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David N. Smith, Mark Fletcher, Katie Head, Wendy Smith and Andy J. Howard

The results from an analysis of pollen, insect and plant macrofossil remains from the shallow wood peat fill of a palaeochannel associated with hummocky (deglacial) sediments infilling the valley of the River Irwell at Walmersley known locally as Burrs Countryside Park, Bury, Greater Manchester (NGR SD 796 127) are presented. Radiocarbon dates from the deposit provide an age range from 1310 to 1040 cal. BC to 920 to 800 cal. BC. The environmental record indicates that during the Middle and Late Bronze Age the valley floor was covered by carr woodland consisting mainly of alder and hazel, including areas of open water. Insect and pollen remains indicate that mixed deciduous woodland (birch, elm, beech and ash) was present on the surrounding slopes. Although non-arboreal pollen remains low and may merely indicate woodland edge grassland communities, increases in the percentage of oak and birch pollen over time may reflect small-scale clearance of the alder carr in the valley bottom. Alternatively, if the pollen diagram is merely recording a decline in alder pollen at the top of the profile, this could also explain the increase in the relative proportion of other arboreal taxa. There are no taxa present directly indicative of human activities associated with the nearby Castle Steads hillfort. The palaoenvironmental results from this site appear to match those for the Greater Manchester area and wider north-west region in general, suggesting that there was a mosaic of environments present in the Bronze Age, with some areas cleared of woodland earlier than others.

Keywords: Greater Manchester, Bronze Age, palaeoenvironments, insects, pollen

Introduction

The late prehistoric archaeology of the north-west of England, particularly the area around Greater Manchester, is relatively under-explored when compared to other areas of Great Britain. This paucity of data is particularly acute for the Late Bronze Age and Iron Age in the region. This is despite clear evidence for Bronze Age settlement from the Manchester Airport site, and the occurrence of a number of large hillforts in the area during the Late Iron Age, for example, Mellor at Stockport, Castle Steads at Bury, Beeston Castle, Cheshire and Eddisbury, Cheshire.

This pattern is particularly true for palaeoenvironmental studies in this region. Hall and Huntley (2007, 51) and Kenward (2009) in the English Heritage regional reviews for this area stress the rarity of palaeoenvironmental sites of Bronze Age date east of the Pennines and in greater Manchester specifically. Major studies are limited to the English Heritage-funded North West Wetlands Survey for Greater Manchester, centred on a study of pollen at Chat Moss Mire as well a number of smaller mires (Wells *et al.* 1993; Hall *et al.* 1995). Despite this activity, the number of Bronze Age and Iron Age sites with palaeoenvironmental investigation in the region still remains relatively small and only provides broad and disparate data with which to attempt landscape

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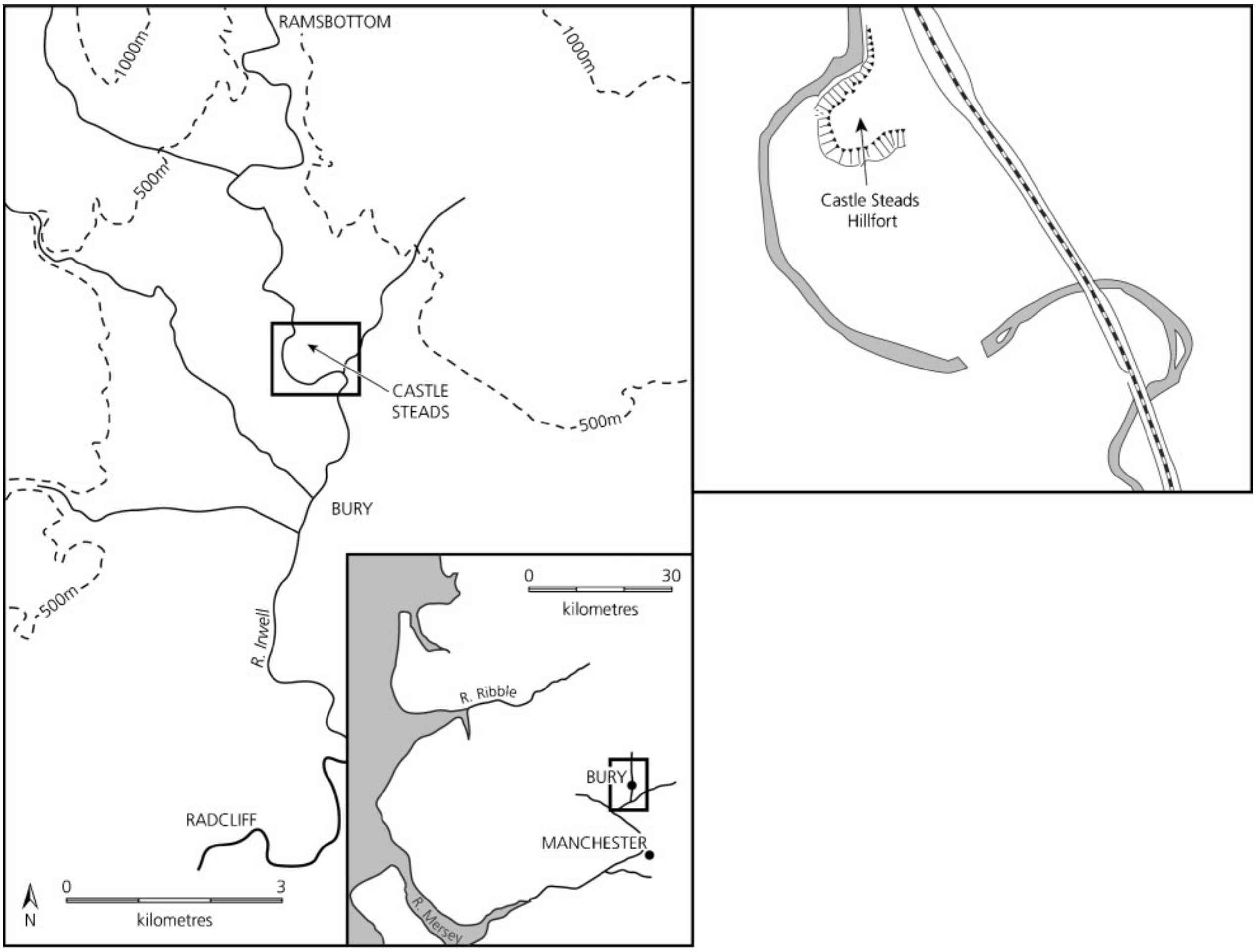

Figure 1 **Location of Bury, Walmersley, Greater Manchester, UK**

reconstruction. As a result of this paucity of data in the region, Hall and Huntley (2007, 254) suggest that all wetland sites west of the Pennines and dating to the earlier prehistoric warrant specific attention.

