Land Use Summit

Prioritising land use in the midst of a climate and nature crisis

Tuesday 16 April 2024

Contents

Welcome

to the ZSL Land Use Summit, in collaboration with the British Ecological Society

ZSL is a global science-led conservation organisation helping people and wildlife live better together to restore the wonder and diversity of life everywhere.

We're ZSL, an international conservation charity, driven by science, working everyday to restore wildlife in the UK and around the world. We're a powerful movement of conservationists, working together to save animals on the brink of extinction and those who could be next.

A united team from different disciplines and different nations, we're bound together by our passion for nature and a pioneering spirit to solve the biggest challenges facing wildlife.

We are the British Ecological Society: the oldest ecological society in the world.

With over a century of leadership in the science of ecology, the British Ecological Society is renowned for convening the ecological community and taking evidence from the field and lab to the heart of government. With a 7,000 strong international membership from over 120 countries, we are united by a mission to create solutions for a planet under threat.

Information

Equality, diversity & Inclusion

At ZSL we believe that inclusion and diversity is fundamental to our future. We aim to promote equality and diversity in science through inclusive, accessible and equitable programming, ensuring the event is open to those from all backgrounds, roles, and levels of seniority. We strive for our panels of speakers to have a diverse representation and to amplify the voices and experiences of those from underrepresented backgrounds. Read more about our EDI priority areas.

Sustainability

At ZSL, we strive to employ the most environmentally friendly and sustainable practices possible. More information on ZSL's goals pertaining to sustainability may be found here. This booklet is available in electronic format, with only a small number of printed copies available at the meeting. Please download this booklet onto your devices and refer to the e-copy. We will provide all registered delegates with a name badge and holder. Please return these holders at the end of the meeting and they can then be reused for future meetings.

Food & drink

Lunch will be provided for attendees, as well as refreshments during the breaks and on arrival. Please ensure you included any dietary requirements upon booking, or contact scientific.events@zsl.org to discuss these.

Photography and videography

Filming of presentations is not permitted, but recordings of talks will be made available after the Summit. Please refrain from using flash photography at any point during live talks. We respect the fact that many delegates will want to take photographs of presenters and their slides to post these on social media, however please do so with due respect and consideration. We suggest that presenters clearly highlight anything in their talk or poster that they would prefer people not to take photos of or post about.

Social media

We encourage delegates to use the following ZSL and BES handles when posting about the Summit:

@ZSLScience @BritishEcolSoc @OfficialZSL #LandUseSummit

Travel information

The Summit will be held in the Huxley lecture theatre at ZSL London Zoo. The entrance is located on the Outer Circle, between the ZSL Main Offices and the Nuffield Building (Institute of Zoology).

TUBE

Camden Town (0.8 miles)
The nearest Underground station to the Zoo (Northern Line). Once out of the station, the route will take you along Camden Parkway and past the canal.

Chalk Farm (0.9 miles)
(Northern Line) is an Edgeware line alternative to Camden Town station, approximately the same walking distance from the Zoo. **This station has lift access.**

Baker Street (1.1 miles)
Approx. 20 minute walk. Serviced by the Bakerloo, Circle, Metropolitan and Hammersmith & City Lines via Regent's Park, and by 274 bus northbound.

Regent's Park (1.2 miles)
Bakerloo line station. Once out of the station, cross Marylebone Road and follow the signposts.

NATIONAL RAIL

Euston
If arriving at Euston, the fastest route is to transfer to the Northern Line for Camden Town or Chalk Farm.

Marylebone
From the main entrance of Marylebone Station walk left to Baker Street then follow Baker Street tube walking directions, or take the 274 bus northbound.

CYCLING

We have a public bike shed located at the **East Service Gate**. There are also two TfL Barclays Cycle Hire scheme docking stations, one of which is in the small car park opposite the main Zoo entrance.

BUS ROUTES

88 Northbound: towards Kentish Town. Alight on Albany Street at Prince Albert Road.

88 Southbound: towards Great Portland Street. Disembark at Albany Street, Regent's Park Barracks.

274 Northbound/Southbound: Get off at Prince Albert Road, then cross the bridge to ZSL London Zoo.

DRIVING

The most sustainable routes to the zoo are by public transport. If travel by car is necessary, the post code for parking is NW1 4SX. Parking will incur a daily charge.

Disabled parking is available in front of the main Zoo entrance and in the main car park.

