

# UNIVERSITY *of* York

This is a repository copy of *From Rackham to REVEALS : Reflections on Palaeoecological Approaches to Woodland and Trees*.

White Rose Research Online URL for this paper:  
<https://eprints.whiterose.ac.uk/112787/>

Version: Published Version

---

## Article:

Richer, Susan [orcid.org/0000-0002-8293-9526](http://orcid.org/0000-0002-8293-9526) and Gearey, B.R. (2017) From Rackham to REVEALS : Reflections on Palaeoecological Approaches to Woodland and Trees. *Environmental Archaeology*. ISSN 1461-4103

<https://doi.org/10.1080/14614103.2017.1283765>

---

## Reuse

This article is distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs (CC BY-NC-ND) licence. This licence only allows you to download this work and share it with others as long as you credit the authors, but you can't change the article in any way or use it commercially. More information and the full terms of the licence here: <https://creativecommons.org/licenses/>

## Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing [eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk) including the URL of the record and the reason for the withdrawal request.



[eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk)  
<https://eprints.whiterose.ac.uk/>

# From Rackham to REVEALS: Reflections on Palaeoecological Approaches to Woodland and Trees

Suzi Richer & Benjamin Gearey

To cite this article: Suzi Richer & Benjamin Gearey (2017): From Rackham to REVEALS: Reflections on Palaeoecological Approaches to Woodland and Trees, Environmental Archaeology, DOI: [10.1080/14614103.2017.1283765](https://doi.org/10.1080/14614103.2017.1283765)

To link to this article: <http://dx.doi.org/10.1080/14614103.2017.1283765>



© 2017 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 02 Feb 2017.



Submit your article to this journal [↗](#)



Article views: 328





View related articles [↗](#)



View Crossmark data [↗](#)

## From Rackham to REVEALS: Reflections on Palaeoecological Approaches to Woodland and Trees

Suzi Richer <sup>a,b,c</sup> and Benjamin Gearey <sup>d</sup>

<sup>a</sup>Department of Archaeology, King's Manor, University of York, York, UK; <sup>b</sup>Environment Department, University of York, York, UK; <sup>c</sup>Worcestershire Archive and Archaeology Service, The Hive, Worcester, UK; <sup>d</sup>Department of Archaeology, University College Cork, Cork, Ireland

### ABSTRACT

In this paper we reflect on aspects of palaeoecological approaches to understanding past woodland environments. With increasing requirements for interdisciplinarity in research, and an increase in popular interest in the 'natural environment' such as 'new nature writing', we suggest that palaeoecology is potentially well situated to engage with other audiences and disciplines, and inform wider debates. However, in order to achieve this, we tentatively suggest that palaeoecology should be self-reflexive and examine how current methods, terminology and underlying theoretical perspectives inform (and inhibit) our practice. Using insights from Oliver Rackham's influential woodland studies as focal points, we examine selected aspects of method and theory in palaeoecology and suggest an approach to developing a praxis of woodland palaeoecology. In practical terms, this (1) incorporates other information and alternative perspectives, and is willing to question its methods and ways of thinking, (2) takes account of past and present, differences in the perceptions of the environment, (3) looks to build enriched accounts without privileging one perspective/set of 'data' over another by 'flattening out' knowledge hierarchies, potentially making the discipline more flexible in its outlook and applicability. A short case study from Shrawley Woods, Worcestershire, UK, illustrates the approach and includes the first example of historical documents and oral history accounts being used in the construction of a pollen diagram.

### ARTICLE HISTORY

Received 22 November 2016  
Accepted 21 December 2016

### KEYWORDS

Palaeoecology; archaeology; woodland; theory; method; Oliver Rackham

### Introduction

Oliver Rackham was one of Britain's pre-eminent woodland historians: his key texts (1990, 2006) provide some of the most comprehensive research on woodlands, with insights gleaned from palynology, historic tree surveys, place name evidence, observation and historical documents. Rackham's work is also important as it includes pollen analysis in discussions of woodland history, bringing the discipline to a popular audience. Within these texts, we, as palaeoecologists, find some of the issues and 'problems of inference' that can be encountered in the process of 'reconstructing' past landscapes and when attempting to portray the relationship between people and their environment. In recent years, there has been significant methodological progress in palynology, including the development of modelling techniques such as REVEALS (Sugita 2007). In this paper, we address three facets of how we approach the study of past woodlands, with a view to suggesting some possible areas for further discussion in the context of practice, but also the theory of palaeoecology:

- (1) *How do we approach the study of woodlands as palaeoecologists?* Following Rackham's statement 'Pollen analysts have to take their deposits where they find them' (1990, 31) we discuss methodological constraints and opportunities, especially related to the location and focus of palaeoecological study.
- (2) *Human impact – people as active and passive agents:* The identification and characterisation of past human impact is one of the central aims of palaeoecology. We reflect briefly on how this might affect how we think about past peoples interactions with woodland. We also consider the relationship between palaeoecology and archaeology, focussing on one specific question in the form of the 'tree factor' (Conolly and Lake 2006, 230).
- (3) *Terms, definitions, interdisciplinarity and 'flattened' knowledge structures:* Rackham's work draws attention to a plethora of terms used to describe woodland in the historic periods, such as 'underwood', 'timber', 'forest' and 'wood-pasture'. We ask

**CONTACT** Suzi Richer  suzi.richer@york.ac.uk  Environment Department, University of York, Wentworth Way, York, UK

© 2017 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group  
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

whether we should think more precisely about terminology and in particular how terminology works across disciplines. Rackham (1990, 107) suggested that we ‘should make simultaneous use of as many lines of inquiry as possible,’ we propose that we need to find a path through the forest that allows palaeoecology to communicate more closely not only with other scientific approaches, but with the humanities and less conventional sources of information such as oral history. We illustrate this with a short case study of Shrawley Woods, Worcestershire. There has been a pronounced increase in inter- and intra-disciplinary research in recent years, and areas such as the environmental humanities are starting to draw attention to the role of science, as well as literature, in constructing potentially problematic versions of the relationship between people and ‘the natural world’ in the past and present. We propose that whilst methodological developments are of great importance to the discipline of palaeoecology, attention should also be paid to such theoretical questions and interfaces.

After reviewing these three issues, we propose an approach where we can start to acknowledge that people and woodlands were part of the same lived world, in a complex recursive manner, and in ways beyond the latter simply providing material resources. This also considers how we bring together different perspectives, methodologies and techniques through a ‘flatter’ structure of knowledge, which we argue makes engagement with other audiences, disciplines and debates a more fluid, flexible and less hierarchical process. Whilst in this paper we focus on the study of woodlands, many of the points are equally applicable to how we approach palaeoenvironmental research more broadly.

