Manchester Metropolitan University

iale UK
INTERNATIONAL ASSOCIATION FOR LANDSCAPE ECOLOGY

25 YEARS OF LANDSCAPE ECOLOGY

ialeUK Conference

27–29 JUNE 2017, MANCHESTER METROPOLITAN UNIVERSITY, UK

iale.uk/conference2017 • conference2017@iale.uk

Tues 27 June am – The long view on landscape ecology

Landscape Ecology: The Long View

Authors and Affiliations:
Roy Haines-Young
Co-Director and Senior Researcher, Fabis Consulting Ltd,
and Emeritus Professor, School of Geography, University of Nottingham
Email:
roy.haines-young@fabisconsulting.com

It is useful to reflect on the issues that interested people at the first meeting of IALE UK in 1992 because it can help us look critically at the state of the disciple today. This long view suggests that while we have made good progress in a number of areas, a persistent concern is that landscape ecological knowledge is not used in decision making as effectively as it might. Although many of the barriers to using knowledge arise because of the nature of our governance systems, uptake may also be frustrated because our research is not always seen as relevant. Taking the long view on the work of IALE UK suggests that for the future it may be helpful to focus more on the characterisation landscape change rather than landscape structure. It also suggests that if we want to explain better why landscape change matters to people, then a deeper understanding of the way landscape change affects the delivery of ecosystem services might also be helpful. We need to show that landscape is more than a cultural ecosystem service and that an understanding of its structure, condition and dynamics is fundamental to exploring the relationship that people have with the environment. Sustainable development is more about the way we change than the state we are in or seek to achieve.

The Story of IALE UK – a personal view

Authors and Affiliations:
R.G.H. Bunce
Estonian University of Life Sciences, Kreuzwaldi 5, 51014 Tartu, Estonia
Email:
Robert.Bunce@emu.ee

IALE started in the former Czech Republic in 1982, as a means of enabling travel outside the Soviet bloc, but the first open meeting took place in Veldhoven, in the Netherlands in 1981, followed by regular international conferences. Our Chapter was initiated in a small meeting held in University College London, which led to the first conference, held in Nottingham in 1992.

The early meetings contained much that belonged to mainstream ecology, e.g. changes in heath lands, although the papers had underlying themes of landscape ecology - such as fragmentation. Our meetings contributed to the progressive development of Landscape Ecology as a science. The major topics that are now central to the discipline will be identified in the paper, together with their relationship to our related subject, landscape architecture. Future topics which need to be addressed will also be discussed.

Since 1992 an wide range of quantitative and statistical approaches have now been applied to subjects varying from meta-populations to landscape monitoring. In this respect, Geographical Information Systems, which were not widely available in 1992, have played a key role.

We are now one of the leading chapters of IALE, and are in a strong and healthy position to maintain the high standards we have set.

Landscape delivery in Natural England – paradigm shift or evolution?

Authors and Affiliations:
Patricia Rice
Senior Specialist, Ecosystem Approach and Natural Capital, Natural England
Email:
patricia.rice@naturalengland.org.uk

Natural England is the government's adviser for the natural environment in England. Established in 2006 it brought together functions of its founding bodies and has a wide remit, helping to protect England's nature and landscapes for people to enjoy and for the services they provide. This presentation provides a Natural England perspective on how landscape delivery has changed over the last 25 years and, in particular, how policy drivers since the Lawton Review[1] (published 2010) and subsequent Natural Environment White Paper[2] (published 2011) have led to landscape ecology principles being increasingly reflected in practical place-based delivery.

When these changes are examined through the lens of a long standing delivery partnership (Figure1) a picture emerges that shows a parallel evolution in relation to key policy drivers. The Humberhead Levels and Moors Partnership was formally established in 1997 at the time of the Countryside Agency Land Management Initiatives, projects set up to explore sustainable agricultural practices to benefit the environment, economies and communities. The partnership's approach is underpinned by a strong understanding of landscape character and from this early foothold it has demonstrated the ability to take the opportunities offered by more recent changes to policy, most notably in becoming a Nature Improvement Area in 2012. The Humberhead Levels Partnership now works to a shared vision and delivery plan and demonstrates the practical importance of strong partnership working in achieving landscape delivery.

In October 2016 Natural England published Conservation 21[3], a strategy to identify what the organisation needs to do differently to help achieve the government's ambition for England to be great place to live with a healthy natural environment on land and sea that benefits people and the economy (Figure 2). Conservation 21 identifies three key strategic shifts that centre around creating resilient landscapes and seas; putting people at the heart of the environment and growing natural capital. As the Humberhead Levels Partnership illustrates, these shifts have long been evident in the direction of travel, but Natural England has recognised that a step-change is required for them to be reflected more widely in practice, providing a potential opportunity for the landscape ecology community to contribute to practical place-based delivery.

(1) Lawton, J.H., et al (2010) Making Space for Nature: a review of England's wildlife sites and ecological network. Report to Defra.

(2) HM Government (2011) The Natural Choice: securing the value of nature.

(3) Natural England (2016) Conservation 21 Natural England's Conservation Strategy for the 21st Century. www.gov.uk/natural-england

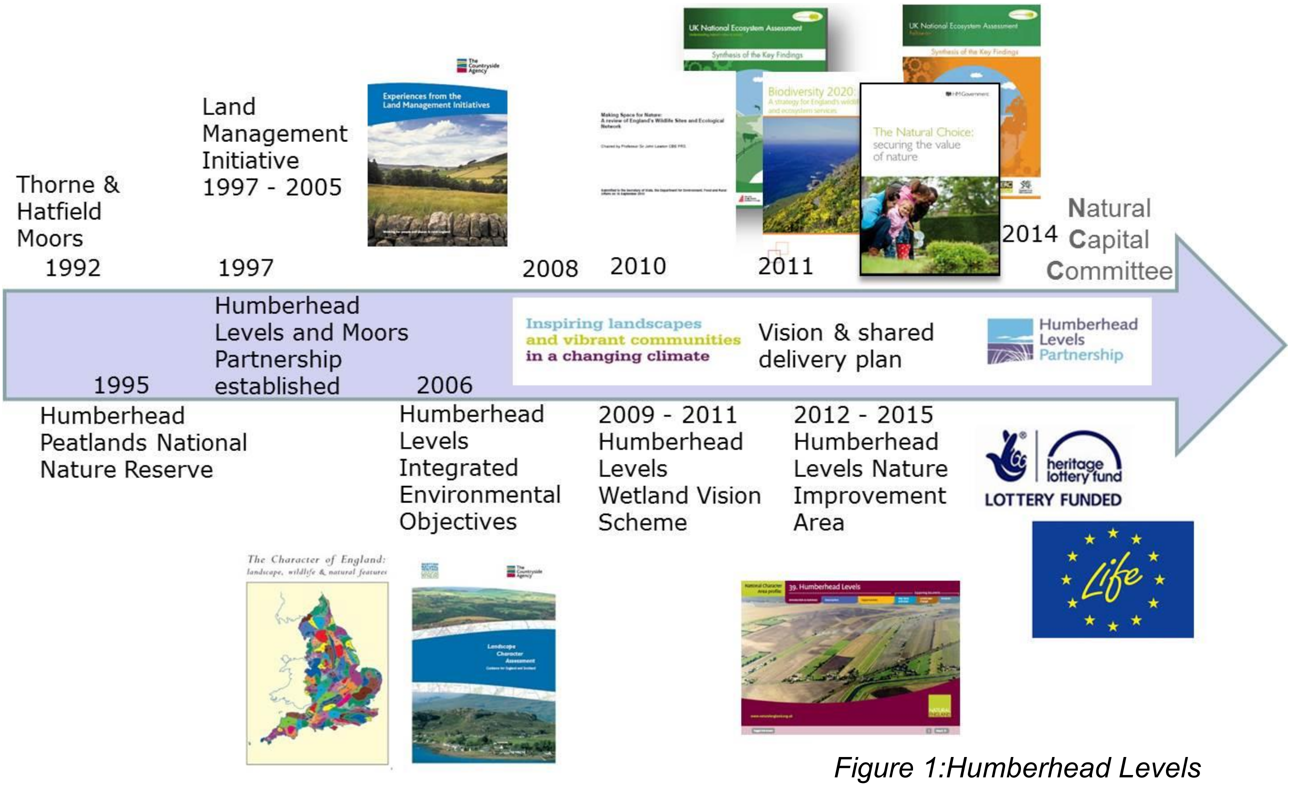


Figure 1:Humberhead Levels Partnership policy and practice timeline

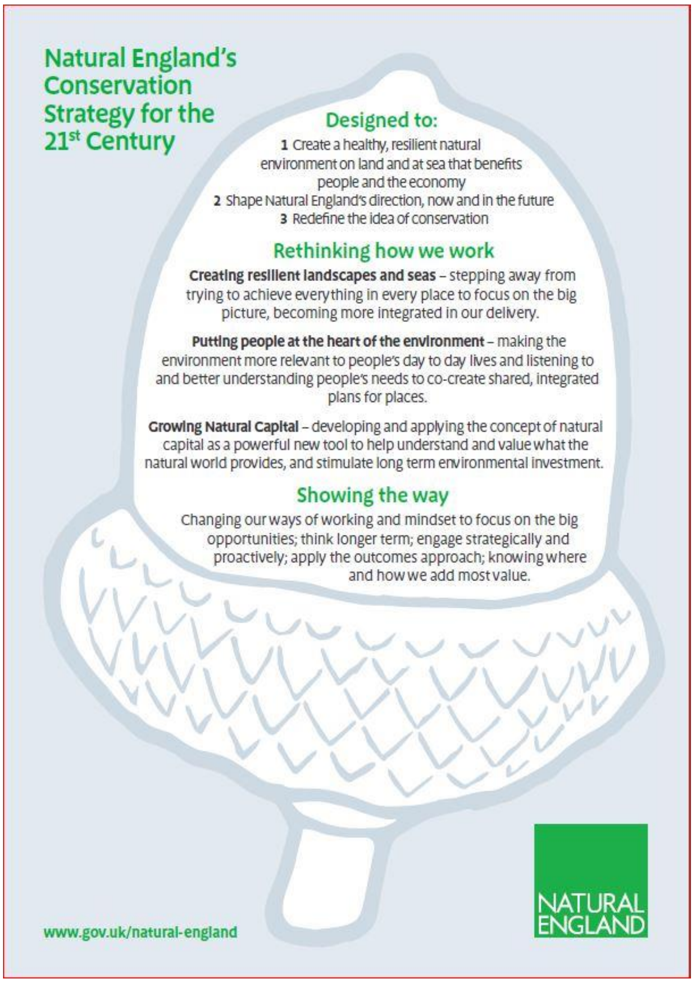


Figure 2: Natural England's Conservation Strategy in a nutshell

The Development of Landscape Ecology in Eastern Europe

Authors and Affiliations:
Kalev Sepp
Professor, Estonian University of Life Sciences Institute of Agricultural and Environmental Sciences, 1 Kreutzwaldi St, 51011 Tartu, Estonia
Email:
kalev.sepp@emu.ee

I.S. Zonneveld, the first President of the International Association for Landscape Ecology (IALE), wrote in 1983 “IALE, was conceived in Veldhoven, The Netherlands in 1981, and born in Bratislava, in 1982”. IALE initially consisted of geographers who had developed a system of ecological cartography, as well as ecologists working on populations and communities. Practioners such as landscape developers and architects were also involved. In 1983 25 people met at Allerton Park in the USA, to discuss the foundation of “Landscape Ecology” and, in the same year, the first IALE Bulletin was published. Landscape ecology then gradually became recognised as an independent discipline throughout the world. In Eastern Europe, geographers played a driving role in the formulation of landscape science, with close links to problems of natural resource management.

Using a literature review and personal interviews with key landscape ecologists from Eastern Europe, the presentation analyzes how landscape ecology has changed in the past decades in the following countries: the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Russia and the Ukraine. How the discipline is likely to continue to evolve will then be discussed. The key researchers involved in developing landscape ecology in the countries will also be identified. The following main research topics will then be described: ecological infrastructure, ecology of catchment areas, Geographical Information Systems, landscape ecological aspects of agro-ecosystems and urban ecology. The development and establishment of the various IALE chapters will also be included.

Delivering the global Aichi biodiversity targets at a landscape scale in the UK

Authors and Affiliations:
Dr Adrian Southern
Head of Landscape Scale Conservation, The Royal Society for the Protection of Birds
Email:
adrian.southern@rspb.org.uk

The Aichi targets are a global policy effort to preserve biodiversity, established by the United Nations Convention on Biodiversity (CBD) and 191 countries have committed to deliver these targets by 2020. The 20 targets form a global strategic plan that aims to reduce the pressures on biodiversity and improve its status (www.cdb.int). It is clear that it will be challenging to meet these targets by 2020, but how will we be performing against biodiversity targets over the next 25 years time?

A particularly important target, from a landscape perspective, is Aichi Biodiversity Target 11, that states; "By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes". Target 11 also seems to act as an overarching framework for most if not all of the other 19 Aichi targets, placing landscape approaches at the heart of Aichi target delivery (Blackie & Sunderland 2015).

This presentation will outline some of the current efforts aimed at delivering Aichi target 11 within a UK context, and where we could be in 25 years time.

Blackie and Sunderland (2015) Mapping landscape guidelines and principles to the Aichi targets. CIFOR infobrief.

Whatever happened to historical ecology and why isn't there more of it in landscape ecology?

