CIEEM

in practice

Issue 122 | December 2023

Bulletin of the Chartered Institute of Ecology and Environmental Management

Palaeoecology: Bridging the Evidence Gap

Starting an Ecology Career: Tips from the Early Careers SIG

Tree Climbing: Gaining a New Perspective

Biodiversity Net Gain: Contributions from Ecoacoustics

2024 CIEEM Awards

Nominations Are Open!

Our annual awards is the event of the year to celebrate the outstanding work of ecologists and environmental managers in our sector.

These awards are your chance to celebrate your achievements and the projects you feel most proud of, recognise the skills of your peers, and remind one another of the reasons why you chose to pursue a career in the environmental sector.

Award	Closing date
Promising Professional	5 January 2024
NGO Impact	5 January 2024
Climate and Nature Action 2030	5 January 2024
Best Practice Innovation	12 January 2024
Knowledge Sharing	12 January 2024
Stakeholder Engagement	12 January 2024
Best Practice Large-scale Practical Nature Conservation	12 January 2024
Best Practice Small-scale Practical Nature Conservation	12 January 2024
Best Practice Large-scale Project Mitigation, Compensation and Enhancement	12 January 2024
Best Practice Small-scale Project Mitigation, Compensation and Enhancement	12 January 2024
Member of the Year	15 January 2024
Small, Medium and Large Consultancy of the Year	19 January 2024

Visit our website or scan the QR code to download a nomination form

www.cieem.net/2024-awards

CIEEM

Editorial

Welcome

One of the most pressing issues for the professions of ecology and environmental management, and for CIEEM, is the need to continue to attract (and retain) motivated, talented and committed people to work in a wide variety of roles and organisations. After all, everything we do, and that we want to achieve, depends on having the people to do it now and in the future. CIEEM is very active in this area, expanding our work to reach out to young people and to underrepresented communities to promote awareness of and access to career opportunities. And we promote diverse routes into the profession for all ages and backgrounds, supporting all those aspiring to a career in ecology and environmental management. I recently had the pleasure again of speaking to participants in the CIEEM early career training programme and am inspired and hopeful for the future.

We are making progress and I am proud of CIEEM's leadership, but it got me to thinking about why and how I came into the profession and what lessons we might learn from my own experiences and from yours.

I was definitely influenced, and inspired in many ways, to pursue a career in the environment sector by the environmental crisis of the 1970s and 1980s, holidays in beautiful and remote places, parents who encouraged inquisitiveness and an open mind, and of course the best natural history TV programming on the planet. However, there were no scientists in my family and no one particularly concerned or engaged with the emerging environmental movement.

My experience, and maybe you share this, is that what really made the difference was the influence and support of a few key people I met and got to know along the way. I'm not going to name names so I think I am safe to say that in many respects these were ordinary people (meant as a compliment), passionate about nature conservation and science, but just doing their jobs. And their jobs were not at face value to help recruit new ecologists. In my case they were a conservation officer at a wildlife trust, a nature reserve warden and a university lecturer.

They shared their fascination and knowledge of nature and science with me. They encouraged my burgeoning interest and, perhaps most important of all, having studied art as my first degree, they helped me realise what I really wanted to do, and critically, said to me *"yes you can"* when I wasn't sure whether, with my background, I could become an ecologist. They helped me find and pursue a way to retrain as an ecologist as a mature student.

These people may not have realised or appreciated the impact they had on me. But I am sure that I would not have been able to do it without them.

The lesson I take from this is that we probably all have the capacity to inspire, encourage and support others in the way I was supported. It is not necessarily about being a charismatic leader, being an ambassador or having the aptitude and time to reach out and mentor others. For me it is about being open and willing to share your experience, knowledge and ideas with others who might be looking for encouragement and a way into the profession.

As well as everything you do in paid and unpaid roles, and as a member of CIEEM, don't underestimate what a difference a bit of advice and a few encouraging words can make to someone contemplating a future in the sector. You can change lives that way and help shape the future of the profession and of course the natural environment.

I believe that we all have it in us to connect with, influence and support people to explore and hopefully pursue a career in ecology and environmental management.

Richard Handley CEcol MCIEEM

President, CIEEM

CIEEM

CIEEM's lineup of 2024 Conferences

Peatland Restoration: Approaches and Challenges in Wales

BOOK NOW

2024 Wales Conference **January, Wales**

We're joining forces with Natural Resources Wales to welcome a fantastic range of speakers showcasing collaborative action through the Peatland Action Programme and other initiatives focused on restoring the peatlands of Wales. With a full programme of talks sharing learning from applied research and long-term projects, this conference is a must if you are interested in hearing from practitioners about the most effective techniques for peatland restoration, monitoring and management to enhance biodiversity and boost ecosystem services.

Biodiversity Net Gain In Practice

CALL FOR PAPERS OPEN

2024 Spring Conference **March, Online**

Biodiversity Net Gain (BNG) becomes mandatory in England in January 2024 so this conference will analyse how it's going so far. Presentations will emphasise the delivery of BNG post-planning approval to spotlight successful projects and discuss both innovative and tried-and-tested approaches to habitat creation and enhancement. This conference is a must if you're planning, managing or monitoring BNG and with the focus squarely on implementation, the case studies and approaches presented will be equally applicable to practitioners working at a range of scales across the UK and Ireland.

Examining the Practical Impacts of Environmental Policy and Legislation on Ireland's Ecology

CALL FOR PAPERS OPENING SOON

2024 Ireland Conference **April, Location TBC**

This conference will provide an opportunity for a deep dive into new and emerging environmental policy and legislation, and its impact on nature and people through the work of ecologists and environmental managers. Speakers will reflect on the challenges of the EU restoration law, policy divergence, the National Parks and Wildlife Service review, and evolving approaches to Ecological Impact Assessment, and Environmental, Social and Corporate Governance. Attending this conference will provide you with digestible insights into the impacts and opportunities of rapid policy and legislative change in Ireland.

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Cover photo: Red Moss of Balerno, Edinburgh, Scotland.

CIEEM News

New bat mitigation guidance published

The 2023 *Bat Mitigation Guidelines* reflect the significant changes in our understanding of bat ecology and mitigation practice since the publication of English Nature's (now Natural England's) original *Bat Mitigation Guidelines* (Mitchell-Jones 2004). They have been produced by synthesising the most up-to-date research and evidence available at this time and the expertise of bat ecologists drawing on decades of experience. That they have been almost 5 years in the drafting reflects both the extensive amount of additional information available and the complexities of delivering successful bat mitigation and compensation. It also highlights the dedication and huge time commitment volunteered by the authors, supported by the steering group and all those who responded in detail during the consultation phase.

Find the new guidance in the CIEEM Resource Hub at https://cieem.net/resource/uk-bat-mitigation-guidelines-2023/.

Recent webinars

We continue to run a full and varied series of webinars for members and the sector. Readers may be interested in the below recent webinars that are available on the CIEEM Resource Hub.

- ASIG/ERHC Meeting October 2023: Habitat Creation and Restoration: The Need for Guidance and Standards
- ASIG Meeting September 2023: Building the Evidence Base for Rewilding
- CIEEM Webinar: Biodiversity Net Gain: What Next?

Past webinars are available in the CIEEM Resource Hub (https://cieem.net/i-am/resources-hub/). Also look out for future webinars in events and training listing on the website (https://events.cieem.net/Events/Event-Listing.aspx).

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.

Recent blog posts

Recent blog posts on the CIEEM website (https://cieem.net/news/) include:

- Reflections on the Scottish Government's Announcement to Develop a Scottish Biodiversity Metric – by Sarah Kydd
- What Exactly is 'Other Neutral Grassland' and How Should we Make the Best of It? – by Richard Gowing
- To Stack or Not To Stack: The Role Of Nutrient Neutrality In UK Ecology – by Cameron Carmichael
- The River Thames Scheme: How Ecological Surveys are Informing Design, Site Investigation and Habitat Enhancement – by Lucy Robertson and Joe Whittick
- Why Woodland Expansion Needs a Better Decision-making Tree – by Andrew Weatherall and Vicki Swales
- Growing our Skills Base – by Liz Barron Majerik
- Starting My STEM Ambassador Journey – by Jason Reeves
- I Grew Up Without Elm. What is my Grandson Growing Up Without? – by Ruth Mitchell
- Creating Resilient Treescapes: Action Research, Tools, And Strategies – by Jess Allan and Jen Clements
- Biochar-based Carbon Sequestration: Opportunities, Challenges and the Way Forward – by David Kesner
- Breaking the Green Ceiling: The Barriers Faced by Working Class and First-Generation Ecologists – Dr Ciara Dwyer

If you would like to contribute your own blog, please contact sophielowe@cieem.net.

CIEEM Conferences

Date	Title	Location
31 January 2024	CIEEM Wales Conference 2024 – Peatland Restoration: Approaches and Challenges in Wales	Swansea

Find out more: https://cieem.net/events

In Practice Themes and Deadlines

Edition	Theme	Article submission deadline
March 24	Water and Ecology	n/a
June 24	Afforestation and Tree-Planting	16 Feb 24
September 24	Financing Nature's Recovery	17 May 24
December 24	Non-themed (submissions welcome on any topic)	16 Aug 24

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: https://cieem.net/in-practice/

Staff changes

In October we were joined by two new members of staff. **Olivia Dutson** is our new Membership Administrator, and **Lucy Brogan** is our new Marketing Assistant.

Helen Winstanley has moved from Office Administrator to Membership Development Officer, and **Pip Cragg**, after a stint temping with us, has moved into the Office Administrator role.

Best wishes for the festive break

From all the staff at CIEEM we wish all members a peaceful and restorative festive break. Thank you to all who have volunteered your time on committees, working groups or in other ways over the year. We look forward to seeing you all in 2024!

Did You See?

State of Nature Report released

The *State of Nature Report* has been released by the State of Nature partnership. This report represents the most comprehensive evaluation of the UK's current biodiversity and is produced through the collaboration of over 60 partners, including CIEEM. This report has found that nearly 1 in 6 of the more than 10,000 species surveyed are at risk of extinction in the UK. Alongside this, habitats for wildlife were also found to be faring badly, with only 1 in 7 of those assessed being reported as in good condition. The report also includes a number of success stories, such as the stabilisation of natterjack toad in key conservation sites. The report can be read at https://stateofnature.org.uk/

Climate Change Committee's first assessment of climate change adaptation in Wales | Asesiad cyntaf y Pwyllgor Newid Hinsawdd o addasu i newid yn yr hinsawdd yng Nghymru

The Climate Change Committee (CCC) has released the report of their first assessment of progress in delivering the current adaptation plan to climate change. The key messages from the report are that there has been insufficient progress in the delivery and implementation of adaptation, there are some positive examples of good plans but this is not consistent across sectors and the next national adaptation plan for Wales must go further to drive delivery across the public sector. The report also includes numerous recommendations for the Government.

https://www.theccc.org.uk/publication/adapting-to-climate-change-progress-in-wales

Lough Neagh continues to be beset by environmental issues

Lough Neagh is the largest freshwater lake in the UK and supplies half of Belfast's drinking water and 40% of Northern Irelands overall. The lough and its catchment area are a critical part of Northern Ireland's ecosystems and over the summer the lake suffered a mass blue-green algal bloom, which spread right the way to the Northern coast of Northern Ireland through the River Bann. These algal blooms can be harmful to humans and highly toxic to many animals, causing serious disruption throughout ecosystems. The bloom has been caused by a combination of different drivers, such as excess nutrients from agricultural and wastewater systems, climate change and the presence of the invasive zebra mussel species. The Department of Agriculture, Environment and Rural Affairs (DAERA) has said that the Lough Neagh problem will take "years, if not decades, to solve."

https://www.bbc.co.uk/news/uk-northern-ireland

Just Transition Taskforce

Following the Climate Action Plan 2023, a Just Transition Commission has been established to provide advice to the Government. This taskforce will monitor the implementation of just transition principles, commission research to examine which sectors are likely to experience disruption, advise and support the Government and examine specific just transition challenges.

https://www.gov.ie/en/publication/just-transition-taskforce

New implementation date set for Biodiversity Net Gain

The UK Government has announced the new implementation date for Biodiversity Net Gain (BNG) which was due to become a mandatory component of the planning system in England this November. The updated timetable will require developers to deliver 10% BNG from January 2024 when building new housing, industrial developments and commercial developments. To alleviate some of the uncertainty surrounding BNG following this delay the Government have committed to publishing all guidance and regulations relating to BNG by the end of November.

https://www.gov.uk/government/news/biodiversity-net-gain

Scotland's Biodiversity Strategy

The Scottish Government is seeking views on its plans and actions to accelerate nature restoration and regeneration. The consultation sets out the key elements of Scotland's overall Biodiversity Framework. The consultation is split into two parts. Part A includes the final draft of the Scottish Biodiversity Strategy and a draft of the first 5 year delivery plan. Part B focuses on elements to be included in the Natural Environment Bill, specifically statutory targets for nature restoration and amendments to the aims, purpose and function of Scotland's National Parks.

https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy

Feature

How CIEEM is Tackling its Own Greenhouse Gas Pollution

Figure 1. Solar panels on the CIEEM office building. Photo credit: James Cleary.

John Box
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Keywords: biodiversity crisis, climate emergency, compensating residual CO_2 emissions, global heating, greenhouse gas management, nature-based solutions

The scale of global heating and the urgency of the climate emergency mean that the best action is to stop polluting the atmosphere with greenhouse gases. The blanket of pollution trapping heat on Earth is made worse by burning coal, oil and gas. The atmosphere is now so full of CO_2 that global heating is having dramatic effects on the environment throughout the world and human communities are being seriously affected. This article outlines how CIEEM is reducing the greenhouse gas pollution from its operations and activities and how the Institute deals creatively with its remaining emissions using nature-based solutions.

CIEEM is committed to net zero by 2030

CIEEM committed to reducing its CO_2 emissions to net zero by 2030 following its declaration in 2019 that the climate emergency and biodiversity crisis are inextricably linked, cannot be addressed in isolation, and require urgent and immediate action. CIEEM launched the Action 2030 project (https://cieem.net/i-am/action-2030/) that will see the Institute reach net zero carbon emissions by 2030 and will lead the way for our professions in taking urgent action. Achieving Action 2030 is one of the five overarching ambitions in the Strategic Plan 2021–2024. CIEEM has a carbon reduction plan up to 2030 that is updated annually (CIEEM 2022). The Institute is following the Institute of Environmental Management and Assessment (IEMA) greenhouse gas management hierarchy (IEMA 2020) by taking actions to eliminate, reduce and substitute sources of carbon emissions from its operations and activities and finally to compensate for the remaining residual CO_2 emissions (Connett and Box 2020, Box and Connett 2021, CIEEM 2022).

In 2021, CIEEM signed up to the Pledge to Net Zero (www.pledgetonetzero.org/pledge). This is the environmental industry's global commitment, requiring science-based targets from its signatories to tackle greenhouse gas emissions within their organisations. The CIEEM target is, by 2030, a 90% absolute reduction from 77.52 tonnes CO_2e (see Note) in 2019/20 (the baseline year) to no more than 7.75 tonnes CO_2e and to compensate for the residual emissions.

What are CIEEM's CO_2 emissions and how are they being reduced?

The carbon emissions from CIEEM's operations and activities declined from 77.52 tonnes CO_2e in 2019/20 to 56.52 tonnes CO_2e in 2020/21 to 50.54 tonnes CO_2e in 2021/22. These reductions were due to changes that CIEEM had implemented to reduce its CO_2 emissions but were also due to the restrictions required by the COVID-19 pandemic. However, the emissions in 2022/23 have increased significantly to 69.90 tonnes CO_2e as the Institute (and the rest of society) returns to more in-person activities, such as conferences and training, and as the Secretariat has grown because there are now over 7000 members.

CIEEM has made every effort to reduce its CO_2 emissions. From 2015 onwards, 100% renewable electricity was used for the Winchester office. In July 2021, CIEEM moved to the new office in Romsey that is more energy efficient, has no gas supply and has solar panels (Figure 1) that supply some of the electricity for power and heating, with the balance being generated from renewable sources. CIEEM promotes working practices by staff and by members involved with committees and attending events such as conferences that seek to minimise harmful environmental impacts. Online meetings are arranged wherever possible. The electronic version of *In Practice* is actively promoted. More details are set out in the CIEEM Environmental Policy (CIEEM 2019) and the Carbon Reduction Plan (CIEEM 2022).

The top five sources of carbon emissions in 2022/23 generated 64.73 tonnes CO_2e, which is 92.6% of the total emissions. These are energy usage and catering at venues for events like conferences and awards events (35.90 tonnes CO_2e), staff commuting (10.73 tonnes CO_2e), working from home (6.96 tonnes CO_2e), the production of *In Practice* (6.42 tonnes CO_2e) and the use of couriers (4.72 tonnes CO_2e). CIEEM faces a real dilemma as a professional institute with over 7000 members. How could these sources be changed significantly without affecting the high-quality services that CIEEM provides to its members?

How is CIEEM compensating for its residual CO_2 emissions?

Compensating for (or offsetting) emissions of greenhouse gases usually involves paying for others to reduce their greenhouse gas emissions or to absorb CO_2 through nature-based solutions. Carbon reduction, energy efficiency and renewable energy are necessary projects, but CO_2 and other greenhouse gases need to be removed from the atmosphere now. Nature-based solutions such as creating woodlands or restoring habitats like peatland, coastal salt marsh or seagrass beds must play a key role in mitigating against and adapting to climate change and reversing the ongoing losses of biodiversity (CIEEM 2020). CIEEM has made an annual donation since 2017 to habitat creation and restoration projects in Britain and the island of Ireland to compensate for its residual emissions (Box 1) (Figures 2–4).

In 2021, CIEEM agreed a set of principles for offsetting residual CO_2 emissions and there was a minor revision in 2022 to add habitat management to the principle of permanence (Box 2) (CIEEM 2022). These principles take account of the Oxford Offsetting Principles (Allen *et al*. 2020), the Environment Agency review

Box 1 Environmental projects to compensate for residual CO_2 emissions

2017 – Wildflower meadow habitat conservation by Plantlife in England. CIEEM donated £200. Plantlife is protecting and restoring a range of habitats including grasslands, woodlands, coastal habitats, heathland, wetlands and biodiverse roadside verges.

2018 – The Native Woodland Trust planting programme in Ireland. CIEEM donated £200. This project has raised €1.3 million. Over 2500 native trees have been planted although most woodland expansion is done by natural regeneration.

2019 – Trees for Life Caledonian Forest restoration in Scotland. CIEEM donated £200. Trees for Life has been working since 1993 to restore the Caledonian forest and has developed a local tree nursery to grow rare trees for planting in the forest, such as aspen. The charity has returned red squirrels to forests in the North West Highlands where they had not lived for over 50 years and has sought to bring back beavers to rivers and lochs.

2020 – Project Seagrass in Wales. CIEEM donated £200. Project Seagrass undertakes research, community engagement and seagrass restoration projects around the UK. In west Wales, Project Seagrass has planted 2 ha of seagrass using over 1 million seeds (Figure 2).

2021 – Fleet Moss Peatland Restoration in England. CIEEM donated £200. The Yorkshire Peat Partnership, led by Yorkshire Wildlife Trust, is restoring over 100 ha of Fleet Moss peatlands as part of a wider project to restore over 30,000 ha (Figure 3).

2022 – Forsinard Flows National Nature Reserve in Scotland. CIEEM donated £760. The RSPB is managing and restoring 21,000 ha of the Flow Country, a vast expanse of blanket bog, sheltered straths and mountains, which is a candidate World Heritage Site (Figure 4).

2023 – Expected to be a peatland restoration project in the island of Ireland. The CIEEM donation will be £1000.

Figure 2. Seagrass restoration by Project Seagrass at Dale Bay (Pembrokeshire) using seeds sown in hessian bags attached to ropes placed on the seabed (CIEEM donated in 2020; see Box 1). Photo credit: Joseph Gray/WWF-UK.

Figure 3. Pools forming behind newly installed coir logs on Fleet Moss (CIEEM donated in 2021; see Box 1). Photo credit: Jenny Sharman/Yorkshire Peat Partnership.

of the evidence behind potential carbon offsetting approaches (Environment Agency 2021) and the British Standards Institution PAS 2060 standard for carbon neutrality (www.bsigroup.com/en-GB/pas-2060-carbon-neutrality/).

The 2021 and 2022 projects to which CIEEM made donations generally meet the CIEEM offsetting principles agreed in 2021 but do not wholly meet the principles of being verifiable and undertaken in real time. Schemes and mechanisms for validating and verifying such projects need to be extended to cover more projects and a wider range of habitats. The 2023 donation is expected to be to a peatland restoration project in the island of Ireland and this project will be assessed against the offsetting principles.

Box 2 CIEEM principles for offsetting residual CO_2 emissions (CIEEM 2022)

Additional – it is fundamental that offsetting funds do not pay for work that would have happened anyway.

Verifiable – verification and certification of the CO_2 offsetting in a transparent and accountable process.

Remove CO_2 from the atmosphere – nature-based solutions that create new habitats and restore existing habitats and ecosystems will help to address the biodiversity crisis and deliver ecosystem services.

Permanent – the CO_2 removed from the atmosphere should not be released in the future except through natural processes and habitat management.

Undertaken in real time – CO_2 emissions should be offset simultaneously with their generation or over a defined short period of time.

Based locally – offsetting schemes should ideally be based in Britain or the island of Ireland.

Avoid negative impacts – offsetting schemes should have a very low risk of creating unintended consequences for people or the environment.

Figure 4. Patterned landscape of blanket bog with dubh lochans and the lookout tower at RSPB Forsinard Flows (CIEEM donated in 2022; see Box 1). Photo credit: RSPB (rspb-images.com).

"Setting a high carbon value would establish a very challenging benchmark and CIEEM would be seen as a leading environmental organisation in relation to the climate emergency and biodiversity crisis through credible habitat restoration and creation projects."

Independently validated and verified projects involving carbon sequestration and habitat restoration and creation are available through schemes such as the Woodland Carbon Code, the Peatland Code, the emerging Saltmarsh Code and Wilder Carbon projects. CIEEM has not yet been able to find a Woodland Carbon Code or a Peatland Code project involving a public body or voluntary organisations with certified and validated offsetting credits that are available. This situation will change as the range and number of these schemes increases and CIEEM is keeping these schemes under review.

What carbon value should CIEEM adopt for compensating for its residual CO_2 emissions?

The annual donations made by CIEEM to habitat restoration or creation projects (Box 1) and the carbon emissions from CIEEM's operations and activities (see above) can be used to calculate the value (or the cost) of each tonne of CO_2 emitted. This value has increased from less than £5/tonne CO_2e during 2019/20 (the baseline year) and 2020/21 to £15/tonne CO_2e for 2021/22 and £14/tonne CO_2e tonne for 2022/23.

The value of carbon for compensating for CO_2 emissions is likely to increase in the future and this has been discussed at Wildlife and Countryside Link meetings. There is a range of carbon values that have been used by other organisations.

The market costs of verified woodland carbon units (Woodland Carbon Code schemes) and peatland carbon units (Peatland Code schemes) appear to be around £20/tonne CO_2e. The cost of a Wilder Carbon credit is £75/tonne CO_2e.

The UK Government has implemented a very significant change to its valuation of greenhouse gas emissions in policy appraisal (BEIS 2023). Carbon values are used across government for valuing impacts on greenhouse gas emissions resulting from policy interventions. They represent a monetary value that society places on 1 tonne of CO_2e. The modelled carbon values from 2020 to 2050 give a central value for 2023 of £252/tonne CO_2e (low value is £126 and high value is £378).

The British Ecological Society has recently set a value of £252/tonne CO_2e on its residual carbon emissions to generate funds for restoring degraded peatlands through rewetting and revegetation in order to reduce and eventually halt carbon emissions from degraded peat as well as to bring benefits in terms of biodiversity conservation and flood protection (Norman 2023).

The question for CIEEM is what carbon value should be used for compensating its residual CO_2 emissions? Compensating for the residual 2022/23 CO_2 emissions of 69.90 tonnes CO_2e using the carbon value of £252/tonne CO_2e would require a donation of £17,600, which needs to be set in the context of other uses for such monies, for example new projects, new staff or new services to the members.

My view is that setting a high carbon value would allow CIEEM to establish a very challenging benchmark for the leading environmental organisations in the UK. A high carbon value would put economic pressure on the earlier steps of the IEMA greenhouse gas management hierarchy (avoid, reduce and eliminate) to see if there are further potential reductions in CO_2 emissions from CIEEM's operations. CIEEM would be seen by its members and by potential members as being a leading environmental organisation in relation to the climate emergency and biodiversity crisis and in compensating for its CO_2 emissions through credible habitat restoration and creation projects.

About the Author

John Box CEcol CEnv FCIEEM is a CIEEM Fellow and was President from 2012 to 2015. John chairs the Action 2030 working group which provides challenge and advice to CIEEM on the climate emergency and biodiversity crisis.

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Note

CO_2 equivalent (CO_2e) allows a carbon footprint composed of CO_2 and the other greenhouse gases (for example, methane and nitrous oxide) to be expressed as a single number. It is a standard way of expressing the impact of each of the greenhouse gases in terms of the amount of CO_2 that would have the equivalent global heating potential.

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Delivering for Biodiversity and the Economy: A Collaborative Approach to Redhill Business Park Design and Delivery

Figure 1. One of the created wildlife ponds with the General Electric research facility in the background. In the middle ground is a former marl pit which was incorporated into the green infrastructure. Photo credit: Staffordshire County Council.

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Keywords: business parks, economic development, habitat management, teamwork

The publication of Natural England's *Green Infrastructure Framework*, the Institute of Civil Engineers' *Manual of Blue-Green Infrastructure* and the Chartered Institution of Highways and Transportation report *Green and Blue Infrastructure* demonstrate a momentum towards providing high-quality green infrastructure. Can economic development and nature recovery work together? This article considers the practicalities of delivering a successful scheme.

Figure 2. Redhill Business Park habitats in 2023. Reproduced courtesy of Staffordshire County Council.

Ten years of economic growth and biodiversity enhancement

A walk around Redhill Business Park would take you through a formal entrance way, along well-maintained surfaced pavements and past several light industrial buildings occupied by thriving local businesses. It would also take you alongside species-rich hedgerows, past pools whirring with dragonflies and flower-rich grasslands alive with insects and into shaded woodlands full of birdsong. This is no ordinary business park and an exemplar of how a teamwork approach to design can deliver for both biodiversity and the economy.

Nine years after completion, the business park supports nearly 2000 jobs and a wealth of biodiversity.

Site history

Prior to development, the site was a County Farm grazing tenancy. It consisted of a series of large fields laid to pasture and enclosed by species-poor hedgerows. There were two secondary woodlands, New Plantation and Little Gorse, along with several ponds and historic marl pits used by a population of great crested newts (*Triturus cristatus*) for breeding. A Site of Biological Importance (SBI), Redhill Farm Wet Woodland, home to several rare and uncommon plant species in the county, lay on the northern boundary.

From the outset, Staffordshire County Council (SCC) required the design of the business park to pay respect to the environment, to preserve important existing habitats and to provide the means to increase biodiversity wherever possible. An existing planning obligation (a section 106 agreement) covered part of the site. It was related to newt habitat and an adjacent development. This, along with the presence of newts, were the initial drivers behind the high level of ecological and landscape involvement. It meant ecology and landscape had to be considered from the outset and drove a landscape design which maintained newt habitat and connectivity (Figure 2).

Design philosophy

Designed in 2012 by SCC, Redhill Business Park is a 28 hectare employment site close to junction 14 of the M6, north of Stafford.

SCC established a project group consisting of a project manager, an ecologist, a landscape architect and civil engineers. Their work was supported by technical experts, with ecological survey and reporting in support of the planning application, as well as post-development monitoring, carried out by Apex Ecology. The sustainable drainage system (SuDS) was designed by Donaldson Associates. Balfour Beatty were appointed under an Early Contractor Involvement to assist in bringing forward the civil engineering detailed design. Middlemarch Environmental provided ecological advice to Balfour Beatty and were retained as Ecological Clerks of Works during construction.

A balance was struck between retaining existing landscape features and providing enough land for development.

Some 60% of the site area was to be turned over for commercial development, leaving 40% allocated as retained and enhanced green space. The concept of providing a high-quality environment was fully supported by the local planning authority (Stafford Borough Council).

Surface water treatment

A carefully designed SuDS provides an engineering function and a habitat creation opportunity. A challenge for the drainage design was replicating green field run-off from the original pasture to contribute to the hydrology of the wet woodland SBI on the northern edge of the site. The solution was to discharge surface water from some of the developments on the business park into three spreader ditches which align with the wet woodland. Prior to development, the wet woodland was fed by surface water from a sloping field. A series of dip wells were installed to record ground water levels. Green field run-off rates were obtained for the two watercourses which drain the site. The drainage engineering consultants assumed an impermeable surface area on each of the proposed development plots and designed their system around permissible discharge rates for 1-in-1 year, 1-in-30 year and 1-in-100 year+ 20% events. The developers were required to install additional SuDS components within their plots along with interceptors to remove oils.