### How do we approach the study of past woodlands?

Palaeoecology may be simply defined as the study and reconstruction of past biota, environments and ecosystems (Birks 1996); pollen analysis often forms the basis for the majority of the reconstructions (Edwards et al. 2015). Rackham’s (1990, 31) statement, ‘Pollen analysts have to take their deposits where they find them’ would appear at first glance to be a truism; but it is not entirely so, as it excludes the fact that much palynological research is driven by factors other than the location of potentially polleniferous deposits. Pollen will survive in environments where there is low microbial activity, such as in anaerobic, saline or dry conditions (Moore, Webb, and Collinson 1991). Most research is conducted on sequences from peat bogs and lake sediments due to the likelihood that accumulation will be gradual and continuous; or in archaeological circumstances where there are onsite waterlogged deposits,

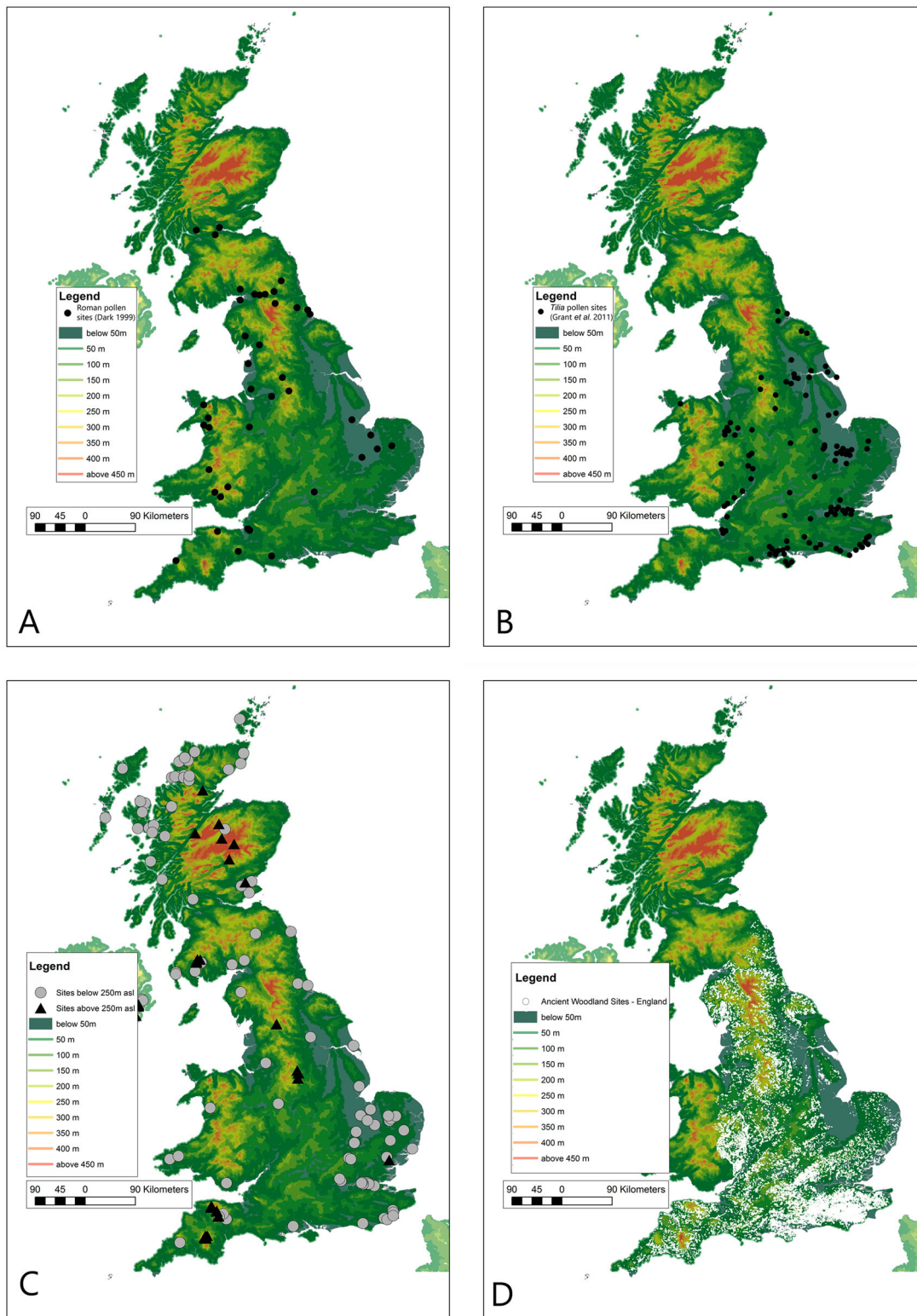
such as ditches and wells. A closer look at the location of palynological studies is instructive.

A bias in the distribution of sites can be seen when synthetic studies, e.g. Dark (1999) (Figure 1(a)) and Grant, Waller, and Groves (2011) (Figure 1(b)), or sites are represented on regional databases, e.g. the European Pollen Databases (Figure 1(c)), with sites being primarily located in the western and northern fringes of the UK, and a swathe across the southeast that reflects archaeological work in London and the Fens. These databases and syntheses are only as good as the data/publications that have been entered and are therefore not necessarily a true depiction of where all palynological work has been undertaken, but they are representative of broad trends.

When the distribution of palaeoecological sites is compared with the distribution of Ancient Woodland sites in England (Figure 1(d)), we can see that large areas of the country were potentially covered by woodland in the past, whilst relatively few in-depth pollen analytical studies appear to have been undertaken across such a wide-ranging area. If we want to address targeted and subject-specific questions, such as those concerning woodland, then we also need to look beyond the widely published academic research data, to some of the ‘grey literature’ reports from developer-funded activity. When we do this, we see that other sites do exist, but that the data from those studies are often buried in Historic Environment Record (HER) offices, or that the sequences from these sites are problematic in some way. However, we would argue that these records are valuable, as long as we are aware of the caveats.

Worcestershire is a landlocked county (Figure 2), dominated by two river systems and their floodplains, the Severn and the Avon. Significant palaeoecological research was undertaken by Brown (Brown 1982, 1988; Brown and Barber 1985) in the 1980s along the floodplain of the Severn. It is this research that forms Worcestershire’s contribution to Grant et al.’s (2011) review of ‘*Tilia* (lime) decline’ sequences – a total of five sites (Figure 1(b)). Figure 1(a,c) include no sites in Worcestershire. Instead, if we look to the publically accessible HER we can see that substantially more pollen work has been undertaken in the county. A total of 52 sites have been studied (40 recorded on the HER), of these, only 10 for research purposes (primarily the sites mentioned above) and the bulk ( $n = 41$ ) pollen analysis has been undertaken as part of developer-led work (Figure 2).

Whilst these ‘developer-led’ studies offer an opportunity to widen the geographic spread of sites, they often do not provide the same time-depth, continuity of deposition, level of chronological control, or resolution of sampling, demonstrated by the low number of radiocarbon dates associated with pollen profiles in Worcestershire (Figure 3). This reflects another



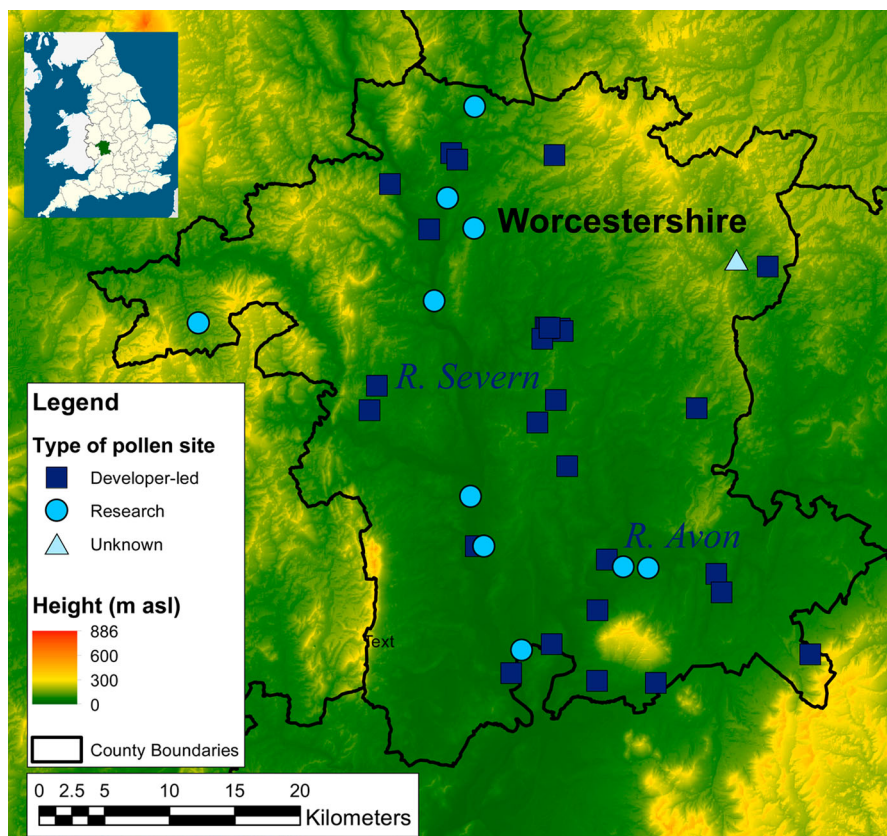
**Figure 1.** Distribution of (A) pollen sites covering the Roman period in Britain, after Dark (1999). (B) Distribution of pollen sites with evidence of the 'lime decline' in Britain after Grant, Waller, and Groves (2011). (C) Pollen sites in Britain contained in the European Pollen Database. (D) Ancient Woodland sites in the England.