Authors and Affiliations:
Duncan McCollin
The University of Northampton
Email:
duncan.mccollin@northampton.ac.uk

Historical ecology is an approach for reconstructing past landscapes and is particularly important in helping understand how past human-nature interactions affect the current ecology and distribution of organisms and in informing future management needs. Here, I show how little historical ecology is going on in the context of landscape ecology and suggest this is not only because of the challenging nature of the subject but also due to problems associated with the perceived originality of case studies. I highlight that contemporary approaches to landscape ecology are rooted in equilibrium thinking and there is a need to recognise the importance of historical ecology: first, in terms of providing evidence to establish the temporal continuity of habitats and how such historical continuity can be important for maintaining the distribution of certain groups or species; second, in that such species may have time lags in their responses to contemporary landscape change and the need to recognise the implications of this for landscape planning; third, in terms of recording the history of past disturbance regimes (e.g., of fire, or grazing) and to recognise their implications, and fourth, in terms of broadening our appreciation of past biocultural interactions of humans and nature. In summary, it is suggested that landscape ecologists continue to seek innovative ways to incorporate historical landscape data into their analyses such that analyses relating to contemporary landscapes can take on board the points highlighted above and potentially address non-equilibrium dynamics.

25 years of landscape ecology and woodland birds

Authors and Affiliations:
Paul Bellamy[1], Shelley Hinsley[2], Richard Broughton[2], Ross Hill[3]
RSPB Centre for Conservation Science[1], Centre for Ecology and Hydrology[2], Bournemouth University[3]
Email:
paul.bellamy@rspb.org.uk

A paper on birds in small woods was presented at the 1992 inaugural IALE(UK) meeting. We will follow the development of that work over the past 25 years which has included many contributions to IALE(UK) conferences.

The focus of the initial paper was on patterns of species occurrence and community structure for woodland birds in a landscape of highly fragmented woodland. We will show how this developed to look at the processes involved in producing the observed patterns including variation in dispersal, breeding success and habitat quality between large woods and small woods concentrating on a few hole nesting species. The project also spans a period of technological development and incorporated the increasing use of GIS and remote sensing to characterise landscapes and habitat at different scales. Finally we show how these ideas from landscape ecology are being used in the conservation of woodland birds in the UK.

Tues 27 June pm – Upland landscape ecology

Nature Land and Power: The role of landownership and co-management in sustainable management of upland ecosystems in Scotland

Authors and Affiliations:
Rob McMorran

Email:
rob.mcmorran@sruc.ac.uk

Upland ecosystems represent the largest areas of near natural and semi-natural habitats in the UK and the majority of the world's heather dominated habitats, with 3.4M hectares (43%) of Scotland consisting of Mountain, Moorland and Heath (UK NEA, 2011). The uplands provide a range of ecosystem services, including 70% of the UK's drinking water, 40% of the soil carbon resource and high experiential values. The extent and condition of moorlands has been shaped by a history of management including burning, grazing and predator control. Upland areas have experienced considerable change since WWII, resulting from management and policy shifts in response to market demands (e.g. high sheep stocking densities in response to payments designed to address food security). This has resulted in a decline in the areas of bog, heathland and native woodland habitats, due to encroachment from conifer afforestation and agriculture and increasing deer densities linked to sporting estate management. An increasing emphasis on environmental values from the 1970s led to impacts being moderated by conservation policy and reform of agricultural policy. Current trends include habitat restoration, reintroductions, hill farming decline, native woodland expansion and renewable energy development. Nevertheless, 'traditional' land uses remain important to rural economies and a core aspect of management on many private landholdings. The uplands therefore represent multifunctional landscapes – with a wide range of users and trade-offs apparent. This paper examines the role of landownership and land management to the development of upland ecosystems, including reviewing key outcomes of different landownership models. Four key challenges are examined: i) renewable energy and wildness values; ii) deer management and native woodlands; iii) grouse shooting and raptor conservation; and iv) rewilding in a cultural landscape context. Conclusions are drawn in relation to: i) the role of landowners and landownership; and ii) the role of co-management in sustainable upland ecosystems.

Characterising landscapes – cultural and ecological perspectives from estates in the Scottish Highlands

Authors and Affiliations:
Euan Bowditch, Melanie Smith
Inverness College, University of the Highlands and Islands
Email:
euan.bowditch.ic@uhi.ac.uk

Cultural landscapes in Scotland have been shaped by individuals, dominant patterns of land ownership and ecological processes over hundreds of years, in a way which continues to impact policy and practice. This paper describes research which informs a definition of cultural landscapes through identifying how individual land managers perceive landscape and management practice. This sharpened definition contributes to improved communication and visualisation to inform policy. Increased demand for timber has led to woodland expansion being a focal point for policy responses that facilitate land use integration. A walking interview methodology is used to spatially map cultural perception of ecological land use practice and narratives associated with both everyday management and longer-term perspectives of the landscape.

Woodland landscape maps are constructed from land manager defined criteria, which balances historical, dominant and emerging land use aligned with current needs, personal perspective and future conditions. Individual cultural interpretation of landscape is key to shaping policy that effectively represents and considers local practice. This study shows that land managers acknowledge up to 38% of land is suitable for woodland through a mix of SRF, longer-term production and amenity objectives, discounting the potential for montane scrub woodland.

Engaging land managers in the field increases receptiveness to exploring land potential drawn from historical evidence, memory and experience, as well as cues from the landscape that triggers a more holistic way of interpreting the landscape. Whereas, conventional, less dynamic methods show less receptivity to exploring diverse options. This study highlights the importance of immersive approaches to develop greater opportunities for visible and realistic planning that leads to decision-making framed by local ecology and culture.

Understanding public preferences for woodland and landscape visions in an upland region of Scotland

Authors and Affiliations:
Louise Sing[1], Marc Metzger[2], Duncan Ray[3]
Forest Research, University of Edinburgh[1], University of Edinburgh[2], Forest Research[3]
Email:
louise.sing@forestry.gsi.gov.uk

Increasing Britain's tree cover is a current policy for each of the devolved administrations of England, Wales and Scotland which is intended to deliver multiple benefits. British public opinion surveys of forestry show high levels of support for increasing woodland cover. However, public perceptions of multifunctional landscapes in Scotland are complex (Nijnik and Mather, 2008); therefore understanding people's perceptions of landscape and their preferences for woodland cover can help to inform environmental planning and policy making.

A research project conducted by Forest Research and the University of Edinburgh is looking at public preferences for the type and extent of woodland cover in the landscape using a landscape visualisation tool. The project uses a simple interface to capture the complexity of multiple benefits and the trade-offs and synergies that result from prioritising and managing for particular benefits. Previously this method has been used to identify management preference clusters for an upland landscape close to Edinburgh. In their survey, Schmidt et al. (2016) found a strong pattern of preference for nature-oriented management. This talk will describe the tool and present results for woodland expansion and land use preferences for the Lochaber region in the western Highlands.

Nijnik, M., Mather, A., 2008. Analyzing public preferences concerning woodland development in rural landscapes in Scotland. Landsc. Urban Plan. 86, 267–275.

Schmidt, K., et al 2016. The Sociocultural Value of Upland Regions in the Vicinity of Cities in Comparison With Urban Green Spaces. Mt. Res. Dev. 36, 465–474.

Understanding stakeholder visions for woodland expansion

Authors and Affiliations:
Vanessa Burton, Marc Metzger[1], Darren Moseley[2], Calum Brown[3]
University of Edinburgh[1], Forest Research[2], Karlsruhe Institute of Technology[3]
Email:
vanessa.burton@ed.ac.uk

Globally, forest restoration is accepted as an important mechanism to deliver biodiversity and climate change targets. In Scotland, this is framed as a government aspiration for woodland expansion, to deliver a wide range of benefits. However, there are diverse values held with regards to the Scottish landscape and the amount and types of woodland wanted. This PhD research is combining stakeholder engagement and modelling techniques to explore the effect of different 'visions', or 'plausible and coherent descriptions of positive futures' for woodland expansion on biodiversity and ecosystem services into the future. As normative scenarios, visions have a role in both searching for common ground between diverse stakeholder groups, and in thinking openly and creatively about the types of woodland that can be encouraged, and how the Scottish government aspiration can be met. A document analysis of 54 existing policies and plans from various stakeholders involved in forestry, conservation and land use has revealed that there are at least five distinct visions for how woodland expansion and forestry might develop in Scotland over the next century. These visions formed the focal point for a national level stakeholder workshop, as well as further semi-structured interviews, where input was received on how the visions might look and work into the 21st century. The visions will be used as alternative future trajectories in order to explore their potential implications for biodiversity and ecosystem services. Modelling techniques, integrating ecosystem service models with an agent-based model simulating the effect of individual behaviour and governance mechanisms, will be applied at the national scale, as well as in two contrasting case study landscapes: the Coigach-Assynt Living Landscape in the NW Highlands, and the Loch Lomond and Trossachs National Park, west of Glasgow.

Characterising the Upland Landscapes of Great Britain

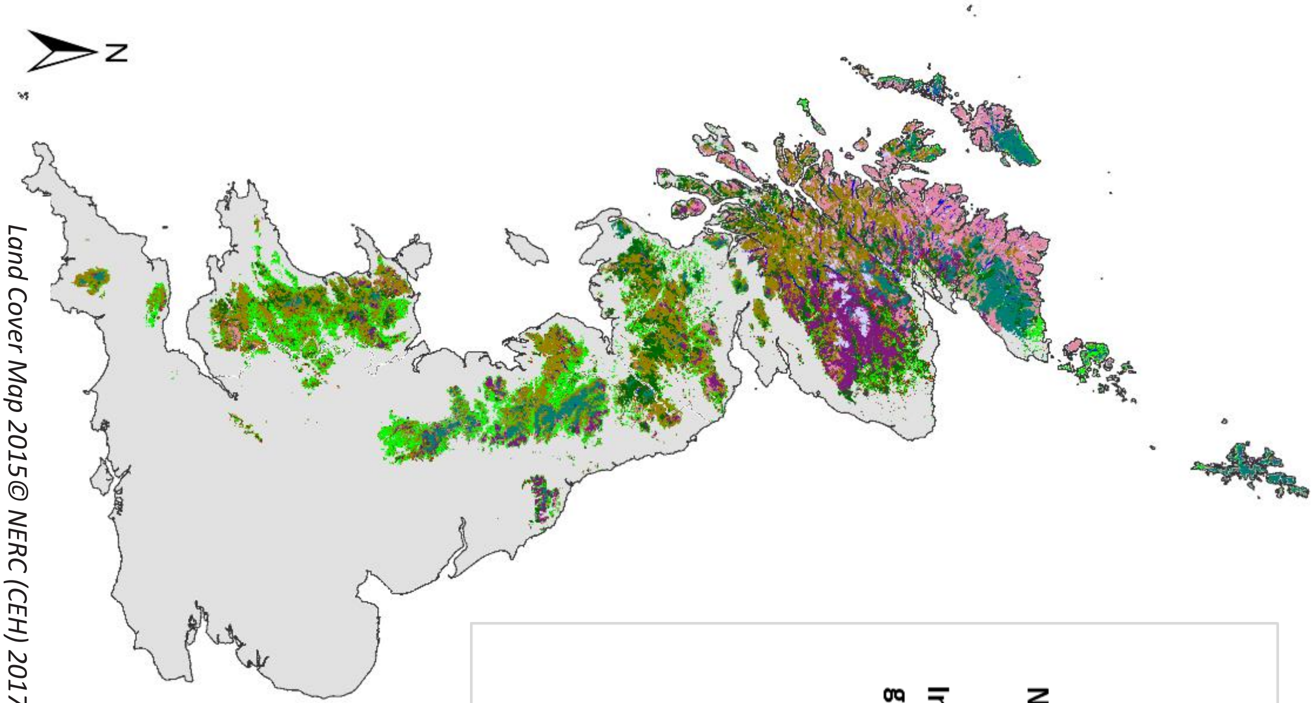
Authors and Affiliations:
C. Wood[1], R.G.H. Bunce[2]
Centre for Ecology and Hydrology, Lancaster Environment Centre, Bailrigg, Lancaster[1],
Estonian University of Life Sciences, Kreuzwaldi 5, 51014 Tartu, Estonia[2]
Email:
clamw@ceh.ac.uk

There are no estimates of the area of the British uplands produced by consistent statistical methods except for a preliminary paper using Countryside Survey data in 1987. The method of derivation of the figures that are available (e.g. from the Royal Society for the Protection of Birds), are not given. Other figures (e.g. those for upland habitats given by the Joint Nature Conservation Committee) are incomplete and have been extracted from different sources, so are not consistent. The situation is also confused because many upland landscapes (such as in the English Lake District) have valleys within them that are composed of vegetation with lowland characteristics, although extreme situations such as the Cairngorms are purely upland. It is therefore necessary to define exactly what categories are included in any given set of figures.

