, it is unclear if the surveys were optimal in every manner, or that limitations were discounted or ignored. Providing a Limitations section, while omitting to recognise the possibility of limitations to the data, would score 2. Neither 1 nor 2 would provide a credible basis for decision-making.

A score of 3 would see a mention of limitation issues in the Limitations section, but a statement that they were not important. The absence of any validating test or support to back up the assertions is critical. Planners need to see the implications of potential limitations; scores of 3 or less fail to provide this.

As few UK planners have ecological qualifications or competence (CIEEM 2017, House of Lords 2018), the statement in a planning submission that PJ has been used appears to offer reassurance. To score 4, there would be a Limitations section, a statement that limitations were recognised but, due to the use of PJ, any limitations were unimportant. However, this PJ would be unsupported by statistical tests or a clear examination of the data in graphical or similar form. Without those details and tests, a score of 4 offers no more than an informed personal opinion (BSI 2013, CIEEM 2016).

For planners, only a score of 5 would be suitable: the recognition of relevant limitations in a Limitations section, with any assertions of PJ or statement of no significant impacts supported by statistical tests. Given the samples sizes, and some of the conditions of data collection, non-parametric tests would be most suitable. However, this is open to practitioner discussion and refinement, and could well be a targeted area for CIEEM involvement. This is the only sort of information that should accompany a planning application. A score of 3 or less should be unacceptable, and a score of 4 rejected until supporting data and explanations/validated tests are provided.

Using a scoring system such as this would mean that almost all current applications would need to be improved before submission. For the 33 cases discussed above, all scored 3 or less. If one of the goals claimed in many applications is proving no significant impact, and providing a valid baseline against which to assess no net loss or net gain (Defra 2018, House of Lords 2018), then a credible baseline is fundamental. It also seems to be rarely provided. If planners in the UK were to use scoring as part of their appraisal of the ecological component of a planning application, it is likely that the quality of data would rapidly improve as shortfalls became more apparent.

Conclusion

If limitations are not formally assessed in the majority of EcIA, ES or EIA presented in the UK, it may mean that there is no concern about the methods, circumstances or interpretation being placed on data in every case. Conversely, there may be a general presumption of suitable error-free professional quality in data provided by a developer's ecologists that transcends any need for validation or stating limitations. Assertions about the lack of limitations, or their effects, need to be formally evaluated or tested. The general absence of Limitations sections, or the failure to test data or support assertions, must raise some concerns. Using unverifiable PJ statements does not provide any additional robustness; instead, it underlines the risk of personal opinion being used in place of facts in deciding planning applications. If UK planning authorities used a scoring system, and Limitations sections were used effectively, it would provide the basis for improving the quality of planning submissions.

About the Author

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A New Code of Conduct to Improve the Ethics of Employing Freelance Ecologists

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Keywords: code of conduct, employers' code of practice, ethical employers, ethics, exploitation, freelance, graduates, living wage, minimum wage, seasonal work

This article aims to start the conversation about creating an ethical industry where the onus on acting responsibly towards freelance staff is placed where it should be: on the employer. Increasingly in the UK, new ecologists are having to work as freelancers to break into the industry. Rather than a conscious career choice, freelancing is seen as a means to an end, to gain enough experience to perhaps one day be offered that elusive permanent contract. However, the lack of any consistent standards for payment means that exploitative situations are rife in the industry. A Code of Practice for the Employment of Freelance Staff is needed, aimed at employers to make it clear what an ethical business looks like, and which shows freelance workers what they should expect from an ethical employer.

Since I started working as an ecologist in 2002, one of the biggest changes in the industry has been the relative increase in the use of seasonal field surveyors. These seasonal surveyors are often freelance, or on short-term or zero-hours contracts, and they are often young ecologists trying to break into the industry.

This raises some serious ethical issues for those of us on the sharp end of hiring and recruitment, because a labour model which has an over-supply of people desperate to carve out a career is open to abuse. Add in the growing popularity of social media for hiring freelance staff and you have the makings of a system which is unfair and unethical.

Recent graduates often email me looking for work experience opportunities, and they usually offer to shadow me for free. However, employers should be aware that there are only a very limited set of circumstances where they don't have to pay at least minimum wage (UK Government 2013). Unless the person is (1) taking the work placement as part of a further or higher education course, (2) is school age or (3) is shadowing you and only observes what you are doing and doesn't perform any work, then they are entitled to the minimum wage. CIEEM has excellent good practice guidance documents that cover this issue (CIEEM 2019), but in my experience these guidelines are not being adhered to by all employers.

Aside from the legalities, the ethics of unpaid work placements are at best dubious. They limit opportunities to people from certain backgrounds, namely those who can afford not to work, for example because their parents can help with living expenses and are prepared to do so. Without wishing to conflate class and race, this contributes to ecology being both a predominantly white and a predominantly middle-class profession. It therefore actively hinders organisations' efforts to increase diversity in recruitment since the candidates with more experience tend to come from those demographics that can afford to work for free. This was highlighted recently in the excellent blogs for CIEEM by Mya-Rose Craig (2019) and Liam Barker (2020), the former of whom noted that only 0.6% of environmental professionals are visible ethnic minorities, and the latter that socio-economic barriers to work are part and parcel of trying to obtain work as an ecologist. Likewise, the exploitation of graduate ecologists was also covered in the blog for CIEEM by Marcus Kohler (2020). *(Editor's note: see Marcus' follow-up to his blog on page 26 of this issue.)*

The recruitment of freelance staff is often undertaken via social media in addition to more traditional methods such as website and print adverts. Specialist groups and pages on Facebook such as British Ecologists and Nomad Ecologists are often used to recruit freelance workers for surveys at short notice. It is extremely

rare for adverts, either online or in print, to indicate the hourly rate range that will be paid, but my experience of responding to them is that the employers always know the maximum hourly rate they will pay. A 'quick and dirty' search of posts on the British Ecologists Facebook page from 2020 found 41 job adverts, nine of which stated a rate (although it should be noted two of those stating rates were posted by the author of this piece). This is clearly anecdotal rather than scientific, but it certainly serves to highlight the trend.

The major problem with not disclosing pay rates is that it allows for the exploitation of freelance staff by unethical employers. Discussion with freelances has revealed widespread unethical practice in terms of the pay offered. One company paid £25 in total for a bat survey, while another told the freelance that they paid less for travel time than survey work. Given that while you are travelling to a site you cannot be working for someone else, it is wholly unethical to pay people less for this aspect of their work.

At the current minimum wage rate of £8.20 for 21–24-year-olds, £25 is 3.05 hours of work. Assuming 2 hours for the survey, that leaves the surveyor with just over £8 to cover travel costs and their time to get to and from site. It may (just!) be legal, but it's hardly ethical.

This race to the bottom in terms of fees has another, hidden, cost. If employers are only paying their surveyors the bare minimum, and if their payment terms are over 30 days, which is a situation I have frequently come across especially from bigger firms, then they are setting themselves up for staffing issues. If freelance staff are only making just over the minimum wage it is likely that they will take any and all work they are offered. This means that employers will have tired surveyors working on their jobs who are consequently more prone to error. This is a health and safety issue for which employers could find themselves liable if an accident occurs. How can employers expect staff to run reliable vehicles, fill them with fuel, take sensible and sufficient rest breaks, pay for continuing professional development and keep themselves healthy when they are working in an industry with at best 7 months of work out of 12 and being paid the absolute minimum?

Although CIEEM has produced excellent good working practices guidance, this is tailored to employees rather than freelance staff (CIEEM 2020), and is only accessible to CIEEM members.

So how can we, as an industry, counter this? I would suggest there needs to be a Code of Practice for the Employment of Freelance Staff, which should be tied to CIEEM's Registered Practice status. CIEEM describes Registered Practices as:

"Champions of high professional standards and the delivery of the best outcomes for biodiversity whilst supporting a thriving economy. They are ambassadors for our profession, helping to raise its profile and to communicate its valuable contribution to society. Registered Practices actively seek to share their knowledge and expertise and support others, both individuals and organisations, to do their bit for our natural world."

(source: https://cieem.net/i-am/registered-practices/)

It seems logical that as Registered Practices are businesses that should set the standard and lead by example, signing up to a Code of Practice for the Employment of Freelance Staff is a natural fit for Registered Practice status. I propose that the following should be considered in such a Code of Practice:

1. A commitment to pay a minimum hourly rate of £15 per hour. This is over both the minimum wage and the real living wage (£9.50 in the UK/£10.85 in London). However, we expect graduate ecologists to have a degree and their own (reliable) transport, and to be able to carry out work to the standard required of a professional, in a job that does not keep standard 9–5 hours. Added to this, freelances will likely only have 7 months of the year to earn money. Even if they manage to work 37 hours a week for the entire survey season, they will only earn £16,650 before tax, and they have none of the benefits of permanent employment.
2. A commitment to paying freelances as swiftly as possible after an invoice is received, and not breaching 30 day payment terms.
3. A commitment to paying freelances for time spent training them in new skills; it benefits your business to have high-quality surveyors.
4. A commitment to providing an hourly rate band, or salary band, on every advert, including social media posts.
5. A commitment to paying the same rate for travel time and site work time.

By signing up to these five commitments, we can normalise paying people fairly, and shine a light on the corners of the industry that don't play (or pay!) fair. It will be obvious to new graduates what they should be being paid, so they won't be as easily tempted into exploitative situations. CIEEM has made huge strides in raising the professional status of ecologists: now it's up to us as employers to commit to raising standards further, and in turn help to diversify our workforce by treating freelance staff ethically.

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Early Career Ecologists: Time to Root Out Exploitation in the Consultancy Sector

“For an industry that is allegedly compassionate about the environment, it can be quite brutal in the way it treats its greatest assets.”

CIEEM has been actively involved in the promotion of welfare for its members and has recently updated the *Good Working Practices* guidance (available in the members' area of the CIEEM website). Recent *In Practice* articles such as Owain Gabb's *What We Look for in an Early Career Ecologist* (September 2020) provide an excellent insight for the student considering a rewarding career in ecological consultancy.

Marcus Kohler MCIEEM
MKA Ecology

There is, though, an elephant in the room, and it is one that has concerned many in the industry and still seems to be prevalent in a small but significant section of employees. There are consultancies both small and large that are exploiting early career ecologists on both summer contracts and first jobs by prolonged exposure to antisocial and challenging hours, placing profit and function way above well-being, safety, personal development and true sustainability.

This article could be alarming for an early career ecologist to read, and it has been rightfully pointed out that a lot of companies of all sizes have policies that seek to protect the well-being of their staff. However, that is all the greater reason to put pressure on those who place profit above welfare to stop risking lives and undermining the profession.

As the 2021 survey season approaches, it is an opportunity for this community to strengthen a commitment to create a supportive and sustainable workplace for early career ecologists. In order to do this we have to shame those consultancies that see such practice as a necessary baptism into the industry, and to meet their profit margins, to think again.

I was asked to write a blog (www.cieem.net/graduate-ecologists-and-their-exploitation-in-ecological-consultancy-by-marcus-kohler-mcieem/) on this in 2020, having raised the issue at the 2019 CIEEM AGM. Recruitment interviews have brought this matter repeatedly to my attention. This article is constructed from both responses to that blog and my own interviews with early career ecologists.

Ecology is not the first profession to succumb to exploitation of junior staff; look at the hours that young doctors and lawyers undertake. But exploitation creates a toxic culture that breeds poor practice, poor mental health, limited professional development, the capacity for serious mistakes, token ecological appraisal and the chance of causing a serious accident and endangering lives.

Some examples of graduate experiences:

- *"We had to go and do nocturnal surveys and we were expected to drive two or more hours to a different site and then undertake a dawn survey."*
- *"We also had to go and do nocturnal surveys that were as far as three hours away and not have a hotel booked, so we had to drive straight back after."*
- *"During peak season we'd be out almost every night of the week, and still be expected to produce reports during this time. We'd still have to go and do reptile/PEAs during the day as well."*

This is exploitative, dangerous and illegal. In the blog I pointed to the opportunity to make a case under the Working Time Directive (WTD) which sets out the right to fair working conditions, limiting working to 48 hours a week and, crucially, ensuring sufficient rest time between work, especially when working antisocial hours. Putting to one side for a moment the issues of being a 'temporary worker' or how very tough this would be for a new person in their first job, I was alerted to the practice of ecologists being asked to opt out of the WTD. A Twitter poll registered 37 votes to 10 on UK ecologists being asked to opt out of the WTD, and was described as "*common and widespread*". The CIEEM *Good Working Practices* guidance states:

"The limit on working hours is to protect employees from becoming so tired that they are unable to work effectively and to protect the employer from the liability for accidents that may occur as a result of tiredness. Employers can ask employees to choose to opt out of the Working Time Directive for a temporary or permanent period, but an employee cannot be unfairly treated or dismissed for refusing to do so. Requests to employees to opt out should be exceptional and should not be used by employers to cover a lack of staff resource for the work being undertaken."

A senior ecologist with one company described the approach as this:

"New employees are pressured into signing an exemption from the WTD. Whilst they would probably deny it was pressure, you are given it at the time of your induction and expected to sign it there and then… I could accrue TOIL in lieu of payment."

What I also found from the blog was a strong response and more examples of exploitation and, sadly, some pretty entrenched use of such a policy. There appears to be very little training by some consultancies. Another example:

"At my last job we only went out with a senior ecologist for our first survey, then we did all the rest by ourselves. This includes PEAs and Preliminary Roost Assessments, of which I had no prior experience. This means we'd be doing PRAs without a licenced bat ecologist, which I did bring up to the senior ecologist but he said it was fine unless we found a bat."

This is so wrong on so many levels. How can it be expected for early career ecologists to develop with so little training? How can the consultancy be confident of the quality of the work? These practices could easily lead to criminal breaches of wildlife legislation and are certainly not contributing to the sustainable development process. Do these consultancies care? Is an early career ecologist going to know how to find a bat in a building or recognise or even understand the nuances of appropriate ecological interpretation?

The effects on early career ecologists from such practices are multiple: demotivation, extreme tiredness and social isolation. These effects can easily lead to depression and long-term health issues. At the very least, such an absence of professional support and practice can lead to a cynical approach to the profession. I received several responses to my blog from those who had left the industry for these very reasons, as one commented:

"This was an issue when I started in the industry nearly 10 years ago, and it's still ongoing. I believe this to be the core reason why we struggle to hire more senior staff – because by the time a lot of ecologists reach that level, they have had enough."

Consultancies could argue that this approach enables efficiency and a viable pricing mechanism, and on one level I agree. Exploitation has always been the cash baby of the unscrupulous. Consultancies that undertake such practices drive down the value of the profession and the delivery of effective, informed ecology. It has no place within an industry based around principles of sustainability and well-being.

As one ecologist commented:

"It's the perennial problem of trying to get work by bidding low and then sending out your lowest paid member of staff to carry out the surveys, alongside trying to get them to maximise their working day, all whilst keeping the costs down by not providing accommodation."

One experienced ecologist re-told their experiences with a large company, which conveys effectively the dilemma that early career ecologists face:

"Monday morning saw me drive from Kent to the office to meet the team to get to Gatwick to fly to Glasgow, where we picked up the hire cars and travelled to our accommodation. That evening we started 4 nights of dusk/dawn surveys on trees. At 10 am Tuesday–Friday we field assistants all sat down and did sound analysis from the dusk/dawn surveys until lunch time,

"It's the perennial problem of trying to get work by bidding low and then sending out your lowest paid member of staff to carry out the surveys, alongside trying to get them to maximise their working day, all whilst keeping the costs down by not providing accommodation."

with tutoring from the senior ecologist. Each afternoon Tuesday–Thursday we either set out a reptile survey or carried out a reptile check. We had a free hour or so before dinner then it was out for a dusk/dawn again. After sound analysis on Friday morning we would drive back to Glasgow airport, fly back to Gatwick. It was very tiring but … it was incredibly difficult to get a foot in the door when I left uni – and probably more so now – so I took the 6 weeks work back then with no question. But would I want another graduate to go through that? No. It's not a nice introduction into the industry and many of the assistants I worked with during those 6 weeks left ecology before ever getting properly started."

Perhaps the most alarming response was from a senior manager who tried to address the issues:

"[M]y predecessor on a site project was a graduate ecologist who was working 16–18 hour days on the project (it was supposed to be a 10 hour day) without any extra pay or TOIL. As a graduate with no ECoW experience, she was working herself sick trying to do a lot of things that were someone else's problem. The last time I spoke with her she was no longer working in the industry."

This article cannot for legal reasons name names, although it is fair to say that some arise repeatedly. It cannot also vouch for the authenticity of such comments, although it is written in every faith that they are genuine, and the sources are too varied over too great a time period not to be so. Although there appear to only a few larger companies that are doing this there are also a few smaller companies growing their influence with such practices.

Ecological consultancy has come a long way in the last 30 years: it provides a fulfilling and rewarding career and an intellectual journey, but it's important to be aware that these practices are present. You are within your rights to raise these issues. Perhaps it will need a representation of a group of you, but use the CIEEM guidance and contact the secretariat for advice if this practice is taking place.

Now, of all times, given the difficulties that young people have faced with prolonged, enforced isolation at their most social time of life, we really have to raise the flag. This practice has to stop. As one senior ecologist said to me:

"For an industry that is allegedly compassionate about the environment, it can be quite brutal in the way it treats its greatest assets."

Want to help?

Interested in being involved in further discussion around addressing exploitation of junior/freelance ecologists and environmental managers in the industry? Get in touch via enquiries@cieem.net.

About the Author

Marcus Kohler MCIEEM is Managing Director of MKA Ecology, a company he founded 22 years ago. He has also worked as Global Flyways Officer for Birdlife International and as an international wildlife tour leader and consultant.

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Becoming a Better Botanist: Tools for Early Career Ecologists

Figure 1. Yellow-horned poppy (*Glaucium flavum*), a Red-listed plant (in England) that is an indicator for coastal vegetated shingle, a habitat of principal importance.

Oliver Glenister MCIEEM
Mott MacDonald Ltd

Keywords: botany, Field Identification Skills Certificate, plant identification, professional development, survey standards

This article summarises the range of tools available for ecologists (especially at the early stages of their careers) to become better at identifying plants. Being able to identify plants is prerequisite to undertaking habitat surveys to a high standard.

Background

The lack of botanical survey ability among ecological consultants has recently been highlighted in *In Practice* as contributing to the continuing loss of important plant populations and habitats to development in the UK (Hutchinson *et al*. 2019). It is no surprise, then, that botanical survey ability is a skill valued in applicants seeking work as ecological consultants, including in the early stages of their careers (Gabb 2020).

At all stages, ecologists should have a strong incentive to develop their botanical survey skills as these skills are a prerequisite to performing all habitat survey work at a high standard, and crucial if surveyors are to:

- recognise important habitats and plant populations (e.g. Section 41 habitats and species)
- identify habitats and plants that are important to other protected species (including specialist invertebrates)
- establish baseline data for Biodiversity Net Gain (BNG) so that the calculated extent of habitat enhancement and creation required to achieve BNG is accurate.

Because it is important for consultancies to have staff who are able carry out the above tasks, being able to identify plants can open pathways for career progression.

Learning how to identify plants

Overview

The botanical survey methods used by ecologists can often be taught on the job by experienced colleagues. However, it is much more difficult to teach someone to accurately identify all the plants they encounter on a site, despite this being a prerequisite for undertaking habitat and botanical surveys effectively.

There are over 1400 species of native vascular plants in the British and Irish flora, and there are more than double that number of alien species. This compares with around 200 bird species and 17 species of bat that regularly breed in the region. Despite the rich diversity of plants, they are less mobile and more easily observed than animals, and there are many tools and strategies available to ecologists that make the process of identifying them easier.

Wild plants are found in essentially every type of habitat in the country, even buildings and on other built surfaces. As a result, there are opportunities for new and advanced botanists to become familiar with new species almost anywhere. Ecologists also have the benefit of visiting many different habitats in the course of their protected species work and encountering a range of plants in the process. Developing the habit of learning unfamiliar plant species when they are seen is the basis for improving as a botanist, not just during habitat surveys but wherever possible, on and off the job.

“It is no surprise that botanical survey ability is a skill valued in applicants seeking work as ecological consultants, including in the early stages of their careers.”

Identification guides

Often, the best way to find out the species of plant you have encountered is to use an identification guide or key. This applies to botanists of all skill levels, although the optimal guide depends on the user’s familiarity with botanical keys and terminology. Field guides for beginners, like *Harrap’s Wild Flowers* (Harrap 2014) and the *Collins Complete Guide to Wild Flowers* (Sterry 2006) are illustrated with photographs and supported by text with notes on key identification features. The next step up from these are books like the *Collins Wildflower Guide* (Streeter 2016) and *The Wild Flower Key* (Rose 2006), which illustrate most plant species and also include keys, the use of which requires a greater understanding of botanical terminology than the guides for beginners. A hand lens (of at least ×10 magnification) is also required to observe some features.

At the specialist professional level, botanists in the UK most often identify plants using either the *New Flora of the British Isles* (Stace 2019; for plants in flower or fruit) or the *Vegetative Key to the British Flora* (Poland and Clement 2019; for plants not in flower or fruit). Both have keys that cover the complete British flora, and contain relatively few illustrations, other than to demonstrate certain key features.

The books recommended above all have glossaries defining the specialist terms they use in their keys, as well as species descriptions. In some cases, however, searching for these terms on Google images is more informative, especially when illustrations are not provided.

Ecological context

Understanding the context in which different species occur is crucial when identifying plants, as species have different habitat preferences and are distributed in different parts of the country. Most identification guides only briefly describe habitat preferences and distribution. County floras are useful companions to identification guides as they go into more detail in this regard. Many British counties have published floras that provide accounts of every wild plant species recorded in the county, and provide detailed descriptions of the locations and habitat types in which each occurs.

When making plant identifications it is useful to know which species have previously been recorded within a geographic area. For example, if a county flora says that a species is common and abundant in a county, but a botanist living in the county has never knowingly encountered it, it suggests that they may need to assess similar species more closely to ensure they are not recording these plants incorrectly.

An additional and free resource with a national scope is the Online Atlas of the British and Irish Flora (see Resources list at the end of the article). On this website, all British plant species have searchable pages with summaries of their habitat preferences. The online Botanical Society of Britain & Ireland (BSBI) Maps tools can be used to search for every species recorded in the BSBI database and displays zoomable maps showing their distribution in 2 km × 2 km squares (known as tetrads).

Other ways to identify plants

Plant identification apps using automated image recognition are increasingly popular as an alternative to identification guides, but as the best of these have a successful identification rate of less than 60% (Jones 2020) they should only be used as a tool to generate possible identifications. Their results should be confirmed by other means. Another option, with generally a higher level of accuracy, is to post photographs to the Wild Flowers of Britain and Ireland Facebook page. Photos posted here typically return a consensus on the species’ identification within an hour, often with input from national experts. Although useful, it

is best not to rely too heavily on this page and to attempt an identification independently using a guide or key before posting a photo for confirmation.

Not every species can be identified using photos, which don't always show critical features in sufficient detail. Membership of the BSBI provides access to national experts who are available to identify plant samples sent through the post, known as BSBI Referees. The Referees have different specialised groups (e.g. grasses or crucifers) and there are also two generalist Referees for beginners.

Training

The BSBI also has local botanical groups in many British counties (detailed on their website, https://bsbi.org) and most of these hold regular recording events at botanically interesting sites. You do not have to be a member to go to most of these events. Attending is a good way to become familiar with many plant species in a relatively short time and attendees usually encompass the full spectrum from beginner to expert level. Many of the locations visited by local groups are nature reserves or designated wildlife sites, and sometimes permission is given to access sites normally off limits to the public. Visiting sites that are of high botanical value is helpful because they are the best places to become familiar with the rare and notable plants that are most significant to ecological consultancy work.

Another recommended strategy to get better at identifying plants is to attend botanical training courses. These are particularly useful for species that are difficult for beginners to get into, such as grasses, sedges and aquatic plants. The BSBI website has a good summary of reputable course providers, including the Field Studies Council which provides a wide range of courses, such as short courses that focus on different plant families.

Figure 2. White helleborine (*Cephalanthera damasonium*), a Red-listed plant (in Great Britain) that is a species of principal importance (SPI) usually associated with the lowland beech and yew woodland habitat of principal importance.

"Attending a BSBI local botanical group event is a good way to become familiar with many plant species in a short time. The BSBI also posts online training videos and seminars on its YouTube channel."

The coronavirus pandemic has also led to a proliferation of online training videos and recorded seminars as most in-person examples have been postponed or cancelled. Several are available for free on the BSBI YouTube channel including some that focus on more difficult plant groups. There are also several high-quality and inexpensive plant identification webinars available at http:// britishbotany.co.uk, some of which are specifically designed for ecological consultants.