Agenda overview

Huxley Lecture Theatre, ZSL

9:15	**Registration, refreshments and networking**
9:45	**Welcome remarks**, *Matthew Gould, CEO, ZSL*
9:50	**Introductory session**
	Chair: Professor Nathalie Pettorelli, ZSL
10:15	**Session 1:** Nature recovery and food
	Chair: Georgina Chandler, ZSL
11:15	**Break and poster viewing**
11:45	**Session 2:** Nature recovery & energy
	Chair: Professor Bridget Emmett, British Ecological Society
12:45	**Lunch and poster viewing**
13:45	**Session 3:** Nature recovery & housing and infrastructure
	Chair: Sue Riddlestone, Bioregional
14:45	**Break and poster viewing**
15:15	**Session 4:** Bringing everything together: how do we do it?
	Chair: Ben Spencer, Sunday Times
16:00	**Conclusions:** What do we do next?
	Chair: Dr Andrew Terry, ZSL
16:40	**Closing remarks**, *Matthew Gould, CEO, ZSL*
16:50	**Optional networking and poster viewing**
18:00	**Meeting close**

Introductory session: Contextualising nature recovery in the midst of multiple governmental priorities and visions

Chair: Professor Nathalie Pettorelli, ZSL

9:50 **Professor Bridget Emmett, President, British Ecological Society**
Introductory remarks

9:55 **David Hill,** Director General for Environment, Defra
Biodiversity collapse, food production and land use

10:00 **David Wagstaff**, Head of Energy Infrastructure Development, DESNZ
Energy and climate change challenge, and land use

10:05 **Joanna Averley**, Chief Planner, DLUHC
Government Approach to Land Use Planning

Session 1: Nature recovery and food

Chair: Georgina Chandler, Head of Policy and Campaigns, ZSL

10:15 **Dr Tara Garnett**, Director of Table, University of Oxford
Interactions among food, climate, health and broader sustainability issues

10:30 **Professor Lynn Dicks**, Professor of Ecology, University of Cambridge
Regenerative agriculture

10:45 **Dr Paul Behrens**, Author and Associate Professor, Leiden University
Diet, food production & nature recovery

11:00 **Dr Jonny Wentworth**, Environment Advisor, POST
Sustainable land-environment-food system interactions

Session 2: Nature recovery & energy

Chair: Professor Bridget Emmett, President, British Ecological Society

11:45 **Professor Jan Webb**, Professor of Sociology of Organisations, University of Edinburgh
The challenges associated with energy systems transformation and land use requirements

12:00 **Victoria Copley and Alex Fawcett**, Principal Advisors, Natural England
Planning for offshore wind in the midst of a climate and nature crisis

12:15 **Professor Heiko Balzter**, Professor of Physical Geography, University of Leicester
Land Use for Net Zero, Nature and People - Introducing the LUNZ Hub

12:30 **Chris Stark**, Chief Executive, Climate Change Committee
Path to Net Zero & nature recovery

Session 3: Nature recovery & housing and infrastructure

Chair: Sue Riddlestone, Chief Executive, Bioregional

13:45 **Dr Peter Cruddas**, Senior Lecturer in Water and Environmental Engineering, University of Portsmouth
Housing, nutrient pollution and biodiversity conservation

14:00 **Professor Nick Hanley**, Chair in Environmental and One Health Economics, University of Glasgow
Biodiversity Net Gain: opportunities & threats

14:15 **Natalie Duffus**, DPhil Student, University of Oxford
Exploring the ecological outcomes of Biodiversity Net Gain and the statutory biodiversity metric

14:30 **Cllr John McKay**, Executive Lead for Climate Change & Biodiversity, South Hams District Council
Local government challenges associated with nature recovery & infrastructure and housing development

Session 4: Nature recovery & Bringing everything together: how do we do it?

Chair: Ben Spencer, Science Editor, Sunday Times

15:15 **Dr Amy Thomas**, Soils and Ecosystem Services Modeller, Centre for Ecology & Hydrology
Integrated Modelling & Global Dependencies

15:30 **Dr Tom Finch**, Conservation Scientist, RSPB
Comparing alternative scenarios of future UK land use to achieve climate and nature goals

16:00 **Jane King**, Senior Researcher, ZeroHour
The Climate and Nature Bill

Conclusions: What do we do next?

Chair: Dr Andrew Terry, Director of Conservation & Policy, ZSL

16:00 **Professor Nathalie Pettorelli**, Institute of Zoology, ZSL & British Ecological Society
Summary

16:10 **Roger Mortlock**, CEO, CPRE
The case for an integrated approach to land use

16:20 **Lucy Smith,** Director General of Strategy and Change, Defra
England's land use strategy

16:30 **Professor Tim Benton**, Research Director, Chatham House
The Global Land Crunch

16:40 *Closing remarks,* **Matthew Gould**, CEO, ZSL

16:55 ***Optional poster viewing and networking***
18:00 ***Meeting close***

Poster abstracts

Authors and their affiliations in **bold** will be in attendance at the Land Use Summit.