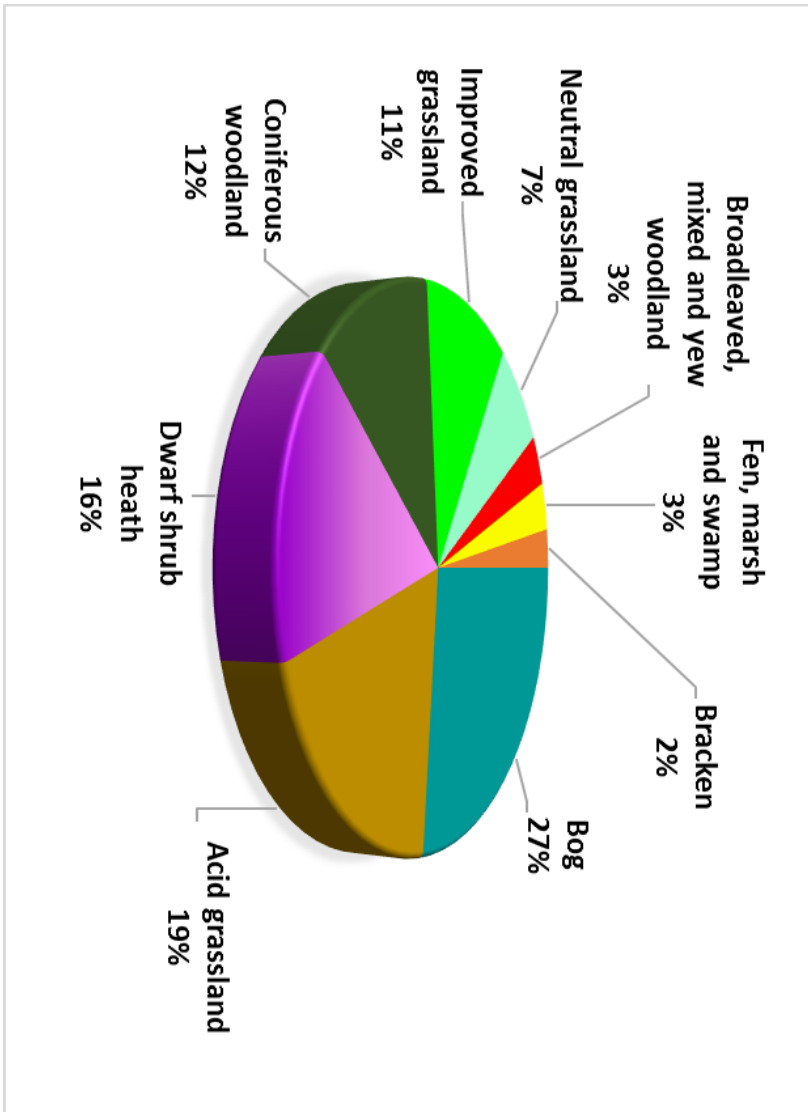
The databases from the Countryside Survey allow an analyses of upland landscapes to be carried out. The present paper therefore uses a structured approach to derive statistically consistent figures at four levels:

1. The landscape level. This level is available from an Environmental Classification of all one km squares in Britain. Originally 32 classes and now 45 classes to allow for separate estimates for England, Wales and Scotland. Provisional estimate: 8.8 m ha/38% of GB.
2. The Broad Habitat level. Combinations of habitats make up the landscapes and figures are available from mapping standard defined habitats recorded in the field in sample squares. Provisional estimates (proportion of GB uplands): Bog – 25%, Acid grassland – 18%, Dwarf shrub heath – 15%
3. The vegetation level. Combinations of vegetation make up the habitats.
4. The species level – frequency of individual species from the vegetation plots. Top 3 most frequent species: Potentilla erecta, Calluna vulgaris, Agrostis capillaris

The figures will be extracted from the 2007 survey and presented at these four main levels.



Land Cover Map 2015© NERC (CEH) 2017



Proportion of Broad Habitats in British uplands
(Habitats >2% cover)

Strathard ecosystem services project: Assessing the effect of implementing Natural Flood Management measures in the Duchray Water catchment

Authors and Affiliations:
Huw Thomas & Samantha Broadmeadow
Centre for Ecosystems, Society and Biosecurity
Email:
huw.thomas1@forestry.gsi.gov.uk

The Strathard Ecosystem Services project aims to achieve multiple benefits of land and water management; by identifying opportunities within the Strathard Project area to influence forest and land management operations and design to reduce flood risk. A key goal of the partnership is to slow the flow in the Duchray Water catchment, using natural flood management. The catchment was modelled using the Soil Conservation Service (SCS) Runoff Curve Number method to assess the impact of implementing Natural Flood Management measures on flood flows. Suitable reaches for NFM measures such as instream debris dams and floodplain storage areas were identified in the catchment using GIS techniques. If all the NFM measures were implemented in the catchment (some 448 debris dams, 18 ha of floodplain storage, and 70 ha additional storage in the catchment), as much as a 20% decrease in peak flows was predicted for more frequent 1 in 5 year rainfall events while a slightly lower 16% decrease was predicted for more extreme 1 in 200 year events. A 5% increase in catchment storage volumes were predicted, while peak timing increased by as much as an 1 hour 7 minutes for a 1 in 5 year rainfall event, to 53 minutes for a more extreme 1 in 200 year event. These numbers need to be treated with caution since the SCS method remains to be validated for UK conditions, however they support growing evidence that woodland creation and management could have a significant role to play in flood risk management.

Viridian Logic: An Optimised Natural Flood Management Planning Tool

Authors and Affiliations:
Leon Baruah
NERC/RSE Enterprise Fellow, University of Sussex | Director, Viridian Logic Ltd
Email:
l.baruah@sussex.ac.uk

There is a need for regional or national plans to provide the framework for natural resource management, and the additional need of local knowledge for implementation, since not all high-service provision is aligned with environmental gain. This need is clearest in planning natural flood management schemes, where opportunity mapping doesn't indicate where to solve problems.

The Viridian Logic platform goes beyond opportunity mapping, calculating hydraulic flow over land topology and rating the ability of locations across the landscape in mitigating water quantity and quality problems before rainfall reaches the river network. The system models catchments to produce maps that show (1) how hard each part of the landscape is working to provide the specific benefits needed locally, then (2) identifies which habitats to create and where to create them to produce the greatest improvements in service provision at least cost. This is at a 5m scale and has been applied up to 720 square kilometres in the UK. Identifying the areas of least ability, and then proposing various habitat planting schemes, the maps that are delivered describe the optimal land use change in the right upland (and sometimes lowland) areas to reduce flooding that affects communities downstream.

The talk will expand upon the motivations for building the tool, how it works, some of the areas it has already been applied to, and a sneak peek at some of the exciting platform developments on the horizon.

Threats and opportunities to upland landscapes in post-Brexit England

Authors and Affiliations:
Dr Steve Carver
School of Geography, University of Leeds
Email:
s.j.carver@leeds.ac.uk

All recent indications from government announcements are that the current level of agricultural subsidies will continue at least until 2020. After this date, the picture is less certain, but it must be assumed that change is likely and that this could mean less financial support for upland agriculture. This will have far-reaching implications for the sector and knock-on effects on the wider landscape of the English hills. This paper will explore the possible threats and opportunities to upland landscapes in England under several post-Brexit scenarios including "business as usual", land abandonment, rewilding and intensification of both livestock grazing and commercial forestry. Readily available spatial datasets will be used together with some newly created national wildness maps to identify possible geographical patterns of land use change over the next few decades in a post-Brexit climate. Datasets used include Agricultural Land Capability (ALC), High Nature Value farming (HNV) areas, Less Favoured Areas (LFA), Agricultural Census information of stocking densities, etc. together with wildness quality indicators (remoteness and naturalness) mapped for the John Muir Trust across the whole of the UK. Possible spatial patterns in threats (e.g. abandonment) and opportunities (e.g. rewilding) together with changes in land use patterns from intensification of grazing, game and commercial forestry activities will be mapped.

Wed 28 June am – Lowland landscape ecology

Using historical changes in lowland landscapes to inform future restoration

Authors and Affiliations:

K. Watts[1,2], E. Fuentes-Montemayor, N. A. Macgregor, K. J. Park

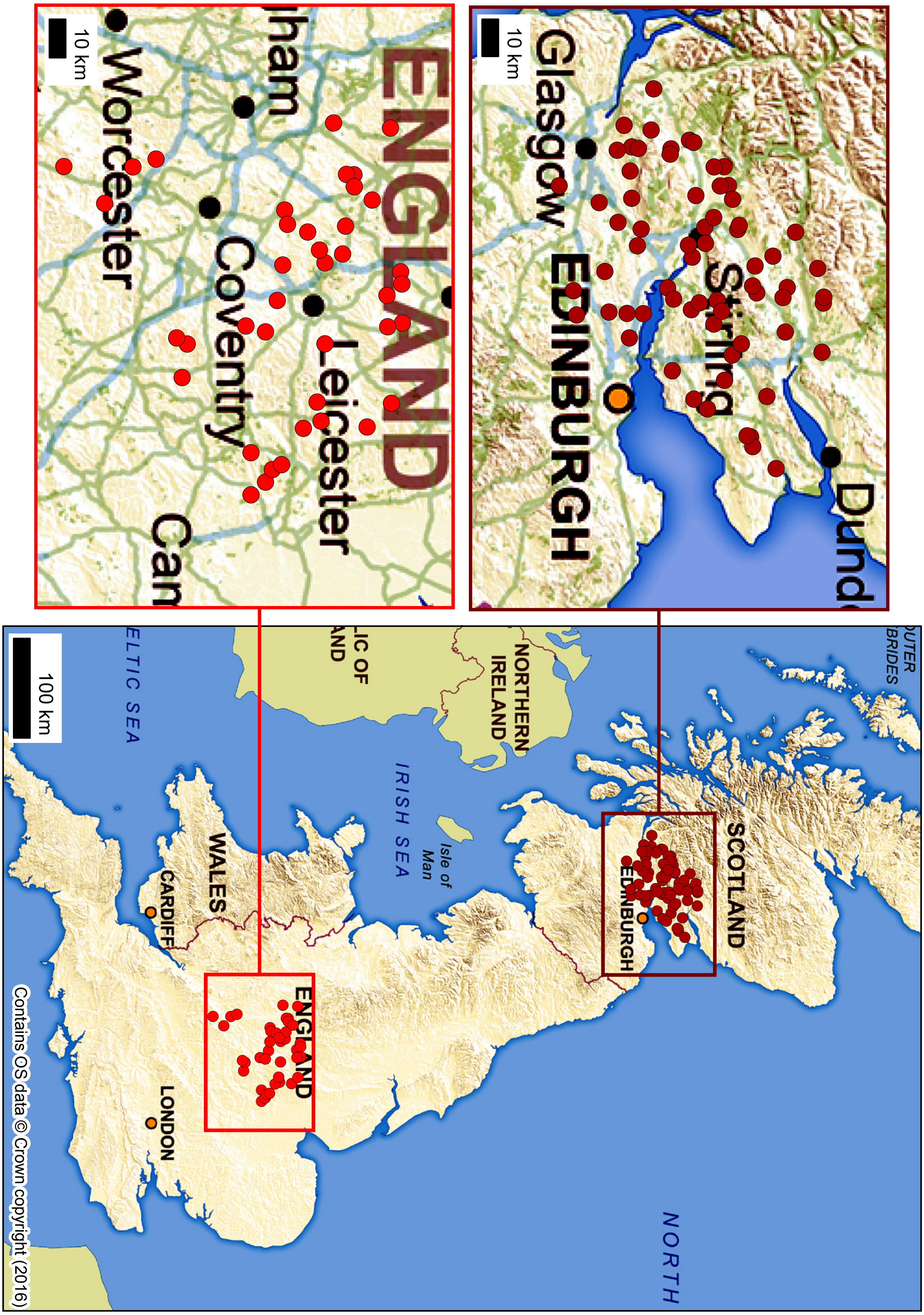
[1]Forest Research, Alice Holt Lodge, Farnham, Surrey, GU10 4LH, England, UK. [2]Biological & Environmental Sciences, School of Natural Sciences, University of Stirling, Stirling, FK9 4LA, Scotland, UK. [3]Durrell Institute of Conservation and Ecology (DICE), School of Anthropology and Conservation, University of Kent, Canterbury Kent CT2 7NR, England, UK. [4]Natural England, Nobel House, 17 Smith Square, London SW1P 3JR, England, UK.

Email:
kevin.watts@forestry.gsi.gov.uk

Landscape-scale conservation strategies are increasingly proposed to combat the effects of habitat loss and fragmentation. These appealing strategies are based on sound ecological principles and have been widely embraced by the conservation community. However, the empirical evidence is limited and equivocal, and there is debate on the relative merit of, and balance between, site- and landscape-level actions. There is also uncertainty regarding whether the ecological consequences of removing natural land cover (i.e. fragmentation) and the benefits of putting it back (i.e. restoration) are reciprocal, further complicating decisions around when and where to focus restoration efforts.

A greater use of experimental approaches could clearly help to resolve this situation, increasing the chances of teasing apart the relative influence of alternative conservation actions. Although the importance of experimentation to advance ecology and inform conservation is widely acknowledged, these types of studies are rarely carried out over large extents. There are two fundamental challenges to large-scale experimentation in ecology. The first is based on the trade-off between the spatial scale necessary to ensure ecological realism, enabling the collection of evidence applicable to practical conservation, and the ability to exert experimental control and replication. The second is related to temporal scale, given the time it may take for biodiversity to respond to change, coupled with the difficulty and cost of running long-terms experiments and the urgency for evidence.

Natural experiments have been proposed as a way to potentially overcome these challenges as they attempt to overlay an experimental design on an ecosystem where change or active manipulation has occurred or is planned, beyond the control of the researcher. As such, natural experiments fall between true manipulative experiments and the more common, but less rigorous, correlative or observational studies. We describe how we developed the WrEN (Woodland Creation & Ecological Networks http://www.wren-project.com) project to utilise the significant changes in lowland landscapes in the UK as basis for a long-term, large-scale natural experiment. The project, which is based on 160 years of woodland restoration in UK lowland landscapes, attempts to overcome the challenges and inform future restoration by: 1. investigating the effects of habitat restoration and creation, rather than habitat removal and fragmentation; 2. studying real landscapes at spatial scales that are sufficiently large to ensure ecological realism and the applicability of evidence; 3. incorporating appropriately long time scales to account for lag effects; 4. sampling a wide range of explanatory site- and landscape-level variables; 5. examining a wide range of species. We conclude with a few insights into the emerging evidence from WrEN and possible implications for future conservation and restoration in the UK and beyond.