The spreader ditch design includes concrete edging kerbs set at an appropriate horizontal level. At times of peak run-off, the ditches overtop the edging kerbs and the resulting sheet-flows recharge the wet woodland and adjacent marshy grassland, with no scour, as could result from a piped discharge. This provides water input across the woodland area in a similar pattern to the original green field flow. The spreader ditches permanently hold water. They afford important additional aquatic habitat to the three wildlife ponds which were also created on the park. Species include yellow flag (*Iris pseudacorus*), broad-leaved pond weed (*Potamogeton natans*) and branched bur-reed (*Sparganium erectum*).

Figure 3. Wet meadow looking towards Redhill Farm Wet Woodland Site of Biological Importance on the right. Photo credit: Staffordshire County Council.

The SuDS design not only maintains a suitable hydrological regime for the wet woodland SBI, it also enables the colonisation of wetland habitats outwards, filling the former grazing land between the wet woodland and spreader ditches. This includes bladder sedge (*Carex vesicaria*) swamp (NVC community S11; Rodwell *et al.* 1995), and extensive swards of species-rich wetland plants including skullcap (*Scutellaria galericulata*), lesser spearwort (*Ranunculus flammula*), celery-leaved buttercup (*Ranunculus sceleratus*), marsh-bedstraw (*Galium palustre*), water forget-me-knot (*Myosotis scorpiodes*), fine-leaved water-dropwort (*Oenanthe aquatica*), marsh woundwort (*Stachys palustris*), pale persicaria (*Persicaria lapathifolia*), golden dock (*Rumex maritimus*), jointed rush (*Juncus articulates*) and Cyperus sedge (*Carex pseudocyperus*). The wet woodland plant community has colonised new areas and continues to support extensive tussocks of tufted-sedge, *Carex elata* (NVC S1 sedge swamp), a very rare habitat within the county, with signs of young plants establishing and spreading. Another amazing find has been bladderwort (*Utricularia australis*), not recorded in the county for 50 years.

As well as celebrating the successes at Redhill Business Park it is important to reflect on what could have been done differently. The clay nature of the topsoil results in swelling and contracting throughout the year. This movement has caused the concrete edging kerb at the spreader ditches to crack and heave in places. Although this has compromised the ability of the ditches to achieve a full sheet flow, the desired effect on the hydrology has not been lost. Water still reaches the wet woodland, but in many small rivulets rather than an even sheet flow. Perhaps a wider concrete lip or spillway would have achieved a better result. Sometimes it pays to install a more 'engineered' solution to guarantee robustness and longevity. This is particularly true in ensuring such features survive the attentions of maintenance contractors.

Woodland

Regrettably one third of New Plantation was cleared to create a marketable development plot. New broadleaved woodland planting was introduced around the development plots to an equivalent area to that which was lost. Felled areas comprised secondary

Figure 4. One of three spreader ditches which form part of the site's SuDS. Redhill Farm Wet Woodland SBI is on the right and Little Gorse woodland is on the left. Photo credit: Staffordshire County Council.

woodland of relatively low ecological or landscape significance. The proposed planting contained a more diverse mix of species. In addition, remaining woodland was put into restorative management.

Timber of suitable size was carved into benches and seats using a chainsaw and these were positioned alongside footpaths around the site.

Little Gorse woodland was retained in its entirety and lies in the heart of the business park. It offers quiet and shade, made accessible with pathways and demonstrates how mature woodland and development can thrive alongside one another. The access road into the site off the A34 was re-aligned at the design stage to retain mature trees at the entrance point.

Wildflower meadows

Staffordshire Wildlife Trust provided green hay, harvested from a Site of Special Scientific Interest in the west of the county. It is almost impossible to obtain a seed mix typical of Staffordshire meadows from commercial suppliers, unless specifying a bespoke mix which is prohibitively expensive. The hay was strewn across prepared areas around the wildlife ponds, spreader ditches and the attenuation pond. Meadow habitat is now well established across these areas and species include yellow rattle (*Rhinanthus minor*), meadow vetchling (*Lathyrus pratensis*), grass vetchling (*Lathyrus nissolia*), autumn hawk-bit (*Scorzoneroides autumnalis*), eye-bright (*Euphrasia officinalis*), common knapweed (*Centaurea nigra*), red clover (*Trifolium pratense*), devil's-bit scabious (*Succisa pratensis*), common cat's-ear (*Hypochaeris radicata*) and self-heal (*Prunella vulgaris*).

Invertebrates and bats

The ponds provide excellent foraging habitat for dragonflies and damselflies. Butterfly species recorded in 2023 include marbled white (*Melanargia galathea*), ringlet (*Aphantopus hyperantus*), meadow brown (*Maniola jurtina*), gatekeeper (*Pyronia tithonus*), small skipper (*Thymelicus sylvestris*), Essex skipper (*Thymelicus lineola*), large skipper (*Ochlodes sylvanus*), orange tip (*Anthocharis cardamines*), small white (*Pieris rapie*), small copper (*Lycaena phlaeas*), peacock (*Aglais io*), small tortoiseshell (*Aglais urticae*), comma (*Polygonia c-album*) and red admiral (*Vanessa atalanta*). The habitat existed for these species before work started but was limited to small pockets and was not extensive enough to support the numbers it does today.

Bat boxes installed in New Plantation and Little Gorse during the construction phase have become occupied by soprano pipistrelle (*Pipistrellus pygmaeus*). Additional bat boxes have been installed by Apex Ecology following tree safety work, which is now carried out as part of the site management operations. The woodlands also support populations of noctule (*Nyctalus noctula*), common pipistrelle (*Pipistrellus pipistrellus*) and whiskered bat (*Myotis mystacinus*).

Wildlife tunnels

Two climate tunnels were installed in the carriageway across the arterial road through the business park. The tunnels are 500 mm wide and provide wildlife connectivity between areas of woodland and grassland on the site. Manufactured

by ACO, the climate tunnel is installed within the highway carriageway rather than underneath the road. It has a slotted top, which according to ACO's literature, "equalises ambient conditions between the tunnel and the open air, maximising light and humidity. Constructed of polymer concrete, it has no metal reinforcement, so animals are not disorientated by distortion of magnetic fields." Having County Council highway engineers on the design team greatly assisted in being able to install such features in the adopted highway. The tunnels were fitted with cameras by Froglife to record passing wildlife and they were monitored for 3 years. The target species was great crested newt and these were recorded using the tunnels, along with brown rat (*Rattus norvegicus*), wood mouse (*Apodemus sylvaticus*), shrew (*Sorex* spp.), fox (*Vulpes vulpes*), bank vole (*Myodes glareolus*), common frog (*Rana temporaria*), common toad (*Bufo bufo*), smooth newt (*Lissotriton vulgaris*) and even a blackbird (*Turdus merula*), a song thrush (*Turdus philomelos*) and a robin (*Erithacus rubecula*).

Habitat management

The 5 year monitoring period for great crested newts, post completion, has shown a significant increase in population. As well as continuing to use the original ponds that were present prior to the development, great crested newts have also colonised, and used for breeding, all of the newly created wildlife ponds and SuDS spreader ditches. The original surveys indicated that the population pre-development was 'small' to 'small to medium' sized (English Nature 2001). The peak aggregate counts have fluctuated during the monitoring period but have shown a general trend upwards, with a post-development peak aggregate count indicating a 'large' population to now be present.

A simple factor contributed in large measure to the ecological success of Redhill Business Park: landscape and ecology were covered under item 1 in meeting agendas throughout the life of the project. This originated at the outset, with SCC's desire to create a business park embedded within diverse habitats, and no one thought to alter the agenda throughout the remainder of the project. The result was a shift in focus in the minds of the engineers and the contractors. Everyone involved bought into the aims of the project and it ensured both green and grey infrastructure were brought forward as one. In the early stages of the project, during an ecological survey, one of the young civil engineers was unable to leave site until he had seen a great crested newt. His patience was eventually rewarded.

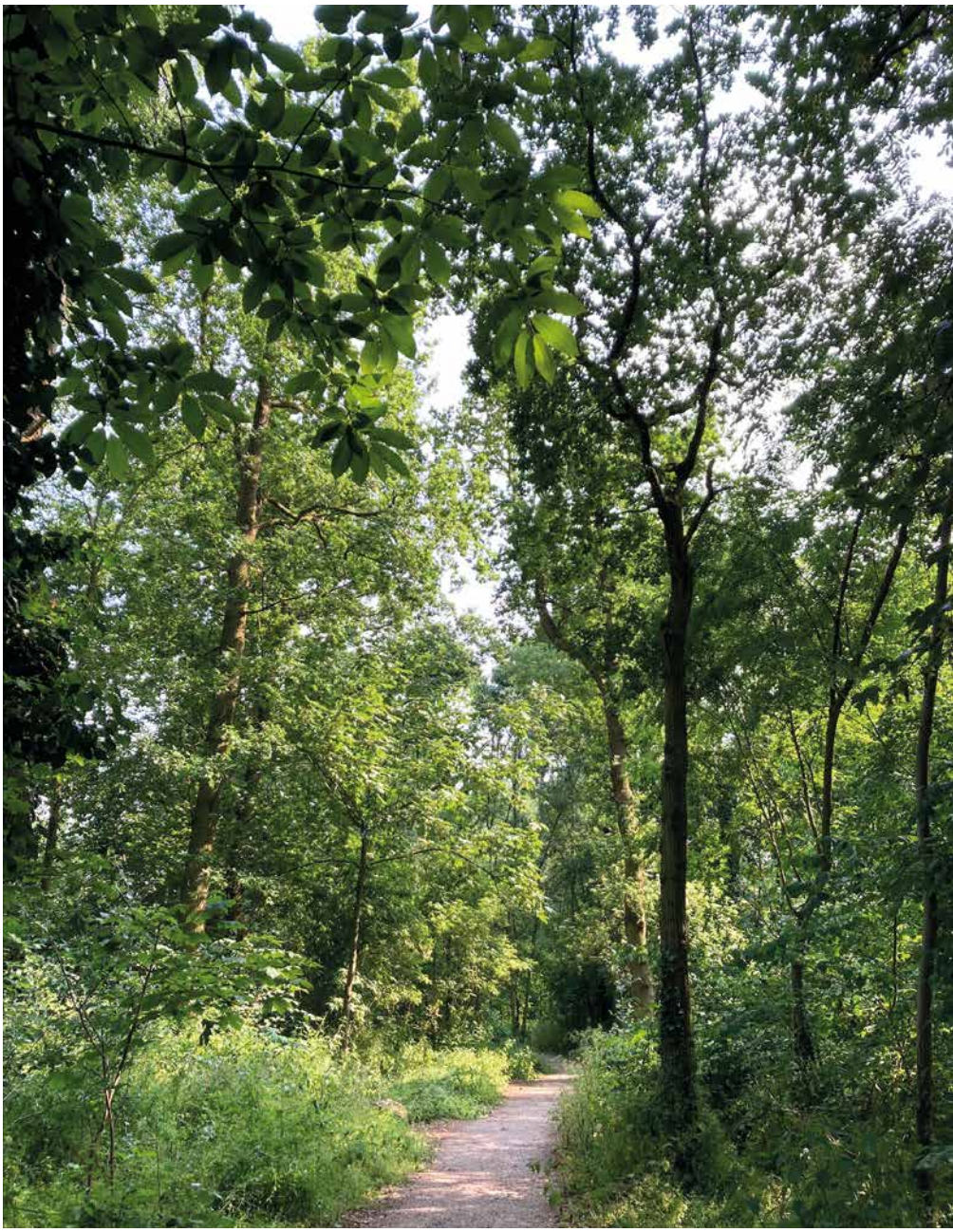

Figure 5. A woodland path through Little Gorse. Photo credit: Staffordshire County Council.

Promotion of Redhill Business Park internally within the Council demonstrates to decision-makers how ecology and economic development can co-exist. New drivers such as Biodiversity Net Gain and our duty to enhance biodiversity under the Environment Act will help ensure we can develop excellent schemes in the future.

Middlemarch Environmental led on production of the Habitat and Ecological Management Plan at the planning application stage, with input from SCC. This document had a 10 year life span and has just been replaced with a new management plan which will cover the next 10 years. This guides the maintenance schedules

which are produced by SCC for private contractors to tender against. SCC included a condition of sale which gives it the ability to charge occupiers for grounds maintenance. The Council charges occupiers annually in arrears for all scheduled grounds maintenance and habitat management works. The maintenance contract is renewed every 5 years.

Redhill Business Park is now home to General Electric, St Gobain Abrasives, Sure Store and Omicron Electronics UK, and Altecnic are due to move to the park at the end of 2023. Some of these companies have stated the quality of the environment was a major factor in affecting their decision to locate on the park.

Dozens of employees use the network of footpaths for exercise and to refresh themselves over lunch. The site is also popular with local residents for dog walking.

Biodiversity Net Gain

There is little point in retrospectively applying the Biodiversity Metric to a scheme that was devised over 10 years ago and before any net gain, or indeed no net loss, requirement, in Stafford Borough. However, it is clear from these figures that a net loss would be reported from the Metric, largely due to the trading rules (loss of species-poor grassland) and the perceived difficulty in creating meadow and wetland habitats. Overall, however, we consider this is an excellent scheme that has already delivered the benefits of an expanded great crested newt population, meadow in good condition and expanded more diverse wetland habitats. The wetland adjacent to the wet woodland is still increasing in extent and species richness below the spreader ditches, while some of the amenity grassland shows considerable diversity and will be managed accordingly over the next few years, so a process of continuous improvement will bring gains into the future.

Site designation

The site is now being considered for designation as a Local Wildlife Site; a first in the county for a commercial site. We are confident it will meet the criteria for grassland in addition to wetland and ponds. Planners have to zone land to make sensible allocation decisions; however, Redhill Business Park shows sites can be multi-functional. Designing for nature and humans need not necessarily be exclusive. They can succeed together on the same site.

Table 1. Indicating habitats before and after development.

Habitat	Pre-development (ha)	Post development (ha)
Broadleaved woodland	2.87	2.2
Plantation woodland	–	1.95
Mixed woodland	1.0	1.0
Marsh	0.5	0.87
Swamp	0.2	0.2
Meadow	–	2.27
Poor semi-improved grassland	23.2	0.81
Ruderal	–	0.11
Amenity grassland	–	0.8
Ponds	0.08	0.02
SuDS	–	0.35
Built development	0.01	17.3
Garden	0.02	–
Total	**27.88**	**27.88**

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Can Palaeoecology Help to Bridge the Evidence Gap in UK Conservation?

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Palaeoecology, the study of past environments, has great potential to support conservation work by providing insights into ecosystem dynamics, species extinctions and historic land management. This study investigated the perceptions of palaeoecology among UK conservation professionals to provide recommendations for using palaeoecology more widely in conservation.

Introduction

Conservationists are increasingly having to respond to rapidly escalating environmental threats without adequate evidence on which to base their actions. A key challenge is the 'knowledge-doing gap' between academics and

practitioners. University research is often not well communicated to those working in practice, nor is it always relevant to their needs. This is exacerbated in conservation by a lack of structured (and funded) knowledge-sharing mechanisms, which are commonplace in other fields such as medicine (Kadykalo *et al.* 2021).

Studies have shown this to be a result of time pressures, funding shortages, inadequate training and poor research design. Initiatives such as Conservation Evidence are making progress in improving knowledge exchange, but many practitioners still don't feel that they are using evidence effectively. For example, only 13% of Wildlife Trusts felt they were delivering evidence-led conservation to a high standard, despite 80% agreeing that it was important to incorporate evidence (Parry *et al.* 2022). As the climate and biodiversity crises worsen, there is a pressing need to address the knowledge-doing gap and support conservation through new research.

Palaeoecology and conservation

Palaeoecology, the study of past environments, is not typically part of the everyday vernacular of conservation practitioners. Despite this, it holds untapped potential to support conservation. The aim of palaeoecology is to provide information beyond the reach of contemporary monitoring records, by utilising natural archives that infer ecological and environmental information. These include things like pollen, diatoms, charcoal remains and radioisotopes (see Box 1).

The approach is rooted in the idea that the past is the key to the present, which asserts that the Earth's underlying natural processes act in the same way throughout time; in short, conclusions can be drawn about past ecosystems based on our understanding of present ones. As many ecological processes act on decadal or centennial timescales, this temporal perspective provides valuable insight – particularly into the characteristics of habitats before they were affected by human activities such as industrialisation. The primary focus of much palaeoecological research has been relatively recent geological time, particularly the Quaternary period (the past 2.58 million years), but it can also be utilised to investigate the recent past (10s–100s of years), and has increasingly been developing as an applied field, well placed to support decision-making in conservation.

If palaeoecology is to become an accessible toolkit for conservation practitioners, it is important for us to consult them directly to establish how the practice could best be utilised and to explore what the current barriers to access might be.

Box 1 How has palaeoecology already supported conservation work?

Although it remains relatively low profile outside of academia, palaeoecology has played an important role in supporting conservation in the UK, informing policy drivers to tackle key environmental challenges. One of the most prominent of these was the use of diatom-inferred pH models in the 1980–90s to evidence the acidification of freshwater lakes caused by 'acid rain'. This contributed to the successful case for legislation on long-range transboundary air pollutants (Battarbee *et al.* 2014). In the following decades, the reference conditions required by the EU Water Framework Directive and EU Habitats Directive were derived from palaeoecological studies, which provided new opportunities for applied work to assess ecological status (Bennion *et al.* 2011).

Beyond this, there is a broad body of work demonstrating the application of palaeoecology to conservation questions over the past 50 years. A study at Blelham Bog National Nature Reserve (NNR) revealed – through pollen analysis – that the conditions in the presumed 'naturally' developed bog on which the designated NNR was predicated were actually the result of historic peat cutting practices (Oldfield 1970).

Another study examined the cause and extent of the decline to extinction of the priority macrophyte slender naiad (*Najas flexilis*). In the absence of long-term monitoring records, key data were documented from seed remains in sediments (Bishop *et al.* 2019). Other work has attempted to calculate past ecosystem service provision utilising palaeoecological proxies for establishing historic values of water quality, biodiversity and soil stability (Dearing *et al.* 2012).

There is a clear case for the value of a long-term perspective when addressing questions of ecosystem management and restoration, as well as providing opportunities to reflect on wider societal challenges. These include 'shifting baseline syndrome' whereby successive generations of conservationists (and members of wider society) have an inconsistent and often degrading picture of what 'normal' or healthy ecosystems should look like in terms of biodiversity and bio-abundance.

Methods

We conducted a survey of over 150 conservation professionals from across the sector, including participants from statutory bodies, local government, private consultancy and environmental non-governmental organisations. The aim was to ascertain (1) whether they had heard of palaeoecology, (2) whether they thought it would be useful, (3) what barriers they perceived to its use and (4) what solutions they thought would improve its accessibility. In particular, we wanted to explore whether those who had prior experience of working with applied palaeoecological research differed in their views compared to those who did not. Those with experience would likely have a more informed opinion about how realistic it is for a professional to access and use this kind of research. Is applied palaeoecology just a nice idea with limited practical potential? Or do those with experience confirm the potential value?

How is palaeoecology understood?

The majority of respondents had heard of paleoecology before being approached about the survey, though less than half felt that they had a confident understanding of its meaning.

Figure 1. A short sediment core collected using a gravity corer from a large, lowland lake in the UK. Photo credit: Helen Bennion.

Only 26% of participants had any experience working with palaeoecological research in a conservation context. Those who had come across palaeoecology before were then asked to define it in their own words. Nearly all these definitions reflected an understanding that the term related to (1) 'ecology' and (2) 'the past', but relatively low numbers of respondents expressed an understanding of how and why one may go about conducting palaeoecological research. Just over a quarter of responses mentioned the use of fossils or 'remains' as a source of information, and fewer still specified types of indicators such as pollen (14%) or the use of sediment cores to source material (12%). Diatoms were only mentioned by one respondent, despite being one of the most used indicators in palaeoecological research.

Is palaeoecology useful?

Respondents rated different applications of palaeoecology on a scale from 'not helpful' (1) to 'helpful' (3) (Figure 2). There was a positive response, with a range of mean ratings between 2.6 and 2.2. The highest rated aligned with more traditional applications of palaeoecology, to investigate questions around historic species distributions and site conditions. There was most uncertainty around novel and less-precedented applications, specifically the valuation of past ecosystem services and natural capital. There was consistency between both groups of respondents, but those with experience were more positive about the usefulness of palaeoecological research, particularly in relation to past site condition and species assemblages, which were most likely what their experience related to. After being presented with suggested uses, non-experienced participants were additionally asked if they would now be likely to use palaeoecology in their practice: 72% responded 'definitely' or 'probably'. Only one respondent voted 'definitely not'.

What are the barriers to using palaeoecology?

Respondents also addressed potential barriers using or accessing palaeoecological research as part of their work. Seven barriers (plus an option for perception of 'few barriers') were suggested to participants, and they were asked to rank them in order of importance from 1 (most) to 8 (least) (Figure 3).

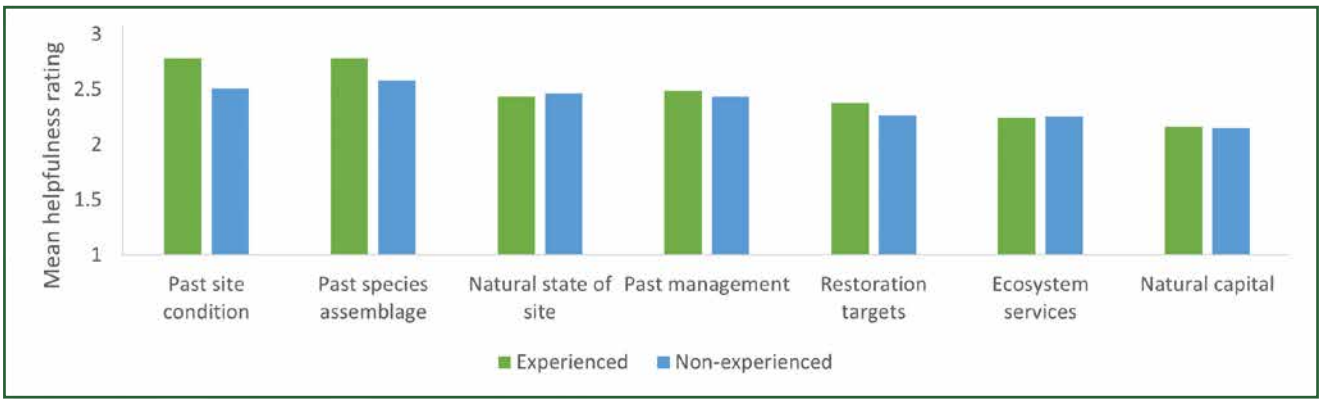

Figure 2. Valuation of different applications of palaeoecology for conservation.

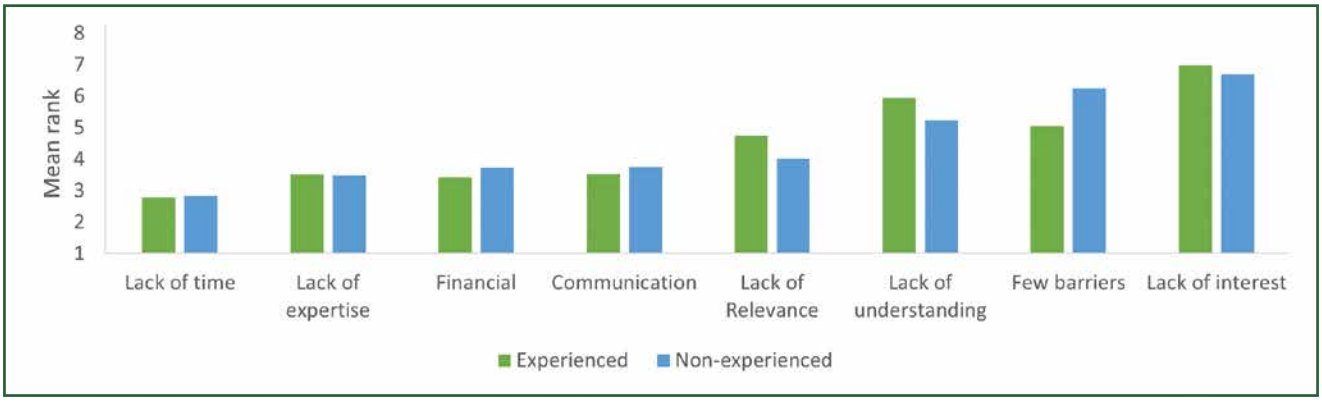

Figure 3. Ranking of barriers to utilising palaeoecology in conservation. Mean ranking is on a scale from 1 (largest barrier) to 8 (smallest barrier).

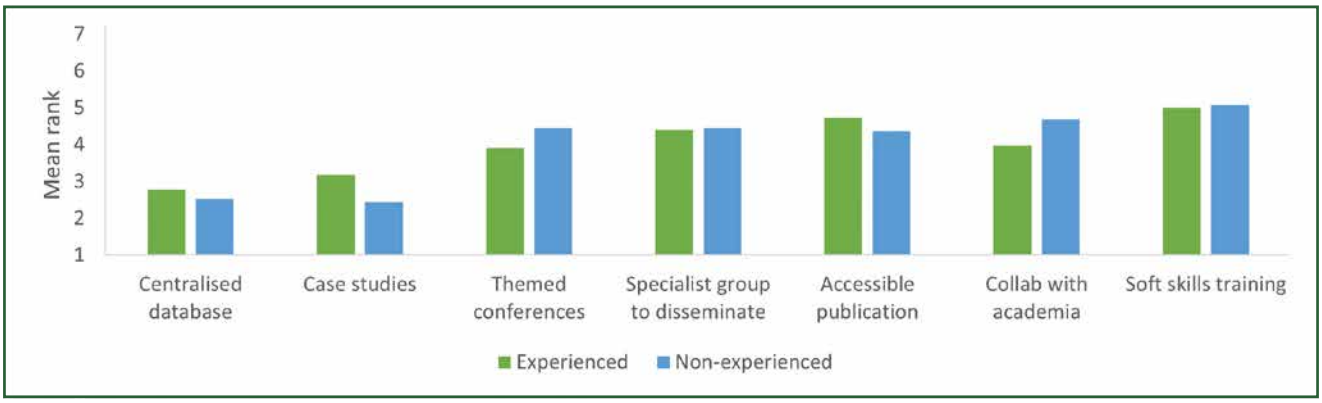

Figure 4. Ranking of solutions to improving the accessibility of palaeoecology for conservation. Mean ranking is on a scale from 1 (best solution) to 7 (worst solution).

The highest-ranking barriers – in particular, 'lack of time' – were related to resources. This mirrors other research which looked more broadly into the accessibility of evidence for conservation practitioners, so it is not unique to palaeoecology. It is perhaps reflective of an overall lack of funding and capacity in the sector.

'Communication' was another highly ranked barrier, which again echoes common themes in the wider knowledge-exchange literature about the inaccessibility of academic research for practitioners. This has an interface with the resource-related barriers, due to paywalls on academic publications and expertise needed to interpret the research.

Encouragingly, 'lack of interest' was ranked as the lowest barrier. Conservationists with experience in palaeoecology ranked 'few barriers' more highly than those without. They also had a lower tendency to cite 'lack of understanding' as an issue. This implies that exposure and experience foster an informed mindset able to overcome barriers.

How might we navigate those barriers?

Finally, we asked respondents about potential solutions to improve the ability of conservation practitioners to engage with palaeoecological research. Respondents were presented with seven potential solutions and were asked to rank them in order of importance from 1 (most) to 7 (least) (Figure 4).

The most popular solutions were the creation of a centralised database and the provision of case studies to illustrate applied research in practice. Both follow a theme of providing information and data in formats that practitioners are already familiar with. Non-experienced respondents were surprisingly keener on case studies than experienced ones.

The lowest-rated solution was 'soft skills training' (such as project management and communication) for academics and students. Whereas it did not resonate with survey respondents, this is an idea that has been suggested in knowledge-exchange literature to give academics a better understanding of project-based structures and communication skills.

A hunger for knowledge

Conservation professionals in the UK are clearly interested in applying palaeoecology to their work. Although some respondents lacked detailed understanding of the practice, the consensus between participants strongly validates the potential of palaeoecology in conservation. Many participants expressed a desire to learn more about how they could use palaeoecology and suggested that basic training courses could be provided.

"I would like to see more about the practical uses of palaeoecology. I have worked in land management for the past 40 years and not really seen much about it." **Respondent #99**

Many respondents were interested in applied examples and case studies. This matches other studies, which have emphasised the importance of practitioner-led research project design in directing relevant outputs. There is already a wealth of applied palaeoecology case studies, but there is clearly an issue with the accessibility and dissemination of that information.

Much palaeoecological work is confined to academic journals, some of which are unlikely to be frequented by busy professionals. Many mentioned publications such as CIEEM's *In Practice* and *British Wildlife* as appropriate avenues for dissemination. A greater exposure to ongoing research would be an important step in helping to build capacity for paleoecology into the conservation sector.

Finding the time…and money

Of course, there are big concerns around the resource implications of palaeoecology. The perception of palaeoecology as expensive and time-consuming is not unfounded, but there are ways in which it can be made more accessible.

"Unless funding changes dramatically, I doubt it'll be used in more than a few key situations." **Respondent #3**

Partnering with academics could enable equipment and expertise to be accessed more easily. There are options for cost-effective laboratory analysis: for example, analysing only the top and bottom of a sediment core to provide a snapshot of change, instead of every interval. A centralised database or specialised consultancy service could also have the potential to make this kind of research more readily available.