Taken out of context, the site described here could be seen as 'parochial' and the research undertaken as somewhat limited since only a relatively small period of time is considered. The results are somewhat unspectacular, largely confirming our views of the Late Bronze Age/Early Iron Age environment of this region. However, given the discussion above, it is clear that even such a limited study as this is of regional importance for Greater Manchester and helps to fill what are in fact previously 'blank' time periods.

This paper describes the results of an environmental analysis of a shallow deposit of Middle to Late Bronze Age wood peat associated with hummocky (deglacial) sediments infilling the valley of the River Irwell at Walmersley, Bury, Greater Manchester (NGR SD 796 127) (Fig. 1). In addition to the opportunity to explore natural vegetation succession and landscape change, the position of the sampling site, directly below the small promontory hillfort at Castle Steads, potentially provided the opportunity to reconstruct the environmental setting of this area in the period prior to Late Iron Age to Romano-British human occupation.

Background

The work results from commercial trial trenching undertaken (under PPG16) by Matrix Archaeology, prior to groundworks related to the Burrs Caravan Park, and funded by the Caravan Club. The site was located in an area of pastureland 2 km to the north of Bury town centre, and lies at the base of the slope below the Castle Stead Hillfort. A series of radiocarbon dates on charcoal from the fort ditches has produced a combined age range of 550 cal. BC to 247 cal. AD (Beta-56798; Beta-58075; Beta-58076; Beta-58077: 1-sigma – Fletcher 1986; 1992). The peat-filled palaeochannel appeared to have developed as an oxbow and, until the 1990s, was regularly flooded after heavy rain. At *c*. 91 m OD, the palaeochannel

Figure 2 The excavation in progress at Bury showing the depth of the deposit excavated

was elevated about 6 m above the level of the present riverbed. The trial-trench was located just 100 m to the south of the Castle Steads promontory, which rises to a height of 114·50 m OD.

An organic-rich 'wood peat' infilled the palaeochannel hollow associated with the hummocky terrace sediments aggraded during deglaciation at the end of the last cold stage (the Devensian). These Quaternary sediments rest upon shales and fine sandstones of the Carboniferous Coal Measures. The soils developed upon these parent materials comprise either groundwater gleys or freely draining brown-earths (Mackney *et al.* 1983; Fletcher 1986).

Environmental assessment of the sedimentary sequence (pollen, insect and macroscopic plant remains) confirmed the potential of this deposit to yield proxy records for climate and land-use (Head 2005; Smith and Smith 2005). Radiocarbon dating of the uppermost palaeochannel sediments (0–10 cm) yielded an age estimate of 920 to 800 cal. BC (Beta-210417: 2 sigma) and dating of the basal deposits (40–50 cm) yielded an age estimate of 1310 to 1040 cal. BC (Beta-210418: 2 sigma). This indicated that the organic sequence extended from the Middle well into the Late Bronze Age.

Methodology and results

As the organic-rich sequence was relatively thin (0·5 m) (see Fig. 2), environmental samples were removed in 10 cm spits. Since the dates from the upper and lower units were chronologically close, it was decided to concentrate full environmental analysis on three of the five samples (# 1, 0–10 cm; # 3, 20–30 cm; # 5, 40–50 cm).

Pollen

Sediment samples of 2 cm^3 were measured volumetrically. The samples were washed in 10% hydrochloric acid and then digested by 10% potassium hydroxide for 20 minutes in a boiling water bath to break up the soil matrix and dissolve any humic material. As the samples contained a large amount of organic matter, they were acetolysed for three minutes to break down the cellulose material. Finally, the pollen pellet was stained with safranine, washed in alcohol to dehydrate the sample, and preserved in silicon oil.

Pollen grains were counted to a total of 500 land pollen grains (TLP) and analysis was undertaken on a GS binocular polarising microscope at 400 × magnification. Identification was aided by using the pollen reference collection maintained by Worcestershire County Council Historic Environment and Archaeology Service and the reference manual by Moore *et al.* (1991). Nomenclature follows Stace (1997) and Bennett (1994). The pollen diagram (Fig. 3) was constructed using TILIA, TILIA.GRAPH and TGView 2·0·2 software (Grimm 1990; 2004). The diagram was not divided into pollen assemblage zones in this case, as only three samples were analysed.

Insects

The samples were processed using the standard method of paraffin flotation as outlined in Kenward

