Bulletin of the Chartered Institute of Ecology and Environmental Management

CIEEM

inpractice

Issue 101 | September 2018

Environment and Pollution

In this issue

Welcome

This is the last edition of *In Practice* during my time as President of the Institute, and the editorial team have very kindly indulged me with the opportunity to say a few words of thanks as I hand over the baton into the capable hands of Max Wade.

My three priorities for my tenure as President were:

1. to raise our external profile, including our political profile, and to become an important 'go-to' consultee on matters of environmental policy;
2. to focus on increasing membership and developing the membership 'journey' and experience; and
3. to manage the finances of the Institute responsibly and sustainably.

As a chartered body we have a responsibility to provide advice to the government(s) of the day on our areas of expert knowledge. Over the last two years we have met with over 25 parliamentarians from across the party-political spectrum to explain our concerns around Brexit and future environmental policy. We have organised two parliamentary round tables – one on future agricultural policy and one on the proposed environmental watchdog. A further round table on 'net gain' is planned for the autumn. Our influence in this area is demonstrated by our increasing invitations to attend stakeholder events and to give evidence to select committees. It has been heartening to see our words reflected in Parliamentary Questions and in Select Committee reports. I am very proud of how far the Institute has come in this area in a short time, and extremely grateful for the hard work put in by our Policy and Communications Manager, Jason Reeves; for the advice and support we have had from our consultants, Riverside Communications; and for the contributions, both financial and intellectual, from our Policy Investors: Arcadis, Biocensus, BSG Ecology, Ecological Planning and Research, and Peter Brett Associates.

The CIEEM Membership team, headed by Stuart Parks, the Membership Admissions Committee, and the Governing Board have done amazing work on the Institute's approach to membership over the last three years. The first stage of this work was to put in place new IT systems so that we can better track our relationships with members. With that system now working effectively, we are in a position to simplify our membership grades and support members through the transition between grades on a membership journey towards chartership. We have a very low lapse rate for a membership organisation – once people join us, they do tend to stay – and we want everyone to make the most of their membership. We will also soon be rolling out a 'Registered Practices' scheme, so that organisations can show their support for the Institute and commitment to good practice.

I'm pleased that the Institute has continued on a solid – if not luxurious! – financial footing over the last three years and is slowly building up its resilience. The calm heads of our Finance Manager John Gordon, Treasurer Steve Pullan, and the guidance of the Audit and Risk Committee, chaired by Paul Goriup, have been invaluable. We have been considering a number of new ways to raise money so that we can deliver more for members – see page 57 for our proposals regarding charitable status – and I would urge anyone with an interest or experience in fundraising to get in touch with me, Paul Wilkinson or Tim Hounsome.

There is one person, though, without whom very little of this would happen – the force of nature that is CIEEM CEO Sally Hayns. It has been a pleasure and a privilege to work with Sally over the last three years. I thought I was a good multi-tasker, but I remain in awe of Sally's ability to keep all the plates spinning. Thank you.

Stephanie Wray CEcol CEnv FCIEEM
President

Information

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CIEEM's Employment and Salary Survey Published

The full report of the 2017-18 Employment and Salary Survey report was published last month and reveals some interesting trends about the profession. Generally, it paints a picture of a profession that works long hours, is paid less well than some peer professions, but has relatively high levels of job satisfaction and is still felt to be a worthwhile career for those who want to make a difference. There are some areas of concern that we will be seeking to explore further to see if we can help to address them, and in this context the report provides a useful baseline from which to measure future trends.

Combined EcIA Guidelines

Following on from the publication of the revised Ecological Impact Assess (EcIA) Guidelines for Terrestrial, Freshwater and Coastal Habitats in 2016, the intention was to do a similar update for the Marine EcIA Guidelines. However, the Technical Review Group decided that the time had come to merge the two sets of EcIA Guidelines into one and last month we published the first Combined EcIA Guidelines (www.cieem.net/ecia-guidelines-terrestrial-). Widely supported by government agencies, NGOs and other professional bodies, the new guidelines are now the new industry standard for the EcIA process. We are grateful to all of those who contributed to the development process.

Accredited Ecological Clerk of Works

Following the successful implementation of Phase 1 of the project, the development of competency profiles for different roles and responsibilities in the clerk of works process, the next stage is to develop the assessment and training tools in collaboration with stakeholder partners. With the help of Balfour Beatty, a funding bid has been submitted to CITB's Flexible Fund to enable Phase 2 to be undertaken, hopefully starting this Autumn.

Guidance on Biodiversity Net Gain

Developed in partnership with CIRIA and IEMA, we expect the new UK Guidance on Biodiversity Net Gain to be published later this month. Aimed at a number of target audiences, the guidance is necessarily broad-brush in some areas and further, more detailed, technical guidance may be required in the future. Meanwhile the partners are considering what further activities, such as training, could be developed to support successful implementation of biodiversity net gain projects.

Natural England's Earned Recognition for Consultants

We are continuing to work with Natural England, the Bat Conservation Trust and the Association of Local Government Ecologists on the development of a new system of earned recognition for consultants working on projects involving bats (and hopefully a system that will eventually extend to other protected species). Earned recognition will combine elements of CIEEM's Competency Framework and BCT's Professional Training Standards to define the competences required of consultants in planning development situations involving risk to bats, together with an assessment framework for these competencies. The aim is to streamline the licensing system and place more emphasis/resources on monitoring and enforcement by taking more account of professional expertise and judgement.

Application for Charitable Status

At our forthcoming AGM members will be asked to decide whether or not CIEEM should apply to become a registered charity. The reasons why the Governing Board are proposing this are set out in an article from the President on Page 57. Please read the article carefully and make sure that you cast your vote when the time comes. Thank you.

Are you Treasurer material?

CIEEM is seeking a Treasurer-elect who can take over the important Treasurer role from the current Treasurer, Steve Pullan, in November 2019. The Treasurer sits on the Governing Board and Audit and Risk Sub-committee and remotely oversees authorised expenditure over prescribed financial limits. As well as oversight of financial management activities, the Treasurer plays a full and active role in the work of the Governing Board.

If you are interested in supporting the work of the Institute through its governance and are not fazed by the sight of a budget spreadsheet or balance sheet this could be the role for you. You will work closely with our Office and Finance Manager, John Gordon, who ensures that you have regular financial updates and information, and you are supported by the Audit and Risk Sub-committee.

If you are interested, please contact John via email (johngordon@cieem.net) or on 01962 868626.

Governance Elections

September sees the launch of the 2018 governance elections, with opportunities to get involved in the Governing Board, the Advisory Forum and many of our Member Network Committees. We will be inviting nominations throughout September and early October, with voting taking place online in October and November and at our AGM on 21 November 2018.

Keep an eye on your emails and at www.cieem.net/cieem-committee-vacancies for information on how you can make a difference to your Institute.

STEM Ambassadors – We Need Your Help!

Are you a STEM Ambassador? Are you willing to share your ideas on how CIEEM can support you in your STEM role? If you are a STEM Ambassador and would like to contribute to discussions as part of the development of our Careers Strategy, please get in touch at training@cieem.net to express your interest. Discussions will take place via teleconference during October 2018 with further details to be confirmed.

CIEEM Welsh Conference 2018

Recovering Nature: Approaches to species reintroduction and rewilding

16 October 2018, Cardiff

Over the centuries many parts of the UK have lost keystone species and habitats through the actions of development industrialisation, persecution and hunting. Many of these lost native species, like the beaver, have a key role as ecosystem engineers creating dynamic wetland resources and habitats. Top predators, such as the lynx and wolf, drive ecological processes. Red squirrels, pine martens and sand lizards are enigmatic species which add value to the natural landscape. In Wales there have been concerted efforts to reintroduce a number of these species contributing to the 'rewilding' of the landscape.

The Conference aims to establish what rewilding is, its historical context and its value as a tool for ecological enhancement and protection. It will explore where rewilding stops and where traditional conservation management practices start. It will outline some of the measures, like species reintroduction, which can be employed to 'rewild' the landscape. Expect lively discussion, healthy debate and passionate speakers, pushing the boundaries of what might be possible in the future.

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

CIEEM Autumn Conference 2018

Advances in Ecological Restoration and Habitat Creation

20-21 November 2018, Glasgow

The two-day Autumn conference will bring together policy-makers, land owners and practitioners to review current thinking in ecological restoration and habitat creation. Drawing on examples from a wide range of ecosystems, the conference sessions will examine the different stages of the ecological restoration and habitat creation process from the policy and legislative context through to post-implementation monitoring. Delegates attending the conference will leave with a better understanding of the why, the how and the critical factors in delivering success.

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

CIEEM Summer conference 2018 – Presentations

The presentations from the 2018 Summer Conference – Fit for the future: Developing an ecologically resilient protected sites network – held at the Natural History Museum are available to view at www.cieem.net/previous-conferences.

Staff changes

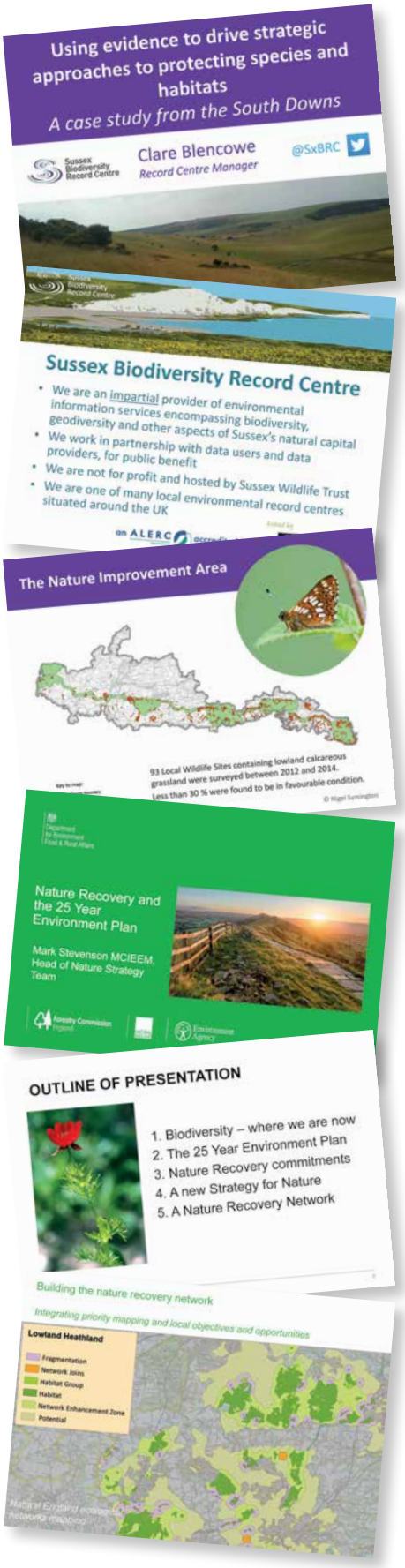
The past few months have seen a number of changes to the staff at CIEEM.

After over three years with CIEEM as the Marketing Officer, Emma Downey left CIEEM in June to explore new opportunities.

Later in June, Amber Connett joined the team as Policy and Communications Intern. This is a 9-month internship that will assist with CIEEM's policy engagement activities.

In July we welcomed Mimi Stanwood as the new Marketing Officer. Mimi has a diverse range of experience that members will hopefully start to see coming through in our marketing and communications in the coming months.

To complement the existing country project officers in Ireland (Elizabeth O'Reilly) and Wales (Diana Clark), Annie Robinson is starting this month as the new Project Officer (Scotland).



A selection of slides from the 2018 CIEEM Summer Conference Presentations

Prime Minister announces new Environment Bill

On 19 July 2018, Prime Minister Theresa May announced plans to publish the first new Environment Bill in over 20 years. Appearing before the Liaison Committee of Select Committee Chairs, the Prime Minister made the announcement in response to calls for a new Clean Air Act. She stated clean air would be part of the wider Environment Bill, which will set out a legal framework for the government's promise to leave the environment in a better state over the next 25 years.

https://www.bbc.co.uk/news/science-environment-44883501

Welsh Government consulting on new land management schemes

The *Brexit and our land: Securing the future of Welsh farming* consultation outlines a new Land Management Programme to replace the Common Agricultural Policy. It consists of two payment schemes: the Economic Resilience Scheme and Public Goods Scheme. The consultation on these plans runs until 20 October 2018, and can be responded to via the link below.

https://beta.gov.wales/support-welsh-farming-after-brexit

Natural Resource Wales to invest £2.6 million to improve environment

In June, Natural Resource Wales announced it will fund projects over the next two years to help Wales' most threatened wildlife, improve habitats and increase access to some Welsh landscapes. The projects will fit under four themes, including: flooding and pollution; improving habitat management, biodiversity and connectivity; improving access to the outdoors and using the natural environment to support the economy and develop skills.

https://naturalresources.wales/about-us/news-and-events/news/nrw-to-invest-26-million-in-innovative-projects-to-improve-the-environment/?lang=en

EU renewable energy policy target set at 32% by 2030

Targets set by the European Parliament, European Commission and European Council aim to increase the proportion of energy which comes from renewable sources to 30-33% by 2030. These targets form part of the Renewable Energy Directive.

http://europa.eu/rapid/press-release_STATEMENT-18-4155_en.htm

Report outlines economic value of Ireland's marine ecosystem services

A report, written by the Socio-Economic Marine Research Unit (SEMRU) values ecosystem services in addition to direct income from Ireland's marine ecosystems. The provisioning marine ecosystem services of fisheries and aquaculture is estimated to be worth €473 million per annum to producers operating in Irish waters.

http://www.nuigalway.ie/semru/documents/marine_ecosystem_service_non_technical_report_final.pdf

£10 million awarded to peatland restoration

The government has awarded £10 million to restore 6,580 hectares of peatland in England. The project will be delivered through four local partnerships and will work towards the government's goal for peatland restoration set out in the 25-Year Environment Plan. Peatlands are essential for carbon storage, improving water quality and reducing flood risk.

https://www.gov.uk/government/news/10m-fund-to-restore-peatland-opens-for-applications

€500 million of funding for climate action under Project Ireland 2040

The Climate Action fund was announced by the Government which aims to support initiatives which contribute to achieving Ireland's climate targets. The funds will be open to submissions from summer 2018, with funding being allocated from 2019.

https://greennews.ie/state-500m-funding-climate-action-project-ireland-2040/

UK Government announce funding to fight plastics pollution in Overseas Territories

On 11 July, the UK Government announced a new package of funding to reduce and monitor plastic pollution on St Helena, and create a data collecting and reporting system in Monserrat for long-term sustainable fisheries. The Darwin Plus Scheme has also reopened for applications to fund conservation and environmental projects in UK Overseas Territories.

https://www.gov.uk/government/news/new-scheme-to-fight-plastics-pollution-gains-government-grant-funding

£3.34 million Scottish Invasive Species Initiative launched by SNH

The initiative, led by Scottish Natural Heritage (SNH) and funded by The National Lottery, was set up to tackle invasive non-native species which are threatening Scotland's habitats and wildlife. It is a volunteer-based programme, particularly engaging with local schools. Species that will be targeted by the initiative include: Himalayan balsam, Giant hogweed, Japanese knotweed and American mink.

https://www.snhpresscentre.com/news/ambitious-project-launches-to-halt-alien-invasion

Government publish independent fisheries policy plan

On 4 July 2018, the UK Government published *Sustainable Fisheries for Future Generations* which outlines how the UK will manage its waters independently from the EU. The White Paper provides a blueprint for how fisheries will be managed post-Brexit, and what powers will be proposed in the upcoming Fisheries Bill. A 10-week consultation on the paper has also been announced, ending on 12 September 2018. The full white paper and consultation questionnaire can be viewed here: https://www.gov.uk/government/consultations/fisheries-white-paper-sustainable-fisheries-for-future-generations

Review of national parks launched

Environment Secretary Michael Gove has launched a new review into the nation's National Parks and Areas of Outstanding Natural Beauty. The announcement committed to conserve and enhance England's most cherished landscapes. An independent panel will look at how current National Parks meet our needs, including whether there is scope for the current network to expand. The report of the review is expected in 2019.

https://www.cieem.net/news/481/review-of-national-parks-launched

Scotland exceeds nature targets

A report by Scottish Natural Heritage has found Scotland has exceeded targets for key areas including: natural capital integration, designating Marine Protected Areas, restoring habitats and increasing awareness.

https://www.snhpresscentre.com/news/embargoed-until-00-01hrs-on-tuesday-22nd-may-scotland-leads-the-way-in-international-nature-targets

Swansea Bay Tidal Lagoon rejected by Westminster

After a long wait following the Hendry Review, the UK Government has rejected the proposal for a Swansea Bay Tidal Lagoon. Business and Energy Secretary Greg Clark MP said the £1.3 billion project did not meet the government's 'value for money' criteria. The decision has been criticised by Welsh politicians across the parties.

https://www.bbc.co.uk/news/uk-wales-south-west-wales-44589083

Natural England chair announces retirement

Andrew Sells has announced he intends to retire in January 2019. He has held the position since January 2014. In a statement he said: *"It has been a huge privilege and pleasure to serve as the chair of Natural England and, thanks to the highly capable and committed staff, the organisation has changed for the better."*

https://www.gov.uk/government/news/natural-englands-chair-announces-retirement

Wildlife licence charges consultation response published

Defra published the response to the consultation on 17 May 2018, which summarises responses and outlines Natural England's proposed course of action.

https://consult.defra.gov.uk/natural-england/wildlife-licence-charges/

Fourth phase of Forest Expansion Scheme opened by DAERA

The scheme aims to encourage landowners to plant their own woodland in order to expand tree cover in Northern Ireland and sustainably manage existing woods and forests. Previous phases of the scheme have provided more than £1 million of grant aid to support over 600 hectares of new woodland.

https://www.daera-ni.gov.uk/news/forest-expansion-scheme-opens

Marine scientists discover rare sponge reef and potential new species in Ireland's seas

Following a three-week expedition 300 miles off the west coast of Ireland, scientists have discovered a rare sponge reef, coral species which have not previously been recorded in Irish waters and a black coral which may be a new species.

http://www.marine.ie/Home/site-area/news-events/press-releases/scientists-discover-rare-%E2%80%98sponge-reef%E2%80%99-and-new-corals-ireland%E2%80%99s

UN global biodiversity mapping platform launched

The United Nations Development Program, the United Nations Environment and the Secretariat of the Convention on Biological Diversity, launched the UN Biodiversity Lab - an interactive mapping platform that allows policymakers and other partners to access global data layers, upload their own datasets, and query multiple datasets to provide information on the Aichi Biodiversity Targets and Sustainable Development Goals for nature.

http://www.greengrowthknowledge.org/learning/un-biodiversity-lab

New Woodlands for Wales Strategy published

The Welsh Government have published *Woodlands for Wales: The Welsh Government's Strategy for Woodlands and Trees*. The 50-year strategy covers all trees and woodlands in Wales. Its vision is that *"Wales will be known for its high-quality woodlands that enhance the landscape, are appropriate to local conditions and have a diverse mixture of species and habitats..."*

https://beta.gov.wales/sites/default/files/publications/2018-06/woodlands-for-wales-strategy_0.pdf

Government publishes revised NPPF

Following consultation earlier in the year, the government has published the revised National Planning Policy Framework (NPPF). This sets out the government's planning policies for England and how these are expected to be applied, and replaces the previous version published in March 2012.

https://www.gov.uk/government/publications/national-planning-policy-framework--2

Reduction in Natural England's Discretionary Advice Service (DAS) and Pre-submission screening service (PSS)

In preparation for the introduction of charges for licensing, Natural England has reduced the DAS and PSS services, meaning many new commissions for advice work will be declined. The reduction will be in place for 6 months. Exceptions include Nationally Significant Infrastructure Projects and contractual arrangements.

Pollution Prevention Guidance and the Role of the Ecological Clerk of Works

Nicola Tyrrell CEnv MCIEEM
WYG Principal Ecologist

Keywords: construction, Environmental Advisor, Ecological Clerk of Works (ECoW), Environmental Clerk of Works (EnvCoW), pollution prevention, training

Many CIEEM members provide advice on pollution prevention matters. This article outlines recent changes in the Pollution Prevention Guidance Series and discusses how pollution prevention can fit within the roles and responsibilities of the Ecological Clerk of Works. With relevant expertise and up-to-date knowledge, ecologists and environmental managers can highlight to clients and contractors the value of considering pollution prevention explicitly as part of their responsibility to protect the environment.

Use of coir matting and hydro-seeding to promote bank stabilisation.

Introduction

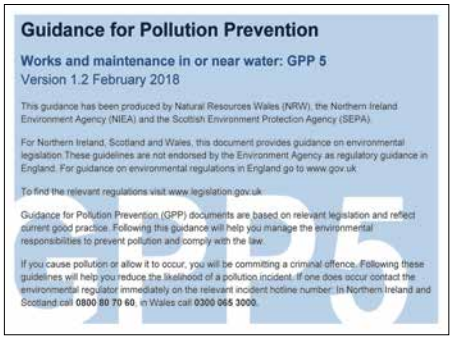
The Pollution Prevention Guidance (PPG) Series is a key driver for decision-making and the provision of advice but it has been subject to regulatory change in recent years. It has been rebranded as the Guidance for Pollution Prevention (GPP) Series and incorporates some key amendments, which differ between devolved regulatory approaches across the UK. These have altered recommended practices and changed how measures are put into effect across the UK.

At the same time, the integration of pollution prevention into the roles and responsibilities of the Ecological Clerk of Works (ECoW) remains variable and is often defined on a project-by-project basis. Pollution prevention is not relevant to every project but, in some cases, ecological professionals on site are tasked with this responsibility. In other situations, this remit is left out altogether unless the ECoW takes the initiative and incorporates a pollution prevention responsibility into their role.

Recent changes and current framework

The Pollution Prevention Guidelines (PPGs) Series was first developed by the Environment Agency for England and Wales (the latter now part of Natural Resources Wales, NRW), the Northern Ireland Environment Agency (NIEA) and the Scottish Environment Protection Agency (SEPA). Therefore, until recently, businesses, individuals, developers and land managers across the UK could consult and follow the same guidance to minimise pollution, comply with environmental legislation and carry out established good practice.

Some PPGs are still in existence; however, many were withdrawn following a review of the PPG Series in 2015. The Guidelines were considered to be out of date and no longer appropriate as government advice in England because they contained a mix of regulatory requirements and good practice advice. At the time, they were not replaced by the Environment Agency, leading to a short period of uncertainty over what guidance could be recommended. Clarity has since been provided on the regulatory body websites and with the



help of NetRegs (www.netregs.org.uk/) (whose website is managed by SEPA and NIEA), working alongside NIEA and NRW to produce new guidance. A replacement guidance series, now branded as the 'Guidance for Pollution Prevention' (GPP), outlines good practice relevant to the whole of the UK, including environmental regulatory guidance directly applicable to Northern Ireland, Scotland and Wales only.

For businesses in England, regulatory guidance is available from GOV.UK including details on how to:

- Prevent pollution if you're a business
- Report an environmental incident
- Get permission to discharge to surface or groundwater
- Manage business and commercial waste
- Comply with oil storage regulations
- Discharge sewage with no mains drainage
- Work on or near water
- Manage water on land.

Box 1. Additional resources and further information

Additional resources available on the NetRegs website (www.netregs.org.uk/) include:

- New e-learning tools covering various topics including pollution prevention.

- Links to recently created video clips hosted on the NetRegs YouTube Channel, including case studies demonstrating good performance in air pollution control, carbon reduction and efficiency; emergency response, environmental management; land; materials, fuels and equipment; transport; waste; water; and the circular economy.
- Seven, easy-to-use, online, self-assessment tools that act as an anonymous business evaluation of environmental performance. A report or checklist is produced that highlights areas of compliance and non-compliance and includes recommendations of where improvements can easily be achieved. The target areas are air, water, waste, materials and equipment, hazardous substances, packaging and beyond compliance.

Other useful resources can be found on the following websites:

Scottish Environment Protection Agency, SEPA. See www.sepa.org.uk/

Northern Ireland Environment Agency, NIEA. See www.daera-ni.gov.uk/northern-ireland-environment-agency

Environment Agency, EA. See www.gov.uk/government/organisations/environment-agency

National Resources Wales, NRW. See naturalresources.wales/?lang=en

In summary, there are now PPGs and GPPs available for use as well as separate regulatory guidance in England. You can still find withdrawn PPGs on The National Archives should you wish to make a comparison. Consult the NetRegs website to keep up-to-date and check the relevant regulatory body or government website for the detail you need to know, along with any new updates – the most recent were issued in January 2018 (Box 1).

Some new GPPs are in the final stages of preparation, for example GPP 22 will provide guidance on spills. Before long, GPP 30 will provide guidance on micro-breweries and micro-distilleries for those engaged with supervising or assessing the design, construction and operation of such facilities. Other guidelines are expected shortly from SEPA and NIEA.

The overall objectives of the updated versions are to highlight changes in regulations, focus on going beyond compliance and promote best practice within business. The provision of GPPs and the review of existing PPGs is welcome. It is one of the most popular programmes within NetRegs at the current time (see Box 1).

Siltbuster mobile silt trap.