Exploring next steps

Researchers need to explore new avenues to share their work and make sure it is presented in an accessible format. Publishing in a publication like

Figure 5. Ben with a sediment core collected in a wide-barrelled piston corer from Bee Garden Pond at Chobham Common in May 2023. Bee Garden Pond is a shallow pond which has existed on Chobham since at least the 1700s. Photo credit: James Shilland.

In Practice, for example, would be a good way to do so. An outreach initiative could provide basic training on palaeoecology, as well as other collaboration opportunities. In addition, a platform to provide easy access to data and digestible information would be welcomed by many.

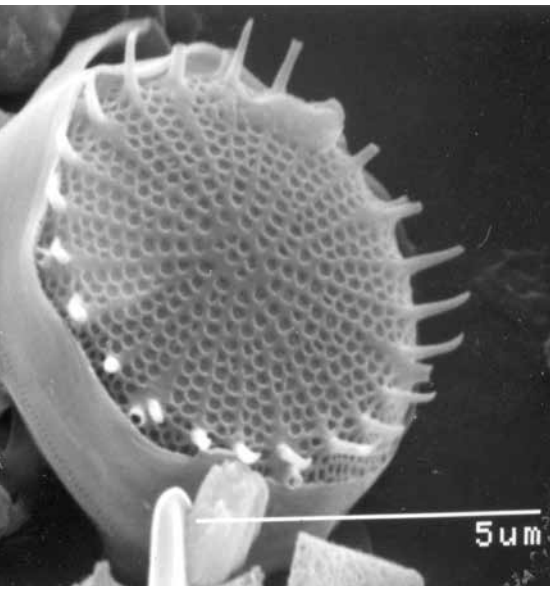

Figure 6. *Stephanodiscus hantzschii* f. *tenuis* (diatom), scanning electron microscopic image. Photo credit: Helen Bennion.

"It would be good to have an accessible and easy-to-read set of guidance, advice and or links to academic institutions."

Respondent #139

Consultation with practitioners when designing research would mean that projects are built with their real-world outputs in mind and maintain relevance to modern conservation pressures. Researchers should also explore ways to align palaeoecology with policy and legislation. There are a variety of options for this, ranging from examining the prescriptions from site designations to more ambitious applications to tie in with Biodiversity Net Gain and the Environmental Land Management Scheme.

"This research has to be brought to the forefront of policy and private industry (and public and charity sector), landowners and the new and emerging biodiversity credit markets."

Respondent #103

The next steps for this research are to explore all of these avenues.

Conclusions

There is a clear appetite for palaeoecological research in the UK conservation sector. For it to become part of a widely used toolkit for conservation practitioners it needs to be affordable, relevant and accessible. Closer links with policy and funding mechanisms, more collaborative work and better all-round communication could deliver a promising future for the discipline.

Acknowledgements

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Feature

Monitoring Biodiversity Net Gain: Potential Contributions from Ecoacoustics

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Keywords: bioacoustics, habitat, measurable difference, statistical power

Biodiversity Net Gain (BNG) schemes will require monitoring over a 30 year period. Habitats are proxies for wider biodiversity – meaning the value of offsets for preventing biodiversity loss is largely unknown. Habitat assessment and mapping by surveyors is open to significant biases, which limit consistency between schemes and years. Additional monitoring methods are required to deliver useful data, enabling the successes and failures of BNG policy to be reviewed. Ecoacoustic techniques can comprehensively capture a wide range of species and soundscape information, with the ability to archive, review and re-analyse this over the decades needed for BNG implementation. We recommend that best practice guidance for monitoring BNG, including robust methods such as ecoacoustics, is rapidly developed by consultants, local authorities and statutory agencies.

Introduction

The 2021 Environment Act will make it mandatory for many developments in England to demonstrate they will result in a 10% increase in Biodiversity Net Gain (BNG). BNG is currently measured in units described by the government's Biodiversity Metric, a simple indicator reflecting the area, ecological condition and distinctiveness (a proxy for conservation value) of each patch of habitat within the development boundary. The Metric does not consider faunal diversity, wildlife abundance, species conservation value or other legal/ policy factors to assess wider biodiversity values or ecosystem conservation status. The Act, however, requires developers to provide evidence that their BNG obligations have been met, and the requirements for management and monitoring extend for 30 years. With this long delivery period, there is a critical need to define standards for monitoring design, data collection, storage and analysis that will reliably demonstrate support for net gain outcomes, and for those standards to be sustainable and cost-efficient over decadal timescales. We recommend that these standards adopt a broad range of methods that can be conducted consistently and comparably alongside the Metric to verify that a wide cohort of species benefit from restoration projects, and that they are collectively contributing to the kind of landscape-scale change intended by the policy.

Habitats

Changes in habitat type, condition and area, as summarised in the Metric, provide one measure of ecosystem change, but it is widely recognised that this is only one blunt proxy for biodiversity, and is potentially biased and insensitive to wider changes. Furthermore, the 'if we build it, they will come' rationale for this approach assumes the UK landscape is reasonably intact, rather than being among the least resilient in the world (Burns *et al.*

2023). Many threats can impact the persistence of species without observable changes in habitat scores (e.g. impact of introduced diseases on red squirrels; Everest *et al.* 2021), and habitat creation does not imply the recovery of all plant or animal species (Fuentes-Montemayor *et al.* 2022, Hughes *et al.* 2023). There are winners and losers to any shift in an ecosystem, and explicitly promoting one group of plant species will produce sub-optimal conditions for an array of other plants, and does not guarantee they are well suited to supporting other wildlife (Gardner *et al.* 2022). As monitoring a wide range of species has traditionally been expensive, we have relied on a limited range of criteria to define habitat quality and value in the hope they represent most biodiversity values. Given the continued decline of biodiversity in the UK and globally we must question this approach (Starnes *et al.* 2021).

The Environment Act specifically requires the calculation of units impacted and delivered to be made using the Metric, and the base monitoring requirements are limited to a summary of habitat type, extent and condition, i.e. a repeat of the Metric habitat assessment every few years. This minimal and strict focus on habitats is, however, at odds with the broader objectives of the policy to restore biodiversity in the wider sense, for example in line with the Good Practice Principles (Baker 2016), which define BNG as "development that leaves biodiversity in a better state than before, and an approach where developers work with local governments, wildlife groups, landowners and other stakeholders in order to support their priorities for nature conservation". We would, therefore, recommend that good practice monitoring of BNG schemes should accept multiples lines of biodiversity evidence, including more detailed species assessments alongside habitat mapping. It is likely that this could often be enabled through the Environmental Impact Assessment process on development schemes, as part of the post-construction monitoring of impacts on protected or notable species.

The design of the Biodiversity Metric has had to deliver a balance between the need for a robust understanding of biodiversity values and the capacity of surveyors to deliver assessments with minimal training and field time. The unit scores produced by the Metric are highly sensitive to the type and condition of habitats that a user assigns, and some diagnostic features are difficult to interpret. It is well known that wide differences in the outputs of habitat mapping and assessment can occur due to individual surveyor biases (Cherrill and McClean 1999), and this can result in substantial variation in Metric calculations, even among experienced ecologists (zu Ermgassen *et al.* 2021). We might assume that comparisons over time are standardised because the surveyor's bias is the same, but given that agreements to deliver BNG will span decades, and changes in survey personnel, skill levels and technological advances in mapping, there are challenges to even comparing over time. The uncertainty this subjectivity will introduce is a key issue for monitoring the successes and failures of the BNG system.

Measurable change

Putting to one side the suitability of habitat classes to represent the breadth of biodiversity, the ambiguity in how status or even some habitat classes are assigned poses clear problems for demonstrating *measurable improvement* for BNG. The legitimacy of offset systems rests on the assertion that (1) biodiversity units accurately portray the ecological value of different sites, meaning that compensation is proportionate to impact and results in a positive outcome and (2) the measured gains are the result of habitat creation/restoration actions, not chance. While the scale by which the first point is measured has been the subject of the Metric's development, far less attention has been paid to how surveyors will effectively demonstrate gains have occurred on the ground. Payments for offsets will be based on biodiversity outcomes, not because landowners simply performed all the 'right' actions (Pressey *et al.* 2021). Despite this, information on the monitoring methods that should be undertaken for BNG schemes is scarcely mentioned in the legislation, policy or guidance. Defra's (2022) consultation documents have suggested that monitoring should provide a "summary of habitat type, extent, and condition (with a comparison where applicable against the expected condition)" – however, this limited information is unlikely to allow the success of wider BNG principles to be properly assessed. Site owners, land managers, local authorities and statutory agencies rapidly need to establish good practice for monitoring protocols and evidence types that will both satisfy the legal obligation to deliver measurable improvement and properly demonstrate that biodiversity is being conserved and enhanced.

Multiple lines of evidence

The new legislative requirements will require repeated habitat mapping surveys that cannot be achieved cost efficiently by increasing the time spent by individuals in the field – especially with the ongoing capacity crisis in the ecology sector (CIEEM 2022). Instead, we need to consider what tools are available for condition assessment of hundreds of individual sites and allow audit of the effectiveness of the BNG policy. One such technology that could serve this demand is ecoacoustic monitoring (Figure 1), alongside other methods such as satellite remote sensing, trail cameras and environmental DNA. Ecoacoustic monitoring is increasingly undertaken using automated recorders that minimise human involvement in fieldwork and enable consistent surveying across landscapes (Browning *et al.* 2017). Passive acoustic monitoring can record sound data over long time periods, allowing standardised reproducible protocols independent of observer biases (Stowell and Sueur 2020). The raw sound files can be permanently archived for comparison with data collected in the future, potentially using analysis methods that

"We recommend that good practice monitoring of BNG schemes accepts multiples lines of biodiversity evidence, including more detailed species assessments alongside habitat mapping."

Figure 1. Acoustic recorder deployed at a restoration site. Photo credit: Alex Bush.

have not even been created yet. Developments in ecoacoustics have now progressed to such a point that good practices for survey and monitoring can be implemented (Metcalf *et al.* 2023).

Ecoacoustics can be used to survey a wide range of species or to gather data on the entire soundscape (including environmental sounds and human-generated noise) within an area. The breadth of taxa includes birds, mammals, orthoptera, amphibians and aquatic invertebrates. Additionally, soundscapes can be recorded above ground, below ground and in marine and fresh water (Farina and Gage 2017). The data gathered for all these species and ecosystems can provide information on changes in species composition, and the frequency of detection across sampling sites (occupancy) can act as an indicator of species rarity (Abrahams and Geary 2020). For some taxa, acoustic data may also provide an indication of abundance (Pérez-Granados and Traba 2021). The ecoacoustic approach is therefore well suited for long-term assessments of BNG compensation sites, offering an increased level of biodiversity information beyond that provided by vegetation assessments alone.

Development of ecoacoustic standards: habitat condition versus acoustic condition

Ecoacoustics could play a valuable role in biodiversity monitoring, combining with habitat assessment, or by providing an alternative perspective on the changes delivered by land management and restoration. However, more research is required to establish how closely acoustics data correlate with habitat condition in a BNG context. If the magnitude of change in acoustic communities (turnover in the composition and abundance of species) strongly correlates with changes in Metric values, acoustics could provide an alternative estimate of restoration impact at a site (Figure 2). In addition, if species are closely tied to habitat features that we can approximate from aerial/satellite maps and habitat surveys, we can begin to anticipate how individual restoration projects will collectively contribute to the recovery of landscape diversity. We can quantify and account for variability in acoustic detections, but uncertainty may also arise due to otherwise equivalent habitats being awarded different Metric scores, and this complementary evidence may provide valuable context for supporting assessments in which condition is difficult to judge but highly influential to the Metric score. It is also entirely plausible that changes in ecoacoustic data do not correlate strongly with the scales of Metric assessments (Figure 2). Such a weak association between the Metric and acoustic diversity, potentially coupled with low predictability of acoustic composition, would still be informative, as it would suggest processes outside the defined scope of habitat management are limiting suitability for those species (e.g. lack of roosting sites

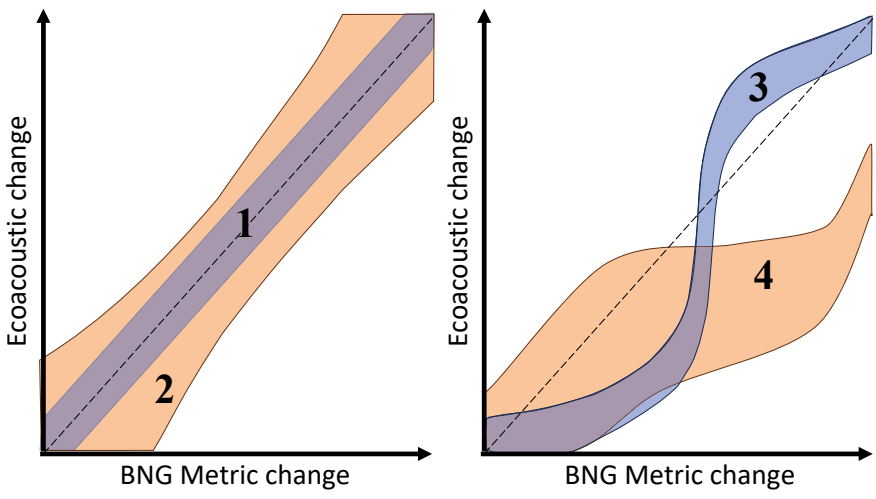

Figure 2. Theoretical relationships between measures of change in habitat type/condition by the Metric, and measures of change in the acoustic community. Acoustic species diversity may correspond strongly (1 and 2) or weakly (3 and 4) overall to Metric changes, and those changes may be highly predictable (1 and 3), or more variable and uncertain (2 and 4).

or seasonal food sources, grazing density, insecticide application or even conditions overseas).

Understanding how ecoacoustic information relates to and complements evidence from habitat surveys requires an understanding of how the design of ecoacoustic survey affects our ability to detect various species. The duration of a survey, and the time of day when recordings were made, naturally influence what species are detected – but the number of detectors that should be deployed in parallel is not clearly understood (Abrahams and Geary 2020). How comparable are surveys from different times of year, and to what extent does urban/suburban noise impact detectability relative to more natural habitats? The variation that results from these decisions can be incorporated into standard statistical models to moderate predictions, and to identify how much survey effort is needed to deliver a robust assessment with defined confidence.

Conclusion

There is an urgent need to develop guidance for the monitoring of BNG schemes that goes beyond the basics of occasional habitat mapping, with its attendant biases, which will be compounded over the 30 year periods required for implementation. To standardise the toolkit for good practice in BNG we should emphasise methods based on 'raw' field data, rather than an observer's impressions. Ecoacoustic data can be collected now, so that adaptive management of individual sites can be effectively delivered, and the overall effects of BNG policy can be reviewed. This would be of benefit to those responsible for scheme implementation, as well as other organisations such as financial bodies that are seeking to track and verify translatable units of biodiversity that can be reported and traded as credits. Many previous offset schemes have failed to deliver the expected benefits because insufficient attention was paid to the role of monitoring (zu Ermgassen *et al.* 2019). No one wants to waste this opportunity, and collaboration between business, government and academia – drawing from ecologists, economists and data scientists – is needed to transform landscapes for the better. The authors are currently engaged in research to illustrate how new monitoring tools like ecoacoustics could contribute and we would welcome contact from anyone else conducting BNG habitat assessments or acoustic surveys, who would like to collaborate.

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If you are interested in incorporating ecoacoustic surveys alongside your own BNG monitoring, or are already involved in ecoacoustics in the UK and would like to collaborate, please contact Alex Bush for more information.

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Feature

Mandatory Biodiversity Net Gain: A New Era for Ecology in the Planning System?

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Keywords: biodiversity duty, Biodiversity Metric, conservation covenant, Local Planning Authorities, monitoring, section 106, Small Sites Metric

Biodiversity Net Gain can elevate ecology to a pivotal position in the planning system, but it also brings challenges – especially for Local Planning Authorities. New research suggests novel processes and technology will be needed to manage the risks and grasp the opportunities.

When Biodiversity Net Gain (BNG) becomes mandatory throughout England in January 2024, it will mark the start of a potential revolution in the role ecology plays in the planning system. Across the country, many thousands of planning applications each year can no longer be consented without a legally binding plan to make quantified improvements in biodiversity.

This brings great opportunities, to reverse decades-long declines in our natural environment and enhance local communities. And it brings new risks and burdens – across the system, and in particular for Local Planning Authorities (LPAs).

It also represents a paradigm shift in how ecology operates and is perceived within the planning community: moving from (in the eyes of some) a damage-limitation exercise to a function that delivers significant benefits for biodiversity and local communities (and, in some cases, revenue for LPAs).

Paul Mellor, who holds a senior planning role at the London Borough of Bromley and is both a Chartered Town Planner and a Full Member of CIEEM, told us: "BNG is thrusting ecology into the mainstream. Where previously ecological input was in many cases sporadic and sometimes peripheral, it is now an intrinsic, legal requirement from day one for a great many applications. This has implications for colleagues across the planning system, including in planning policy and management as well as ecologists."

To grasp these opportunities, ecologists, planners and their colleagues need to handle a range of challenges, including analysing and tracking large amounts of complex data over a period of decades.

This article, an expanded version of the article published on the CIEEM blog in July 2023 (Marsh and Forup 2023), summarises recent research into how to meet these challenges. Carried out by ecological software firm Verna in collaboration with a pilot group of seven LPAs, the research programme has also included interviews with a wider group of over 40 LPAs and expert stakeholders from local government, central government, academia and consultancy. The author is Director of Ecology at Verna and, together with the wider Verna team, we engaged with the pilot group on a regular basis to understand their existing processes around ecology casework, including BNG for those with a requirement for net gain defined in local policy. Through this engagement, a wide range of pain points – and potential ways to overcome them – were identified.

LPAs sit at the heart of the BNG system

The framework created by the Environment Act 2021 dictates that consent for every relevant planning application will include a condition requiring a BNG plan to be approved by the LPA prior to commencement of works. This plan must include detailed measures to enhance and/or create habitats over a 30 year period (potentially both on and off site), with regular monitoring to ensure these actions are on track.

LPAs sit at the heart of this system. The government has tasked them with managing and enforcing BNG through the planning system, and under the newly strengthened Biodiversity Duty LPAs are required to enhance biodiversity and to report on BNG progress. This role for LPAs is both a legal requirement and

> **We identified many BNG-related challenges for LPAs. In many English LPAs, ecology teams lack spare capacity and are poorly positioned to handle the extra workload posed by BNG.**

crucial for ensuring the benefits of BNG are realised.

With local government ecologists already overstretched, these new duties have consequences for people working across the planning system. Within LPAs, planning, validation and enforcement officers will all face new demands and ways of working. And for ecology consultants creating proposals for submission, an understanding of LPAs' requirements will be vital in getting plans approved.

If this transition is not managed well, it will certainly cause disruption across the planning system – and in the extreme it could even lead to legal action, public backlash or a rethink of BNG policy.

BNG brings a host of new requirements for LPAs

Our research has identified a large number of BNG-related challenges for LPAs that are additional to existing requirements. In many LPAs across England, ecology teams lack spare capacity, and they are poorly positioned to handle the considerable additional workload posed by BNG. However, getting internal signoff to hire extra staff can be very challenging – and will effectively be impossible in the most cash-strapped LPAs. Even where there is recruitment, attracting qualified candidates can be very difficult. We know of several examples where LPAs have had no applicants to advertised posts.

Some LPAs hope to involve the wider planning teams on certain aspects of BNG. For example, validation teams may undertake an initial check of submitted information to assess if minimum standards have been met, and only when this is the case will the ecology team be asked for a consultation response. Many LPAs intend to not involve the ecology team in simpler planning applications that involve the Small Sites Metric (SSM) as opposed to the standard Biodiversity Metric used for larger schemes, and indeed this is what the SSM has been designed for. The SSM is intended for use on small development sites that meet certain criteria, such as having no priority habitats or European protected species, and where no off-site interventions are being proposed.

However, for applications involving larger sites, assessing BNG proposals can be extremely time consuming. Tasks include relating data within Biodiversity Metrics to information in baseline reports. The Biodiversity Metric itself is a complex spreadsheet containing up to 18 pages of data, each with many long rows containing complicated inputs and calculations. Where baseline habitats and their condition cannot be verified, the LPA may seek clarifications from the applicant.

Experienced staff must also establish how the mitigation hierarchy has been applied and check the feasibility of the proposed habitat enhancement or creation proposals, especially where target habitats and conditions appear particularly ambitious.

Following the assessment stage, once a scheme is taken forward to construction, further work will be needed to assess the detailed habitat management and monitoring plan, and it must be verified that land agreements are in place, which may involve both on- and off-site areas.

When construction is complete and BNG habitats have been established, the scheme enters its minimum 30 year monitoring phase, during which time regular monitoring reports will be issued by the site owner/operator that require appropriate processing and assessment by the LPA to ensure that stated commitments are being delivered. In addition, LPAs must report on their BNG delivery as part of their enhanced Biodiversity Duty and this in turn requires robust management of BNG data.

Assurance of BNG implementation is an underappreciated challenge

Some of the challenges described above are now well understood, and the most forward-thinking LPAs are identifying processes to deal with them. However, the scale and requirements of the new monitoring work remain generally underappreciated. This is partly owing to uncertainties about requirements, as secondary legislation and associated guidance was not due for publication until November 2023. At the time of writing (October 2023), LPAs have only been informed by the government that it is up to them to define specific and proportionate monitoring requirements as part of planning conditions and obligations used to secure all off-site BNG and all 'significant' on-site BNG.

The legal responsibilities for assuring BNG delivery are complex and will vary with the type of project and the bodies involved (potentially including landowners, developers, management firms, residents' committees and habitat bank operators). Typical delivery mechanisms include section 106 agreements or conservation covenants. Section 106 agreements – also referred to as planning obligations – are legal agreements between a planning authority and a developer (or undertakings offered unilaterally by a developer) to ensure that certain extra works related to a development, such as BNG delivery and monitoring, are in fact undertaken. Conservation covenants are agreements made between a landowner and a 'responsible body' to do (or not to do) something on their land for a conservation purpose, such as BNG. Responsible bodies must be approved by the Secretary of State and can include local authorities and other bodies that have at least some main activities relating to conservation, such as conservation charities.

Regardless of which delivery mechanism is used, however, in every situation the LPA has a watchdog role. In some cases this may be as simple as ensuring satisfactory legal agreements are in place at the outset and collecting data over time to feed into fulfilling statutory reporting duties and providing information to stakeholders such as councillors and citizens. In a significant number of cases, however, the LPA will need or want to actively monitor the project over its 30 year lifespan.

What might this workload look like? To assure a project, the LPA should receive and scrutinise an ecological monitoring report on a defined schedule specified based on the level of risk in delivery. An example might be reports at years 1, 2, 5, 10, 20 and 30 following the establishment of BNG habitats and/or the end of construction. Every project sets its own 30 year schedule, so the total burden grows as more projects are consented. If an LPA consents to 300 projects each year that need monitoring, after 1 year of mandatory BNG checking these reports might require around 8 weeks of staff time; after 5 years this might have grown to 24 weeks per year, around 50% of a team member's time. (These estimates assume that it takes just 1 hour to read and file or respond to each report.)

This is when everything goes smoothly. But there will inevitably be bumps along the way. To handle those, LPA teams may also need to:

- keep track of who is responsible for implementing BNG plans, including as land changes ownership or different bodies take over (possibly with implications for subsequent monitoring and enforcement approaches, e.g. in the case of residents' committees)
- check monitoring reports are submitted and chase missing ones
- take action when plans go off-track or management actions haven't been implemented, including negotiating remedial steps and ensuring relevant documentation is updated (such as the BNG plan and Biodiversity Metric), and using appropriate enforcement powers where necessary, involving the LPA's enforcement officers
- in some cases, undertake site visits to support all of these actions.

"The solutions may lie partly in new policies and processes, and partly in smart systems for collecting, assessing and managing data."

Case study: Leeds City Council's preparations for mandatory BNG

Leeds City Council currently handles about 9000 planning applications per year with a team of 1.8 full-time equivalent planning ecologists. After April 2024 a significant proportion of these applications will fall under mandatory BNG.

The Council takes its wider Biodiversity Duty seriously, including in relation to BNG. It is now referring to itself as the BNG Monitoring and Reporting Body, and is working out how it will approve BNG plans, management plans for the lifetime of the development together with periodic progress reports, and periodic habitat monitoring reports, and also ensure off-site BNG locations are entered onto the National Register. Monitoring and reporting on consented applications will also require site visits and enforcement action, where necessary.

The Council considers that it has a responsibility to assure on- and off-site delivery equally given that, after applying the appropriate multipliers, the Biodiversity Metric regards one on-site biodiversity unit as equivalent to one off-site unit. However, on-site units will be more numerous because they are easier to create due to on-site landscaping often being required, and cheaper for residential schemes because the long-term management is paid for by residents rather than developers. On-site units are also not subject to other requirements such as conservation covenants or the National Register.

As well as developing policies and procedures to ensure that its costs to monitor and report on off-site delivery are understood and can be recovered, the Council is also considering whether any charging mechanisms can be used for on-site delivery, but this is difficult if planning conditions are used rather than planning obligations, such as section 106 agreements.

Leeds, like many LPAs, is also considering offering developers the option to buy off-site units from the Council. This aligns with the Biodiversity Duty and, given that Councils are large organisations, it is possible to avoid conflicts of interest with the right governance. For example, it separates delivery and scrutiny so that the same monitoring and reporting regime is objectively applied to all Council service teams delivering BNG as is applied to on-site delivery and by third-party off-site providers.

LPA ecologists are ideally placed to set up and deliver the BNG Monitoring and Reporting Body role, and in Leeds it is managed by the Nature Team's ecologists (sitting within Planning).

Teams will need to deliver all of this in a coordinated way, recording and transferring all relevant data as staff members move on over a 30-year period.

New processes could help LPAs manage the BNG system

Our research has found that the solutions may lie partly in new policies and processes, and partly in smart systems for collecting, assessing and managing data.

We have seen that some LPAs have put great time and effort into having policies and procedures ready for mandatory BNG. One example is Leeds City Council, which has developed a detailed approach under the leadership of Senior Nature Conservation Officer, Richard Marsh (see Box for details).

Given the data burdens, software can play an important role

It is not possible to automate ecology, and human expertise will always be needed to interpret and make judgements on complex ecological information. For example, monitoring reports will usually need to be assessed by ecologists. However, there are parts of the challenge where software is perfectly suited to assist local government ecologists and their colleagues in validation, planning and enforcement.

For example, software can:

- import the Biodiversity Metric and automatically run validation checks – such as checking minimum BNG thresholds are met, flagging any

errors or warnings in how the Metric has been constructed, and detecting any corrupted or even deliberately tampered with Metric formulae (as spreadsheet file, it is impossible for the Metric to be fully secure, and we have heard multiple reports of both corrupted and altered Metric files being submitted to LPAs)

- present imported Biodiversity Metrics via an easier interface, supporting initial assessment and long-term tracking of expected versus delivered biodiversity units
- check Habitat Management and Monitoring Plans are on file, keep track of updated versions and help check that plans are based on good ecological science
- keep track of what reports are due when, flag any that are overdue, and assist with prompting the responsible organisations to meet their obligations
- highlight the most risky habitat enhancement or creation plans, to help prioritise human time (this could enable an element of risk-based scrutiny, which may be inevitable given constrained resources)
- provide a robust documentation trail when enforcement is required
- calculate and report progress and biodiversity units delivered across all sites and projects – including in formats tailored for statutory reporting to central government, progress reporting to stakeholders or Freedom of Information responses.

It has become clear that existing software used by LPAs is not able to handle these new challenges created by BNG, in particular the need to assess and import BNG-specific data from thousands of cases, track and analyse monitoring information over decades and present collated reporting of these data regularly to a range of audiences.

Verna is building a software tool (called Mycelia) to address these needs and offer other areas of support. We are continuing to learn about and collaborate with other organisations addressing these issues, and welcome additional partners in this effort.

As well as saving LPA teams a great deal of time, having the right processes and software in place could help create confidence in the whole BNG system and reduce the need for active enforcement. If everyone knows LPAs are managing the situation successfully, everyone is more likely to proactively comply with their responsibilities.

Global leadership on integrating ecology into planning?

If the ecology and planning communities can work together to make mandatory BNG successful there is potential to deliver transformational positive impacts across England.

It could also set an example for other nations to follow. Environmental policies developed in England, and the UK as a whole, have previously influenced and provided templates for similar initiatives around the world. The UK's Climate Change Act, for example, inspired comparable legislation in many other countries. We are already aware of policy experts closely following England's BNG progress in other nations of the UK and further afield such as in the USA.

We need to create solutions together

The purpose of our collaborative research is to pool knowledge and best practice, and develop systems and approaches that can help everyone – so that across the sector we can do the best possible job of implementing these new ways of working.

To that end, we are happy to share our findings with anyone, including resources being produced by participants such as emerging BNG policies. We are also keen to hear from others conducting research or developing solutions.

We hope that by working together we can avoid BNG becoming an unmanageable burden and instead make it what it should be: an opportunity to create long-lasting nature-rich areas, and help deliver wider benefits for our communities and environment.

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Feature

Metric Applications on Major Infrastructure Projects: Findings from HS2

Figure 1. Drone photo showing HS2 construction in Buckinghamshire. Photo credit: HS2 Ltd.