Food and agriculture

Rory Barber, Enya O'Reilly
Joint Nature Conservation Committee

16. *Spatial Prioritisation: The use of environmental data to prioritise applications for The Slurry Infrastructure Grant – A Case Study*

Every year, farms in England generate and use millions of tonnes of livestock slurry. Slurry contains lots of nutrients that can benefit soil health and support crop growth. However, if mismanaged, it can contribute significantly to water and air pollution. It is therefore important to improve slurry management to reduce environmental pollution.

DEFRA's Slurry Infrastructure Grant was introduced to provide farmers with funding to build or upgrade their slurry infrastructure. Due to the expected popularity of the scheme, it was necessary to prioritise applications in areas where there is greater demand to improve air and water quality.

The Joint Nature Conservation Committee supported the grant's application prioritisation process through their spatial prioritisation work. This work aims to identify actions which would contribute to multiple environmental objectives in a given location, by combining evidence on where ecosystem service delivery is most beneficial, where land-management actions can be taken and what the expected impact of those actions may be on ecosystem service delivery.

Our work identified target areas where:

i) Sites of Special Scientific Interest were sensitive to ammonia (component of slurry) and
ii) there were both water and air quality issues and
iii) agriculture was a contributing factor to poor environmental quality.

These areas were used to prioritise applications for the first and second round of funding for the grant, totalling approximately £105 million. Our analytical method identified locations where the greatest environmental benefit to air quality, water quality and protected sites would be achieved, enabling strategic land use prioritisation.

Amanda Cooper, Becky Davies, Tamsin Lockwood, Michael Morecroft and Justin Moat
Kew

12. *Development of a non-destructive method for estimating carbon in hedgerows*

Hedgerows have long been used in agriculture to enclose and protect livestock, to mark field boundaries, and to prevent soil erosion and water run-off. They are also important for supporting biodiversity, as their woody structure can act as connective pathways between woodland patches and the plant species within provide food and shelter for birds, insects and small mammals. The role of hedgerows in storing carbon is less well understood but they have the potential to store as much carbon as woodlands through active management processes. Management practices, in terms of timing of trimming and shape, vary which has an impact on their structure and ability to maintain biomass. However, few studies have measured biomass in hedgerows, in part because destructive sampling of hedgerows is difficult. As an alternative to destructive measure, this studies aim is to explore the use of mobile lidar to measure the volume of hedgerows as a non-destructive method for estimating carbon. Two hedgerows have been surveyed using a GeoSLAM Horizon mobile scanner and "slice" samples were taken and weighed to determine if an observable volume-to-weight relationship could be observed. This study found that volume, as calculated from a lidar scanner, provided a better estimation of biomass than simply measuring the height of a hedgerow. Further work is needed to explore the consistency of this relationship across hedgerows of varying structure, management, and species composition. Establishing a simple, cost-effective, and non-destructive approach for estimating carbon in hedgerows will enable recognition of their carbon storage capacity.

Betty Roberts
Joint Nature Conservation Committee

14. *Spatial Prioritisation: An approach for identifying more impactful actions & options on land*

72% of UK land is managed for agriculture. Increases in agricultural productivity over the past decades has been responsible for the greatest impacts on nature, driving biodiversity declines due to habitat loss and fragmentation. The sector also indirectly contributes through pressures on soil health, pollinators, air, and water quality (State of Nature report, 2019). However, there are many demands on land use in the UK and all countries have committed to ambitious targets such as 30x30, achieving net zero, clean up our waters and tackle pollution. Responding to multiple policy priorities poses a significant challenge: how do you decide where to take which action to maximise benefits across multiple targets?

Our approach considers multiple productivity and environmental evidence sources to build a system that investigates what is the right thing do to, in the right place, at the right scale. There are 4 key steps:

1. Demand maps – for each ecosystem service delivered by land, where would it be more beneficial to improve delivery?
2. Location-based eligibility mapping – where are existing natural capital assets and where can they be created?
3. Impact Assessment – identifying the benefits and trade-offs across ecosystem services.
4. Decision support tool – a Multi-Criteria Decision Analysis (MCDA) that combines outputs from steps 1-3 and identifies more impactful actions & options for specific areas of land.

By spatially organising actions based on demand, eligibility and impact this evidence-based approach enables decision makers and land managers to consider actions that have higher environmental benefit(s) and are better value for money.

