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Blue & Green Infrastructure

In this issue

Welcome

Health and Wellbeing of the Profession

Those of us who attended the Summer Conference on health and wellbeing in our profession came away, I am sure, thoughtful and humbled by the honesty and bravery of some of the speakers who shared their personal health challenges and how they have sought to manage them. The programme blend of individual accounts and strategies together with descriptions of organisational approaches at a range of scales was very effective and provided much food for thought. You can see some of the presentations on the website.

For me, there were four key learning points that I want to share:

1. Your physical and mental health and wellbeing is precious – you must take responsibility for looking after it and not rely on others to do it for you.
2. Having said that, we all have a responsibility as colleagues, managers, peers and friends to look out for and look after each other. Do not turn away when you think somebody needs help. Do not miss an opportunity to provide support or signpost to someone else who can help.
3. The 'health and wellbeing' part of Health & Safety policy and practice is just as important as the 'safety' part but is perhaps being overlooked. It should not be optional. Leaving aside our moral responsibility, it makes absolute business sense to do so as well.
4. Collectively we can create workplaces that enable us to raise our hand and say: *"I don't feel great. I need some help please."* What a difference that would make. There are lots of tools and resources out there, but the first step is to acknowledge that we need to do it.

Many of us came away from the conference with ideas about things we could change for the better. I thought that in my team, the CIEEM Secretariat, we do pretty well in supporting each other but I now know there is still more that we can do and we will be looking to implement some changes over the coming months.

Our recently published Health and Wellbeing Survey Report shows that there are many challenges you face, not least some tacitly accepted working practices that undermine your ability to perform well and to have happy, balanced, healthy lives. This should be unacceptable and things need to change. This is only the start of the conversation and the journey we need to take as a profession. I fully accept that CIEEM needs to play a leading role but you, the members, need to play your part too and help drive change.

We are collating ideas and suggestions as to what the next steps should be so please do make your voice heard, either through LinkedIn or by emailing me at sallyhayns@cieem.net.

I would like to thank Liza Oxford-Booth and Mike Oxford for raising the idea of the conference with me and for putting together such an effective and impactful programme. Their advocacy of this topic has been instrumental in helping us take it forward. I also want to thank Liza and Mike for introducing me to the Japanese concept of 'Ikigai' – roughly translated as a reason to enjoy life or a reason to get up in the morning. One thing that always comes across in our member surveys is that, despite the stresses and strains of our work, we all retain that shared passion and belief that what we do makes a difference for biodiversity and people. That is part of our personal 'Ikigai' but I also like to think that it is part of our collective professional 'Ikigai'. We must make sure that we don't lose it, both for ourselves and for those coming behind us. We need to look after it, and making our profession one in which everyone can be healthy, happy and energised is surely a fundamental part of doing so.

Let's do it together.

Sally Hayns CEcol MCIEEM
Chief Executive Officer

Information

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Front cover: Green landscape, Barton Creek, Austin, Texas, USA.

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Governance Elections 2019

September sees the launch of the 2019 governance elections, with opportunities to get involved in both the Governing Board and the Advisory Forum as well as many of our Member Network Committees. Being an active member of one of the Institute's committees provides a great opportunity to get involved and grow your Institute. We will be inviting nominations from mid-August until mid-September, with voting taking place online from mid-October until mid-November and at our AGM on 20 November 2019.

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.

CPD Limits

From 1 October this year there will be some maximum annual limits on different types of CPD in order to encourage members to engage in a range of CPD activities and avoid repetition where it does not appear to aid development of skills. Full details are available on the online CPD recording tool and in the updated guidance (both in the members' area of the website). Also see page 41 for more information.

Parliamentary Group for Nature

CIEEM launched a new All-Party Parliamentary Group (APPG) for Nature in Westminster on 8 July 2019. Barry Gardiner MP was elected as Chair of the group, and Steve Double MP, Caroline Lucas MP, Kerry McCarthy MP, Angela Smith MP and Baroness Barbara Young were elected as Officers.

The APPG for Nature provides a forum for engaging and inspiring parliamentarians and others with the natural world, the major threats that it faces today, and the positives that come from a healthy natural environment. CIEEM is providing the Secretariat for the APPG.

More information can be found at www.cieem.net/appg-for-nature/.

CIEEM agrees MoU with SER Europe

In July, CIEEM and the Society for Ecological Restoration (SER) Europe signed a Memorandum of Understanding (MoU).

SER Europe is the European chapter of the international Society for Ecological Restoration. It is a network of restoration experts, exchanging knowledge and expertise for the promotion of ecological restoration in Europe. Their mission is to promote ecological restoration as a means of sustaining the diversity of life on Earth and re-establishing an ecologically healthy relationship between nature and culture.

The agreement between CIEEM and SER Europe includes reciprocal promotion of events, publications and activities. CIEEM members will have access to the SER Europe newsletter and discounts on selected SER Europe events. CIEEM will be able to contribute to the wider network of European Conservation Societies and actors, and where appropriate, SER Europe will advocate CIEEM's positions in the European policy arena. CIEEM and SER Europe will collaborate, as opportunities arise, on co-organising relevant courses, workshops, conferences and other professional development events. CIEEM has become an Affiliated Member of SER Europe.

Thanks to the CIEEM Ecological Restoration and Habitat Creation Special Interest Group (ERHC SIG) for initiating and facilitating this process.

Staff Changes

We are sad to report that **Deborah Alexander** has left CIEEM as Professional Standards Officer. Deborah had been with CIEEM for six years. We have undertaken a recruitment process and are hopeful of appointing her successor in the near future.

Another long-serving member of staff, **Vicky Bowskill**, will be leaving CIEEM this month to start a PhD on floodplain meadow management. Vicky has been our Volunteer Coordinator for six years. Stepping into a slightly altered role, we are pleased to welcome **Drew Lyness** to the team as Volunteer Engagement Officer.

Rohan Seeliger-Morley joined the CIEEM Membership Team in June as Assistant Membership Officer. Her role replaces the previous Registration Officer role, which has been revised to provide more resilience for the Membership Team.

Jade Hemsley, our current Professional Development Administrator, will be leaving CIEEM this month. We are currently recruiting for her replacement.

We wish all of our colleagues who are moving on all the very best for their new adventures.

CIEEM Conferences		
Date	**Title**	**Location**
24 September 2019	Scottish Conference – Climate Change: Its Impact on Scotland's Wildlife & Landscapes	Stirling
19-20 November 2019	Autumn Conference 2019 – Planning for Success: Maximising Biodiversity Through Planning and Strategic Land Use Management	Llandudno

In Practice themes

Edition	Theme	Article submission deadline
106 – December 2019	Future of Land Management	n/a
107 – March 2020	International Approaches	25 November 2019
108 – June 2020	TBC	24 February 2020

If you would like to contribute to one of these themes please contact the Editor at GillKerby@cieem.net.

Environment Secretary launches review into strongest protections for English seas

On World Oceans Day, former Environment Secretary, Michael Gove, announced a review to examine whether and how the strongest protections for areas of sea, known as Highly Protected Marine Areas (HPMAs), could be introduced. The review, led by Richard Benyon MP, will be asked to establish an evidence-based process and criteria for selecting Highly Protected Marine Areas and recommend potential locations for pilot sites.

https://cieem.net/environment-secretary-launches-review-into-strongest-protections-for-english-seas/

Scotland exceeds tree planting targets

Twenty-two million trees were planted in Scotland last year as part of a push to tackle the "global climate emergency", covering 11,200 hectares. This exceeds the current annual target of 10,000 hectares. The Cabinet Secretary for the Rural Economy, Fergus Ewing, praised the success of the scheme, adding "with an increase in tree planting in the pipeline, it is now more important than ever to make sure the right trees are planted in the right places."

https://www.independent.co.uk/environment/trees-planted-scotland-england-woodland-climate-a8958601.html

Recording Rare Plants In Scotland

The Royal Botanic Garden Edinburgh (RBGE) is seeking information on some rare plants and lichens that grow in Scotland's most inaccessible mountain locations. The work focuses on three main plants: Alpine blue sow-thistle, tufted saxifrage and Alpine sulphur tresses. If any ecologist or botanist has information which they can share, please use the following link for more details and on how to submit your record.

https://www.rbge.org.uk/science-and-conservation/recording-rare-plants-and-lichens/

Updated guidance for undertaking woodland management where dormice are present

Forestry Commission and Natural England have updated the protocol on how to check for dormice in woodlands and operate in their presence.

https://www.gov.uk/guidance/manage-and-protect-woodland-wildlife

Irish bee and butterfly populations facing decline

A report from the National Biodiversity Data Centre has found Ireland's biodiversity status is *"precarious"*, predicting that bee and butterfly populations will continue to face a rapid long-term decline. The report outlines habitat loss, fragmentation, pollution and exploitation as the primary contributors to biodiversity loss in Ireland.

https://greennews.ie/pollinators-facing-precipitous-decline-in-numbers-report-reveals/

New route for M4 in Wales will not go ahead

Welsh First Minister, Mark Drakeford, has announced the M4 'black route' around Newport will not go ahead. The proposed road was dropped on the grounds of cost and environmental impact. The expected cost of the road would be £1.4 billion. The route would go through an area of the 'Gwent Levels', a network of waterways that has been dubbed "Wales' equivalent of the Amazon Rainforest" by the Gwent Wildlife Trust.

https://cieem.net/new-route-for-m4-in-wales-will-not-go-ahead/

Irish Government launch cross-sector climate action plan

The *Climate Action Plan to Tackle Climate Breakdown* contains 180 actions in areas such as electricity, transport, agriculture, heating, and waste. The Government will finalise Ireland's long-term climate strategy by the end of 2019 as per the advice of the Intergovernmental Panel on Climate Change and the recommendation of the Joint Oireachtas Committee on Climate Action.

https://greennews.ie/all-gov-new-climate-plan/

Minister announces sustainable farming scheme for Wales

The Minister for Environment, Energy and Rural Affairs, Lesley Griffiths AM, has unveiled proposals for a sustainable farming scheme to replace the Basic Payment Scheme once the UK leaves the European Union. The new scheme merges the two proposed schemes outlined in the Brexit and Our Land consultation. The consultation on the proposed scheme closes on 30 October 2019.

https://gov.wales/new-welsh-sustainable-farming-scheme-will-protect-and-enhance-our-environment-lesley-griffiths

Welsh Minister for Housing and Local Government warns against the use of netting in development

Minister for Housing and Local Government, Julie James AC/AM, has written to all Heads of Planning with regards to the use of netting on trees and hedgerows in and around development sites. The Minister warned that the practice should only be used as a last resort, and developers should avoid circumstances that require netting to be used. She also refers to our position on the subject.

https://cieem.net/wales-minister-for-housing-and-local-government-warns-against-the-use-of-netting-in-development/

MSP puts forward proposal for Bill to protect wild animals in Scotland

Alison Johnstone MSP has put forward a proposal for a Bill to improve the protection and conservation of wild mammals by ending the hunting of wild mammals with dogs, protecting foxes and hares, and tightening the criteria for issuing a licence for the killing of certain wild mammals. A consultation is now open on the proposal and the deadline for responses is 15 September 2019.

https://www.parliament.scot/parliamentarybusiness/Bills/112079.aspx

Integrating Green and Blue

Sue Illman

Keywords: Blue Infrastructure, climate change, flooding, Green Infrastructure, Integrated Design, SuDS

The recent explosion of publicity around climate change clearly emphasises the need to explore the key role that Green and Blue Infrastructure can play in modifying both our urban and rural environment, if we are to maximise the environmental benefits that can accrue.

The effect of changing weather patterns with more extreme and prolonged rainfall events are clear, affecting how we need to manage land, understand groundwater, and consider our response to coastal flooding from higher sea levels and coastal surges. At the same time, our major towns and cities are mainly located on rivers, where the effect of flooding is exacerbated by upstream land management, urban development and redevelopment, when our sewers are already at capacity. Overall, this makes one in five homes and businesses at risk of flooding, with the huge financial and social cost of flood damage, reinstatement and its long-term impact on those affected. The type of problems that arise throughout the catchment vary depending on location, but with villages, towns and cities potentially affected along the entirety of its length. This multiplicity of causes requires an equally varied range of solutions in each part of a catchment.

Over the 12 years since the 2007 floods, government's position has been reactive as each disaster has struck rather than proactive, despite the excellent analysis and proposed solutions within a range of government documents and reviews. There has been no clear policy around flooding and water management, with policy driven by economic growth and the recent dream of 1,000,000 new homes, with the consequence that the legislation to make Sustainable Drainage Systems (SuDS) compulsory was abandoned, so development in areas of high risk continues, and opportunities to deliver multiple benefits are not realised.

However, over the previous few years we have gradually seen a range of changes that could help to guide us into a new and more sustainable direction. The National Adaptation Plan as published by the Committee for Climate Change (Defra 2018) has a major focus on water, and continues to express concern over the effectiveness (or lack) of government policy. The National Infrastructure Commission is similarly engaged, but finds other issues more critical (except when serious events occur and our infrastructure fails). At the more detailed scale, whilst the government's own review into the effectiveness of SuDS delivery was positive (but superficial), a more detailed review engaging with the Lead Local Flood Authorities highlighted the key problems of poor design, a reliance on hard engineering, and inconsistency in policy throughout the country which thwarts a sustainable water management approach (Landscape Institute and Construction Industry 2019, https://www.landscapeinstitute.org/news/suds-delivery-llfa-review-jan-2019-published/).

SuDS draining the highway in Sheffield as part of their Grey to Green project.

On the positive side, we have now had minor changes to the National Planning Policy Framework (NPPF) which says that SuDS should deal both with water quantity and quality and be multifunctional (Ministry of Housing, Communities and Local Government 2019). This then demands changes to the National Planning Policy Guidance (NPPG) (see https://www.gov.uk/government/collections/planning-practice-guidance). The 25 Year Environment Plan (HM Government 2018) lays down the challenge of us delivering Environmental Net Gain, with the metrics for Biodiversity Net Gain in place and working. Government has also accepted the need for an integrated land management approach. So, policy is gradually turning in the right direction.

Plus, it's not all bad out there; in the industry and at the grass roots level much is happening, with ever-increasing opportunities for environmental specialists to contribute as key members of the team. However, to deliver the best outcomes we all have to recognise that each has a part to play, no one discipline takes priority, and that the approach must be adapted to suit every site individually. We call it 'Integrated Design'. Even developers are learning and are conscious of the need to respond, and local communities in particular are more well-informed and active.

We have to make the best of the opportunities available to us. At the local level most authorities have policies covering flood risk, Green Infrastructure, provision of public open space, public amenity, trees and biodiversity, along with a range of targets. We therefore need to ensure that this suite of policies is applied collectively and coherently, to balance and maximise the potential benefits within a site. Use of the pre-application planning advice system is fundamental to the successful delivery of well integrated projects, as trying to shoe-horn good water management into a fully designed scheme is both depressing, and delivers a fraction of what a fully integrated solution can achieve. However, there is still an unnecessary reliance on 'grey engineering'. The annoying thing is that the well-integrated scheme invariably delivers exactly the same number of houses (for example), but starts from a very different place, and produces a very different outcome. We then need proper follow through, so that the essence of a good scheme is not lost at the detailed design stage, by phasing, or through delivery on site.

Example of an integrated masterplan for a proposed housing development.

We also have the opportunity to deliver well-integrated water management everywhere, not only in the urban environment through new build, regeneration schemes or retrofitting, but also through wider land management schemes. At the local level, Neighbourhood Plans provide the opportunity to address local problems and effect change.

However, the problem is very large, and a number of towns, and some cities are starting to 'revision' their land in a way that acknowledges the disastrous effect that large scale flooding has had (or could have) on them, now that flood maps can clearly identify these problems. This applies not only to inland areas, but to coastal areas as well, where surges and rising sea levels can combine with flood flows along rivers. Solutions can be hard or soft, and we are now embracing the acceptance that both land and property may need to be sacrificed to provide the necessary protection a community requires. However, there is much scope to ensure that the solutions are attractive, creative and often multi-functional, involving habitat creation alongside grey engineering.

The concept of win-win has created a whole new series of partnerships, particularly between water companies and local communities. Water companies are responding in a range of different ways from co-funding SuDS retrofit projects, to much larger schemes.

Water companies struggle with capacity in their sewage networks, so retrofitting SuDS to remove surface water enables them to free-up capacity, prevents them polluting water courses when their sewage systems surcharge, and enables them to delay major investment plans for new infrastructure, all whilst reducing flooding in local communities in an attractive and environmentally sound way. Win-win.

A good example of a large-scale approach is the Moors for the Future project in the Peak District National Park and South Pennines, where Yorkshire Water have been involved in restoring degraded land which was causing erosion and pollution. The recreation of sphagnum peat moss helps prevent flooding by holding 20x its weight in water. It prevents erosion of the peat that acts as a carbon sink, encourages a wide range of species within its varied wetland profile, and importantly for the water company, it reduces peat particles in the water, avoiding the need for expensive chemical treatment to remove the unacceptable brown colouration of domestic tap water. Win-win.

Masterplanning with water in particular is almost impossible to retrofit effectively, as the lie of the land dictates where and how the water can be collected, and where the space to accommodate it is required. Not more space, just enough space in the right place. Getting this wrong condemns us to solutions of drainage pipe to bomb crater (otherwise known as a pond), with minimal amenity and little ecological value).

The archetypal bomb crater of a SuDS pond: unattractive, unnecessary and dangerous.

Conversely, when we get it right, we can create places that whilst being functional, combine beauty with utility, providing places for people to enjoy, and a rich diversity of habitats, while also improving water quality. Designing planting with water is especially rich, with opportunities to provide a wide range of habitats, particularly as some of the systems require drought tolerant plants as well as those adapted to a wide range of damp or wet conditions.

But we still have hurdles to jump, as all will appreciate the problem of the immediate response to open water into development; the fear of danger for small children in particular. This can easily be overcome by appropriate design, but it takes much longer to engage with residents to allay their fears. Sadly, many SUDS schemes we are starting to see on the ground are exactly the opposite of what they should be – steep to the point of dangerous, unattractive, not biodiverse, and the product of an unimaginative, simple engineered solution. We can easily do better. Until we re-establish our day to day relationship with water as a natural and positive feature of the landscape, understanding its critical role in the environment and its value as a precious resource, we will not achieve the well-integrated, sustainable designs we need. This challenge grows daily. Grey infrastructure will always be a part of the answer, but blue and green offer so much more.

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About the Author

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A Decade of Green Roofs and Green Walls in London

Gary Grant CEnv FCIEEM, Director, Green Infrastructure Consultancy

Dusty Gedge, President of the European Federation of Green Roof and Green Wall Associations, Founder of livingroofs.org

Keywords: biodiverse roofs, biosolar roofs, blue roofs, green roofs, green walls, urban greening factor

It is just over ten years since the Greater London Authority included its living roofs policy in the London Plan. Since that time more than 1.5 million m^2 of green roofs have been installed across Greater London, mostly in the Central Activity Zone, and further evidence has been gathered to describe the multiple benefits of urban greening with green roofs and green walls, including surface water management, summer cooling, provision of habitat, noise abatement, improved air quality and improvements to health and wellbeing. Now that green roofs have become mainstream in London, policy focus is changing to ensuring that all developments have the necessary quantity and functionality of Green Infrastructure through tools such as the Urban Greening Factor, which is being promoted in Policy G5: Urban Greening in the draft New London Plan.

Figure 1. Biodiverse extensive green roof on David Attenborough Building, Cambridge. Photo credit Green Infrastructure Consultancy.

Introduction

In 2008, the Greater London Authority published the *Living Roofs and Walls Technical Report* to inform the new green roof policy in the London Plan (Greater London Authority 2008). It stated: '*The Mayor will, and boroughs should, expect major developments to incorporate living roofs and walls where feasible and reflect this principle in Local Development Framework policies*.'

At that time, few people in the UK were aware of the green roofs in Germany, Austria and Switzerland and there were few examples in London. Green roofs seemed new and mysterious. Interest in green walls was confined to enthusiasts who had seen installations in Paris. A decade later, as a result of the new London policy, things are different. Professionals are familiar with green roofs and walls and developers now accept them as a normal building component. In April 2019, Shirley Rodrigues, London's Deputy Mayor for Environment and Energy, launched *Living Roofs & Walls: From Policy to Practice – 10 years of urban greening in London and beyond* at the 3rd European Green Infrastructure Conference (Grant and Gedge 2019). It was a celebration of the 1.5 million m^2 of green roofs installed across Greater London.

Green roofs

Whilst the general concept of a green roof has not changed in ten years – a green roof is a vegetated roof – innovation

has led to variants. This is especially true where green roofs are combined photovoltaics and blue roofs. The German Landscape Research, Development and Construction Society's Green Roof Guidance (Forschungsgesellschaft Landschaftsentwicklung Landschaftbau 2018) was first published in 1982. It forms the basis of the Green Roof Code of Practice in the UK (Green Roof Organisation 2014). These documents divide green roofs into intensive and extensive, which refers to the intensity of maintenance.

Intensive green roofs (roof gardens) are irrigated and receive several maintenance visits each year. Soils (growing media or substrates) are deeper on intensive green roofs (typically >200 mm). *Semi-intensive green roofs* have characteristics of both intensive and extensive green roofs. They are planted with ornamentals that require little maintenance.

Extensive green roofs are vegetated with low-growing, drought-tolerant vegetation including stonecrops (Sedum spp.) and dry meadow vegetation on shallow substrates (usually <150 mm deep). They receive occasional maintenance and are not irrigated (except during establishment). *Biodiverse roofs* are designed to provide a diverse sward of (predominantly) native vegetation (Figure 1). *Brown roof* was the term given to green roofs established using construction waste and allowed to colonise naturally. The purpose was to compensate for brownfield habitats lost through development. Problems with contaminated materials being put onto roofs, the poor water-holding capacity of crushed concrete, the slow rate of colonisation by native plants and rapid colonization by butterfly bush *Buddliea davidii* and Fleabane species *Conzya* spp. means that this approach is no longer recommended. Seeding, plug planting or the use of suitable vegetation mats is preferred.

Blue roofs store rainwater, acting as a source-control feature in a sustainable drainage system. In its simplest form, a blue roof is not vegetated. *Blue-green roofs* consist of a green roof that sits above a void that stores water. Water can also be stored temporarily above the substrate and vegetation, creating a *wetland roof*. In recent years, blue roofs have become increasingly 'smart', using software that allows the stored water to be discharged completely in advance of heavy rain to maintain maximum water-storage potential.

A *biosolar roof* combines a green roof with photovoltaic (PV) arrays. The substrate is used as the ballast to secure the frames onto which the PVs are mounted. Green roofs cool PVs and increase their efficiency.

Figure 2. Green wall at the Rubens at the Palace Hotel, London. Photo credit Red Carnation Hotels.

Green walls

Green façades are formed by climbing plants rooted into the ground or planters. Climbers may be grown directly onto the building façade or trained against wires or trellises. Green façades take some time to establish, however maintenance requirements are low and irrigation may not be necessary. *Living walls* are made from a range of materials including textiles, plastics and metal (boxes and cages) (Figure 2). Some are substrate-based whilst others are soil-free, with mineral wool or foam. Living walls are usually irrigated, often with the use of pumps that are activated by a timer or software. There are examples of passive living walls (or vertical rain gardens) where water wicks into planters from tanks that collect rainwater run-off from roofs (see Landscape Institute 2015).

Benefits

Since 2008, a significant body of new evidence has been assembled that makes the case for urban greening even more compelling. For more detail, download the new report and follow the links (Grant and Gedge 2019). The benefits include:

Surface Water Management

Green roofs cover impermeable surfaces and absorb and slow stormwater. Extensive green roofs can intercept 50% of annual rainfall and roof gardens can intercept up to 90%.

Urban Cooling

Green roofs and walls reduce the temperature of a building's exterior, by shading, albedo (reflectivity) and evapo-transpirative cooling. Insulation provided by soil and vegetation reduces heat loss in winter. Energy consumption for cooling and heating is reduced. Green roofs and walls reduce the urban heat island effect, thereby saving lives.

Biodiversity

Green roofs are relatively small, isolated and exposed, which limits the number of species that occur, however they do support invertebrates (including wild bees, beetles and spiders), birds and bats. Research in Switzerland and London shows that invertebrate diversity is influenced by vegetation type, diversity and structure, setting, substrate depth and features like deadwood, stones, sand lenses and ephemeral pools. Avoiding sedum monocultures and planting drought-tolerant native wildflowers has been shown to boost biodiversity. Buglife – the invertebrate

conservation charity – has published advice on how green roofs can be designed to encourage invertebrates (Gedge *et al.* 2012). In London, the rare black redstart *Phoenicurus ochruros* has benefitted from the provision of green roofs as 'stepping stones' allowing it to spread from the derelict sites of London's Docklands onto the rooftops of Soho and Mayfair.

Air Quality

Vegetation reduces air pollutants by filtering and capturing particulates and absorbing and breaking down gases. Plants with finely branched, hairy or sticky leaves tend to be better at trapping particulates. Green walls, in particular, offer the potential to reduce air pollution at street level – vegetation in street canyons reduces nitrogen dioxide levels by 40% and particulates by 60% (see Air Quality News 2012).

Noise Reduction

Soils absorb sound well. This means that green roofs (especially those with deeper substrate) and green walls with growing media, form excellent sound barriers. 100 mm deep green roofs have been found to reduce noise by up to 10 dB; 80 mm thick modular green walls reduce noise by 15 dB.

Health and Wellbeing

Lack of greenspace, poor air quality and excessive heat is associated with poor health and higher mortality. Green roofs have the potential to provide additional greenspace for people to relax and encounter nature. Extensive green roofs, where access is normally only permitted for maintenance purposes, can still improve health by being overlooked.

Economic case

Normally, there is no income directly attributable to roof greening. The decision to green a roof is usually considered in terms of construction and maintenance costs, rather than the economic value of the benefits. However, this position is now changing as we value the ecosystem services provided. Many of the benefits are public (including resilience and health), which may deter investors who do not benefit directly. We see, however, that the costed benefits of stormwater management, insulation, summer cooling, pollution abatement, improved health and increase in property value, when combined, produce a convincing economic case for greening.

The growth of London's green roofs

In 2010, just two years after the introduction of the policy, there was a total area of 715,000 m^2 of green roofs in London (Greater London Authority 2008). The area of green roofs per inhabitant at that time was 0.08 m^2. As of the end of 2017, the total green roof area in the Greater London Authority area, was 1,510,000 m^2, equivalent to 0.17 m^2 per inhabitant. In London's Central Activity Zone (CAZ), green roofs cover 290,000 m^2, equivalent to 1.26 m^2 per inhabitant. London's CAZ now boasts more green roofs per inhabitant than Berlin, Chicago or Toronto.

Extensive green roofs make up the majority of green roofs (75%) compared to intensive green roofs (25%). Of the extensive green roofs, only 11% of those are biosolar roofs (which are relatively new). Infographics are available showing the breakdown of roofs for each London borough (see Livingroofs.org, Figure 3).