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Keywords: biodiversity accounting, biodiversity metrics, development, HS2, major infrastructure projects

Major infrastructure projects, by nature, are often far more logistically complex than standard development projects and therefore bespoke guidance for how the statutory Biodiversity Metric should be applied to them is required. At time of writing, guidance for major infrastructure projects is still in development, so how do we equip these projects being worked on now to embed Biodiversity Net Gain in their often lengthy programmes? This article identifies the challenges major infrastructure projects face in a climate of evolving biodiversity metrics and how projects such as HS2 can help feed into the forthcoming guidance for nationally significant infrastructure projects.

Mandatory net gain

Biodiversity Net Gain (BNG) is the approach to development, land management and marine management that leaves biodiversity in a measurably better state than before (Natural England 2022). Soon it will become mandatory under the Environment Act 2021 for most new development projects in England consented under the Town and Country Planning Act (TCPA) 1990 to demonstrate they will achieve a 10% net gain in biodiversity using the new Defra statutory Biodiversity Metric (Defra 2023a). Furthermore, under the

Environment Act, this requirement will also become mandatory for nationally significant infrastructure projects (NSIPs) from November 2025 (Defra 2023b).

NSIPs are major infrastructure projects that bypass normal local planning requirements. They range from power plants to major road or rail projects. The primary legislation that underpins the development consent regime for NSIPs is the Planning Act 2008. In addition to this consent regime, additional land is sometimes required for adjustments to projects following consent. In this situation these changes will need additional planning applications, which are often consented under the TCPA. All of these should be included in any assessment of the overall biodiversity impact of an NSIP.

Some major projects, like HS2, are not captured under the Planning Act 2008, however. Instead, they are determined through the hybrid Bill process and are subject to approvals under Schedule 17 of the HS2 Act 2017 which puts in place a detailed approvals process. HS2 is not subject to mandatory BNG under the Environment Act 2021 and its environmental policies and commitments are set out in its Environmental Minimum Requirements (HS2 2017).

The guidance for how to apply the statutory Biodiversity Metric will need to be adapted for NSIPs due to their significant scale, programmes and complexity. For example, NSIPs can span multiple Local Planning Authorities and have a large number of stakeholders, all of which may have different nature recovery objectives. This makes it difficult to provide a consistent approach to determining factors such as strategic significance and spatial risk multipliers using a biodiversity metric. Work is currently being undertaken by the Defra group to get this NSIP guidance ready for November 2025. Meanwhile, there is no guidance for NSIPs and other major infrastructure projects that want to adopt Metric and keep up with industry best practice. This lack of guidance means that developers working on NSIPs are having to devise their own set of assumptions for applying the Metric. This results in potential inconsistencies in approach between current NSIPs striving to achieve BNG and leads to planning challenges. This is a particular problem as these projects often span multiple counties, cover large areas of land and intersect numerous habitats.

HS2 and biodiversity accounting

HS2 is Britain's new zero-carbon, high-speed railway, the UK's flagship transport levelling up project and is Europe's largest infrastructure project (HS2 2023). The new high-speed line will run between the Birmingham and London with trains continuing on the existing network to connect to the major cities in Scotland and the north of England.

Construction on HS2 started in 2020 and since then we have delivered over 120 ecology sites along the line of route. These ecology sites form part of our mitigation and compensation measures and will contribute to our biodiversity goals.

The use of a biodiversity metric to record the impact of development on biodiversity has evolved significantly over the past decade. As a major infrastructure project, HS2 was the first to adopt a No Net Loss in biodiversity goal in 2013. This was before wider BNG policies and guidance were formally developed. Since this point, HS2 have invested time and resources in developing and employing a Defra Metric-based approach (the 'HS2 metric') to audit the biodiversity accounting progress on the whole project. The HS2 metric was developed at the same time Defra were working on their first Biodiversity Metric – the Defra biodiversity offsetting pilot metric (Defra 2012) – and was used to complete the biodiversity accounting calculations prior to Defra publishing their Metric.

The size and scale of HS2, as well as the considerable dataset collected, have allowed the project to play its part in the wider development of the Defra Biodiversity Metric, including joint workshops with Natural England to secure industry input to the emerging spatial and hedgerow multipliers in 2017.

Figure 2. Drone photo of new ponds, grassland and scrub at an HS2 site in Buckinghamshire. Photo credit: HS2 Ltd.

An evolving metric landscape

Over the last 4 years, Defra and Natural England have published five updates to their Biodiversity Metric and associated guidance, resulting in the statutory metric (Defra 2023a). These updates have involved significant changes to how biodiversity units are calculated for area habitats, hedgerows and watercourses compared to the previous metric. Many of these changes require developers to collect more or different data to what they previously needed to gather to complete the biodiversity accounting calculations.

For existing major infrastructure projects looking to keep up to date with the latest Biodiversity Metric, the new requirements can lead to significant cost and programme pressures to collect all the data required. Equally, habitats may have been cleared for a project already, making retrospective gathering of data impossible. Major infrastructure projects, by their nature, often have long lead-in times for development. For example, on HS2, the route optioneering stage (selecting the best route for a project) was undertaken in 2009, scheme design development took place between 2010 and 2016 and consent to construct the railway was granted in 2017. Following scheme design, detailed design was started and construction began in 2020.

The guidance issued by the Defra group for Biodiversity Metric 4.0 in April 2023 was that users of previous versions of the Defra Biodiversity Metric should continue to use that metric (unless requested otherwise by their client or consenting body) for the duration of the project it is being used for (Natural England 2023). This is because users may find that certain biodiversity unit values generated from Biodiversity Metric 4.0 will differ from those generated by earlier versions. However, for major infrastructure projects with long lifespans that are under greater public scrutiny there is still a drive from stakeholders (including non-governmental organisations and members of the Defra group) that these projects should stop using the previous version of the Defra Biodiversity Metric and adopt the latest Defra metric available.

Incorporating updates

HS2 has been collecting ecology data for over 10 years and our ecology survey data have been collected using guidance available at the time; i.e. Phase 1 habitat surveys and condition assessments in accordance with the third edition of the Farm Environment Plan (Natural England 2010). Most major infrastructure projects currently in development started collecting ecology survey data to inform their ecological impact assessments either prior to or during the metric updates over the past few years. It is not possible for these projects to re-survey all their sites as it would result in significant programme delays and costs (often at the expense of the tax payer). Equally, habitats may have been cleared for a project already. Table 1 summarises the key elements of metric updates that have presented challenges to HS2 and which may be relevant to other major infrastructure projects.

Updating the biodiversity accounting methodology on a project means the contractors need re-instructing with the new methodology and upskilling. Then they may have to update the project's habitat design which can result in additional costs and programme delays.

Temporary land-take considerations

Beyond metric considerations, there is currently no consensus on how major infrastructure projects should include land temporarily required during construction within their biodiversity accounting calculations. Major infrastructure projects typically include temporary land take (such as land required for a construction compound) as well as permanent land-take areas (such as land required for the footprint of the new railway track). Temporary land-take areas can contribute a significant area of the total scheme footprint. On many projects, including HS2, an assessment of impacts from this temporary land take is completed, often based on land being restored to its previous use after construction and handed back to the landowners with no restrictions (such as a conservation covenant). Most major infrastructure projects include this reinstated land in their biodiversity accounting calculations even if there are no restrictions in place and in the absence of clear guidance.

If temporary land can only be included in the post-construction calculations with restrictions (like conservation covenants) being in place, it will trigger additional significant impacts to landowners and associated compensation events if these restrictions are imposed. If restrictions are not able to be imposed and developers cannot continue to include these areas in their post-construction biodiversity accounting calculations (i.e. only accounting for the loss of habitats in pre-construction), it will significantly worsen a major infrastructure project's biodiversity accounting position. This will result in significant additional cost to deliver off-site compensation or purchase additional biodiversity units/ credits from the market.

Figure 3. Ecologists inspecting habitat creation at an HS2 site in Warwickshire. Photo credit: HS2 Ltd.

Table 1. Defra Biodiversity Metric updates and their impact on major infrastructure projects.

Element of Defra Biodiversity Metric	Metric first including this this element (year)	Issue for major infrastructure projects
Strategic significance multiplier (measurement of local significance of a habitat based on location and habitat type) and Spatial risk multiplier (measure reflecting relationship between location of on-site biodiversity loss and location of off-site habitat compensation)	Biodiversity Metric 2.0 (2019)	There is no clear guidance as to how these multipliers should be applied, especially when they typically cross counties and landscapes. Ecologists working on these projects need to make assumptions about how to apply the multipliers, which can vary between projects. This is compounded as most Local Nature Recovery Strategies are not yet published.
Watercourses (including watercourse encroachment and riparian encroachment)	Biodiversity Metric 2.0 (2019)	Current projects that started ecological surveys prior to 2019 have not completed watercourse surveys in accordance with the watercourse survey methodology requirements introduced in Biodiversity Metric 2.0. Ecologists need to make assumptions to shoehorn existing watercourse data into the latest Defra metric, leading to discrepancies in approach between projects.
Temporal multipliers (early/delay)	Biodiversity Metric 3.0 (2021)	Major infrastructure projects designed and consented before 2021 couldn't have factored these multipliers into project design. Many projects do not ascribe every individual area of habitat loss with a corresponding area of habitat compensation. This is because such projects typically only ascribe specific areas of mitigation at locations where likely significant effects have been identified during the Ecological Impact Assessment. Major infrastructure projects must make assumptions about how to apply these multipliers, leading to discrepancies in approach.
Individual trees	Biodiversity Metric 4.0 (2023)	The need to include individual trees was introduced in spring 2023. Some major infrastructure projects collect individual tree information throughout construction meaning that as construction progresses the biodiversity accounting position for these projects will get worse. Equally, some arboricultural surveys collect data on groups of trees as opposed to each individual tree on a major infrastructure project.
Habitat survey methodology	Biodiversity Metric 2.0 (2019)	The habitat classification methodology changed from JNCC Phase 1 habitat surveys to UKHab surveys in 2019. Projects in development prior to this typically collected habitat data using JNCC Phase 1 methodology. Ecologists on these projects must make assumptions when translating JNCC Phase 1 habitat codes to UKHab codes as they don't perfectly align, causing inconsistencies in translation between projects.
Condition scores	Biodiversity Metric 2.0 (2019)	The habitat condition assessment methodology was first updated in 2019 and has since continued to be updated for different habitats. Projects in development prior to this collected habitat condition assessment data in accordance with the Farm Environment Plan (Natural England 2010). This means how condition scores are assigned can vary between these projects.

Looking forward

Whereas both TCPA and NSIP projects will use the statutory Biodiversity Metric in future, the nuances between the differing project types need careful consideration when applying the Metric. We believe that the following should be considered by environmental professionals working on major infrastructure projects at the earliest possible point to understand the implications of adopting the statutory Biodiversity Metric.

1. Have the ecology data for the project been collected in a way that allows for input into the Metric? This is critical given the often lengthy survey periods for major infrastructure projects and the small changes that assumptions can have on scores generated. If not, this will require consultation with the consenting bodies and regulators to agree a way forward.
2. Has the programme of works been planned to recognise the penalties that may result if habitats are cleared in advance of mitigation sites being established? With such complex multi-disciplinary programmes, it is crucial that time lags are minimised. For example, can landscape mitigation planting be implemented earlier in the project's programme to reduce the time lag between clearing habitats and implementing compensation?
3. Have temporary and permanent land-take areas been appropriately captured in the Metric? Given the necessity for habitat management to be a minimum of 30 years for a habitat to be included within the Biodiversity Metric, understanding the implications of handing land back to landowners or third parties is essential. This can be difficult on major infrastructure projects where the design and construction phases overlap, meaning the exact areas of temporary and permanent land take are not finalised until late in the design programme.
4. Has feedback been provided to the Defra group to outline challenges, constraints and opportunities in adopting the Metric? It is crucial that feedback and case studies are provided to the Defra group as the guidance for NSIPs is produced over the coming years. The expertise of the environmental teams working on major infrastructure projects should be sought by the Defra group to allow for early input into the accompanying guidance.
5. Can you share lessons learned from other major infrastructure project teams? Application of a Biodiversity Metric on such projects is still in its infancy with little clear guidance. Collaboration is key to helping ensure consistency among projects, reducing the risk of external challenge and delivering joined up nature recovery. This could involve reaching out to other major infrastructure projects or discussing the matter with relevant government departments.

Conclusion

The purpose of BNG and use of the statutory Biodiversity Metric is to improve outcomes for biodiversity on development projects and help support nature recovery. Any considerations around how the Metric should be applied needs to bear this in mind to ensure developers aren't spending all their time and money on metrics with no improvements in biodiversity outcomes.

There is still a way to go to get major infrastructure projects ready for BNG using the statutory Biodiversity Metric in 2025. In the meantime, the Defra group need to work with developers and ecologists working on existing major infrastructure projects to gain from lessons learned and understand the complexities of such projects and how forthcoming guidance will impact NSIPs. It is also our view that the Defra group should engage with developers and ecologists on major infrastructure projects wanting to retrofit the statutory Biodiversity Metric to their project. This will involve parties agreeing pragmatic assumptions, grounded in robust ecological justification, for these projects to use the statutory Biodiversity Metric.

The statutory Biodiversity Metric has only just been published, with guidance still in its infancy for major infrastructure projects. Collaboration and partnership working, which is embedded in HS2's biodiversity approach (HS2 2022), will be vital for major infrastructure projects to deliver mandatory BNG and contribute towards the Government's ambitious nature recovery targets.

Acknowledgements

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Application of Habitat Suitability Assessment as an Alternative Approach to Predicting Water Vole Populations on Large Sites

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Keywords: habitat suitability assessment, surveying, water vole

Water vole survey methods normally require detailed searches for field signs to establish presence and to provide likely population estimates. However, due to financial reasons or time limitations, this methodology may be difficult to implement on very large sites containing a complex network of water features. We report on an alternative approach to surveying water voles on such sites, based on assessment of key habitat features. This approach was validated using point searches for field signs and also latrine counts on selected 100 m stretches, supported by statistical analysis. We found that the habitat score is a good predictor of water vole presence and the higher the habitat score, the greater the number of latrines (implying higher density of water voles).

Introduction

In January 2022, the Broads National Park (the Broads) received funding from the Nature for Climate Peatland Grant Scheme to develop a series of restoration projects for re-wetting peat

soils to reduce carbon emissions. The habitats in the Broads represent an extensive network of rivers, grazing marsh and fen habitats, interspersed by water-filled dykes and ditches. Water vole (*Arvicola amphibius*) are believed to be widespread throughout the area and so the implications of raising water levels on this species needed to be built into projects at an early stage. Following the procurement process Suffolk Wildlife Trust was invited to undertake comprehensive water vole surveys on 11 sites to provide a high-level overview of the potential impacts and to feed into the detailed project designs.

Guidance on water vole survey methods is provided in Dean *et al.* (2016). As well as recording habitat suitability, detailed searches for field signs should be undertaken to establish presence, with spot checks at a minimum of every 5 m to provide likely population estimates. Unfortunately, due the complexity and very large size of the identified areas for survey, averaging around 50 ha per site, traditional methods wouldn't have been feasible in terms of available time and budget, so an alternative approach was required to deliver cost effectiveness while still obtaining robust results.

To address this problem, it was considered that a survey method based on assessing habitat quality as a predictor of likely water vole presence could be utilised. This approach was originally devised by Jane Harris and was previously used for the Broads Flood Alleviation Project (BFAP) (Halcrow Group 2007, Harris 2002, Harris *et al.* 2009) prior to water voles receiving full protection under the Wildlife and

Table 1. Habitat suitability criteria.

Attribute	Code	Notes
Well developed (>60%) bankside and emergent vegetation	WDBV	If there is over 60% bankside vegetation cover then score 1. Vegetation should ideally be >30 cm high and provide a relatively continuous cover. If water level is obviously at a high point try to imagine the water body at a time of normal water levels. If bankside vegetation is insufficient then score 0.
Year-round availability of food sources	YRFA	Where there is a good mixture of vegetation types (grasses, reed and reed rhizomes, sedge and limited areas of scrub such as hawthorn or bramble) and plenty of currently green vegetation then score 1. If the vegetation is very low and sparse and patchy then score 0.
Suitable refuge areas above extremes in water levels	SRA	Where there is good refuge (i.e. an area of dense rush or grass tussocks) within 10 m of the water margin and situated on higher ground, which would not become flooded at high water levels, then score 1. If there are no tussocks present or they are very sparse then score 0.
Steep banks suitable for burrowing	SBB	Where the banks are >40–50 cm high freeboard, an angle of 30–50°, appear stable and with a substrate suitable for burrowing, score 1. If the banks are <30 cm in height above the current water level, or are at a very low angle, then score 0. If the bank is two-staged (e.g. two clear slope phases but not a wetted berm proper) then a comment should be made accordingly.
Permanent open water	POW	Where there is permanent open water score 1. Where the water body is choked with emergent vegetation to the point where water vole cannot freely swim to escape predators, and/or the water is shallow (typically <30 cm), score 0. If score is 0 then note whether ditch may still provide sink habitat.
Presence of berm (a shelf or area of cover above water level but below bank top)	POB	If there is a continuous berm along the water body edge score 1. If there is only a very limited berm or none at all, then score as 0.
Lack of disturbance through poaching and grazing and/or recent management	LOD	Where there are few signs of poaching damage (or poaching is clearly historical and no longer occurring) or no sign of recent cutting/slubbing out of the water body, or the provision of stock-proof fencing, then score 1. Tracks with ditches both sides often afford this feature. However, if there is obvious poaching damage to the bank and short, grazed bankside vegetation then score 0.
Nest-building opportunities in vegetation above water level	NBO	Where there are low, unsuitable bank levels the presence of nearby nest-building opportunities provide an alternative refuge habitat. Where there are numerous, dense grass, rush or sedge tussocks within 5 m of the water body margin then score 1. If there are few tussocks then score 0. If suitable nest-building opportunities are present >5 m from the margin this should be noted separately.

Table 2. Assessment of habitat suitability.

Score	Suitability	Comment
0	Unsuitable	A score of 0 means that the habitat contains none of the desirable attributes including permanent open water. At best, it may provide seasonal dispersal habitat but will not be permanently occupied.
1	Sink/unsuitable	This type of water body will contain very little if any vegetation, poor shallow or low banks, no berm and with no rush/grass tussocks in close proximity of the water body. It is possible that this type will have been recently dredged out and will have scored 1 from having open water present.
2	Sink/unsuitable	A score of 2 will also be unsuitable and lack well-developed vegetation cover.
3	Sub-optimal	In this case there will be a small number of positive features; these water bodies may rarely be of enhancement potential.
4	Sub-optimal	This type of water body is quite common, often characterised by suitable open water, steep banks and good vegetation coverage. A score 4 water body will often have good enhancement potential to make it an optimal water body.
5	Sub-optimal	A score 5 water body can often appear suitable for water voles and will often have a number of field signs present; enhancement potential to make it an optimal water body is almost certain.
6–8	Optimal	A score of 6–8 represents an optimal water body for water voles. It will often have dense and varied vegetation, tall and structurally sound banks, permanent open water, a lack of disturbance (often due to the exclusion of cattle) and the presence of one or more of a berm, suitable refuge sites or nest-building opportunities. A water body scoring 6, 7 or 8 will often be lined with a 5–10 m band of grass or rush tussocks.

Countryside Act 1981, as amended. An expert steering group was formed to provide guidance to the delivery of the project, particularly regarding the development and validation of the survey methodologies. Members of the group included staff from Natural England, The Mammal Society and Broads Authority as well as four independent water vole experts.

Application of Water Vole Habitat Suitability Assessment (WVHSA)

The WVHSA methodology is based on eight habitat attributes which are likely to be particularly relevant to the presence of water vole (Table 1). The habitat score is derived from the combined totals of the above, ranging from zero to eight (Table 2). It is predicted that the higher the score for a particular length of water body the more suitable it is for use by water voles.

Validation of the methodology

To test the validity of using the WVHSA method to predict water vole presence and likely population density, a pilot was undertaken on three sites. To ensure the independence of the data, stratified sampling was undertaken at 100 m intervals using pre-set points generated by Q-Field, recording WVHSA scores at each point. As part of the project, additional habitat information such as water depth and freeboard height were also collected at each point. Evidence of water vole was searched for 15 m either side of each sampling point with sighting and/or latrines taken as definitive evidence, but feeding signs were also noted. Additional sampling points were included where there was an observed change in habitat on a dyke section and at intersections where two or more drains met.

The stratified sampling data (199 points) were analysed using a binomial logit linked generalised linear model (GLM). It was demonstrated that habitat score appeared to be a good predictor for water vole presence, with increasing habitat score being linked to higher probability of water vole presence. A sensitivity and specificity analysis was conducted to identify the habitat score that would reduce the rate of false/true positive and false/true negative rates if a simplified binary (presence/absence) result was required. It was found that the threshold value at which habitat scores could be classified into water vole presence and absence binary outcomes occurred when the habitat scores are greater than 5.5. This in turn provides support for the use of an 'optimal' habitat classification for habitats with a score of 6 and above.

The survey method was then refined because of the time-consuming limitations of the stratified point sampling methodology. At the remaining eight sites the survey method recorded habitat suitability for homogenous ditch lengths until a habitat change was noted. A spot check for signs of water vole was undertaken within each homogenous ditch distance (Figure 1). In addition, continuous fingertip searches for water vole evidence were also undertaken for 100 m stretches, counting latrines, burrows and feeding remains. These stretches represented homogenous habitat that had been categorised as being sink/unsuitable, sub-optimal or optimal (based on the Table 2). Where possible, this search was undertaken three times for each habitat category, totalling nine detailed surveys per site; however, at some sites some categories were under-represented.

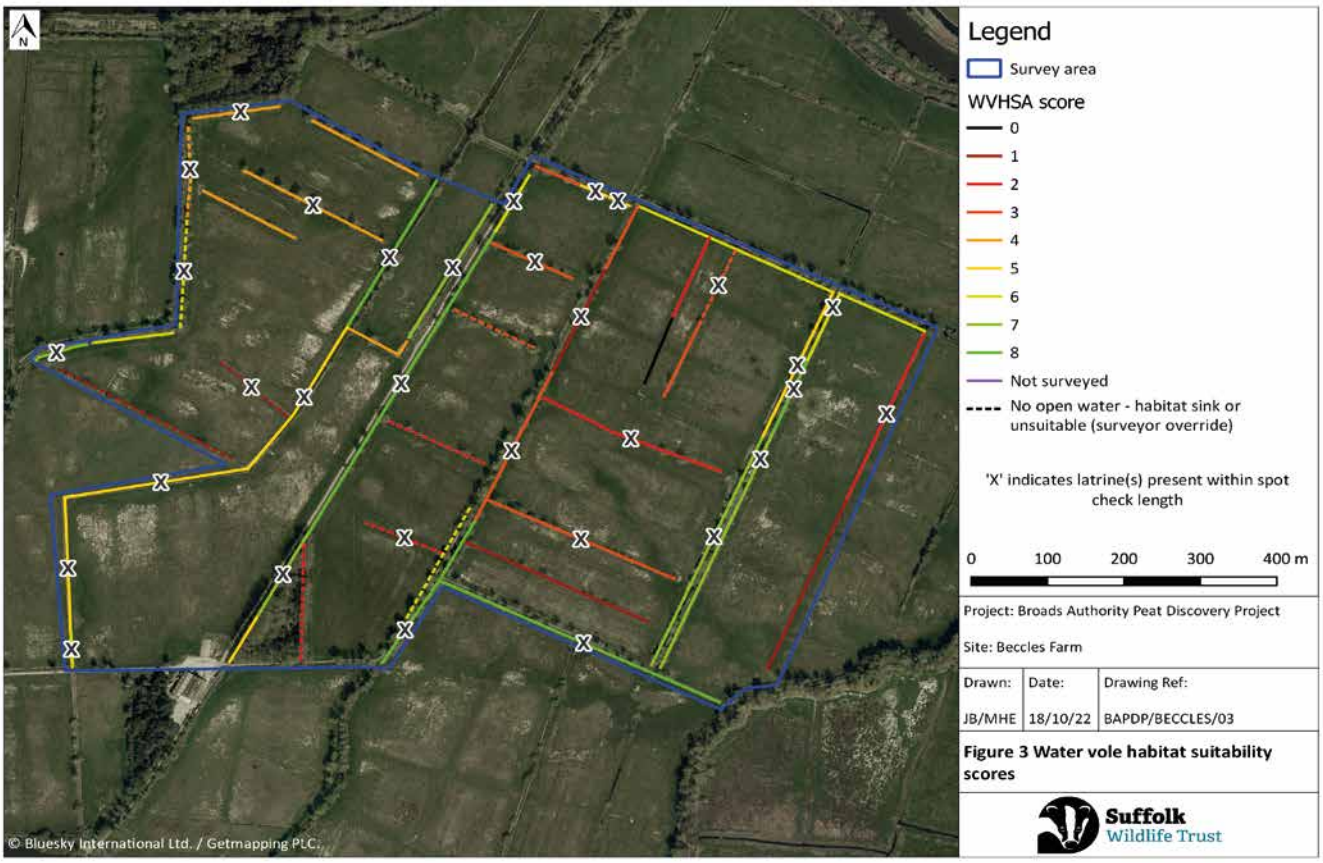

Figure 1. Water vole habitat suitability scores with presence of a latrine shown as a X.

Analysis of combined ditch habitat scores

When comparing the habitat scores between ditches with water vole presence (n = 297) and water vole absence (n = 132), it was found that ditches with water vole presence had a higher mean habitat score (Figure 2). A non-parametric Kruskal–Wallis test found that the distributions of habitat scores within the two present/absent groups were significantly different (χ^2 = 76.82, df = 1, p<0.001).

Assessment of the importance of specific habitat attributes

To further investigate the individual importance of the habitat variables they were fitted within a binomial GLM, with a logit link to water vole presence/absence response. A stepwise removal process that iteratively removes the least important variable was conducted in the fitting process. The model found that the presence of well-developed bankside vegetation (WDBV) is highly important in predicting the presence of water vole and year-round availability of food sources (YRFA), steep banks suitable for burrowing (SSB) and permanent open water (POW) are also all important for water vole presence.

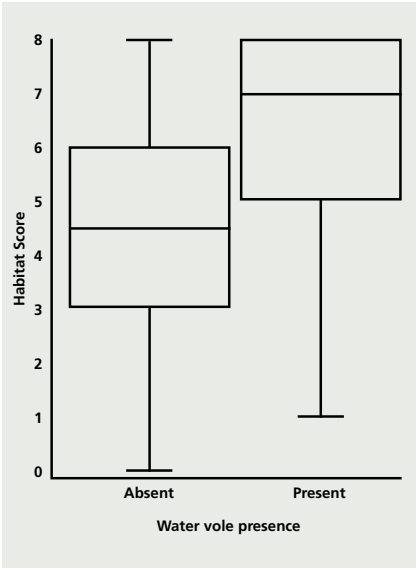

Figure 2. Median habitat score for ditches with water vole presence, with interquartile range and range (n = 297) and absence (n = 132).

Comparison of latrine count with habitat score for 100 m stretches

The total number of latrines was compared with the reported habitat score from each 100 m transect. The results indicate that as habitat score increases the number of latrines increases proportionally. This pattern was found to be consistent across the sites. A linear regression analysis was significant in predicting the number of field signs by habitat score (R^2 = 0.12, F(1,66) = 13.74, p = 0.002). Whereas this is only responsible for 12% of the variation this once again supports the method as not only presence, but also the number of latrines are linked to the habitat score.

Estimating population density using habitat classification

The relative population density of water voles across the whole site can be predicted from the recorded habitat quality of ditches and their overall lengths. For each habitat classification (sink/unsuitable, sub-optimal and optimal) the mean number of latrines per 100 m stretch was calculated for each site and also to obtain the average density across all sites surveyed. The total length of ditches for each habitat classification within each site was also measured.

The results demonstrate that the density is higher in the higher suitability classes. In optimal habitat the average latrine density was 14.94 latrines/100 m (standard deviation (SD) = 17.14), in sub-optimal habitat it was 9.14 (SD = 14.87) and in sink/unsuitable habitat it was 2.0 (SD = 4.67). The pattern was the same across all sites with the exception of one. Whereas the standard deviations are high, it is worth noting that these combined average densities coincide broadly with the predictions of Dean *et al.* (2016) for relative population density of water vole in the first half of the survey season.

Conclusions

This alternative methodology has successfully identified the presence of and a relative population estimate for water voles at 11 large sites in the Broads National Park, so that the effects of the re-wetting projects on the local water vole populations can be identified. Through consultation with Natural England, the data were considered to be acceptable to contribute to water vole mitigation licences.

We believe that this approach of assessing habitat suitability combined with spot checks for field signs to be of intrinsic value when considering the ecological impact of proposed planning applications on large sites known to be capable of supporting water vole populations. We emphasise, however, that the experience of the surveyor is critical to ensure accurate interpretation of the attributes and training in the method is advisable, especially where multiple survey teams are involved. It may also prove to be a valuable tool for assessing habitat quality ahead of water vole reintroductions.

