

Putting Nature on the Map

A webinar to introduce a practical resource from the University of Oxford to identify locations for nature recovery and nature-based solutions.

20th March, 2024

Answers to questions raised by participants during the event. Kindly provided by Alison Smith, Senior Research Associate, Environmental Change Institute.

Note that the following questions were posed live in the webinar. Please refer to the [recording](#) for answers (main Q&A starts at 49 minutes).

- Will other mapping tools be considered to generate data, for example, AI-based satellite or LiDAR data? (ref 16'31")
- Is there ambition to create a user-friendly interface to widen opportunities for use by other groups? Who is the tool available to?
- Have you considered nutrient neutrality regions? If so, do you intend to include these at some point?
- Is there a way of mapping areas of opportunity based on species requirements? (ref 20'25")
- How would you see this approach relating to the proposed Land Use Framework [for England]?

Q: Does the tool come with any paywall issues, such as purchasing a licence to use outputs from OS maps?

- Yes. You need an OS Mastermap license and an ArcGIS license to create the maps. Public sector organisations and their contractors, and academics, have access to OS Mastermap. If someone else has created a map, you need an OSMM license to receive a copy of the data. The maps are also much easier to display if you have ArcGIS as you will be able to use the correct symbology. However, we have set up a system for exporting individual opportunity layers that do not include OS Mastermap information, so these individual layers should be more shareable.

Q: Which version of ArcGIS does the tool run on? Can maps be generated using other GIS software?

- It runs on the most recent version of ArcGIS Pro. ArcGIS desktop is being phased out. There have been a few issues with sharing the maps with people who don't have the most up to date version, as sometimes the symbologies do not seem to transfer to earlier versions. I hope ESRI will sort out this issue soon,

as ArcGIS really should be backwards-compatible. I hope to generate equivalent QGIS symbologies at some point. But the maps cannot currently be created in QGIS because the software relies heavily on ArcPy functions.

Q: How are the ecosystems service scores derived? Was there consideration for other models such as 'intact nature' or other, more holistic approaches?

- The scores have been derived in a series of projects over the last 10 years, including stakeholder workshops, a big [literature review](#) of over 700 papers looking at the links between ecosystem attributes and ecosystem service delivery, and peer review as part of the development of the [Environmental Benefits from Nature tool](#) for Natural England, which uses the same scoring system. A paper describing the system in more detail is in preparation. The system aims to be holistic in that it reflects a wide range of services including production of food, climate mitigation and adaptation, and five cultural services including interaction with nature. The opportunity mapping is based on the premise that we need to make space for nature recovery and nature-based solutions alongside other objectives including food production, which I see as a holistic approach.

Q: What was the source of the carbon scores for different habitats?

- Carbon is assessed both as a score out of 10 and also as a value for carbon storage in tonnes carbon per hectare, and for carbon sequestration in tonnes carbon per hectare per year. The values come from various literature sources, drawing heavily on the recent Natural England report [NERR094](#). The scores were initially based on [Cantarello et al 2011](#), using the same approach as the EcoServ model, and then extrapolated across a wider range of habitats. The scores aim to be proportional to the literature values. For woodland, the scores are informed by assessment using the Woodland Carbon Code calculator for generic woodland types (coniferous vs broadleaved, plantation vs semi-natural).

Q: What data did you use to calculate flood benefits as part of the ecosystem services assessment?

- The score for flood protection is based on the ability of different habitats to intercept rainwater, intercept overland flow, enable soil infiltration, and dry the soil through evapotranspiration. We hope to publish the full rationale for the scores in a paper soon. This is a very simple assessment of the potential for different habitats to deliver a service, not a hydrological model. It should not be used for detailed planning of flood management interventions. There is also an opportunity layer for natural flood management based on the Environment Agency's Wider Catchment Woodland dataset, which shows where there are soils with impeded drainage where planting trees could help to improve

infiltration. Again, this is not a hydrological model – it does not take account of topology, flow paths or storage capacity.

Q: Does the carbon storage ecosystem service cover all habitats including soil?

- Yes, the scores and values in t/ha both take account of carbon stored in soil as well as in vegetation. However the evidence base is still poor, due to wide variation in carbon stored even within the same habitat, and dependence on factors such as soil depth. We aim to provide a consistent system that takes account of the expected relative storage in different habitats based on patterns observed in the literature, rather than plugging in actual estimates that may not be from consistent studies.

Q: Are other habitat classifications, such as saltmarsh or marine areas to be included at some stage? Are they included in potential habitat network opportunities?

- Saltmarsh and other coastal habitats are already included in the habitat map and have scores for ecosystem services. We hope to include them in the opportunity mapping soon, using existing opportunity maps (see our list of data sources available on our website).