Certification

The best way for ecologists to test the knowledge they have gained through the above methods, and to find out how good they are identifying plants, is to take the BSBI's Field Identification Skills Certificate (FISC). This is a day-

“Strong botanical identification skills are necessary for ecologists to competently undertake habitat and vegetation surveys. They are valued by consultancies and useful for career progression.”

long assessment split into a lab session and a field session. In the lab session, candidates are required to name fresh specimens of 30 species around Britain within a time limit. The field session consists of a survey, where candidates must record as many species as possible in a small but botanically rich site (typically supporting over 100 plant species), again within a set time. After the test candidates are awarded a grade between 1 (beginner) and 6 (exceptional). A level 4 is considered to be the minimum requirement for undertaking professional National Vegetation Classification surveys (*see Tim Rich's experience of this certificate on the next page of this issue*).

An increasing number of job advertisements for ecological consultants now list it as desirable for applicants to have attained FISC level 3 or 4, even non-specialists. FISC scores are also used to inform the botanical competency criteria developed by consultancies (in line with the CIEEM Competency Framework) to assess the ability of staff (including subconsultants) to complete various types of survey, reporting and mitigation work (see Price 2019).

Aiming for FISC certification can be a great motivator for improving plant identification skills and certification is valuable for career progression.

Conclusion

To conclude, strong botanical identification skills are necessary for ecologists to competently undertake habitat and vegetation surveys. These skills are valued by consultancies and useful for career progression, as well as for getting hired in the first place. Employees increasingly consider FISC levels when recruiting as well as assigning staff to projects.

Developing the habit of learning new plant species wherever encountered (not just on habitat surveys) is crucial to becoming a better botanist. There are keys and identification guides for botanists of all levels, and it is easy to get preliminary identifications verified by national experts, either through Facebook or by sending samples to the BSBI Referees. Going on site recording excursions with BSBI local groups and attending identification courses is a good way to make rapid improvements in your plant identification ability.

About the Author

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Resources

British Botany Online Training Courses. http://britishbotany.co.uk

BSBI Maps. https://bsbi.org/maps

BSBI Local Groups. http://bsbi.org/local-botany

BSBI Training Courses. http://bsbi.org/training-courses

BSBI YouTube channel. http://youtube.com/c/BotanicalSocietyofBritainandIreland

Online Atlas of the British and Irish Flora. www.brc.ac.uk/plantatlas/

Wild Flowers of Britain and Ireland Facebook Group. http://facebook.com/groups/735961066428140

Species Identification Skills are the Basis of Ecological Survey Standards

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Keywords: botany, CPD, training

The quality of ecological surveys is primarily driven by two factors: the species identification skills and the experience of the surveyor.

Consultancies and individuals need to continually invest in surveyor skills, while recognising each individual limitations, in order to generate quality, informative and repeatable survey results and reports.

I noted down the raven (*Corvus corax*) and kestrel (*Falco tinnunculus*) but as for the flock of small brown birds with white flashes on their tails, I hadn't a clue. Was the yellow fungus apricot club (*Clavulinopsis luteoalba*) or golden spindles (*Clavulinopsis fusiformis*)? At least I knew the Faeroes dandelion (*Taraxacum faeroense*) in the marshy grassland. As I was undertaking a Phase 1 habitat survey and I am a botanical specialist, my lack of knowledge of birds and fungi was probably not significant, but my plant identification skills, and consequently my classification of the habitats, were. In this article I describe some of the issues surrounding species identification skills and point to some of the solutions.

In consultancy, we need to present the evidence on which our assessments and recommendations are based. In most cases, the quality of these assessments depends on the quality of the field work undertaken, which in turn depends on the species identification skills and

experience of the surveyor. The species data also need to be interpreted and applied correctly to the classification system being used.

Observer errors (misidentifications, not recording species present) have been known and studied for many years along with numerous other features of survey design, but there have been few studies quantifying the importance of surveyor quality in determining data quality. In the first botanical study of its kind, we assessed sources of variation in the number of plants found on repeat 2.5 hour tetrad surveys in Sussex (Rich and Smith 1996). The results surprised even me as one of the authors: the expertise of the botanists was by far the biggest factor in determining the number of species recorded, far more important than the number of habitats recorded or the length of route walked (a measure of area recorded). Other studies have also looked at observers. For example, Lindenmayer *et al.* (2009) found significant observer differences for estimates of bird species richness and the probability of detection of three exemplar taxa in Australia. They consequently introduced pre-survey screening to ensure that only experienced ornithologists participated in surveys. Most of our ecological surveys, consisting of single visits by one ecologist, are not set up to quantify such variation.

Any ecologist who has repeated someone else's survey knows how often we come to different conclusions. Differences may arise from the methods used, the way they are applied or from the basic data collected by the surveyors. The classic work of Cherrill and McClean (1999) showed the huge inconsistencies in repeat Phase 1 habitat surveys by six different surveyors, who not only classified the vegetation types differently but also put the boundaries between communities in different places. Similar inconsistencies between surveyors were found for repeat National Vegetation Classification surveys by Hearn *et al.* (2011). Richard Wheat has now extended their approach to the recently developed UK Habitat Classification survey method (UKHab 2020), but you'll have to wait for those results.

"We assessed sources of variation in the number of plants found. Botanist expertise was by far the biggest factor in determining the number of species recorded."

If the basic identification data are wrong or incomplete, it does not matter how good the survey method is. At Tetra Tech, for one recent planning appeal I was required to re-survey some meadows full of chamomile (*Chamaemelum nobile*), which must have been there since the fields were enclosed from the common land over 100 years ago. The previous consultants had classified the vegetation as improved grassland and listed 'only' seven plants as present (I listed 47, even in October, and assessed the grassland as unimproved). Similarly, another site had horse-grazed pastures that 50% covered with knapweed (*Centaurea nigra*), which were not improved grasslands either. Only by repeating these surveys could such errors be established and the inaccurate classifications of habitats rectified and appropriate recommendations made.

Extrapolating such findings to ecological surveys in general, we might expect that the better the identification skills and more expertise we have, the better the data we will collect and the better our surveys and advice. Such improvement usually requires training, and there are many reported examples of the benefits of training to improving the quality and consistency of surveys (e.g. for birds, Kepler and Scott 1981; for Phase 1 survey, Cherrill 2016).

As surveyors we can take professional courses, learn from others on the job or teach ourselves. Raising

"For plants, the Field Identification Skills Certificate (FISC), developed and run by the BSBI, provides an objective assessment of botanical knowledge."

the standards of surveys is not a new topic (e.g. Cherrill 2014) and continuing professional development is a fundamental part of our CIEEM membership requirements. Survey skills include both accurate identification and the field craft of knowing what to look for and where: the latter only comes with experience. Working with others works both ways and I gain valuable knowledge from colleagues; on a survey this year I pointed out pignut (*Conopodium majus*) to my entomological colleague David Goddard, who predicted from previous experience that he would find the chimney sweeper moth (*Odezia atrata*), and lo and behold the next month he did.

Qualifications provide some quality reassurance, provided they are relevant. Many ecologists will have already undertaken degrees in relevant subjects, though few courses teach identification skills *per se* (some courses do teach them, such as the Reading University MSc in Species Identification and Survey Skills or the Manchester Metropolitan University MSc in Biological Recording and Ecological Monitoring; see the Courses list at the end of this article for links). There are also many short courses available, for example the CIEEM training programmes, and if you are lucky enough to work for a large company these may be funded.

Many of us learn on the job, often through helping other experts. At Tetra Tech a key part of my role is to increase botanical and habitat survey standards. This includes providing the ecology team with internal training and seasonal refresher training to standardise methods across the team, and sharing the 'experience' I have gained over the years. In addition I have been mentoring staff undertaking Brenda Harold's excellent Identiplant course in their own time (Identiplant is a simple course with modules on names, terminology, a range of different plant families and developing skills to identify plants across the board; however, its future is currently uncertain). Staff are encouraged to send me pictures of unknown plants, to discuss issues with habitat classifications and to ask for survey help when needed. I have very much enjoyed being a

junior assistant (even at my age!) for butterfly, dormouse, otter and bat surveys, and learned far more directly than I could have done from books. I hope I've disseminated some botanical knowledge in return. Interaction with other ecologists also provides checks and balances on our own knowledge.

However, it is likely that most identification learning will be undertaken in our own time, puzzling over specimens or images collected during our surveys using, whatever range of identification manuals we can afford. Joining local naturalists' excursions or specific social media groups can also be good ways to learn informally. Ultimately, the skill levels obtained are down to us as individuals and the learning time we put in.

Once we think we are capable, it helps to know what level of skill we have developed. I can subjectively assess someone's botanical knowledge within a few minutes of being with them in the field, or by reading their reports and seeing which plant species combinations are recorded. For plants, the Field Identification Skills Certificate (FISC), developed and run by the Botanical Society of Britain & Ireland, provides a more objective assessment of botanical knowledge. By undertaking a 1 day test in the lab and field, the relative skill level from 1 (beginner) to 5 (professional), or – exceptionally – level 6, can be determined. I plucked up courage to take a FISC this year, only to have it delayed by COVID (*see Oliver Glenister's experience of this certificate on page 29 of this issue*). Similar skill assessments need developing for other groups.

We all have to work within the constraints of people power, time and cost. Desk reviews of data from Local Environmental Records Centres (LERCs) can help fill some knowledge gaps, but given that LERC data are usually *ad hoc,* they often only indicate what species have previously been recorded (and thus may need to taken into consideration): they cannot indicate which species are present but not recorded. Verification of reports by senior colleagues in offices helps with general quality control, but they cannot verify that on-site recording is accurate. The larger consultancies are able to support more specialists and some have frameworks for assessing competencies so that only competent staff undertake relevant surveys (e.g. Price 2019). Supporting specialists is not so easy for the small consultancies or sole traders, for whom a broad general knowledge may be more important for the business as a whole. In such cases it is important to know when to call in a specialist.

For any consultancy, having staff with appropriate species identifications skills is essential, and for ecologists developing such skills can help us move up through our careers. Standards depend on us knowing our own limitations and then doing something to improve them. Continuing professional development through self-learning and group training play key roles, and interacting with other ecologists provides is an educational opportunity.

Specialists will probably always collect better data. However, those undertaking baseline ecological surveys to classify habitats need to have the expertise to correctly identify the habitats on site, and this is through personal learning, on-the-job shadowing and external training, but also knowing our own abilities. No one knows every species, but accuracy of identification as well as knowing what to look for, and where, does come with time. As with anything, hard work and dedication do pay off. Now, I wonder if the CIEEM website has some training courses so I can learn what those small brown birds with white flashes on their tails were?

About the Author

Dr Tim Rich holds a degree in ecology and PhD in plant physiology. He has specialised in plant taxonomy and vegetation of the vascular plant flora of Britain and Ireland and has over 330 publications. He currently works as a botanical specialist for Tetra Tech.

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Manchester Metropolitan University. MSc in Biological Recording and Ecological Monitoring. www.mmu.ac.uk/study/postgraduate/course/msc-biological-recording/

Reading University. MSc in Species Identification and Survey Skills. www.reading.ac.uk/ready-to-study/study/subject-area/biological-sciences-pg/msc-species-identification-and-survey-skills.aspx

The Ornithological Skills Pyramid: Creating a Benchmark for the Ecological Consultancy Community

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MKA Ecology

David Wege

The baseline level of ornithological knowledge in commercial consultancy often falls below an acceptable standard. Using MKA Ecology's in-house bird skills evaluation process, we undertook a preliminary consultation to mirror the design of the BSBI's Botanical Field Skills Pyramid, but with a focus on commercial ecological surveying. We present the Ornithological Survey Skills Pyramid as a work in progress, and invite CIEEM member input.

Bird identification: a dark art?

Is it the perceived difficulty of identifying bird songs and calls? Most surveyors will detect 60–70% of species by call and song alone, so its importance cannot be underestimated. Among the uninitiated, the seeming impossibility of learning bird song is often expressed. However, just think about this for a moment. How many songs on your playlist can you identify by their first riff? Hundreds? How many actor or sports pundit voices do you instantly recognise? Dog owners can even identify their own dog's bark, so learning individual sounds is not the actual problem.

It is more a question of timing, and learning over the course of a calendar year so that by the time you encounter the glory of a May dawn chorus, you know a solid foundation of bird songs well enough to pick out the individual species. You have the skill set already. It's just about training your aural muscle memory, and a bit of formal mentoring support.

Background

Experience tells us that the baseline level of ornithological knowledge in commercial consultancy can often fall below an acceptable standard. Moreover, training for continuous professional development in this taxonomic group is patchy at best. This is compounded by the absence of a published reference of what constitutes an acceptable standard. The reasons for this may be attributable to the *false* presumptions that:

- it is self-evident by either designation or habitat type whether further bird surveys are required
- because bird surveys are less frequently recommended as a further survey requirement when compared to most other groups, the skills are not needed
- bird identification is inherently difficult, with a degree of elitism among those who have the skill, and requires the use of expensive specialist equipment
- if you are not a life-long birder there is no measurable standard you can aspire to and attain, resulting in self-exclusion from bird knowledge development.

This is in stark contrast to the position within the wider public and stakeholder community. Birds are arguably the taxonomic group with the broadest and most knowledgeable skill base in the wider community, leading to a vocal and informed local interest.

This situation has several impacts on the ecological consultancy profession:

- Some specially protected species and birds of conservation concern are probably not being appropriately evaluated in the Preliminary Ecological Appraisal (PEA)/Ecological Impact Assessment (EcIA) process.

Figure 1. Hobby: a Schedule 1 species that is again declining after a period of sustained population increase (563% up since 1973). Hobbies are difficult to detect at breeding sites until young are being fed, and are easier to find in August. When did you last commission a species-specific hobby survey? Photo: David Wege.

- Poor species lists in preliminary evaluations promote a perception that professional ecology is ill-informed. This can be cited by knowledgeable stakeholders (of which there are many) as an indication of the low standard of professional ecological expertise, even if (as is often the case) the evaluation report is generally of high quality.

In bird and wildlife fora that cut across natural history communities, consultancy is often criticised for poor knowledge levels. Consultants find themselves called upon to defend the profession, and without an objective standard of skills measurement, the profession remains exposed to this (perhaps justifiable) criticism.

An accessible, achievable baseline for ornithological survey skills and knowledge

To kick-start the development of a measurable standard, and using MKA Ecology's in-house bird skills evaluation process, we undertook a preliminary consultation with the aim of mirroring the design of the Botanical Society of Britain and Ireland (BSBI) Botanical Field Skills Pyramid (Whild and Townsend 2007), but with a defined focus on commercial ecological surveying.

"This benchmark is intended for all professional ecological surveyors who undertake PEA surveys within a commercial context."

Many ecologists are 'generalists'. Some will specialise in a specific taxonomic group, but a certain level of competence in all groups is required to evaluate a site. Our experience has shown that an early career ecologist can go from 'novice' to 'capable' (see Figure 2) within a year, given both in-house support and the desire for knowledge development. By refining the Ornithological Survey Skills Pyramid through further consultation, we have an opportunity to raise the standard within our consultancy community. Early career ecologists coming through can shine in this area, where the current generation as a whole perhaps have not. It's a matter of will, in-house support and self-belief. Now more than ever, there are many tools to assist in that journey, from the excellent British Trust for Ornithology bird identification series of identification videos (www.bto.org/develop-your-skills/bird-identification/videos) to self-development quizzes on bird song (www.birdid.no/bird/training.php).

Purpose of the pyramid

The Ornithological Survey Skills Pyramid describes the expertise required for delivering survey requirements and assessments associated with the development sector. The purpose is thus to formalise the learning curve required to undertake basic site evaluation surveys, but also to outline the skill base for undertaking bespoke ornithological surveys. The primary reason for developing the pyramid is the need for a baseline benchmark. However, in creating it we also recognised that the upper tiers of the ornithological survey skill base would benefit from a similar approach.

Intended audience and exclusions

This benchmark is intended for all professional ecological surveyors who undertake PEA surveys within a commercial context.

Certain specific elements of ornithological expertise are not included, including experience in ringing, policy areas and research. Nesting bird checks are also beyond the scope of this benchmark. No best practice guidance currently exists for nesting bird checks,

"Experience tells us that the baseline level of ornithological knowledge in commercial consultancy can often fall below an acceptable standard."

resulting in wide interpretation of a practice which urgently requires an industry-wide review.

Developing the skill set

The training required to move surveyors through this progressive pyramid has not been addressed here. As with all field skills, experience, repetition and mentorship are key to progression. We firmly believe that the progression to Level 3 can be achieved through the dual processes of in-house training combined with self-development. The development from Level 3 to 5 and above is more challenging and requires a great deal of personal commitment should one wish to specialise in this taxonomic group. It is still eminently achievable but, as with all specialisms, the journey can be challenging and requires personal commitment. That high interest level that will only ever appeal to a few.

Review process

The Ornithological Survey Skills Pyramid (Figure 2) is presently a work in progress, although a discreet consultation process has taken place. The pyramid has been subject to initial review by the CIEEM Professional Standards Committee, Dawn Balmer, Guy Belcher, Jamie Dunning, Phil Edwards, James Heywood, Tim Hounsome, Jane Kohler, Will O'Connor, Rob Robinson, Andy Symes, Duncan Watson and Paul Watts. It has also been informed by the developing *Bird Survey Guidance for Ecological Impact Assessment: Provisional Guidelines* (directed by the CIEEM Bird Survey and Assessment Steering Group). As a work in progress, we would welcome your input, so please do contact the authors by **1 May 2021**.

Levels of the pyramid

Each level builds on/is additional to the previous one, and requires fulfilment of all/most knowledge areas/

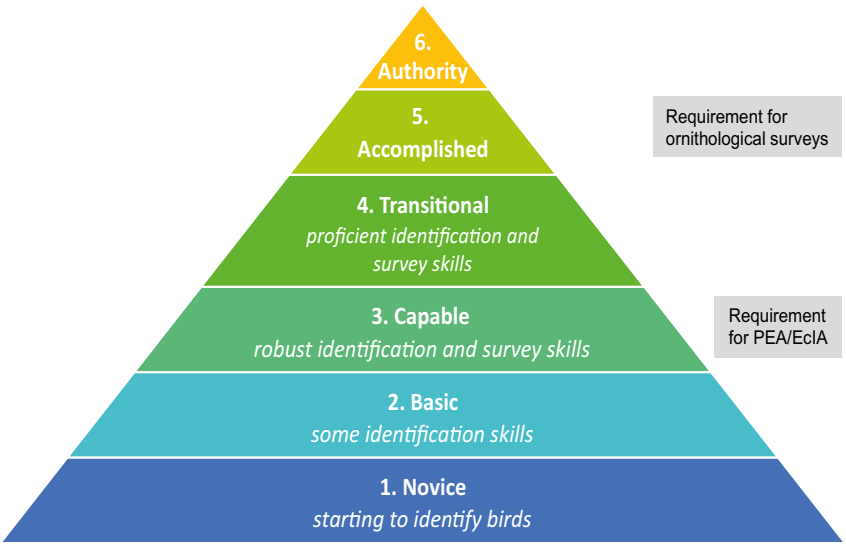

Figure 2. The Ornithological Survey Skills Pyramid

1. Novice: starting to identify birds

Can recognise some (c.20, e.g. see Appendix 1) common bird species by sight, but very limited bird call or song identification. Ideally participating in the BTO's Garden BirdWatch and/or RSPB's Big Garden Birdwatch.

2. Basic: some identification skills

Can identify the common birds of garden, urban and rural areas (c.50–70 species, e.g. see Appendix 2) by sight, and can identify some of these species in flight and by call and song. Aware of bird behaviours and phenology (breeding season and migration) but not yet a detailed understanding.

3. Capable: robust identification and survey skills

Minimum requirement for undertaking PEA and EclA

Within a defined geography and set of habitats, able to identify most of the common resident, migrant breeding and wintering species by sight, and the commonest of these in flight and by song and/or call. Creating accurate lists on PEA surveys (as appropriate to their geographic and habitat expertise), but able to recognise their own limitations in terms of knowledge and experience, and taking guidance prior to surveys to address limitations and potential pitfalls. Able to recognise the need for further ornithological survey. Familiar with the most frequently encountered birds listed on Schedule 1 of the Wildlife and Countryside Act (1981) (Appendix 3) and the UK Red List for Birds (Birds of Conservation Concern) (www.bto.org/our-science/publications/psob and Eaton *et al*. 2015) within their geography and set of habitats. Can identify common raptors and farmland waders at distance. Has an understanding of bird phenology (breeding season, migration, bottlenecks, flocks and roosts/influxes of winter migrants, etc.), and the importance of it for predicting species presence (especially those on Schedule 1 and Birds of Conservation Concern). An awareness of the conservation status, distribution and ecological requirements of species which are likely to be encountered within the survey area and adjacent habitats (informing an awareness of species that could be missed on a single visit). Has an understanding of legislation around protected species. Ideally submitting their observations to BirdTrack, eBird or their county bird recorder as they build their field experience. May be participating in transect and/or territory mapping projects (including in the voluntary sector).

4. Transitional: proficient identification and survey skills

Routinely undertaking PEA/EclA surveys across a range of geographies and habitats, and providing supervision/oversight for those at Level 3

Can identify by sight, typical song and call any of the 244 species of breeding, passage or wintering birds for which there are significant populations in the UK (i.e. the species assessed for the UK Red List for Birds (see Eaton *et al*. 2015) and that are relevant to the surveyor's geographies/habitats). Able to identify, through a knowledge-based process, more challenging and rarer species. Demonstrated knowledge of common identification pitfalls (and ability to mitigate appropriately). May have specific species-group or habitat expertise such as waders/waterbirds, estuaries, etc. Able to judge which species are likely to be encountered in a given habitat, geography and time of year (accounting for phenology, behaviour and geographic distribution), with special reference to Schedule 1 species and Species of Conservation Concern. Able to undertake territory mapping, species-specific surveys and accompanied estuary surveys having shadowed a Level 5 or 6 ornithologist on a range of surveys. May be a member of a relevant society and submitting their observations as appropriate.

5. Accomplished: very good identification and survey skills

Minimum requirement for undertaking ornithological surveys professionally (and independently)

Experienced in identification of the bird species that occur in the UK on their breeding and wintering grounds, and at migration bottlenecks, or able to identify them through a knowledge-based process. Able to identify species in flight based on calls and short views. Can easily identify waders/waterfowl at an estuary in winter and experienced in the use of a telescope for identification and observation. Familiar with identification and ageing of difficult groups such as gulls and waders. Experienced in counting large flocks accurately (within 10%). Full understanding of bird phenology, habitat requirements and geographic distribution. Confident in undertaking breeding and wintering (e.g. Wetland Bird Survey, WeBS) bird surveys unsupervised and in a variety of habitats, using territory mapping/transect/point count methodologies as appropriate. Able to determine which survey methodology is appropriate, and also the knowledge and awareness of how to analyse the results. Has a full understanding of the legislation around protected species.

6. Authority: excellent field ornithologist

A widely experienced field ornithologist and in a position to train in ornithological survey skills, ecological assessment and survey, survey design and analysis. Significant experience observing all species that do/could occur in the UK. May be involved in one or more of: WeBS counts, Breeding Bird Surveys (BBS), atlas projects or species-specific research. Confident in determining where species-specific surveys are needed, and under which methodology (e.g. for nocturnal/crepuscular species).

expertise/experience in the previous tier before progression. At each level, the surveyor should be able to recognise their own limitations in terms of knowledge and experience.

Levels 1–3 present a pathway to delivering PEAs and EcIAs, which all professional ecologists should aim to achieve.

Levels 4–6 describe levels that require significant desire, commitment and passion but provide a benchmark for undertaking bespoke ornithological surveys.

The pyramid allows for flexibility in terms of geography, habitat factors and circumstances.

Appendices

Appendix 1. Top 20 commonest birds in RSPB's Big Garden Birdwatch (2020)

House Sparrow
Starling
Blue Tit
Woodpigeon
Blackbird
Goldfinch
Great Tit
Robin
Long-tailed Tit
Magpie
Chaffinch
Collared Dove
Dunnock
Jackdaw
Feral Pigeon
Coal Tit
Carrion Crow
Greenfinch
Wren
Song Thrush

Appendix 2. The 70 regularly recorded birds in RSPB's Big Garden Birdwatch.