Dr Bruce Winney[1], Professor Kate Heppell[2] and David Hoccom[1]
[1]National Landscapes Association
[2]The Chilterns Conservation Board, QMUL

15. *Restoring nature in the calcareous landscapes of southern England: land use opportunities and trade-offs*

The calcareous landscapes of southern England, comprising grasslands, woodlands, mosaic habitats, chalk streams and aquifer-fed wetlands, are culturally important and globally significant for wildlife. They are central to protecting 30% of land for biodiversity and halting species decline by 2030. Thriving calcareous landscapes protect historic heritage and water supplies, store carbon, conserve natural beauty and help improve people's health and wellbeing.

BIG CHALK is a big idea – linking nature conservation and related activities across 19% of England's land area, including 26 Local Nature Recovery Strategy zones, and demonstrating that landscape connectivity is possible at a scale that increases ecological resilience and enables wildlife to respond to climate change. It identifies strategic habitat linkages between protected landscapes and sites, giving life to the Making Space for Nature principles of more, bigger, better and joined-up spaces for nature.

Taking the adjoining National Landscapes of the Chilterns and North Wessex Downs as case studies, we use land-use data to model the contribution of protected landscapes to the UK's 30 by 30 nature ambition. We highlight the opportunities and likely co-benefits and trade-offs arising from meeting the related drivers of protecting nature and delivering ecosystem services, including sustainable food production. We demonstrate the potential for strategic conservation initiatives to align with bottom-up, participatory modes of delivery, connecting landscapes and sites at a scale beyond that achieved by most land-use planning frameworks and contributing to a Nature Recovery Network for England. We discuss the importance of scale in monitoring nature's recovery.

Eleri Kent[1], Kirsty Park[1], Elisa Fuentes-Montemayor[1], Isabel Jones[1], Mark Whittingham[2], Chloe Bellamy[3], Carol Williams[4] and Katherine Boughey[4]

[1]**University of Stirling**
[2]Newcastle University
[3]Forest Research
[4]Bat Conservation Trust

11. *The effects of landscape woody features cover and spatial configuration on bat activity – implications for woodland creation*

How we best target woodland creation to accrue the greatest biodiversity benefits has become an important question given ambitious tree planting targets for carbon sequestration and habitat restoration. The importance of landscape context, including cover and configuration of existing habitat, on the effectiveness of restoration projects is unclear, however, it has been suggested that conservation actions are most effective in landscapes with intermediate habitat cover. Bats in the United Kingdom are highly mobile woodland taxa likely to benefit from woodland creation and are sensitive to landscape effects. To investigate the effects of woodlands and trees outside of woodland, (ToW) on landscape wide bat activity, we surveyed ~600 locations across 60 agricultural landscapes in the UK. The resulting ~15,000 hours of recordings were analysed by the Bat Conservation Trust's automatic ID pipeline. Across our surveys we detected ~16 million calls from 8 species. Preliminary analyses found that the amount of woodland cover surrounding sampling locations has a relatively limited impact on bat activity. In contrast, many species responded positively to landscape ToW cover and activity at ToW sites was similar to activity at woodland edges. These results highlight the importance of hedges, tree lines and individual trees as habitat for bats in agricultural landscapes.

Hien Luong, Colin Beale, Julia Touza-Montero and Jacco Thijssen
University of York

17. *The price to pay to plant a planet of plenty for pollinators and people*

Through the Kunming-Montreal Global Biodiversity Framework, governments seek to plug the finance gaps in nature conservation with private investments to deliver efficient and equitable biodiversity conservation. Biodiversity markets rely on a metric to provide reliable and accurate information in a well-functioning market. Reviews of suggested biodiversity metrics have highlighted differences in the methods to measure habitat, species and genetic diversity, but it remains unknown whether the different metrics could potentially deliver geographically similar incentives for investments in conservation in Britain. This is important because each metric may incentivise investment funding differently for biodiversity potentially leading to unintended consequences in biodiversity outcomes from applying different metrics. The metrics cover Defra's Biodiversity Metric with Plan Vivo's methodology, a conservation prioritisation metric and a rarity-weighted richness metric. Results show that metrics that use rarity will favour investment into the north and the west of Britain; in contrast, metrics that measure abundance incentivise investment into the south and east. The large differences we find in spatial incentives for investment from the use of different metrics contrast with the expectation that biodiversity goals require targeted action in specific areas, suggesting careful choice of metric is essential if biodiversity markets are to deliver the biodiversity gains envisaged.

Olivia Nelson
The Floodplain Meadow Partnership, Open University

13. *Floodplain meadows: Beauty and Utility for resilient floodplains*

This poster will provide information on now rare, species rich floodplain meadows in the UK, providing examples and evidence of their multifunctional value for delivering ecosystem services. It will refer to the current state of the UKs floodplains, the impact this will have in the face of the crises we face and the decisions which need to be made to ensure floodplains are more resilient. The poster will show that the new 72,000 ha restoration target for floodplain meadows for England is key as the meadows will deliver their ecosystem-service benefits much more effectively if restored at scale.