Future direction

The draft new London Plan includes Policy G5: Urban Greening, which promotes the use of the Urban Greening Factor (UGF) (Mayor of London and London Assembly (2019). This technique requires planning applicants to measure and categorise urban greening features in order to calculate an overall score. Sealed surfaces score 0 and natural habitats 1, with various categories and scores inbetween. Planning authorities will set a target (typically 0.4),

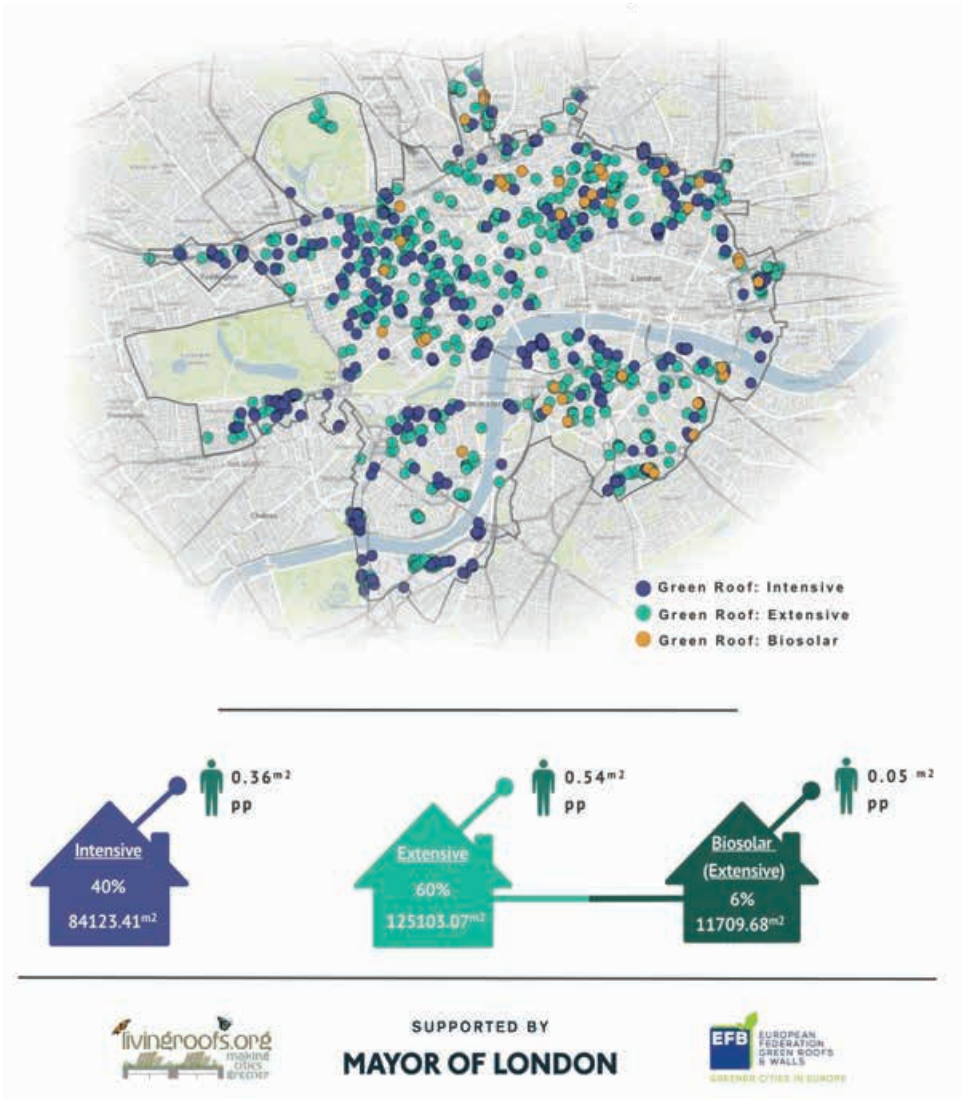
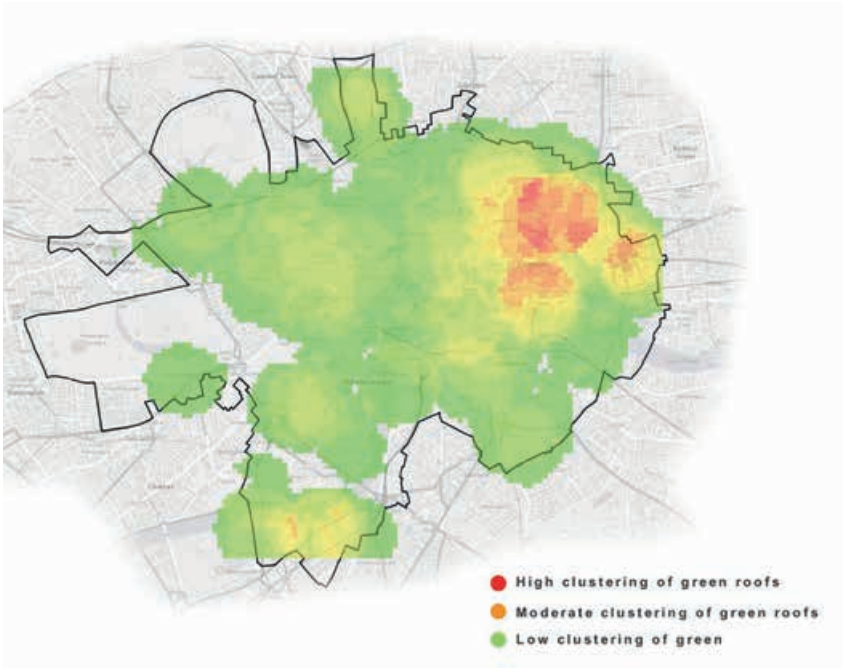


Figure 3. Infographic showing distribution of green roofs in London's Central Activity Zone.



Infographic showing distribution of green roof hotspots in Greater London. Livingroofs.org.

which can often only be met by installing green roofs and green walls. This new approach, driven by increasing concerns over climate change adaptation, combined with new urban microclimate computer modelling techniques (for example, the Greenpass from our colleagues in Vienna (see greenpass.at), means that many more green roofs and green walls are on their way. There is also now much interest in greening tall building, with project like the Bosco Verticale in Milan leading the way (ArchDaily 2015). In 2016, 42% of the UK green roof market was in London, however this proportion is likely to shrink in the future as roof greening increases overall and spreads to other UK cities, with growth driven by new urban greening policies.

Concluding remarks

In ten years, attitudes in London's planning, design and construction industries towards green roofs and green walls have changed from these features being a curiosity to becoming a normal component of a building. In that time, evidence has been gathered that supports their use and now policy makers are looking at new ways of ensuring that urban greening meets future needs. Urban greening policy and practice is now spreading across the UK, with strategies expounding the benefits now in place in most cities. As climate change bites and biodiversity losses mount, expect to see more green roofs and walls.

About the Authors

Gary has written widely on Green and Blue Infrastructure and has worked as ecologist on many planning and design projects, including for the London 2012 Olympics, Olympic Park Biodiversity Action Plan and QEOP Management Plan. He was formerly a Director at AECOM Design + Planning and is now Director of the Green Infrastructure Consultancy and thesis tutor at Bartlett Faculty of Built Environment, UCL.

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The 'Cool Towns' Project: Using Green/Blue Infrastructure to Reduce Heat Stress in Public Open Spaces

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Keywords: co-benefits, green/blue infrastructure, heat stress

This paper describes the emerging concern about the impact of heat stress on people in urban areas and how this is being used as an additional factor in promoting Green and Blue Infrastructure.

Bird nesting in a textile-based wall made by Sioen Industries, Belgium, spring 2019. © Sioen Industries NV – GreenTecStyle.

Introduction

As environmental professionals we promote Green and Blue Infrastructure (GBI) for the wide range of well-established, associated benefits, and particularly for providing wildlife habitat. There is growing interest in taking an integrated and wide-ranging approach encompassing multiple ecosystem benefits including those relating to human health, which we usually consider as promoting exercise, general wellbeing and minimising stress. Planting trees to sequester CO_2 as mitigation for climate change is found in many policies and strategies and the idea of Nature-based Solutions (NbS) is gaining traction but how often is the role of Green and Blue Infrastructure in mitigating local climate-induced impact on people mentioned?

The impact of low temperatures in raising mortality during winter cold spells is well established but that of heat stress is emerging as an issue for policy makers and, particularly, town planners, architects, landscape architects and environmental managers. The European Environment Agency (2016) has collected data which has revealed that there has been a substantial increase in heat waves in recent decades, with records broken in 2006, 2007, 2010, 2013, 2014 and 2015, causing tens of thousands of premature deaths in Europe since 2000. The summer of 2003 was an outstanding example with an estimated 70,000 premature deaths; summer 2015 saw more than 3,000 deaths in France alone. The report goes further to state that it is virtually certain that as the duration, frequency and intensity of heat waves increases this will result in increased mortality, especially in vulnerable groups, unless adaptation measures are taken.

Heat stress

When considering the impacts of heat stress on people, there are two phenomena that need consideration.

1. Climate change – The UK Climate Change Risk Assessment 2017 Evidence Report, in the Technical chapter on People and the Built Environment, predicted that the number of heat-related deaths in the UK will increase by around 250% by the 2050s based on the median estimate (Kovats and Osborn 2016). The 2018 Intergovernmental Panel on Climate Change report (IPCC 2018), with the announcement that there are just 12 years left if we are to avert catastrophic temperature rise, has further heightened awareness of the possible scenarios of impact from climate change induced temperature rise and the impacts for human wellbeing.

In this context, local authorities are taking this issue very seriously, as evidenced by publications such as *Rising to the Climate Crisis – A Guide for Local Authorities on Planning for Climate Change* (Town and Country Planning Association 2018), and

policies for climate change mitigation will soon be included in strategic plans. This is a key opportunity to promote the importance of Green and Blue Infrastructure both at the wider, landscape-scale of parks and rivers as well as on individual sites. In this article we describe two projects focusing on initiatives to mitigate heat stress at landscape and local scales.

2. Urban Heat Islands – Urban Heat Islands (UHI) are the 'characteristic warmth' (Voogt 2004) which develops several hours after sunset in the densely built, central parts of cities (Figure 1). The cause of the Urban Heat Islands effect is complex but a key component is the density of buildings, which can reduce air flow and funnel wind through the 'canyons' made by narrow, high-sided streets. The geometry of the built environment also reduces 'sky view', the degree of openness to the atmosphere that allows heat to dissipate. In addition, many building materials absorb and store heat, releasing it when the air temperature drops as the sun goes down in the evening. It is this that leads to the high night-time temperatures that make it difficult to sleep and can adversely affect the old, the young and otherwise vulnerable groups.

Why is heat stress important?

Recent studies have looked at the impact of heat stress on economic productivity and output. A working paper by the Centre for Climate Change Economics and Policy and the Grantham Research Institute on Climate Change and the Environment (Costa *et al.* 2016) estimated that in a warm year in the far future (2081-2100), economic losses due to heat stress and lower productivity would be 0.4% of Gross Value Added (GVA) for London corresponding to total losses of around €1.9 billion for London.

The Urban Heat Island map in Figure 2 shows the results of an 'UrbClim' simulation (*https://vito.be/en/product/urbclim-urban-climate-modelling)* for the mean temperature at midnight during the summer of 2011 (May to September) at a resolution of 250 m. This year was selected as a typical summer for a West-European city. On average, the night-time temperature is approximately 4°C higher in the city centre compared to rural locations. During some hot nights, even larger effects are observed.

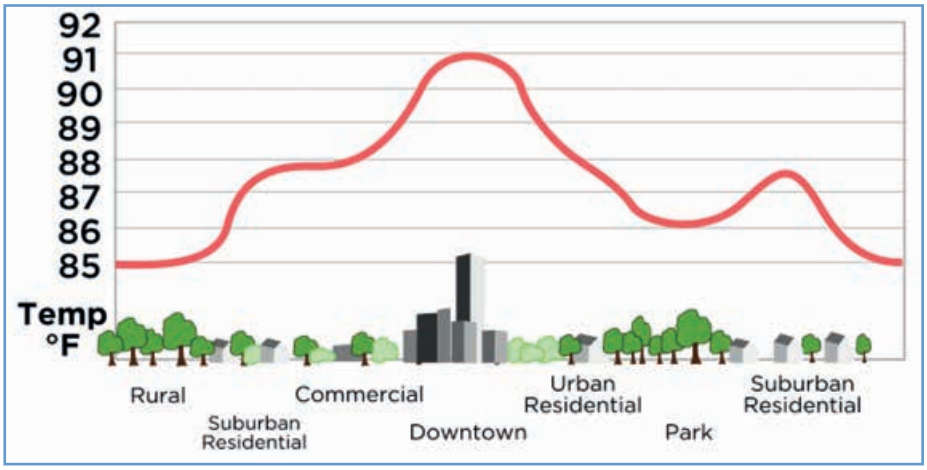

Figure 1. Urban Heat Island: typical temperature profile. Source: https://www.worldatlas.com/articles/urban-heat-island-causes-and-consequences.html

The potential benefits of Green and Blue Infrastructure for mitigating heat stress in the urban environment are clear but surprisingly little real evidence exists quantifying – and so justifying investment in – the effect of different interventions. When considering how to reduce heat stress in an open square, for example, should trees be planted or would a water feature be more effective?

The Cool Towns Project

This project began in September 2018 and is funded until 2022 by the European INTERREG 2 Seas programme (https://www.interreg2seas.eu/nl/cooltowns).

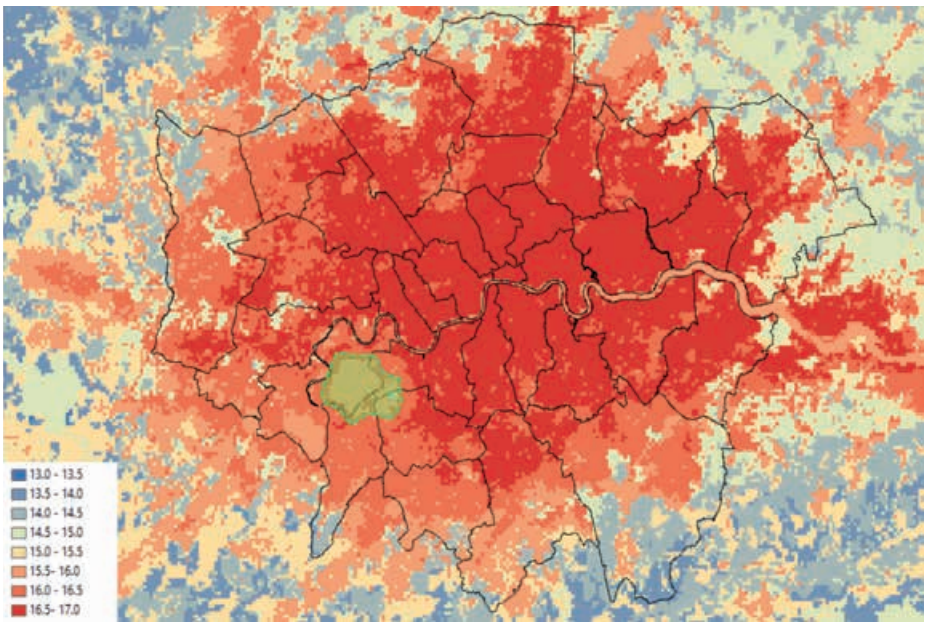

Figure 2. London's Urban Heat Island showing average summer temperatures in 2011. Colours represent the temperature gradient from a high (red) of 17°C to a low (dark blue) of 13°C. The effect of the built environment on temperature is clear with the mitigating impact of Green and Blue Infrastructure clearly illustrated by the lower temperatures around Richmond Park in South West London, with the extent of this effect shown by the dashed green line
Source: Dataset available on the London Datastore. The mapping project was carried out by VITO (Vision on Technology for a Better World, https://vito.be/en) using an 'UrbClim' simulation (https://vito.be/en/product/urbclim-urban-climate-modelling) as part of an EU-funded RAMSES programme (http://www.ramses-cities.eu) on the urban impacts of climate change.

It has been set up to assess the effectiveness of different interventions at mitigating heat stress. The subtitle is *Spatial Adaptation for Heat Resilience in Small and Medium Sized Cities* with partners from Belgium, France and the Netherlands as well as the UK, with University of Greenwich as a member of the scientific advisory team. The focus is on public open spaces where people experience heat stress during hot weather and there are associated economic costs, particularly to urban businesses such as retail outlets which people are less likely to visit when the temperature outside is uncomfortable. The effect of a range of interventions, both existing, new and pilot installations, will be measured to provide data on both actual impact on temperature and on perceptions of heat stress.

Developing a decision support tool

Given the general lack of data, planners are unable to factor in mitigation for heat stress when considering the costs and benefits of urban design options. One of the outputs from the Cool Towns Project will be a decision support tool that compares different Green or Blue Infrastructure interventions in site-specific contexts enabling the most appropriate design for the situation to be identified. All the project partners are collecting data on installation and – importantly – ongoing maintenance costs as well as measuring actual effects following a standardised protocol using instruments provided by the project. This evidence of the impact of green/Blue Infrastructure on local microclimates will be combined with information on co-benefits (aesthetic, biodiversity, air quality and general wellbeing effects) to inform decisions and investment.

Some interesting examples are emerging. While there are many benefits associated with tree planting, the main impact of trees on heat stress is the provision of shade. Evapotranspiration, often stated as a cooling mechanism, is less effective as plants tend to close stomata to reduce water loss during hot periods. It is interesting to see how different partners in the Cool Towns Project manipulate trees to maximise shade. Figure 3 shows plane trees in the Netherlands, in winter and in summer, demonstrating how to maximise shade provision – but how acceptable would this be in the UK? And how many local authorities, in these times of austerity, would contemplate such an intensive tree management regime?

Green walls and facades are becoming more popular despite the capital and maintenance costs. Many claims are made about the benefits in terms of reducing pollution, improving air quality and reducing noise but, although the insulating effects on internal building temperature is well established and they certainly improve the appearance of buildings, what impact do they have on reducing outdoor temperatures? Recent tests in Italy showed that on a hot summer's day the difference in temperature (monitored on the external surface) between the bare wall and the covered wall ranged from 1°C to 20°C (Mazzali *et al*. 2013) and has the potential to reduce cooling load by over 30% (Djedjig *et al*. 2016). At an urban scale, the use of green walls is considered more beneficial than cool paints as, rather than reflecting radiation (which may be intercepted by other buildings), radiation is absorbed and dissipated by evapotranspiration. However, data is sparse and to complicate matters further there are many different systems, some textile based, others box systems, but the benefits for wildlife, particularly insects and birds, are clear (Figure 4).

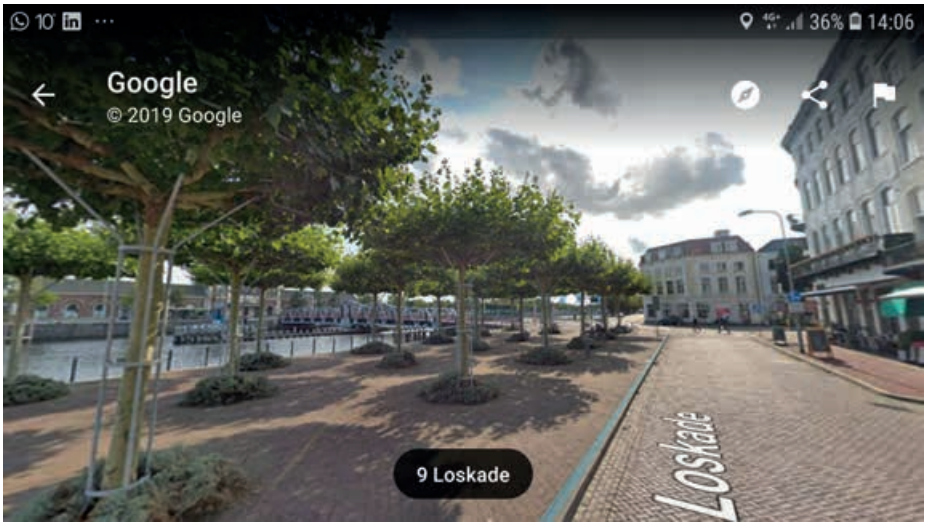

Figure 3. Plane trees in Middleburg, the Netherlands, (left) in winter and (below) summer, pruned and trained to maximise shade.

There is greater awareness of the multiple co-benefits afforded by Blue Infrastructure, including mitigation of heat stress, enhancing resilience to flooding and climate change and providing wellbeing benefits but there is even less data than for Green Infrastructure. Water features are well liked by the public and specific sites have been selected in the Cool Towns Project to collect information on the costs and benefits. Research suggests that rivers can have a significant cooling effect with an average reduction of 1°C found up to 30 metres away from the riverbank during temperatures higher than 20°C (Hathway and Sharples 2012). This effect was negligible at 40 metres although where streets are open to the river, air flow combined with vegetation can increase effective cooling.

The decision support tool will include a review of the scientific and grey literature as well as direct measurements of PET (potential evapotranspiration) from a wide range of Green and Blue Infrastructure interventions. When completed, it will be freely available in all the four languages of the partner countries and is likely to be web based.

Figure 4. Bird's nest in a textile-based wall made by Sioen Industries, Belgium, spring 2019. © Sioen Industries NV – GreenTecStyle.

Co-benefits (or ecosystem services)

The conventional rationale for promoting Green and Blue Infrastructure is for biodiversity, health and wellbeing, with the latter being focused on aesthetic aspects, mental health and exercise; nevertheless, the need for heat stress mitigation is emerging as a powerful driver to support the promotion of Green and Blue Infrastructure to policy and decision makers. The most interesting aspect of the Cool Towns Project is the opportunity to raise awareness of the wider or co-benefits of Green and Blue Infrastructure for humans, wildlife and the environment in general. All the partners have been running workshops taking decision-makers (planners, facilities/maintenance managers, architects, and the like) through a problem-solving process exploring both the benefits and disadvantages of various Green and Blue Infrastructure heat stress mitigation options. For example, although most ecologists agree that planting trees in public places is generally a good thing, not everyone likes trees – have you ever parked your car under a sycamore or lime in summer? For facilities managers, leaf clearance, ideally before anyone slips on them, is an annual headache and a real financial cost. The benefits of water features, particularly when they are multi-purpose with flood or water retention functions, can be easier to justify although there are still health and safety implications. Working through the advantages and disadvantages of different options with multiple stakeholders has been very useful and will ensure that the decision support tool provides genuinely useful information for the users. Training materials will also be produced, aimed at promoting the full range of benefits (and disbenefits) to planners, architects and maybe ecologists and environmental managers as well.

If you are involved in any Green and Blue Infrastructure projects and would like to contribute information on installation and/or maintenance costs, please do let us know. The author (or her postgraduate students) would be happy to come along – on a suitably hot day – to measure the effectiveness in terms of heat stress mitigation.

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Blue Infrastructure in Green Networks: the CSGN and 10,000 Raingardens for Scotland

Emilie Wadsworth MCIEEM and **Rachel Howlett**, Central Scotland Green Network Trust

Keywords: raingardens, stormwater, surface water management, urban greening

The Central Scotland Green Network is Europe's largest greenspace initiative; it places Green and Blue Infrastructure at the heart of economic and social regeneration. Mitigating and adapting to climate change is a key driver of the Network, particularly using nature-based solutions to water management issues. The 10,000 Raingardens for Scotland campaign is a priority project for the Central Scotland Green Network Trust and its partners, and here we present an update on the Glasgow Pilot Project for the campaign, working with Southside Housing Association, Glasgow City Council and Scottish Natural Heritage.

Planter box raingarden installed at CSGNT's offices, planted with a range of native wildflowers and herbs that can cope with periods of wet and dry. © CSGNT.

The Central Scotland Green Network

The Central Scotland Green Network (CSGN) is one of 14 national developments for Scotland created in the Scottish Government's third National Planning Framework (NPF3). It seeks to transform Central Scotland into a place where the environment adds value to the economy and where people's lives are enriched by its quality. With an all-encompassing remit, far beyond just a 'green initiative', the CSGN aims to improve the social, physical, cultural and environmental health and wellbeing of central Scotland, as well as helping the area to meet the challenge of climate change. The CSGN will deliver: '*...a step change in environmental quality, woodland cover and recreational opportunities...[and] make Central Scotland a more attractive place to live in, do business and visit; help to absorb CO_2; enhance biodiversity; and promote active travel and healthier life styles*'.

The concept of the CSGN was established in 2010. It covers an area of nearly 10,000 sq km in the Central belt of Scotland, from Ayrshire and Inverclyde in the west, to Fife and the Lothians in the east, including the metropolitan areas of Glasgow and Edinburgh (Figure 1). Nearly two-thirds of Scotlands' population lives in the CSGN, so it has the potential to improve the lives of 3.5 million people.

Throughout 2010 and 2011, CSGN partners worked together to develop a

Figure 1. Area covered by the CSGN shown in green.

Vision for 2050 centred around five key themes: a place for growth, a place in balance, a place to feel good, a place to belong and a place for nature. These themes cover sustainable economic growth, support health and wellbeing, community empowerment, mitigating and adapting to climate change, and enhancing biodiversity and landscapes. Whilst Green and Blue Infrastructure play a large part in all the themes, most of the activity sits in 'a place in balance'. This includes increasing woodland cover, protecting and restoring peatlands, natural flood management, urban greening and water sensitive design using nature-based solutions. Key among these activities is the 10,000 Raingardens for Scotland initiative, led by the Central Scotland Green Network Trust (CSGNT) on behalf of partners, the Scottish Green Infrastructure Forum.

10,000 Raingardens for Scotland

The 10,000 Raingardens for Scotland campaign began with a remit to increase awareness of how raingardens can contribute to surface and stormwater management and flood reduction. Besides the general public, the campaign targets environmental professionals including planners, developers, architects, landscape architects and environmental managers. 10,000 Raingardens for Scotland aims to encourage and increase the use of raingardens, particularly in urban areas.

Figure 2. In-ground raingarden installed in a Taylor Wimpey show-home. Positioned at the lowest part of the garden, it collects and uses the rainwater, helping to drain the rest of the garden. © CSGNT.

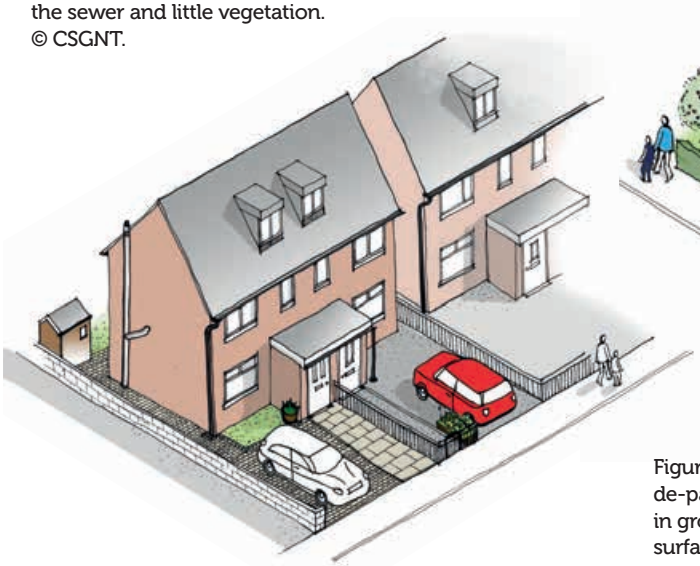
The message is simple: installing just one raingarden will make a difference to your local area, having 10,000 raingardens across Scotland will make a huge contribution to reducing the likelihood of flooding, improving the health of rivers and streams, and people, whilst also increasing wildlife-friendly green spaces in towns and cities.

The initiative is modelled on successful projects in Melbourne, Australia, and Portland, USA, which aim to increase the amount of Green-Blue Infrastructure being used to manage rainfall, particularly in urban areas. A raingarden is defined as: *'a vegetated area designed to capture, use and slow down rainfall'*. Raingardens can be anything from a green roof to a garden pond and can be used to divert rainfall from the combined sewer system, or to improve drainage in gardens and greenspaces (Figure 2).

Raingardens include many features that we are familiar with as ecologists or environmental managers, for example SuDs basins, seasonal wetlands and attenuation ponds. However, they also include structures such as green roofs, green walls, planter boxes under disconnected downpipes, and 'in ground' features such as bog gardens, ponds, swales and flood plains (Figure 3). Even if these features only divert or slow down a small amount of water, every little helps, particularly in Scotland!

In addition to water management, raingardens have multiple benefits if designed and implemented well. For

Figure 3a. A 'normal' house with paved driveways, downpipes connected to the sewer and little vegetation. © CSGNT.



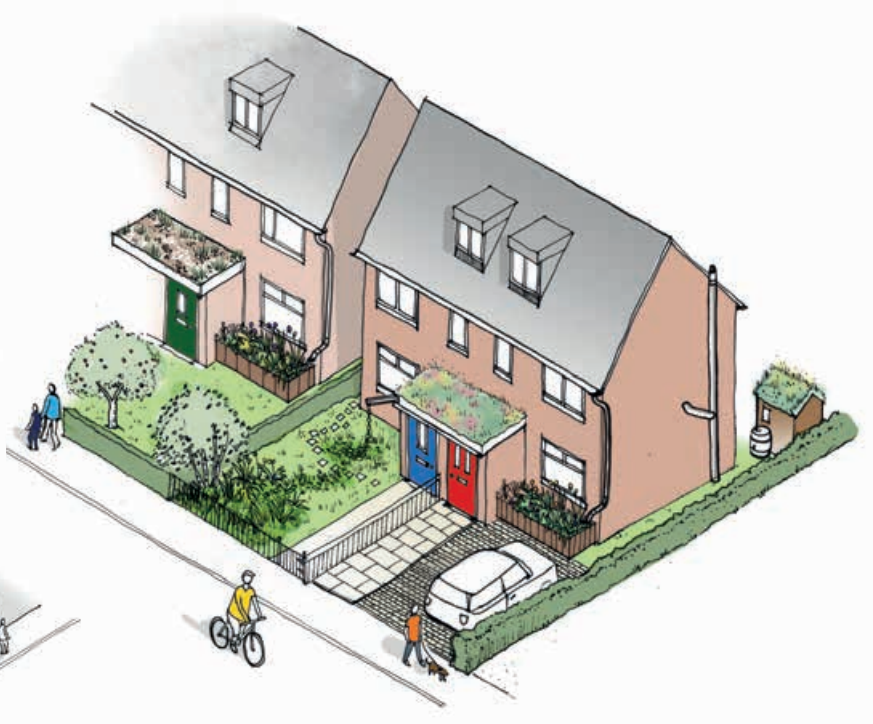


Figure 3b. A 'raingarden' house, using green roofs on the porch and shed, de-paving part of the driveway, disconnecting downpipes into planter boxes, in ground raingardens and using vegetation instead of man-made impermeable surfaces. © CSGNT.