problem with developer-led projects, which for various reasons, often fail to follow up on 'best practice' recommendations, including full palaeoenvironmental analyses or comprehensive radiocarbon dating strategies (see Gearey, Chapman, and Howard 2016).

Nevertheless, developer-led work provides something of an untapped resource and in addition, there

are other resources that assist in looking beyond the more obvious areas of palaeoecological potential. English Heritage (now Historic England) commissioned a *Toolkit For Rapid Assessment Of Small Wetland Sites* (Pearson 2014) as part of the National Heritage Protection Plan, which designed as a desktop method to be used to identify 'small and discrete sites (that) are





**Figure 2.** Distribution of pollen sites in Worcestershire (excluding the city of Worcester).

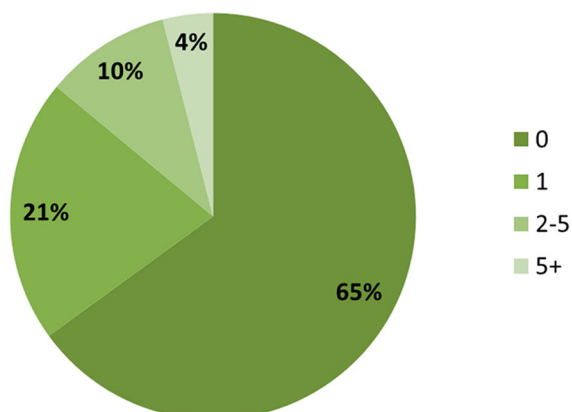
often at far more threat than the generally better documented and protected large expanses of blanket peats in England, yet contain unique and important evidence potential' (Pearson 2014, 1). In total the study identified 1652 new sites in Worcestershire alone, drawing attention to the potential abundance and importance of these smaller sites.

Returning to lowland woodlands, if we want to examine their history and palaeoecology then a starting point could be to work backwards from an area of 'ancient' woodland that exists today, as suggested by Rackham (Rackham 1990, 122). However, finding

suitable coring sites with relatively undisturbed deposits in extant woodlands can be notoriously difficult due to the fact that many British woodlands have survived because they:

- Are on marginal land that was not suitable for agricultural use, e.g. steep-sided wooded valleys (Rackham 1990, 112), where both erosional and depositional processes are currently active.
- Have regenerated on sites of historical woodland industries e.g. brick making, charcoal burning, and coppicing, as they fell into decline with the industrial revolution. As a result of past activity, deposits underlying the industry may now be heavily disturbed/truncated, or the overlying deposits will often be relatively recent.

#### Percentage of pollen site with radiocarbon measurements



**Figure 3.** Percentage of pollen sites with radiocarbon measurements in Worcestershire (excluding the city of Worcester).

A project focussing on Shrawley Woods, Worcestershire, one of Britain's last remaining small-leaved lime woodlands (Richer, *forthcoming*), used a combination of the 'Toolkit For Rapid Assessment of Small Wetland Sites' (Pearson 2014) and local ecological, archaeological and historical knowledge to locate a sampling site within the woodland (Richer, *forthcoming*). The aim of the research was to understand the history of the woodland, and especially that of small-leaved lime. Given the insect-pollinated nature of small-leaved lime, locating a coring site in a location where the species could be detected was crucial. A small in-filled basin was located towards the edge of the current extent of the woodland.

Initial pollen and chronological analysis (Richer in press) suggests that the sediments are at least 1.35 m deep and date back to cal. AD 1030–1220 (95% probability; SUERC-63639,  $887 \pm 31$  BP). This importantly demonstrates that woodland sites *do* have the potential to be suitable for palaeoecological study, even if they are not immediately obvious and if we change our focus from looking for long, undisturbed sequences, to ones that will address the question at hand.

### Human impact: thinking about people as active and passive agents

In attempting to reconstruct past ecosystems, then we need to consider people as both ‘active’ and ‘passive’ agents, in the sense of whether past human activities were having an identifiable ‘impact’ on the environment. The identification and characterisation of ‘human–environment interactions’ through palaeoecological data often seems to carry an implicit assumption that trees and woodland were viewed in the past as an obstacle and/or as resource, something to be cleared for settlement or farming, or used for fuel and construction (e.g. ‘A traditional approach’ in Walsh, Richer, and de Beaulieu 2006). This is in large part for the good methodological reason that people tend only to appear as ‘active agents’ in our reconstructions when there is palynological evidence for their indirect presence; for example in the form of ‘anthropogenic indicators’ showing the spread of taxa regarded as associated with ‘ruderal’ environments (e.g. Behre 1981). However, the significance of woodland in the past extends beyond a perception of trees as resource/obstacle (e.g. ‘An alternative approach’ in Walsh, Richer, and de Beaulieu 2006), and beyond the implicit assumption that the clearance and removal of woodland must have been an inevitable desire of all people from the Neolithic onwards.

For example, it has been suggested that dwelling in woodland would have been important in the creation and maintenance of social identities in prehistory (Allen and Julie 2012; Bell and Noble 2012; Evans 2003) whilst trees may themselves have acted as part of ‘monumental architecture’ (Cummings and Whittle 2003). Thus, trees provided important ‘functional’ materials but woodland must also have had social significance and resonance (Brophy and Millican 2015; Thomas 2013, 390). Following this line of discussion, in which woodland and trees were regarded as ‘sacred’ (for want of a better word), Chapman and Gearey (2013) have suggested that it might be relevant to think of particular episodes of woodland clearance as being potentially deliberate socially disruptive acts.

There are examples of disjunctures between archaeological and palaeoecological research, in part related to methodological constraints but we would argue are in part also theoretical in origin. An example of this

has been pithily described as the ‘tree factor’ (Conolly and Lake 2006, 230), related to the interface between palaeoecology and so-called ‘phenomenological’ approaches to the archaeological record. The philosophical methods and related critiques of phenomenology cannot be easily outlined in short (see Brück 2005), but from a palaeoecological point of view, the debate has largely turned on the question: ‘Where were the trees?’ At the most basic level, this describes the observation that statements concerning the ‘visual experience’ of landscapes by people in the past, would have been dependent, in part at least, on the position and character of vegetation, and that palaeoecological data cannot be generated at the resolution to ‘place vegetation’ at a chronological or spatial scale appropriate to address this problem (Chapman and Gearey 2000).