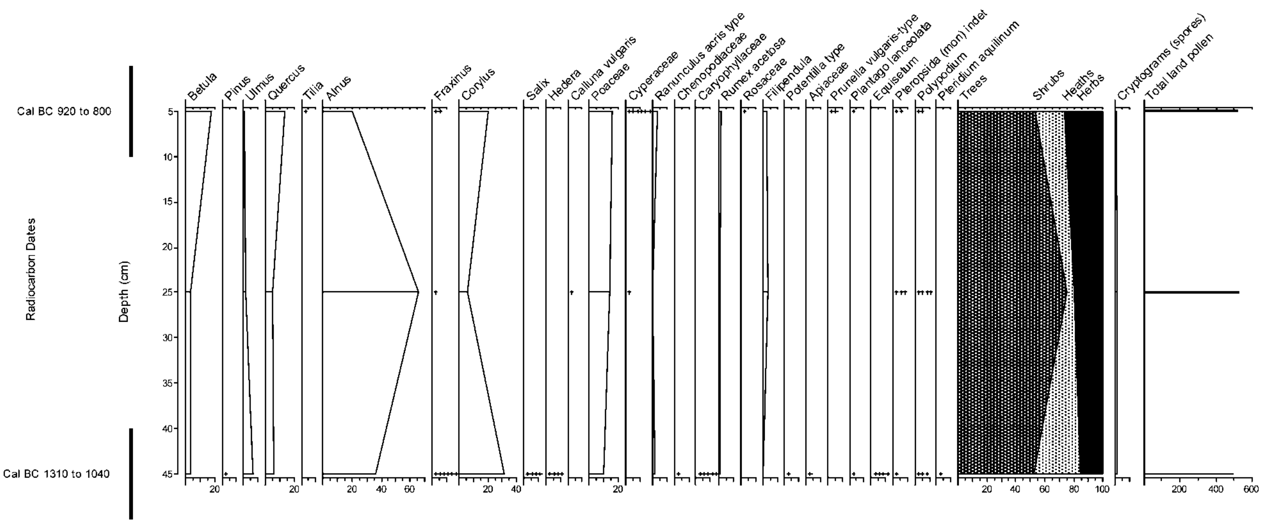

Figure 3 Pollen percentage diagram for Bury

et al. (1980). Each processed sample was of 20 litres. The insect remains present were sorted from the flots and stored in ethanol. The Coleoptera (beetles) present were identified under a low-power binocular microscope at magnifications between $\times 10$–$\times 45$ and by direct comparison to the Gorham and Girling Collections of British Coleoptera held at the University of Birmingham. The records are presented in Table 1, where the taxonomy for the Coleoptera (beetles) follows that of Lucht (1987). Where applicable, each taxon has been assigned to one or more ecological grouping(s) and these are indicated in the second column of Table 1. These groupings are derived from the preliminary classifications outlined by Robinson (1981; 1983) and are described at the end of Table 1. The various proportions of these groups, expressed as percentages of the total Coleoptera present in the faunas, are shown in Table 2 and Fig. 4. The dung/foul, tree, grassland and moorland groupings are calculated as a proportion of the terrestrial taxa recovered rather than as a proportion of the minimum number of individuals for the whole fauna (effectively excluding the dominant water beetles from this statistic). Column 6 in Table 1 indicates modern rarity of certain of the recovered taxa. The scheme used follows the Red Data Book (RDB) classifications of Hyman and Parsons (1992; 1994). Column 7 in Table 1 presents the host plants for the various species of phytophage (plant feeding) beetles recovered. The information included is primarily taken from Koch (1992). The plant nomenclature follows that of Stace (1997).

Macroscopic plant remains

Sub-samples of 500 ml were washed over a 0·3 mm sieve and all of the material retained was sorted at $\times 12$ magnification. Identifications were made at magnifications up to $\times 40$, in comparison with the Institute of Archaeology and Antiquity reference material, as well as in consultation with standard keys (Beijerinck 1976; Schoch *et al.* 1988; Cappers *et al.* 2006). Nomenclature follows Stace (1997). A list of taxa recovered from all three samples and a list of taxa with a specific habitat(s) are illustrated in Tables 3 and 4 respectively. A summary interpretation of the waterlogged plant macrofossil data is provided in Table 5.

The reconstructed landscape present at Bury during the Middle and Late Bronze age

The three environmental proxies studied (pollen, insects and plant macrofossil remains) all suggest that a similar environment existed through out the sequence

Indicators for woodland

All three proxy indicators clearly suggest that woodland formed a dominant aspect of the landscape. Arboreal pollen (trees and shrubs) accounts for 85% of the terrestrial land pollen (TLP) in the basal sample with a slight decline to 74% by the upper sample (Fig. 3). Woodland is represented by ecological group ‘l’ for the Coleoptera data presented in Tables 1 and 2 and Fig. 4 and accounts for approximately 25% of the terrestrial fauna recorded in all three samples. Values such as this for woodland indicators in the archaeoentomological record often are used to suggest the presence of a closed canopy (Robinson 1981; 1983; Whitehouse and Smith 2004; Smith and Whitehouse 2005).

The pollen suggests that, at least locally, this woodland mainly consisted of alder (*Alnus glutinosa*

Table 1 The insects recovered from Bury

		1	3	5	RDB status	Phytophage plant hosts(from Koch 1992)
HEMIPTERA						
Family, gen. et spp. indet.		+	++	++		
COLEOPTERA						
Carabidae						
Nebria brevicollis (F.)		1	–	–		
Clivina fossor (L.)		1	–	–		
Trechus quadristriatus (Schrk.) or *T. obtusus* Er.		1	–	–		
Trechoblemus micros (Hbst.)		1	–	–		
Bembidion spp.		1	–	–		
Patrobus septentrionis Dej.	ws	1	–	–		
Pterostichus diligens (Sturm)	ws	–	2	1		
Pterostichus nigrita (Payk.)	ws	1	2	–		
Pterostichus anthracinus (Ill.)	ws	1	–	–		
Pterostichus oblongopunctatus (F.)	t	3	–	–	nb	
Pterostichus aethiops (Panz.)	t	1	–	–	nb	
Abax parallelepipedus (Pill. Mitt)	t	1	–	–		
Agonum fuliginosum (Panz.)	ws	4	2	–		
Platynus assimilis (Payk.)	t	2	–	1		
Haliplidae						
Haliplus sp.	a	1	–	1		
Dytiscidae						
Coelambus impressopunctatus (Schall.)	a	1	–	–		
Hydroporus palustris (L.)	a		–	5		
Hydroporus spp.	a	1	–	3		
Stictotarsus duodecimpustulatus (F.)	a	–	–	1		
Agabus bipustulatus (L.)	a	3	1	–		
Agabus sturmi (Gylll.)	a	6	–	–		
Agabus spp.	a	–	4	1		
Ilybius ater (Geer)	a	5	–	2		
Ilybius fuliginosus (F.)	a	3	–	4		
Dytiscus spp.	a	1	1	–		
Hydraenidae						
Hydraena britteni Joy	a	4	–	–		
H. spp.	a	48	4	2		
Ochthebius spp.	a	1	–	2		
Limnebius spp.	a	14	–	–		
L. spp.	a		1	5		
Helophorus spp.	a	1	–	–		
Hydrophilidae						
Coelostoma orbiculare (F.)	a	4	2	1		
Megasternum boletophagum (Marsh.)	a	3	1	1		
Laccobius spp.	a	2	–	1		
Enochrus sp.	a	–	–	1		
Hydrobius fuscipes (L.)	a	9	2	4		