ENGLAND
Leicester
Coventry
Worcester
10 km
Glasgow
EDINBURGH
Stirling
10 km
SCOTLAND
NORTHERN IRELAND
IRISH SEA
Isle of Man
WALES
CARDIFF
LONDON
NORTH
100 km
Contains OS data © Crown copyright (2016)

Funding environmental management and research over the long term: the Mersey Gateway case study

Authors and Affiliations:
Philip James
Professor of Ecology, School of Environment and Life Sciences, Ecosystems and Environment Research Centre, University of Salford
Email:
P.James@salford.ac.uk

When a local authority is the developer of a major civil engineering project, the normal route to ensure appropriate environmental mitigation, a Section 106 agreement, is not feasible. The construction of a six-lane toll bridge between Runcorn and Widnes in the northwest of England, scheduled to become operational in autumn 2017, is such a case. A novel approach had to be found to address environmental concerns. It is now also recognised that innovative forms of funding to support these actions will be required as both public and NGO spending on biodiversity has stagnated or reduced. In 2014–15, £452 million was spent by the UK public sector on biodiversity, and in the previous year non-governmental organisations spent £215 million. Between 2009–10 and 2014–15, public sector spending decreased by 26 per cent, while NGO spending remains relatively stable.

The solution to both issues was to establish a charitable environmental trust. The concept of the trust was driven, in part, from a recognition of the importance of landscape ecological research, which had previously demonstrated the return of biodiversity following post-industrial environmental improvements, the movements of species in and through the area, and the feasibility of large-scale habitat management; all of which had informed the conservation policy of the local authority.

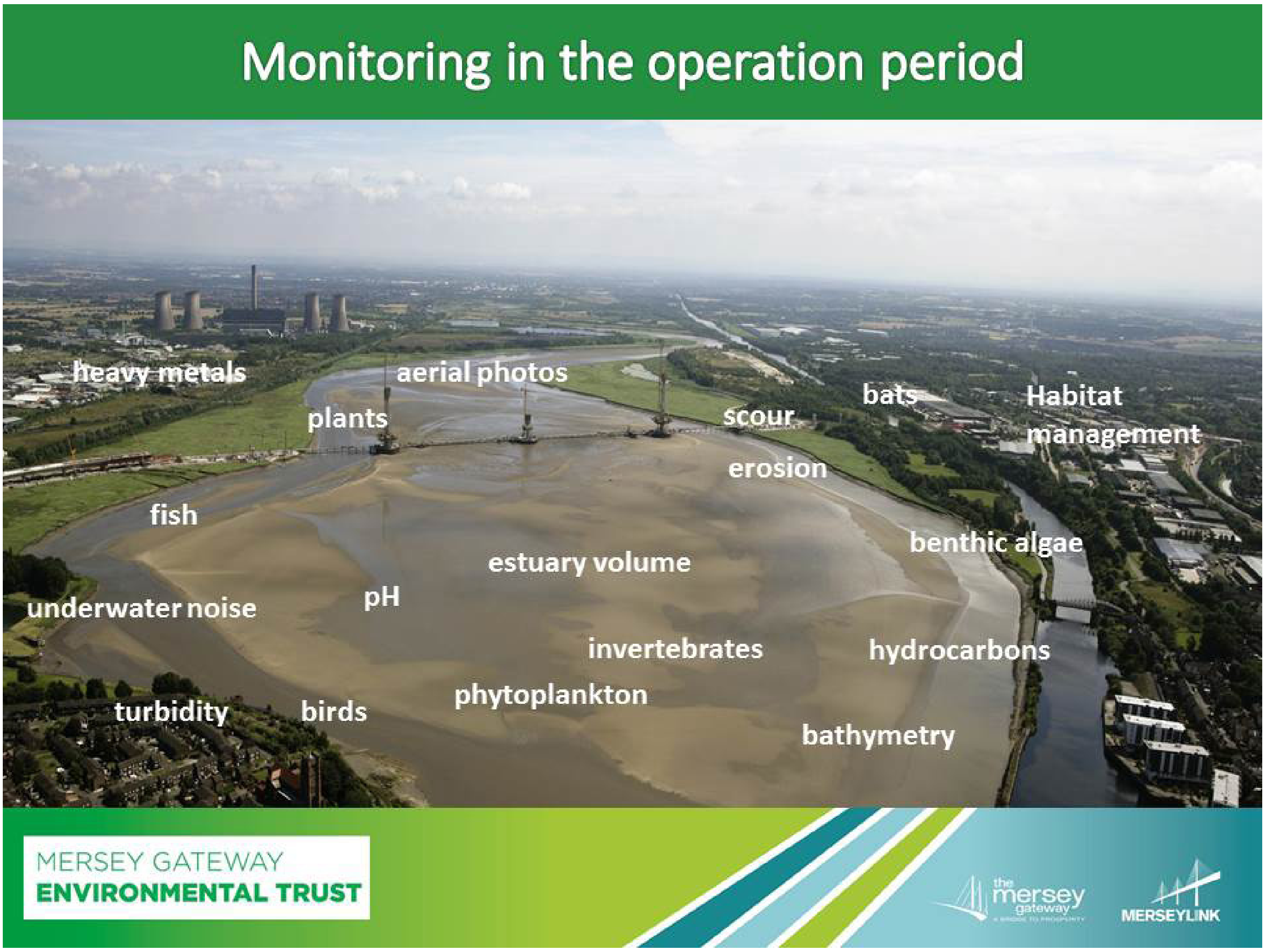
The trust will be funded by the development costs and including the income from the tolls. Initially for 30 years, the objective of the trust is to manage the environmental mitigation and other conservation activities over a 1,650ha area of estuary stretching from the existing Silver Jubilee Bridge to the centre of Warrington.

The aims of the trust are:

- to promote saltmarsh management for nature conservation purposes;
- to assist in the implementation of the Mersey Gateway Biodiversity Management Plan;
- to manage land as a local nature reserve;
- to advance the education of the public in the biodiversity of the Upper Mersey Estuary;
- to promote, organise and encourage academic study and research for the advancement of knowledge of biodiversity in the Upper Mersey Estuary;
- to become a grant-making body to other charitable organisations.

Embodied within the approach is the establishment of a Living Laboratory. Research has already been undertaken regarding specific species, landscape-scale habitat improvement, natural capital forecasting for 30 years, carbon sequestration, and visitor management. The site is now the focus of attention from an international group undertaking long-term environmental monitoring across a number of habitats.

At a time when exploring innovative funding sources is paramount in the minds of many conservation professionals, this case study provides an illustration of how major civil engineering projects can be a source of long-term secure funding for conservation monitoring, management and research.



Modelling hot spots areas for the invasive alien plant Elodea nuttallii in EU

Authors and Affiliations:
[1]Bart Steen, [2]Ana- Cristina Cardoso, [3]Alberto Pistocch, [4]Eugenio Gervasini, [4]Konstantinos Tsiamis, [5]José I. Barredo

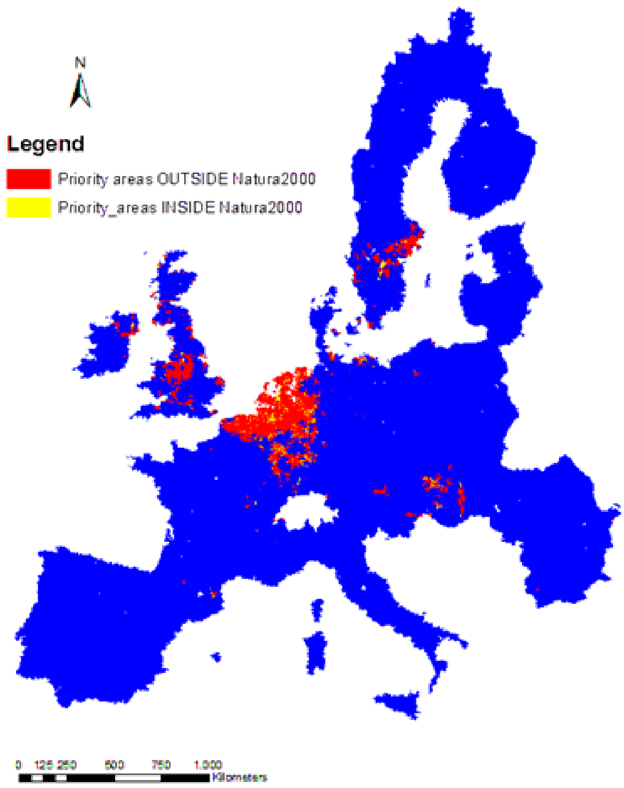
[1]MSc. Former member of the European Alien Species Information Network (EASIN) team of the Joint Research Centre (JRC) of the European Commission
[2]Coordinator of the EASIn team of the JRC, [3]Scientific project officer at the JRC, [4]member of the EASIN team of the JRC, [5]Scientific officer at the JRC

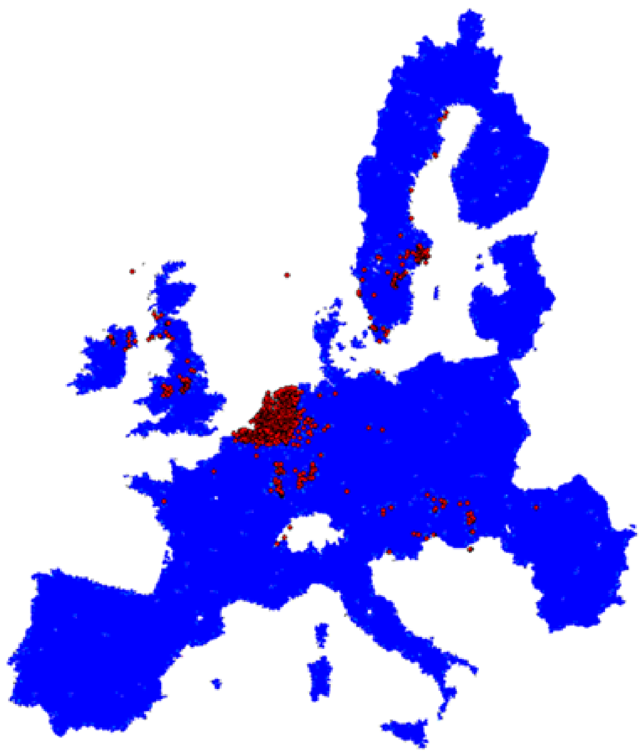
Email:
b.r.l.steen2@gmail.com

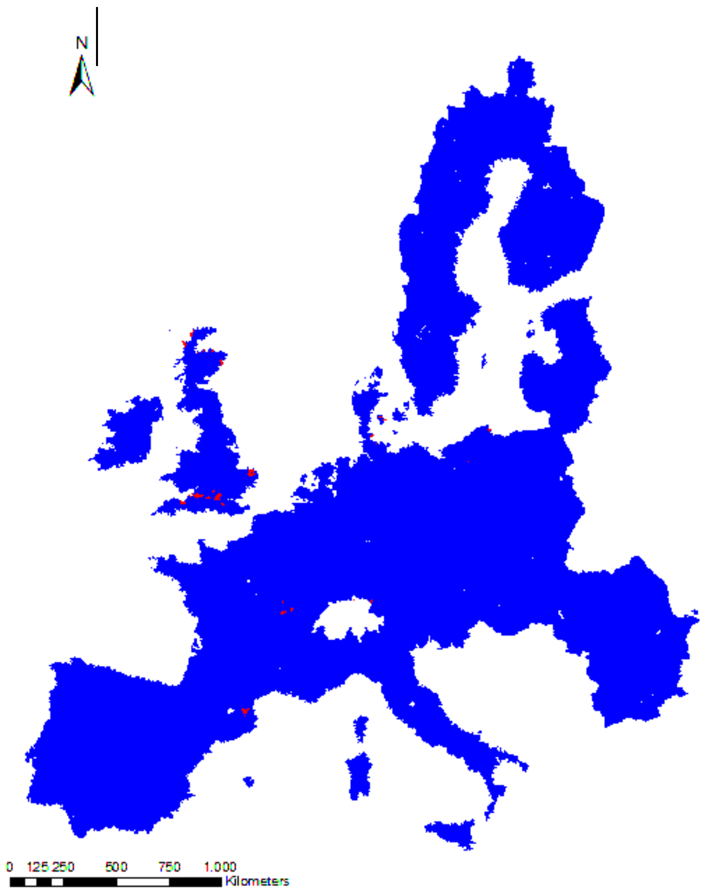
Invasive Alien Species (IAS) constitute one of the most important threats to biodiversity, causing severe ecological and socio-economic impacts. Recognizing the need for a coordinated set of actions to prevent, control and mitigate alien species invasions, the European Parliament and the Council have adopted the IAS regulation (EU Regulation no. 1143/2014) on the prevention and management of the introduction and spread of IAS.

It is widely accepted that prevention is the best strategy when tackling IAS, since it is much more cost efficient than eradication or containment and control. The key element for an effective prevention is the early warning coupled with rapid response, before an IAS could establish and widely spread within an area. Early warning can benefit from risk modelling maps, indicating areas of high probability that an IAS could successfully establish, reproduce and spread. This kind of information can be valuable to managers and stakeholders to choose and prioritize the appropriate decision making against IAS.