Identifying the species composition and spatial structure of woodland and other environments have long been of interest to palaeoecologists. One of the most recent advances in palynology has been the development of methods aimed at modelling the distribution of vegetation in past landscapes (Bunting et al. 2013; Farrell 2012; e.g. Farrell, Bunting, and Middleton 2016; Fyfe et al. 2013). Spatially explicit models of palaeoenvironments are now possible which were essentially unthinkable a decade ago. A recent review by Edwards et al. (2015) provides an overview of the advances in the different modelling techniques – including the Regional Estimates of VEgetation Abundance from Large Sites (REVEALS), Local Vegetation Estimates (LOVE) and Multiple Scenario Approach (MSA) – and posits that modelling ‘marks perhaps one of the most significant advances in the analysis of pollen data in recent decades’ (Edwards et al. 2015, 123).

From a practical point of view, in what way might these models be usefully employed to consider questions such as the ‘tree factor’ (Conolly and Lake 2006, 230)? If MSA models can be described as ‘potential landscapes’ or ‘pseudo-landscapes’ (Edwards et al. 2015) what does this actually mean in conceptual and interpretative terms? These terms and associated concepts are highly abstract; this is not intended as a criticism but an observation that such abstraction brings problems as well as potentials into focus, especially in interdisciplinary collaborations. Whilst more robust than the essentially intuitive reconstructions which are otherwise typical of much palaeoenvironmental study, these models have been described as currently of limited value at the spatial scale required for interpretation where the landscape is considered from the ‘perspective’ of an individual in the past. As Casehdine, Fyfe, and Hjelle (2007, 545) have observed:

The really fine scale local reconstructions of landscape mosaics that many archaeologists would desire are not really a potentially reliable goal at present using this modelling approach.

Communicating uncertainties to others unfamiliar with method or practice is a source of potential confusion. Can the maps produced using pollen modelling techniques, best be regarded as ‘data visualisations’ or as ‘representative visualisations’ (McCoy and Ladefoged 2009)? The production of a map of past vegetation distribution suggests at least some form of ‘stability’ to a reconstruction, hence implying the latter.

In a broader context, phenomenological approaches within archaeology have been much criticised (e.g. Barrett and Ko 2009; Brück 1998, 2005; Fleming 1999, 2005) and arguably no longer draw the same archaeological research focus as a decade ago. In areas of archaeological debate, there have been developments focussing on issues concerning living, being and ‘becoming’ (Gosden and Malafouris 2015) some of which present an entirely different set of challenges as to the potential contribution of palaeoecological approaches. It may also be useful to consider how concepts of ‘dwelling’ (see e.g. Ingold 1996, 2000), which have influenced archaeological thought on perceptions of landscape, might be useful within environmental archaeology (e.g. Kourampas 2012).

There are recent practical examples of how close collaboration between palaeoecologists and archaeologists can generate new hypotheses and perspectives (e.g. Bishop, Church, and Rowley-Conwy 2015; Innes, Blackford, and Rowley-Conwy 2013) but the potential for further work is high. Taphonomic studies are important, for example, recent work by Waller et al. (2012) analysed the palynological signature of coppicing, hence moving beyond the identification of ‘human impact’ as an act that involved the purposive destruction of trees. This work is significant as it demonstrates that the disappearance of a particular arboreal pollen type (e.g. *Tilia*) from the record might actually be related to woodland management rather than the absence or deliberate clearance of that taxon. This has implications for how we regard ‘human activity’ as manifested in palaeoecological records. Given the potential evidence from the wetland archaeological record for management of woodland from perhaps as early as the Mesolithic in some places (McQuade and O’Donnell 2007), it is important that we consider the concept that people might have been active agents in past woodlands (e.g. Brown 1997), but that the palaeoecological evidence for this might be difficult or ambiguous to characterise.

The perspectives expressed in Rackham’s (1990, 31) and Caseldine, Fyfe, and Hjelle (2007, 545) statements only limit progress if we regard our methodological and interpretative approaches as restricted by their shortcomings, rather than enabled by their potential. However, as the example of the ‘tree factor’ above illustrates, we may also expect to encounter methodological and theoretical discontinuities between different methods for understanding the past (Chapman and

Gearey, *forthcoming*). These admittedly complex questions and debates may seem far apart from ‘conventional’ palaeoecological discussion of woodland, but this does not mean that they are entirely outside the reach of our enquiry. The challenge is how we might usefully mobilise palaeoenvironmental data in such discussions and this problem is in origin ultimately a theoretical one. As Perry et al. (2016, 11) have recently stated: ‘... the grand challenges that archeology and palaeoecology are engaged with do not just require more and bigger data, but more ways to use and synthesise it’. noting in particular the importance of: ‘... theory as a way to inform empirical data and also as a way to “experiment with theory”’.

This brings us close to a discussion of epistemology, which in itself is an area that would rarely be seen as central to palaeoecology (but see Head 2008; Jackson 2012).

A recent important summary of the progress of palynology includes only a brief reference to theory stating that it is not necessary for the future development of the discipline, due to an assumption that this is unnecessary or irrelevant for progress and only important in latter stages of archaeological integration (Edwards et al. 2015, 129). However, if we define theory simply as ‘the order in which we put our facts’ (Johnson 2010, 2) then the importance of theoretical engagement is brought more clearly to the fore. Some palaeoecologists may be more comfortable with an explicitly or implicitly empiricist positions (see e.g. Johnson 2011) whilst others might be happier to use data in more pluralistic and contingent ways. We would argue that there is not necessarily a right or wrong answer or approach here, but that theoretical differences rather than just methodological constraints, are ultimately at the heart of some fractures between archaeology and palaeoecology, such as the ‘tree factor’ (Conolly and Lake 2006, 230) discussed briefly above.

### Terms, definitions and interdisciplinary working

The earliest use of the term ‘woodland’ dates to 869 AD (Oxford English Dictionary 1928); people are intricately bound-up with woodlands whether in the past for fuel, food, shelter, medicine, or craft materials, essentially because they were part of people’s lived experience in many different ways. The question posed at the start of the first section, ‘How do we approach the study of woodlands as palaeoecologists?’ is not asking only about the scientific reconstruction of past environments – how woodland was used by people in the past – but also how it is perceived and conceptualised in the present. As discussed earlier, this concerns the way that we might use palaeoecological data to explore interactions beyond those that are evidenced by clear changes in pollen taxa referred to above.



People of course perceive and understand their environments differently and this is contingent on time, place, social and cultural context. Therefore, in this section we briefly explore definitions of ‘woodland’ and the implications of these, especially in the context of interdisciplinarity where issues of common terminology can be seen to plague integration more widely (Füssel 2007; Green et al. 2015; Nelson et al. 2011).

The words ‘forest’, ‘woods’ and ‘woodland’ are often used synonymously. But do these necessarily refer to the same things? Hemery (2011), with a background in forestry, explores some of the collective nouns for trees, drawing attention to the historic and social contexts of names. Reflection on the names of landscape features, in particular woodland and trees, are a theme in new nature writing (e.g. Macfarlane 2015a, 2015b), in which they are demonstrated to be anything but passive nouns, instead possessing a complex legacy:

Take the familiar word *forest*, which can designate not a wooded region, but an area of land set aside for deer-hunting – as those who have walked through the treeless ‘forests’ of Fisherfield, Applecross and Corrour in the Highlands of Scotland will know. *Forest* – like numerous wood-words – is complicatedly tangled up in political histories of access and landownership. Nature is not now, nor has ever been, a pure category. (Macfarlane 2015b, 7)

These political and social histories associated with places, and represented in part through their names, are rarely taken into account in palaeoecological work, nor is the role of palaeoecology in generating particular narratives concerning concepts such as ‘forest’, ‘nature’ and ‘place’. It could be argued that terms like ‘forest’ only apply to the historic period where the meaning of particular words is known, and therefore are not relevant to palaeoecological study. But we can see a further disconnect between a palaeoecological perspective and one situated within contemporary nature writing (and hence being portrayed to sections of the general public) with the term ‘wildwood’. Macfarlane defines wildwood as ‘natural woodland unaffected by Neolithic or later civilisation forestry’ (Macfarlane 2015b, 317). The concept of ‘wildwood’ has been debated in palaeoecology, not so much (Whitehouse and Smith 2010, 2004) the question of ‘what is wild?’ but rather the detail of species structure and degrees of openness. Notions of ‘wildwood’ and ‘wilderness’ are not neutral in connotation or meaning, and may come under useful critical review through an ecocritical analysis (see Garrard 2011), for example how these terms are employed within conservation agendas to support and protect particular versions of ‘authentic’ habitats and species.