Table 1 Continued

		1	**3**	**5**	**RDB status**	**Phytophage plant hosts(from Koch 1992)**
Histeridae						
Abraeus globosus (Hoffm.)	df	1	–	–		
Silphidae						
Silpha spp.		1	–	–		
Ptiliidae						
Acrotrichis spp.		1	1	1		
Liodidae						
Agathidium spp.	t	1	–	–		
Scydmaenidae						
Scydmaenidae gen. et spp. indet.		2	–	–		
Staphylindae						
Proteinus spp.		5	–	1		
Eusphalerum spp.		3	1	3		
Phyllodrepa ioptera (Steph.)		4	–	2		
Omalium spp.		1	–	1		
Lathrimaeum unicolor (Marsh.)	ws	1	1	–		
Olophrum piceum (Gyll.)	ws	4	–	3		
Acidota crenata (F.)		–	1	1		
Lesteva heeri (Fauv.)	ws	6	2	–		
Lesteva longelytrata (Goeze)	ws	1	–	1		
Lesteva pubescens Mannh.	ws	1	–	–		
Lesteva spp.		–	1	1		
Trogophloeus spp.	ws	1	–	–		
Oxytelus rugosus (F.)	df	2	–	–		
Stenus spp.		20	1	1		
Lathrobium spp.		4	1	–		
Gyrohypnus fracticornis (Müll)		1	–	–		
Xantholinus spp.		2	–	–		
Philonthus spp.		5	2	1		
Bolitobius spp.		1	–	–		
Tachyporus sp.		1	–	–		
Tachinus rufipes (Geer)		1	–	–		
Aleocharinidae gen. et. spp. indet.		4	2	1		
Pselaphidae						
Rybaxis spp.		–	1	–		
Brachygluta spp.		1	–	–		
Cantharidae						
Cantharis rufa L.		1	–	–		
Cantharis pallida Goeze		1	–	1	nb	
Elateridae						
Melanotus rufipes (Hbst.)	t	1	–	–		
Athous haemorrhoidalis (F.)	g	1	–	–		
Eucnemidae						
***Melasis buprestoides* (L.)**	t	–	1	–	nb	Dead timber in old broadleaf woodland
Throscidae						

Table 1 Continued

		1	3	5	RDB status	Phytophage plant hosts(from Koch 1992)
Throscus spp.	g	–	–	1		
Dascillidae						
Dascillus cervinus (L.)	g	1	–	1		
Helodidae						
Helodidae gen. & spp. indet. (?*Cyphon* spp.)	ws	32	2	32		
Dryopidae						
Elmis aenea (Müll)	a	1	–	–		
Esolus parallelepipedus (Müll)	a	–	–	1		
Limnius volckmari (Panz.)	a	1	–	1		
Nitidulidae						
Epuraea sp.	g	–	–	1		
Rhizophagidae						
Rhizophagus bipustulatus (F.)	t	1	–	1		Usually under bark of a range of broadleaf trees
Cryptophagidae						
Cryptophagus spp.		1	–	–		
Lathridiidae						
Lathridius minutus (Group)		1	–	–		
Corticaria sp.		–	1	–		
Colydiidae						
Cerylon spp.	t	1	–	–		
Coccinellidae						
Chilocorus renipustulatus (L.)	t	1	–	1		normally on willow (*Salix* spp.)
Cisidae						
Cis sp.	t	–	–	2		
Anobiidae						
Grynobius planus (F.)	t	1	1	–		
Anobium punctatum (Geer)	t	1	–	–		
Ptinidae						
Ptinus spp.		1	3	–		
Mordellidae						
Anaspis spp.		2	–	2		
Scarabaeidae						
Geotrupes spp.	d	1	1	–		
Aegialia sabuleti (Panz.)	d	1	–	–	nb	
Aphodius fimetarius (L.)	d	2	–	–		
Lucanidae						
Sinodendron cylindricum (L.)	t	1	–	–		Dead wood of a range of broadleaf trees
Cerambycidae						
Grammoptera spp.	t	1	–	–		
Chrysomelidae						
Donacia versicolorea (Brahm.)	ws	2	–	–		On pond weed (*Potamogeton* spp.)
Donacia vulgaris Zscach.	ws	1	–	1		On bur-reed (*Sparganium* spp.), sedges (*Carex* spp.) and bullreed (*Typhaea* spp.)
Plateumaris sericea (L.)	ws	13	–	2		Usually on sedges (*Carex* spp.)
Lema spp.	g	1	–	–		

Table 1 Continued

		1	3	5	RDB status	Phytophage plant hosts(from Koch 1992)
Chrysomela sp.	g	1	–	–		
Phaedon spp.	g	2	–	–		
Prasocuris phellandrii (L.)	ws	3	–	3		On aquatic cow parsleys (APIACEAE)
Gastroidea viridula (Geer)	g	–	–	1		Usually on dock (*Rumex* spp.)
Scolytidae						
Scolytus scolytus (F.)	t	1	–	–		Usually on elm (*Ulmus* spp.)
Ieperisinus varius (F.)	t	1	–	–		Usually associated with ash (*Fraxinus excelsior* L.)
Dryocoetes alni (Georg)	t	1	–	–		Usually on alder (*Alnus spp.*)
Xyloterus domesticus (L.)	t	1	–	–		Usually associated with beech (*Fagus sylvatica* L.)
Curculionidae						
Deporaus betulae (L.)	t	3	1	–		Usually birch (*Betula* spp.)
Phyllobius spp.	t	2	–	1		
Strophosoma spp.		–	–	1		
Tanysphyrus lemnae (Payk.)	ws	1	1	–		On duck weed (*Lemna* spp.)
Notaris spp.	ws	–	1	–		
Micrelus ericae (Gyll.)	m	1	–	–		Usually on heather (*Erica* spp./*Calluna* spp.)
Rhynchaenus spp.	t	1	–	1		
Rhamphus pulicarius (Hbst.)	t	2	–	–		On willow (*Salix* spp.)
DIPTERA						
Cyclorrhapha gen. et spp. indet.		+++				
TRICOPTERA						
Gen. et spp. Indet.		+++	+++	++++		

Ecological groupings
a – aquatic species
ws – waterside species either from muddy riverbanks/shores or from waterside vegetation
df – species associated with dung and foul matter
d – species associated with dung
g – species associated with grassland and pasture
t – species either associated with trees or with woodland in generalm – species associated with moorland and acid bogs
For non Coleoptera the numbers present have been estimated using the following scale:
+=>10 individuals
++=<10 individuals
+++=<20 individuals
++++=<50 individuals