Figure 4. Queensland Court and Gardens, Cardonald, Glasgow. © CSGNT.

example, they can contribute to pollution control and reduction (air, water and soil); they can support and enhance biodiversity, particularly in an urban setting; they can deliver green networks by acting as links between larger greenspaces; and, they can support mental and physical wellbeing by creating attractive places to work, commute through and visit.

If implemented at a catchment scale, linking rural and urban areas, raingardens can support natural flood management. This is demonstrated well by the Slow the Flow project in Calderdale, where the objective is simply to slow water flow from the upper catchment to the main river channel to reduce the flood peak and limit out of bank flow in the towns and villages of Calder Valley. It has been achieved by retrofitting Green and Blue Infrastructure back into the catchment, for example river restoration and tree planting upstream, and the installation of many different types of raingardens in towns like Hebdon Bridge.

Phase 1

Thanks to funding from Scottish Natural Heritage's Green Infrastructure Community Engagement Fund, the Postcode Lottery Trust and Glasgow City Council, we were able to start phase 1 of the campaign in 2018, the 10,000 Raingardens Glasgow pilot project

In this pilot phase, we are working with Southside Housing Association (SHA) and Glasgow City Council at SHA's Queensland Court and Gardens residency in Cardonald, Glasgow (Figure 4). The area is known to suffer from flash flooding and has long-term drainage issues. The Cardonald area is one of the first locations being used by Glasgow City Council to try innovative surface water management techniques, including raingardens in flood schemes. CSGNT are working with residents to raise awareness of raingardens and involve them in the design and creation of small-scale raingarden features across the grounds. We have also been raising awareness across Glasgow with both public and professional audiences. We have showcased model raingarden houses at a series of events, and developed tools and resources for use by architects, planners, homeowners and schools on how raingardens work and how to create them. This is just the start of a comprehensive suite of guides, which will be complemented by an interactive website.

Conclusion

The establishment of a baseline from which to measure progress towards the 10,000 target is vital to evaluating the success of the initiative. This is underway, by collating information from Local Authorities on SuDS in their area, as well as green roofs, green walls and house-plot scale raingardens via a promotional campaign. From the information gathered so far, we estimate there are around 4,000 raingardens already in place.

It has taken time, but the concept of raingardens is gaining traction, particularly with water management and urban design professionals. The next steps are to roll the campaign out across the CSGN and engage more planners, architects and developers.

Further information

Further information is available at the following websites:

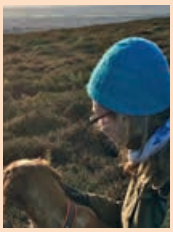
www.centralscotlandgreennetwork.org

www.csgnt.org.uk

www.10kraingardens.scot

or follow us on twitter:
@csgreennetwork @10k_raingardens

About the Authors



Emilie Wadsworth has worked for the Central Scotland Green Network Trust for 15 years, becoming Deputy Head of Strategic Development in 2018. She leads on the Trust's thematic work on Biodiversity and Heritage, Urban Greening, Green Infrastructure, and Community Growing.

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Rachel Howlett joined Central Scotland Green Network Trust as Glasgow Raingarden Project Officer last year, a role which draws on her background in Landscape Architecture and teaching. Since joining, she has been out and about around Glasgow, raising public awareness of how raingardens can reduce flooding and improve water quality. Rachel has an MA from the University of Sheffield in Landscape Architecture as well as a BA in Primary Education with Art.

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Green Infrastructure: A Biodiversity or Public Benefit Agenda?

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Keywords: biodiversity, Green Infrastructure, multifunctionality, public benefit

Green Infrastructure assessments vary greatly in both their methods and outputs. Overall, they have the potential to promote and support positive outcomes for biodiversity conservation but we need to be careful that an emphasis on multifunctionality and wider public benefits is not detrimental to biodiversity priorities. Green Infrastructure initiatives should not direct funds away from biodiversity priorities and we must address the risk of biodiversity conservation being retrofit at the site level alongside competing priorities.

Green Infrastructure as a vital philosophy

Recent reports on climate change (IPCC 2018) and global species' extinction (IPBES 2019) make stark reading for the future sustainability of human society. They encourage us to rethink our priorities away from Gross Domestic Profit and unsustainable development, towards realising the more fundamental quality-of-life benefits derived from natural capital and healthy ecosystem services.

Investing in Green (as opposed to built) Infrastructure offers an opportunity to align more closely with this philosophy by following the principle that green (vegetation), blue (water) and brown (early

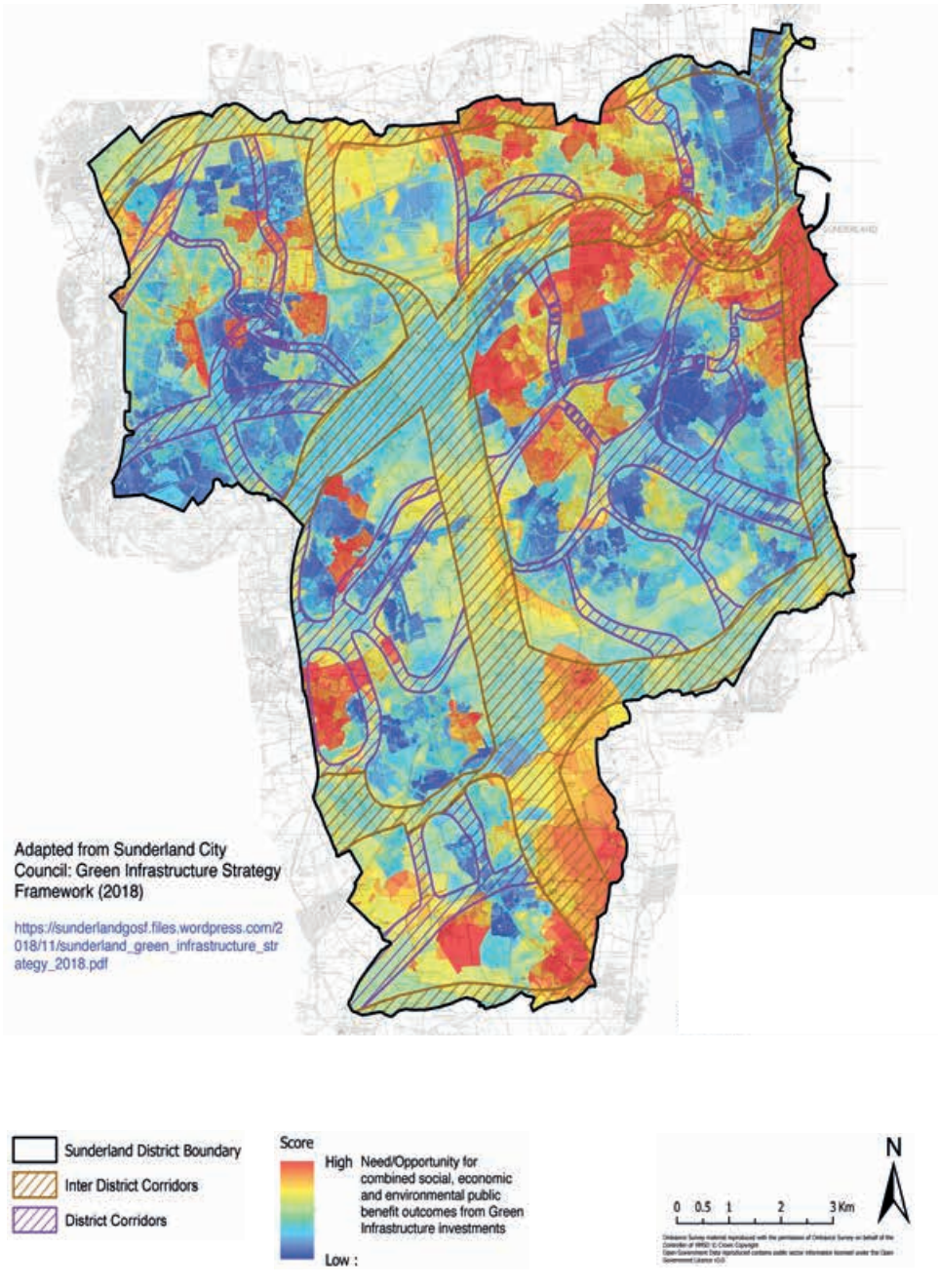

Figure 1. Combined economic, social and environmental themes with corridors. Adapted from Sunderland City Council's Green Infrastructure Strategy Framework (2018).

successional) spaces should complement and intersperse our towns and cities. Further, they should connect with the wider landscape in order to contribute to the vital natural processes and ecosystem services that underpin sustainable societies, such as clean air and water.

Multifunctionality – diluting priorities?

Through the design and delivery of Green Infrastructure, we can contribute towards a broad range of policy issues such as healthy lifestyles, social cohesion, flood prevention and economic investment. But whilst Green Infrastructure is based on a truly multi-disciplinary approach, as anyone who has been to a Green Infrastructure conference can attest, the delegates are overwhelmingly ecologists and representatives from nature conservation organisations. Green Infrastructure is still perceived as a biodiversity-led agenda, directed towards outcomes for habitats and species.

However, biodiversity is usually only one of many (sometimes 20 or more) factors that feed into Green Infrastructure studies. These can include assessments of labour productivity, food production, health and wellbeing, climate change adaptation, education, recreation, leisure, tourism, cultural heritage, landscape character, etc. The output is often a series of maps, highlighting priority areas for greenspace investments to deliver this range of social, economic and environmental benefits for the public, in equal terms.

Biodiversity priorities are inherently diluted many-fold through this process. The resulting greenspace delivered on the ground, under such prescriptions, will no doubt be delivered with an outwardly 'natural' character, and with associated wildlife benefits. However, this approach puts public (not wildlife) benefits at the heart of Green Infrastructure planning, which together with the built environment, leaves biodiversity conservation left to be retrofit, as an afterthought, and often with compromise at the site level.

A bottom-up approach

There are many good examples of site-level projects delivering biodiversity gains alongside wider environmental outcomes (West 2019). But compromise to accommodate local policies such as for housing and employment, can lead to biodiversity marginalisation.

Initiatives such as Biodiversity Offsetting and District Level Licences offer the opportunity to restore the balance by releasing compensatory funds to invest in habitat creation in wider landscapes where wildlife refuges and more specialised habitats may be accommodated. With the right planning, these could create the sustainable landscapes of the future, perhaps even a 'rewilding renaissance'. However, it is imperative that we prioritise biodiversity benefits and deliver Biodiversity Net Gain in Green Infrastructure initiatives alongside delivering other public benefit. Otherwise, we may unconsciously exclude the most endangered and least adaptable species.

Should Green Infrastructure planning then place a greater emphasis on biodiversity? Biological diversity and species richness are essential to fundamental ecosystem processes, including productivity, carbon storage, water and nutrient cycling, and decomposition. These processes are important, not only for the functioning of ecosystems but for humanity, and they require appropriate green networks to function properly (Science for Environment Policy 2012). Biodiversity conservation then arguably represents a more fundamental public benefit planning priority.

But the multifunctionality of the Green Infrastructure approach presents a great opportunity to increase funding and investment in natural spaces and biodiversity conservation overall. It provides an evidence base to attract support, for example, in areas such as health and water management, where relatively small investments in Green Infrastructure now could prevent much more extensive costs in health care and flood damage repair later. The potential release of funding from such areas, when considered additively, could be substantial. But these must be seen as additional benefits to the appropriate planning of biodiverse, green networks of healthy and functioning ecosystems.

Encouraging cross-discipline engagement

Approached in this way, Green Infrastructure research and planning would benefit greatly from the expertise, understanding and innovation that a broader range of professionals across sustainability agendas might bring. As ecologists, we must often rely upon publicly available, generalised datasets to interpret priorities for wider disciplines, without the insights of, for example, hydrologists or public health officials. Further, the collection of more specific data of relevance to Green Infrastructure planning is not advocated for from within these respective fields. Greater integration of these wider disciplines would help to generate more funding and support for Green Infrastructure, ultimately improving efficient land-use and 'naturalised solutions' for engineering, economic and social challenges.

Site- and landscape-level approaches

Sunderland Green Infrastructure Strategy is an example of a landscape-scale study (Sunderland City Council 2018). Assessment criteria were devised, based upon the principles of sustainable development, outlined within the National Planning Policy Framework (Ministry of Housing, Communities and Local Government 2012). Areas of greatest investment opportunity and the greatest need to generate social, economic and environmental benefits were identified using GIS, spatial datasets and local knowledge. With equal scoring across agendas, the priority areas for investment were generally found to be within urban and industrial contexts, particularly those associated with higher deprivation scores (for example, under the Indices of Deprivation published by the Ministry of Housing, Communities and Local Government 2015). Areas of high existing biodiversity value, and opportunities to enhance these, were generally not highlighted as investment priorities through the assessment approach.

In order to promote biodiversity and landscape connectivity, the results were therefore superimposed upon a series of landscape-scale green corridors, defined by a Green Infrastructure Steering Group and based more closely upon wildlife corridors for the city (Figure 1). In this way, opportunities to protect, augment, enhance and connect important existing

natural assets were also identified, alongside areas of opportunity for wider public benefits. Further, Sunderland City Council's Core Strategy and Development Plan 2033 includes separate policies each for Green Infrastructure and Biodiversity, alongside wider public benefit agendas, to steer associated planning and investment approaches.

A site-based assessment approach to enable measurement of net changes in natural capital and ecosystem services that result from land-use change is being used by Defra and Natural England working with a consortium led by the University of Oxford (Ecosystems Knowledge Network 2019). This 'Eco-metric' approach is based on a biodiversity-led assessment toolkit, where Biodiversity Net Gain is a fundamental pre-requisite of applying the tool. It recognises that net gains in biodiversity inherently provide benefits in natural capital, which provide ecosystem services for people in turn. Where possible, the toolkit looks to support additional uplifts across a series of 18 associated ecosystem services, provided that Biodiversity Net Gain is not compromised by the process.

A similar, biodiversity-led approach for Green Infrastructure studies could easily be applied through weighted scoring, biodiversity filters or precursor requirements, and would better reflect its importance alongside the wider public benefit opportunities.

Conclusion

Green Infrastructure is a multidisciplinary concept, central to the future realisation of sustainable societies. It offers opportunities to fund and deliver more naturalised and resilient environments with associated localised benefits for wildlife. It does, however, prioritise human rather than biodiversity interests. Biodiversity conservation needs to be planned and prioritised in its own right, to ensure that we conserve as many species and habitats as possible, to meet the challenges of the future.

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Green Transport Corridors Project, A590, Cumbria: area of roadside verge harvested for biomass by volunteers. © Nick White.

Leaves on the Line Please: Using Green Infrastructure to Unlock the Potential of Linear Assets

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Keywords: asset efficiency, cost benefits, Green Infrastructure, Linear Assets, performance, resilience

Safe and efficient operations are critical to our strategic road, rail, energy and water infrastructure networks. They form a complex network of linear assets that cross the country, vital to economic development and prosperity. Green Infrastructure is no longer viewed as a hindrance to these networks but as an asset in its own right, capable of delivering Biodiversity Net Gain alongside multiple other benefits. However, there is a need for detailed industry guidance to help minimise the costs and maximise the benefits.

Introduction

Green Infrastructure is defined as a strategically planned and delivered network of natural and manmade green (land) and blue (water) spaces that sustain natural processes. It is designed and managed as a multi-functional resource capable of delivering a wide range of environmental and quality benefits for society (see susdrain.org).

The perception and understanding of Green Infrastructure along linear assets such as roads and railways has evolved extensively in the last two decades, from a position of vegetation control management – managing land to ensure linear assets operate efficiently and safely – to one of active management. By incorporating well designed, managed and maintained Green Infrastructure along linear assets, environmental managers can increase efficiency, performance and resilience as well as improve returns on investment.

The *Delivering Green Infrastructure along linear assets – Scoping study (Phase 1)* project was initiated in July 2017 by CIRIA with Arup (CIRIA 2017). This study underpins the intention to produce a range of outputs for clients and planners, whilst highlighting examples of good practice on implementing Green Infrastructure along the linear assets and sharing good practice approaches between different asset managers and sectors across the industry. Linear assets include road, rail, energy and water infrastructure.

This first phase highlighted the numerous opportunities that exist through both the National Infrastructure Plan (HM Treasury 2014) and National Infrastructure Delivery Plan (Infrastructure and Project Authority 2016), which establish the government's plans to:

- invest in the Strategic Road Network, which aims to deliver over 100 major schemes by 2021

- undertake large-scale rail modernisation including high speed rail
- set a new consumer-driven energy policy for electricity generation and decarbonisation
- regulate investment in the water sector
- deliver 1,500 flood defence schemes
- plan for flood risk management through a National Flood Resilience Review.

Policy is already resulting in shifting patterns for business, with several companies (including Skanska UK, BT, Siemens, DB Schenker Rail UK) having set a net-zero or carbon neutral commitment in recent months, in many cases exceeding government proposals to target 2045. Phase 2 of the project aims to bring together linear asset operators from the UK and Ireland with environmental practitioners to demonstrate how Green Infrastructure provides opportunities to improve linear assets.

The connection between linear assets and Green Infrastructure

The relationship between linear assets and Green Infrastructure has been dominated by the need for efficiency and safety, and the perceived conflict between vegetation management and operational demands. However, the benefits of Green Infrastructure are now widely recognised and there is an industry-wide shift in perspective, as illustrated in Figure 1.

The influence of linear assets in the UK and Ireland extends to all sections of society. For example, Network Rail manages 20,000 miles of track; the National Grid operates the transmission network over 7,200 km of overhead lines; and London Underground's trackside land alone amounts to 10 per cent of all green spaces in the capital, providing a home to a wide variety of wildlife (London Assembly 2012). Highways England's Road Investment Strategy to 2020 (Department for Transport and Highways Agency 2016) sets out plans to build 1,300 additional lane miles, improve safety across the road network, improve cyclist networks, reduce noise impact, improve air quality and unlock land value. The way in which Green Infrastructure is incorporated into these improvements provides the opportunity to create safe, secure spaces for wildlife alongside infrastructure resilience.

Good practice

In 2017, ten case studies were shortlisted (from a long list of 66) and reviewed to analyse context-specific opportunities for Green Infrastructure. Key aspects included whether Green Infrastructure was designed to increase infrastructure efficiency (now and in future), address risk, engage with environmental experts, stakeholders and the community, or to deliver value for money. Here we discuss two case studies, selected for their exemplary approach in addressing critical success factors as identified in Phase 1 of the project, for example being a strong champion, having diverse funding sources and demonstrating quantifiable benefits.

Case Study 1 – Green Transport Corridors Project, A590, South Cumbria

Highways England are aiming for no net loss of biodiversity by 2025 and net gain by 2040. They are testing an innovative management approach involving local volunteers (trained by managing agents, with strict health and safety arrangements) in roadside management to develop civic pride in the project, increase biodiversity and reduce long-term maintenance needs. Between October 2005 and August 2016, work by volunteers resulted in 13 tonnes of logs and 44 m^3 of biomass being collected in a single day from roadside verges, through a combination of tree felling and grass cutting; if this effort was replicated across the network it could deliver £90 M in harvesting revenue over 25 years. In addition to biomass harvesting, volunteers planted flowering herbs, and trees and shrubs were retained as part of ongoing habitat management plans. Overall, the initiative is predicted to deliver a 123% increase to the baseline level of biodiversity (calculated using the Defra biodiversity metric).

Figure 1. The contrast between poorly designed and well-designed and managed Green Infrastructure. Reproduced from *Delivering Green Infrastructure along linear assets – Scoping study (Phase 1).* CIRIA 2017. © Arup.

Guidance

Phase 2 of the project is currently underway and focuses on providing guidance and advice to support infrastructure clients, commissioning bodies and delivery organisations. The guidance will demonstrate how Green Infrastructure can help to improve industry performance whilst also delivering on government environmental objectives. It will set out a clear business case for delivering Green Infrastructure, highlighting lower whole-life infrastructure costs and cost-effective management. In summary, the guidance will:

Case Study 2 – Network Rail Sustainable Lineside Vegetation Strategy

Network Rail aimed to transform the existing lineside landscape along 380 km^2 of land holdings either side of the track in various locations across its network. Their aim was to move from a costly management liability to a fully-functioning environmental and ecological asset whilst also reducing the estimated £100 M annual cost of vegetation impacts on train performance. Their Sustainable Lineside Vegetation Strategy was implemented as a company initiative from 2012 onwards and recognises the direct and indirect financial return from establishing a working lineside landscape. It sets principles and techniques for a productive landscape resource and delivers on Network Rail's sustainable development and corporate social responsibilities.

- **provide practical guidance** on delivery mechanisms to achieve successful Green Infrastructure that provides multiple benefits along linear assets
- **raise awareness** of the potential and opportunities for Green Infrastructure to provide multiple functions and to improve resilience, efficiency, operation and performance of the asset itself
- provide **support and advice** to a range of stakeholders involved in the design, management and maintenance of linear assets
- help to **encourage and facilitate** the development **of new and better partnerships** and links across disciplines and stakeholders
- **illustrate successful case studies** with additional evidence on **quantified benefits** as supporting tools for delivery to support the case to mainstream a Green Infrastructure approach to linear assets, developing a robust, persuasive and accessible narrative that facilitates delivery.

Conclusions

Operators are increasingly recognising the benefits of integrating Green Infrastructure into the linear asset networks to meet statutory duties, respond to government policy, future-proof business operations and deliver on sustainability objectives. These internal operational benefits are further expounded when the external, multiple benefits for society and the local environment are recognised and highlighted, for instance the vegetation and the species living in linear-side habitats delivering environmental and amenity value.

Network Rail Sustainable Lineside Vegetation Strategy: creating a diverse habitat that delivers benefits both visually and for biodiversity. © Network Rail Infrastructure Ltd.

Showing what is possible with Green Infrastructure, where it has worked and how it should be implemented and managed, will support a transition in the development and management of rail, road, energy and water networks to mainstream Green Infrastructure delivery.

Note

Susdrain.org. Created by CIRIA, www.susdrain.org is the independent and authoritative platform for those involved in delivering sustainable drainage. See glossary at *https://www.susdrain.org/resources/glossary.html.*

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Parish Green Infrastructure Strategies

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Keywords: biodiversity, climate change, Green Infrastructure, health and wellbeing, landscape, Neighbourhood Development Plan

Parish Green Infrastructure Strategies provide a framework to allow councils to integrate Green Infrastructure at a local level. They help communities to identify social, environmental and economically sustainable initiatives that will improve their immediate environment as well as contributing to regional and national environmental policy.

Introduction

Since the introduction of the Localism act (2011), local parish and town councils have been shaping development in their communities by producing Neighbourhood Plans. An essential part of this process is the planning and delivery of Green Infrastructure; however, to date, most Green Infrastructure Strategies have been produced at the sub-regional or local authority level, and not within a Neighbourhood Development Plan context. Local authority Green Infrastructure Strategies often encompass large geographical areas and set broad aims and objectives rather than informing Local Plans; Parish Green Infrastructure Strategies (PGIS) are based on detailed analysis of opportunities at a local level but set in the context of broader local authority policy.

This article describes how three Parish Green Infrastructure Strategies were formulated for a parish council and two town councils in Devon. The strategies were partly financed by Locality budgets allocated to community groups to fund technical and planning guidance to inform community projects in their area (see https://locality.org.uk). They were facilitated by a multi-disciplinary team of ecologists, landscape architects, urban designers and community engagement specialists.

Green Infrastructure

'Green infrastructure (GI) is a network of multifunctional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities.' National Planning Policy Framework (NPPF) 2019 (Ministry of Housing, Communities and Local Government 2019).

Multifunctional green and blue networks benefit both people and nature and are essential for thriving and sustainable communities. Research on the importance of access to green space for people's health and wellbeing is well documented with current research finding links between a reduction in depression and obesity (Institute for European Environmental Policy 2017). Provision of these networks is also a vital response to climate change through the creation of low carbon neighbourhoods and to the ever-increasing threats to biodiversity through provision of improved links for biodiversity. By focusing at the parish scale, challenges faced by communities can be identified and solutions can be specifically tailored to the local area. This not only helps to guide and inform Neighbourhood Plans but is also useful for Local Planning Authorities. For example, it provides an evidence base when allocating Section 106 and Community Infrastructure Levy (CIL) funds. PGIS could also help Local Authorities to identify opportunities for developers to deliver a cohesive approach to Biodiversity Net Gain across the parish through financial contributions to CILs, for instance.

In Devon, three parishes have recognised the importance of promoting a strong Green Infrastructure network. In 2015, Clyst Honiton Parish Council began to explore how a PGIS could be used to protect and enhance their local environment. Housing developments underway as part of a wider Exeter and East Devon Growth Point strategy were threatening to encroach on the character of the parish and the parish council was seeking advice and guidance for their emerging Neighbourhood Plan. Tor Ecology and Landsmith Associates were commissioned to provide evidence for the Neighbourhood Plan, and the Parish Green Infrastructure Strategy emerged from this process. Subsequently, PGIS have been produced for Buckfast and Buckfastleigh Town Council and most recently Totnes Town Council (South Devon). Specialist consultants were invited to work on specific aspects where necessary, for example Streets Re-Imagined worked on a creative and people-centred approach to the design and use of urban realm for Totnes Town Council.

Approach

The purpose of a Parish Green Infrastructure Strategy is to produce a series of evidence-led proposals to inform and guide Neighbourhood Planning, and to provide a vision and framework for connecting people, place and nature into the future. The focus area includes all land within the parish boundary (urban and rural areas) plus an additional 1 to 2 km to provide a wider context.

The first stage is a broad, baseline, desktop study and site visit followed by an initial meeting with the parish council to invite input and to outline the direction of the PGIS. Following further work, the emerging strategy is returned to the parish representatives for comments and suggestions.

The next stage includes a more detailed site appraisal of local demographics and health, flood zones and watercourses, local community incentives and projects, foot

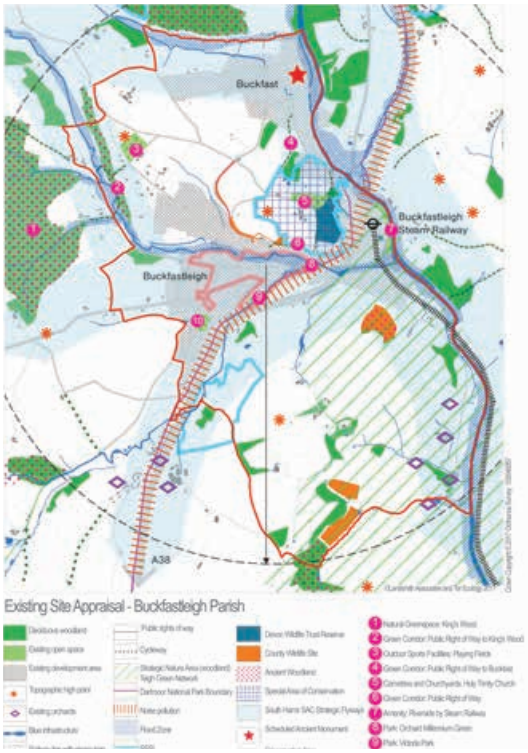

Figure 1. Buckfast and Buckfastleigh Town Council Site Appraisal. © Landsmith Associates and Tor Ecology.

and cycle networks; a biodiversity audit and character assessments of the built and natural environment; a review of planning policy and guidance; and site visits to review existing Green Infrastructure within the parish. Figure 1 represents the key findings of the Buckfast and Buckfastleigh site appraisal phase.

Each aspect of the local landscape is analysed to identify where issues could be alleviated through Green Infrastructure initiatives (e.g. town centre flooding could be alleviated by tree planting along a river upstream). Key issues include biodiversity, health and wellbeing, flooding, air quality, development, recreation, food production and travel. All of these are complex and will vary depending on the location and needs of the local community. Liaison with stakeholders, such as Local Planning Authorities, conservation organisations and NGOs, ensures Parish Green Infrastructure Stategies relate to existing high-level, strategic, local policy, principles and initiatives.