Pollution prevention and the role of the Ecological Clerk of Works

First and foremost, it is important to emphasise that it is the client's or contractor's responsibility to take reasonable action to manage pollution prevention and control measures on construction sites. Where pollution prevention is necessary, the Environmental Clerk of Works (EnvCoW) or Environmental Advisor can assist the client or contractor with this responsibility, although training may be needed to perform this role effectively (see Box 2). However, the distinction between the roles and responsibilities of an EnvCoW and ECoW can become blurred and confusion in commissioning specialists can ensue.

The need to commission one or both specialists to assist in pollution prevention control may not be an obvious requirement to clients and contractors. It is easy to understand why. Clients, contractors, regulatory bodies and consultants have varying levels of knowledge and may struggle to make a judgement on what role would best suit a particular project. Indeed, many in the industry are still unfamiliar with the terms Ecological Clerk of Works and Environmental Clerk of Works, perhaps because they are relatively new roles compared to some of the more traditional construction positions like Project Manager, Engineer or Clerk of Works.

The upside of the role of the ECoW not being set in stone is that it *can* be defined on a project-by-project basis, including whether pollution prevention is included or omitted. It depends on the specifics of the construction project, the ecological constraints, the environmental receptors and other factors. However, more and more ecologists are covering a wider environmental remit during preparation for and supervision of construction works. It is increasingly well understood that there are circumstances when it is appropriate for an ECoW to encompass a pollution prevention role within their duties.

An example would be where an Ecological Appraisal recommends avoidance or mitigation strategies to protect a Special Area of Conservation (SAC) designated for Atlantic salmon *Salmo salar* and freshwater pearl mussel *Margaritifera margaritifera*, that refer to specific PPGs and GPPs (in Scotland). The presence of an experienced ECoW on site will help the contractor to formulate and adopt appropriate working methods that will minimise sediment or pollutants entering the freshwater environment downstream – thus minimising impacts on the favourable conservation status of the two target European Protected Species. Direct and early consultation between the ecological specialist and the relevant environment agency and statutory nature conservation body can be key to agreeing the most successful course of action.

Pumping clean water back to watercourse whilst avoiding scour of channel bed.

A less obvious example is where a site is considered to be of low ecological value and doesn't support a protected or notable species in the immediate zone of influence; yet, the site is potentially at risk of freshwater pollution incidents when topsoil is removed to expose the subsoil. In a high rainfall event, sediments could be mobilised into the freshwater environment downstream, which a Preliminary Ecological Appraisal might not have surveyed (it is noted that a desk study would highlight designated sites and historical records but does not provide a full baseline). Ecological risk is often inherent in such projects – even when legally protected receptors are not defined within the zone of influence of proposed works. Again, an experienced ECoW would identify the risk and provide advice ahead of any pollution event.

Box 2. Training

Training to help define roles and raise the standards of ECoWs, Environmental Advisors and EnvCoWs has been part of the industry for some years now. The CIEEM *ECoW* course introduces the basic concepts of pollution prevention as part of the ECoW remit and encourages delegates to share experiences and insights. More specifically, CIEEM's *Environmental Advisor on Construction Sites* training course focusses on the importance of pollution prevention and the options for management/ incident response that can be used to achieve this. Additional training courses and guidance documents are available from CIRIA relating to the control of pollution and environmental good practice (see www.ciria.org).

Define your role and be prepared

Irrespective of what specialist takes on this role, it is important that pollution prevention responsibilities are delegated and managed correctly. An increasing number of ECoWs have the skills and knowledge to provide clients and contractors with appropriate advice, as well as being able to assist in identification and resolution of extremely complex pollution prevention control and incident management scenarios. A high level of competence relies on experience, in-depth guidance and training (see Box 2).

Intercepting rainfall and pumping upslope to adjacent grassland to protect watercourse.

If you plan to integrate pollution prevention into your ECoW role then make sure you have the necessary expertise. Be prepared to advise clients and contractors of the value of protecting the environment as well as the legal and policy framework that underpins their environmental responsibilities. Highlight relevant government guidance, recommend good practice, monitor compliance, advise on suitable preventative actions and assist in incident response and reporting. Make sure you agree your remit with the client or contractor at the outset and formally record your responsibilities. Do this by defining the scope or job description at the start of a project to make roles and responsibilities clear. If the client does not want you to take a pollution role forward, then at least they will have been made aware of the need to acquire this expertise from another specialist.

Remember, it is ultimately the responsibility of the client and principal contractor to safeguard the environment and protect the huge range of ecosystem services that it supports; however, as a professional ecologist and environmental manager, you can play a part in raising awareness and highlighting the need for comprehensive pollution prevention and control.

Extensive deployment of silt fencing and other preventative measures being overtopped by high rainfall event.

Box 3. Sharing experience and insight

Readers are invited to contribute to a discussion on pollution prevention and the ECoW role by sharing experiences and insights on CIEEM's LinkedIn forum. The intention is to highlight the multitude of scenarios faced by an ECoW and the flexibility of the role whilst sharing good practice. Some questions to consider:

- When is it appropriate for an ECoW to encompass pollution prevention within their remit?
- When is an EnvCoW on site sufficient to cover this remit?
- When is it unnecessary for either party to be on site or should they only be on site if an incident occurs?
- What approaches are successful and what could be improved?
- Have you experienced situations where there is confusion among ECoWs, EnvCoWs and Environmental Advisors over where the responsibility for pollution prevention lies?
- How frequently does the responsibility for pollution prevention remain not delegated? Have you been called in to help resolve/mitigate for an incident or to advise on these issues?

All photo credits Nicola Tyrrell.

About the Author

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The Impact of Dogs on the Environment

Keywords: conservation management, dogs, environmental impact, human-wildlife conflict

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Dogs may be 'man's best friend' but they come at a social, environmental and wildlife cost that makes them one of the most challenging management issues that conservation land managers face. This article introduces these problems and offers solutions for how negative impacts can be reduced.

Introduction

Domestic dogs *Canis familiaris* first evolved from ancestral grey wolves *Canis lupus* some 19,000 to 32,000 years ago (Thalmann *et al*. 2013). Originally selectively bred for hunting, herding and guarding, they are now amongst the most common carnivorous species in the world with an estimated population of around 900 million. The most recent estimates place the UK population at approximately 8.7 million (PFMA 2018).

Dogs play an important role in society, providing a host of benefits including companionship, increased physical activity, improved mental health and social capital, benefits for child development, and social status (Okin 2017). In addition, many are working animals, provide assistance for people with disabilities and help to maintain household security. There are also economic and societal benefits in the form of dog-related goods and services. For example the UK dog food industry is valued at approximately £1.3bn per annum (PFMA 2018).

Social and environmental costs of dogs

Despite the many benefits of dog ownership there are many problems associated with such a large population of carnivorous, predatory animals, which are often poorly understood and insufficiently and/or inappropriately trained. For example, it is estimated that around 3% of UK dogs show aggression toward people on a weekly basis (PDSA 2016) resulting in over 7,000 hospital admissions each year (HES 2015). Besides the aversion that many non-dog owners have toward them, dogs also commonly attack other dogs as well as livestock. Indeed, Sheepwatch (www.sheepwatch.co.uk) estimate that 15,000 sheep die each year as a result of off-lead pet dogs.

It takes approximately 0.27 hectares of land to feed a medium-sized dog (Vale and Vale 2009). Whilst most dog food is a by-product of human food production, it can be estimated that producing food for the combined UK dog and cat population generates the equivalent of around 6 million tonnes CO_2-equivalent methane and nitrous oxide emissions per year (Okin 2017).

Based on figures provided by Okin (2017), the UK dog population produces around 1,300 tonnes of faeces each day, along with 6-7 million litres of urine. This poses a considerable health risk. Of particular concern are leptospirosis (Weil's disease), toxocariasis (roundworm) and parvovirus, all of which can be readily transmitted to humans via soil and water. There has been little research to identify the spread of diseases from dog faeces to wildlife but dog tape worms can be readily transmitted to livestock.

Under the Clean Neighbourhoods and Environment Act 2005, the Dog Fouling Act (Scotland) 2003 and the Clean Neighbourhoods and Environment Act

(Northern Ireland) 2011, people in control of a dog are legally required to remove their dog's faeces from any areas open to the public, other than in woodlands, heaths, agricultural areas and certain other places, e.g. besides highways with a speed limit of 50 mph or more (in Scotland only agricultural land is exempt). However, as anyone who undertakes fieldwork on public access land will testify, not all owners pick up their dogs' waste. Nevertheless, the majority now do and whilst this is to be welcomed for reasons of public health (except when, as all too commonly happens, the plastic bag is then discarded or hung on trees), it is creating a different problem: the disposal of 100,000 tonnes of excrement per year to landfill and the subsequent release of more greenhouse gases. Dog waste collection, which may now cost local authorities as much as £100m per year, also requires the production of considerable quantities of single-use plastic in the form of poop-scoop bags.

Impacts on wildlife habitats and species

If the average UK dog is walked 1.5 times per day then, based on access figures given by the NFU (2018), some 3.8 billion dog walks and 2.3 billion off-lead walks are undertaken within the countryside each year. Whilst there are no specific figures available for the number of walks undertaken within SSSIs or other places of high nature conservation value (henceforth 'nature reserves'), most publically accessible sites with easy access to large population centres and readily available parking are extremely well used. For example, Burnham Beeches NNR receives over 550,000 visitors accompanied by 140,000 dogs per year (Wheater and Cook 2016).

The habitats most vulnerable to damage by dogs are ponds, which provide a focal point on many dog walking routes, especially in summer (Figure 1). Heavy dog usage can reduce small, shallow ponds to more-or-less permanently turbid, near plant-free water bodies with a hugely impoverished invertebrate fauna; although uncompetitive marginal plant species benefit from light disturbance and the loss of invertebrate predators may help maintain otherwise depressed newt populations (Denton and Groome 2017). Dogs can also spread invasive plants, including New Zealand pigmyweed *Crassula helmsii*, from one pond to another, including those beyond the site being visited. The impacts of wormer, tick and flea treatments, some of which contain chemicals that are harmful to aquatic invertebrates, including the neonicotinoid imidacloprid, may also contribute to habitat degradation.

In other habitats, the negative impact of dogs typically relates to predation and disturbance to individual species or groups of species, although eutrophication is a problem, notably close to car parks and alongside paths, in some low fertility sites (Taylor *et al*. 2005, Lowen *et al*. 2008). A more significant, albeit indirect, negative impact is that many nature reserves that would best be managed by grazing are not because of a reluctance by site managers and/or graziers to put out livestock potentially prone to dog worrying. Where livestock are used, the choice of species and breed may lead to suboptimal grazing, e.g. by cattle instead of sheep.

The simple presence of dogs can lead to dramatic reductions in bird populations, even in woodlands (Banks and Bryant 2007) and especially across sites with high dog usage (Taylor *et al*. 2005, Lowen *et al*. 2008, Hennings 2016). For ground-nesting species such as nightjar *Caprimulgus europaeus*, this typically results from the loss of eggs to opportunistic predators, especially corvids, following disturbance by dogs to nest-sitting adults. However, direct predation, to which lekking birds may be particularly vulnerable, is also thought to be widespread (Hennings 2016). For summer-breeding shore birds, disturbance can lead to a loss of breeding success, whilst for overwintering species, many of which have travelled thousands of

Figure 1. Dogs in turbid, near plant-free pond at Birkdale Sandhills, north Merseyside.

Figure 2. Dogs disturbing shore birds on Ainsdale Beach, north Merseyside.

miles at the expense of considerable energy, disturbance by dogs increases the likelihood of mortality (Figure 2). Indeed, studies have shown there is a consistent negative effect of recreational use, especially where dogs are involved, on shorebird abundance (e.g. Stigner *et al*. 2016).

Disturbance and/or predation of species other than birds has been much less studied in the UK. However, given that all dogs retain an innate tendency to chase a moving object such as a wild animal, almost all ground-dwelling vertebrates are at risk from the predatory instincts of dogs. Whilst this does not appear to have a significant impact on populations of common species, patterns of behaviour can be significantly altered and fecundity affected (Taylor *et al*. 2005, Hennings 2016). Rarer species with much smaller populations are much more vulnerable to repeated dog disturbance, which is known to result in the displacement of many species in protected sites across the world (Hennings 2016).

Solutions

Regardless of what may be seen as the most straightforward solution – don't own a dog – people are not going to give up what the vast majority of owners consider to be valued members of the family. This said, ownership could be reduced if potential new owners were made fully aware of the extent of the long-term commitment that owning a dog entails and the cost: between £21,000 and £33,000 (PDSA 2016). Whilst many animal charities work hard to highlight the responsibilities of dog ownership, a general lack of awareness remains a problem.

Dogs and the law

National legislation relating to dogs in the countryside is largely aimed at reducing anti-social impacts. For example, the Clean Neighbourhoods and Environment Act 2005 and the Clean Neighbourhoods and Environment Act (Northern Ireland) 2011 introduced Dog Control Orders (DCOs) allowing local authorities (outside Scotland) to identify areas within which dog walkers must remove their dogs' faeces regardless of land use, place them on leads, take only a limited number of dogs with them or not take dogs altogether. Such measures have largely been replaced in England and Wales by the Anti-social Behaviour, Crime and Policing Act 2014, which allows local authorities to establish Public Space Protection Orders (PSPOs). As a result, there are now numerous DCOs and PSPOs across the country. One of the most extensive is the PSPO issued in late 2017 by Guildford Borough Council in Surrey, which requires those in charge of a dog to remove faeces from ALL publically accessible land across the borough unless they are registered blind or have landowner permission to leave it in-situ.

Building on the Dogs Act 1871, to which Section 2 requiring dogs to be '*under proper control*' still applies, the Dangerous Dogs Act 1991 made it an offence for anyone to be in charge of a dog that is *'dangerously out of control in a public place'*. This was defined as *'any occasion on which there are grounds for reasonable apprehension that it will injure any person, whether or not it actually does so'*. Under the Anti-social Behaviour, Crime and Policing Act 2014 *'a public place'* was amended to *'any place in England or Wales (whether or not a public place)'* Similar changes were made under the Control of Dogs (Scotland) Act 2010.

The Dogs (Protection of Livestock) Act 1953 makes it an offence to not only allow a dog to attack but also to chase livestock *'in such a way as may reasonably be expected to cause injury or suffering'* on *'any agricultural land'*. Given that agricultural land covers *'land used as... grazing land...'*, the Act applies wherever conservation grazers put out livestock.

On *'access land'* designated under the Countryside and Rights of Way Act 2000 (applicable to England and Wales only), dogs must be on a lead no more than 2 m in length between 1st March and 31st July and at all times near livestock unless existing rights exist or landowner permission has been given to the contrary. Owners of land managed as grouse moor can exclude people with dogs for up to five years at a time. Owners or farm tenants can exclude people with dogs in fields (up to 15 ha) used for lambing for a single period of up to six weeks in each calendar year. In addition, access to 'access land' does not *'entitle a person to be on any land if...he...intentionally or recklessly takes, kills, injures or disturbs any animal, bird or fish'*. Allowing a dog to run out-of-control could be argued to be reckless.

Whilst such laws are undoubtedly influencing dog walkers' behaviour, especially in urban areas, they are by no means entirely effective. This can partly be attributed to lack of enforcement following public sector spending cuts and, where laws are enforced, by displacement of dog walkers to unprotected/unenforced sites. Moreover, none tackles the carbon footprint of dog ownership. As yet, the only ways to reduce this are to not

over-feed pets, avoid food containing excess animal products, walk to and from exercise areas, and to use biodegradable or compostable poop-scoop bags which can be buried at home or composted.

Reducing the impacts of dogs on wildlife

There is little current legislation available to prevent disturbance to wildlife in publically accessible sites beyond ensuring dogs are not dangerously out of control or, in the case of *'access land'*, are kept on a lead during March-July. This means that nature reserve managers need to consider practical methods to protect vulnerable habitats and species. These include siting car parks as far away as possible from the most important wildlife areas, diverting paths, encouraging gorse screens beside heathland paths and installing fences around or across ponds. However, such measures may become ineffective if, for example, irresponsible dog walkers break down fences or lift their pets over them. What is needed, therefore, is a more integrated approach that combines physical protection with legal enforcement, strategic planning, positive engagement (based on a better understanding of dog walkers' psychology) and measures to promote responsible behaviour (Edwards and Knight 2006, Sport Industry Research Centre 2008, Jenkinson *et al*. 2010, Lowe *et al*. 2014, Scottish Natural Heritage 2015).

Dog zonation

Dog walking zones are one of the best methods for managing dogs on nature reserves where recreational access is a key management aim, and where it may be desirable to prevent displacement to more vulnerable sites. Effectiveness depends on proper planning and implementation, especially at the strategic level and in liaison with local dog walkers. Although there is much variation, these usually comprise two or three clearly defined zones (best identified using a traffic light system) where dogs: are allowed to roam off-lead (green), must be kept on a lead (amber or red where no exclusion zone exists) or are excluded altogether (red). Such zones can be retained year-round, as for example at Jeskyns Community Woodland, Kent, or applied seasonally to reflect variations in site sensitivities such as when livestock or ground-nesting birds are present, e.g. at Greenham Common, Berkshire (Figure 3).

Figure 3. An entrance board at Greenham Common identifying both the areas where dogs are welcome as well as where they are excluded.

Green zones will, by design, become the most well-used areas since off-lead dog walking is the most important prerequisite for dog walkers (Sport Industry Research Centre 2008). It is therefore essential that they be of sufficient size and interest to those using them, and provisioned with carefully sited dog waste bins. A dedicated dog swimming area is highly desirable, especially where wildlife-rich ponds are within red zones. An all-weather pedestrian path may also be needed. Additional features to encourage dog walkers to use green zones include dedicated dog walking and/or activity trails (such as that at Coatham Community Woodland, Teesside), dog washes (e.g. Worcester Woods Country Park) and enclosed dog training areas (River Hamble Country Park, Hampshire).

Dog walker engagement

Dog walkers are likely to be the most populous group of any accessing a nature reserve, particularly in the lowlands. Understanding their motivations, beliefs and patterns of behaviour, which vary from site to site, and initiating positive engagement is therefore key to encouraging more responsible behaviour. This can be achieved, whether a zonation scheme is used or not, at both the individual and group level, by for example:

- using positive, easily understood signage which places equal emphasis on welcoming dogs to areas where their impact will be negligible to discouraging them in areas of greatest harm (Figure 3)
- providing leaflets to encourage responsible behaviour (see for example the English and Welsh 'dog walking code' https://naturalresources.wales/media/4862/the-dog-walking-code.pdf and the 'Scottish Outdoor Access Code' http://www.snh.org.uk/pdfs/publications/access/full%20code.pdf)
- undertaking meet-and-greet and dog-friendly events, such as those run by Dorset Dogs www.dorsetdogs.org.uk
- engaging with local, including professional, dog walkers during consultations (e.g. when considering creating dog walking zones or developing new Suitable Alternative Natural Greenspaces, SANGs)

- providing information on websites (e.g. the National Trust offer *'dog-friendly places for you to explore'*, see www.nationaltrust.org.uk/for-dog-walkers, and the Forestry Commission suggest *'best places for dog-walking'*, see www.forestry.gov.uk/dogs) and social media (e.g. Brighton and Hove Council provide information on Twitter on when sites are being grazed by sheep).

Conclusions

The long-term aim of positive engagement is to improve dog walkers' behaviour and thereby reduce negative impacts on the environment and on wildlife in particular. Legislative controls such as Public Space Protection Orders can be used to tackle the problem of environmental pollution from dog faeces but greater enforcement is needed, as are continued efforts to raise awareness. Given that most dog walkers' attitudes are framed by other dog walkers, time will be needed for positive cultures to replace *laissez faire* ones. Whilst numerous, often extremely good, initiatives have been launched in recent years, a more consistent national approach that includes measures to protect wildlife, including enforcement, would help considerably.

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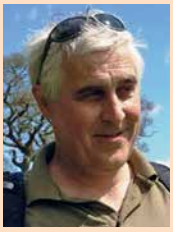

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Intensive Poultry Units: Their Potential Impact on Lichens and Lower Plants in Mid Wales

Julian Jones CEnv MCIEEM

Keywords: ammonia, cumulative impact, nitrogen-sensitive species

This article highlights the proliferation of intensive poultry units in Mid Wales and the associated pollution risks to lower plants. Although carefully regulated, and with environmental impacts largely assessed by air pollution modelling, ecological assessments also need to be rigorous especially when considering impacts on lower plants. This is hampered by a lack of specialist survey skills, leaving rare and vulnerable species at risk of being overlooked. The slow growth of many lichens and bryophtyes means that negative impacts of pollution are not visible for some time. Current regulatory processes and mitigation measures are discussed together with possible strategic approaches to protect sensitive species.

Introduction

You may not have heard of Radnorshire – one of the three vice-counties that constitute Powys in Mid Wales – but if you purchase poultry products in British supermarkets then it's likely you've eaten eggs or chicken from Radnorshire. What Powys lacks in people – 132,976 according to the 2011 census (Powys County Council 2013) – it makes up for with an estimated 7 million hens, producing a substantial amount of dust, phosphate-rich chicken manure and ammonia. Within living memory, a roast chicken was a special treat, but now UK consumption is such that the multi-national company Cargill operates a chicken factory in Hereford

which employs 2,000 people and processes up to 1.6 million chickens per week (Woods 2017).

There are hundreds of intensive poultry units operating in Powys and neighbouring Welsh and English counties (Figure 1). They include housed birds with over 40,000 hens (and subject to Environmental Permitting Regulations) as well as free-range egg laying units and free-range organic activities with between 12,000 and 16,000 hens. Clearly, without stringent controls and careful waste management, the potential for pollution is serious, both from existing units and from the proliferation of applications for new intensive poultry units.

Lower plants such as lichens are especially vulnerable to air pollution and are well-known as nitrogen pollution indicator species (Box 1). However, impacts may not be immediately obvious because of their slow growth, and there is concern among ecologists that nitrogen pollution from a high density of intensive poultry units may have long-term detrimental effects. This problem is exacerbated when there is a shortage of specialist ecologists with the necessary identification skills to survey and monitor lower plants.

This article is written from an ecological perspective rather than a regulatory or planning standpoint but acknowledges that the regulatory framework is designed to avoid negative impacts on biodiversity and does take account of lower plants as being sensitive to aerial pollutants. The question is whether more needs to be done to protect vulnerable lower plants from pollution effects and, if so, what is achievable?

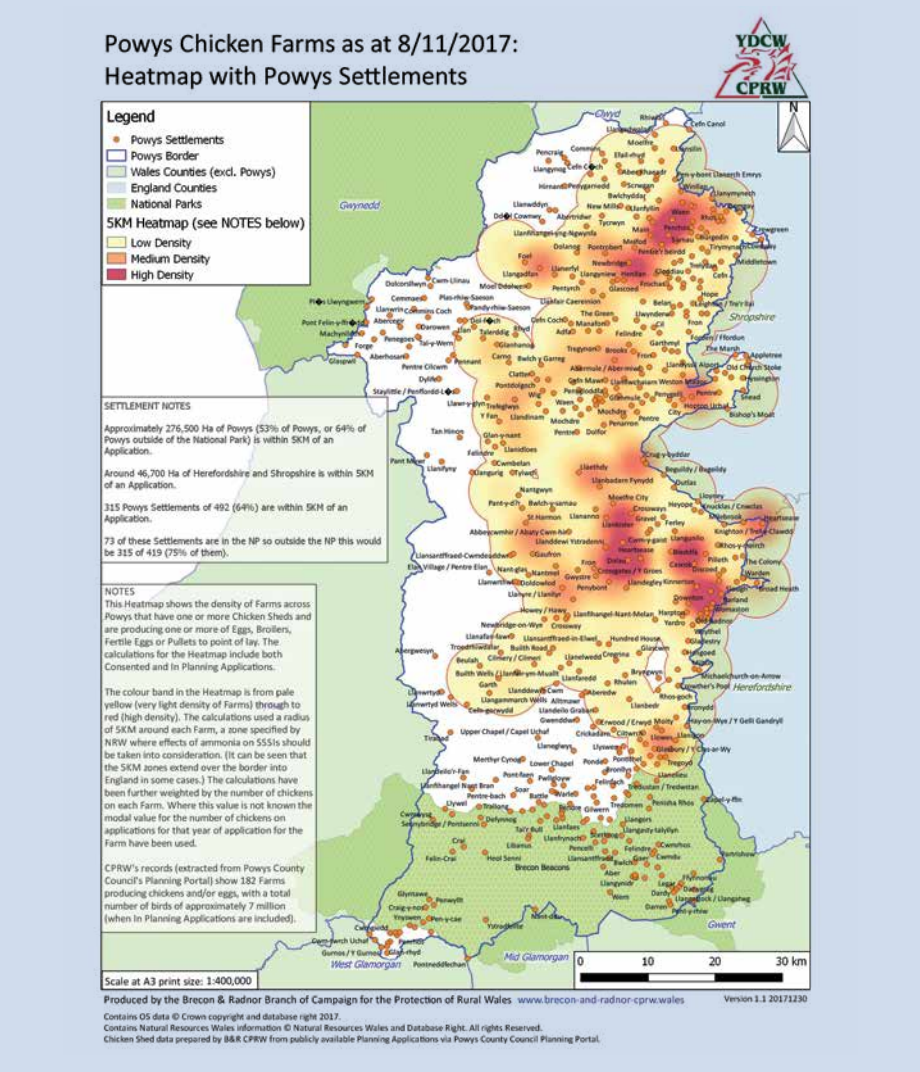

Figure 1. Density of Poultry units operating in Powys (see http://www.brecon-and-radnor-cprw.wales). Source CPRW.