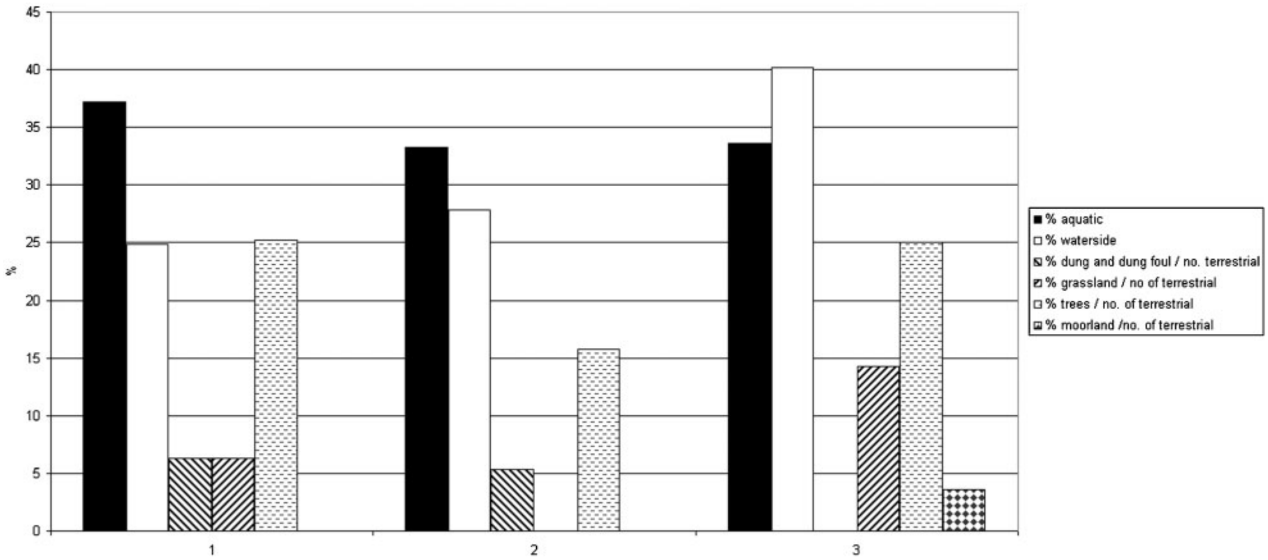

Figure 4 The proportions of the ecological groups of Coleoptera recovered from Bury

(L.) Gaertn) and hazel (*Corylus avellana*-type) (Fig. 2). There is an increase in the representation of alder in the middle of the sequence. The overall dominance of alder is also evident in both the insect and plant macrofossils recovered from this middle deposit. The presence of the beetle *Dryocoetes alni*, which is normally associated with alder (Koch 1992) is considered significant. Normally, alder is under-represented in the archaeoeoentomological record (Girling 1985; Smith *et al.* 2000; Smith and Whitehouse 2005). The presence of other trees, most likely as part of the alder carr, is indicated by the insects *Chilocorus renipustulatus* and *Rhamphus pulicarius*, which are associated with willow (*Salix* spp. — Koch 1992), and by the seeds of downy birch (*Betula pubescens* Ehr.). The insect remains suggest that deadwood (such as from fallen trunks and tree limbs) was present. This is represented by taxa such as Agathidium, *Melanotus rufipes*, *Rhizophagus bipustulatus*, *Grynobius planus*, *Anobium punctatum*, *Sinodendron cylindricum* and *Grammoptera* sp. Several of the ground beetles recovered are associated with leaf litter and forest soils, including *Pterostichus oblongopunctatus*, *P. aethiops*, *Abax parallelepipedus* and *Platynus assimilis* (Lindroth 1974). Wood-sorrel (*Oxalis acetosella* L.), a well-known plant of shaded and/or woodland environments (Packham 1978), was recovered in the plant macrofossil assemblage; however, this taxon can occur elsewhere, such as along hedgebanks (e.g. Stace 1997, 475) or in rough grazing, especially on hill slopes (Packham 1978, 680).

Table 2 The relative proportions of the ecological groups of Coleoptera recovered from Burrs Countryside Park, based on MNI

Sample number	1	3	5
Number of individuals	293	48	107
Number of species	95	31	47
% aquatic	37·2%	33·3%	33·6%
% waterside	24·9%	27·1%	40·2%
% dung and dung foul (of terrestrial)	6·3%	5·3%	0·0%
% grassland (of terrestrial)	6·3%	0·0%	14·3%
% trees (of terrestrial)	25·2%	15·8%	25·0%
% moorland (of terrestrial)	0·0%	0·0%	3·6%

More mixed woodland probably grew on the higher valley sides. Limited indicators for elm (*Ulmus* spp.), oak (*Quercus* spp) and silver birch (*Betula pendula* Roth), as well as occasional examples of ash (*Fraxinus excelsior* L.), lime (*Tilia cordata* Mill.) ivy (*Hedera helix* L.) and pine (*Pinus* spp.) are all found in the pollen, plant macrofossil and insect records. The pollen record suggests that there is a minor decline in the occurence of alder and elm pollen towards the upper part of the sequence.

Indicators for open areas and cultivated ground

There is little evidence for the presence of substantial clearance or cultivated ground in the pollen record; both herb and heath pollen only account for 15% to 20% of the terrestrial land pollen in each sample. This is a minor aspect of the pollen profiles, which is dominated by grass (Poaceae undiff.) with only the occasional presence of other herbs primarily meadow buttercup (*Ranunculus acris*-type), common sorrel (*Rumex acetosa* L.) and meadowsweet (*Filipendula* spp.). There is a slight increase in the proportions of these species towards the top of the sequence, perhaps suggesting an increase in clearings in the area, although this simply could indicate localised damp/wet ground. Classic indicators for clearance such as ribwort plantain (*Plantago lanceolata* L.) and self-heal (*Prunella vulgaris*-type), however, appear only in the upper sample, supporting an open grassland interpretation; either cleared by humans or reflecting woodland-edge grassland communities.