The approach is fully collaborative and brings together the disciplines of ecology, landscape architecture and urban design. The core team remains constant but further specialist input is invited whenever it is required, depending on the specifics and character of each locality (for example % urban to rural ratio) and this inter-disciplinary method of working produces a solid evidence base.

In the case of the Totnes Parish Green Infrastructure Strategy, a community engagement specialist who also focused on the design of public realm elements, was part of the team due to the specific requirements of the town. A small consultative group was selected to represent a demographic spectrum of the community, including older people, teenagers, people with disabilities, a regular cyclist, people from different parts of the town, people with long-term knowledge of the town's development, and others involved with the development of key Green Infrastructure projects. This consultation approach ensured that the strategy was inclusive, addressing the needs and aspirations of the community whilst challenging perceptions.

Each member of the group was interviewed to establish how people experience, value and interact with Green Infrastructure in Totnes. Examples of feedback include: "*[Totnes] fails to create an inclusive and cohesive public realm for all and there is a lack of diverse green space. This is negatively impacting on the community and nature",* and "*space provision for pedestrians is very poor throughout the town centre, in particular, pavements are very narrow on Fore Street / High Street and at Totnes Bridge which is challenging for those with mobility problems and is detrimental in terms of accessibility and inclusion".*

Outcomes

Clyst Honiton and Buckfastleigh Town Council have adopted their strategies as technical guidance to inform their Neighbourhood Development Plans. The Totnes PGIS will be adopted by the Town Council in Autumn 2019. Local Authorities have entered into discussion with developers about funding a new foot/cycle network and woodland planting, and with a parish council to explore the best way to create a new market square, amongst other proposals. At Clyst Honiton, the community is looking at ways to improve their public spaces via re-design and road closures, planting of riverbanks and a 'community plant-a-tree' project (see Figure 2). Buckfast and Buckfastleigh have embraced the opportunity to create a new town centre, providing a heart for the community and a place for people to meet and enjoy open green space.

Conclusions

The proposals contained within a Parish Green Infrastructure Strategy provide a framework for communities to deliver their 'green vision' for their local area with the expectation that the parish or town council will take ownership of the strategy and drive forward Green Infrastructure enhancements in consultation with community, stakeholders, local authority and other interested parties. Proposals are developed to support growth within the parish, providing potential solutions to challenges such as those associated with an ageing population, climate change, public health and wellbeing and impoverished biodiversity, amongst others.

Figure 2. Clyst Honiton Parish Council Green Infrastructure Proposals. © Landsmith Associates and Tor Ecology.

PGIS provide an interconnected role in enhancing and protecting the built and natural environment. They assist in developing social, environmental and economically sustainable aspirations that can contribute, influence and impact positively at local, regional and national levels.

Feedback and lessons learned

- A successful PGIS depends upon a huge amount of engagement within the community so that the aspirations and wishes of the parish for the protection and development of Green Infrastructure can be comprehensively addressed. This must be coupled with a desk-based study undertaken by a multi-disciplinary team to produce a strategy that supports the whole community. This collaborative process empowers communities to shape their local area and reassert their connection with nature and the environment.
- Ongoing collaboration is also important in order to manage expectations, ensure that the limitations of the PGIS are clear and to emphasise that the documents are a framework not a complete solution. However, engagement with local landowners, estate managers and farmers can be more difficult, particularly when changes in estate and farming management practices are advocated.
- It is important to collect feedback from the parish or town councils after publication of Parish Green Infrastructure Strategies to inform revisions to the documents or subsequent strategies. For example, following feedback from Buckfastleigh Town Council, a summary version was added to the Totnes Parish Green Infrastructure Strategy, which made it easier for people to engage with and helped to widen its appeal. Councillors and others participants have commented that it has been *'a very positive and galvanising process'*.
- Funding is a major issue for delivery and maintenance of Green Infrastructure. However, planning obligations and the Community Infrastructure Levy (CIL), can help. Landscape is defined as infrastructure therefore proposals set out in the strategies are potentially suitable for CIL for strategic and local allocation; a high percentage of CIL is allocated to flood defence / Green Infrastructure, landscape and public realm projects (open space, environment and transport). For example, Bristol City Council had allocated 90% of CIL funds to Green Infrastructure / public realm and greening projects at strategic and local area level by June 2019 (see *https://www.bristol.gov.uk/planning-and-building-regulations/community-infrastructure-levy-money).* However, a rural parish may have no access to the few funding streams that are available. It is therefore important to involve the local authority early in the process of drawing up Parish Green Infrastructure Strategies so that parishes can source possible funding opportunities and grant streams.
- Current guidance on producing Green Infrastructure Strategies comes from Natural England (2008), however there are no published guidelines on how to produce Parish Green Infrastructure Strategies.
- Finally, an interactive, open database, web-based approach to the strategies is an important step for the future. It would increase accessibility to Parish Green Infrastructure Strategy documents, enabling more people to use the information to support Green Infrastructure development. For example, an ecological consultant aiming to incorporate Green Infrastructure provision within a design for a housing development would be able to access the mapping associated with a Parish Green Infrastructure Strategy and include this within their proposals.

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Mammal Underpasses – Balancing Cost Effectiveness and Design

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Keywords: culvert, mammal underpass, mitigation, monitoring, success

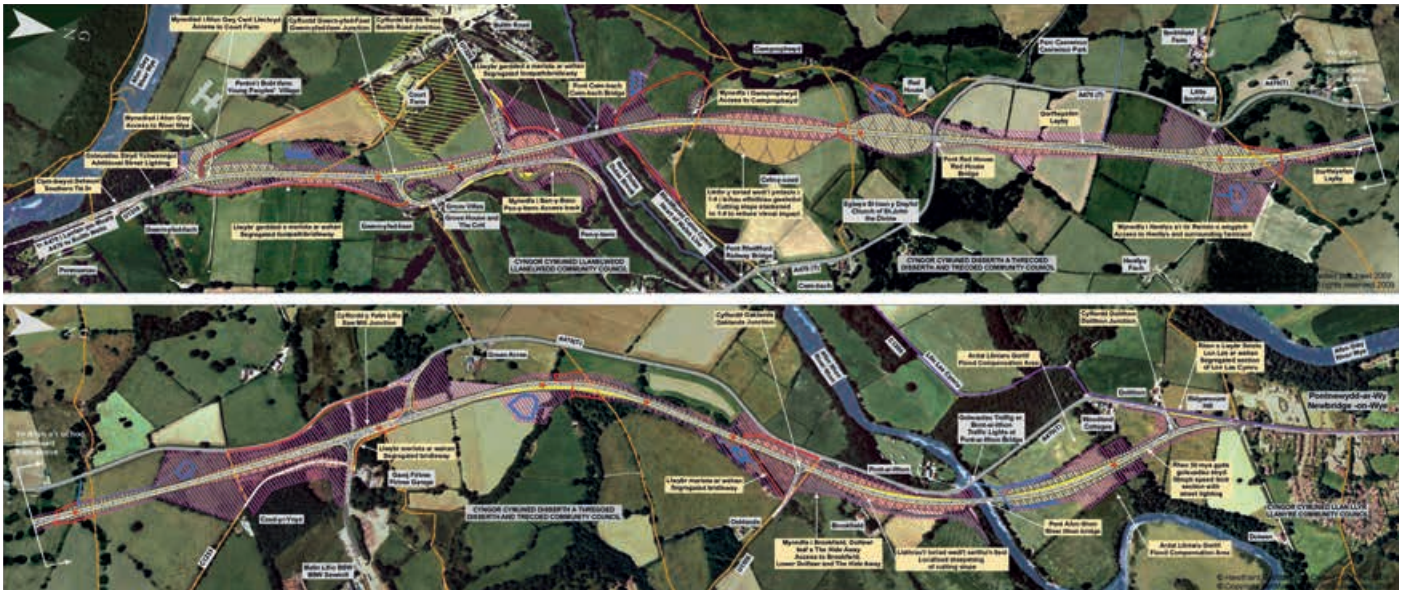

Figure 1. Overview of the A470 Scheme. Approximate location of mammal underpasses shown as red stars.

We question the generic advice to install extensive fencing to guide mammals to road underpasses and demonstrate the effectiveness of under-road crossing points without associated fencing.

Introduction

The Design Manual for Roads and Bridges (DMRB) Volume 10 (Highways Agency 1992) is now some decades old but is still the main reference source that informs the environmental design and mitigation for Highways schemes. Those of us who started our professional careers in the early 1990s can remember it being first published, in draft form, at that time! Volume 10 Section 4 Part 4 (Highways Agency 1999) advises providing mammal-proof fencing to guide otter *Lutra lutra* to under-road crossing points.

In 2008, as part of the ecological mitigation strategy for the A470 Cwm-bach scheme in Powys, Mid Wales, we proposed numerous large underpasses but specified no mammal-proof fencing. Despite this, we still achieved mitigation success, recording positive evidence of use by mammal species, no records of otter road traffic casualties during the aftercare period (2011-2016), and a considerable saving in construction and carbon.

The scheme

The A470 Cwm-bach to Newbridge-on-Wye project was a 6 km Welsh Government scheme to re-align and improve the single-carriageway trunk road. Jacobs' role was to act as Designer/Environmental Consultant from 2007 until 2016; the scheme opened to traffic in 2011. The new road alignment (see Figure 1) was offset from the existing A470 and ran through a high-quality rural landscape meaning careful integration was required. The most sensitive ecological issues were the need to cross the River Wye and Tributaries Special Area of Conservation (SAC), at the Dulas Brook and River Ithon, maintain habitat connectivity and minimise the risk of road traffic casualties (RTC). Mitigation measures were incorporated into the road design to ameliorate its impact on protected species.

The key issues

During the design development phase, 2007-2009, baseline surveys were carried out to inform the ecological assessment. Badgers *Meles meles*, otters and various bat species (common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, Natterer's *Myotis nattereri*, noctule *Nyctalus noctula*, brown long-eared *Plecotus auritus* and whiskered *Myotis mystacinus*) were confirmed using the woodlands, hedgerows and watercourses that would be affected by the scheme. Consultation with key stakeholders, who at that time were Countryside Council for Wales and Environment Agency Wales, highlighted the need to address the habitat severance effects, with a preference for large culverts, clear span road bridges and associated fencing.

The mitigation approach

Nine large culverts and two clear span road bridges were specified as part of the scheme design. The bridges allowed river banks beneath the road to remain untouched and available for continuous mammal use. The indicative culvert design is shown in Figure 2. The seven culverts carrying watercourses were a minimum of 900 mm in diameter and included an integral ledge on both sides that would remain dry in a 1-in-10-year flood event. Two dry mammal pipes were placed at key landscape connections, a hedgerow and woodland respectively. The planting at either end of the underpasses integrated into the retained vegetation to guide mammals to the culverts (see Figure 3 showing one of the culverts at road opening in 2011 and four years later).

However, the guidance (Highways Agency 1999) recommends fencing for 500 m either side of an under-road mammal crossing point, to help funnel and guide mammals to the entrance. In this 6-km scheme, the eleven under-road crossings were often less than 1 km apart. Therefore, had we followed the DMRB advice literally, we would have needed to mammal-proof fence the entire scheme using over 12 km of fencing. Additional land would also have been needed to allow for the below-ground return, where the fencing mesh must be buried parallel to the surface to prevent burrowing, adding to the overall cost.

Wholesale fencing in this way was not an approach we felt would work in practice for the following reasons:

- There was a risk that it would result in higher rates of road traffic casualties, due to animals becoming trapped on the 'wrong side' of the fence, particularly as the new scheme tied in to the existing A470 road which had no mammal-proof fencing.
- Based on previous experience, we were confident that the design (large size) and location (along existing habitat features such as the watercourses and hedgelines) of the culverts would make them attractive features that animals would immediately start to use.
- We wanted to promote an environmental mitigation design that delivered long-term value for money. Given the number and relative location of crossings, the additional 'belt and braces' provision of fencing added substantial cost and complexity that was unwarranted. The below-ground return requires additional land adding to the construction costs. The long-term maintenance and materials needed also increases the carbon budget.
- The traffic modelling for the scheme did not indicate a significant increase in vehicles with the scheme in place: approximately 6,000 vehicles annual average daily traffic (AADT) in both the 'Do nothing' and 'Do something' scenarios. Therefore, with similar traffic volumes the overall risk of a mammal collision was similar, although a slightly increased risk of mortality was predicted due to likely higher vehicle speeds once the scheme was operational.
- Finally, unlike other areas such as Scotland or the New Forest, large wild mammals such as deer were not present and hence there was no requirement for any other protective fencing.

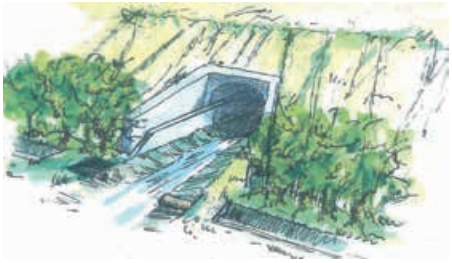

Figure 2. Mammal underpass (conceptual) at planning stage.

Figure 3. A mammal underpass when first built in 2011 (top) and four years later in 2015 (bottom).

The concept of no mammal-proof fencing was agreed with statutory stakeholders and following a successful Public Local Inquiry and Minister's Decision in 2009, detailed design work and construction started in early 2010.

Use of the underpasses

Ecological monitoring was carried out during the five-year aftercare period, 2011-2016, to determine the effectiveness of the innovative approach. The nine culverts were surveyed each year, up to eight visits, to collect data on mammal use. This included laying sand traps to record footprints, setting wildlife camera traps and carrying out automated and manual bat surveys (to record bat calls). The results are summarised in Table 1, showing that otters, badgers and bats all used the underpasses. Data on any otter RTCs within scheme was collected annually from the Cardiff University Otter Project.

Clear span bridges and continuous otter use

Otter is a qualifying feature of the River Wye and Tributaries SAC, which the road crossed via two clear span bridges. The bridges were designed to ensure that the banks of the Dulas Brook and River Ithon were untouched by the road crossing. This was to minimise impacts on otter using these watercourses. All of the watercourses crossed by the scheme were surveyed for otter between 2005 and 2015. Table 2 illustrates use of watercourses by otter through the scheme phases. This evidence, along with that presented in Table 1, shows how the provision of culverts and clear span bridges has achieved habitat connectivity for otter.

Successful mitigation

The regular use of the mammal underpasses and the continued use by otters of all watercourses crossed by the scheme throughout all key phases of the project indicated that the potential for severance of the landscape by the new road was not realised. Taken together, the evidence of use and lack of any otter RTC records demonstrates that the innovative approach of large culverts, clear span bridges and not specifying mammal proof fencing was a success from an environmental as well as a financial perspective.

Table 1. Summary of mammal species using the nine culverts, 2011-2016. Bat species abbreviated: Pip45 *Pipistrellus pipistrellus*, Pip55 *Pipistrellus pygmaeus*, Myo Myotis sp., LHB *Rhinolophus hipposideros*, BLE *Plecotus auritus*, Noc *Nyctalus noctula*, Natt *Myotis nattereri*, Daub *Myotis daubentonii*.

Culvert number	Year / Species recorded				
	2012	2013	2014	2015	2016
1 (wet)	otter 2 bat spp. (Myo, LHB)	otter 4 bat spp. (Pip45, Pip55, Myo, BLE)	otter badger 3 bat spp. (Pip45, Pip55, Myo)	otter badger 5 bat spp. (Pip45, Pip55, Myo, LHB, BLE)	otter 5 bat spp. (Pip45, Pip55, Myo, BLE, Noc)
2 (wet)	4 bat spp. (Pip45, Pip55, Myo, LHB)	otter 4 bat spp. (Pip45, Pip55, Myo, LHB)	badger 4 bat spp. (Pip45, Pip55, Myo, LHB)	badger 4 bat spp. (Pip45, Pip55, Myo, BLE)	otter badger 5 bat spp. (Pip45 Pip55, Myo, BLE, LHB)
3 (dry)	4 bat spp. (Pip45, Pip55, Myo, LHB)	4 bat spp. (Pip45, Pip55, Myo, LHB)	Not surveyed – land access withdrawn		
4 (wet)	otter 4 bat spp. (Pip45, Pip55, Myo, LHB)	otter 5 bat spp. (Pip45, Pip55, Myo, Natt, LHB)	otter badger 5 bat spp. (Pip45, Pip55, Myo, Noc, LHB)	otter badger 6 bat spp. (Pip45, Pip55, Myo, LHB, BLE, Noc	otter badger 4 bat spp. (Pip45, Pip55, Myo, LHB)
5 (wet)	4 bat spp. (Pip45, Pip55, Myo, LHB)	5 bat spp. (Pip45, Pip55, Myo, Noc, Daub)	otter badger 3 bat spp. (Pip45, Pip55, Myo)	otter 3 bat spp. (Pip45, Pip55, Myo)	otter 5 bat spp. (Pip45, Pip55, Myo, BLE, Noc)
6 (wet)	otter 2 bat spp. (Pip45, Myo)	otter 4 bat spp. (Pip45, Pip55, Myo, Natt)	otter 4 bat spp. (Pip45, Pip55, Myo, Noc)	otter badger 4 bat spp. (Pip45, Pip55, Myo, Noc)	otter 6 bat spp. (Pip45, Pip55, Myo, BLE, Noc, LHB)
7 (wet)	otter 3 bat spp. (Pip45, Pip55, Myo)	otter 6 bat spp. (Pip45, Pip55, Myo, Noc, Natt, BLE	otter badger 5 bat spp. (Pip45, Pip55, Myo, Noc, LHB)	otter badger 4 bat spp. (Pip45, Pip55, Myo, Noc)	otter badger 5 bat spp. (Pip45, Pip55, Myo, BLE, Noc)
8 (wet)	otter 2 bat spp. (Pip55, Myo)	otter 3 bat spp. (Pip45, Pip55, Myo)	otter 4 bat spp. (Pip45, Pip55, Myo, Noc)	otter 4 bat spp. (Pip45, Pip55, Myo, Noc)	otter 5 bat spp. (Pip45, Pip55, Myo, BLE, Noc)
9 (dry)	3 bat spp. (Pip45, Pip55, Myo)	4 bat spp. (Pip45, Pip55, Myo, Natt)	badger 3 bat spp. (Pip45, Pip55, Myo)	badger 5 bat spp. (Pip45, Pip55, Myo, BLE, Noc)	badger 5 bat spp. (Pip45, Pip55, Myo, BLE, Noc)

Table 2. Summary of otter evidence along watercourses, 2005 – 2015. ES refers to surveys completed to inform the Environmental Statement.

Watercourse (scheme crossing)	Otter evidence recorded					
	ES	Pre-construction	Construction		Aftercare	
	2005	2009	2010	2011	2013	2015
Cwm-sheperd Brook (MU1)	Yes	No	No	Yes	Yes	Yes
Court Farm Drain (MU2)	No	No	No	No	Yes	Yes
Dulas Brook (clear span bridge)	Yes	Yes	Yes	Yes	Yes	Yes
Little Smithfield Brook (MU4)	No	No	No	No	Yes	Yes
Rhydfelin-fach Stream (MU5)	No	No	No	No	No	No
Nant-yr-Hwch (MU6-8)	No	Yes	Yes	Yes	Yes	Yes
	No	Yes	Yes	Yes	Yes	Yes
	No	Yes	Yes	Yes	Yes	Yes
River Ithon (Clear span bridge)	Yes	Yes	Yes	Yes	Yes	Yes

Acknowledgements

Thanks to Peris Jones at Welsh Government for permission to write this article. Thanks to all our Ecologists and other members of the Jacobs team who supported this project between 2007 and 2016.

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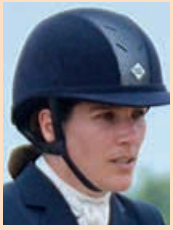

Iona Pearson CEnv MCIEEM has worked in consultancy for almost 20 years on a variety of large infrastructure projects. She has led much of the work in Jacobs to make ecological data collection and display more innovative, and pioneered the use of GIS and electronic data capture on a number of projects early in her career.

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CIEEM Featured Training

Survey, Ecology and Identification

Accurate Identification of Protected Mammal Tracks and Signs

West Sussex, 09 & 10 October

Bringing together the extensive tracking knowledge of John Rhyder (Woodcraft School) and Richard Andrews (Andrews Wildlife Consultants), this interactive and practical two-day course is aimed at professional ecologists with some working knowledge and experience of identifying mammal tracks and signs, but who would benefit from more detailed understanding and guided practice. (The course is also suitable for the relative beginner who has a broad understanding of British mammals and their signs but may not have much practical experience).

Identifying Coastal Wading Birds

Lancaster, 31 October

This one day training course delivered by Mike Douglas will focus on coastal, non-breeding wading birds, although coastal wildfowl will also be identified in the field.

The course will be delivered by a combination of presentations, group problem solving, question and answer sessions. Peer guiding will be used to help participants towards the course objectives, aided by regular feedback and the use of one of the UK's premier coastal birding sites as the outdoor venue.

Introduction to Bats and Bat Survey

Dunblane, 06 November

This course will provide a look at the primary legislation in relation to bats (focused on Scotland), important bat identification features and key aspects of bat ecology. A range of roost types for different species will be discussed and pointers will be given on what to look out for in roost identification. Key bat survey requirements and methods will be reviewed, to allow delegates to gain a greater understanding of required methods in relation to current good practice guidance.

Planning and Development

Developing Skills in Ecological Impact Assessment (EcIA) (Ireland)

Dublin, 15 & 16 October

A two-day practical course aimed at those practitioners who have existing experience of undertaking EcIAs and wish to develop those skills further. Sessions have been tailored to explore legislation and case studies relevant to practitioners working in Ireland but the principles are applicable in both ROI and any UK nation. 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.

Biodiversity Net Gain Through Development

London, 14 November

This course provides training on designing biodiversity net gain for development projects. It is based on the UK's good practice principles for biodiversity net gain (CIEEM/IEMA/CIRIA, 2016) and the associated practical guidance (CIEEM/IEMA/CIRIA, 2019).

Making the Most of the Ecology Assessment in BREEAM and the BREEAM Family

London, 26 November

An introduction to the ecological component of BREEAM and how to get the most from it. This workshop will cover all types of BREEAM assessment, across the BREEAM family and include worked examples of how the BREEAM criteria can be used for maximum ecological benefit. Each of the ecology credits will be discussed individually, including the use of the ecology/biodiversity gain calculator. The aim of the workshop is for ecologists to be able to achieve maximum ecological benefit from BREEAM and similar assessments.

Transferable Skills

Train the Trainer for Ecologists

Manchester, 05 & 06 November

This unique two-day course is specially designed for ecologists and environmental professionals and covers 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 of tuition.

Effective Communication Skills for Women

Birmingham, 07 November

Communication is complex: It's not just what you say, it's how you say it and the method you choose to convey it. Good communication often leads to positive results, but when communication goes wrong, issues can quickly escalate. From the written to the spoken word, from having a difficult conversation to giving a persuasive presentation, this training course helps you to be confident that the message you are giving is the one that you want the other person to receive.

Effective Workplace Mentoring

Birmingham, 19 November

Mentoring offers the opportunity for both the mentor and the mentee to grow and develop within an organisation. Being a mentor hones many skills such as coaching and listening, it can develop greater self-awareness and increase job satisfaction. 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.

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The SBIF Review... Designing the Blueprint for a New Type of Green Infrastructure?

Claire Lacey CEnv MCIEEM
Scottish Oceans Institute, University of St Andrews

Keywords; biodiversity, biological records, data, data sharing,

Following an extensive review, the Scottish Biodiversity Information Forum (SBIF) is working to create a blueprint for improving the biological recording infrastructure in Scotland. Think of this just like Green Infrastructure… but for your biodiversity data!

Introduction

As a self-confessed data-nerd, there is very little I find as pleasing as a database full of biological data. I work on marine mammals, so for me it's not uncommon for a single field trip to last 6 weeks, resulting in excess of 150,000 GPS records, 2,000 environmental records and 400 sightings records. That's without the acoustic data, the photographs and all the other incidental material collected to add context to the survey. Data storage is cheap, so I can record acoustic data for beaked whales collecting 500,000 samples a second and filling up hard drive after hard drive. But in the age of easy data storage and increased capacity, what happens to all these records once the project is completed? At a time when organisations like the European Commission are calling for science to become more open and adhere to FAIR (findable, accessible, interoperable and reusable) data management principles (Popkin 2019), do we have an obligation to contribute our biological data?

Data sharing

Historically, we ecologists are not the best at sharing data. We do not have a culture of cooperative curation and sharing that is fully established within our field (Hampton *et al*. 2013). Some of the reasons for this are – well – reasonable. In a world of increased demands on our time, increasing competition for work or funding, a need to fulfil the requirements of our employers, email, meetings, licence returns, Continuing Professional Development, etc., etc. – the time left over to compile data and submit it to the records office or database is limited. But the advantages of such initiatives should be obvious too.

Red squirrel *Sciurus vulgaris*. © Claire Lacey.

With strains on our natural environment at a critical level, and daily news full of warnings about the loss of biodiversity and the impacts of anthropogenic activities and climate change, don't we have an obligation as professionals to share the data we have as widely as possible?

Not that this is a new idea; it has been talked about since 1975. The preface to the BIOREC conference proceedings (BIOREC 1975) states that '*the demand for reliable biological information is escalating.*

It is, therefore, essential that a unified system for biological data accumulation, storage and retrieval facilities is adopted' – which is a true today as it's ever been.

Scottish Biodiversity Information Forum

In 2009, the public petition from Biological Recording in Scotland (BRISC) '*to urge the Scottish Government to establish integrated local and national structures for collecting, analysing and sharing biological data to inform decision making processes to benefit biodiversity*', resulted in the formation of the Scottish Biodiversity Information Forum (SBIF). In 2010, Scottish Government tasked SBIF's cross-sectoral membership (comprising members from CIEEM, the recording community, National Park Authorities, National Museums of Scotland, Scottish Natural Heritage and Scottish Wildlife Trust, amongst others) '*to develop a strategic approach (by consensus) to the collection, collation and sharing of biological data across Scotland*'. Where this differs from previous approaches, however, is in the depth of the review that SBIF have completed, and the scale of the vision for the new infrastructure.

The SBIF 'Review of Biological Recording Infrastructure in Scotland' was conducted from 2016-2018 and has been characterised throughout by a sense of partnership and a shared vision for a resilient and inclusive information infrastructure (Wilson *et al.* 2018a). Opinions were collected from interviews with people from 42 different organisations ranging from academia to commercial; Local Record Centres to Statutory Agencies (Wilson *et al*. 2018b). A questionnaire (circulated to all Scottish CIEEM members, as well as others from a similar breadth of sectors) received 290 responses (Wilson *et al.* 2018c), and four workshops were attended by 39 organisations (see Annex 1, Wilson *et al.* 2018a). This massive consultation effort is what makes SBIF stand out from other attempts to set up a data-sharing initiative, and hopefully will prove the key to its success. The review itself makes 24 recommendations (Figure 1) including a central data repository that all record centres and other data providers will feed in to, data access through a single online portal, and an online data verification

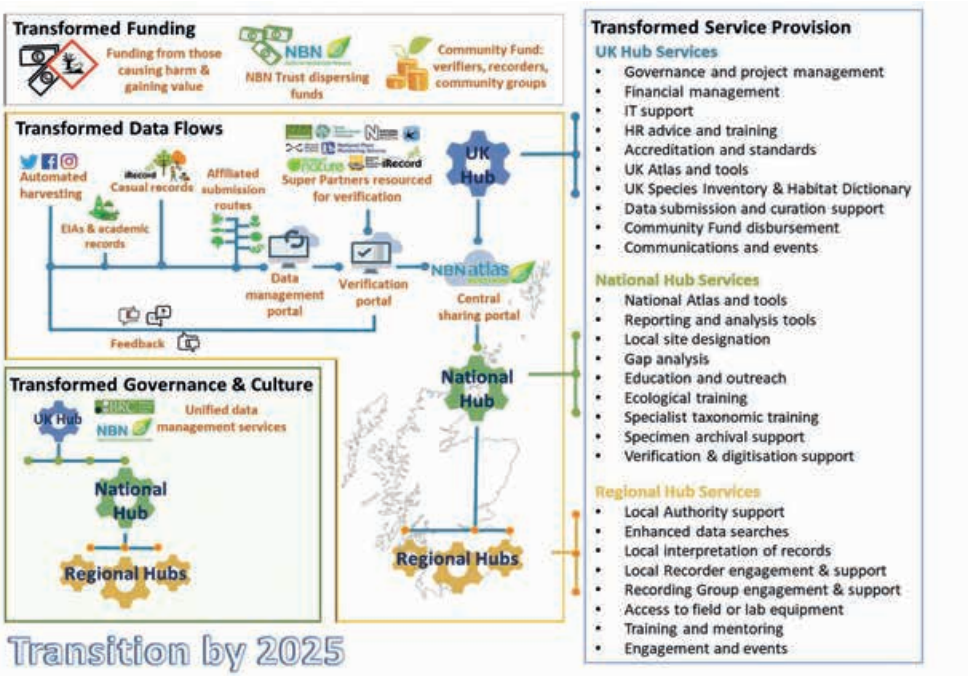


Figure 1. The recommendations of the SBIF review. See Wilson *et al.* (2018a) for these in full. © SBIF.

portal (Figure 2). Recommendations also include simplifying the system and improving and standardising the data provision services that are available.

