



Bigger, better hedgerows – assessing hedge structure and landscape context for pollinating insects

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Biodiversity is in decline, including key insects such as butterflies¹ and other pollinating insects (bees and hoverflies)². Hedgerows are important semi-natural habitats in farmed landscapes, providing resources and refuges for animals and plants, and supporting ecosystem services including pollination. This is recognised in the government's [25-year Environment Plan](#)³ and a substantial increase in hedgerow extent has been proposed, to mitigate biodiversity loss (60% increase suggested in Natural England's [Definition of Favourable Conservation Status for Hedgerows](#)⁴) and increase carbon sequestration (40% increase, [Committee for Climate Change](#)⁵).

Hedgerow condition, including height, width and gappiness⁶, is also important for many species, including pollinating insects^{7,8}, but less than 50% of hedges are in good condition⁹. We urgently need to know where to plant new hedges and how best to manage our current hedgerows to support biodiversity.

This studentship will be based at the UK Centre for Ecology & Hydrology (UKCEH) in Wallingford and the Department of Agriculture at the University of Reading, working with a dynamic group of insect and applied ecologists. The research project will address the challenge of understanding the relative importance of habitat quality, extent and age of hedgerows for pollinators including butterflies. This will inform management and policy for improving the UK hedgerow network and the biodiversity benefits it can deliver. During the PhD, the following research questions will be addressed:

- 1) How do pollinating insects (including butterflies) respond to the extent and size of hedgerows, and to the surrounding landscape context, using national Citizen Science datasets?
- 2) Is local habitat quality (hedgerow structural condition, woody species composition) more important than hedgerow extent in the surrounding landscape for the pollinating insects associated with hedges?
- 3) How does hedgerow age affect pollinating insects, and how long after planting do hedges become a valuable habitat?

During this project a combination of existing and newly collected ecological data will be analysed, to better understand the value of hedgerows for biodiversity. A novel map of hedgerows in England, which includes data on hedgerow extent and height (currently being developed at UKCEH from LiDAR), will be used in combination with national Citizen Science data on butterfly (Wider Countryside Butterfly Monitoring and UK Butterfly Monitoring Schemes, WCBS and UKBMS) and other pollinator (Pollinator Monitoring Scheme, PoMS) species. The analyses will include links to landscape context, using variables including semi-natural habitat cover, habitat diversity and mass-flowering crop cover, derived from the UKCEH Land Cover and Crop maps.

Fieldwork will focus on collecting new insect data from hedges that vary in habitat condition or age, within differing landscape contexts, using survey methods successfully applied in previous projects at UKCEH and

University of Reading. This fieldwork component could focus on either Lepidoptera (butterflies and moths) or on other pollinating insects (bees, hoverflies), depending on how the project develops and the interests of the student.



Figure 1. Pollinating insect surveys along hedges: a) bumblebee transect © Judy Hart, UKCEH; b) Small Tortoiseshell butterfly on bramble © Krisztina Fekete, UKCEH; c) blackthorn flowering in a recently planted hedge © Jo Staley, UKCEH

Training opportunities:

The student will receive training in GIS, spatial modelling, invertebrate identification and habitat assessments. They will get the chance to work with other PhD students in active and vibrant research communities at UKCEH and the University of Reading.

The student will also spend three-months with the Tree Council and have opportunity to work on a policy briefing, developing skills in translating research for policy and dissemination, and also on a public engagement event.

Student profile:

We encourage candidates with a minimum 2:1 undergraduate degree in Biology, Ecology, or a related subject, and/or an equivalent MSc/MRes. Some experience of fieldwork and insect identification, GIS and statistical analytical skills, would be useful but not essential. An additional skill is readiness to interact with a range of stakeholders, including NGOs and government agencies, for whom the project results will be relevant. A desirable trait is a broad outlook on wider environmental issues, in order to put these research results in context and achieve impact in this topical policy area. The student will need a driving license to travel to field sites.

Funding particulars:

This project has co-sponsorship, with CASE funding from the Tree Council. See Training opportunities above for details of the CASE placement.

References:

¹Fox, R. et al. (2015) The State of the UK's Butterflies 2015. Butterfly Conservation and Centre for Ecology and Hydrology, Butterfly Conservation, Wareham, Dorset, UK. <https://butterfly-conservation.org/butterflies/the-state-of-britains-butterflies>

² Powney, G.D. et al. (2019) Widespread losses of pollinating insects in Britain. Nature Communications, 10, 1018. <https://doi.org/10.1038/s41467-019-08974-9>

³Department for Environment, Food and Rural Affairs. (2018) A Green Future: Our 25 year plan to improve the environment. Department for Environment, Food and Rural Affairs, London, UK.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

⁴Staley, J.T. et al. (2020) Definition of Favourable Conservation Status for Hedgerows. Favourable Conservation Status for habitats and species. UK Centre for Ecology and Hydrology, Access to Evidence catalogue <http://publications.naturalengland.org.uk/publication/5565675205820416?category=5415044475256832>.

⁵Committee on Climate Change (2019) Net Zero - the UK's contribution to stopping global warming. Committee on Climate Change, London. <https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/>

⁶Department for Environment, Food and Rural Affairs (2007) Hedgerow Survey Handbook: A standard procedure for local surveys in the UK. Department for Environment, Food and Rural Affairs. <https://www.gov.uk/government/publications/hedgerow-survey-handbook>

⁷Graham, L. et al. (2018) The influence of hedgerow structural condition on wildlife habitat provision in farmed landscapes. *Biological Conservation*, 220, 122-131. <https://doi.org/10.1016/j.biocon.2018.02.017>

⁸Garratt, M.P.D. et al. (2017) The benefits of hedgerows for pollinators and natural enemies depends on hedge quality and landscape context. *Agriculture, Ecosystems & Environment*, 247, 363-370. <http://www.sciencedirect.com/science/article/pii/S0167880917302918>

⁹Carey, P.D. et al. (2008) Countryside Survey: UK Results from 2007. NERC/Centre for Ecology & Hydrology, Lancaster, UK. <https://countrysidesurvey.org.uk/content/uk-results-2007>

¹⁰National Farmers Union (2019) Achieving Net Zero: Farming's 2040 goal. <https://www.nfuonline.com/nfu-online/business/regulation/achieving-net-zero-farmings-2040-goal/>

<https://research.reading.ac.uk/scenario/>