Conversely, the presence of areas of cleared ground, meadow or pasture is only indicated in the insect faunas from the lower two samples. The evidence for this consists of a few individuals of Geotrupes and Aphodius 'dung beetles', the 'click beetle' *Athous haemorrhoidalis*, which is associated with grassland, and the 'leaf beetle' *Gastroidea viridula*, which is associated with docks. However, this ecological group only represents a very small proportion of this insect fauna (see ecological group 'p' in Table 2 and Fig. 4) and probably suggests that clearings (not necessarily created through human agency) were limited at this time. One possible explanation for the discrepancy between the archaeoentomological and palynological data may be a decline in alder pollen in the upper sample; this would

Table 3 Waterlogged plant remains from Bronze Age palaeochannel deposits at Bury

Sample number	**1**	**3**	**5**	
Sample location in column	**0–10 cm**	**20–30 cm**	**40–50 cm**	
Latin Binomial				**English Common Name**
Urtica dioica L.	–	1	–	Common Nettle
cf. *Urtica dioica* L.	1	–	–	?Common Nettle
Betula pendula Roth	–	1	5	Silver Birch
Betula pubescens Ehr.	–	5	12	Downy Birch
Betula spp. – indeterminate	18	64	37	Birch
Betula spp. – catkin	–	–	1	Birch
cf. *Betula* spp. - buds	–	2	–	Birch
Alnus glutinosa (L.) Gaertn.	9	481	317	Alder
Alnus glutinosa (L.) Gaertn. – infrustructure	–	1	4	Alder
cf. *Alnus glutinosa* (L.) Gaertn.	–	10	–	Possible Alder
Stellaria media (L.) Vill. agg.	–	185	–	Common Chickweed
Cerastium spp.	3	–	–	Mouse-ear
CARYOPHYLLACEAE – *Silene* type	–	–	1	Pink Family
cf. *Salix* sp. – bud	2	1	–	Possible Willow Bud
Filipendula ulmaria (L.) Maxim.	–	–	2	Meadowsweet
Rubus spp.	1	6	–	Bramble/Blackberry
cf. *Sanguisorba minor* Scop. ssp. minor	2	2	–	Possible Salad Burnet
Melilotus/Medicago/Trifolium sp.	–	1	–	Melilot/Medick/Clover
Medicago sp. – pod fragment	–	10	–	Medick
Myriophyllum sp.	–	1	–	Water-milfoil
Oxalis acetosella L.	2	11	1	Wood-sorrel
Galeopsis sp.	–	–	1	Hemp-nettle
Lycopus europaeus L.	1	101	2	Gypsywort
LABIACEAE – unidentified	1	–	1	Mint Family
Callitriche spp.	96	132	123	Water-starwort
Campanula sp.	2	–	–	Bellflower
Galium sp.	–	1	–	Bedstsraw
ASTERACEAE – unidentified	–	–	1	Daisy Family
Alisma cf. *plantago-aquatica* L.	1	50	452	Possible Water-plantain
Potamogeton spp.	–	–	3	Pondweed
Juncus spp.	25	289	5	Rush
Carex spp. – 2-sided urticle	38	386	8	Sedge
Carex spp. – small 3-sided urticle	–	60	–	Sedge
POACEAE – indeterminate large grass caryopsis	1	110	–	Large-seeded Grass
POACEAE – indeterminate medium grass caryopsis	33	–	7	Medium-seeded Grass
POACEAE – indeterminate small grass caryopsis	12	25	3	Small-seeded Grass
Unidentified – anther	–	–	3	Anther
Unidentified – buds	1	2	27	Bud
Unidentified – large, elongated bud	–	3	5	Large, Elongated Bud
Unidentified – bud scars	–	4	1	Bud Scar
Unidentified – fruit/bud	–	4	–	Fruit/Bud
Unidentified – leaf fragment	1	–	–	Leaf
UNIDENTIFIED	3	6	3	Unidentified
TOTAL IDENTIFICATIONS	**253**	**1955**	**1025**	
OTHER REMAINS OBSERVED				
Bryophite – unidentified fragments	–	–	+	Moss
Daphnia spp.	+	++	++	Waterflea

Nomenclature follows Stace (1997). Unless otherwise stated, counts are for seeds (in the widest sense).Key: +=<5 items, ++=5–20 items, +++>20 items

Table 4 Habitats of waterlogged plant macrofossils from Bronze Age deposits at Burrs Countryside Park (Habitat information follows Stace 1997)

HABITAT	WATER	WATER-SIDE	WET/ DAMP GROUND	FENS/ MOORS	HEATH-LAND	GRASS-LAND	CULTIV-ATED GROUND	WASTE/ ROUGH GROUND	HEDGE-BANKS	WOOD-LAND	ROCKY PLACES	OPEN GROUND (UN-SHADED)	SHADED PLACES	ACID SOILS	CALCA-REOUS/ BASE-RICH SOIL	NITR-OGEN RICH SOIL	NEU-TRAL SOIL	
Latin Binomial																		English Common Name
AQUATIC TAXA																		
Myriophyllum spp.																		Water-milfoil
Callitriche spp.			?															Water-starwort
Alisma cf. *plantago-aquatica* L.																		Possible Water-plantain
Potamogeton spp.																		Pondweed
WATERSIDE TAXA																		
Alnus glutinosa (L.) Gaertn.																		Alder
Lycopus europaeus L.																		Gypsywort
Carex spp.																		Sedge
WET/DAMP GROUND TAXA																		
Filipendula ulmaria (L.) Maxim.																		Meadowsweet
Juncus sp.																		Rush
WOODLAND TAXA																		
Urtica dioica L.																		Common Nettle
Betula pendula Roth																		Silver Birch
Betula pubescens Ehr.																		Downy Birch
Oxalis acetosella L.																		Wood-sorrel
TAXA OF VARIED ENVIRONMENTS/ SOILS																		
Galeopsis spp.			?							?								Hemp-nettle
Stellaria media s.l.																		Common Chickweed
cf. *Sanguisorba minor* Scop. ssp. minor																		Possible Salad Burnet

automatically result in a relative increase in the proportion of herb/heath pollen, even if the actual number of pollen grains was constant.

There is also a suggestion that some areas of heath or bog may have been locally present. Small traces of heather (*Calluna vulgaris* (L.) Hull) pollen were found along with two individuals of the weevil *Micrelus ericae*, which feeds on heather. Small numbers of the spores of horse tail (*Equisetum* spp.), polypody fern (*Polypodium* spp.) and bracken (*Pteridium aquilinum agg*.) were also recorded on the pollen slides. A single individual of the scarabiid beetle *Aegialia sabuleti* was also recovered. This species is normally associated with decaying matter on sandy ground (Jessop 1986).