Box 1. Ecological surveys – the importance of including pollution indicators

Lichens are invaluable indicators of air pollution yet in many ecological surveys, including Environmental Impact Assessments carried out in Powys over the past ten years, very little importance has been attached to lichens and bryophytes outside of the standard regulatory processes. This is largely because lower plant ecology is a specialist area and few professional ecologists have the necessary expertise – but that is not a good reason to ignore these key indicator species.

Worse still are those reports prepared by ecologists lacking specialist non-vascular plant knowledge that state that surveys for lichen and bryophytes have revealed only common species, with no species present that would be at risk through increased levels of ammonia. Quite correctly, there is an emphasis upon legally protected species and sites, but this should not mean that key ecological features such as highly threatened, nitrogen-sensitive lichen species are ignored. Clearly there is a need for a greater awareness of the importance of lower plants, especially as pollution indicators, and for specialist training courses that address the skills gap.

Regulatory control

Proposed intensive poultry developments (>40,000 livestock places) must apply for a permit from the appropriate regulatory body, in this case Natural Resources Wales (NRW). Permits are only granted after an air pollution assessment confirms that impacts on biodiversity do not exceed 'impact' thresholds. Pollution impacts are assessed using screening techniques, and where necessary, atmospheric dispersion modelling by which zones of influence, and hence impact of poultry units, are accurately identified by non-ecological studies. The permit determination process takes the sensitivity of lower plants into account as part of the screening approach and ecological surveys are usually only requested as a last resort.

In common with other regulatory bodies, NRW carries out an ammonia assessment as part of the screening process to determine the level of ammonia emissions from an intensive livestock unit (known as a process contribution). If that contribution is less than the set 'impact' threshold value then it is deemed to have an acceptable impact and can be permitted without any further assessment (ecological, modelling or otherwise). The screening process relies on an internet-based, publically accessible tool called SCAIL Agriculture (http://www.scail.ceh.ac.uk/cgi-bin/agriculture/input.pl). If the process contribution is greater than a given threshold then NRW will ask an applicant to (i) carry out detailed air quality modelling, and only then, (ii) if the modelled data is shown to be above the 'impact' threshold, will NRW look further into the spatial extent of impacts and the sensitivity of a species to ammonia.

'Thresholds' are percentage amounts of the level of atmospheric ammonia above which there will be damage to a habitat or species – known as the critical level. There are two critical levels – one for lower plants (lichens, bryophytes, mosses, etc.) (1µg/m^3) and one for everything else (31µg/m^3). The lower plant critical level is the lower of the two and so, by definition, the critical level takes account of the fact that lichens are more sensitive than other species possibly being impacted.

In summary, before an applicant needs to think about identifying the exact species of lichen present in areas that could be impacted by a development, the regulatory body will carry out an assessment process and run a series of screening processes to decide whether a permit can be granted. This process accounts for the sensitivity of lower plants. Ecological survey is invariably a last resort, partly because NRW can usually identify species from designated site citations rather than needing comprehensive ecological surveys. Furthermore, asking an applicant to complete an ecological survey is costly and time consuming, and is therefore something regulatory bodies will avoid if possible.

Further detail on this process can be found in NRW's internal guidance *Guidance Note 20 (GN020) - Assessing the impact of ammonia and nitrogen on designated sites from new and expanding intensive livestock units: Technical guidance for determining environmental permit applications or responding to planning application consultations.*

Given this level of scrutiny by the regulatory body as part of planning controls, can we be confident that pollution impacts on lower plants are assessed and considered alongside other impacts? As more poultry units are proposed, should more be done to protect the most vulnerable lichen populations?

Polluting impacts of ammonia

Ammonia is a common by-product of poultry waste and is formed by the microbial breakdown of uric acid in faeces and urine. The uric acid derives from unused nitrogen in feedstuffs passing through the animal, and commonly operators will tailor feeds to reduce its loading to avoid excess nitrogen excretion. Ammonia gas is characterised by an unpleasant odour and has serious impacts on air and water quality as well as animal, plant and human health.

The Centre for Ecology and Hydrology (CEH) believe over 89% of 'sensitive wildlife habitat' in Wales is subject to excess nitrogen and it has been suggested that two-thirds of vascular plant species in the UK are at risk from increased nitrogen levels (Plantlife 2018). Research has shown that the nature conservation interest of protected sites may be damaged up to 2.8 km away from an intensive poultry unit. For example, nutrient-loving species like cocksfoot *Dactylis glomerata* profit from an increased uptake of nitrogen and out-compete less generalist species which are often the target of conservation efforts (Jones *et al*. 2013).

Lichens

Levels of ammonia from intensive poultry units can be directly toxic to bryophytes (mosses and liverworts) and lichens such as *Cladonia* species, as well as to vascular plants such as common heather *Calluna vulgaris*. A study in the Netherlands confirmed that nitrogen-sensitive lichen species began to increase, and nitrogen-tolerant lichen species decline, when levels of ammonia decreased (Sparrius 2007).

In Powys, there are a number of nationally and internationally important sites for lichen, fungi and bryophytes of which a significant number are sensitive to elevated levels of ammonia. For example, Radnorshire Wildlife Trust's Gilfach Farm Nature Reserve supports 420 species of lichen, a number of which are nationally rare or scarce (Robertson and Jones 2003). It is of possible concern that intensive poultry units have been given planning / permit approvals within a kilometre or so of Gilfach, arguably one of the most important lichen sites in Wales.

In Radnorshire, there has been particular concern for one of the rarest and more threatened members of Wales' lichen flora, the great ciliate lichen *Anaptychia ciliaris* (Figure 2). In recognition of its vulnerability, Welsh Government have included it within a list of species in need of special conservation measures – so called 'Section 7 Species', derived from the Environment (Wales) Act, 2016. The species is thought to be confined to just one location throughout the whole of Wales and the West Midlands – on a field maple *Acer campestre* in the village of Old Radnor. Yet, even though this lichen species is of national importance, it is increasingly

Figure 2. *Anaptychia ciliaris*

Figure 3. An intensive poultry unit – increasingly commonplace in the Radnorshire countryside. Photo credit Julian Jones.

encircled by existing, consented intensive poultry units within a 5-km radius (Figure 3).

Planning controls

Given the rapid proliferation of potentially polluting intensive poultry units in Wales, it is crucial that the planning and permitting processes are effective, and that appropriate mitigation is enforced. Notwithstanding the screening process carried out by NRW, assessing the impact of a new intensive poultry unit upon wildlife sites and species is complex, especially as cumulative impacts may not be seen for some time where slow-growing lower plants such as lichens and bryophytes are present.

Radnorshire Wildlife Trust and others have called upon Powys County Council and NRW to support a moratorium on the approval of any further developments until a full survey of rare and vulnerable lower plants has been carried out. NRW's own report looking at the cumulative and in-combination effects of intensive poultry units in Powys, concluded that:

> *This study clearly demonstrates if clusters of farm units are grouped close to statutory sites their impacts could cause significant damage. Therefore, careful consideration through the planning process needs to be given to the location of further livestock unit developments in any area* (NRW 2015).

However, we acknowledge that NRW's hands are bound by the limitations of the legislation. In practice, a moratorium or 'no permitted development zone' is likely to be an absolute last resort, but perhaps there is a compromise to be found?

Some progress has been made in recognition of the potential impact posed by ammonia, including lowering thresholds of the ammonia critical level to afford greater protection to lichens and bryophytes at permit and planning pre-application stages. In addition, NRW have been working to enhance planning guidance and we welcome the work by Natural England to provide well-evidenced information in support of these improvements (Natural England 2016). Clearly, any future changes should be based on similar, high-quality research but we need to be confident that enhanced protection for lower plants will not be too little, too late.

Mitigation

Mitigation measures are possible through a variety of measures, including (but not limited to) the planting of new woodland and tree belts, which can reduce the impact of ammonia released from intensive free range poultry units by blocking aerial dispersion pathways to sensitive sites and species (Woodland Trust 2014). However, whilst this may be an effective measure in principle, more research is needed to determine how much new woodland is needed to reduce harmful impacts of ammonia on existing wildlife sites and species, and how long it will take for newly planted woodland to become effective at lowering levels of air pollution.

We hope this article will raise awareness of the situation and the particular vulnerability of lichens and other lower plants to development, and to the invisible threat of air pollution. Other innovative mitigation measures are needed urgently and we would welcome feedback and suggestions from readers with relevant experience. Please contact the author at julian@rwtwales.org.

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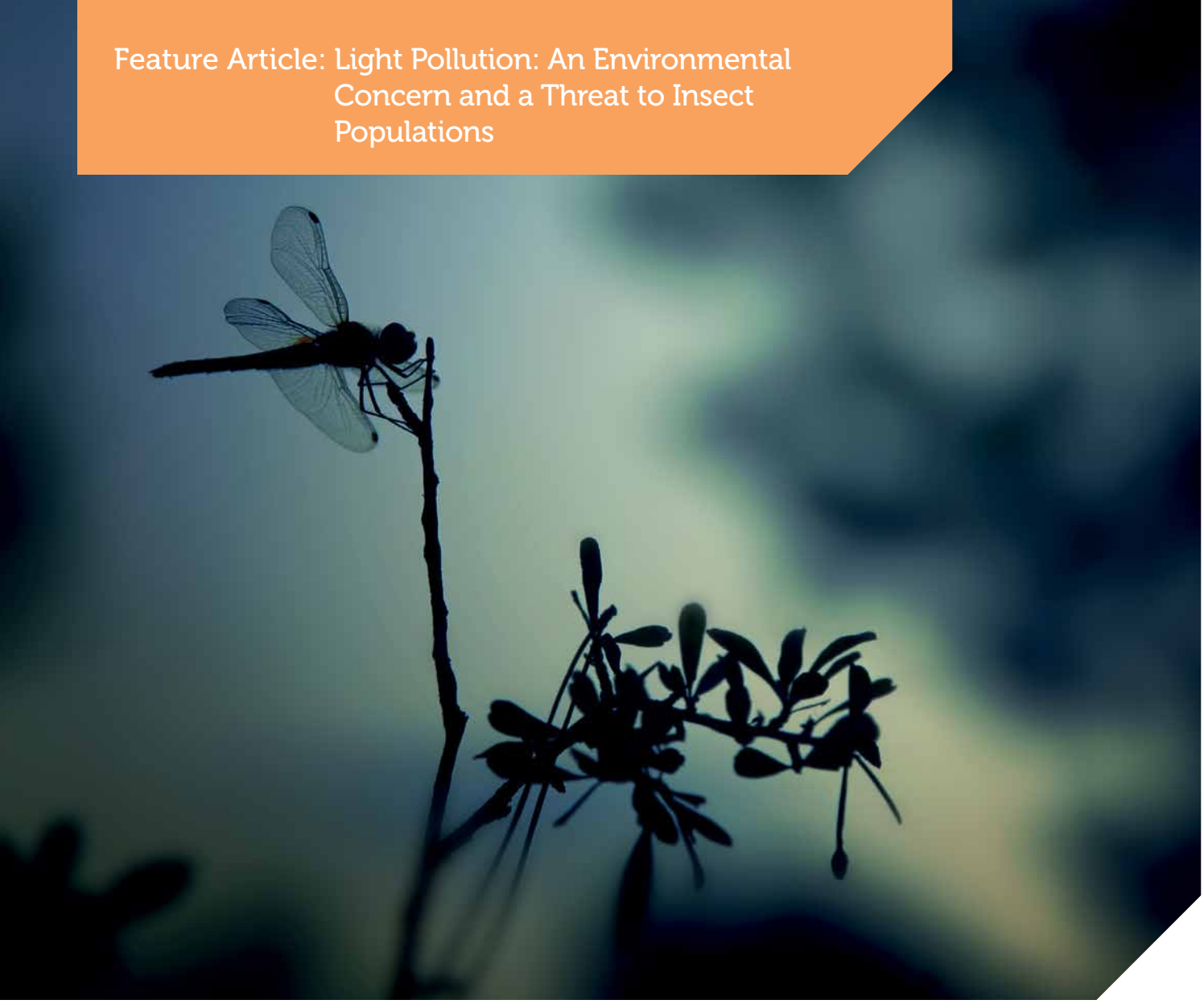

Light Pollution: An Environmental Concern and a Threat to Insect Populations

Keywords: agroecosystems, artificial light at night, ALAN, artificial lighting, drivers of global change, insect declines

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The use of artificial lighting has increased rapidly in recent decades, transforming nocturnal environments worldwide. The associated light pollution raises concerns about potentially adverse effects on organisms and processes in nocturnally-lit ecosystems. Light pollution has numerous negative impacts on insects, and in light-polluted areas it could be contributing to their population declines. This is particularly important in agroecosystems, where insects provide important ecosystem services and are already under significant environmental pressure. Understanding the contribution of light pollution to insect declines is necessary for mitigation and recovery of insect fauna and the services they provide in our landscapes.

Introduction to light pollution: sources, effects and prevalence in the environment

When thinking about pollution, we commonly focus on a wide array of chemicals, such as pesticides, fertilisers, metals, or gases emitted by industrial processes. However, pollution comes not only in the form of chemicals and substances, but also energy. When introduced into the environment so that it has unintended and adverse effects, energy such as heat, noise and light can also act as a pollutant.

Light pollution results from the inappropriate or excessive use of artificial lighting, such as street lights, residential, security and decorative lights, billboards, lights from vehicles, off-shore platforms, fishing boats, etc. While the use of artificial lighting allows us to extend our activities into the night and undoubtedly provides benefits to humankind, it also has unintended and adverse effects. These include ecological effects on organisms and processes in illuminated ecosystems, effects on human health, and obstruction of the view of the night sky and astronomical observations. As mounting evidence shows that artificial light at night affects microorganisms, plants, animals and humans, light pollution is increasingly recognised as a threat to biodiversity.

Light pollution is a relatively novel phenomenon – large-scale use of artificial lighting began only when electricity became widely accessible and human settlements started to spread. Over the last few decades, the use of artificial lighting has been increasing annually by 3-6% worldwide (0-20% depending on the region) (Hölker *et al*. 2010a), and the increasing trend persists to this day (Kyba *et al*. 2017). Light pollution includes direct light that illuminates a relatively small area around the light source, as well as indirect light that scatters in the atmosphere to form skyglow which spreads over much larger areas, up to hundreds of kilometres from its source. Today, 23% of the world's non-polar surfaces experience increased nocturnal light levels due to light pollution (Falchi *et al*. 2016), with a minimum increase of 8% above the natural levels (Figure 1). Artificial light at night has thus been recognised as one of the fastest-spreading and most pervasive anthropogenic environmental alterations; it contributes to global change and raises concerns about potentially adverse effects on biodiversity and functioning of illuminated ecosystems.

Light pollution as a disturbance to natural light cycles

Light pollution increases nocturnal sky brightness above natural levels and disrupts natural light/dark cycles. Light/dark cycles driven by the Earth's rotation are one of most stable and predictable environmental fluctuations, and almost all life on Earth evolved to use these patterns as a source of information to anticipate environmental changes. Through complex molecular mechanisms of circadian,

Figure 1. The nighttime view of Earth from space (Source: NASA Earth Observatory 2012, NOAA NGDC, Suomi-NPP).

Figure 2. Experimental field to study effects of artificial light at night on aquatic and riparian areas. Westhavelland Nature and Dark Sky Reserve, Brandenrurg, Germany. © Maja Grubisic/seeing-nature.de.

circannual and circalunar regulation, light entrains endogenous biological clocks and synchronises metabolism, growth and behaviour with the external environment. By disrupting natural light/dark cycles, light pollution can mask natural cues and interfere with biological clocks to influence physiology, timing of life history events and behavioural activities.

Furthermore, a vast number of organisms evolved to be active at night. More than 30% of vertebrates and 60% of invertebrates are nocturnal, including half of over 900 thousand currently described species of insects (Hölker *et al*. 2010b). Nocturnal and crepuscular (active at dusk and dawn) insects are adapted to dark or dim-light night conditions; they use nocturnal light for orientation, navigation, predator avoidance and location of food and mates. Some species, such as dung beetles, are extremely sensitive to light and able to orientate using dim starlight. Some species increase their activities during moonlit nights (e.g. visual predators), while others are less active, relying on dark nights to escape predators. By increasing nocturnal light above natural levels, artificial light at night can differentially disrupt the natural behaviour and activities of many insect species, changing interactions within and between species.

Negative impacts of light pollution on insects

Empirical studies have demonstrated numerous lethal and sub-lethal effects of artificial light at night (ALAN) on insects (Figure 2). The best-known phenomenon is attraction to lamplight, which can cause high insect mortality and create local population sinks (Eisenbeis 2006). Even skyglow increases background illumination and could disorientate insects at greater distances from lamps, increasing the chances that they will fly into the lamp attraction zone and end up being trapped at the lamps. Attractiveness of artificial light to insects largely depends on its spectral composition – lamps rich in UV and short wavelengths (e.g. mercury-vapor, fluorescent lamps and cool-white light-emitting diodes) are highly attractive, affecting the largest numbers and diversity of insects. Sub-lethal effects of ALAN include disruption of feeding, communication and reproductive behaviour (e.g. fecundity, oviposition, courtship and mating success), effects which have been observed in moths and fireflies (e.g. Firebaugh and Haynes 2016, van Geffen *et al*. 2015, van Langevelde *et al*. 2017). By decreasing fitness, reproduction and population growth and increasing mortality, ALAN may have serious negative effects on insect populations in light-polluted areas.

Most effects of ALAN have been reported at the organism level, but there is increasing evidence of effects at higher levels of biological organisation such as communities and ecosystems. Streetlamps have been reported to alter species composition of flying and ground-dwelling insects, often with seasonally-specific changes in species abundance and diversity (e.g. Meyer and Sullivan 2013, Manfrin *et al* 2017). Population changes induced by ALAN can have cascading effects through food webs (Bennie *et al*. 2015) and alter species interactions, e.g. decreases in aphid

numbers under artificial light at night can cause a decrease in specialist parasitoid wasps (Sanders *et al*. 2015). How these impacts interplay to influence ecosystem functioning and balance is still unclear.

Declines in insect populations have been reported from several countries including the UK, Germany, and The Netherlands (see Leather 2018), with agricultural intensification, use of pesticides, habitat fragmentation and climate change commonly considered as drivers of these negative trends. While ALAN is widespread and has many negative impacts on insects, it is rarely considered to be a contributor to these declines. ALAN often co-occurs with other anthropogenic stressors in urban and sub-urban areas; its effects are therefore hard to disentangle. However, a link between ALAN and moth declines has been established recently in a Dutch study which found that moths that are attracted to lights have stronger population declines than species that are diurnal or not attracted to lights (van Langevelde *et al*. 2018). While direct experimental evidence linking insect declines and light pollution is still missing, and there is a need for long-term field studies, a growing body of evidence suggests that light pollution can impose substantial pressure on insect populations. In agricultural areas, where insects are already under multiple pressures, light pollution can thus increase overall environmental pressure, contributing to insect declines.

Insects and light pollution in agricultural ecosystems

Insects provide important ecosystem services to agriculture, such as natural pest control, pollination, nutrient cycling and maintenance of soil structure. Negative effects of ALAN on insects can also impact the services they provide: for example, behavioural changes induced by ALAN can disrupt nocturnal pollination by moths, by attracting individuals to fly higher above the field margins (Macgregor *et al*. 2017). Moths are not essential for pollination of crops, but together with bees and non-bee pollinators (e.g. wasps, butterflies, flies and beetles) they contribute to pollination of various plants in field margins, meadows, hedgerows and road verges, supporting and maintaining biodiversity in agricultural landscapes. These semi-natural habitats are important refuges and dispersal corridors for numerous arthropods that provide functional connectivity within landscapes, necessary for maintenance of the biodiversity that supports ecosystem services and agricultural production.

Rows of street lights can create barriers to insect movements across landscapes, limiting their dispersal and fragmenting the nocturnal habitat. In agricultural areas, where insect habitats are fragmented by cropping fields, ALAN may disrupt nocturnal recolonisation of isolated habitat patches, increasing habitat fragmentation and decreasing the resilience of insect populations. Simultaneously, ALAN may alter the composition of insect communities, including prey-predator and host-parasitoid interactions, as well as directly affecting the physiology and phenology of crops. How these effects interplay to affect crop

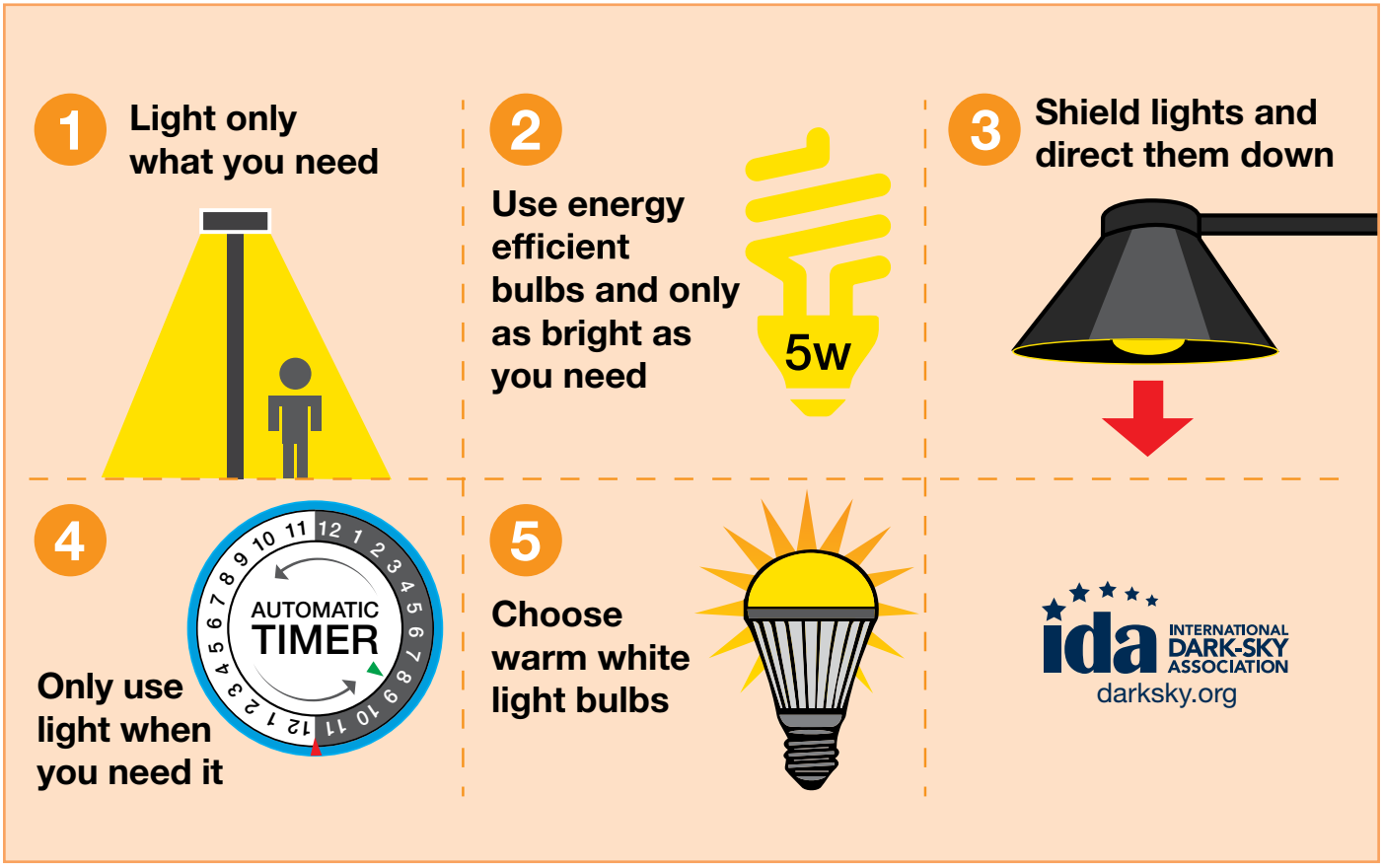

Figure 3. Recommendations for minimising light from artificial lighting. International Dark-Sky Association (IDA, darksky.org)

production and biodiversity in agricultural landscapes is still unknown. Agricultural management may need to develop nocturnal strategies to mitigate the adverse effects of artificial lighting on insects and to help maintain the ecosystem services they provide (Grubisic *et al*. 2018).

Practical solutions and suggestions for mitigation

Artificial lighting consumes around 20% of global electricity production (see Hölker *et al*. 2010a) and in many regions of the world traditional streetlights are being replaced with energy-efficient light-emitting diode (LED) lamps in order to reduce costs and greenhouse gas production from artificial illumination. LEDs typically emit broad-spectrum white light with significant amounts of short (blue) wavelengths. Blue light has been shown to have strong ecological and environmental impacts, including the disruption of circadian regulation in many organisms, and attraction of insects. However, the technological flexibility of LEDs allows for tuning of its spectral composition to avoid short wavelengths, which has the potential to reduce the negative ecological impacts of street illumination.