Achieving the optimum balance will require careful planning to avoid conflicts between, for example, food production, government tree-planting targets and the drive for net zero. The poster will argue that species-rich floodplain meadows are an extremely cost-effective "no regrets" high-nature-value farming system that provide multiple benefits, maintaining agricultural productivity whilst helping to meet the ambitions of the 25 Year Environment Plan. The restoration/creation of species-rich grasslands is a stepping-stone towards achieving more dynamic natural systems and restoring natural processes in floodplains, without stopping farming altogether in what is a very productive landscape.

The poster will provide case studies of how the Floodplain Meadow Partnership has used data and robust evidence collection to help shape decisions on a landscape scale for managing land on catchments. It will also refer to the historic floodplain landuse mapping research project it is using to help shape decision making at a local level.

Dr Andrew Weatherall
RSPB

10. *Right place first-why woodland creation and commercial afforestation are land use strategy decisions.*
The land squeeze is a challenge for countries like the UK with high ecological footprint and low biocapacity. The UK is 60% self-sufficient in food and only 20% self-sufficient in wood. Dependence on imports is inevitable, but there is no guidance on appropriate levels of self-sufficiency. Consequently, food and wood security issues compete with demands for land for nature's recovery, renewable energy (solar farms, onshore wind and energy crops), public access and urban development. This poster presents a flow chart to aid decision making to meet tree cover expansion targets, one driver of land use change. Switching the 'right trees in the right places' mantra into the proposed right place first approach will ensure any land use change benefits nature, climate and people.

Decisions start with **place**, if it is already high carbon/conservation/community value land, or highly productive farmland, there will be better places for tree cover expansion.

If place is appropriate, the right **reason(s)** should be determined. These may include nature's recovery, domestic timber supply, climate mitigation, flood alleviation, recreational access, etc.

Place plus reasons guides **tree cover type(s)**, which should contain diverse species and structures for resilience to pests, diseases and abiotic threats (e.g., drought, wind and fire) associated with climate change. Tree cover types include native woodland creation, commercial afforestation and amenity woodlands.

Selecting the **right trees** is straightforward. Forest Research's Ecological Site Classification provides information (on productivity, National Vegetation Classification communities, climate suitability and mixtures) for experts (especially Chartered Foresters) to combine with local knowledge.

Climate

Samuel Aizlewood[1], Nick Sellwood[2], Dr Hazel A. Jackson[2], Professor Robert, J. Smith[1] and Professor Zoe. G. Davies[1]
[1]Durrell Institute of Conservation and Ecology, University of Kent
[2]Woodland Trust

2. *Systematic Conservation Planning in the Northern Forest: exploring how an integrated approach to nature recovery might work.*
Producing a large, multi-use, multi-stakeholder landscape is far from straightforward. As an example, the Northern Forest is an ambitious project to restore and create wooded habitat across the North of England, involving multiple stakeholders working at a variety of scales and across different time frames. The Northern Forest Partnership is a collaboration between the Woodland Trust and four of England's Community Forests (The Mersey Forest, Greater Manchester's City of Trees, White Rose Forest and Humber Forest), as well as the Community Forest Trust. To help achieve their aims, there is a need to translate the project's broad vision into specific objectives, address trade-offs

and prioritise where to work. Widely used around the world, systematic conservation planning seeks to identify sets of priority areas that meet conservation objectives whilst minimising impacts on other sectors. Using the Northern Forest as a case study, we demonstrate systematic conservation planning's utility to explore how an integrated approach to nature recovery across a large multi-stakeholder landscape might work. The project demonstrates how planning at a larger scale may serve as a complement to locally focused opportunity mapping exercises. At present, designated sites for conservation cover 12.8% of the study area and our analysis identified an additional 17.2% in which to focus efforts to expand the Northern Forest. The project also served as an opportunity to understand the challenges of planning at this scale within a UK context, identifying areas for future research and highlighting the importance of collaboration between stakeholders across the region.