In one of Oliver Rackham’s last works, *The Ash Tree* (2014, 50), we see a hint of merging the scientific and nature writing perspectives as he suggests that ‘the composition of wildwood is known from pollen ...’

but even this statement is somewhat tricky, as Rackham appears to be talking about a ‘wildwood’ closer to Macfarlane’s definition, of a ‘natural’ woodland, but with little acknowledgement of the social/cultural resonance of these terms. Even if the activities of past people were not having a palynological ‘impact’ on woodland, the concept of a ‘wildwood’ or an ‘undisturbed’ woodland is problematic archaeologically, as people may have been utilising clearances or open areas in woodlands during the Mesolithic which were the result of ‘natural’ disturbances (Brown 1997).

The depth and diversity of meaning contained in place-names, including woodland names, is coming under increased academic focus, with recent work describing them as ‘underexploited repositories of TEK’ (traditional ecological knowledge) (Jones 2016). So can palaeoecology usefully engage with such traditional ecological knowledge for the historic period? Although as discussed above, palaeoecologists have long contributed to areas of archaeological work and thought (e.g. Godwin 1981) with numerous examples of the success of such collaborations (Edwards et al. 2015), we may consider ways to develop new enriched perspectives.

We are working in a world where interdisciplinarity is increasingly required from intellectual, practical and funding perspectives, and to meet this challenge new connections may be valuable in various ways. Whilst we might currently *refer* to the perspectives of other disciplines, such as history and archaeology, in our final interpretations, we use a brief example to explore how we might *incorporate* them more fully into our palaeoecological work at an earlier stage. Through this case study, the role of less conventional sources of information, in particular oral histories and traditional ecological knowledge – a ‘local’ but no less relevant voice – can also have a part to play.

To recall the example of Shrawley Woods (see above; Richer, *forthcoming*) we can see one way how such a perspective might work in practice. A summary compiled by historian Peter King of the 1806 woodbook from Shrawley shows that: *hop poles, whitturine poles, other poles, timber, other wood, cratewood, faggots, saph lath, etherines* and *lops* were all being extracted from the wood. These terms primarily tell us about the economic use of the woods, they do not inform us about the tree species involved, this is potentially one area where the palaeoecology can provide data. But we can also allow the historical evidence to ‘act back’ on the palaeoecological evidence.

The term *whitturine* or *whittern* is one which occurs frequently in documentary sources from the 1500s, but disappears prior to the 1800s; before the 19th century the attachment of species names to trees was an exception – not the rule. Oral history from a woodsman, Mr Osbourne, from Grafton Wood (Smart and Wellings 2009) less than 20 miles away from Shrawley,

tells us that a *whittern* refers to the white bark of a young oak. However, a local landowner in Shrawley informs us that *whitterns* refers to the small-leaved lime (*Tilia cordata*) that grows in the woods. In any case, when Mr Osbourne looked at an oak tree or its timber, he would not think of this as *Quercus* in the Linnean botanic sense, he'd see a *whittern* or a *pole*. It could be argued that the difference is semantic, but the point remains that the language we use structures the way we think about the world and vice versa.

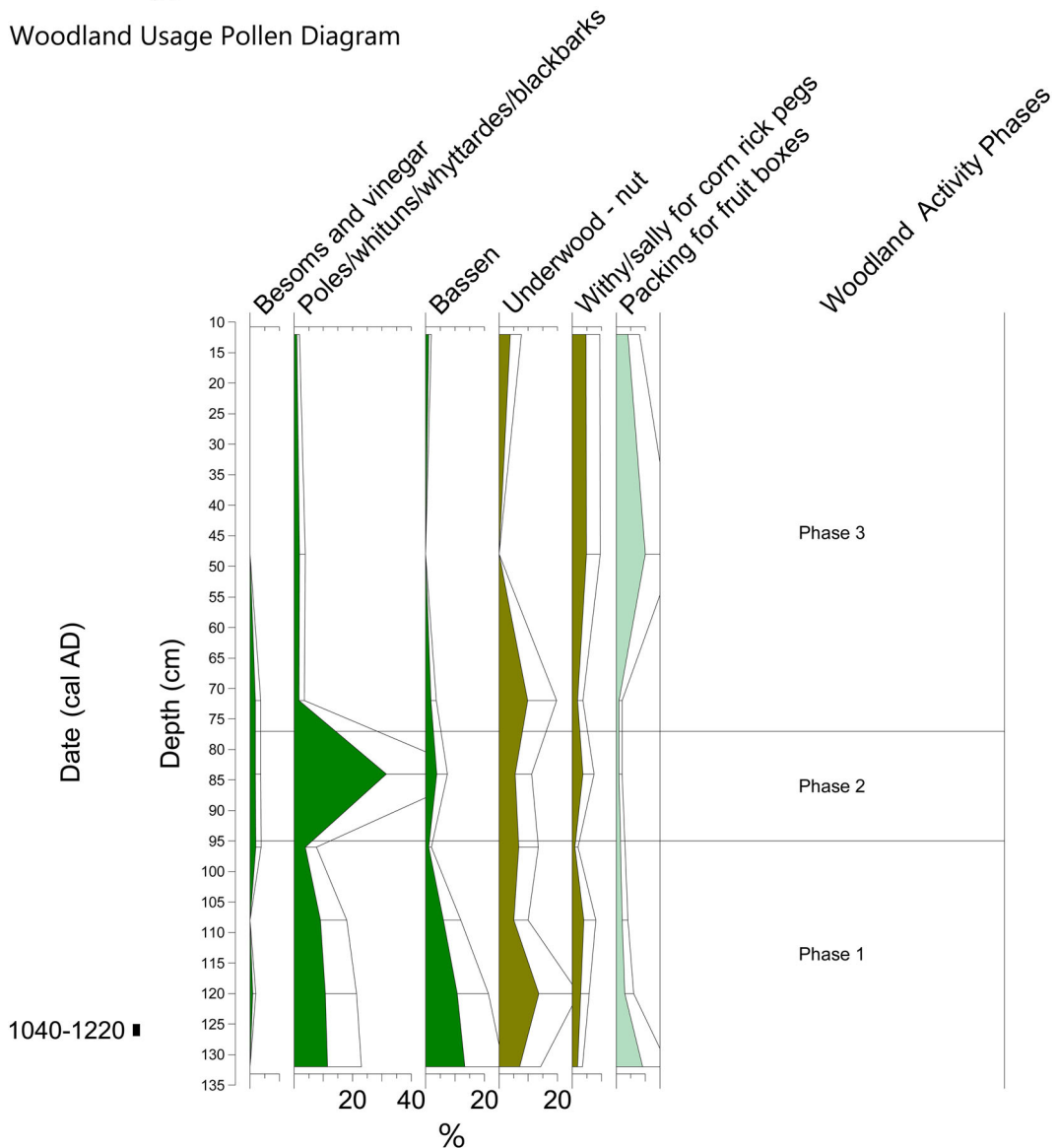
For the first time in palaeoecology, we take the oral history evidence, historical documents and traditional ecological knowledge and allow them to now feed back into the palaeoecological process. This allows us to produce a very different type of pollen diagram (Figure 4) from the 'conventional' one (Richer, *forthcoming*), which can be regarded as an

exploratory or experimental pollen diagram. This diagram does not use 'scientific' Linnean taxonomic names, but instead is structured around information from historical documents or traditional knowledge – drawn from the vocabulary of those who dwelt in these environments. By shifting our terminology we have subtly shifted perspective and also made the palaeoecological evidence accessible to other audiences (i.e. a very localised audience, those people who work with wood).