House Sparrow
Starling
Blue Tit
Woodpigeon
Blackbird
Goldfinch
Great Tit
Robin
Long-tailed Tit
Magpie
Chaffinch
Collared Dove
Dunnock
Jackdaw
Feral Pigeon
Coal Tit
Carrion Crow
Greenfinch
Wren
Song Thrush
Great Spotted Woodpecker
Nuthatch
Pheasant
Bullfinch
Rook
Jay
Herring Gull
Blackcap
Common Gull
Siskin
Pied Wagtail
Sparrowhawk
Buzzard
Goldcrest
Red Kite
Mallard
Redwing
Stock Dove
Green Woodpecker
Treecreeper
Moorhen
Marsh Tit
Fieldfare
Kestrel
Grey Heron
Grey Wagtail
Reed Bunting
Redpoll
Mistle Thrush
Yellowhammer
Barn Owl
Red-legged Partridge
Tawny Owl
Chiffchaff
Raven
Lesser Black-backed Gull
Linnet
Little Owl
Great Black-backed Gull
Mute Swan
Meadow Pipit
Corn Bunting
Grey Partridge
Tufted Duck
Skylark
Great Crested Grebe
Lapwing
Gadwall
Teal
Wigeon

Appendix 3. Most frequently encountered breeding species from Schedule 1: Birds of the Wildlife and Countryside Act (1981)

Great Bittern
Garganey
Goshawk
Marsh Harrier
Red Kite
Hobby
Peregrine
Quail
Corncrake
Avocet
Stone-curlew
Little Ringed Plover
Mediterranean Gull
Little Tern
Barn Owl
Kingfisher
Woodlark
Black Redstart
Cetti's Warbler
Dartford Warbler
Firecrest
Marsh Warbler
Bearded Tit
Crossbill
Cirl Bunting

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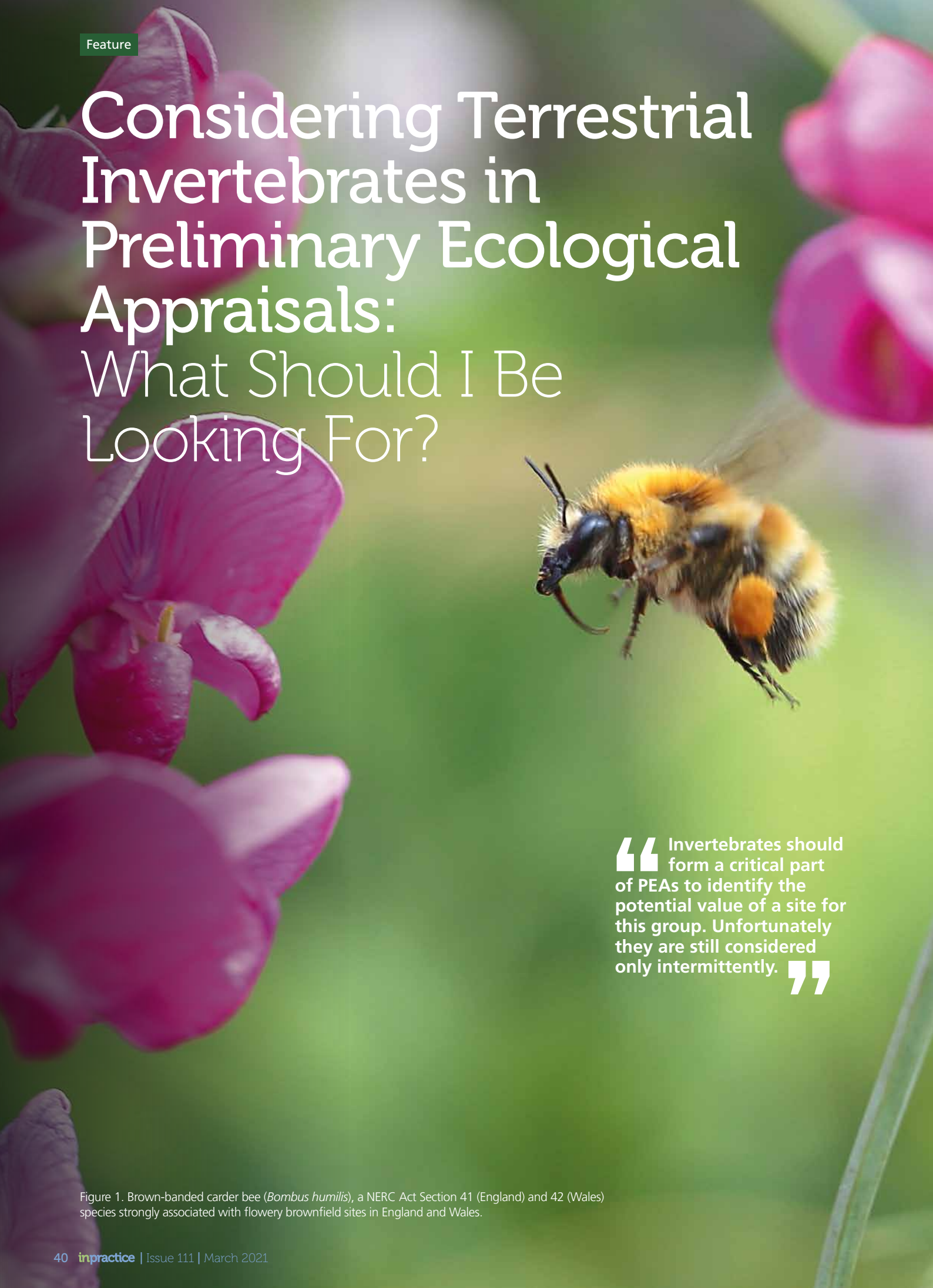
Feature

Considering Terrestrial Invertebrates in Preliminary Ecological Appraisals: What Should I Be Looking For?



> **Invertebrates should form a critical part of PEAs to identify the potential value of a site for this group. Unfortunately they are still considered only intermittently.**

Figure 1. Brown-banded carder bee (*Bombus humilis*), a NERC Act Section 41 (England) and 42 (Wales) species strongly associated with flowery brownfield sites in England and Wales.

The profile of invertebrates as an equally important element of ecological assessment to other taxonomic groups is gaining traction throughout the ecological consultancy sector. However, there is still much that can be done to help and assist ecologists identify potentially important sites or features that may hold significant resources of invertebrates. This article focuses on one particular area: identifying post-industrial sites that may be of value to terrestrial invertebrates. I identify key attributes that make a site potentially rich with invertebrates and is hoped to be a guide for identifying these sites. The guide includes an active checklist that may be refined over time.

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Keywords: brownfield, invertebrate ecologist, invertebrates, Preliminary Ecological Appraisal, site assessment

Introduction

Invertebrates should form a critical part of Preliminary Ecological Appraisals (PEAs) to identify the potential value of a site for this group. Unfortunately, however, invertebrates appear still to be considered only intermittently. Leather (2013) deals with this topic in detail, discussing the mismatch between invertebrates and vertebrates in conservation priorities. This bias towards vertebrates is in part due to a lack of understanding and awareness of how demanding invertebrates are on resources and also, importantly, the complex relationships that occur between an invertebrate, its landscape and also other invertebrates. There may also be a fear of the unknown, owing to the lack of attention given to invertebrates more widely, resulting in it being yet another thing for ecologists to learn and consider. But this should not be viewed as a valid reason to sideline this important group.

This article focuses on the importance of terrestrial invertebrates only, as they are the author's specialism, but it should be acknowledged that aquatic invertebrates are also under-represented in PEAs.

Why consider terrestrial invertebrates in a site assessment?

Our invertebrate fauna includes many species listed on the IUCN Red List as scarce or threatened. They have been afforded this status through assessment by specialists. Many can be found in status reviews on the Natural England website (Natural England n.d.). There are also almost 400 invertebrate species listed in the Natural Environment and Rural Communities Act (2006) as priority species of principal importance (SPI). Therefore, like plants, birds and mammals, invertebrates are still part of planning policy and therefore should constitute material consideration within the processes of assessment and evaluation.

From an economic perspective, invertebrates play a huge role in ecosystem services. It is estimated that 84% of EU crops (valued at £12.6 billion) and 78% of wildflowers rely on insect pollination (Potts *et al.* 2015). Beetles, wasps, flies and spiders are all prolific predators of other invertebrates and help keep pest species in balance, reducing the need for chemical control measures.

More fundamental, however, is their intrinsic value: invertebrates are part of our biodiversity and any reduction or total loss of a species is something to be concerned about. Strong data from the numerous invertebrate-recording societies contribute to scientific research charting the fortunes, or otherwise, of invertebrates. Some of the trends in recent decades are worrying:

- seven bumblebee species have declined by more than 50% in the last 25 years (Buglife n.d.)
- 70% of our butterflies are in long-term decline (1976–2014 data; Anon 2015)
- across Europe, 38% of bee and hoverfly species are in decline, and only 12% are increasing (Buglife n.d.)
- in German grasslands, a 34% reduction in invertebrate richness and a 78% decline in number of individuals has been reported (Seibold *et al.* 2019).

These are not insignificant reductions. Given that many sites proposed for development may be some of the richest invertebrate sites in the UK, it is imperative to try to identify key sites and safeguard adequately the invertebrates that live on them.

Why have invertebrates declined?

There are a number of reasons why invertebrates have declined. A summary of the principal drivers is given below. Other issues exacerbate these drivers, such as the use of pesticides. Information on pesticides and invertebrates is widely accessible now, including work by Professor Dave Goulson at Sussex University (see www.sussex.ac.uk/lifesci/goulsonlab/), whose research focuses on the use of neonicotinoids and their effect on pollinating insects.

The familiar themes driving decline are similar for other taxonomic groups and include, but are not restricted to, the following:

- loss of habitat – leading to fragmentation of habitat and isolation of species populations
- homogenisation of the landscape – resulting in a loss of high-fidelity niches
- succession of habitat – particularly loss of important pioneer habitats

Figure 2. Grizzled skipper (*Pyrgus malvae*), a species that has declined by 53% since the 1970s (Butterfly Conservation n.d.).

- change in climate – leading to a change in species distribution and abundance.

This article has been prepared to guide ecologists in identifying some of the key features of land potentially important to invertebrates, in particular to rich and varied assemblages of species. I focus on one important type, post-industrial mosaics. There is, however, relevant cross-over to wider countryside habitats and also arable land, where the guide and checklist may also offer some support to ecologists.

This article is a condensed version of part of my training course, Invertebrates in Site Assessment. Please contact the author for details on training offered. Numerous universities also offer postgraduate courses in entomology, including Reading University and Harper Adams University.

Both the Field Studies Council (FSC) and the Tanyptera Project (based in the World Museum, Liverpool) also offer a very wide range of training courses in invertebrate identification. Joining one of the many invertebrate study groups will also open up opportunities to training courses.

What makes a good post-industrial invertebrate site?

Generally speaking, and not withstanding that some sites contain particular features that meet the requirements of a few highly specialised species, most sites that have rich and varied resources of invertebrates follow a similar set of criteria. These criteria are flexible and applicable to the macro- and micro-scales: the macro-scale being as large as a landscape and the micro-scale being as small as an individual feature or small suite of features. However, some of the criteria are of less relevance when applied to sites at the extreme ends of the scale. Most commonly, however, they are considered to be most useful when applied to a site or defined area of land, such as a red line boundary (RLB) development plot.

Mosaics and juxtapositions of habitats

Sites that have a range of different habitat types or features, even if some are seemingly unlikely to contain substantial resources, can be of high value to invertebrates. Since many invertebrates require a large number of habitats or features in close proximity to one another, they can be demanding of a site or landscape. Within the habitat mosaic, invertebrates may also require a specific feature to be present, or even a particular plant species. This is not

something that is easy to discern from a PEA, but when undertaking a walkover, inter-habitat complexity is important to bear in mind.

Structural variation

For each of the habitat types or features on the site, there should be some variation within its structure (intra-habitat complexity). This could be as obvious as an unmanaged scrub fringe or the varied sward height and density of grassland. Complex niche provision enables a large number of different species to inhabit a particular habitat or feature, thus raising the potential for a rich and varied resource to be present on a site. Increased variation also raises the chances of encountering scarce and 'demanding' species. Structural variation therefore increases the range of niches and subsequent opportunities present in each habitat.

Topographical variation

Many invertebrate sites, particularly brownfield ones, have their value elevated through topographical variation. This may be the presence of bunds, banks and dumped aggregate material to tyre ruts and shallow depressions producing subtle microtopography on bare ground and early successional mosaics. Topographical variation is important in that it provides a range of niches and sheltering potential for invertebrates. Even the shallowest depression could result in a microclimatic feature beneficial to thermophilic species.

Strong flower abundances

Invertebrates need flowers, lots and lots of flowers. They are either pollinators, relying on pollen and/or nectar as adults, or predators of species that visit the flowers.

A range of flower types is important. Flat white daisy-type flowers and yellow composites (Asteraceae) are of very high value, as a wide range of pollinators use them, most notably groups of flies, beetles and short-tongued bees. Deep-corolla-type flowers such as the trefoils (Fabaceae) and dead-nettles (Lamiaceae) are essential for some of the scarce brownfield long-tongued bees, including some of our rarest bumblebees such as ruderal bumblebee (*Bombus ruderatus*).

For a rich invertebrate resource there does not need to be a rich and diverse flora. As mentioned above, so long as there is a range of flower types and high abundance, the site could be of considerable value to invertebrates. However, as with other criteria, the greater the variation in flower types and species, the greater the opportunity for a wide range of species, from pollinators that forage from a very limited range of flowers (oligolectic species) to those that live out almost their entire lives on a single flower species, such as the fruitflies (Tephritidae).

Although native plant species are important, it is accepted that some horticultural varieties and non-natives

Figure 3. Deadwood is a useful resource for invertebrates. It does not need to be high volume or to have intact native timber. Assemblages of stem-nesting bees and wasps, for example, can be readily recorded in piles of rotting railway sleepers.

Figure 4. Sandy access track and adjacent woodland fringe along the edge of an arable field, a rich location for ground-nesting bees and wasps that nest in the sandy track. Regular disturbance keeps the trackway free from vegetation.

can also be highly prized by our native invertebrates as pollen and nectar sources. Broadleaved everlasting pea (*Lathyrus latifolius*), for example, is proving to be important to many of our scarce species of principal importance, including long-tongued bumblebee species such as the brown-banded carder bee (*Bombus humilis*; see Figure 1 at the start of this article.)

Areas of sunlight

Many invertebrates, even woodland species, like warmth. It may be required for only a short period of each day or particular stage of their life, but a site benefits from some part of it being sunny and warm. Therefore, and as a general rule with some exceptions such as the cool-/dark-/damp-loving invertebrate groups, hot and sunny sites or those with areas of sunlight tend to be richer and more diverse than cool and shady sites.

There are noted caveats to this in relation to a few habitats, such as closed-canopy humid woodlands. These are not frequently encountered during PEAs normally undertaken on proposed development sites, however.

Heterogeneity versus homogeneous sites

As the above criteria suggest, varied and complex sites often have richer invertebrate resources and also support a greater proportion of scarce species than homogeneous sites or those with poor niche variation. Outside typical brownfield development sites, there are a few caveats that contradict the above advice, or initially appear so.

A contradiction: arable fields

As arable fields appear homogeneous, since they are typically a single-stand monoculture, they can be easily dismissed as being of low value. However, there is often variation and niche development at the field margins and can, in their own right, be a habitat of principal importance. Key features that may indicate increased invertebrate potential include:

- tractor ruts – creating mini-exposures
- friable bare or patchy bare ground (see Figure 4)
- flowery margins – may not be diverse, but even high-dominance stands of poppies and crucifers are significant resources
- hedgerow interfacing with tall ruderals and/or tall semi-improved grass.

RLB context and questions to ask when undertaking a PEA

As with all things, context is important. This is the case with many proposed development sites. Since many are urban, they are often adjacent to or near other, similar sites. This clustering of sites can elevate each site's individual status, as they complement one another's features, increase the value of any key feature footprints and consequently assist in creating robust populations of species. Being mindful of this, it is important to consider the following questions.

- Is my RLB site contiguous or near contiguous with a larger block of similar habitat?
- Does the surrounding land include habitats or features that complement any within my RLB site?

This is especially useful to bear in mind, since sometimes RLB sites at first glance do not appear to be of value, as they have a limited range of features or are small but, when viewed more holistically, can be a crucial component to a cluster of neighbouring development plots.

In summary

The criteria for identifying rich and varied invertebrate sites can be summarised as follows:

- They possess mosaics and juxtapositions of habitats (inter-habitat complexity).
- Within each habitat type, there is often structural variation (intra-habitat complexity).
- Topographical variation adds to the overall potential of the site, on the macro- or micro-scale.
- Strong flower abundances mean higher potential for pollinator invertebrate species to be present.
- The site does not necessarily have to be flower species-rich; flower abundance can still be of high value.
- Areas of sunlight are important (with exceptions as noted)
- Varied sites will almost always be richer than homogeneous sites, but arable field systems should not be dismissed out of hand. Always check the perimeters.

Based on the above, ask yourself the following questions:

- Does my site possess mosaics and juxtapositions of habitats (inter-habitat complexity)? What are they?
- Are some or all of the habitats complex? Which are they?
- Does my site have macro-topographical variation (bunds, banks, hollows, ditches) and/or micro-topographical variation (small depressions, vehicle ruts, undulations)?
- Is there a strong flowering plant presence (not necessarily botanically diverse)? What flower types (flat-daisy types, deep-corolla types, etc.) are there?
- Are there any areas of sunlight?
- What sort of site is it? Varied and complex, or homogeneous?
- If homogeneous (such as agricultural) have I checked other factors such as field margins, soil type and presence of large grazing animals?
- Is my RLB site contiguous or near contiguous with a larger block of similar habitat?
- Does the surrounding land include habitats or features that complement any within my RLB site?

What do I do next?

From reviewing the information you have collected from the site visit, which should include photographs, it may be clear that a site can be dropped from further field surveys if it does not show any potential.

If it is obvious that the site is of potential value or if there is any doubt, it is recommended that, at this point, you contact an appropriately qualified and experienced applied invertebrate ecologist to discuss the site and the results of your PEA. A cursory review of the photos and information gathered will be sufficient for them to help you make a judgement on the course of action required. In some instances, though, the invertebrate specialist will recommend a scoping visit, especially where site characters are subtle or extra information is required to advise a survey method or focus.

If it is concluded that the site requires full assessment, it will require a number of survey visits to appraise the quality of the features highlighted in the PEA. This full survey, which may take a number of months to complete, is required to understand the actual value of the site and its key features to invertebrates. At this point, the invertebrate ecologist will be able to take the assessment to the next step for you, that being the full survey, evaluation and providing appropriate mitigation proposals.

Conclusion

The common theme of a potentially rich invertebrate site is complexity, interfaces and juxtapositions. The scale is not an overriding factor, as rich resources of invertebrates can be found on comparatively small areas of land. That is not to say that other land types and forms are not important (i.e. arable margins, horse-grazed pasture), but rather may not be as rich in invertebrates and may possess a more niche or selective suite of species. Therefore, where there is ambiguity or uncertainty, or the situation is not clear cut, just ask.

It is always advisable to seek the services of an experienced invertebrate ecologist, one with a demonstrable applied history in site surveys and assessment. They can either corroborate your thoughts or advise otherwise on the potential value of your site.

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Development and Net Gain: Promise and Reality

> **“I have frequently been a lone voice in implementation teams fighting to ensure that commitments to protect biodiversity are duly adhered to.”**

Here I present a critique of the problems around delivery of biodiversity mitigation and enhancement through the planning system in an attempt to catalyse debate and discussion about what can be improved. As Biodiversity Net Gain moves closer to being a mandatory requirement of development proposals, I feel there is a growing need to ensure that this means net gain in reality, delivered and functioning, not just net gain on a paper document that gets disregarded or watered down once consent is achieved. The article draws on my experiences over 26 years as a professional ecological consultant working on development projects at all scales, from house extensions to national infrastructure projects. It also draws on discussions over that time with professional colleagues, non-governmental organisations and developer clients about the practical and commercial challenges and the incentives and disincentives for delivering on promises made at the consent stage of the development process.

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Keywords: delivery, enforcement, enhancement, monitoring, net gain, planning conditions

Introduction

Gaining planning consent for a project requires, in almost every instance, promises to be made. These promises may be made by developers and project promoters to either do something or not do something. They may be tangible and physical in nature; for example, the building of a new community centre in a housing estate and the gifting of this to the local Parish Council. They may be fiscal in nature, such as a financial contribution to a local authority from the developers of a new housing estate for use in improving local bus services. They may be based on a set of clear and easily enforceable criteria, as in pre-defined restrictions on construction working hours to prevent nuisance to neighbours. Or, they may be based on a commitment to follow strategies or methods of working intended to limit or prevent damage to the environment, like working to an agreed construction environmental management plan that sets out measures to prevent pollution.

This article primarily concerns the last of these categories, which is the most difficult to enforce and the most reliant on individual and corporate responsibility and due diligence rather than external regulation. In my 26 years of professional practice, I've accompanied – through the planning, consent and implementation phases – over a thousand discrete projects on various scales. In that time I have frequently been a lone voice in implementation teams fighting to ensure that commitments to protect biodiversity are duly adhered to. I have also seen the consequences of abdication from such commitments on many other development projects that I've not been involved in directly. These experiences have compelled me to write this article to challenge certain perceptions that I believe prevail in the planning and development sectors about the efficacy of current systems of controlling the environmental impacts of construction. I am concerned that the prevalence of such perceptions could undermine the good work that has been done in getting biodiversity further up the agenda and net gain onto the statute books (well, nearly). My hope and intention here is that this article will spark overdue debate among planners, regulators, developers, consultants and those in the construction industry over how to improve matters and reduce the incidence of avoidable, potentially significant and arguably unlawful environmental harms arising.

What are the problems with the existing planning, regulatory and enforcement systems?

I've identified five major problems with the way current systems operate and which significantly increase the likelihood of promises being broken at the implementation stage of a project. There may be more, but the five are as follows.

1 Disconnect between planning and construction teams

This is one of the biggest root causes of problems with larger-scale developments. With such projects it is extremely rare, in the author's experience, to continue to work with the same individuals through both the process of seeking and obtaining planning consent, and latterly implementing it. Often this is because the company obtaining the consent is not the same as that implementing it, but, even where it is, the organisational structure in most development companies is to have a planning (or consent) team and a separate construction (or implementation) team. The former is concerned with obtaining planning consent and perhaps also with discharging conditions and reserved matters. They then hand over to the latter, who are concerned solely with construction, and typically as cheaply and rapidly as possible.

The potential for problems to arise with this approach is not hard to foresee. Often construction and implementation teams have no more than a vague notion, still less a detailed knowledge, of the hurdles the planning and consent team may have had to overcome to clear the bar of 'acceptability' and achieve the consents for what they are implementing, let alone the reasons

> **There needs to be improved continuity between planning and construction teams, ideally so that those who secured the consent have a close role in implementing it.**

behind those hurdles being put there. Even when they are part of the same company, the implementation team may not even know their colleagues in the planning team, and indeed they may harbour prejudices such as the consenting department 'not knowing how the real world works'. This does not cultivate a culture of continuity and it affords construction managers the temptation to re-shuffle the terms of reference of the consent based on their own, or their superiors', priorities.

2 'Don't look back' syndrome

Related to point 1 is the common perception or preconception among implementation teams that the consent process is 'water under the bridge': a gateway stage that is now dealt with and in the past. Even when implementation teams are aware of the matters that were engaged with at the planning stage, they may see them as no longer a concern and feel relatively free to decide how to proceed in the most quick and cost-effective manner. For their part, the planning team (even if in the same company) may feel that their work is done on discharge of the last pre-commencement condition and that it is enough to hand over volumes of complex planning documents to a construction manager and walk away (or, they may not be given the time and resources to do anything else). Even when a more meaningful attempt at informed hand over is made, often, all that bridges the gap between the teams is a slim document that attempts to distil multiple residual requirements set by a planning consent into a summary that just cross-refers to the original planning paperwork. It is not hard to see why a construction manager is reluctant to delve into what may be perceived as 'ancient history'. Add to that the natural inclination to be a 'new broom', and the route for departure from the planning consent is set.

3 Departure from planning consent by contractors

The problem of shifting perceptions and understanding may be further compounded when complex documents submitted for planning and to discharge reserved matters and conditions are distilled into procurement packages. This can result in contractors quoting for construction projects on the basis of an approach that is much simpler and less restricted than the planning permission actually allows. If and when omitted details emerge at a later stage, the stage is set for arguments over contract variations and the related financial burden of meeting them. At that point, pressured construction managers may feel obliged to weigh up the relative risks of enforcement action from resource-starved planning authorities and regulators (see point 4 below) against answering to their superiors about overspend and breaches of budgetary constraint. It's not hard to see which of these two is generally considered to be the lesser risk. All too often this can cultivate a culture of 'the tail wagging the dog' where contractors are emboldened to make alterations or even disregard requirements by using the threat of additional costs invoked by contractual clauses as a sword of Damocles. In the author's experience, this is one of the biggest causes of departure from the terms of a planning consent and it is vanishingly rare for it to be called out, in large part because of point 4.