Lauren Barnes
University of York

4. *Are existing rewilding sites in locations that are important for biodiversity in the UK?*

The UK's commitment to 30x30 is a vital step towards mitigating biodiversity loss and enabling nature recovery, if effective protection can be delivered. Protected areas play a valuable role in biodiversity safeguarding. Ineffective protection attributed to lack of funding and internal and external pressures reduces the coverage of effective terrestrial protected areas to potentially as low as 5%. Rewilding initiatives have the potential to contribute to 30x30 as other effective area-based conservation methods (OECMs), alongside protected areas. Yet in Britain, it is unclear if rewilding can contribute effective biodiversity conservation to the 30x30 target as little is known about the contribution rewilding initiatives to biodiversity representativeness and their role in structural connectiveness and climate change adaption. This research will examine the contribute of rewilding initiatives publicly listed on the UKs rewilding network to biodiversity representativeness, connectedness to protected area sites and future climate change resilience. I will investigate this through the following aims: (1) do rewilding sites increase initial biodiversity representativeness in the UK? (2) Do rewilding sites increase connectivity within the protected area network? (3) Do rewilding sites increase future climate change resilience?

Beckie George[1], Rachel Warren[1], Jeff Price[1], Aldina Franco[2], James Pearce-Higgins[3],Dario Massimino[3]
[1]Tyndall Centre for Climate Change Research, School of Environmental Sciences, University of East Anglia, Norwich, UK
[2]School of Environmental Sciences, University of East Anglia, Norwich, UK
[3]British Trust for Ornithology, The Nunnery, Thetford, UK

5. *Spatially integrating climate risk into nature-based solutions to improve bird conservation outcomes under climate change.*

Land use change and climate change are often considered two separate drivers of biodiversity loss. Yet habitat associations and changes in land use factor profoundly into a species' ability to respond to environmental change. While the effects of climate change are expected to intensify, maximising the climate change resilience of biodiversity remains an essential but often overlooked aspect of strategic spatial planning. Here we integrate climate change risks posed to birds, into potential future UK land use pathways that balance the complex and interconnected challenges of achieving nature recovery, land-based climate change mitigation, and food security. Global MaxEnt species distribution models provided by the Wallace Initiative were reprojected for a comprehensive assemblage of UK bird species, including those of conservation concern, under six warming scenarios extracted from UKCP18 12km climate projections. From these models, baselines and six projected species richness maps were produced for habitat-associated bird communities. Using Zonation spatial prioritisation software, all UK grid cells were ranked for maintaining species richness across warming scenarios and suitability for restoration to the respective associated habitat. For policy relevance, the highest ranked 30% of cells were considered priorities. Mid-century land use scenarios exploring different pathways to land-based climate change mitigation and food security, were compared for their capacity to realise restoration and protection of priority areas for each bird community. These results highlight potential for embedding climate change resilience of biodiversity into UK land use policy, enhancing synergies for the efficient utilisation of one of the UK's most in-demand and finite resources.

Claudia Gutierrez-Arellano[1], Mansi Mungee[1], Humphrey Crick[2], Daneen Cowling[2], Lorna Drake[2], Victoria Hawkins[2], Laura Newland[2], Sarah Taylor[2], Thomas Travers[2] and Jenny Hodgson[1]
[1]**Department of Evolution Ecology and Behaviour, University of Liverpool**
[2]Natural England

7. *Informing nature recovery in England by analysing "bottlenecks" in broad habitats*

Background. To fulfil the Nature Recovery Network's commitment to delivering better-connected habitat networks at the national scale, it is important to target restoration in strategic sites where it will have the greatest impact on ecological connectivity. Action on the ground has been started through several initiatives. These will benefit greatly from spatially explicit indicators of high-impact habitat creation and restoration.

Aim. We identified key areas where connectivity "bottlenecks" occur (where connectivity is restricted) in England for four broad habitats: grasslands, heathlands, wetlands, and woodlands.

Methods. We used the decision support tool Condatis to identify bottleneck areas. We modelled the movement of generic species with moderate-low (1 km) and moderate-high dispersal abilities (3.4 km) across the landscape. We developed a scoring system applicable across different landscapes and spatial scales, that allowed us to categorise bottlenecks into severe, major, and minor and to rank the areas within these categories.

Outputs and findings. We produced national maps of the most significant bottlenecks in broad habitats and estimated their national coverage percentage. These are ready for use by practitioners as 'search areas' for restoration.

Implications and potential. Restoration action in severe or major bottleneck areas would deliver efficiently and effectively. We suggest that these maps are used alongside other relevant spatial information (e.g. topographic, infrastructure, or land use maps), to help identify sites where restoration is feasible. In cases where restoration is not possible, awareness of a bottleneck can bring into consideration alternative conservation plans (e.g. translocation). Our methods can be applied to other habitats and landscapes.