Wetlands and local bodies of water

There is clear evidence in all of the environmental proxies that this wood carr peat developed in an area which contained pools of still or stagnant water surrounded by waterside vegetation, damp ground and carr woodland. The insect fauna was dominated by aquatic and waterside species (see groups 'a' and 'ws' in Table 2 and Fig. 4). The vast majority of the species recovered are 'diving water beetles' (Dytiscidae) such as *Agabus bipustulatus*, *Ilybius ater*, *I. fuliginosus* and *Coelambus impressopunctatus*. These species are all associated with small bodies of slow-flowing or still water, often with dense stands of waterside vegetation (Nilsson and Holmen 1995). *Agabus sturmi* and the hydraenid *Hydraena britteni* usually favour similar bodies of water, particularly if decaying tree leaves are present (Hansen 1987; Nilsson and Holmen 1995). Other water beetles present such as the *Ochthebius*, *Limnebius*, and *Laccobius* species, and *Coelostoma orbiculare*, also indicate similar conditions (Hansen 1987). Damp, muddy and possibly also waterside conditions are also suggested by several of the species of plant macrofossils recovered, including gypsywort (*Lycopus europaeus* L.), rush (*Juncus* spp.) and sedge (*Carex* spp.). Evidence for slow-flowing, deep water is strongly supported by abundant macrofossil remains of water starwort (*Callitriche* sp.) and water plantain (*Alisma cf. plantago-aquatica* L.), which account for 40%–56% of all seed identifications in the samples (Table 5). It is probable, therefore, that this deposit represents alder carr developing around a pool.

Large numbers of the 'reed beetle' *Donacia vulgaris* suggest that either sedges or bur-reeds surrounded the open areas of water. The presence of these species of plant is also recorded in both the pollen and plant macrofossils assemblages. Open areas of water also seem to have supported pondweed (*Potamogeton* spp.) and duckweed (*Lemna* sp.), since these plants are the hosts of *Donacia versicolorea* and the weevil *Tanysphyrus lemnae* respectively. The striking yellow and blue-stripped 'leaf beetle' *Prasocuris phellandrii* suggests that waterside 'cow parsleys' also occurred in the area (Koch 1992). The presence of dense stands of waterside vegetation growing in soft silt and mud is also suggested by the ecology of the range of the Carabidae, 'ground beetles', recovered. These included *Patrobus septentrionis*, *Pterostichus diligens*, *P. nigrita*, *P. anthracinus* and *Agonum fuliginosum* (Lindroth 1974). Similar conditions are often favoured by several of the species of staphylinid 'rove beetles' recorded such as the *Lesteva* species, *Lathrimaeum unicolor* and *Olophrum piceum* (Tottenham 1954). The helodid genus *Cyphon*, present in large numbers, usually is associated with shallow detritus and leaf filled waters in small ponds (Harde 1984).

Table 5 Summary of macroscopic plant remains analysis. Numbers in [ ]=relative proportion of all identifications

Sample	Water conditions	Surrounding Vegetation
Sample 1 (0–10 cm)	Deep water – water starwort (*Callitriche* spp.) abundant [38%]	Some evidence for damp to wet ground (*Juncus* spp./*Carex* spp.) [25%]. Only limited evidence for woodland, with a small quantity of indeterminate birch (*Betula* spp.) seed present [7%]
Sample 3 (20–30 cm)	Deep water – water starwort (*Callitriche* spp.) and water plantain (*Alisma* cf. *plantago-aquatica* L.) present, but not accounting for a large proportion of the overall assemblage [9%]	Strong evidence for damp to wet ground (*Lycopyus europaeus* L., *Juncus* spp. and *Carex* spp. seeds abundant) [40%]. Also supported by substantial quantities of alder (*Alnus glutinosa* (L.) Gaertn.) seeds. Evidence for woodland (most likely carr) with alder and birch seeds abundant [37%]
Sample 5 (40–50 cm)	Deep water – water starwort (*Callitriche* spp.) and water plantain (*Alisma* cf. *plantago-aquatica* L.) abundant [56%]	Evidence for damp ground very limited, with only small quantities of *Lycopus europaeus* L., *Juncus* spp. and *Carex* spp. seeds recovered [2%]. Alder and birch seeds still abundant – suggesting woodland (most likely carr with birch in drier areas) present [29%]

Discussion: the use and change in the landscape at Bury and its comparision to regional patterns

This multi-proxy analysis suggests that, at least on the valley floor, the landscape was dominated by alder carr wetland during the Middle and Late Bronze Age. Though alder carr dominates throughout the whole period of the sedimentary record, there does appear to be a change in the vegetational sequence from one dominated by alder/hazel carr woodland to one including a more substantial proportion of oak and birch. It is possible that this represents a change in how pollen from the valley sides was 'filtered' by the surrounding vegetation and the alder carr during this period (Waller 1994); alternately reductions in local prolific pollen producers (such as alder) may have resulted in increased proportional representation of the dryland taxa (Fyfe 2006). Indeed, it is clear from all the proxy environmental indicators from these three deposits that there are changes to both the surface and marginal waterside vegetation, which suggests that the area may have gone through drier and wetter phases. It is also possible that this change in the pollen spectra simply may represent a 'recolonisation' of the landscape by oak and birch during the Late Bronze Age. This may suggest that the area had been cleared to a limited extent by local populations in the Early or Middle Bronze Age. This is perhaps supported by Barnes' (1993) work on the pollen from Castle Steads itself which showed a decline and subsequent recovery in elm pollen at this time. In addition, in the later or uppermost deposit, there are occasional clearance indicators in the pollen data such as ribwort plantain (*Plantago lanceolata* L.) and self-heal (*Prunella vulgaris* L.), although these herbs never appear to have contributed significantly to the overall vegetation and may merely highlight woodland edge communities or a general opening up of the landscape by means other than human agency. The presence of small clearings in earlier periods is also suggested by the recovery of a small number of dung beetles. It is possible that these changes in vegetation indicate clearings created through human activity such as grazing livestock and farming. However, the role of wild, as well as domesticated, animals in forming and maintaining such small clearances should not be forgotten (Buckland and Edwards 1984; Robinson 2000; Vera 2000).

A single undated pollen sample from the 1992 excavations from the ditch sequence in Castle Steads hillfort suggests that many aspects of the landscape seen in the Bronze Age at this site continue into later periods (Barnes 1993). Perhaps the main differences are that arboreal pollen had declined to 50% TLP and that there were higher values for open ground indicators, such as grasses and ribwort plantain (*Plantago lanceolata*). Barnes (1993) suggested that this may relate to the opening the area around the plateau of the Hillfort, but that the valley of the Irewell probably remained thickly covered with alder even in this later period. Similarly, Tallis and McGuire (1971) found that material from below the Roman Road at nearby Ainsworth also gave very high values for alder.