4 Lack of proper regulation, monitoring and enforcement

On the occasions where the scenarios painted under points 1–3 result in planning commitments being missed or disregarded, the safety net for the environment most obviously comprises the various regulatory authorities. However, all planning authorities and environmental regulators are cash-starved, now arguably more than ever. This has direct and obvious consequences for the resources channelled into regulation and enforcement, and consequently the scrutiny given to construction projects.

Where scrutiny is applied at all, there is often a mismatch between the relative attention given to environmental issues compared to more easily measurable and quantifiable elements, or those that are made impossible to ignore because of public complaints. The care given by contractors to keeping a promise to retain an area of habitat within a construction site, especially one screened from the public eye by hoardings, may be lower than the stringency applied to ensuring that mud tracked onto the adjoining public roads be swept off twice daily. Natural public surveillance can do much to enforce and regulate the bigger and more obvious transgressions, even where specific checks from the relevant authorities are absent. But who picks up on the less tangible or less obvious condition breaches unless someone from the local authority is tasked to do it, has the necessary experience to understand what is required and actually does the job?

5 Setting of unrealistic, impractical and/or throwaway commitments

Examples of such commitments include the use of extremely loose (to the point of meaningless) phraseology in order to tick a box. Environmental commitments and planning conditions should be SMART (i.e. specific, measurable, achievable, relevant, time-bound) but are often not. A construction environmental management plan (CEMP) stating that noisy activities will be sited well away from sensitive receptors 'where possible', or that consideration will be given to the possible presence of noise-sensitive species prior to commencing of piling or concrete crushing, is effectively meaningless if the construction project happens to be in a sensitive area in the first place.

Overly complex, overlapping and repetitious conditions also do not help to set parameters that are easily understood by construction managers, or practical and achievable to meet. This tends to become a particularly acute problem with large and complex developments that are phased over an extended timescale, such as urban extensions that may involve multiple land ownerships.

What can be done?

The factors touched upon above are not a comprehensive diagnosis but a mere illustration of how the thread connecting a planning permission to what actually

happens on the ground is currently weakened by multiple points of potential failure. Those reading this may be able to think of other points and means by which good intentions at consent stage get sidelined at implementation. In my experience it is generally the exception, rather than the rule, for a planning permission to be implemented in close accord with the parameters and terms of reference set down by the actual consent. Some of these departures go unnoticed, but those that don't do a disservice to the planning system and erode the public's faith in it at a time when its efficacy in delivering sustainable development is being questioned, perhaps more than ever.

Further, it is the larger, more complex and potentially more environmentally risky projects where this mismatch between on-paper expectations and assumptions and construction-site reality is most likely to arise, and most likely to be significant. Of course, there are instances where departure from a written consent is unavoidable and justifiable, and duly checked and sanctioned by the regulating authorities, but in the author's experience such scenarios are rare.

Pumping a lot of government money into local authorities and regulators for the express and ring-fenced purpose of improving monitoring and enforcement would be one possible solution but is an adversarial approach unlikely to find favour with current policy-makers. Therefore, improving the situation is likely to require unilateral and industry-wide improvements to professional practice, both in planning and regulation, and within the development and construction industry itself. A number of obvious actions for improvement are listed below.

- There needs to be improved continuity between planning and construction teams, ideally so that those who secured the consent have a close role in implementing it. Among other things, this may help mitigate against 'throwaway commitments' made to get across the consent 'finish line'. Ecologists are some of the more likely members of a planning team to be retained through to the implementation phase. This means that CIEEM members are well placed to help ensure this continuity, for example by asking proactive questions about the carrying over of commitments or putting themselves forward as reviewers and checkers of procurement documents.
- Recognition is needed at board and finance level that construction and implementation budgets and timescales must be cast with realistic cognisance and appraisal of planning commitments and what they involve, and in recognition of other legitimate constraints. This requires that active environmental responsibility be budgeted for and costed, not assumed, at the very top of corporate structures. It requires improved accountability, and individual and corporate responsibility to the environment as a universal ethos, not merely as something to put in public relations literature. This is not something CIEEM members can directly influence in their day-to-day work, perhaps, but which the organisation could lobby for via policy changes.
- Implementation teams should be properly informed, resourced and monitored, and projects should be costed on a realistic and representative basis. This would avoid situations where construction managers feel unsupported and are encouraged to cut corners to achieve unrealistic targets.
- Ecological Clerks of Works (ECoWs) should be mandatory for projects above a certain threshold based on scale, types of environmental commitment and sensitivity of the receiving environment. ECoWs must be properly independent, suitably skilled and properly supported, giving them the incentive to challenge deviations from planning commitments.
- Regulators and planning authorities need to be better resourced by government or by developers via community infrastructure-type levies that are ring-fenced to the project. The latter may be justified by cost-benefit analysis of pre-empting problems versus cleaning up afterwards. It could be set on a sliding scale relative to the size of the development and the sensitivity of the site and adjoining areas. This will only work if regulators are sufficiently empowered; Planning Performance Agreements ostensibly perform this function but those involved must be supported and have the incentive to challenge problems.

Conclusion

Government policy and legislation require that development projects adequately mitigate and compensate for impacts on ecological resources, and the Environment Bill sets the stage to go further by mandating net gain in England.. These things are an acknowledged and accepted part of gaining planning consent, but problems with their practical delivery mean that on-paper promises often far exceed on-the-ground reality. If development is to play its part in addressing the biodiversity crisis, rather than contributing to it, this gap needs to be plugged and the shortfall in delivery addressed. This is achievable only if the necessary structures, checks and balances are there to ensure environmental commitments are adhered to, not just at planning stage but right through to laying the final brick, selling the final house and beyond. Ecological practitioners all have a part to play in seeing this happen, but the first stage is to acknowledge the deficiencies in the status quo, identify the best possible solutions and, as a collective membership, promote these to clients, planners and policy-makers. It is for the long-term benefit of our industry that CIEEM members improve their standing as active participants in the development process, and not simply as facilitators.

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Feature

Carbon and Ecosystems

> **We have reviewed the literature on carbon and habitats to provide some background information for decision-making.**

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Keywords: carbon, habitats

The climate emergency and biodiversity crisis demand urgent solutions and CIEEM members have a major role to play in designing and implementing those solutions. To assist this process, we have reviewed the literature on carbon and habitats to provide some background information for decision-making. This will need re-appraisal once new data become available. The subject is complex, and there is a dearth of relevant UK evidence. As new reports become available, we will summarise them in future CIEEM e-news publications.

Context

UK greenhouse gas (GHG) emissions declined by 43% between 1990 and 2018, but targets post-2022 will be missed and ministers are recommended to build a resilient post-COVID-19 recovery supporting a transition to a net-zero economy with improved resilience to climate change impacts (Committee on Climate Change 2020). However, not only must annual GHG output be reduced to achieve net zero by 2050, but existing levels of GHG in the atmosphere need depleting significantly to avoid the worst effects of climate change. One of the Committee on Climate Change's five investment priorities to achieve this is to increase total UK tree cover from the current 13% to 17% and further enhance peatland restoration and green infrastructure at a landscape scale.

At the same time, State of Nature reports repeatedly demonstrate that most species and habitats continue to decline and that the UK will not meet most of its 2020 Aichi Biodiversity Targets (Hayhow *et al*. 2019). Moreover, climate change is predicted to have significant effects on biodiversity, thus making increased habitat resilience, extent and quality essential. In the profession, we have a unique opportunity to address the threats arising from climate change simultaneously with the biodiversity crisis and other ecosystem services' needs.

Carbon and ecosystems

Knowing where carbon accumulates most in different ecosystems helps focus future solutions. Measuring the net balances in the carbon cycle is difficult, so determining the impact of actions in various scenarios is not always easy. However, the carbon stock in ecosystems is more readily measured and can help prioritise actions.

Carbon in soils

Soils are a critical carbon stock. Globally they contain three to five times more carbon than vegetation and two to three times more than the atmosphere, although this varies. The creation and persistence of soil organic matter depends on complex interactions between soil biota, mineral soil chemistry and physics, and climate, which determines vegetation productivity and decomposition rates (Deng *et al*. 2016). Over 50% of carbon stock can lie below the top 0.3 m (Ward *et al*. 2016), influenced by vegetation, litter quality (Jobbagy and Jackson 2000) and events like regular flood-plain inundation, which can bury significant carbon stores below 1 m (D'Elia *et al*. 2017).

Soil organic carbon (SOC) increases with higher clay content as organic particles are added to mineral storage over, potentially, many centuries. In sandy soils, in contrast, microorganisms access organic carbon more easily, resulting in greater decomposition. Most SOC is stored in acidic and anaerobic conditions, the extremes being peat and soils rich in organic matter. Milne and Brown (1997) give the soil carbon for Avery soil groups for England and Wales in which peat and earthy peat soils stand out, with gleyed soils, stagnogleys and podsols coming next (Table 1).

Table 1. Soil and vegetation carbon content. Totals for 0.3 m could be double at 1 m depths.

Soils under different habitats	Carbon in soil to 0.3 m unless shown otherwise (tC/ha)	Carbon in vegetation (tC/ha)
Humic-alluvial gley soils	438	NA
Peatland	259 to 0.5 m, 576 to 1 m	2
Flood plain grasslands	286 (to 3 m)	NA
Podsols under heath	175–211	2
Salt marsh	143	8.32
Broad-leaved mixed wood	124 (175.8 to 1 m)	70–111
Acid grassland	87	1
Heath lowland and upland	81–103	2–7.11
Bracken	77	NA
Fen, marsh, swamp	76	NA
Conifer plantation	73–120 (to 0.3 m)	59–94
National average, all wood types	66	57
Neutral grassland	60	1
Agriculturally improved grassland	59–61	1
Arable	43–64	1–2.36
Ponds	16–28	NA

Data from Milne and Brown (1997), Alonso *et al.* (2012), Hagon *et al.* (2013), Taylor *et al.* (2019). NA, not available or not applicable. See Box 1 for measures.

Podsols are extensive so they hold about 10% of UK soil carbon (Alonso *et al*. 2012). Brown calcareous earths and rendzinas store less carbon owing to more rapid biomass breakdown. Adding to the complexity, soils with a higher biomass of ectomycorrhizal and ericoid mycorrhizal fungi can contain 70% more carbon per unit nitrogen than soils in ecosystems dominated by arbuscular mycorrhizas (Averil *et al*. 2014).

Obviously, the total carbon content depends on the area of each land-use type, so pasture overall will currently hold more than woodland, due to its much larger coverage, even with a very low carbon content per hectare. Overall, High Value Conservation habitats (originally developed by the Forest Stewardship Council in 1999 and now adopted as a tool for achieving several UN Sustainable Development Goals) hold 30% of the UK terrestrial carbon on 20% of the land area with almost half held in heathland (mostly in Scotland), despite its lower per-hectare SOC value compared with peatland (Table 1). Soil carbon stocks take time to develop and some soils have a carrying capacity, although it might

Box 1. Converting measures

Measures of carbon are given in tonnes per hectare (tC/ha) or tonnes per hectare per year (tC/ha/year). tCO_2e = tonnes of carbon dioxide equivalent (thus including other GHGs). Divide by 3.6667 to convert tCO_2e/ha/year to tC/ha/year.

Figure 1. A flower-rich restored hay meadow on National Trust land in the Peak District, England.

take decades to reach it. Measurements therefore reflect past land-use history as well as natural capacities, and will change over time.

Carbon in vegetation

Apart from woody material, vegetation generally contains little carbon (Table 1). It accumulates more rapidly when trees and shrubs are growing strongly, but slowly when young and at maturity. Use of timber will determine how much carbon is lost or stored and further carbon losses occur with harvesting and replanting activities (ploughing, fertilising, drainage and machinery use, etc.; Crane 2020). Overall, carbon stocks are greater in diverse, long-established, semi-natural, well-structured woodland compared with short-term plantations.

Carbon losses

Soils lose carbon if damaged through land-use change, especially through habitat destruction and drainage. Historical drainage and reclamation of peatlands has resulted in high losses, especially in agriculturally cultivated peatlands, which will be losing the most carbon (up to a massive 30 tCO_2e/ha/year). Ploughing or other disturbance to any soils results in organic matter loss as it breaks down and decays. Ploughing-dependent arable cycles release more carbon than is captured by crops by about 0.14 tC/ha/year. Clearance of scrub and trees as part of management can also negatively impact carbon stocks, at least temporarily.

Capturing carbon: where to focus

Ecosystem carbon capture is a potentially vital tool to reduce atmospheric CO_2 levels and climate change effects. Safeguarding and enhancing the current carbon stock must be a priority as it takes time to accumulate carbon in new habitats. Moreover, it is essential that new or restored habitats and soils do not replace those already high in carbon and of nature conservation value as can happen when tree planting destroys wildflower or fungi-rich grasslands. This could result in less carbon sequestrated and a loss of soil carbon, as Friggens *et al*. (2020) found in heathland planted with trees. In general, the carbon balance of new ecosystems is low in the early stages (possibly 3–30 years), but improves over time, before plateauing out in some habitats, possibly after decades. More can be trapped over time, especially in active flood-plains, marine habitats, some woodlands and organic soils. Table 2 provides figures for carbon sequestration in existing and new ecosystems, but does not include carbon losses while undertaking works, which need to be factored into carbon budgets. The measures are indicative as data are inadequate for all habitats, climates and soils and for different time periods in the UK and Ireland. Moreover, measures are often derived using different methods.

The significance of habitat restoration/creation for carbon capture will depend on scale and time. Habitats with potential to sequester significant carbon totals need to be established at scale for the optimum results, but small additions on a larger scale could be equally beneficial. Table 2 shows that several different habitats could provide similar carbon sequestration potential, depending on soils, climate, hydrology and whether marine or terrestrial. *Planting trees is not the only – nor, in places, the best – solution for climate change amelioration*.

Although not top of Table 2, peatland restoration, plus measures to minimise peat loss in agricultural situations (e.g. by adopting some form of paludiculture), must be the first choice as the net benefits could average 9 tC/ha/year when stopping carbon loss as peat decays and new sequestration are combined (Artz *et al.* 2013). Restoring acid grassland to heathland (where it is not damaging an existing valuable habitat) would also be highly beneficial, as heathland can trap double the carbon and continue over time compared with carbon capture by woodland (Quin *et al*. 2015).

Woodland creation has an important role but should focus on clay-rich and avoid organic soils (where carbon would be lost), preferably utilising arable or improved pasture to maximise benefits. Maximum carbon capture rates can be achieved using fast-growing, densely planted plantations (Morison *et al*. 2012), but these are poor habitats and capture rates in trees and soils decline with time. A larger long-term carbon store is achievable with semi-natural woodland, with naturally generating woodland capturing increasing carbon amounts as it passes from the shrub to the mature stage (Wrigley and Driver 2019).

Wetland creation, including reconnecting rivers to flood-plains, is important for carbon capture. Indeed, wetlands can store carbon 10–12 times faster than terrestrial systems, but scale is important. The results of Taylor *et al*. (2019) for small, well-vegetated ponds exceeded expectations and show the potential for focused, concentrated carbon capture hot-spots. Marine habitats like salt marsh and sediments are very important as potentially large-scale and significant carbon traps, but

Table 2. Indicative carbon sequestration rates for new and existing ecosystems.

Habitat: soils and vegetation	Carbon exchange, tCO_2e/ha/year	tC captured/ ha/year
Restored habitats		
Improved grass to woodland, 2–21 years	13.7	3.74
Restore acid grassland to heather heathland	12.65	3.45
Adding red clover to grassland	11.62	3.17
Arable to wetland	8.07–16.87	2.2–4.6
Arable to forestry, 115 years	7.53	2.05
Create wood pasture from pasture*	4.8	1.3
Small ponds, well vegetated	2.89–5.21	0.79–2.47
Restore flower-rich grassland from improved sward	3.96–6.93	1.08–1.89
Creation of intertidal/saline habitat from arable or grassland*	3.8/2.90	1.03/0.79
Create reedbed from arable or grass*	4.00	1.09
Arable to heathland, 1–100 years	3.32	0.91
Arable to flower-rich grassland, 2–39 years	3.8–4.03	1.03–1.10
Grassland to wetland	2.39–14.30	0.65–3.9
Create heath on mineral soils	3.05	0.83
Change to organic agriculture	2.0	0.55
Create successional scrub on pasture*	1.8	0.5
Create fen from arable or grass*	0.9	0.25
Restored peatlands	0.88–6.93	0.24 to 1.89
Existing habitats		
Broad-leaved wood	9.17	2.5
Conifer woodland	7.33	2.0
Rough upland grass	4.77	1.3
Eelgrass beds	3.04	0.83
Salt marsh	2.82–23.83	0.77–6.5
Heathland	2.20–12.65	0.6–3.45
Peatland in good condition	0.7–3.7	0.19–1.01
Estuaries in intertidal and subtidal mud	0.59	0.16

Sources: Alonso *et al.* (2012), Natural England (2012*), Artz *et al.* (2013), Wrigley and Driver (2019).

Figure 2. Infilled drain filled with *Sphagnum* on Clara Bog, Ireland.

more information is needed on the relative importance of each. Estimates of grassland carbon capture vary. De Deyn *et al.* (2011) show high carbon capture in northern species-rich hay meadows with added red clover but no fertilisers, while Fornara and Tilman (2008) suggest species-rich swards can store 500–600% more soil carbon than monocultures.

Funding sources

Funding sources for carbon capture in habitat creation and restoration schemes focus on agri-environment schemes (now or promised), government support (e.g. for peatland restoration) and the woodland and peatland carbon codes.

Woodland Carbon Code

The Woodland Carbon Code (www.woodlandcarboncode.org.uk/), managed by Scottish Forestry on behalf of UK forestry authorities, is supported by a Carbon Advisory Group. Projects that achieve validation under the code can then sell the rights to the carbon captured on the open market (so the price per tonne can fluctuate). Rights can be sold for the carbon capture in advance or later as the trees mature. The code uses carbon 'units' calculated for the project at validation, which become Woodland Carbon Units once verified. One unit is 1 tCO_2e sequestered.

The net carbon sequestration is calculated by factoring in tree species, spacing, yield class, management regime and age at felling (if relevant). Planting does not have to be in plantation style. Carbon sequestered is calculated in 5 year intervals and varies between time periods to account for aging. Emissions from the establishment process (including from the soil) are removed to calculate the total sequestration.

Peatland Code

The more recent Peatland Code was developed by the IUCN UK Peatland Programme (www.iucn-uk-peatlandprogramme.org/funding-finance/peatland-code). Like the Woodland Carbon Code, it is a voluntary certification scheme that enables projects to market their carbon benefits. The Peatland Code gives assurance that the climate benefits being sold are real, quantifiable, additional and permanent. The carbon credits gained via peatland restoration are a result of emissions reduction rather than carbon storage, since degraded peatlands are significant GHG emitters. By implementing measures to restore the peatlands, such as drain-blocking and re-vegetating hags, the GHG emissions are reduced, enabling the sale of carbon credits. The amount is calculated based on the conditions from which the peatland is changed; for example, restoration can lead to a change from actively eroding peat to drained and re-vegetated peatland.

Conclusions

For practising ecologists, knowing more about carbon helps inform habitat creation activities to support and enhance ecosystem services. The current mantra for tree planting should be integrated into a much broader ecological palette to support more of our declining wildlife and avoid damaging important habitats. We need to consider what is achievable at different scales and maximise the potential of schemes for carbon and other ecosystem services as well as wildlife. We still need food and agriculture, so farmed landscapes are also important and must be integrated into these emerging opportunities. As carbon codes develop, they may provide an opportunity for land managers to monetize the carbon capture and storage capacity of their land using the carbon codes or benefit from agri-environment schemes where payments focus on ecosystem services, increasing the value of these much-needed products.

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The Importance of Considering Detection Probability and Species Ecology in Ecological Surveys: a response to Gorman *et al.*, Extended Season Environmental DNA Surveys for Great Crested Newts

Great crested newt

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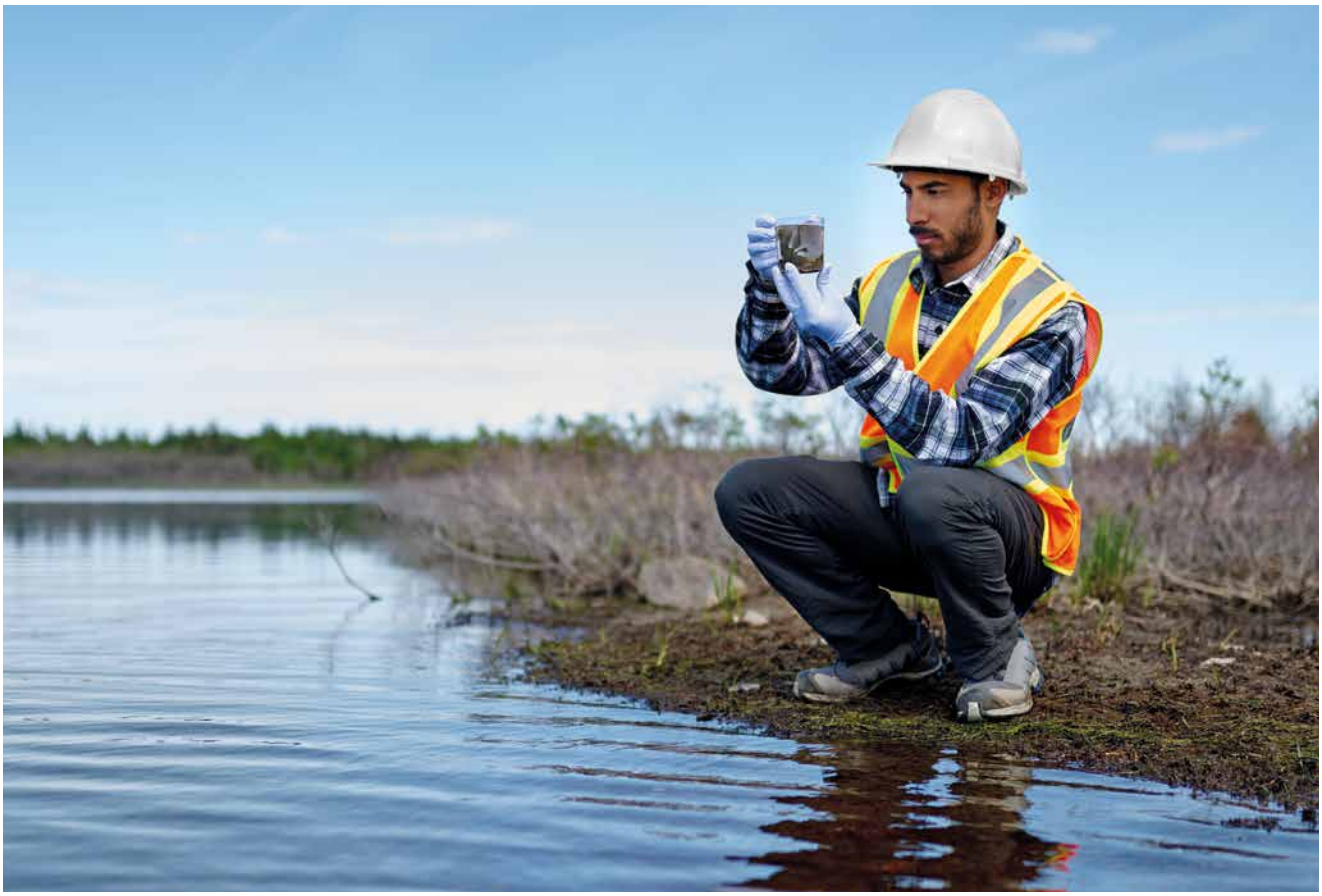
Surveys of protected species suffer from imperfect detection. This applies to methods that use indirect signs, such as environmental DNA (eDNA), as well as direct observations. Either way, missing a species when it is actually present has far-reaching consequences in decision-making. Although highly sensitive for detecting great crested newts, the detectability of eDNA varies seasonally. This is related to both life history and environmental conditions. Equally, both breeding and non-breeding sites play roles in the stability of viable metapopulations. We therefore caution against extending survey windows to those times of year when eDNA detectability is low, or downplaying non-breeding ponds in ecological assessments.