Street lights are the single biggest source of light pollution, but often up to 35% of emitted light is wasted due to poor lamp design. Improvements to lamp design to use shielding and full cut-off lamps would minimise light trespass, glare and skyglow, directing light to where it is needed. Use of dimmers, timers and motion sensors would further save energy costs, reduce nocturnal illumination levels and minimise unnecessary nocturnal illumination in rural and suburban areas. In summary, responsible use of artificial lighting that minimises light pollution includes taking steps to ensure that artificial light is only used when it is needed, where it is needed, in the amount that is needed, and while applying shielding and minimising blue light emissions (Figure 3).

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Are Insects in Decline? The Jury is Still Out

Keywords: agroecosystems, vehicle collision, evidence, insect declines, long-term data sets, shifting baselines

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Major declines in insect populations have been widely reported in the media amid fears that this heralds the oft-predicted breakdown in ecological processes. This article assesses the evidence and suggests ways to reduce the impacts of some of the factors at play.

Introduction

This summer I had an unexpectedly busy couple of weeks talking about declines in insect populations. Back in November 2017 I wrote a blog about the sudden media interest in 'Insect Armageddon'. The spark that ignited the media flare-up was a German research paper reporting on a 75% decline in the biomass of flying insects over a 27-year time period (Hallmann *et al*. 2017). I followed my blog post with a more formal Editorial in *Annals of Applied Biology* at the beginning of the year (Leather 2018). More recently, I've taken part in a televised roundtable discussion and been quoted in the press talking about the apparent decline in insect numbers since my student days. A similar story, featuring another veteran entomologist, appeared in the New Zealand press, as befits something that has been billed as being global.

I have been musing about extinctions and shifting baselines for a while now. My generation are liable to wax lyrical about the clouds of butterflies that surrounded us as we played outside in glorious sunshine. We can also fondly reminisce about the hordes of moths that used to commit suicide in the lamp fittings or beat fruitlessly against the sitting room windows at night. The emptying of the lamp bowl was a weekly ceremony in our house. We also remember, less fondly, having to earn our pocket money by cleaning the family car, laboriously scraping the smeared bodies of small flies from windscreens, headlamps and radiator grilles and, in particular, the hard-to-wash-away red smears left by the eyes of countless Bibionid (St Mark's) flies, as they crashed into the front windscreens (Figure 1). Are these memories real or are we looking back at the past through those rose-tinted glasses that only show the sunny days?

Figure 1. Typical Bibionid – note the red eyes; designed specially to make a mess on your car windscreen.

The evidence

The idea that insects are in terminal decline has been rumbling on for some time; more than a decade ago Kelvin Conrad and colleagues highlighted a rapid decline in moth numbers (Conrad *et al*. 2006) and a few years later, Dave Brooks and colleagues, using data from the UK Environmental Change Network, revealed a disturbing decline in the numbers of carabid beetles across the UK (Brooks *et al*. 2012. There are reliable and robust long-term data sets showing the declines of butterflies and moths over the last half-century or so (Thomas 2005, Fox 2013). On a less scientific note, I no longer find myself sweeping up piles of dead moths from around bedside lamps. Other charismatic groups, such as the dragonflies and

damselflies are also in decline (Clausnitzer *et al*. 2009). But what about other insects? A remarkable 42-year data set looking at the invertebrates found in cereal fields in southern England (Ewald *et al*. 2015) found that of the 26 invertebrate taxa studied, less than half showed a decrease in abundance. These included spiders, Braconid parasitic wasps, carabid beetles, *Tachyporus* beetles, scavenger beetles, fungus beetles, leaf mining flies, *Drosophila*, pointed wing flies, and surprisingly, aphids. The others showed no consistent patterns although bugs, excluding aphids, increased over the study period. Of course, intensively managed cereal fields are not a natural habitat and studies from natural grasslands in Germany have documented long-term declines in Hemiptera and Orthoptera (Schuh *et al*. 2012ab).

But what about the car-smearing insects, the flies and other flying insects? Have they declined as dramatically? My first thought was that I certainly don't 'collect' as many insects on my car as I used to, but is there any concrete evidence to support the idea of a decline in their abundance? The shape of cars has changed markedly since the 1970s. Cars were much more angular then, so perhaps the aerodynamics of today's cars filter the insects away from the windscreen to safety? But how do you test that? In June 2004, the RSPB ran a survey called the Big Bug Count to address this very point. The idea, was to obtain standardised counts of insect impacts on car number plates over one month. The results were thought to be very low, as the quote below shows, but on what evidence was this based?

> *"Using a cardboard counting-grid dubbed the 'splatometer', they recorded 324,814 'splats', an average of only one squashed insect every five miles. In the summers of 30-odd years ago, car bonnets and windscreens would quickly become encrusted with tiny bodies." "Many people were astonished by how few insects they splatted." the survey's co-ordinator, Richard Bashford, said.*

Unfortunately, despite being widely reported, the RSPB did not repeat the exercise. Therefore, what scientific evidence do we have for a decline in these less charismatic insects? Thanks to the Rothamsted Insect Survey, data have been collected from a nationwide network of suction and light traps for more than 50 years. Most of the publications arising from the survey have tended to focus on aphids and moths, although the traps do, of course, catch many other types of insect (Knowler *et al*. 2016). Unfortunately, two studies using data on a wide range of insect groups (Shortall *et al*. 2009, Ewald *et al*. 2015) do not give us a clear indication of insect decline. However, both studies are limited in their geographic coverage and may not be representative of the whole country. What a shame the RSPB stopped collecting 'splatometer' data.

Causes of decline

The TV roundtable that I mentioned earlier included Nick Rau from Friends of the Earth, Lutfi Radwan, an academic turned organic farmer, and Manu Saunders, an ecologist from the University of New England, Australia. If they had hoped for a heated argument they were out of luck. We agreed on almost everything: yes insects did not seem to be as abundant as they had once been, and this was almost certainly a result of anthropogenic factors, intensive agriculture, urbanisation and to a lesser extent climate change. Unlike some commentators (e.g. Goulson 2013, 2014) who firmly point the finger at the use of pesticides as the major cause of the declines reported, we were more inclined towards the idea of habitat degradation, fragmentation and loss being responsible for the reported decline in insect numbers. Urbanisation and agriculture are inevitably reducing the natural habitats available for insects to use, something some people have been aware of for a long time, as the naturalist and novelist Gene Stratton-Porter pointed out in 1909 in her novel *A Girl of the Limberlost:*

> *'Men all around were clearing available land. The trees fell wherever corn would grow. The swamp was broken by several gravel roads… Wherever the trees fell the moisture dried, the creeks ceased to flow, the river ran low, and at times the bed was dry. From coming in with two or three dozen rare moths a day, in three years time Elnora had grown to be delighted with finding two or three. Big pursy caterpillars could not be picked from their favourite bushes, where there were no bushes. Dragonflies could not hover over dry places and butterflies became scare in proportion to the flowers'.*

One habitat that has been increasing in parts of the UK over the last century or so, is forest and woodland: tree cover has risen from less than 5% in 1900 to just over 13%, with much of this happening in the last 50 years, coinciding with the growth in agricultural intensification. Forests, although managed, have far fewer inputs, especially in terms of pesticides and human footfall when compared with agriculture. Data from the Rothamsted Light Trap network shows that those moth species associated with trees do not appear to be in decline (Figure 2) and an analysis of the populations of two tree-feeding aphid species, the sycamore aphid *Drepanosiphum platanoidis* and the green spruce aphid *Elatobium abietinum*, shows that they are both doing rather well (Estay *et al*. 2012). It would seem that in those areas where suitable habitat is increasing, insects are either increasing or holding their own, whereas in areas where habitat is decreasing and being fragmented, the opposite is seen.

It is important to remember that insect populations are not static, they vary from year to year and the natural fluctuations in their populations can be large. This is illustrated by both the orange ladybird *Halyzia sedecimguttata* and the winter moth *Operopthera brumata* whose numbers fluctuate over several years. This highlights yet again the importance of long-term data sets (Figures 3, 4), without which it is very difficult to establish cause and effect.

Human impacts

It is obvious, whether we believe that an ecological catastrophe is heading our way or not, that humans are having a marked effect on the biodiversity that keeps our planet in good working order, and not just through our need to feed an ever-increasing population. In addition,

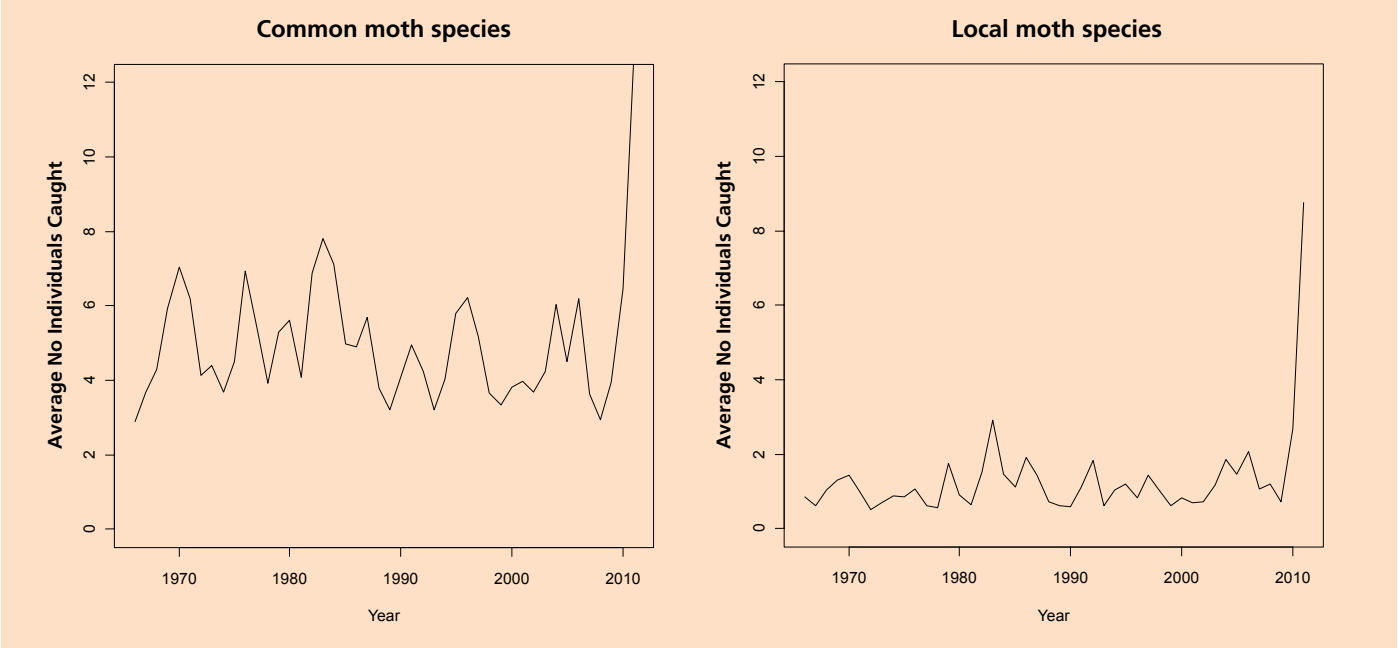

Figure 2. Average number of common and localised moth species associated with woodlands and forests in the UK caught per year by moth traps at sites with data sets extending over 20 years. Data from Rothamsted Insect Survey.

our fixation with car ownership is killing billions of insects every year (Keilsohn *et al*. 2018) and our fear of the dark is putting insects and the animals that feed on them at ever-greater risk (Eccard *et al*. 2018; Grubisic *et al*. 2018). We have a lot to answer for and this is exacerbated by our growing disconnect from Nature and the insidious effect of 'shifting baselines' which mean that succeeding generations tend to accept what they see as normal (Leather and Quicke 2010), highlighting the importance of robust, long-term data sets to counteract this dangerous and potentially lethal view of the world (Soga and Gaston 2018).

Final thoughts

I suspect that the current *'Ecological Armageddon'* scenario will not result in an immediate and wide-scale step change in attitudes such as we saw in the response to the ash dieback furore. We can hope, though, that it may lead to greater research effort into sustainable agriculture and for governments to encourage farmers to adopt farming strategies that encourage more wildlife and use fewer inputs. At the same time, given the increasing number of studies that implicate urbanisation as a major factor in the decline of insect numbers (Dennis *et al*. 2017), it would behove local planning authorities to increase

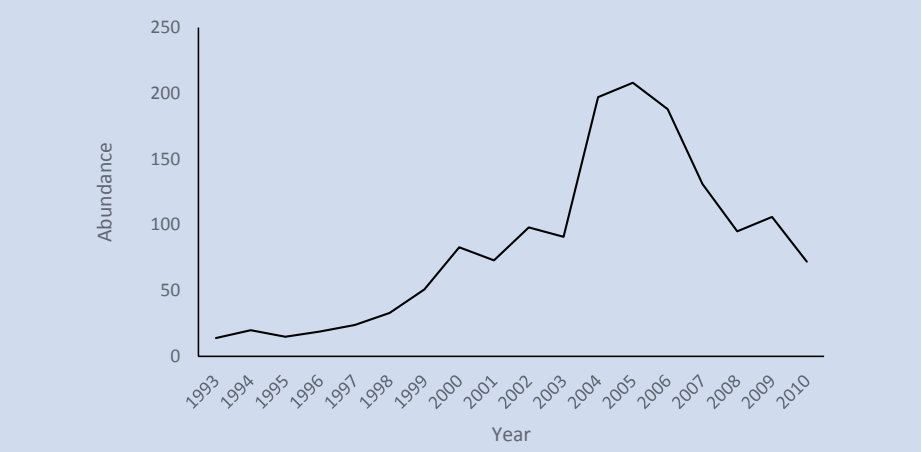

Figure 3. Populations of the orange ladybird *Halyzia sedecimguttata*, a mildew feeder, on sycamore *Acer pseudoplatanus* trees at Silwood Park, Ascot, as recorded by the UK Ladybird Survey.

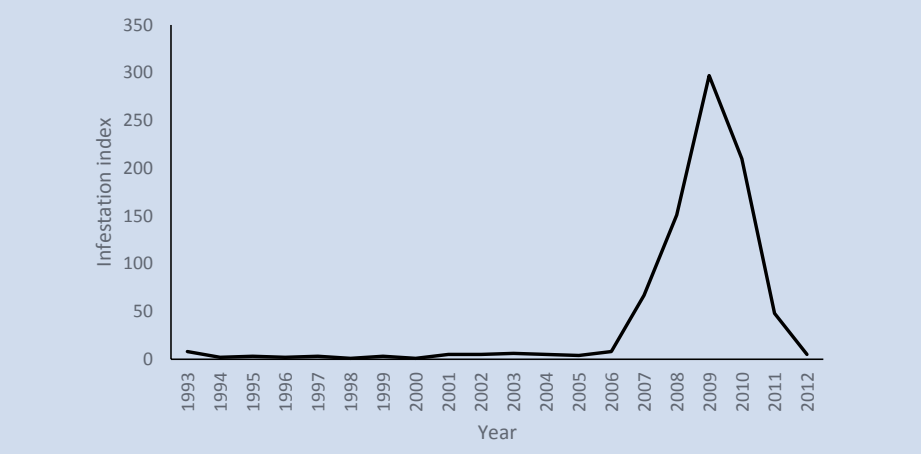

Figure 4. Populations of the winter moth *Operphtera brumata* on sycamore trees at Silwood Park, Ascot.

their efforts to provide much-needed green spaces in our towns and cities, and to ban the use of decking in gardens as well as the replacement of front gardens with concrete and tarmac car parking areas, and to encourage greater use of public transport and environmentally friendly heating to reduce the impacts of climate change.

Clearly, we need funding for more long-term studies into insect populations. We also need to find instances where the data already exist but have not yet been analysed; amateur records and citizen science projects may be of use here and perhaps data collected as part of Ecological Impact Assessments can contribute valuable records. Alternatively, as was done recently in France (Alignier 2018), it is possible, using the identical protocol, to resample a site after a gap of decades, to see what changes have occurred.

I hope for the sake of our descendants that recent reports of an *'Ecological Armageddon'* have been exaggerated. This should however, be a wake-up call to all those with the power to do something to mitigate the decline in biodiversity worldwide. The concept of biodiversity net gain could play a crucial part in changing attitudes and precipitating efforts at a practical level but insects must not be neglected in favour of more charismatic species. Governments need to respond quickly and to think long-term and responsibly. The current attitude of politicians to adopt a short-term 'how safe is my job' political viewpoint is no longer a viable one for the planet. It is precisely that attitude that got us into the situation that we find ourselves in now.

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Can Vegetation Management be a Realistic Response to the Loss of Plant Protection Products?

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Keywords: biodiversity conservation, biological control, IPM, land management, resistance

Grain aphids. Photo credit Tom Pope.

Plant Protection Products (PPP) are essential to efforts to maximise yields from agricultural production, yet their overuse can impact on water quality and biodiversity, and can lead to pest resistance. EU regulation aims to reduce environmental impact but may complicate management of resistance in pests by restricting chemical options. Vegetation management of non-crop habitats to promote a diversity of natural enemies, at field and landscape levels, offers opportunities to enhance natural biological control of pests, simultaneously reducing reliance on PPP, risk of resistance and non-target impacts.

The problem

The agricultural and horticultural industries are facing a range of complex and contradictory challenges. The UN predicts that increasing populations worldwide will result in a requirement for a 70% increase in food production by 2050 (Godfray *et al*. 2010). This must be achieved against a background of limited land availability leading to increasing production intensity. The problem is exacerbated by climate change, and societal changes leading to a greater proportion of meat in the global diet (Nelson *et al*. 2009). In addition, both recent and ongoing declines in the number of plant protection products (PPP) and modes of action (MOA) that are available in some regions (e.g. Europe) is resulting in overuse of some remaining products, leading to an increased frequency of resistance (Sparks and Nauen 2015). In turn, this can also contribute to an increasing overall pesticide use, generating concerns about environmental pollution. Although the problems might be ameliorated by recent technological developments (e.g. new plant breeding techniques), some, such as genetically modified (GM) crop varieties, have proven to be socially unacceptable in Europe (Bredahl 2001).

The use of synthetic pesticides has provided numerous benefits, the most apparent being increased crop yields per unit area, allowing for increased overall agricultural production with reduced labour, energy expenditure and land take (Cooper and Dobson 2007). Pesticide use has, however, encountered public concern over a range of issues associated with environmental and human health. Biodiversity declines across Europe have, in part, been attributed to the direct and indirect impacts of pesticides on non-target species. It is often difficult, however, to separate the impacts of pesticide use from those of landscape change (arising from both crop production and other factors such as residential development, and associated infrastructure, etc.), and declines in many invertebrates and farmland birds have also been associated with reductions in the abundance and diversity of food plants, in both cropped and off-crop areas (Lamichane *et al*. 2016). Excessive levels of some pesticides in surface and ground waters can also pose challenges for biodiversity and result in the need for extensive treatment of water to meet residue limits for human consumption. Moreover, while average crop yields have steadily increased over the last decades of the 20th century, more recently there have been signs of plateauing or declining yields attributed variously to soil depletion, loss of natural pest control provided by natural enemies, failure to adopt new technologies, and the increasing numbers of pests resistant to PPP (Lamichane *et al*. 2016).

These considerations point towards the need for strategies for better targeted and more sustainable use of both PPP and other pest management techniques. Integrated Pest Management (IPM), as promoted by EU Directive 2009/128 on the Sustainable Use of Pesticides, can play a central role. Potential benefits include a reduced risk of contamination of water bodies and the wider environment; protection of biodiversity; enhanced ecosystem service provision by natural enemies and pollinators; and extending the useful life of existing PPP through reduced risks of resistance or their withdrawal resulting from either environmental concerns or costs associated with periodic registration renewal.

Regulatory pressures on availability of Plant Protection Products

Recognition that PPP carry a range of risks to the environment and human health has rightly led to rigorous processes for testing, registration and monitoring of the efficacy and non-target impacts of both existing and new products. The impact of the registration process on the introduction to the market of new products may, however, result in unintended consequences. Strict regulation of PPP is likely to reduce the range of effective chemical controls available for economically important pests, leading to increased usage/pressure on remaining pesticides and an increased risk of pesticide resistance developing (The Andersons Centre 2014).

The primary legislation regulating approval (Regulation (EC) No 1107/2009), establishes requirements for registration based on the predominance of environmental protection and health over agricultural production. In addition there is separate legislation concerning the sustainable use of PPP (Directive 2009/128EC); maximum residue levels of pesticides in or on food and feed (Regulation (EC) No 396/2005); product classification, labelling and packaging (Regulation (EC) No 1272/2008); statistics on PPP (Regulation (EC) No 1185/2009); the establishment of a framework for water policy (Directive 2000/60/EC); the protection of groundwater (Directive 2006/118/EC); environmental liability (Directive 2004/35/CE); and quality of water intended for human consumption (Directive 98/83/EC). As a result, the development and use of conventional PPP in the UK has been required to meet ever higher standards, with the objective of ensuring modern products are even safer to the environment than those previously used.

Testing the safety of pesticides

Before products can be approved for use, more than 100 specific tests are currently needed with a major focus on impact on the environment, ecotoxicology and toxicity to humans and animals. Investigation of toxicity and metabolism is focused on assessment of both chronic and acute toxicity, assessing the fate of the product once it has entered an organism, its absorption and movement, and how it is degraded and excreted. Work on environmental aspects also includes the pesticide's fate in soil, water, and air, and potential effects on non-target organisms (including birds, bees, aquatic species and others). Studies of residues in food are also required together with data on the presence and duration of residues on crops following recommended uses of products. Environmental issues are also a focus of the Water Framework Directive (WFD) which requires member states to bring their waters into good chemical and ecological status. Criteria include limits on the concentrations of substances, including pesticides, in rivers, lakes, ground and coastal waters. Limits are also defined for groundwater which, amongst other uses, may be abstracted for irrigation or drinking water. Achieving the strict standards set out in the WFD can sometimes be difficult and this is contributing to the development of restrictions on the use of pesticides for crop protection. In addition to toxicity and environmental impact, other legislative

Plant Protection Product being applied to an arable crop.

requirements include a range of data on aspects such as efficacy (demonstrating a satisfactory level of control of the target), chemical and physical properties (ensuring quality, consistency of product composition), purity and detection of potential residues.

Developing and registering new PPP currently takes approximately 11.3 years and costs $286M (Phillips McDougall 2016). The required investment, coupled with higher uncertainty about the potential life of a new product and restrictions placed on their use, is resulting in caution in decision-making regarding registration of new (or re-registration of existing) PPP for the European market. The exact list of PPP that may be affected is uncertain, but The Andersons Centre (2014) estimated that use of 40 active substances are likely to be lost or restricted as a result of implementation of EC 1107/2009.

Potential consequences of loss of PPP

Advocates of IPM and sustainable intensification are in agreement that PPP will remain a key element of crop production because alternative approaches cannot guarantee pest numbers remain below thresholds at which damage to crops becomes unsustainable. What then are the potential consequences of a loss of PPP? In the UK, the most immediate, and obvious, predicted impact is that pest control is likely to become more difficult. Restricting availability of active substances for pest control may also fail to deliver environmental benefits. Agricultural land area may increase to compensate for reduced production/income per ha. Furthermore, if PPP of first choice are withdrawn, farmers may fall back on older technology, such as pyrethroids, which are not without environmental impacts. Indeed, overall applications of PPP may increase as less effective products become the only option. This risks greater impact on water quality and non-target fauna and flora, but also raises the chances of pests developing resistance (The Andersons Centre 2014).

A role for vegetation management and IPM?

The EU Sustainable Use Directive encourages the promotion and uptake of IPM. Pest management techniques used in IPM approaches include, amongst others, cultivation techniques (including crop rotation and reduced tillage), selection of resistant cultivars, biosecurity, use of semiochemicals (such as pheromones) and biopesticides, use of thresholds for application of conventional PPP (which protect biodiversity), and management of ecological infrastructure to increase populations of beneficial organisms at field and landscape levels.

Here we focus on the role of natural enemies in pest suppression in cereals. Among the key groups of natural enemies in UK cereal crops are ground beetles, spiders, hoverflies and parasitoids. A range of natural and man-made habitat components such as woodland patches, grass strips between fields, stone walls, hedges, farm tracks, field margin wildflower strips, and conservation headlands, represent significant features that have been shown to enhance both the abundance and diversity of these groups and their impact on pest numbers (Powell *et al*. 2004, Marshall *et al*. 2006). But can use of these habitat components be cost-effective in commercial production?

Natural enemies such as hoverflies play an important part in Integrated Pest Management.

Vegetation management has a key contribution to make and there is a growing literature, particularly on the effectiveness of management interventions implemented through agri-environment schemes, such as the UK's Countryside Stewardship (e.g. Haaland *et al*. 2011, Holland *et al*. 2012, Tschumi *et al*. 2013, Ramsden *et al*. 2017). For example, high mortality of aphid parasites can occur during winter, but this is mitigated when they utilise habitats such as tussocky grasses, which offer protection from low temperatures and heavy rainfall. Encouraging such vegetation in unproductive areas of a farm offers a low-cost option which is also important for overwintering beetles and spiders. Floral diversity during spring and summer, promotes hoverfly numbers and species richness (Marshall and West 2007). Careful selection of flower mixes, can increase impact. For example, the egg load of females of hoverfly species such as *Episyrphus balteatus* varies depending on the pollen species they have fed on, offering the potential for larger populations where flower mixes are optimal (Powell *et al*. 2004). Further research on management of habitat components and landscape to optimise the 'mix of natural enemies' would be desirable (Haaland *et al*. 2011) because diverse communities of natural enemies have been shown to be more effective at suppressing cereal pest numbers (Snyder *et al*. 2006, Gonjito *et al*. 2015, Walters and Cherrill 2018).

