Oliver Baines

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Research Interests

I am passionate about using geospatial data to tackle ecological problems. I have worked with multispectral, hyperspectral and LiDAR data as part of several projects, both in a support capacity, and as project lead. I have recently completed a PhD which used remote sensing data to disentangle plant-environment relationships in the Arctic. Some of my current projects include deriving land cover information from historical aerial photography, and synthesising multiple sources of land cover information to understand implications for contemporary biodiversity.

Research experience

01/2023 - present

Geospatial data scientist

Section for Ecoinformatics & Biodiversity, Department of Biology, Aarhus University

Responsible for supporting research across the section, including teaching, analysis, and data management. I have supported PhD students and PostDocs with geospatial analyses, helped create metadata and data storage templates, and been responsible for generating geospatial datasets to be used in research (e.g., via Google Earth Engine). I have also led research projects, including efforts to derive long-term land cover information using historical aerial photography.

05/2021 – 07/2021

Research Assistant

School of Geography, University of Nottingham

Analysed mortality and turnover across ForestPlots censuses of tropical tree species from lianas (using R). I additionally collated a range of environmental datasets to analyse changes against, including climatic, soil, topographic and remote sensing-derived variables (LAI, NDVI).

03/2021

Research Assistant

School of Economics, University of Nottingham

Responsible for identifying, sourcing, and analysing environmental variables that might influence forest growth in Ethiopia, to support work to identify the impact of forest management upon outcomes. I produced fully reproducible workflows (with metadata) using Python and Google Earth Engine.

02/2021-04/2021

PhD placement, Climate Change and Biodiversity Team

UNEP-WCMC

I completed a 3-month internship with UNEP-WCMC, where I was tasked with improving our understanding of ecosystem restoration. During my placement, I drafted a briefing document on the benefits of restoring degraded land prior to conversion and acted as a contributing author on the UN Decade on Ecosystem Restoration Launch Report. I also utilised Python and Google Earth Engine to both produce a method to provide rapid deforestation estimates for Argentina (complementing global scale analyses) and estimate potential restoration potential (in carbon terms) of the Great Green Wall in the Sahel, using MODIS satellite imagery and machine learning.

01/2019-02/2019

Independent Ecological Consultant

National Namibian Leopard Survey

I was tasked with producing a density estimate to support a national assessment of the status of African leopards in Namibia. I devised a methodology to produce a national, spatially explicit density figure, by scaling up local camera trap estimates using spatially explicit capture-recapture models and random forests in R. This method is now being written up for publication.

Education

10/2018 – 11/2023

University of Nottingham, PhD Geography

'Quantifying geodiversity-vegetation relationships in the Arctic using remote sensing'

Supervised by Dr Richard Field, Dr Franziska Schrodt, Prof. Signe Normand

09/2017 – 09/2018

University College London (UCL)

MSc Remote Sensing – Distinction

10/2014 – 06/2017

Emmanuel College, University of Cambridge

BA Geography – 1st Class Honours

Teaching

Geospatial analysis

'Intro to GIS' and '*Intermediate GIS'* – School of Geography, University of Nottingham

Assisted in practical sessions with 1st and 2nd year undergraduates, teaching key spatial concepts such as data types, spatial joins, digitising data, and analysis techniques such as spatial overlays and network analysis

'UseR' sessions – School of Geography, University of Nottingham

Regular contributor to 'UseR' programming sessions, delivering sessions on Python, QGIS, Google Earth Engine (web-based and via R) and techniques to analyse high-dimensional data

Ecology	*'Emerging Challenges in Biogeography'* – School of Geography, University of Nottingham Created and led fortnightly seminar sessions for small groups of undergraduate students on a range of topics (e.g., thermal acclimation, IUCN Red Listing)
	'*Biologiens forskning I teori og praksis'* – Department of Biology, Aarhus University Led a project to introduce first-year biological students to macroecological research, looking at how we can link leaf-level measurements to satellite images (using R and Google Earth Engine).

Selected publications

- Maliniemi T., … **Baines O.** *et al*., (2024) **'Too much diversity—Multiple definitions of geodiversity hinder its potential in biodiversity research'** *Diversity and Distributions* 30(6) e13843 https://doi.org/10.1111/ddi.13843
- Walker T.W.N., … **Baines O.** *et al*., (2023) **'Leaf metabolic traits reveal hidden dimensions of plant form and function'** *Science Advances* 9(35): 1-13 https://doi.org/10.1126/sciadv.adi4029
- Panter C.T., Baines O. *et al* (2022) **'Ecosystem Restoration: What, Why, How and Where'** *Frontiers for Young Minds* 10(856833): https://doi.org/10.3389/frym.2022.856833
- Walker T.W.N., … **Baines O.** *et al.,* (2021) **'Functional Traits 2.0: the power of the metabolome for ecology'** *Journal of Ecology* 110(1): 4-20 https://doi.org/10.1111/1365-2745.13826
- **Baines O.,** Wilkes P., Disney M. (2020) **'Quantifying urban forest structure with open-access remote sensing data sets'** *Urban Forestry and Urban Greening* 50(126653): 1-13 https://doi.org/10.1016/j.ufug.2020.126653

Work in progress

- Panter C.T., Bachman S., **Baines O**., *et al*. (2023) **'Species abundances often conform to 'abundant-centre' patterns depending on dispersal capabilities'** *bioRxiv*
- **Baines O.,** Schrodt F., Field R., Assmann J.J., Treier U., Normand S. (in prep) **'Hyperspectral models of soil and leaves: accounting for spatial autocorrelation and propagating uncertainty'**
- **Baines O.,** Schrodt F., Bailey J.J., Normand S., Field R. (in prep) **'Accounting for the geospheres is essential to capture pan-Arctic productivity change'**

Selected conference presentations

- **Baines O.,** Schrodt F., Assmann J.J., Treier U., Field R., Normand S. **'Fine-scale relationships between (spectral) biodiversity and (spectral) geodiversity'** (poster presentation) *BES Annual Meeting, December 2021, Liverpool, UK*
- **Baines O.,** Schrodt F., Bailey J., Normand S., Field R. **'Geodiversity: Buffering Arctic Plant Communities Against Rapid Climatic Change? A Use Case for the Earth System Data Lab'** (oral presentation) *ESA Earth Observation Phi-week, September 2019, Frascati (Rome), Italy*
- **Baines O.,** Wilkes P., Disney M. **'A London-wide estimate of Urban Forest Structure'** (oral presentation) *National Centre for Earth Observation (NCEO) Conference, September 2018, Birmingham, UK*
  (winner of best conference presentation)

Invited talks

- **'Inferring land cover legacies for Denmark using historical data'** *University of Glasgow*
- **'Building maps of historic land cover change for Denmark'** *SDFI* 05/09/2023
- **'Accounting for the geosphere is essential to capture pan-Arctic productivity change'** *Woodwell Climate*

Awards & Funding

February 2021	Royal Geographical Society *Henrietta Hutton* grant, to support Arctic fieldwork examining spectral biodiversity—geodiversity relationships (postponed due to COVID-19)	£500
March 2020	European Space Agency Earth System Data Lab (ESDL) Early Adopter Grant to study recent changes in pan-Arctic plant productivity using the ESDL data cube platform	€3000

Other

- Reviewer for *Global Ecology & Biogeography*, *Diversity & Distributions*, *Geoscience Data Journal*