As the gatekeepers to a huge resource of biological and environmental data, buy-in from the professional ecological community is critical. Not only will this improve access to data for our own work, but it will also improve the situation for planners, regulators and many other people who rely on an up-to-date repository of full and accurate biological data.

Take the renewables industry where we are now looking at repowering windfarms in Scotland as they come to the end of

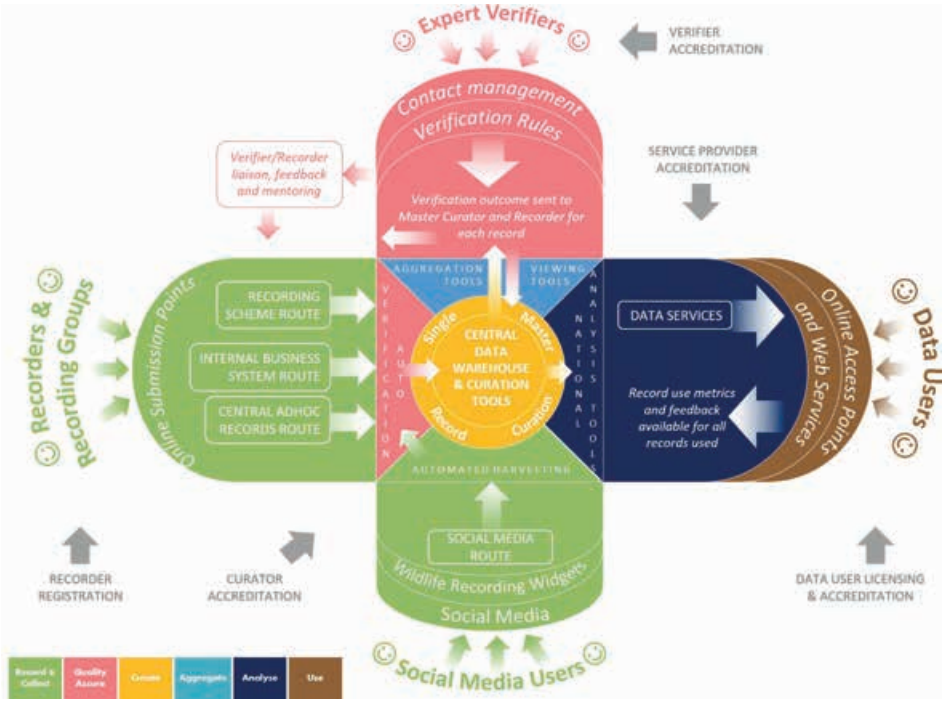


Figure 2. Schematic of the potential data flow model outlined in the SBIF review. Taken from Wilson *et al.* (2018a) with permission. © SBIF.

their 20-year lifespan. We still don't have answers to many of the environmental questions surrounding these structures because it is often not possible to collect enough data from a single site. Imagine how different planning, consenting and mitigation could be if we had a robust, verified dataset containing both *ad hoc* records and those from site-specific commissioned surveys collected as part of the consenting process, as well as all the monitoring data undertaken on site, both as part of the planning conditions but also from wider monitoring initiatives. Now scale up these advantages across all the other industries that require input from us as ecological and environmental consultants and you start to see the potential that the new SBIF infrastructure could have.

Moving forward

SBIF isn't trying to reinvent the wheel. This work is very much a collaboration with the National Biodiversity Network (NBN) Trust with data freely shared by both SBIF and NBN (see Judge *et al*. 2018 for more information on the NBN Trust). In addition, over the coming months the NBN Trust will be working with their data providers and stakeholders across the UK to explore how they can provide more robust services for environmental consultants and other commercial data users.

SBIF are keen to get feedback from professional ecologists, particularly suggestions for what we need this new infrastructure to deliver for us and how this can best be achieved. When you deal with archival of large data sets and short deadlines, it's just not practical to add records one at a time. There are other considerations too – effort data, environmental and weather data, the all-important meta-data. This is our opportunity to influence how this recording infrastructure is set up to make sure it is useful for everyone.

As CIEEM Members we have committed to a set of processional obligations in our Members Code of Conduct. This includes '*the requirement to share, wherever possible, data and other relevant information and to otherwise work to protect and enhance the natural environment'*. I know that this isn't always possible – there can be issues regarding data ownership when surveys are conducted on behalf of a commercial client – but these are not insurmountable challenges. A contract clause stating that data would be contributed unless expressly-requested-otherwise by the client has been used successfully. Contribution of data can be discussed with clients prior to collection, and buffer periods can be used in cases of commercial sensitivity. I'm not saying it will be easy; it will require an industry-wide change of mindset – but that doesn't mean we shouldn't try. Let's not file this under 'too hard' – let's take this opportunity to change our culture of data sharing and make a difference.

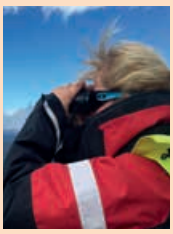
Further information

Information about the SBIF Review and downloadable versions of the report can be found at https://nbn.org.uk/about-us/where-we-are/in-scotland/the-sbif-review/.

Please contact the author at scotland@cieem.net or SBIF development officer Rachel Tierney at rtierney@scottishwildlifetrust.org.uk if you have questions or would like to comment or send feedback. The CIEEM Scotland Committee will be running a series of events to discuss this further with members based in Scotland.

The SBIF review was recently voted Best Practice Stakeholder Engagement Winner at the 2019 CIEEM Awards.

About the Author



Claire Lacey is Convenor of the CIEEM Scotland Geographic section and Vice Convenor of the Marine and Coastal SIG, and is also a member of the SBIF Advisory Group. Claire works at the University of St Andrews where she conducts long-term monitoring projects for cetaceans in European waters.

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Proposed Method for Testing and Accreditation of Great Crested Newt Detection Dogs

Kat Stanhope CEnv MCIEEM and **Victoria Sloan**
Atkins, a member of the SNC Lavalin group

Keywords: accreditation, amphibian, conservation dog, detection dog, great crested newt, *Triturus cristatus*

Interest in the use of search dogs to detect species of conservation importance is rising in the UK, with reports of dog searches leading to improved survey efficiency and higher detection rates than traditional survey methods. However, without a standard methodology for testing and accreditation of dog/handler teams there is a lack of confidence in their use.

Following research to test the ability of detection dog/handler teams to identify and locate great crested newt *Triturus cristatus*, whilst maintaining high welfare and biosecurity standards, we propose a methodology and accreditation system. It is hoped that this will provide a baseline for further testing, refinement of methods and development of standard protocols.

Introduction

A research project to assess the potential of detection dogs to locate great crested newt (GCN) was undertaken on behalf of HS2 Ltd. A rigorous testing method was employed to determine whether dog/handler teams could reliably distinguish GCN scent from other UK amphibians, and locate GCN in the natural environment. Two dog/handler teams were tested, both of which were able to detect the scent of GCN in controlled conditions and in habitat searches. HS2 Ltd have included the use of a suitably trained dog and handler to aid detection of GCN in conjunction with other methods within its organisational GCN Licence.

The potential advantages of using dogs to detect GCN include: the ability to identify presence of GCN outside aquatic survey windows, a reduced requirement for suitable weather for GCN dispersal prior to their capture through *in situ* detection, and the speed at which a dog can search an area of terrestrial habitat. Preliminary search timings suggest that approximately 2-3 km of linear features or sites < 5 ha could be searched within a day. Detection dogs could also be used to reduce time on destructive searches, prior to the removal of amphibian fencing or where lengthy hand searching by humans is unfavourable, such as along railway lines or highways verges. Early confirmation of GCN by dogs may provide sufficient data to take advantage of Natural England Licencing Policy 4, which allows use of reduced or older survey data where impacts can be predicted with confidence.

Figure 1a. Preparation for great crested newt detection testing. Tanks used for keeping great crested newts in captivity. Photo credit Ste Nisbet, Atkins (August 2017).

The use of dogs in detection work is currently unregulated in the UK and there has recently been a call for guidance on the use of detection dogs for ecological survey (Coleing *et al*. 2018). The complexity of both training and testing dogs for detection of GCN and the requirement to guarantee both dog and GCN welfare strongly supports the need for an accreditation system. This should:

- Be scientifically robust
- Mimic scenarios that will be encountered in operational searches
- Be feasible for dog/handler teams in terms of cost and timescale
- Include monitoring of ongoing dog training and re-testing at an appropriate frequency
- Be designed and implemented by those who understand the ecology of the search species in collaboration with those with expertise in dog training, handling and welfare.

Working as a handler with a working dog is a serious long-term commitment. The training required is rigorous and, at the outset of the training, it is not always possible to determine if a dog will have detection ability or will be suitable as a working dog. Before testing of a dog/handler team, training also requires a licence to keep live GCN and relevant experience; Natural England would generally only licence around four GCN to be kept for initial training.

Considerations for GCN detection dog testing: Licensing, Personnel, Biosecurity and Amphibians

GCN are a European Protected Species, so testing must be carried out under an appropriate scientific licence issued by the statutory nature conservation organisation for the taking, possession and transport of GCN as a minimum. A standard GCN survey licence would be insufficient to cover this type of work.

Figure 1b. Belly pattern image used for identification of a juvenile great crested newt. Photo credit Ste Nisbet, Atkins (August 2017).

All testing and searches for amphibians should be carried out by experienced and licensed ecologists. Between activities, GCN need to be kept in suitable conditions by personnel experienced in keeping amphibians in captivity (Figure 1a).

All elements of the validation and testing should be undertaken in accordance with Amphibian and Reptile Groups of the United Kingdom Advice Note 4, version 2 (ARG UK 2017).

Both palmate newt *Lissotriton helveticus* and smooth newt *Lissotriton vulgaris* are required for scent discrimination tests as well as both common frog *Rana temporaria* and common toad *Bufo bufo*. A sufficient number of GCN are required for scientifically robust testing.

Age and sex data on GCN used in testing must be collected. Belly spot patterns should be used for identification of individuals and monitoring of welfare in captivity (Figure 1b).

Testing of dog/handler team

The proposed tests relate only to the detection of live GCN and to the detection of active (not hibernating) newts in terrestrial open habitat or refugia not in aquatic situations. There are two parts: an initial controlled test to assess the ability of a dog to detect unfamiliar GCN scent (i.e. not using GCN the dog was trained on), and field trials to assess whether a dog can reliably locate GCN individuals in habitat searches.

Part 1: Controlled test for scent discrimination

The procedure for scent discrimination testing is based on that used in the UK for testing and accreditation of explosive detection dogs. For explosives, the test is used as a stand-alone validation test (Porritt *et al.* 2015). Here it is used as a means to avoid undertaking more extensive or complex field trials for dogs who cannot recognise GCN scent, and a method of performing a discrimination test where biosecurity protocols can be implemented.

Test implementation

Testing should be undertaken double blind such that the dog/handler team and 'observer' are not aware of the test set-up. Two people in addition to the dog handler are required as a minimum: one as the 'tester' and one as observer. Extra people to help with set-up will speed things up whilst also maintaining biosecurity.

Requirements

- an outside testing area adjacent to a building or other cover (Figure 2)
- 96 sterilised containers with air holes, e.g. flour shakers
- 10 GCN the dog has not encountered before (ideally including adult males, females and juveniles)
- a minimum of five individuals per species of each other amphibian: smooth newt, palmate newt, common frog and common toad
- other scents that the dog may have encountered during training or associated with captive GCN such as handling gloves and soil (but which have had no contact with GCN).

Set-up

1. The GCN, other amphibians and other scents are placed in the containers by the tester at least 30 minutes ahead of testing.
2. Eight containers are placed in numbered holes in a testing rig (wooden planks with a plastic-coated top and holes drilled into the planks to secure the containers, with numbered stickers next to each hole, see Figure 2). The distance between containers should reduce the likelihood of interference between scents and minimise the risk of the dog passing containers too quickly to detect scent (1 m recommended). The layout of the containers in the rig is determined using computer software: Canine Odour Discrimination Software (Defence Science and Technology Laboratories, UK, available as detailed in Porritt *et al*. 2015) for those containing GCN and a random number generator for non-GCN.
3. This is repeated to create 12 runs of eight containers, with each individual GCN being used once (one container in each of 10 runs) and leaving two runs with no GCN (blank runs).
4. The dog/handler teams and observer must be out of sight whilst each run is being set up. The tester moves out of sight of the rig during the dog search and observation.

Procedure

The discrimination test comprises a series of searches along 12 runs of eight containers (Figure 2).

Before the start of the test, the dog/handler team may carry out one or two training runs using containers with no GCN to ensure that the dog is searching effectively.

The dog/handler team then search along a run of eight containers; the dog is allowed to return to the previous container but no further back along the rig. During the run, the handler makes one of three calls:

1. 'Container no. X' when the dog has indicated GCN presence in a container
2. 'Blank' when no indications have been given on any containers along the run, or
3. 'Interest in container no. X' where they have observed a reaction from the dog but not a full indication of the presence of GCN.

If 1 or 2 is called, the tester confirms whether this is correct, the dog is rewarded and the run is ended. If 3 is called, this is recorded in silence and the search of the run continued. The dog cannot repeat the run.

The observer records whether the dog behaviour is consistent with the handler calls, for example to verify that the dog handler is calling the same container number which the dog is indicating on.

The same procedure is repeated for all 12 runs.

Figure 2. Controlled test for scent discrimination: a) setting up the testing rig, b) newt detection dog Rocky (with handler Aran) from Conservation Dogs sitting alongside testing rig to indicate a container with a great crested newt. Photo credit Luke Gorman, Atkins (August 2017).

Outcome

To pass the test, the dog/handler team is required to correctly locate of 8 out of 10 GCN with no more than two false indications. The dog/handler team fail the test if 5 out of 10 GCN or fewer are correctly located, or four or more false indications are given. Intermediate scores require further evaluation, accepting that many factors could affect the results.

Part 2: Controlled field trial in natural habitat

The trial aims to mimic natural terrestrial search conditions; here, the approach for open habitat is described but this approach can be modified for refugia. Where a dog is intended to work in open habitat and on refugia, testing of both would be required. No containers are used as dogs are able to detect ground disturbance (e.g. pits dug to contain GCN) and the scent of containers such as tins, tubs or containers made out of natural material. The field trial gives a detection rate (i.e. number of GCN detected / total number of GCN present) for the dog/ handler team as well as a frequency of false indications where the dog highlights the presence of GCN where none are present.

Trial implementation

The trial site must be within suitable GCN habitat at the site where GCN have been collected, to reduce welfare and biosecurity risks in the event of GCN escaping.

Testing should be undertaken single blind for practical reasons and to ensure GCN welfare, i.e. people with knowledge of the trial set-up are present during dog searches, but the dog handler is not aware if, or how many, GCN are present in any search plot.

A minimum of two people in addition to the dog/handler team are required but extra helpers will speed things up. With four people, the trial takes between two and three days to complete.

Requirements

- Five plots of approximately 40 m^2 (suitable for a dog search lasting no more than 30 minutes) comprising suitable terrestrial habitat for GCN, ideally balancing amounts of cover for GCN with ease of search, recording and observation.
- Plot margins demarcated such that GCN can be easily seen if trying to leave the plot, for example a shallow trench around the plot where there is a light-coloured substrate (see Figure 3).
- 20 GCN caught on site.

Procedure

- Observers walk around the plot disturbing the ground as if releasing GCN, to control for detection of disturbance.
- Observers release between zero and four GCN into the plot (appropriate for the plot size and cover) under vegetation and in shade, then monitor from outside the plot boundary until the GCN are reasonably static (for approximately 30 minutes). In test trials, most GCN stayed in place, some found alternative refuge near to where they had been placed and the few that tried to leave were replaced in the plot and settled down.
- Observers move away from GCN release locations.
- The dog/handler team search the plot, moving back and forth in closely spaced transects.

Figure 3. Field trial for scent detection. Trenched plot for controlled field trials a) in October 2017 and b) in June 2018 (mixed moss / grass / leaf litter). Photo credit Victoria Sloan, Atkins.

- The dog handler calls for a hand search wherever they feel that a GCN has been detected, clarifying whether this is 'indication' or 'interest'. Interest insufficient to call for a hand search may also be flagged by the handler, and areas can be re-checked as desired. When a hand search is called, the dog search is stopped and a hand search for GCN is undertaken immediately by the observer (experienced ecologist with responsibility under the licence). Observers only enter the plot through the area which has already been searched. The dog is rewarded for correct indications when a GCN is found.
- An observer records the coverage of the search area by the dog, the search calls made by the dog handler and notes whether they felt observations made by the dog handler were consistent with dog behaviour.
- Searches are repeated (rotating around the plots) until the dog has searched for a total of 20 (different) GCN and at least 2 plots with no GCN (i.e. blanks).

Outcome

To pass the field trial, the dog/handler team is required to locate 15 out of 20 GCN with no more than five false indications. However, the direct reporting of trial results may also be useful at this stage to enable further assessment of whether a particular dog could be used in different scenarios.

Accreditation

The Conservation Dogs Programme run by the New Zealand Department of Conservation is an accreditation scheme that has provided a model for our recommended UK accreditation scheme, as follows:

1. The dog handler makes an application to the accreditation body providing evidence of experience in dog handling and experience relating to GCN.
2. An interview based on a questionnaire tests the experience level of the handler and ensures the welfare of the dog.
3. If acceptable, the dog/handler team carry out two tests while being observed by someone with knowledge of GCN detection by dogs. They need to pass the first test to progress to the second.
   - Test 1: A controlled test of scent discrimination.
   - Test 2: A controlled field trial for GCN detection in natural habitat.
4. The overall pass level takes into account the results of the tests and the expert observations. Constructive feedback is given to any dog/handler team who do not achieve accreditation.
5. Accreditation is granted subject to a re-test of scent discrimination (test 1) at two-yearly intervals plus submission of a log of training and GCN searches carried out in the interim.
6. Accreditation is issued to a dog/handler team based on the success of the field trials; if the dog/handler team performed well in open field trials but not in refugia trials they may only be accredited to conduct searches in open habitat. The accreditation system may allow for swapping between handlers for a single dog where the handlers can demonstrate handling skills and long-term involvement with the dog in question.

An accreditation body would need to be appointed in the UK and the reviewers of the applications, interviews and tests (i.e. the accreditors) would need to be experienced both in dog handling and GCN to suitably assess candidates.

Conclusions

The training and testing of conservation search dogs to detect great crested newts or other species takes hard work and a high level of commitment over a long period. Only a few dogs are suitable and there are challenges around animal welfare, the availability and use of species for testing, and species licensing issues.

However, there is great potential for conservation dogs to detect cryptic species in the natural environment leading to more efficient searches for survey and mitigation, and expanding survey areas and seasons.

As interest in this approach grows, the UK needs standard methodologies and an accreditation system to ensure consistently high standards. The proposed testing protocol summarised in this article does not cover all possible uses of detection dogs and we invite comments and engagement from those with an interest to enable further development and refinement.

Detection Dogs Working Group

The Detection Dogs in Britain and Ireland Working Group has recently been formed. One of the groups' purposes is to share knowledge and raise awareness of detection dog work in ecology and conservation. To find out about this group and other initiatives, join discussions, share links and experiences, access scientific and 'grey literature' relating to the subject, and help collaboration a Facebook group has been set up. Please contact the authors for more information.

Acknowledgements

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Six Top Tips for Recording Your CPD

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Lindsay Stronge ACIEEM
Ecology by Design

CIEEM aims to promote the highest professional standards and to ensure public confidence in the services offered by its members. Continuing Professional Development (CPD) is an important part of this both for you as an individual, and for CIEEM.

Each year, a minimum of 5% of members are randomly selected for audit of their CPD record. The Training, Education and Careers Development Committee (TECDC) reviews each selected CPD record to ensure members are keeping up to date with their CPD obligations. Based on the 2017-2018 review, TECDC members have the following suggestions to help you improve your CPD record and meet your obligations.

1. Make sure you do enough CPD

Members must complete a minimum of 30 hours of CPD annually, at least 20 hours of which must be 'structured' activity. In the 2017-2018 audit more than 10% of those audited had not completed sufficient CPD hours. CIEEM accepts a very broad range of CPD activities, so there are many ways to complete CPD, even if you have limited time, limited funding or accessibility issues. Also, do not forget that there are additional concessions on CIEEM 'charged for' CPD activities for those on low incomes.

2. Repetition is not necessarily the key to CPD success

Maintenance of knowledge and skills is an important part of CPD, but there is concern that some members are repeating the same CPD activities year after year. Undertaking a particular training session may have developed your skills the first time, but the benefits are likely to lessen if the same training is undertaken year after year. Utilising the 'Learning' section of the CPD record may help to address this.

3. Provide a good 'Description' of the activity

Reviewers provide feedback on the relevance and breadth of CPD activities, this is guided by CIEEM's Competency Framework. You should provide a good description of the activity undertaken. For example, reading technical publications (a common type of unstructured CPD) should be accompanied by specific references to the books, journals and articles. *(Example 1)*

31 Jan 2018	**Activity:** Project work **Description:** Ecological Assessment of Former RAF Coltishall Air Base , Norfolk, in advance of producing a habitat management plan	Habitat identification and evaluation (S3)
	Learning: Researching and finding solutions to very site specific conflicts between military sites (contamination/ restricted land use) and protected species such as great crested newts, reptiles, ground nesting birds, prior to developing a site managemtn plan. This is a new area of knowledge for me. *5 hours, unstructured*	

1 *Good example – Edward's record*

06 Mar 2018	**Provider:** National Biodiversity Data Centre **Activity:** Non-CIEEM Conference (attendance) **Description:** All Ireland Pollinator Conference	Advise on habitat/species management and/or habitat creation projects (M1)
	Learning: Conference detailing the All Ireland Pollinator Plan with speakers from county councils, tidy towns, ecologist and conservation groups. I have applied this learning through providing advice to local community and tidy towns on the creation of pollinator areas. *7.5 hours, structured*	

2 *Good example – Sheila's record*

4. Explain what you learnt

CPD is an activity where you develop skills and broaden your knowledge that you can then apply in your professional life. Some activities, to be meaningful CPD, require reflection and evidence of putting it into practice. When recording CPD you are asked to record 'Learning'. This is where you should record how you have applied, or will apply, this learning. What did you learn? How has it impacted you? How could it benefit others? *(Example 2)*

5. Less may be more

Some members record far more than the required 30 hours. There is no restriction on the amount of CPD you can undertake, but reviewers have noted that when hundreds of hours are recorded, they often lack detail and have no, or very limited, reflection on learning outcomes. Also, tasks which appear to be a routine part of the person's job or study are often included – this does not constitute CPD.

From 1 October 2019 there will be some maximum annual limits on different types of CPD in order to encourage members to engage in a range of CPD activities and avoid repetition where it does not appear to aid development of skills. Full details are available on the online CPD recording tool and in the updated guidance (both in the members area of the website).

6. Record your CPD regularly

CPD should be recorded using CIEEM's online CPD planning and recording tool. We recommend you do this regularly, ideally soon after each activity is completed whilst it's still fresh in your mind.

Get in touch

Get in touch with CIEEM if there are personal reasons why you are struggling to meet your CPD obligation. CIEEM can offer advice, help and discuss options available to you and there are usually solutions to most CPD problems.

Bethany and Lindsay both volunteer their time on CIEEM's Training, Education and Career Development Committee

Further Information:
CIEEM's Continuing Professional Development Guidance provides further information on CPD and the annual CPD Audit. These are available in the members area of the website.

Competency Framework Changes

Sally Hayns CEcol MCIEEM
Chief Executive Officer, CIEEM

We have recently made some changes to the CIEEM Competency Framework which, as an active member, you need to be aware of. You will need to reference the Framework when updating your CPD record, if you are applying to upgrade your membership or applying to become a Chartered Ecologist.

Why we have made changes

The Competency Framework was first published in 2013 and constantly evolves to reflect the diversity of competencies required by our members in their different roles. Its last major review was in 2016. The purpose of this review was to:

a. clarify some of the descriptors where there was evidence of confusion or misinterpretation;

b. remove some unnecessary repetition; and

c. incorporate emerging techniques and tools.

The review was undertaken by members of the Membership Admissions Committee (MAC) and the Training, Education and Career Development Committee (TECDC) with the help of the Advisory Forum.

The key changes

The overarching competency framework themes have not changed and neither has the number of competencies, although a new technical competency (on environmental valuation) has been added and a transferable one (Fundraising) has been merged with another, as described below. The main changes are shown in the table here.

Competency Theme	Competency	What has changed
Surveying	S2: Species identification, handling and population assessment	Population assessment/status has been added to competency
	S3: Habitat identification and evaluation	Habitat assessment has been added
Environmental management	M1: Providing specialist advice on habitat/species management and/ or habitat creation or rehabilitation for plans or projects	Descriptor emphasises that this is the provision of **specialist technical advice** to landowners, land managers, project teams and/or organisations.
	M2: Designing and preparing habitat/species management, mitigation, compensation and/or enhancement plans or projects	Descriptor revised to emphasise competence associated with mitigation, compensation and/or enhancement, including delivery of biodiversity net gain. Also, more emphasis on sustainable environmental solutions including Green Infrastructure, resolving complex or conflicting constraints, monitoring outcomes and planning remedial actions.
	M5: Strategic outcome monitoring, data management and reporting	Descriptor emphasises that this is design and implementation of strategic monitoring of ecological resources at a local (but not site-specific), landscape, regional or national scale. Reviewing and reporting the results from such monitoring.
Environmental assessment	A4: Ecological assessment including Preliminary Ecological Appraisal and Ecological Impact Assessment and the use of biodiversity metrics as part of the assessment of existing/potential ecological features	Incorporation of use of metrics (e.g. as part of biodiversity net gain approaches).
	A5: Environmental valuation	New competency covering evaluation of ecological and broader environmental features as part of economic valuation of the environment (e.g. for ecosystem services assessment, natural capital valuation)

Scientific method	SM2: Analysis of environmental data and modelling	Descriptor revised to emphasise that this covers statistical analysis, modelling, etc in relation to data collected and/or ecological and/or environmental research and experimentation. This does not include interpreting bat detector data (or similar) which is for the purposes of identification and is covered in S2.
	SM3: Interpretation and evidence-based reporting	Descriptor revised to emphasise that this is interpretation of data and evidence and drawing valid conclusions from its analysis.
Organisation management	OM2: Managing business operations	Descriptor amended to include contract management (including tendering).
Project management	PRM1: Managing, funding and evaluating projects	Descriptor amended to include project fundraising
	PRM2: Fundraising	Deleted

How to use the Framework

The descriptors show the breadth of competence covered by each competency – you do not usually have to be competent in everything covered by the descriptor. To help members and prospective members we are developing a new self-assessment tool which uses indicators of competence for each competency. This not only allows you to assess where your strengths and areas of development are, it will also give you an insight into what evidence the membership and chartership assessors are looking for. We hope to publish the tool later this year.

International Focus

The IUCN Red List of Threatened Species 2019

Joanne Nightingale

Working as an ecologist abroad has its challenges. However, one of our most powerful tools for informing decision-making, resource allocation and conservation planning throughout project planning, design and development phases is the International Union of Nature Conservation (IUCN) Red List of Threatened Species 2019[1].

Established in 1964, the IUCN's Red List of Threatened Species has evolved to become the world's most comprehensive information source on the global conservation status of wildlife and serves as a critical indicator of the health of the world's biodiversity. For those of you who have never tapped into this resource, the IUCN Red List of Threatened Species holds useful species information including population trends, size, range, habitat and ecology, use and/or trade, threats and conservation actions.