Elodea nuttallii is a dangerous invasive species in Europe. Environmental variables including bioclimatic data, infrastructure and nutrient levels were inserted in a Species Distribution Model in order to map areas in the European Union suitable to the species. The two main drawbacks of this method, most notably when used on invasive species, are sampling bias and model overfitting. These were compensated for by using the R package ENMeval and by extraction of occurrence data at two spatial scales. The identified areas of habitat suitability compared to Natura2000 sites. Finally, since many areas in Europe remain unaffected, the resulting areas that were 100 km removed from E. nuttallii's known distributions were identified. These are proposed as best candidates for receiving conservation priority.







Above: Identified areas suitable for *Elodea nuttallii* both inside and outside Natura2000 areas, compared to a map of *Elodea nuttallii* occurrences in Europe

Left: Identified suitable areas at least 100km away from nearest *Elodea nuttallii* occurrence.

A comparison between the structure and composition of the principal linear features in Estonia and Arable Landscapes in Britain and Estonia.

Authors and Affiliations:
D.Pungar, R.G.H.Bunce, K.Sepp, M.Villoslada and J.Raet
Estonian University of Life Sciences, Kreutzwaldi 5, 51014 Tartu, Estonia.
Email:
diana.pungar@student.emu.ee

Since the initiation of the Countryside Survey of Britain in 1978, records have been made beside roadside verges, stream-sides and hedges to determine their contribution to biodiversity in lowland landscapes. In a recent project in Estonia the same basic methodology has been used to collect data for a similar objective, but also to provide a framework for modelling the potential impacts of climate change on the expansion of species. 35 one kilometer squares were surveyed with records being made in over 300 plots. Because there are no hedges in Estonia, plots were placed along lines of trees and shrubs. The results will therefore be used in the paper to identify similarities in the contribution to the resources of biodiversity between the two countries, although the comparisons can only be made with the environmental classes defined as Arable Landscapes in Britain because otherwise the bio-geographical differences are too great. The verges had many species in common eg *Lolium perenne* and *Agropyron repens* and had a similar structure because of mowing regimes. There were bio-geographical differences eg the absence of *Bellis perennis* in Estonia whereas eastern species such as *Galium boreale* are present. Streamsides also had similar assemblages of wetland species but comparisons have yet to be made between hedges and lines of trees.

Therefore, although in different bio-geographical zones, linear features fulfil similar landscape ecological roles in lowland agricultural landscapes in Estonia and Britain and their contribution to the resources of biodiversity are threatened by the same processes.

The trait-based response of woodland beetle communities to landscape heterogeneity and change along an urban gradient

Authors and Affiliations:
Chris Foster
The University of Reading
Email:
c.w.foster@reading.ac.uk

The heterogeneity of European agricultural landscapes is known to influence species distributions and the relative importance of landscape composition and configuration varies by taxonomic group (Schweiger *et al*. 2005; Neumann *et al*. 2015, 2016). Historical landscapes can also better explain the distribution of current species populations than contemporary landscapes, suggesting that the effects of landscape change can involve a time lag, resulting in an extinction debt (Kuussaari et al. 2009).

Woodland loss, fragmentation and changes to the surrounding matrix may all reduce functional connectivity for some species, whether the changes are due to agricultural practice or urbanisation. This study aims to determine whether species communities in urban woodland fragments and those in woodlands dominated by agriculture respond similarly to changes in landscape heterogeneity. We take a wildlife ecology approach; collecting field data on a range of ground-dwelling beetles (Carabidae and Staphylinidae) and using species traits such as dispersal ability to assess the impact of changes in connectivity (Barbaro & van Halder 2009).

Fifty-six woodland patches were selected along an urban-rural gradient of 0 to 15km from the centre of Reading, an urban centre in southern England of roughly 60km^2. A 500m radius landscape was established around the centre point of each patch . Beetles were sampled using pitfall traps in summer 2015. The response of species with different life-history traits to landscape composition and configuration in a detailed modern landscape model (based on high-resolution landuse data and aerial imagery) and to a simplified model of wooded and urban habitat changes (Fig. 1) for three time periods (1880s, 1930s and present day) will be assessed using Canonical Correspondence Analysis.

Preliminary results based on contemporary landscape composition show that small, generalist carabids are more frequent in small or urban woodland patches. Large, flightless species are more common in large, rural woodlands. These results are consistent with previous studies of carabid communities in an urban landscape context (Sadler *et al*. 2006; Magura, Lovei & Tothmeresz 2008), illustrating the potential utility of our study in extending this question to other taxa. It is anticipated that results of the historical analysis will infer an extinction debt for slow-dispersing woodland species, whilst increases in arable and urban landcover over the time period may benefit mobile generalists.

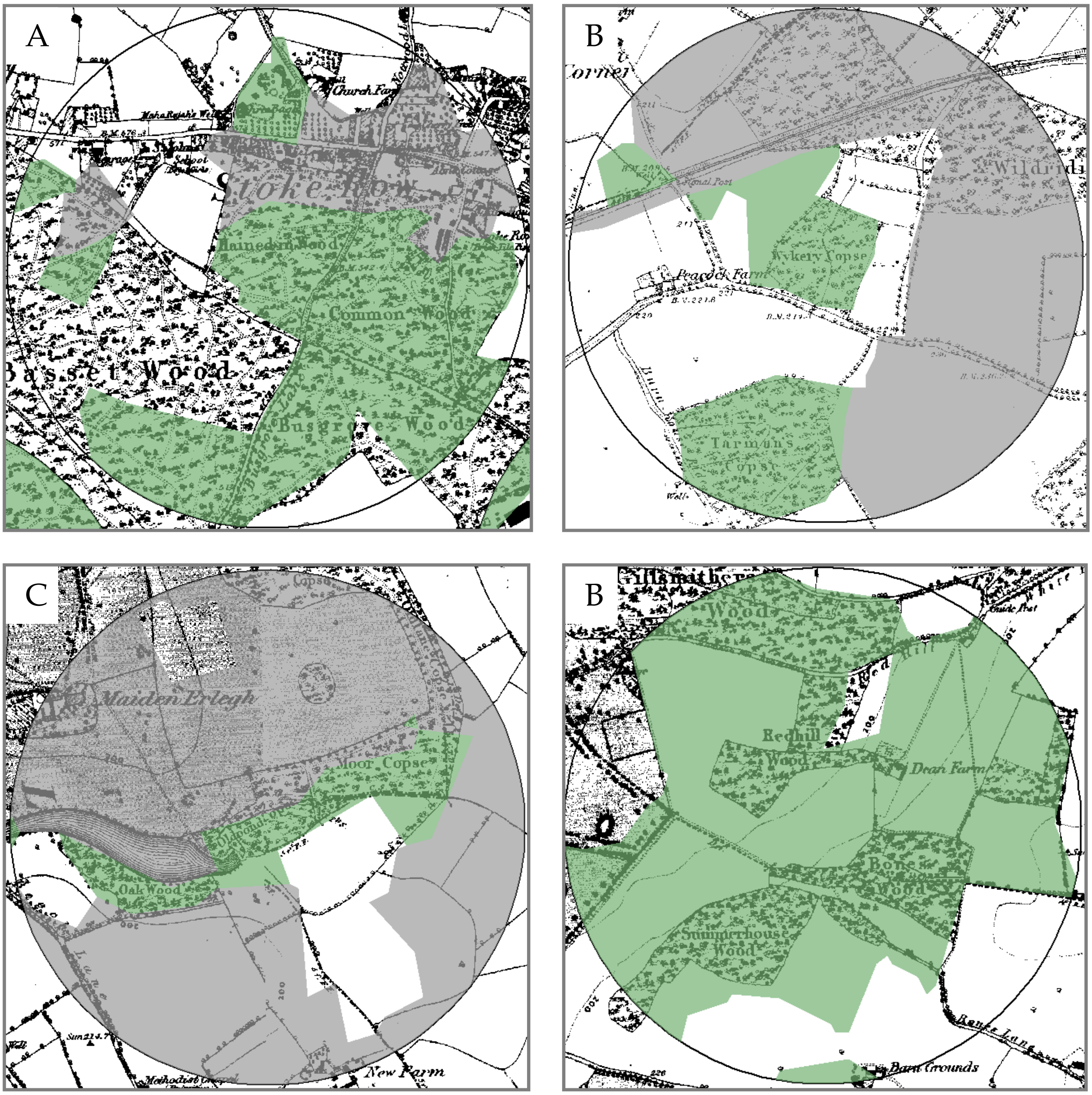
There will continue to be conflicts about how to use and manage land for urban areas, agricultural productivity and biodiversity and creating a functional network demands an understanding of exactly how landscape change impacts on different species. Comparing the responses of multiple taxa with different functional traits to representations of contemporary and historical landscapes will enable us to assess how habitat networks can best be implemented to enhance biodiversity and other ecosystem services.

Figure 1. Landscape changes between the 1880s (Ordnance Survey basemap) and the near-present (overlays from CEH Landcover 2007).

Four selected examples show woodland loss and fragmentation (A and B), urbanisation (B and C) and woodland gain (D).

Legend

- 1880s Woodland extent
- 2007 Woodland landcover
- 2007 Urban landcover



The importance of large-scale spatial data for achieving agricultural sustainability

Authors and Affiliations:
John Redhead[1], Ian Knapper[2], Jon Storkey[3], Richard Pywell[1]
Centre for Ecology and Hydrology[1], DEFRA[2], Rothamsted Research[3]
Email:
johdhe@ceh.ac.uk

The ASSIST (Achieving Sustainable Agricultural Systems) project is a 5 year collaborative research project bringing together expertise from Centre for Ecology and Hydrology, British Geological Survey and Rothamsted Research. The main aim is to develop and test innovative solutions to the challenge of increasing food production whilst reducing the environmental footprint of agriculture.

A key task under ASSIST is to bring together existing large scale datasets from the academic community, government bodies, the farming industry and citizen scientists. These can then be combined in novel ways to inform us about the factors which influence agricultural production, its sustainability and its impact on the environment. We can then use this information to identify constraints and challenges and help to target research into potential solutions.

We present an example of using a time series of national scale data to examine the effect of biodiversity and landscape configuration on the resilience of crop yield (i.e. its consistency over time). We explore some of the challenges involved in integrating large scale spatial datasets from multiple sources, and some of the potential advantages of doing so.

Are we missing the true value of semi-natural and linear habitats in agricultural landscape mosaics?

Authors and Affiliations:
Jessica Neumann & Geoff Griffiths
Department of Geography and Environmental Science, University of Reading, UK.
Email:
j.l.neumann@reading.ac.uk

The representation and analysis of agricultural landscape mosaics has been an important step for landscape ecology in recent years (1). However, the use of broad (often aggregated) landcover groupings limits our understanding about how different species respond to variations in landscape heterogeneity.

Semi-natural habitats and linear features are known to provide important resources and functional connectivity for biodiversity (2). However, these are rarely analysed as separate habitat types. Nor are they represented in a manner that captures their different ecological value or 'quality' for particular species; e.g. a mature hedge can provide very different ecological functions compared with a flailed hedge, an orchard or patch of heathland. This limits our understanding about where, and how best to implement practical conservation measures.

We analysed the effect of landscape heterogeneity (composition and configuration) on woodland carabid communities across 36 2 x 2 km agricultural landscape mosaics in southern Britain. We categorised hedgerows based on their vegetation structure from in-situ surveys and aerial imagery (H1-H3; Fig. 1). We also classified different types of semi-natural habitat such as scrub encroachment, orchard, managed heath and rough grassland (Fig. 2). Other habitats in the mosaic were represented using high-resolution landcover data.

Our results showed three main findings. 1) By considering different types of semi-natural habitat, we could explicitly identify those which provided the greatest ecological value for different species. 2) The best information about how species respond to the landscape was derived from those where we incorporated a measure of habitat 'quality'. 3) The ability for species to actually utilise the benefits provided by a habitat was highly dependent on the spatial configuration of the landscape. For example, 'mature hedgerows with trees' (H3) were significantly important for flightless, slow dispersing carabids in landscapes with a high degree of woodland fragmentation, but 'managed hedgerows' (H1) were not of perceptible value to these species, even where they acted as connections between woodland patches.

Considering habitats as separate components rather than broad landcover groups and incorporating qualitative habitat indicators alongside quantitative landscape metrics conveys a deeper understanding about the ecological processes acting at the local and landscape scale. There is great scope to delve deeper into within-patch heterogeneity in European wooded-agricultural landscapes. This will help us to ensure that conservation actions take account of habitat types, how they are managed and where they are located in a landscape in order to provide the greatest benefits to biodiversity.

Are we missing the true value of semi-natural and linear habitats in agricultural landscape mosaics?

H1: Low-lying, intensively managed (flailed) hedge. Does not contain trees or woody elements. Up to approximately 1.5 metres in height; average width 2.5 metres.

H2: Contains small/ juvenile trees or taller shrub-like species. Less intensively managed than H1. Greater than 1.5 metres in height; average width 7 metres.

H3: Woody hedge, contains mature trees. Appears structurally similar to a linear strip of broadleaved woodland when viewed from an aerial perspective. Average width 15 metres.

Fig. 1: A hedge is not just "a hedge" – classification of different hedgerow types based on their vegetation structure using field surveys and aerial imagery (observed from 250 m above sea level in Google Maps (Terra Metrics, 2013)).