Q: Is there intention to include air pollution emissions data in the opportunity mapping? Are climate change risks considered?

- Yes, we plan to include air pollution data at some point. Climate change risks are not directly considered as there is very little evidence on how different ecosystems will adapt. However, by encouraging a diverse mix of habitats at suitable locations in a connected network, we hope to contribute to more resilient landscapes. Local knowledge and expert advice will be important in determining more detailed plans for what species to use etc. for any given intervention.

Q: Do you have any advice to start replicating this model elsewhere across the globe?

- At a very high level, the same overall approach could be applied elsewhere – i.e. considering the same constraints and opportunities. In other words, protecting high grade agricultural land for food production, but considering agroforestry on that land; not planting trees on other semi-natural habitats such as natural grasslands and savannas; considering the potential to create connected habitat networks; looking for opportunities to reduce erosion on steep slopes; prioritising the restoration of degraded peatland; etc. With some work, some of the python code could be adapted for use elsewhere if you have polygon datasets (not raster), including the core module that merges a

new dataset into a base map while dealing with messy boundaries. But most of the software will not be relevant for other countries because it starts from the UK OS Mastermap and then brings in entirely UK-based datasets.

Q: What spatial and temporal scales can the tool be used at? How much detail are you able to reach in urban areas, and has green infrastructure been considered?

- The tool can be used at a wide range of scales, from a single farm, estate or other landholding, through parishes or local authority districts, up to multiple counties in a region (e.g. we recently mapped all of Yorkshire and Humberside). The code works by asking you to provide a set of boundaries, e.g. local authority districts, catchments, or national character areas, and it then creates the map by setting up one geodatabase for each area and looping through each area in turn at each step of the code. So in theory you could map any number of areas, but it would take a long time and require a lot of storage space to generate maps for very large scales. It would also not be very useful at very small scales (e.g. a garden) as you would not have much (if any) input data and would not be able to see how the area fits into local habitat networks. However there is an option to create a buffer zone around a small area to make it worth mapping. The code is very detailed for urban areas, because OS Mastermap includes grass verges, gardens and green space. All non-sealed surfaces in urban areas are included as opportunities in the same way as other areas; this would include green infrastructure creation. However, we want to improve this in future by looking in more detail at the urban areas and taking into account socio-economic factors (using Natural England's green infrastructure maps).

Q: How were data interpreted to identify opportunities? Could the tool use data to identify vulnerable communities to target nature recovery?

- The rules used to identify opportunities are described in the documentation – an [overview](#) is available on our website. We are hoping to include consideration of vulnerable communities by linking to Natural England's green infrastructure maps that identify deprived communities lacking in green space.

Q: What are the policy implications of this tool? Which organisations or agencies are using it?

- The tool has only just been released for wider use but a range of organisations have been involved in testing. It is very well suited to supporting delivery of Defra's Land Use Framework, as it directly addresses the need to deliver multiple benefits while minimising trade-offs. It has been designed to support Local Nature Recovery Strategies, and can also be used for targeting agri-environment interventions and planning local nature recovery strategies, amongst other uses. It is already being used to support the LNRS in Yorkshire

(see Simon’s part of the webinar) and Oxfordshire County Council is also using it in the Oxfordshire LNRS. It is being used by the North-east Cotswolds Farmer cluster – one of the ELMS Landscape Recovery schemes - to identify opportunities for nature recovery and habitat networks, and we are also producing maps for use by another local farmer cluster in partnership with Natural England and our local wildlife trust, BBOWT. It is also being used by a cluster of three parishes in Oxfordshire to help develop a local nature recovery plan. The Environment Agency used an early version of the maps as part of the Local Natural Capital Plan in the Oxford-Cambridge region.

Links to resources and tools mentioned in the webinar

Nature-based Solutions Knowledge Hub (go to the Mapping page):

- <https://nbshub.naturebasedsolutionsinitiative.org/>

Alison Smith mentioned this tool which can be used with data exported from the maps to explore the outcomes of interventions for ecosystem services:

- <https://publications.naturalengland.org.uk/publication/6414097026646016>

Production of Local Nature Recovery Strategies is now a requirement in England:

- <https://www.gov.uk/government/publications/local-nature-recovery-strategies/local-nature-recovery-strategie>

Read more about the Agile Initiative here:

- <https://www.agile-initiative.ox.ac.uk/>

Find out more about the Oxford University Nature-based Solutions 2024 Conference:

- <https://www.naturebasedsolutionsoxford.org/>

Find out more about EKN’s Nature Tech Expo

- <https://ecosystemsknowledge.net/event/nature-tech-2024/>

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