Several sites within the immediate Greater Manchester area have produced similar results to those from Bury. At nearby Hyde, pollen evidence from two peat deposits at Brook House Meadow and Godley Hall Brook (Ogle *et al.* 1997) indicated an alder carr landscape existed during the Bronze Age, with evidence for major clearance during the Late Bronze Age and Early Iron Age (*c.* 810–415 cal. BC). Similarly, to the south-west of Manchester, pollen from the (first) River Bollin site (Garner 2001) suggested that during the Iron Age the area comprised marginal carr by the river, with the surrounding slopes colonised by hazel and ash (Shimwell and Downhill 1998). Other pollen spectra in the region appear to indicate that clearance and farming, unlike the situation at Bury, were of importance from the Early Bronze Age onwards. This is clearly seen at the excavations at Mellor, Stockport (Thompson *et al.* 2005), where Bronze Age round houses and possible animal enclosures predate the large Iron Age settlement. At the second site from the River Bollin (Oversley Farm), the pollen record for the Bronze Age indicated a dominance of open heathland (with hazel/alder/birch scrub), which would have been grazed by stock. It is also believed that crops were cultivated around the site, and this is borne out by the recovery of charred emmer (*Triticum dicoccum* Schübl.) and barley (*Hordeum* sp.) grain, as well as the presence of crop weeds (Garner 2001). In nearby Cheshire, palaeoenvironmental evidence of clearance and regeneration also has been recorded at a number of Bronze Age and Iron Age sites (Wells *et al.* 1993; Hall *et al.* 1995). Just south of Manchester, at Lindow Moss, the clearance and regeneration of Early Bronze Age woodland was noted in the pollen record, with evidence of increased disturbance during the Iron Age (Branch and Scaife 1995). A notable highly wooded phase and increased period of wetness was also recorded at this site between 770 and 400 cal. BC and is correlated with climatic deterioration (Branch and Scaife 1995; Mullin 2003; Leah *et al.* 1997). Analysis of pollen samples from around Bar Mere Hillfort in Cheshire also suggest woodland clearance, cultivation and regeneration between 2000 and 1500 cal. BC, followed possibly by the selective clearance of oak until cal. 1200 BC (Schoenwetter 1982). On a more regional scale, the pollen diagrams from Deep Clough, Central Rossendale, Lancashire, also suggest that clearance of woodland was relatively late, with a Late Bronze Age/Early Iron Age date suggested (Tallis and McGuire 1971).

It is clear from this brief review of regional environmental data that the Bronze Age landscape of this part of north-west England was a complex mosaic of different environments. Overall, there is a trend for carr woodland to dominate the valley floors before extensive clearance for agriculture during the Iron Age. The environmental record from Burrs broadly agrees with this general model, indicating a large, alder/hazel carr woodland adjacent to the channel, which eventually was cut off and infilled as a slow-flowing or still pool. However, in contrast to other sites in the north-west, no taxa indicative of intense human activities, such as cereal pollen, charred plant remains or charcoal, were recorded, despite the site's location immediately below the Iron Age Castle Steads hillfort. This suggests that the area of the hillfort was not occupied until after the date of this peat formation (e.g. post 920 to 800 cal. BC). However, as outlined above, it seems highly probable that Bronze Age settlements did exist within the Irwell valley between Bury and Ramsbottom. Notably the evidence includes the discovery in 1908 of two urns and a bronze dagger by Bury parish church, 1·8 km south of Burrs (SD 805110), the 1960s excavation of a ring bank cemetery at Whitelow Hillock, 3 km north of Burrs, and the circular cairn at Bank Lane (SD 805172).

There has been considerably less work on the entomological and plant macrofossil record for the region. Palaeoentomological studies are restricted to those associated with the Lindow (raised mire) bog bodies in Cheshire (Dinnin, pers. comm.; Girling 1986; Skidmore 1986) and limited work at Brooks Farm, North Lancashire (Osborne 1995). The English Heritage Environmental Archaeology Database only records a handful of published reports for Bronze Age waterlogged plant macrofossils in the region (http://ads.ahds.ac.uk/catalogue/specColl/eab_eh_2004; consulted Sept. 2008), with the majority of work carried out on mires under the auspices of the North West Wetlands Survey (Hall *et al.* 1995; Leah *et al.* 1997; Middleton *et al.* 1995; Wells *et al.* 1993); the results from Burrs appear to be the first published data directly from a river channel in the Greater Manchester area.

Nationally, the insect fauna recovered compares well with a number of other carr sites which have been examined. There is an obvious correspondence to faunas from several of the later trackways from the Somerset Levels that ran through similar alder woodlands (Girling 1977; 1979; 1980; 1985). Several deposits from the floodplains of the River Thames and Trent have produced similar faunas indicative of dense stands of alder carr (Dinnin 1997; Robinson 1991; 1993; 2000; Smith *et al.* 2005).

Conclusions

The organic-rich sediments infilling the small palaeochannel at Burrs Countryside Park, Bury, Greater Manchester, have provided a useful insight into the Middle to Late Bronze Age landscape of this area. Although extensive palaeoenvironmental studies have been undertaken in this part of north-west England, they have tended to focus primarily on the wetland mires which form such notable features of the contemporary landscape. Therefore, this record from a palaeochannel forms a useful comparative dataset, describing vegetation patterns in a more confined area of the valley floor. It demonstrates that this part of the Irwell Valley was densely wooded throughout the Bronze Age, and there are few signs of human activity, such as clearance and farming, even in the Late Bronze Age. This is particularly notable since the Iron Age hillfort at Castle Steads is adjacent to the site. This perhaps suggests that occupation of this promontory did not occur until the Iron Age.

This work has highlighted two methodological issues, which have wider implications. First, using pollen results from three sub-samples in this 50 cm sequence clearly only glosses over possible environmental changes during approximately 400 years, at most. As an anonymous reviewer pointed out, it would have been preferable to examine 10–12 pollen samples over this sequence. However, this work was carried out as part of commercial trial-trenching and without English Heritage or curatorial support, and most clients would be unsympathetic to expend so much resources on what is in essence a non-archaeological problem.

Although only speculative at this stage, we have put forward the possibility that a decline in one element of the pollen taxa (in this case arboreal pollen) could result in a relative increase in the proportions of other plant communities. This suggests that a multi-proxy approach to environmental reconstruction is essential to ensure that changes in arboreal pollen do not cloud our reconstruction of past environments.

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