We also acknowledge that habitat quality is not the only predictor of water vole presence. Throughout the Broads, American mink (*Neovison vison*) numbers are currently very low due to an intensive trapping regime across the region and as a result are unlikely to be exerting a negative influence on water vole populations. When considering using this method elsewhere, the influence of predation by American mink on water vole populations must be considered. Other factors including seasonal flooding and on-site water management regimes are also relevant when interpreting survey results. In such circumstances, particularly when the effects of mink predation are unknown, it is recommended that the habitat suitability assessment and spot checks should be combined with detailed searches for latrines along 100 m stretches of the most suitable habitat to help ensure estimates of population density are robust.

Figure 3. Photograph of a high-scoring ditch (optimal habitat for water vole). Photo credit: SWT Wilder Ecology.

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Viewpoint

The House That Peat Built: Ensuring Cost-Effectiveness In Peatland Restoration

Figure 1. An example of what a single 'linear' gully might look like on the ground. Photo by Fern White.

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Keywords: design, mapping, NatureScot, Peatland ACTION, peatland costs, peatland restoration

"Basing peatland project design and costings on linear meterage can only deliver the illusion of properly costed operations."

To enable the scaling up of peatland restoration, while maintaining good ecological outcomes and value for money, the restoration industry needs to change the way it designs projects. The standard approach can lead to detrimental outcomes: irreparable ecological damage or significant under-costing. Project design is heavily influenced and promoted by NatureScot, as the main grant funding body, with significant pushback against potentially better ways of designing projects. Using a construction-based analogy I hope to show that basing design and costings on a single attribute of peatland impacts, linear meterage, can only deliver the illusion of properly costed operations. In contrast, using an area-based approach considers more factors and limits the negative implications of misrepresenting peatland degradation.

Peatland ACTION and project scale

To meet Scottish Government targets of 250,000 ha by 2030, NatureScot's Peatland ACTION programme is in place to support the delivery of restoration projects. A 10 year funding package, announced in 2021, provides grant

funding for the delivery of new and existing projects across Scotland. With Peatland ACTION now 11 years old, it's worth considering whether the industry is competently designing projects to ensure value for money for taxpayers.

To meet the two aims of (1) government targets and (2) value for money, the scale of projects needs to be sufficient to contribute sensibly to both. Therefore, scale has been main driver for peatland restoration in recent years, increasing overall restoration and reducing cost per hectare.

However, project size is constrained by restoration season, the number of machines available, the facility to reasonably project manage good outcomes and the severity of degradation, etc. In general, a project of more than 100 ha per season could be considered suitably scaled, given the numerous constraints, and seeking to produce a balance between targets and value for money.

Using the analogy of a large construction project

As peatland projects fall under Construction Design regulations (2015) – and the contractor costs alone of a suitably scaled project can be around half a million pounds – the design of these projects is akin to a large construction project. This is the analogy I will use to help identify the issues with the current status quo.

Firstly, the construction industry is built, quite literally, on making conditions for any build uniform, constructing level and precise foundations, from which all construction that follows is standardised and known. This could not be further from the peatland industry, in which conditions vary enormously, and largely cannot be controlled. Factors that influence project conditions include topography, ground composition (e.g. peat integrity, presence of mineral, tree roots), extent and type of vegetation, severity and type of degradation, season, past and present weather, and the cascading impact of interventions as they are worked.

This is a long way from British Standard specifications and engineering calculations. It is unrealistic to precisely 'design-in' the myriad of factors of the natural environment, and so options and flexibility are needed to address the conditions that are found.

Secondly, while techniques for addressing artificial drainage and minor erosion are well established, the industry is now increasingly attempting to restore much more severe erosion, manifesting in more variable ground conditions and larger or more intricately networked gullies. This is a progression that will only become more evident as the easier work is completed and more severe degradation is all that remains.

The palette of techniques that gives flexibility to a design is varied, with nuance and ground conditions dictating which technique can be used where. Often this can only be known on the day as it is fundamentally condition-dependent, and no project can have the degree of certainty at project outset that a traditional construction project has – even with leaps forward in remote sensing.

How current projects are specified

Having set the scene. How does the funding body that oversees peatland restoration in Scotland specify how projects should be designed for the purpose of ensuring value for money?

The design of most projects follows the spatial guidance provided by NatureScot (www.nature.scot/doc/peatland-action-spatial-data-guidance-support-your-project). This dictates that impact features (e.g. gullies and peat haggs) should be digitised as linear lines (see Figure 1). The squiggly hand-drawn lines over-simplify and mis-represent the underlying impacts, but provide a decisive, if subjective, linear meterage.

Linear meterage can differ by more than 100% depending on the scale at which these lines are drawn, the detail of aerial imagery and accuracy of the digitiser (see Figure 2). A meterage assumes uniformity in all other characteristics except length. It does not take into account depth, width or surrounding environment (such as accessibility for machines, or availability of donor turf), which all impact the time and cost involved in restoration. However, current guidance promotes design based on linear meterage; a single variable, which itself is likely inaccurate.

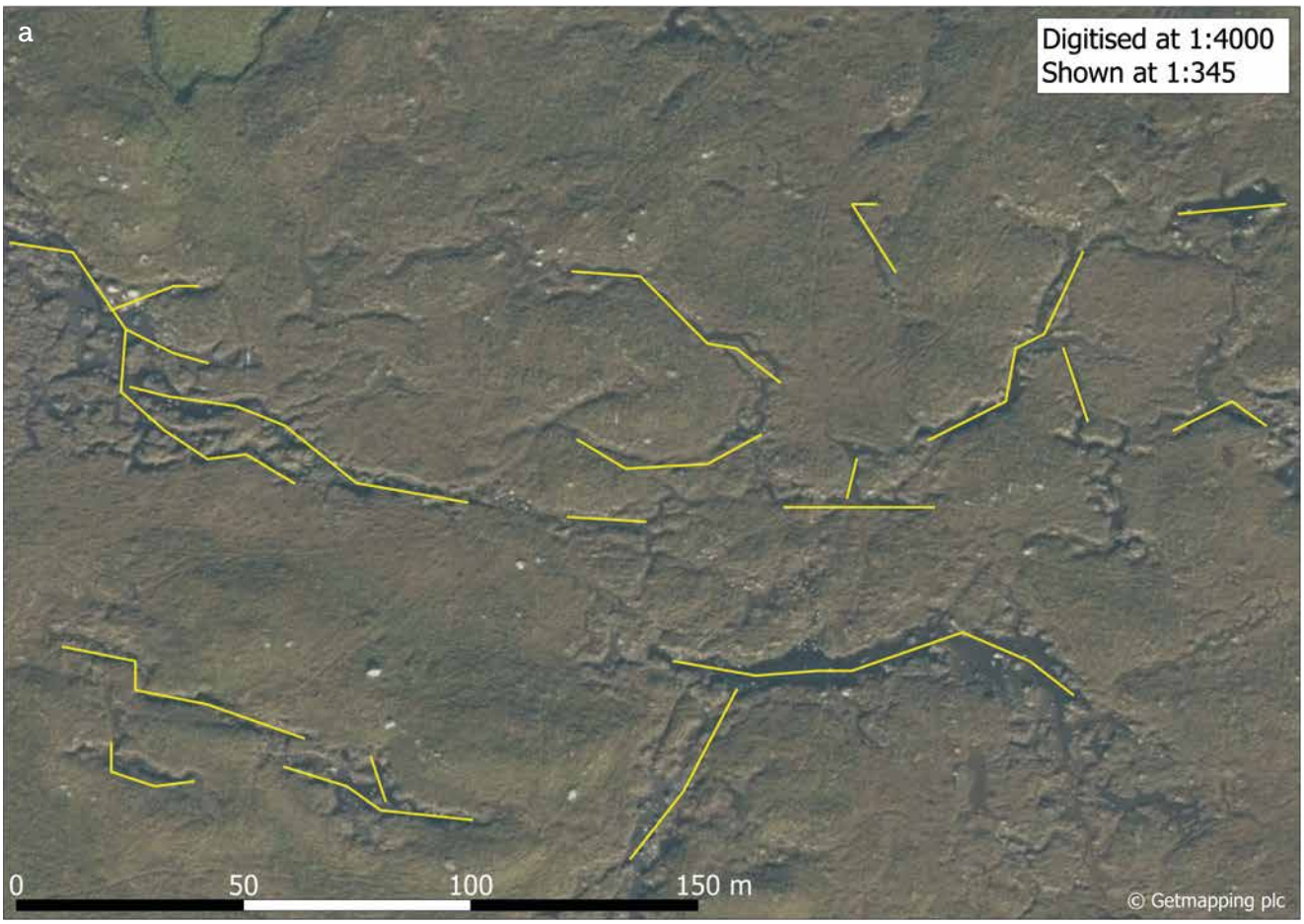
"Linear meterage can differ by more than 100% depending on the scale at which the lines are drawn, the detail of aerial imagery and accuracy of the digitiser. A meterage assumes uniformity in all other characteristics except length."

Further, the costing will be outsourced to contractors. Each will rely on these figures to accurately reflect site conditions. Optimistically, a contractor may swallow the cost of a day visit to a remote Scottish location, where they could realistically only assess a tiny proportion of a large variable site. Then the resultant cost per metre must ensure restoration can be achieved, risk is managed and a sustainable business can be run.

For example, a small 1000 m gully system might have dams at every 5 m, requiring 200 dams at a given cost per dam and reprofiling of the side walls for 800 m at a given cost per metre. However, each dam might be sized between 50 cm and 5 m wide, with equivalent increases in depth. The reprofiling may be quicker, longer or not possible, based on vegetation cover and access. All this can vary for any given length or even what the weather is like.

Unfortunately, as outlined, this linear approach omits much of the key information that is significantly impactful on cost, only providing confidence to the grant funder in its spurious 'precision'. At best, this results in delay mid-project, where significant further funds are requested from Scottish Government, but at worst it can lead to poorly implemented works on a delicate environment as projects may attempt to keep to an unrealistic budget. Considering the necessary balance between cost/time and robustness of works, inadvertently reducing the former could inevitably lead to irreparable damage in a delicate ecosystem.

Returning to my house building analogy, this is akin to designing and costing a house purely based on the length of frontage. In such a situation both a cottage and block of flats could be priced similarly. By taking account of just one criterion – linear meterage – the approach fails to account for the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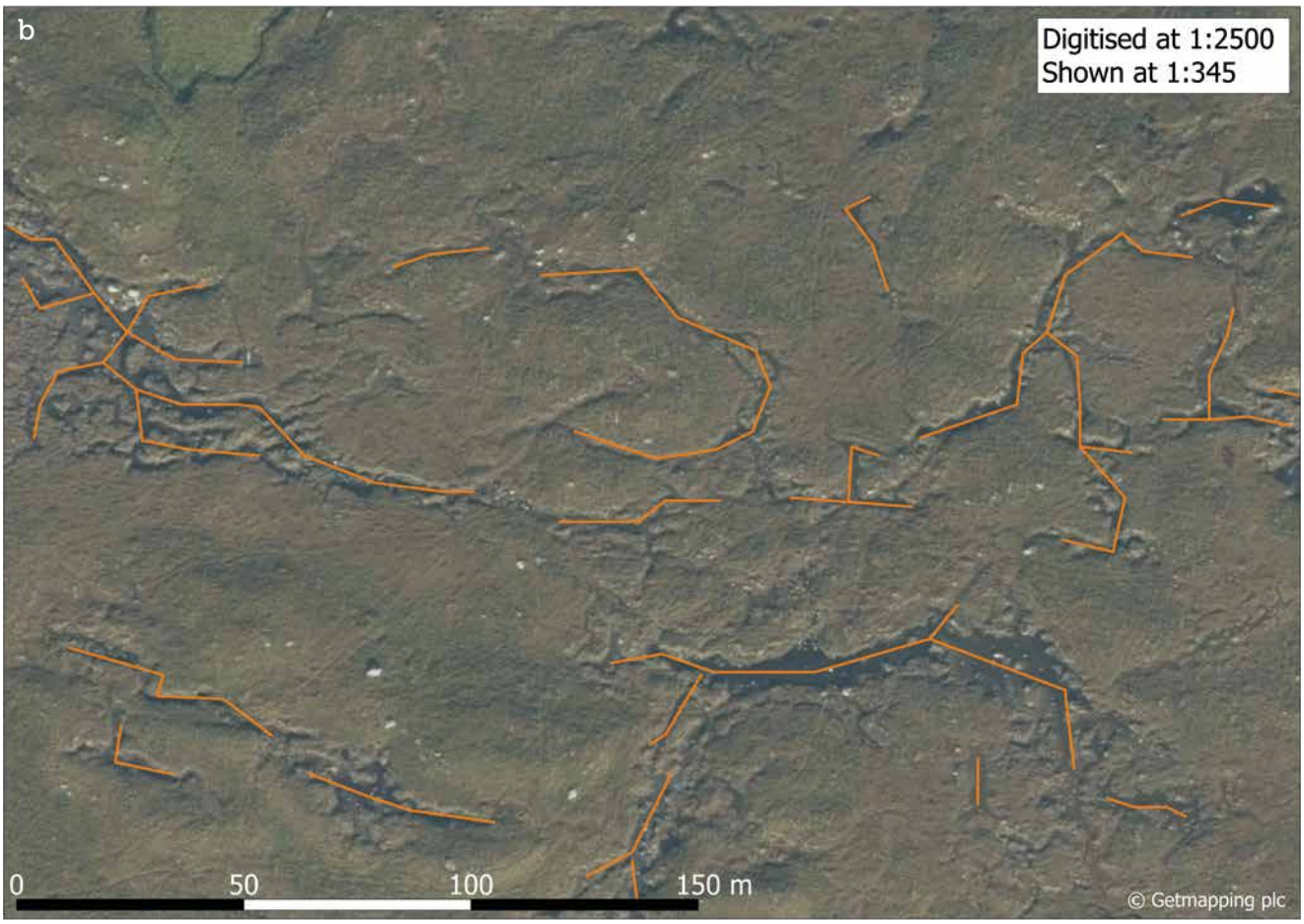
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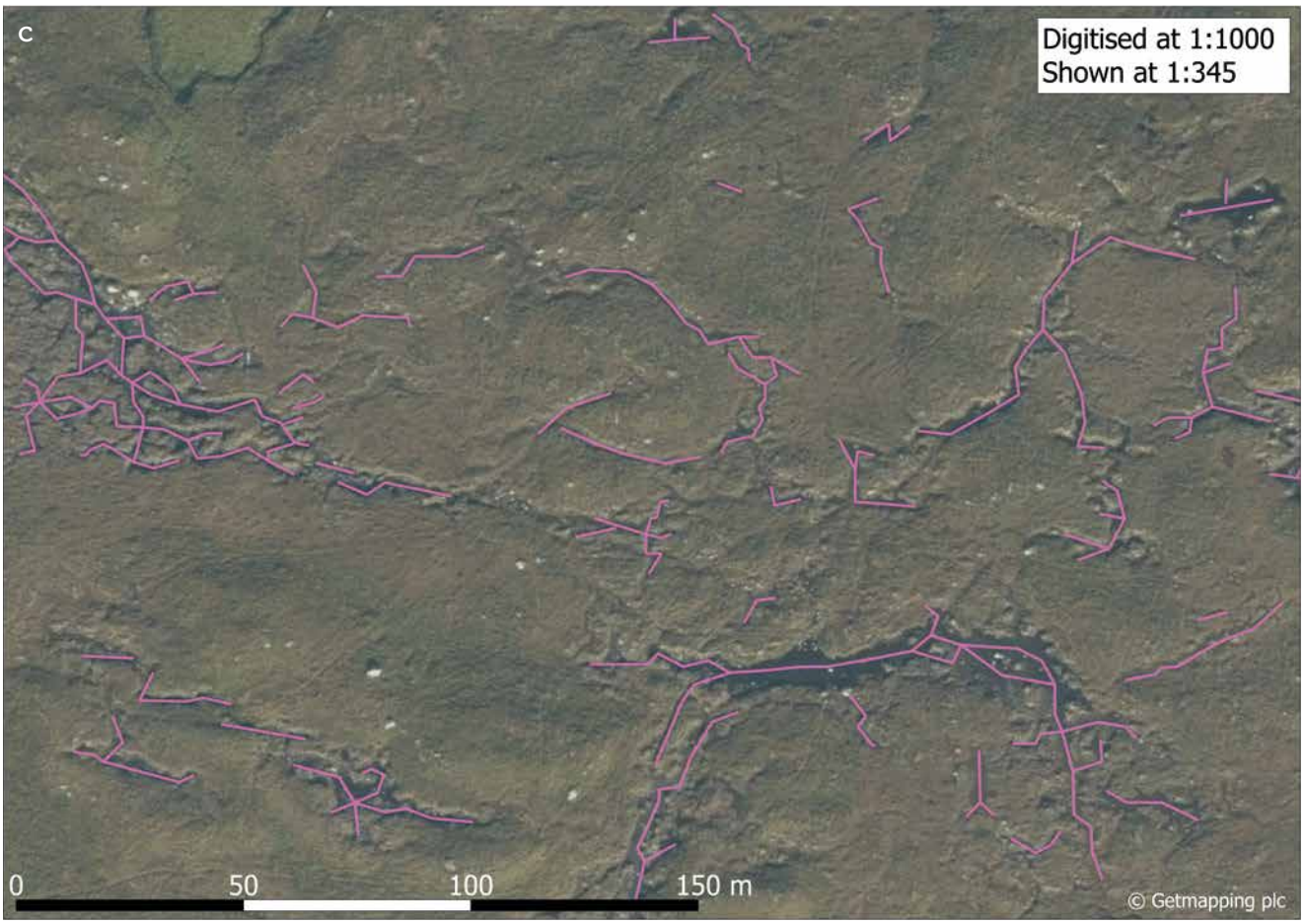

Figure 2. An example of the variation in outcomes for linear digitisation on an existing project. Hand digitised at (a) 1:4000, (b) 1:2500 and (c) 1:1000 scales; resulting in approximately 790 m, 1100 m and 1820 m in total linear meterage respectively. There is a 130% difference between the less and more accurate digitisations.

plethora of information that dictates the time and therefore cost requirements to restore.

A better house design?

An alternative is to base the project on area, allowing costs to be attributed to a per-hectare estimate; or square-metre cost in the house analogy. A quantified degradation category can then be allocated, so that minor, moderate or severe categories would have different cost rates. In the same way, a living room, kitchen and bathroom would have different average costs, which would then be scaled with the square meterage.

For example, a living room would on average cost a certain amount per square metre, so too would a peatland restoration project for a given severity on average take a certain amount of time (cost) per hectare. There is a lower limit for both, where even a small, plain living room, or relatively low-severity project, would have a minimum cost.

This is in part why an area-based project, designed by an experienced designer, is unlikely to under-estimate costs by as great a degree as a linear meterage approach.

Given the scale of a house, square meterage is logical choice for building design; likewise, hectarage is the logical choice for peatland restoration. Allowing each hectare to have its own category (e.g. 100 severity allocations in a 100 ha project) refines the design further.

The categorisation is based on the ratio of bare peat present in each hectare. Increased bare peat could mean:

1. a single large gully; larger gullies are often deeper and/or wider; increased depth or width generally increase time to implement restoration techniques
2. heavily networked gullies; the more networked the ground, the more broken the surface, the less vegetation for use in restoration, the greater the difficulty of access and the slower and more delicate the progress; otherwise, multiple machines needed to work collaboratively
3. large peat pans; low level of vegetation, often either topographically varied or possibly deep and wet; access is difficult and perhaps requires multiple machines; expensive hand labour is likely to be needed.

From experience, an increased ratio of bare peat to hectarage is a good proxy for increases in time/cost, which is then quantified via our known evidence base.

The specific percentage ratios for each severity category are less important, but how they match with machine rates is, and, critically, what is the evidence? In our case, we have a large evidence-base (>5000 ha of machine-rate-based restoration) for this type of project, which is now used to refine each severity category for optimum accuracy. Our classification of bare peat is generally a conservative one, via a

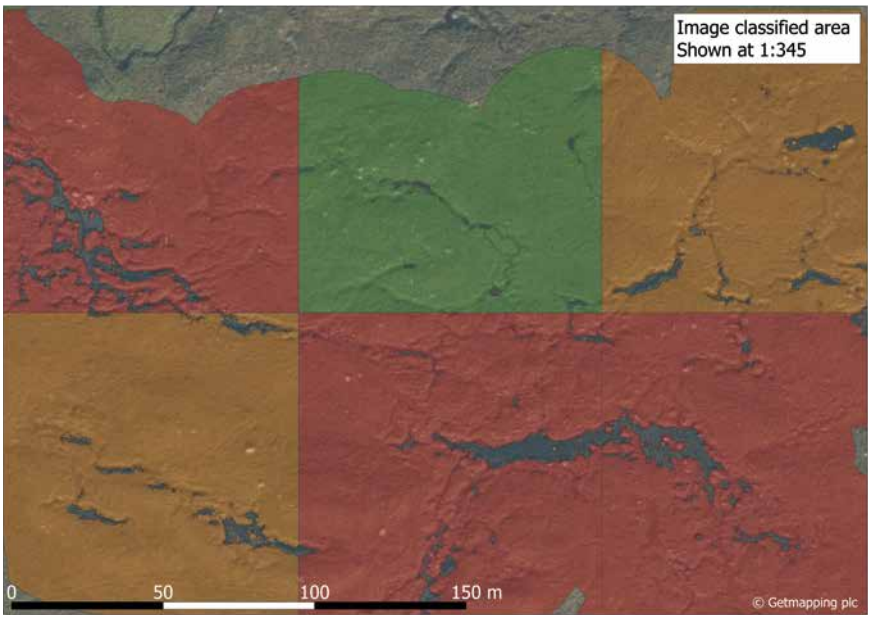

Figure 3. Hectare allocations to each severity type; red = severe; orange = moderate; green = minor. The bare peat element in each hectare is transparent to show underlying aerial imagery. Hectares are defined within a 30 m project boundary.

standardised image classification process accurate to 25 cm, which is then matched with achieved machine rates.

Substantial experience of average machine work rates on similar projects helps allocate machine rates to categories, providing a lower, middle or upper estimate for each hectare (Figure 3). Any given project under similar conditions should then have a good estimate of the time needed for the restoration operation.

This makes further sense when you assign the need to treat the entire area, and not just the line that would otherwise have been digitised. Contractors then have the budget to use a wide range of techniques, as directed by an experienced and competent project manager, to ensure all impacts are treated robustly. There is no focus on the lines that have been digitised with unknown accuracy, matched with the potentially insufficient budget that has then been allocated.

“An area-based approach allows flexibility in project design. It provides much-improved integration of site data, allowing costs to have a greater degree of certainty and providing an improved estimate of value for public money.”

A flexible approach based on experience

This approach, based on significant experience of managing peatland operations, allows flexibility in project design (e.g. what intervention goes where), which is necessary for the conditions found on any given day. It also provides much-improved integration of site data, allowing costs on average to have a greater degree of certainty across a project and providing an improved estimate of value for public money.

Taking the example in Figure 3, and strictly upscaling it to a 100 ha heavily degraded project, would equate to about £450,000 of contractor works. A misrepresentation of bare peat of 100% would only shift 2 ha up a severity level. If this were a consistent issue across the whole project, i.e. the entire project deviated significantly away from the worked evidence base (highly unlikely), the project would be under-costed by approximately £100,000; a 20% difference.

Similarly, for linear meterage, assuming the same initial cost, would result in an under-costing of £450,000; or direct 100% difference. The distinction is that under-estimating linear meterage is a more likely risk and the repercussions are also more costly.

When estimating costs of non-uniform, non-consistent, non-standardised construction projects, reducing worst-case scenarios from a possible 100% shortfall to a less likely 20% is quite substantial.

Unfortunately, the area-based methodology requires significant experience in peatland restoration project management, as well as data to estimate machine rates on similar ground. However, ensuring a designer has suitable experience and competence to deliver your £500,000 house build would be the first step in construction. As CIEEM members we should be establishing standards of professional competence and promoting better ways of working; this is something that the peatland industry needs urgently.

Although Peatland ACTION does allow for the area-based approach, and more than 20% of all projects use similar methodologies for design, there is still significant pushback for not following the ‘standard’ approach. Restricting the design to a flawed linear-based methodology is a questionable way to upscale the industry. The challenge then is for NatureScot and the wider industry to acknowledge the significant shortcomings of the standard approach. Poorly designed projects and their negative consequences cannot deliver value for money. Encouraging project design that is fit for purpose in these highly changeable environments would be a huge step forward.

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Stuart Burbidge MCIEEM has been an ecologist for more than 10 years, specialising in applied research and operational scale. In the last 6 years he has been directly involved in about 20% of all peatland restoration conducted in Scotland. He has provided advice to the Scottish Government, Peatland Code and various other organisations.

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Drivers for Change in Ecological Consultancy: What New Skills Are Needed and How Can They Support Increased Diversity in the Sector?

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Keywords: consultant ecologist, design ecologist, digital ecologist, drivers of change, skills

"Technological innovation is changing the way we deliver ecological baselines and monitoring, and ecologists are increasingly asked to deliver more than the traditional requirements."

The September 2023 edition of *In Practice* focused on the topics of diversity, accessibility and capacity in our sector. Many of the challenges discussed in that edition – with respect to breaking into the profession and the related solutions that were suggested – are associated with the more traditional view of what a consultant ecologist is/does. However, my role has evolved significantly in recent years, primarily due to the emergence of the Biodiversity Net Gain approach in England and links to wider drivers such as those related to COP15 targets. I have thus become acutely aware of how the profession itself is changing, and how the role-related responsibilities of consultant ecologists are becoming more diverse. This broadening of the role requires new skills and consequently can drive greater diversity in the sector.

Introduction

The traditional view of a consultant ecologist tends to be of someone who has always had an interest in the natural world. In pursuing this interest professionally, they will have completed a relevant degree, and in most cases also a postgraduate degree. In addition, they may have undertaken voluntary or paid seasonal fieldwork as a way of breaking into the profession. When they start their careers, the expectation is they will spend much of their time in the field, at least in those early years, learning at every step. This may include long and antisocial hours, surveying for protected species such as newts and bats, often involving travelling and staying away from home. These requirements can be off-putting and may present barriers.

Of course, this is a generalisation and there will be those who came into the profession by different routes and those who thrive at the desk-based elements, but I think the CIEEM website (https://cieem.net/i-want-to-be/what-is-an-eem/) demonstrates we still focus heavily on the protected species and fieldwork element of the role: for instance, "…special qualities are needed for a successful career in ecology or environmental management. These skills include:

- an interest in the natural world;
- a knowledge of the functioning of natural systems;
- good academic qualifications in biological or environmental subjects;
- expertise in one or more groups of living organisms;

- enjoyment of fieldwork;
- the staying power needed to complete tedious and sometimes uncomfortable tasks in the field or laboratory; and
- an ability to take an objective approach to conservation issues."

However, the profession is changing for a number of reasons (addressed in *In Practice* by Murray 2023). Technological innovation is changing the way we deliver ecological baselines and monitoring, and ecologists are increasingly required to deliver more than the traditional requirements of baseline surveys, protected species licencing, impact assessments and Ecological Clerk of Works (ECoW) duties. New legislative and policy drivers present significant challenges around capacity, but I believe technological innovation and an expansion of the responsibilities of the role present significant opportunities to attract more diverse talent into a sector with an acknowledged lack of ethnic and socio-economic diversity (see, for example, the SOS-UK 2022 report) and which can also be hard to access for people with physical disabilities.

This article looks at the drivers for a changing profession and what skills we need to access and develop to leverage the best outcomes for biodiversity. It considers how embracing these drivers presents a significant opportunity to offer many and varied roles within the profession that may be more accessible and appealing to a wider audience.

My own experience

The start to my own professional ecology career followed the traditional path. I obtained a degree and PhD in ecological sciences, undertook a range of voluntary and low-paid field work, and volunteered with English Nature (now known as Natural England). Subsequently, I got a job in consultancy and, during the first 10 years of my career, my work involved a significant amount of fieldwork. This often involved long travel, overnight stays and antisocial hours.

After this time, as I became more senior and more desk-based, for a variety of reasons I focused on a technical career path, as opposed to one with more managerial/team leadership responsibility, an option provided and supported by my employer. This technical expertise was, at that time, focused very much on Ecological Impact Assessment (EcIA) and Habitat Regulations Assessment (HRA). However, my decision ultimately coincided with the emerging application of the Biodiversity Net Gain (BNG) approach in England alongside a period of rapid digital innovation and a wider proliferation of policy, legislation and frameworks around the biodiversity and climate crisis. This opened up a range of new opportunities and required me to get to grips with a range of topics and skills, which inform the remainder of this article.

Drivers of change

Technology and innovation

In his September 2021 *In Practice* article, James Cook considered how technology may change the way in which ecologists work over the next 30 years (Cook 2021). Undoubtedly, the use of technologies such as remote sensing, automated recording and identification, environmental DNA (eDNA) and artificial intelligence is changing the way we work. These new technologies, and innovation in where and how they can be applied, are increasingly being used to support and develop biodiversity baselines, providing the ability to develop baselines at scale, earlier in projects and in many instances reducing the volume of fieldwork previously needed (e.g. as with eDNA and great crested newts). These new technologies require ecologists to acquire new skillsets and increased inter-disciplinary working with geospatial professionals, data scientists, soil scientists and microbiologists, to name but a few. Ecologists with strong data skills are now essential to many projects and businesses and the role of the 'digital ecologist' increasingly sits alongside the more traditional field ecologist.

