The WrEN project: a large-scale natural experiment

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WrEN is a large-scale natural experiment designed to study the effects of 160 years of woodland creation on biodiversity and inform landscape-scale conservation.

INTRODUCTION

Conservation strategies to tackle habitat fragmentation require actions at local (e.g. increasing the size and quality of existing habitat patches) and landscape levels (e.g. increasing habitat amount and connectivity; Fig. 1). However, the relative merit of these actions is still poorly understood, causing much debate on how to prioritise between them. This is mainly because biodiversity responses often occur over large spatial and temporal scales, which are difficult to study in controlled, wellreplicated settings while maintaining ecological realism.



Fig. 1. Components of an 'ecological network' to facilitate species movements in otherwise fragmented landscapes (Lawton et al. 2010).

STUDY APPROACH - a 'natural' experiment

UK landscapes offer a unique opportunity to study biodiversity responses to long-term, large-scale habitat creation. Following extensive deforestation over centuries, woodland creation programmes since the late 1800s and accelerated in the 1900s led to current British landscapes containing a large number of secondary woodland patches (a process well documented in historic maps; Fig. 2). Many of these woodlands were established on former agricultural land, without remnant woodland biodiversity. Therefore, the presence of species within these sites represents successful colonisation, presumably mediated by attributes of the woodland sites and the landscapes around them.

<u>SITE SELECTION</u>: We developed a semi-automated site selection protocol using digital spatial datasets and historic maps to identify secondary woodland patches (Fig. 2). These were systematically selected to reflect variation in key local (e.g. patch size and age) and landscape-level (e.g. amount and connectivity of surrounding woodland) attributes likely to influence woodland biodiversity.



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Fig. 2. A woodland patch in the current landscape (left; 2014) is traced back to when it appeared (middle; 1900) on formerly agricultural land (right; 1860)
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Woodland Creation & Ecological Networks

WORK TO DATE

- Since 2013, 106 secondary woodlands (67 in Scotland, 39 in England; Fig. 3) have been surveyed to describe their habitat structure and attributes of the landscapes around them.
- Standard methods have been used to survey a wide range of woodlanddependent species of different life-history traits (e.g. mobility and habitat specificity).
- We are still processing these data but have so far recorded:



- vascular plants 177 species; lichens 172 species; bryophytes 77 species
- beetles 30,000 individuals, 130 species; spiders 4,000 individuals, 103 species
- craneflies 5,000 individuals, 104 species; hoverflies 1,300 individuals, 63 species
- bats 1,700 hours of acoustic recording, 57,000 bat passes, 6+ species/genera
- small mammals 15,000 trap nights, 1,700 individuals, 4 species
- birds 8,000 records of 59 species
- moths 11,300 individuals, 257 species
- <u>FUTURE WORK</u>: soil & carbon; importance of hedgerows; comparison with ancient woodlands; decision support system for policy & practitioners; ecological interactions; taxa with conflicting needs.