Whilst we will never 'access' how people perceived past environments directly through a pollen diagram or indeed through any palaeoecological dataset, we can acknowledge the ways in which we approach and think of past environments are contingent on our methods and very much rooted within a particular scientific tradition. Fyfe, Caseldine, and Gillings (2010, 157) have made a similar observation:

## Shrawley, Worcestershire

### Woodland Usage Pollen Diagram



**Figure 4.** Example of a 'woodland usage' pollen diagram constructed from the documentary and oral history evidence of those who dwelt in around the woodlands.

If we see landscape as merely environmental backdrop then economic and adaptive concerns quickly come to the fore; ... if we instead we see landscape as the lived world of everyday experience then both factors come into play in often complex and nuanced ways.

## Conclusion

Oliver Rackham ‘was the first to explore woods from a variety of different perspectives – ecology, archaeology, timbers, place-names, manuscript records – in order to recreate a wood’s history and what he called the wood’s *genius loci*’ (Marran 2015). We embrace this interdisciplinary perspective, and propose that to move further towards it, we need to think in terms of theory as well as method and practice in palaeoecology. Under the broad term of ‘woodland’ Rackham brings together forestry, palynology, personal experience, cartography, place name studies and historical records, to name just some of his sources. Perhaps a somewhat obvious point, but he also recognised the limitations of these sources in that: ‘Records, for example, do not reveal that much of the woodman’s labour ...’ and further questions how the different methods may inform us about a woodland’s history: ‘How does pollen analysis link wildwood with managed woodland?’ (1990, 71–72); suggesting that we ‘should make simultaneous use of many lines of inquiry as possible’ (1990, 107). We would also propose that we should consider not just how these lines of evidence might be woven together, but where friction might occur and how we navigate potential ruptures. As more and more sophisticated scientific approaches to ‘reconstructing’ past landscapes develop, as archaeological perspectives diversify, and the need to work in an interdisciplinary arena increases, it is important that palaeoecology reflects on aspects not only of method, but also of theory.

In addition, in the light of contemporary, wider cultural interest in woodlands and the ‘natural world’, we may think of ways to explore the perspectives of different disciplines and their relationship with and to palaeoecology. Society is increasingly aware of the benefits of trees and woodlands to people’s health and well-being (O’Brien 2005), with a growing desire to connect to the ‘natural world’ through a new genre of popular writing (Dee 2016; Macfarlane 2016), much of which focuses on trees and woodland (e.g. Deakin 2010; Elford 2011; Maitland 2013; Stafford 2016; Tudge 2006; Watkins 2016). Palaeoecology has a role to play here, not least in terms of critiquing ideas of ‘primeval woodland,’ ‘unspoiled nature’ or ‘rural idylls,’ but there are other ways in which the discipline is relevant to contemporary issues, including those that can be described as essentially political (e.g. Riede, Andersen, and Price 2016). Given the possible scale of ecological problems associated with the Anthropocene (Waters et al. 2016), the growing ‘nature awareness’ within

popular culture, and the increasing pressures and potential of interdisciplinary research, it could be argued that active engagement in public and political arenas might be instructive to wider debates (Gearey and Richer n.d.) but also critical for the growth of a discipline that has traditionally regarded such issues as largely outside its aims or purpose.

In particular, we suggest that reflection of aspects of theory within the discipline is critical in terms of practice and interpretation. We perhaps should better acknowledge the strengths as well as weaknesses of palaeoecology, and consider an exploration and reflection on people’s perceptions of and interactions with environment, in both the past and present. The latter could be described as a reflection on the praxis of palaeoecology; defined as an exploration of the relationship between method, theory and social context (e.g. Hodder 1995, 3). In practical terms, this critical reflection can assist us to: (1) find ways to utilise other data, information, and alternative perspectives, and to question our own methods and ways of thinking; (2) take account of past and present, cultural and social differences in terms of the environment; (3) build enriched accounts without privileging one perspective/set of ‘data’ over another, attempting to ‘flatten out’ knowledge hierarchies (cf. Clarke 2014) potentially making the discipline more flexible in its outlook and applicability. These are merely proposed starting points; hopefully as scholars engage with these ideas and concepts, they will continue to unfold. Whilst it might be appropriate to think in wider terms of palaeoecology’s relationship with its own practitioners and beyond, other ways of ‘being in a landscape’ and how we can build more enriched, embodied interpretations of past environments, focussing on woodland in this paper has allowed us to explore how a few of these concepts might be developed.

## Acknowledgements

Pollen data were extracted from the European Pollen Database (EPD; <http://www.europeanpollendatabase.net/>) and the work of the data contributors and the EPD community is gratefully acknowledged. Worcestershire Archive and Archaeology Service for providing coring equipment, North Worcestershire Archaeology Group, Harry Green and Nick Trustram Eve for core extraction and Mr Powick for access to his land. Data from the The Ancient Woodland Inventory were kindly provided by Natural England through data.gov.uk and staff at the Worcestershire Historic Environment Record office are acknowledged for undertaking searches. Shrawley Lime Group for access to research and support. Thanks also to the editors of the Journal for assistance and encouragement, and the helpful comments of two anonymous referees.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

The Shrawley pollen work was supported by the Quaternary Research Association under the Quaternary Research Fund.