When a survey for a species is undertaken by any method, there are usually one of three outcomes: (1) the species is present and detected, (2) the species is not present and is not detected and (3) the species is present but not detected ('false negative'). A fourth possible outcome is that the species is recorded as present even if it is absent ('false positive'), but this will be down to recorder or methodological error. The overall probability of detecting the species if it is indeed present (detection probability) can be calculated via occupancy modelling (MacKenzie *et al.* 2002). Occupancy modelling requires multiple observations from a site and multiple sites to generate an estimate of the proportion of sites occupied and the probability of detecting the species. This can be undertaken using software such as the software package unmarked, in R (Fiske and Chandler 2011), or the standalone program PRESENCE. In fact, with indirect survey methods such as environmental DNA (eDNA), false negative and false positive errors can occur at two stages of sampling: the field and laboratory analysis stages (e.g. see https://blogs.kent.ac.uk/edna/, Diana *et al.* 2020, Griffin *et al.* 2020).

There are significant risks in not accounting for false negative error rates in conservation decision-making. These risks impact both developers and the conservation of the target species. Failure to identify a species offered protection by either the Wildlife and Countryside Act 1981 (as amended) or the Conservation of Habitats and Species Regulations 2017 (as amended) can have far-reaching consequences. Failure to identify a protected species when it is present can result in a breach of current legislation, delays to works being undertaken and/or a reduction in the stability of the target species population, potentially leading to localised extinctions. As a result, it is imperative that false negative error is minimised within all ecological surveys to protect species and practitioner reputations, and to prevent breaches of legislation. From a conservation point of view, false negative error is much more concerning than false positive error where the worst-case scenario is unnecessary mitigation which may still have benefits for wider biodiversity.

The *In Practice* article Extended Season Environmental DNA Surveys for Great Crested Newts (Gorman *et al.* 2020) poses the position that eDNA sampling for great crested newts should be extended outside the survey window currently advised by government: mid April to the end of June (Natural England 2014). This timing is based on the early work on great crested newt eDNA surveillance by Biggs *et al.* (2014). Gorman *et al*. base their suggestion on the fact that eDNA samples taken outside the current survey window have returned positive results (Buxton *et al.* 2017a, Rees *et al.* 2017). However, even though positive eDNA results have been obtained through to October, the probability of detection of eDNA is reduced. Although Gorman and colleagues "*call for more evidence to support an extension to the recommended eDNA survey window…*", here we highlight other existing research in this area and urge caution in extending the season beyond the current window.

Gorman *et al.* (2020) correctly identified that Buxton *et al.* (2017a) showed two peaks in eDNA concentration, with the late season peak (July–August) associated with the abundance of larval newts. However, the reasons for the first peak in eDNA concentration were overlooked. Buxton *et al.* (2017a) showed that the peak in eDNA concentration during the breeding season, which is targeted by the current eDNA survey protocol, is associated with the release of spermatophores and eggs, rather than the number of adults using the ponds, which can peak slightly earlier. Despite newts being present before and after the peak in eDNA release, the chances of detecting eDNA were lower at those times and the risk of false negatives therefore higher than during the core breeding period. Buxton *et al.* (2017a) did also identify small numbers of adults remaining in the water into late October. However, there were again very low concentrations of eDNA at that time, which would not be a reliable target for surveys.



In a separate study Buxton, Groombridge and Griffiths (2017b) observed how detection probability changes following the removal of great crested newts from a water body. This research concluded that although some detection was possible after 3 weeks, the probability of detecting the species reduced very rapidly in the initial period after removal, with a very low probability of detection towards the end of the 3 week period. This is because DNA in the environment degrades and has a half-life influenced by environmental conditions. As such, confidence in a negative result could only be relied upon in the first few days after the species left a pond. To minimise the risk of false negative results, eDNA surveys need to target the time newts are in the water or very soon after.

Finally, Buxton *et al.* (2018b) looked at a range of natural ponds in spring, summer, autumn and winter, all with confirmed occupancy during the breading season, but at different population densities. Using occupancy modelling it was clear that the probability of detecting the species using eDNA if they are present in spring and summer was between 80 and 90% (leaving false negative results between 10 and 20%). In the autumn, this detection probability fell to less than 50% in most sites and was less than 20% over the winter. This means that even if the species is present, autumn surveys would miss the species 50% of the time, while in the winter they would miss them 80% of the time.

Although great crested newts may be found in water all the year round, over-wintering is limited to small numbers of individuals, with reduced activity during this period, and is not observed in all occupied ponds. So, a combination of reduced numbers, reduced breeding and activity, and the decay of persisting eDNA quickly reduces the chance of detection. Consequently, to have the greatest confidence in the result, the most appropriate time to collect an eDNA sample is during the breeding period.

Buxton *et al.* (2017a) conclude that summer (July–August) eDNA samples could be used to target core breeding ponds, but would be unreliable in ruling out occupancy in ponds not used for breeding. Indeed, Gorman and co-authors (2020) suggest that missing ponds where there was no breeding and no larvae may not be important "*… as breeding waterbodies are by far the most important aquatic resource for this species and form the core of most licensing considerations*". There are several issues with this position, from both legal and ecological perspectives. Current legislation covering great crested newts makes it an offence to capture, kill, disturb or injure individuals, damage or destroy breeding or resting places, or obstruct access to places used for shelter or protection (Natural England 2015). Therefore, all habitat used by the species, whether it is for breeding or not, needs to be considered in an impact assessment, to avoid offences being committed, protect the population and trigger appropriate mitigation measures.

Great crested newts occupy structured populations linked by dispersal (Griffiths 2004, Cayuela *et al.* 2020). Indeed, the importance of both breeding and non-breeding sites for maintaining the stability of such metapopulations has long been recognised (e.g. Pulliam 1988). Some ponds within a metapopulation form core breeding

ponds (source ponds) while others are occupied but not used for breeding to the same extent (sink ponds). Sink ponds will be used by juveniles and non-breeding adults for foraging, growth and shelter, and provide reservoirs of non-breeding individuals for source sites. For example, in a study spanning two decades, a small number of great crested newts were observed moving 250 m between a sink pond and a source pond in a metapopulation in Kent (Zakaria 2017). However, in-season dispersal of individuals has been recorded between ponds up to 1.6 km apart (Haubrock *et al.* 2016), suggesting populations can operate over at least this scale. Equally, which ponds are sources and which ponds are sinks changes over time as environmental conditions change. This means that although a newt population in an individual pond may be unstable, the wider metapopulation of which it is a part will be stable and afford long-term viability (Griffiths 2004). For instance, an isolated population that faced a pollution event or early drying of the core breeding pond would be impacted to a much greater extent than if the population were able to utilise other local ponds (Langton *et al.* 2001). Similarly, because great crested newts use both source and sink ponds in a landscape, habitat connectivity between them needs to be considered in an impact assessment. If an impact assessment were to only focus on the core breeding ponds this could lead to non-viability of the wider metapopulation. It is therefore essential to identify, with the highest degree of confidence, both breeding and non-breeding habitat used by a great crested newt population to fully assess the potential development impacts.

In summary, although positive eDNA samples can be obtained late in the season, the confidence in negative results is diminished. In terms of impact assessment, this may increase the risks to newts, ecologists and their clients. Although arguments to extend the great crested newt eDNA survey window into July may have some merit, our research suggests it may be as valid to argue for delaying the onset of the great crested newt eDNA survey window until the start of May. Equally, accounting for both breeding and non-breeding ponds in impact assessments is important for maintaining viable metapopulations. On balance, if eDNA sampling was permitted commercially through the summer and the autumn the risk of increased false negatives, particularly in non-breeding ponds, would have wide-ranging negative impacts.

To assist practitioners with analysing and interpreting the risks of false negatives and false positives in large-scale, single-species eDNA surveys, we have developed a user-friendly app for carrying out these analyses: https://blogs.kent.ac.uk/edna/ (Diana *et al.* 2020). We invite practitioners to test the app on their own data and welcome any feedback.

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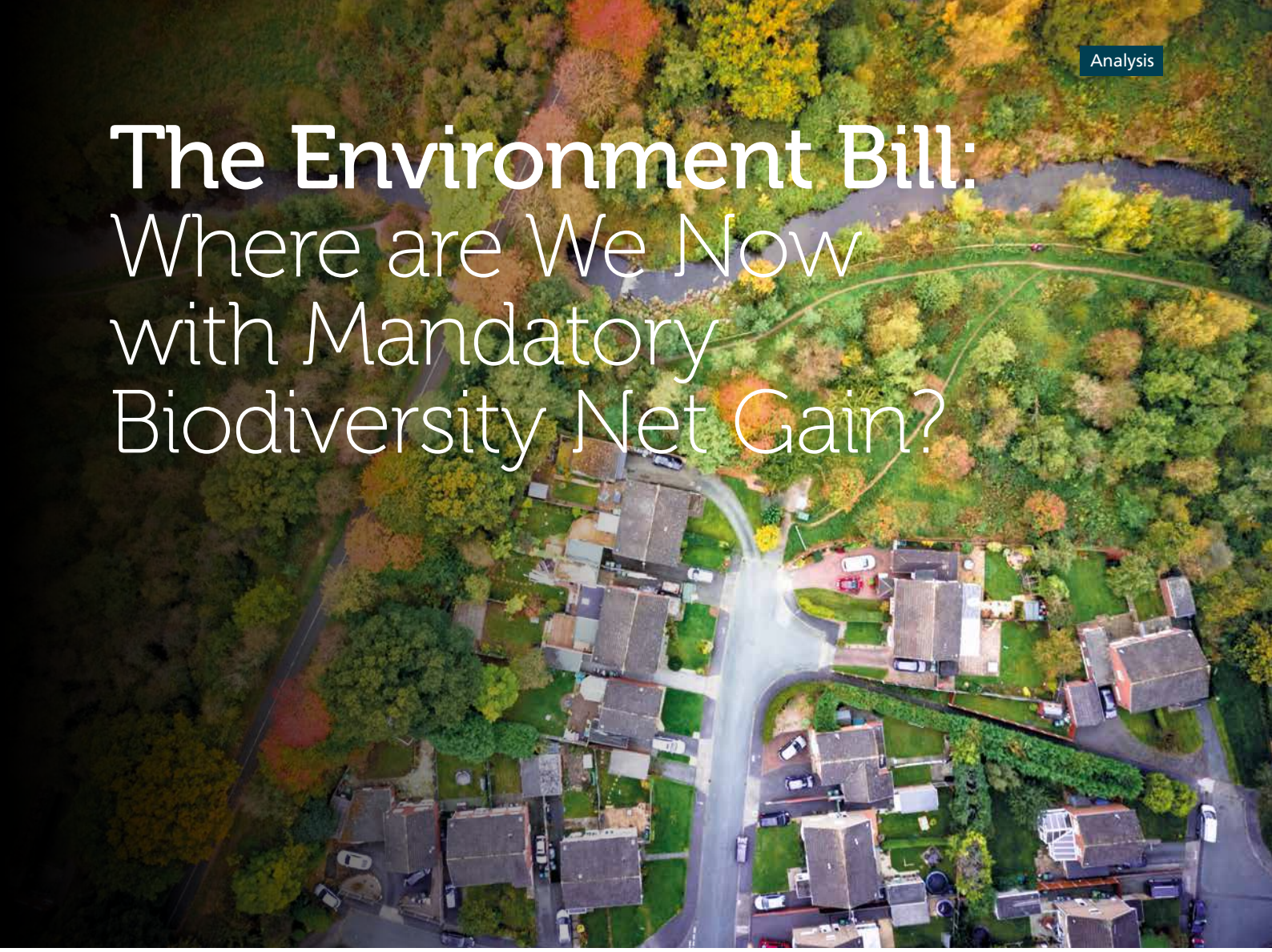
The Environment Bill: Where are We Now with Mandatory Biodiversity Net Gain?



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Now that the Brexit transition period has concluded, the next significant development for those working in the environment sector is the long-awaited Environment Bill 2019–21.

Introduced by the Government as "*a landmark bill*", this draft piece of legislation contains wide-ranging provisions aimed at positioning the UK as "*a world leader on improving air quality, environmental biodiversity, a more circular economy, and managing our precious water resources in a changing climate.*" The bill's objectives include, among other things, the introduction of a new nature recovery network, legally binding targets for air quality, nature, water, and resource and waste efficiency, and the creation of an independent Office for Environmental Protection which will hold the government and public bodies to account for their environmental credentials.

This article focuses, in particular, on the key provisions of the Environment Bill 2019–21 relating to the new mandatory biodiversity requirement and the implications of this requirement for environmental professionals, developers and landowners.

Anticipated timetable

As the title suggests, the Environment Bill 2019–21 has been in discussion for over a year (since it was first published prior to the 2019 general election) and was expected to become law by the end of December 2020 to address, among other things, any gap in governance when the UK leaves the EU. That process of course has been delayed due to various factors (including the ongoing pandemic), resulting in the passage of the bill being suspended on various occasions throughout 2020.

At the time of writing, the most recent version of the bill resumed its passage through Parliament in November 2020, and was due to have the first day of its report stage on Tuesday 26 January 2021 before progressing to third reading (i.e. the final chance for members of Parliament to debate the contents of the bill). The bill would then need to proceed to the House of Lords prior to receiving royal assent (and thereby become law).

However, Defra has confirmed that the Environment Bill's return to Parliament has been delayed once again (by at least 6 months) and that the bill is now expected to receive royal assent in autumn 2021, at the earliest. This timing, which is subject to change, is crucial to the application of the new mandatory Biodiversity Net Gain (BNG) requirement which is expected to apply 2 years after the Environment Act comes into force.

10% Mandatory Biodiversity Net Gain

The Environment Act (once it comes into force) will mandate BNG as a legal requirement. As such, all developers will be required to deliver a 10% increase in biodiversity value of habitat for wildlife (compared with the pre-development baseline) in respect of all new development in England where planning permission is granted under the Town & Country Planning Act 1990 (TCPA) regime. As suggested above, the current version of the bill envisages a 2 year transition period (after receiving royal assent) before these provisions come into effect. Given the ongoing delay to the bill's passage, this means the mandatory BNG requirement is now likely to take effect in autumn 2023 at the earliest.

The mandatory BNG requirement will be implemented through incorporating the need for an approved "*biodiversity gain plan*" as a deemed general planning condition in all planning permissions by virtue of the new Schedule 7A of the TCPA. This provision envisages that the granting of all planning permissions in England will be subject to a condition that both of the following criteria are met:

- Development may not be begun unless a biodiversity gain plan has been submitted to the local planning authority (LPA).
  The biodiversity gain plan must specify, among other things, all the information about the steps taken or to be taken to minimise the adverse effect of the development on the biodiversity of the on-site habitat (and any other habitat), and the biodiversity value of the habitat before and after development. It must also set out any off-site gain or credits allocated to the development (which would need to demonstrate that the BNG requirement of 10% is met).
- The LPA has approved the biodiversity gain plan.
  Importantly, the LPA can only approve the biodiversity gain plan submitted if, among other things, the "*biodiversity gain objective*" is met. The biodiversity gain objective would in turn be met where the biodiversity value attributable to the development exceeds the pre-development biodiversity value of the on-site habitat by at least 10% (i.e. the current "*relevant percentage*" for BNG[1]).

The Environment Bill also seeks to require net gains to be maintained for a minimum of 30 years. The two main legal mechanisms for securing net gain outcomes are:

1. conservation covenants, to be entered into between landowners and responsible bodies (e.g. LPAs), which will bind the relevant sites as local land charges. Importantly, this mechanism provides the scope for longer agreements than 30 years to be entered into for the maintenance of net gains; or
2. planning obligations (i.e. section 106 agreements) which run with the land.

It is important to note that the proposed bill would not change existing planning policies relating to BNG. The current position in the National Planning Policy Framework and supporting planning practice guidance (on the natural environment) is that the English planning system should provide BNG where possible. A number of LPAs have also incorporated BNG as a planning requirement within local development plans (although, in practice, different approaches have been employed by LPAs across England).

Calculating net gain

References to biodiversity value are to be calculated using the "*biodiversity metric*", produced and published by Defra (currently in conjunction with Natural England)[2].

Natural England published the most up-to-date version of the biodiversity metric (i.e. Biodiversity Metric 2.0) in July 2019 as a "*beta test version*"[3]. The metric encompasses both area (e.g. grasslands) and linear (such as rivers and streams) habitats. The metric does not account for individual wildlife species. Instead, the metric uses broad habitat features as a proxy measure for the biodiversity 'value' of the species communities that make up different habitats. The metric calculates biodiversity units (i.e. the 'currency' of the metric) based upon: habitat size, habitat condition, habitat distinctiveness and spatial location[4]. Through this metric, the value of the land before and after development can be assessed.

Natural England has advised that the revised Biodiversity Metric 3.0 (i.e. the future successor of the beta test metric 2.0) is scheduled to be released in spring 2021. Natural England has also indicated that the Biodiversity Metric 3.0 will include detailed guidance and case studies illustrating how the calculation has been applied in previous projects to assist users.

Pending the release of the new metric, Natural England has recommended that environmental consultants, developers and landowners should continue to use the Biodiversity Metric 2.0 to calculate the biodiversity value of their sites for existing development projects.

Pre- and post-development biodiversity value

The biodiversity value attributable to the development is the total of the predicted habitat value of the development site on completion of development, any registered off-site biodiversity gain allocated to the development and any biodiversity value of any biodiversity credits. In order to meet the biodiversity gain objective, the value attributable to the development must be greater than the pre-development value.

Pre-development value

Where planning permission is being applied for a development site, the baseline for assessing BNG is to be measured from the date on which planning permission is applied for. However, where a development site has already been granted planning permission, then the baseline for the pre-development biodiversity value for any future development would be calculated based on the condition of the site when the final permission was granted.

The Environment Bill seeks to ensure that the biodiversity of the land cannot be purposefully reduced or damaged before planning permission is granted. As such, if a developer were to carry out activities on their land on or after 30 January 2020 that were not in accordance with planning permission, and as a result of those activities the biodiversity value of the on-site habitat became lower than it otherwise would have been, then the pre-development biodiversity value of the on-site habitat would be taken as the value immediately before the activities were carried out.

Post-development value

The post-development biodiversity value of the land is defined as the projected value of the on-site habitat at the time the development is completed.

The post-development biodiversity value is to be calculated by taking the pre-development biodiversity value and adding or subtracting the biodiversity value of the on-site habitat, depending on whether the completed scheme will have increased or decreased the biodiversity value. If the increase in biodiversity value was considered by the LPA to be significant, then this can only be considered part of the post-biodiversity value where the habitat enhancement will be maintained for at least 30 years after the development is completed through a planning condition, planning obligation or conservation covenant.

Key mechanisms for delivering net gain

The Environment Bill sets out three mechanisms for delivering net gain:

1. through increasing the post-development biodiversity value of on-site habitat (i.e. land to which the relevant planning permission relates);
2. through acquiring biodiversity units of any registered off-site biodiversity gain allocated to the development (e.g. buying biodiversity units from landowners, environmental organisations, or LPAs); or
3. through purchasing statutory biodiversity credits for the development (note that this option would only be available if the above two options were not).

“Defra has confirmed that the Environment Bill’s return to Parliament has been delayed once again (by at least 6 months) and that the bill is now expected to receive royal assent in autumn 2021, at the earliest.”

On-site biodiversity gain

There is nothing stated in the Environment Bill to say that the priority is to provide net gains on the development site. However, the biodiversity metric plainly has this effect.

The preference for making gains on-site will be delivered through the design of the biodiversity metric as well as policy and guidance so that on-site habitat compensation is incentivised. For example, in the post-net gain calculation made using the Defra biodiversity metric, additional factors to account for the risk associated with creating, restoring or enhancing habitats are considered. One of these risks is the ‘off-site risk’, a score based on whether any compensation is undertaken sufficiently nearby to the site at which habitat is lost. Therefore, if a habitat is created to compensate for losses elsewhere, the metric will account for its proximity to the impact site, thus incentivising net gain delivery that is on or close to the impact site.

Registered off-site biodiversity gain

"*Registered off-site biodiversity gain*" is where land outside the development site, normally in the local area, can be allocated to the development by way of the biodiversity gain site register.

The biodiversity gain site register will be a register of 'gain sites'. This is land where a person is required under a conservation covenant or planning obligation to carry out works for enhancement of the biodiversity of the habitat, maintained for at least 30 years, and is then made available to be allocated in accordance with the terms of the covenant or obligation to one or more developments for which planning permission is granted.

The Environment Bill provides that Defra may introduce future regulations in relation to the register. These regulations, once introduced, should also set out what should be recorded in relation to land on the register, including the location, the works to be carried out to achieve habitat enhancement, who is required to maintain the habitat enhancement, any development to which the habitat enhancement has been allocated and the biodiversity value of such habitat enhancement.

We understand from the recent communication with Natural England that the biodiversity gain site register is expected to go live between autumn and winter 2022 (although is subject to change). In any event, the register will need to be ready ahead of the BNG requirement coming into force for TCPA developments.

Biodiversity credits

As a third option for delivering net gain, the Environment Bill provides that Defra may set up a system to sell supplies of statutory biodiversity credits to developers, which will be equivalent to specified gains in biodiversity value and eligible for inclusion in the developers' biodiversity gain plan (discussed above). The price of these credits has not yet been set; however, they will be higher than market value. Any proceeds received by Defra from the sale of biodiversity credits must be used for enhancing habitat diversity, buying land in England to do so, or for operating or administering such arrangements. The aim behind this third option is to design a system whereby funds are invested directly into predetermined nationally strategic habitats.

Natural England is currently running a pilot scheme to test the practical implications of a national biodiversity credit system. The pilot scheme was anticipated to last until February 2021.

Developments which are not subject to the mandatory BNG requirement

The following types of developments (i.e. not permitted under the TCPA regime) fall outside the scope of the proposed mandatory BNG requirement:

- nationally significant infrastructure projects granted permission by a development consent order
- marine development (the government is, however, looking to introduce a separate approach to address net gain for marine developments. As such, environmental professionals working in the marine sector should keep abreast of future consultations on this topic).

Defra also has the power to modify or exclude from the mandatory BNG requirement certain developments through future regulations. For example, the Environment Bill provides that modifications or exclusions of the general planning condition can be made where the on-site habitat is "*irreplaceable habitat*", in recognition of the fact that it is impossible to achieve net gain in relation to such habitats. Examples of irreplaceable habitats include ancient woodland, blanket bog, limestone pavement, sand dunes and salt marsh. Where

> **"Although the mandatory BNG requirement is likely to impose additional delivery costs on future developments, it also presents an exciting opportunity for greener planning which will in turn lead to more attractive and sustainable sites."**

development does impact irreplaceable habitats, regulations must require measures, agreed with the planning authority, to be taken to minimise the negative impacts of the development on the biodiversity of the habitat.

Implications for environmental professionals

A crucial ingredient in the successful delivery of BNG is the collection of relevant data for development sites and sites proposed for biodiversity gain early in a scheme. Developers and landowners will no doubt require input from ecologists throughout the process, such as:

- establishing an appropriate baseline for development sites
- devising viable management plans to help developers/landowners/delivery partners demonstrate how net gain will be maintained for a minimum of 30 years
- gathering relevant data and carrying out metric calculations to identify opportunities for potential sites to optimise returns on the emerging register or credit platform
- formulating monitoring scheme to ensure the viability of a proposed scheme.

Implications for developers

Although the mandatory BNG requirement is likely to impose additional delivery costs on future developments[5], it also presents an exciting opportunity for greener planning which will in turn lead to more attractive and sustainable sites. For savvy developers, the Environment Bill might lead to new commercial gains if land could be offered for units or credits.

It is important to consider how BNG will be incorporated into and delivered in the existing and future development schemes early (i.e. prior to entering into any agreements with landowners to secure future development sites to ensure sufficient land will be secured to deliver the biodiversity gain).

We at Freeths LLP have seen that some LPAs are already imposing BNG through planning policies even though the Environment Bill has not yet gained royal assent. As such, the starting point for developers currently dealing with development sites that are likely to impact on-site habitats is to check for any requirements relating to BNG in the current (and any emerging) local development plan. They should also seek to align proposed schemes with existing guidance and standards (such as those published by the CIEEM-IEMA-CIRIA group); again, there will likely be demand for ecologists to assist with this process.

Further, even where the local development plan does not prescribe strict requirement on net gain, developers (who may need to be guided by their ecologists) could still be planning ahead now (particularly for longer-term sites going through local plan allocation) for opportunities to address BNG as early as the design stage or even during site selection (such as by considering whether on-site mitigation can be delivered). Data collection for any on-site habitat will be key to the successful delivery of BNG within a development scheme, and should begin as early as possible.

Implications for landowners

The new BNG requirement undeniably comes with advantages for landowners in relation to the potential to sell units on the biodiversity gain site register.

The major challenge at this stage, though, is the lack of information about how that register will take shape, which will need to be confirmed by Defra by way of secondary legislation. Currently the bill envisages that future regulations will address key details, such as circumstances in which land would be eligible to be registered as "*gain sites*"; the application process to register potential land (the bill contains quite a lot of further issues on this point[6]); information to be recorded in relation to any land that is registered; removal of land from the register; and fees payable in respect of any application. As such, landowners should be alert to upcoming consultations on future regulations.