Embedding biodiversity in development and strategic decision-making

We're currently working in a period of significant change in legislation, policy and initiatives in respect of nature. These new requirements will drive new workstreams for consultant ecologists and are all in addition to existing established workstreams relating to EcIA, HRA, protected species licensing and ECoWs. A key thread in all these new initiatives is nature recovery and this means a shift for consultants from a reactive, 'mitigate and compensate' approach to biodiversity, to a more proactive approach, embedding it into projects and their design.

Mandatory BNG in England is a significant new requirement that will be led in most cases by ecologists. It demands a variety of skills, some of which were outlined in an *In Practice* article regarding competencies for delivering BNG (Edmonds *et al*. 2022). These include habitat classification skills, knowledge and experience of applying the BNG good practice principles, use of the Biodiversity Metric and habitats restoration enhancement and creation techniques. Updated policy in Wales and Scotland relating to net benefits for biodiversity and positive effects for biodiversity will also require similar skillsets to deliver.

Delivering BNG, while likely to be led by ecologists, is necessarily an interdisciplinary activity requiring collaboration. Engineers need to be on board to adapt scheme designs to avoid impacts and consider nature-based solutions. Landscape architects, soil scientists and hydrologists, among others, will be needed to deliver habitat restoration and creation schemes, and financial expertise will be needed to navigate new nature markets.

The need for the BNG approach to be implemented from the very start of a project will bring ecologists to the table when it comes to optioneering and design in a way that has not been the case with the business-as-usual approach. Formerly, ecologists have been brought in late in the day to consider and address the impacts of the chosen design. All this means we need another type of ecologist: the 'design ecologist'. Similar design skills will be required where habitat restoration and creation are required by other drivers such net-zero targets, for example blue/green carbon sequestration.

In the context of the development of policy and legislation, BNG and similar initiatives in the devolved nations are likely to be the precursor to Environmental Net Gain (ENG), which

was a central pillar of the 25 Year Environment Plan (HM Government 2018). Natural capital approaches underpin ENG, and require ecologists with a good understanding across the breadth of natural sciences.

And, beyond delivering BNG and ultimately ENG on development projects, what we're also seeing is the adoption of these same approaches to strategic-level decision-making to support company disclosure of impacts and dependencies on nature against frameworks such as Environmental Social Governance (ESG), Taskforce for Climate Related Disclosures (TCFD) and Task Force for Nature Related Financial Disclosures (TNFD) (see Morgan *et al*. 2022 for a discussion of these financial drivers). Critical to this will be ecologists who are able to engage effectively with environmental economists, understanding their drivers and the opportunities that exist to use these measures as a lever to increase biodiversity.

What does this mean in terms of skills?

The drivers of change in the profession mean that the role of a consultant ecologist is necessarily changing. No one person can do it all and we need to recognise, that across the sector, we will need a range of people and roles to help deliver for nature. We still need the traditional skills. We still need people with expertise in species ecology, we need experienced ECoWs, we need field ecologists and, indeed, we need more botanists than ever before! We also need EcIA and HRA experts. But, given technological innovation, there are likely to be fewer fieldwork hours than in the past and we will also need more ecologists with:

- an understanding of the policy, legislation and frameworks available to embed biodiversity in strategic thinking and development delivery
- great communication and leadership skills to leverage positive outcomes for biodiversity
- strong digital and data skills;
- habitat restoration and design skills
- great collaborative skills to work across disciplines to develop innovative proposals for habitat restoration, creation and enhancement
- an ability to think of the big picture, as well as the fine detail, knowing when to take a broad-brush approach and when it is critical to delve into the detail and practicalities
- an understanding of the need for, and opportunities to maximise co-benefits for, other ecosystem services and social value and how to incorporate these into the business case for a project.

Conclusions

Growing up during the joint climate and biodiversity crises, making a positive environmental difference in their job, is a key driver for many young people today (Environmental Analyst 2022). The broadening of the role of the consultant ecologist offers a significant opportunity for the sector to appeal to people from a much wider variety of socio-economic backgrounds, with a range of physical abilities and from across the neurotypical and neurodivergent spectrum. The same applies to ecologist roles in other sectors, such as local authority ecologists and those working for conservation charities and in land management.

We need to attract new candidates who won't necessarily be seeking the more traditional role upon which the profession was established. Given the variety of roles and skills now needed in the profession, it should no longer be seen as essential that candidates are willing to do voluntary fieldwork to break into the profession or that they must to take on a significant fieldwork role, with the related travel and antisocial hours early in their career. These factors can present barriers to many people. The drivers of change at work within the profession should lead us to place significant emphasis on different skills when it comes to recruitment. We need people with skills in leadership, communication, collaboration, data and design, and with an ability to see the bigger picture. This opens up opportunities in our profession for people who would have previously been deterred by some of the aspects of that role, who faced barriers relating to accessing the profession or who never even considered the profession as they didn't think the skills they had would be of value to a career in ecology.

It is therefore crucial to recruitment, and retention, that we acknowledge, advertise and embrace this diversification of the role alongside other vital initiatives to improve pathways into the profession.

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Feature

Leverage: Subtle Ways to Bring About Change

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Keywords: dairy, ecological land management, North Wales, regenerative farming, unimproved pasture

“The farmers who supply Carrie with milk are open to regenerative farming ideas that improve soil health and climate resilience.”

Leverage means positional advantage; the power to act effectively. What do a sheep’s milk dairy and a large agricultural estate have in common? They are both businesses that can apply leverage to ensure that their clients and customers follow a sustainable agenda, consciously or not. The premise is that the entrepreneurial policies of one will have a spillover effect on the other. Here are two interviews demonstrating the dedication for the natural world that drives the individuals who run them.

Introduction

Our inability to influence change in the face of relentless ecological and environmental damage can often feel overwhelming, so meeting people who have been proactive in ways outside the professional field of ecology is inspiring. This might include activists, political agitators, guerrilla gardeners or ‘soft influencers’. I met two who have structured their business model to influence their customers in novel and effective ways.

Interview with the cheesemaker

I arrive at the Cosyn Cymru Dairy on a Saturday afternoon in early June, just as Carrie Rimes is putting the shop signs out. You can purchase the small rounds

of unpasteurised soft sheep's milk cheese directly from the little shop in the front of a converted Catholic Church in Bethesda, North Wales, which is also the dairy where she makes it.

Carrie used to work for the Nature Conservancy Council and was part of the original Phase 1 survey in 1984. Later, part of the Joint Nature Conservancy Council Carrie worked on the acid waters survey during the early 1990s, when fears around acid rain were pervasive, and then as part of the lowland grassland network, where she modestly describes her role as 'mostly administrative.'

How it all started

In 2011, she took early severance during the re-organisation of the conservation organisations. The Countryside Council for Wales was subsumed into a larger organisation, Natural Resources Wales (NRW), which became operational in 2013. Lots of people throughout the conservation network were made redundant, and others, including Carrie, offered severance payments. If there was ever going to be a time to put her ideas into action, this was it.

Carrie went to France as part of WWOOF, the WorldWide Opportunities On Organic Farms. There she stayed for 3 years, serving a cheesemaking apprenticeship to small farmers with cows, sheep and goats in various parts of southern and central France, ending up on a small farm in the Auvergne with 18 cows.

*"I walked into a field and there was globe flower (*Trollius europaeus*) and Dyers greenweed (*Genista tinctoria*) and foliage of whorled caraway (*Carum verticillatum*) everywhere, and I thought 'wow'. The farmers just laughed. It wasn't even a particularly special field, and I thought if you can do it here, why not in Wales?"*

When she returned to Wales, accomplished in the skills of artisan cheesemaking, Carrie's specifications were less easily met. What gives the bespoke cheeses in France their uniqueness is the way they are made: unpasteurised milk, cattle grazed in a 'traditional' way and following the seasons on pasture which has had little if any artificial fertiliser. It is not high-yielding but the cheese is eminently superior to an equivalent mass-produced product, being rich and creamy. There are also strict laws governing unpasteurised milk in the UK. "Environmental health make me jump through so many hoops," she says "but the large majority of the small-scale French cheeses use raw milk, and nobody is the worse for it…and probably a good deal better than in the UK!"

Carrie has moved around a lot locally in her search for somewhere to make cheese. I met her first in 2011, in the Food Technology Centre in Coleg Menai, Llangefni, Anglesey, which has an in-house dairy. A pair of swallows were nesting just above the door, presenting a potential health hazard, although she was reluctant to see anything done about it. Later she moved to another small dairy in the village of Pentraeth, but the opportunity to convert the Catholic Church in Bethesda, a short distance from the Penrhyn slate quarry in Gwynedd, was where the idea of owning her own dairy began to seem like a reality.

Obviously, the church needed a complete refurbishment before it could be made to function as a dairy. "I benefited from a Food Business Investment Scheme grant, and an interest-free loan from Gwynedd Council, but I still have a huge debt," she says. "I live very frugally." For a moment she looks very tired. "But look, let's get some of the finished product, shall we?" She's up from the table and the energy comes back, drawn from the sheer enthusiasm she has for the art of good cheese.

I buy some. Brefu Bach is a rich, soft cheese. It's like eating clotted cream, but less oily and with a more friable texture. She shows me one made from the milk of sheep on improved rye-grass pasture and one from Rhôs, the rush pasture that dominates the Welsh upland fringes. The rye-grass cheese is bigger, and the rind is smooth, lacking the wrinkled texture of the smaller, cheese from semi-improved pasture. "It's not SSSI grassland or anything as good as that," she tells me, "and it isn't always as obvious as these two," pointing to the two rounds. "But milk from sheep grazed on less intensive pasture makes the better cheese." After the effort she's gone through to get this far, I'm prepared to take her word for it.

This prompts my question: has her requirement for cheese from

Figure 1. Brefu Bach cheese.

Figure 2. Carrie with her trophy.

unimproved grassland influenced the farmers who supply it to her?

Carrie takes time to think about this.

"I have to be careful here," she says. The farmers who supply her with milk are not necessarily conservation-minded but are open to regenerative farming ideas that improve the health of soil and improve climate resilience. "It's not really herb-rich grassland…it's nothing exceptional…but so much better than rye-grass monocultures."

While there are only a few farmers supplying her with milk, she has little influence, but Carrie is at pains to point out that the farmers approached her, interested in providing her with the milk she requires to make cheese, and she did not have to seek them out. They also had to invest in the equipment necessary to milk sheep – a niche product. The ties that bind both parties are cooperative, and it is not a case of one wielding any influence over another, but Carrie's cheese is marketed as the result of farming practices that are regenerative. If more farmers volunteer to provide her with milk that meets her specification, she would inevitably favour that which made the best cheese, thus engendering a competitive element that could persuade farmers to improve the diversity of their grass, with consequential effects on overall biodiversity gain. That, at least, is one of her ambitions.

Before drawing the interview to a close, I suggested, perhaps flippantly, that she consider entering the BBC Food and Farming awards 2023. She was initially non-committal, but I nominated her anyway...which was just as well, because she was announced as the winner in the Best Food Producer category on 29 October!

The landowner's story

Sam doesn't present as somebody who has inherited a large estate. Before he did so, he worked in NRW as a lower plant specialist and is still renowned as such – he was one of the editors of the field guide *Mosses and Liverworts of Britain and Ireland* – as well as being an authority on insects. It was not altogether surprising that when management of the estate in Gwent became his responsibility, he chose to depart from the intensive agriculture that tenants had practised in the past and return the estate to a much more wildlife-friendly one.

"My family started the transition to less intensive farming in 2008, when I was working for the Countryside Council for Wales (now NRW). I was talking regularly to Tir Gofal agri-environment staff about management options."

I'm seeing it in early 2023, and Sam has not been implementing changes for very long. I've already noticed several uncommon plants on the estate, including orange foxtail (*Alopecurus aequalis*) and goldilocks (*Ranunculus auricomus*), and the morning moth trap had a splendid lime hawkmoth (*Mimas tiliae*), which, despite there being an avenue of lime trees along the drive, Sam assures me is only the second record for the estate. He is a meticulous recorder.

"My uncle had been farming the land with a light touch for the preceding 15 years, gradually putting arable fields into setaside and grazing them extensively with cattle and sheep. When my uncle retired, two local farmers took on tenancies on the land, but we offered them substantially lower than market rents in return for restrictions on what they could do. The prescriptions we used came straight from Tir Gofal, and meant that the setaside fields and permanent pasture couldn't be ploughed, reseeded or fertilised with anything other than farmyard manure."

The land is rolling; the underlying geology red sandstone and the soil a neutral loam. There are also many non-native specimen trees, including mature redwood (*Sequoiadendron californicum*) and Atlantic cedar (*Cedrus libani*). Sam points out a

spotted flycatcher (*Muscicapa striata*) sitting in the crown of the redwood tree. His knowledge of the natural history of the estate is encyclopaedic, reflecting the enthusiasm he has for its current direction.

How easy has it been getting tenant farmers to buy into such a radical change in land management, I wonder?

"The original tenants opposed some of our environmental restrictions, but the rent was much cheaper than other land in the area so they went along with it. One of them argued that slurry and manure were the same thing; they aren't, as far as semi-natural grasslands are concerned, but we stuck rigidly to our policy. Another tenant interpreted a 'wildflower mix' as a rye-grass, timothy, white clover ley! It has taken 15 years to revert to a less lush grassland."

What is clear from this is that, at best, an uneasy détente exists between Sam's ambitions and those of neighbouring farmers: some of the estate is still farmed using intensive agricultural methods.

"We were lucky that the Gwent Wildlife Trust took on the land when one of the original tenants left, because they managed the fields as we would want. They began actively reverting the fields towards greater flower richness whereas the reversion was just passive under the original tenants."

This pricks my interest. I ask if there are any significant changes yet.

"There have been massive changes in overall species diversity, and things continue to change. The best three fields were setaside from arable in the mid 1990s, cattle grazed until 2015 and since then have been haycut and aftermath sheep grazed." He rattles off a list of species indicative of biodiverse grassland that have appeared since the management regime was imposed. Later I post him some seeds of mousetail (*Myosurus minimus*) and shepherds's needle (*Scandix pecten-veneris*) to actively spread around. Sam isn't averse to adding species.

*"The shift in grasses, from agriculturally productive rye-grass to a sward of native species, has seen a huge increase in insects, including abundant grasshoppers, meadow brown, marbled white, large, small and Essex skipper butterflies and the little grass veneer moth (*Chrysoteuchia culmella*)."*

Figure 3. Sam in action.

Sam goes on to list species of robber fly, and not being in the same league insect-wise as he is, I have to look them up later. Clearly, though, these are species associated with an improvement in the capacity of the fields to support more insects. I ask how far he intends to go with the concept of regenerative farming. Sam is often venerated for the breadth and depth of his knowledge, but he shows some hesitancy about setting out on such an innovative venture. So much knowledge has been lost, even within a family that has been managing the land for generations. His answer is revealing.

"We are still learning here, and want to trial ideas including agroforestry, and outwintering cattle using bale grazing – taking hay bales from our most flower-rich fields and allowing cattle to eat/trample them to increase diversity in fields where diversity has not progressed as much."

Possibly my most significant question concerns the attitude of surrounding farmers and landowners to the direction he is taking land management on the estate.

"I don't think the neighbouring farmers consider us as 'proper' farmers at all, but if we can show that our land is still producing food and making good money (because our inputs have been massively reduced) we might start to turn a few heads. There are three other farms on the estate, one of which is soon to be taken on by another regenerative farmer. In time, we hope to be a proper cluster of environmentally friendly farms."

There it is then: the potential for leverage. Although it's questionable that Sam's policy has influenced the practices of his neighbours to any noticeable degree so far, his ambitions are more far-reaching. It may take time, but the sympathetic tenants that he is accruing on the estate means he won't be alone. He may also be helped by the commitment of the Welsh Assembly to the Global Biodiversity Framework (Convention on Biological Diversity 2023), and in particular target 10, to "ensure that areas under agriculture,

Figure 4. Green-winged orchid (*Anacamptis morio*).

aquaculture, fisheries and forestry are managed sustainably".

I was prepared to be a little critical; after all, an estate managed in this way will produce less food at a time when climate change puts the global food system under intense strain, and the owner of a huge estate might be accused of indulgence. But Sam has tried many ways to increase the estate's horticultural output. There is a beautiful walled garden, with rich, dark soil that has been worked for over a century, and which is as productive as the farmland for growing quantities of vegetables, if not more so (Nicholls *et al*. 2020). Attempts to create a vegetable box scheme have been financially unsuccessful, perhaps because of the absence of a nearby large town providing an accessible market, and now it will be grassed over. I'm sure the tragedy of that isn't lost on Sam, not least because it will limit the places where mousetail and shepherd's needle grow, but the evolution of food supply chains simply no longer allows for small-scale production. One day, perhaps, when modern methods become untenable, but not yet.

My last question is, what has been your most exciting discovery since you started?

"Each year there is something exciting. Grass vetchling (*Lathyrus nissolia*) appeared for the first time a few years ago and is now well established. Large meadow mining bee (*Andrena labialis*) and long-horned bee (*Eucera longicornis*) were good indicators of our abundant nectar sources, and increasingly regular black-neck moth (*Lygephila pastinum*) in the moth trap suggests our tufted vetch now supports a population of that species." Sam's record keeping makes a priceless long-term data set.

"My greatest thrill, though, was the appearance of a green-winged orchid (*Anacamptis morio*) in 2022: the first in our landscape in living memory. It was growing in a field, which was arable in the early 1990s. Potentially even more exciting was a curlew (*Numenius arquata*) singing around the fields in spring 2023, but as far as we can find that didn't lead to nesting."

Maybe next year...

Leveraging ecology

The premise is that the entrepreneurial policies of one will have a spillover effect on those who engage with those policies: customers, neighbours and visitors. If you buy Carrie's cheese, or beef produced by one of Sam's tenant farmers, you are supporting their principles. This is leveraging by indirect action. There may be valid arguments for producing large amounts of food cheaply, but not at the expense of damaging the very environment that facilitates it, as agriculture has been doing for decades. It is possible to change attitudes by exerting political influence, but first one has to convince the politicians of the urgency, and so far the rhetoric hasn't matched the actions. Another option is the direct action demonstrated by the activities of Extinction Rebellion and Just Stop Oil. Carrie and Sam are examples that indicate a third way is possible: changing attitudes away from destructive methods of production in agriculture, to sustainable, regenerative ones by the actions of their businesses. Both highlight that it can be a slow process, but that's because they are still a minority. The more we engage with businesses like theirs, the greater their influence becomes. The only question is whether there is enough time for the power of such small business enterprises to gain sufficient traction that they become as effective at initiating change as big corporations are at influencing agricultural practices. Time – perhaps something of a luxury now – will tell.

"It is possible to change attitudes by exerting political influence or by direct action, but Carrie and Sam are examples of third way: changing attitudes away from destructive methods of agricultural production to sustainable, regenerative ones by the actions of their businesses."

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Tree Climbing: Gaining a New Perspective

Kirsty McNicol
Hi-Line Training

Keywords: additional skills, aerial surveys, climbing qualifications, tree climbing, training

“The last 2 years have seen a significant increase in the number of ecologists wanting tree climbing qualifications. A qualification can open up new avenues of work and give greater accessibility to arboreal habitats.”

This article is an introduction to the tree climbing and aerial rescue qualification. The qualification can increase the skillset and experience of ecologists.

Although climbing arborists and those who climb trees recreationally are fully aware of the happy hormone buzz that climbing a tree can give, over the last couple of years we have seen a significant increase in the number of ecologists looking to gain tree climbing qualifications. Candidates from the ecology profession include both freelancers looking to add skills and knowledge to larger ecology companies looking to put a number of employees through the qualification to offer an additional service for their clients. Gaining a tree climbing qualification and becoming competent working at height can open up new avenues of work for ecologists and give greater accessibility to habitats that are harder to fully understand from ground level.

While keen to learn a new skill, many of the ecologists who have attended the Level 2 Tree Climbing and Aerial Rescue course have commented that the course was more physical than they expected and that they did not appreciate how much would be covered in the 5 days training, with many feeling a little unprepared.

This article looks at tree climbing and aerial rescue training in more detail. What qualification do potential climbers need to do? What equipment is needed? What can be done to prepare in advance? How can candidates get the most out of the training days? What benefits does having a climbing qualification bring?

Figure 1. A candidate learning to climb.

Why add climbing to your skillset?

Although surveys and inspections, such as bat roost surveys, can be carried out from the ground or, depending on location, from a mobile elevated work platform, neither of these options offers the close-up view that an aerial survey can provide. Adding climbing to your skillset will give you a wider range of services that you can offer clients, for example installing bird and bat boxes, assisting with bird ringing, creating habitats in trees, monitoring bat boxes and installing trail cameras. It will give you a different perspective and understanding of the tree and habitat you are surveying. Adding this qualification may help you reduce costs by allowing in-house aerial work, rather than needing to hire a sub-contracted arborist.

Amie, a consultant ecologist at RSK Biocensus, recently passed her Tree Climbing and Aerial Rescue qualification (previously known as CS38). She commented, "I am very happy to add the CS38 ticket to my qualification roster. As a relatively early career ecologist I am looking to build my repertoire and abilities to conduct more arboreal species surveys. This ticket will allow me to accompany licensed ecologists on bat and nest inspections which will add to my own experience record and aid me to become licensed for such activities myself, further increasing my skillset and employment value."

The benefits of climbing for you and your practice

Adding tree climbing to either your or your employees' qualifications can bring a range of benefits.

Mark, who transitioned from a career in arboriculture to a career in ecology at Hi-Line, commented that "being a licensed bat worker and having a climbing qualification allows me to undertake aerial inspections of potential roost features within the tree canopy that have been identified from a primary ground survey. It gives you a better perspective of the tree's features and allows better access into a tree compared to a ladder, plus it is safer. Having a climbing qualification allows you to follow the whole process through, from initial ground survey up to the aerial inspection."

Some of the benefits may include:

- being able to offer an all-round service to clients that other ecology practices may not be able to provide
- the option to offer specialist services to clients in which experienced, qualified ecologists are able to carry out both ground-based and aerial surveys and work
- cost and time efficiency of being able to complete aerial surveys in-house rather than using sub-contractors
- ensuring employees are fully trained and qualified with a thorough understanding of safe climbing practices
- providing employee engagement and increased employee retention by offering options for employees to add new skills to their current skillset.

What qualification do you need?

Unless your insurers state otherwise, then you'll need the Level 2 Tree Climbing and Aerial Rescue qualification to climb in the workplace. This is usually 5 days' training followed by an independent assessment on a separate day. The course is widely available at training providers across the UK. The cost varies a little between providers, but you'll be looking in the range of £700 to £950 for the training and City and Guilds Land Based Services (formerly National Proficiency Tests Council, or NPTC) assessment. When comparing costs, it is worth looking at what equipment is provided on the course by the training provider. Some training providers include a full climbing kit in the price for candidates

to use and try out on courses, whereas others require you to either bring your own or hire one.

Refresher training is recommended every 5 years following gaining your qualification; this option is also available at multiple training providers.

For people who do not climb regularly, attending a tree climbing refresher workshop every year is a good way to make sure you stay current with your climbing and rescue skills.

Try before you buy

Tree climbing is not for everyone so it can be useful to attend a climbing experience day before you commit to signing up for the qualification course. Contact training providers to see if they offer an introduction to tree climbing day. Such days can be great for checking that the basics are in place before you decide on attending a full course; for example, do you like heights, do you have the necessary strength and fitness to access and move around the tree, and do you enjoy it? It also gives you an opportunity to meet the instructors, find out about the course and ask lots of questions without the pressure of an assessment in the back of your mind.

What does the Level 2 Tree Climbing and Aerial Rescue course cover?

During the course you will learn how to access the tree using ropes, harness and other equipment, move safely around the canopy, and perform an aerial rescue in the crown of the tree as well as from a standing pole. The course content includes:

- relevant industry health and safety legislation relating to tree climbing and working at height
- risk assessments and emergency planning for tree climbing operations
- identifying hazards and associated risks
- carrying out a basic hazard evaluation of a tree
- how to select, inspect, safely use and store a variety of tree climbing equipment
- learning a selection of knots
- accessing and manoeuvring within a tree canopy
- carrying out aerial rescues from a variety of different situations
- how to use climbing spurs/spikes.

The location of the course will depend on your training provider but will usually be based in woodland or parkland using one or more medium to large open grown, spreading trees.

As part of the training, you will learn how to initially access the tree, install your ropes and climb to the canopy. You will learn how to move around the tree and branch walk at least 5 m out from the main trunk.

You need to be 16 years or over to do the course but other than that there is no age limit. The course is physically demanding, but as long as you can get yourself up a rope to access the tree then you can learn to climb. When learning to access a tree you need to be able to lift your own body weight and will be taught a method called body thrusting. This involves using your hands to slide a friction hitch up the rope while pushing your feet on the trunk of the tree to create an upward thrust with your hips, helping you to ascend to the first branch. Once qualified, the advances in equipment mean there are lots of options to make it a little bit easier on your body!

There will usually be four candidates on the training and assessment days with a ratio of one instructor/assessor per four candidates. When looking at training providers, ask whether the instructor will be up in the tree with the candidates or instructing from the ground. You'll get a much better experience if your instructor is up in the tree with you.

Figure 2. Candidates on the tree climbing and aerial rescue course.

Equipment

All workplace tree climbing equipment falls under the Lifting Operations and Lifting Equipment Regulations (LOLER) 1998 and will require a thorough LOLER examination every 6 months. The checks needed on equipment are covered during the course and include pre-use checks, weekly inspections and 6 monthly thorough examinations. Many training providers are also able to offer you a LOLER examination service once you have purchased your kit; if not, they can probably give you some recommendations.

It can be useful to either attend a course where equipment is provided for the training, so you can try out items and ask questions before buying your own, or to visit a reputable arboricultural equipment supplier before purchasing your climbing kit. There is a wide range of equipment available and being able to try harnesses on and look at different rope and karabiner options will save you potentially rushing to buy your first kit without researching it first.

Buying second-hand climbing equipment is not recommended. Although it may be tempting to try and save money and buy equipment second hand it is essential that you know the history of each item you are buying and know that the item is safe: how old it is, whether it has been involved in any incidents, what it has been used for and how it has been stored.

All personal protective equipment, which includes arborist climbing equipment, must meet certain conformity standards. BS EN standards are the British standard implementation of the European standards (ENs). Other conformity standards include the CE and UKCA mark.

Each climber has a different preference for what climbing systems they use but Table 1 gives an example of the Hi-Line Training candidate climbing kit.

More people are now using mechanical friction devices rather than just textile-based friction hitches in their climbing systems and climbers may decide to add items such as a Petzl Zigzag, Rock Exotica Akimbo, ART Spiderjack or Notch Rope Runner Pro. Although not required as part of the course syllabus some training providers may look at the options available for additional equipment to help candidates decide on items that would suit them.

It is essential that all items within a climbing system are used as advised by the manufacturer, so getting advice from either your training provider or arboricultural equipment supplier is key to ensuring you purchase and use items correctly.

Table 1. Example candidate climbing kit.

Item	Quantity	Description
Arborist harness	1	Tree climbing harnesses are known as sit or seat harnesses and include a waist belt and leg loops. Popular options are Teufelberger Treemotion Pro, Petzl Sequoia, Edelrid TreeRex and Notch Sentinel. BS EN 358 and BS EN 813
37 m rope	2	Arborist ropes are low-stretch (compared to rock climbing ropes) and come in a variety of diameters and lengths. When choosing ropes it is important to check compatibility with the mechanical devices you may be using. A climber's primary rope must be long enough to reach the ground from their highest anchor point. BS EN 1891 A or B
5 m positional/side strop	1	Shorter length of rope for positioning while moving around the tree. BS EN 1891 A or B or BS EN 354 depending on length/type
Friction cord	3	Used as part of a system to ascend or descend from the tree using ropes. BS EN 795B or BS EN 566 (sometimes marked with both)
Prusik loop	2	Used as part of a climbing system; tied around the rope in a knot it will slide up the rope or grip the rope, for the climber to ascend or descend the tree using ropes. BS EN 795B or BS EN 566 (sometimes marked with both)
Tape sling	1	Has multiple uses in tree climbing and aerial rescue including as an improvised chest harness for casualty rescue.
Cambium saver	1	Used to protect the tree's cambium and bark from friction; can also make climbing easier. BS EN 795B
Three-way locking karabiner	8	Should be three-way self-locking, spring-loaded. Come in different styles depending on what they are being used for in the climber's system. Brands include Petzl, DMM, ISC and Edelrid. BS EN 362
Small swing cheek pulley and triple attachment pulley	1 of each	Used as part of the climber's system. BS EN 12278

Figure 3. Tree climbing equipment.

Preparation before the course

During the 5 days' training there are a lot of new skills to learn and information to process so taking time to do some preparation prior to attending can make a big difference.

One of the comments we regularly receive from candidates is that they didn't realise how physical the course would be. Although you don't need any prior experience to attend the course, and don't need to have the fitness of an Olympic athlete, having a good level of fitness will make the course easier on your body and will make it more enjoyable. Maintaining or building up your fitness before the course with simple body-weight exercises such as squats, push ups, pull ups and sits ups, combined with some stretching exercises such as yoga, can be beneficial. You'll need strength to pull yourself up the ropes and flexibility to move around the tree. Remember to consult your GP or a qualified fitness instructor before starting any new exercise programme.