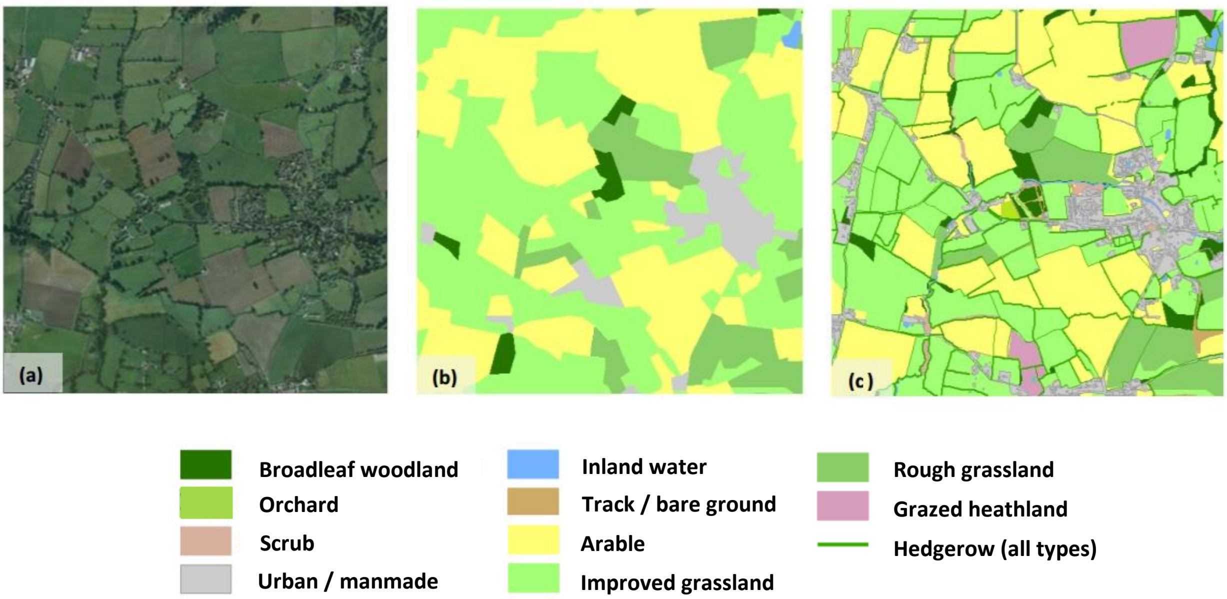


Fig. 2: Comparison of a typical 2 x 2 km study landscape mosaic. (a) 'Real' landscape. (b) Landscape classified according to broad landcover types – all semi-natural habitats are represented in 'mid' green. (c) Landscape classified to account for different semi-natural habitats and linear features (as shown in the legend).

Managing Landscape Fire: Traditional Knowledge and Changing Regimes in Mediterranean Chestnut Forests

Authors and Affiliations:
James D.A. Millington[1], Francisco Seijo[2]
Department of Geography, King's College London, London, UK[1],
Middlebury College C.V. Starr School in Spain, Madrid, Spain[2]

Email:
james.millington@kcl.ac.uk

In many areas of the world fire plays an influential role in shaping landscape structure and change. In some regions, people have used fire as a landscape management tool for thousands of years; in others a shorter history of fire exclusion has resulted in what some have characterised as a 'socioecological pathology'. In the context of the scientific and policy debate surrounding potential climate change adaptation and mitigation strategies, here we examine how fire regimes are shifting in landscapes undergoing socioeconomic change. Specifically, we examine chestnut forest landscapes in two municipalities in central Spain – Casillas and Rozas de Puerto Real – which have similar biophysical properties but diverging economic development and fire management policies. Both municipalities are characterised by a Mediterranean-type climate and have forests dominated by chestnut (Castanea sativa Mill.). However, there are clear differences between the two municipalities in both per capita income levels (greater in Rozas) and occupational activities (greater employment in the service sector in Rozas). Furthermore, costs of fire exclusion per hectare between the landscapes differ markedly (greater in Rozas). To examine possible differences in landscape structure and fire regime between the municipalities, we conducted a dendroecological study to identify fire activity through tree scars, collected official fire statistics, and examined aerial photography. To understand traditional knowledge of fire as a management tool we conducted interviews and questionnaire surveys with local inhabitants, and examined how this knowledge corresponds to the current biophysical landscape state and recent fire activity.

Our results suggest that fire incidence in both landscapes has increased in recent decades but fire season, fire size, and forest structure have changed to a greater extent where socioeconomic and land-practice changes have been greatest. From aerial photography we found that although 'open canopy' forest (Figure 1a and b) has declined in both municipalities since mid-Twentieth century, with corresponding increases in the extent of 'closed canopy' structure (Figure 1c and d), this process seems to have taken place to a greater extent in Rozas than in Casillas. In Casillas most fires still take place in the traditional fire season (i.e. autumn and spring months) and seem to be linked to the management devoted to the production of chestnuts, firewood and other traditional management goals such as annual controlled litterfall burning next to or inside the hollow chestnut tree trunk to prevent root rot (Figure 2). In contrast, in Rozas the vast majority (71%) of fires occur in summer months, seemingly corresponding to non-traditional fire regime attributes linked to different land uses (greater abandoned shrubland in Rozas), land tenure (larger land holdings used as hunting estates) and the abandonment of traditional fire use.

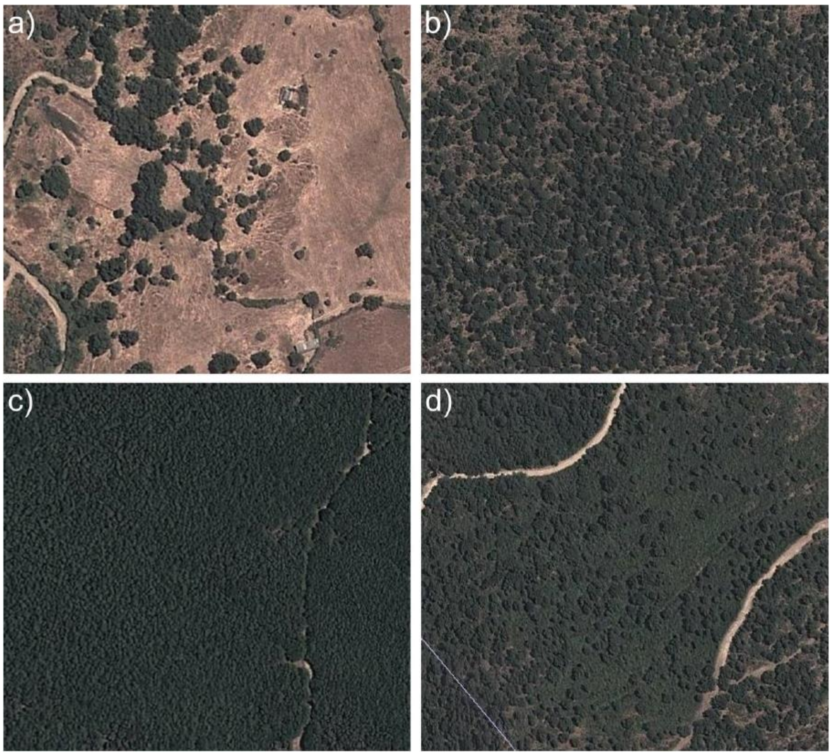


Figure 1. Example aerial imagery used to evaluate landscape structure in the municipalities. (a) Open large canopy, (b) open medium canopy, (c) closed small canopy, (d) closed mixed canopy. Source: Fig 3 of Seijo et al. (2015) Land Use Policy 47 130–144 doi: 10.1016/j.landusepol.2015.03.006

Figure 2. Traditional landscape management using fire in Mediterranean chestnut forests. The 'pile-burning' technique involves (a) raking, (b) piling and (c) igniting leaves. This contrasts with 'a manta' broadcast burning in which leaves and ground litter are burned across larger areas (as used in the area shown in d). Source: Fig 9 of Seijo et al. (2015) Land Use Policy 47 130–144 doi: 10.1016/j.landusepol.2015.03.006

The importance of landscape characteristics for the delivery of cultural ecosystem services

Authors and Affiliations:
Lucy E. Ridding[1], John W. Redhead[1], Tom H. Oliver[1,2], Reto Schmucki[1], James McGinlay[3], Anil R. Graves[3], Joe Morris[3], Richard B. Bradbury[4], Helen King[3,5] and James M. Bullock[1]

[1]NERC Centre for Ecology and Hydrology, Maclean Building, Benson Lane, Crowmarsh Gifford, Wallingford, Oxfordshire, UK, OX10 8BB, [2]School of Biological Sciences, University of Reading, Whiteknights, PO Box 217, Reading, Berkshire RG6 6AH, UK, [3]School of Energy, Environment and Agri-Food, Cranfield University, Cranfield, Bedfordshire, MK43 0AL, UK, [4]RSPB Centre for Conservation Science, The Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire, SG19 2DL, UK, [5]Faculty of Business and Law, Open University, Walton Hall, Milton Keynes, UK, MK7 6AL

Email:
lucridd@ceh.ac.uk

The importance of Cultural Ecosystem Services (CES) to human wellbeing is widely recognised. However, quantifying these non-material benefits is challenging and consequently they are often not assessed. Mapping approaches are increasingly being used to understand the spatial distribution of different CES and how this relates to landscape factors. This study uses an online Public Participation Geographic Information System (PPGIS) to elicit information on outdoor locations important to respondents in Wiltshire, a dynamic lowland landscape in southern England. We analysed these locations in combination with spatial datasets representing potential influential factors, including protected areas, land use, landform, and accessibility. We find that areas that are accessible, near to urban centres, with larger views, and a high diversity of protected habitats, are important for the delivery of CES. Other factors including a larger area of woodland and the presence of sites of historic interest in the surrounding landscape were also influential. These findings have implications for land-use planning and the management of ecosystems, by demonstrating benefits from high quality ecological sites near to towns and the importance of maintaining and restoring landscape features, such as woodlands, to enhance the delivery of CES.

A comparison between lowland arable landscapes in Great Britain with those in a Baltic State, Estonia.

Authors and Affiliations:
R.G.H. Bunce[1], K.Sepp[1], T. Kikas[2], C.M. Wood[3]
[1]Estonian University of Life Sciences 51014 Tartu, Estonia. [2]University of Tartu, Ulikooli 18, 50090 Tartu, Estiona. [3]Centre for Ecology and Hydrology, Library Avenue, Bailrigg, Lancaster, LA1 4AP.

Email:
Robert.Bunce@emu.ee

Although Estonia is at about the same latitude as Shetland – Lerwick is at 60.15 and Tallinn is at 59.44- the country has many intensively managed arable landscapes with a few raised bogs and a high forest cover. This is partly because of more extensive fertile soils, and partly because the climate is more suitable to arable farming. It is therefore a useful exercise to examine the structure and composition of these landscapes and to compare them with similar situations in Great Britain (GB) to determine whether intensive agriculture has produced convergent landscapes.

In GB an Environmental classification was used to separate the flat plains of East Anglia, with a relatively continental climate and fertile soils and associated intensive arable agriculture; from the rest of the country with more variable altitudinal ranges and soils. In Estonia, with less pronounced environmental gradients, a project on defining High Nature Value farmland provided a reliable estimate of the distribution and character of intensively managed agricultural land. The methodology involves an expert system to identify the landscape ecological character of agricultural land and will be described in the paper.

The databases available from the two countries will be analyzed to provide quantitative descriptions of the structure and composition of the relevant landscapes in the two countries. From field observation, it is apparent that similar methods of intensive agriculture have produced comparable prairie type landscapes. These have resulted from the removal of linear features, small habitat patches and point elements for increased agricultural efficiency.

Urban-rural land-cover mapping using a woodland stratification approach

Authors and Affiliations:
Matthew Dennis

Department of Geography, University of Manchester, UK

Email:
matthew.dennis@manchester.ac.uk

An ecological approach to land-cover mapping is often absent in studies into the area-level relationship between the natural environment and human well-being. Research within public health often bundles the natural environment into simplistic metrics such as proportion cover by green space, without consideration of wider ecological parameters such as quality, structure, type or succession. Although measures related to population well-being, socio-economic status and cultural background are increasingly sophisticated in related studies, such an in-depth approach is still rarely applied to characterisation of the physical landscape. This paucity of detail in characterising green space in public health research persists despite the availability of remote sensing and GIS techniques which permit the relatively rapid creation of data towards describing landscape characteristics at a range of scales. Applying the use of relevant landscape metrics at a scale congruent with data available on population health remains a challenge in research into the natural environment and human well-being.

Using high resolution (10m) remotely sensed data (Sentinel 2A; 2016), a supervised classification method was used to characterise the landscape of the conurbation of Greater Manchester stratified according to recognized woodland habitat successional layers. Additional data on canopy cover (Red Rose Forest, 2011) and water bodies and courses (OS VectorMap, 2016) were incorporated and, after final manual editing, the resulting dataset was cross-validated using Edina Digimap aerial photography (2017).

Subsequent measures of land-cover were used in the calculation of a range of landscape indices using the QGIS landscape ecology plug-in (LecoS 2.0.7). These were then reduced, through factor analysis, to reveal thematic properties such as cohesion/fragmentation, diversity, evenness, complexity and succession throughout the landscape. This allowed a typology of landscape character to be generated using K-means clustering. The resulting typology presents a practical resource for use, alone or in combination with other socio-demographic typologies, in a range of potential social-ecological analyses.