Pest suppression at the field edge only?

It is often suggested that natural enemies do not move far into crops, instead concentrating their activities in field edges. However, good levels of pest suppression by hoverflies has been demonstrated more than 100 m into cereal crops (Walters and Cherrill 2018). Moreover, research has recently begun to focus on the landscape scale and the extent to which non-crop habitat at distances of thousands of metres from the crop influences the abundance of beneficial organisms and the effectiveness of natural pest control (Hatt *et al*. 2018). Distance of non-crop habitats from the crop is important, but they do not always have to be immediately adjacent. Whereas 10-100 m is the 'operational distance' of some walking, flying or wind-borne natural enemies, many will move much further under appropriate conditions. In addition, permanent habitat features, such as woodland patches, can be linked using hedges and 'stepping stones', such as strategically placed wildflower patches. Further research is required to improve our understanding of the functionality of different habitat components and their optimal spatial arrangement. One objective should be to firmly establish the underpinning principles of landscape design that can be used to maximise suppression of pest populations with minimum use of productive land.

Not a complete solution

It is unlikely that habitat management alone will offer sufficiently reliable pest population suppression across all commercial crops, farms and years. IPM involves a range of simultaneous management options, including use of well-tested PPP (emerging from the registration process), which provide an intervention option when other approaches are insufficient (Powell *et al*. 2004). Where PPP are used, careful choice of selective pesticides will reduce impact on the natural enemies already in the cereal crop, and a reservoir of natural enemies will be available in the non-crop habitats to rapidly recolonise when the pesticides become inactive. Initial indications are that significant reductions in the number of applications of PPP may be achieved using this approach, potentially reducing variable production costs and safeguarding the remaining products for future use. An additional benefit is that many landscape management interventions support multiple ecosystems services, for example wild flower areas also promote many pollinator species, making their establishment and maintenance more cost-effective.

Conclusions

To meet the demands of feeding the world's population over the next 30 years, crop production needs to be substantially increased. In Europe this has to be achieved against a background of recent and ongoing declines in the number of conventional PPP and MOA, which threaten to result in overuse of the remaining products leading to an increased frequency of pest resistance, increased overall use of insecticides and associated environmental consequences.

IPM is part of the solution to this problem with vegetation management at the farm and landscape scales playing a central role. Evidence of effective movement of natural enemies such as parasitoids and hoverflies over long distances supports the concept of planning vegetation management at a landscape level. A mosaic of managed habitats across a landscape that makes use of uncropped areas, or corners of inconveniently shaped fields, may be a more attractive option than headlands that take up good arable land.

The importance of diversity, in providing resilience through species redundancy or complementarity is well established, and planning vegetation management to promote a wide range of natural enemies will increase resilience of IPM. This can be achieved by establishing habitats that can support multiple groups (e.g. grasses promote parasitoids, carabids and spiders, while florally enriched habitats support dipteran predators and pollinators). The various natural enemy species will respond differently to environmental conditions (for example weather), and where multiple control agents are available, the absence of large populations of one species is likely to be countered by the presence of others. Thus, such multi-functional habitats may promote user confidence and uptake, contributing to a package of measures that will promote the sustainable (and reduced) use of conventional pesticides, and help to maintain a larger range of modes of action and products, thus retaining this important component of many Integrated Pest Management approaches.

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An Evaluation of the Effectiveness of Footprint Tracking Tunnels for Detecting Hazel Dormice

Keywords: presence/absence, small mammals, survey sensitivity

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Hazel dormouse.

Traditional survey techniques for hazel dormice include nest tubes and nest boxes or detection of field signs. We present details of the use of footprint tunnels as a non-invasive tool for detecting their presence and demonstrate that the technique, when compared with other methods, is a more effective survey tool within scrub and hedgerow habitats. In high canopy woodland, footprint tunnels perform at least as well as traditional techniques. We provide recommendations on survey protocols and encourage ecologists and site managers to consider using footprint tunnels when undertaking surveys.

Introduction

The hazel dormouse *Muscardinus avellanarius* is native to England and Wales and is a scarce, arboreal small mammal

of woodlands, hedgerows and scrub, hibernating at ground level in winter. They are a 'European Protected Species' under the EU Habitats Directive (1992) enacted as the Conservation of Habitats and Species Regulations (2017) within the dormouse range in the UK. Although currently described as of 'least concern' in the IUCN Red List, an analysis of data derived from the UK's National Dormouse Monitoring Programme (NDMP) indicates that they have suffered a 72% population reduction in the last 22 years (Goodwin *et al*. 2017) and a recent review describes them as 'vulnerable' within their UK range (Matthews *et al*. 2018). Consequently, knowing where dormice occur is an essential first step towards securing a sustainable future for populations which, if undetected, would be vulnerable to habitat loss and fragmentation arising from development.

Methods of detection of hazel dormice currently fall into two categories: searching for field signs (gnawed hazel nuts and summer nests), or the more frequently used techniques of deploying nest tubes and/or boxes in woody vegetation within which the animal may build a nest during its active phase.

Despite a range of methods being available, hazel dormice can be a difficult species to detect. In the absence of fruiting hazel *Corylus avellana* or a dense shrub or scrub layer, field signs cannot be found. Similarly, in habitats such as unmanaged mature woodland or over-stood coppice, there may be plentiful tree crevices high in the branches and dormice may be less likely to nest in boxes or nest tubes. Likewise, when there is a poorly developed shrub layer there may also be a reduced incentive for dormice to venture lower to the ground, potentially resulting in a false negative for a nest tube or nest box survey.

Dormouse footprint detection

Hazel dormice have very distinctive triangular-shaped pads on the 'palms' of both their front and hind feet (Figure 1, Box 1).

Several studies have already been undertaken to investigate the potential for dormouse footprint detection, using a variety of devices. These include modified bird feeders (Mills *et al*. 2016), Tetra Pak

Figure 1. Close-up of hazel dormouse hind foot showing triangular palm pads.

Box 1. Recognising dormouse footprints

When a dormouse footprint is left behind on white card, it is usual to see three obvious triangles, although this is dependent upon the quality of the print (Figure 2). In addition, both feet are usually turned outwards when walking on a flat surface, so the toe prints (if present) appear offset to the direction of travel. The fifth toe on the hind foot rarely prints and the three central toes of the hind foot are arranged close together. Wood mice *Apodemus sylvaticus* and yellow-necked mice *A. flavicollis* are also highly arboreal and regularly enter footprint tunnels but compared with dormice their palm-pad prints appear more rounded (Figure 3). It is difficult to reliably separate the two *Apodemus* species based on their footprints.

Figure 2. Hazel dormouse footprints. Front foot (blue) and hind foot (red).

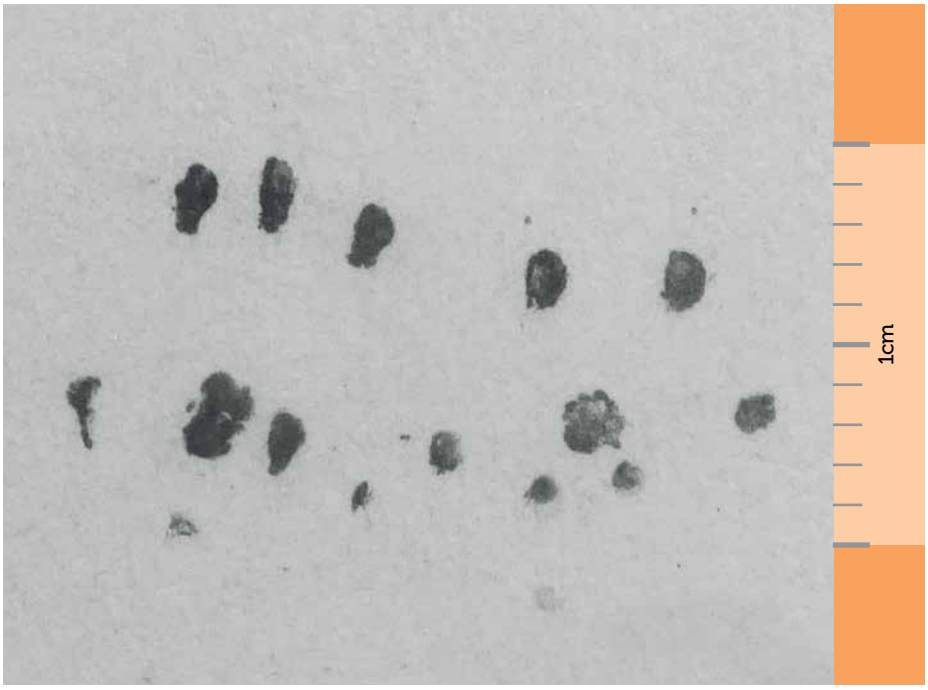

Figure 3. Wood mouse footprints. Hind foot (left) and front foot (right).

cartons (Haag and Tester 2016), modified nest tubes and sections of plastic down-pipe (Middleton-Burke 2017). Where bait was used, it was necessary to protect the tracking device from grey squirrel *Sciurus carolinensis* damage. All these studies found that it was possible to obtain hazel dormice footprints and that they were distinctive from other small mammal footprints.

Evaluating the effectiveness of footprint tunnels

In 2017, we tested how well footprint tunnels detected hazel dormice, compared with other survey methods. We used a simple, low-cost design constructed from black plastic down-pipe with a wooden insert (Figure 4, Box 2). In 2016, we successfully trialled this equipment and

Box 2. Footprint Tunnel Design
(see Figure 4)

The footprint tunnels are constructed out of 65 mm square black drainpipe cut to 400 mm lengths, with plywood cut to 500 mm lengths to provide a landing platform on either side of the tunnel. As no significant difference in detection occurred whether the tunnel was fixed on top or beneath a branch, the tunnels are best attached using two black cable ties (4.7 mm x 380 mm) to the underside of horizontal branches as they are more stable in this position.

In the centre of the plywood is a strip of high quality white card (250 gsm/350 microns) cut from an A4 sheet along the long edge and attached to the plywood using double sided sticky tape. Masking tape is wrapped around the ply at either end of the card but not overlapping it, to enable the card to be easily removed and replaced. The tracking medium is painted onto the masking tape in a thin layer. It is a mixture of three heaped teaspoons of ultra-fine, pharmaceutical grade activated charcoal powder (considered to be safe for dormice) to 15 level teaspoons of olive oil, which provides sufficient quantity for approximately 50 footprint tunnels. The consistency is similar to tomato soup! No bait is used. The unit cost is around £2 each, excluding consumables.

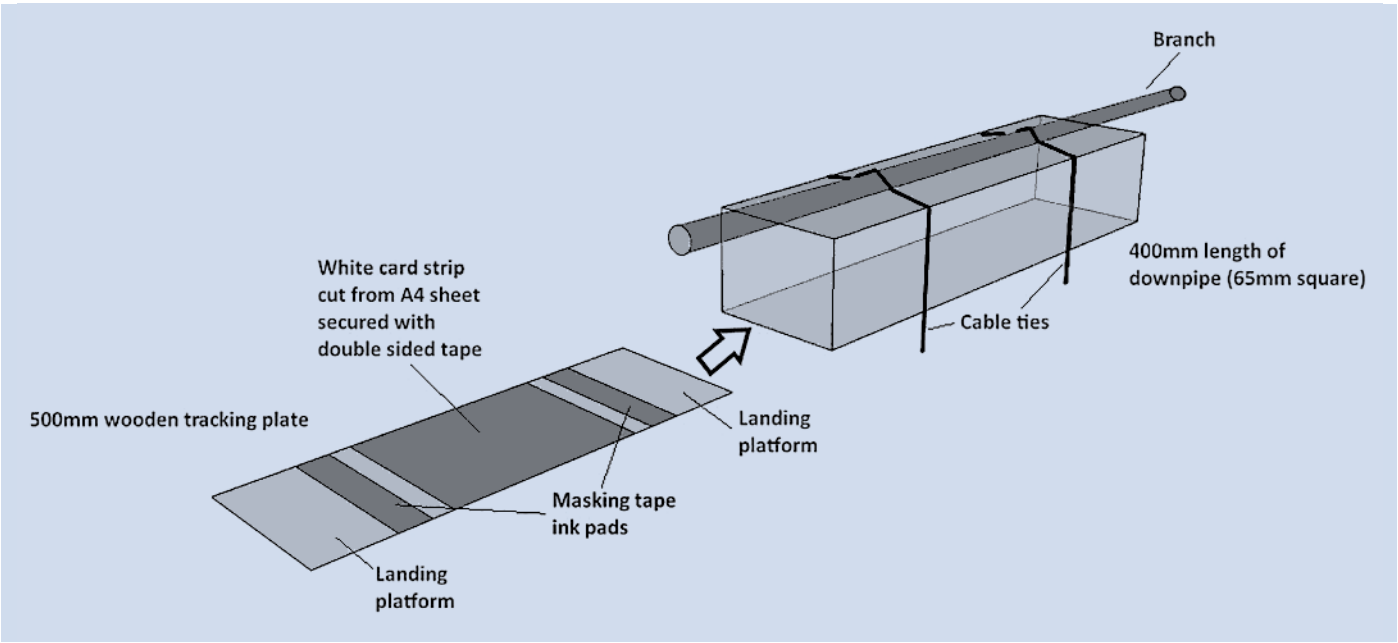

Figure 4. Footprint tunnel design showing the arrangement of card and ink pads on the wooden tracking plate, which is inserted into the shorter tunnel made of square downpipe.

found that dormice would readily enter the tunnel without any added attractants, so no bait was used.

Twelve sites in south Suffolk with varying habitats were chosen for the study. These were already part of the National Dormouse Monitoring Programme (NDMP) or were sites where previous surveys had revealed dormice were present. Fifty sampling points, 15-20 metres apart, were set up at each site in either a grid in woodlands or in a transect for hedgerows and scrub sites. At each sampling point a dormouse nest box, nest tube and a footprint tunnel were placed in woody vegetation, approximately within one metre of each other and at 1-1.5 metres height, depending on the habitat. At each site, random number tables were used to place half of the tunnels above the branch and the other half below, but it was subsequently found that tunnel position had no significant effect on levels of dormouse detection.

The nest boxes and nest tubes were checked at the end of every month from April to November 2017 and nests and animals were recorded where present. The footprint tunnels were checked twice every month as it was necessary to renew the ink after two weeks, but any footprints in a tunnel were only recorded once, even if present in both checks. Card was replaced whenever footprints of any species were present, or if found wet or damaged by molluscs. In addition, searches for natural nests and nibbled hazel nuts were carried out in the autumn.

By the end of November, hazel dormice had been detected at ten sites, with nest boxes, nest tubes and footprint tunnels all confirming presence. Natural nests were also found at all the positive sites but opened hazel nuts were found at only five sites. At the two negative sites, dormouse presence was already known to be very low from surveys in 2016.

Survey results

The overall detection rates (i.e. the proportion of deployments where presence was detected in a month) between the three methods were compared, with formal statistical comparison based on a binomial Generalised Linear Mixed Model (GLMM). The analysis took into account the non-independence of the data which arose from having a nest tube, nest box and footprint tunnel at the same sampling points. Figure 5 compares the presence of nests in the three different habitats against the presence of footprints. The 'box or tube' bar refers to the proportion of times where detection occurred in the box or the tube, indicated by the presence of a nest (old or new) or a dormouse. As adjacent nests appear to elevate adjacent footprint levels, in the analysis all tunnels were excluded where situated adjacent to a box or tube where dormice were ever recorded.

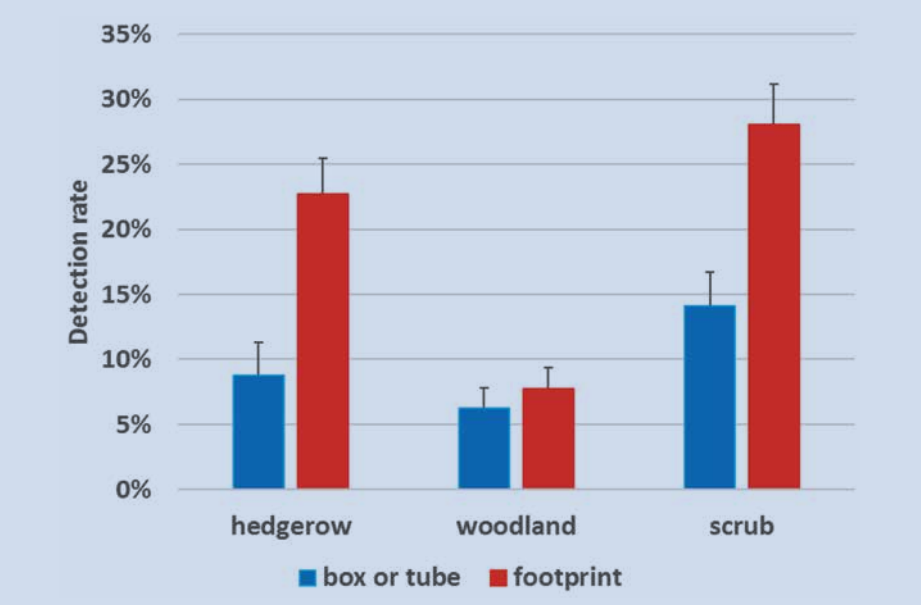

Figure 5. Comparison between hazel dormouse detection rates using either nest boxes or nest tubes and using footprint tunnels in three different habitat types. Bars are upper 95% confidence limits. Data were collected over an 8-month period and represent 868 detection events.

We found that footprint tunnels are considerably more effective at detecting dormice in hedgerows (22.7%, 95% confidence limits +/- 2.7%) and scrub (28.1% +/- 3.1%), when compared with nest detection in these habitats (8.8% +/- 1.6% for hedgerows and 14.1% +/- 2.0% for scrub). The lowest detection rates occurred for the three closed-canopy woodlands, with no significant difference in detection rate between the two survey types.

The differences in the detection rates between months also varied, with highest detection rates between May-October, and with the lowest in April and November. Further analysis of our data revealed that if 50 footprint tunnels are deployed for three months between May to October, the probability of detecting dormice, even where they are likely to occur at very low density, is 97.5%. Compared with nest tube surveys, this has considerable value in reducing the survey period and providing an earlier indication of the presence or likely absence of dormice in a development context.

Implications for professional practice

Footprint tunnels provide greater certainty of detection of hazel dormice in hedgerow and scrub habitats and are more likely to achieve positive results within a shorter timescale, when compared with nest tubes and nest boxes. This is not surprising as it only takes a fleeting moment at the entrance of a tunnel for the evidence to be obtained, compared with the amount of activity associated with nest-construction.

The cost of the materials compares well with nest tubes, although the twice-monthly checks to re-ink the pads and change the papers requires increased surveyor time. The tunnels are heavier and bulkier than nest tubes and if access to the survey location is only by foot, then fewer can be carried by a surveyor at any time. In our pilot study, we attempted to reduce the size of the tunnel but found this was detrimental to keeping the tracking paper dry. However, these minor negative

Figure 6. Footprint tunnel *in situ* within a hedgerow.

points are offset by the benefits of an early indication of dormouse presence. In addition, a footprint tunnel survey started at the beginning of August, following the recommended methodology until the end of October, would demonstrate a high probability of likely absence in the event of a negative survey.

The method does not require a survey licence, although there is a slight risk that a dormouse could be encountered. During the study, dormice were encountered on four occasions in footprint tunnels, two where a nest had been constructed that disappeared by the following month and two other occasions when a dormouse was seen leaving a tunnel. This represents four encounters out of 9,600 possible occasions, so the likelihood of a surveyor encountering a dormouse during a footprint tunnel survey is considered to be low. However, the survey should always be halted in the event of a non-licensed surveyor coming across a nest or an animal in a tunnel. Footprint tunnels are also an ideal survey method in areas of high public disturbance because should the tunnel be investigated, a dormouse is highly unlikely to be present. In contrast, they are more likely to be present within a nest tube or nest box during the day and consequently are more vulnerable.

It is advisable for a surveyor to have some knowledge of hazel dormouse habitat requirements and ecology in order to set out the footprint tunnels in a way that is most likely to detect them. For this reason, we recommend that surveyors should either hold an existing dormouse survey licence or, at the very least, have been trained in the technique. Dormice footprints can be very faint and hard to spot, particularly when in amongst numerous other small mammal or bird prints. Consequently, we recommend that papers are collected and labelled in the field so they can be carefully checked later and independently verified if required.

When setting out footprint tunnels, these should be placed beneath horizontal branches and secured using cable ties (Figure 6). When used in combination with nest tubes, they can be placed at the same locations or alternating with each other, as long as the spacing between nest tubes remains at 15-20 m. The height that the tunnels are secured will depend upon the habitat type, but they are most effective when placed in dense woody vegetation at least a metre above the ground.

Wherever possible, the tunnels should be aligned along a transect. In woodlands, we recommend that woodland edge habitat or ride edges are chosen, rather than placing the tunnels in a grid. This is because dormice are more likely to forage within edge habitat where sunlight will promote flowering and fruiting of shrub species. In scrub, the tunnels should again be placed to maximise edge habitats which will be the most productive as food sources. As such habitats are often thorny, it can be a challenge to place and check the tunnels, but we have found that these locations are very good for detecting dormice. Bramble entanglements are also useful detection sites, but several bramble stems may be required to secure the weight of the tunnel. In hedgerows, consideration should be given to whether they will be flailed in the autumn and that the placing of the tunnels is deep enough within the hedge to remain unaffected.

Footprint tunnels are currently only used as a presence/likely absence technique and therefore in built-development scenarios this survey technique alone cannot provide

the level of detail required to fully evaluate any impacts. It is therefore essential that they are used in conjunction with other validated methods for projects that may result in a dormouse mitigation licence being required.

Regardless of the above, the outcomes of our study confirm that footprint tunnels are a viable, non-invasive survey method for detecting hazel dormice and should now be given serious consideration as an effective survey technique.

Recommendations for footprint tunnel surveys

1. A footprint tunnel survey should be undertaken for at least three months in the period May to October, unless dormouse evidence is detected. However, in the absence of any footprints or any other survey evidence such as nests in habitats where dormouse presence is thought likely, the survey should be continued beyond three months.
2. A footprint tunnel survey must be used in combination with another detection method such as nest tubes and nest boxes if the survey is for built-development purposes or is likely to require a mitigation licence.
3. If it is suspected that the survey location is not permanently occupied by dormice but is used primarily as a dispersal corridor, the months of September and October should be included in the survey.
4. Although footprint tunnels can be put out from late March, if no dormouse evidence is recorded in April then this month should be excluded from the three-month survey duration due to low detection rates at this time of year.
5. As dormice footprints can be hard to spot, all papers should be collected and labelled in the field, so they can be carefully checked later and independently verified if required.

Acknowledgements

This study was funded by People's Trust for Endangered Species. We thank Andy Mercer, SWT Shotley Wildlife Group, Essex and Suffolk Dormouse Group and Realise Futures, Ipswich, who all assisted with project start-up, surveys and data entry, and the landowners who allowed access to their land. The authors also appreciate the input of the *In Practice* Editorial Board into earlier drafts of this article.

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About the Authors

Dr Simone Bullion MCIEEM is Conservation Manager at Suffolk Wildlife Trust and is also County Mammal Recorder and author of the book 'The Mammals of Suffolk'. As well as managing the Trust's consultancy, she has 20 years' experience of undertaking hazel dormice surveying and habitat restoration projects and is a member of the UK Dormouse Steering Group.

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Meet the Author – Giles Groome

What do you do?

I am a freelance Consultant Ecologist, specialising in vegetation survey, assessment and management. My job is very varied and I have undertaken contracts covering every terrestrial, coastal and freshwater habitat in Britain. The work ranges from one-off botanical surveys of garden lawns to large-scale habitat, community and species mapping of whole landscapes; multidisciplinary EIAs (I usually head-up teams of associates specialising in other fields); hydroecological assessments of water catchments; site management and landscape restoration plans; and multi-year monitoring and research projects. I also provide site management advice; give training in species identification and survey methodology; and write the occasional article, research paper and book chapter.

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

I had easy access to the countryside throughout my childhood in the early 1970s and, fuelled by an insatiable appetite for reading encyclopaedias and watching Jacques Cousteau programmes, started studying nature from an early age. However, once I hit my teens my interest shifted to the things more typical of my age and it was not until I visited the Himalayas at the age of 21 and saw the devastating effects of deforestation that I began to consider a career in biological conservation.

What have been the most important steps along the way?

Going back in to education to study firstly biology and then Conservation Management and rediscovering scientific enquiry to the point that I wanted to do a PhD more out of interest than as a career move; volunteering in the office of my local Wildlife Trust and at my local nature reserve; looking at and reading about nature; and having access to numerous exceptional naturalists prepared to share their knowledge with me along the way.

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

To do what I do now, yes. You must have a sound basis in ecology and conservation biology that can only be gained by years of formal study and you must have the ability to identify plants that only comes from years of examining them with and without flowers/fruits/capsules. But don't let that put you off if you don't have these yet. The journey is as rewarding as the destination.

Do you have any advice for someone setting out on a career in the profession?

If you want to be an ecologist join the British Ecological Society, your local naturalist group/s and CIEEM. Read as much and attend as many field meetings, training courses and conferences that you can.