Based on transparent criteria, each assessed species has been assigned a category according to the IUCN Red List categories scale which indicates a species' risk of global extinction, namely: Not Evaluated, Data Deficient, Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild, and Extinct. To date, more than 98,500 species have been assessed for inclusion in the IUCN Red List. Whilst many species have not been assessed (many plant species in particular), the global taxonomic coverage continues to evolve through the support and commitment of a network of Red List Partners, specialists and researchers. The IUCN is also developing a Red List of Ecosystems, following an approach similar to the Red List for Threatened Species.

Both Red Lists are endorsed by lender guidelines (i.e. the International Finance Corporation). Regular users will also be aware that the IUCN offers a range of useful links to publications, research and useful tools. For example, data from the IUCN Red List are included in the Integrated Biodiversity Assessment Tool (IBAT) which supports decision-making for business and conservation sectors. It is however important to respect IUCN's terms of use and consultants should be particularly mindful of this. Nonetheless, the IUCN Red List of Threatened Species is an invaluable resource in our ecology toolbox.

Note

1 IUCN (2019). *The IUCN Red List of Threatened Species*. Version 2019-1. http://www.iucnredlist.org. [Accessed 21 March 2019].

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Apprenticeships are Go!

Sally Hayns CEcol MCIEEM
Chief Executive Officer, CIEEM

There are now two new apprenticeships and one established apprenticeship (currently England only[1]) that may be of interest to employers and those looking to gain a foothold into our profession (see box). Apprenticeships provide an opportunity to combine both taught and work-based learning that are collectively structured to enable the apprentice to reach a defined level of competence. This competence expectation is set out in the published standard for each approved apprenticeship.

Apprenticeships are developed by consortia of employers and may (as in these two cases) be supported by relevant professional bodies. We are grateful to all of the CIEEM members who contributed their time to the employer groups and we are particularly indebted to Dr Debbie Bartlett FCIEEM who coordinated the work of the Level 7 Ecology Apprenticeship Working Group.

Employing an Apprentice

Apprentices are employed by their host organisation for the duration of the apprenticeship, although this can include current employees. They must be paid at least the minimum wage (CIEEM would expect employers to pay the Living Wage as a minimum). The length of the apprenticeship can vary but for each apprenticeship there is a 'typical duration' shown with the description of the relevant apprenticeship standard.

A minimum of 20% of the apprentice's time is allocated to formal training (e.g. via a higher education institution or other training provider) but, for those potential employers who do not pay the apprenticeship levy there is funding allocated to cover up to 95% of the cost of the training and assessment of your apprentice (so you only have to find 5%). If your company does pay the apprenticeship levy (which is a requirement for larger employers) there is a different calculation to be made as to how much funding you will receive. Training organisations have to have registered as a training provider for each apprenticeship.

There is some ongoing assessment of your apprentice and then, at the end of the apprenticeship, there is an 'end point

Available Apprenticeships in England	
Level 7 Ecologist	**Typical duration: 36 months**
This new apprenticeship is typically aimed at applicants with at least an upper 2nd class degree or have demonstrated significant prior experience. The successful apprentice will gain a Masters degree as well as the level 7 Apprenticeship on satisfactory completion of their end point assessment. We anticipate apprentices being able to start this apprenticeship from September 2020 once the training providers have finalised their offer to employers. The Level 7 Ecologist standard has been designed with three options which each have slightly different knowledge and understanding requirements: a. Ecological Scientists would typically work in academia, research organisations or statutory agencies. b. Consultant ecologists would typically work for specialist ecological consultancies or larger engineering and environmental companies. c. Landscape Ecologists will work in multidisciplinary teams including local authorities, NGOs, statutory agencies and consultancies.	
Level 6 Environmental Practitioner	**Typical duration: 60 months**
This new apprenticeship emphasises knowledge and understanding of broader environmental principles and techniques which can then be applied to a range of environmental specialisms including ecology, landscape, heritage, water resources, climate change and sustainability. The successful apprentice will gain a first degree as well as the Level 6 Apprenticeship on satisfactory completion of their end point assessment. Recruitment to this apprenticeship is available to employers now. Entry requirements are decided by individual employers and their training providers but would typically include 3 A-levels or a relevant Level 3 Technician Apprenticeship.	
Level 3 Environmental Conservation	**Typical duration: 18 months**
This apprenticeship will be closed to new applicants from August 2020. Apprentices that successfully complete this apprenticeship and satisfy the end point assessment will gain a Diploma in Work-based Environmental Conservation. Typical roles include Ecologist, Senior Estate Worker, Access and Recreation Officer, Education/ Interpretation Officer, Senior Ranger or Environmental Management Officer.	

assessment' designed to assess whether the apprentice has reached the required standard. Employers need to find both training providers and end point assessors but help with this is available online at www.gov.uk/take-on-an-apprentice.

We hope that apprentices will be encouraged to join CIEEM as Qualifying members. On successful completion of the apprenticeship they will be eligible to apply to upgrade their membership.

Recruiting your Apprentice

Apprenticeship advertisements can be advertised and recruited in the normal way, and you can advertise relevant apprenticeships for **free** on the CIEEM website. The Government also has a 'Find an apprenticeship' website that you can use. You must treat the apprentice as an employee so there are terms and conditions of apprenticeship contracts that must be followed.

You can find out more about offering an apprenticeship in England at https://www.gov.uk/topic/further-education-skills/apprenticeships.

The following websites may also be helpful for those working in other countries:

- https://www.nidirect.gov.uk/campaigns/apprenticeships
- https://www.skillsdevelopmentscotland.co.uk/what-we-do/apprenticeships/modern-apprenticeships/
- https://gov.wales/apprenticeships-skills-and-training
- https://careersportal.ie/apprenticeships/

Note

1 CIEEM cannot lead on the development of new apprenticeships but if you are part of an employers group developing relevant apprenticeships outside of England (or at Levels 3 or 4 in England) and would like CIEEM support please do get in touch via enquiries@cieem.net.

Who Runs CIEEM?

Sally Hayns CEcol MCIEEM
Chief Executive Officer, CIEEM

Well the answer is that you, the members, do. Perhaps sometimes it doesn't feel like that, so it is important that you understand the way CIEEM is governed and how decisions are made. It is also important to understand that all members involved in CIEEM's governance are volunteers and are giving up their valuable time to support the Institute and the profession. Without them there would be no CIEEM.

Governing Board

CIEEM's Governing Board acts in a very similar way to the trustees of a charity. They are 12 volunteer members who are elected by the rest of the membership though elections held as part of the Annual General Meeting. The Board is charged with governing CIEEM in accordance with our Royal Charter and ByLaws. Its most important function is to ensure that CIEEM operates legally and is financially sound, but it also makes key decisions that affect the future direction of the Institute.

The Board is accountable to the membership, so it is very important that they are also representative of the membership. In addition to the President, who is chair of the Board, there are four Vice Presidents – one each to represent England, Scotland, Wales and the island of Ireland. The remaining seven Board members include an Honorary Treasurer and an Honorary Secretary, each with specific responsibilities.

Although we do not have strict employment sector or national quotas, we do encourage representation from across the sectors and nations. So, for the current Board, we have six members who work in the private sector (two for large consultancies, four for small or medium consultancies), one member working for a local authority, one member working for an NGO, three members working for statutory nature conservation organisations and one member working for a utility company. Representatives of academia would also be very welcome.

The Board meets quarterly but may also take decisions between meetings. Typically, meetings deal with regular governance issues, review the financial performance of the Institute, discuss the impact and direction of policy work and receive reports and requests for decisions from Standing Committees and Working Groups.

Members of the Governing Board are always keen to hear feedback from members, including ideas and suggestions for future priorities. Annual general meetings are an ideal opportunity to do this, but you can contact Board members at any time via the contact details in the governance area of the website (www.cieem.net/governance/).

The Governing Board is ably supported by the Advisory Forum, Fellows Forum, Standing Committees and Sub-committees.

The Advisory Forum and Fellows Forum

It is important that the Governing Board has access to good advice and for this it can rely on the members of the Advisory Forum and the Fellows Forum.

The **Advisory Forum** is composed of a representative of every Geographic Section, nine elected members (elected by the membership) and the Chairs of the Membership Admissions Committee (MAC), Training, Education and Careers Development Committee (TECDC) and the Professional Standards Committee (PSC). It is attended by the President and the four Vice Presidents who are there to listen to the views of the membership as expressed through the Advisory Forum.

The Forum meets twice a year. It provides operational advice to the Board and also to the Standing Committees as requested but does not take decisions. Members of the Forum can raise issues for discussion so this is another route for individual members to give feedback or to highlight concerns and know that they will be heard by the Governing Board. Again, details of who makes up the Advisory Forum can be found in the governance area of the CIEEM website.

Examples of issues recently considered by the Advisory Forum are the introduction of annual limits on certain types of CPD (see page 41), the development of the Registered Practices scheme, the design of the new website, and the review of membership grades.

By contrast the **Fellows Forum** meets once a year. All Fellows of the Institute are automatically entitled to attend. The role of the Fellows Forum is to horizon scan and to provide strategic advice to the Governing Board on the future direction, challenges and issues affecting the profession and the Institute. Examples of items discussed include gender equality in the profession, policy engagement strategy, capacity within the profession and implications for staff welfare, income generation and the promotion of evidence-based policy and decision-making.

A list of all current Fellows can be found in the online Members Directory (www.cieem.net/members-directory/).

Standing Committees, Sub-committees and Panels

The Standing Committees of MAC, TECDC and PSC together with the Registration Authority, the Audit and Risk Sub-committee, the Strategic Policy Panel and the Country Policy Groups are appointed by the Governing Board. Vacancies on all of these committees are advertised to the membership as and when they arise and interested members are asked to send in their CV and a covering application statement.

All of these committees have a distinct role and responsibilities which are set out in

CIEEM's Governance Regulations. They may make operational decisions (in accordance with CIEEM's Scheme of Delegation), engage in operational activities (e.g. as in undertaking the annual CPD audit, membership or chartership application assessments, investigating complaints against members or drafting policy responses), provide advice to the Secretariat or Governing Board or present proposals to the Governing Board for approval.

We always strive to ensure that these committees are representative of the membership, both in terms of geography and employment sector, so sometimes you will see a recruitment email that says 'applications from [sector, geographic location, etc.] would be particularly welcome'. But, of course, we are relying on volunteers and we are very grateful to anyone who puts themselves forward.

So how can you influence CIEEM's governance and decision-making?

As a member it is important that you know how to engage with the Institute's governance and decision-making processes and there are a number of ways of doing so.

- Annual General meeting (AGM) – big decisions are often put forward for members to vote on or discuss at the AGM (e.g. last year we asked members to vote on whether we should apply for charitable status) so make sure you use your vote. You do not have to attend in person but can vote online beforehand. This year we will also try to stream the AGM live so that you can take part remotely. The AGM is also an opportunity to elect new members of the Governing Board or Advisory Forum (who represent you), to ask questions of the Governing Board and CEO and to take part in discussions about future plans.
- Give your ideas or feedback to your Geographic Section Committee or to an Advisory Forum elected member. Again, they are there to represent you and to make your voice heard.
- Start or contribute to a CIEEM discussion thread on LinkedIn or Facebook – Governing Board members and/or the Secretariat will use this to inform discussions around key topics or issues that need to be addressed.
- Email a member of the Governing Board directly (contact details are on the website) or talk to them at a conference or other networking event. They are very keen to hear from you.
- Stand for election to the Governing Board or Advisory Forum or join a committee. You can make an invaluable contribution to your professional body and its members, and you can learn a lot of useful information as well.

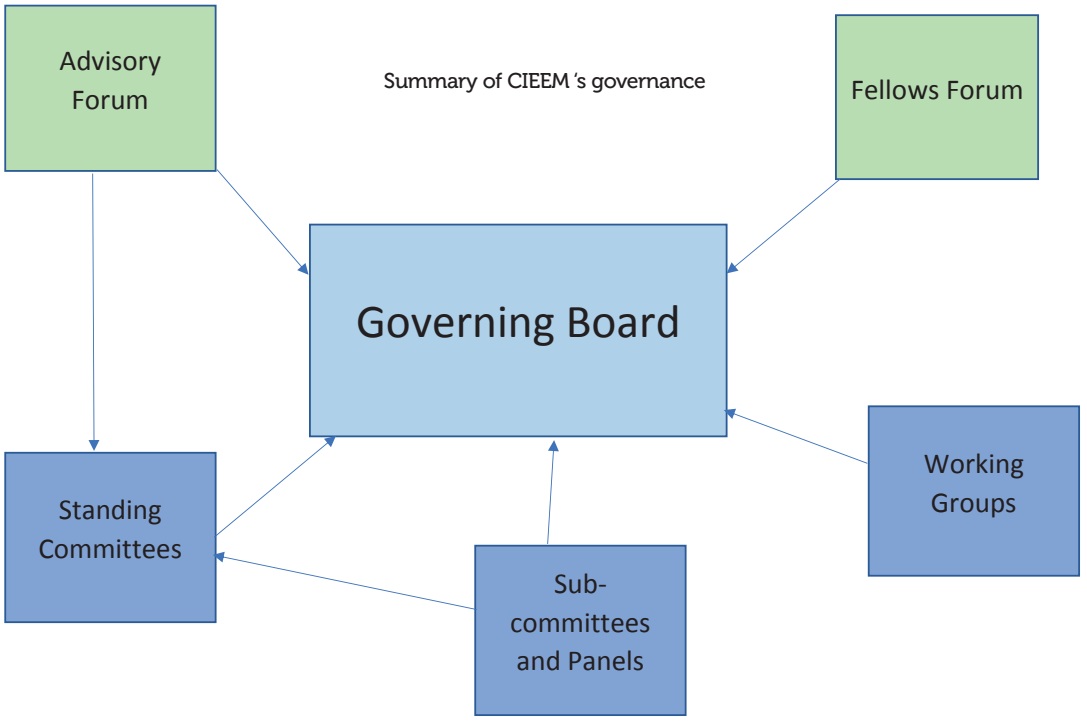
Remember it's your Institute, run by the members for the members.

Governance vacancies – get involved!

At this year's AGM we will be looking to elect

- a new Treasurer
- 2 new Governing Board members (or to reappoint 2 current members)
- 2 new Advisory Forum members (or to reappoint 1 current member)

Nominations close at 5pm on Friday 20 September 2019. Role descriptions and details of how to apply can be found at: https://events.cieem.net/Portal/VolunteeringwithCIEEM/Volunteers_Opportunities.aspx



New Tools to Help You Build Your Career

Siân Kear
Professional Development Officer, CIEEM

As part of CIEEM's Strategic Plan 2018-2021 we made a number of commitments to improve the support that we provide for students, graduates, and those developing their careers.

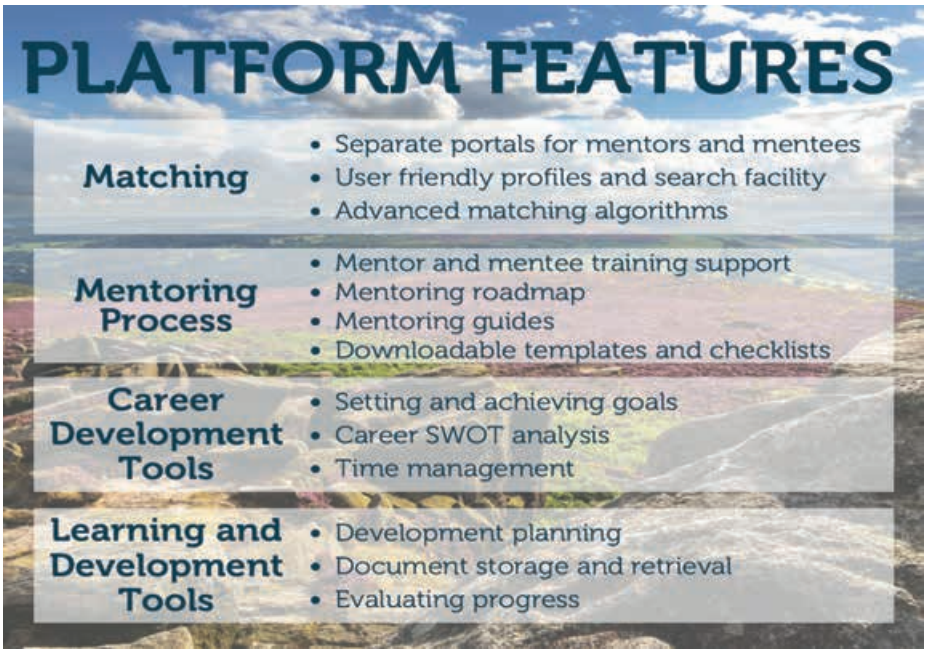
We are therefore pleased to announce two new initiatives which will be arriving this autumn for our members!

Mentoring

The first of these initiatives is our new online Mentoring Platform (https://cieem.onpld.com). Mentors and mentees can participate by registering on the platform and filling out their profile detailing areas of experience/areas that they are looking to develop. An advanced algorithm matches mentees with suitable mentors based on this information and the mentoring journey begins.

For mentees, mentoring can help you with career and professional development by matching you with suitable mentors based on your personal and professional development goals. Your mentor will have experienced the challenges and opportunities associated with developing and progressing a career in the sector and will be able to advise and guide you. You may be starting out in the profession or need help identifying the next steps in your career. You may want support to upgrade your membership or to apply for chartership. Or you may be facing work challenges that you need help to overcome. An appropriate mentor can help you with all of these things.

It isn't all one-sided though, involvement in a mentoring scheme offers great benefits for mentors too. As a mentor, you have much that you can offer someone looking to progress their career, drawing on your own experiences and insights. Volunteering as a mentor can also help you to develop professionally, re-define your own career goals, and allow you to see things from a new perspective. It is a fantastic opportunity to give something back to your profession and it also counts towards your own annual CPD requirement.



The mentoring platform has a number of integrated resources for both mentors and mentees to make use of (e.g. collaborative goal setting, career SWOT analysis and tools to analyse progress). Alongside this, we will also be publishing our own guidance to support mentors and mentees, as well as running a short instructional webinar on how to get the most out of the platform and your mentoring relationship. Don't worry if you're not able to make the live webinar – it will all be recorded and will be free to download from our website.

Getting Connected with Work Placements

The second initiative that we are excited to launch is a new area of our website, which is designed to facilitate structured work placements. Employers/hosts can advertise work placement opportunities for free (provided they are willing to follow our good practice *Guidance on Providing Work Experience* and where accredited degree/degree pathway programmes can advertise placements being sought by students. These opportunities will be actively promoted to our student members, although they will be visible to everyone.

Although relatively simple in its design and approach, the scheme will bring tangible benefit to students and others looking for a career in the profession, as well as benefiting host organisations by helping students to develop workplace-relevant understanding and skills that will make them more employable.

If you are interested in advertising a placement opportunity, please get in touch with enquiries@cieem.net. You will be provided with a template form on which to detail: start and finish dates, duration of

the work placement, the types of activities/ learning that would be available, whether there is any remuneration, the application process, and any deadlines. For longer placements a description of the role and potential projects would also be beneficial for possible candidates.

If you manage an accredited degree/degree programme pathway and would like to place an advert to seek placements for your students, please get in touch with enquiries@cieem.net. You will be provided with a different template form to detail: the degree programme that the students are following, the duration of the work placements needed, approximate start and finish dates, locations (if restricted), and whether supervised or not.

In anticipation of the launch of this new platform, CIEEM has updated its existing work experience guidance document, *Guidance on Providing Work Experience*.

We have also written a sister document to support those who are looking for work experience placements, *Guidance on Undertaking Work Experience*.

These documents have been produced to help organisations ensure that they provide legally compliant, ethically sound, properly planned, and rewarding work experience placements to those seeking to enter the profession. All referenced documents can be found in the members' area of the website.

Call for Trainers – Coming Soon!

Siân Kear
Professional Development Officer, CIEEM

CIEEM is working hard to expand and develop its Professional Development Programme and the training that we offer to our members.

Following a comprehensive Training Survey which was undertaken earlier this year we have identified a number of training course topics that we would like to add to our training programme and will therefore be commissioning for development and delivery.

We will be undertaking a 'Call for Trainers' later this year where those courses that we are looking to develop will be advertised on the website at www.cieem.net/continuing-professional-development/. From the website you will be able to view the Tender Brief and Tender Proforma for each course.

If you are interested in becoming a trainer with us, please keep an eye out for when this goes live as we would be delighted to hear from you. You can express your interest by completing and returning the Tender Proforma to us at training@cieem.net.

How to Propose Your Own Training Course Ideas

If you run any training courses which aren't currently included within our training programme and you think would be of interest to our members, we would be pleased to discuss these with you for possible inclusion in the programme.

The process of becoming a CIEEM trainer via this route is summarised nicely in the infographic on this page. If you would like to discuss your training course with the Professional Development Team, or have any questions, please get in touch with us at training@cieem.net or on 01962 868626.

CIEEM Awards 2019: Another Inspirational Year

Mimi Stanwood
Marketing Officer, CIEEM

2019 Awards finalists

If you've never been to the CIEEM Awards, you're missing out on something special. The weather somehow never fails to be spectacular, and as you stroll through the opulent rooms of Merchant Taylor's Hall, London, you can't help but be a little overwhelmed by the history of the place. It has an air of gravitas that's palpable; you can practically taste it – a subtle undertone in your first glass of fizz as you stand in the sun-drenched courtyard. A fitting venue, then, to honour the achievements of those who strive to protect the planet's biodiversity – a sentiment that has compelled us for hundreds of years, evolving into what our members embody today and what we celebrate at our annual Awards; namely best practice and inspirational work in the name of the environment.

The nominees, sponsors and their guests were coaxed in from the glorious sunshine with promises of a delicious silver service lunch, plenty more wine and an outstanding guest speaker: David Lindo – broadcaster, writer, naturalist, photographer and well known as The Urban Birder. David soon had the room giggling, recounting the story of how, as a three-year-old, he went missing at a wedding, resulting in his mother calling the police in a panic, only for David to turn up in a graveyard down the road, quite happily watching the antics of a mischief of magpies. David's early passion for wildlife was easy to relate to and was the perfect opening to the ceremony itself, hosted by CIEEM Wales Section Convenor and member of CIEEM's Training, Education and Career Development Committee, Harriet Webb CEcol CEnv MCIEEM.

Harriett was as effervescent as the wine, expertly steering several hundred off-the-leash-during-the-height-of-survey-season guests through the presentations, with award winners being invited on stage to receive their trophies, and all finalists receiving certificates of commendation. We were particularly thrilled at the response to our newest category, Planning Authority of the Year, which received exemplary entries, although Warwickshire County Council managed to pip the others to the post after several difficult rounds of judging.

It was another awe-inspiring year and we're already looking forward to launching 2020's in a few months. We would like to thank all of the entrants who took the time to submit a nomination and say another resounding 'congratulations' to the finalists and winners. We would also like to extend our particular thanks to our sponsors, both returning and new, for their generous support, and to our judges for their time and expertise, without whom this special even wouldn't be possible.

Promising Professional

Winner: Georgina Young Grad CIEEM (WSP Ltd.)

Highly Commended: Max Hemmings (Mott MacDonald)

Commended: Henry Gunning Grad CIEEM (Arcadis Consulting (UK) Ltd.)

Commended: Chris Gilbert Grad CIEEM (Aspect Ecology Ltd.)

Award Sponsor

pba peterbrett now part of Stantec

Member of the Year

Winner: Mike Oxford CEcol FCIEEM (Mott MacDonald)

Highly Commended: Julia Baker CEnv MCIEEM (Balfour Beatty)

Highly Commended: Mihai Coroi CEnv MCIEEM (Mott MacDonald)

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David Lindo

Max Wade (CIEEM President), Sally Hayns (CIEEM CEO), David Lindo (guest speaker), Harriet Webb (Awards host)

Postgraduate Student Project

Winner: Ewelina Gruchala (Swansea University)
– Rewilding, Ecological Restoration and Land Management Priorities. Applications and Challenges in Scotland.

Highly Commended: Rachel Kennedy (University of Aberdeen)
– Quantifying the Impact of Anthropogenic Disturbance on Localised Water Vole Arvicola amphibius Populations.

Award Sponsor

TEP | 20 YEARS THE ENVIRONMENT PARTNERSHIP

NGO Impact

Winner: The Norfolk Ponds Project (Norfolk FWAG, UCL, UEA, local farmers, Norfolk Wildlife Trust, Norfolk Biodiversity Partnership, Norfolk Rivers Trust, Norfolk Non-native Species Initiative, Norfolk Biodiversity Information Service, National Trust, Norfolk County Council and Natural England).

Award Sponsor

Wildcare Nationwide Ecology Supplies

Planning Authority of the Year

Winner: Warwickshire County Council

Highly Commended: Basingstoke & Deane Borough Council

Highly Commended: Shropshire Council

In Practice

Winner: Kat Bruce
– DNA Metabarcoding of Invertebrates to Evaluate Outcomes of Ecological Restoration

Highly Commended: Isabella Tree
– Creating a Mess: The Knepp Rewilding Project

Commended: Tom Tew MCIEEM, Jeremy Biggs and Tony Gent
– District Licensing for Great Crested Newts: Delivering a Big Idea

Award Sponsor

greenhouse Design | Print | Signage | Display

Consultancy – Large Category

Winner: Aecom

Highly Commended: Atkins

Commended: WSP

Award Sponsor

MFL McParland Finn Ltd INSURANCE BROKERS

Consultancy – Medium Category

Winner: Clarkson Woods

Highly Commended: BSG Ecology

Highly Commended: JBA

Award Sponsor

MFL McParland Finn Ltd INSURANCE BROKERS

CIEEM President Max Wade

Consultancy – Small Category

Winner: Wildwood

Highly Commended: Biocensus

Highly Commended: Tor Ecology

Award Sponsor

MFL McParland Finn Ltd INSURANCE BROKERS

Best Practice – Small-scale Nature Conservation

Winner: Central Scotland Green Network Trust – Breich Park

Award Sponsor

The Ecology Consultancy

Best Practice – Large-scale Nature Conservation

Winner: Kielder Water Vole Partnership (Forestry Commission, Northumberland Wildlife Trust and Tyne Rivers Trust) *– Restoring Ratty*

Highly Commended: PBA, now part of Stantec for Knight Frank and Mapletree *– Green Park Biodiversity Benchmarking*

Highly Commended: AECOM – Vangarde Shopping Centre

Award Sponsor

The Ecology Consultancy

Best Practice – Small-scale Mitigation

Winner: BSG Ecology and O&H Hampton Ltd *– Hampton East Brownfield Habitat Creation*

Highly Commended: Baker Consultants Ltd and Welbeck Estates *– Summit Colliery*

Award Sponsor

ARCADIS

Best Practice – Large-scale Mitigation

Winner: Ove Arup, Pinewood Studios Ltd, Sky Garden, Sir Robert McAlpine *– Pinewood Studios Development Framework*

Highly Commended: Applied Ecology Ltd. Essex County Council, Place Services *– Hadleigh Park*

Commended: The Environment Partnership (TEP), Redrow Homes, Natural Resources Wales, Wild Ground and Flintshire Council *– Heathlands*

Commended: AECOM *– Vangarde Shopping Centre*

Award Sponsor

ARCADIS

Best Practice – Innovation

Winner: Kier Utilities *– Velcro: Getting to Grips With Plastic Waste Reduction*

Highly Commended: AECOM in partnership with FrogLife and DP World *– London Gateway GCN Tunnel Monitoring*

Highly Commended: The Environment Partnership (TEP), Greater Manchester Combined Authority (GMCA) as part of Natural Course EU Life Integrated Project *– River Irwell Natural Capital Account and Ecosystem Services Assessment*

Award Sponsor

love every drop anglianwater

Best Practice – Stakeholder Engagement

Winner: Scottish Biodiversity Information Forum *– The SBIF Review: Re-imagining the Biological Recording Infrastructure in Scotland*

Highly Commended: Dialogue Matters with UCLAN *– Living Coast Youth Voice*

Commended: Kier Utilities with Bristol Water *– The Southern Strategic Support Main*

Award Sponsor

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Tony Bradshaw Award

Winner: BSG Ecology and O&H Hampton Ltd *– Hampton East Brownfield Habitat Creation*

CIEEM Medal

Professor Desmond B.A. Thompson FCIEEM FRSE

Awarded in recognition of his outstanding contribution to biodiversity conservation and upland ecology

Find out more about the CIEEM Awards, from this and previous years, at: www.cieem.net/cieem-awards/

CIEEM Medallist Des Thompson enthuses at the Awards Ceremony

At the 2019 CIEEM Awards Ceremony, Des Thompson was awarded the CIEEM Medal in recognition of his outstanding contribution to biodiversity conservation and upland ecology. You can read the full citation for Des on the CIEEM website at www.cieem.net/cieem-medal/. Des gave a short acceptance speech and, given its positive and encouraging content, we reproduce an excerpt here.