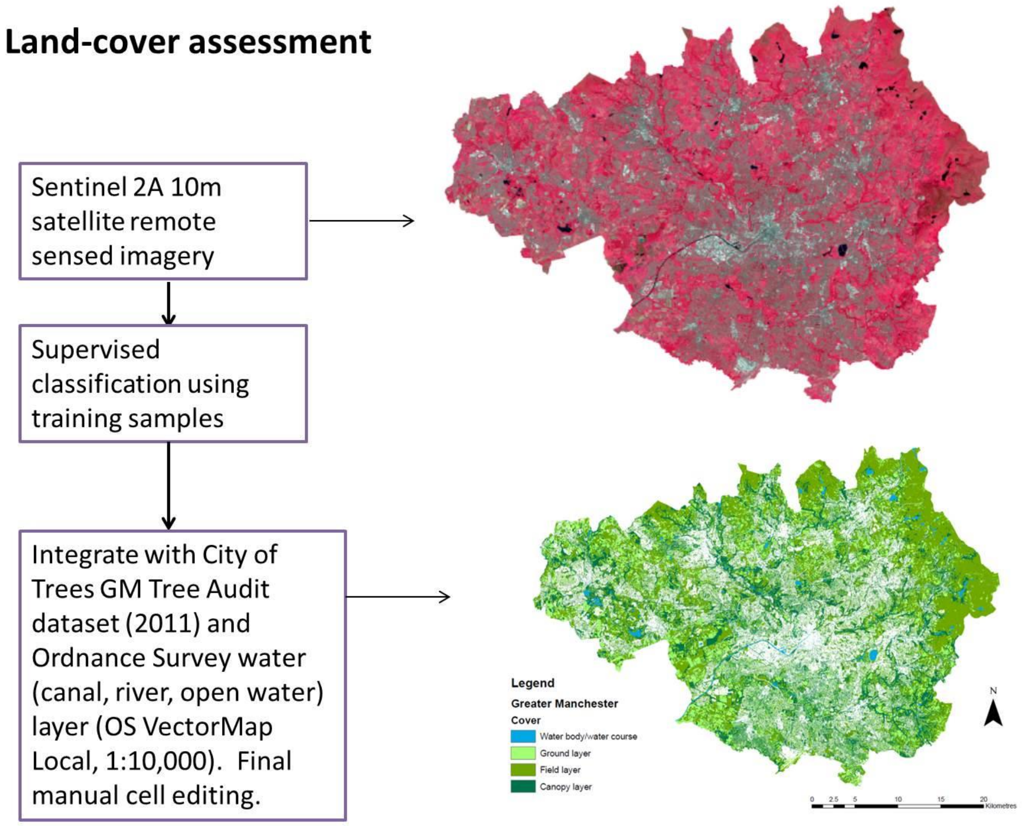


Figure 1: Land-cover assessment workflow

Weds 28 June pm – Seascape ecology

The Edinburgh Shoreline

Authors and Affiliations:
Leonie Alexander
Urban Biodiversity Project Officer,
Royal Botanic Garden Edinburgh,
Edinburgh Living Landscape

Email:
l.alexander@rbge.ac.uk

A brief description of Edinburgh Living Landscape (ELL) with its aspiration to make Edinburgh the best city to live in by 2050! The Shoreline is one ELL initiative which aims to consider the 27+ km of the city's coast at a landscape scale and raise awareness of this part of the city - much of which is inaccessible and dysfunctional. The coast encompasses a whole range of contrasting land uses including honeypot recreation areas such as Cramond and Portobello, areas of multiple deprivation immediately adjacent to high levels of affluence, post-industrial derelict vacant land (DVL), recent high rise development, a number of sailing clubs, privately owned estate policies and the extensive Forth Ports docks at Leith. The Edinburgh shoreline forms part of the Forth Special Protection Area (SPA).

The Shoreline project aims to raise awareness of the city's coast – its biodiversity and future potential in the context of intense development pressure and response to climate change through a series of interventions including temporary use of DVL, demonstrating scientific research into Greening the Grey – making coastal defences biodiverse, creative public engagement, facilitating exploration of its biodiversity and investigation through citizen science and by promoting good practice from elsewhere in the world.

The evolution of Seascape Character Assessment

Authors and Affiliations:
Sally Marshall
Associate, LUC.
Licentiate member of the Landscape Institute.
Email:
sally.marshall@landuse.co.uk

This presentation will explain how the process of marine planning (spurred on by the passing of the Marine & Coastal Access Act 2009), and more offshore development – particularly wind farms – began to identify a gap in knowledge and evidence on 'seascape'. Prior to this, people only really considered views out to sea, including in the descriptions available in Landscape Character Assessments which include a coastline.

The talk will then explore the early origins of Seascape Character Assessment as a process in its own right, with examples from across the UK. These will include approaches that focus on 'visual envelopes' (e.g. in Wales and Scotland), versus more recent examples of a nested hierarchy of 'Seascape Character Types' and 'Seascape Character Areas' - more akin to the more established process of LCA.

The talk will also consider how Seascape Character Assessments can, and are being used. In addition, it will explore how Landscape and Seascape Character Assessments can be integrated together to provide seamless evidence on 'character' to inform policy and decision-making.

The Ecometrica Mapping Platform: A web-based tool to understand seascapes and improve planning and conservation efforts

Authors and Affiliations:
Jil Bournazel, Mark Cleverley, Sarah Middlemiss, Veronique Morel, Richard Tipper
Ecometrica Ltd, Orchard Brae House, 30 Queensferry Road, EH4 2HS, Edinburgh, UK
Email:
jil.bournazel@ecometrica.com

The landscape of applications with which we can learn about the world is becoming richer. Continuing instrumentation of the physical world through the proliferation of sensors, increasing interconnection of people and institutions and the broadening of access to high performance analytics are the main trends that are observed. Practitioners are specialists in their fields, but they are missing the technology to support their skills and knowledge. Ecometrica has developed a web-based mapping platform that enables accessing, organising, sharing and analysing spatial data on ecosystems for non GIS experts. As higher resolution data becomes available at a lower cost, research, governments and industry all face the challenge of managing this "big data" to deliver mapping-related activities of various scales. Data has traditionally been stored on unconnected devices, with analysis requiring download to GIS software, proving it difficult to share project spatial outcomes. The Ecometrica mapping platform is built on spatial cloud technology and brings together in a geospatial paradigm relevant data, areas of interest and stakeholders.

Essential functions include viewing and querying spatial data, providing guidance to help users interpret the results they extract, and summary reporting. Access is secure but mapping applications can also be made publicly available.

The platform can be used in many ways; e.g. by publishing or sharing research results with peers, and providing practical and insightful advice to non-specialist end users, industry groups and policy makers. Depending on how a mapping application has been customized, end-users can obtain quantitative and qualitative information about resources, measure impacts and opportunities, check compliance to environmental legislation, monitor changes to vegetation, water and other resources.

We will illustrate these capabilities using a case study concerning seagrass in the Balearic Islands. The mapping platform supports an application, built as part of the OPERAs project on ecosystem services, that shows how various stakeholders extract the information needed on coastal ecosystem services to make informed decisions.

Aquatic ecosystem services and synergies: Restoration insights from Scotland, Danube, Balearic and Barcelona

Authors and Affiliations:
Dr Meriwether Wilson
University of Edinburgh
Email:
meriwether.wilson@ed.ac.uk

This talk explores four diverse ‘seascapes’ that contribute to a 5-year EU project OPERAS on ecosystem services. It considers diverse approaches to successful restoration, and to what degree can the starting point not be what experts consider an optimal state of ecosystem condition, but what people want their seascapes to look like, and how protecting and restoring ecosystems can achieve their goals. The four sites are characterised by coastal rhizomatous root systems (dunes, seagrasses, marine and freshwater marshes) with core ecosystem services, e.g. coastal protection, fisheries, biodiversity, carbon and tourism. However, the baselines and drivers of environmental change across the sites reflect different time lines and pace of alterations; resulting in diverse states of ecological condition and rich evidence of natural history and social histories.

The coast of the Firth of Forth has been influenced by 100 years of seawalls for farmland. The lower Danube marshes have been conserved to support fisheries and farming for 50 years. Barcelona’s dunes have been flattened over the past 20 years for beach tourism. The seagrasses of the Balearic Islands have also been impacted from tourism over 20 year resulting in smaller-scale impacts from anchoring and fishing. Each site illustrates radically different eco-engineering approaches along a passive-active restoration spectrum and very different ways of engaging with local communities. The cases illustrate the importance not only of stakeholder engagement, but perhaps most critically for the environmental trajectories of these sites to informed by the local people, reflecting their knowledge of the past and visions of the future. In this context, the concept of seascape is vital, as it links the domains of landscape, history and ecology in ways few other disciplines offer.

Inner Forth Futurescape

Authors and Affiliations:
David Anderson
RSPB Scotland
Email:
david.anderson@rspb.org.uk

The Inner Forth Futurescape is an exciting and ambitious project working across 2000ha of the Inner Forth floodplain between Stirling and Blacknesss. We have built strong partnerships with local authorities, NGOs, land managers and community groups, all working towards a shared vision to create a sustainable future for the wildlife and people of the Inner Forth landscape. We have created new wetland habitat and planned what would be the biggest managed realignment in Scotland. Furthermore, we have also engaged the local population in the issue of flood risk management and land use change through providing more access to the wetland habitats of the Forth, and encouraging schools to explore their local landscape.

This project therefore represents a successful landscape scale conservation project in action and demonstrates what can be achieved when strong partnerships are established. Our poster presentation will highlight several projects which have been taken forward and what the next steps are to take the Inner Forth project forward.

Talking Forth: Citizen participation in seascape planning in the Inner Forth, Scotland

Authors and Affiliations:
Anja Helena Liski, Marc Metzger and Meriwether Wilson
University of Edinburgh
Email:
anja.helena.liski@ed.ac.uk

The Inner Forth estuary in the central belt of Scotland is a dynamic socio-ecological system, representing many other seascapes that are being rapidly shaped by both climate change, post-industrialisation, urbanisation and social deprivation. Many expert stakeholders are proposing ecosystem restoration of tidal areas, to return marshland and mudflats for natural flood management and wildlife. This policy context provides an interesting opportunity to explore and develop tools for participatory decision-making in the seascape, to incorporate local knowledge and values in planning and management. The authors will present results from a citizen-inclusive participatory process with a cross-section of people living in the Inner Forth. We will present a framework for addressing awareness gaps in terms of knowledge and world views from both local and expert perspectives. We will also highlight how five common barriers for stakeholder inclusion can be overcome during the participatory process. The results suggest that seascape governance can be improved if citizens are better informed and included in the planning and decision-making, however, their knowledge particularly regarding governance and local solutions to global drivers is limited, and more inclusive approaches to articulating stakeholder values need to be adopted.

POSTERS

Condatis – a tool for planning and prioritising habitat creation and restoration

Authors and Affiliations:
Katherine Allen, Jenny Hodgson
University of Liverpool
Email:
kaallen@liv.ac.uk

If species are to adapt to the changing climate, they must be able to relocate to new habitat when their existing habitat becomes unsuitable. To do this, the landscape must contain enough patches of suitable habitat for a species to successfully disperse to, and subsequently reproduce in, to make steps across the landscape to reach newly suitable conditions. Worldwide, habitats are increasingly fragmented and action is required to increase the number of protected areas as well as their size, quality and connectedness. Even where large protected areas exist, they may be so spatially separated that movement between them is severely limited. In order to build resilience and conserve biodiversity in the long term, habitat restoration and creation is required, and increasingly prioritised by conservation planners. Condatis is a tool for planning and prioritising habitat restoration based on the overall connectivity of the landscape. It is based on electrical circuit theory and is designed to be quick and simple to run, allowing scenarios to be compared. It can answer the questions, “Where would be the best place to add a new patch of habitat, to facilitate the dispersal of species x?”, “Which of the proposed set of restoration projects would increase the connectivity of the landscape the most?” and “Which of the current habitat patches are the most important in facilitating species movement across the landscape? This poster will present some examples of the existing applications of Condatis and invite discussion on potential future applications.

How does woodland restoration affect future landscape ecosystem services?

Authors and Affiliations:
Lucie Jerabkova, James D.A. Millington, Mark Mulligan
Department of Geography, King's College London
Email:
lucie.jerabkova@kcl.ac.uk

The UK has a low total area of woodlands compared to most European countries, and their functioning is often further impaired by their individual small size and isolation. At the same time, woodlands satisfy a number of vital societal needs such as clean air, flood protection, and timer. Considered as ecosystem services, an increase in the size of woodlands or improvement in their condition may enhance these benefits. We assess possible outcomes of different scenarios of woodland restoration and management in terms of the flow of ecosystem services under future climate. The 'flow of ecosystem services' refers to provision of products and benefits from the ecosystems to society, and incorporates several descriptors of the process: what service is provided, *quantity* measured by a metric, *where* is the source of the service, in absolute and relative location, and *how* the service provision changes over time. We use two ongoing large-scale restoration projects in England and Scotland (The National Forest and the Great Trossachs Forest) as case studies, and focus on simulating the effects of alternative outcomes of various planned scenarios. We integrate a suite of simulation modelling tools in a spatially explicit approach to project long-term landscape-scale dynamics of existing and potential woodlands. We use tools such as InVest and CostingNature to quantify the ecosystem services associated with each scenario, and assess sensitivity of the models to structural and environmental factors (e.g. size, age, forest type of woodland patches) to discern relative role of different drivers. The target ecosystem services include timber production, renewable energy, biodiversity, nutrient retention, carbon sequestration, erosion control, water retention, air quality, and recreation and education. The project aims to fill a significant knowledge gap through its approach to multifunctional, dynamic projections of ecosystem services provision over time, integrated with spatial analyses and strengthened by use of multiple tools and scales. It will improve our understanding of the drivers underlying the changes in ecosystem services provision, and provide salient information to managers and policy makers for decisions in the face of future uncertainties.