## ORCID

Suzi Richer  <http://orcid.org/0000-0002-8293-9526>

Benjamin Gearey  <http://orcid.org/0000-0003-0323-4921>

## References

- Allen, Michael J., and Gardiner Julie. 2012. "Not Out of the Woods Yet; Some Reflections on Neolithic Ecological Relationships with Woodland." In *Image, Memory and Monumentality Archaeological Engagements with the Modern World*, edited by Andrew M. Jones, Joshua Pollard, Michael J. Allen, and Julie Gardiner, 93–107. Prehistoric Society Research Paper 4. Oxford: Oxbow.
- Barrett, John C., and Ilhong Ko. 2009. "A Phenomenology of Landscape: A Crisis in British Landscape Archaeology?" *Journal of Social Archaeology* 9 (3): 275–294.
- Behre, K.-E. 1981. "The Interpretation of Anthropogenic Indicators in Pollen Diagrams." *Pollen et Spores* 23: 225–245.
- Bell, Martin, and Gordon Noble. 2012. "Prehistoric Woodland Ecology." In *Image, Memory and Monumentality Archaeological Engagements with the Modern World*, edited by A. M. Jones, Joshua Pollard, Michael J. Allen, and Gardiner Julie, 80–92. Prehistoric Society Research Paper 5. Oxford: Oxbow.
- Birks, H. J. B. 1996. "Contributions of Quaternary Palaeoecology to Nature Conservation." *Journal of Vegetation Science: Official Organ of the International Association for Vegetation Science* 7 (1): 89–98.
- Bishop, Rosie R., Mike J. Church, and Peter A. Rowley-Conwy. 2015. "Firewood, Food and Human Niche Construction: The Potential Role of Mesolithic Hunter-Gatherers in Actively Structuring Scotland's Woodlands." *Quaternary Science Reviews* 108 (January): 51–75.
- Brophy, Kenneth, and Kirsty Millican. 2015. "Wood and Fire: Scotland's Timber Cursus Monuments." *Archaeological Journal* 172 (2): 1–28.
- Brown, A. G. 1982. "Human Impact on the Former Floodplain Woodlands of the Severn." In *Archaeological Aspects of Woodland Ecology*, edited by Martin Bell, and Susan Limbrey, 146 vols, 93–104. Oxford: BAR International Series.
- Brown, A. G. 1988. "The Palaeoecology of Alnus (alder) and the Postglacial History of Floodplain Vegetation. Pollen Percentage and Influx Data from the West Midlands, United Kingdom." *The New Phytologist* 110: 425–443.
- Brown, A. G. 1997. "Clearances and Clearings: Deforestation in Mesolithic/Neolithic Britain." *Oxford Journal of Archaeology* 16 (2): 133–146.
- Brown, A. G., and Keith E. Barber. 1985. "Late Holocene Palaeoecology and Sedimentary History of a Small Lowland Catchment in Central England." *Quaternary Research* 24 (1): 87–102.
- Brück, Joanna. 1998. "In the Footsteps of the Ancestors: A Critical Review of Christopher Tilley's "A Phenomenology of Landscape: Places, Paths, and Monuments." *Archaeological Review from Cambridge* 15 (1): 23–36.
- Brück, Joanna. 2005. "Experiencing the Past? The Development of a Phenomenological Archaeology in British Prehistory." *Archaeological Dialogues* 12 (1): 45–72. Cambridge University Press.
- Bunting, M. J., Michelle Farrell, A. Broström, K. L. Hjelle, F. Mazier, R. Middleton, A. B. Nielsen, E. Rushton, H. Shaw, and C. L. Twiddle. 2013. "Palynological Perspectives on Vegetation Survey: A Critical Step for Model-Based Reconstruction of Quaternary Land Cover." *Quaternary Science Reviews* 82 (December): 41–55.
- Caseldine, Chris, Ralph M. Fyfe, and Kari Hjelle. 2007. "Pollen Modelling, Palaeoecology and Archaeology: Virtualisation and/or Visualisation of the Past?" *Vegetation History and Archaeobotany* 17 (5): 543–549. Springer-Verlag.
- Chapman, Henry P., and Benjamin R. Gearey. 2000. "Palaeoecology and the Perception of Prehistoric Landscapes: Some Comments on Visual Approaches to Phenomenology." *Antiquity* 74 (284): 316–319. Cambridge University Press.
- Chapman, Henry P., and Benjamin R. Gearey. 2013. "Iconoclasm in European Prehistory? Breaking Objects and Landscapes." In *Striking Images, Iconoclasms Past, Present and Future*, edited by S. Boldrick, L. Brubaker, and R. Clay, 25–39. USA: Ashgate.
- Chapman, Henry P., and Benjamin R. Gearey. *Forthcoming*. "Palaeoenvironments, Chronology and Perception of Landscape Change in the Neolithic: A Case Study of Hatfield Moors, England." In *Living Landscapes: Neolithic Ireland and Beyond*, edited by Rick Schulting, and Nicki Whitehouse. Oxford: Archaeopress.
- Clarke, Bryan. 2014. "Becoming Rhizome Researchers." *Reconceptualizing Educational Research Methodology* 4 (1): 35–43.
- Conolly, James, and Mark Lake. 2006. *Geographical Information Systems in Archaeology*. Cambridge: Cambridge University Press.
- Cummings, Vicki, and Alasdair Whittle. 2003. "Tombs with a View: Landscape, Monuments and Trees." *Antiquity* 77 (296): 255–266.
- Dark, Petra. 1999. "Pollen Evidence for the Environment of Roman Britain." *Britannia* 30: 247–272.
- Deakin, Roger. 2010. *Wildwood: A Journey Through Trees*. London: Penguin.
- Dee, Tim. 2016. "Super Natural: The Rise of the New Nature Writing." *The National*. Accessed 10 November. <http://www.thenational.ae/arts-culture/books/super-natural-the-rise-of-the-new-nature-writing>.
- Edwards, Kevin J., Ralph M. Fyfe, Chris O. Hunt, and J. Edward Schofield. 2015. "Moving Forwards? Palynology and the Human Dimension." *Journal of Archaeological Science* 56: 117–132.
- Elford, Colin. 2011. *A Year in the Woods: The Diary of a Forest Ranger*. London: Penguin.
- Evans, J. G. 2003. *Environmental Archaeology and the Social Order*. London: Routledge.
- Farrell, Michelle. 2012. "Is Relative Pollen Productivity Constant Across Europe?" *Quaternary International* 279: 461–478.
- Farrell, Michelle, M. Jane Bunting, and Richard Middleton. 2016. "Replicability of Data Collected for Empirical Estimation of Relative Pollen Productivity." *Review of Palaeobotany and Palynology* 232: 1–13.
- Fleming, Andrew. 1999. "Phenomenology and the Megaliths of Wales: A Dreaming Too Far?" *Oxford Journal of Archaeology* 18 (2): 119–125.
- Fleming, Andrew. 2005. "Megaliths and Post-Modernism: The Case of Wales." *Antiquity* 79 (306): 921–932.