Landowners also need to keep in mind that sites must achieve nature conservation outcomes that demonstrably exceed existing obligations (i.e. proposed biodiversity gain sites would not simply deliver something that would occur anyway). Defra is due to publish more guidance to assist landowners (and assisting ecologists) on this point. In the meantime, however, landowners could consider undertaking indicative metric calculations to assess the biodiversity value of potential sites. This will likely involve appointing an ecologist early to gather the relevant data to assess biodiversity value of potential sites.

Notes

1. Note that the Secretary of State may introduce regulations to change the "*relevant percentage*" in future (see draft Schedule 7A, para 2(4) of the TCPA).
2. Note that this metric may, from time to time, be revised and republished (see draft Schedule 7A, para 4(3) of the TCPA).
3. Note that Biodiversity Metric 2.0 updates and replaces the original Defra biodiversity metric published in 2012.
4. Natural England has indicated that information relating to "*ecological connectivity*", which was required in the Biodiversity Metric 2.0 (beta test version), will not be required in the final Biodiversity Metric 3.0.
5. Defra reported in 2019 that the expected overall direct cost to developers of introducing mandatory BNG in England will be £199 million per year.
6. For instance, Defra is yet to introduce regulations to confirm who would be entitled to apply to register land on the biodiversity gain site register, the procedure to be followed, how an application is to be determined and any appeals process against the rejection of an application.

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Arunsiri and Sabrina are both members of Freeth LLP's Environmental Law Team, which continues to monitor the progress of the Environment Bill.

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Ethical Dilemmas

This is our series of problems and conundrums that can face members during their professional practice. The purpose of the feature is to encourage you to reflect on and explore scenarios that you may face during the course of your work and to consider the appropriate ways to respond to ensure compliance with the *Code of Professional Conduct.*

In the December 2020 issue of *In Practice* we described a dilemma in which a very experienced senior Ecological Clerk of Works (ECoW) has provided written advice to inform an innovative and non-standard method statement with the main contractor on a construction site. The method statement is intended to address an almost unique situation. In an email exchange, it has been agreed these works will be undertaken while the senior ECoW is away on holiday but supervised by one of her experienced ECoW colleagues. At the last minute, a less experienced ECoW, who has never previously visited the site, is sent to site to observe the works, because the intended ECoW who would have provided holiday cover has had to take time off due to illness.

When works commence on site, the less experienced ECoW is worried that the method statement is not consistent with published good practice and they advise the contractor's team on site to stop immediately. There is no written evidence that the senior ECoW actually approved the final method statement that is being used.

The contractor is insistent that works should recommence immediately, on the basis that they are working to an 'agreed' method statement, or they will ask for the less experienced ECoW to be taken off the project on the grounds of incompetence. The less experienced ECoW is very concerned that the method statement is unsound and if implemented may result in a wildlife crime. He is unsure what to do and concerned about the implications for the biodiversity interest and their own position.

We asked what you would do in this situation and what information you would require to inform your decision?

Our advice

In seeking a solution, first distinguish between the facts, and any assumptions and claims expressed, and how these may have shaped consequent conclusions, opinions and fears; such as:

a. Establish the facts – as evidenced by the written correspondence between the original ECoW and the contractor:
   i. This is a unique situation requiring a non-standard solution.
   ii. Written advice was offered to the contractor describing how an innovative approach might be employed.
   iii. The advice given by the original ECoW represents a departure from standard good practice.
   iv. It was agreed that the works will proceed while the ECoW who wrote the method statement is on leave.
   v. The intended alternative experienced ECoW is not available at the last minute.
   vi. A less experienced ECoW unfamiliar with the site has to oversee the works.
   vii. Nothing exists in writing to confirm that the final method statement was approved by the original ECoW.
b. Identify any assumptions that have been made:
   i. The less experienced ECoW has assumed that a departure from published good practice represents a risk to biodiversity.
   ii. The person responsible for sending the less experienced ECoW to site at the last minute has assumed that they are competent to oversee the work.
c. Establish what claims have been made:
   i. The contractor claims their method statement has been agreed and is acceptable.
d. Clarify the basis upon which any opinions and fears have been expressed?
   i. Based on their own assumptions, the ECoW on site has formed an opinion that a wildlife crime may be committed or, at best, biodiversity may be harmed.

In these circumstances, and due to their lack of relevant experience, it would be unreasonable for the ECoW's company to expect them to make a decision on site and on their own. The ECoW should therefore request a temporary pause in works until they have been able to talk with the appropriate manager in their office. In talking to their manager, they should ask whether the contractor's claim can be verified (i.e. is there evidence that the method statement was agreed, albeit only verbally by the original ECoW?).

The manager should take over communication with the client at this point and – most important – they should establish if the contractor's final method statement is consistent with the written advice given by the original ECoW. If the method statement is consistent, the contractor's claim can be verified as correct.

Then, if the manager has full confidence in the competency of the original ECoW, they should advise the contractor that they can recommence work immediately. The ECoW on site should be instructed to oversee the works so that they are implemented in accordance with the 'agreed' method statement.

Caveats

1. For the manager to have full confidence in the original ECoW,

they need to be sure that any innovative approaches are fully described, explained and justified, in the same way that a departure from standard or best practice would be for non-standard ecological surveys (in accordance with Clause 6.3.7 of BS42020:2013). However, where the manager has cause to believe that the original ecological advice given to the contractor was unsound, they would be unwise to agree to works recommencing until a full review can be carried out. At best, this would be embarrassing and could incur substantial additional work and costs, and, at worst, could even result in a financial claim by the contractor against the ecological consultancy.

2. If the contractor's method statement is not consistent with the original ecological advice given, the contractor should be advised that they should halt until a method statement can be agreed; adding that to proceed otherwise would result in a possible wildlife offence.

Finally, the manager should remind all staff that where any final documents are agreed with a client, this should be recorded in writing and copied to all relevant personnel.

So, now for this issue's dilemma.

You are the in-house planning specialist working at an environmental NGO. From your weekly check of the local authority's planning portal, you discover that one of your colleagues has submitted a planning application to build a new hide and enlarge the existing wetland at one of your reserves. The reserve is a local wildlife site with a number of priority habitats and is regionally important for waders.

Unfortunately, when you review the planning application you find that the ecological assessment submitted to support it is far below the standards you would expect and, indeed, those you expect of external developers when reviewing ecological information in support of planning applications. There is an over-reliance on historic data/old survey information, the timings of some of the current surveys are questionable, at least two priority habitats are not mentioned and the proposed mitigation, especially in relation to the potential increase in visitor numbers, seems inadequate.

You call your reserve manager colleague to find out more. They are more senior than you and sit on the NGO's management board. You don't know them well as they are relatively new in post.

They tell you they are really excited by the development as they hope it will bring more visitors and increased revenue. They say the site is well managed and the NGO is a nature conservation specialist, so they expect the local authority will trust it and be able to make a positive decision based on the ecological assessment submitted. If further survey information is needed they suggest it is collected after the application is approved.

How would you handle this situation with your colleagues, the local planning authority and the local community?

Complaints Update

Breaches of the Code of Professional Conduct

At a professional conduct hearing held on 6 November 2020, Mr David Bennett MCIEEM of Clwydian Ecology was found in breach of clauses 2, 3, 4, and 5 of the *Code of Professional Conduct* in respect of the standard of his ecological surveys and reports and non-compliance with the requirement to provide evidence of continuing professional development. Mr Bennett has been reprimanded with sanctions and a requirement to demonstrate improvement in his work.

Coping with Depression: an Ecologist's Perspective

Is it all about the biology? The animal instinct for fight, flight or freeze?

Mike Oxford CEcol CEnv FCIEEM

As ecologists, CIEEM members are familiar with complex biological systems that have self-regulating mechanisms. We also know that animals have an innate desire for self-preservation, ready to fight, flee or freeze in response to danger. Humans have the same response, and our own nervous systems are triggered when we perceive risk in our environment. Unfortunately, most of our emotional responses to the modern world are rooted in our distant evolutionary past and are still hard-wired into our physiology.

While the 'triggers' for the stress response are an essential part of our self-regulating make-up, they do not necessarily serve us well when we become overwhelmed with modern life. Self-regulation in this form can be tough to cope with. However, there is growing evidence that we can also optimise our autonomic functioning and bring our body back into a state of safety that activates our innate capacity to heal.

Recognising that I have depression

I have depression. While very hard to accept, it became official during 2020 when, as a last resort, my GP prescribed antidepressants. And while many would describe 2020 as a pretty awful year, my own depression has nothing to do with COVID-19 and the impacts of a global pandemic. In fact, my best months were during the first lockdown.

To recognise I have depression has been shocking. I am too happy by nature; too strong; too busy; too in touch with my own feelings. I can't be depressed. I'm the kind of person who has gotten my act together. However, despite my objection to the idea, my body seems to be persistently telling me: "*I am most definitely not OK!*" That's been really hard to accept. I'm not the super-resilient person I thought I was. I'm depressed and no amount of intellectualising and thinking positive thoughts has been able change where I am at the moment. Whatever my preconceptions, it isn't all in the mind. If it was that simple, I would use willpower to snap out of it. The last 18 months have been some of the most difficult of my life.

At times when I feel at my lowest, it's almost paralysing. I can hardly motivate myself to do anything at all. I have no energy and very little interest in things that I know really interest me. I feel as if I am an observer looking at my own internal workings and unable to change how I feel by simply *thinking* positive thoughts. It comes in waves and I can rarely predict when my emotions are about to suddenly plunge over a cliff. I know words and events can act as a trigger, but it's hard to discern any clear pattern of cause and effect. I guess that's part of the problem too. Subconsciously I am constantly on alert, scanning for the next threat. I expect it is very similar for others with depression, although I am sure their triggers will be different.

Fortunately, and help from my family, I reached a point in mid 2020 when I recognised my attempts at self-help weren't enough. It was time to talk to my doctor, who was really great, and he talked me through my options, one of which was medication.

At this point, the terms 'rock' and 'hard place' came to mind, as turning to antidepressants felt like the final admission that I was a 'failure' at some deep and profound level. But then I stumbled across an article that explained how at least some antidepressants work. I discovered that the drug my doctor was recommending (sertraline) acts by inhibiting the brain's reabsorption of serotonin. Or, put another way, this drug means I end up retaining more serotonin in my brain and, since it's one of the body's happy hormones, the end result is that I feel less depressed and much more able to cope.

This was a bit of a lightbulb moment. It began to shine some much-needed scientific light on my most urgent questions. Why do we generate negative emotions that seem to be so counterproductive? In evolutionary terms, what's the benefit of being in a state of almost perpetual misery? And why can't I snap out of it?

Fight, flight or freeze – a nervous system response

It all seems a bit obvious now, but previously I had never really thought about *where* my emotions actually originate. I imagined they 'spring into existence' from somewhere in my head. In my simple model, good and bad emotions just show up in response to

good and bad things happening in my life. They all come and go. Or more to the point, they used to come and go. A feature of being depressed means that I now often remain depressed even when good things are happening around me. Worst of all, I am conscious that I am unable to feel happy emotions, even when I know I have reason to be happy. This often leaves me with a terrible feeling of being disconnected from people and events around me.

As a self-employed person working from home, my normal tendency when I've felt things are beginning to overwhelm me has been to literally curl up for an hour. This is where I can close my eyes and shut out the world. It puts a stop to unwelcome stimuli from every direction. I thought this was just something I did … but it seems that this is symptomatic of a well-known physiological response across the whole Animal Kingdom. It's a form of shutdown, a means of ensuring survival. It's part of our stress response when facing a perceived threat. You're probably familiar with *flight* or *fight* but I have discovered that my response is to *freeze*. Since I have no option to physically fight or flee, I just play dead.

I've read about flight or fight in ecology books, watched them acted out on the Serengeti (on TV), and have even seen it all through the comic interaction of our dog with neighbourhood cats. But I had never previously thought about it in terms of my own behaviour.

This is where the light begins to shine on the first of my questions. Flight, fight and freeze are controlled by the autonomic nervous system (ANS). As such, the ANS manages *automatic processes* and is constantly scanning the environment for cues of threat and cues of safety. This all goes on without our conscious awareness. Information from our senses is fed back to what is evolutionarily the oldest part of the brain, the brainstem, enabling the body to act accordingly. When the demands of the body change, the ANS responds automatically to meet its needs.

This is the reason why I can't simply snap out of my freeze response: the response is automatic, and I have no conscious control over it.

Trauma's effect on nervous system response

So, what about my other questions? Why does this all happen in the first place? Why have I become depressed?

Since the ANS functions to protect us, something clearly goes wrong if we end up unable to return to a normal safe and social (non-stressed) state. It seems problems occur when the two main divisions of the ANS, principally the sympathetic (SNS) and parasympathetic systems (PSNS) (Figure 1), fail to regulate vital functions to achieve homeostasis.

Under normal circumstances, the SNS prepares us for fight or flight by increasing the heart rate, increasing blood flow to the muscles and decreasing blood flow to the skin. Nerves for the SNS originate in the thoracic and lumber spine and connect to individual organs. In contrast, the PSNS regulates actions that do not require rapid response, such as rest and digestion; it also turns off the sympathetic response. Parasympathetic control of the organs is largely through just one cranial nerve originating just below the brain stem – the *vagus nerve* – which happens to be the longest nerve in the body. It is also, arguably, one of the most important when it comes to restoring a healthy functioning ANS.

> **"As a self-employed person working from home, my normal tendency when I've felt things are beginning to overwhelm me has been to literally curl up for an hour."**

Unfortunately, our ANS can be severely disrupted by all kinds of trauma, both

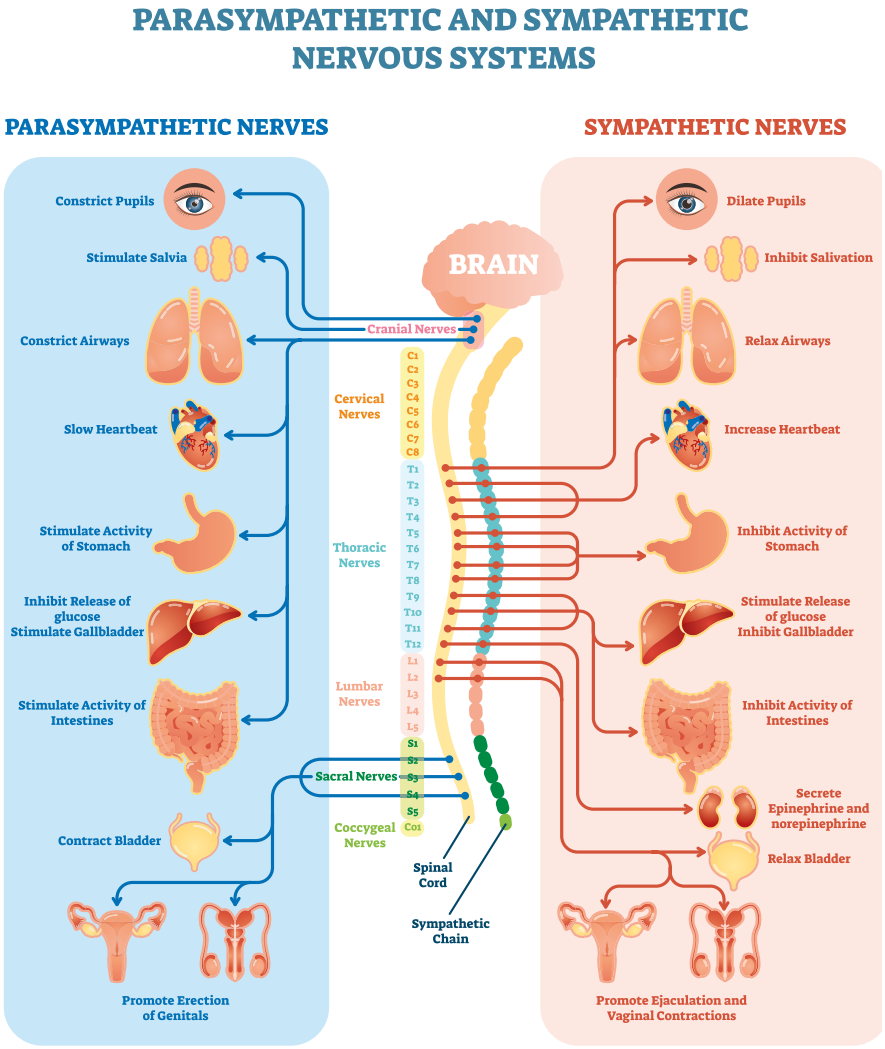

Figure 1. The parasympathetic and sympathetic nervous systems

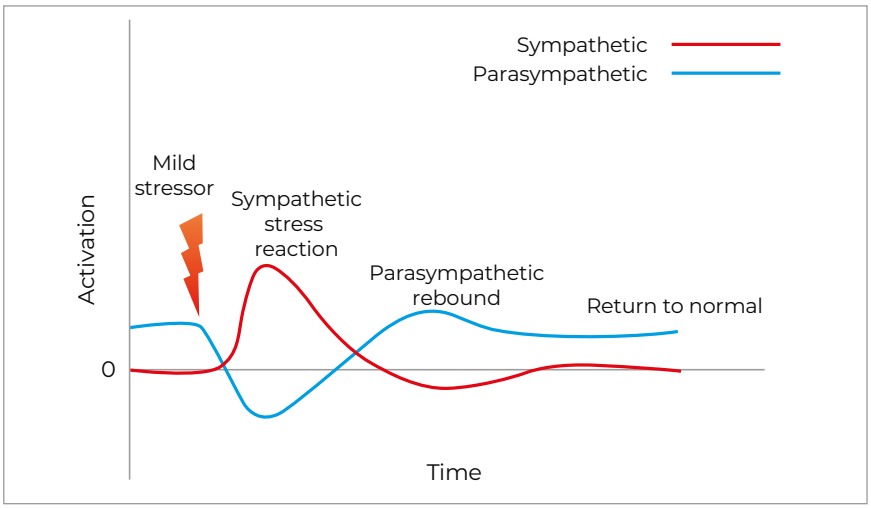

Figure 2. Mild acute stress response. With only minimal 'normal' levels of stress, people's attitude to life is characterised by the words: *I can*! Reproduced from Payne *et al*. (2015) under the Creative Commons Attribution License (CC BY).

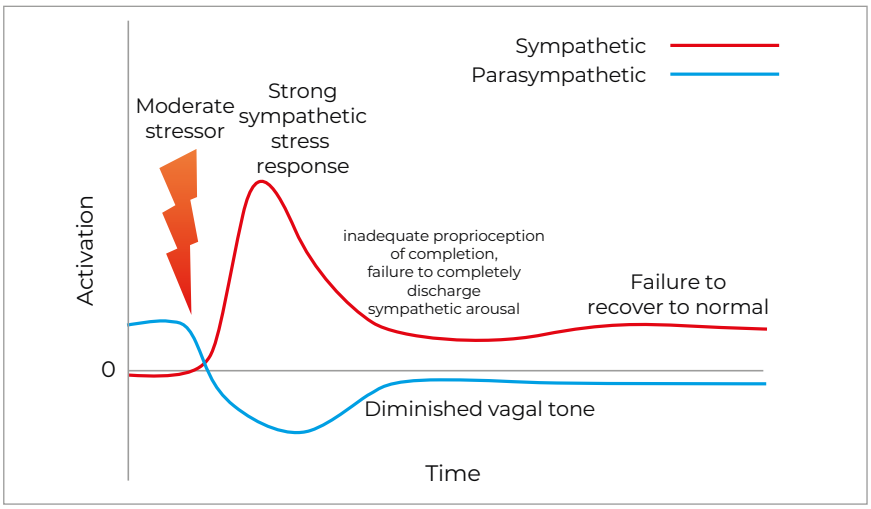

Figure 3. Chronic stress response. With increasing levels of stress, people's attitude to life is characterised by the words: *I should* or *I must*! Reproduced from Payne *et al*. (2015) under the Creative Commons Attribution License (CC BY).

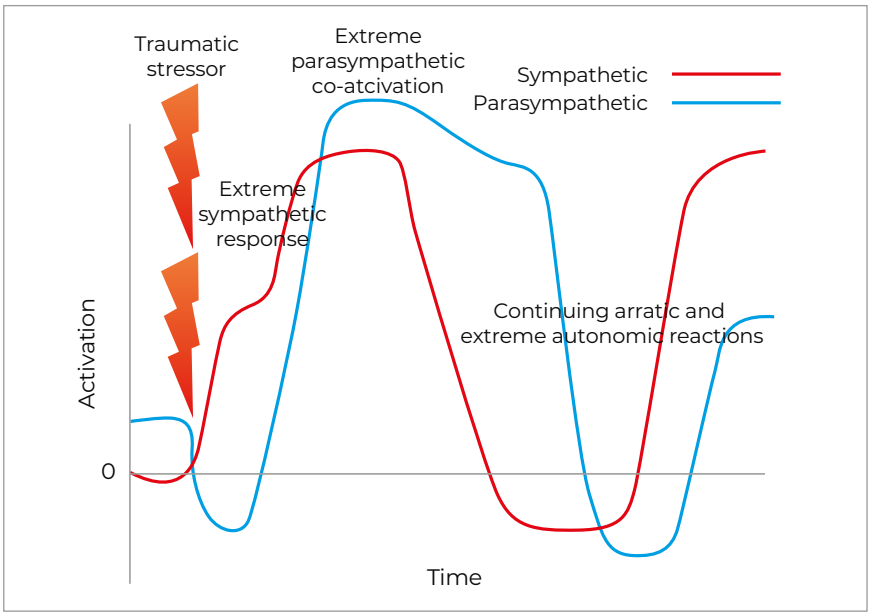

Figure 4. Traumatic stress response. With high and persistent levels of stress, people's attitude to life is characterised by the words: *I can't*! Reproduced from Payne *et al*. (2015) under the Creative Commons Attribution License (CC BY).

physical and psychological. The kinds of events that hurt and leave a permanent mark. The death of a loved one, loss of a job, breakup of a relationship, sustained pressure at work or an illness or injury are just a few examples.

What is perhaps not so commonly understood is precisely how trauma affects our physiological ability to recover. However, there is a rapidly emerging range of both popular publications and peer-reviewed scientific articles on this and related topics. For instance, the subject is discussed at length by Payne *et al.* (2015). They present what I think is a useful summary of the effects of different levels of trauma on the ANS and our subsequent ability to recover. Figures 2, 3 and 4 show the sympathetic and parasympathetic nervous response to three levels of threat or trauma.

Mild stress response: in Figure 2, where a mild stress response is required, the SNS is activated together with a lessening of vagal (parasympathetic) activity. Positive feedback within the whole system leads to a rapid reset and resumption of normal functioning once the threat has been addressed.

Chronic stress response: Figure 3 shows that if the stress rises above a certain intensity or duration, the sympathetic response is more intense and, where there is an inadequate defensive response, the system as a whole may fail to reset to normal functioning. This state may persist indefinitely, giving rise to a state of 'chronic stress', where the system responds inappropriately to environmental challenge with excess activation (e.g. irritability with loved ones).

Traumatic stress response: in the face of extreme challenge (Figure 4), when we are either overwhelmed or unable to take action, there is first an extreme sympathetic activation with loss of vagal (parasympathetic) tone. With continued challenge, the ANS then becomes locked into a dysfunctional state of extremely high activation of both the sympathetic and parasympathetic systems, leading to freeze, collapse or dissociation, and may also oscillate erratically between extremes. People in this state may struggle to manage alternating depression and extreme anxiety or rage.

Emerging understanding

Although I still have a lot to learn, and have some way to go before I am able to properly reset my ANS, I do at least now understand why I have good and bad days and why sometimes I just feel everything is too much. I also draw comfort from knowing that the erratic mood swings and accompanying emotions are all part of the disease.

The importance of the vagus nerve

Just about everything I have read about restoring the normal functioning of the ANS mentions the importance of the vagus nerve (see References and further reading, and you can also search online). Basically, when our SNS remains activated longer than evolution intended, we must actively bring the body back to a more relaxed and natural resting state. It appears this can be achieved through stimulation of the vagus nerve. There are a variety of interventions for this, including meditation, counselling, grounding and stretching exercises, interoception, and even humming! If you wish to learn more, you may be interested to watch Seth Porges' YouTube presentation (see References and further reading).

I hope to report back on my own experiences of working with the vagus nerve in a future article.

Finally: facing the stigma

On top of all the other perceived threats my nervous system is managing, I've also had to accommodate one more significant fear. The fear of what other people will think of me.