Modelling 10,000 years of human-environment interactions

Authors and Affiliations:
Andrew Lane and James D.A. Millington
Department of Geography, King's College London.
Andrew Lane would also like to note his funding body, the EPSRC, and CANES, his CDT
Email:
andrew.lane@kcl.ac.uk

A key challenge to the preservation of Earth's biodiversity is to develop understanding of how terrestrial ecosystems can be used sustainably. This entails the study of how anthropogenic changes to the landscape interact with natural ecological processes and climate over decadal timescales. Focusing on the notably biodiverse Mediterranean Basin, I will use Agent Based Modelling (ABM) to explore the dynamics of forest structure change in the Iberian Peninsula since the arrival of agriculture at the beginning of the Holocene.

The data sources are predominantly paleological, and include pollen sequences and sedimentary charcoal analyses from sites across Iberia. The relative performance of a given model will be determined by how well it can explain data from a variety of study sites simultaneously. Such performance indicators will be calculated within a Bayesian framework. Having inferred a number of optimal model structures and parameterisations based on empirical data, I will use those models to generate synthetic data describing system trajectories through an abstract state space of various emergent social and ecological variables.

This approach is inspired by statistical mechanics and, when combined with clustering techniques from the machine learning literature, will assist in the identification of system states which are expected to be qualitatively meaningful to landscape management professionals. I will then use statistical techniques such as Markov State Modelling to identify the transition rates between these states. My ambition for this work is to provide practitioners with novel insights into the dynamics of coupled socio-ecological systems over decadal time periods.

The distribution of woodland flora in relation to edge effects: A UK woodland case study

Authors and Affiliations:
Duncan McCollin
University of Northampton
Email:
duncan.mccollin@northampton.ac.uk

Edge effects may be defined as the biotic and abiotic changes that occur over the abrupt transition between adjacent landscape patches and result from the juxtaposition of contrasting habitats on either side of the discontinuity. The poster presents the results of a study carried out in Short Wood, a deciduous woodland in Northamptonshire, on the distribution of plant species from the edge. Plant species showed distinct edge-related patterns but unexpectedly, also patterns in relation to an internal ride. The implications of these patterns are discussed in relation to management.

Monitoring the singing activity of a bird community in an urban forest through the soundscape

Authors and Affiliations:
Emilio Padoa-Schioppaa, Giovanni Zambona, Alessandro Biscegliaea and Claudia Canedolia

Department of Earth and Environmental Sciences, University of Milano-Bicocca, Milan, Italy

Email:
emilio.padoaschioppa@unimib.it

In natural and semi-natural environments birds contribute most to the soundscape composition, especially during singing activity picks. At the same time they are subjected to the acoustic environment influence, to the extent that some of their physiological and ecological aspects can be altered. The aim of this study was to evaluate the spatial and temporal variability of the singing activity of a bird community in an urban forest in relation with increasing distances from a noise sources. The study has been conducted in a rectangular forest lot of 19 hectares in Milan (Italy) with an high-traffic highway that pass parallel to the forest border to a distance of 150 meters. Sounds were recorded with LCR recordings in 22 sites in a regular grid at an increasing distances from the highway. Each recording was 4-5 days duration and was repeated for 6 sessions from April to June. The Acoustic Complexity Index (ACI) was calculated by extrapolating the recordings from 6.30 am to 8.30 am. In addition, assisted traditional phonometric measures and traditional noise indexes (Leq and L95) were used. Methodologically, we experimented how the passive recording of environmental sounds through LCR is a non invasive survey method that allows us to obtain a considerable amount of data without disturbing or altering the birds behaviour. Results of Leq e L95 highlighted the negative relationship between vocalization abundance and proximity to a disturbance source. However, the analysis of the spatial and temporal trends of ACI did not revealed clear patterns related to the increasing of distance from the highway. This result may be due to the size of the study area (too small) and to the complexity of the environmental surroundings and the presence of multiple noise sources. Comparison with traditional sound metrics showed that ACI is a robust index in representing and quantifying the presence of biophonies but the application in urban environment still needs further analysis.

The Virtual Catchment Laboratory: An intuitive online tool to access data and run models at catchment level

Authors and Affiliations:
B.Percy[1], J.Clark[2], R.Gurney[1], J.Neumann[2], T.Breeze[3], M.Barnett[4], A.Ingham[5] and the rest of the Loddon Project Team

University of Reading, Meteorology[1]; University of Reading, Geography and Environmental Science[2]; University of Reading, Agri-Environment[3]; Environment Agency[4]; Hampshire and Isle of Wight Wildlife Trust[5]

Email:
j.l.neumann@reading.ac.uk

The Virtual Catchment Laboratory (VCL) is a new tool under development that will give non-academic professionals and the general public access to state-of-the-art environmental data and models. Initially focusing on the Loddon catchment, the VCL's first task is to provide an interactive platform for access to the results of a NERC Impact Accelerator project that mapped Ecosystem Goods and Services. Over the internet, users can view, localise the results, adjust colour schemes and scaling, and modify weightings.

Loddon VCL
Virtual Catchment Laboratory

The Virtual Catchment Laboratory: An intuitive online tool to access data and run models at catchment level

B.Percy[1], J.Clark[2], R.Gurney[1], J.Neumann[2], T.Breeze[3], M.Barnett[4], A.Ingham[5] and the rest of the Loddon Project Team[6]

[1] University of Reading, Meteorology [2] University of Reading, Geography and Environmental Science [3] University of Reading, Agri-Environment [4] Environment Agency [5] Hampshire and Isle of Wight Wildlife Trust [6] Additional project team members listed below

Introduction

The **Virtual Catchment Laboratory** (VCL) is a new tool under development that will give non-academic professionals and the general public access to state-of-the-art environmental data and models. Initially focusing on the **Loddon** catchment, the VCL's first task is to provide an interactive platform for access to the results of a NERC Impact Accelerator project that mapped Ecosystem Goods and Services. Over the internet, users can view, localise the results, adjust colour schemes and scaling, and modify weightings.

Implementation

All tools to be deployed as well as the interface itself have been, and will continue to be, driven by the anticipated user base. Workshops with stakeholders will inform the direction of the development and provide feedback on usability and utility. For the Loddon VCL, the main users are members of the **Loddon Catchment Partnership** (LCP, details below). The LCP needs a tool to enable non-technical specialists to access and make sense of multiple data sources across the catchment to inform catchment planning and prioritisation of restoration measures.

The web interface thus far has been developed using HTML, CSS and JavaScript, utilising plug-ins such as jQuery, Turf, ColPick, and Google Maps APIs.

This initial implementation is designed for typical PC and laptop screen sizes and is intended to work with the standard browsers. The *α.2* version has been tested on iPads (using Safari) by a number of LCP members in a short workshop at the beginning of September (2015) where it received favourable feedback as well as suggestions and priorities for the coming weeks.

Future work

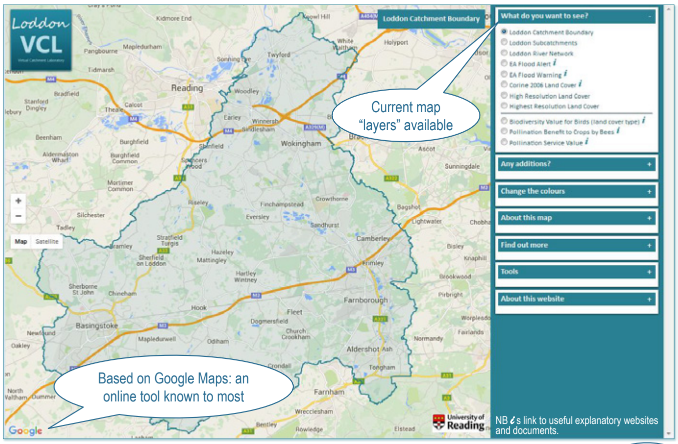
This tool can already deliver research data in a way that is understandable to engaged users via an interface that is intuitive. The next step is to add more data, from many different sources, and begin to incorporate some process-based models.

A second VCL is already being planned for use by a water company in order to meet their regulatory requirements while ensuring residents, farmers and businesses within the catchment can understand the reasoning behind the requests and directives placed upon them.

Technical Details

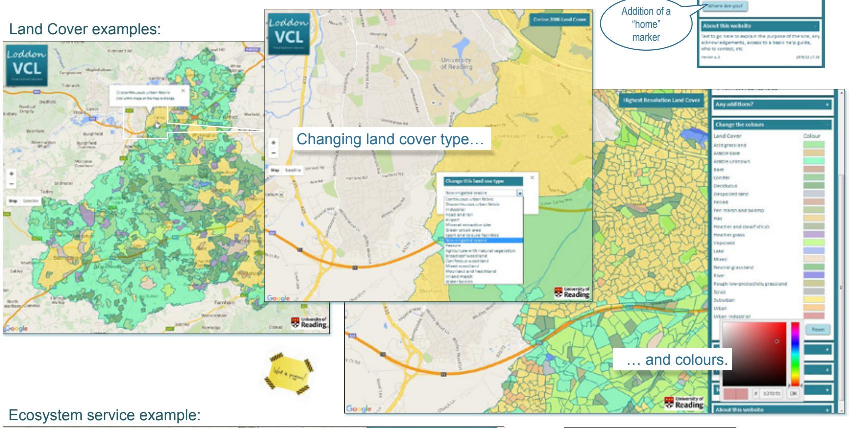
Source shapefiles are converted to geoJSON.
Future development: Models will be exposed as RESTful web services conforming to the Open Geospatial Consortium Web Processing Service interface standard using the Python-based PyWPS, a framework written in Python 2.6 for the implementation of WPS 1.0.0. Data access will depend on the size, format and location of the data. The web client will send the server an HTTP GET request to execute a process with a number of parameter values and, once execution terminates, an XML or JSON response is sent back and parsed at the client side to extract the results.

Results – The Loddon VCL, Version α.3, September 2015

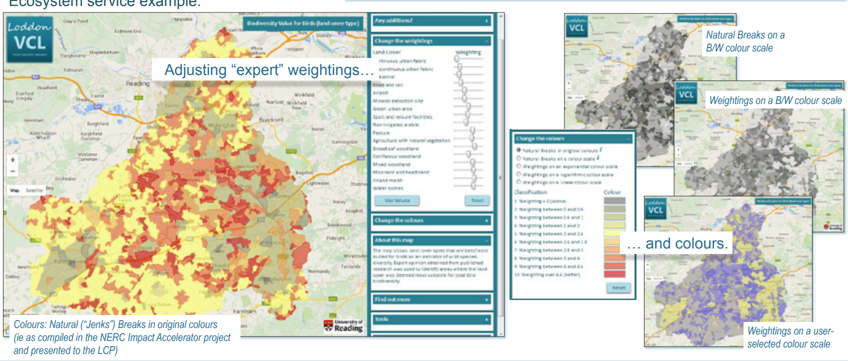


Examples of panel contents are shown below PLUS
a) Selection of markers to add to the current map to investigate point rather than spatial data:
b) Other related and useful sites:
c) And settings for using the site:

Land Cover examples:



Ecosystem service example:



Colours: Natural ("Jenks") Breaks in original colours (ie as compiled in the NERC Impact Accelerator project and presented to the LCP)

The Loddon Catchment Partnership

The Loddon Catchment Partnership (LCP), formed under Defra's Catchment Based Approach initiative[a], has obligations for the 680km^2 lowland area within the Thames river basin. The LCP is a consortium of partners within the catchment ranging from the Environment Agency (EA), water companies and local authorities to parish councils, environmental charities, farmers, and land-owners. Its main aim is to meet the EU Water Framework Directive[b] for "good status" for all waters bodies. EA investigations show that physical modifications, pollution from urban and rural areas (nitrogen, phosphorus, metaldehyde) and waste water are key challenges to the water environment in the catchment that the LCP need to address. Furthermore, the LCP partners are concerned with the flood risk within the catchment and the protection of habitats and wildlife as a whole.

[a] catchmentbasedapproach.org [b] ec.europa.eu/environment/water/water-framework

Some of the LCP partners

[6] The Loddon Project Team Other members of the team include: H.Cloke❶, G.Griffiths❶, D.Macdonald❷, S.Mortimer❸, G.Parker❹, S.Potts❸, A.Verhoef ❶. ❶UoR, Geography & Environmental Science ❷British Geological Survey ❸UoR, Agri-Environment ❹UoR, Henley Business School, Real Estate & Planning

University of Reading
NERC SCIENCE OF THE ENVIRONMENT

Scottish land reform and ecosystem services

Authors and Affiliations:
Tom Tyldesley
University of Edinburgh, School of Geosciences
Email:
t.tyldesley@sms.ed.ac.uk

This project focuses on the question of landownership in Scotland and how ownership influences the value of natural capital and associated ecosystem service flows. In contemporary Britain, land ownership is concentrated into the hands of a wealthy elite. In Scotland, the pattern is even more unequal: it is estimated that half of the nation's land is owned by 432 individuals. The latest estimate of Scotland's population is 5,327,000, so half of a fundamental resource for the country is owned by 0.008% of the population. Land reform is a prominent and current political debate in Scotland, with arguments focusing on the pros and cons of a historically concentrated ownership structure.

A key argument put forward by opponents of the land reform agenda is that most estate owners are good stewards, and so concentrated ownership leads to sustainable management of the land and natural resources. As landowners these "Green Lairds" have the control and capacity to implement and enforce conservation initiatives on their estates, and make a significant contribution to Scotland's environmental targets. Policymakers increasingly use an ecosystem services framework in decision-making: if landowners can demonstrate that their land management activities increase stocks of natural capital and the associated flows of environmental benefits from their land, this will justify the existing pattern of concentrated land ownership.