- Füssel, H.-M. 2007. "Vulnerability: A Generally Applicable Conceptual Framework for Climate Change Research." *Global Environmental Change: Human and Policy Dimensions* 17 (2): 155–167.
- Fyfe, Ralph M., Chris Caseldine, and Mark Gillings. 2010. "Pushing the Boundaries of Data? Issues in the Construction of Rich Visual Past Landscapes." *Quaternary International* 220 (1–2): 153–159.
- Fyfe, Ralph M., Claire Twiddle, Shinya Sugita, Marie-Jose Gaillard, Philip Barratt, Christopher J. Caseldine, John Dodson, et al. 2013. "The Holocene Vegetation Cover of Britain and Ireland: Overcoming Problems of Scale and Discerning Patterns of Openness." *Quaternary Science Reviews* 73: 132–148.
- Garrard, G. 2011. *Ecocriticism*. Routledge: London.
- Gearey, Benjamin, Henry P. Chapman, and Andy Howard. 2016. *Down by the River*. Oxford: Oxbow Books.
- Gearey, Benjamin, and S. Richer. n.d. "Towards an Ecocritical Palaeoecology." *International Review of Environmental History*.
- Godwin, H. 1981. *The Archives of Peat Bogs*. Cambridge: Cambridge University Press.
- Gosden, Chris, and Lambros Malafouris. 2015. "Process Archaeology (P-Arch)." *World Archaeology* 47 (5): 701–717.
- Grant, Michael J., Martyn P. Waller, and Jon A. Groves. 2011. "The Tilia Decline: Vegetation Change in Lowland Britain During the Mid and Late Holocene." *Quaternary Science Reviews* 30 (3–4): 394–408.
- Green, Olivia Odom, Ahjond S. Garmestani, Craig R. Allen, Lance H. Gunderson, J. B. Ruhl, Craig A. Arnold, Nicholas A. J. Graham, et al. 2015. "Barriers and Bridges to the Integration of Social-Ecological Resilience and Law." *Frontiers in Ecology and the Environment* 13 (6): 332–337.
- Head, L. 2008. "Is the Concept of Human Impacts Past Its Use-by Date?" *The Holocene* 18 (3): 373–377.
- Hemery, Gabriel. 2011. "Forest, Woodland, Copse or Spinney." *Gabriel Hemery*, 1 August. <https://gabrielhemery.com/2011/08/01/forest-woodland-copse-or-spinney/>.
- Hodder, Ian. 1995. *Theory and Practice in Archaeology*. London: Routledge.
- Ingold, T. 1996. "The Temporality of the Landscape." *World Archaeology* 25: 152–174.
- Ingold, T. 2000. *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*. London: Routledge.
- Innes, James B., Jeffrey J. Blackford, and Peter A. Rowley-Conwy. 2013. "Late Mesolithic and Early Neolithic Forest Disturbance: A High Resolution Palaeoecological Test of Human Impact Hypotheses." *Quaternary Science Reviews* 77: 80–100.
- Jackson, Stephen T. 2012. "Representation of Flora and Vegetation in Quaternary Fossil Assemblages: Known and Unknown Knowns and Unknowns." *Quaternary Science Reviews* 49: 1–15.
- Johnson, Matthew. 2010. *Archaeological Theory: An Introduction*. London: Wiley-Blackwell.
- Johnson, Matthew. 2011. "On the Nature of Empiricism in Archaeology." *Journal of the Royal Anthropological Institute* 17 (4): 764–787.
- Jones, Richard L. C. 2016. "Responding to Modern Flooding: Old English Place-Names as a Repository of Traditional Ecological Knowledge." *Journal of Ecological Anthropology* 18 (1). doi:10.5038/2162-4593.18.1.9.
- Kourampas, N. 2012. "Soils, Sediments and Landscapes of Dwelling: Geoarchaeology and the Symmetrical Project." *Journal for Ancient Studies* 3: 209–212.
- Macfarlane, Robert. 2015a. "A Poet's Field Guide." *Cambridge Alumni Magazine*: 32–37.
- Macfarlane, Robert. 2015b. *Landmarks*. London: Penguin.
- Macfarlane, Robert. 2016. "Why We Need Nature Writing." *New Statesman*. Accessed 10 November. <http://www.newstatesman.com/culture/nature/2015/09/robert-macfarlane-why-we-need-nature-writing>.
- Maitland, Sara. 2013. *Gossip from the Forest: The Tangled Roots of Our Forests and Fairytales*. London: Granta.
- Marran, Peter. 2015. "Professor Oliver Rackham: Botanist and Expert on Historic Trees and Ancient Woodland Whose Work Inspired a Generation of Conservationists." *The Independent*, 27 February. <http://www.independent.co.uk/news/obituaries/professor-oliver-rackham-botanist-and-expert-on-historic-trees-and-ancient-woodland-whose-work-10076570.html>.
- McCoy, Mark D., and Thegn N. Ladefoged. 2009. "New Developments in the Use of Spatial Technology in Archaeology." *Journal of Archaeological Research* 17 (3): 263–295.
- McQuade, Melanie, and Lorna O'Donnell. 2007. "Late Mesolithic Fish Traps from the Liffey Estuary, Dublin, Ireland." *Antiquity* 81 (313): 569–584.
- Moore, Peter D., J. A. Webb, and M. E. Collinson. 1991. *Pollen Analysis*. Oxford: Wiley-Blackwell.
- Nelson, M. C., M. Hegmon, S. R. Kulow, M. A. Peeples, K. W. Kintigh, and A. P. Kinzig. 2011. "Ecology and Society: Resisting Diversity: A Long-Term Archaeological Study." *Ecology and Society* 16 (11). <http://www.ecologyandsociety.org/vol16/iss1/art25/>.
- O'Brien, Elizabeth. 2005. "Trees and Woodlands: Nature's Health Service." *Forest Research*. [http://www.forestry.gov.uk/pdf/FR\\_twnhs\\_book.pdf/\\$FILE/FR\\_twnhs\\_book.pdf](http://www.forestry.gov.uk/pdf/FR_twnhs_book.pdf/$FILE/FR_twnhs_book.pdf).
- Oxford English Dictionary. 1928. "Woodland, N." <http://www.oed.com/view/Entry/230046?redirectedFrom=Woodland>.
- Pearson, Elizabeth. 2014. "Toolkit for Rapid Assessment of Small Wetland Sites." Report 1982. Worcestershire Archive and Archaeology Service. <https://content.historicengland.org.uk/images-books/publications/toolkit-rapid-assessment-small-wetland-sites/6244-small-wetland-s-report-ver2.pdf/>.
- Perry, George L. W., John Wainwright, Thomas R. Etherington, and Janet M. Wilmshurst. 2016. "Experimental Simulation: Using Generative Modeling and Palaeoecological Data to Understand Human-Environment Interactions." *Frontiers in Ecology and Evolution* 4 (109). doi:10.3389/fevo.2016.00109.
- Rackham, Oliver. 1990. *Trees and Woodland in the British Landscape*. London: Phoenix Press.
- Rackham, Oliver. 2006. *Collins New Naturalist Library (100) - Woodlands*. London: Collins.
- Rackham, Oliver. 2014. *The Ash Tree*. Dorset: Little Toller Books.
- Richer, S. Forthcoming. "The Site That Slipped through the 'Lime Decline' Net: A Holocene History of Tilia at Shrawley Wood, Worcestershire, UK." *Quaternary Newsletter*.
- Riede, Felix, Per Andersen, and Neil Price. 2016. "Does Environmental Archaeology Need an Ethical Promise?" *World Archaeology*: 1–16.
- Smart, Ron, and Richard Wellings, eds. 2009. *Worcestershire Woodin': Hazel Woods in a Nutshell*. Coalbrookdale: Small Woods Association.
- Stafford, Fiona. 2016. *The Long, Long Life of Trees*. Yale: Yale University Press.

- Sugita, Shinya. 2007. "Theory of Quantitative Reconstruction of Vegetation I: Pollen from Large Sites REVEALS Regional Vegetation Composition." *The Holocene* 17 (2): 229–241.
- Thomas, Julian. 2013. *The Birth of Neolithic Britain: An Interpretive Account*. Oxford: Oxford University Press.
- Tudge, Colin. 2006. *The Secret Life of Trees: How They Live and Why They Matter*. London: Penguin.
- Waller, Martyn, Michael J. Grant, M. Jane Bunting, and Claire Ivison. 2012. "Modern Pollen Studies from Coppiced Woodlands and Their Implications for the Detection of Woodland Management in Holocene Pollen Records." *Review of Palaeobotany and Palynology* 187: 11–28.
- Walsh, Kevin, Suzi Richer, and J. L. de Beaulieu. 2006. "Attitudes to Altitude: Changing Meanings and Perceptions within a 'Marginal' Alpine Landscape – the Integration of Palaeoecological and Archaeological Data in a High-Altitude Landscape in the French Alps." *World Archaeology* 38 (3): 436–454.
- Waters, Colin N., Jan Zalasiewicz, Colin Summerhayes, Anthony D. Barnosky, Clément Poirier, Agnieszka Gałuszka, Alejandro Cearreta, et al. 2016. "The Anthropocene is Functionally and Stratigraphically Distinct from the Holocene." *Science* 351 (6269): 138–149.
- Watkins, Charles. 2016. *Trees, Woods and Forests: A Social and Cultural History*. London: Reaktion Books.
- Whitehouse, Nicki J., and David Smith. 2004. "'Islands' in Holocene Forests: Implications for Forest Openness, Landscape Clearance and 'Culture-Steppe' Species." *Environmental Archaeology* 9: 203–212.
- Whitehouse, Nicki J., and David Smith. 2010. "How Fragmented was the British Holocene Wildwood? Perspectives on the 'Vera' Grazing Debate from the Fossil Beetle Record." *Quaternary Science Reviews* 29 (3–4): 539–553.