Guest speaker David Lindo, Medal winner Des Thompson and CIEEM President Max Wade

Over the last few months there are rays of hope, and bizarrely these are borne out of a potential environmental calamity. First, we had the urgent headline messages from the IPCC *Special Report on Global Warming* of 1.5°C. Then we had the school strikes led by Greta Thunberg; Sir David Attenborough's 'Climate Facts'; and the 'Extinction Rebellion' protests. And finally, in early May we had two reports published: the UK Climate Change Committee's *Net Zero Report*, and on 6th May, the IPBES *Global Assessment of Biodiversity* was launched in Paris. This IPBES report is arguably the single most significant and far-reaching environmental report ever published. A tenth of the planet's species possibly going extinct was the headline, and the five direct drivers of change are vividly described.

A key response has been the declaration of national climate emergencies – the UK, Scottish and Welsh governments, and France, Canada and Ireland have all declared emergencies. This is unprecedented, and for the first time climate and nature are inextricably linked in proposed action plans and measures to sustain us and nature. Never before, and certainly not in my lifetime, has there been such a groundswell of support for nature and action to avert what will be an environmental catastrophe unless we take action.

That is why I believe we are actually in the most exciting time for environmentalism. As professional managers, advisers, researchers and advocates we will never have a stronger voice, and CIEEM must seize this opportunity. We must work with governments, agencies, NGOs, businesses, developers and the great array of land and water managers to make our influence count. We may never have such an open goal scoring opportunity again.

I've just returned from fieldwork in the Arctic and that proved transformative personally on a number of fronts.

First, I can tell you that the nature of change in a landscape that influences so much of our climate is both rapid and dynamic. I walked over areas of permafrost which gave way underfoot for possibly the first time in hundreds of years. Frankly, that terrified me.

Second, being unconnected with social media and the news, and then returning to the hub bub of the 24-hour news cycle, you realise that most of what we read and listen to in the media is pretty stultifying. It really is empowering to cut yourself off from some of this and instead to connect with nature in a real sense – through studying it, thinking about it, trying to do something for it, and being a part of it. That is something we are encouraging in the environmental charity I chair, the Field Studies Council.

Third, looking around me on my return I've become more convinced that we need to be far more radical and even disruptive in how we work and act. Same old attitudes and practices simply won't do it for the challenges and opportunities we have to embrace. Instead, we have to be much less lethargic, more innovative and energetic, and far clearer about what needs to be done to sustain nature.

And if there is one key shift we need to make it is engaging young people more actively and intelligently in the work we do. Young people in the decades ahead will curse or bless us depending on what we do for and with them now. Not just through education and awareness-raising, but through organisational governance changes, we need to involve young people more actively and prominently in our work, and for the CIEEM I hope this is something we can rise to.

Membership Update

Stuart Parks
Head of Membership and Marketing, CIEEM

The 2018-2019 subscription year has been a busy period of change for the Membership team at CIEEM. Not only have we seen changes to personnel, roles and responsibilities, but we have also processed more applications than at any time since the introduction of the competence-assessed application process. Read on to find out more about current trends in membership and the projects we have been delivering and/or supporting. And, as always, I am very happy to hear from any member about your experience, your ideas and your expectations of your membership body to help inform continued growth and development – after all, it's your membership.

In August, Sarah Cox returned from a period of maternity leave (congrats again Sarah!) to a new role as Membership Operations Manager. Sarah now has increased responsibility for the day to day running of the membership scheme, its application processes and delivery of its benefits. Sarah continues to be very ably supported by a small but dedicated team in Winchester. Saz Hayward, who also stepped into a new role as Membership Officer, now has specific responsibility for supporting and developing the membership offer for what is still our fastest growing membership sector: Student members and those at the earliest stages of their career. Katie Allen has stepped up from being an Administrative Assistant into the role of Assistant Membership Officer and is now more fully involved in developing ever more efficient administrative processes. Our former Registration Officer, Michael Hornby, left CIEEM for pastures new and was replaced in June by Rohan Seeliger-Morley. We took the opportunity to revise the role somewhat, and Rohan's new position as Assistant Membership Officer provides much more resilience for the membership team and allows her to take full advantage of the overlaps between membership and chartership processes. The team is also supported on a part-time basis by Linda Redman, CIEEM's Finance and Administration Officer.

As we near the end of the subscription year I am pleased to report that the number of applications received per month shows a continuing trend of exceeding those received in each of the previous four years by healthy margins. At the time of writing we enter Q4 of the 2018-2019 subscription year having already exceeded the total number of applications processed in the whole of the 2017-2018 subscription year by 12%. In fact, the membership team, with the support of our invaluable volunteer assessors, has processed in excess of 1,000 applications in the current subscription year to date. We currently have 6,170 members, 915 of whom have been welcomed as new members to the Institute so far this subscription year. This represents a 42% increase on the figure for the total number of new members admitted in the whole of the last subscription year. Across all grades of membership our admission rate currently sits at an average of 89% (compared with an 83% average at the end of the last subscription year), meaning that almost all of our applications are successful (even if not all at the first attempt). We hope that this is in part due to the efforts we have been putting into creating guidance resources, videos and webinars for applicants.

As mentioned earlier, our fastest growing membership sectors continue to reflect the interest from those at the earliest stages of their career, or still at undergraduate level. Of course, an increasing number of early career professionals is great news for the sector, and for CIEEM, but also requires us to provide services and benefits that will better meet their needs. Much of the work of teams across the Secretariat during the latter months of this subscription year has been focussed on developing additional resources that will not only support these young professionals, but also benefit their employers, peers and, ultimately, their clients. For example, you can find more detail on the CIEEM website, and in this issue of *In Practice*, about a new online mentoring platform that will allow more experienced members to be matched with other members requesting guidance and support on a whole host of subjects, and perhaps also benefit themselves from some informal 'reverse mentoring'. Our Professional Development team is gradually building a comprehensive library of career focussed resources and guidance as part of a wider strategy to support those new to the sector to find, and secure, employment and to build a better informed idea of which direction they would like it to take them. In addition, we'll be using the new website to allow members to offer work experience opportunities for those who need to be able to build their experience and competence. And alongside these work experience opportunities we have been working with partner organisations to develop some recently launched apprenticeships, allowing businesses (in England at present) to offer structured, high-quality opportunities for others looking to break into ecological and environmental management professions. Finally, you will see elsewhere in this issue more information about an exciting new bursaries programme – another opportunity for experienced members with the means and willingness to do so to work with us to provide effective and practical support to those needing a hand to get started in the sector.

For members who are already established in their careers we have been working on a new online tool to take you through a process of self-assessment against the criteria detailed in the newly revised Competency Framework. If you are thinking of upgrading your membership, applying for Chartered Ecologist status, planning your professional development, or sponsoring or mentoring a team member through the application process, the tool should make the task considerably more straightforward. And if you are leading a team and would like some more bespoke support with any aspect of the membership and chartership application processes please do get in touch so that we can discuss your needs and how best to deliver them in your organisation.

At the other end of the experience scale, interest in attaining Chartership continues to grow and we have already seen the first applicants for Chartered Ecologist status coming through our recently revised process. We have been working hard with the Registration Authority and some of our volunteer assessors to make the process more straightforward and less onerous without compromising the standard of the award. If you are interested in finding out more about becoming Chartered do have a look at the revised process on the website, or contact Rohan in the membership team to discuss possibilities for having us work with you to deliver a workshop or webinar for your company.

A growing, increasingly diverse, engaged and ambitious membership benefits not only CIEEM as a body, but also the sector and, by extension, the natural environment and society. As a CIEEM member, how can you help?

i. Take some time to consider if you could act as a mentor or offer to act as a sponsor for a colleague or team member considering joining or upgrading.
ii. Think about how your business might be able to offer work experience or apprenticeship opportunities and give a young professional a boost at the earliest stage of their career.
iii. Encourage your colleagues and team members to engage with the Competency Framework to help shape their professional development and work towards upgrading their membership.
iv. Renew your membership! If you have yet to pay your invoice please do so soon – it really does help if you can act on this promptly.
v. Talk to us. CIEEM exists for its members so if there is something you think we should be doing as your professional body then let us know so that this can be explored.

Contact Stuart at:
StuartParks@cieem.net

Policy Activities Update

Amber Connett GradCIEEM
Policy and Communications Officer, CIEEM

We have had a busy summer of policy work at CIEEM, publishing briefings and position papers and launching an All-Party Parliamentary Group (APPG) for Nature.

UK and England

The APPG for Nature was launched in Parliament on 8 July 2019. Barry Gardiner MP was elected as Chair of the group, and Caroline Lucas MP, Baroness Barbara Young, Kerry McCarthy MP, Angela Smith MP and Steve Double MP were elected as Officers. The launch included a series of talks on Natural Capital by Dr Martina Girvan (Arcadis), Dr Adam Dutton (Office for National Statistics) and Graham Morgan (EDP and CIEEM England Policy Group Chair). The event was also attended by a range of environmental organisations who provided a lively discussion. More information can be found at www.cieem.net/appg-for-nature/.

APPG for Nature Membership

Associate membership of the APPG for Nature is open to non-parliamentary organisations. Membership subscriptions from these organisations provide a source of funding that allows CIEEM to organise events and cover some administration costs. CIEEM will facilitate the running of a regular meeting and site visit programme, parliamentary work and information distribution.

Associate members will receive:

- All APPG for Nature newsletters, reports and briefings
- Invitations to all APPG for Nature events
- Input into the development and delivery of the APPG's programme of events and activities
- Recognition of their Supporter Status at APPG for Nature events and on the APPG for Nature webpage

Annual membership subscription costs £200 per year.

Barry Gardiner MP and Steph Wray

We launched a briefing on Natural Capital for decision-makers at the APPG event, and have since also published one for ecologists and environmental managers. These briefings were produced by the CIEEM England Policy Group and are available at the Resources Hub (www.cieem.net/resources-hub/).

In July, a group of 43 organisations, including CIEEM, wrote to the Conservative and Liberal Democrat leadership candidates urging them to prioritise the climate and environmental emergency and commit to ramping up policies and investment. The letters called for ambitious legally binding targets on environmental issues, rapid phasing out of fossil fuels, investment in tackling the climate and environment emergency, and for the government to put environment and climate action at the heart of the UK's international agenda. The letters are available at the Resources Hub.

We recently met with Natural England to discuss their broad ambitions and strategy, monitoring, protected species licensing, Biodiversity Net Gain, and communications. Natural England is working on a new 5-year roadmap which covers four key areas: landscapes and nature recovery; connecting people and nature; greening fishing and farming; and sustainable development.

In July, I attended a meeting of the Biodiversity and Ecosystems Working Group, which focused on the development of the Nature Recovery Network and how it can assist with adaptation to climate change. The results of this meeting fed directly into Defra and Natural England.

Sally Hayns (CEO) has attended a workshop which focused on ensuring the implementation of Biodiversity Net Gain delivers for people as well as nature.

Scotland

We recently published *Biodiversity Net Gain in Scotland*, which defines Biodiversity Net Gain, how it can be implemented in Scotland, the action required by decision-makers and case studies. The briefing was produced by the Scotland Policy Group and is available on the Resources Hub.

In June, Kathy Dale (CIEEM Scotland Vice President), Caroline McParland (CIEEM Scotland Vice President-Elect) and Annie Robinson (CIEEM Scotland Project Officer) met with the Scottish Environment Protection Agency (SEPA). Topics of discussion included SEPA's Sector Plans, business links and Ecological Impact Assessment Guidelines.

Also in June, we joined 96 other organisations in writing to the First Minister of Scotland, asking her to bring forward a Scottish Environment Act as part of the Scottish Government's legislative programme for 2019-2020. The letter can be viewed at www.scotlink.org/wp/files/documents/Letter-to-the-First-Minister-calling-for-a-Scottish-Environment-Act.pdf.

In July we had a very useful high-level meeting with Scottish Natural Heritage. We discussed closer partnership working, including on guidance and training, and also agreed to have regular 6-monthly liaison meetings.

Annie also attended a workshop on Scotland's biodiversity research in July. This aimed to identify Scotland's research priorities and gaps for biodiversity, work on engaging stakeholders and identify major themes.

Professor Sir Ian Boyd speaking at the Environment Platform Wales launch.
Photo credit: Diana Clark (CIEEM Wales Project Officer).

Wales

On 21 May 2019, Penny Lewns (Wales Vice President) and Diana Clark (Wales Project Officer) attended a Cross Party Group for Biodiversity event at the Senedd in Cardiff, on Public Goods and Future Land Management Policy. The event was run by Wales Environment Link, chaired by John Griffiths AM, and was attended by a number of stakeholders, including farmers, NGOs, Welsh Government and Assembly Members. Our attendance will feed into work that CIEEM's Wales Policy Group is doing in relation to consultations regarding the future of farming in Wales.

Penny and Diana have also since attended the Royal Welsh Show in July. This was an opportunity to make policy-makers and others more aware of CIEEM, to gather intelligence, and to make connections for future collaborations.

On the 26 June 2019, Diana attended the launch of the Environment Platform Wales (www.epwales.org.uk), a consortium that aims to increase the quality and relevance of evidence available for environmental management and policy-making in Wales. Members include all Welsh universities, Welsh Government, Natural Resources Wales, and the Centre for Ecology and Hydrology. We look forward to supporting this excellent initiative going forwards.

Our recommendations on the use of netting on hedges and trees to prevent birds from nesting in vegetation (https://cieem.net/cieem-and-rspb-advise-against-netting-on-hedges-and-trees/) have been cited by the Welsh Minister for Housing and Local Government, Julie James AC/AM. The Minister wrote to all Heads of Planning with regards to the use of netting on trees and hedgerows in and around development sites, warning that the practice should only be used as a last resort, and that through early engagement developers should avoid circumstances that require netting to be used.

At the time of writing, the Wales Policy Group is finalising a briefing paper on Green Infrastructure and planning.

Ireland

In May, Will Woodrow (Ireland Vice President) and Liz O'Reilly (Ireland Project Officer) met with the National Parks and Wildlife Service (NPWS) to introduce CIEEM and our work in Ireland, and discuss the NPWS approach to pre-planning engagement, their current priorities, and how CIEEM can help them moving forward. Will has also since met with Ireland Heritage Officers to discussion possible collaboration.

Jenny Neff has stood down as Chair of the Ireland Policy Group after having continued in the role for a year after stepping down as Ireland Vice President. We would like to thank Jenny for all her hard work on both the Ireland Policy Group and the Strategic Policy Panel over many years, and for being a driving force in the creation of the country policy groups.

Consultations

We have recently responded to the following consultations:

- Environmental Principles and Governance for Scotland (Scottish Government)
- Environmental Principles and Governances in Wales post-EU exit (Welsh Government)
- Updating the UK Marine Strategy (Part One)
- A Network for Net Zero: Our Approach to Implementing Biodiversity Net Gain (Scottish and Southern Electricity Networks)

Future Priorities

In the coming months we will be focussing on developing a programme of events for the APPG for Nature, continuing our work on climate change and biodiversity loss, and engaging with agriculture polices and environmental governance.

We will also be planning our activities for 2020 – a big year for the natural environment – which includes the UN Convention on Biological Diversity summit that will hopefully agree a new 'Global Deal for Nature'.

Contact Amber at:
AmberConnett@cieem.net

Investing in the Future:

Announcing a New Bursary Scheme for Early Career Members

Sally Hayns CEcol MCIEEM
Chief Executive Officer, CIEEM

Encouraging and supporting talented and enthusiastic people into our profession is incredibly important. It is not the easiest career to get started in, especially as many employers are looking for a little more than academic achievement. Many of us were given a helping hand by someone along the way so now it is time to give something back.

We are pleased to announce the launch of a new bursary scheme for those seeking to progress a career in ecology and environmental management. Two bursaries are available, each to the value of £2,000 (or Euro equivalent).

The Bursaries

The bursaries are designed to help undergraduates/postgraduates, or those who have recently undertaken a relevant vocational programme of study, develop their knowledge and skills in key areas of ecological and environmental competence, building on their academic learning. Applicants must be current or recent students who are not in paid employment.

Bursaries can be used in a number of ways including:

- Attending relevant training courses, BES Summer Schools, conferences and related events
- Purchasing equipment
- Costs associated with gaining relevant work experience
- Undertaking research projects

We do not want to be too prescriptive and it will be up to the applicants to make the case for how they would use the bursary.

Further details, including how to apply, are available on the CIEEM website. Whilst we particularly welcome applications from members of BAME communities, any eligible undergraduate (in their final or penultimate year) or postgraduate student can apply. The deadline for applications is 1 November 2019.

How You Can help

This is just the start. Although the Governing Board will seek to make funds available for further bursaries next autumn, should CIEEM's financial position allow, perhaps you are in a position where you or your organisation could fund a bursary or contribute towards funding further bursaries? If so, we would love to hear from you.

We do not just want your money though (although you can just donate money if that is what you want to do of course!). We want bursary investors to provide support to their recipients. This might take the form of providing work experience opportunities, access to specialist equipment, supporting research activity or, perhaps, being a mentor throughout the 12-24 month period of the bursary.

Get Involved: Invest in the Future!

Can you help someone start their career in ecology and environmental management?

Could you donate funding towards a bursary?

Can you give your time to mentor or support those looking for a career in our profession?

If so, please get in touch now via enquiries@cieem.net. We would love to hear from you!

Looking Ahead

As you can see from our focus on supporting early career members, not only via the bursaries and other initiatives such as the 'Find a work placement' scheme and new mentoring platform, this is a really important part of our strategy moving forwards. Over the coming months we will be looking to work collaboratively with the British Ecological Society and other partners to offer a 'joined up' approach to potential new members of the profession.

Student Hub:
CV and Interview Tips

Mimi Stanwood
Marketing Officer, CIEEM

You know when you do that thing you really shouldn't do? Your knee hurts a little, so you Google the symptoms… Big mistake. Within 30 seconds you're 100% convinced that death is just around the corner.

Well, I just did that with careers in ecology and environmental management and can now fully appreciate how terrifying trying to get your first job in the sector can be. Here are a couple of highlights:

- *"The work is repetitive but at least the pay is bad."*
- *"Reptile surveys? Better be on a site damn early to catch things whilst they're still trying to warm up. Bat surveys? Better not like sleeping. Newt surveys? Better not like sleeping and enjoy getting wet."*

I was about ready to give up writing this piece before I'd even started, but then I remembered two things:

1. The internet exists for people to complain (and cat memes).
2. Some of the smartest, kindest, most passionate people I have ever met have worked in the environmental sector.

You know why? Because they went into the profession out of a genuine concern for nature. They embarked on this career because they couldn't see themselves doing anything else with their lives and that's the best reason in the world. It's people like that who make humanity bearable (bats are still better, obviously). Sure, the pay isn't banker-level, but salaries are improving as the sector becomes more professional.

So, don't be put off. You've come this far, and you joined CIEEM because we can help you. And we will. We've picked the brains of members from every branch of the sector, from academics to consultants and compiled some top tips for nailing your interview technique. We will also be launching a new Mentoring Platform very soon (see page 48), so you can get a helping hand from someone who's been there, done that and loves what they do so much that they want to give something back.

Harriet Webb – Principal Ecologist, Environment, Maritime and Resilience, Jacobs

- Make your CV look professional. Stalk some key players on LinkedIn and use the format of their CV.
- Work experience, volunteer, volunteer and volunteer some more! Being involved with bat groups, amphibian and reptile groups etc. will help you generate awareness of yourself in the industry.

Bethany Lovell – Advisor, National Biodiversity (Regulation & Compliance), Environment Agency

- However much you want the interview to be over, if there's something you wished you'd said, or you feel you didn't get across clearly, ask if you can have a minute to explain. Better to do that than to leave the interview regretting that you missed an opportunity.
- Whatever the outcome of your interview, it's good to try and get feedback so you can learn for the future.

Chris Gerrard – Natural Catchment and Biodiversity Manager, Anglian Water Services

- If you know there's a weakness in your CV, be honest and upfront about it and don't just hope it won't come up – it probably will. Explain how you'll overcome it.
- Always, always, always have questions to ask at the end. It shows you're interested and gives you a further opportunity to impress them.

Chris Smillie – Programme Leader: MSc Countryside Management, Scotland's Rural College

- The interviewer will be asking questions about you (an opening question is often 'take me through your CV'), so make sure you know your skills inside out. Don't spend all your time looking at the job requirements instead.
- Always give examples. It's no use just saying you are good at teamworking – give an example of where you have demonstrated those skills.

Jackie Jobes – Manager, Gloucestershire Local Nature Partnership

- Think about your own work/life balance and consider the workplace environment. The way we work is changing, but many businesses aren't keeping up and are still stuck in the 9-5 routine of the last century. Asking for flexible working is still such a taboo, which will and must change to attract and retain the next generation. It's important that people are aware of the opportunity for a more balanced lifestyle and have the courage to challenge the status quo.

Sue Lawley – County Ecologist, Staffordshire County Council

- Practice – even if your Mum is fed up with hearing about your newt handling skills!
- Understand that being an ecologist involves hours spent in the office writing reports. Don't imply you want to work in ecology because you want to be outside all the time – it can sound like you have unrealistic expectations.

For more top tips and insider experience, tune into our webinar on 24 October 2019.

Accredited ECoW – Phase Two Launched!

Sally Hayns CEcol MCIEEM
Chief Executive Officer, CIEEM

Thanks to an exciting new project partnership between the Construction Industry Training Board (CITB), Balfour Beatty and CIEEM we have been able to launch Phase Two of development of an accreditation scheme for the Ecological Clerk of Works (ECoW) role on construction and development sites.

A successful application to CITB's Flexible Fund means that over the next 18 months we will be building on the work done in Phase One with a view to launching the accreditation scheme in 2021. This follows on from an engaging and useful joint CITB-Advisory Group meeting at the end of April.

Phase Two activities, undertaken in consultation with the Project Advisory Group, include:

- Finalising the competency profiles and role titles of the different ECoW roles
- Writing the standards for the identified competencies (including adapting existing national occupational standards where appropriate)
- Developing the relevant training programmes and assessment methodologies
- Writing the accompanying training manual
- Developing an online learning management system for record keeping and assessment
- Delivering a pilot scheme and evaluating its outcomes
- Engaging more widely with stakeholders

David Plummer, Flexible Fund Manager at CITB said: *"This project will provide benefits to the wider construction industry, by raising the professional standards of ECoWs, ensuring their role has greater recognition and prominence on construction sites."*

CIEEM has recently advertised a tender for contractors to help us deliver Phase Two and work gets underway from the beginning of September. There will be two routes to accreditation: a fast-track route for experienced ECoWs and a more comprehensive training and assessment programme for those less familiar with the role. The training courses will be available to interested providers via the CITB website.

The format of assessment is yet to be determined but is likely to include online assessment of knowledge and understanding and practical assessment of skills. It is hoped that the scheme will also incorporate the training and assessment required for CSCS (Construction Skills Certification Scheme) cards, thereby creating a direct route for the appropriate Professionally Qualified Persons card.

Working in partnership with Balfour Beatty Civil Engineering.

On the development of Phase 2 of the project, Julia Baker, Balfour Beatty's Highways Business Biodiversity Specialist said: *"The work carried out to date on the Ecological Clerk of Works (ECoW) accreditation addresses a vital gap in acknowledging the skills needed to embed ecology into the construction industry. By providing comprehensive accreditation and training schemes, the collaboration between Balfour Beatty, CIEEM and CITB will help to develop the significant contribution that ECoW can bring to the industry."*

The project is being supported by a number of organisations and companies who are volunteering their time and expertise as members of the Advisory Group, which is chaired by CIEEM Past-President Stephanie Wray CEcol CEnv FCIEEM. Details of the members of the Advisory Group and project updates are available on the CIEEM website at www.cieem.net/accredited-ecow.

Are you interested in co-sponsoring this project?

We need to find some sponsors able to help provide matched funding for the development of the accredited ECoW scheme. Sponsor packages are available for £1,500 spread over two years.

If your company is interested in becoming a sponsor and becoming actively involved in the development of this exciting new scheme please contact me at sallyhayns@cieem.net.

British Ecological Society

A New Way to Discover Environmental and Ecological Knowledge

A large amount of applied ecological information is not preserved or shared in a way that enables us to build on the existing knowledge base and learn from past successes or challenges. The British Ecological Society (BES) and *Journal of Applied Ecology* are taking steps to help solve this issue with the launch of a new project in 2020: Applied Ecology Resources (AER).

AER will be a dynamic online resource, designed to facilitate information exchange for anyone involved in the management or monitoring of environmental resources. Promoting evidence-based decision making, AER will contain a wide range of documents such as research summaries, open access journal articles, stakeholder reports, and case studies. It will also include a new peer-reviewed open access journal, *Ecological Solutions and Evidence*, publishing articles with direct relevance for the management of biological resources and ecological systems. The journal will encourage contributions from people in a range of ecological roles. It will include original research and case studies communicating key findings and observations.

AER will allow everyone, anywhere in the world to browse and read the content free of charge. Uploading of reports, case studies and other information for long-term preservation and sharing on AER will be available through organisation-level membership in order to make the resource sustainable in the longer term. Membership will include a range of other benefits such as advertising of events, access to training resources, and free or discounted publication in the new journal *Ecological Solutions and Evidence*.

Membership of AER will increase the discoverability of an organisation's work and boosting their scientific profile in the community. It could also help organisations improve and support how knowledge is managed internally. AER membership is offered at a range of tiers and price points designed to suit all types of organisations. There are introductory offers available, and all members who sign up in the first year will have the opportunity to shape the strategic development of the resource as a Founding Member.

As one of the major aims of AER is to improve connections and information exchange, we are also developing partnerships with other societies and organisations, including exploring opportunities to work together with CIEEM. We hope that AER will collate and preserve information that is not currently shared widely, as well as promoting other excellent resources that are synthesising and preserving evidence and data.

AER will launch in 2020 and over the next six months we are recruiting our Founding Members and formalising our partnerships.

To find out more or discuss membership options, please contact Erika Newton (Erika@britishecologicalsociety.org). You can also check www.britishecologicalsociety.org for the latest information.

Applied Ecology Resources will help everyone share and discover key information on the management of environmental resources.

Member Network News

With regional Section Committees across England and national Sections in Wales, Ireland and Scotland, as well as Special Interest Groups (SIGs) focussing on specific topics, we have something for everyone.

Each network is run by a committee of volunteers, providing opportunities to share knowledge, meet like-minded people and learn more about the science and practice of our profession.

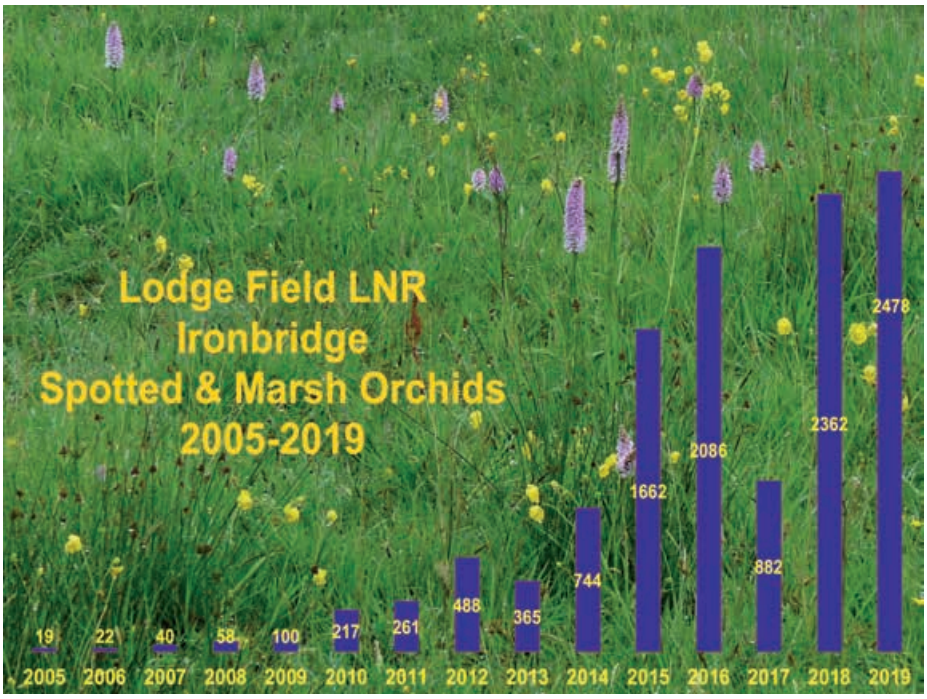
There are currently about 170 Member Network volunteers doing amazing work all over the UK, Ireland and beyond. If you'd like to find out about what they get up to and how you can get involved, please visit www.cieem.net/member-networks.