For me, there is still a stigma around admitting that I am in poor mental health. It's hard to imagine that people won't think less of me; after all, it's something that I'd rather not admit – even to myself. I also sadly know of people who have not received the support and understanding that they should from their colleagues and managers. In this respect I am fortunate because the reaction I have received from others when I have told them about my depression has been nothing but reassuring. This is hugely important because *reassurance* helps create an environment that is safe. Each demonstration of empathy, each understanding word, makes my world less threatening. It helps move me from a state where my SNS is activated to one where I am able to once again rest and relax.

I can also make this argument from a rational point of view. Would I prefer people to see me performing at a level well below my best and leave them thinking that it's because I am unreliable, incompetent or out of my depth, or even erratic, lazy or simply negligent? Or would I prefer that they know I am simply unwell? The latter is much easier to live with. It's less frightening.

CIEEM Member Assistance Programme

Members are reminded that CIEEM offers a Member Assistance Programme. CIEEM members can access an extensive package of support including telephone advice lines, counselling services and a website full of information and practical advice on topics as wide ranging as debt management, stress management and mental health. The services are available 24/7 and are delivered confidentially. More information is available via the My CIEEM area of the website under 'Member benefits'.

Last thoughts

Over the coming months I wish to explore – with the assistance of my ANS – how I can return more regularly to a state of safety. A place where I can consciously activate my body's innate capacity to heal and where I can find greater resilience to withstand the stresses that life throws up.

References and further reading

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About the Author

Mike Oxford is not a neuroscientist or psychologist, nor is he a qualified therapist. He is only passing on what he has picked up from reading lots around this topic and by talking with people much more qualified than himself. The article is based on his own experience of depression and his limited understanding of some of the physiology around how we humans sense and feel things. At heart he knows he is a happy soul.

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Meet the Editorial Board

This issue, *In Practice* has a change of Editor. We take the opportunity to introduce you to the current Editorial Board and new Editor, Nik Prowse.

The Board members contribute to each and every edition by reviewing all the feature articles we receive and providing comment and feedback. Their expert judgement ensures that the content is accurate, informative, well-targeted and relevant to CIEEM members. The Board broadly represents the membership in terms of expertise, profession and geographic location.

Jon Barnes CEnv MCIEEM is an experienced environmental manager, managing a UK-wide team of ecologists. He currently works as an Associate Director for Jacobs UK, leading their Freshwater Ecology team. The team provides expert advice through planning, consenting and compliance, from small fish pass and river restoration projects to the delivery of the most complex infrastructure projects in the UK and Ireland. Most of his time is spent working in freshwater and marine protected areas, and as such he has specialised in the delivery of EIA, HRA and WFD assessments. When he was still allowed into the field, his formative years were focused on undertaking estuarine and coastal fish population assessments, studies of invertebrate taxonomy, habitat mapping and monitoring of non-native species.

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Kate Bayley MCIEEM is a senior advisor with the Environment Agency's National Agriculture team, working on the development of environmental land management and shaping associated technical guidance. Kate has a broad range of experience, having worked with the EA for 16 years on complex and high-profile casework both at an area and national level. Kate specialises in regulatory aspects of biodiversity and air quality issues, and in particular the regulation of atmospheric nitrogen.

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Andrew Cherrill CEnv MCIEEM is Senior Lecturer in Applied Ecology and Countryside Management at Harper Adams University. He is part of a team running a suite of programmes including the UK's only MSc in Entomology, plus a CIEEM-accredited undergraduate degree in Wildlife Conservation and Environmental Management. Andrew's teaching and research revolves around wildlife conservation science, entomology and field survey skills. He has been a member of the *In Practice* editorial panel for almost 10 years.

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Dominic Coath MCIEEM has worked as an ecologist for over 20 years, mainly in the public sector but also as a consultant and for a number of wildlife NGOs. He worked for several years in London and the south east advising on planning and green infrastructure for Natural England. He currently works for the national biodiversity team at the Environment Agency, developing policy that will better embed biodiversity outcomes into its ways of working. Occasionally he gets let out of the office to see if any of this is doing any good.

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Joanne Denyer MCIEEM is a freelance botanical and bryological consultant based in Ireland. She completed a DPhil in Plant Ecology (grassland ecology) at the University of Sussex and subsequently worked on the impacts of land use, climate change and grazing on upland plant communities at the Macaulay Institute in Aberdeen (now the James Hutton Institute). Joanne specialises in the survey and assessment of wetland habitats, with a focus on petrifying springs, fens, bogs and wet woodland and has worked on a wide range of projects and sites in relation to this habitat. She also provides training on bryophyte ecology and identification.

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Neil Harwood CEnv MCIEEM is an Associate Director at Arup and has over 20 years of experience in ecological consultancy, based in both the UK and Australia. As well as being on the Editorial Board, Neil is a member of CIEEM's Professional Standards Committee. His particular specialisms are in birds and bats and he remains optimistic about getting back out on site again soon. He has a broad range of experience across many industries and sectors, including large-scale, nationally significant infrastructure, energy and mixed-use schemes. Neil's real passion is in the emerging drive for net gain, strategic enhancement opportunities and landscape-scale ecological restoration, and collaborations and partnerships that deliver better outcomes for nature conservation.

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Claire Howe
MCIEEM is a senior specialist for mammals at Natural England, providing national expertise on the conservation management of mammals. Her role is to interpret evidence to provide expert, practical advice across Natural England in relation to licensing, planning and protected sites casework and to set standards for mammal conservation work. She has previously held roles in species regulation and licensing at Natural England. Prior to joining Natural England she held roles within environmental consultancies and also completed a PhD in hedgehog ecology at the University of Bristol.

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Caroline McParland
CEnv CBiol MCIEEM is an environmental consultant with 16 years' consultancy and 5 years' academic experience. She currently works as a Technical Director for Ecology at WSP, carrying out Habitats Regulations Assessment and EcIAs, mainly for transport and energy projects. She is also CIEEM's Vice President for Scotland, and has contributed to development of EIA Guidelines for New Zealand and updates of CIEEM Guidelines for EcIA in the UK and Ireland. Caroline has a BSc Honours degree in Zoology from the University of Aberdeen, and a PhD in Environmental Biology and Ecology from Canada's University of Alberta, where she researched wildfowl and wetland ecology in the prairie pothole region. Previously she has been a freshwater ecologist before taking on amphibian, reptile and terrestrial habitat work and then becoming a protected species ecologist and EcIA specialist.

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CEnv MCIEEM is an Associate Director and Technical Authority within the Atkins Ecology Practice and is also the Ecology Lead for HS2 London to West Midlands (seconded). Kat has 20 years of experience relating to biodiversity issues and environmental management. This includes extensive experience of managing the scope, programme and budget of large environmental and ecological projects in the UK and overseas. Kat has a background in environmental science and has an interest in habitat creation, conservation translocations and innovation in ecology. Kat is a member of the Ecology Detection Dogs of Great Britain and Ireland Working Group.

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Patrick White
MCIEEM works at Edinburgh Napier University and teaches a range of subjects from statistics to bird surveying on a CIEEM-accredited MSc course. He also carries out applied research in a range of areas relating to surveying techniques, species conservation, biodiversity and ecological modelling. He joined CIEEM several years ago and has previously contributed to the Scotland Section committee, while he is currently on the committees for the Academia SIG and TECDC.

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Internal contributions coordinator
Jason Reeves
CEnv MCIEEM is Head of Policy and Communications at CIEEM. He leads CIEEM's policy and advocacy activities, being responsible for ensuring that CIEEM is recognised by its members and external stakeholders as the voice of the profession. He is also responsible for ensuring that CIEEM's external communications are effective and engaging. He has over 15 years of experience in the ecology and environment sector.

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***Editor* Nik Prowse**
has a BSc in Biological Sciences and a PhD in evolutionary biology. After his PhD he moved into science publishing and since 2004 has been a freelance editor and project manager, specialising in the life sciences and medicine. In that time he has copy-edited many books, including on a range of ecology subjects. He has also project managed the production of over 80 large academic textbooks, including several encyclopedias, and been Managing Editor on a suite of trainee medical journals. He is an Advanced Professional member of the Chartered Institute of Editing and Proofreading. The best part of his role across all aspects of his editing work is engagement with the authors of the materials he helps to publish, and ensuring that they are treated in the best way to pass on valuable knowledge to the reader.

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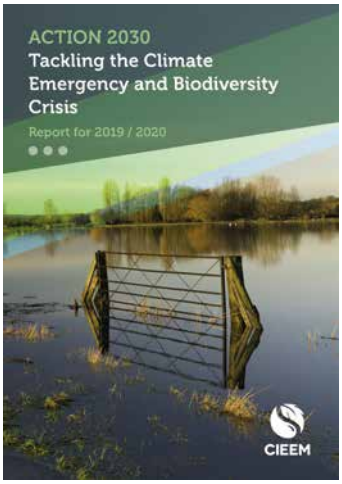
Policy Activities Update

Amber Connett GradCIEEM
Policy and Communications Officer, CIEEM

Following the postponement of major global events in 2020, including the UN Biodiversity Summit (COP15) and the UK Climate Conference (COP26), 2021 is set to be an important year for the environment. We will continue to work with our Strategic Policy Panel, Country Policy Groups, Action 2030 and Special Interest Groups to influence policy and forthcoming legislation surrounding these events and wider changes.

The Action 2030 group has published its 2019–2020 activity report (https://cieem.net/resource/action-2030-tackling-the-climate-emergency-and-biodiversity-crisis-report-for-2019-20/), along with starting a pledge for climate action. Find out what you can do at https://cieem.net/i-am/influencing-policy/action-2030/2021-member-pledges/.



UK and England

In December 2020, the All-Party Parliamentary Group (APPG) for Nature held a virtual 'parliamentary roundtable' event on nature-based solutions (NbS), jointly hosted with the RSPB. Speakers presented the latest research in NbS, followed by a wider discussion amongst parliamentarians. The event was attended by Lord Blencathra, Kerry McCarthy MP and Tony Lloyd MP as well as environmental organisations. Minutes and the event briefing can be found at https://cieem.net/appg-for-nature/. In January, the APPG for Nature also held an event on the impact of coronavirus on conservation in January, jointly with the APPGs on International Conservation and Zoos and Aquariums. The group is also planning an event in February/March on Local Authority capacity to deliver the 25 Year Environment Plan.

In recent years there have been several initiatives in England attempting to streamline licensing for protected species by taking a more strategic view, rather than focusing on the protection of individuals. We recently published our position (https://cieem.net/resource/cieem-position-statement-on-strategic-protected-species-licensing-schemes-december-2020/), welcoming initiatives to streamline the protected species licensing system for the benefit of all stakeholders, provided such initiatives demonstrably enhance the conservation of the species concerned.

We also set out our response to amendments to the Environment Bill, tabled by Bill Wiggin, Conservative MP for North Herefordshire, which will undermine the environmental assessment process of the Conservation of Habitats and Species Regulations 2017/1012 (https://cieem.net/amendments-to-weaken-environmental-protections-will-make-everyone-worse-off/).

Members of the CIEEM Marine and Coastal Special Interest Group helped with our response to the 'Updated UK Marine Strategy Part Two: Marine Monitoring' consultation and attended the January meetings of the Country Policy Groups to ensure our work for 2021 covers marine and coastal issues.

In 2020, we also signed up to Nature Nearby, a letter to UK Prime Minister Boris Johnson on equal access to nature (https://youthfornature.uk/2020/11/16/letter-to-the-prime-minister-on-equal-access-to-nature/).

Scotland

We are pleased to announce that, in December 2020, CIEEM was admitted as a member of Scottish Environment Link. This will allow us to contribute to a stronger voice for the environment, bring opportunities to collaborate with a range of organisations in the environmental sector and assist with learning and sharing information with organisations who have similar goals to us.

The Scottish Policy Group has recently responded to consultations including the 'Draft Strategy for Environment, Natural Resources and Agriculture Research 2022-2027' and 'Draft Infrastructure Investment Plan – 2021-22 to 2025-26'. The group is, at the time of writing, working on a response to the 'Clean Air in Scotland 2' consultation and the Scottish Government's position statement on the National Planning Framework 4 (NPF4).

CIEEM has also been invited to sit on a Scottish Government working group which seeks to inform the development of an updated planning policy on biodiversity in NPF4.

At the time of writing, the Scotland Policy Group is finalising a follow up briefing to the 'Biodiversity Net Gain in Scotland' briefing paper (http://cieem.net/biodiversity-net-gain-in-scotland/) on implementation for local authorities.

Wales

A task and finish group formed of members from the Wales Policy Group and the Wales Member Network

Committee has continued working on developing a simple guidance document on net benefit for local authority planners. We have also begun regular liaison meetings with Welsh Government civil servants to discuss ongoing policy and planning changes and development.

We recently published a document outlining key issues we would like all political parties to consider within their manifestos in advance of Senedd elections in May 2021. This can be found on the Resources Hub and is available in both English and Welsh.

Ireland

The Ireland Policy Group has formed three sub-groups for priority focus areas in 2021: Climate Emergency and Biodiversity Crisis, Protection of Biodiversity in Planning, and Agriculture and Land Use. At the time of writing, briefs and objectives for these sub-groups are being formulated.

The wider Ireland Policy Group is also working on responses to two consultations at the time of writing: 'Environmental Plans, Principles and Governance for Northern Ireland – Public Discussion Document' and 'Discussion Document on a Climate Change Bill'.

Future Priorities

Over the coming months, we will continue to focus on our priority policy areas, including ensuring a green recovery, Biodiversity and Environmental Net Gain, and the COP15 and COP26 events.

All of our briefings and consultation responses can be found in our Resource Hub (https://cieem.net/resources-hub/) under 'Policy Resources'.

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CIEEM is grateful to the following organisations for investing in our policy engagement activities:

ARCADIS Design & Consultancy for natural and built assets
RSK biocensus EXPERTS IN ECOLOGY
EPR
Stantec

CIEEM Welcomes New Fellow

Fellows are role models and ambassadors for CIEEM, inspiring others and often having a strong track record of having given back to the profession. They are highly respected and have reached a demonstrable level of professional excellence within the disciplines of ecology and/or environmental management. CIEEM's Fellows help to shape and set the strategic direction of our Institute and more widely through their professional careers and varied roles. Fellowship matters, both to the individual and the Institute.

We are delighted to welcome another member to Fellowship:

Dr Tim Hounsome CEcol FCIEEM

Tim Hounsome is an ecologist of more than 25 years standing and is currently the Managing Director of RSK Biocensus. Most recently he has established a new enterprise, RSK Wilding, committed to promoting rewilding as a conservation and land management approach for stakeholders beyond the traditional conservation organisations or large landowners.

The majority of Tim's career has been in consultancy, but he remains at heart a conservation scientist. As such he has remained in touch both with the academic world, keeping abreast of new techniques and applying them in consultancy and voluntary projects, and with various conservation NGOs. He has been, and still is, actively involved in research to inform environmental policy and practice, including the ecological effects of badger culling and the prevalence of birds in the diet of Eurasian badgers.

Tim is widely regarded as an active promoter of good practice in ecological work and he is leading the current development of new guidelines for bird surveys and assessment to benefit the profession. He is always generous with his advice to other consultancies on assessment of birds pending the publication of the guidance and, through his work and leadership of his team, consistently demonstrates his commitment to raising standards within the profession.

Changes to the Routes to Chartership

Sarah Cox
Membership Operations Manager, CIEEM

Becoming a Chartered member of the Institute is increasingly a key goal for many of our members as part of both their immediate and their longer-term career aspirations. Gaining Chartered status recognises not only the hard work and dedication of these experienced professionals, but also the efforts these members have gone to in order to promote the understanding of ecological and environmental management issues and best practice within their work. They act as advocates and respected leaders within the sector.

Already, over 30% of our eligible members have successfully gained Chartered status. As the Institute continues to grow our ambition is to see this proportion of our eligible members with Chartership increase as well. Growing numbers of Chartered Ecologists and Chartered Environmentalists not only increase the pool of recognised expertise that we can draw upon to inform and support our work as our influence continues to grow, but also reinforces the importance of striving for the highest standards of professionalism, increasing the reputation of the sector and inspiring the next generation of professionals in the process.

Over the last year, we have been working with the support of both the Registration Authority (RA) and Membership Admissions Committee (MAC) – and in consultation with the Society for the Environment (SocEnv) with regards to the Chartered Environmentalist (CEnv) route – to review and improve our routes to Chartership. These improvements, as well as aligning our membership administration processes across all grades to improve efficiency, have resulted in changes to the application and assessment processes for both forms of Chartership. We are also pleased to have been awarded a licence from SocEnv to offer Chartered Environmentalist status for another 5 years.

For both routes to Chartership:

- In response to feedback from applicants, word counts for written submissions have been increased and are now set at 350 words for each competency being evidenced and 500 words for the personal statement.
- To further increase consistency of assessment and create a more easily auditable process, a new scoring system will be used by assessors for both stages of the assessment process. Application forms will be reviewed independently by three trained volunteer assessors and an invitation to interview will only be offered should all competencies being evidenced meet the required level of competence. This will also reduce the risk of applicants who are not yet evidencing the required standard preparing for, and paying for, an interview that they are unlikely to be successful at.
- Professional Review Interview (PRI) questions have been reviewed for suitability and updated to provide interviewers with more flexibility and allow applicants to benefit from demonstrating other less tangible aspects of being a Chartered professional.
- Revised and improved guidance is now available for applicants with documents available for both the written stage 1 assessment and the PRI stage 2 assessment.
- We have removed assessment deadlines to enable you to submit an application at any time of the year to suit your workload.

Aligning the two Chartership processes more closely and bringing them into line with our existing processes for Associate and Full membership applications will enable us to process your application more efficiently. It will also enable us to monitor and audit all of our assessment processes more effectively to ensure the highest standards across the board.

If you have been considering applying for either Chartered Ecologist or Chartered Environmentalist status please take a look at our dedicated Chartership webpages (https://cieem.net/chartered-status/). We have provided electronic forms on these pages for you to submit an expression of interest to us and we will send you the latest guidance information and application forms to get you started. Laura Wilson is our Membership Officer dedicated to overseeing Chartership administration and is available to answer any questions regarding submitting an application.

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

Figure 1. A breakdown of Chartered members compared to other membership grades, January 2021.

From the Country Project Officers

Elizabeth O'Reilly – Ireland Project Officer

As we headed into 2021, Ireland was confined to 5 km, had 8 hours of sunlight and one number that kept going up. We were all working from home and for some, home-schooling was back. But luckily there was light on the horizon, the Irish Conference on **Nature Based Solutions – Opportunities in a time of biodiversity crisis and climate emergency.**

Working closely with a sub-committee and Krystie Hamilton (our brilliant CIEEM conference leader), we have spent the last 3 months organising what we hope will be an amazing event for all. This will be the second year we have run it online and, although we will miss meeting you all face to face, we are glad to be able to run the event and in a way that you will find engaging. This is due to take place in April but that was not all I got up to in early 2021. We were working on our monthly Member Network events, university talks at TCD and UCD and I was delighted to hear about new research at the Irish Ecological Association conference.

We were active on policy engagement as we moved into 2021, with Brexit having been realised and a new set of COVID-19 lockdown rules. Our Irish Vice President and Irish Policy Group have been hard at work on behalf of our Irish membership and I speak for us all when I say it is really appreciated.

Keep an eye out for our Irish Section events and newsletters and I hope to see you all at the Irish Conference in April.

Contact Elizabeth at:
elizabeth@cieem.net

Diana Clark – Wales Project Officer

By the time you read this we will have already held our Wales Conference, **Bringing Our Rivers Back to Life**, which – as I type in late January – is a week away today. A lot of my time over the last few months has been spent preparing for this yearly event, and I am delighted to be able to present a great range of speakers for your appreciation and delectation. If you missed it, there is still an opportunity to catch up with the sessions; please contact enquires@cieem.net for details.

Our Wales Policy Group has also been busy, submitting two consultation responses (Barriers to the Successful Implementation of the Well-Being of Future Generations Act, and Changes to Guidance for Assessing the Impact of Ammonia and Nitrogen from Agricultural Developments) to CCERA and NRW respectively towards the end of 2020. Looking ahead, we hope to respond to the forthcoming agricultural consultation and to planning policy consultations later this year.

In addition, the group has also produced (in bilingual format) a list of key commitments we would like political parties to include in their manifestos for May Senedd Cymru/Welsh Parliament elections, as well as doing further work on a simple piece of guidance in relation to net benefit aimed at local authority planning officers.

This is my last *In Practice* contribution as Project Officer for Wales, as I am leaving CIEEM in mid-February to spend more time on my own freelance ecological consultancy practice. I am sure you will make the new Project Officer feel as welcome and supported as I have been, and I look forward to catching you at a CIEEM event in the near future.

Contact the new Wales Project Officer at: wpo@cieem.net

Annie Robinson – Scotland Project Officer

Although 2021 hasn't started off in the best of ways, I hope you are all coping with juggling working, home schooling and everything else. Do remember the COVID-19 updates (http://cieem.net/covid-19) and the Member Assistance Programme (see page 6 of this issue).

The ongoing pandemic means that in-person Member Network events are on hold, but continue with virtual arrangements. Whereas we miss seeing everyone at events, online access makes events more accessible for dispersed members. We plan to continue a mix of events in future to keep on reaching more Scottish members, especially on the Scottish islands. We will also continue our student and early career events and have already had an event with St Andrews University.

Although it seems like only yesterday we had the conference on **Land Use in Scotland: Changes, Challenges and Solutions**, we are already planning the 2021 conference on **Greening Our Grey**.

Much work has been done by the Scottish Policy Group. Various consultation responses have been submitted, including Draft Strategy for Environment, Natural Resources and Agriculture Research 2022-2027 and Cleaner Air for Scotland 2.

For further updates see the Scottish Section newsletter and join us at a Member Network event.

Contact Annie at:
annierobinson@cieem.net

British Ecological Society

Online Events Offer a New Way into the Latest Science

What does the success of a series of free online talks from the British Ecological Society (BES) mean for the future of events?

A new season of Ecology Live has begun. The set of free online talks from the BES is being broadcast on Zoom every Thursday until 20 May 2021. We have lined up 12 great speakers from around the world to give talks on their latest research, covering a wide range of ecology for a broad audience. Anyone can register online to join live each week. And if you ever miss a talk, you can catch up later on our YouTube channel.

You can hear from Katharine Suding, University of Colorado Boulder, talking about resilience and the ecology of change. Duncan Cameron, University of Sheffield, will decode the secret language of soils. Maria Dornelas, University of St Andrews, explores understanding of the wide variation in biodiversity loss from region to region. And Martin Nuñez considers how we can make ecology a truly global endeavour with the inclusion of both Global North and South scientists.

The series is proving exceedingly popular, with thousands registering. That is gratifying because we see these free 30 minute talks as an important way of sharing the latest high-quality science in a very accessible way with our broad international community. At the same time, they are a real demonstration of the diversity and vibrancy of ecology and ecologists. Ecology Live definitely fits right into what the BES should be looking to achieve for our community and our science.

We have been lucky to be able to build on a very successful series of talks last year. We launched Ecology Live at speed at the start of the coronavirus pandemic, when campuses were closing and little research was possible for many. Our first talk in mid-April 2020 was little more than 3 weeks after lockdown began in the UK. We chose a short, simple format we hoped would work, not really knowing how to use Zoom yet and had speakers booked for just a few weeks ahead. We thought we had a good idea, but even we were shocked when over 1000 ecologists attended the first talk. Imagine what that number of people would look like in a university lecture hall.

Of course, we were far from the only ones experimenting and discovering what digital events could achieve. Now there are many online conferences, workshops, discussions and debates we can all choose from. Online events were clearly something for which its time had come. The technology was there, along with the ability for people to organise and access events easily. The pandemic simply accelerated the take-up.

There are great advantages in holding events online for accessibility, in reaching audiences around the world, and the reduction in time, travel and carbon involved. Most of us have been pleasantly surprised at how easy it is to watch and contribute to events, and how good the content can be.

There are downsides of course. Some types of accessibility are not improved: subtitling requires significant effort to do well and people whose internet coverage is patchy lose out. Perhaps most of all, however, it is very difficult to replicate the opportunities at in-person events to network, socialise, bounce ideas around and to pick up on people's body language and reactions, which is such a core part of meeting face-to-face. We are social animals after all, and our interactions when we are in the same place together are part of who we are.

So what is the future for events post-COVID-19? If you can tell us that, we would be glad to know! I am sure we will keep experimenting as we go forward. We look forward to the return of in-person events and that connection with our members and community that we have been missing. We have little doubt that online events have a lot to offer and are here to stay, and that can bring a great mix of opportunities to get the latest insights in ecology. We will all need to pick the right format to suit an event's purpose and audience.