Getting to know some of the knots you'll be learning during the training can also help you progress quicker. The knots covered on the course are bowline, distel, Prusik, fisherman's stopper, fisherman's loop, alpine butterfly, bowline on the bight and Blake's hitch. There are many instructional knot-tying books or videos available which will include all of these and while you will be taught everything you need to know on the course it can be useful to familiarise yourself with them beforehand. Hi-Line Training have our own set of knot-tying videos, which can be found at www.hilinetraining.co.uk.

Most training providers will be able to recommend books or videos to their candidates.

An essential book for making sure you are compliant when tree climbing in the UK is *Arboricultural Association Technical Guide 1 Tree Climbing and Aerial Rescue* (Cooper-Abbs and Brooker 2020). Available in both a wire-bound A5 version, and more recently an e-book, it is recommended to all candidates attending the tree climbing and aerial rescue course. It is an invaluable addition to any climber's kit bag.

Even before starting the course you can access the NPTC assessment schedule from their website, www.nptc.org.uk, and can start learning some of the basics. Familiarising yourself in advance can give you more time to get an understanding of what will be covered in your assessment.

And finally, making sure you have the equipment the training provider has asked you to bring (such as a helmet and suitable footwear), that you know where you need to meet on the first day and arranging any necessary accommodation will simplify the first day of the course for you.

Getting the most out of your course

Training providers want all their candidates to get as much as they can out of the course – and, obviously, for them to pass the assessment at the end of the training. Here are some simple tips to get the most out of your training.

- Find out as much information about the course as you can: does the training provider run any courses specifically for ecologists, and do they offer an introductory day?
- Follow the preparation advice given in this article.
- Listen to and learn from your instructor.
- Engage with the instructor and other candidates and ask questions.
- Practise what you've been taught and revise the assessment criteria: if you find it tricky to revise from written material then look at different methods for revision.
- Think about what you're eating and drinking throughout the course – bring a healthy lunch and snacks – and leave the energy drinks at home. They will not be your friend if you're climbing all day!
- Don't panic if you feel everything isn't sinking in; instead, chat to your instructor. Often candidates can feel that they have not remembered everything by day 5, but then it all comes together for the assessment.
- Enjoy yourself. Tree climbing can give you the opportunity to see around you from a very different view.

To summarise, if you are looking at adding tree climbing to your qualifications, do your research before signing up to a course, do a bit of work on your core strength, learn a few knots and, most importantly, when you're on the course, enjoy it and take the opportunity to experience a new perspective of the natural world.

Acknowledgements

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Feature

Starting a Career as a Professional Ecologist: Tips from the Early Careers Special Interest Group

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The CIEEM Early Careers Special Interest Group (SIG) was set up in 2022 to support those in the first few years of their ecological and environmental careers. The purpose of this article is to provide advice to those who are looking to achieve their first positions and start to establish themselves in their chosen career. Here the SIG provides guidance on how to develop key skills, produce attention-grabbing applications and CVs, and hints and tips to help you stand out from the crowd.

Introduction

The CIEEM Early Careers Special Interest Group (SIG) was formed in 2022. The purpose of the Group is to provide advice and guidance to ecologists in the first few years of their professional career. The SIG committee is drawn from public, private and academic sector professionals; members include early career ecologists with recent

experience of navigating their way into paid employment in ecology, lecturers coordinating university degree courses and directors of multi-disciplinary and independent ecological consultancies.

Since its inception, the Group has held a number of online events that have included question and answer sessions. Various common themes have emerged from these sessions. This article sets out to provide guidance to assist early careers staff with one of the main areas of concern: namely how to gain the correct experience to get your career off to a good start.

Getting the right experience

Early career posts are keenly contested, and whether you are looking to secure your first full-time role or to move into a new position that will advance you along your chosen career path, your chances of successfully securing any position, let alone the post you want, can feel very limited. How do you go about taking charge of your own destiny? Many discussions at SIG events to date have revolved around this question.

Frequently the SIG has been asked whether/what voluntary experience might be beneficial in helping develop relevant skills. Another key area for discussion has been the nature of seasonal or short-term paid opportunities that might help in developing skillsets and transitioning into full-time work.

An area that has attracted fewer questions, but one which goes hand in hand with these, is what you, as an early career ecologist, should be looking for in a prospective employer. If you are prepared to invest in your own development, you should expect your employer to do so too. This article therefore provides a little guidance as to what you should be looking for and the sorts of questions to ask at interview that might help you make good decisions for your career development.

Selecting the most appropriate voluntary opportunities

Voluntary experience can help develop skillsets that set you apart from your peers when applying for jobs or looking to secure your next career move. There are numerous opportunities to volunteer for nature conservation organisations and special interest groups.

However, it is very important to have a clear view of the skills you want to gain and the advantages they might bring, and to choose what you do carefully.

An example (based on professional experience) is that mainstream ecological consultancy companies value botanical and protected species survey and monitoring experience highly, whereas involvement in practical land management work may be of less relevance to them (unless it relates to specialist work such as habitat creation). This might lead you to look for opportunities to join local natural history groups, such as the Botanical Society for the British Isles (BSBI), or local bat, dormouse or herpetological groups if looking for a consultancy career (although numerous other options are available). Conversely, a reserve management role might well start with voluntary work for land-owning charities, such as the National Trust, Royal Society of Wildlife Trusts or Royal Society for the Protection of Birds – to name but a few – by undertaking practical conservation work or public engagement on their sites. Part of your decision-making will necessarily also be about personal practicalities: voluntary work often requires a car to reach sites, and the timing of the most ideal work may not be compatible with your other commitments.

Additional guidance from the SIG with regard to volunteering is given here.

- Show commitment. If you become involved in a specialist natural history-focused group that will help develop your technical skills, it is likely to be run by committed volunteers. If you attend regularly, assisting with both the more attractive and less glamorous tasks, your contribution will be greater. This will lead to people investing more time in you and providing references and recommendations for you where they can.
- Continue your volunteering alongside your paid employment if it is possible to do so and it helps expand your skillset. Your profile and your network will also grow.
- Whether the voluntary work is delivering exactly what you want or not, it often results in good networking. Given how small ecological networks tend to be (people working in the environment sector tend to only have a few degrees of separation), the importance of your own network and your reputation as a reliable individual will open up opportunities and increase your likelihood of gaining paid employment.
- Do not take unpaid employment, particularly in consultancy. Consultants are paid for the work they do, and so should you.
- Volunteering not only develops technical skills but also transferrable skills. Being able to demonstrate a range of transferrable skills, such as organisation and time keeping, is just as valuable to an employer as the knowledge you have learned and can bring to the job.
- Keep a skills log of everything you have done. This may be an updated CV, or by using the CIEEM CPD My Career Path online log. This will help you to identify the skills you have, what you need to work on and any gaps that need addressing (e.g. to help you secure a licence). Use the CIEEM Competency Framework to help you (see https://cieem.net/resource/competency-framework/). This list is an indispensable tool when it comes to applying for jobs and preparing for interviews.

> **“Questions to the SIG have included what to look for in a prospective employer. If you are prepared to invest in your own development, you should expect your employer to do so too.”**

Paid positions

Contrary to the perception of many of the graduate attendees at our SIG events, there are various opportunities for paid work for early career ecologists that enable them to build towards full-time positions during and following the completion of studies. You just need to know where to start looking. Examples are outlined below.

Many ecological consultancies need seasonal survey assistants. The support needed can be via contracts, more ad

hoc arrangements (hourly/flexible support) or through internships.

- Seasonal consultancy contracts of up to 6 months' duration (April to September inclusive) are not uncommon. Many seasonal contracts that commence in the spring are advertised as early as the previous autumn.
- Casual hourly rate work with consultancies is also commonly available. This often suits people with limited availability (due to family or non-ecological work commitments) transitioning towards a future career as an ecologist, or who are still in higher education. It is possible to work on an hourly rate basis across various different regional consultancies if you have the flexibility in terms of your time. This might also be an option if you are unable to secure a full-time seasonal contract immediately, and has the benefit that you will get to know different people and be aware of opportunities arising across various companies.
- Paid internships can be challenging to secure while still in university, with many of those that do exist arising from established arrangements between universities and ecological organisations. There are various reasons for this, including that longer contracts are often favoured by employers than the typical duration of an internship (due to the initial training costs they incur, the length of the survey season and because they can be used as a way of selecting potential permanent staff).

An alternative route in is through an apprenticeship. Opportunities for apprenticeships are present in the public sector and to a lesser extent in the third (charitable) and private sectors.

- Organisations such as Natural England and the Environment Agency offer apprenticeships for current, eligible employees, including 2 year ecology Master's degrees. The apprenticeships are paid for by the employer and are undertaken alongside an employee's day job.
- Ecological apprenticeships in the third sector can deliver wide-ranging and very valuable training. The Scottish Wildlife Trust is an example of an organisation that has offered structure training in the past (through their Developing Ecological Surveying Skills programme which involved full-time placements for a period of 18 months).
- Some private sector companies are also starting to offer apprenticeship schemes, and it is worth searching for and reviewing these to determine what the qualifying criteria are, their duration and nature of the training involved.

"Once you have identified organisations that offer ecological services in your area, it is advisable to be proactive and persistent in your contact with them."

Some tips to consider when trying to secure paid experience/an early career role include the following.

- LinkedIn is useful for expanding your local network and becoming more aware of different organisations and the opportunities they offer.
- Once you have identified organisations that offer ecological services in your area, it is always advisable to be proactive and persistent in your contact with them (unless you are told not to be!). Bear in mind that many professionals have a huge throughput of emails, so a lack of immediate response does not mean no opportunity. Work can develop from being in touch with the right contact at the right time.
- When you get an opportunity that requires a CV, make sure it is concise, relevant and well-formatted, and that you accompany it with a letter than states exactly why you want the job you are applying for. It is very important to evidence the experience you have that makes you suitable for the position, and to draw on transferrable skills in doing so.
- Note that public sector vacancies do not accept CVs in the UK or the Republic of Ireland. Instead, candidates are required to complete an online application form. Applications are scored based on answers to capability-based questions and are blind-sifted to make the application process as fair as possible. Subsequent interviews will likely be based on the capability questions presented at application stage and may include a technical test.
- If you are tempted to use a recruitment consultant to help you secure an early career post, note that some organisations don't accept approaches via recruiters, and that this avenue will lead to an increased cost to the employer.

There are numerous ways of finding out about opportunities. Established websites such as environmentjob.co.uk and the Countryside Job Service (www.countryside-jobs.com/) are good starting points. Jobs are also advertised by CIEEM, on company websites and via social media.

What to consider when choosing (to further) your studies

You may be considering beginning (e.g. an undergraduate degree) or further development of your formal education (e.g. via a Master's degree or PhD). As with voluntary work, think carefully about the skillset that the programme is offering when selecting your course; one key aspect to check is that the programme will provide you with the skills and knowledge appropriate for the applied practical aspects of working in environmental consultancy.

CIEEM has accredited a series of undergraduate and postgraduate degrees in England, Scotland and Wales (see https://cieem.net/i-want-to-be/how-to-become-an-eem/what-to-study/accredited-degrees/). Accredited degrees are recognised as providing the appropriate skillset required for environmental consultancy as well as having better links between the industry and the development of appropriate and required skills.

In addition to formal education, there are also opportunities to develop specific skills via short courses. These opportunities are provided via multiple routes which may or may not have an associated cost. Below is a list of some organisations offering such courses.

- The Freshwater Biological Association offers a range of courses which can provide accreditation for specific skills (www.fba.org.uk/shop/p/invertebrate-identification-for-biotic-

assessment-accreditation-including-examination).

- CIEEM offers a series of training events that provide skills directly used in environmental consultancy (https://events.cieem.net/Events/Event-Listing.aspx).
- Buglife provides short courses for invertebrate identification (www.buglife.org.uk/events/).
- The Field Studies Council provides a range of natural history and academic courses (www.field-studies-council.org/courses-and-experiences/).
- The BSBI has a range of online courses (including the Identiplant training course), training webinars and videos and also hosts field meetings and indoor training events (https://bsbi.org/training).

What to look for in an employer

If you are considering whether to take a post that has been offered to you or whether to move on to another employer, you may want to ask whether the organisation you are considering has the following:

- a robust time-off-in-lieu (TOIL) policy that is effectively implemented and health and safety-led (TOIL is accrued when individuals work outside 'standard hours' as defined by the policies of the employer and involves individuals taking time back to ensure they are able fully to rest and work effectively)
- flexible working from both home and office
- structured line management and mentoring/support processes delivered by experienced professionals
- a graduate/early career training programme (covering technical and wider consultancy skills) plus provision for training to meet the differing needs and goals of individual staff members
- varied work that will help you grow through different experiences
- established health and safety policies, guidance and training
- good project management systems that make hybrid working more straightforward and make delivery of outputs to clients easier
- opportunities to work in the field and in the office throughout the year
- career progression opportunities.

What other questions might you ask at interview?

- If looking at a seasonal contract, ask what proportion of seasonal staff are kept on at the end of the contract period. Some companies have a seasonal 'draft' to do volume work and lay off most of them.
- Ask whether you will have objectives for the contract period. If you will, will there be a clear framework to deliver against? This suggests the company is seriously considering retaining you from day one (and the question demonstrates to them that you are thinking about your future career).
- Ask how many projects you will be working on, and the sorts of opportunities you will get through them. If it is one or two in the same sector, it would be logical to ask what range of opportunities you might have.

Further information

The Early Career SIG aims to host regular events. Information on these can be found on the group LinkedIn page (www.linkedin.com/groups/12699825/).

You can also register to be notified of SIG events on the CIEEM website, as follows: https://cieem.net/ > My CIEEM > [login] > Update personal preferences > 03 SIG Early Careers [check box].

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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 September 2023 issue of *In Practice* we described a situation where you are a Local Planning Authority (LPA) ecologist with 10+ years' experience of reviewing ecological reports and commenting on development proposals as part of the planning process. You are a Full CIEEM member, you hold several protected species licences (bats, dormice and great crested newts) and your CPD is up to date. You consider yourself to have an extensive knowledge of ecological reports and what is needed to make a good report, especially to inform planning decisions.

You appreciate that there is a vast range of different types of ecological consultant in your area ranging from the large engineering companies through to sole traders. Indeed, you have worked with many of the authors of the reports that land on your desk over the years, mainly as volunteers on National Bat Monitoring Programme surveys and so on, and generally the standard of report writing is good.

However, there is one particular ecological consultancy that is really causing problems. All of the reports from this company are of poor quality

and this means that a lot of time is wasted on asking for clarification and additional information to be submitted so that you are able to make your recommendations to the planning officer. It is now becoming a significant problem that needs to be tackled.

Some of the ecologists employed at this consultancy are knowledgeable, experienced and, whenever you have met them on site for a meeting about a development proposal, they have generally been able to answer your questions and respond to your concerns adequately. However, the reports are not what you would expect and need to be improved.

A planning application has just been submitted for a proposed development of 125 houses that could have a significant impact on biodiversity. However, the ecological report submitted with the application has been prepared by this consultancy and there are lots of gaps in their survey methodologies, impact assessments and mitigation recommendations, which will take a substantial amount of time to put right.

You feel that the time has come to do something about this, especially because of your limited capacity due to a high workload.

You notice that the author of the report is a Full CIEEM member, and you are considering whether to make a complaint about the standard of the report. However, you are reluctant to do this because you feel that it would affect the good working relationship you have with the consultancy as a whole and picking on one ecologist may not be entirely fair when the problem appears to be more generic.

1. What are your options?
2. Would a complaint to CIEEM actually be a good way forward, and if not, why not?
3. How would you handle this sensitively?
4. Is there a way of working with the consultancy to improve the quality of their work (which would benefit others)?
5. Is it important to secure a good working relationship between the LPA ecologist and the ecological consultancy; and what are the key benefits of doing this?

Our thoughts

1. What are your options?

This has been an ongoing issue with this particular ecological consultancy for several years and it is just taking up too much of your time to get the report to a sufficient standard, time that you don't have anymore.

It has become apparent that the consultancy in general have not learned from their mistakes in the past and have not made improvements to the way that they present their ecological information to adequately inform planning decisions. This is despite your previous comments, discussions at site meetings and general recommendations on planning application proposals. It seems that they are unaware of the impact this could have on the standard of development being permitted.

It could be said that this is not your problem, it is not within the remit of the LPA to encourage consultants to improve their reports. However, it is having a detrimental impact on your ability to do your job well and is causing you extra stress that you could do without. And who will do it if you don't?

Firstly, due to the good working relationship that you have with the consultancy in general, it would be a good idea to contact them directly to discuss the issue. It is not necessarily one poor consultant; it appears to be a systemic issue within the company, and they need to review the way that they write their reports. Picking up the phone for a conversation with the Director or someone you know well within the company would be a good starting point. Obviously, this would need to be handled sensitively, but the company needs to take action to improve their reputation.

Depending on the outcome of the phone call and the reception to your advice, you may decide to write an email to the Managing Director of the company – sometimes making your points in writing can be easier, as you can take time over what you are saying and re-draft until you are comfortable with the tone. Perhaps even get someone else to proofread and check it before you send it.

This may differ if you are dealing with a sole trader. Obviously, you would need to pick up the phone to them personally. If they are receptive to your feedback, then it might open up a conversation with them about how they could improve their style/format and content of their reports to help the LPA – perhaps they just don't understand what is needed from your point of view.

A report that is being submitted for a planning application needs to be accessible to a wide audience and they need to appreciate that they are not just writing it up for their client – the report will be read by the developer and their design team, but it will also be read by the LPA ecologist, landscape architect, tree officer, other consultees (e.g. Natural England, Environment Agency, Wildlife Trust), planning officer, planning committee members, as well as the general public. It may also be read by other ecological consultants, as a local resident or for marketing purposes (to check out the competition).

We refer you back to the *Why Effective Ecological Reports are Essential* article in *In Practice* issue 111 (March 2021) which explains more about what LPAs need to make lawful decisions in relation to ecology. This article points towards the quality assurance process as a way of helping those who are struggling to consistently meet required standards to identify areas that require improvement. However, it also offers those who are already providing adequate reports with the opportunity to demonstrate their expertise against best practice standards – hopefully to be seen as a commercial advantage.

The 2021 article also argues that good quality reports correspondingly mean a smoother ride through the planning system, offering developers greater certainty that the information submitted will be accepted as adequate by the LPA. It is better for the consultancy's clients that this issue is solved – it's not just about the impact on you as the LPA ecologist. Their clients are also likely to tire of the delays and may not employ them again.

2. Would a complaint to CIEEM actually be a good way forward, and if not, why not?

A complaint about the author of the report for the planning application for

125 homes would be unfair to the member and you might want to consider holding off making a complaint to see if the company improves after you have spoken/written to the Managing Director. You could pick this up again at a later date if necessary.

A complaint to CIEEM would be about a single member who was responsible for the report and would not necessarily result in the outcome you want, which is for the whole company to improve. It would cause a lot of stress and anxiety for that individual and they may lack the support of their colleagues and managers within the company. Ultimately, if they are relatively new to the job or have limited experience and support it could result in a loss of confidence, and they may decide to leave the profession altogether.

You could make a complaint against the Managing Director of the company if they are also a CIEEM member, as they have overall responsibility for their staff and the way that the company operates, including the provision of sufficient training for staff and the standard of their reports. This could be a more effective way to raise standards within the company as a whole.

As a member of CIEEM, the Director of the company has a duty to (a selection from the *Code of Professional Conduc*t only):

- Uphold the reputation of the profession, not bring the profession into disrepute and protect the public interest.
- Exercise sound professional judgement in their work, applying objectivity, relevance, accuracy, proportionality and impartiality to the information and professional advice they provide.
- Ensure that those working for them are appropriately qualified, trained, competent, supervised and supported.
- Accept responsibility for their professional actions and decisions.

So, ensuring that their staff are capable is required as part of the code of conduct. A complaint would therefore make sense in relation to this aspect alone.

However, it is also about the reputation of the profession and protecting the public interest – if the poorly presented ecological information is accepted by an LPA (e.g. with no in-house ecologist) and used to inform a planning decision, then it could have a detrimental impact on the public interest – the planning decision could be based on inaccurate details and may have a significant impact on biodiversity, which would have a knock-on effect on the local community.

3. How would you handle this sensitively?

Of course, if you are a local authority ecologist and you have a good working relationship with an ecological consultancy, then it will be a difficult conversation to have with them if you are not happy with the standard of their reports. However, when you are commenting on the planning application for 125 homes that could have a significant impact on biodiversity, what are you going to say? Are you going to shy away from asking for more details, a justification for why certain surveys weren't carried out or a more robust impact assessment? No, you are going to explain why the report is lacking and you are going to recommend that further information is required before a positive determination of the planning application in order to comply with Section 15 of the National Planning Policy Framework, the relevant local plan policies on biodiversity, protected/priority species and priority habitats and the relevant legislation, including the council's duty under Section 40 of the Natural Environment and Rural Communities Act 2006, etc. If you are also a CIEEM member, it is in

your professional code of conduct to do so and it is also your responsibility to ensure that planning decisions are based on adequate information. You will want to make sure that wildlife is respected and fully taken into account as part of the development.

Therefore, a balance must be struck. Do you continue to accept poor reports and spend hours of your time ploughing through them, picking out all of the mistakes, writing your consultation response to the planning officer, waiting for more details to be submitted, writing another consultation response, waiting for more details to be submitted, and so on?

The situation does need to be handled sensitively (hopefully how to do this has been covered above), but a conversation with someone at the consultancy to open up the channels of communication may be welcomed and it will resolve itself in a short amount of time.

If it cannot be resolved by phone/email and the consultancy is not listening to your well-meaning feedback, then it may be time to submit that complaint to CIEEM.

4. Is there a way of working with the consultancy to improve the quality of their work (which would benefit others)?

One of the questions you could ask when you speak to the consultancy is whether they receive adequate training – if you contact the consultant that you are particularly familiar with and speak to them about what it's like working for the company, you may get some more insight into what the problems are. This may help you in deciding whether to make a complaint about the Managing Director or not.

To follow up the phone call and email, you could suggest meeting with the company to talk through the issues and explain what they should be including in their reports in order to help you do your job more effectively and to ensure high-quality planning decisions. This could be an informal meeting or a more formal training event. A 1 hour training session could save you a lot of time in the long run.

Alternatively, of course, the company could (and probably should) be sending their staff on training courses about Preliminary Ecological Assessment (PEA) and Ecological Impact Assessment (EcIA) report writing.

It may also be a good idea to suggest the use of the CIEEM/ALGE EcIA Checklist as an internal quality assurance tool, to ensure that reports contain the minimum requirements that must be covered. This is freely available from the CIEEM website: https://cieem.net/resource/ecological-impact-assessment-ecia-checklist/

5. Is it important to secure a good working relationship between the LPA ecologist and the ecological consultancy; and what are the key benefits of doing this?

A good working relationship has lots of benefits, including feeling that you are able to pick up the phone for a quick chat about a case that is causing you lots of consternation from both sides.

Biodiversity conservation is what we are all concerned about; it is likely that a love for the natural world is why we became ecologists in the first place. We want to increase the appreciation of nature after decades of destruction, fragmentation and decline, and make sure that new developments are doing everything they can to respect and restore wildlife.

It therefore makes sense that we should work together to bring this about.

As the article from March 2021 concludes, we must all be advocates for nature and 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.

Local authority ecologists are not the enemy! They are there for a reason and they are doing a similar job to ecological consultants in terms of ensuring that biodiversity is properly taken into account as part of the planning process. They face similar issues internally such as a lack of understanding and a careless attitude towards mitigation and compensation from many sources. Sometimes it can be a struggle to stand up for what you believe in, but working together positively could have significant ramifications for nature's recovery.

The next dilemma

So, now for this issue's dilemma.

You are the lead ecologist for an infrastructure improvement scheme in southern England, being carried out by contractors on behalf of the commissioning client. Dormice are known to be present and a licence is in place. Design changes resulting from unexpected ground conditions once construction has started mean that several small (up to 50 m^2) additional areas of vegetation require clearance. You advise your client that a licence amendment is required, and as soon as a revised design is produced, a licence amendment request is submitted.

Unfortunately, due to a combination of the seasonal window for vegetation clearance and the time taken to obtain a licence amendment, it becomes obvious that these elements of the works are likely to be delayed. The contractor is adamant that they cannot wait until an amendment is obtained, as doing so would put them in breach of their contract with the client and result in them incurring substantial financial penalties. Their proposal is to clear the additional areas 'at risk' ahead of receiving the licence amendment, as doing so would allow them to get into those areas before the seasonal window closed. They propose to use a methodology identical to that for existing (licensed) habitat areas, including checks by an Ecological Clerk of Works prior to commencement. Several of the ecologists on site have expressed misgivings about doing so under these circumstances.

What advice can you give the contractor and client, beyond the obvious recommendation that they should really wait until a licence amendment is obtained? How do you manage the issues around your team's involvement in these works if they do go ahead 'at risk'?

Welcoming a New Fellow

Dr Patrick White FCIEEM

Dr Pat White is currently Associate Professor of Applied Ecology at Edinburgh Napier University and, in the opinion of the Fellowship Review Panel, continues to make a significant contribution to the profession in many ways, including:

- Pat's substantial experience in the fields of avian and mammalian ecology has led to the publication of several peer-reviewed papers that have been influential in changing policy and practice. Many of these papers have been published in high impact international and UK journals, as well as in widely read publications for UK practitioners. His expertise is comprehensive, and he is highly respected, as evidenced by his invitations and appointments both nationally and internationally. Pat clearly makes a significant contribution to the profession by his research and dissemination of such, which has had positive conservation results in the UK and abroad. Pat's involvement in various national and international working groups has led to him being involved in successfully attracting partnership funding tackling important conservation issues.
- Pat's application provides evidence of substantial experience in teaching and training. Through this, Pat connects the academic world to the practitioner world, supervising students who have gone on to produce impactful research themselves and works in partnership with industry and consultancy. The work of one of Pat's PhD students is contributing to revision of the Otter Survey Guidelines, published by the Mammal Society. He is a founding member of his University's Centre for Conservation and Restoration Science and is highly respected by his colleagues and students, with the latter taking his positive influence into their own careers.
- Pat's application provides evidence of a significant contribution to the profession by his commitment to high standards of research and practical conservation work, and the delivery of academic and bespoke education. He is strongly committed to maintaining and delivering a high standard of ecological training, both within Edinburgh Napier University and CIEEM. This applies to both undergraduate and post graduate work, including supervising PhD students.

In summary, the Governing Board agreed with the review panel that:

"Patrick White has shown that he is an enthusiastic and authoritative university lecturer and researcher who is keen to apply the outcomes of his and his students' research to solving practical ecological conservation problems. He has made a significant contribution to the standards and standing of ecological teaching within his university. His reputation has led to him being invited to participate in various conferences, working groups and other partnerships."

Policy Activities Update

Douglas Lewns
Policy Officer, CIEEM

Overall update

Since the last edition of *In Practice* the UK Government in mid-September announced a slew of rollbacks on planned and existing net zero policies, including a 5 year delay to the ban on diesel and petrol engine car sales, scrapping policies requiring landlords to upgrade energy efficiency in properties and delaying bans on installing new oil and LPG boilers. Following these announcements approval was given for one of the largest undeveloped oil fields in UK waters, Rosebank. Both decisions have been highly controversial, and have been widely condemned by environmental organisations and businesses across different sectors.

Alongside these announcements the State of Nature partnership has released the *State of Nature Report*. This report represents the most comprehensive evaluation of the UK's current biodiversity and is produced through the collaboration of over 60 partners, including CIEEM. This report has found that nearly 1 in 6 of the more than 10,000 species surveyed are at risk of extinction within the UK. Alongside this, habitats for wildlife were also found to be faring badly, with only 1 in 7 of those assessed being reported as in good condition. The report also includes a number of success stories, such as the stabilisation of natterjack toad in key conservation sites.

UK and England

Following on from the joint position statement on woodland management that we published with the Institute of Chartered Forestry, we are now working on a follow up event for early in the new year. We have also been joined by the Woodland Trust, Forestry Commission and CEH to organise the event. The event will present new evidence on woodland management to continue to highlight the benefits of brining more woodlands under management for people, nature and economy.

Our England Policy Working Group have been busy putting in responses to consultations from the Department for Environment, Food and Rural Affairs and the Office for Environmental Protection. The group is now deciding what their focus should be for 2024, and how we can create the most policy impact in England and the UK.

Scotland

Our Scottish Project Officer Annie and the Scotland Policy Working Group have been focusing much of their energy on drafting our response to the Scottish Government's consultation on Tackling the Nature Emergency: Consultation on Scotland's Strategic Framework for Biodiversity.

Wales

Since the last edition of *In Practice* our Wales Policy Group has provided a consultation response to Welsh Government regarding targeted policy changes to Planning Policy Wales, and the Group has continued to engage with Natural Resources Wales on the Welsh Area Statements.

The Group is now considering how they will respond to the Welsh Government's consultation on Net Zero Sector Skills alongside CIEEM's Action 2030 Working Group, emphasising the need for ecology skills to support the transition to net zero across sectors.

Ireland

The Ireland Policy Group has responded to a number of consultations including the National Biodiversity Data Centres Consultation on their Strategic Plan 2024–2028. This was a welcome opportunity for CIEEM to emphasise the importance of enhancing biodiversity within the NBDC's mission statement.