What's the best thing about your job?

Besides working in/with nature and its endless variety, as a freelancer I get to go, do and see so much more than I did when I was an employee. I also get to pick the hours I work, meaning I can avoid sitting in traffic...which I can't stand!

What's the downside?

It is very rare that I have the opportunity to initiate projects. They come to me and I do the part I am contracted to do. Unless it's monitoring work, I usually have no involvement once I've undertaken my surveys and written my report.

What's next for you?

I've been meaning to write a book on the philosophy of nature conservation for years now. One day I must get round to it...

What is your top tip for success?

Never stop learning. Nature is far more complex than it first appears, but so much more interesting.

For further information

Contact Giles at:
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CIEEM Featured Training

Ecological Assessment

Developing Skills in EcIA

Cambridge, 16-17 October

A two-day practical course aimed at those practitioners who have existing experience of undertaking EcIAs and wish to develop their skills further. The course will follow the approach to EcIA set out in CIEEM's guidelines and will focus on the terrestrial (rather than the marine) environment.

Habitats Regulations Appraisal of Plans / Projects (Scotland)

Aberdeen, 30 October

This beginner – intermediate level course will provide a thorough understanding of the overall purpose, process and methodology of Habitats Regulations Appraisal, including Appropriate Assessment and the roles of different organisations and individuals in the process.

Ecological Report Writing

Swindon, 6 November

A one-day course on how to produce good quality ecological reports for species and habitat surveys, and Preliminary Ecological Appraisals (PEAs), following CIEEM's 'Guidelines for Ecological Report Writing'.

Planning and Development

Ecological Clerk of Works

Swansea, 4 October

Aimed at the beginner – intermediate level, this one-day course will provide an introduction to the role and responsibilities of an Ecological Clerk of Works (ECoW).

Calculating and Using Biodiversity Units

London, 1 November

This one-day course provides training on biodiversity unit calculations based on Defra's guidance. It is for individuals wishing to develop or enhance skills in undertaking and using biodiversity unit calculations.

BS42020 Biodiversity: Code of Practice for Planning and Development

Reading, 29 November

With sessions led by Mike Oxford, Chair of BSI's Technical Committee on Biodiversity and principal author for BS42020, the course will focus on how to achieve effective ecological input at all five stages of the planning and development process.

Transferrable Skills

Train the Trainer for Ecologists

Edinburgh, 7-8 November

This two-day course is specially designed for ecologists and environmental professionals covering field as well as classroom tuition. The aim is for participants to develop their training skills towards designing and delivering courses to a professional standard.

Effective Communication Skills

Newcastle, 13 November

A one-day course to assist participants in improving their communication skills when working with customers, contractors, suppliers, colleagues, managers and other professionals.

Effective Workplace Mentoring

Newcastle, 14 November

This one-day course will take you through the end to end process of effective mentoring. From learning what mentoring is and isn't, through to examining tools and techniques to get the best from your mentee.

Book Early for Discounted Course Fees on all our Training Events

http://events.cieem.net/Events

CIEEM Awards 2018: A Celebration of Achievement in the Sector

Deborah Alexander
Professional Standards Officer, CIEEM

A celebratory photo of all the 2018 Awards finalists

Guests were welcomed through the historic doors of Merchant Taylors' Hall, London to celebrate excellence in the sector at the 2018 CIEEM Awards. The event, held on 21 June 2018, was an opportunity to both applaud and showcase the inspirational work of individuals, organisations and partnerships for the profession and biodiversity.

The sunlit courtyard garden provided an elegant backdrop for the drinks reception, sponsored by **The Ecology Consultancy**, and there was a palpable sense of anticipation when formal proceedings commenced. Paul Goriup CEcol CEnv FCIEEM warmly welcomed the VIPs, sponsors, judges and finalists present and led the 230 guests seamlessly through the Awards Event. As guest speaker, Dr Stephanie Wray CEcol CEnv FCIEEM was invited to throw off the constraints of her Presidential role and share her thoughts about the profession. Dr Wray entertained guests with a witty and personal reflection of her career, sharing a bountiful supply of anecdotes including some of the scrapes and successes that have helped to fuel her passion for ecology.

A delicious three-course lunch then afforded attendees the opportunity to relax and converse before the presentation of the Awards. Judging had taken place in the spring with fierce competition in a number of categories requiring some judging panels to deliberate long and hard before reaching a final decision. Award winners were invited on stage to receive their trophies and all finalists received certificates of commendation. The four winners of the inaugural Consultancy of the Year Awards were delighted with their success as were the winners of the two new Best Practice Awards for Mitigation and/or Enhancement.

CIEEM could not have hosted the 2018 Awards without the assistance of a host of individuals and organisations including all of the entrants who took the time to submit a nomination as well as the finalists and winners. We would particularly like to extend our thanks to our sponsors for their generous support and our judges for their time and expertise, without whom the event simply would not happen. We look forward to launching the 2019 Awards later this year.

Best Practice Award – Innovation

Winner: Yorkshire Peat Partnership – Yorkshire Wildlife Trust

Highly Commended: Bird Bioacoustics Advancements – Baker Consultants

Highly Commended: Canary Wharf Biodiversity Roadmap – Canary Wharf Group & Greengage Environmental Ltd

Representatives from Yorkshire Peat Partnership

Best Practice Award – Knowledge Sharing

Winner: Manchester's Great Outdoors: A Green and Blue Infrastructure Strategy for Manchester – Manchester City Council

Highly Commended: Mollusc of the Glen: Forestry Management and freshwater pearl mussels – Alba Ecology Ltd

Highly Commended: School Ecology Workshops – The Ecology Consultancy

Stephanie Wray (left) with representatives from Manchester City Council

Best Practice Award – Stakeholder Engagement

Winner: Hatfield Forest 'Shaping the Future' – Dialogue Matters & The National Trust

Highly Commended: Hampstead Heaths Ponds Project – Atkins Ltd, City of London Corporation & BAM Nuttall

Highly Commended: Manchester's Urban Watercourse Restoration – Manchester City Council & Atkins Ltd

Representatives from Dialogue Matters and the National Trust with Stephanie Wray (right)

Best Practice Award – Large Scale Mitigation and/or Enhancement

Winner: Victory Oak Development and St Leonards Heath Nature Reserve – Sovereign Housing & Johns Associates

Highly Commended: A46 Newark to Widmerpool Dualling Scheme – ACEOM & Balfour Beatty

Highly Commended: Wadswick Green Continuing Care Retirement Community – Applied Ecology Ltd

Highly Commended: Western Peripheral Road Mitigation and Enhancement – BSG Ecology

Stephanie Wray (left) with representatives from Johns Associates and Sovereign Housing

Best Practice Award – Small Scale Mitigation and/or Enhancement

Winner: Crown Farm Quarry – Atkins Ltd & Tarmac

Highly Commended: Rugeley Flood Alleviation Scheme – Environment Agency

Commended: The Return of the Wart-Biter – South East Water

Stephanie Wray (left) with representatives from Atkins and Tarmac

Best Practice Award – Large Scale Nature Conservation

Winner: Dove Stone Upland Restoration – RSPB & United Utilities

Highly Commended: Ellis Meadows Open Space – Leicester City Council

Highly Commended: Swindale Restoration Project – RSPB, Environment Agency, Natural England & United Utilities

Stephanie Wray (left) with representatives from RSPB and United Utilities

Best Practice Award – Small Scale Nature Conservation

Winner: Bringing Back the Bulbourne – Environment Agency & Box Moor Trust

Highly Commended: Bridgewater Basin Floating Ecosystems – Manchester City Council

Highly Commended: Conservation of the threatened plants of seasonal wetlands on the South Gloucestershire Commons – South Gloucestershire Council

Stephanie Wray (left) with a representative from Bringing Back the Bulbourne

Tony Bradshaw Award for Outstanding Best Practice

Winner: Hatfield Forest 'Shaping the Future' – Dialogue Matters & The National Trust

Consultancy of the Year – Large

Winner: Atkins Ltd

Highly Commended: Arcadis

Commended: WYG

Representatives from Atkins Ltd with Martin Jackson MFL (far right)

Consultancy of the Year – Medium

Winner: BSG Ecology

Highly Commended: Tyler Grange LLP

Commended: CSA Environmental

Representatives of BSG Ecology

Consultancy of the Year – Small

Joint Winner: Greenspace Ecological Solutions and Peter Brett Associates

Consultancy of the Year Awards sponsored by McParland Finn Ltd

Representatives from Greenspace Ecological Solutions with Martin Jackson from MFL (far right)

Stephanie Wray (left) with Helen Evriviades from Peter Brett Associates (centre) and Martin Jackson from MFL

In Practice Award

Winner: *Getting it Right With Reintroductions: What Conservation Evidence Tells Us About Bringing Back Birds* – Claire Wordley (March 2017)

Highly Commended: *Rewilding in a Managed Landscape: The Swindale Beck Restoration Project* – Lee Schofield, Jean Johnston, George Heritage & Oliver Southgate (March 2017)

Highly Commended: *Conservation on a Shoestring: The Mutualistic Benefits of the University-Nature Reserve Collaborations* – Sarah L Taylor, Andrew J Hunt & Khaled de Jesus (December 2017)

Sponsored by Greenhouse Graphics

Stephanie Wray (left) with Ian Crossley from Greenhouse Graphics (centre) and Claire

Promising Professional Award

Winner: Clare Knight Grad CIEEM

Highly Commended: Rosie Jackson Grad CIEEM

Highly Commended: Cameron Chester Grad CIEEM

Sponsored by Peter Brett Associates

Helen Evriviades of Peter Brett Associates with Clare (right)

Award Sponsors

NGO Impact Award

Winner: Little Ouse Headwaters Project – Little Ouse Headwaters Project

Highly Commended: Biodiverse Society – Lancashire Wildlife Trust

Highly Commended: Yorkshire Peat Partnership – Yorkshire Wildlife Trust

Sponsored by Wildcare

Stephanie Wray (left) with a representative of Little Ouse Headwaters Project and Fran Tattersall of Wildcare

Postgraduate Student Project Award

Winner: Helen Pietkiewicz Grad CIEEM

Highly Commended: Robert Monje Grad CIEEM

Sponsored by The Environment Partnership

Stephanie Wray (left) with Helen (centre) and Francis Hesketh of The Environment Partnership

Members' Award

Winner: Morgan Taylor CEnv MCIEEM

Sponsored by Peter Brett Associates

Stephanie Wray (left) with Morgan (centre) Jonny Riggall from Peter Brett Associates

CIEEM Medal

The CIEEM Medal is the Chartered Institute's highest accolade and is awarded annually. This year it has been awarded to **Professor Dame Georgina Mary Mace DBE FRS** for her outstanding, life-long contribution to biodiversity and ecosystem change and resilience. Georgina will be presented with the award at the CIEEM Autumn Conference in Glasgow.

Professor Georgina Mace, recipient of the 2018 CIEEM Medal

Trophies ready for presentation to the deserving winners

Attendees enjoy Stephanie Wray's Speech in the grandeur of Merchant Taylors' Great Hall

Policy Activities Updates

Amber Connett
Policy and Communications Intern, CIEEM

We have continued to promote our Brexit key messages[1] to MPs and Peers. To date, CIEEM President Stephanie Wray, CIEEM CEO Sally Hayns and Policy and Communications Manager Jason Reeves, have met with over 25 parliamentarians from across the party-political spectrum (see full list on website[2]). Our key focus now is to ensure meaningful follow up of the meetings that we have already had.

In July we held a roundtable dinner, hosted by Angela Smith MP, on the topic of the Environmental Principles and Governance Bill consultation (Defra) which CIEEM has responded to. The discussion was wide-ranging, looking at issues including existing models, what resources the new independent environment body will need, what powers the body needs to have, whether it should be a UK-wide body, how to embed environmental protection across all government activity, and the constitutional questions raised by a body with powers equivalent to those currently held by the EU. The event was attended by MPs including Sandy Martin MP, Matthew Offord MP and Alan Whitehead MP, alongside Amira Amzour (Environment Bill Manager at Defra), CIEEM Strategic Policy Panel members and staff.

In conjunction with our work in Westminster, we have started engagement in the devolved nations. Diana Clark (Wales Project Officer) has been building contacts in Wales, whilst Ireland Vice President Jenny Neff continues to do the same in Ireland. We have recently recruited a Scotland Project Officer.

We have also continued our joint work on Brexit where appropriate. Recent partners include the Environmental Policy Forum (EPF), Greener UK, Wildlife and Countryside Link, and the Association of Local Government Ecologists (ALGE).

We have responded to a number of high-profile consultations in recent months in addition to the Environmental Principles and Governance Bill consultation, to which we also jointly produced a high-level response with the EPF. Other consultations we have responded to include:

- Environmental Principles and Governance Inquiry (Environmental Audit Committee)
- Scoping a New Forestry Plan for Antrim Area Forests and Woodlands (Forestry Planning, DAERA)[3]

CIEEM is grateful to the following organisations, which have invested in our Brexit engagement activities:

At the time of writing we are drafting a response to the 'Sustainable Fisheries for Future Generations' consultation and the 'Developing an Environmental Strategy for Scotland' discussion paper.

CIEEM's Strategic Policy Panel[4] was unfortunately unable to meet in July, however the next meeting has been scheduled for 19 September 2018. The aim for this meeting is to discuss future European engagement and strategic planning for our policy work up to March 2019.

We are now organising the second round of meetings for our Country Policy Working Groups[5], in which we hope to plan out their activities and continue their work with consultation responses and horizon-scanning.

In June 2018, the Policy and Communications team was joined by a Policy and Communications Intern (Amber Connett) for a 9-month internship. This post will help to deliver CIEEM's policy ambitions throughout the Brexit process and expand our policy activities.

We have recently sent out a survey which aims to determine the commercial impacts of the Brexit vote on ecologists and environmental managers, and what measures have been used to mitigate these impacts. We hope to use the data gathered in this survey to positively influence the Brexit debate.

Following the unfortunate dissolution of the European Network of Environmental Professionals (ENEP), CIEEM is currently developing ways of increasing our European engagement. We will be working closely with the EPF (as several EPF members were also ENEP members) to decide on the best course of action.

In the coming months, CIEEM will be continuing its policy work by responding to consultations, including the anticipated Environmental Net Gain consultation and the consultation on a new Agriculture and Fisheries Bills. We will also be continuing to engage in Westminster through upcoming roundtable events, including one on Environmental (and Biodiversity) Net Gain in September, and the development of the new Parliamentary group for nature.

Notes

1. https://www.cieem.net/eu-referendum#Key-Messages
2. https://www.cieem.net/eu-referendum
3. https://www.cieem.net/past-consultation-responses
4. https://www.cieem.net/strategic-policy-panel
5. https://www.cieem.net/country-policy-groups

MPs, members and invited guests in discussion in the House of Commons

Obituary: Charles Gimingham

Des Thompson FCIEEM and Sarah Woodin

Patron of our Chartered Institute and Medallist in 2008, Professor Charles H. Gimingham OBE FRSE FRSB, who has died aged 95, was the foremost expert on heather and moorland landscapes. Emerging as a post-war force for scholarly environmentalism, Charles was without the fanfare or glitz that a modern day expert of his standing would command.

Charles was the denizen of moorland. On the Muir of Dinnet National Nature Reserve, some 13 miles east of Balmoral Castle, Charles unravelled through field experiments and observation, the special regenerative capacity of moorland, and its international distinctions.

The principal plant, ling, is known scientifically as *Calluna vulgaris*, from the Greek 'kallyno' (to brush or sweep clean), referring to its use in floor brooms. This plant, and the fire and grazing management which governs its growth and distinctive appeal, was the subject of Charles's pioneering research and quiet advocacy. Studying moorland 'heaths' in northeast Scotland and continental Europe, Charles unravelled the importance of heather burning and grazing in sustaining them. Through chairing expert groups from 1955 onwards, he developed enduring guidance enshrined in legislation governing heather burning, now known in Scotland as *The Muirburn Code*, revised this year.

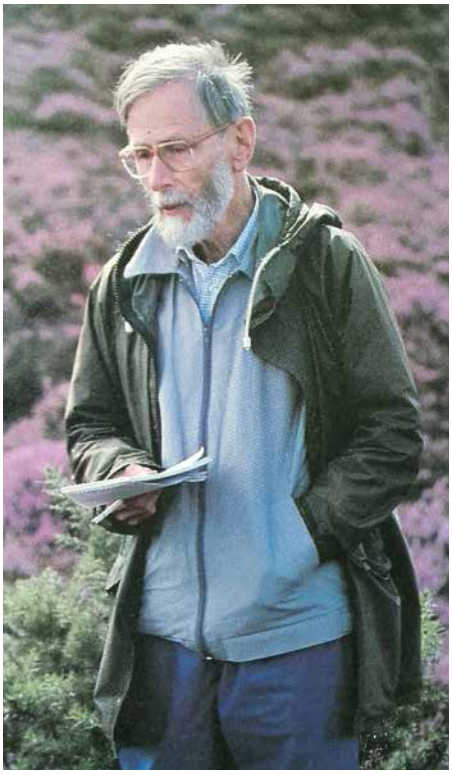
Based in the University of Aberdeen, first as research assistant in 1946, lecturer in 1948, and Personal Chair in 1969, he became Regius Professor Botany in 1981, and 'retired' as Emeritus professor in 1988. The title 'Regius Professor' dates back to 1497 with James the IV conferring the first such title at Aberdeen University.

The broadcaster Magnus Magnusson, founder Chairman of Scottish Natural Heritage (SNH), hailed Charles as *"a living legend"* in his foreword to *Heaths and Moorland: Cultural Landscapes*, published in 1995 in honour of Charles's work. Charles wrote in that: *"During the progress of nearly 50 years of heathland ecology there has been one very major change in perception. At the beginning of this period it seemed that there was little threat to heaths and moors because they were widespread in Britain, but it is now realized they are fast disappearing throughout the west European heath region, including south England."* Poor management and industrial acidification were the main culprits and, through his research and ensuing textbooks (notably *Ecology of Heathlands* 1972, *An Introduction to Heathland Ecology* 1975 and *The Lowland Heathland Management Handbook* 1992) and many research papers, Charles wielded scholarly influence over conservation and management practices.

Educated at Gresham's School, and as an open Scholar at Emmanuel College, Cambridge, he took a First Class in Natural Science in 1944, spent a year as research assistant at Imperial College, before moving to his final academic destination, Aberdeen, where he got his PhD in 1948, and gained a DSc from Cambridge in 1977.

His father, Conrad Theodore, was an eminent entomologist and Director of the Plant Pathology Laboratory in the Ministry of Agriculture. In 1948, Charles married Elizabeth Caroline Baird, the only daughter of the Reverend J. Wilson Baird, former Minister of the ancient St Machar's Cathedral in Old Aberdeen, where Charles remained a faithful worshipper and became the longest serving Elder.

Amongst many prestigious positions, Charles was President of the British Ecological Society (1986-87) and The Heather Trust (2004-07), elected a Fellow of the Royal Society of Edinburgh in 1961 and Royal Society of Biology in 1967,



Credit: Des Thompson

and awarded an OBE in 1990. He was a member of many government and agency committees including the Countryside Commission for Scotland, SNH, and the now James Hutton Institute.

Erudite, dignified, and the embodiment of academic humility, Charles supervised many PhD students going on to be international leaders in environmental science. At some time most wore the T-shirt 'Prof Gim rules OK', much to his bemusement. Inspired by Aberdeenshire botanist Alex Watt, himself a student of Sir Arthur Tansley, the pioneer of plant ecology, Charles is arguably the last in line of traditional field botanists embedded as much in academic endeavour as in formative advice to government conservation bodies. The applications of his research to moorland management remain an outstanding legacy.

He is survived by his wife Caroline, daughters Alison, Anne and Clare, and their families.

CIEEM in Numbers

Unless otherwise stated, the below information represents the year April 2017 to March 2018.

At a Glance

At the end of the March 2018, CIEEM members totalled **5,390** – up from **5,024** in the previous year.

CIEEM currently has **440** volunteer roles, filled by **320** dedicated volunteers, who between them contribute in the region of **19,000** hours of valuable time each year to make CIEEM such a success – that represents nearly **10** FTEs!

As of March 2018, CIEEM had **17** members of staff (although when you read this in September 2018 we will have **20**).

Membership

For 2017-2018, we saw a **65%** increase in membership applications received. This is an increase from **566** applications in 2016-17 to **934** (208 upgrades and 726 new applications) received in 2017-18.

On average, two new applicants applied to become CIEEM members every day.

Our volunteer assessors reviewed **360** applications, meaning that at 'higher' (or professional) grades our volunteer assessors looked at almost one new application every day. For new applicants there was a **87%** success rate.

New members admitted between 1 April 2017 and 30 March 2018 totalled **637**.

We supported **107** members with abeyance agreements.

Member Networks

CIEEM's **170** Member Network volunteers organised **63** local events, which were attended by around **1,350** delegates. This is a fantastic opportunity to network and share skills.

Professional Practice

Our Professional Development team organised **119** training courses, attended by **1,141** delegates, alongside organising **8** conferences that were attended by **925** individuals. The average feedback for training events was **4.63** (scored out of 5, with 4 = 'very good' and 5 = 'excellent'). We also conducted **11** webinars, reaching an audience of over **2,000** people.

We investigated **15** complaints against members.

Policy and Communications

The Policy and Communications team posted **65** news items to the website, in addition to publishing **38** feature articles (in four editions of *In Practice*).

On social media, we have increased our Twitter followers to over **5,000** and to more than **7,000** LinkedIn group followers.

On policy, we responded to **7** consultations and queries, and attended over **50** engagement events and meetings across the UK and Ireland.

Carbon Emissions

CIEEM activities produced a total of **25.598** tonnes of CO_2. This is a combination of travel (staff and volunteer) and Secretariat energy consumption in Winchester. To help offset this, CIEEM will donate **£200** to a relevant project in the UK and/or Ireland.

Review of CIEEM Membership Grades: The Findings

Stuart Parks
Membership Manager, CIEEM

In recent issues of *In Practice* we have referred to a comprehensive review of CIEEM's membership structure and grades undertaken this year (see Issue 97, pg 59-60). This review has looked at trends in our own membership recruitment and retention, and assessed how our existing offer compares with those of other professional bodies (and, in particular, bodies relevant to the broader environmental sector). The review was commissioned by the Governing Board and has been undertaken by the Secretariat supported by the Membership Admissions Committee, the Registration Authority and the Advisory Forum.

Some of the issues that we have uncovered as part of this process, for example changes needing to be made to the terms of abeyance agreements, the simplification of membership application forms and the relaxation of some unnecessarily rigid criteria around sponsors for applicants, have been straightforward to resolve and, with the Governing Board's approval, we have been able to implement these to allow members to benefit from them without delay. Other findings have required more discussion which has led to some additional changes being proposed. This article outlines what we propose to change, why we feel it is right to do so, and the process for implementation.

Where are we now?

Members will be pleased to learn that overall things are very positive from a membership recruitment and retention perspective. We are seeing an increasing number of new applications, month by month and, encouragingly, whilst the majority of our members are still at the Full grade, our fastest growing categories of membership are Student and Graduate. In an effort to better support these members at the earliest stages of their careers, our internal Student and Careers Working Group, supported by the Training, Education and Career Development Committee, is focussing their efforts on improving our careers advice and support and planning a dedicated programme of professional development opportunities for this audience.

For those with considerably more experience, the Chartered Ecologist Register continues to grow steadily and applications for both this and Chartered Environmentalist perhaps reflect the evidence that we have started to see of a growing demand for this level of professional accreditation from employers and clients. There is more to learn from employers across the sector and we have already embarked upon a series of exploratory discussions to inform the future development of our offer.

Our review highlighted that, in comparison with other professional bodies serving our sector, CIEEM's membership offer is very reasonably priced, has comparable member benefits and our recent investment in new IT systems has allowed us to keep our administration fees significantly lower than those of other bodies. We also enjoy an enviable retention rate of well over 90% of our members every year so it is encouraging that, overall, we appear to be getting it right for you. However, we feel that we currently present a confused membership journey with a lack of clarity over which grades to apply for. There is also some evidence that many potential members at the earliest stages of their career do not apply for membership as they think they need to be in paid employment to be able to successfully evidence their competence.

What has become very apparent is that to continue to offer a specific Graduate membership grade when our overarching principle is to reward evidence of competence is now difficult to justify. Whilst we recognise that it is likely that someone putting considerable effort into achieving a degree level qualification will be able to move more swiftly to the next grade of membership, we are also aware that other members with equivalent competence, gained through alternative, non-academic routes, are being treated less favourably in terms of membership benefits.

At the more senior end of the membership journey, there is a perception that the application process for Chartered Ecologist status is too onerous (rather than the award being too difficult to achieve).

What are we planning to do?

In order to address these issues, the Governing Board has agreed to close new admissions to the existing Graduate membership grade in 2019 and create a new 'Qualifying' grade of membership to support all those at the early stages of their career, whether graduates or non-graduates. Our ambition for this grade is to welcome early career ecologists and environmental managers and allow them to benefit from the CPD and networking opportunities that CIEEM has to offer at the earliest opportunity. Therefore, instead of requiring applicants for this grade to

wait until they can evidence a Basic level of competence, we will instead admit them to the new Qualifying grade (which will not have an associated post-nominal), ask them to use the Competency Framework to identify the skills they wish to develop and then offer support for them to do so. We will also keep the subscription fee for this grade affordable compared with other bodies to make it as accessible as possible.