Anne Harrison[1]**, Leanne Tough**[1], Ian Dickie[2] and Allegra Naldini[2]
[1]**WWT Slimbridge**
[2]Economics For The Environment Consultancy Ltd

3. *Restoring and creating 100,000 ha of UK wetland – exploring the potential*

This poster describes a strategic land use prioritisation exercise based around wetland suitability and need. Wetlands are under unprecedented pressure, both globally and in the UK, due to catastrophic loss and degradation caused by land-use change, pollution, invasive species, unsustainable use, disrupted flow regimes and, in turn, the changing climate. Wetlands provide essential protection against climate change, flooding, droughts and pollution, and are vital for our health and wellbeing. However these wetland 'superpowers' are undervalued in UK policy and by society. In light of this, WWT are calling for the creation of 100,000 hectares of new and restored wetlands in the UK by 2050. WWT's Roadmap to 100,000 hectares project aims to identify strategic areas where this scale of wetland restoration is best-placed to deliver the biggest impact on society and nature, and estimates the value of the key benefits provided. We have mapped the areas of highest 'demand' for wetlands targeted at carbon storage, flood resilience, water treatment and urban wellbeing. Within these areas, we have mapped the potential for new and restored wetlands. This poster describes the mapping process, presents maps showing the extent of wetland potential in the UK (addressing conflict with other land-uses), gives the estimated economic benefits of the 100,000 hectares target, and outlines how we plan to use these outputs to drive wetland policy, restoration, and the wider appreciation of wetlands.

Jack Hatfield, Jane K Hill and Chris D Thomas
Leverhulme Centre for Anthropocene Biodiversity, University of York

1. *FAR-sighted conservation for a dynamic Anthropocene*

The landscapes and ecosystems in the UK are constantly changing due to dynamic processes and have been influenced by people for thousands of years. Much of conservation, however, aims to restore ecosystems back to a historic baseline state. Given the multitude of demands on UK landscapes and a changing climate, such aims may be unrealistic and even detrimental to overall conservation goals.
To set strategic conservation priorities for a 'nature crisis' in a changing world, we propose a Facilitate-Acceptt

Resist framework, for places and species as well as ecosystem services and human wellbeing. For every decision the options to Facilitate, Accept and Resist changes must be considered alongside who these would affect and how these would be done. Land is finite and everywhere is important, with different places important for different things (e.g. food production, carbon storage or vital to a particular set of species). This must be evaluated for not just the present but also the future. A FAR framework can then be applied in an inclusive manner to develop appropriate future orientated strategies.

In this poster we will discuss with examples, how a FAR framework could be integrated into conservation and planning from targets to monitoring and evaluation. We will also discuss inclusive engagement to ensure the benefits are equitably shared. Only by adopting a forward-looking perspective can we realise our aims of biodiversity positive and carbon negative UK landscapes that still produce enough food and contribute to human wellbeing.

Rebecca von Hellfeld[1], Fabio Carvalho[2], Héloïse Robinson[3], Arkan de Lomas[1], Jon Reid[1], Duncan Whyatt[2], Carly Whittaker[3], Alona Armstrong[2], Astley Hastings[1], Robert Matthews[3]
[1]**School of Biological Sciences, University of Aberdeen**
[2]Lancaster Environment Centre, Lancaster University
[3]Energy Lancaster, Lancaster University

6. *Quantifying Greenhouse Gas Emissions and Soil Carbon Budgets from Different Land Use Change Options*

In line with the UK net zero targets, much focus has been placed on land use change (LUC) towards the most sustainable and efficient option for food security, energy provision, carbon sequestration, and greenhouse gas (GHG) emission reduction. Whilst the understanding for maximising food security and energy provision is well established, gaps remain for soil carbon sequestration and GHG emissions. Thus, to effectively plan land use in line with net zero targets and climate policies, the impacts of different LUC options on emissions and sequestration must be better understood.

We conducted a systematic literature review in which we extracted available evidence on spatial and/or temporal changes in net GHG emissions and/or carbon sequestration rates of different land use options. These included energy crops, solar farms, short rotation forests, and short rotation coppice for biomass production. The gathered data will inform full life cycle assessments for each land use option. This work will later be integrated into a decision-making tool to determine the most appropriate land use option for each region, to help the UK achieve its net zero goals by 2050.

Energy

Fran Tattersall[1] and Paul Howden-Leach[2]
[1]**Automated Bioacoustics**
[2]Wildlife Acoustics

9. *Protecting bats at wind farms with responsive curtailment*

Wind farm operators need to balance bat conservation with wind energy production and economics. Blanket curtailment based on time of year and environmental conditions is the current leading global solution for reducing bat fatalities at wind farms but can severely limit operation.