The Group has also been busy developing a policy briefing paper focused on Biodiversity Enhancement for New Developments in Ireland. This paper makes recommendations on the approach to biodiversity enhancements in Northern Ireland and the Republic of Ireland, and we hope that it will contribute to a broader discussion on the best approach for Ireland.

Further priorities

The policy groups are now preparing for any additional consultations coming before the end of the year, and are developing their plans for how we can create the most policy impact in 2024 throughout the UK and Ireland.

We currently have some vacancies in our Scottish, Welsh and Irish Policy Working Groups and are looking for anyone interested in taking an active role in influencing national policy and legislation in the areas that matter to you! Members with any level of expertise or experience are welcome to get involved and you can find out more on the CIEEM policy webpage.

Contact the policy team at policy@cieem.net

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 ECOLOGICAL EXPERTISE, EVOLVED
Stantec

From the Country Project Officers

Annie Robinson – Scotland Project Officer

We had a fantastic turn out at our Scottish conference – **The Role of Trees in a Sustainable Future** – in October. There was a great line-up of speakers as well as a suite of very interesting poster presentations. I really enjoyed meeting and engaging with all of you on the day.

We have held an incredible 10 Member Network events this year. I hope you have enjoyed all the in-person events across many areas of Scotland. We are already looking forward to and planning events for 2024, so if you have event ideas the Scottish Committee would be delighted to hear from you.

The Scotland Committee has also been supporting lots of career events at higher education institutions and we have delivered a talk to the Association of Graduate Careers Advisory Service (AGCAS) on Green Jobs for Nature jointly with NatureScot and Scottish Forestry.

The Scottish Policy Group has been working hard on the CIEEM response to the consultation on Scotland's Strategic Framework for Biodiversity. We really value members' support and expertise in policy work, so please get in touch if you would like to be involved in the Scottish Policy Group.

So, as 2023 draws to a close, I would like to thank everyone for their continued support, engagement and membership of the CIEEM Scottish Section. It has been a pleasure working with you all and I look forward to 2024 and the exciting developments ahead.

I hope you all have a restful and enjoyable festive period.

All the best, Annie

Contact Annie at:
AnnieRobinson@cieem.net

Elizabeth O'Reilly – Ireland Project Officer

Nollaig Shona Dhuit / Merry Christmas

Since the last edition we have continued a programme of events here in Ireland. We had three Lunchtime Chats – with Killian Murphy, the Irish Green Building Council and William Murphy, and the recordings of these webinars are available on request. We were also delighted to join the law firm Philip Lee at a very informative legal session in November. These events were added to a range of events held in Ireland in 2023 and I want to take this opportunity to thank every volunteer who helped in making these possible.

I would also like to thank everyone involved in putting together the Irish Section position paper on Biodiversity Enhancement in Ireland. If you have not come across it, it is available in the Resource Hub on the CIEEM website, and lays out CIEEM's position on biodiversity enhancement in the current landscape in Ireland. We look forward to engaging with the sector on this in 2024.

In addition, as we head to the end of the year, organisation of the 2024 Irish Section Conference is underway. The **Call for Papers is now open!** Our Committee has decided to focus on an important area and theme – **Examining the Practical Impacts of Environmental Policy and Legislation on Ireland's Ecology** – and we need your help to make it an informative and engaging day. Have a look on our website for more information and we would be delighted to hear from you.

It was a pleasure working with you all and I look forward to doing so again in 2024.

Merry Christmas and Happy New Year!

Liz

Contact Elizabeth at:
Elizabeth@cieem.net

Mandy Marsh – Wales Project Officer

S'mae pawb / Hello everyone

Great news about our Welsh conference – for various reasons we have changed the theme of the conference from marine to **Peatland Restoration: Approaches and Challenges in Wales**. We have received plenty of exciting papers and by the time you read this our programme and tickets will be available on the website. I look forward to seeing lots of you in January.

Elsewhere we have made exciting new links with Nature Service Wales. This organisation encompasses training and volunteering opportunities including paid placements and apprenticeships. Its aims tie in well with September's *In Practice* theme of Diversity, and Capacity in ecology, and our own Green Jobs for Nature (GJfN) campaign. Please consider submitting your own job profile to GJfN, to encourage the next generation who are taking up environmental careers: https://greenjobsfornature.org/job-profile-form/

It's been election time here at CIEEM, and a big shout out to all our volunteers who have stepped up yet again to do their best for the Institute and for the environment. It's only with your help that we can do all the things we do. But it's a two-way process – it reaps rewards for volunteers too. So if you'd like to add to your CPD and make your CV more relevant, link up with people who can help you in your career and potentially get free places at conferences and events, just let me know.

Hwyl, Mandy

Contact Mandy at:
MandyMarsh@cieem.net

British Ecological Society

Connecting Ecologists to Other Disciplines

A new grant from the BES promotes interdisciplinary skills by funding 4 month placements for ecologists to work in a different discipline or sector.

By providing an immersive experience of interdisciplinary collaboration, this grant aims to demonstrate the value of ecology in solving real-world problems.

The essence of the programme is to immerse an ecologist in another professional world where ecology can make a difference. This can include another discipline, NGO/charity, a public sector organisation or a business.

This grant will foster relationships between disciplines and sectors. It offers successful individuals the chance to build key skills and offers the recipient organisation a deeper understanding of what ecological science has to offer.

This grant is open to those who:

- are PhD students, postdoctoral fellows and early career ecologists who would like to develop interdisciplinary skills
- have approval from their employer/supervisor to step out of current activities for 3–4 months
- have a willing host organisation/department who will collaborate on the grant application
- want to immerse themselves in a different discipline or sector.

This grant is designed for a secondment. Applicants must demonstrate that this is additional to any existing employment or studentship. The placement must be distinctly different from their current areas of work/research.

Collaborations must identify an output of their work, not necessarily academic. This could be (but isn't limited to): a scientific paper; a grant proposal or concept note for a future proposal; a film or blog; a think piece; a contribution to an organisation's delivery plan; and many other possibilities.

How to apply

There will be two rounds of funding in 2024. The first round of funding will open in early January and close in early March. The second round of funding will open in early July and close in early September.

Applications are made via Flexigrant (www.bes.flexigrant.com) and full details are on our website.

Value

You can claim up to £20,000 when applying for the grant. The grant allows individuals to take a break from their current employment/research. This grant is not a salary replacement for the applicant or any employee associated with an organisation.

If you have been given permission from your current employer to go on a placement, your employer cannot claim any costs or receive any reimbursements.

Costs that can be claimed by the applicant include:

- any small pieces of equipment needed to complete the placement
- expenses that the host organisation might incur, such as training expenses
- essential living expenses such as rental cover, travel and subsistence.

Full evidence of all expected expenses will need to be provided as part of the application process.

If you are interested in applying, further information can be found on our website (britishecologicalsociety.org/funding).

You can also contact the BES Grants Officer at grants@britishecologicalsociety.org.

By Members ForMembers

Introducing the new CIEEM Freshwater Ecology SIG!

We're very excited to be bringing you CIEEM's latest addition to our growing inventory of Special Interest Groups, the Freshwater Ecology SIG! If you're interested in the conservation and ecology of freshwater ecosystems and habitats, from ponds to lakes, rivers to marshes, then this is the special interest group for you. You can join the group's mailing list and be the first to hear about upcoming events and activities through the My CIEEM area of the website, by updating your personal preferences.

This topic of ecology transcends geographical boundaries, and to quote the River Trust *"0% of all rivers in England and Wales are in good overall health"*, while in Ireland *"almost half of rivers have unsatisfactory water quality levels and there was a decline in water quality in 230 rivers recorded in 2020."* Freshwater ecosystems are being critically threatened by pollution (increasing eutrophication), habitat degradation, the introduction of invasive species and climate change. This SIG will be working collaboratively with the CIEEM Geographic Section Member Networks and external groups, to run events that, crucially, bring together ecologists and environmental mangers interested in freshwater ecology, and unite their experiences, expertise and enthusiasm to reverse the decline in the state of freshwater habitats. The SIG seeks to improve skills and knowledge around supporting these freshwater habitats, finding and sharing an evidence base to influence policy, and identify areas of science that can be further developed in freshwater ecology.

The SIG's core objective is also to provide opportunities for networking, and sharing case studies and experiences to build a strong evidence base which can be called upon when investigating issues and hot topics impacting freshwater habitats. We are really excited to see the outcomes of this new SIG and the CIEEM office would like to express our thanks to the volunteers who contributed their time towards the set up and launch of the group.

Drew Lyness

Volunteer Engagement Officer, CIEEM

Ireland Geographic Section

Conservation management of habitat and rare or threatened insects at Lagan Meadows

The CIEEM Ireland Member Network were joined by experts from Buglife and Butterfly Conservation for a walk and talk to look at the rare and threatened invertebrate species that occur at Lagan Meadows. Part of the Lagan Valley Regional Park in south Belfast, the site hosts a range of priority habitats and threatened or rare invertebrates. From wood pasture to wet meadows and open bare dry soil, there exists a mosaic of habitats for a variety of species.

There was a specific focus on bee species that appear on the Regional Red List of Irish Bees including discussion on habitat requirements for nesting and foraging. Grey-banded mining bee (*Andrena denticulata*), listed as vulnerable on the Regional Red List, was targeted, as was its kleptoparasite, black-horned nomad (*Nomada rufipes*).

This event focused on recording and surveying, including FIT counts and timed counts for butterflies. There were opportunities for participants to take part in a FIT count including discussing features to look out for in field identification to family or genus of bees, when specimens cannot be obtained. A fascinating session for everyone involved, where it was brilliant to appreciate the invertebrates that inhabit this special site.

Wales Geographic Section

Red Squirrels in mid-Wales: past, present and future?

Sarah Kay, the Mid-Wales Red Squirrel Officer with the Wildlife Trust of South and West Wales, joined the CIEEM Wales Member Network to deliver and online talk. Sarah provided a crucial update on the mid-Wales red squirrel project featuring lots of camera trap imagery and recent updates of the current situation and what the project team are working on.

Sarah grew up in mid-Wales and studied ecology at the University of East Anglia. After graduating, Sarah spent some time volunteering before starting work as assistant warden on Skomer Island where she lived and worked for 3 years before moving back to mid-Wales to take on the role of Mid-Wales Red Squirrel Officer with the Wildlife Trust of South and West Wales.

Grey squirrels are an invasive non-native species and cause thousands of pounds of damage to trees each year as well as causing declines in our native red squirrel population by competition and spread of disease. Red squirrels have survived in a remote area of mid-Wales against the odds as grey squirrels spread across much of Wales. We're at the tipping point for this population where we have to decide if it has a future. Sarah explained how this was a complex issue of landscape-scale versus species-focused conservation. Thank you to Sarah for her time and insight.

Academia Special Interest Group

A discussion of evidence and ecological consultancy

The ASIG were joined by Richard (Dez) Delahay, as he explored the role of scientific evidence in ecological consultancy. Evidence-based conservation advocates the systematic application of empirical evidence to conservation management, but are we routinely achieving this in our profession? And what are the implications if we are not? He discussed the nature of scientific evidence and where to find it, described 'evidence complacency', 'evidence transparency' and, importantly, what to do when there isn't any evidence!

The ASIG writes *"Practising ecological consultants employ a library of guidance documents to support their advice and actions to mitigate and compensate for impacts on protected species and habitats. Familiarity with this guidance is a preoccupation for career development in consultancy, and a review of any handful of commercial ecology reports will likely reveal the same standard citations provided as evidence for best practice in relation to a range of taxa. Furthermore, adherence to this body of guidance is expected by local authorities, Statutory Nature Conservation Bodies (SNCBs) and commercial clients, and hence a network of key stakeholders is invested in this approach. But just how much of this guidance is based on sound evidence?"* If you have any thoughts on this or would like to get involved please do get in touch with the ASIG by emailing us at membernetworks@cieem.net and we'll pass your thoughts on to Dez.

The Green Jobs are Coming

Judy Ling Wong
CBE, CIEEM Patron

The devastating wildfires and flooding, here and across the world, have put climate change and the effort to move towards net zero at the forefront of our minds. Putting green jobs into place is probably one of the most significant strategic moves to take the UK towards its legal commitment to net zero by 2050. The Green Jobs Taskforce's Report[1] to the Government, Industry and the Skills Sector (2021) saw the government set an ambition to create 2 million new green jobs by 2030, pledging £12 billion.

Fast forward to 2023 – the Green Jobs Task Force has been disbanded and the Green Jobs Delivery Group is in place, working out the detail. Two million jobs are a lot of jobs. Beyond the intended investment is the crucial consideration of who is going to aspire to take up the needed training and go for the jobs?

The 2 million green jobs for the UK are not a choice. It is a historic necessity that underpins our very survival. In 2018, the UN-backed Climate Summit[2] urged *"action to the next level"* claiming more than 65 million 'low-carbon jobs' can be created by 2030. Recently, Deloitte[3] said, *"As the world moves to net zero, a new category of worker is emerging: the 'green collar' workforce. With coordinated and rapid decarbonization and the right policies in place, more than 300 million additional green-collar jobs can be created by 2050."*

The fundamental challenge is to create the level of aspiration to deliver the needed number of people to take on these vast numbers of skilled jobs. This requires the theme of green jobs to enter everyday societal conversation. We must all begin to talk about green jobs to colleagues across all sectors, to our friends and to our family, especially our children, who may well take up green jobs. The world that the full range of green jobs creates will be a different world, and it is societal engagement that will help to shape that world.

I am often asked *"What is a green job?"* There are three key categories of green jobs. There are jobs that directly support the reduction of carbon emissions, like putting up solar panels or building the electrification framework. Then there are nature-based jobs that sequester carbon with tree planting and the restoration and maintenance of ecosystems. Plus, any other jobs can be green jobs, operating in a way that no damage is done to nature. Alongside all of this are supporting jobs from sustainability management that enable organisational culture shift, research into green technologies, roles for digital wizards to environmental artists trained to understand issues in detail and creatively stimulate lifestyle changes. Inspired understanding goes way beyond intellectual understanding.

Framed within the societal conversation, we must target children and young people at school. They can hardly name green jobs, never mind aspire to them. Contact with nature is fundamental to that journey of caring for nature but we need to purposefully introduce the range of green jobs and enable them to grasp that having a green job means devoting one's entire working life to making the necessary green future possible. The Department for Education has just put the virtual National Education Nature Park[4] resource for schools into place. What an opportunity to link nature and climate awareness to the world of green jobs!

Green jobs protect people and nature. Green jobs will transform our society and support levelling up. Communicating the coming green jobs is a process, a chain of events. We must get better at identifying and taking action about the missing links. The character of a chain is that one missing link and the whole thing fails.

There is great excitement and opportunity associated with the creation of the 2 million green jobs that we need. Colleagues have been throwing ideas around, including for example creating copy for community groups' newsletters to drip feed information and opportunity with links to videos of *"a day in the life of…"* so that we can directly reach the community, including parents and those in job transition. We need to put our thinking caps on, with keen observation and enthusiasm, and take action to fuel the essential societal awareness for the coming green jobs. We are in for a fantastic ride towards shaping the green future that we need if we all do this together.

Find out more about CIEEM's Green Jobs for Nature project at www.GreenJobsForNature.org

References

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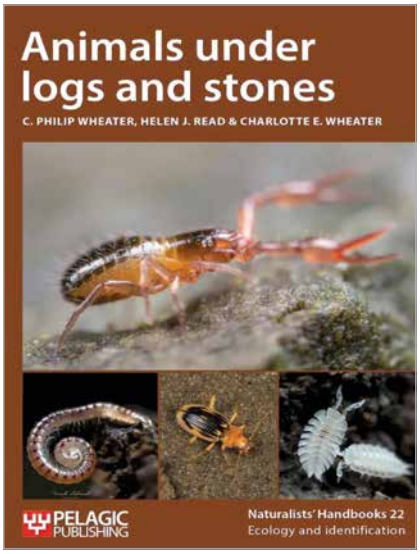
2. Climate and Environment (September 2018) https://news.un.org/en/story/2018/09/1019472#:~:text=New%20UN%2Dbacked%20commitments%20to,Sustainable%20Development%20Goals%20(SDGs)
3. An overview of green job growth (May 2023) https://action.deloitte.com/insight/3340/an-overview-of-green-job-growth
4. National Education Nature Park (November 2022) https://educationhub.blog.gov.uk/2022/11/10/what-is-the-national-education-nature-park-and-how-are-we-working-with-the-natural-history-museum-to-teach-children-about-climate-change-your-questions-answered/

Universities, businesses and colleges are all working together on more training courses and apprenticeships that combine knowledge and the hands on skills that are such is a huge element of green jobs.

BOOK REVIEW

Compiled by the Academia Special Interest Group



Animals Under Logs and Stones, 2nd edn

Wheater, C.P., Read, H.J. and Wheater, C. (2023).

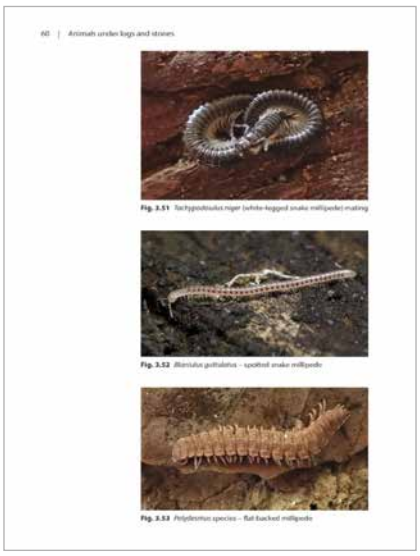
Pelagic Publishing Ltd. ISBN 9781784274177

Reviewed by Alvin J. Helden, Applied Ecology Research Group, School of Life Sciences, Anglia Ruskin University, Cambridge, UK

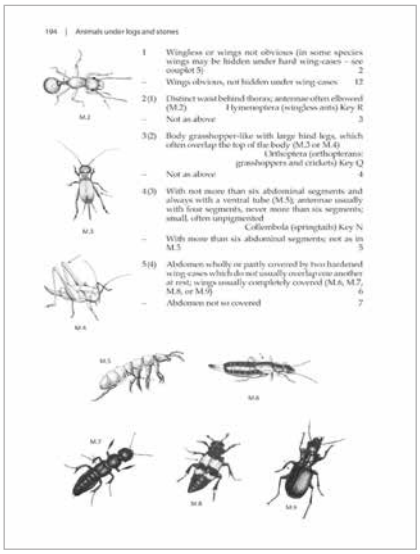
When the second edition of a book is released, it is sometimes tempting to think that an update is unlikely to contain much new material, and that there is little value in purchasing it as a replacement for the original. In the case of the second edition of *Animals Under Logs and Stones* such a thought would be a grave error. The new edition has so much new and updated content that it is almost unrecognisable from the original book.

The central core of the book remains the series of dichotomous keys, designed to enable the user to put a name to the cryptozoan animals they find hidden away under objects at the interface of soil and vegetation litter. This section on identification has been expanded in scope and detail to include new keys to flatworms, mites, earwigs, cockroaches, amphibians, reptiles and mammals. The broadening of the scope from a purely invertebrate focus to encompass vertebrates is a very useful addition, given the widespread use of artificial refugia to survey reptiles, and also helps to dispel the rather artificial distinction between the ecological value of invertebrates and vertebrates it is so easy to adopt. Not only are there new keys, but the level of detail in the identification section has increased greatly, with many more species described and much updating of the taxonomy. The level of development of this core part of the book is illustrated in that in the first edition the keys took up 46 pages, whereas in the second edition they take up 168. Importantly, each key is preceded by a short introduction that sets out the scope and coverage of what follows and points to sources of information for those who wish to take the identification of specimens to levels beyond the scope of the book.

The clear recognition that the book in itself cannot be a comprehensive source of information for identification is an important message for the reader, and one really excellent aspect of the book is the level of additional sources it points to. In recent years there has been an explosion of useful internet-based resources for species identification that did not exist when the first edition was published in 1996. The book references very many of these, as well as including a comprehensive list of books and journal articles. Of course, it is inevitable that with the speed of change on the internet that any list of such web-resources will need updating to maintain their currency, but this in no way detracts from the quality of what has been included.



Prior to the central block of identification keys, the book has a section on the biology of each animal group in turn. Whilst much of the information included is present in the first edition, the sections have been expanded to some extent and a large number of photographs have been added. As well as illustrating issues in the text, the photographs enliven the book and inspire the reader to go out to try to find some of the creatures shown.



As in the original edition, the authors introduce the reader to some useful ecological approaches, such as applying the theory of island biogeography to refugia, and consideration of succession, daily activity patterns, feeding guild composition and energy flows. These concepts are approached in a clear and simple way that will allow the non-specialist to understand. Towards the end of the book is a section dedicated to ways in which the animals under logs and stones can be

JOURNALS AND RESOURCES

studied. As expected, there is coverage of a range of practical methods, ranging from behavioural choice chamber experiments and marking of individual animals to extraction and collection methods. Much of this content was also present in the previous edition, although the second edition has been enhanced with many more useful photographs and other illustrations. The first edition had a small section on the writing up of results and the authors have expanded it and added a new section on project design. This includes consideration of health and safety, ethical issues, descriptive statistics, the graphical presentation of results and the principles of hypothesis testing. The inclusion of some suggestions of general project ideas, together with the rest of the study methods, will provide excellent pointers for those wanting to carry out project work on the cryptozoa under refugia, but will also be valuable interested in other approaches such as the investigation of animals in leaf litter of those collected in pitfall traps.

With its coverage of ecology, identification, additional sources of information and study methods, the second edition of *Animals under Logs and Stones* is an excellent and very useful book for naturalists, ecologists, ecological surveyors, or indeed anyone interested in knowing what lives in the hidden places of their garden. It caters well for the growing interest in and use of bug hotels and will help anyone establishing them to understand more about the animal communities they support. The emphasis on study methods, combined with the relatively simple methods that can be used and the potential for novel discoveries, makes the book particularly useful for university and other students who would like to do projects on those animals that hide away under refuges, hidden yet all around us.

Paper Review OPEN ACCESS

Balancing making a difference with making a living in the conservation sector

Pienkowski, T., Keane, A., Castelló y Tickell, S., Hazenbosch, M., Arlidge, W. N. S., Baranyi, G., Brittain, S., de Lange, E., Khanyari, M., Papworth, S. & Milner-Gulland, E. J. (2022)

Conservation Biology 36, e13846. https://doi.org/10.1111/cobi.13846

This extensive study reports on the views of 2694 respondents from 145 countries active in the conservation sector. This sample included 969 men and 1208 women, of whom 1094 worked in academia with the remainder describing themselves as practitioners. The respondents had an average of just over 12 years of working in the sector. The high proportion who said the goal of making a meaningful contribution was important suggests working in conservation was more than just a job for most although many reported struggling to earn adequate incomes or develop/maintain stable careers. They also felt that little progress was being made toward collective conservation goals and this influenced their personal feeling of well-being and satisfaction. This was particularly evident among those with university-level education, possibly as this group would have greater environmental awareness and are more exposed to 'gloom-and-doom' discourses. Further research is needed to understand how many leave the sector because of these challenges.

There is a clear message here for employers and funders to support those working in the sector to deliver conservation outcomes, helping them make a difference while at the same time having stable and rewarding livelihoods.

Paper Review OPEN ACCESS

Putting conservation gardening into practice

Munschek, M., Witt, R., Kaltofen, K., Segar, J., Wirth, C., Weigelt, A., Engelmann, R. A. & Staude, I. R. (2023)

Scientific Reports 13, 12671. https://doi.org/10.1038/s41598-023-39432-8

Residential gardens can be important sources of biodiversity, but despite the availability of a plethora of advice on 'wildlife friendly gardening', its not always clear how best to target our efforts in the interests of conservation. This study focuses on the concept of 'conservation gardening', involving the creation of refuges for declining native plants in public and private green spaces. The authors present a framework for providing 'conservation gardeners' with the targeted information they need to make informed decisions. The study involved the collation of data on declining vascular plant species from red lists for each of the German federal states, together with information on their amenability to gardening and their commercial availability. It turns out that just over 40% of the declining plant species identified are known to be suitable for gardening and that 66% of these are currently available to buy. The state-specific lists of declining species and accompanying guidance on their purchase and cultivation are then made available via an easily accessible web-based application, providing a 'one-stop shop' of advice for the conservation gardener. There are likely to be many opportunities to apply similar frameworks in other geographies to make the most of existing data to inform conservation gardening efforts, and thereby help mitigate the decline of many plant species.

Paper Review OPEN ACCESS

Pollutant accumulation in road mitigation tunnels for amphibians: a multisite comparison on an ignored but important issue

White, K. J, Petrovan, S. O. & Mayes, W. M. (2023)

Frontiers in Ecology and Evolution 11, 228. https://doi.org/10.3389/fevo.2023.1133253

This study looked at four amphibian mitigation tunnels created for ecological mitigation purposes at a range of sites across the UK. The research aimed to understand how pollutants from road run off impact the sediments within these features. The sediment was checked for the presence of potential contaminants and results were compared to sediments from similar reference sites near the tunnel locations. The reference sites were chosen based on criteria such as distance from roads and geological similarity to the tunnel locations. The results showed that at three out of the four mitigation tunnel locations, sediments contained higher concentrations of copper, lead and total petroleum hydrocarbons compared to reference sites, and zinc levels were elevated in all four tunnels relative to reference sites. Tunnel sediment at all four sites showed significantly higher pH values, sometimes exceeding environmental safety thresholds. The study findings indicate the likelihood of shared pollution sources and pathways across geographically diverse sites and suggest that road tunnels established for ecological mitigation could potentially serve as significant conduits for road surface pollutants to amphibians.

The article highlights the need for focused monitoring and maintenance of underpasses and recommends measures such as regular cleaning or pre- and post-implementation adjustments in mitigation designs to reduce pollution transfer. Whilst the direct impacts to the amphibians are not known, the issues in this study raise important considerations for ecologists and developers.

Publication Summary

Reintroduction and Conservation Translocations: Case Studies from the UK. Volume 1

Wells, P. J. & Heydon, M. (eds). (2022)

NERR125. Natural England. https://publications.naturalengland.org.uk/publication/4940855555915776

This recent publication provides a summary of ten reintroduction and conservation translocation case studies from across the United Kingdom. The studies cover a range of taxa and include a project summary, goals, success indicators, lessons learned and reasons given for success/failure. The case studies are formatted similarly to those found in the IUCN's Global Reintroduction Perspectives series, which has multiple editions covering global case studies. The aim of the publication is to provide a useful resource that offers insights into the challenges faced by projects aiming to restore biodiversity through reintroduction and translocation efforts, and to serve as a valuable reference for future initiatives.

There are plans to release additional editions and the submission of more case studies is being encouraged, particularly those that have encountered difficulties or failures, as these can provide valuable insights into the complexities of species reintroduction.

Paper Review OPEN ACCESS

FAR-sighted conservation

Thomas, C. D., Hill, J. K., Ward, C. & Hatfield J. H. (2022)

Ecological Solutions and Evidence 3 (4), e12188. https://doi.org/10.1002/2688-8319.12188

The context for this article is the potentially conflicting messages between the text of the United Nations Convention on Biological Diversity (CBD), which acknowledges the integration of human and biological processes and places, the benefits that people derive from nature and the ongoing reality of change and the first three CBD Action targets in the draft post-2020 global biodiversity framework) which retain a desire to protect intact ecosystems and restore those that are degraded, as well as recognizing integration and change. These authors suggest that conservation targets that reference historical expectations, such as maintaining specified areas of intact ecosystems, restoring degraded ones or maintaining the historic distributions of species, may not be realistic in the context of ongoing environmental change. They point out that all ecosystems have already been shaped by interactions with people and that a more realistic approach is necessary as ongoing change is inevitable.

An alternative approach based on a Facilitate–Accept–Resist (FAR) framework is proposed for all levels of conservation decision-making and actions, ranging from overall conservation strategies, to planning, target setting, and monitoring indicators from site-specific to landscape and individual species scale with integration of ecosystem service provision. The approach is based on evaluating each decision with respect to the rationale and the method by which any change might be facilitated, accepted or resisted. The value of inclusive engagement in this process is emphasised to ensure that benefits from biodiversity are equitably shared.

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As the dark nights and mornings draw in, it's not uncommon to experience Seasonal Affective Disorder (SAD) which is a type of seasonal depression caused by lack of sunlight. Or perhaps you're feeling low about the coming New Year, or stressed about work, or you have a lot going on in your personal life.

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30 & 31 January **Advanced Communications Skills (for ECOW site-based work)** Online	30 & 31 January **Train the Trainer for Ecologists** London	31 January **CIEEM 2024 Wales Conference** **Peatland Restoration: Approaches and Challenges in Wales** Swansea	1 & 2 February **Red Squirrel Ecology and Surveys** Scotland
6–9 February **Beginner QGIS for Ecologists and Conservation Practitioners** Online	8 & 9 February **Pine Marten and Wildcat Ecology and Survey** Scotland	20–23 February **QField for Ecologists and Environmental Practitioners** Online	27 February–1 March **Beginner QGIS for Ecologists and Conservation Practitioners** Online
12 March **Positive Planning for Biodiversity** Online	23 April **Otter Ecology and Surveys** South West England		

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