This change will be for new early career applicants. All current Graduate members will keep their existing benefits, including their post-nominal, for a further period of up to 24 months to allow them enough time to gain sufficient competence to progress to Associate membership.

We have also recognised that more than a third of our eligible members have now achieved Chartered status. In order to help meet, and hopefully further fuel, the growing demand for this standard we will be repositioning Chartered status as a more clearly aspirational goal for our members. From the start of the next subscription year we will be working with the Registration Authority to make changes to our application and assessment processes for Chartership, focussing on taking into account previously evidenced competence and making the application processes far more straightforward without compromising standards. Further information on this will be provided in a future edition of *In Practice*.

The coming subscription year will see us making even more use of our recent investment in IT systems to increase our understanding of the skills, interests and needs of our members. This growing knowledge will inform the development of our new website. Alongside this we intend to make our membership offer even more relevant and will be introducing additional benefits to further increase value for money. All of these changes will contribute to the creation of a much more straightforward and accessible membership structure, with clear aspirational goals and simpler processes to achieve them. We are also talking to a range of employers from across the sector to both improve our understanding of the value of membership to their staff and to identify ways to support their continuing professional development needs.

Our membership is growing. As our voice is becoming louder and our influence more widely recognised we need to have a membership structure and processes that can welcome those that hear it and want to be part of what CIEEM represents and what CIEEM does. These changes are an important step in that development process.

If you would like to know more detail about the forthcoming changes (other than chartership) or are an employer and would like an opportunity to take part in our employer engagement programme, please contact StuartParks@cieem.net.

Myth-Busting the Membership Application Process

The Secretariat's membership team has processed hundreds of applications since the introduction of the competence-assessed application process for higher grades of membership. Here they address some of the most frequently asked questions and misconceptions they come across. So if you are considering upgrading your own membership, or encouraging (or even sponsoring) a colleague to apply, please read on.

1: I don't think I've been working for a sufficient number of years to upgrade

There is no eligibility criteria based on number of years' experience. Use CIEEM's Competency Framework to plan your personal development and understand what is expected of members at the next level of competence. Regular self-assessment, ideally supported by your line manager, will help you to identify the right time to apply to upgrade. When the time comes it is best to start working on your application in your own time rather than under a time pressure later.

2: I don't think I'd be successful with an application to upgrade my membership

It is important that members hold the grade of membership which best reflects their skills and ability, so if you have remained at the same grade for some while then now might be time to start working on your upgrade application. Last year almost 80% of upgrade applications were successful.

3: I don't know who to ask to sponsor my application

For Student applications no sponsor is required, and for our Qualifying grade your sponsor just needs to confirm that the details provided in your application are correct. Sponsors for other grades need to be people best placed to endorse the evidence in your application. It could be an academic tutor, your line manager or a colleague you work alongside. Sponsors are not required to financially support your application.

4: I don't know any CIEEM members to act as my sponsors

Ideally sponsors supporting membership applications should also be CIEEM members but we understand this is not always possible. We therefore do accept non-member sponsors, but we will require you to send in a copy of their CV so that we can verify their suitability to endorse your evidence at that level of competence you are claiming.

5: I've only ever worked in one company so can't find enough support for my application

We understand that the people who know you and your work best are often the colleagues you work alongside each day, and if you have only ever worked for one company, or the same company for a long time, the pool of potential sponsors could be small. Consider the evidence you are providing within your application and approach those who are best placed to endorse your claims. Sponsors are asked to provide supporting statements for each piece of evidence and well written sponsor statements really help to strengthen your application. If your pool of potential sponsors is limited, start by talking through your experience with them before writing your application to ensure you select examples that best demonstrate how you meet the requirements of the competencies you have identified as your strengths.

6: I cannot find sponsors to endorse every piece of evidence in my application

As long as each of your competency statements are endorsed by at least one of your sponsors, that is ok. On rare occasions we may even allow you to select a third sponsor for a specific piece of evidence. Remember too that you do not have to ask a sponsor who may have supported an earlier application from you to sponsor you again. Ensure you choose people who are best placed to be able to support the evidence you have provided within your current application.

7: My colleagues think that acting as a sponsor is too onerous and they don't have time

Well we do not think it is, but it is also not a responsibility to be taken lightly. As a membership organisation we hope that more experienced members will be willing to support and encourage more junior colleagues to develop their competence, progress in their careers and be recognised for it. Do encourage reluctant sponsors to read the 'Guidance document for sponsors' available online to better understand the role. Consider also when the 'best' time of year might be to approach them and provide as much notice as you can so that they do not feel under pressure.

8: I understand I can only apply in October at the start of the subscription year

We accept applications for membership throughout the year, so you can submit an application at any point when you feel

ready. If you're applying for Chartership you will need to check our website for the latest application submission dates which fall throughout the year.

9: I've heard it can take a long time to receive an outcome

Student and Qualifying applications are processed by the Secretariat and an outcome is provided within four to six weeks. Competence-assessed grades are reviewed by assessors who are members themselves and act as volunteers. Though they work to deadlines to ensure applications are processed as quickly as possible, given the volume of applications we receive it typically takes around four months for the whole process to be completed. You can help by ensuring your application is completed fully in the first instance and responding promptly to any requests for additional information. Bear in mind too that assessors have limited availability over the summer months due to work commitments so do plan well ahead when preparing your application, particularly if you are needing it for work or a particular project.

Chartered Ecologists

Reassessment

The Royal Charter that established the Register of Chartered Ecologists requires Registrants to be reassessed periodically to ensure that they have maintained their level of competence and continue to meet the required standard for registration. CIEEM's Governing Board, which has responsibility for maintaining the Register of Chartered Ecologists, has recently determined that reassessment shall be required seven years after initial registration.

To facilitate this, a straightforward reassessment process has been agreed to ensure that continuing professional standards expected of Chartered Ecologists are being met. No fee will be charged to undertake this process and re-register.

Registrants will be notified 12 months prior to the 7-year anniversary of their initial registration. Therefore, the first Registrants needing to go through this process will be notified in October 2019 for re-registration by October 2020. Registrants will be able to request their re-registration to be brought forward to help manage specific personal circumstances and ensure their availability. Six months prior to the anniversary, Registrants will be invited to submit the relevant reassessment documents for review. Reassessment documentation will include a short personal statement explaining how the Registrant has continued to be an effective ambassador for the profession and champion of the natural environment, and how they have maintained or enhanced their level of competence.

The assessment will be mainly desk-based with the documents being reviewed by Chartered Ecologist assessors. Very occasionally there may be a need to attend a short professional review interview, which will be conducted by video conference where possible.

Further information about re-registration will be available on the CIEEM website in due course.

Chartered Ecologist Workshops

We regularly hold workshops on applying for Chartered Ecologist status. If you are interested in attending one in your area, please contact the Registration Officer, Michael Hornby, at registrationofficer@cieem.net.

We have recently held a successful workshop on applying for Chartered Ecologist status for a large employer, supported by their local Geographic Section Committee. If your organisation might be interested, please contact the Registration Officer and we may be able to organise a workshop in your workplace.

Lastly, a pilot workshop webinar can be viewed on the CIEEM webinars section of our website www.cieem.net.

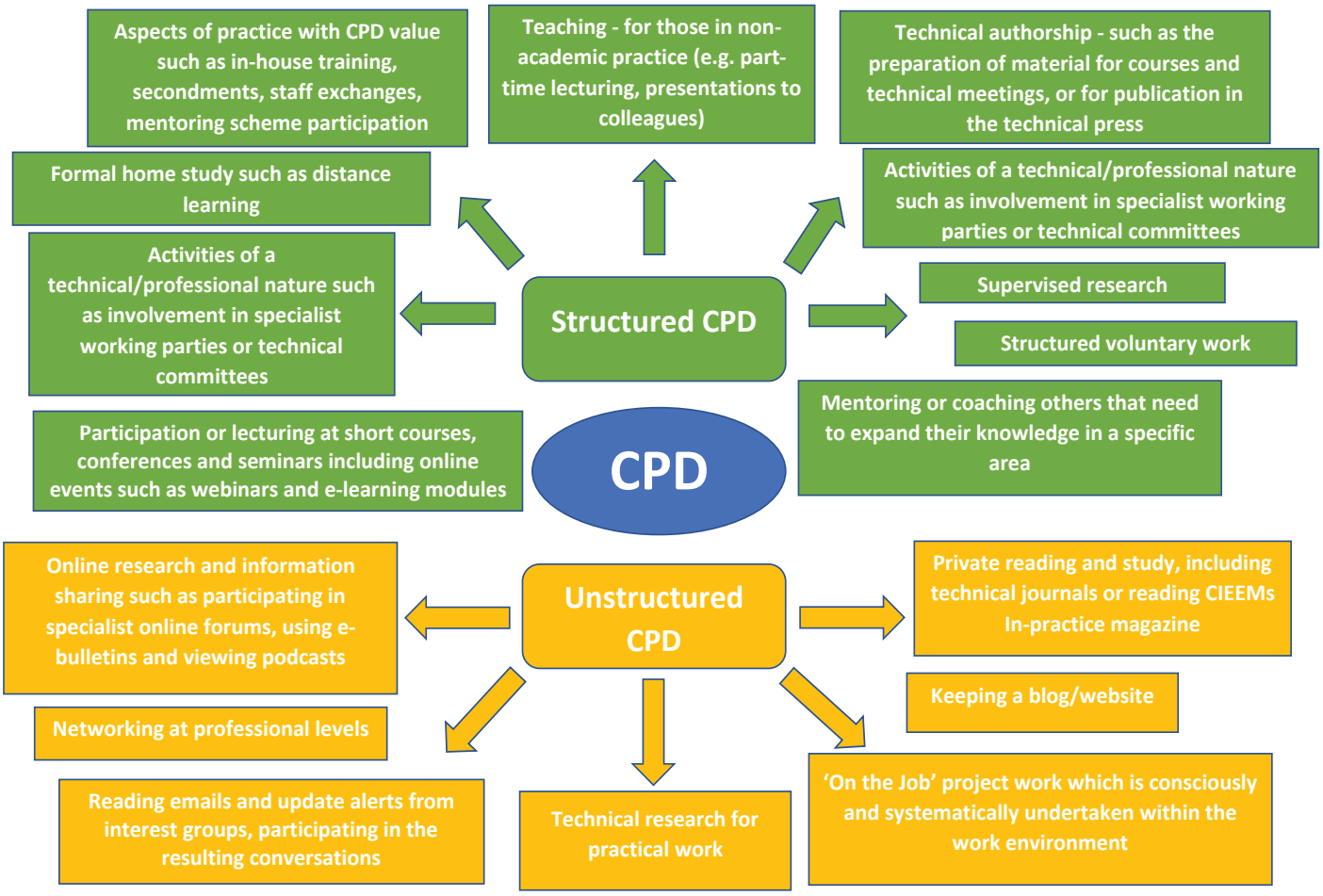
Continuing Professional Development – Making It Work For You

Krystie Hamilton
Professional Development Co-ordinator, CIEEM

Fitting Continuing Professional Development (CPD) in around a busy work schedule can be difficult and CIEEM's member obligation – a minimum 30 hours a year – can seem a little daunting. However, professional bodies require members to do CPD for two good reasons. Firstly, the body is promoting its members to the public as being sufficiently competent to do what the public requires them to do, and therefore we do expect members to ensure that their knowledge and skills are up-to-date. Secondly, we can all become accustomed to doing the same routine tasks to the same standard as usual. A requirement for CPD encourages members (and their employers where appropriate) to invest in developing new areas of knowledge and skills, to challenge thinking and continually improve and enhance your career prospects along the way.

What is CPD?

As the diagram shows, there are many different types of relevant CPD activity that can count towards meeting your member obligation. We are very aware of the



barrier that fees can be for our members and we do keep the costs of our provision as affordable as possible. There are also a lot of CPD activities that are free or very low cost – it is not all about training courses and conferences.

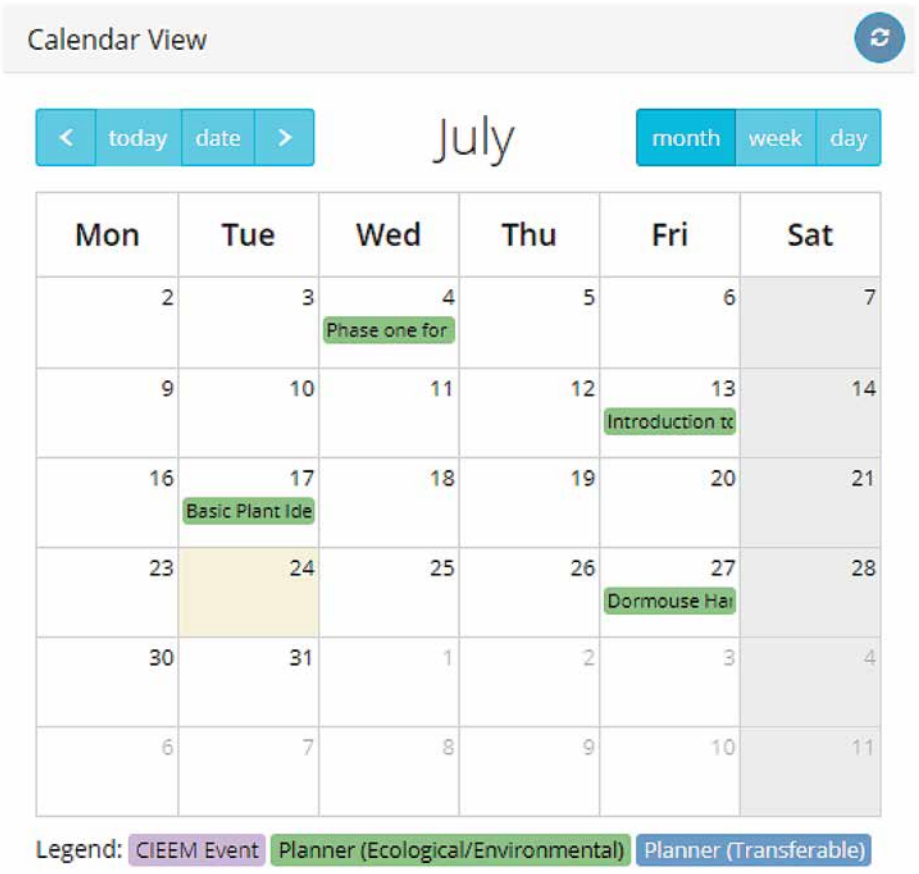
Members are required to complete at least 20 hours structured CPD each year (shown in green in the diagram). The remaining 10 hours can be structured or unstructured – the choice is yours!

Relevant CPD

CPD activities must be relevant to the professional practice of ecology and environmental management. Learning new knowledge and skills whilst volunteering can be one of the many ways of doing this. We judge relevance by whether the activity relates to any aspect of our Competency Framework, which can be found at www.cieem.net/competency-framework.

Recording your CPD – Making the most of the online CPD tool

Your member obligation is to not only do at least the minimum amount of CPD, but also to record it and make it available to us if requested to do so. CIEEM's online CPD tool is there to help make recording it easier for you. The tool includes a planning calendar to help schedule in your CPD for the upcoming year, which can then be easily transferred into a record on completion. We have a friendly Professional Development Team on hand to help, if you do need any guidance and there is also a helpful webinar available on our website, which provides a tutorial on how to use the online CPD tool.



The 'learning outcome' section on the CPD tool is designed to help you to reflect and evaluate each activity and think about how it will influence your professional practice. This is often the most overlooked part of CPD recording but is the most valuable part. Reflection can also help you to identify other competency areas that you would like to focus on.

CIEEM's Training, Education and Careers Development Committee (TECDC) audits a random selection of members' CPD records each year, not only to ensure that the membership obligation is being met but also to provide feedback to those members and to identify trends in learning. The CPD audit process is changing in 2019, but more of that in the next issue of *In Practice*.

Should CIEEM become a Registered Charity?

Stephanie Wray CEcol CEnv FCIEEM
CIEEM President

One of the questions members will be asked at the next AGM is whether CIEEM should become a Registered Charity in addition to having its Royal Charter. This question has arisen because the law in the UK requires organisations undertaking charitable activity to be registered. There are numerous examples of other professional bodies that are both chartered and registered charities.

Why are we eligible?

It is perhaps not so much a question of being eligible as being required to consider it. Indeed IEEM (as we were then) did consider applying previously and consulted with the Charity Commission, but the Institute's priority and focus became gaining chartered status, which of course we did in 2013. CIEEM's Objects, as set out in the Royal Charter, are:

> *"to advance the understanding and the standards of practice of ecology and environmental management for the benefit of the natural environment and the public good; and to further the conservation, management and enhancement of biodiversity and the maintenance of ecological processes and life support systems essential to a fully functional biosphere."*

These Objects fall within the Charity Commission's definition of charitable purposes. This, together with the fact that CIEEM's activities are designed to support the profession to deliver the best possible outcomes for biodiversity, means that we are delivering public benefit as well. Having reviewed legal advice, the Governing Board is of the opinion that we should register CIEEM as a charity. Alternatively, we may have to reconsider our Objects to make them less charitable.

What happens to the Royal Charter?

Becoming a registered charity does not affect our Royal Charter. We would still be complying with all of the provisions of the Royal Charter and the powers that it gives us. There would be no need to change our name and the Royal Charter would also be our Constitution. We would still be under the oversight of the Privy Council, but we would also have oversight from the Charity Commission. CIEEM would be registered as a Charitable Incorporated Organisation (CIO) with members still having the same voting rights as you do now.

What are the benefits?

The benefits are that we would be complying with the law without having to change our Objects. We would also be able to apply for charitable funding (e.g. grants) for projects that we want to do that deliver a public benefit (bearing in mind that supporting sustainable management of biodiversity is a public benefit). Should our turnover increase significantly there may be tax benefits, but we are a long way off that point at present.

What are the drawbacks?

The Governing Board has been unable to identify any significant drawbacks. Oversight from the Charity Commission is not onerous and CIEEM should be complying with good practice in this regard anyway. The Directors (i.e. the Governing Board) would also be the Trustees of the charity. The financial accounting requirements are very similar to what we do currently. We would still be able to carry out our current full range of activities, including our policy influencing work and being a source of advice for governments (which is a requirement of our chartered status).

What happens next?

You, the members, have to decide whether or not we should apply to become registered as a CIO or not. You will have the opportunity to do so by voting at the AGM (or voting electronically beforehand) and we will then report back to you. If the answer is 'yes', then we will begin the application process as soon as possible.

Student Hub:
Advice for Students

Amber Connett

BSc (Hons) Conservation Biology graduate and CIEEM Policy and Communications Intern

What advice would you give other students who want to study in this field?

To anyone struggling to fit work experience around their studies, I would highly recommend taking that year out whilst still within the support network of the university, as getting stuck into a full-time placement gives you a real opportunity to experience the work and get to know whether it is right for you! If a placement year is not possible, joining relevant professional bodies, attending training courses and volunteering with local organisations or businesses also offers invaluable experience and allows you to build contacts who may help with further work experience.

Alex Pelton

Third year BSc Countryside and Environmental Management student at Harper Adams University

Why did you choose to study this course and how has CIEEM helped you along your career journey?

Numerous reasons exist for me choosing to study this course: the desire to work in the environment sector; engaging course content; and excellent graduate employability. At Harper Adams, each student must undertake a work placement. Placements are an invaluable way of learning and developing industry specific skills. A year of experience, skills and qualifications gives students a major advantage over students who haven't received the same opportunities.

Studying a CIEEM accredited course has allowed me to connect and network with potential employers, it aided me in finding a placement and being a Student member of CIEEM gives me the opportunity to take part in subsidised training courses.

Amy Lovegrove

Final year student at The University of South Wales studying BSc Natural History

What is your career goal and do you undertake any extra-curricular activities to help achieve this?

After graduating next year, I'm hoping to go on to do a masters and PhD in ecology, having strengthened my interest in environmental conservation during two internships abroad. I also volunteer with local conservation charities, so I can learn more about fieldwork and how habitats are managed, and to gain more experience so that I can work in ecological research in the future.

This is such a competitive field, so for someone pursuing a career in this area, I'd say that getting as much voluntary experience as possible is a huge help as it will develop important skills such as surveying and taxonomic identification. My internships have taught me that it's one thing to be able to understand the theory in a university environment, but it's totally different working in the field!

CIEEM | Chartered Institute of Ecology and Environmental Management

Get more when you partner with CIEEM

Looking for someone exceptional?

Don't miss the opportunity to advertise your job vacancy to an audience of industry professionals on the CIEEM jobs webpage or inside *In Practice*.

CIEEM conferences

By sponsoring a conference or exhibiting at one, you reach an audience of professionals before, at and after the event via emails, programmes, webpages and social media.

Celebrate the sector with us in 2019

The annual CIEEM Awards celebrate achievements of both the profession and of individual practitioners. The Awards raise the profile of the sector, highlighting our role in championing the importance and practice of ecology.

For more information contact:

enquiries@cieem.net

www.cieem.net

British Ecological Society

Richard English
Communications Manager, BES

Hello and welcome to the latest round up of BES news. In this edition, our main news is Annual Meeting registration and abstract submission are open and we have launched our newest journal: *People and Nature*. As ever, we are always happy to chat through any potential collaborations, so please do get in touch.

BES Annual Meeting

16-19 December 2018, Birmingham, UK

Registration and abstract submission are now open: www.britishecologicalsociety.org/BES2018

Our Annual Meetings are an inclusive place to discover the latest science, network with 1,200 international delegates, attend career-progressing workshops and enjoy our fun social events.

Our Thematic Sessions aim to discuss important questions and showcase integration with disciplines outside of ecology. This year they include:

- Infectious disease ecology at the human-wildlife interface: management and conflicts
- Microbial influence on climate change feedbacks
- Advancing our understanding of long-term ecology: combining ecological and palaeoecological approaches and metrics
- Upscaling biodiversity-ecosystem functioning research
- Long-term ecological experiments: Unique challenges and opportunities

Our ever-popular interactive workshops include:

- How to create engaging video content using a smartphone
- Introducing early career researchers to publishing in international journals
- Setting up a successful field course workshop
- Social media for science communication
- Turning science into policy, via government consultations and inquiries

People and Nature

Our newest journal opened for submissions in June and we're pleased to see a steady stream of interesting inter-, multi- and trans-disciplinary work coming in. **We welcome submissions from practitioners**. We publish work from across research areas exploring relationships between humans and nature. We encourage conceptual and empirical approaches to answer interesting questions within this scope. If you have an idea for a submission and would like to discuss it before submission please do get in touch with the Managing Editor, Emilie Aimé, at emilie@britishecologicalsociety.org.

LGBT+ STEM Day

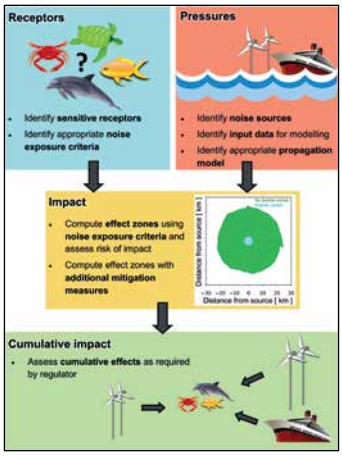
We were pleased to take part in the first ever international LGBT+ STEM day of celebration! The 5th of July was the day we honoured the memory of those LGBT+ people who came before us, as well as increasing the visibility of the community to show that it is possible to follow your passion whilst being yourself. We are also starting an LGBT+ network so, if you are interested in joining the group and/or helping to set it up, email me at richard@britishecologicalsociety.org.

Summer Schools

As we write this, we will be working hard with CIEEM to deliver our *two* July Summer Schools. The first is our A-Level group, closely followed by our Undergraduate group. The Summer Schools are a jam-packed 5-day whirlwind tour of ecology full of lectures, excursions, lab work and tutorials. They provide an excellent opportunity to experience the breadth of ecology and network with professionals and peers. Watch out for a full round up in our next *In Practice* update!

The latest *Practitioner's Perspective* from *Journal of Applied Ecology*

With human activity increasing, ocean noise is affecting more wildlife, big and small. In their recent *Practitioner's Perspective*, Rebecca Faulkner and colleagues present a framework of key principles for assessing the impacts of underwater noise. Read more about the team's practical solutions for tackling this growing marine concern for here: http://bit.ly/2u8wq1n



Credit: Rebecca Faulkner, Guiding principles for assessing the impact of underwater noise (DOI: https://doi.org/10.1111/1365-2664.13161)

Contact
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Member Network News

CIEEM has regional Geographic Sections across England and national Sections in Wales, Ireland and Scotland. Special Interest Groups (SIGs) provide a focus for activity in particular topic areas of ecology and environmental management.

Each is run by a volunteer committee, providing opportunities to network, share knowledge and learn more about the science and practice of our profession.

There are currently over 160 Member Network volunteers. For further information about what they get up to and how you can get involved, please visit www.cieem.net/member-networks.

WALES

Reptiles Around Borth
21 April 2018

Mark Barber of the Amphibian & Reptile Conservation Trust led our visit to the Ynyslas Dunes and Borth Bog (Cors Fochno), part of the Dyfi NNR, in search of reptiles. As we waited for the group of eight CIEEM members to arrive at the Ynyslas Visitor Centre, Mark had already found several common lizards and a male adder along the paths just a few metres from the Centre with the legions of dogs and their walkers and Visitor Centre visitors all oblivious of the herpetology at their feet!