We present a case study for a wind turbine in Southern England trialling a new responsive curtailment approach. In July and August of 2023, a real-time bat detection system with smart curtailment modelling capabilities was deployed at the turbine. Seven bat species were detected, with varying levels of activity per night and throughout the 2-month summer period. No bats flew in wind speeds over 8m/s and 10% of activity was at over 4m/s. Focussing on 3 days with the most bat passes and factoring in wind speed, we modelled lost energy production using smart curtailment versus curtailment at 4m/s vs. 6m/s. We then evaluated the number of alarms resulting in turbine stops per day and modelled stops vs downtime based on the bat activity over the two months.

We discuss how an operator can evaluate curtailment strategies for managing stops to determine the optimal strategy and balance between energy production, strain on the turbine hardware and bat protection. Is the optimal decision to have several short stops or fewer longer stops? For this particular site, data and the operator supported stoppage for 10 minutes when bat activity alarm criteria were met.

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8. *Restoring Resilient Ecosystems – Future restoration should enhance ecological complexity and emergent properties*

There is an urgent need to restore degraded ecosystems and landscapes for biodiversity and the provision of ecosystem services. Restoration projects frequently aim to re-create indigenous reference communities, with specific target species lists. However, for some ecosystems knowing what this indigenous reference community looks like and what species it 'should' contain is problematic, as there may be no truly undisturbed examples remaining. Secondly, even if we can recreate an indigenous reference community, there is the assumption that this community is resilient to the rapidly changing global climate. Currently, many restoration projects that use a traditional reference community approach fail to achieve their intended outcomes, and therefore, there is need to reconsider approaches for restoring ecosystems.

The *Restoring Resilient Ecosystems* (RestREco) project aims to deliver a step change in restoration science, by considering ecosystem complexity, multi-functionality, and resilience as fundamental aims for restoration projects, rather than attempting to re-create specific reference ecosystems. Here, we define complexity as the number of components in a system and the number of connections among them. Focusing on broadleaf woodlands and calcareous grassland at different stages of transition from degraded states, a range of ecological data has been collected on plants, invertebrates, soil microbes, bioacoustics, habitat structure and food webs. Using these data, multiple complexity measures will be calculated, along with a composite variable for a single site-level measure of complexity. We predict that more complex sites support more emergent properties, including multi-functionality and resilience to perturbations.

Infrastructure

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19. *How does post-industrial land regeneration contribute to Biodiversity Net Gain in the UK?*

Restoration of former mining sites often aims to enhance biodiversity. Habitat restoration and offsets have been proposed to compensate biodiversity losses, however few studies provide empirical evidence of success, and technical challenges exist to effectively measure losses and gains owing to mining. Emerging mechanisms and policies aim to both advocate for and enforce effective conservation action, including The 2021 Environment Act, which has made Biodiversity Net Gain mandatory for granted planning permissions in the UK. Progress towards targets can be tracked by use of biodiversity indicators, which allow the quantifiable assessment of biodiversity, and can be used to monitor levels of recovery and added value. In the context of Biodiversity Net Gain, monitoring, reporting and validation should be considered at both the project and policy level. This PhD will assess whether the project-level management, monitoring, enforcement, and proposed reporting are sufficient and achievable. To do this, biodiversity variability will be examined on 12 well-characterised former open-cast mining sites at different stages of restoration in Northumberland over a two year period. Invertebrate surveys, including pollinator surveys, and soil

analysis will be conducted to measure above and below ground health, and habitat surveys and remote sensing will be used to measure changes in vegetation structure. This PhD will contribute to our understanding of how effective the current methodologies are for achieving Biodiversity Net Gain on former mining sites, helping to strengthen the achievability of conservation goals in the UK.

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18. *Will England's Biodiversity Net Gain policy contribute to bigger, better, more joined up nature recovery?*

Biodiversity Net Gain (BNG) policy came into force in February 2024, mandating that almost all planning applications in England deliver a minimum 10% net gain of biodiversity post-development. However, debate remains over whether BNG could, and should, contribute to nature recovery on a national scale, and no study to date has investigated the policy's potential to contribute to the 'bigger, better, more joined up' habitats recommended for nature recovery by the Lawton Review. This research investigates the size and connectivity of on-site habitat patches, which are estimated to comprise 95% delivered biodiversity units. We also explore the incentives provided by the statutory DEFRA biodiversity metric to deliver different habitat types, investigating whether the policy encourages landowners to deliver 'better', wildlife-rich habitats for nature through the planning process. We find there to be no difference in the size of onsite habitat patches before and after developments have happened, and no difference in direct connectivity to other semi-natural habitats. We also find large bias in the habitat changes incentivised in the statutory metric, with grassland creation strongly incentivised over habitats such as woodlands. These results suggest alterations to the metric and more stringent guidance may be required to improve outcomes for nature under BNG. This has implications both for existing policy in England and future policies developed elsewhere.

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