Online events from the BES

The BES is organising a wide range of digital events in 2021, from Ecology Live broadcasts on Zoom to workshops organised by our Special Interest Groups.

www.britishecologicalsociety.org/events/

Speakers from our 2020 series of *Ecology Live* talks

Student Hub

Career Profile

Name: Drew Lyness BSc (Hons)
Organisation: CIEEM
Job title: Volunteer Engagement Officer
Years in the sector: 5

What inspired you to pursue a career in ecology?

In my primary school years, I lived in urban South London and my daily routine was disconnected from nature. However, my parents took me to the WWT London Wetland Centre in Barnes. It was then that everything changed, and my passion for birdwatching was ignited. Getting close-range views of exotic wildfowl was something completely new, and I found the diversity of birdlife awe-inspiring. I even saw a wild bittern out on the reserve! I have never looked back. Wildlife conservation was a world that I was willing to dive into head first. I think of myself as living proof that young people must have access to wild places so that they can appreciate their value and wonder.

How did you get here/what was your career path?

In the fortunate position of knowing (a least roughly) where I wanted to pursue my future career, I undertook biology and geography at A-level, and used my results to join an Ecology BSc course at the University of East Anglia (UEA). However, between A-levels and beginning university, I had a 6 month job at a well-known food store to save funds because I had heard that access into the ecology sector often relied on having significant voluntary experience. I used my savings to fund a 6 month summer residential internship as an Assistant Reserve Warden. Living in the heart of possibly the UK's most biodiverse nature reserve, RSPB Arne in Dorset, was truly magical. Singing woodlark became my morning alarm clock!

Volunteering provided the knowledge and practical skills I needed to understand how conservation is delivered on the ground. Building a portfolio of contacts at the RSPB was a vital element for me in gaining my first paid role in the ecology sector. Over the coming years I joined an RSPB local group, volunteered with the Norfolk Wildlife Trust and became president of UEA's Conservation and Wildlife Society.

After graduation, it took just two job applications before I was rewarded with my first paid job in wildlife conservation, as Local Groups and Volunteering Support Officer with RSPB Eastern England. After three excellent years in the role, I switched to my current role at CIEEM so I could apply my experience to new challenges on a different side of the sector.

What are your main responsibilities?

In my current Volunteer Engagement Officer role at CIEEM I am responsible for developing good volunteer management standards across the Institute, providing practical support to Member Networks and Special Interest Groups, and developing the role of volunteers as ambassadors for both CIEEM and the overall profession.

What does a typical day/week look like?

My work involves predominantly supporting and building positive working relationships with volunteers and, in pre-COVID times, travelling the country (on public transport) to meet volunteers across Britain and Ireland who donate their time to CIEEM. My role has since adapted to technology and involves online meetings to provide support to volunteer committees remotely, as well as leading on volunteer recruitment, induction and recognition procedures. I have a mixture of responsive work and longer-term projects focusing on updating CIEEM policies and procedures for managing volunteers. I aim to ensure volunteers find their roles both impactful and rewarding.

What do you like most about your role?

Meeting so many amazing people with a wealth of diverse expertise, who share my concerns about the future of our planet and want to act on the biodiversity and climate crisis! It is a privilege to motivate, provide the tools and enable volunteers to make a real impact.

What skills and abilities have benefitted you the most?

People skills are vital, especially to build successful working relationships with colleagues and volunteers and to communicate with the public. This is transferable across all roles in the sector. Being a keen naturalist, and having a broad knowledge of British wildlife, have been highly useful.

What one piece of advice would you give to someone looking to join the sector?

It is often said, it is not what you know but who you know. The ecology sector is a small world, and it can feel as though everyone knows each other. Networking is vital, so my advice would be to build up a list of key contacts as a priority. Join wildlife-related clubs or societies. Volunteer with them if you have the time. You won't regret it!

Shorelark by Drew Lyness

By Members ForMembers

A Boost of Energy for 2021

Member Networks and Special Interest Groups are geared up to help you through the challenges of the year ahead!

Our volunteer committees are getting ready to support CIEEM members far and wide. Although 2020 was undeniably a difficult year for many of CIEEM's volunteers, we hope that 2021 will be a more active year for CIEEM's member groups. Adjustments are being made to Member Network and SIG activities to make them as accessible as possible for members, and already some fantastic events have been led in early 2021. While there are some exciting plans in place for field visits in the latter half of 2021 (assuming it will be safe to do so), the majority of Member Network and SIG activity will be online for the foreseeable future in the form of webinars, workshops and group discussions. Some Member Networks will also facilitate more informal chats for members, to allow for collaborative problem solving and support on specific worries or concerns. In these difficult times, we all need support, and it is hoped that our member groups will become a more active part of this for CIEEM members.

Many new volunteers joining in 2020, as well as group Convenors and Vice Convenors, took part in a volunteer induction session held in late December. This introduced and refreshed volunteers on the resources available to help them in their roles, including support for leading online events. Member groups continue to receive support from the CIEEM Secretariat to ensure they have everything they need to engage with members. Visit the My CIEEM area of the website to learn more about our Member Networks and SIGs. We continue to welcome interest regarding any volunteer vacancies on our committees. For more information on how to get involved, contact us at: membernetworks@cieem.net.

Getting a Foot on the Ladder

Our amazing Member Network and Special Interest Group volunteers are here to share experiences and advice to help students and career starters.

Do you work for a university or higher-education institution? If so, CIEEM's Member Networks and Special Interest Groups might be exactly what your students are seeking. Our member groups are packed with volunteers who have experience, knowledge and expertise across all areas of the ecology and environmental management sector, and they are keen to support students in kickstarting their careers. There are many questions that are frequently brought up with regards to working in the sector, and CIEEM's volunteers will have the real-life experience from a wide variety of roles in the sector to assist with answering these queries.

Have your students ever wondered: What does the life of an ecologist look like? What do ecologists do in the winter? What is the best route into the sector? What are the core and desirable skills most likely to get you a paid role after graduating? What is the realistic income rate, and what might this mean in terms of lifestyle? What roles are out there for those without a driving license?

The answers to all these queries, and much more, lie within the knowledge base of CIEEM's volunteers. If your university or HEI would be open to receiving support from CIEEM volunteers, at an upcoming careers event or discussion panel/Q&A session for students, we are here to help. In the past, our volunteers have delivered presentations and given one-to-one career advice to students to help them make the best possible start upon leaving education and entering the world of employment. They will also explain more about CIEEM Student membership and the benefits this can bring. You can request support from a CIEEM Member Network by emailing: membernetworks@cieem.net.

Academia SIG

Connecting Practical Ecology and Research

The ASIG has been working hard to ensure that its members feel supported during these challenging times. Following the inclusion of a resource hub in the group's e-newsletters, the ASIG is also testing out a brand new suite of online events to discuss specific hot topics currently circulating in the world of academia.

The first of these events was held in January, and successfully brought together academics, ecological consultants and students to chat about connecting practical ecology and research. Sharne McMillan, a PhD student from the University of Hong Kong, shared a case study focusing on a Eurasian otter population. Knowledge of the population dynamics, distribution and ecology of otters in Hong Kong is limited, and research was desperately needed to fill in the gaps. Surveys of otter tracks and spraints, as well as molecular ecology techniques, revealed their population to be small, restricted in distribution and reliant on a human-dominated environment. This research informed an IUCN Red List assessment, a species action plan and mitigation strategies. This case highlighted the importance of building research methods and making conservation decisions based on scientific evidence and making scientific research readily available.

The full presentation is available via the CIEEM Resource Hub. Keep an eye out for further upcoming ASIG events on the CIEEM website too.

Bat boxes

Ireland Geographic Section

NR18 Scheme Bat Mitigation Strategy

The Ireland Member Network has launched a series of monthly online webinars (Lunchtime Chats) on a wide range of topics. In November's event, the Irish Section Committee had a chat with Dr Tina Aughney from Bat Conservation Ireland regarding bat mitigation measures. She explained how the vicinity of the new road scheme of the N18 is important for bats in general but particularly the lesser horseshoe bat (*Rhinolophus hipposideros*). The N18 scheme was merged with two other schemes to form the M17/M18 Gort to Tuam public-private partnership Scheme. This road was built and opened in September 2017.

As part of the bat mitigation measures, Garryland House, an existing derelict house located in Garryland Woodland, was renovated as a maternity roost for lesser horseshoe bats. The number of lesser horseshoe bats recorded in Garryland House has seen an annual increase since works were completed in April 2011. The renovation works have significantly improved the building as a maternity roost and numbers present now match historical records from the 1970s, having declined to zero in the 1990s. In addition, the building now provides suitable roosting sites for this species all year around, which was previously not the case.

As part of the bat mitigation measures to facilitate the safe movement of this bat species across the motorway, a green bridge was constructed. The location of the green bridge was determined by radio tracking within the Coole Park and Kiltartan Cave area. Preliminary trail camera surveillance has documented various terrestrial mammal species crossing the motorway. Therefore, the green bridge also facilitates the safe passage of other wildlife species.

Look out for more upcoming Lunchtime Chats on the CIEEM Events webpage.

Eurasian otter

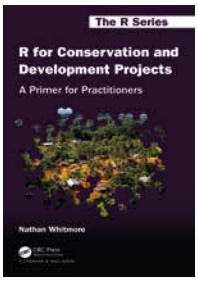
BOOKS, JOURNALS AND RESOURCES

Environmental Impact Assessment: Appraising Access

Author: Institute for Public Rights of Way and Access Management
Price: £25.00 (or £10 direct from Alison Gibson at iprow@iprow.co.uk)
Available from: www.lulu.com

IPROW, the Institute for Public Rights of Way and Access Management, has produced a UK-first guide on how public rights of way and wider outdoor access resources should be assessed in Environmental Impact Assessments. This guide sets out the standards of investigation and consideration that are deemed to meet best practice, making it easier to evaluate an Environmental Statement; understand the process; and ensure that the public's access needs and resources are appropriately considered.

R for Conservation and Development Projects: A Primer for Practitioners



Author: Nathan Whitmore
Price: £25.00 (or £10 direct from Alison Gibson at iprow@iprow.co.uk)
ISBN: 9780367205485
Available from: www.routledge.com

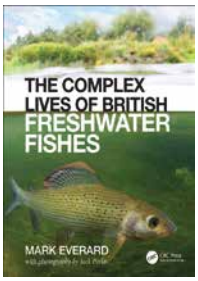
This book is aimed at conservation and development practitioners and seeks to give people with a non-technical background a set of skills to graph, map and model in R. Relatable examples, which are typical of activities undertaken by conservation and development organisations, and worked examples showing how data analysis can be incorporated into project reports are included.

Britain's Habitats: A Field Guide to the Wildlife Habitats of Great Britain and Ireland (2nd Edition)

Authors: Sophie Lake, Durwyn Liley, Robert Still and Andy Swash
Price: £24.99
ISBN: 9780691203591
Available from: www.nhbs.com

This illustrated photographic guide provides a comprehensive overview of the natural history of wildlife habitats in Britain and Ireland. This new edition presents detailed information on the characteristics, extent, geographical variation, key species, cultural importance, origins and conservation of all main habitat types. The foreword is provided by Alastair Driver.

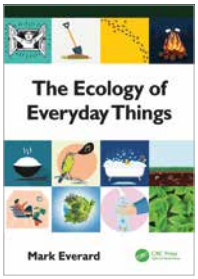
The Complex Lives of British Freshwater Fishes



Author: Mark Everard
Price: £47.50
ISBN: 9780367440329
Available from: www.routledge.com

This illustrated book explores the life histories of Britain's freshwater fishes, highlighting their importance for conservation as part of the living ecosystems upon which we all depend, and their value in providing food, ornamentation, sport and culture. Technical details on lifecycles and feeding habits are described in an engaging way, aimed at both conservationists and those with an interest in the natural world.

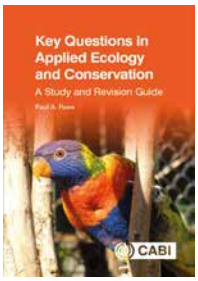
The Ecology of Everyday Things



Author: Mark Everard
Price: £18.99
ISBN: 9780367636319
Available from: www.routledge.com

This textbook uncovers the ecological origins of everyday things, including the tea we drink, things we wear, read and enjoy and the important roles played by germs and 'unappealing creatures' such as slugs and wasps. Mark highlights how nature underpins everything in our lives, and the importance of addressing its unsustainable use in todays society.

Key Questions in Applied Ecology and Conservation: A Study and Revision Guide



Author: Paul A. Rees
Price: £19.99
ISBN: 9781789248494
Available from: www.nhbs.com

This text is a study and revision guide for students following programmes of study including applied biology, ecology, environmental science and wildlife conservation. It allows the reader to learn and revise the meaning of terms used in applied ecology and conservation, study the effects of pollution on ecosystems, the management, conservation and restoration of wildlife populations and habitats, urban ecology, global environmental change, environment law and much more.

Free downloads that may be of interest to members:

Goudeseune, L., Solerød, M., Aleksandrova, M., Asanica, A., Eggermont, H., Jacques, C., Le Roux, X., Lemaitre, F., Popa, A., Ungvári J. (2020). *Handbook on the Use of Biodiversity Scenarios in Support of Decision-making*, Biodiversa. Available at: http://www.biodiversa.org/1816

Mike Alexander FCIEEM FRSB. (2020). *Management Planning*. The Wildlife Trust of South and West Wales. Free download at https://www.welshwildlife.org/reports/management-planning/

Investigating the implications of shifting baseline syndrome on conservation

Jones L.P., Turvey S.T., Massimino D. and Papworth S.K.

People and Nature 2020, 2 (4): 1131–1144 (Open Access)
DOI: 10.1002/pan3.10140

Shifting baseline syndrome (SBS) refers to a persistent downgrading of perceived 'normal' environmental conditions with every sequential generation, leading to under-estimation of the true magnitude of long-term environmental change on a global scale. This study used large-scale online questionnaires to collect public perceptions of long-term biological change regarding 10 UK bird species and knowledge and experience of the local environment. Evidence of generational amnesia was found as an age-related difference in perceptions of past ecological conditions, supporting the need to encourage greater intergenerational communication and increase experience of local nature.

Correspondence: sarah.papworth@rhul.ac.uk

Species distribution modelling is needed to support ecological impact assessments

Baker D.J., Maclean I.M.D., Goodall M. and Gaston K.J.

Journal of Applied Ecology 2021, 58 (1): 21–26 (Open Access)
DOI: 10.1111/1365-2664.13782

Protections for biodiversity are frequently undermined because the distributions of priority species are poorly known in most locations at the spatial scales required to inform planning decisions. In this paper, the authors argue that the integration of species distribution modelling frameworks into ecological impact assessments will strengthen biodiversity protections in planning and development processes.

Correspondence: d.baker2@exeter.ac.uk

Invasive species influence macroinvertebrate biomonitoring tools and functional diversity in British rivers

Guareschi S., Laini A., England J., Johns T., Winter M. and Wood P.J.

Journal of Applied Ecology 2021, 58 (1): 135–147
DOI: 10.1111/1365-2664.13795

This study explores the response of freshwater macroinvertebrate communities to biological invasion using taxonomic and functional indices. Functional richness and redundancy were examined before and after the colonisation of the invasive species *Dikerogammarus haemobaphes*. Findings indicate that *Dikerogammarus haemobaphes* should be considered a significant pressure to riverine communities. The results show community functional measures are useful in characterising the effects of invasive species and may form a valuable part of the 'toolbox' used for studying biological invasions in rivers.

Correspondence: S.Guareschi@lboro.ac.uk

Pollinator monitoring more than pays for itself

Breeze T.D. *et al*.

Journal of Applied Ecology 2021, 58 (1): 44–57 (Open Access)
DOI: 10.1111/1365-2664.13755

This study evaluated the full costs of running four national pollinator monitoring schemes against the economic benefits to research and society they provide. Results show that the annual costs of monitoring are less than 0.02% of the economic value of pollination services that would be lost after a 30% decline in pollination services and monitoring schemes would save at least £1.50 on data collection per £1 spent.

Correspondence: t.d.breeze@reading.ac.uk

Teaching and learning in ecology: a horizon scan of emerging challenges and solutions

Cooke J. *et al*.

Oikos 2021, 130 (1): 15–28 (Open Access)
DOI: 10.1111/oik.07847

This article presents a horizon-scanning exercise that identified current and future challenges facing the teaching of ecology, through surveys of teachers, students and employers of ecologists. Authors propose a number of solutions developed at a workshop by a team of ecology teaching experts such as teaching students to be ecological entrepreneurs and influencers, embedding skills-based learning and coding in the curriculum, and using new technology to enhance fieldwork studies.

Correspondence: zlewis@liv.ac.uk

A mechanistic framework to inform the spatial management of conflicting fisheries and top predators

Sundberg J.H., Olin A.B., Evans T.J., Isaksson N., Berglund P. and Olsson O.

Journal of Applied Ecology 2021, 58 (1): 125–134 (Open Access)
DOI: 10.1111/1365-2664.13759

Managing the trade-from resource competition between fisheries and marine top predators has proven difficult due to a lack of knowledge regarding the amount and distribution of prey required by top predators. This paper presents a framework that can be used to address this: a bio-energetic model linking top predator breeding biology and foraging ecology with forage fish ecology and fisheries management.

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Q&A

Richard Handley CEcol MCIEEM, Operations Manager – National Environmental Assessment and Sustainability team at the Environment Agency (EA) and President Elect of CIEEM.

How did you get into the sector?

As a teenager I volunteered for the Norfolk Wildlife Trust. I was studying art and design, and producing leaflets, signage and newsletters for them. I spent increasing time on nature reserves and went on to work as a seasonal warden in the Norfolk Broads. After a couple of years doing that, and despite not having the appropriate qualifications, I decided to study ecology. That gave me the foundation I wanted. I subsequently worked for English Nature as an ecological consultant, did a PhD, a couple of postdocs abroad, and then, in 2005, started working for the Environment Agency where I have been ever since.

What does your current role include?

I currently manage a National Environmental Assessment and Sustainability team for the Environment Agency. We are a team of over 100 environment and landscape professionals who help to manage the risks associated with the EA's flood risk management programme. At the same time we identify opportunities to enhance nature and deliver projects in the most sustainable way.

What is your favourite part of your current role?

Working with an amazing group of talented and committed people, and looking for ways to improve how we work and what we deliver for nature, and at the same time delivering essential flood risk management services for communities across England. I also really enjoy being part of the CIEEM team.

What is your least favourite part of your current role?

It was travel, because that takes me away from my family. That is not an issue at the moment, with the COVID-19 restrictions, but as and when those restrictions ease I hope to be able to manage that pressure better.

What do you think is the biggest issue facing the sector?

Change. By that I mean how we carry out our role in the context of rapid environmental change, due to the changing climate, but also other changes like the economic shock and the impact on the way we work of COVID-19.

Why did you get involved with CIEEM?

I first joined CIEEM in 2005 as I contemplated returning to the UK after a few years working abroad. I become involved in the governance of CIEEM in about 2010 and have had a number of roles. I first joined CIEEM because I wanted the post-nominal letters and access to training while I was looking for work. I achieved CEcol soon after it was available because, along with CEnv, it is recognition of the importance and standing of our professions and the value to society of the work we do. I got involved in governance to learn new skills and support CIEEM because it can only prosper with the voluntary support of the members.

What is the next big thing for the sector?

Please don't ask me to pick one. I'm going to go for the next big *things* if that is okay? I think they include: risks and opportunities of being outside the EU, implementation of Biodiversity Net Gain and moving to Environmental Net Gain within and beyond the planning system, rewilding, working with habitats and species in a changing climate, and, lastly, it has been on the agenda for a while, but I think we will increasingly see remote sensing and advanced analytical techniques, and methods like eDNA, adding to our understanding of the natural world and the tools we have available.

Who inspires you?

Mya-Rose Craig, because she is opening a door for many people to engage with and appreciate nature and because by highlighting and challenging inequality in nature conservation she is addressing a profoundly important issue for all of us.

What advice would you give to those just starting out in the sector?

Join CIEEM and get involved. The people you meet are such an important influence and help as your career progresses, so invest time in building a great network of friends and colleagues.

What is your favourite species?

Do I really have to pick just one? Ok, the European otter because of cherished memories of special encounters and what its recovery represents – hope.

What is your favourite thing to do outside of work?

Enjoying nature and fresh air with my 8-year-old daughter and wife. And getting on my bike.

Can you tell readers something random about yourself?

I'm quite obsessed with making sourdough. Lockdown and home-working have significantly improved my baking.

Use Esri UK's new Phase 1 Habitat Surveys app to deliver detailed, accurate environmental impact assessments

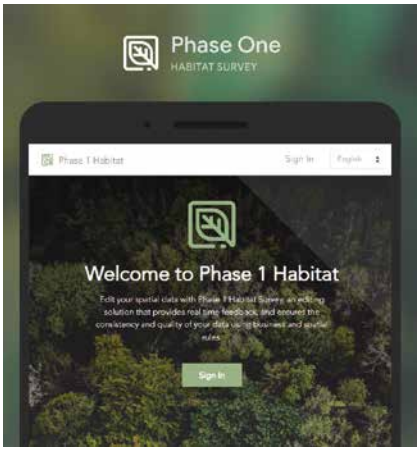
Pre-Covid, the UK construction sector had already been striving to go digital. Months of Lockdown and the initial suspension of all building activities have concentrated many minds in the sector on the need to reduce the over-dependence on paper and move to more automated, efficient work practices, especially around on-site record-keeping.

At the same time, the UK construction industry is growing more and more accepting of the need for informational 'golden threads' all the way through the construction lifecycle, whether around safety, sustainability or other key original project goals. The good news is that technology now allows surveyors and project managers to both further the digital and golden thread agendas when it comes to preliminary environmental assessments.

Increasing ecological awareness means the public is sensitive to negative impacts from building projects

Soon the wet British winter will be over, and teams will be about to start (or resume) projects. A key legal requirement under UK planning laws is the preliminary environmental audit, which typically takes place from April until October and so needs to be on your to-do list now.

We'll all be familiar with this work: the need to produce a full and accurate Phase 1 Habitat Survey, the P1HS, following the compliance regulations laid down by the JNCC, the public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation. This is far from being a box-ticking



exercise; increasing ecological awareness means the public is sensitive to negative impacts from building, especially in the Green Belt.

The problem is that far too much very well-intended P1HS work still gets done 'the old way'—with clipboard, paper, and perhaps an urgently typed note on a hastily-grabbed iPhone out on-site. All these paper notes need to then be digitised back in the office. Forms must be completed in the correct fashion, inevitably involving manual steps that can result in reporting delays, human error in the interpretation of the surveys if carried out by different people than the person visiting the site, and in some cases, lost or inaccurately-compiled surveys that need revising.

Consistently and easily produce accurate Phase 1 Habitat Surveys

All those issues could well cause delays, or in the worst case, stop your project moving ahead. A new approach—and one that also enables you to add your own 'stitch' to that all important 'golden thread'—is doing this digitally, in the field, helping professionals like you consistently and easily produce accurate Phase 1 Habitat Surveys. The philosophy of leaving paper behind is the design behind a time-saving new app from GIS (Geographic Information Systems) leaders Esri UK.

So—picture yourself on-site as you survey an environment and having with you a tablet or a laptop and an app that presents an easy-to-follow process for inputting all you are going to want to record. Even better, you can use it whether or not you have an internet connection. The app gives you the ability to create all that the survey requires, from defining survey areas to habitats, as well as capturing ad hoc supplementary notes and pictures quickly and easily. The app makes full use of autofill and 'smart' forms to help automate capture and avoid errors. Once completed, the survey synchronises to the cloud, meaning it's available immediately back in the office, boosting the overall efficiency of your entire P1HS activity.

Increase your productivity and efficiency by downloading this new Esri app

Available on Web browsers as well as Windows, iOS and Android tablets, it's clear the Phase 1 Habitat Survey app from Esri UK is your go-to tool for capturing an accurate digital twin of the survey environment now that building is getting going again.

To see how you and your team's vital P1HS work can get done faster and more precisely, check out esriuk.com/phase1habitatapp or call Esri UK on 01296 745599.

PROFESSIONAL & PERSONAL SUPPORT FOR MEMBERS

MENTORING

Looking to identify the next steps in your career?

Need support in upgrading your membership or applying for Chartership?

Register your development needs online to be matched with a volunteer mentor that can help.

Why not become a mentor and give something back to your profession? You may learn something too, and it counts as CPD!

MEMBER ASSISTANCE PROGRAMME

A library of online resources and guidance, and practical advice on topics such as debt, legal and tax issues, as well as family care and support, is freely available to CIEEM members and their dependants. In these challenging times, you can also use a free, confidential telephone adviceline to explore your worries and concerns with a trained counsellor who will guide you towards realistic positive solutions which work for you.

Access all this support through the members page of the website

www.cieem.net

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