Read more about it at www.cieem.net/wales

Mark Barber with the group looking for sand lizards (photo by Fred Slater)

SCOTLAND

The Lynx and Us
28 June 2018, Edinburgh

June saw CIEEM Scotland members (as well as a large, and very welcome, contingent of non-members) treated to a fascinating and informative talk about one of Europe's least well-known predators. Dr David Hetherington covered a great range of topics ranging from species biology and ecology, to the history of the species in the UK, to how the species interacts with and comes into conflict with humans in other parts of its range; some of which it has been reintroduced to, and in some of which it has always been present. The talk was illustrated by some outstanding photographs, and augmented with a very interesting Q&A session after the talk.

The first in a series of species specific *'Returning to the Wild'* seminars put on by the Scottish Geographic Section, this was their best attended event of the year so far. The Section hopes to build on the success with subsequent events. Keep an eye on the events pages for details of the next ones.

Read more about it at https://www.cieem.net/scotland

WALES

British Ecological Society A-Level Summer School 2018

Beyond Academia: Delivering CIEEM sessions at the BES A-Level Summer School, South Wales
12 July, Margam Park

On Thursday 12 July 2018 our Project Officer for Wales (Diana Clark) led a group of fantastic CIEEM member volunteers to deliver sessions on 'Careers Beyond Academia' at the BES Summer School for A-Level students, held in the FSC Discovery Centre at Margam in South Wales.

The Summer School concept has been designed by BES to immerse a select group of 16-17 year olds from disadvantaged backgrounds in the joys of working in ecology – from academic research to intertidal marine ecology, from moth trapping and quadrats to surveying for bats – all packed in to a single week of fun.

We kicked off our sessions with a brief introduction to CIEEM and what its purpose is, followed by a 1-minute 'potted history' from each volunteer on how their career path worked out. Emphasis was placed on the multiple path options available to arrive at many varied careers.

We spent an hour visiting part of Margam Park, viewing the site from the perspective of an NGO reserves manager, a Local Planning Authority (LPA) ecologist and an ecological consultant, before returning to the classroom for a debrief – and cake! The rest of the session included brief talks on turning WWII bunkers into bat houses, becoming an entomologist, the role an LPA ecologist has and getting green infrastructure into our urban environment. We also discussed the skills employers require from new graduates and topped off the day with an evening bat walk, checking out

continued.....

horseshoe and pipistrelle emergences en route to the lake for a show of Daubentons' acrobatics.

Huge thanks to all who assisted in making this event so successful, including Alex Ellis (Arcadis), Sean Hathaway (Swansea Council), Nia Howells (Cardiff Museum), Kailey O'Brien (Arcadis), Laura Palmer (Neath Port Talbot Council), Julie Player (Arcadis), Ellen Quinton (Arcadis), Sarah Simons (Arcadis) and Anna Sutcliffe (Biodiversity Solutions). Also to Karen Devine at BES for her fabulous, unwavering support.

2018 CIEEM ELECTIONS

September sees the launch of the 2018 CIEEM elections, with opportunities to get involved in all of our Member Network Committees. We'll be inviting nominations during September and early October, so do keep an eye on your emails and at www.cieem.net/cieem-committee-vacancies for information on how you can take the next step.

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

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

Complaints Update

Breaches of the Code of Professional Conduct

Andrew Warren MCIEEM was found to have breached the following clauses of the *Code of Professional Conduct*: 4 and 6.

These breaches related to:

- Insufficient quality assurance processes for ensuring that work (including that undertaken by sub-contractors) was completed to a sufficiently high standard.

Mr Warren has been reprimanded with advice.

New Members

The decision on admission is usually taken by the Membership Admissions Committee or Registration Authority under delegated authority from the Governing Board but may be taken by the Governing Board itself.

CIEEM is pleased to welcome the following individuals as new, upgraded and Chartered members:

ADMISSIONS

Chartered Ecologist (CEcol)

Victoria Alexander, Simon Boswell, Clare Caudwell, Jonathan Davies, Judith Giles, Louisa Medland, James Packer, Samantha Saunders-Davies, Lorraine Woolley

Chartered Environmentalist (CEnv)

Samuel Arthur, Sam Bower, Dr Samuel Bridgewater, Tim Brooks, Rachel Lenane, Jennifer Pollard, Barnaby Scott, Richard Smith, Laura Thain

Full Members (MCIEEM)

Naomi Diver, Lindsay Mackinlay, Sally McColl, Philip Newman, Ashley Pinnock, Katie Spencer, Dr Lorna Wilkie, Dr Julie Winterbottom

Upgrades to Full Membership (MCIEEM)

Andrea Cordon, Dr Leslie Cousins, Thomas Deaney, Paul Diamond, Emily Dickins, Samuel Durham, Joanna Greetham, John Hynes, Holly Lewis, Julie Player, Daryl Robinson, Natalie Walsh, Joel Wright

Associate Members (ACIEEM)

Reena Bhavsar, Darren Denmead, Maria Gill, Craig Greenwell, Nicholas Hall, Dr Jessica Lea, Kathryn Loat, Stuart Macpherson, Samuel O'Hara, Rebecca Price, Katherine Reed, Jenny Ross, Darran Sharp, Dave Welsh, Donnacha Woods

Upgrades to Associate Membership (ACIEEM)

Sophie Amphlett, Lucy Boyett, Kirstene Campbell, Benjamin Christie, Emily Clark, Emma Downie, Timothy Elton, Ryan Harris, Thomas Richards, Lindsay Stronge, Grace Turner, Sharon Yardy

Graduate Members (Grad CIEEM)

Harriet Baber, Rebecca Brown, Katie Cammack, Heather Clayson, Dean Cordelle, Patrick Dixon, Joanne Doolin, John Falconer, Jessica Flanagan, Rachel Geller, Edward Gladigau, Samantha Gray, Lucy Groves, Jessica Hinds, Catherine Hunter, Bill Jeffreys, Oliver Kemp, Samantha Lincoln, Rosie McEwing, Cian Ó Ceallaigh, Daniel Perlaki, Adelle Pilfold, Ellen Poppleton, Megan Richmond, Martin Roche, Alexander Rose, Joe Salkeld, Tania Smith, Jake Smith, Amy Spilsbury, Jonathan Stuttard, John Totterdill

Upgrades to Graduate Membership (Grad CIEEM)

Lara Bates-Prior, Georgina Baulcomb, Benjamin Brown, Helen Butt, Joanna Coxon,Daniel Flew, Rory Glackin, Elizabeth Mattison, Julie Merrett, George Poulton, Joseph Stevens, Miles Watchman

Qualifying Members

Nicholas Ball, Emma Bolton, Ellis Fenwick, Steven Greenwood, Lee Jenkins, Jayne Lea, Maëva Perez, Gary Price, Michele Quarta, Hannah Rawnsley, Mariya Tarnavska, Cassian Wigley, Katherine Williams, Sarah Wotton

Student Members

Daniel Alexander, Saul Avery, Callum Bees, Wabeka Bekalaze, Steven Bennett, Olivia Benson, Rowell Bingham, Lottie Birch, Olivia Breeze, Thomas Bristow, Katrina Caine, Jennifer Clayton-Brown, Megan Coates, Andrew Cochrane, Caroline Coogan, Elizabeth Cooper, Marisa Costa, Gabrielle Cruttenden, James Delaney, Fraser Donachie, Joe Earnshaw, Lorcan Fenton Leogue, Caroline Folwell, Aurora Gonzalo Tarodo, Elizabeth Grafton, Javier Granados Garcia, Scott Gudrich, Paul Hammond, Sue Head, Olivia Hillman, Rebecca Holmes, Luke Howard, Byron Humphries, Lydia King, Mary Lane, Oluwatoyin Lasisi, Jordan Mann, Francesca Marcolini, Thabo Moea, Benjamin Morris, Jack Moseley, Alex Nadasanu, Rajat Nag, Evan Norcliffe, George O'Ferrall, George Offer, Jay Oliver, Ellen Peet, Tom Powton, Sam Prior, Rosie Purchase, Kaelib Reece, Kathryn Reynolds, Anya Rodriguez-Leon, Amy Screech, Lynn Sorrentino, Robert Sowden, Charlie Sproul, Joy Stephens, Jane Thatcher, Aira-Bree Watson, Connor Wild, Oisin Wilson

Britain's Mammals 2018: The Mammal Society's Guide to their Population and Conservation Status

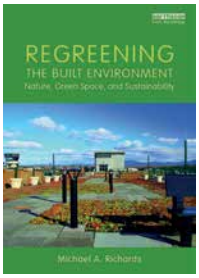
Author: The Mammal Society

ISBN: 9780993567339

Price: £17.99

Available From: www.nhbs.com

This book provides a concise, accessible overview of the results of the latest mammal population and conservation status review, conducted by The Mammal Society. This review used more than 1.5 million records from 58 mammal species in the UK, to produce a comprehensive account of population sizes, geographical ranges, temporal trends and predicted future trends. The book presents findings firstly through a summary of key findings for each species, followed by a series of species accounts which highlight the state of the population and its IUCN status, and finally, by highlighting research priorities which are necessary to fill the gaps in our knowledge of British Mammals.



Regreening the Built Environment: Nature, Green Space, and Sustainability

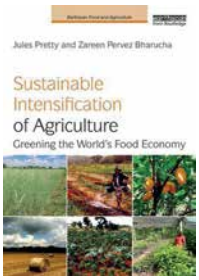
Author: Michael A Richards

ISBN: 9781315195681

Price: £31.99

Available from: www.routledge.com

This book examines the relationship between the built environment and nature. It demonstrates how rethinking the design of infrastructure can sustain the earth environmentally, economically, and socially. Case studies demonstrate how existing infrastructure can be retrofitted with green infrastructure. The book highlights how it is possible a building can be designed that creates greenspace or generates energy, an alley can be a wildlife corridor, and a parking surface can be a garden.



Sustainable Intensification of Agriculture: Greening the World's Food Economy

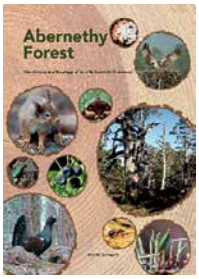
Author: Jules Pretty & Zareen Pervez Bharucha

ISBN: 9781138196025

Price: £29.99

Available from: www.routledge.com

Sustainable intensification refers to increasing yields without adverse environmental impact and the cultivation of more land, which has emerged as a powerful conceptualisation of agricultural sustainability. This book sets out current thinking around sustainable agriculture and intensification. It recognises that world population is increasing rapidly, so yields must increase to maintain food security. Evidence shows how innovations are improving yields, resilience and farm incomes, for both smallholders in developing countries, and in the developed world.



Abernethy Forest: The History and Ecology of an Old Scottish Pinewood

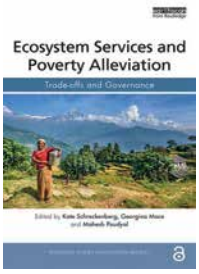
Author: Ron W Summers

ISBN: 9781999988203

Price: £29.99

Available from: www.nhbs.com

This is an in-depth account of Abernethy Forest: a RSPB nature reserve in the central Highlands of Scotland. Trees in this wood of the few remaining examples of Caledonian pinewood with veteran trees dating to the 1600s. Illustrated with period and contemporary photographs, graphs and maps, the book describes the physical geography and history of the forest, covering the changes caused by people and the natural processes that have shaped the forest. It also describes the astonishing diversity of wildlife, with over 3,800 species of plants, fungi and animals, some of which is not found in such abundance elsewhere in the UK.



Ecosystem Services and Poverty Alleviation: Trade-offs and Governance

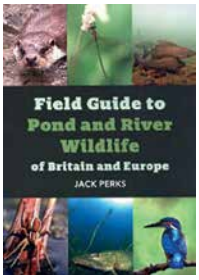
Edited by: Kate Schreckenberg, Georgina Mace & Mahesh Poudyal

ISBN: 9781138580848

Price: Open Access (Online) or £36.99

Available from: www.routledge.com

This book provides a review of current thinking on the links between ecosystem services and poverty alleviation. It showcases the key findings of the Ecosystem Services for Poverty Alleviation (ESPA) programme, which has funded over 120 research projects in more than 50 countries since 2010. ESPA's goal is to ensure that ecosystems are sustainably managed in a way that contributes to poverty alleviation as well as to sustainable growth. This is particularly timely as governments across the world map how they will achieve the 17 ambitious Sustainable Development Goals.



Field Guide to Pond and River Wildlife of Britain and Europe

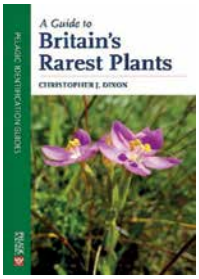
Author: Jack Perks

ISBN: 9781925546101

Price: £14.99

Available from: www.nhbs.com

This Field Guide will help you to identify over 200 species that can be found in our freshwater habitats, including: marginal plants and aquatic plants, fish, amphibians, reptiles, birds, mammals and invertebrates such as dragonflies.



A Guide to Britain's Rarest Plants

Author: Christopher Dixon

ISBN: 9781784271466

Price: £19.99

Available from: www.pelagicpublishing.com

Here, 66 of Britain's rarest flowering plant species are discussed, including the reasons for their rarity and the work being done to save them.

Estimating national population sizes: Methodological challenges and applications illustrated in the common nightingale, a declining songbird in the UK

Chris M. Hewson, Mark Miller, Alison Johnston, Greg J. Conway, Richard Saunders, John H. Marchant, Robert J. Fuller

Journal of Applied Ecology 2018; 55: 2008-2018

https://doi.org/10.1111/1365-2664.13120

National population estimation requires that species-specific variability in detectability, and individuals present outside surveyed areas are accurately accounted for through survey design and statistical analysis. Accounting for these sources of error will not always be possible and will make it difficult to assess true population size and to determine whether sites exceed critical thresholds of importance. This study makes recommendations for study design by presenting methods used to estimate the UK population size of the common nightingale *Luscinia megarhynchos*. The study assesses the sensitivity of the population estimate to the analytical method used and identifies sites of national importance for this species.

Correspondence: chris.hewson@bto.org

Is saltmarsh restoration success constrained by matching natural environments or altered succession? A test using niche models

Martin J. P. Sullivan, Anthony J. Davy, Alastair Grant, Hannah L. Mossman

Journal of Applied Ecology 2018; 55: 1207-1217

https://doi.org/10.1111/1365-2664.13033

In saltmarshes, restored habitats created through managed realignment, sometimes fail to meet targets for biological equivalence with natural reference sites. Understanding why this happens is important in order to improve restoration outcomes. This article outlines the use of niche models to test whether differences in species occurrence between restored and natural saltmarshes in the UK result from failure to recreate adequate environmental conditions. Differences in elevation and redox conditions between natural and restored marshes explained species differences, as well as marsh age. Niche models can, therefore, be used to test whether abiotic differences between restored sites and their natural counterparts are responsible for discrepancies in species occurrence.

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Size and spacing rules can balance conservation and fishery management objectives for Marine Protected Areas

Rachel Fovargue, Michael Bode, Paul R. Armsworth

Journal of Applied Ecology 2018; 55:1050-1059

https://doi.org/10.1111/1365-2664.13043

Size and spacing rules (SSRs) have been proposed as a design guideline for Marine Protected Areas (MPAs) and refer to the size of MPAs and the space between them. Using population models, this article demonstrates that the performance and usefulness of SSRs as guidelines for MPAs depends on the level of knowledge about larval dispersal, and the level of exploitation in the fishery. These context-dependent results offer guidance to future MPA design projects in regions with limited connectivity data, which would typically be used to target areas for protection.

Open access: https://besjournals.onlinelibrary.wiley.com/doi/10.1111/1365-2664.13043

Making rewilding fit for policy

Nathalie Pettorelli, Jos Barlow, Philip A. Stephens, Sarah M. Durant, Ben Connor, Henrike Schulte to Bühne, Christopher J. Sandom, Jonathan Wentworth, Johan T. du Toit

Journal of Applied Ecology 2018; 55: 1114-1125

https://doi.org/10.1111/1365-2664.13082

Rewilding is increasingly being proposed as an environmental management option to enhance biodiversity and ecosystem services. However, there are still uncertainties surrounding its implementation. Here, 5 key research areas are identified to inform the implementation of rewilding initiatives. It is stressed that, a better understanding of the constraints, a clear definition of rewilding and a scientifically robust rationale, is necessary to progress initiatives and the current environmental legislation which focusses on restoring habitats to a historical species assemblage, may no longer be viable given the changing climatic conditions.

Open access: https://besjournals.onlinelibrary.wiley.com/doi/10.1111/1365-2664.13082

Staged-scale restoration: Refining adaptive management to improve restoration effectiveness

Jonathan D. Bakker, Eric G. Delvin, Peter W. Dunwiddie

Journal of Applied Ecology 2018; 55:1126-1132

https://doi.org/10.1111/1365-2664.13050

Staged-scale restoration is a three-part process involving: experimental assessments of alternative restoration techniques on-site, evaluation of treated areas over time, and scaling up of the most successful techniques. This addresses many criticisms directed at conventional adaptive management (AM), and provides a scientifically rigorous strategy to improve restoration while customising treatments for individual sites, through integrating ecological research into restoration. The authors urge the restoration community to explore the utility of staged-scale restoration in diverse socioeconomic circumstances and ecosystems.

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Optimizing the positioning of wildlife crossing structures using GPS telemetry

Guillaume Bastille-Rousseau, Jake Wall, Iain Douglas-Hamilton, George Wittemyer

Journal of Applied Ecology 2018; 55: 2055-2063

https://doi.org/10.1111/1365-2664.13117

Development of transportation infrastructure can have negative impacts on wildlife and their ecosystems due to fragmentation of habitats and danger of death. The importance of wildlife crossing structures to mitigate adverse effects of such features is widely recognized, but the siting of and investment in crossing structures is contentious. Here, the authors develop two algorithms to prioritize crossing points based on frequency of use or breadth of coverage among tracked individuals, using elephant movement as a case study. The study highlights challenges in the approach and necessary data.

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Quantifying landscape-level land-use intensity patterns through radar-based remote sensing

Ruth A. Howison, Theunis Piersma, Rosemarie Kentie, Jos C. E. W. Hooijmeijer, Han Olff

Journal of Applied Ecology 2018; 55:1276-1287

https://doi.org/10.1111/1365-2664.13077

Here, the authors develop a new radar-based remote sensing technique for large scale quantification of agricultural land-use intensity. This is a powerful tool that allows ecologists and land managers to include agricultural land-use intensity measurements in population studies of plants, insects, birds and mammals, at the spatial scale of entire populations. One application of this tool is to evaluate the effectiveness of European agri-environment schemes. This article also outlines a case study of its use on black-tailed godwits.

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Recoverable Earth: a twenty-first century environmental narrative

Paul Jepson

Ambio 2018.

https://doi.org/10.1007/s13280-018-1065-4

This article outlines the potential for rewilding and the process of nature recovery, to become a new environmental narrative. This narrative provides a positive, hopeful view of future relationships between society and nature, and is a stark contrast to past narratives which have focussed on the finite resource of nature and the negative impact of man. The author stresses these differing narratives are complementary and are necessary to encourage conservation of biodiversity in policy and development.

Open access: https://link.springer.com/article/10.1007/s13280-018-1065-4

A review of riverine ecosystem service quantification: Research gaps and recommendations

Dalal E. L. Hanna, Stephanie A. Tomscha, Camille Ouellet Dallaire, Elena M. Bennett

Journal of Applied Ecology 2018; 55: 1299-1311

https://doi.org/10.1111/1365-2664.13045

The ecosystem service concept has potential to inform riverine ecosystem management and decision-making processes. In this review, 33 unique riverine ecosystem services were evaluated across 89 studies to assess research gaps which restrict the use of ecosystem service quantification to manage riverine ecosystems. The review highlights these gaps and points to studies showcasing methods that can be used to address them.

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Spatial prioritisation of EU's LIFE-Nature programme to strengthen the conservation impact of Natura 2000

Virgilio Hermoso, Dani Villero, Miguel Clavero, Lluís Brotons

Journal of Applied Ecology 2018; 55:1575-1582

https://doi.org/10.1111/1365-2664.13116

Despite advances in conservation efforts within Europe during recent decades, assessments highlight a need for adequate financing mechanisms to support the Natura 2000 network. This article demonstrates a method that could be used to identify priority Natura 2000 sites that could guide investment in the future. The method used key species lists associated with each Natura 2000 site to map the distribution of all priority species covered by the Birds and Habitats Directives. Marxan software was used to prioritise allocation of conservation funds among sites, while mimicking the observed conservation effort implemented under the LIFE programme in the period 1992–2013. A poor relationship was found between priority sites with high value species, and the distribution of funds in previous LIFE-Nature programmes. These recommendations could help guide LIFE project proposals from the Member States and fill the current gap in the coverage of priority species.

Correspondence: virgilio.hermoso@gmail.com

Forthcoming Events 2018

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

Conferences		
Date	Title	Location
16 October 2018	CIEEM Welsh Conference 2018 – Recovering Nature: Approaches to species reintroduction and rewilding	Cardiff
20-21 November 2018	CIEEM Autumn Conference 2018 – Advances in Ecological Restoration and Habitat Creation	Glasgow

Training Courses		
September 2018		
3-4	An Introduction to the NVC	Birnam, Scotland
6	Phase 1 for Development	Cambridge
11	Identification of Invasive Alien Plants	Royal Botanic Gardens Kew
12	Introduction to Bats and Bat Surveys	Chipping
12-13	QGIS for Ecologists and Conservation Practitioners	Manchester
15	Bat Handling and Identification	Herne Bay
17-18	Ground Water Dependent Terrestrial Ecosystems	Birnam, Scotland
18	Water Vole Ecology and Surveys	Cirencester
19	Water Vole Mitigation	Cirencester
25	An Introduction to SUAVs for Ecological Practice	Preston
26	Barn Owl: Ecology, Surveying and Mitigation	Tamworth
27	Peregrine Falcon: Ecology, Survey and Mitigation	Birmingham
27	Preliminary Ecological Appraisal: An Applied Approach	Cooksbridge
October 2018		
3	Introduction to Bat Ecology and Bat Surveys	Wareham
3	Eurasian Beaver Ecology and Survey Techniques	Birnam, Scotland
4	Eurasian Beaver Mitigation and Management	Birnam, Scotland
4	Bats: Impact Assessment of Development, Mitigation and Enhancements	Wareham
4	Ecological Clerk of Works	Swansea
9	Effective Communication for Women	Birmingham
11	Badger Ecology and Surveys	Shrewsbury
12	Badger Mitigation	Shrewsbury
16-17	Developing Skills in Ecological Impact Assessment (EcIA)	Cambridge
18	Habitats Regulations Appraisal of Projects (England & Wales)	London
30	Habitats Regulations Appraisal of Plans / Projects (Scotland)	Aberdeen
November 2018		
1	Calculating and Using Biodiversity Units	London
6	Ecological Report Writing	Swindon
7	Floodplain Meadows – monitoring, and factors affecting plant communities	Glastonbury
7-8	Train the Trainer for Ecologists	Edinburgh
8	Ground Level Tree Assessments for Bats	Wotton-under-Edge
12-13	Phase 1 Habitat Survey	Birnam, Scotland
13	Effective Communication Skills	Newcastle
14	Effective Workplace Mentoring	Newcastle
14-15	Biodiversity and the Planning System	Bradford-on-Avon
29	BS42020 Biodiversity: Code of Practice for Planning and Development	Reading
December 2018		
5	Ecological Impact Assessment (EcIA)	London
5-6	QGIS for Ecologists and Conservation Practitioners	Kingston-upon-Thames
6	Survey and Assessment of Hedgerows in Winter Months	Damerham

WYG Welcomes Dr Tim Rich as Principal Ecologist

Working on projects throughout the UK and further afield Tim will share his expertise and experience, to help develop and upskill the wider WYG ecology team.

Tim's vast knowledge of ecology comes from his many years' experience studying, working and teaching others and is joining WYG to continue this.

Over the last 30 years there has been a near-extinction of university botany courses and a steer towards DNA in the lab whereas there is now a call for whole organism biology in the field. This, coupled with the dominance of work on protected animal species for planning, means that the general standard of botanical surveying has dropped, despite its fundamental importance to the initial assessment of all sites. Tim's experience and knowledge can help ensure all WYG colleagues have the skills deliver the high-demand botanical surveying required. He has a degree in Ecology, a PhD in plant physiology however is probably best-known as one of Britain's leading vascular plant botanists, including difficult plant groups such as hawkweeds and whitebeams. He has authored over 300 books and papers on the British flora and is Botanical Society of the Britain and Ireland referee for the cabbage family, gentians, whitebeams and fumitories.

He was the first post-doctoral Research Associate in the Unit of Vegetation Science at Lancaster, and and teaches on the MSc on Biological Recording at Manchester Metropolitan University.

WYG's skilled botanists and ecologists complete site assessments and with additional knowledge from Tim can offer the most relevant and effective solutions. Committed to the development of teams and employees WYG delivers services to help clients progress their projects.
As part of Tim's role at WYG he will be jointly helping to develop training courses which focus on both habitats (such as how to assess grasslands, hedges and ancient woodlands) and species (such as vegetative grass identification or out of season woody species).