ECOLOGICAL RESTORATION AND HABITAT CREATION SIG AND WEST MIDLANDS SECTION

Field Visit to Venus Pool
8 June 2019, Shropshire

A great site visit for CIEEM members to the species-rich lowland meadows, created by Professor Ian Trueman from the University of Wolverhampton between 2001 and 2005, at Venus Pool in Shropshire (owned by the Shropshire Ornithological Society). A walk over the site in light rain guided by Ian, who explained his meadow creation techniques, and a sandwich lunch in one of the bird hides made it a real field visit. This was a joint event between the Ecological Restoration and Habitat Creation Special Interest Group and the West Midlands Section. The meadows were created by green-hay strewing which is a very successful technique that Ian has pioneered. The green hay for Venus Pool was harvested from four SSSIs in Shropshire as well as Mottey Meadows NNR in Staffordshire and the green hay from each donor site was transferred to different fields around Venus Pool.

Read more at: https://cieem.net/members-visit-meadow-restoration-site-at-venus-pool-shropshire/




© Ian Trueman

ECOLOGICAL RESTORATION AND HABITAT CREATION SIG

Practical Restoration and Creation: Lowland and Uplands Grasslands Conference
Chesterfield, 19 June 2019

Focusing on lowland and upland grassland restoration and creation this conference was the first of its kind organised by the Ecological Restoration and Habitat Creation Special Interested Group. Sessions covered 'Planning & Design', 'Implementation' and 'The Long Term', with questions and discussions throughout.

The conference opened with an overview of grassland restoration and creation from 'Terry Wells' to the present day, and continued with insights into grassland communities. The importance of site preparation, soils, seeds and other implementation techniques were explored in depth. Experiences were shared, ranging from challenging urban sites and floodplain meadows to upland hay meadows.

Presentations from the day can be found in the Resources Hub at https://cieem.net/i-am/resources-hub/

ECOLOGICAL RESTORATION AND HABITAT CREATION SIG

EcoWorks: whistle-stop problem-busting for restoring, creating and translocating habitats

This new initiative is up and running as a pilot scheme. The idea is to provide suggestions and support on habitat creation, restoration and translocation for members of the Ecological Restoration and Habitat Creation Special Interest Group. A panel of volunteers with extensive experience of these topics provides a rapid personal opinion in response to questions about projects and share knowledge and best practice. This initiative has been developed in response to some of the issues raised by the large number of members of the SIG who came to the workshop at the Autumn Conference in Manchester in 2017.

Find out more at: http://events.cieem.net/Portal/VolunteeringwithCIEEM/ERHC_EcoWorks.aspx

ELECTIONS 2019

Is this the year you get involved?

We have a number of positions available on our Member Network Committees this year. Being an active member of your committee is a fantastic opportunity to meet new people, get involved in some great events and projects and take the chance to influence the sector in your area. Who knows where it might lead you!

You can find out more about the positions available and how to nominate yourself in the Members' area at: https://events.cieem.net/Portal/VolunteeringwithCIEEM/Elections.aspx

WALES

Swifts and How You Can Help Them
7 June 2019, Bangor

We had 16 attendees from CIEEM and the North Wales Wildlife Trust (NWWT) for this joint event. Ben Stammers from NWWT gave a fascinating talk about swifts, their ecology, their conservation status and how to survey for them and submit records.

There are plenty of ways for those working in the ecology sector to help swifts and to try to halt the decline of this amazing bird. Volunteers are working within the industry to pass on requests for swift nest boxes to be installed, as well as calling for any natural entry holes not to be closed during re-roofing and other house maintenance.

Read more at: https://cieem.net/welsh-members-learn-about-swifts-and-how-you-can-help-them

SCOTLAND

Exploring UKHab and its field key
29 June 2019, Aberdeen

CIEEM members travelled from across Scotland to learn about the UK Habitat Classification (UKHab). Alistair Watson introduced the components of the UKHab and their relationships to other classifications before leading a group exercise field session (on possibly the hottest day of the year!) trying out the UKHab Classification Field Key and Secondary Codes. Lina-Elvira Bäck discussed how UKHab informs the Defra Biodiversity Metric 2.0 and associated Eco-metric. Many thanks to Glenn Roberts of NESBReC for providing insights into the Integrated Habitat System, which the newer UKHab shares many attributes with.

Read more at: https://cieem.net/scottish-members-explore-ukhab-and-its-field-key/

IRELAND

Irish Members discuss No Net Loss and Net Gain
18 June 2019, Dublin

We were delighted to welcome Liz Newman (AECOM) to Ireland to discuss her work on No Net Loss and Net Gain in the UK. We also got an insight into No Net Loss in Ireland from Robert Fennelly (AECOM) who ran through its current standing here and also opened up the floor to an interesting discussion. Thanks to everyone who attended on the day, it was great to get an opportunity to chat and we hope to meet more members at our future events.

Read more at: https://cieem.net/irish-members-discuss-no-net-loss-and-net-gain/

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.

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 and Chartered members:

ADMISSIONS

Chartered Ecologist (CEcol)
Dr Martin Brammah, Dr Catherine Burton, Thomas Docker, James Littlemore, Jeffrey Lunn, Peter Newbold, Steven Roe, Samantha Shove, Jenny Singh, Tilly Tilbrook

Chartered Environmentalist (CEnv)
Dr Ben Aston, Ruth Bramwell, Zoë Costas-Michael, Kate Hobbs, Sarah Ive, Joanne Makin, Dr Barry Walls

Full Members (MCIEEM)
Dr Kevin Austin, Marlies Boydell, Charlotte Bradley, Duncan Brown, Rebecca Clover, Laura Cottrell, Alan Cowlishaw, Dr Nicola Goodship, Dr Waldemar Heise, Jonathan Hudson, Catherine McGuire, Rosanna Mooney, Prof Timothy Shreeve, Hal Starkie, Richard Thompson, Grant Walker, Jonathan Webb, Richard White

Upgrades to Full Membership (MCIEEM)
Michael Ashford, Timothy Bailey, Peter Bonney, Nathan Coughlan, Thomas Coyne, Rachel Fine, Lily Gilbert, Candice Howe, Rebecca Hoyle, Natalie Kay, Matthew Lawton, Timothy Lees, Kristen Liptrot, Rosanna Marston, Gareth Mason, Shea O'Neill, Amy Richards, Lloyd Richards, Kathryn Skinner, Lucinda Sweet, Luke Verrall, Alexander Watkinson

Associate Members (ACIEEM)
Jennifer Abery, Mingaile Anderson, Mark Blacker, Dominic Bowyer, Sally Conyers, Stephanie Cox, Laurence David, Helen Edwards, Kirsty Elliott, Caleb Fry, Eilish Halford, Dr Kirsten Hazelwood, Gareth Hey, Lewis Hillier, Elspeth Ingleby, Sarah Joscelyne, Sophie Kirk, Andrew Lewis, Alison Looser, Freya McCarthy, Stefanie Pearse, Andrea Place, Dr Des Purdy, Rebecca Ratcliffe, Samantha Rigg, Victoria Rusby, Alexandra Saunders, Amanda-Jayne Tomkins, Alexandra Wadia, Alice Webb

Upgrades to Associate Membership (ACIEEM)
Laurence Allnatt, Eloise Arif, Timothy Body, Robert Corcoran, Ben Crossman, Aidan Crowl, Ryan Davies, Thomas Elliott, Patrick Ellison, Lauren Fear, Grace Gardner, Ewan Gibson, Elliott Hails, Alexander Hannam, Max Hemmings, James Heywood, Michael Hockey, Poppy Hookings, James Johnston, Jennifer Kearney, Amelia Kent, Ben Lappage, Nadine Little, James Longley, Callum McLaren, Declan Murphy, Nichelle Murray, Andrew Noble, Sabina Ostalowska, Lindsay Overstall, Helen Pearce, Jennifer Pearson, Adelle Pilfold, Amy Reddick, Sarah Rochelle, Kate Rooney, Joe Salkeld, Naomi Scala, Rachel Seddon, Emily Simpson, Robin Somers-Yeates, Jaclyn Walker, Matthew Wall, Michael Waller, Rosie Walton

Graduate Members (Grad CIEEM)
Shannen Allison, Arun Al-Nuaimi, Katharine Banham-Hall, Matthew Bassett, Chris Bawler, Annoushka Bayat, Felix Bird, Alexander Bishop, Robert Bishop, Emma Bolton, Libby Brooks, Oliver Brown, Danielle Charlton, Jessica Cole, Alexander Cromarty, Rachel Crookes, Amy Davies, Annie Davies, Rhodri Davies, Robert Evans, Ryan Evans, Rhiannon Evetts, Emily Fergusson, Sophie Field, Charles Foreman, Liam Fullard, Samantha Gate, Joel Giordano, Gemma Golding, Alexandra Gow, Bethany Gray, Louise Henry, Rosanna Hignett, Bethany Hunt, Lorna Hutchison, Katrina Jenkinson,

Andrew Latham, Kate Lewis, Alicia Logan, Charlotte Martin-Taylor, Alexander Matthams, Elyssia Mayhead, Fiona Mc Auliffe, Sinead McCarthy, Chloe Mockridge, Kate Morley, Michelle Newman, Zak Newman, Kailey O'Brien, Jamie Peacock, Paul Pestana, Christopher Petchey, Leo Plevin, Christopher Poole, Alexander Powell, Liam Price, Alexander Radl, Tom Reed, Amanda Richards, Rebecca Rooney, Amy Scott, Jacqui Shaw, Shep Shepherd, Hannah Shone, Alana Skilbeck, Lorelei Smith, Holly Spencer, Charles Stamp, Laura Thomas, Sophie Trigg, Bryony Unwin, Joshua Waggott, Conor Watson, Laura Webb, James Westgate, Rachel Whyte, Alice Williams, Megan Williams

Upgrades to Graduate Membership (Grad CIEEM)

Victoria Brown, Sinéad Clifford, Harriet Duffield, Carl Goldsack, Jacob Haddon, Nia Howells, Beth Mell, Jack Morphet, Adèle Remazeilles, James Smith, Rachel Sore, Nicolle Stevens, Anna Williams, Kate Wolstenholme, Rebecca Yearsley

Qualifying Members

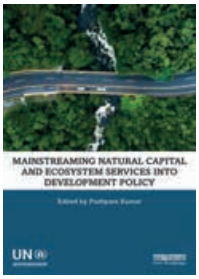
Charlotte Alanine, Daniel Alexander, Matthew Armes, Ciara Askin, Adrian Bailey, Rebekah Baker, Chloe Balmer, Scott Barron, Lottie Birch, Joseph Bishop, Alenka Blatnik, Matthew Blee, Rebecca Burgess, Megan Burton, Joshua Cartlidge, Dr Philip Chapman, Alex Charlesworth, Johanna Chesham, Thomas Chester, Ben Cianchi, Joshua Clarke, Shannon Clifford, Catherine Close, Georgina Colman, Elizabeth Cooper, Joel Cronin, Tomos Crosse, Hannah Daniels, Patrick Davis, Alicia de Gracia Sánchez, Max Dupe, Hannah Dyer, Robert Dymott, Thomas Eavis, Naomi Eckersley, Rachel Edwards, Myriam El Harouchy Calzado, Erika Exelby, Murray Gauld, Carol Greenwell, Jacob Greer, Jessica Grimbley, Andrew Hall, Anna Harper, Bethany Hasell, Thomas Hicks, Olivia Hill, Kieran Holliday, Emily Howard-Williams, Sue Howes, Dr Kirsten Hunter, Natasha James, Ailsa Johnson-Marshall, Andrew Johnston, Bryony Jones, Ieva Karklina, Jefferson Kay, Douglas Kilpatrick, Elsa Little, Jim Lowe, Erin MacDonald, Isaac Marin-Andrew, Aaron Martin, Chloe Marzuoli, Alexander Maynard, James Rufus McKay, Orlando Methuen-Campbell, Jacob Ian Middleton, Samuel Miller, Dr Christian Milner, Michael Moores, Ian Morgan, Jordanna Morrish, Emma Morrison, Meghan Nicholson-Brown, Kate O'Donnell, Samantha Reading, Rob Regan, Scott Reid, Jennifer Reid, Angelica Richardson, Aileen Russell, Ian Ruston, Alice Samuel, Claire Smith, Rory Smith, Joanna Sykes, Kalliopi Symeonidou, Hattie Ann Taylor, Ewa Tomalak, Samuel Toon, Rowena Tylden-Pattenson, Olivia Walton, Maico Weites, Rebecca Whatmore, Claire Wiggs, Betty Wilson, Matthew Wilson, Connor Woods, Ross Wotherspoon, Philip Wright

Upgrades to Qualifying Membership

Christian Cairns, Thomas Clarke, Rebecca Lloyd, Dylan Owen, Fiona Shuttle, Emily Thomson

Student Members

Farhiya Abdi, Guy Andrews, Claire Astin, Oliver Banks, Rodrigo Batistela, Teodora Bokonyi, Martin Boyle, Peter Breivik, Rachael Bryan, Lauren Butler, Bethany Carpenter, Elizabeth Cave, Jennifer Cook, Niamh Cooper, Samuel Cottage, David Daly, Laura Daniels, Samba Darbo, Will Dartnell, Emma-Louise Davies, Annmarie Dixon, Jodie Duff, Elizabeth England, Hannah Field, Carol Finch, Frederick Fulford, Samantha Fulton, Rebecca Gibbs, Eliza Maeve Gibson-Hall, Elizabeth Godfrey, Nayara Cristini Celestino Gouvea, Robert Greene, Bryony Haines, Bridie Hamilton, Luke Hammond, Arran Heap, Rachel Heller, Meaghan Henry, Tasha Hesketh, Emma How, Cameron Hubbard, Kirsty Hulme, Andrew Jackson, Heather Johnstone, Eleanor Jolliffe, Kristina Karlovic, Martin Kinnear, Natalie Kneebone, William Lavelle-Bowden, Christopher Liebmann, Daniel Lock, Emma Longford, Bernardo Lopes, Sophie Lyons, Robyn Mackie-Smart, Kevin Mason, Jessica Maxwell, Hannah Mayled, Lachlan McKessar, Hannah Messenger, Katarina Miler, Rosalin Mistry, Christina Mowat, Anthony Murphy, Liam Murtagh, Katie Neary, Lea Nightingale, Maddison Nixon, Dermot O'Boyle, Carol Omara-Ojungu, Hanna Partoft, Rachel Peacock, Bethia Pearson, Rebecca Poole, Martha Preater, Sophie Price, Tom Reed, William Rennison, Nicola Riley, Megan Rowland, Olivia Satur, Kasey Scotney-Streeton, Dr Michael Scott, Henrietta Shaw, Hal Shinnie, Alexander Sinclair, Craig Smith, Caroline Stevenson, Robert Stokes, Imogen Sykes, Madeline Thurlow, Lydia Traher, Lewis Traynor, Amy Treadwell, Imogen Turner, Callum Vandertak, Emma Walters, Jennifer Webb, Joseph Wilkie, Katie Williams, Luke Williams, Gaia Wilson, Lucy Witter, Michael Woods



Mainstreaming Natural Capital and Ecosystem Services into Development Policy

Editor: Pushpam Kumar

ISBN: 9781138693111

Price: £115.00

Available from: www.routledge.com

This book addresses what could be the possible pathways to mainstream natural capital assets into development policies and what is currently known about the economic values of ecosystem services. It highlights the latest advances in the science and practice of using ecosystem services to inform decisions for economic development in the context of the developing countries. Case studies are also provided.

Britain's Day-Flying Moths: A Field Guide to the Day-Flying Moths of Great Britain and Ireland

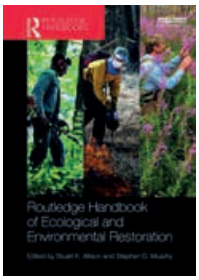
Editors: David E Newland, Robert Still, Andy Swash

ISBN: 9780691197289

Price: £13.99

Available from: www.nhbs.com

This field guide helps to identify the day-flying moths most likely to be seen in Great Britain and Ireland. Photographs are provided alongside key identification features, when and where to look for it, and information on its status, life history, special features and caterpillar food plants.



Routledge Handbook of Ecological and Environmental Restoration

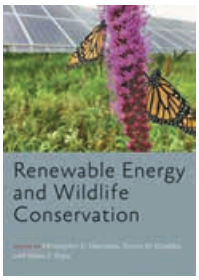
Editors: Stuart K. Allison, Stephen D. Murphy

ISBN: 9780367352400

Price: £39.99

Available from: www.routledge.com

Ecological restoration is a rapidly evolving discipline and the rapid pace of climate change, continuing habitat destruction and the spread of non-native species has forced restoration ecologists to re-evaluate their goals and the methods they use. This handbook describes current practices and identifies new directions for the field. Management and policy issues are examined in detail.



Renewable Energy and Wildlife Conservation

Editors: Christopher E Moorman, Steven M Grodsky, Susan P Rupp

ISBN: 9781421432724

Price: £45.50

Available from: www.nhbs.com

The effects of renewable energy on biodiversity can be complex. While capturing renewable resources can require more land than fossil fuel production, potentially displacing wildlife habitat, renewable energy infrastructure can also create habitat and promote species health when thoughtfully implemented. This book synthesizes the rapidly growing base of research and insights.

Wetlands Ecosystem Services, Restoration and Wise Use

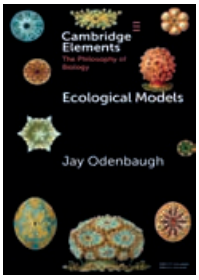
Editors: Shuqing An, Jos TA Verhoeven

ISBN: 9783030148607

Price: £119.99/£71.50 (eBook)

Available from: www.link.springer.com

This volume discusses the recent wetland conservation and restoration activities in China and neighboring countries. Invasive species in coastal wetland are also covered, as well as case studies on wetland restoration. The book is intended for academics, students and practitioners in the field of wetland ecology, management and restoration.



Ecological Models

Author: Jay Odenbaugh

ISBN: 9781108728690

Price: £14.99

Available from: www.nhbs.com

This book considers what ecological models are, how they are tested and how they inform environmental policy and politics. Case studies are provided to show how ecological models can explain and predict complicated ecological systems. Additionally, the case studies show how they affect environmental policy and politics.

Free downloads that may be of interest to members:

Integrated Planning: Policy and Law Tools for Biodiversity Conservation and Climate Change

Genetic frontiers for conservation: an assessment of synthetic biology and biodiversity conservation

Both available from: https://portals.iucn.org/library/

The contribution of constructed Green Infrastructure to urban biodiversity: A synthesis and meta-analysis

Alessandro Filazzola, Namrata Shrestha, J. Scott MacIvor

Journal of Applied Ecology 2019; Accepted Articles
https://doi.org/10.1111/1365-2664.13475

This study comprises a meta-analysis to determine whether Green Infrastructure provides additional benefits to biodiversity over conventional infrastructure or natural counterparts. Results show that Green Infrastructure significantly improves biodiversity over conventional infrastructure equivalents, and that in some cases it had comparable measures of biodiversity to natural counterparts.

Open access: https://besjournals.onlinelibrary.wiley.com/doi/10.1111/1365-2664.13395

Are agri-environment schemes successful in delivering conservation grazing management on saltmarsh?

Lucy R. Mason, Alastair Feather, Nick Godden, Chris C. Vreugdenhil, Jennifer Smart

Journal of Applied Ecology 2019; 56(7): 1597-1609
https://doi.org/10.1111/1365-2664.13405

This study aimed to assess whether conservation grazing is being achieved and whether agri-environment schemes are effective in delivering this management through conducting a national survey on English saltmarshes. Results show this is not the case. The authors recommend policy-makers, researchers and managers work together to ensure better translation of conservation guidelines into schemes, increase the specificity of management prescriptions and improve understanding.

Correspondence: jennifer.smart@rspb.org.uk

Long-term impacts of changed grazing regimes on the vegetation of heterogeneous upland grasslands

Robin J. Pakeman, Debbie A. Fielding, Liese Everts, Nick A. Littlewood

Journal of Applied Ecology 2019; 56(7): 1794-1805
https://doi.org/10.1111/1365-2664.13420

This study used a large-scale, long-term grazing experiment in the UK uplands to assess the impact of intensification, abandonment and grazer diversification on vegetation composition in a heterogenous area of grassland. Results show that responses differed between vegetation communities and overall, vegetation changes are slow, making predictions of consequences difficult. Management decisions in the uplands require complex trade-offs between production, biodiversity and a range of ecosystem services.

Correspondence: robin.pakeman@hutton.ac.uk

The economic benefits of invasive species management

Nick Hanley, Michaela Roberts

People and Nature 2019; 1(2): 124-137
https://doi.org/10.1002/pan3.31

This paper outlines the nature of the economic impacts of invasive species and presents a range of non-market valuation approaches for estimating the economic costs of invasive species, and therefore, the benefits of management programmes.

Open access: https://besjournals.pericles-prod.literatumonline.com/doi/10.1002/pan3.31

Managing hedgerows for nocturnal wildlife: Do bats and their insect prey benefit from targeted agri-environment schemes?

Jérémy S. P. Froidevaux, Katherine L. Boughey, Charlotte L. Hawkins, Moth Broyles, Gareth Jones

Journal of Applied Ecology 2019; 56(7): 1610-1623
https://doi.org/10.1111/1365-2664.13412

This study assessed whether hedgerow management prescribed by targeted agri-environment schemes to improve habitat conditions for the greater horseshoe bat *Rhinolophus ferrumequinum* in England may positively influence the species, the entire bat assemblage and their insect prey. Changes in trimming regime strongly affected hedgerow height which directly and indirectly influenced bat occurrence, activity and species richness along hedgerows. Although the authors highlight the success of current prescriptions on hedgerow management, they suggest that effectiveness can be optimised by encouraging farmers to keep hedgerows untrimmed for longer periods.

Correspondence: jeremy.froidevaux@bristol.ac.uk

Grassland biodiversity restoration increases resistance of carbon fluxes to drought

Andrew J. Cole, Robert I. Griffiths, Susan E. Ward, Jeanette Whitaker, Nicholas J. Ostle, Richard D. Bardgett

Journal of Applied Ecology 2019; 56(7): 1806-1816
https://doi.org/10.1111/1365-2664.13402

This study used a long-term field experiment to test the hypothesis that management aimed at biodiversity restoration increases the resistance and recovery of ecosystem carbon fluxes to short-term summer drought. Results showed that, while grassland diversity restoration management increases the resistance of carbon fluxes to drought, it also reduces agricultural yields, revealing a trade-off for land managers. Legumes, promoted through long-term restoration treatments, can help to maintain plant community productivity under drought by increasing their biomass.

Correspondence: andjcole@gmail.com

Shifting up a gear with iDNA: From mammal detection events to standardised surveys

Jesse F. Abrams, Lisa A. Hörig, Robert Brozovic, Jan Axtner, Alex Crampton-Platt, Azlan Mohamed, Seth T. Wong, Rahel Sollmann, Douglas W. Yu, Andreas Wilting

Journal of Applied Ecology 2019; 56(7): 1637-1648
https://doi.org/10.1111/1365-2664.13411

Invertebrate-derived DNA (iDNA), in combination with high throughput sequencing, has been proposed as a cost-efficient and powerful tool to survey vertebrate species. This study compared iDNA and camera-trap surveys to detect mammalian occupancy in Borneo. Results showed consistent estimates of occupancy probabilities produced by camera-trap and iDNA datasets. iDNA may therefore be a suitable method for studying and monitoring mammal species in tropical rainforests. This approach can also be used for the analysis of other invertebrate DNA and environmental DNA data.

Correspondence: abrams@izw-berlin.de

Forthcoming Events

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

Conferences		
Date	**Title**	**Location**
24 September 2019	Scottish Conference – Climate Change: Its Impact on Scotland's Wildlife & Landscapes	Stirling
19-20 November 2019	Autumn Conference 2019 – Planning for Success: Maximising Biodiversity Through Planning and Strategic Land Use Management	Llandudno

Webinars		
3 October 2019	Cephalopods of UK Waters and the Impacts of Climate Change	Online
7 October 2019	Delivering the Diversity in Biodiversity Net Gain	Online
24 October 2019	Early Careers Webinar: CV Writing and Interview Tips	Online

Training Courses		
October 2019		
2	Introduction to Bat Ecology and Bat Surveys	Wareham
2-3	QGIS for Ecologists and Conservation Practitioners	Cardiff
3	Bats: Impact Assessment and Mitigation	Wareham
3	Eurasian Beaver Ecology and Surveys	Birnam
4	Eurasian Beaver Mitigation and Management	Birnam
9-10	Accurate Identification of Protected Mammal Tracks and Signs	West Sussex
10	Badger Survey, Impacts and Mitigation	West Lothian
15	Water Vole Mitigation	Cardiff
15	Being an Expert Witness I – Producing Excellent Reports & Statements	London
15-16	Developing Skills in Ecological Impact Assessment (EcIA)	Dublin
16	Being an Expert Witness II – Giving Evidence at an Inquiry / in Court	London
16	Ecological Report Writing	Cardiff
17	Biodiversity Net Gain Through Development	Leeds
23	Protected Mammals (excluding bats) Survey	Dunblane
24	Protected Mammals (excluding Bats) Impacts and Mitigation	Dunblane
31	Identifying Coastal Wading Birds	Lancaster
31	Ecological Clerk of Works	Reading
November 2019		
5-6	Train the Trainer for Ecologists	Manchester
6	Introduction to Bats and Bat Survey	Dunblane
6-7	QGIS for Ecologists and Conservation Practitioners	Scotland
7	Bat Impacts and Mitigation	Dunblane
7	Effective Communication Skills for Women	Birmingham
7-8	Water Vole Live Trapping, Handling, Practical Care and Re-establishment	Lifton
12	Floodplain Meadows – monitoring, and factors affecting plant communities	Glastonbury
12-13	Developing Skills in Ecological Impact Assessment (EcIA)	Newport
14	Biodiversity Net Gain Through Development	London
19	Effective Workplace Mentoring	Birmingham
21	An Introduction to Appropriate Assessment	Ireland
26	Making the Most of the Ecology Assessment in BREEAM and the BREEAM Family	London
26	Advanced Ecological Impact Assessment (EcIA)	Crewe
27	Winter Tree Identification	TBC
28	Ecological Clerk of Works	Nottingham
December 2019		
3	Effective Communication Skills	London
4	Introduction to Ecological Impact Assessment (EcIA)	London
5	Survey and Assessment of Hedgerows in Winter Months	South East / West
5	Habitats Regulations Appraisal of Plans / Projects (Scotland)	Glasgow
12	BS42020 Biodiversity: Code of Practice for Planning and Development	Swansea
12	Introduction to Ecological Impact Assessment (EcIA) (Scotland)	Edinburgh

Our Ecology team work throughout the year carrying out surveys to identify, record, and monitor species and their habitats. As we enter autumn we continue to look for enthusiastic and capable people to join our growing team of experienced ecologists.

Our ecology work continues to ramp-up into the autumn season with survey and mitigation works underway for badgers, bats, water voles, reptiles and other species where Licensable works may soon be off-limits for the winter.

We employ seasonal field surveyors and experienced ecologists throughout the year to support our national team, with a particular focus currently on supporting our Belfast, Leicester, Cardiff, Bristol and Southampton teams.

We also have permanent vacancies from Assistant to Principal level across the UK to work on a variety of projects in England, Wales, Scotland & Northern Ireland – from developing wintering bird mitigation strategies, to minimising impacts on biodiversity whilst realising developable areas.

At WYG we believe in a good work-life balance and recognise that our employees may need flexible working throughout different stages of their career. We appreciate that everyone is different and give our employees time to develop their skills and specialise in their own area of ecology.

Find out if you could join one of our award-winning teams across the country and enjoy support for training and our excellent benefits package including:

- Company car for all grades
- Excellent flexible benefits package
- Bonus day off for your birthday
- Progression, training & CPD

Search and apply for our current vacancies at www.wygcareers.com or email your cv to ecology@wyg.com

creative minds safe hands

www.**wyg.com**